

Technical Memo



To: Lynn Helms, Director, North Dakota Department of Mineral Resources

From: Jordan Shuck, Project Manager, Wenck Associates, Inc.
Joel Toso, PE, Barr Engineering, Inc.

Date: September 15, 2020

Subject: Extension of Ordinary High Water Mark (OHWM) of the Historical Missouri River Bed

The OHWM of the historical Missouri River was determined in our report submitted to the Department of Mineral Resources in October 2018. Since that time, follow up work has been done by North Dakota Trust Lands to update property boundaries and areas as a result of the OHWM determination. Trust Lands consultant, KLJ, identified the need for additional determination at the upstream and downstream ends of the project boundary. This memo documents the work done to extend the OHWM line on the east and west ends of the project boundary as requested by Trust Lands.

Data used for 2018 OHWM determination were opened and reviewed including aerial photography and topographic maps. The determination methodology was also reviewed to ensure the methods used for the extensions of the OHWM lines were consistent with the previous work.

East End Extension to SEP 2018 Map 1 of 18

The eastern project boundary is defined by the northern border of the Fort Berthold Indian Reservation. Different datasets show this boundary at different locations. The boundary for the 2018 OHWM determination referenced information on the State of North Dakota GIS system base at the time. More current information shows the boundary approximately 400-feet farther south. Figure 1 shows the extension of the OHWM line the determination to the most current Fort Berthold Indian Reservation boundary.

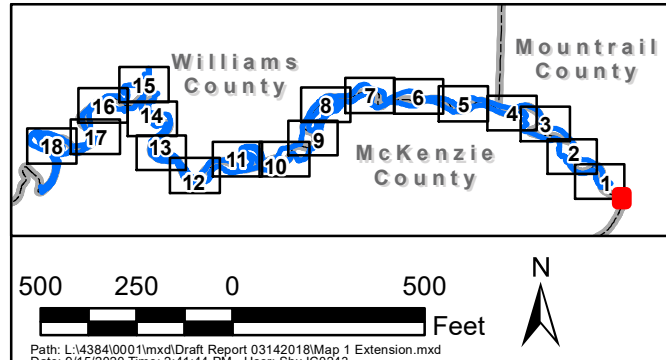
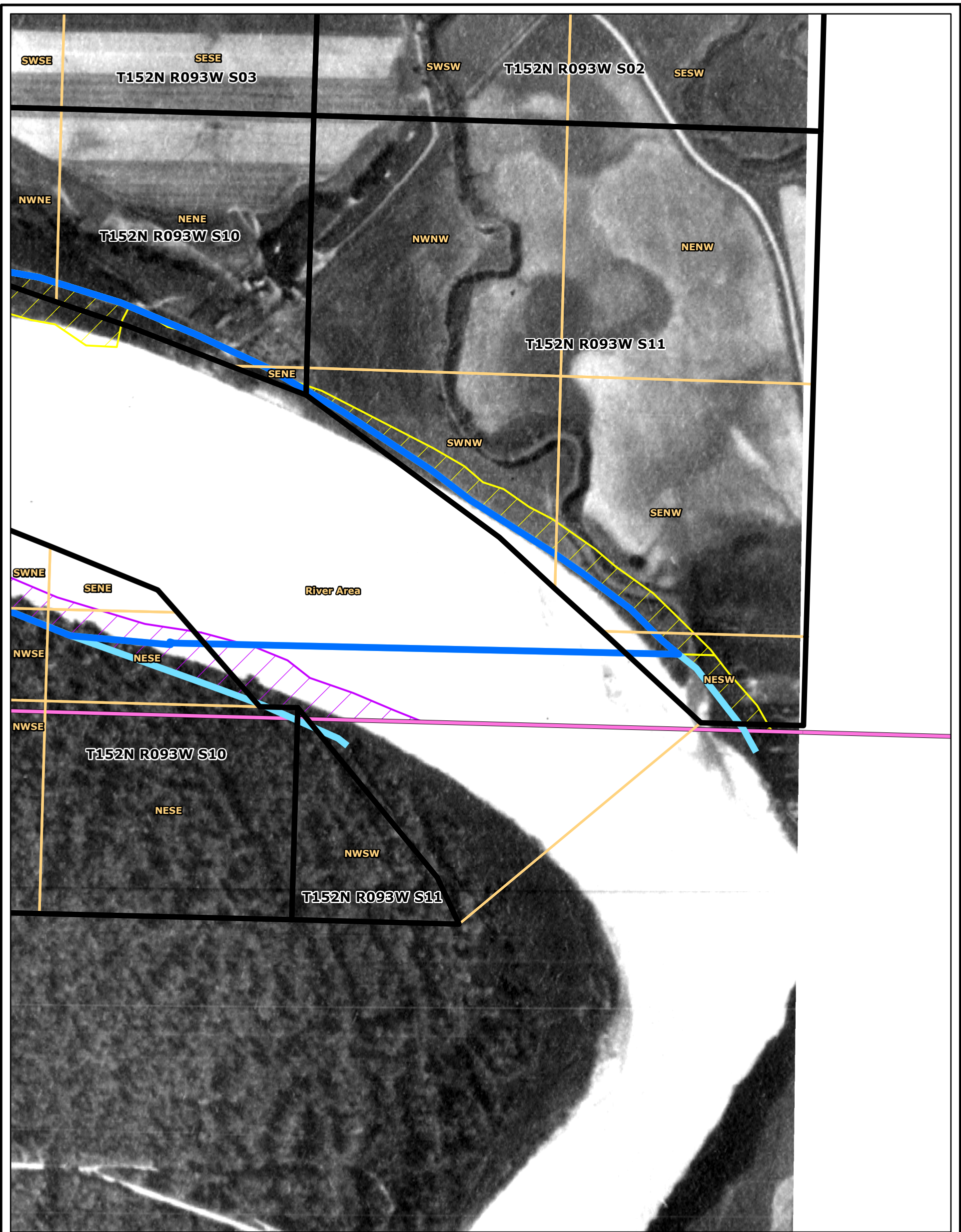
Considering the east bank, the topographic maps show steep bluffs extending close to the river water line. The OHWM line extension follows the same mark along the river as the upstream 2018 line, very close to the toe of the bluffs.

The west bank of the river is floodplain with significant tree cover. The OHWM line extension follows the same mark along the river as the upstream 2018 line, close to the same topographic line and riverward of the thick tree line.

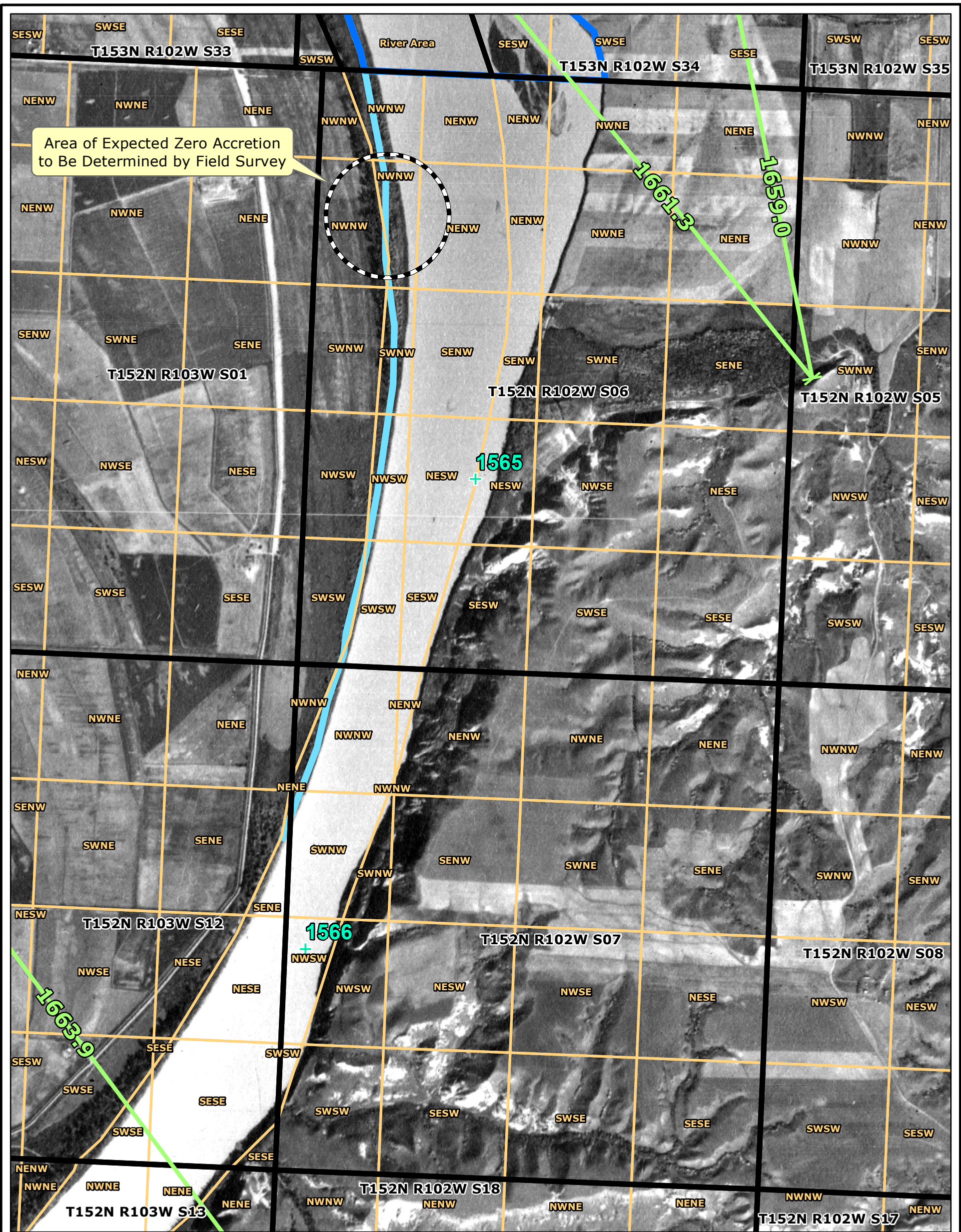
West End Extension to SEP 2018 Map 18 of 18

The western project boundary is defined by the southern line of Section 33 and 34, T153N, R102W. The 2018 determination ends the OHWM mark at the section line as required. The end point on the west bank is in an accretion zone (area where the river has deposited sediment). Surveyors currently determining property boundaries as a result of the 2018 OHWM determination require a point of zero accretion. To accommodate this, the OHWM

line was extended upstream on the west bank so that a point of zero accretion may be determined. General Land Office (GLO) maps were used to identify areas of zero accretion in comparison with the OHWM. The extension of the OHWM on the west end of the project boundary is projected onto with the aerial photo in Figure 2A and onto the GLO map in 2B.



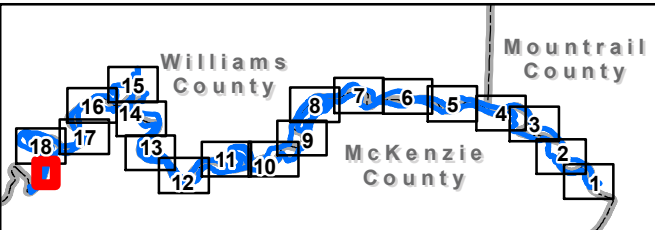
- Legend**
- BLM PLSS Section Boundary
 - BLM PLSS Qtr Qtr Section Boundary
 - Fort Berthold Boundary (KLJ)
 - + River Miles
 - USACE Cross Section
 - + Ordinary High-Water Mark (OHWM)
 - + OHWM Extension
 - + Recommend Correction to Account for More Recent Aerial Information
 - + Recommend Correction to Account for Frequently Flooded Accretion
 - + Recommend Correction to Account for Active Meandering (Reliction)



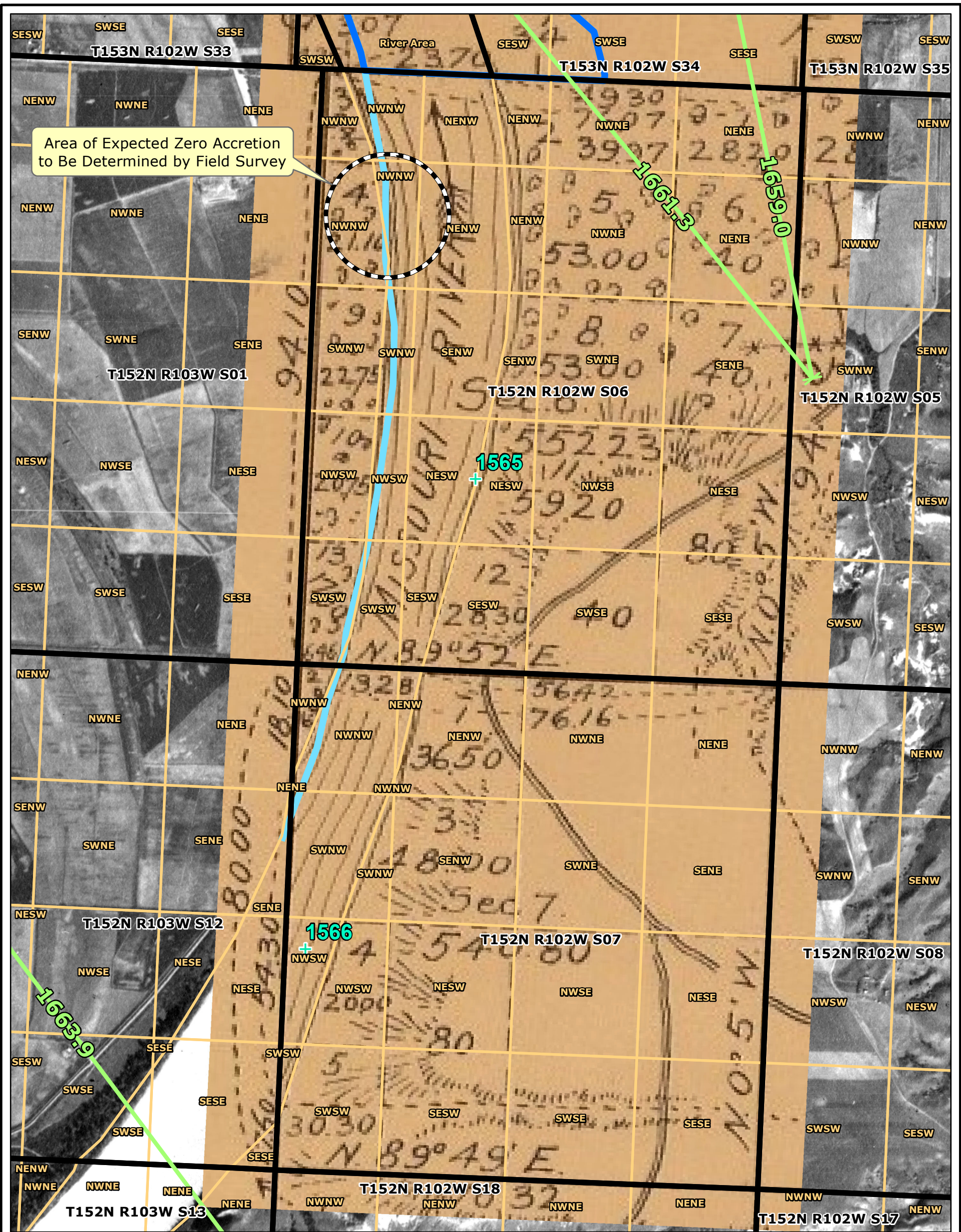
Area of Expected Zero Accretion to Be Determined by Field Survey

Legend

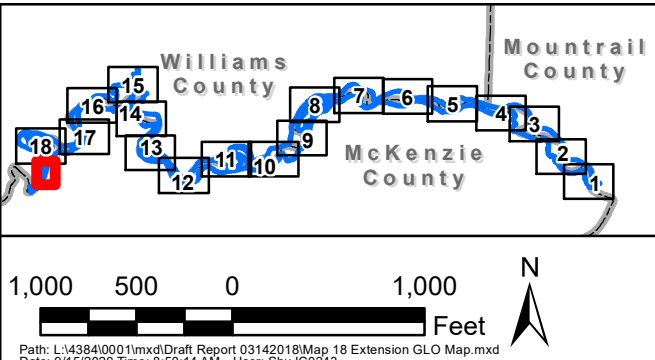
-  BLM PLSS Section Boundary
-  BLM PLSS Qtr Qtr Section Boundary
-  River Miles
-  USACE Cross Section
-  Ordinary High-Water Mark (OHWM)
-  OHWM Extension
-  Recommend Correction to Account for More Recent Aerial Information
-  Recommend Correction to Account for Frequently Flooded Accretion
-  Recommend Correction to Account for Active Meandering (Reliction)



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Area of Expected Zero Accretion to Be Determined by Field Survey



Legend

- BLM PLSS Section Boundary
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