



5309 Shilshole Avenue NW
Suite 200
Seattle, WA 98107
206.789.9658 phone
206.789.9684 fax

www.esassoc.com

memorandum

date June 20, 2012

to Kirk Holmes and Doc Hansen, Kittitas County

from Steve Winter, PH

subject Kittitas County SMP
Preliminary Channel Migration Zone Delineation Results

This memorandum describes our preliminary channel migration zone (CMZ) delineation for approximately 7 miles of the Teanaway River between the forks and Red Bridge Road in Kittitas County, Washington. This effort is intended to support the County's Regional Shoreline Master Program update. The work described here is offered as a preliminary deliverable for review by the County, Department of Ecology, and the Technical Advisory Committee to confirm the basic approach to the mapping and also plan the subsequent efforts to extend this mapping to other areas of the County.

The CMZ mapping is based on a number of data sources; primarily:

1. A shapefile prepared by the Department of Ecology designating reaches of shoreline streams in Kittitas County with the potential for migration.
2. 2011 color aerial photo provided by the County
3. 10m Digital Elevation Model provided by Ecology
4. 1:100,000 scale geology mapping developed by WA DNR
5. 1954 and 1955 aerial photos – scanned images provided by Central Washington University.
6. 1884 GLO map obtained from the BLM website
7. Previous channel position mapping for the lower Teanaway Valley provided by WSDOT.
8. 1:24,000 scale USGS topography.
9. Approximate floodplain mapping (FEMA Q3 data)

This mapping generally followed the methods described in Clallam and Mason Counties (see for example *DRAFT Channel Migration Assessment – Clallam County* [Ecology, GeoEngineers, Cardno-Entrix, December 2011]). This process consists of first identifying the existing active stream channel corridor and then adding appropriate avulsion and erosion hazard buffers. Using this process we created a preliminary map of the potential lateral extent of the CMZ (Figure 1). The preliminary map of the Teanaway River reach is likely to be less resolved when compared to reaches where more accurate LiDAR topography is available. For the CMZ delineation, we followed the process outlined below in Table 1, with notes regarding how the mapping was developed for this reach.

Table 1. Channel Migration Zone Delineation Elements

Element	Source/development	Notes
Active Channel	Digitized from 2011 aerial photo	Active channel included bars and secondary channels judged to be frequently activated.
Avulsion hazard areas	Included locations from 1950s aerials showing main channel outside existing active channel. Taken from existing meander bend apex downstream if there is a relict channel or swale judged to be within the inundation area.	A number of avulsion hazard areas were identified; exclusively on the river left (facing downstream) bank of the channel.
Erosion Hazard Buffer – Active Channel	150 to 300 foot buffer from Active Channel	Based on width measurements, the active channel meander amplitude typically ranged from 150 to 350 feet.
Erosion Hazard Buffer – Avulsion hazard areas	100 foot buffer from Avulsion Hazard Areas.	Incorporated on the outside (away from Active Channel) edge of mapped avulsion hazard areas.
Disconnected Areas	--	No disconnected areas were identified in this reach.
Geotechnical Setbacks	Sketched along terrace in portions of river right bank.	Identified for locations with taller terrace composed of landslide or glacial outwash materials. These areas would require more detailed analysis to determine appropriate management measures.
Channel Migration Zone	Sketched along outside edge of the Erosion Hazard buffer areas described above.	Typically, a 300 foot erosion hazard buffer was applied to the river left bank, and 150 feet were applied to the river right bank to capture the greater potential for migration into the alluvial valley. In select locations, additional erosion hazard buffer was assumed in sections with a wider meander belt width.

For this effort, the 1884 GLO map and the 1950s aerials were approximately orthorectified to provide some estimate of previous channel positions. The 1884 GLO map was used only for context because registration errors suggested that it should not be used for explicit mapping of channel position. The 1950s aerials were very valuable for identifying and mapping historic channel position, and the rectification errors were low in terms of warping the image to fit the 2011 aerial.

The floodplain mapping was used as a general indicator to determine if relict channel features on the valley floor could be inundated. If so, the features were typically captured as an avulsion hazard zone.

The entire section was delineated as one reach. Changes in channel form are generally subtle in the study area with most of the reach exhibiting sinuous meanders often with multiple channels, and some forested islands. A smaller proportion of the study area includes straight single channel sections, but these were not delineated as

separate reaches as part of this effort. In future efforts it may be better to have a CMZ reach break at the confluence with the North Fork.

Discussion

For the period from 1954 to 2011, active migration is evident in a number of locations along this seven mile reach. The overall channel plan form generally follows the river right (facing downstream) valley wall. Migration has occurred almost exclusively within the alluvial sediments of the valley floor.

Migration along into the right bank valley wall is limited to two or three locations and the extent of migration is not as great in these locations as compared to the extent of migration along the left bank. The valley walls in these locations are mapped as older landslide materials, a glacial outwash terrace, and limited exposures of sedimentary rock (middle unit of Rosyln formation) based on WA DNR 1:100,000 geology mapping. The valley wall at these locations is near vertical or very steep in the downstream portion, transitioning to a less steep hill slope with dissected terrace in the upstream portion.

As noted above, this mapping is preliminary, but illustrates the methods that would be applied throughout the Shoreline jurisdiction in Kittitas County where Ecology has identified the potential to migrate. No field work has been performed to develop this mapping, nor have there been any geotechnical investigations.