MEMORANDUM

RE:	WILLOW CREEK STREAM INFLOW AND TIDAL HYDROLOGY
DATE:	January 7, 2013
FROM:	Alex Hallenius, PE
CC:	Jerry Shuster (City of Edmonds) Keeley O'Connell (EarthCorps) Paul Schlenger (Confluence Environmental)
TO:	David Cline, PE (Shannon & Wilson, Inc.) Kathy Ketteridge, PhD, PE (Anchor QEA LLC)

BOUNDARY CONDITIONS

This memo summarizes the Willow Creek stream and tidal inflow hydrology information related to the hydraulic modeling for the Willow Creek Early Feasibility Study.

The project survey vertical datum is the North American Vertical Datum of 1988 (NAVD88). Elevations in tidal environments (and from NOAA tidal gauges) are often reported in Mean Lower Low Water (MLLW) datum. For the project, the NAVD88 elevation can be approximated from the MLLW datum by subtracting 2.09 feet. This transformation was calculated using NOAA's VDatum v3.1 computer program. We recommend a professional surveyor confirm this transformation prior to development of project final design plans.

The tidal data from the NOAA Seattle Elliot Bay gage was compared with the LTC-1 logger installed at the Edmonds Marina for the time period September 1 through 14, 2012. There was little noticeable period (time) shift between the locations. In general, the amplitude of the LTC-1 location was diminished compared to the Seattle Elliot Bay tidal data by -0.2 feet. This may be attributable to the breakwater effect of the Edmonds Marina jetty. Therefore, it appears reasonable to use the Elliot Bay tidal data as a boundary condition for the Edmonds Marsh hydraulic modeling tidal boundary conditions. Figure 1 is a graph of the comparison.

Inflow hydrology modeling results, provided from the Dayton St. / SR-104 stormwater study, were reviewed. Based on our review of the modeling data, and information regarding recent historical flooding in the marsh, we recommend a modeling period of October 1, 2007 through September 30, 2008 for the Willow Creek Early Feasibility Study. This period corresponds to an observed flood event in December 2007 that had documented flooding, including overtopping of the Chevron/Unocal stormwater pond banks (Rasar, 2012).

The estimated 100-year flood event flows are 69cfs for Shellabarger at the SR-104 culvert, and 49cfs for Willow Creek at the 216th St. culvert (Geisburt, 2012). Data provided from the Dayton

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St. / SR-104 study for the October 2008 through September 2008 period have peaks inflows of 52cfs and 36cfs, for Shellabarger and Willow Creek respectively, which is on the order of a 25-year flood event. We did not identify inflow peak events on the order of the 100-year flood event. Therefore, we recommend using the large storm event of December 2007, with field documentation for flood overtopping of the Chevron stormwater pond as the project design flood hydrology.

Input files were created for the period October 1, 2007 through September 30, 2008. The data is provided in a file named "Boundary Conditions_20130107.xlsx". The worksheet "Elliot Bay" contains recorded tidal data from the Seattle Elliot Bay tidal gage for the time period, in one-hour time steps. The worksheet "Upstream" contains modeled flows from the SR-104 HSPF model for the time period, in 15-minute time steps. The designations RCH 200 and RCH 300 represent Shellabarger Creek and Willow Creek, respectively. A graph of the upstream boundary conditions is shown in Figure 2.

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Figure 1. Comparison of tidal gages

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Figure 2. Upstream Inflow Boundary Conditions