

Trip Report to the Denali Commission
Holy Cross, Alaska
November 3, 2011

1) Participants: Jason Norris (CEPOA-EN-CW-PF), Robert Tedrick (CEPOA-EN-CW-HH), Pamela Lovasz (CEPOA-EN-GES-GM), and Tatton Suter (CEPOA-EN-CW-PF).

2) Situation: We visited Holy Cross, Alaska October 3rd and 4th, 2011 to conduct a site visit and coordination meeting related to the potential relocation of the town's barge landing. The current location is just north of the town in Walker Slough, which is slowly being filled with sediment rendering it inaccessible by barges during low water events.

We met with Eugene Paul (First Chief), John Aloysius Jr. (Second Chief), Tessiana Paul (Administrator), Matthew (Last name unknown), and a few residents around town (names not known); which gave us information on the town's requests and desires. Matthew was our boat guide for the two day visit and showed us all of the proposed locations. Mr. Eugene Paul also took the team via pickup on an inspection of the existing road access to the north of town past the Shale Rock Quarry to the mouth of St. Mary's Slough.

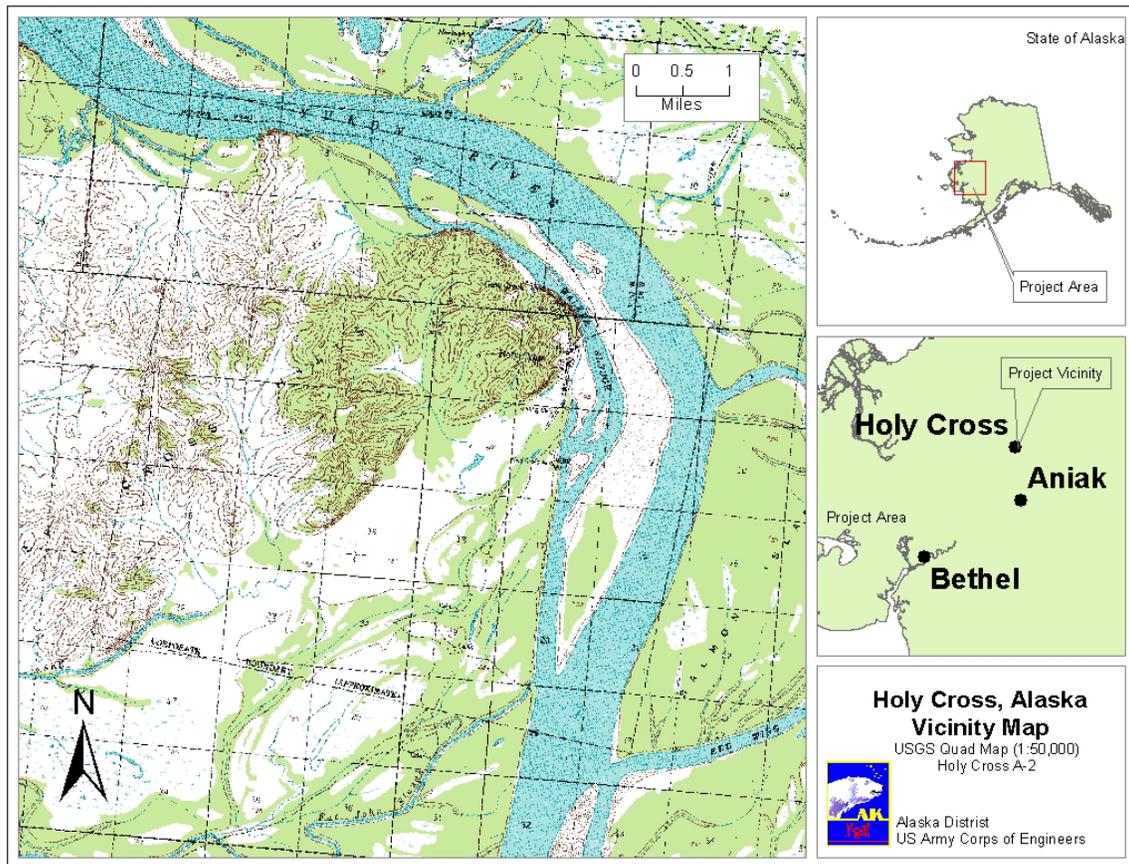


Figure 1. Location of Holy Cross

3) Background: Holy Cross is located 345 air miles west-northwest of Anchorage Alaska and 164 air miles north-northeast of Bethel Alaska. Access to Holy Cross is by boat or airplane. The main sources of food and supplies for the 178 (2010 census) residents of Holy Cross comes from supply planes, subsistence living, and barges that arrive during summer months. Barges bring in food, vehicles and other larger supplies that cannot be carried via plane or smaller fishing vessel.

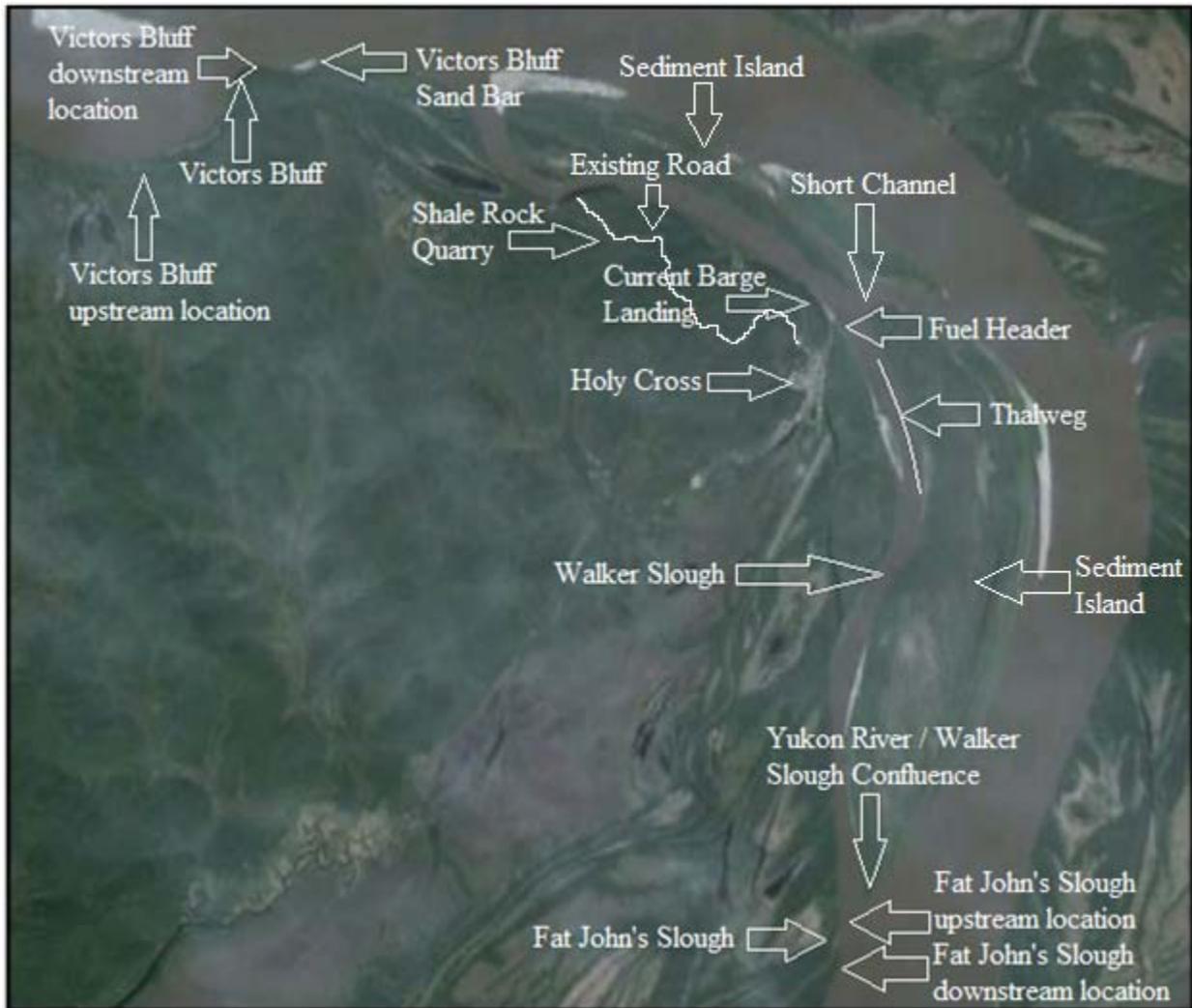


Figure 2. Aerial of Holy Cross with Victor's Bluff and Fat John's Slough locations

The existing barge landing is on a relatively stable, silty sand beach, approximately one third of a mile north of the town and includes the fuel header that allows filling of the village's fuel tanks. This beach is several hundred feet long and also allows for the boats to be moored in this area.

Victor's Bluff, a rock out cropping north-west of town, has historically kept the Yukon River from attacking the area of the existing landing, but the Yukon is continuing to migrate away from the current landing site. Aerial imagery (Figure 2) indicates that the river has

historically meandered through several hundred feet of bank on the far side from Holy Cross. Our field bathymetry measurements indicated that the thalweg (deepest part of the Yukon River) is just adjacent to the river bank on the far side from Holy Cross. We witnessed two large chunks of silt falling into the river from this steep silt bank during our brief time on the water. These observations all indicate that the river is continuing to erode the far bank and travel away from town.

Historical data indicates that Holy Cross was directly on the bank of the Yukon River into the 1930's, but after that time the river moved away from the village and formed sediment islands, which separate the Yukon River from what is now known as Walker Slough (Figure 2). A short channel connecting Walker Slough with the main river channel provides barge access to the current barge landing. This short channel is getting shallower threatening continued barge access to the existing landing site.

4) Investigation: The village council directed us to two potential landing locations near town, Victor's Bluff and Fat John's Slough.

a. Victor's Bluff: Victor's Bluff is located north-west of town, 4 miles from the current barge landing (Figure 2). There were two locations, one upstream and one downstream of Victor's Bluff that we investigated for potential barge landing locations.

The terrain leading from town to the Victor's Bluff locations is predominantly rolling hills. There is an existing road that has been used to access the Shale Rock Quarry (Figure 2) that would require upgrading. Approximately four miles of new road, three miles of re-conditioning existing road, and seven miles of new fuel line would have to be implemented to achieve the Victor's Bluff location. The required length of new road is very approximate as additional work would be needed to establish an alignment for this new access road.



Figure 3. Victor's Bluff Shale Deposit

i. Geologic Assessment of Victor's Bluff: The geology of Victor's Bluff consists of floodplain deposits, tidal flats and estuarine deposits. A visual identification of these floodplain deposits consisted of mainly silt and fine sand particles (Figure 5 and 6). Victor's Bluff also consisted of shale bluffs (Figure 3), which has contributed to the slow erosion of the bluff. Shale in the area (Figure 4) was previously used as gravel for local roads and for the airport runway. This shale is in abundance (Figure 3 and 4) and would be a good source for constructing gravel roadways leading to a new barge landing site. The geology of the site was based on published maps and a visual reconnaissance. No subsurface investigations have been performed for this project to date.



Figure 4. Shale Rock Quarry enroute to mouth of St. Mary's Slough

ii. Hydraulic and Hydrology assessment of Victor's Bluff: At daylight on 4 October the team went with Matthew and travelled by boat to Victor's Bluff. The upstream location is a near-vertical silt face with potential for scour to occur. Grading this bank to allow for a barge landing would not be difficult; however the risk of the river moving either into or away from this location is high.

The downstream location provides a fairly steep shale river bank in what appears to be a very stable condition. The bank would have to be graded to allow access and a staging area. A sand bar is present at the downstream extent (Figure 5) of this area indicating that the potential for deposition of sediment also is present in this area. Moving upstream from this sand bar would provide a buffer to help decrease the risk of having decreasing depth for a barge landing in this area.



Figure 5. Victor's Bluff Downstream location with downstream sand bar in sight

b. Fat John's Slough: Fat John's Slough is located south of town, approximately 4 miles from the current barge landing, at the confluence of Walker Slough and the Yukon River (Figure 2). There were two locations, one upstream of Fat John's Slough and one downstream of Fat John's Slough that we investigated for potential barge landings.

The terrain leading down into the Fat John's Slough locations is relatively flat and marshy through an area of historical meandering river bank. The distance of constructing a new road and fuel header would be equal to the four miles that the new barge landing would be from the existing landing.

i. Geologic Assessment of Fat John's Slough: The geology of Fat John's Slough consists of floodplain deposits, tidal flats and estuarine deposits. A visual identification of these floodplain deposits consisted of mainly silt and fine sand particles (Figure 6 and 7).



Figure 6. Fat John's Slough downriver Location

ii. Hydraulic and Hydrology assessment of Fat John's Slough: Access to the potential downstream Fat John's Slough location would require the crossing of Fat John Slough. The team discussed the possible use of bridge or culverts. The possibility of closing this slough was also mentioned; however this may not be an environmentally viable solution. The river bank at this potential site was steep silt with many downed trees along the bank (Figure 6).

The upstream Fat John's Slough location has a flatter slope than the downstream location, and was free of logs on the beach (Figure 7). The access problems caused by Fat John's Slough don't exist at this site; however, the channel size, of navigable water, at this location, due to the confluence of Walker Slough and the Yukon River, may cause maneuvering problems for barge access.

Both of these sites near Fat John's Slough are located in an area of Ox Bow formation from historical meandering of the river channel. While the river continues to move away from Holy Cross, this may not present a problem. However if the river were to start migrating back towards the village, this would leave these barge landing sites subject to erosion.



Figure 7. Fat John's Slough Upriver Location

- 5) **Possible Dredging Alternative:** After the site visit the team brainstormed other potential solutions centered mostly around allowing the barge landing to remain in its current location. Dredging in the channel that connects Walker Slough with the main channel of the Yukon River was considered. The placement of the dredged material was discussed and the concept of putting it in Walker Slough just downstream from the current barge landing was proposed. The idea being that blocking Walker Slough either at this location or near its mouth would force additional flow through the barge access channel from the main river and thus help to keep this channel open with sufficient depth to allow for continued barge access. This “slough block” concept for Walker Slough would likely need some armoring in addition to placing the dredged material and possibly additional fine grained fill.