Porter to Elma Flood Mitigation Alternatives Analysis Project

Watershed Science & Engineering
- Sargent Engineers
- PanGEO
- Confluence Consulting
- Pacific Geomatic Services

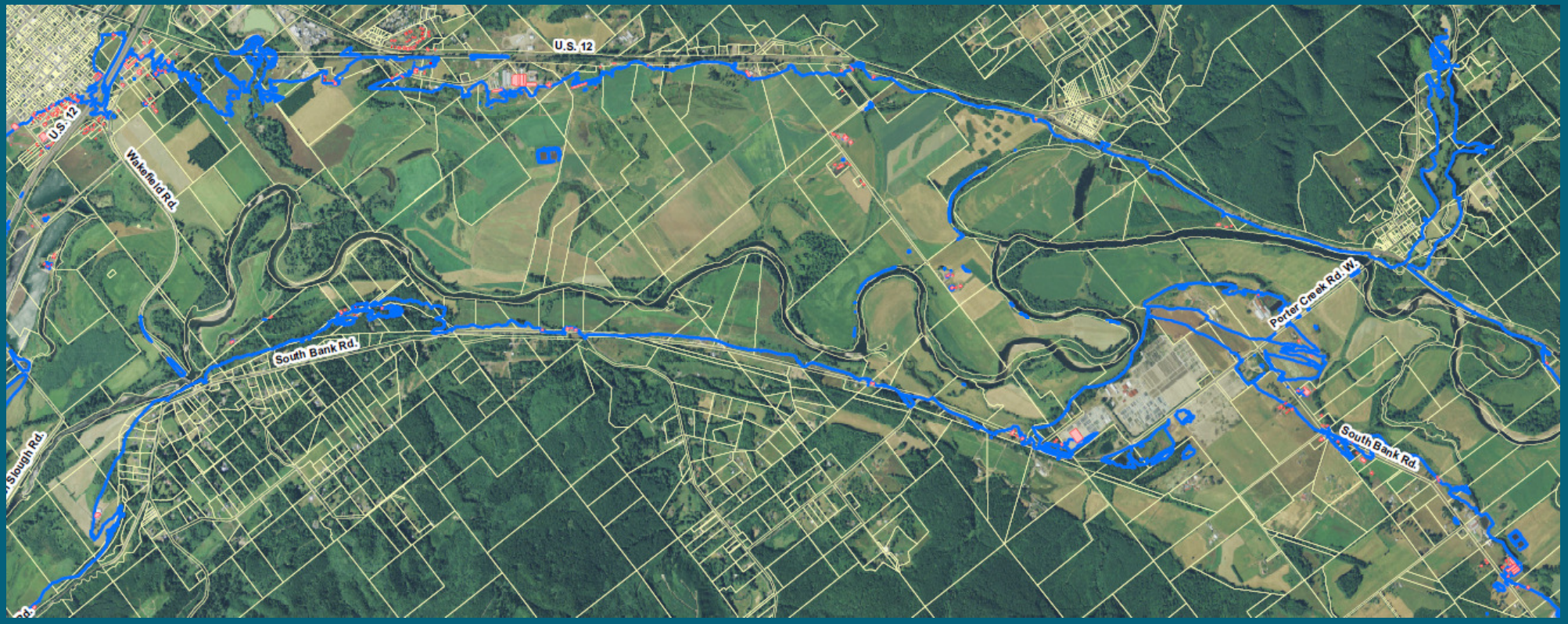
Flood Mitigation Alternatives Results Meeting

23 October 2014

Agenda

- Status Update
- Review of Alternatives
  - Wakefield Road Bridge Alternatives
  - Culvert at the intersection of Porter Creek Road and South Bank Road
  - Dunlap Road Bridge Expansion
  - Sediment Removal in Main Channel Downstream of Wakefield Road Bridge
  - Preventing Backflow through Highway 12 Culverts
- Questions and Discussion – Next Steps

Study Reach – Porter to Elma



Wakefield Road to Porter Creek Road

Scope of Work

Task 1 – Project Coordination and Outreach

Task 2 – Hydraulic Modeling and Analysis

Task 3 –Engineering Design and PS&E Documents for Bridge

Task 4 – Geotechnical Engineering Services for Bridge

Task 5 – Critical Areas Review / Permitting Strategy for Bridge

Task 6 –Development and Evaluation of Additional Flood Mitigation Alternatives for Porter to Elma Reach

Task 1 – Project Coordination and Outreach

Kickoff Meeting (May 1, 2014)

Existing Conditions Analysis and Preliminary Bridge Alternatives

Wakefield Road Bridge Design Alternative Analysis Presentation

Additional Flood Mitigation Alternatives Development Meeting

Alternatives Analysis Presentation and Review

Task 2 – Hydraulic Modeling and Analysis

Bathymetric Survey (completed)

Hydraulic Model Development (completed)

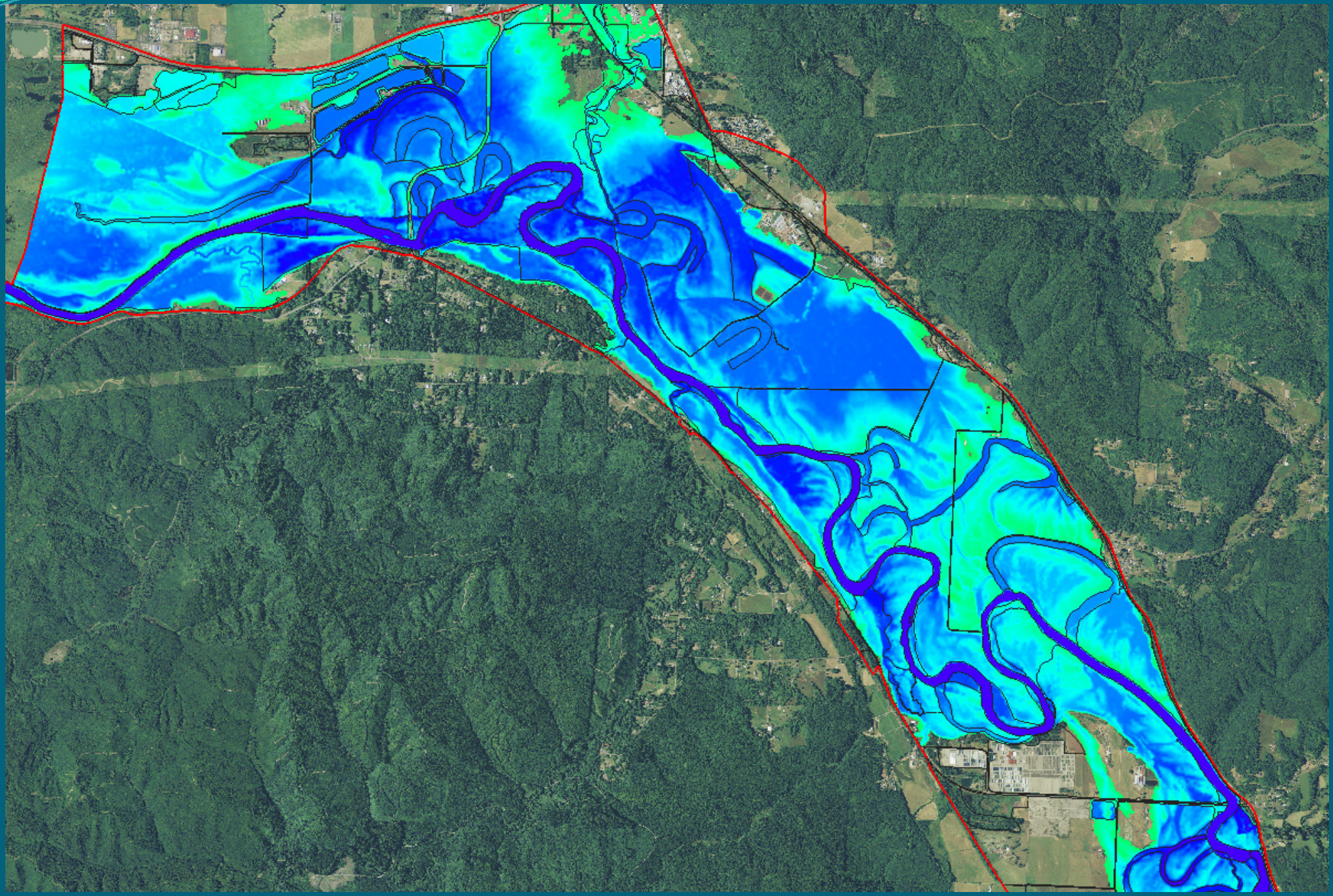
Model Calibration (completed)

Existing Conditions Analysis (completed)

Evaluation of Wakefield Road Bridge Alternatives (completed)

Evaluation of other Flood Mitigation Alternatives (completed)

Hydraulic Modeling and Analysis – Study Reach



Hydraulic Modeling and Analysis - Calibration

Table 1: Calibration Results – Low Flows and December 2007 Flood

Calibration Points				
Description of Point	Flow (cfs)	Observed WSE (ft)	Simulated WSE (ft)	Error (ft)
At USGS Porter Gage	4,150	36.4	35.6	-0.8
	5,150	37.5	36.9	-0.6
	12,300	43	43.7	0.7
	86,500	53.2	53.7	0.5
54 Dunlap Road	86,500	42.7	43.5	0.8
Power Pole on Gordon Property	86,500	43.5	42.9	-0.6
Wakefield Road	86,500	38.2	38.25	0.05
Red Barn	86,500	46.5	45.8	-0.7
Yellow Pump House	86,500	46.5	45.8	-0.7
Power Pole	86,500	46	45.7	-0.3

Wakefield Road Bridge Alternatives Evaluated

- Wakefield Road Bridge Alternatives
  - 900 foot Wide Overflow Bridge on Wakefield Road
  - 1300 foot Wide Overflow Bridge on Wakefield Road
  - 3600 foot Wide Overflow Bridge on Wakefield Road
  - 1250 foot Wide South Overflow Bridge on Wakefield Road
  - Widen Main Channel Bridge
- Widen Bridge and Raise Wakefield Road
  - Existing Conditions
  - 900 foot Wide Overflow Bridge
  - 1300 foot Wide Overflow Bridge

Evaluation of Wakefield Road Bridge Alternatives

Table 2: Flow Rates and Frequency of Overtopping at Wakefield Road

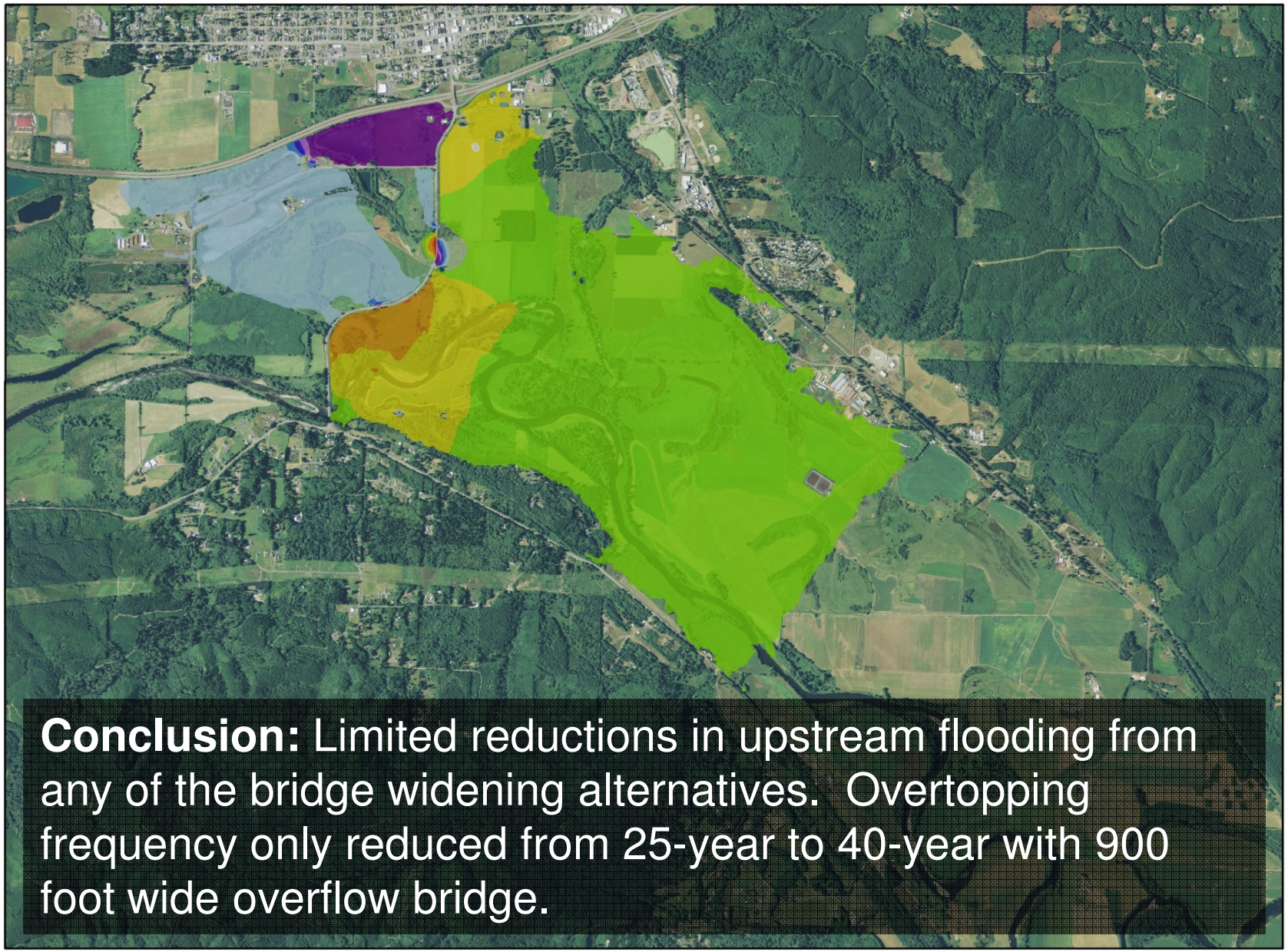
	Flow Rate (cfs)		Overtopping Return Period	
Scenario	First Water on Road	Overtopping	WSE, 2014	WEST, 2012
Existing	50,700	60,400	25-year	18-year
900ft Bridge	56,700	67,300	40-year	30-year
1300ft Bridge	57,300	70,000	50-year	37-year
3600ft Bridge	66,800	77,400	90-year	50-year
1250ft South Bridge	54,000	68,700	45-year	32-year
Widen Main Channel Bridge	53,200	65,200	35-year	25-year

Evaluation of Wakefield Road Bridge Alternatives

Table 3: Upstream and Downstream Water Levels Associated with Bridge Alternatives

	Water Surface Elevation (feet NAVD) at OFM 100-year Event (86,145 cfs)				
Scenario	Airport	Downstream of Wakefield Road	Upstream of Wakefield Road	Near Gordon Property	Upstream of Porter Creek Road
Existing	36.7	38.4	39.8	43.4	54.6
900ft Bridge	36.7	38.5	39.5	43.3	54.6
1300ft Bridge	36.7	38.5	39.3	43.3	54.6
3600ft Bridge	36.7	38.7	39.2	43.2	54.6
1250ft South Bridge	36.7	38.6	39.6	43.3	54.6
Widen Main Channel Bridge	36.7	38.3	39.7	43.3	54.6

Water Surface Elevation Benefits of 900 foot wide Overflow Bridge



Porter-Elma Reach Analysis
Chehalis River

Water Surface Elevation Difference
(900ft Bridge with Wakefield Road Raised vs. Existing)

Legend

Water Surface Elevation Difference (ft)

- 0.5 - 1
- 0.4 - 0.5
- 0.3 - 0.4
- 0.2 - 0.3
- 0.1 - 0.2
- 0
- -0.2 - -0.1
- -0.3 - -0.2
- -0.4 - -0.3
- -0.5 - -0.4
- -1 - -0.5

Grays Harbor County, WA

0 1,300 2,600 Feet

N

Scale: 1:25,000
NAD 1983 HARN
StatePlane Washington
South FIPS 4602 Feet

10 Oct 2014

WATERSHED SCIENCE & ENGINEERING

Conclusion: Limited reductions in upstream flooding from any of the bridge widening alternatives. Overtopping frequency only reduced from 25-year to 40-year with 900 foot wide overflow bridge.

Evaluation of Wakefield Road Bridge Alternatives

Table 4: Upstream and Downstream Water Levels with Bridge/Road Raise Alternatives

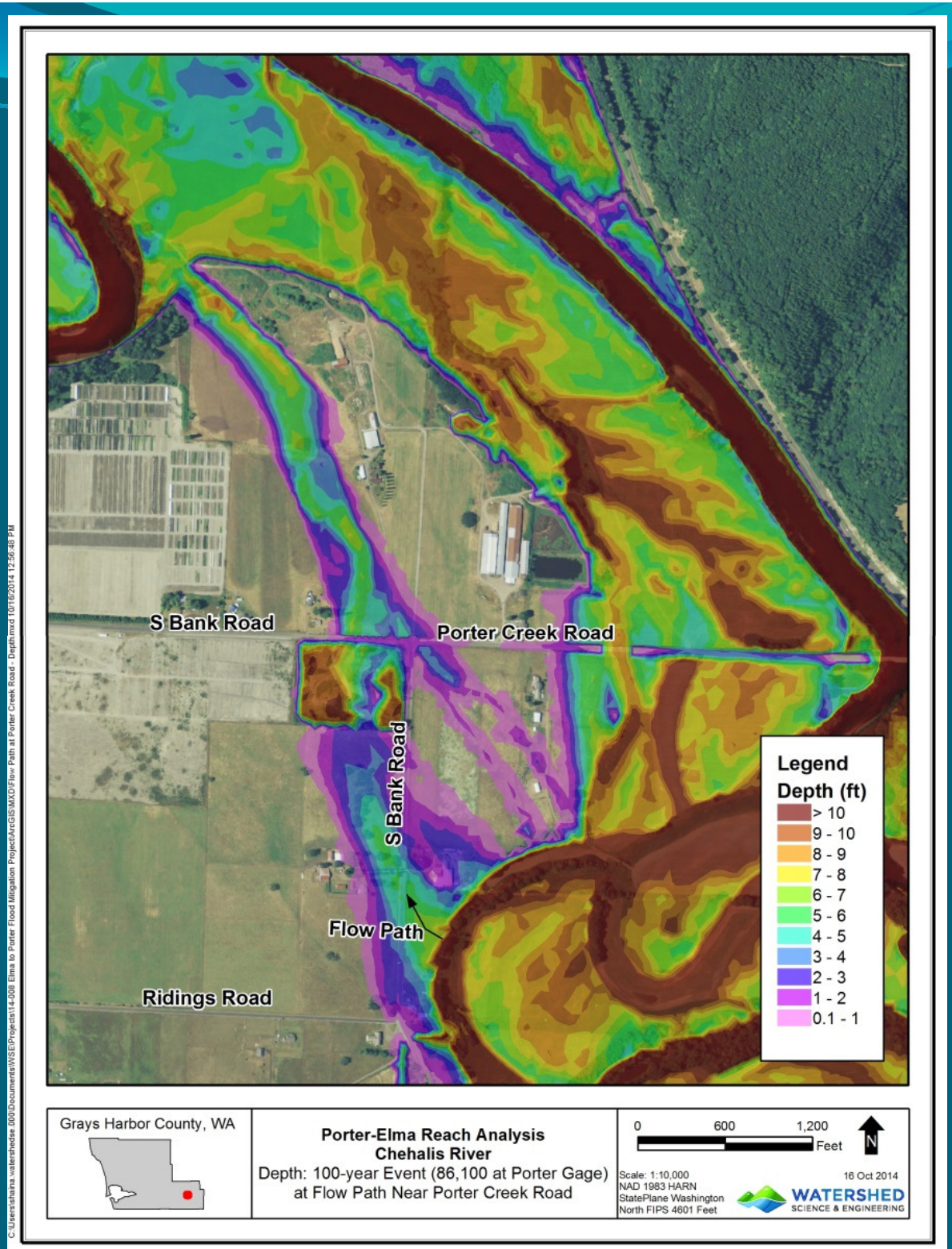
	Water Surface Elevation (feet NAVD) at OFM 100-year Event (86,145 cfs)				
Scenario	Airport	Downstream of Wakefield Road	Upstream of Wakefield Road	Near Gordon Property	Upstream of Porter Creek Road
Existing	36.7	38.4	39.8	43.4	54.6
Existing with Raised Road	36.6	37.8	41.4	43.9	54.6
900ft Bridge with Raised Road	36.7	38.3	39.9	43.4	54.6
1300ft Bridge with Raised Road	36.7	38.4	39.4	43.4	54.6

Conclusion: A 900-foot wide bridge together with raising Wakefield Road could prevent overtopping and not increase upstream water levels. The cost, however, would be significantly higher than bridge widening alone.

Task 6 –Development and Evaluation of Additional Flood Mitigation Alternatives for Porter to Elma Reach

- Culvert at the intersection of Porter Creek Road and South Bank Road
- Dunlap Road Bridge Expansion
- Sediment Removal in Main Channel Downstream of Wakefield Road Bridge
- Preventing Backflow through Highway 12 Culverts

New culvert at the intersection of Porter Creek Road and South Bank Road



Culvert at the intersection of Porter Creek Road and South Bank Road

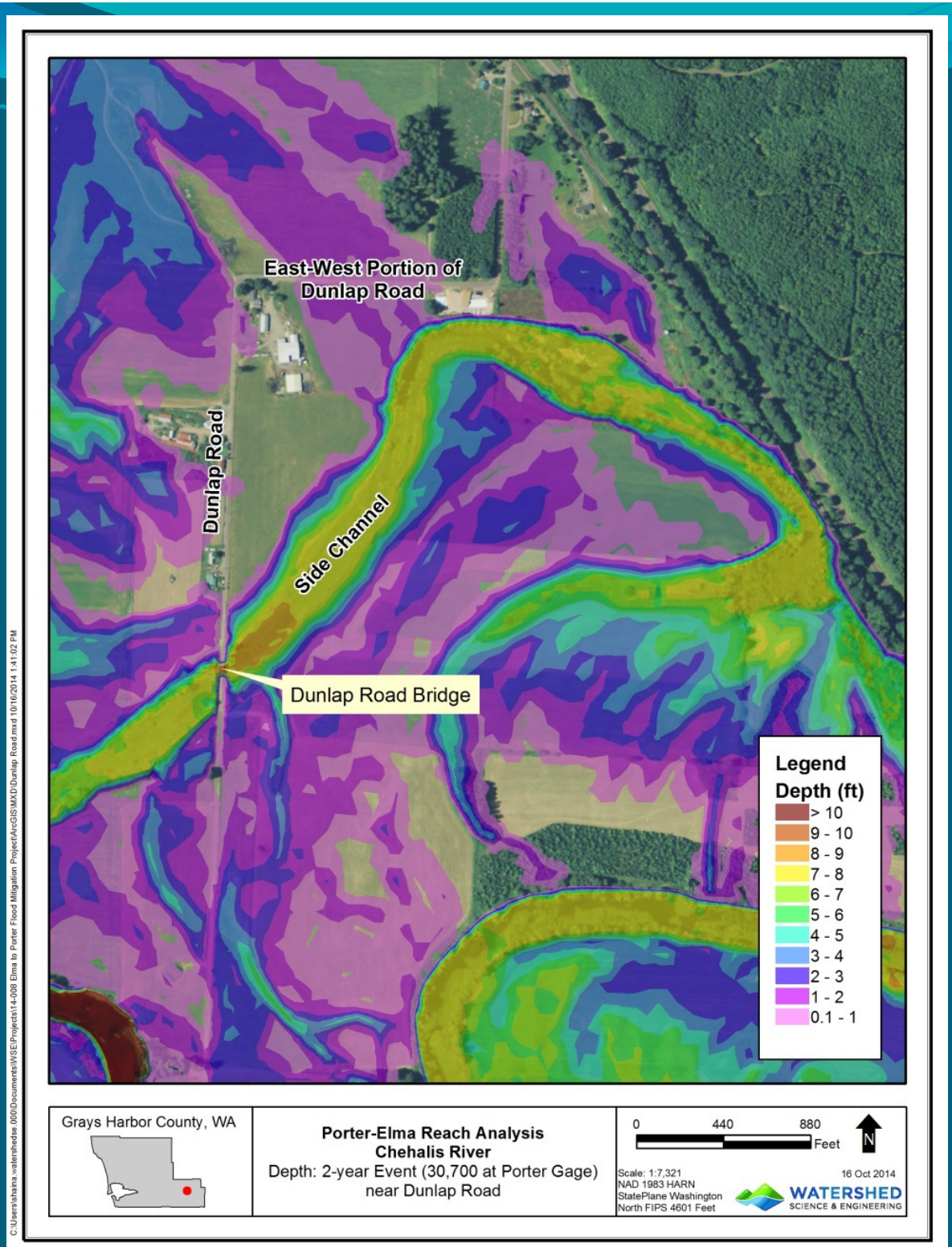
Table 5: Hydraulic Model Data at Proposed Culvert Location at the Intersection of Porter Creek Road and South Bank Road

			Water Surface Elevation		
Chehalis Flow (cfs)	Approx. Recurrence	Lowest Road Elevation (feet NAVD)	Upstream (feet NAVD)	Downstream (feet NAVD)	Swale Flow (cfs)
47,200	10-year	51.5	51.7	48.8	70
56,100	20-year		51.9	49.7	350
86,100	100-year		53.2	52.8	2900

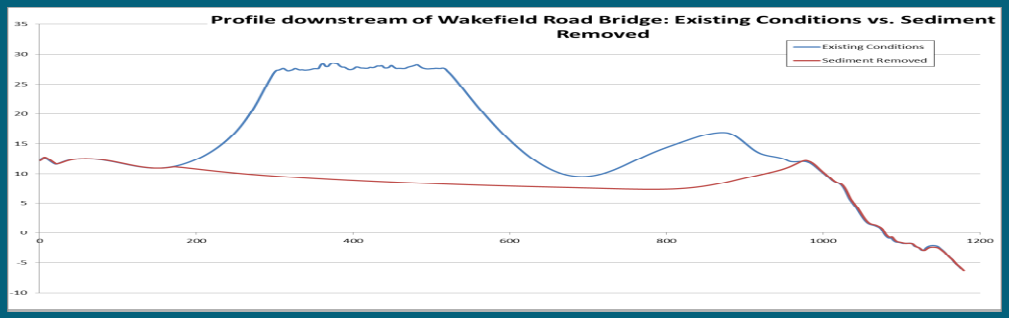
Conclusion: Culvert could probably provide enough capacity to pass the 10-year to 20-year flood event but would require a bridge to pass larger flows. South Bank Road would still overtop south of intersection.

Widening of Existing Dunlap Road Bridge

Conclusion: Currently flows break out of side channel and overflow east-west portion of Dunlap Road at about a 2-year flood. The project would reduce water levels slightly at but would not significantly affect the ferquency of overflows.

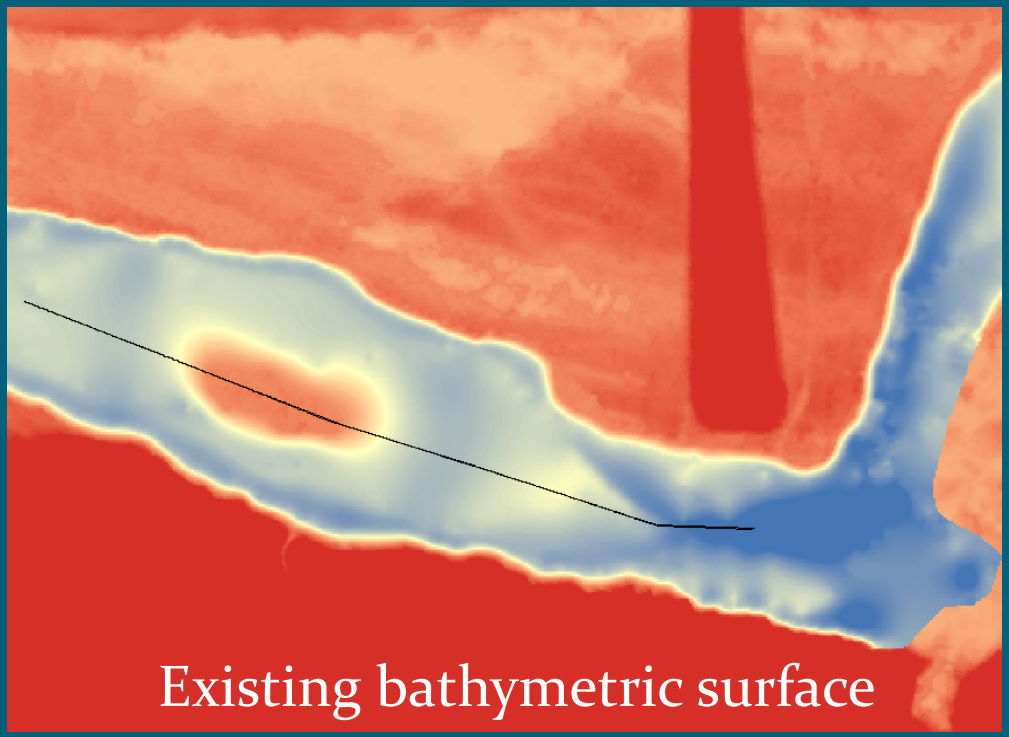


Sediment Removal in Main Channel Downstream of Wakefield Road Bridge

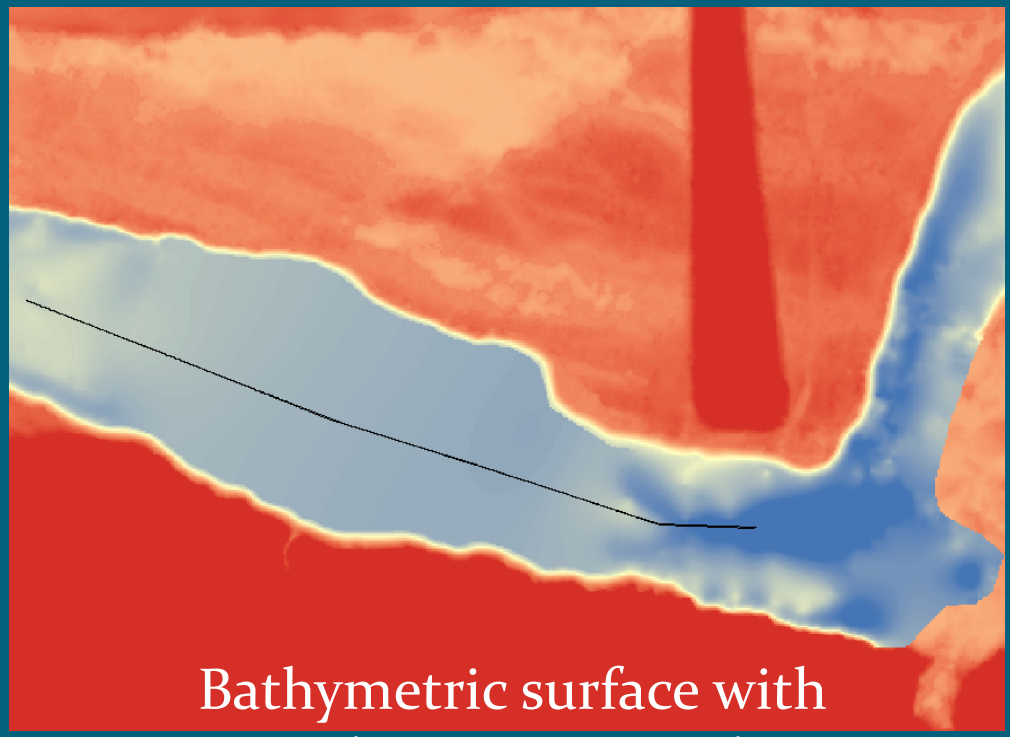


Channel profile pre- and post-removal

Conclusion: Only minor water level reductions from removal of the in channel sediment island

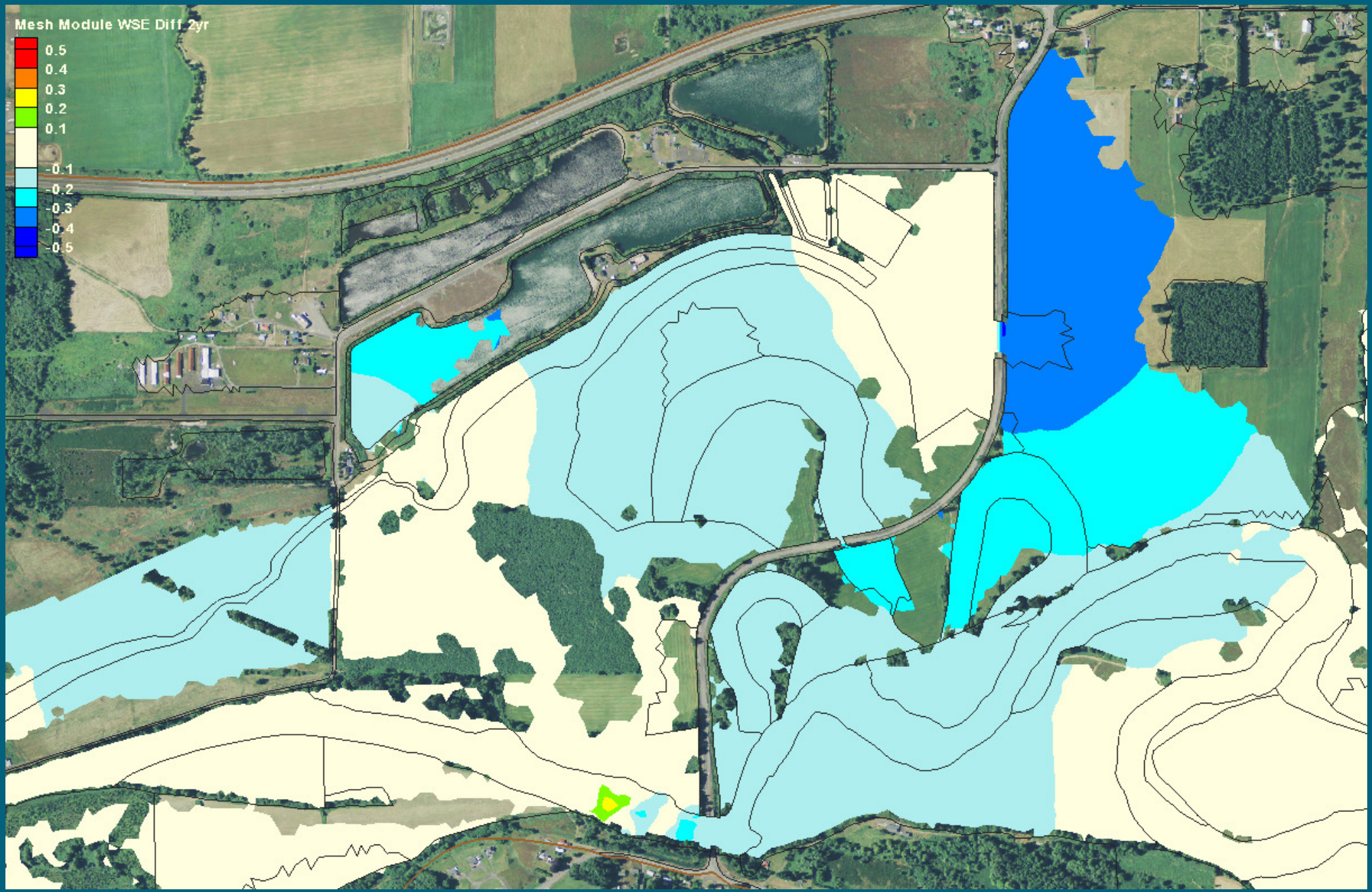


Existing bathymetric surface

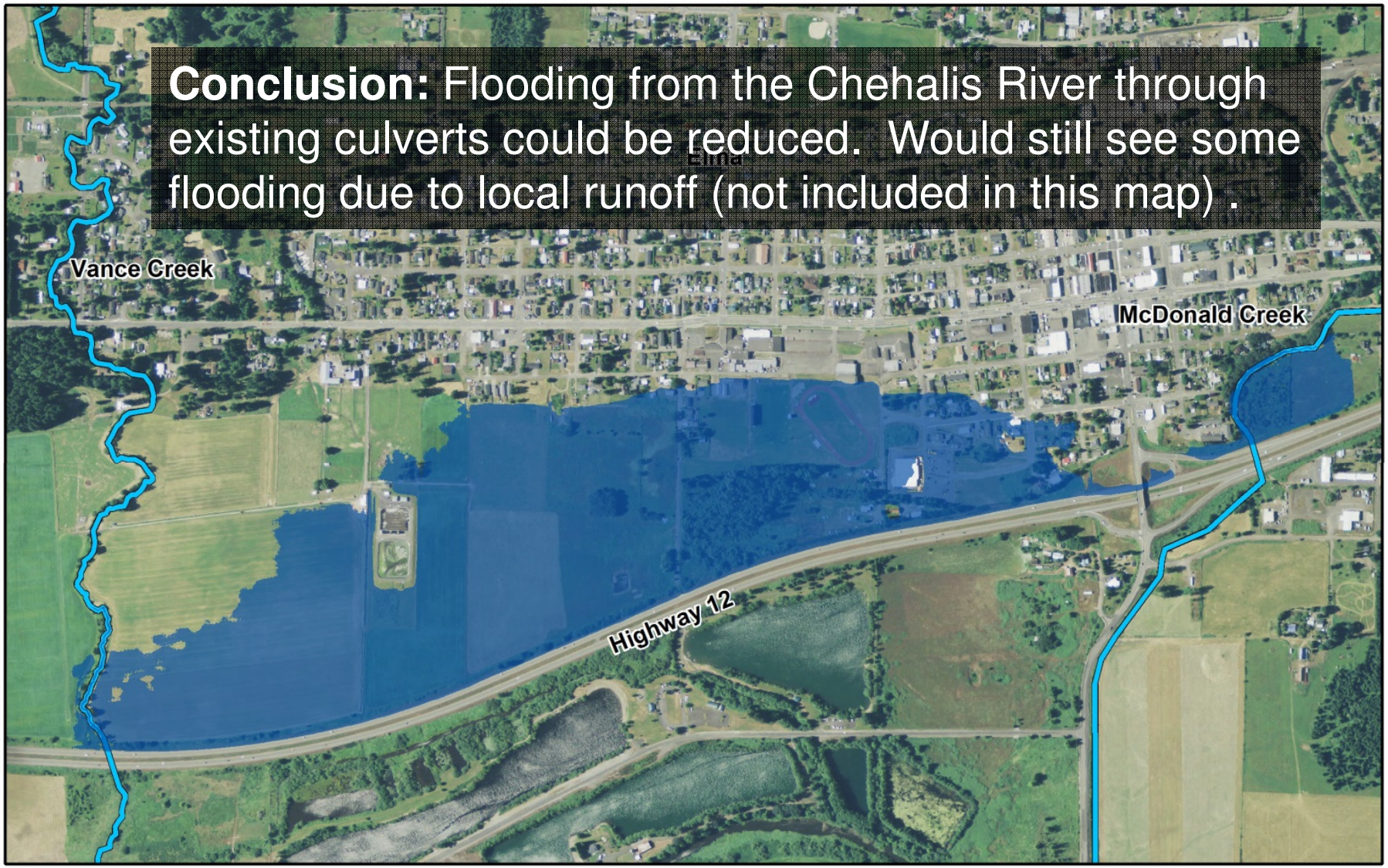


Bathymetric surface with sediment removed

Main Channel Sediment Removal
(Water surface elevation differences in 2-year event)



Preventing Backflow through Highway 12 Culverts



Questions ?

Larry Karpack
Watershed Science & Engineering
(206) 521-3000
larry@watershedse.com