

To: Jolene Martinez
City of Casper

From: T.C. Dinkins
Fort Collins

Project/File: North Platte River Restoration Projects Date: June 1, 2022

Reference: Field Observations on the North Platte River Between Bryan Stock Trail and Knife River Property

Dear Jolene,

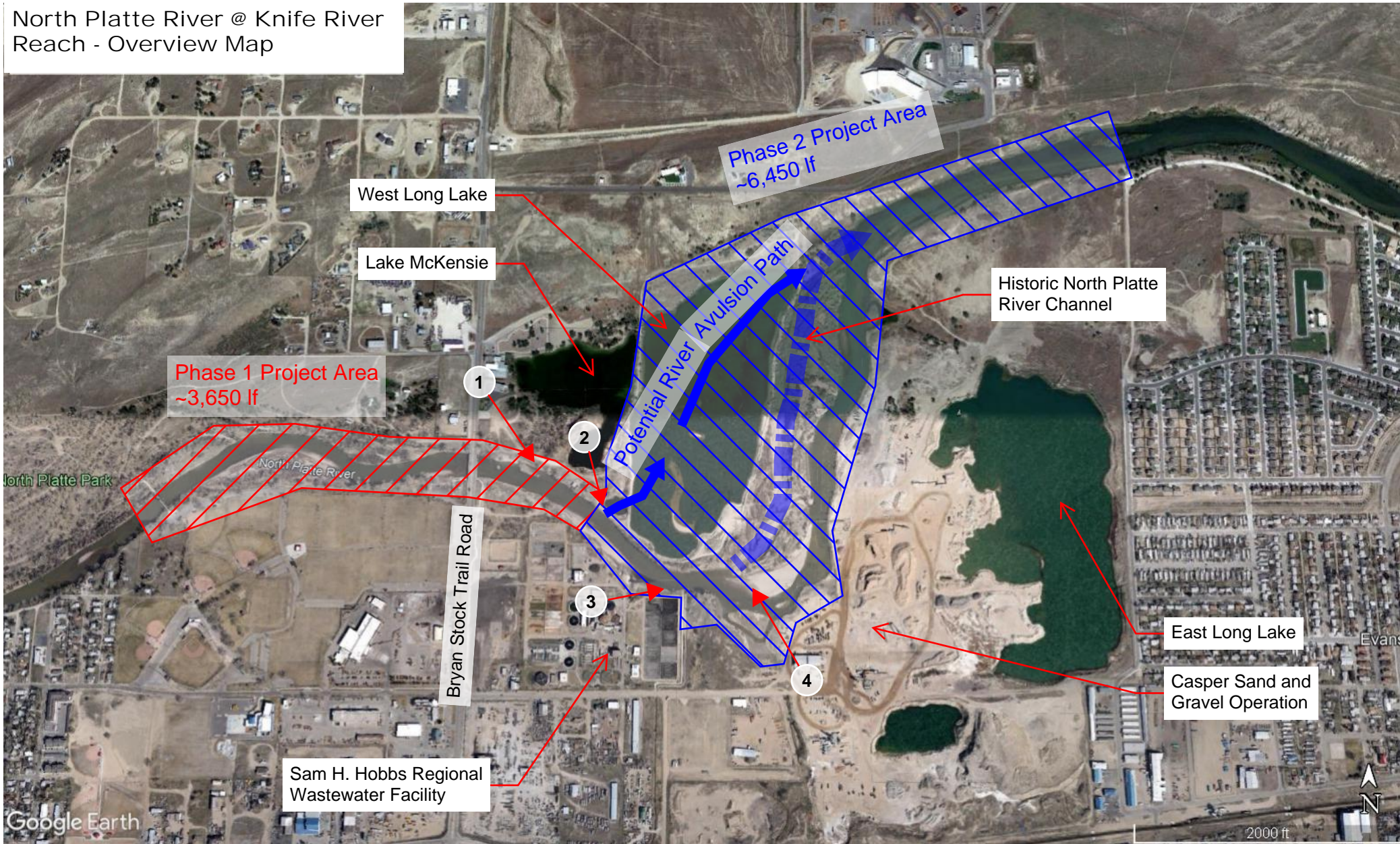
This memo is intended to serve as a written summary of field observations along the North Platte River between Bryan Stock Trail and Knife River Property. This reach was identified as one of the high priority restoration reaches in the “North Platte River Environmental Restoration Master Plan – Phase 1 (Stantec 2012)” This section of river has been highly modified by various activities including; channelization, bermed banks, gravel mining activities, floodplain fill, river capture of a gravel pit, mass wasting of channel banks, and dumping of wasted concrete along banks. These prevalent alterations in the channel and floodplain have resulted in a very unstable reach, prone to continuance of bed and bank erosion and aggradation processes.

Stantec personnel visited this site on 4/21/2022 to document the current conditions and to evaluate any noticeable changes in the last 5-6 years. During this visit, Stantec documented four problem areas that are explained in greater detail below and represented by an overview maps and photos in the following pages.

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North Platte River @ Knife River Reach - Overview Map



Problem Area 1

Problem area 1 located on the left descending bank just downstream of the Bryan Stock Trail Bridge. This approximately 210' long section has served as a dumping ground for waste concrete poured along the bank. In addition, a large pile of concrete slabs in the channel about 30' from the bank, constricts flow and has formed a scour pool. This is contributing to the undermining of the bank and development of a sediment aggradation bar immediately downstream. Without removal of concrete, failure of the bank toe and additional sediment deposition is expected to continue increasing localized stress on the bed and bank, leading to further erosion upstream and downstream of this area.

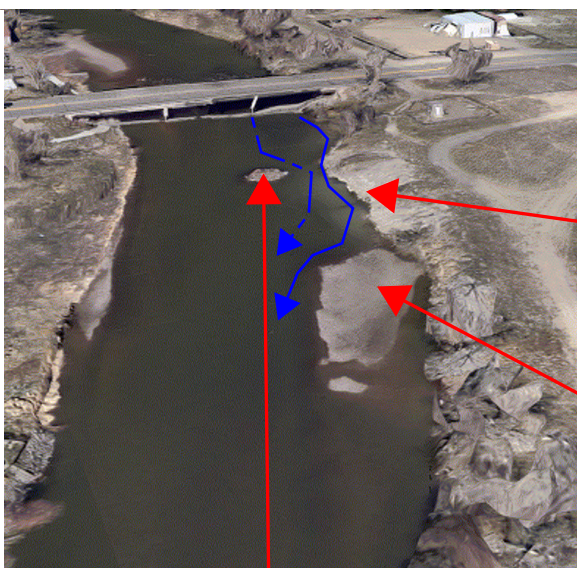


Photo 1: Layers of poured concrete visible along left bank being undercut by scour pool at least 8-10' deep.



Photo 2: Layers of poured concrete along left bank



Photo 3: Island formed from wasted concrete slabs

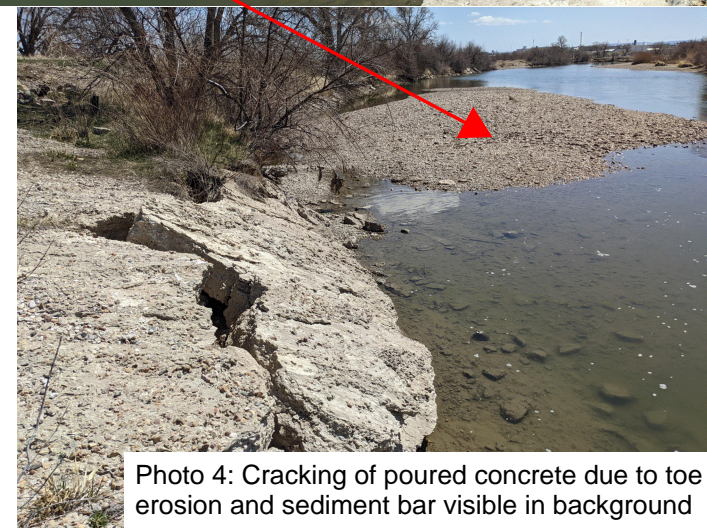


Photo 4: Cracking of poured concrete due to toe erosion and sediment bar visible in background

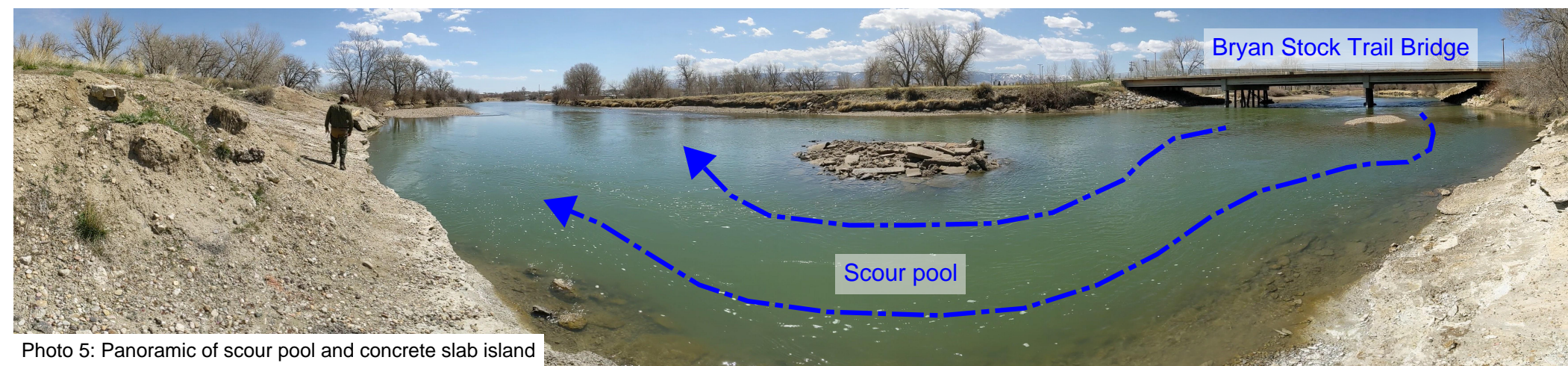


Photo 5: Panoramic of scour pool and concrete slab island

Problem Area 2

Problem Area 2 is located on the left descending bank about 1,000 feet downstream of the Bryan Stock Trail Bridge. This area is currently property of JTL Group Inc., but the City of Casper is in negotiations to purchase the property. The river corridor has been channelized and bermed along this reach with no floodplain access on the north bank. The river is making a broad right-hand turn and the thalweg is located along the left bank toe resulting in high near bank stress.

The bank angle is near vertical through much of this section with sparsely vegetated banks and is experiencing toe erosion and bank sloughing. The river is separated from a relic gravel pond by a narrow (12-15') strip of bermed bank for approximately 200 linear feet. This 200' section of bank, consisting primarily of unconsolidated small cobble/gravel/sand bank material, has lost all vegetation and exhibits signs lateral migration toward the pond. The pond side of the berm is also nearly vertical, sparsely vegetated with woody plants, and does not appear to be very robust. If the lateral retreat of this bank toward the pond is allowed to continue or if a large overtopping flow event were to occur, risk of a major channel avulsion through the gravel pond is likely. In this event, the river would likely abandon it's current course and flow through the gravel pond to the North-East, before returning back into the existing river channel (As shown in the Overview Map).

The liability of this potential river avulsion needs to be a key consideration in any negotiations involving purchase of this land. The potential restoration of this area will require addressing this avulsion risk and also reworking the southern portion of the large gravel pond. As such, coordination with JTL Group, additional land acquisition, and/or securing of an easement will be critical to appropriately restore the river corridor and to mitigate potential risk of avulsion.

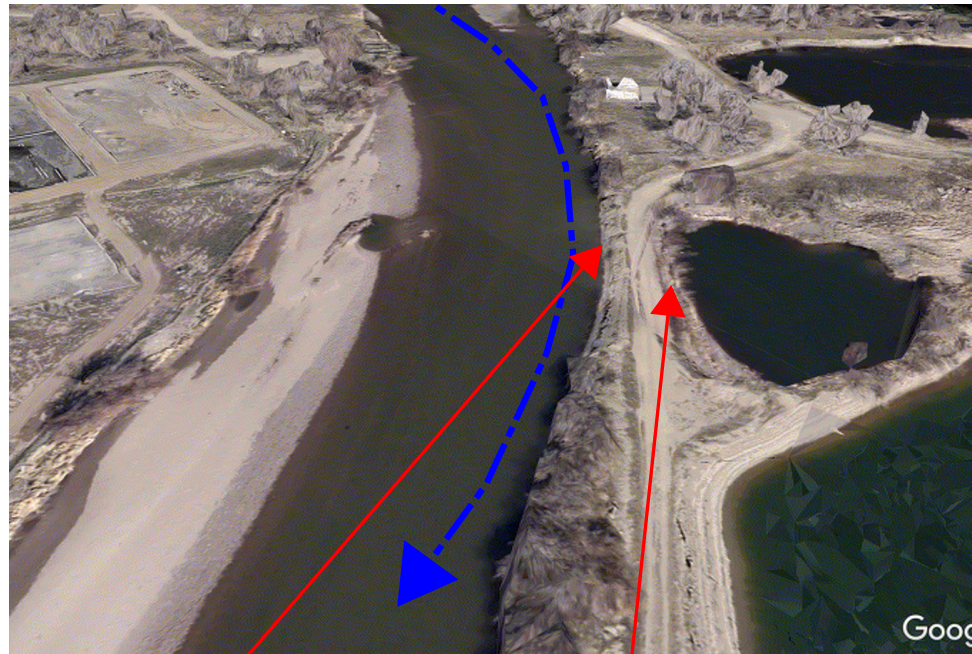


Photo 1: View east looking downstream of unstable river bank



Photo 2: View west looking upstream of narrow berm separating the river from gravel pit pond

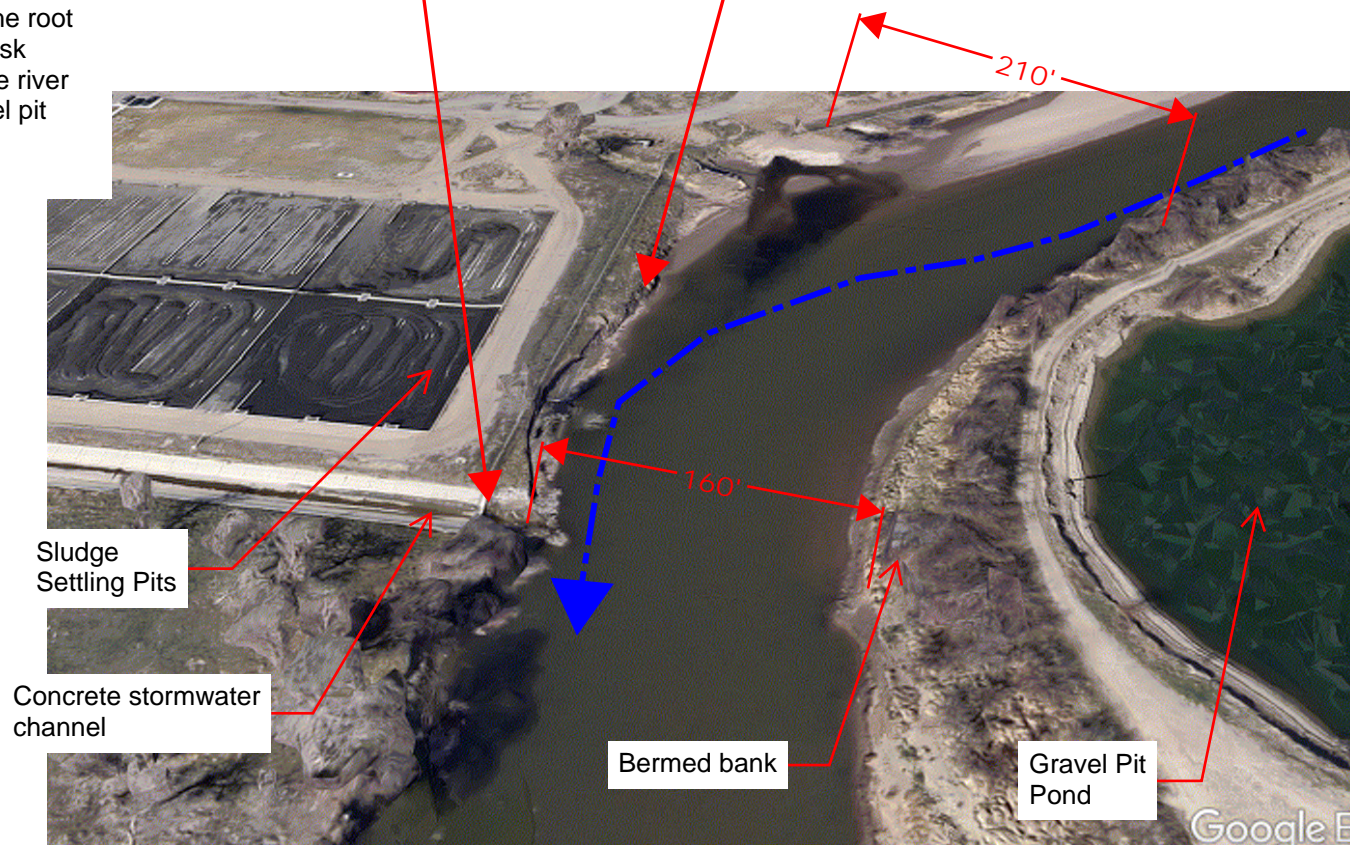
Problem Area 3

Problem Area 3 is located on the right descending bank, adjacent to the Sam H. Hobbs Regional Wastewater Facility, approximately 1,500 ft. downstream from the Bryan Stock Trail Bridge. The river thalweg shifts from the left to right side of the river along this reach and the wetted width reduces from approximately 200 ft. to approximately 160 ft. The reduction in width was created by the channelization and berming of the left bank for gravel mining operations. This constriction and high near bank stress along the right toe is causing toe erosion and mass wasting of the bank immediately adjacent to the Wastewater Facilities sludge settling pits.

There has been noticeable erosion and retreat of the bank apparent in the aerial imagery from the last 10-15 years, and it is currently threatening to undermine the facilities perimeter fence, which is only 30-40 from the edge of the sludge settling pit. Without intervention, incremental lateral retreat of this bank towards the wastewater facility is likely to continue. Additionally, a large flow event has the potential to cause major bank scouring and could threaten the integrity of the sludge pit, resulting in contamination to the river. Release of concentrated wastewater sludge into the river would result in detrimental affects to water quality, aquatic species, and impact downstream drinking water sources.

While temporary stabilization of this bank would help to reduce the short-term erosion risk to the wastewater facility, addressing the root cause of the instability is recommended to provide long term risk mitigation. Addressing the root cause would require shifting the river away from the facility towards the north by modifying the gravel pit pond and improving floodplain connectivity.

Photo 1: View south looking across the river at the unstable river bank adjacent to the Sam H. Hobbs Regional Wastewater Facility



Problem Area 4

Problem Area 4 is located immediately downstream of Problem Area 3. The river was bermed and surrounded on both sides by large gravel pits as part of the "Casper Sand and Gravel Operation" owned by JTL Group, Inc. According to the WDEQ reclamation plan (Permit No. PT215), a high water event in 1984 led to a breach of the eastern berm separating the river and gravel pit resulting in a channel avulsion into the mining area (known as a "pit capture"). The avulsion led to the river abandoning its original channel, and the new river channel corridor was created by backfilling along the new eastern bank with unmarketable sand and gravel generated during on-site mining operations, uncontaminated cut-material imported from various JTL Group, Inc. construction projects, and wasted concrete slabs. Because a majority of the Casper Sand and Gravel Operation was disturbed prior to the enactment of the WEQA, the permit holder has limited reclamation obligations in this area and the permit application claims that the "area has stabilized and extensive vegetation has become established." As such, the "area is classified as not available for reclamation and is excluded from any future reclamation or revegetation requirements." However, the "extensive vegetation" is almost exclusively composed of invasive Russian Olive trees which chokes out and prevents re-establishment of native plants.

Contrary to the claim in the permit, this river reach is very unstable and exhibits both large areas of sediment deposition and bed/bank erosion, as shown in the historic aerial images shown on next page. The extreme expansion and over-widened river cross section drastically reduces the river's ability to transport sediment, leading to the formation of large sediment bars consisting of fine-grained material. Overwide channels have very poor aquatic habitat and shallow water is prone to temperature increases due to solar radiation. In addition, the tight, dogleg turn to the north has experienced bank erosion, requiring extensive bank armoring, which currently consists of wasted concrete slabs. This problematic bank erosion has been observed and documented along the right descending bank, potentially threatening the JTL Group, Inc. property and Shop. The entirety of the right bank through this reach has been armored with wasted concrete slabs in an attempt to stabilize the bank but provide little/no potential for vegetation establishment.

Due to the extensive volume of river alluvium mined from the current North Platte River Channel and a history of river avulsion, successful restoration and mitigation of further avulsion risk in this area will require a holistic approach in order to be successful. This will involve the reworking of the north river bank and southern portion of the adjacent gravel pit pond, in order to improve floodplain access, reduce erosion risk to the wastewater treatment facility, and creation of a robust outer right bank with a reduced radius of curvature required to relocate the river back to the relic channel. The current river channel can be converted into a series of oxbow lakes and wetland systems designed to treat stormwater from south of the site. Because so much of this corridor has been mined, imported alluvium will likely be required to properly reestablish channel banks and floodplains. Locations and configuration of the oxbow lakes will have to be optimized to account for net fill needed to balance the site.

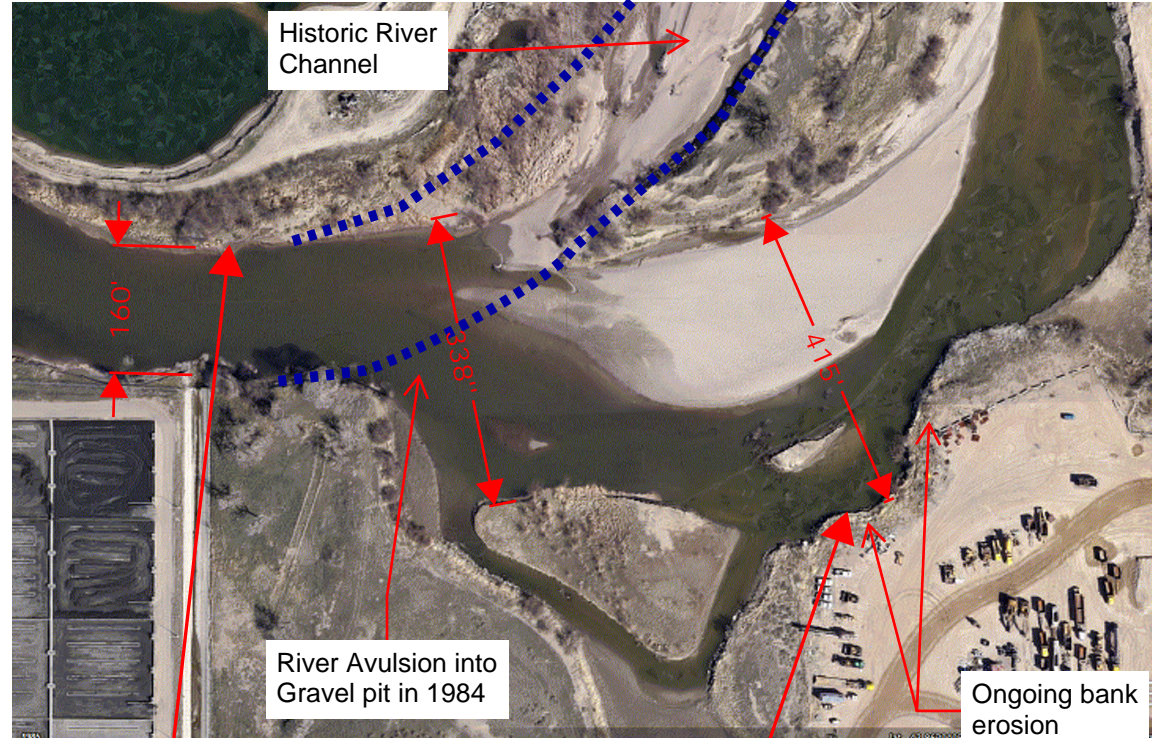


Photo 1: View east looking downstream at the overwide river channel at point of 1984 avulsion.

Problem Area 4
Historical Aerial
Comparison



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Regards,

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