DRAFT MEMORANDUM

Date: December 9, 2020
To: Andrea McNamara-Doyle, Office of Chehalis Basin
From: Larry Karpack, PE, Watershed Science and Engineering; Erik Pipkin, Anchor QEA, LLC
Cc: Chrissy Bailey, Office of Chehalis Basin; Jim Kramer and Ken Ghalambor, Office of Chehalis Basin consultant staff; Heather Page, Anchor QEA, LLC
Re: Local Actions Program Near-term Technical Analyses for Office of Chehalis Basin: Hydrologic and Hydraulic Modeling of the 2080 100-year Floodplain

Overview

This memorandum describes the hydrologic and hydraulic modeling conducted to delineate the late-century (2080) 100-year floodplain for the Chehalis Basin Strategy. Hydrologic and hydraulic analyses were prepared to inform the State Environmental Policy Act (SEPA) Draft Environmental Impact Statement (EIS) and National Environmental Policy Act (NEPA) Draft EIS. The climate analysis for the SEPA and NEPA Draft EISs focused on the mainstem of the Chehalis River and a short distance up some of the major tributaries. The analyses did not provide predictions for the majority length of the tributaries.

For the NEPA Draft EIS, modeling was completed to delineate the 100-year floodplain under current conditions. For the SEPA Draft EIS, climate change modeling used available meteorological data provided by the University of Washington Climate Impacts Group (CIG)[1] and the hydrologic modeling used for NEPA to develop climate change predictions. In summary, average peak flows were predicted to increase by 13% at mid-century and 11% by late-century for the low-end emissions scenario. Average peak flows were predicted to increase by 11% at mid-century and 26% by late-century for the high-end emissions scenario. This analysis was more refined than previous climate change analyses completed for the Programmatic SEPA EIS, which had assumed peak flow increases of 66% during a 100-year flood event.

For the SEPA Draft EIS, predicted changes in flood flow volumes showed similar results to the peak flows. Flows were assumed to increase uniformly across the basin and also uniformly through the duration of the modeled flood flow events. Thus, late-century hydrologic inputs to the RiverFlow 2D hydraulic model were developed by scaling all historical inflows up by 26%. The RiverFlow 2D hydraulic model was run with these scaled-up flows and flood depths and water surface elevations were exported.

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[1] Ecology (Washington Department of Ecology), 2020. SEPA Draft Environmental Impact Statement Publication No. 20-06-002 for the Proposed Chehalis River Basin Flood Damage Reduction Project. February 2020.

Subsequent to completion of the SEPA Draft EIS technical analyses, an error was found in one of the dynamically downscaled General Circulation Model (GCM) data sets, which was subsequently corrected and showed an average peak flow increase for late-century conditions for the high-end emissions scenario of 50% (compared to 26%). Because the corrected hydrologic model predictions for this high-end scenario were found to be substantially higher than the earlier analysis, the hydraulic model was rerun using a 50% scalar on all inflows. These higher scaled inflows (referred to as the 2080 condition with 50% increase) were used to simulate a revised late-century 100-year flood.

Flood depth data from the hydraulic model were extracted to compare: 1) the FEMA special flood hazard area; 2) current conditions 100-year modeled flood extent (from the NEPA Draft EIS analyses); 3) 100-year modeled flood extent with a 26% increase in flow (from the SEPA Draft EIS analyses); and 4) the 100-year modeled flood extent with a 50% increase in flow. Maps showing the change in floodplain extent and flood depth under these four different scenarios are provided in Attachments 1 and 2, respectively.

ATTACHMENT 1

100-YEAR MODELED FLOOD EXTENTS

ATTACHMENT 2
100-YEAR MODELED FLOOD DEPTH