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MEMORANDUM

DATE: September 20, 206

TO: Rocky Howard
Public Works Director
City of Montesano

FROM: Deena Hueneka
Project Manager

SUBJECT: Wynoochee River Bank Protection Alternatives

PROJECT NUMBER: 217-1678-043

PROJECT NAME: Wynoochee River Bank Protection

INTRODUCTION

After conducting a geomorphic analysis and simulating three overbank protection alternatives in the developed SRH-2D hydraulic model, WEST Consultants and Parametrix, Inc. believe that the proposed alternatives may not have the desired effect of permanently protecting the bank of the Wynoochee River near of the City of Montesano Wastewater Treatment Plant (WWTP).

The geomorphic analysis suggests that the rates of lateral migration of the Wynoochee River (Figure 1) are greater immediately to the south of the WWTP, and smaller (but still towards the east) north of the WWTP. The hydraulic modeling of existing conditions and three project alternatives (Figure 2) shows that existing overbank velocities are small, and probably too small to cause significant overbank erosion, and that while groin placement would further reduce velocities near the WWTP, they would have little effect on near-bank velocities in the Wynoochee River.

Overall, while we believe that the hardening of the WWTP with its sheet-pile wall, and the placement of one or more overbank groins might further slow lateral channel migration upstream of the WWTP, there are two potential concerns. The first is that the overbank groins might not completely eliminate lateral migration upstream of the WWTP, and eventually the river might migrate behind the upstream extent of the groin(s) and cut a channel to the east of the WWTP over the long term. The second is that the continuing lateral channel migration to the south of the WWTP might eventually enter the relic channels of the Wynoochee River, moving the entire lower river towards the east, and over the longer term potentially threaten SR 107 between the Chehalis River and the WWTP. We believe that it would be useful to explore alternatives that might better prevent lateral channel migration or cause a re-establishment of the historic Wynoochee River channel towards the west.

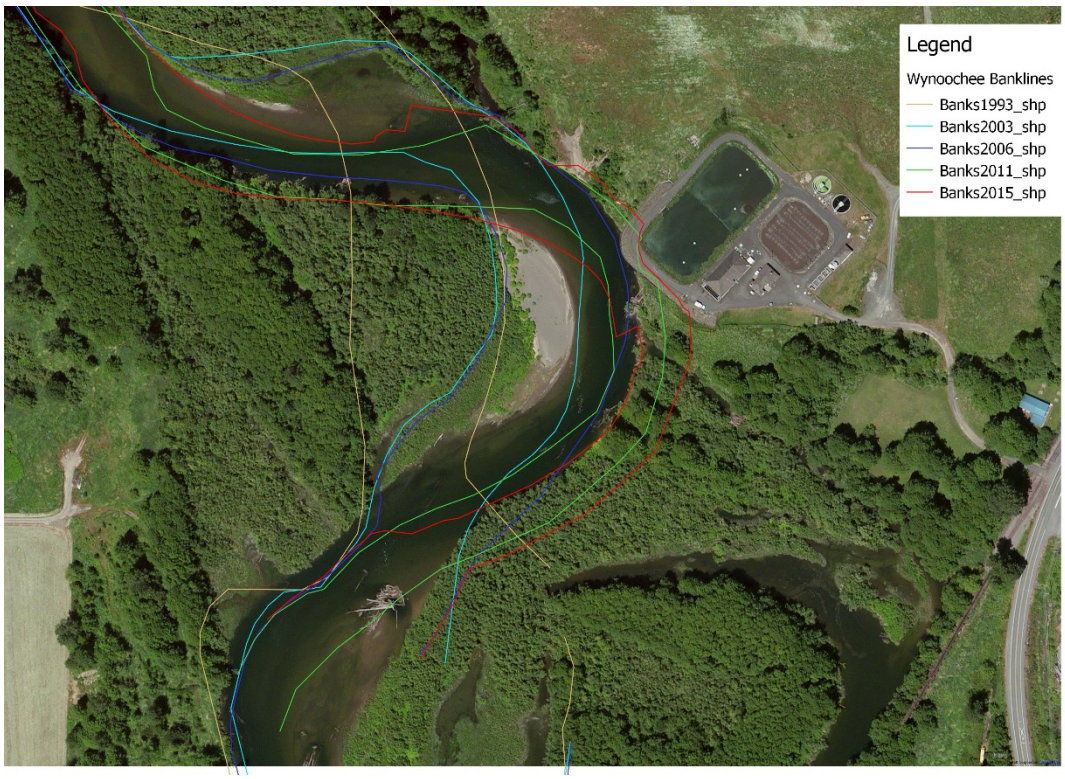

Figure 1. Bankline migration over time.

Figure 2. One alternative (Three Groin alternative) tested using the 2D model.

CHANNEL STABILZATION ALTERNATIVES

There are three methods we might consider to slow or eliminate the threat of lateral migration of the Wynoochee River towards the east that involve either "resistance" or "flow training":

1. Hardening the east bank of the Wynoochee River upstream of the WWTP,
2. Place pile structures around the bend of the river that would accumulate wood and form a "natural" hardening of the bank and direct flow towards the river's center, and
3. Encouraging the Wynoochee River to take a course further towards the west.

Resistance methodology generally uses structures of some sort placed in the path of the channel migration to resist the natural course of channel migration and prevent further movement. Flow Training methods, on the other hand, uses structures to redirect flow into more desirable patterns, which allows the natural channel processes to continue, and may cause the channel to move away from the area that is endangered. Flow training options are generally better long-term solutions, but can require more permitting and approvals for their construction.

1. Hardening River bank

One possible protective measure is to build a hardened structure (such as an excavated riprap revetment) in the overbank to the northwest of the WWTP. This wall could be tied into the western corner of the WWTP, and extend in a curved path northwest to high ground along Sylvia Creek. This may provide enough resistance to prevent the bank from eroding, and the curvature would be designed to direct flow away from the WWTP and the historical overbank channels to the south and east. With enough time, the river may even continue to move towards the south until the bank north of the WWTP is no longer in danger of channel migration. However, experience has shown that the river's thalweg may tend to move next to the structure. A structure could also be extended south of the WWTP to completely prevent the channel from migrating near the plant. Since this is a resistive measure, the channel could move in an unexpected direction, or even erode the bank upstream and get behind the structure. A main advantage of this measure is that it would require fewer permits, since it is constructed entirely in the overbank. One possible layout for this alternative is displayed as a red line below in Figure 3.

2. In-river pile structures

Another possible measure would be to place pile structures in the channel near the WWTP, and fill the area between the piles with natural and woody debris. This should cause the channel to begin to move westward back across the point bar that has been deposited, where there is less resistance to flow. Because the point bar was deposited by the river over time, the sediment is not very compact and is susceptible to movement by natural channel processes. This alternative is shown below as the white markers in Figure 3. This option may also be used together with a hardened structure, which would arrest bank migration on the north side of the WWTP while the pile structure causes the channel to migrate westward away from the plant.

3. River training

The geomorphic analysis showed that the main channel of the Wynoochee River used to lie further to the west until gravel pits were developed in the overbank and a berm placed (probably with material excavated from the pits) that moved the river towards the east. If the berm was breached at several locations along its alignment to encourage lateral migration towards the west, a high-flow 'pilot' channel excavated, and training structures placed in the river, it might encourage the river to move towards the western side of the floodplain and re-establish the main channel there. The possible location of the high-flow pilot channel and training structures are shown in yellow in Figure 3. The yellow lines are not intended to indicate the width of the high-flow pilot channel, only its general location and alignment.

Figure 3. WWTP Vicinity with possible protection alternatives. The sheet pile wall is shown in red, while the piles are shown in the lighter color.

These are not the only options available, but are representative of the types (or combinations) of measures that could be considered. Due to the meandering nature of the Wynoochee, a more comprehensive, large scale set of protective measures may need to be considered.