



northwest hydraulic consultants

memorandum

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Date: 05-Oct-2010

From: Bill Rozeboom, P.Eng.

No. Pages: 2 (incl. Figure 1)

Project No.: 16987

Re: Prairie Creek Mine
Outfall design – preliminary construction details
DRAFT

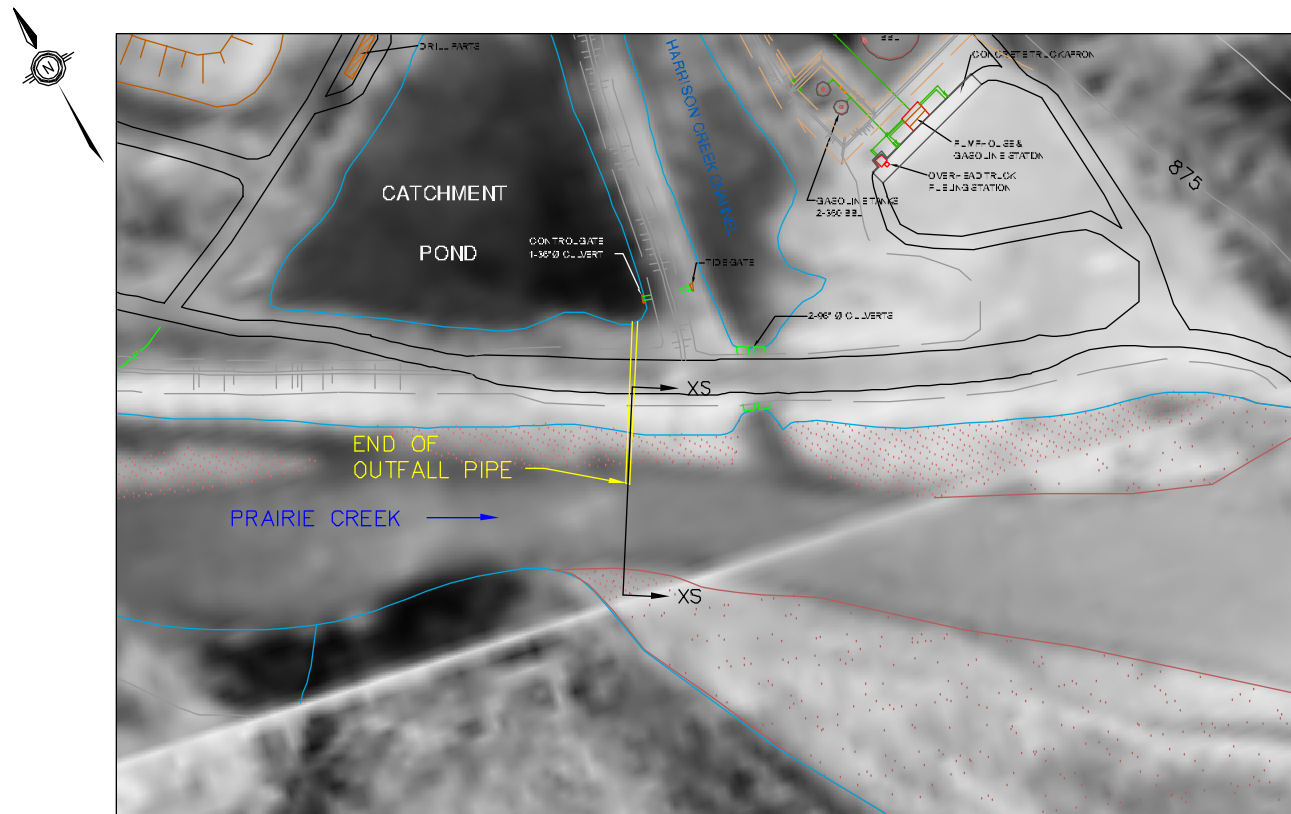
This is to provide preliminary construction details for a simple pipe outlet for the Prairie Creek mine, as requested. Figure 1 shows plan and cross section views of the recommended design.

The recommended outfall position is at a sloping bank section immediately upstream of the upstream end of a low vertical bank. At this location, it will be possible to install the pipe in a narrow trench, and then backfill with native cobble material to fully restore the existing bank along the water edge. From comparison of 2010 photos with a 1994 orthophoto, the channel bank at this location appears to be reasonably stable, due in part to the river training effects of the flood protection berm. The low vertical bank which begins immediately downstream of the recommended outfall location suggests that there has been some recent erosion, but it also shows the limit of erosion of unprotected bank during the major flood in June 2006.

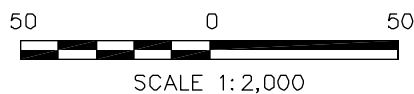
Field surveys in August 2010 determined that the channel thalweg (the low point in the channel) is adjacent to the bank where the outfall is proposed. The pipe is to be constructed so that the bottom of pipe intersects the thalweg about two metres from the edge of water at mean open water flow conditions as seen in the Figure 1 photo. It is necessary for the pipe to extend to the deepest part of the channel so that effluent is released into flowing water during low flow periods.

The outfall pipe should consist of a durable steel pipe that is 12" (0.3m) inside diameter. The pipe end should be cut square, not angled, to create a short protrusion which will promote minor scour at the end of pipe and will also prevent bed material from falling into the pipe end. Design flow estimates for the pipe range from about 40 to 110 L/s, with the range reflecting low and high estimates of mine drainage. The design flows correspond to flow velocities which range from about 0.55 to 1.5 m/s in a 12" pipe, and velocity heads ranging from .02 to 0.12 m. Assuming total energy losses in the outlet system equal to three times the velocity head, the system can perform well under gravity flow with less than 0.4 m water level difference between the catchment pond and the creek. The system will need to include a flap gate or other device to prevent backflow when the creek is at flood stage, when gravity outflow will not be possible.

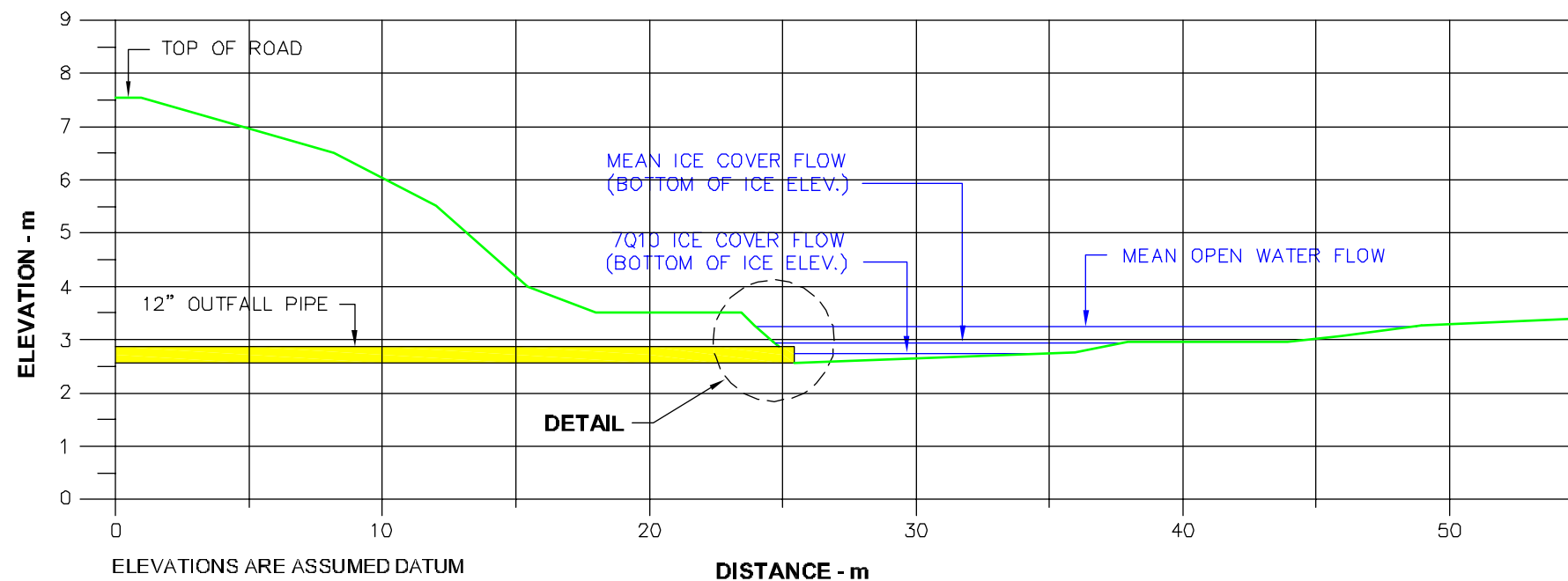
I trust this meets your immediate needs; please call if there are any questions.



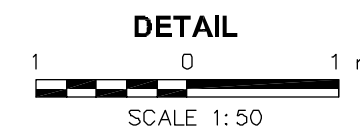
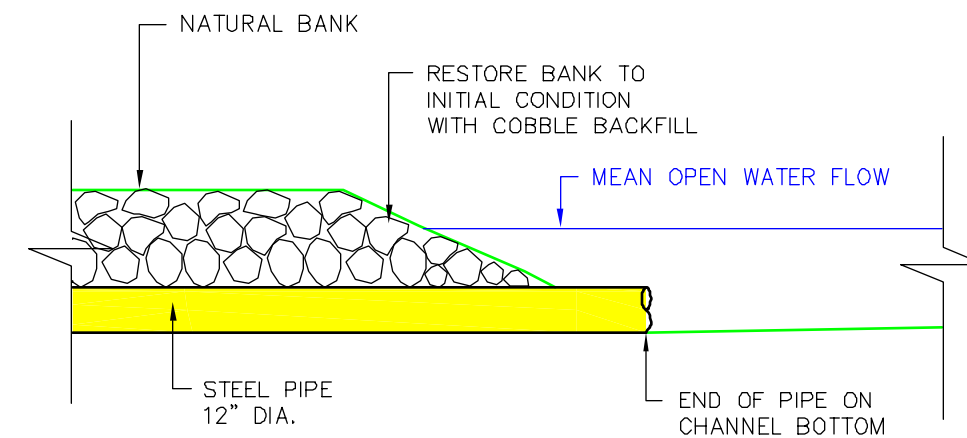
SITE PLAN WITH 1994 BACKGROUND IMAGE



RECENT PHOTO. DATE: AUGUST 9, 2010



**CROSS SECTION AT OUTFALL
(VIEWING DOWNSTREAM)**



NOT FOR CONSTRUCTION

CANADIAN ZINC CORPORATION		
PRAIRIE CREEK MINE		
OUTFALL CONCEPTUAL DESIGN		
Dwg. 6987-002-R1	5 Oct 2010	Figure 1
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