

January 19, 2017

David Fleckenstein
Chehalis-Centralia Airport
900 NW Airport Rd
Chehalis, WA 98532

Re: DRAFT Hydraulic Impact Analysis of Waste Water Treatment Plant Removal

Dear Mr. Fleckenstein:

Watershed Science & Engineering (WSE) was retained by the City of Chehalis (City) to evaluate the hydraulic impacts of removing an existing waste water treatment plant (WWTP) located along the Chehalis River in Chehalis, WA. WSE updated an existing HEC-RAS hydraulic model of the Chehalis River to evaluate impacts to base flood elevations (BFEs) within the 100-year floodplain. The objective of this modeling was to determine how much, if any, flood benefit would be gained through the WWTP removal project.

Project Description

The existing WWTP is located along the right (east) bank of the Chehalis River between Highway 6 and the Chehalis-Centralia Airport, see Figure 1. The City is considering modifications to the WWTP property to increase available flood storage, provide additional fish and wildlife habitat, and to enhance recreational use of the site. Preliminary plans include removing existing buildings and excavating approximately 130,000 cubic yards of in-situ material for use off-site. This will provide a source of structural fill for future floodplain development, while increasing available on-site flood storage that will meet the requirements of “compensatory storage” under the City’s “zero-rise” ordinance. Compensatory storage is used to offset the flood impacts of projects that would otherwise fail to meet zero rise criteria. Portions of the WWTP project are located within the Floodway of the Chehalis River, and the project will therefore be required to meet FEMA’s no-rise criteria for projects within the Floodway.

Hydraulic Analysis

The existing Flood Authority unsteady HEC-RAS hydraulic model of the Chehalis River (completed by WSE in 2014) was used to represent existing (baseline) conditions for this investigation. To determine the water surface impacts of the project, WSE:

1. Created an “existing-condition” model geometry by updating the baseline model to add resolution near the project location. Three cross sections were added near the treatment plant (see figure 1) using 2012 LiDAR information to represent the overbank topography and interpolated channel data to represent channel bathymetry at the new sections.
2. Ran the existing condition model to simulate the 100-year flood and the December 2007 flood of record to determine existing condition water surface elevations.
3. Created a “with-project” model by updating the existing condition model to represent the proposed project based on a ground surface (LandXML) provided by Skillings Connolly, Inc. on November 23, 2016.

4. Ran the with-project model to simulate the 100-year flood and the December 2007 flood of record
5. Compared peak water surface elevations in the with-project and existing-condition to determine any impacts at the site location or in adjacent reaches of the Chehalis River model.

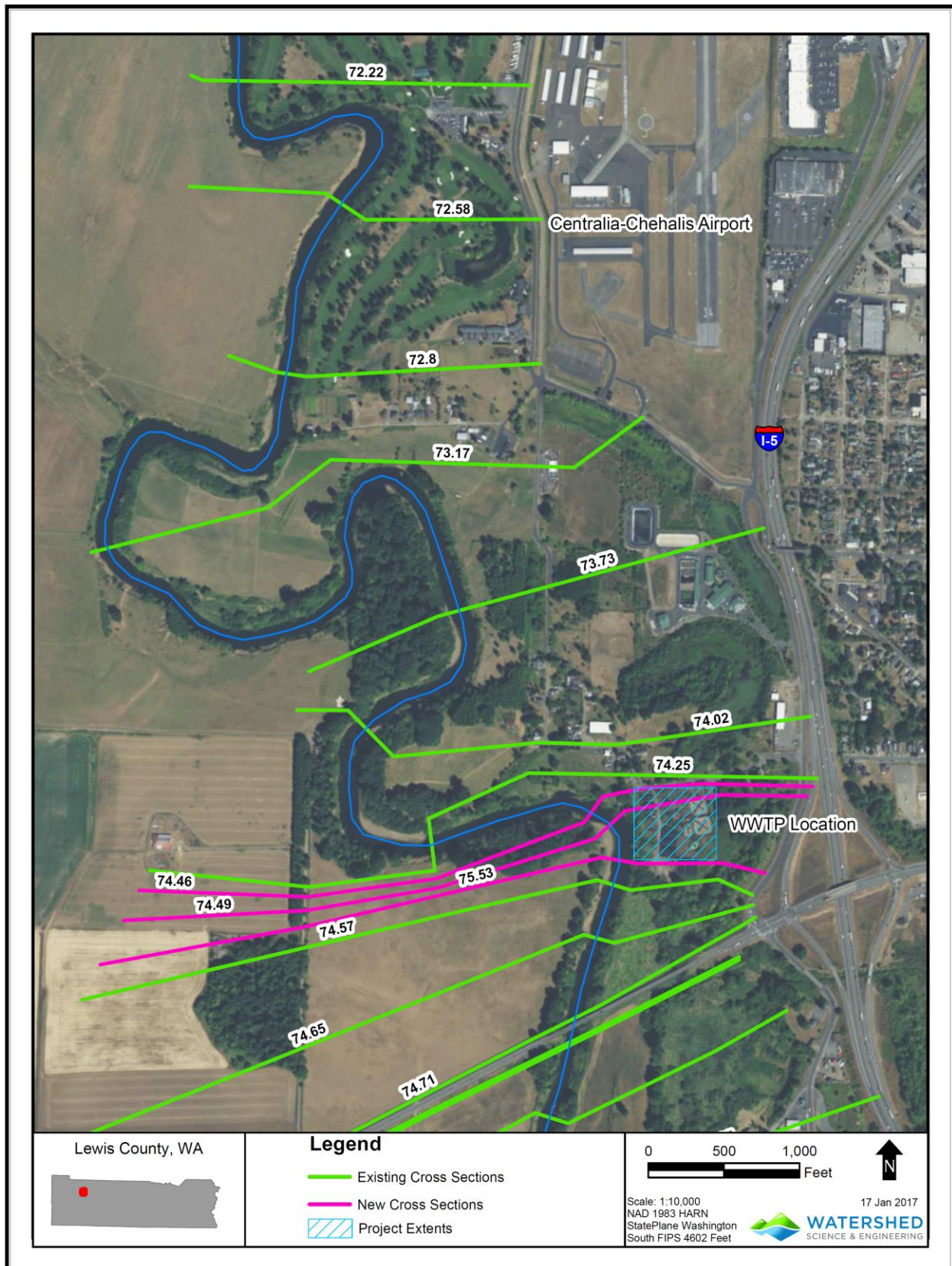


Figure 1. Project Location Map

Results

Changes in the simulated 100-year water surface elevation included a 0.02 foot increase at River Mile (RM) 74.46 located at the project site, and a 0.01 foot decrease in water surface elevation between RM 74.49 and RM 75.09. These results indicate that the “with-project” condition will result in water surface impacts that exceed the threshold typically used in a FEMA No-Rise analysis. Table 1 provides a summary of water surface impacts at Chehalis River model cross sections near the WWTP site.

Table 1. Water Surface Impacts for 100-year Flood Simulation

Location Description	X-section	Max Water Surface Elevation (feet NAVD) or Change in Flood Water Surface (feet)		
		100 Year (ft NAVD)	100 w/Fill (ft NAVD)	Change (ft NAVD)
	74.02	182.26	182.26	0.00
	74.25	182.45	182.45	0.00
Lower extent of project	74.46	182.62	182.64	0.02
	74.49	182.70	182.69	-0.01
Upstream extent of project	74.53	182.81	182.80	-0.01
	74.57	182.90	182.89	-0.01
	74.65	182.95	182.94	-0.01
Downstream Highway 6 Bridge	74.71	183.41	183.40	-0.01
Upstream Highway 6 Bridge	74.73	183.67	183.66	-0.01
	74.82	183.67	183.66	-0.01
	74.95	184.16	184.15	-0.01
	75.08	184.80	184.79	-0.01
	75.09	184.76	184.76	-0.01
Newaukum Confluence	75.2	185.19	185.18	0.00
	75.308	185.70	185.70	0.00
	75.49	185.80	185.80	0.00
	75.71	185.96	185.96	0.00
	75.86	186.03	186.03	0.00
	76	186.13	186.12	0.00
	76.1	186.17	186.17	0.00
	76.36	186.50	186.50	0.00
	76.7	186.93	186.93	0.00

Note: Positive change indicates the alternative raises water levels.

Table 2 and 3 compare “with-project” water surface elevations to baseline water surface elevations at other locations throughout the Chehalis River basin for the 100-year flood and the December 2007 flood of record, respectively. The locations shown in Tables 2 and 3 represent a sampling of sites that have historically been looked at to understand the basin wide impact or benefit of potential projects (see Ruckelshaus Center Report, 2012¹).

¹ William D. Ruckelshaus Center (2012) Chehalis Basin Flood Hazard Mitigation Alternatives Report, Washington State University and the University of Washington, December 19, 2012

Table 2. Summary of With Fill Rise impacts for 100-year Flood Simulation

Location Description	X-section	Max Water Surface Elevation (feet NAVD) or Change in Flood Water Surface (feet)		
		(ft NAVD)	100 Year (ft NAVD)	100 w/Fill (ft NAVD)
Near Doty	100.95	319.23	319.23	0.00
Curtis Store (on S Fork Chehalis)	1.81	232.05	232.05	0.00
Downstream of South Fork	86.42	222.22	222.22	0.00
Near Adna	80.23	197.54	197.54	0.00
Labree Road (on Newaukum R)	4.11	206.37	206.37	0.00
Newaukum Confluence	75.2	185.19	185.18	0.00
Along Airport Levee	71.49	180.51	180.51	0.00
Dillenbaugh Storage Area	SA #301	185.74	185.74	0.00
Airport Storage Area	SA #2	180.27	180.27	0.00
Long Road Storage Area	SA #5	168.00	168.00	0.00
Centralia Storage Area	SA #610	176.48	176.48	0.00
Mellen St	67.43	177.69	177.69	0.00
Bucoda (Skookumchuck R)	11.1	251.90	251.90	0.00
Pearl Street (Skookumchuck R)	2.43	191.36	191.36	0.00
Skookumchuck Confluence	66.88	176.05	176.05	0.00
Upstream of Galvin Road	64.9	168.23	168.23	0.00
Grand Mound (Prather Road)	59.909	147.53	147.53	0.00
Near Rochester	54.476	124.41	124.41	0.00
Anderson Road	51.499	106.29	106.29	0.00
Black River Confluence	46.937	93.48	93.48	0.00
Sickman Ford Bridge	44.175	85.44	85.44	0.00
Porter Creek Road	34.497	56.69	56.69	0.00
Wakefield Road	24.52	41.60	41.60	0.00
Satsop Confluence	19.89	33.89	33.89	0.00
Montesano	12.5	18.64	18.64	0.00
Cosmopolis	1.99	10.72	10.72	0.00

Note: Positive change indicates the alternative raises water levels.

Table 3. Summary of With Project Rise impacts for December 2007 Flood Simulation

Location Description	X-section	Max Water Surface Elevation (feet NAVD) or Change in Flood Water Surface (feet)		
		(ft NAVD)	Dec 07 (ft NAVD)	Dec w/Fill (ft NAVD)
Near Doty	100.95	326.42	326.42	0.00
Curtis Store (on S Fork Chehalis)	1.81	238.70	238.70	0.00
Downstream of South Fork	86.42	228.08	228.08	0.00
Near Adna	80.23	198.72	198.72	0.00
Labree Road (on Newaukum R)	4.11	206.19	206.19	0.00
Newaukum Confluence	75.2	186.42	186.41	-0.01
Along Airport Levee	71.49	182.34	182.34	0.00
Dillenbaugh Storage Area	SA #301	186.85	186.85	0.00
Airport Storage Area	SA #2	182.29	182.29	0.00
Long Road Storage Area	SA #5	179.39	179.38	0.00
Centralia Storage Area	SA #610	177.03	177.03	0.00
Mellen St	67.43	179.07	179.07	0.00
Bucoda (Skookumchuck R)	11.1	243.69	243.69	0.00
Pearl Street (Skookumchuck R)	2.43	185.89	185.89	0.00
Skookumchuck Confluence	66.88	176.91	176.91	0.00
Upstream of Galvin Road	64.9	169.08	169.08	0.00
Grand Mound (Prather Road)	59.909	147.81	147.81	0.00
Near Rochester	54.476	124.60	124.59	0.00
Anderson Road	51.499	106.10	106.10	0.00
Black River Confluence	46.937	93.34	93.35	0.00
Sickman Ford Bridge	44.175	85.31	85.31	0.00
Porter Creek Road	34.497	56.27	56.27	0.00
Wakefield Road	24.52	39.95	39.95	0.00
Satsop Confluence	19.89	32.92	32.93	0.00
Montesano	12.5	16.99	16.99	0.00
Cosmopolis	1.99	10.89	10.89	0.00

Note: Positive change indicates the alternative raises water levels.

Discussion

WSE's analysis found that the proposed WWTP removal project would result in a 0.01 foot reduction in 100-year water surface elevation extending approximately one half a mile upstream from the project site. Slight reductions (less than 0.01 foot) in water surface elevation were also detectable downstream from the project site as far as the Chehalis-Centralia Airport. The magnitude of simulated flood benefits reflects the small scale of the WWTP project relative to the Chehalis River floodplain. The proposed 130,000 cubic yards of additional flood storage would account for less than 0.5% of the existing 100-year flood storage between Highway 6 and the north end of the Chehalis-Centralia Airport.

Analysis also found that the project would cause a 0.02 foot rise in water surface elevation at the WWTP site. Although the rise was confined to one model cross section located along the project site, this exceeds the 0.00 foot rise allowed under the City's zero-rise ordinance and FEMA's no-rise criteria for projects constructed within the Floodway. It may be possible to eliminate this rise through refinement of the project design.

Refinements to the project design may also help to maximize the flood benefit of planned excavation. Model simulations show that most of the proposed flood storage will fill with water before the peak of the flood event, limiting the effectiveness of the project in reducing peak flows and water levels. Before proceeding to final design, we would recommend a hydraulic analysis to compare alternative excavation extents and depths, and to refine the connection between the new storage area and the main river channel in order to maximize flood benefit of the proposed project.

I trust that this analysis and discussion will assist the City in evaluating the hydraulic effects of the proposed WWTP project. Please don't hesitate to contact me with any questions.

Sincerely,

Watershed Science & Engineering, Inc.

A handwritten signature in blue ink, appearing to read "Chris Frei".

Chris Frei, P.E.
Senior Hydraulic Engineer