Chehalis Basin Strategy Local Actions Program Technical Advisory Group Meeting #3

November 13, 2020

Agenda

- Welcome and Purpose of Meeting
- Introductions (small groups again in breakout rooms)
- Summary of results from November 9 meeting
- Potential for Increasing Floodplain Storage
- Potential Local Flood Protection Actions (Structural and Nonstructural)
- Next Steps and Closing

Introductions (again)

- Breakout rooms of three members
- Introduce yourself (one minute each)
- Name and affiliation
- If you have been involved in basin flood issues
- Fun fact about yourself

Tech Group Questions for Meeting

Potential for Increasing Floodplain Storage

- Are there other locations or alternatives for adding floodplain storage that should be considered?

- Are there other technical considerations for any of the potential floodplain storage locations?

Tech Group Questions for Meeting

Potential Local Flood Protection Actions (Structural and Nonstructural)

- Are you aware of other areas, besides the example priority areas, that have relatively high potential for flood damages and relatively dense development that should be added to the list for near-term consideration?

- Are there other possible structural or non-structural solutions and technical considerations?

Tech Advisory Group Schedule

Meeting #4: December 14, 2020
- Discussion and follow-up from meetings #1-3

Meeting #5: January 8, 2021
- Discussion and follow-up from meetings #1-4

Meeting #6: January 13, 2021
- Discussion and follow-up from meetings #1-5

Meeting #7: February 8, 2021
- Discussion and follow-up from meetings #1-6

Summary of November 9 Technical Advisory Group Meeting

November 9 Meeting Feedback

- Use of existing hydraulic models can provide information for a comparative assessment
- Hydraulic model results may overestimate the floodplain and/or include extra areas
- Modeled floodplain needs to be ground-truthed with landowners and local floodplain managers
- Use LiDAR and/or BFE amendments to define tributary streams

November 9 Meeting Feedback (Continued)

- Conduct coarse-scale hydraulic modeling in basins without models
- Assess various increases floodplain area and depth
- Obtain damage information from past flood events to prioritize modeling
- Include a vulnerability assessment to determine upstream and downstream effects
- Consider development trends (current and future)
- Consider long-term forestry practices / conservation, which may affect flood rates

Focus of Meeting

- Potential for Increasing Floodplain Storage
- Potential Local Flood Protection Actions (Structural and Nonstructural)

Chehalis Basin Strategy Local Actions Program

Technical Advisory Committee Meeting #3

November 13, 2020

Outline of Memo and Presentation

- Board Planning Assumptions (page 1)
- Board Desired Outcomes (page 1)
- Questions for TAG (page 2)
- Floodplain Storage Projects Benefits and Constraints
- Summary of Previous Studies of Floodplain Storage (pages 2-6)
- New Evaluation of Additional Sites for Floodplain Storage (page 7-12)
- Near-term Option for Storage Evaluation (page 12)
- Long-term Options (page 13)

Board Planning Assumptions for

- **Plan for the 100-year flood conditions that are predicted for 2080 when considering outcomes and actions**
- **Projects funded through the program will be designed, implemented, and mitigated to avoid making flood damage worse in other areas**
- *Consider a timeframe of up to 30 years to implement the actions*

These planning assumptions provide the foundation for all the outcome measures agreed to by the Chehalis Basin Board

Board Desired Outcomes

- Valuable Structures Protected From Catastrophic Flooding
- Homes & Businesses Protected From Seasonal Urban Flooding
- Farmland & Rural Structures Protected
- Critical Facilities Protected
- Transportation Routes Protected

Questions for TAG

- Are there other locations or alternatives for adding floodplain storage that should be considered?
- Are there other technical considerations for any of the potential floodplain storage locations listed in Table 2 that would change their viability between the YES, MAYBE, NO classifications?

Additional Floodplain Storage

Benefits

- Can be combined with environmental enhancement
- Self-sustaining with low maintenance costs
- Lower cost than “structural” options
- Don’t require “operation” or active management

Constraints

- Difficult to achieve flood reduction across wide range of flows
- Limited opportunities
- Requires large area and volume to achieve meaningful flood reduction
- Effectiveness diminished for extreme floods on major rivers

Review of Past or Current Projects

General Reevaluation Report for the Centralia Flood Damage Reduction Study (USACE, 2003) *(see Page 3 in technical memorandum)*

- Considered broad range of alternatives for flood reduction
- Sought flood reduction for structures and transportation infrastructure in the 100-year event (Feb 1996 flood)
- At least three options included additional floodplain storage: distributed upstream storage, floodplain reconnections, enhanced floodplain storage and flow constriction
- Finding: did not adequately reduce flood hazards, or needed additional structural elements (dams and levees) to achieve goal

Review of Past or Current Projects

Restorative Flood Protection Alternative for Upper Chehalis Basin and Newaukum River (Abbe et.al. 2016 and 2020) *(see Page 4 in technical memorandum)*

- Considered broad improved floodplain connectivity and floodplain "roughening" to enhance floodplain storage
- Sought flood reduction across wide range of flows from 2-year to 100-year late century conditions
- Evaluated as option to the dam and therefore considered effects on flooding in Centralia and Chehalis during extreme floods
- Finding: reduced 100-year flood water level by 0.4 feet at Airport Levee

NSD will give a more detailed presentation on RFPA at December TAG Meeting

Review of Past or Current Projects

City of Chehalis Wastewater Treatment Plant Restoration and Flood Storage Master Plan (City of Chehalis, 2020) *(see Page 5 in technical memorandum)*

- Habitat enhancement and flood storage on 156 acre site near Chehalis
- Excavates 1.5 million cubic yards (930 acre feet) of new flood storage volume along mainstem Chehalis
- Potential for upstream flood reductions resulting from additional storage and shift in timing of flows, downstream results include increases and decreases
- Currently evaluating options to eliminate downstream water level increases, which may affect upstream water level reductions

Review of Other Past Projects

Other projects reviewed:

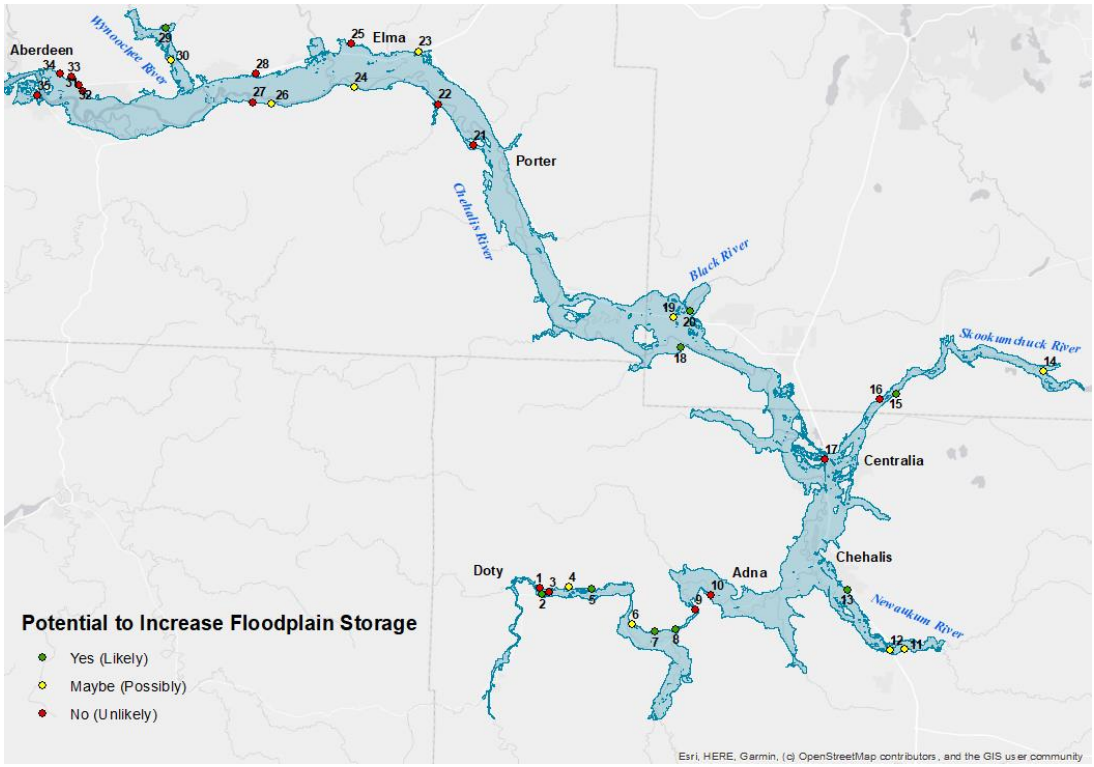
- Porter Oxbow Storage Project
- China Creek Flood and Habitat Mitigation
- Lower Satsop Floodplain Restoration (Chehalis Basin Strategy, ASRP)
- South Fork Newaukum Early Action Project (ASRP)
- Stillman Creek Early Action Project (ASRP)
- Skookumchuck River Early Action Project (ASRP)

Generally these projects focused on habitat restoration and cited potential flood storage additions as an ancillary benefit.

Flood reductions generally anticipated to be localized and mostly for smaller flood events

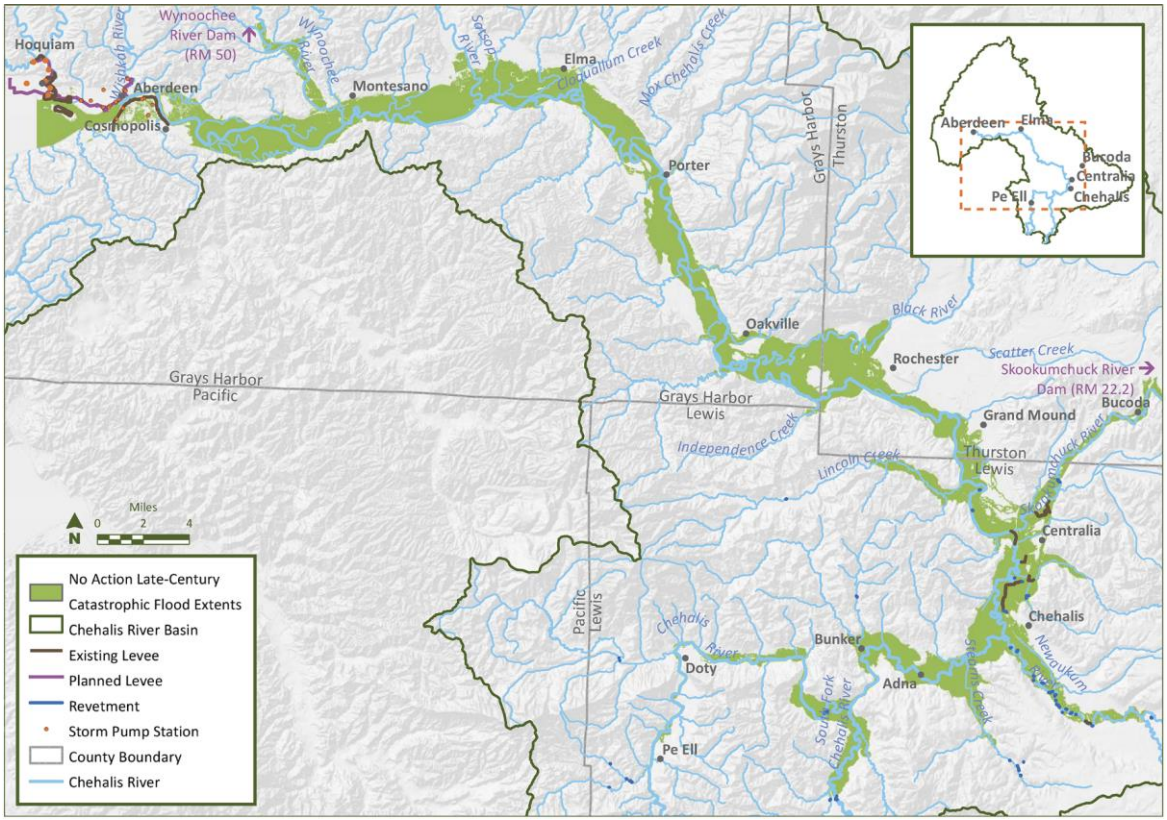
New Evaluation Of Floodplain

- Used latest 2D model results for 2080 100-year flood (WSE, 2019)
- Identified areas for new or augmented flood storage
- Quantified potential additional storage volume
- Qualitatively evaluated potential impacts (eliminated some sites)



New Evaluation Of Floodplain

- Existing flood protection facilities (levees)
- Limited or no possibility for setbacks as there are very few levees
- These will be discussed more in Merri's presentation on local flood protection opportunities



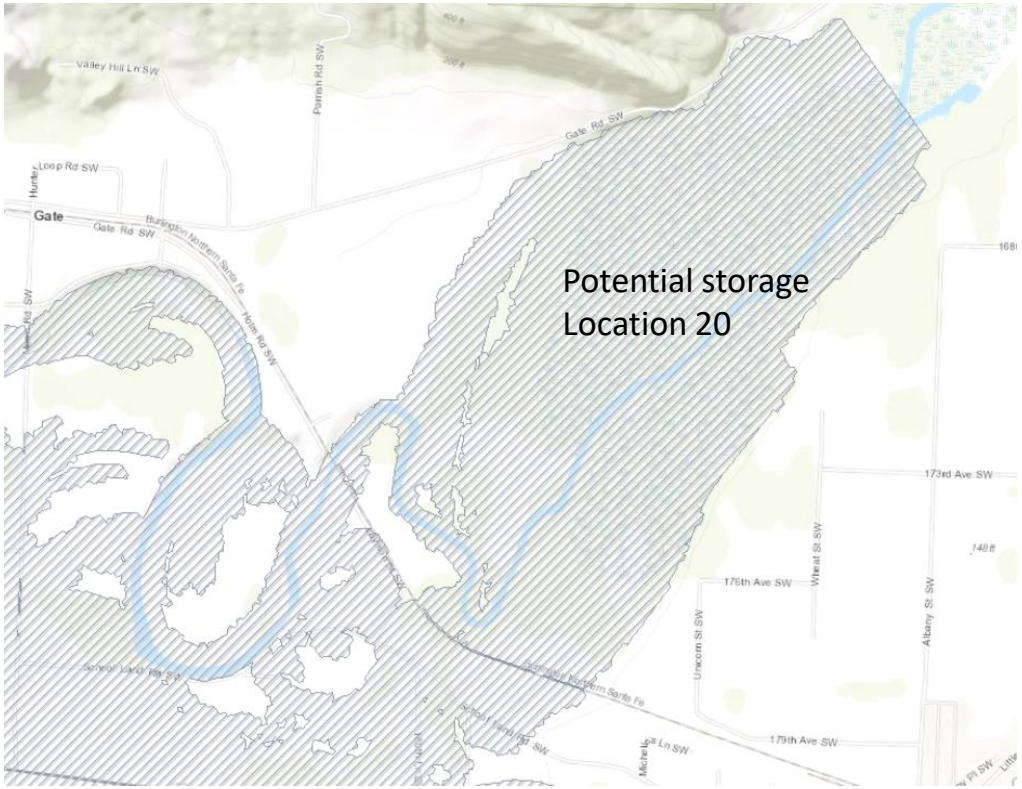
Results of New Evaluation Of

- 9 locations with good viability for new storage (YES)
- 10 locations with possible viability (MAYBE)
- 15 locations either too small or with likely adverse impacts to warrant further evaluation (NO)
- Total potential storage in 19 YES or MAYBE locations is about 1,550 acre feet

POTENTIALLY VIABLE LOCATION FOR FLOODPLAIN STORAGE (YES)		POSSIBLE BUT WITH LIMITED VIABILITY FOR FLOODPLAIN STORAGE (MAYBE)		UNLIKELY TO PROVIDE FLOODPLAIN STORAGE WITHOUT IMPACTS (NO)	
2	Doty-Dryad Road along right bank slightly elevated, limiting overflows to farmland with storage potential.	4	Floodplain area cut off by Willapa RR trail, likely too small to be significant.	1	Backwater from Willapa RR trail already provides upstream storage, downstream properties would be impacted.
5	Old road grade blocks flood access to north floodplain.	6	Willapa RR trail does not overtop. Landward floodplain backwaters but does not completely fill.	3	Chandler Road already stores water upstream but would exacerbate flooding downstream for at least one structure.
7	Willapa RR trail prevents complete filling of area north. Would flood several feet deeper.	11	Kirkland Road blocking access to south floodplain, but if opened would likely short-circuit flow exacerbating downstream flooding.	9	Willapa RR trail blocks left overbank flow, but currently adds some upstream storage and prevents short-circuiting.
8	Willapa RR trail blocks access to modest landward floodplain area.	12	Levee and I-5 fill flock overflow. Would lose storage upstream and flood development downstream.	10	Willapa RR trail partially blocks area south. Would only add minimal depth and volume, and may short-circuit natural flow path.
13	I-5 grade blocks access to northeast floodplain margin and ponds.	14	Skookumchuck Road may block some floodplain access to north, but homes could be impacted.	16	Highway cuts off some floodplain area to the west, but too small to have significant benefit.
15	BNSF RR cuts off landward floodplain and remnant channel.	19	Head difference across SR 12 suggests it is limiting flood volume to the north. Could impact farms.	17	I-5 at Centralia cuts off access to downstream floodplain, but this is too highly developed.
18	Old RR grade does not overtop. Landward floodplain backwaters but does not completely fill.	23	SR 12 blocking full access to north floodplain. Already floods but could be slightly deeper.	21	Nursery perimeter berm may inhibit floodplain storage function, but flooding nursery not an option.
20	Head difference across RR grade southwest to northeast indicates flood access is constricted into Black River floodplain.	24	Old RR grade blocks access to tributary backwater storage, but a culvert likely already exists.	22	Old RR grade blocking access to small part of floodplain to southwest, but too small to be significant.
29	Wynoochee Valley Road only barely overtops, not completely filling landward floodplain.	26	Old RR grade blocks access to backwater storage. Small area but reasonably deep.	25	RR grade may block access to some north floodplain, but small area at very shallow flood depths.
		30	Full access to ponds limited by perimeter berm, would increase pond volume only marginally.	27	Minkler Road appears to cut off a tributary, but likely small and may flood a homestead.
				28	SR 12 freeway appears to cut off small tributary backwater storage. Likely culvert not in model.
				31-34	Roadways cut off series of small backwater floodplains, but culvert(s) likely exist. Possible private property impacts. Minimal benefit this far downstream.
				35	Levee blocks floodplain access on edge of Cosmopolis, but too urbanized and too far downstream for any downstream benefit.

Summary of New Evaluation Of

- Largest potentially viable location (No. 20) on Black River near SR-12 (± 1,100 acre feet)
- 300 acre feet of potentially viable storage upstream of Centralia
- FRE provides 65,000 acre feet of storage and reduces water levels in Centralia by about 2.7 feet (0.04 feet per 1,000 acre feet of storage)



Questions for TAG

- Are there other locations or alternatives for adding floodplain storage that should be considered?
- Are there other technical considerations for any of the potential floodplain storage locations listed in Table 2 that would change their viability between the YES, MAYBE, NO classifications?

Discussion

Chehalis Basin Strategy Local Actions Program

Technical Advisory Committee Meeting #3

November 13, 2020

Outline of Memo and Presentation

- Board desired outcomes
- Existing flood protection facilities
- Previously proposed flood protection facilities
- Example priority areas that could be considered for flood protection facilities
- Near-term and long-term options for consideration
- Questions for TAG

Local Flood Facilities – Board Desired Outcomes

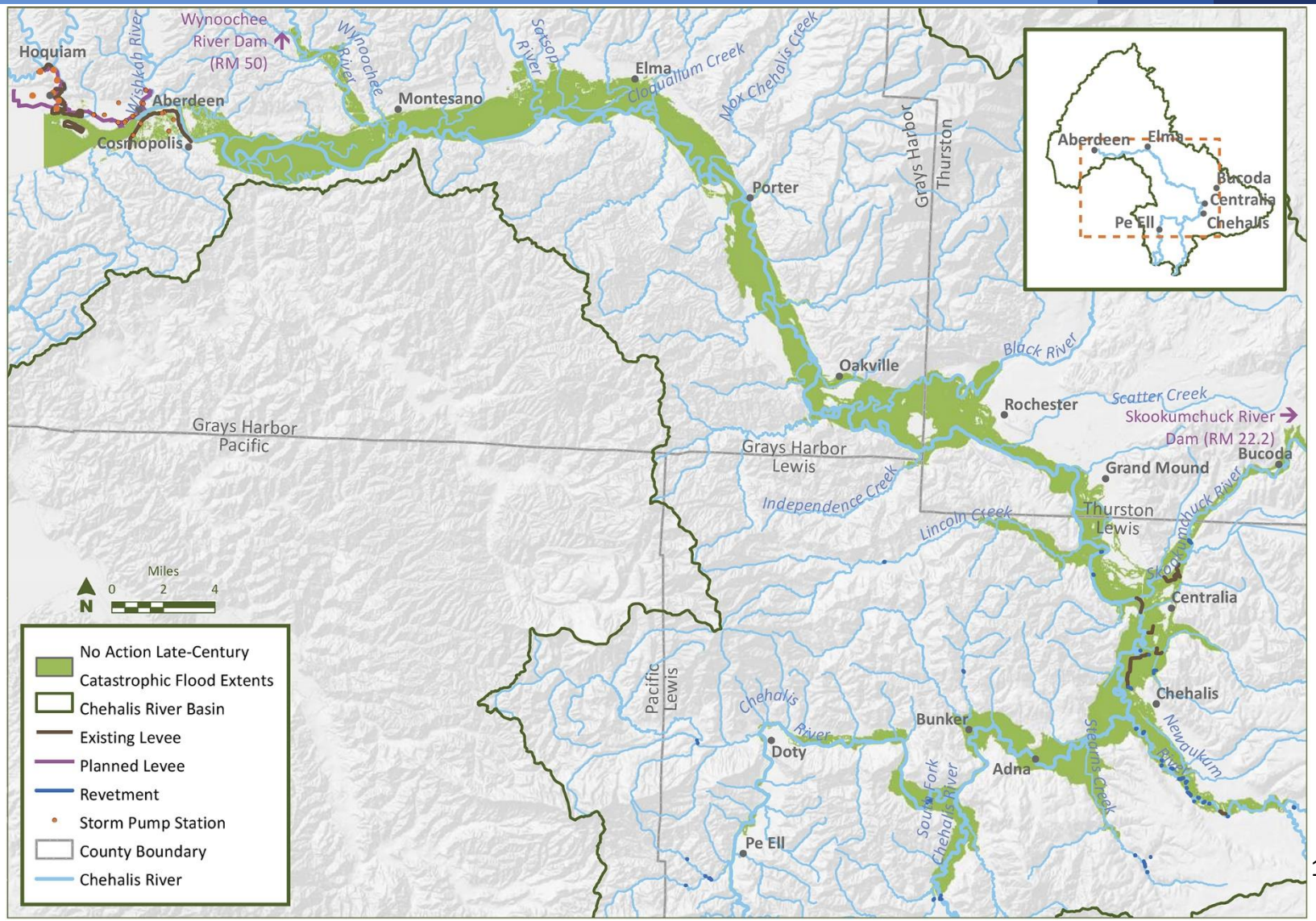
- **X percent of all structures in each county that could be flooded by the 2080 predicted 100-year flood levels in the basin would no longer be vulnerable to flood damage**, because they are protected by localized infrastructure, floodproofed/elevated, or the structure has been removed (Outcome 1: Valuable structures protected from mainstem, catastrophic flooding).
- **X percent of all critical facilities that could be flooded by 2080 predicted 100-year flood levels would no longer be vulnerable to flood damage**, because they are protected by localized infrastructure, elevated/floodproofed, or relocated (Outcome 5: Critical Facilities Protected).
- **A substantial reduction in the overtopping and closure of Interstate 5 (I-5) and the BNSF rail mainline would be achieved for 2080 predicted 100-year flood levels**, and alternative routes would be available to minimize negative effects of closures on freight mobility and commerce (Outcome 6A: Transportation Routes Protected).

Questions for TAG

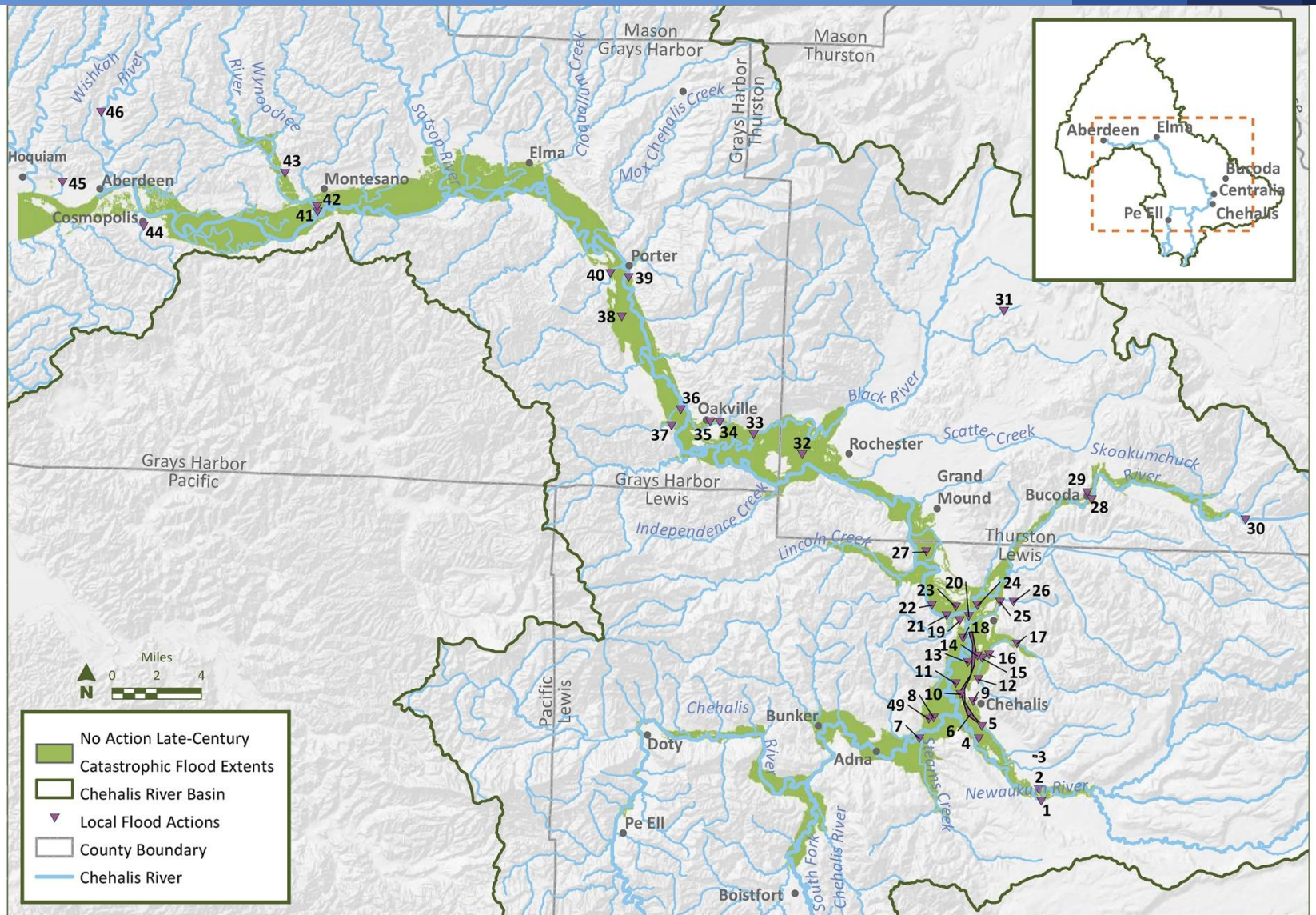
- Are you aware of other areas, besides the example priority areas, that have relatively high potential for flood damages and relatively dense development that should be added to the list for near-term consideration?

- Are there other possible structural or non-structural solutions and technical considerations?

Existing Flood Protection Facilities

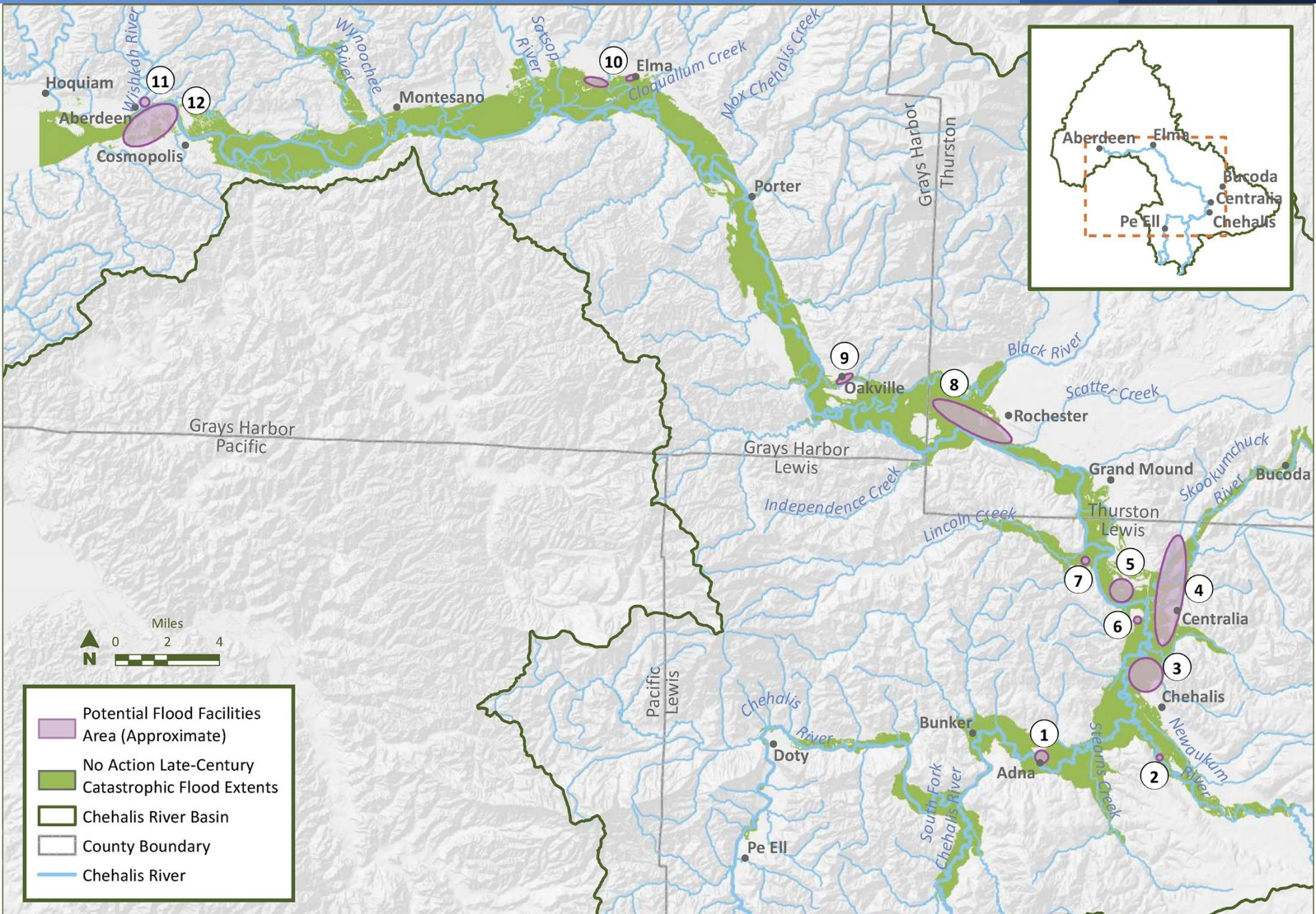


Previously Proposed Flood Protection Facilities or Other Actions



Example Priority Areas for Consideration

1. Adna
2. Lower Newaukum
3. Airport Levee/Chehalis
4. Centralia
5. West Centralia
6. Military Road
7. Galvin
8. Independence Road and north floodplain
9. Oakville
10. Elma
11. South Aberdeen Levee Area
12. East Aberdeen


Hoquiam
Aberdeen
Cosmopolis
Wishkah River
Wynoochee River
Satsop River
Montesano
Elma
Cloquallum Creek
Mox Chehalis Creek
Porter
Grays Harbor
Thurston
Oakville
Black River
Scatter Creek
Rochester
Grays Harbor
Pacific
Grays Harbor
Lewis
Independence Creek
Lincoln Creek
Thurston
Lewis
Grand Mound
Skookumchuck River
Bucoda
Centralia
Chehalis
Bunker
Adna
Doty
Chehalis River
Pacific
Lewis
Pe Ell
South Fork Chehalis River
Stearns Creek
Newaukum River
10
11
12
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4
6
3
1
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Aberdeen
Elma
Bucoda
Centralia
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Chehalis
Miles
0
2
4
N
Potential Flood Facilities Area (Approximate)
No Action Late-Century Catastrophic Flood Extents
Chehalis River Basin
County Boundary
Chehalis River

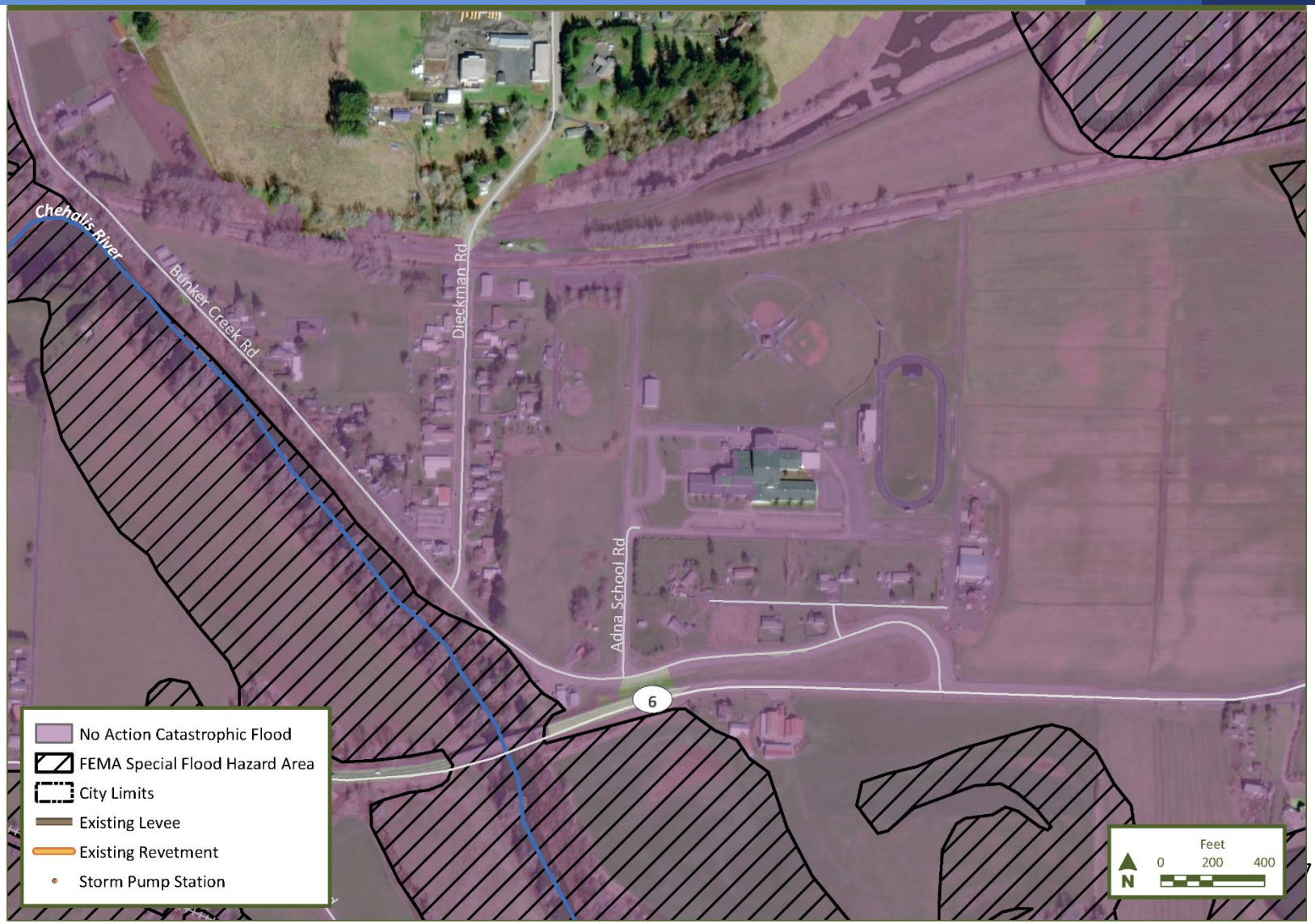
Methods

- Used recent aerial photography and modeled 2080 catastrophic floodplain extent to identify areas with a relatively high number of structures and density of development and then also overlaid economic damage mapping
- Identified example priority areas
- Overlaid example priority areas with structure database to identify number of structures in each area

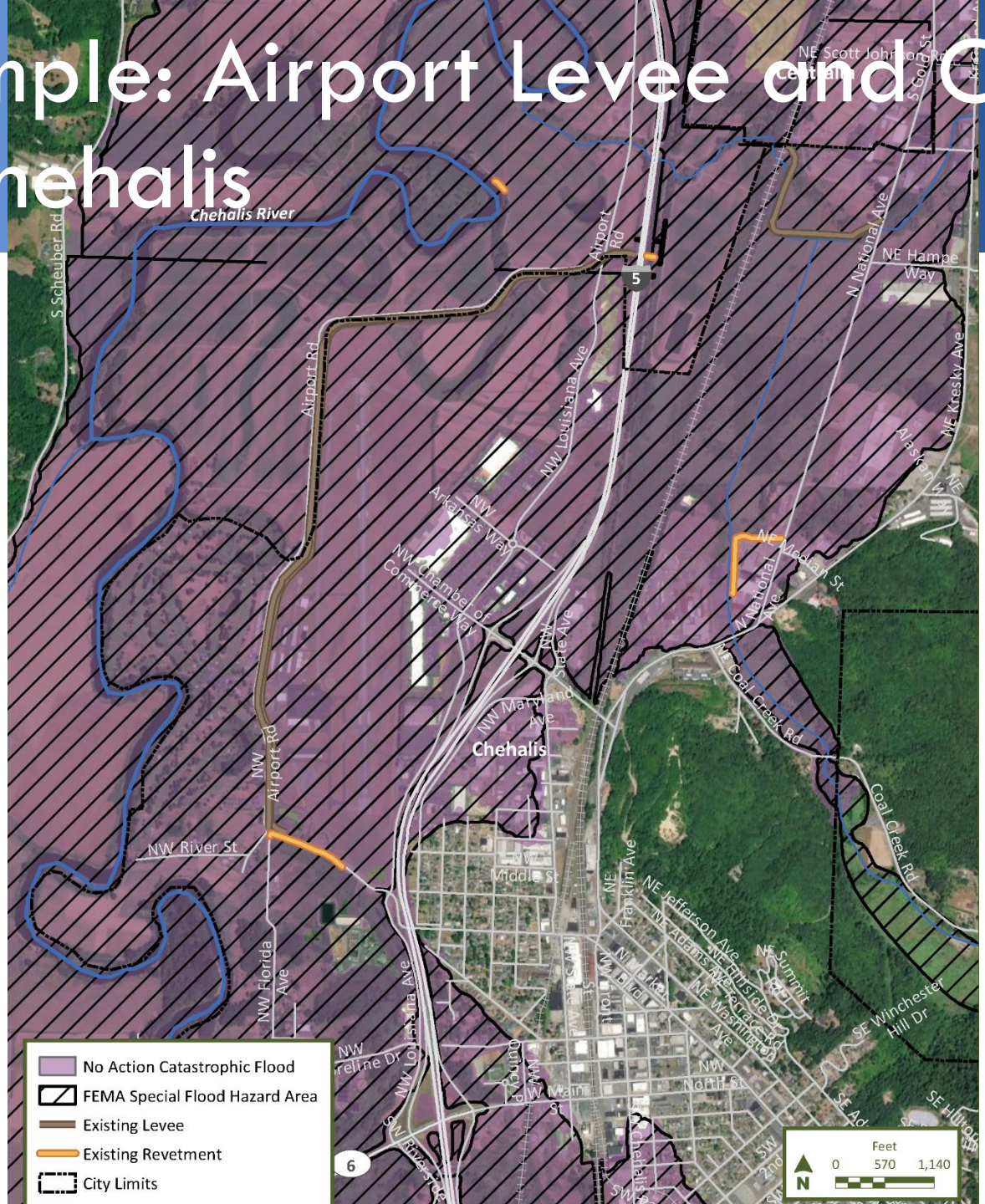
Facilities or Other Actions to Consider; Primarily in Combination

- Levees
- Floodwalls
- Road raising
- Bridge widening
- Drainage improvements
- Pump stations
- Floodproofing
- Relocations
- Flood storage
- Combination with ASRP restoration elements

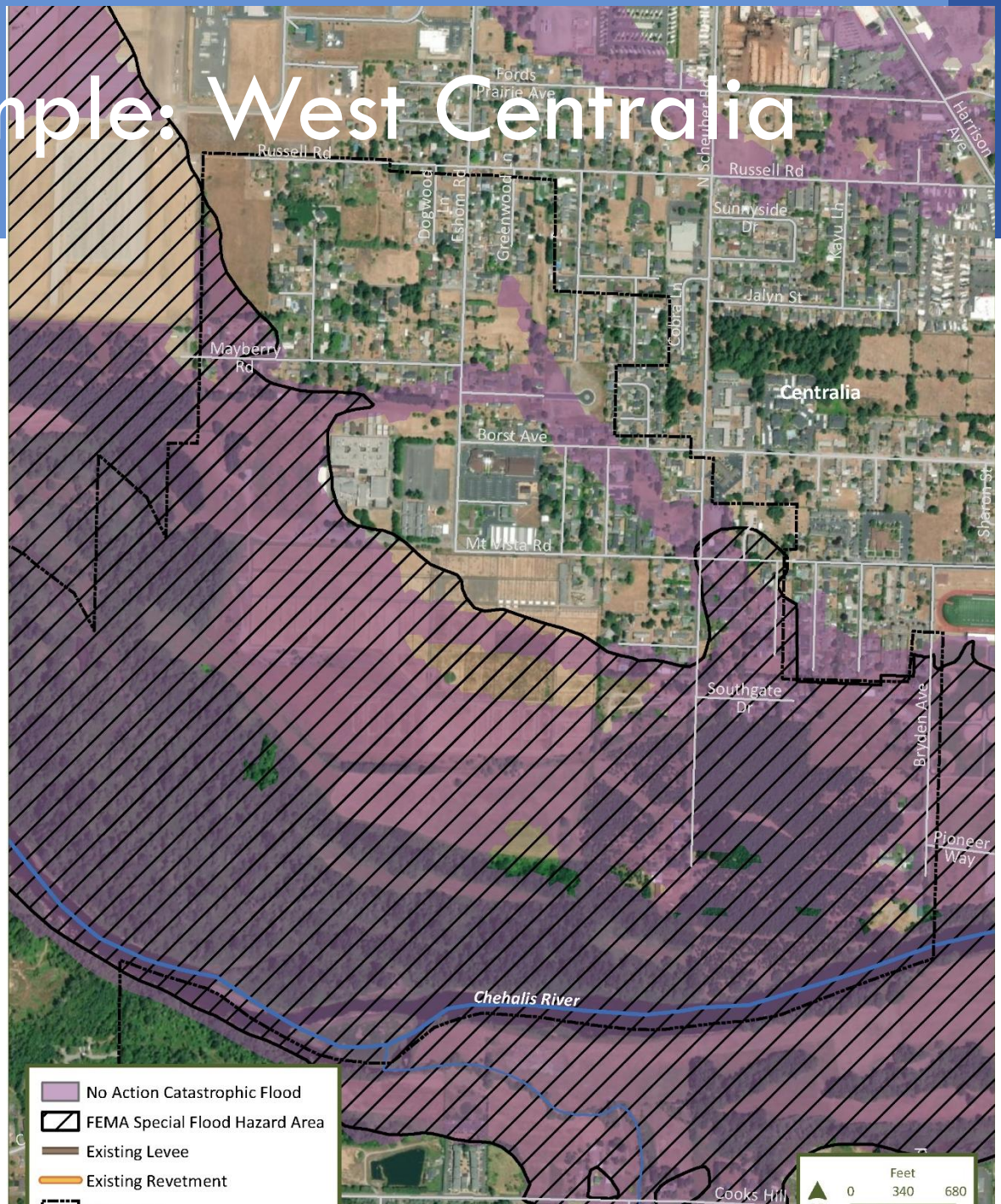
Example: Adna



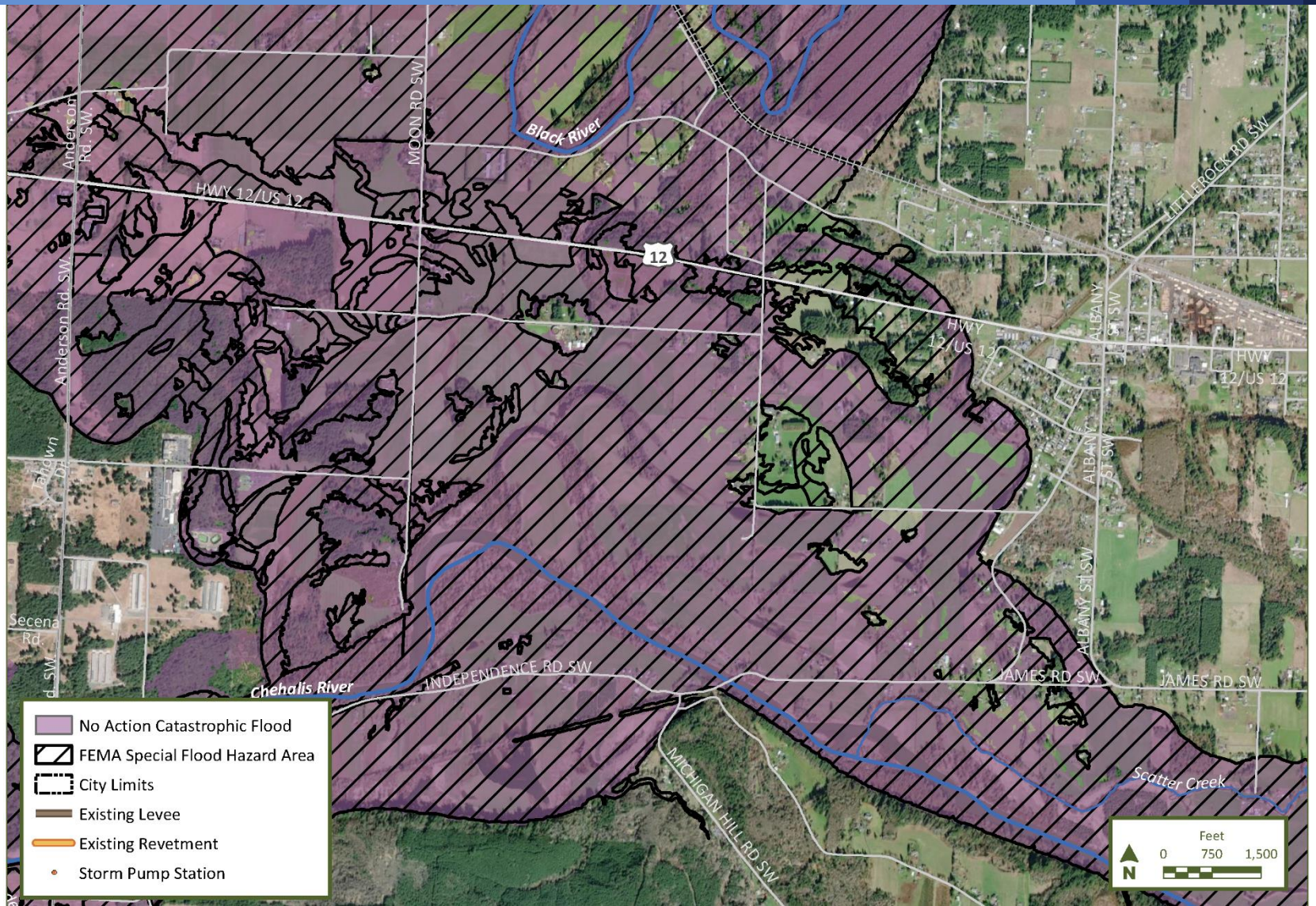
Example: Airport Levee and City of Chehalis



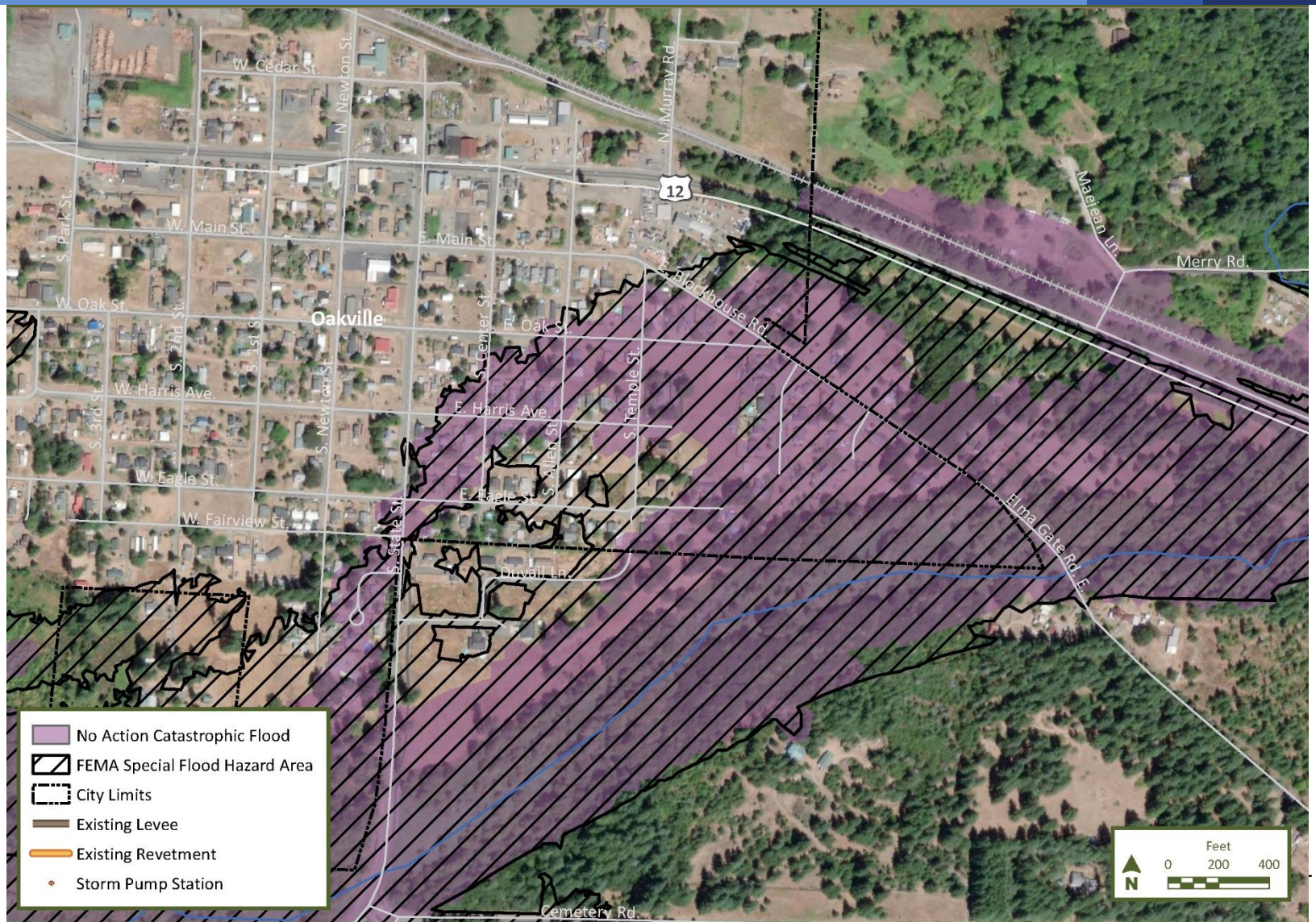
Example: West Centralia



Example: Independence Road and North Floodplain



Example: Oakville



LOCATION	DESCRIPTION AND NUMBER OF STRUCTURES IN MODELED 2080 FLOODPLAIN	POSSIBLE SOLUTIONS AND TECHNICAL CONSIDERATIONS
1. Adna	Concentration of residences and high school **Structures = 83**	Drainage solution implemented in 2013; potential levee or road raise to further protect Adna
2. Lower Newaukum	Moderate number of residences near Stan Hedwall Park **Structures = 20**	May be too few structures for levee
3. Airport Levee and Chehalis	Airport levee and I-5, commercial district of Chehalis. **Structures = 215**	Possible raise of levee, I-5, or floodwalls; combine with other actions such as raising local roads
4. Centralia	Majority of Centralia east of I-5, flooding from Skookumchuck in north half; from Salzer/Chehalis in south half **Structures = 3,484**	Possible new, raised, or setback Skookumchuck levees; possible extension of Long Road levee to protect South Centralia; possible road raises to protect downtown
5. West Centralia	Centralia west of I-5 **Structures = 508**	Potential new levee similar to segment proposed by Corps studies; combine with other actions such as removing fill, raising roads, or widening bridges
6. Military Road	Residential **Structures = 34**	Potential road raise
7. Galvin	Concentration of residences **Structures = 87**	Possible road raise; could also consider flood storage
8. Independence Road and north floodplain	Right bank floodplain of Chehalis River, nearly 40% of river flow goes north towards Black River; numerous residences, Chehalis Reservation **Structures = 306**	Possible causeway or road raises
9. Oakville	South part of town **Structures = 172**	Possible levee and pump station
10. Elma	South Elma along north side of Highway 12; water flows over Highway 12 to low spot **Structures = 148 structures**	Possible raise of Highway 12, levee and pump station
11. South Aberdeen Levee Area	Area protected by levee still experiences tidal, local, and tributary flooding **Structures = 1,203**	Possible pump station and raise of levee; removal of fill on riverward side of levee for flood storage
12. East Aberdeen	Tidal flooding near Wishkah River in commercial area; not protected by North Shore Levee	Possible pump station and fill removal to increase flood storage; floodproofing

Discussion

Questions for TAG

1. Are you aware of other areas, besides the example priority areas, that have relatively high potential for flood damages and relatively dense development that should be added to the list for near-term consideration?

2. Are there other possible structural or non-structural solutions and technical considerations?

Questions for Next Meeting

1. From a technical perspective (e.g., design, engineering, hydrology and hydraulics), how would you categorize the options in terms of the extent of damage/risk reduction potential relative to the degree of project complexity/cost (e.g., HIGH, MEDIUM, LOW potential for damage/risk reduction relative to LOW, MEDIUM, HIGH degree of project complexity/cost)?
2. Which options have the greatest potential overlap with the Aquatic Species Restoration Plan (ASRP) habitat protection/restoration priorities (either positive synergies or potential negative impacts)?
3. What are the pros and cons of each option described in this memorandum?