MEMO

To: Jeffree Stewart, Shoreline Planner, Ecology, SWRO SEA Program
Steve Gray, Deputy Director/Planning Manager, Clallam County
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From: Patricia L Olson, PhD, LHG, Senior Hydrogeologist, Ecology SEA Program

Cc: Peter Skowlund, Brian Lynn

Date: January 2, 2013

Re: Revised draft CMZ boundaries for Lower Morse Creek, Clallam County

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Lower Morse Creek CMZ Modifications

On 04/13/2012, Mary Ann Reinhart GeoEngineers Senior fluvial geomorphologist, Jeffree Stewart Ecology SEA program shoreline planner and I met with Clallam County staff to discuss draft channel migration zones mapped for Clallam County's SMP update. We presented the planning level CMZ delineation methodology used to map the SMP channel migration zones and discussed the draft boundaries. During that meeting Clallam County requested that we reevaluate the draft SMP channel migration boundaries for Lower Morse Creek.

Following the meeting, Jeffree Stewart and I visited lower Morse Creek area. We observed during that brief visit that the boundaries may be altered and still meet the intent of the SMP planning process. However, a more detailed assessment was necessary to determine boundary locations.

The draft SMP planning level CMZ is modified as follows:

- The outer CMZ boundaries (yellow lines) are brought more stream ward than the original boundaries (Figures 1a and b).
- The CMZ is divided into a higher potential hazard CMZ (red boundary Figures 1a and b) and a CMZ buffer which has a lower potential hazard (yellow boundary, Figure 1a and b).

These are only potential ratings because a detailed hazard assessment has not been done.

Discussion

The revised draft CMZ was determined based on conditions observed during 4/13/12 brief site visit, channel characteristics, geology, soils, FEMA floodplain map, and historic aerial photos (1939, 1954, 1979) and maps (1907-08 T-sheet). This historic data (1908-1954) provided additional information on the extent of Morse Creek before development, riprap and levees (Figure 1). New 2012 LiDAR data for Lower Morse Creek is now available from the Puget Sound LiDAR Consortium. A relative water surface elevation model (RWSE) for Lower Morse Creek was derived from the 2012 LiDAR bare earth data (Figure 1b). This newer LiDAR data is higher resolution and better control than the 2002 data. However, the 2012 data does not cover all the streams covered by the 2002 LiDAR.

Currently there is very little development within the higher potential hazard CMZ. The higher potential hazard CMZ contains the stream lines from the historic air photos and T-sheet with the exception of some relic distributary channels evident in the 1954 air photo and 1908 T-sheet.

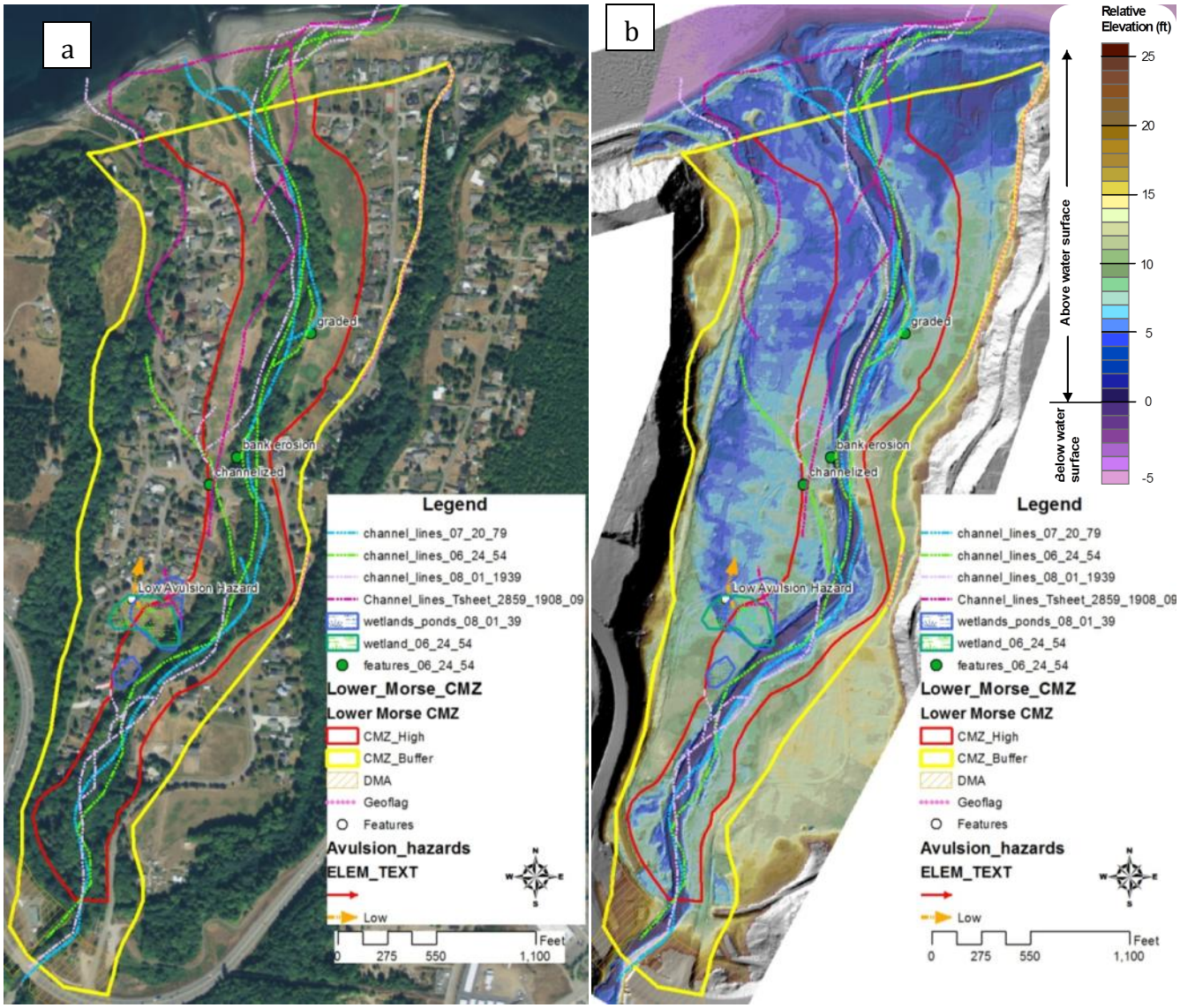

Figure 1: Revised draft SMP planning level CMZ boundaries, 1908, 1939, 1954, 1979 stream lines and other relevant information for Lower Morse Creek. The CMZ was divided into a higher channel migration potential hazard area (red line) and buffer or lower hazard potential channel migration area (yellow line). The boundaries are shown on (a) the 2011 NAIP orthophoto and (b) the relative water surface elevation DEM derived from the 2012 LiDAR bare earth data (Puget Sound LiDAR Consortium). Higher resolution maps are in Appendix A.

The buffer or lower potential CMZ does include development. At this point the river left (looking downstream) floodplain and delta are still within the CMZ buffer because:

- Soils have high sand content (64-68%). The valley geology is alluvium and the right valley wall is outwash. Both the soils and geology are easily eroded. Geoflags are placed where the CMZ intersects the right valley wall.

- The levees are not continuous and do not meet the SMP criteria that allow areas landward of these structures to be a disconnected channel migration zone. Bank stabilization does not meet the criteria either.
- However, if the roads are above the 100-year elevation such as Strait View Drive (Figure 2), built to withstand the 100-year flood hydraulic forces, with a public commitment to keep them intact and maintained can be considered constraints to migration (WAC 173-26-221(3)(b)). The roads within the valley are not considered barriers. Strait View Drive may be if it is maintained by Clallam County or other public agency. On valley left the Discovery Trail may also be a barrier but we don't have information on its maintenance should it fail.
- Much of the area is within the FEMA floodplain (Figure 2) and has areas only slightly higher to below the water surface elevation from the LiDAR data (Figure 1a and 3).
- The relative water surface elevation model and associated profiles indicate a low avulsion hazard on river left (Figures 3 and 4). The avulsion path is likely a relict distributary channel.

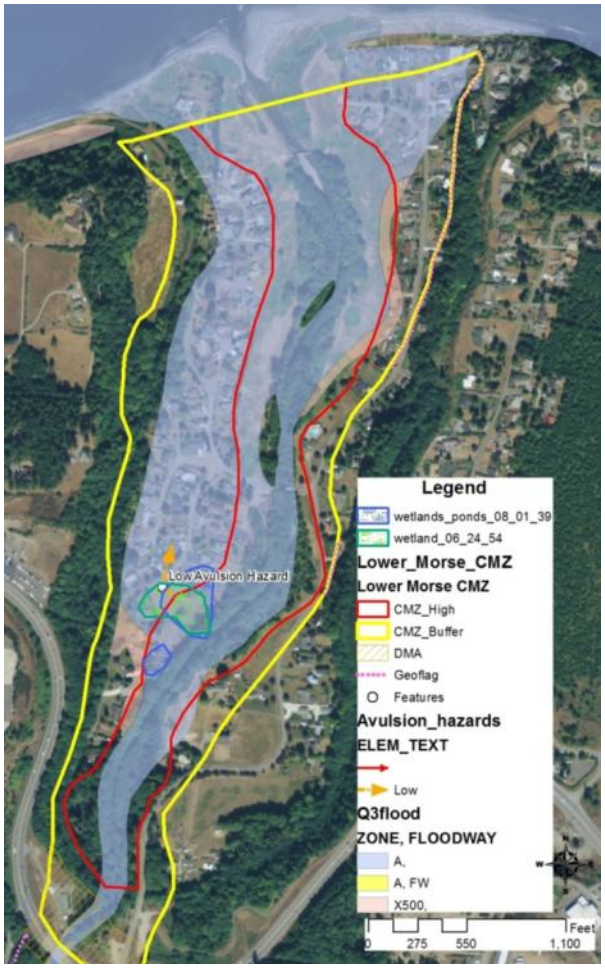

Figure 2. On river left the FEMA floodplain extends to the base of the valley wall. The relative water surface elevation model indicates that this area is lower than the valley floor on river right. The CMZ boundary (yellow line) incorporates the floodplain. Higher resolution maps are in Appendix A.

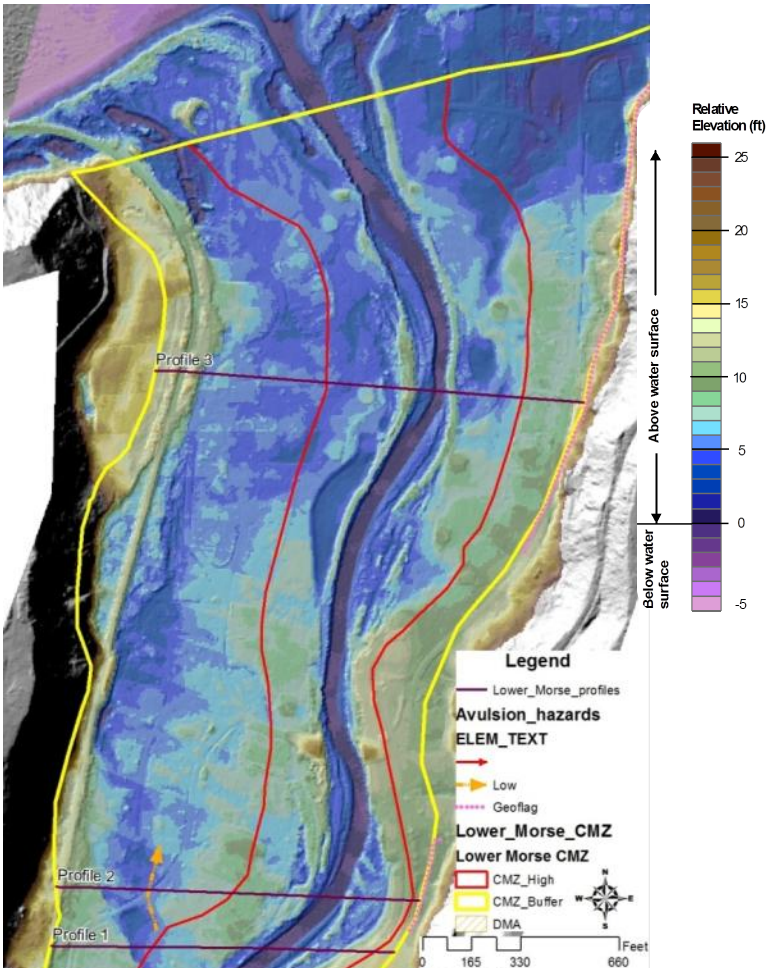

Figure 3. The relative water surface elevation DEM shows that the left valley elevation relative to low flow water surface elevation is slightly higher (4-5 feet) than Morse Creek low flow water surface elevation. The low potential avulsion hazard is indicated by the dashed orange arrow. Higher resolution maps are in Appendix A.

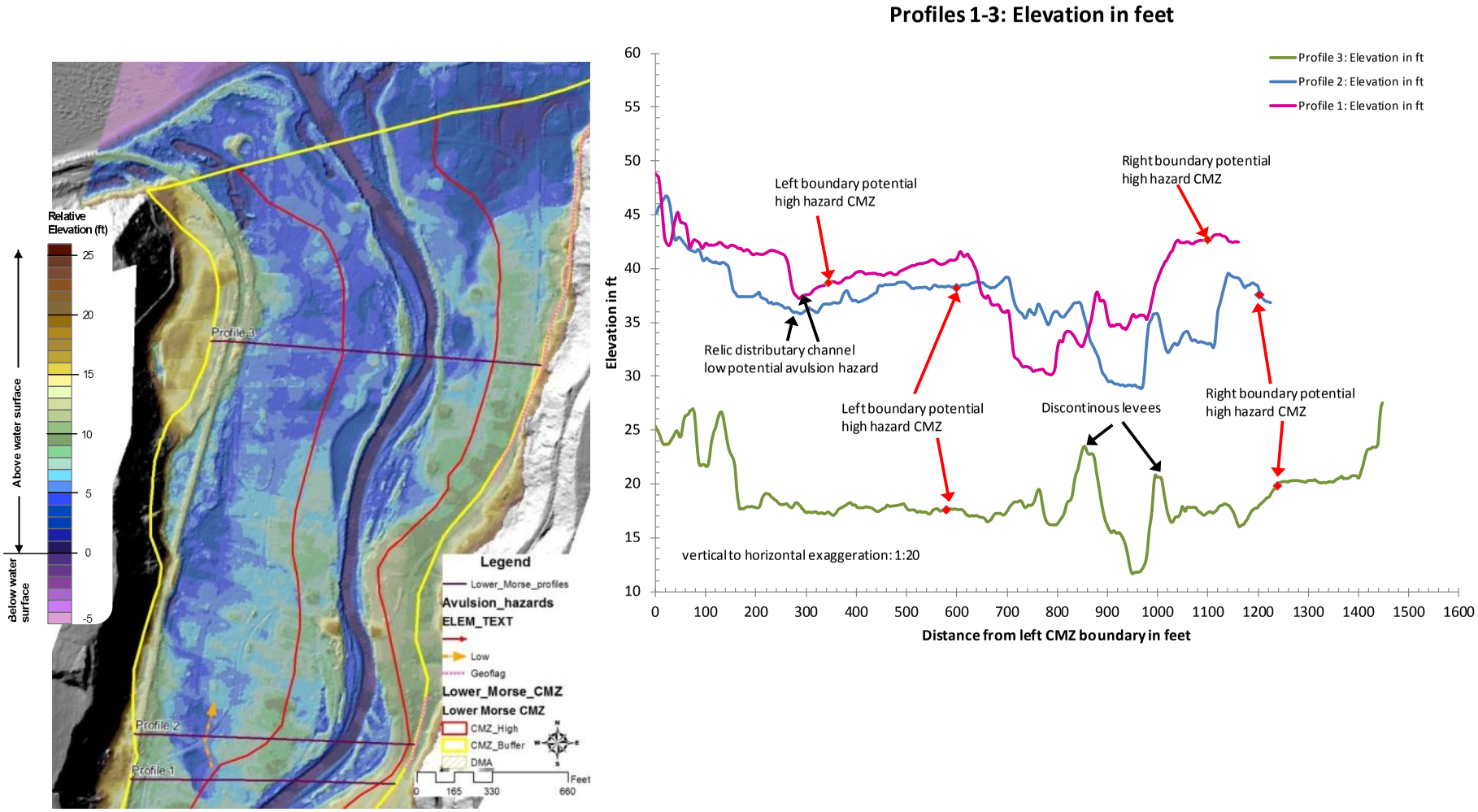

Figure 4: The orange dotted arrow in figure lower left indicates a low potential avulsion hazard. The relative water surface elevation suggests that the land adjacent to the left valley wall was a channel, likely a distributary channel, at one time. The 1908 T-sheet and 1939 aerial photo show channels in this area (Figure 1). Higher resolution maps are in Appendix A. The elevation profile from the LiDAR elevation data also indicates that there was a channel in this location.

Summary

The higher potential CMZ has little to no development within it. The CMZ encompasses recent historic channels (1908-present). The stream has incised. Incised streams at some point usually begin to erode their stream banks and widen. While bank stabilization often is a good indicator that erosion is occurring; there is some physical evidence that bank erosion and some aggradation are occurring. For flood hazard reduction purposes, this area should remain green space as it currently is maintained.

The buffer or lower potential CMZ area is developed. The SMP guidelines under the flood hazard reduction section, WAC 173-26-221(3)(c)(i)-(v) provide standards for maintaining and protection existing development:

(i) Development in flood plains should not significantly or cumulatively increase flood hazard or be inconsistent with a comprehensive flood hazard management plan adopted pursuant to chapter 86.12 RCW, provided the plan has been adopted after 1994 and approved by the department. New development or new uses in shoreline jurisdiction, including the subdivision of land, should not be established when it would be reasonably foreseeable that the development or use would require structural flood hazard reduction measures within the channel migration zone or floodway. The following uses and activities may be appropriate and/or necessary within the channel migration zone or floodway:

- *Actions that protect or restore the ecosystem-wide processes or ecological functions.*
- *Forest practices in compliance with the Washington State Forest Practices Act and its implementing rules.*
- *Existing and ongoing agricultural practices, provided that no new restrictions to channel movement occur.*
- *Mining when conducted in a manner consistent with the environment designation and with the provisions of WAC 173-26-241 (3)(h).*
- *Bridges, utility lines, and other public utility and transportation structures where no other feasible alternative exists or the alternative would result in unreasonable and disproportionate cost. Where such structures are allowed, mitigation shall address impacted functions and processes in the affected section of watershed or drift cell.*
- *Repair and maintenance of an existing legal use, provided that such actions do not cause significant ecological impacts or increase flood hazards to other uses.*
- *Development with a primary purpose of protecting or restoring ecological functions and ecosystem-wide processes.*
- *Modifications or additions to an existing nonagricultural legal use, provided that channel migration is not further limited and that the new development includes appropriate protection of ecological functions.*
- *Development in incorporated municipalities and designated urban growth areas, as defined in chapter 36.70A RCW, where existing structures prevent active channel movement and flooding.*
- *Measures to reduce shoreline erosion, provided that it is demonstrated that the erosion rate exceeds that which would normally occur in a natural condition, that the measure does not*

interfere with fluvial hydrological and geomorphological processes normally acting in natural conditions, and that the measure includes appropriate mitigation of impacts to ecological functions associated with the river or stream.

(ii) Allow new structural flood hazard reduction measures in shoreline jurisdiction only when it can be demonstrated by a scientific and engineering analysis that they are necessary to protect existing development, that nonstructural measures are not feasible, that impacts on ecological functions and priority species and habitats can be successfully mitigated so as to assure no net loss, and that appropriate vegetation conservation actions are undertaken consistent with WAC 173-26-221(5).

Structural flood hazard reduction measures shall be consistent with an adopted comprehensive flood hazard management plan approved by the department that evaluates cumulative impacts to the watershed system.

(iii) Place new structural flood hazard reduction measures landward of the associated wetlands, and designated vegetation conservation areas, except for actions that increase ecological functions, such as wetland restoration, or as noted below. Provided that such flood hazard reduction projects be authorized if it is determined that no other alternative to reduce flood hazard to existing development is feasible. The need for, and analysis of feasible alternatives to, structural improvements shall be documented through a geotechnical analysis.

(iv) Require that new structural public flood hazard reduction measures, such as dikes and levees, dedicate and improve public access pathways unless public access improvements would cause unavoidable health or safety hazards to the public, inherent and unavoidable security problems, unacceptable and unmitigable significant ecological impacts, unavoidable conflict with the proposed use, or a cost that is disproportionate and unreasonable to the total long-term cost of the development.

(v) Require that the removal of gravel for flood management purposes be consistent with an adopted flood hazard reduction plan and with this chapter and allowed only after a biological and geomorphological study shows that extraction has a long-term benefit to flood hazard reduction, does not result in a net loss of ecological functions, and is part of a comprehensive flood management solution.

Disclaimer

As with all hazards that have not been thoroughly investigated, these boundaries are approximate and hazard (high, low) is only a potential rating. The boundaries do not represent a sharp boundary where one side of the line is subject to channel migration, and the other side is immune. Although LiDAR data and the derived RWSE map are powerful new tools for analyzing geomorphic features, they are not a substitute for field investigations and data collected on the ground. Therefore, this assessment should only be used as guidance as to where more specific channel migration and geotechnical studies should be conducted where changes or development is planned within the approximate boundaries established by this study.

APPENDIX A: MAP PORTFOLIO