Nenana River Stabilization and Port Improvements
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Project Description: The City of Nenana is a unique multi-modal transportation hub located on the Parks Highway at the confluence of the Tanana and Nenana Rivers. Nenana provides rail, highway, air and river transportation facilities. The river transportation aspect includes providing essential fuel and freight barge services to Yukon River communities from Pilot Station on the Bering Sea coast to Eagle near the Canadian border. The Port facilities in Nenana include a freight and fuel transfer facility utilizing a bulkhead retaining wall system along the Tanana River and a ways for removing barges, barge repair and storage area along the Nenana River.

However, the unprotected Nenana River has undergone recent significant changes in its channel meanders and bank locations. Historical photographs of this area of the Nenana River show how the river has changed over the course of about 60 years. Historical attempts at controlling erosion have not succeeded. In order to design a stable bulkhead on the Nenana River, it was necessary to address the potential for continued erosion trends upstream from the proposed bulkhead location.

Background Information: Historical air photos were used to delineate the past river channel meanders and bank locations. The historical perspective clearly demonstrates that the current location of the Nenana River is much different than when the port facility was first constructed and that the river has eroded much of the bank that previously provided port protection. A series of digitized historical air photos from 1949 to 1971 with the current 2009 bank location outlined are presented in Figures 1—3. Figure 4 is the most recent aerial photo taken October 18, 2009.

Increased deposition near the confluence of the Tanana and Nenana Rivers is also evident from the historical photos. The historical photos show the river channel has significantly decreased in width, with the braided flood channel to the west almost completely filled in with sediment. The main channel near the confluence has migrated to the west along with the east bank location. In the past 15 years, according to personnel working at the Nenana Port, the river bank has moved about 20 feet toward the west bank of the Nenana River. In order to provide adequate freeboard in the docking area on the Nenana River, the eastern channel is continually dredged.

The aerial photos taken in 2009 were converted to orthometric photos and were used as the basis for the digital terrain model (DTM). A bathymetric survey was completed in 2010 and was incorporated into the DTM. River bed contours were mapped from the 10 ft. Average water level to the confluence of the Nenana and Tanana Rivers. The bathymetric survey and DTM were used in the hydraulic analysis.

Description of Alternatives: Air photos, digital terrain models and planimetric maps were used with river modeling software to evaluate potential alternatives. The model enabled predictions of river levels and velocities as necessary to design bank protection structures. For the purpose of this study, the project area was divided into “upstream” and “downstream” reaches as shown in Figure 4. The upstream erosion control structures focus on stabilizing the meander that has shown recent significant eastern movement. The downstream alternatives present three bulkhead alternatives as well as erosion control structures on the west bank.

No Build: If the current erosion trend of the Nenana River is allowed to continue, it is possible that the river may erode beyond the planned bulkhead, endangering the port facility as well as other developments including the Alaska Railroad main track.

Upstream Reach: Two alternatives for erosion control on the upstream portion of the project area are presented in Figure 5.

Alternative 1: Restore the upstream portion of the river to the approximate 1949 channel location and create an emergent wetland area. The bank will be armored continuously with a 4 foot thick section of Class III riprap. Deepening of the high water channel that starts near the 10th Avenue landing may be required to keep bank full elevations close to existing conditions. Restoring the right bank to the 1949 orientation aligns the channel with the sheet pile wall, increasing the flow and velocity of the river and reducing the buildup of sediment along the wall.

Alternative 2: Stabilize the bank in its current location with armoring. Two types of armoring of the existing bank were considered, a continuous riprap revetment and a combination of riprap revetment and stream bars. A continuous 4 foot thick section of Class III riprap tied into the upper end of the sheet pile dock would be the most robust alternative. Bank full flood elevations will not be significantly changed by either of these armoring alternatives. These armoring alternatives will not reduce sediment buildup along the sheet pile wall.

Figure 1. Nenana River in 1949 with 2009 bank outline.
Figure 2. Nenana River in 1959 with 2009 bank outline.
Figure 3. Nenana River in 1971 with 2009 bank outline.
Figure 4. Nenana River, October 18, 2009.

Figure 5. Upstream Reach Alternatives.