OREGON FISH AND WILDLIFE OFFICE
ISSUE STATEMENT

DATE: May 31, 2007

PURPOSE: Determination of the vertical stability of the lower Chetco River

Concern over the impact of instream gravel mining on the lower Chetco River in Southwestern Oregon has precipitated a reconnaissance level investigation of the vertical stability of the channel from river mile (RM) 11.0 downstream to the mouth. This issue statement summarizes the findings of a brief analysis based on existing data (see attachment) and a one day field investigation on May 23, 2007. Agency staff assigned to this task include: Dr. Janine Castro, USFWS, Chuck Wheeler, NMFS, and Bob Lobdell, DSL. A brief peer review was provided by Dr. Peter C. Klingeman, Professor Emeritus, OSU, Corvallis, OR, Dr. Andrew Simon, Research Geologist, USDA—ARS, National Sedimentation Laboratory, Oxford, MS, Dr. Colin Thorne, Professor of Physical Geography, University of Nottingham, UK, Dr. Brian Cluer, Geomorphologist, NMFS, Santa Rosa, CA, and Rob Sampson, State Conservation Engineer, USDA—NRCS, Boise, ID.

A matrix including the analysis method used, data available, and indication of vertical trend is attached, along with a list of all source data consulted during this analysis.

RECONNAISSANCE ACTIVITIES:

The following analyses were completed during the month of May, 2007, to determine the vertical stability of the Chetco River.

- Specific-gauge analysis, including rating table shifts, completed by Dr. Peter Klingeman, May 9, 2007.
- Analysis of bathymetry from 1939 and 1976 maps, along with recent surveys in 2007 by Tidewater Contractors, completed by Robert Elayer, Tidewater Contractors.
- Planform analysis of the upper Tidewater Contractors site and Emily Creek reach, completed by Castro and Cluer, 2007.
- Highway 101 bridge-scour reports from 2005 and 2006, which includes an underwater investigation, completed by ODOT.
- Evaluation of existing bank-stabilization measures from 1983 to the present, based upon Corps of Engineers permit records and field investigation, completed by Janine Castro.
- Evaluation of municipal water-supply intakes on the Chetco River, including the City of Brookings and Harbor Rural Water District, completed by Chuck Wheeler via personal communication with the City of Brookings.
- Review of time series cross-sections including SCS Flood Study (1977), Marquess and Associates (1980), and Oregon Department of State Lands (1981), completed by DSL.
- Field investigation of bar height relative to floodplain height, completed by Janine Castro and Brian Cluer, 2007.

- Field examination of floodplain and bank areas to identify buried soil horizons, completed by Janine Castro, 2007.
- Riparian vegetation changes from aerial photos and ground surveys, completed by Janine Castro, 2007.
- Field examination of streambed sediment patterns, including armoring, particle imbrication, and particle-size distributions (visual), completed by Janine Castro and Brian Cluer, 2007.

VERTICAL STABILITY DETERMINATION:

Based on the available data at the time of this investigation, the current overall vertical trend of the Chetco River is dynamic equilibrium. This conclusion is further refined into three specific channel reaches.

RM 11.0 to RM 7.0

The positioning of gravel bars in the river from RM 11.0 downstream to RM 7.0 has been stable for many years as indicated by consistent bar form, bar size and degree of confinement of the low water channel width over several decades. The specific-gauge analysis shows short periods with water levels rising and falling for a specified discharge. This can be interpreted to indicate phases of aggradation and degradation at the gauging station, with the most recent phase being degradational. This typifies a stream with significant bedload transport during high flow years, rather than constant bedload transport every year. Based on a regression analysis, the trend for the last 36 years is degradational, but the overall magnitude of change is small (approximately 1 foot for moderate to high flows). Reduced sediment input from the catchment due to changes in land use management may be in part responsible for this trend. The history of gravel extraction both upstream and downstream of the gauge may also have affected the stage/discharge relationship.

RM 7.0 to RM 2.0

Below RM 7.0 downstream to head of tide the channel has been, and continues to be, highly dynamic. For example, the thalweg has shifted laterally, gravel bars have changed location and there is wider variation in bar heights than in the reaches up and downstream. Most of the bank stabilization work performed during the past 25 years has occurred in this reach in response to channel migration and bar formation. Field investigation suggests that failures of bank stabilization works are primarily due to inadequate design and/or implementation rather than system-wide degradation. The low flow channel is much wider and shallower than in the upstream reach, as clearly shown on the aerial photos, with the widest, shallowest section occurring in the region of RM 6.0 to RM 4.0. Lateral instability in this reach is exacerbated by anthropogenic, instream activity. Experience shows that actions that disturb the gravel armor and lower bar elevations may result in accelerated sedimentation and reductions in pool depths. Within this context, recent gravel deposition is evident from a buried soil surface on Freeman Bar at RM 6.0. However, despite the high level of lateral shifting and bar change, the presence

of intact remnant bridge piers at RM 6.5 indicate that adjustments to the bed elevation around this location have been minimal. This interpretation is based on the assumption that the bridge was not a major stream crossing, but rather was used to access the gravel bar on the north side of the river during low flows. Since the bridge was probably constructed for limited access, it is inferred that the bridge piers were not driven to great depths in the channel bed. Additionally, remnant bridge decking was apparent only a few feet above the water surface elevation.

It may be concluded that channel adjustments in this reach during the past 40 years have been predominantly in the lateral rather than vertical dimension.

RM 2.0 to RM 0

The tidal reach of the Chetco River appears to have deepened slightly over the past 20 years based on review of current and historical aerial photos that reveal a decrease in the elevation of intertidal bar forms. The probable cause of channel deepening is a combination of navigational dredging, interruption of littoral-derived sediments, and gravel extraction. This interpretation is corroborated by five cross-sections surveyed by the COE, DSL, and Tidewater Contractors for 1939, 1976, and 2007, respectively.

SUMMARY:

Based on the available data and field reconnaissance, the fluvial course between RM 11.0 and RM 2.0 of the Chetco River appears to be in dynamic equilibrium, while the tidal reach downstream of RM 2.0 has deepened in response to sediment removal. Depending upon the stream reach and the time period considered, there are indications of both slight aggradation and degradation in the fluvial reaches. Much of the channel adjustment that occurs in the lower Chetco River appears to be in the lateral dimension, as indicated by shifting bar forms and bank erosion. Annual disturbance of the bed and bar material due to gravel extraction is exacerbating the lateral instability of the channel between RM 7.0 and RM 2.0. This is because bedload in the Chetco River is transported in significant quantities during major flood events, with reworking of the deposited sediments during intervening years.

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