APPENDIX 3

A TETRA TECH COMPANY

November 19, 2012

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EBA FILE: E22102082
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Canadian Zinc Corporation
Suite 1710 - 650 West Georgia Street
Vancouver, BC V6B 4N9

Attention: Mr. David Harpley

Subject: High Water Levels for Prairie Creek Mine Access Road Stream Crossings
Northwest Territories

1.0 INTRODUCTION

EBA Engineering Consultants Ltd. (EBA), is pleased to provide the following report with design open water levels for seven stream crossings along the access road from the Canadian Zinc Corporation (CZN) Prairie Creek Mine to the Liard Highway #7 east of Nahanni Butte, NWT. This work was performed at the request of CZN. The work was performed under the direction of Mr. Bill Rozeboom who has provided water resources engineering support for the Prairie Creek Mine Project since 2008, and has participated in aerial and ground inspections of the Sundog Creek segment of the mine access road.

Design high open water levels were requested for the following locations where bridges are proposed:

(1) Sundog Creek at Road KM 23 – Permanent Bridge Span

(2) Sundog Creek at Road KM 24 – Temporary Crossing 1 (Removable Span)

(3) Sundog Creek at Road KM 26.4 – Temporary Crossing 2 (Removable Span)

(4) Sundog Creek at Road KM 26.8 – Temporary Crossing 3 (Removable Span)

(5) Sundog Creek at Road KM 28.7 – Temporary Crossing 4 (Removable Span)

(6) Unnamed Creek at Road KM 43 – Temporary Crossing 5 (Removable Span)

(7) Polje Creek at Road KM 53 - Permanent Bridge Span

Design water levels were determined on the basis of HEC-RAS modelling of open water 100-year peak flows. For most crossings, channel geometry and gradient were determined from high-resolution LiDAR elevation data obtained (flown) in June 2012 with 15 cm vertical accuracy and horizontal point density at around one point per square metre. In wetted areas (such as streams), LiDAR elevation data reflects the water surface and does not provide channel bottom elevations. In the absence of bathymetry in combination with apparent shallow flows, a single LiDAR-derived section was used to represent channel geometry for the channel reach at each crossing. LiDAR data was supplemented by results of ground surveys conducted by others which included water edge profiles and mid-channel water depths for most

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crossings. Relatively detailed ground surveys of channel and floodplain sections were available (and used) only for the Polje Creek crossing. For all crossings, aerial and ground photographs were provided by CZN (see attachment) which showed local channel and floodplain characteristics at the crossing locations, and these were used to estimate the Manning "n" hydraulic roughness of the channel and floodplain.

As indicated, the water levels provided herein are for open water flow conditions. There is a possibility of ice-influenced high water levels which should be investigated by field observations at breakup when ice influences will be at their greatest. Ice accumulation has been observed in the box canyon upstream of permanent crossing location (1), but the span elevation at this location is proposed to be well above the creek and the crossing design should not be affected. At the second permanent crossing location (7), the open water high water level is associated with considerable flow over floodplain areas which would not be susceptible to ice effects. While it is unlikely that ice effects will control any of the crossing designs, field observations are needed to rule out this possibility. The design high water level for the bridge crossings based on open water will need to be amended if field observations at breakup identify significant ice effects.

2.0 100-YEAR HIGH WATER LEVELS

Tributary basin areas for each of the crossing locations were determined from digital analysis of GeoBase 1:50,000 scale Canadian Digital Elevation Data derived from the National Topographic Data Base. The watershed analysis was done using Global Mapper software, with a visual inspection of the delineation results to confirm that the results were reasonable.

A regional hydrology analysis was performed by Northwest Hydraulic Consultants (NHC) using the Water Survey of Canada peak flow data for Prairie Creek at Cadillac Mine (495 km^2), Flat River near the Mouth (8,560 km^2), and South Nahanni River above Virginia Falls (14,500 km^2). A best fit trend line of drainage area to 100-year discharge was determined on the basis of these three stations and used to estimate 100-year discharges at the crossing locations. The trend line equation is given below, with discharge (Q) in m^3/s and basin area (A) in km^2.

$$Q_{100} = 1.888\ A^{0.751}$$

A summary of basin areas and 100-year design flows for each of the crossing locations is provided in Table 1.

Table 1: Basin Areas and Design Flows

Crossing	Road KM post	Basin Area Km^2	100-Year Design Q, m^3/s
Sundog permanent	23	14.5	14.1
1st temp Sundog	24	27.24	22.6
2nd temp Sundog	26.4	37.27	28.6
3rd temp Sundog	26.8	38.62	29.4
4th temp Sundog	28.7	45.22	33.0
5th temp, Unnamed	43	17.92	16.5
Polje permanent	53	99.32	59.7

3.0 DESIGN 100-YEAR WATER LEVELS

3.1 KM 23, Sundog Creek Permanent Crossing

A permanent span bridge crossing is proposed over Sundog Creek at Road KM 23. The crossing will be constructed on a bedrock outcrop just downstream of a small (0.5 m high) waterfall which acts as a channel hydraulic control. Figure 1 shows the LiDAR-derived cross section used to determine the high water level at this location. The LiDAR section was used "as-is" without adjustment for bathymetry. The available bed elevation point suggested a depth of about 0.3 m, but this may have been in the plunge pool and not representative of channel hydraulic performance. From prior field observations, the base of the LiDAR cross section is believed to be very similar to the channel bottom elevation at the plunge pool outlet.

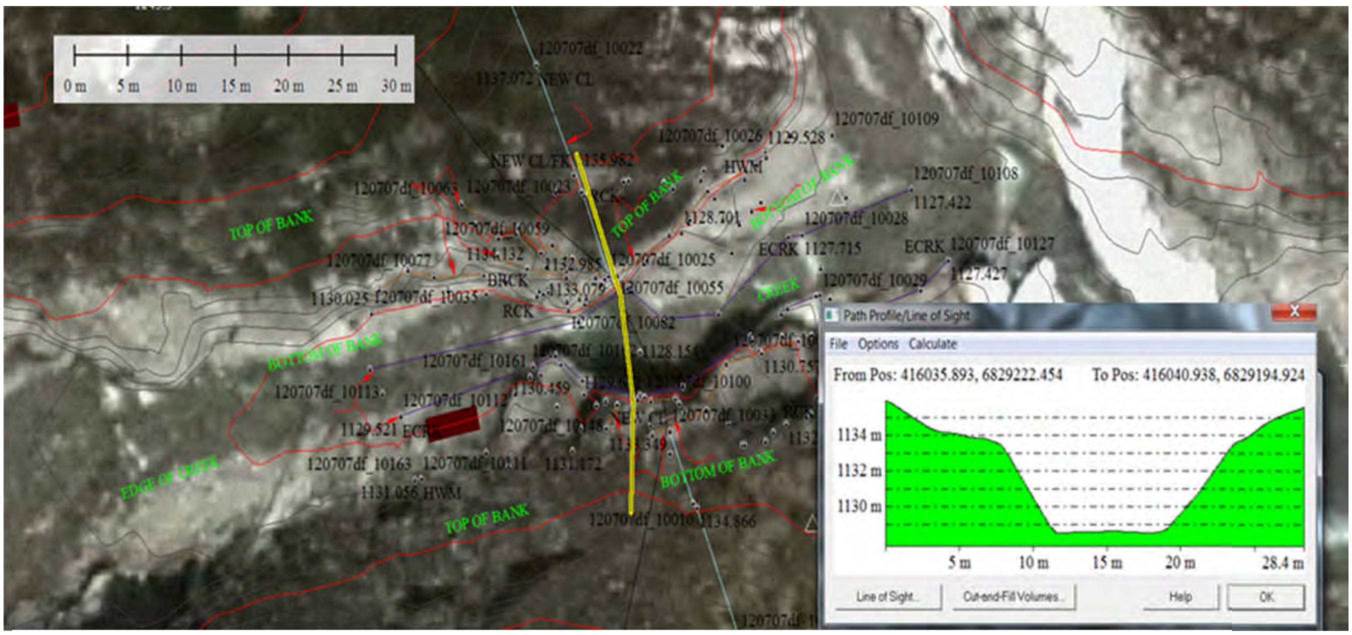

Figure 1: Sundog Creek at KM 23. Flow is from left to right. Section plot is viewing downstream

The crossing is located above a plunge pool and water levels will be controlled by the capacity of the 7 m wide channel at the pool outlet. The channel slope is 0.040 and a Manning's n value of 0.055 was assumed based on the observed channel bed material (D_{84} assumed to be 0.3m) and preliminary hydraulic calculations.

The computed water level at this crossing is 1129.32 m for the 100-year discharge of 14.1 m^3/s. The flow velocity in the main channel is 2.54 m/s and the maximum depth of flow is approximately 0.8 m.

3.2 KM 24, Sundog Creek Temporary Crossing 1

A temporary span bridge crossing is proposed over Sundog Creek at Road KM 24. Figure 2 shows the LiDAR-derived cross section used to determine the high water level at this location. The LiDAR section was used "as-is" without adjustment for bathymetry. The available bed elevation point suggested a depth of about 0.15 m, apparently taken between the larger rocks in the channel that have exposed (out of water) surfaces under summer low water conditions.

On the north side of the crossing, (the left side of the plotted cross section) there is a low area which may convey water at times or is possibly an abandoned channel. To be conservative in estimating the design water level, this left bank area was obstructed such that no flow was allowed below elevation 1099.75 m. The channel slope through the crossing reach is 0.016 and a Manning's n value of 0.055 was assumed.

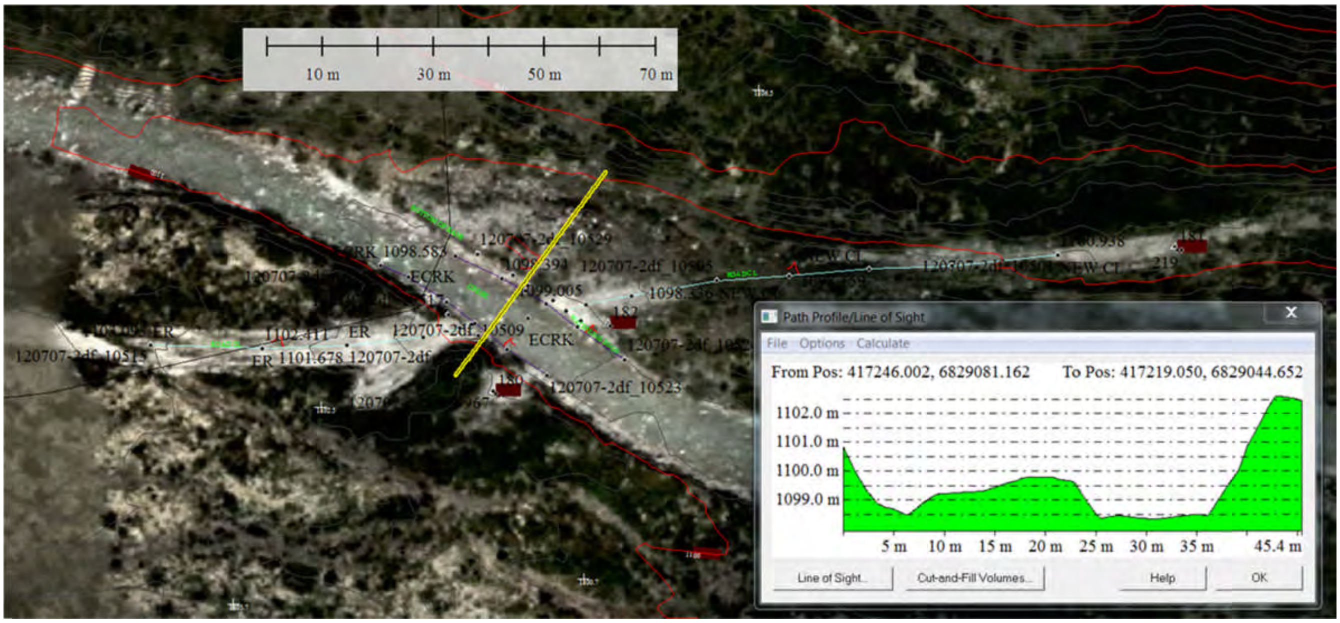

Figure 2: Sundog Creek at KM 24. Flow is from left to right. Section plot is viewing downstream

The computed water level at Sundog Creek Temporary Crossing 1 is 1099.35 m for the 100-year discharge of 22.6 m^3/s. The flow velocity in the main channel is 2.02 m/s and the maximum depth of flow is approximately 1.0 m.

3.3 KM 26.4, Sundog Creek Temporary Crossing 2

A second temporary span bridge crossing is proposed over Sundog Creek at Road KM 26.4. Figure 3 shows the LiDAR-derived cross section used to determine the high water level at this location. The LiDAR section was used "as-is" without adjustment for bathymetry. Based on ground photos, the flow was very shallow with frequent riffles.

The channel slope through the crossing reach was assumed to be 0.015, considering a surveyed water edge slope of 0.013 and slightly steeper downstream conditions. A Manning's n value of 0.055 was assumed.

The computed water level at Sundog Creek Temporary Crossing 2 is 1030.27 m for the 100-year discharge of 28.6 m^3/s. The flow velocity in the main channel is 2.07 m/s and the maximum depth of flow is approximately 1.1 m.

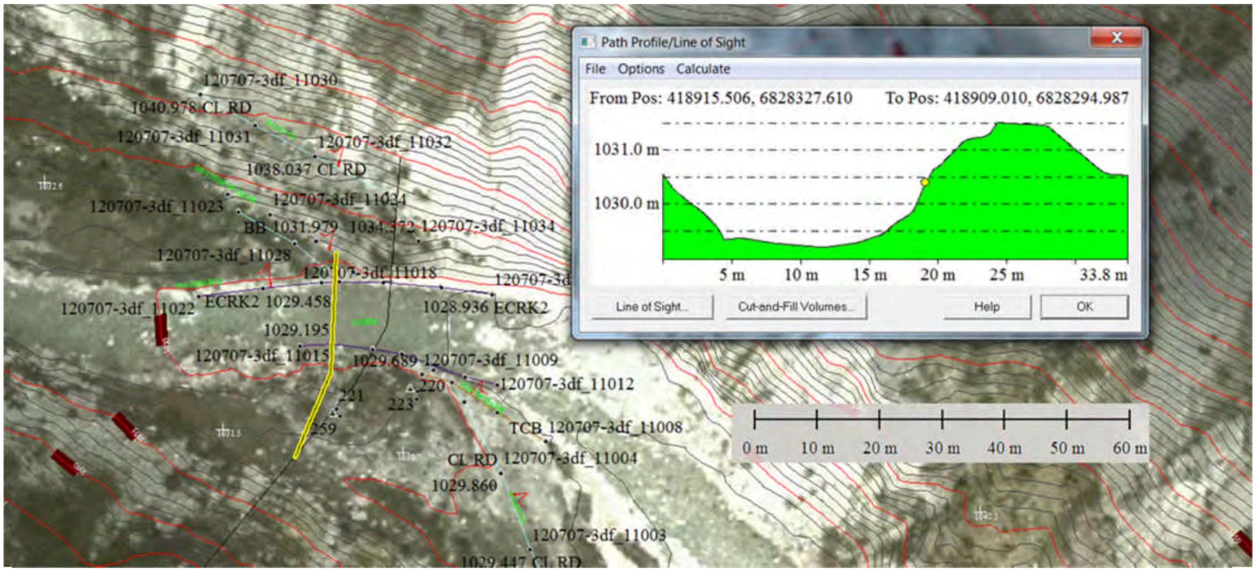

Figure 3: Sundog Creek at KM 26.4. Flow is from left to bottom right. Section plot is viewing downstream

3.4 KM 26.8, Sundog Creek Temporary Crossing 3

The third temporary span bridge crossing is proposed over Sundog Creek at Road KM 26.8. Figure 4 shows the LiDAR-derived cross section used to determine the high water level at this location. The LiDAR section was used "as-is" without adjustment for bathymetry. Based on ground photos, there are frequent huge boulders which have apparently fallen into the creek from the adjacent hillslope. The boulders are sufficiently large to be observable in the Figure 4 orthophoto image.

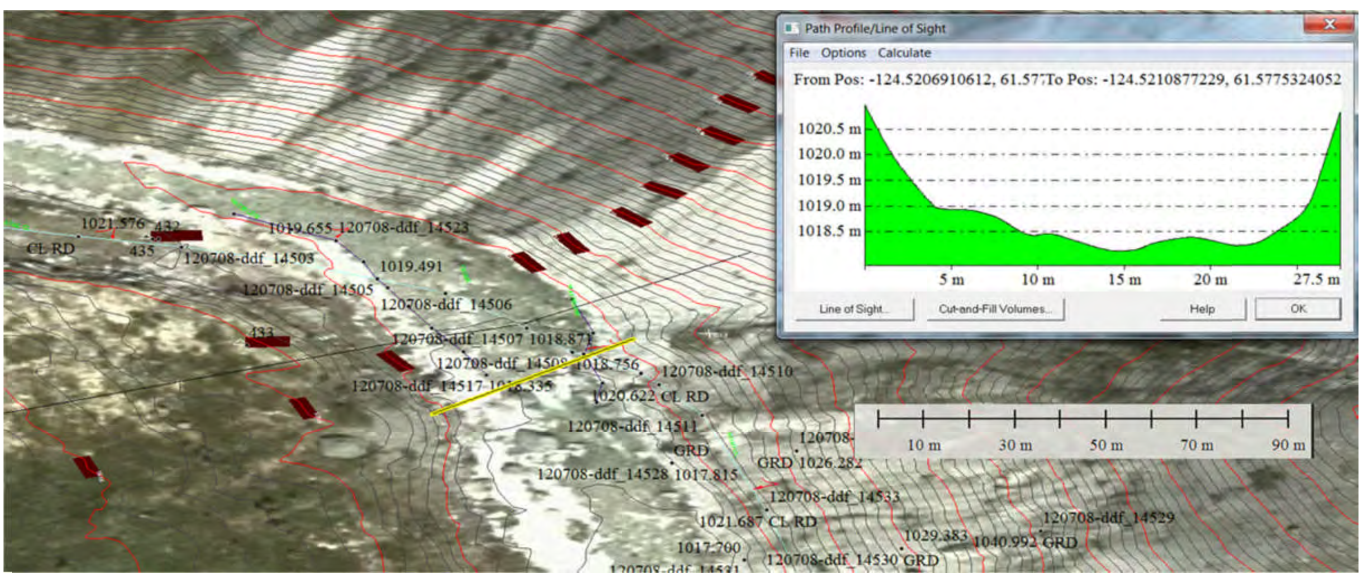

Figure 4: Sundog Creek at KM 26.8. Flow is from left to image bottom. Section plot is viewing downstream

The channel slope at and below the crossing reach was 0.040. A relatively high Manning's n value of 0.080 was assumed due to the boulder obstructions to the flow.

The computed water level at Sundog Creek Temporary Crossing 3 is 1019.13 m for the 100-year discharge of 29.4 m^3/s. The flow velocity in the main channel is 2.20 m/s and the maximum depth of flow is approximately 1.0 m.

3.5 KM 28.7, Sundog Creek Temporary Crossing 4

The fourth temporary span bridge crossing is proposed over Sundog Creek at Road KM 28.7. Figure 5 shows the LiDAR-derived cross section used to determine the high water level at this location. The LiDAR section was used "as-is" without adjustment for bathymetry.

The crossing is located in the middle of a short (15 m) relatively flat reach between upstream and downstream rapids with very large boulders in the channel. Due to difficulty in assessing the local channel slope, the hydraulic analysis for this site considered three LiDAR-derived sections, all applied without any adjustment for bathymetry. The two additional sections were located downstream of the crossing, first at the start of the white water section, and second about midway down though the rapids where the channel slope is approximately 10%. A Manning's n value of 0.080 was assumed for all sections.

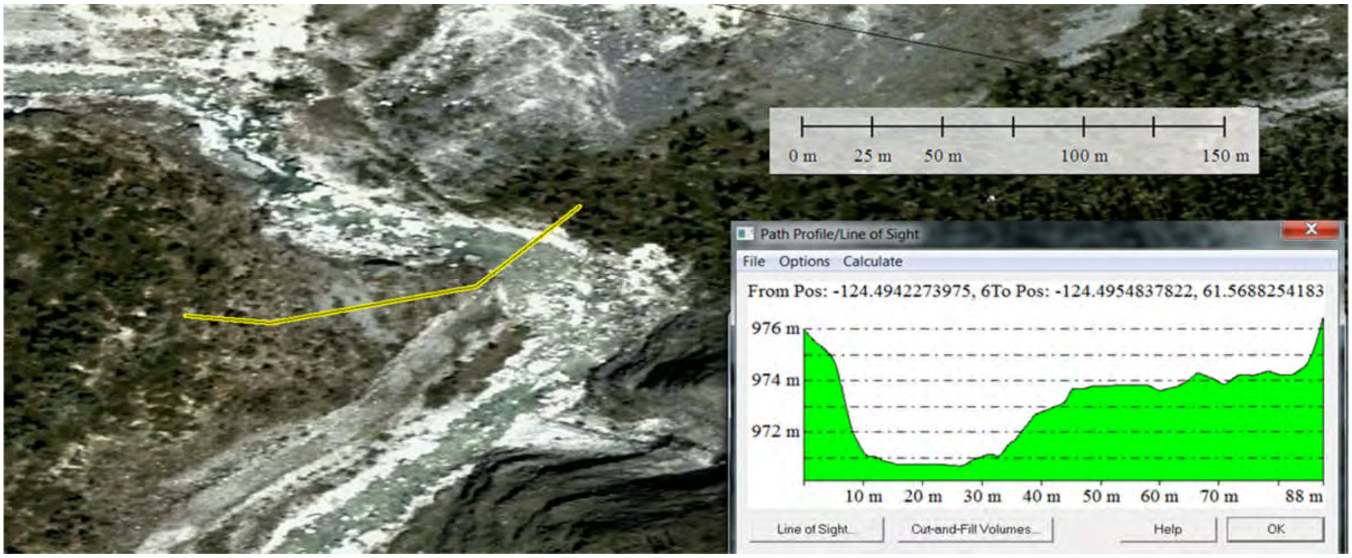

Figure 5: Sundog Creek at KM 28.7. Flow is from left to bottom left. Section plot is viewing downstream

The computed water level at Sundog Creek Temporary Crossing 4 is 971.52 m for the 100-year discharge of 33.0 m^3/s. The flow velocity in the main channel is 2.48 m/s and the maximum depth of flow is approximately 0.8 m.

3.6 KM 43, Unnamed Creek Temporary Crossing 5

A fifth temporary span bridge crossing is proposed over an unnamed creek at Road KM 43. Figure 6 shows the LiDAR-derived cross section used to determine the high water level at this location. The LiDAR section was modified by adding a ground survey bed elevation point which had been measured at the channel centreline. The resulting channel minimum bed elevation is approximately 0.1 m below the LiDAR elevation which represents the water surface.

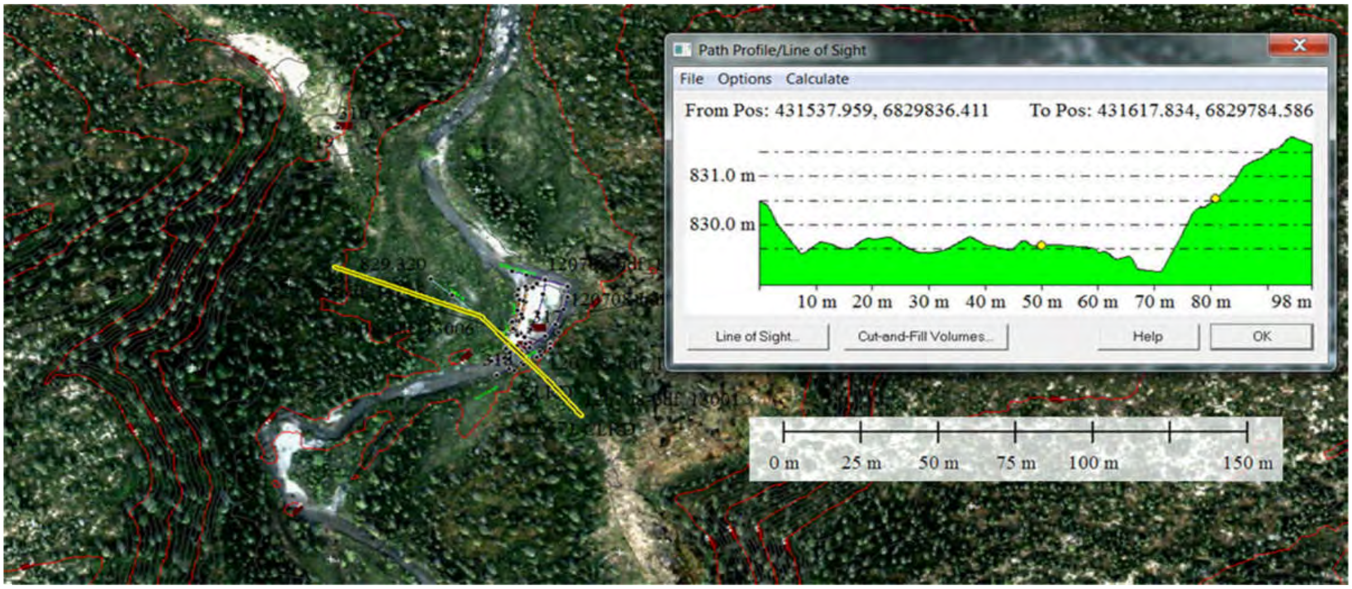

Figure 6: Unnamed Creek at KM 43. Flow is from bottom to top. Section plot is viewing downstream

The unnamed creek is about five metres wide and has a meandering plan form within a floodplain that is approximately 70 m wide at the crossing location. The channel slope through the crossing reach was assumed to be 0.01, considering a surveyed water edge slope of 0.008 and slightly higher LiDAR-derived slopes which will result when channel side bars are overtopped. Manning's n values of 0.024 and 0.080 were assumed for the main channel and overbank floodplain areas, respectively

The computed water level at the unnamed creek Temporary Crossing 5 is 829.86 m for the 100-year discharge of 16.5 m^3/s. The flow velocity in the main channel is 1.90 m/s and the maximum depth of flow is approximately 1.0 m. At the design flow, the entire floodplain will be inundated as shown in Figure 7 below. Any obstruction of the floodplain area due to road fill or bridge abutments will result in increased water levels on the upstream side of the crossing.

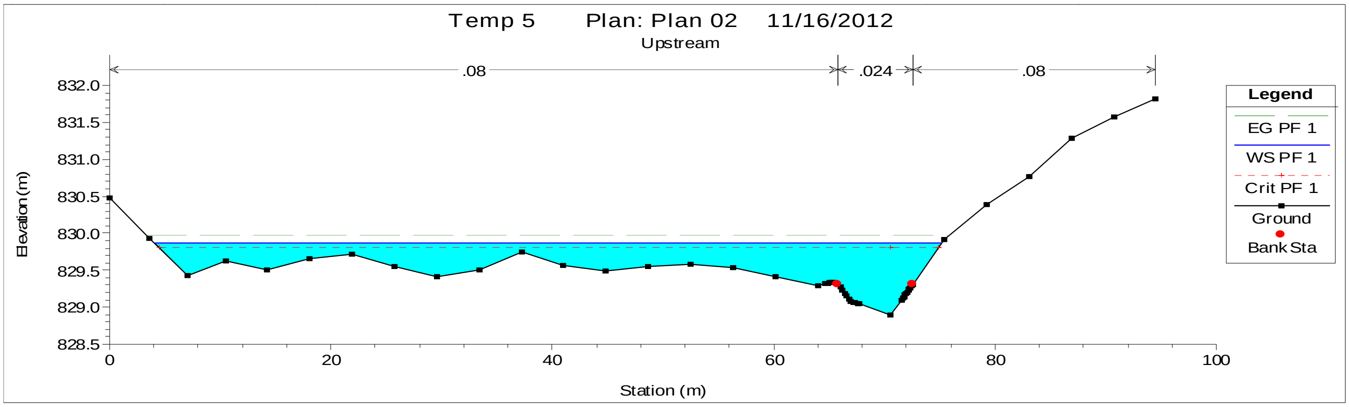

Figure 7: Unnamed Creek at KM 43. Depth and extent of inundation at design flow

3.7 KM 53, Polje Creek Permanent Crossing

A second permanent span bridge crossing is proposed over Polje Creek at Road KM 53. Figure 8 shows the channel configuration and the locations of three sections which were field surveyed and used for hydraulic modelling. The proposed crossing is at the middle section shown in yellow. The section plot included in Figure 8 is derived from LiDAR for consistency with previous figures.

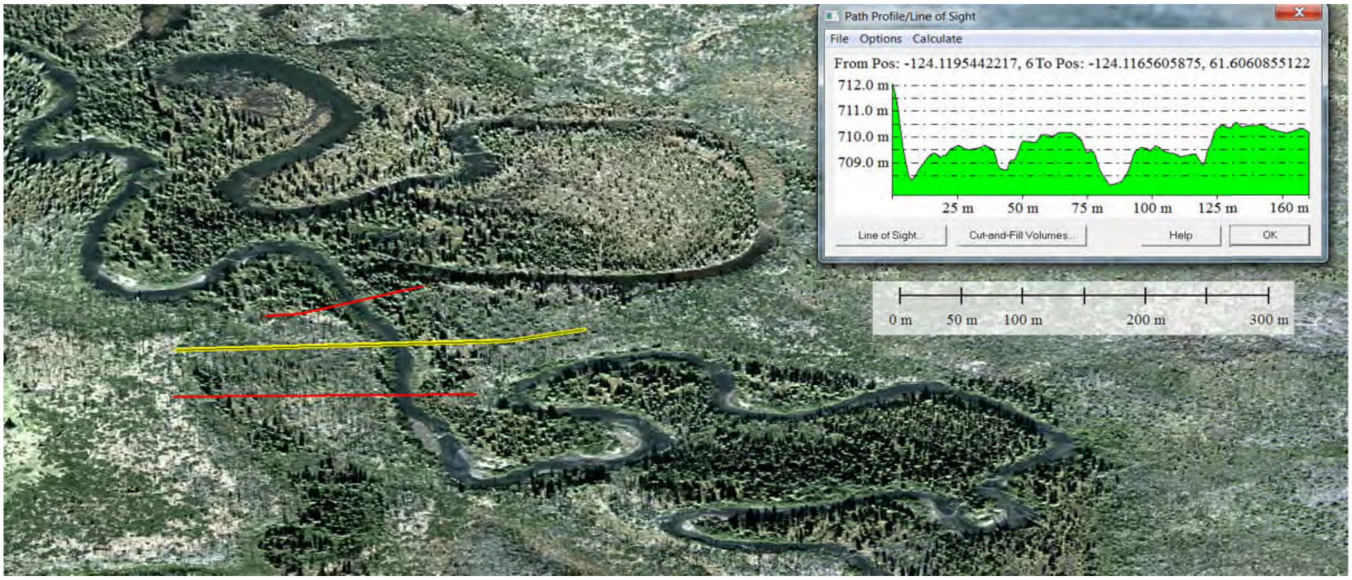

Figure 8: Polje Creek at KM 53. Flow is from bottom to top left. Section plot is viewing downstream

The Polje Creek channel is about eight metres wide and has a meandering plan form within a floodplain that is over 250 m wide in places. The channel slope through the crossing reach is 0.002. Manning's n values of 0.024 and 0.10 were assumed for the main channel and overbank floodplain areas, respectively.

The computed water level at the Polje Creek crossing is 710.40 m for the 100-year discharge of 59.7 m^3/s. The flow velocity in the main channel is 1.73 m/s and the maximum depth of flow is approximately 2.5 m. At the design flow, the entire floodplain will be inundated as shown in Figure 9 below. Any obstruction of the floodplain area due to road fill or bridge abutments will result in increased water levels on the upstream side of the crossing.

The computed design water level is believed to be conservatively high by as much as 0.3 m because it does not account for bypass floodplain flow past the right (east) end of the modelled section. The bypass water would overtop the main channel about 350 m upstream from the crossing, flow north over the right (east) floodplain, and drain into the oxbow channel section that is east from the main active channel.

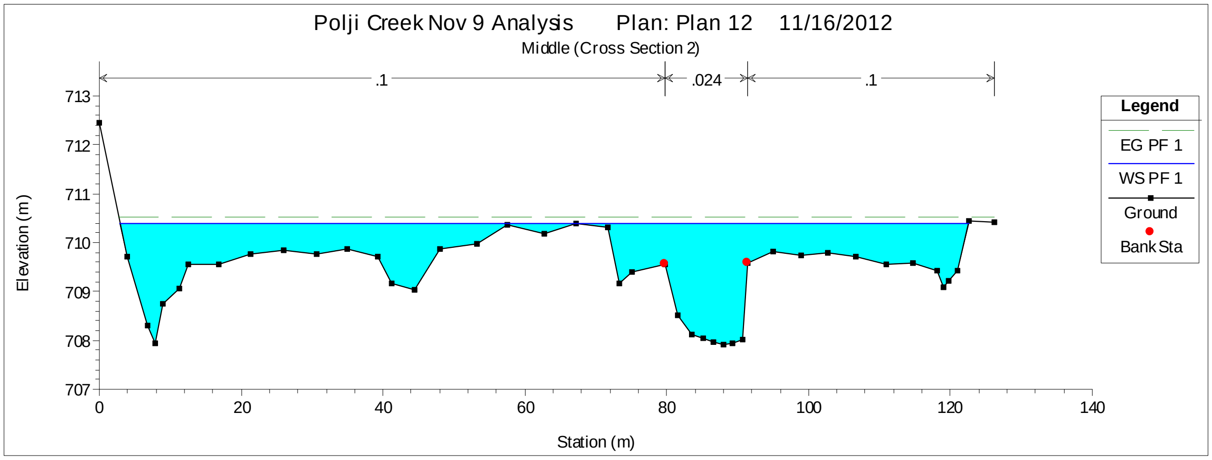

Figure 9: Polje Creek at KM 53. Depth and extent of inundation at design flow.

4.0 CLOSURE

We trust this report meets your present requirements. If you have any questions or comments, please contact the undersigned.

Sincerely,
EBA Engineering Consultants Ltd.

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Nov 19|2012

Attachments: Photos (12)

Photo 1: Sundog Creek Permanent Crossing, Road KM 23. Viewing upstream.

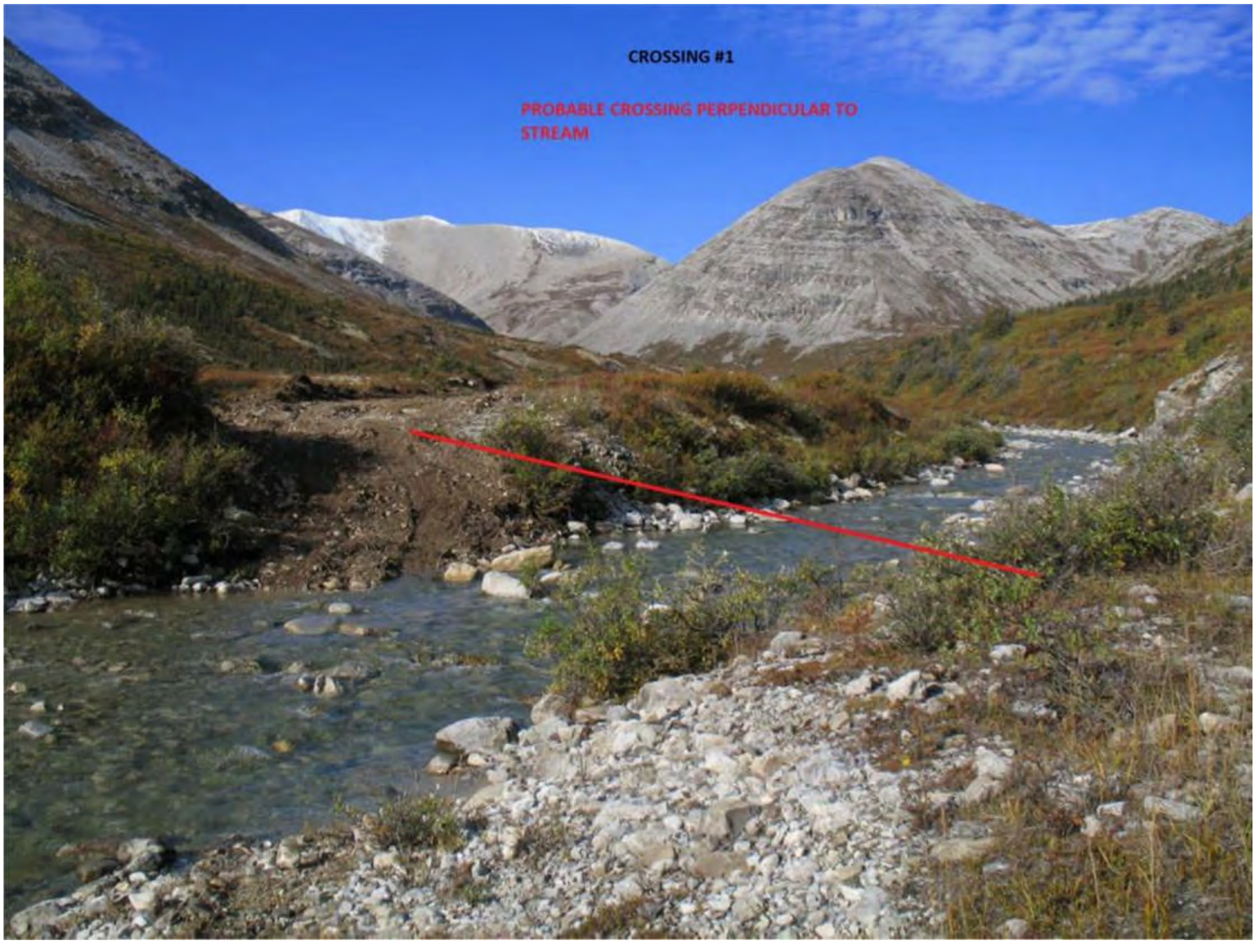

Photo 2: Sundog Creek Temporary Crossing 1, Road KM 24. Viewing upstream.

Photo 3: Sundog Temporary Crossing 2, Road KM 26.4. Viewing downstream.

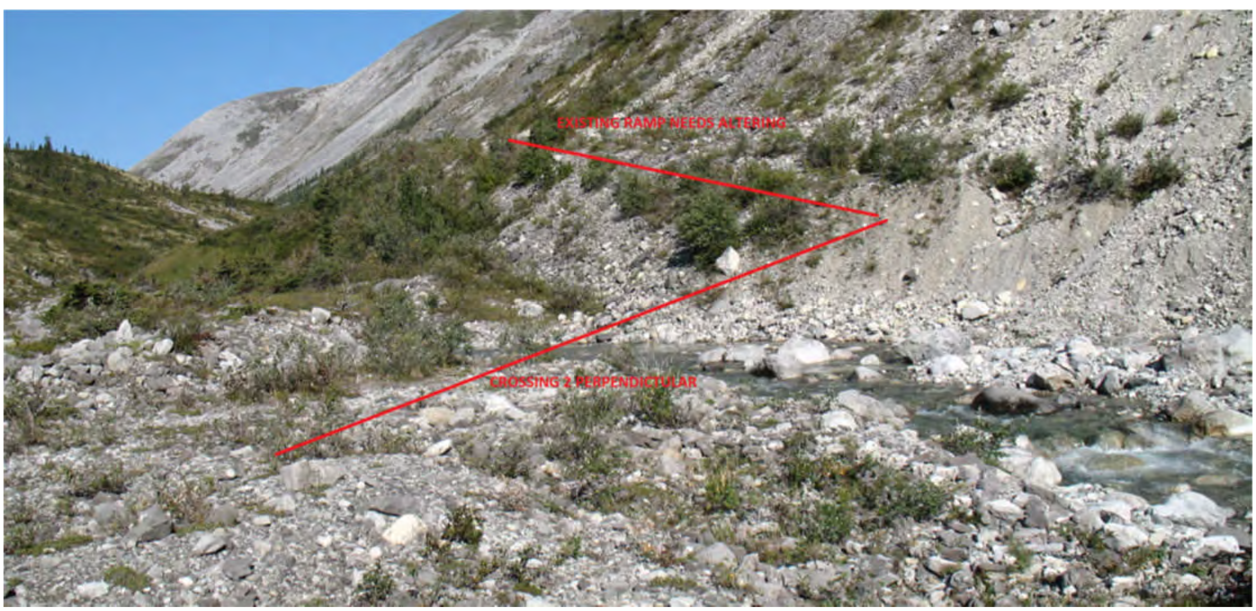

Photo 4: Sundog Temporary Crossing 2, Road KM 26.4. Viewing upstream.

Photo 5: Sundog Temporary Crossing 3, Road KM 26.8. Flow is left to right.

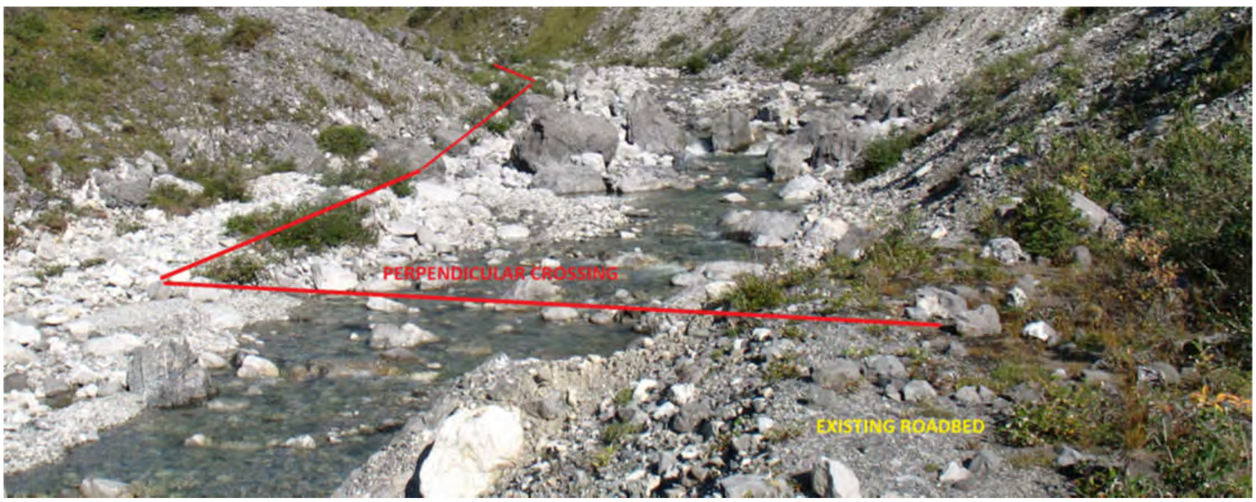

Photo 6: Sundog Temporary Crossing 3, Road KM 26.8. Viewing upstream.

Photo 7: Sundog Temporary Crossing 3, Road KM 26.8. Viewing downstream.

Photo 8: Sundog Temporary Crossing 4, Road KM 28.7. Viewing downstream.

Photo 9: Sundog Temporary Crossing 4, Road KM 28.7. Viewing downstream.

Photo 10: Unnamed Creek Temporary Crossing 5, Road KM 43. Flow is right to left.

Photo 11: Polje Creek Permanent Crossing, Road KM 53. Flow is right to left.

Photo 12: Polje Creek Permanent Crossing, Road KM 53. Flow is left to right.