Highway Flood Protection

I-5, SR6, & US12

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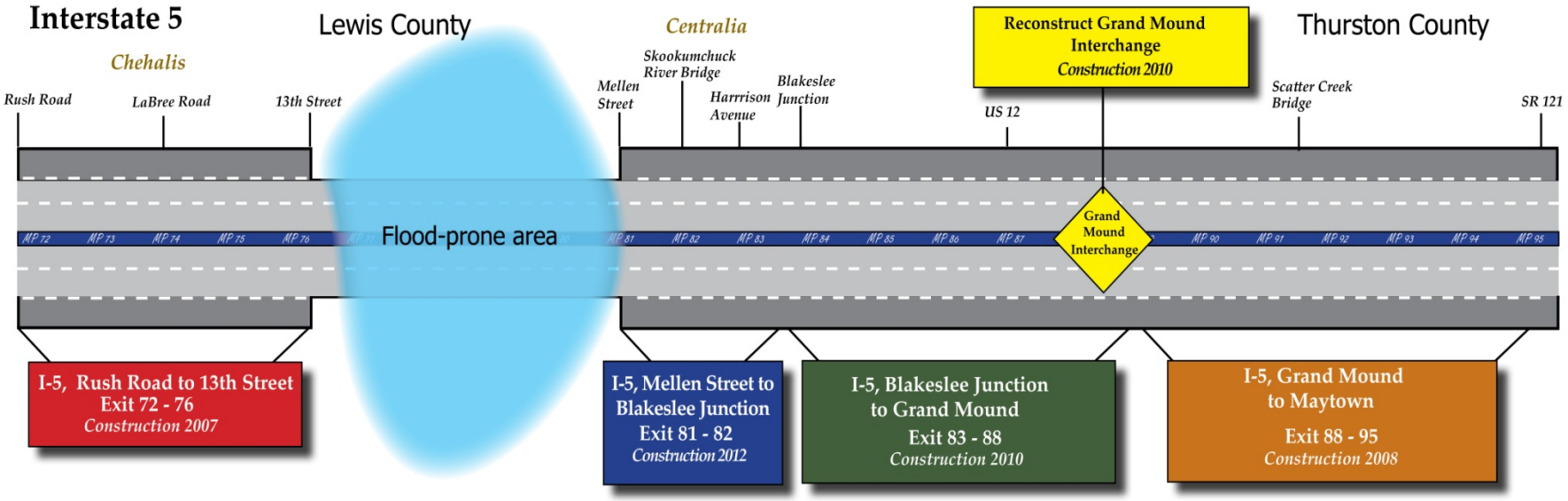
Washington State Department of Transportation

Overview of I-5 improvements

Funded Projects



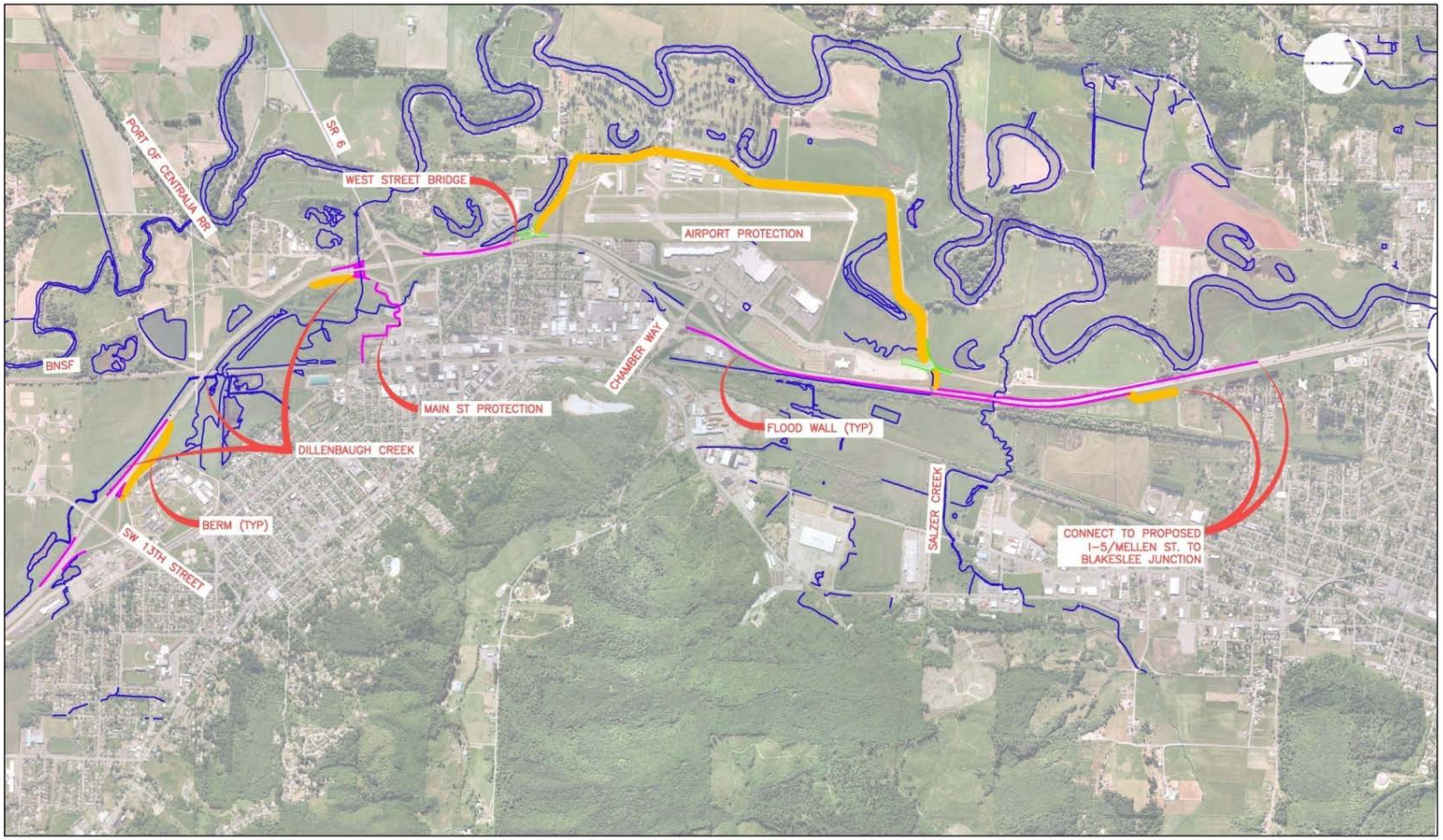
Conceptual Alternatives to Protect I-5
Including protecting Airport

- Raise I-5 using fill material
  - Raise only
  - Raise and widen to six lanes
- Raise I-5 using a viaduct (long bridge with piers)
- Relocate I-5 outside flood area
- Protect I-5 with walls and levees
- Construct I-5 express lanes
- Construct I-5 temporary by-pass lanes

Conceptual Alternatives to Protect I-5
Including protecting Airport

▪ Raise I-5 using a viaduct	Concept dropped
▪ Relocate I-5 outside flood plain	Concept dropped
▪ I-5 Express lanes	Concept on hold
▪ I-5 Temporary by-pass lanes	Concept on hold

Protect I-5 with walls and levees



[Hyperlink to Exhibit]

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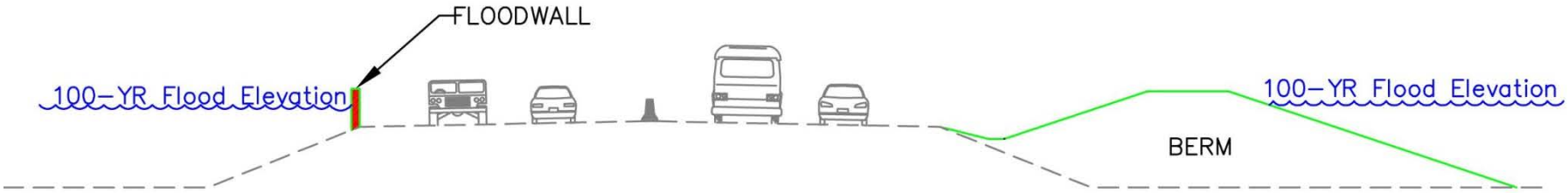
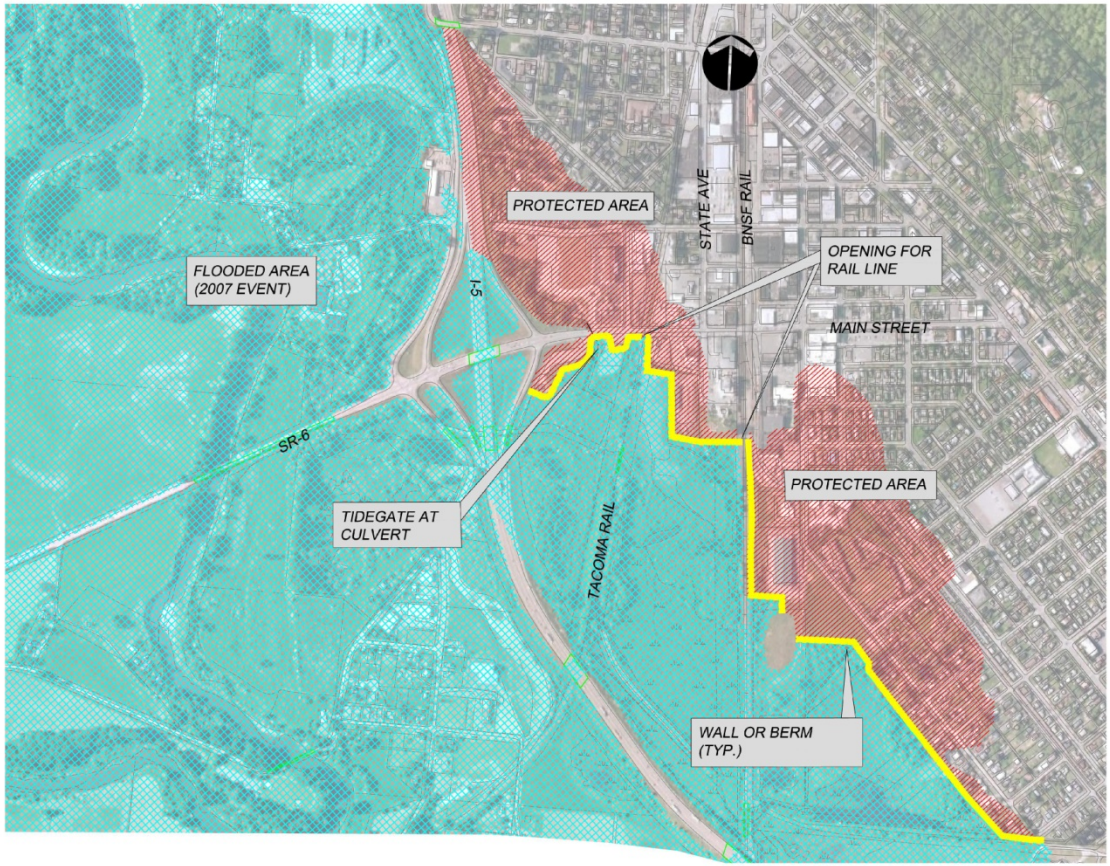
Protect I-5 with walls and levees
Approach

- Design Concept for Walls
  - Install at edge of pavement
  - Use to avoid impacts
- Design Concept for Berms
  - Use where adjacent ground is not too high
  - Use to develop storm water treatment areas



Protect I-5 with walls and levees

Wall or levee south of Main Street



Conceptual Alternatives to Protect I-5
Including protecting Airport

Presently refining only the “Protect I-5 with walls and levees” concept

Includes one design with dam and one design without dam options

Focusing on several areas

- Airport Levee – avoidance of airspace encroachment
- Chehalis Avenue Levee – storm water runoff
- Dillenbaugh & Salver Creek Bridges

Protect I-5 with walls and levees

Options Evaluated for Specific Areas

- Dillenbaugh Creek Options
  - Attach Walls to Bridge
  - Install Culvert Under Bridge
  - Raise Bridges
  - Realign Dillenbaugh Creek

- Selected Culvert Option for Cost Estimate

I-5 crossing of Dillenbaugh Creek

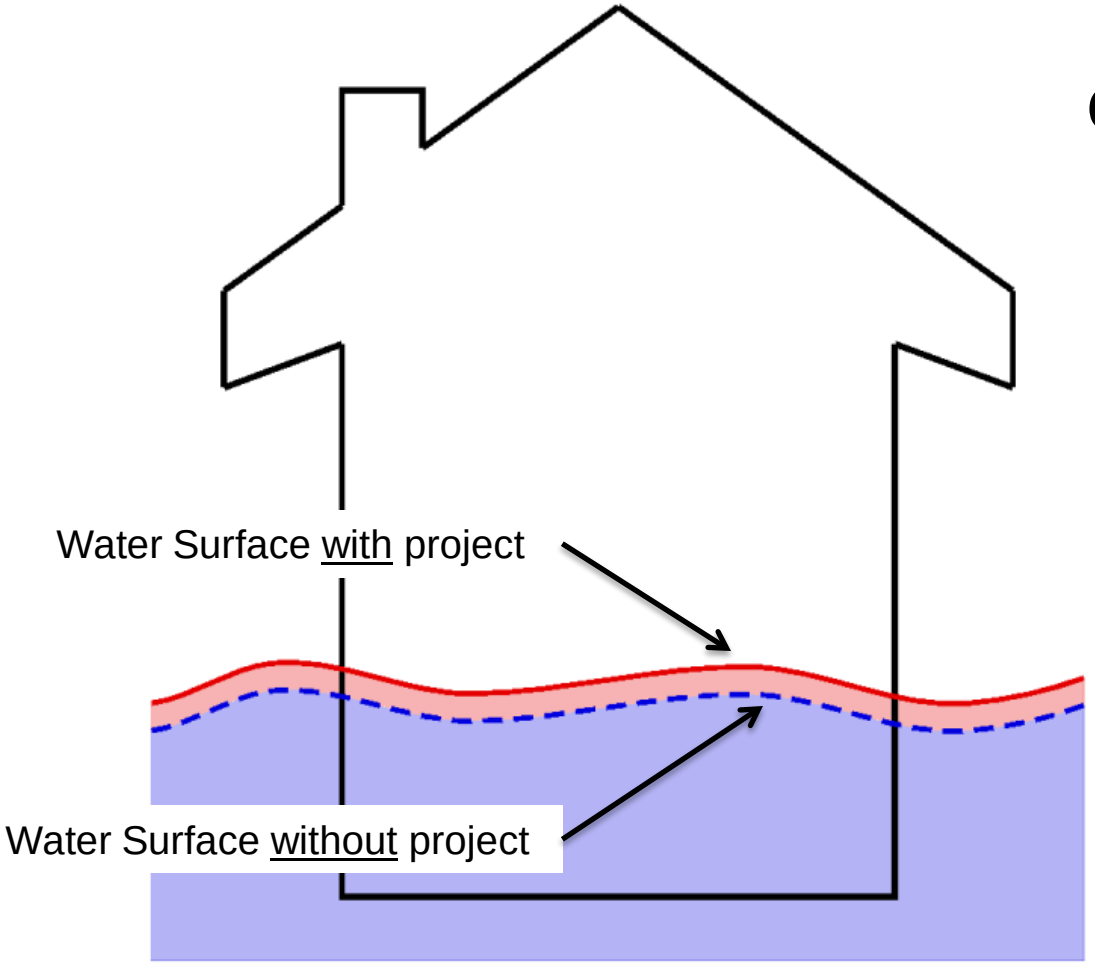
- Salzer Creek Options
  - Attach Walls to Bridge
  - Install Culvert Under Bridge
  - Raise Bridges

- Selected Culvert Option for Cost Estimate

I-5 Crossing of Salzer Creek

Protect I-5 with walls & levees

Initial Data – 100 year event



Change in Water Surface

Increases

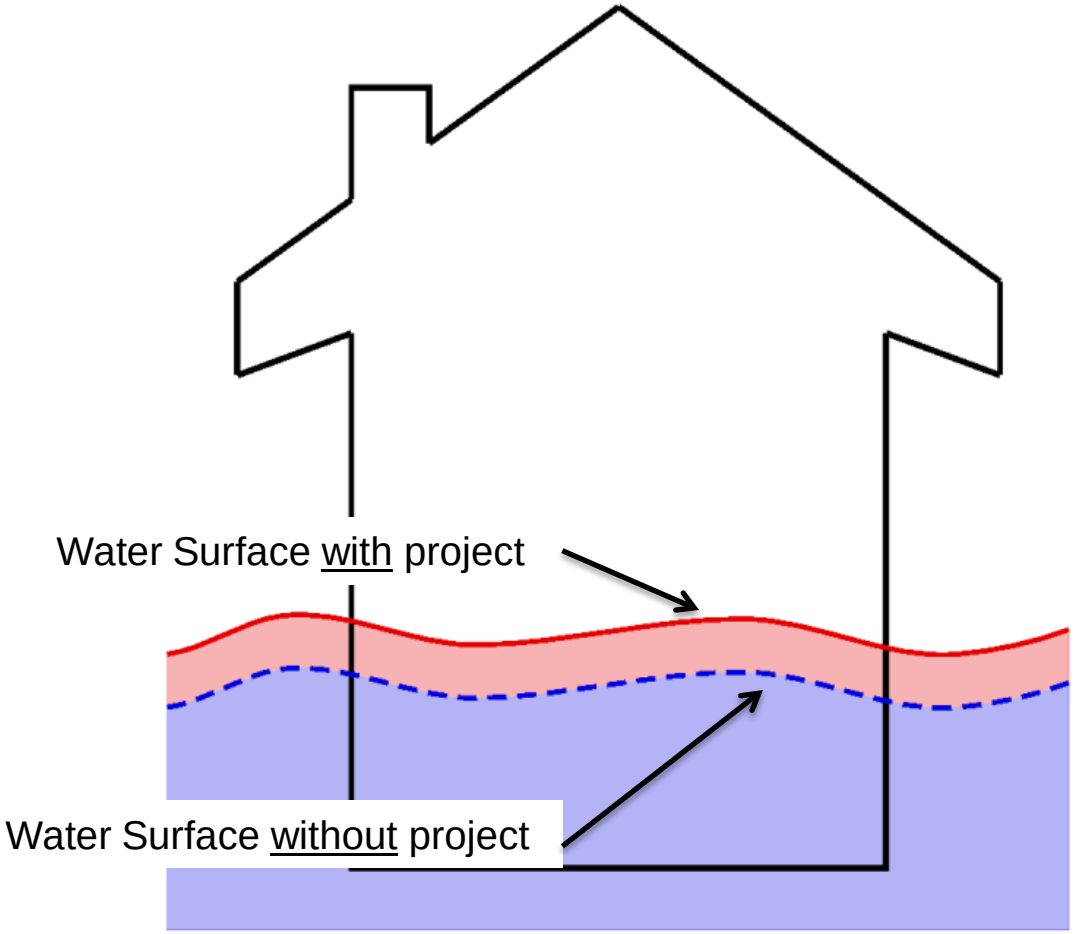
½ inch to 6 inches

Number of Structures Affected

571

Protect I-5 with walls & levees

Initial Data – 100 year event



Change in Water Surface

Increases

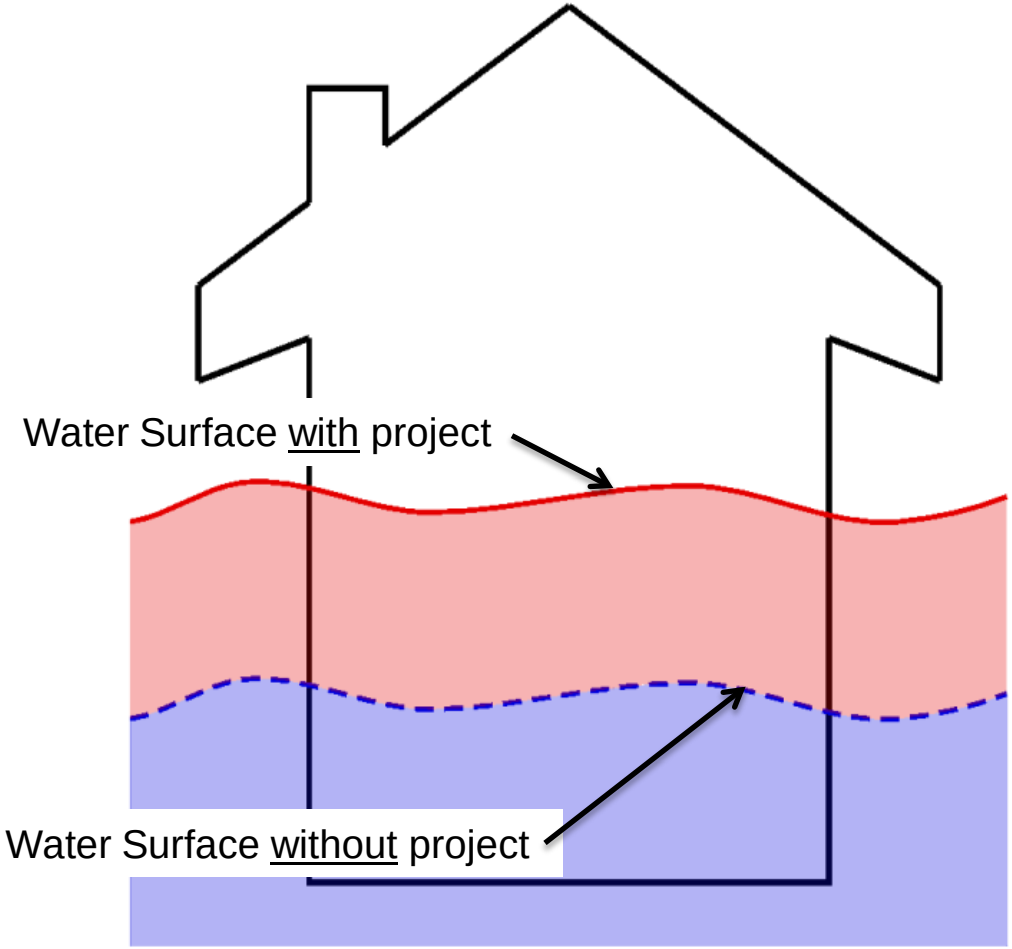
6 inches to 1 foot

Number of Structures Affected

33

Protect I-5 with walls & levees

Initial Data – 100 year event



Change in Water Surface

Increases

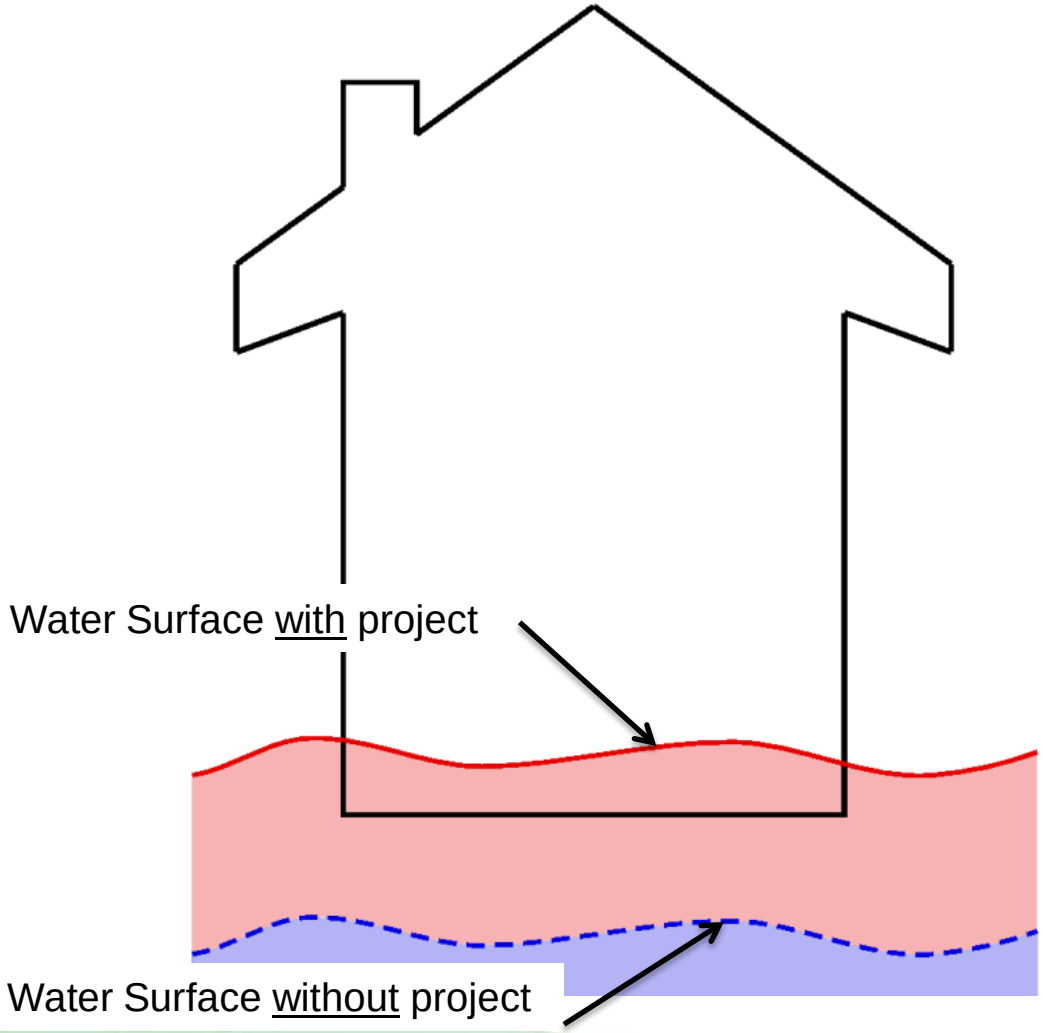
Greater than 1 foot

Number of Structures Affected

0

Protect I-5 with walls & levees

Initial Data – 100 year event

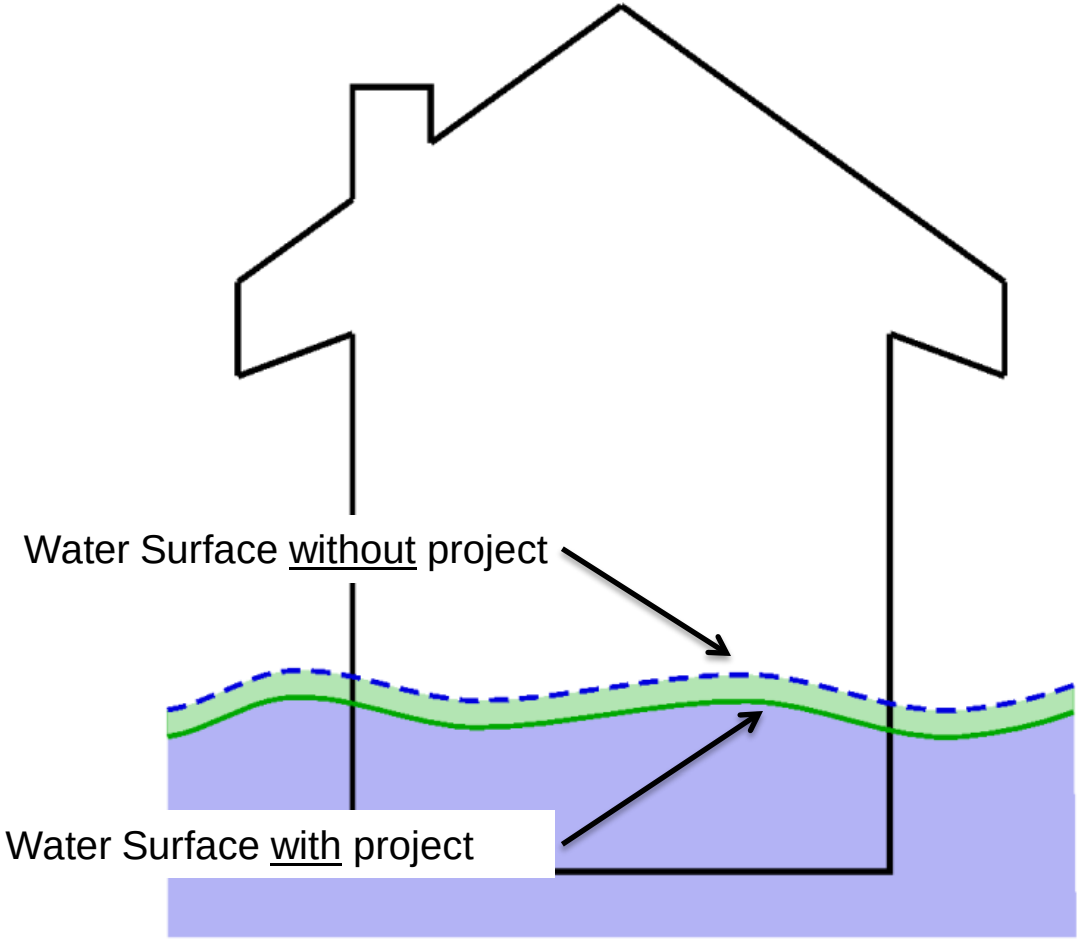


Total Number of Structures
Dry to Wet

29

Protect I-5 with walls & levees

Initial Data – 100 year event



Change in Water Surface

Decreases

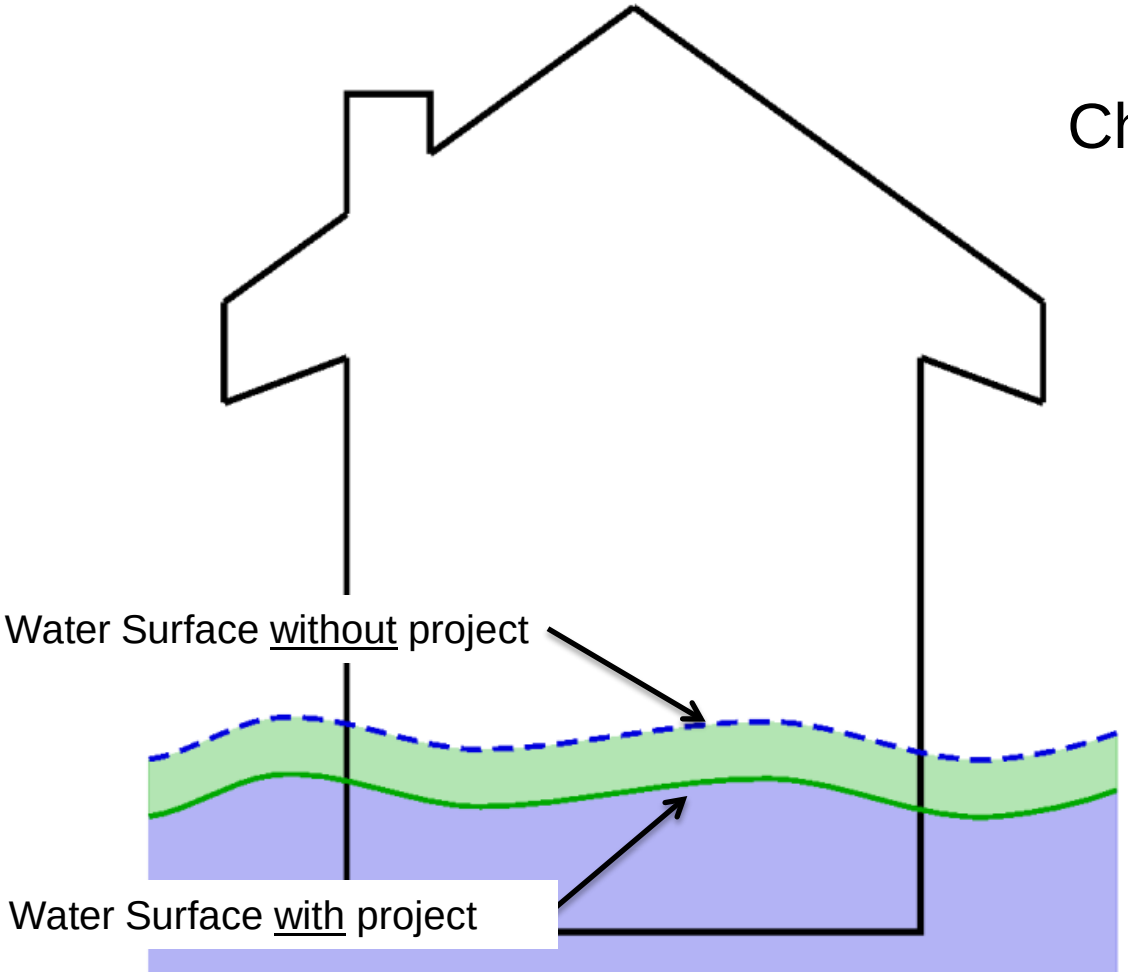
½ inch to 6 inches

Number of Structures Affected

165

Protect I-5 with walls & levees

Initial Data – 100 year event



Change in Water Surface

Decreases

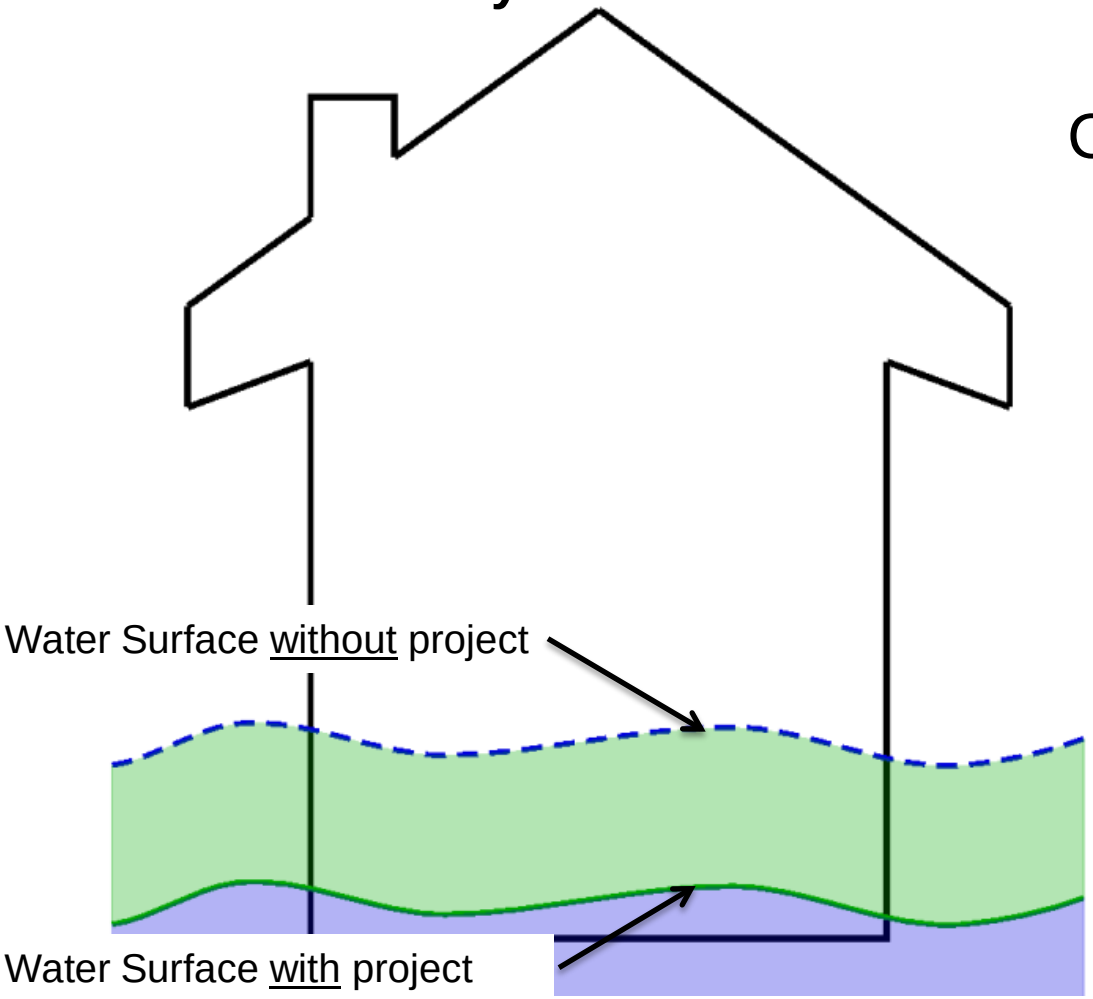
6 inches to 1 foot

Number of Structures Affected

8

Protect I-5 with walls & levees

Initial Data – 100 year event



Change in Water Surface

Decreases

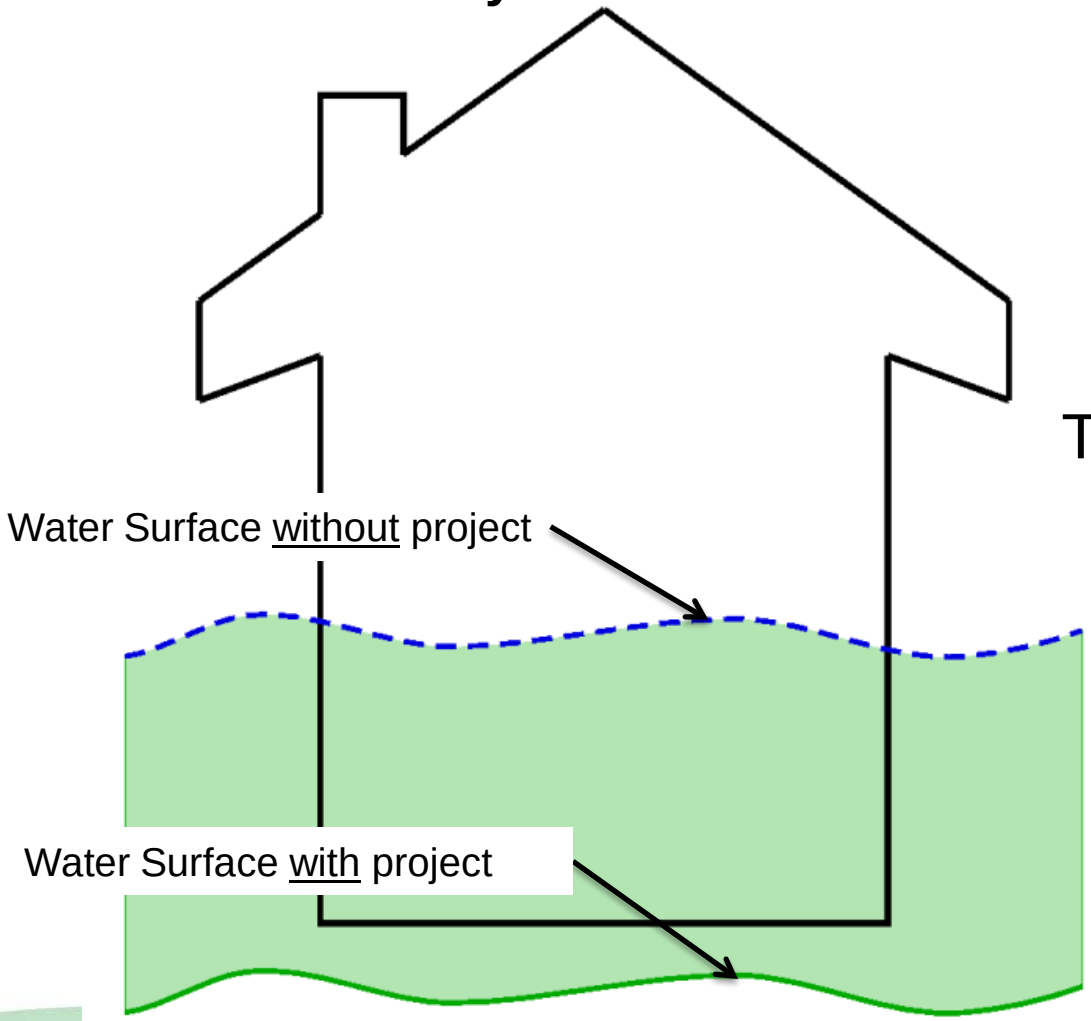
Greater that 1 foot

Number of Structures Affected

65

Protect I-5 with walls & levees

Initial Data – 100 year event

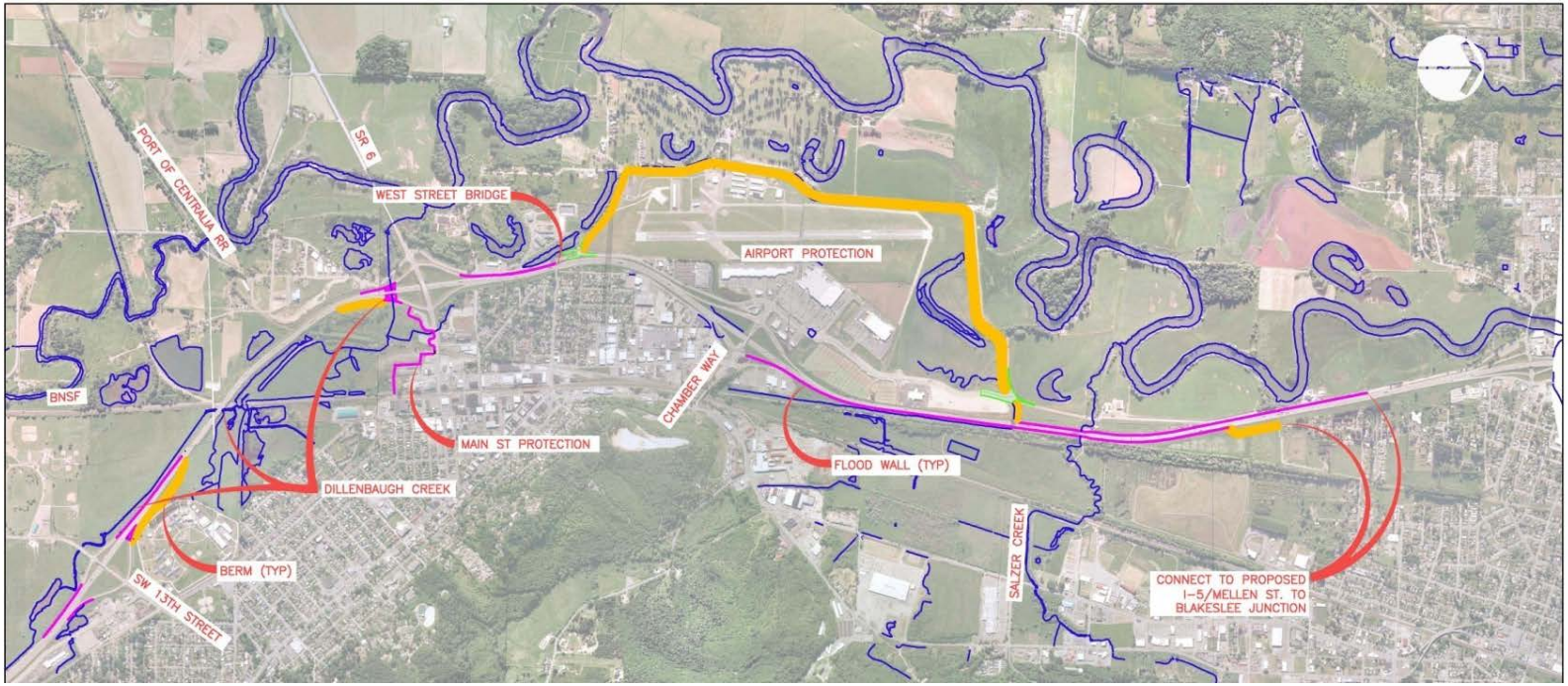


Total Number of Structures
Wet to Dry

118

Protect I-5 with walls and levees

Project Cost: $ 80 – 100 Million



Travel Costs to Impacted Travelers on I-5

UW Transportation Research Center (TRAC) is working on overall travel cost to impacted drivers* for closures of I-5, SR 6, US 12 due to flood events.

The *preliminary estimated value* of travel disruptions on I-5 for a 100-year flood event without flood control structure are:

$ 10-15 Million*

120 closure hours

*Does not include broader societal costs that could be substantially higher

Flood Areas overtopping State Highways

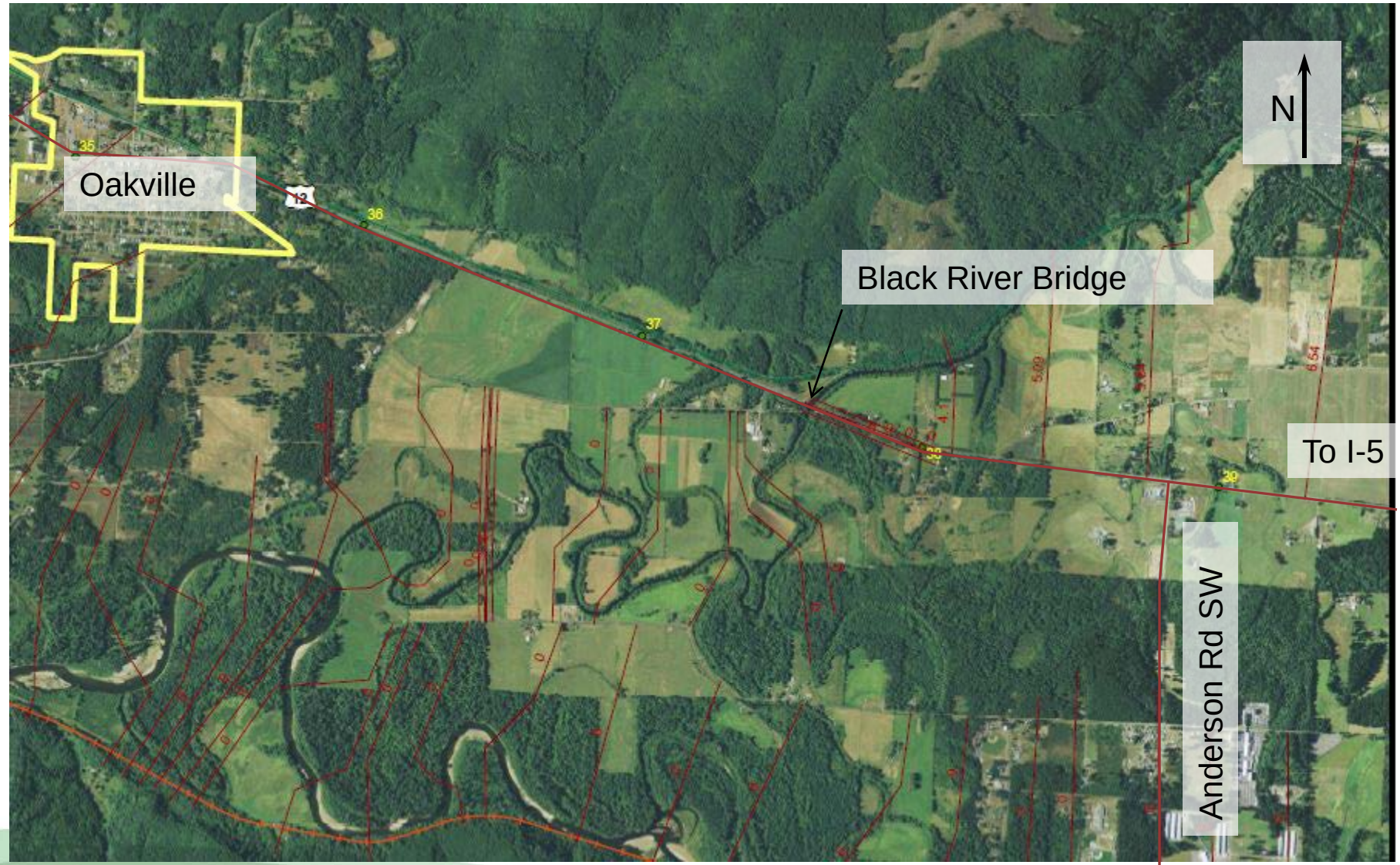
US 12 and SR 6

Simulated flood levels over US 12 and SR 6

Maximum Simulated Flood Depths over Roadway (feet)

		US 12	SR 6		
		East of Black River Bridge	Near Scheuber Rd	Near Adna	Near Rainbow Falls State Park
		~ MP 38.1	~ MP 49.8	~ MP 47	~ MP 35.1
	1996 (calibration)	1.7	2.6	7	2.1
	2007 (calibration)	1.8	3.5	9.5	4.7
	2009 (calibration)	1.7	1.8	4	0.6
	100-year (baseline)	1.8	2.8	7.5	3.2
With FC structure and Airport Levee	1996	1.1	2	4.8	0.0
	2007	0.5	2.7	7.8	1.6
	2009	0.0	0.6	0.0	0.0
	100-year	**1.1**	**2.1**	**5.1**	**0.1**

US 12 Near Black River Bridge



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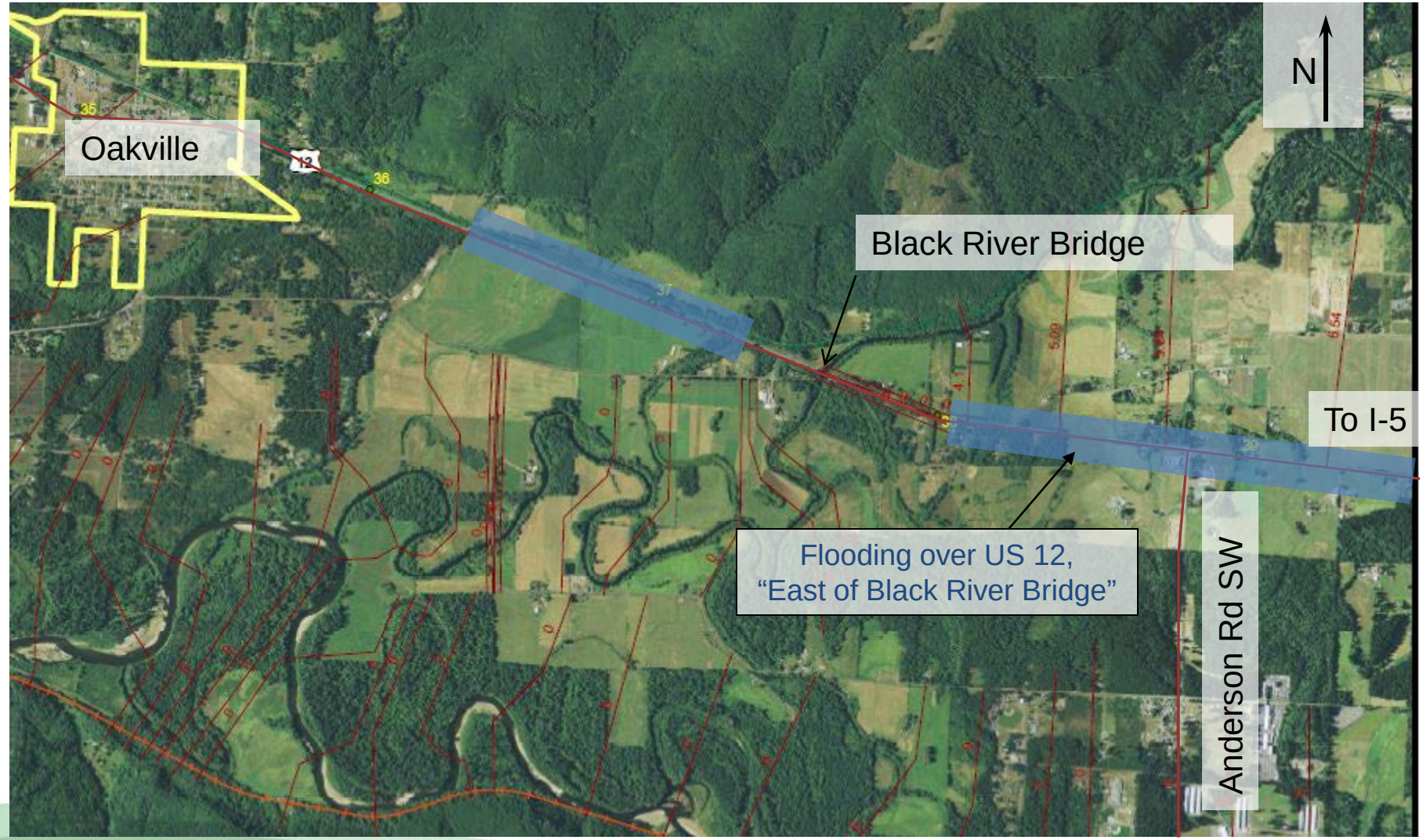
Flood Areas over US 12 Near Black River Bridge



2007 Flooding on US 12 at Anderson Road

East of Black River Bridge

Looking East on US 12

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US 12 East of Black River Bridge

Need (according to simulated flood levels)

- 2007 – 1.8’ over roadway; 1996 – 1.7’; 2009 – 0.7’
- 100-year with FC Structure – 1.1’

Summary of improvement concept

- Raise roadway up to 2’ for 1.8 miles
- Replace 2 bridges, 100’, 160’
- **$12-15 Million***

Risks/concerns

- Impacts from raising roadway

*Does not include costs for mitigation

SR 6 Near Adna

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Flood Areas Over SR 6 Near Adna

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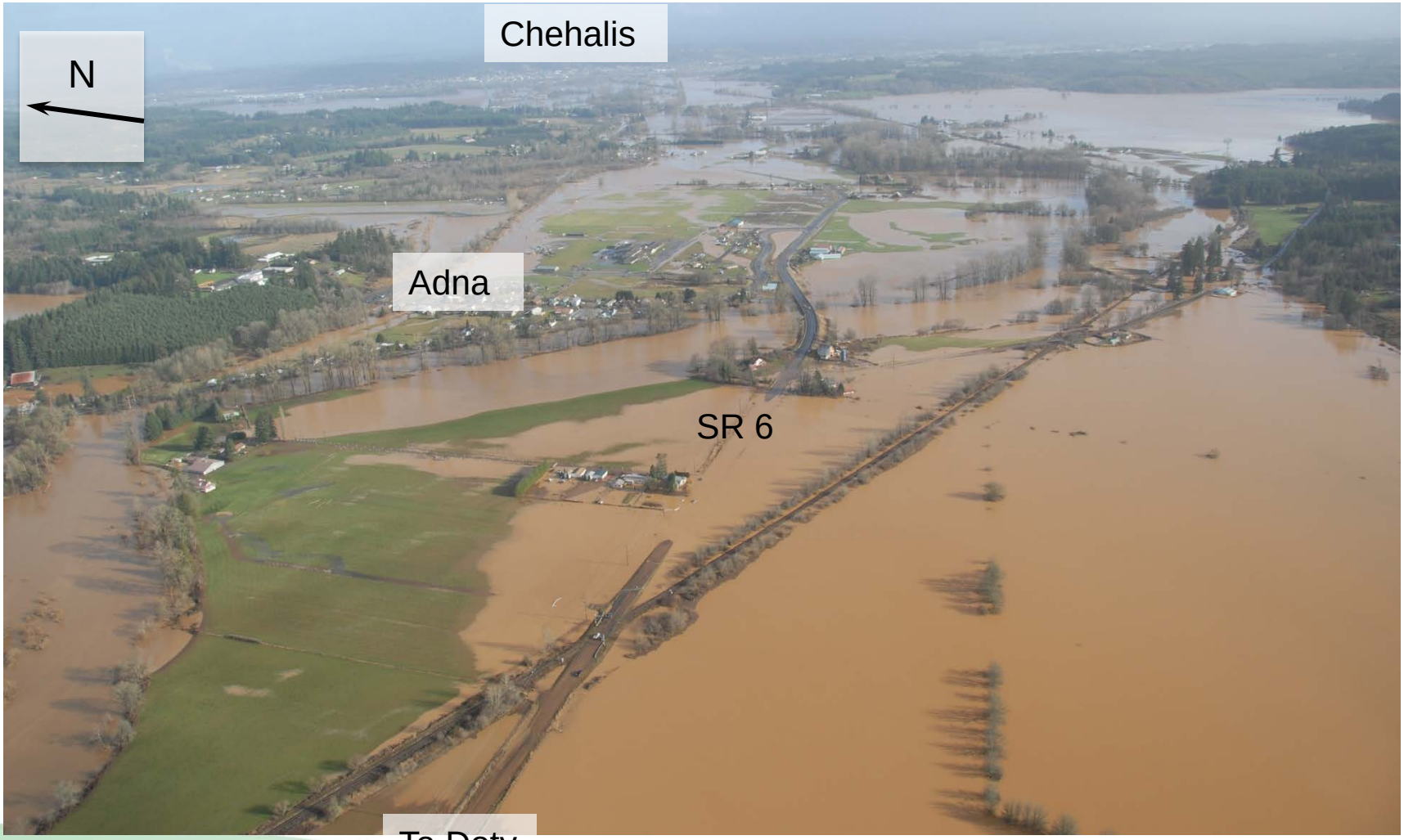
2007 Receding Flood Over SR 6 Near Adna



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SR 6 Near Adna

Need (according to simulated flood levels)

- 2007 – 9.5’ over roadway; 1996 – 7.0’; 2009 – 4.0’
- 100-year with FC Structure – 5.1’

Summary of improvement concept

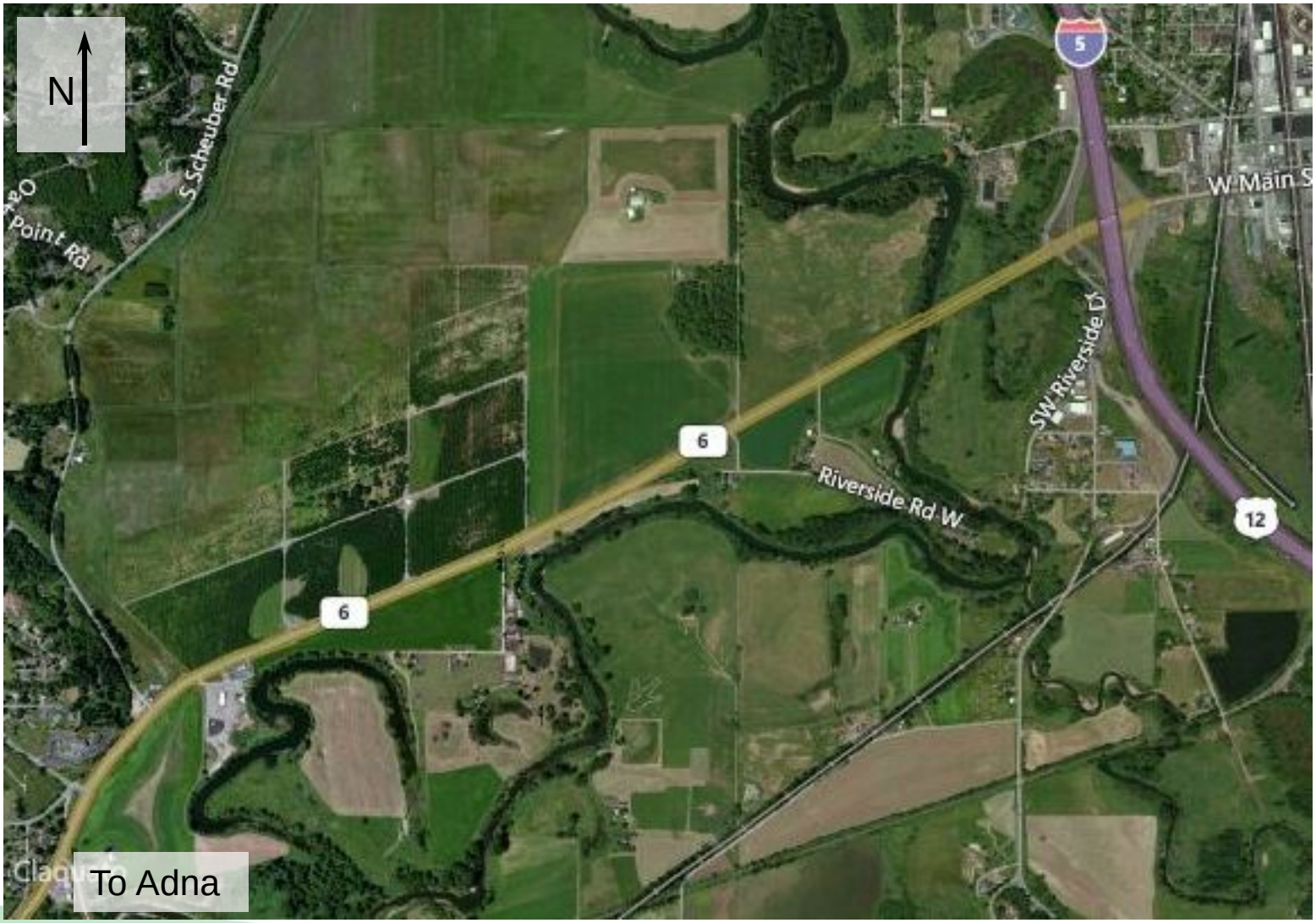
- Raise roadway up to 6’ for 2.4 miles
- Replace 1 bridge, 53’
- **$11-14 Million***

Risks/concerns

- Impacts from raising roadway

*Does not include costs for mitigation

SR 6 - Scheuber Road to I-5



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SR 6 Scheuber Road to I-5

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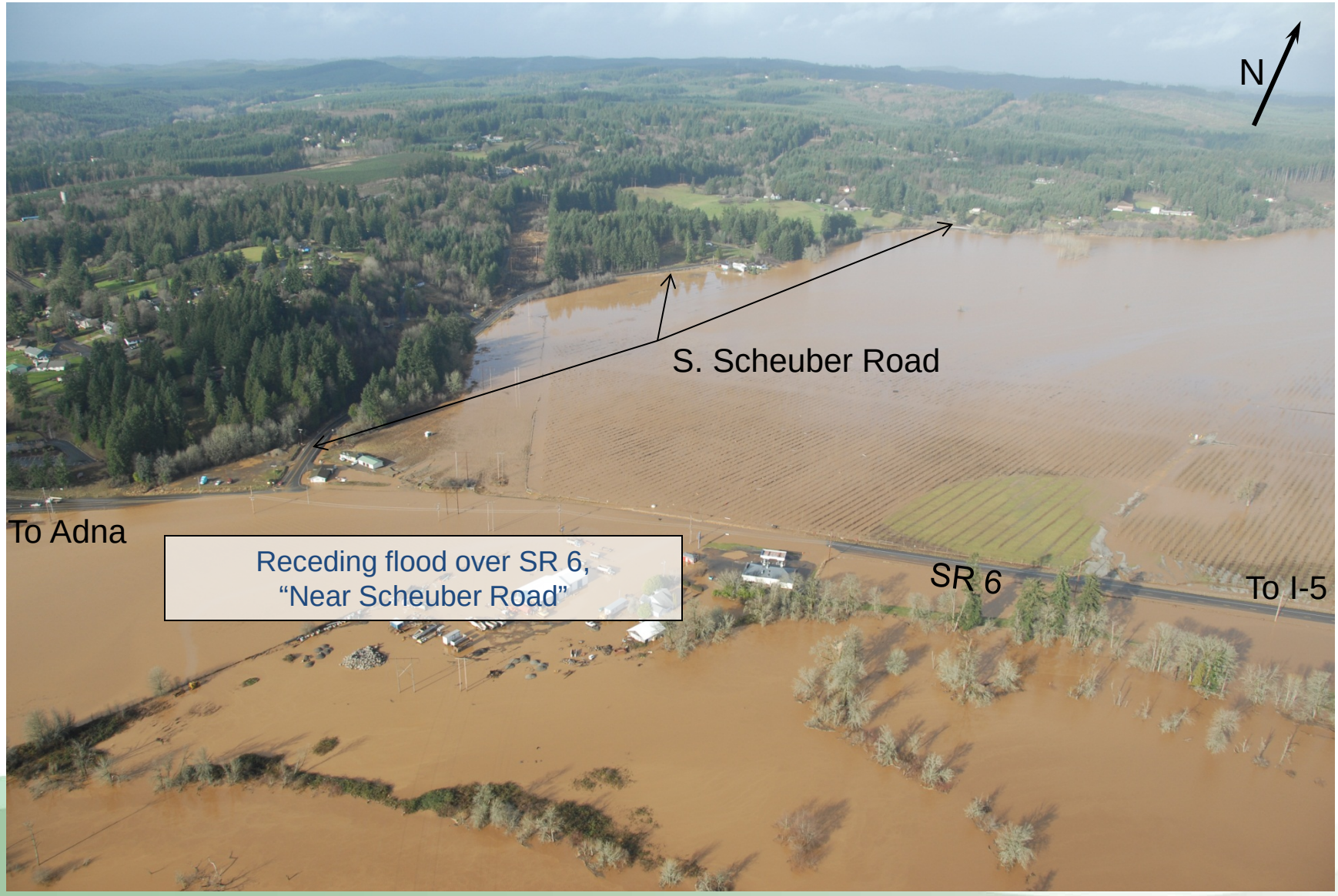
2007 Flood Near Scheuber Road



SR 6 Near Scheuber Road

Need (according to simulated flood levels)

- 2007 – 3.5’ over roadway; 1996 – 2.6’; 2009 – 1.8’
- 100-year with FC Structure – 2.1’

Summary of improvement concept

- Raise roadway up to 3’ for 1.2 miles
- **$3-5 Million***

Risks/concerns

- Impacts from raising roadway

*Does not include costs for mitigation

Other Flood Areas Overtopping State Highways

- SR 6 – MP 2.9 to 3.74
- SR 6 – MP 13.3 to 13.9
- SR 6 – MP 15.1 to 15.2
- SR 6 – MP 16.2 to 16.6
- SR 6 – Near Boistfort Road – MP 40.8 to 42.4
  (See following detail)
- SR 6 – MP 30.6 to 31.2
- US 12 – Westbound on-ramp from SR 107
- SR 107 – MP 7.3 to 7.6

(data acquired from WSDOT Maintenance Crews)

SR 6 Near Boistfort Road

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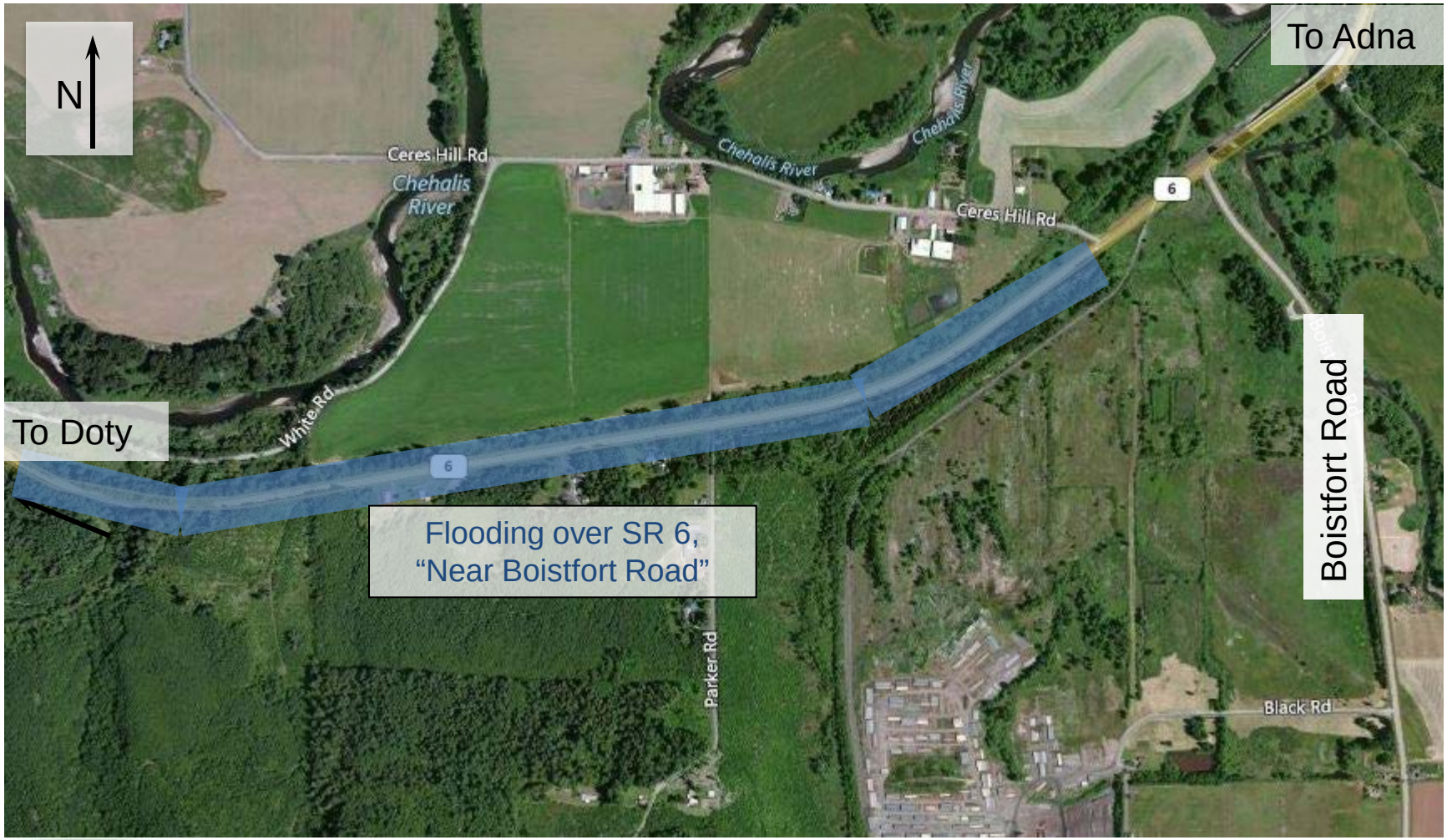
Flooding Over SR 6 Near Boistfort Road



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2007 Flood Receding Near Boistfort Road

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SR 6 Near Boistfort Road

Need (according to WSDOT Maintenance)

- Flooding over roadway every 3-5 years
- Overtopping depth of up to 3’

Summary of improvement concept

- Raise roadway up to 3’ for 1.6 miles
- Accounts for scenario with FC Structure and Airport Levee
- **$4-6 Million***

Risks/concerns

- Impacts from raising roadway

*Does not include costs for mitigation

US 12 and SR 6 Improvements

(Pre-Scoping Estimates)

- US 12 – East of Black River $ 12-15 Million*
- SR 6 – Near Adna $ 11-14 Million*
- SR 6 – Near Scheuber Rd $ 3-5 Million*
- SR 6 – Near Boistfort Rd $ 4-6 Million*

Subtotal $ 30-40 Million*

(Plus Other Flood Areas – Est. $ 5-15 Million*)

*Does not include costs for mitigation

(100-year event with flood control structure)

Travel Costs to Impacted Travelers
US 12 and SR 6

UW Transportation Research Center (TRAC) is working on overall travel cost to impacted drivers* for closures of I-5, SR 6, US 12 due to flood events.

The *preliminary estimated value* of travel disruptions on US 12 and SR 6 is very small compared to I-5 for the 100-year flood event without flood control structure.

- US 12 – **Less than $ 500,000*** - 150 closure hours
- SR 6 – **Less than $ 150,000*** - 50 closure hours

*Does not include broader societal costs

Questions
And
Discussion