



December 16, 2015

**TO:** Flood Authority Members  
**FROM:** Scott Boettcher, Staff  
**SUBJECT:** Replacement of Damaged WF Satsop River Gage

The purpose of this memo is to update and make recommendation on replacement options for the WF Satsop River Gage. We will discuss this material at our December 17, 2015 Flood Authority meeting in Thurston County. Please feel free to call or email if you have any questions (i.e., 360/480-6600, [scottb@sbgh-partners.com](mailto:scottb@sbgh-partners.com)).

### **I. Background:**

In November the West Fork Satsop River gage was damaged by a slope failure. The gage is still recording and transmitting air temperature and precipitation correctly, but the stage is not being reported (i.e., the water level). This is a gage the Chehalis River Basin Flood Authority funded WEST Consultants to install. It is owned by the Flood Authority, not USGS, USACE, Ecology, WEDFW or any other entity. WEST Consultants has been asked to prepare repair and replacement options. These are present below along with a staff recommendation.

#### **Note:**

- Attachment A provides map showing the location of the WF Satsop River Gage as well a link to the gage site on the Chehalis River Basin Flood Warning System.
- Attachment B provides two photos showing the damaging slope failure and compromised bubbler line.
- Attachment C provides replacement options provides by WEST (Note: This type of activity is beyond the scope of normal maintenance repairs as WEST is currently contracted for.)



## II. Replacement Options:

Below (starting page 3), provides for the Flood Authority's consideration and discussion a listing of potential proposed small projects in priority order that have been evaluated and prioritized on the basis of the following criteria:

Option	Cost	Timeline	Comments
1 – Repair, Reinstall Bubbler	\$8,324	<ul style="list-style-type: none"> <li>◦ Complete temporary install by 12/25/2015 (assuming NTP on 12/17/2015).</li> <li>◦ Finish permanent install late summer (when water is lowest).</li> </ul>	<ul style="list-style-type: none"> <li>◦ Requires two trips for installation.</li> <li>◦ Still subject to damage from floating debris and/or slope failure.</li> <li>◦ Requires coordinating with Green Diamond (bubbler conduit goes on their bridge).</li> <li>◦ Reuses existing equipment.</li> </ul>
2 -- Install New Bridge-Mount Radar	\$10,050	<ul style="list-style-type: none"> <li>◦ Complete end-January 2016 to early-February 2016.</li> <li>◦ Requires 4-6 weeks for delivery.</li> </ul>	<ul style="list-style-type: none"> <li>◦ Faster to replace and it wouldn't be subject to bank erosion or damage from river debris.</li> <li>◦ Radar stage sensors are routinely used by USGS and USACE.</li> <li>◦ USGS uses one at Chehalis at Porter (see <a href="http://waterdata.usgs.gov/wa/nwis/nwismap/?site_no=12031000&amp;agency_cd=USGS">http://waterdata.usgs.gov/wa/nwis/nwismap/?site_no=12031000&amp;agency_cd=USGS</a>).</li> <li>◦ This was type of gage Flood Authority and OFM Funded through 2012 Jobs Now Act:               <ul style="list-style-type: none"> <li>▪ See <a href="https://www.ezview.wa.gov/DesktopModules/Documents2/View.aspx?tabID=28124&amp;alias=1492&amp;mid=65213&amp;ItemID=2015">https://www.ezview.wa.gov/DesktopModules/Documents2/View.aspx?tabID=28124&amp;alias=1492&amp;mid=65213&amp;ItemID=2015</a></li> <li>▪ See <a href="http://waterdata.usgs.gov/wa/nwis/nwismap/?site_no=12028060&amp;agency_cd=USGS">http://waterdata.usgs.gov/wa/nwis/nwismap/?site_no=12028060&amp;agency_cd=USGS</a></li> </ul> </li> <li>◦ New data logger is suggested because existing data logger includes a pressure transducer that is best used with bubbler systems (not necessary for radar sensors).</li> <li>◦ Removed bubbler equipment can be used as spare parts for Chehalis below Trash Creek or deployed at a new site.</li> <li>◦ Requires coordinating with Green Diamond (radar would be mounted on their bridge).</li> </ul>

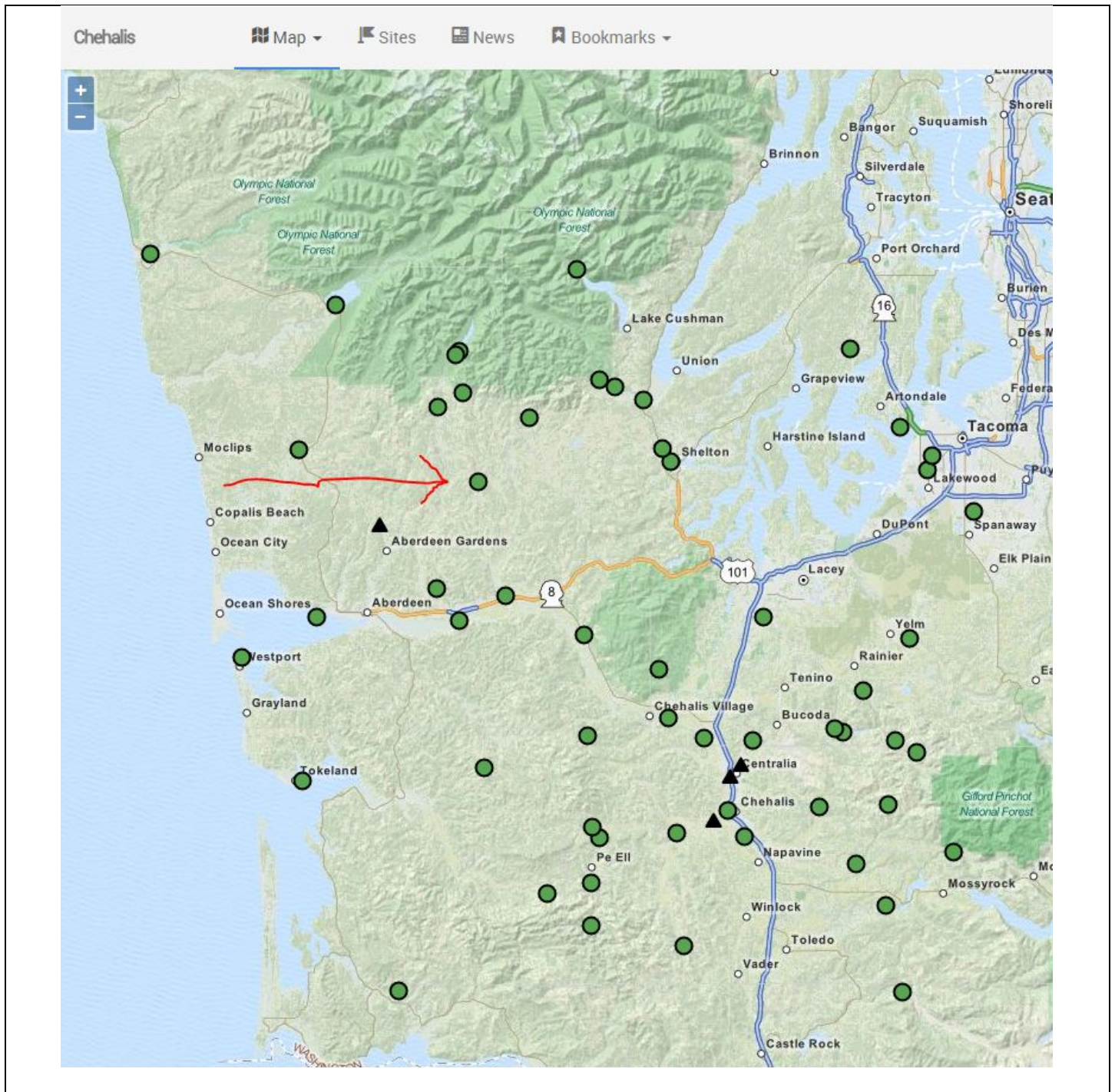


### **III. Recommendation:**

1. **Staff recommends the Flood Authority select Option 2 and the preferred repair choice.** Though it means being without gaging data at that site until late-January/early-February, the end result is preferred as it is:
  - More durable (current method is susceptible to slope failure during saturated soil instances);
  - More state-of-the-art now (USGS, USACE, and others use this option where there is a good bridge placement opportunity);
  - Salvaged old equipment can be reused elsewhere as extra parts inventory; and
  - Cost differential (\$1,726) does not seem so great as to not go with the bridge-mount option.
  
2. **Staff recommends the Flood Authority fund Option 2 using existing local project funds.** More specifically, the City of Aberdeen will likely not be moving forward with construction of the originally proposed Northside levee this biennium. They have a current allocation of \$2.7M. Staff recommends funding the gage replacement from these funds, monitoring for saving over time from other local projects, and where other projects demonstrate savings use those to replenish the Aberdeen allocation.

Attachment A  
Map

Gage Site -- [https://chehalis.onerain.com/site.php?site\\_id=15970&site=7407b97b-a7dc-4591-8fbe-bb8f1515339e](https://chehalis.onerain.com/site.php?site_id=15970&site=7407b97b-a7dc-4591-8fbe-bb8f1515339e)





**Attachment B  
Damage Photos**





**Attachment C  
Replacement Cost Options Detail**

**Option 1: Repair/reinstall bubbler stage sensor conduit line using existing equipment. Conduit and sensor tubing was damaged by left bank failure in vicinity of gage.**

**Task 1A: Temporarily repair/reinstall bubbler conduit as soon as possible. Bubbler line cannot be completely installed to measure all water levels until summer.**

No.	Item	Description	Unit Price	Qty.	Total Price
1	Services	Hydrologist 1	\$103.00	14	\$1,442.00
2	Services	Hydrologist 2	\$78.00	14	\$1,092.00
3	Travel	Hydrologist 1	\$103.00	6	\$618.00
4	Travel	Hydrologist 2	\$78.00	6	\$468.00
5	Per Diem	Hotel: Hydrologist 1	\$89.00	1	\$89.00
6	Per Diem	Hotel: Hydrologist 2	\$89.00	1	\$89.00
7	Per Diem	M&IE: Hydrologist 1	\$51.00	2	\$102.00
8	Per Diem	M&IE: Hydrologist 2	\$51.00	2	\$102.00
9	Mileage	Mileage from Vancouver to site plus local mileage	\$0.575	300	\$172.50
10	Materials	Miscellaneous materials to repair bubbler conduit	\$500.00	1	\$500.00
<b>COST FOR TEMPORARY INSTALLATION</b>			<b>TOTAL</b>		<b>\$4,674.50</b>

**Task 1B: Return during summer to more permanently secure the bubbler conduit and extend as needed to measure low water levels.**

No.	Item	Description	Unit Price	Qty.	Total Price
1	Services	Hydrologist 1	\$103.00	10	\$1,030.00
2	Services	Hydrologist 2	\$78.00	10	\$780.00
3	Travel	Hydrologist 1	\$103.00	6	\$618.00
4	Travel	Hydrologist 2	\$78.00	6	\$468.00
5	Per Diem	Hotel: Hydrologist 1	\$89.00	1	\$89.00
6	Per Diem	Hotel: Hydrologist 2	\$89.00	1	\$89.00
7	Per Diem	M&IE: Hydrologist 1	\$51.00	1.5	\$76.50
8	Per Diem	M&IE: Hydrologist 2	\$51.00	1.5	\$76.50
9	Mileage	Mileage from Vancouver to site plus local mileage	\$0.575	300	\$172.50
10	Materials	Miscellaneous materials to repair bubbler conduit	\$250.00	1	\$250.00
<b>COST FOR LOW FLOW INSTALLATION</b>			<b>TOTAL</b>		<b>\$3,649.50</b>
<b>TOTAL FOR OPTION 1</b>					<b>\$8,324.00</b>



**Option 2: Purchase and install radar stage sensor on bridge to replace bubbler sensor. A new data logger should be purchased with this option because the current H350XL datalogger is specific to a bubbler system. The bubbler equipment that is removed can be used as a spare for Chehalis below Thrash Creek or installed at a new station.**

**Task 1: Install radar stage sensor and new datalogger at WF Satsop gage. Interface datalogger with rain gage, air temperature sensor and GOES radio.**

No.	Item	Description	Unit Price	Qty.	Total Price
1	Services	Hydrologist 1	\$103.00	10	\$1,030.00
2	Services	Hydrologist 2	\$78.00	10	\$780.00
3	Travel	Hydrologist 1	\$103.00	6	\$618.00
4	Travel	Hydrologist 2	\$78.00	6	\$468.00
5	Per Diem	Hotel: Hydrologist 1	\$89.00	1	\$89.00
6	Per Diem	Hotel: Hydrologist 2	\$89.00	1	\$89.00
7	Per Diem	M&IE: Hydrologist 1	\$51.00	2	\$102.00
8	Per Diem	M&IE: Hydrologist 2	\$51.00	2	\$102.00
9	Datalogger	H500XL Datalogger	\$1,900.00	1	\$1,900.00
10	Radar Sensor*	DA Nile, FTS, or HSA HydraPulse	\$4,000.00	1	\$4,000.00
11	Materials	Miscellaneous materials to install radar sensor including mounting hardware, enclosure, conduit	\$700.00	1	\$700.00
12	Mileage	Mileage from Vancouver to site plus local mileage	\$0.575	300	\$172.50
				<b>TOTAL</b>	<b>\$10,050.50</b>
<b>TOTAL FOR OPTION 2</b>					<b>\$10,050.50</b>

\*Radar sensor would not be subject to damage from floating debris or bank failure.