CANADIAN ZINC CORPORATION

December 5, 2016

Mr. Chuck Hubert
Senior Environmental Assessment Officer
Mackenzie Valley Environmental Impact Review Board
5102 50th Avenue,
Yellowknife, NT
X1A 2N7

Dear Mr. Hubert

**RE: Environmental Assessment EA1415-001, Prairie Creek All Season Road**
**Oboni Risk Assessment**

We refer to the November 18, 2016 risk assessment (RA) report, and the November 30, 2016 RA 'cover letter', prepared by Oboni Riskope Associates Inc. Canadian Zinc Corporation (CZN) has reviewed these. In our opinion, there is a need to reconsider and adjust the assumptions made in the RA. Following this, an addendum should be prepared with the updated results, which should be presented in a more detailed format to allow further consideration of location-specific concerns and adaptive mitigation requirements, as necessary. CZN will provide more substantive comment on the RA after the addendum. Our main reasons for requesting an addendum are explained below. Detailed comments are provided in an attached table.

While we agree with Oboni's conclusion that the all season road poses a lower risk than a winter only road, it would be helpful from an environmental assessment stand-point to separate the assessed risks between summer and winter. Based on Oboni's description, we believe that the assessed risks are greater for winter. Therefore, by combining winter and summer risks, the risks for summer appear greater than they actually are.

We have significant concerns regarding the assumptions made in the RA relating to the probability of accidents occurring, and the consequences of those accidents. Before commenting further, we feel it is important to note that, in our opinion, Oboni is at a distinct disadvantage in this regard because the road alignment and terrain were not visited by Oboni in the field, and Oboni is essentially relying on photos and written material. To be succinct, we do not believe Oboni sufficiently understands site conditions. In our view, this poses a real limitation on the reliability of Oboni's assessment and conclusions. A possible, partial, remedy would be to give Oboni the opportunity to view video of the road, during which we strongly advise that some guidance in terms of road locations and kilometre marks in the video be provided. CZN can provide such an opportunity.

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Regarding the probability of accidents, Allnorth, the road engineering consulting firm assisting CZN, believes that Oboni needs to revise: the assumptions of driver behaviour and road conditions; the conclusion that the road is too narrow; and, the approach to determining the frequency of road 'excursions' (tolerance). Allnorth has provided comments on these and other road engineering and operation aspects in the attached letter.

In the RA report, there seems to be some confusion as to whether or not man-made slopes pose a significant risk, and whether or not those risks have been included in the RA. Such slopes will be suitably designed with necessary mitigations during detailed design, and therefore there should not be any significant risks to include in the RA. Similarly, rock fall potential will be mitigated as necessary, and it is not conceivable that such events would cause significant accidents. We also do not agree with Oboni's assumption that b) and c) type accident scenarios (due to landslides) have a significant probability of occurring. We agree that landslides could potentially affect the road, but we consider it extremely unlikely they will cause accidents.

According to the RA report, the assessed consequences of accidents appear to be largely based on Parks Canada's reply to Undertaking #16, although the cover letter implies a slightly greater focus on watercourses. There is no mention of CZN's response to the undertaking, or to CZN's comments on Parks Canada's response. There is also no mention of the consequence information provided by CZN in the DAR and DAR Addendum. CZN has provided comments on the non-engineering aspects of the RA report and cover letter in an attached table. This includes more detailed comments on consequence assumptions. However, in summary, we do not consider the Parks Canada response to Undertaking #16 to be an accurate reflection of regional environmental sensitivities, or a suitable basis for consequence assessment.

Oboni has chosen to use the road Stratifications determined by Allnorth as a basis for conducting the RA and to display results. We understand why this approach was taken as this enables assumptions to be based on design elements. However, because many of the Stratifications have considerable length, and also multiple sub-sections, it is very difficult to understand and visualize the results in terms of road location, and the value of the study is also reduced. This is particularly acute for the grouped 'special sections', which also correspond to most of the higher assessed consequences. We believe a subdivision of the Stratifications is required. To this end, we have prepared a table (attached) reflecting the subdivisions and assigning unique numbers to them. We propose that the table be used in an updated RA. It may not be necessary to reflect all of the subdivisions in the results, some could be grouped depending on commonality of the results, but the added detail will be needed for others, particularly the special sections.

From the above, it is clear that we have significant concerns with the assumptions made in the RA, and these directly relate to all of the conclusions listed by Oboni in their cover letter. We ask Oboni to carefully consider the detailed comments provided by Allnorth, and those by CZN in the attached table.

We appreciate your consideration of these comments which are intended to be constructive. If you have any questions, please contact us at 604 688 2001.

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Yours truly,
CANADIAN ZINC CORPORATION

David P. Harpley, P. Geo.
VP, Environment and Permitting Affairs

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# CZN NON-ROAD ENGINEERING COMMENTS
# OBONI RISK ASSESSMENT

| Page | Comments on Report |
|---|---|
| 10 | 3rd para., ORE (optimum Risk Estimates) – we assume this is a program. Information is required as to what the program is, how it was developed, and how it converts input data into risk estimates. |
| 51 | All concentrate trucks will back-haul supplies, at least diesel, unless diesel demand is significantly reduced by including LNG. CZN is exploring LNG inclusion but cannot confirm this at present. |
| 57 | Last para., this is a relic from the Phase 1 Project (all season road from Mine to TTF) and is no longer being considered. Delete. |
| 61 | While "a total of 18 major stream crossings were identified in the original report', there are now only 9 bridge crossings. |
| 62 | Since "a 100% value for the snow/ice conditions accident increase" has been adopted, we assume there is a resulting significant difference between summer and winter risks. Accordingly, as CZN is already permitted for winter hauling, it is appropriate to separate and compare the risks relating to summer and winter, as the assessed risks at present represent a combination skewed by greater risks in winter. |
| 66 | As "Riskope's SoW specifically requires to only evaluate risks in areas where the all season road differs from the winter road", the avalanche paths 16, 20, 33-35 noted in Table 9 are out of scope as they relate to road sections that do not differ from the winter road. Paths 25-28.5 are on the north side of Sundog Creek and will not influence the all season road which was re-aligned to the south side from the winter location. Hence, any influences assumed from avalanches in the assessment should be removed. |
| 79 | Last para., regarding accidents caused by hazards (b, c), we consider this extremely unlikely (beyond present credibility). Hazards of significance (landslides, major rockfall) occur very infrequently, measures in ten's or hundred's of years. The chance of one occurring just as a truck is passing is considered extremely low. Such events are more likely in spring during thaw, or after summer intense rainfall. There will not be traffic in spring because of the inability to cross the Liard River, followed by load restrictions on the Liard Highway. Intense rainfall would likely cause suspension of trucking, followed by inspections before trucking resumes. Further, maintenance crews and monitors will inspect the road first each day, confirming road clearance before truck arrival. There is a possibility of minor rockfall at any time, however this is unlikely to cause an off-road excursion. Therefore, we believe 'b' and 'c' accidents should be removed from accident assessment. |
| 82 | 2nd para., with cold temperatures, we agree materials are generally stiffer and more brittle. However, concentrate will also freeze, making a spill less likely and recovery easier if a spill occurs. |
| 83 | 2nd para., no justification is provided regarding the assumption that CZN's spill estimates are a 'lower bound', other than to consider them 'rosy' estimates. Please explain why the estimates are not realistic, or assume to be so. Was a higher bound for spill estimates assumed, and if so, what was it? |

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| 85 | Environmental consequences appear to have been largely based on Parks Canada's reply to Undertaking #16. Oboni requested details of locations of sensitive wildlife and vegetation, however it was not clear at the time that the intention was to primarily use that information to determine spill consequences. Wildlife are only at risk if they drink contaminated water or eat contaminated vegetation. With spill response, the latter is unlikely. Impacts to vegetation are unlikely to be significant given a probable localized spill area compared to a much larger area of similar vegetation. Therefore, the consequence focus is incorrect. We believe the focus should be water quality and fish. In addition, we do not believe Parks Canada's response is correctly representative of regional sensitivities. It appears the comments made by CZN on this matter (PR#282) were either not seen or ignored. To reiterate, there is no evidence that a mountain caribou 'population' exists downstream of Sundog Creek. There is evidence that a few caribou occasionally stray from their range to the north and can be seen anywhere between the Mine and the Ram Plateau. Similarly, there is no evidence of a grayling 'population' present in upper Sundog that survives the winter. More likely, a limited number of grayling migrate up to Km 25 in spring, and those that don't retreat don't survive the winter. Parks Canada is asked to provide any data they may have to the contrary. We agree there is some sensitivity regarding fish presence, but the appropriate context needs to be assumed. Regarding karst terrain and underground drainage, the reality is the karst rock has a soil cap that would have to be penetrated by a spill before it would enter any underground drainage. As part of EA 0809-002 studies, SNC Lavalin advanced some shallow boreholes on the Ram Plateau near Km 57 using a hammer drill that drove sampling tubes to the point of bedrock refusal, or shallower. A figure showing locations and the borehole logs are attached. These show that there is a 2-4 m soil cover in the area, and that this includes clay and frozen layers. This data is likely typical of the western Ram, although judging by the thicker vegetation, the soil cover is progressively thicker on the eastern Ram. Further, karst is prone to dissolution along joints and faults at a very slow rate. Such dissolution results in pathways between massive, largely non-permeable dolomite. Areas of dissolution are characterized by dissolution features (poljes, sinkholes) and depressed relief. The road specifically avoids these areas, traversing underlying massive dolomite. Hence, karst sensitivity to spills has been greatly over-stated. Most certainly, clean-up difficulty for water and karst cannot be assumed to be equal. The Tetcela and Fishtrap drainages are not 'sensitive due to easy transport of any spill'. They are flat, low-lying, densely vegetated areas in terms of ground cover. Any spill would not migrate rapidly, and would readily be recovered. A spill in or near the crossings would be a concern, but this is highly unlikely. Tetcela is a flowing river, but Fishtrap is a slow-flowing wetland in the upper reaches proximal to the road and these are not considered to host fish. The area is bird habitat, but the area is very large and the effects from a localized spill would not be significant in this context. Swans are regularly seen in the Fishtrap area (not Tetcela), but not proximal to the road. Yellow Rail may or may not be present, but as noted, their habitat is not limited. Therefore, Parks Canada's response to Undertaking #16 is not considered to be a suitable basis for spill consequence determination. We submit that a better basis for consequence determination can be found in Sections 9.4 and 9.5 of the DAR (PR#55), and Section 7 of the DAR Addendum (PR#100), which focus primarily, but not only, on water quality and fish. In addition, we don't think Oboni has considered the actual severity of potential spills, as called for in their scope of work. In our opinion, potential severity is fundamental to a correct understanding of consequence, and therefore an appropriate focus on those sections of the road where accidents may be more severe. |

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| 87 | 3rd para., CZN acknowledges there are locations with 'difficult cross sections' and not readily accessible in the event of a spill. However, we compensated for this by defining a number of control points in these locations where equipment and supplies will be left for the use of responders arriving on foot. Refer to the DAR, Section 9.5.2. We see no account for this in the assessment. |
| 87 | 2nd last para., to be clear, CZN is not proposing bulk transport with a tarp for cover. Such transport would use the Convey Ore system using solid, lockable lids. Similarly, if concentrate is transported in bags, the bags will be tied-down in a truck box with a solid, lockable lid. |
| 89 | The rationale for Classes 7-9, and their assumed severity, is unclear. Major watercourse crossings will be locations where the lowest speed limits, highest required vigilance and crossing guides will be required. As a result, these locations are likely to be associated with the lowest probability of accidents occurring. |
| 90 | Table 15. Regarding road sections 13-13.76 and 23-23.7, consequence class selection should reflect that there are no fish at these locations and that accessible control points are located downstream. For section 52-53, this is not karst terrain. |
| 91 | Table 16. Stratifications 2 and 3 do not have bridges. Bridges are included in the special sections in between. Stratification 8 is not on karst. |
| 101 | As 'avalanches would typically only be expected in the spring', they would be occurring at a time when trucking will be suspended (April to mid-June) due to absence of a Liard River crossing and highway weight restrictions. |
| 111 | Re man-made cuts, an all season road already exists through the mountainous section, and few cuts will be required for the remainder which will be properly designed. No significant risks are expected. |
| 115 | 2nd para., we agree that higher consequences will occur as a result of the noted characteristics, however, we do not agree that there is a paucity of data related to sensitive potential spill areas (see our reply re page 85) or that there is an absence of baseline information considering the data available and stage of the project. |
| 116 | Fig 26. The high number of predicted excursions for Stratification 5 (km 86.3-90.3) is not credible considering the gentle sloping to flat, lowland terrain, and controls associated with the 2 bridge crossings. Sub-division of the special sections is required to understand where the predicted excursions are on the road. |
| 119 | Fig 28A. As Oboni notes, the predicted number of excursions is distorted by Stratification length. Stratification 7 is highest because it is 56.5 km long. The only section with a degree of difficult is km 53.9-59.1. Fig 28A would be more meaningful if the Stratifications were sub-divided. |
| 119 | The value of Figs 28B and 28C is diminished by a lack of subdivision of the Stratifications, especially the special sections, and low resolution of the more important consequence classes 5-9. In Fig 28C, for the higher consequence classes, Stratifications 8 (class 5) and 5 (class 7) are noted as having higher excursions, yet the road sections they relate to are in relatively flat terrain with an absence of hazards. This indicates issues with the assumptions regarding accident probability and consequences. |
| 120 | 1st para., mitigations will be considered during detailed design. We have anecdotal evidence regarding rockfalls that they aren't significant. However, some sections (e.g. 14.8-15.5) may need protection. |
| 125 | 3rd para., see the reply to page 87 re control points. |
| 126 | 2nd para., note that trucks will drive in convoy most of the time, will be monitored all of the time, and travel times will be reviewed. 'Bravado' will thus be unlikely, and would be spotted quickly. The transport supervisor will determine daily driving requirements, including chain-up. |

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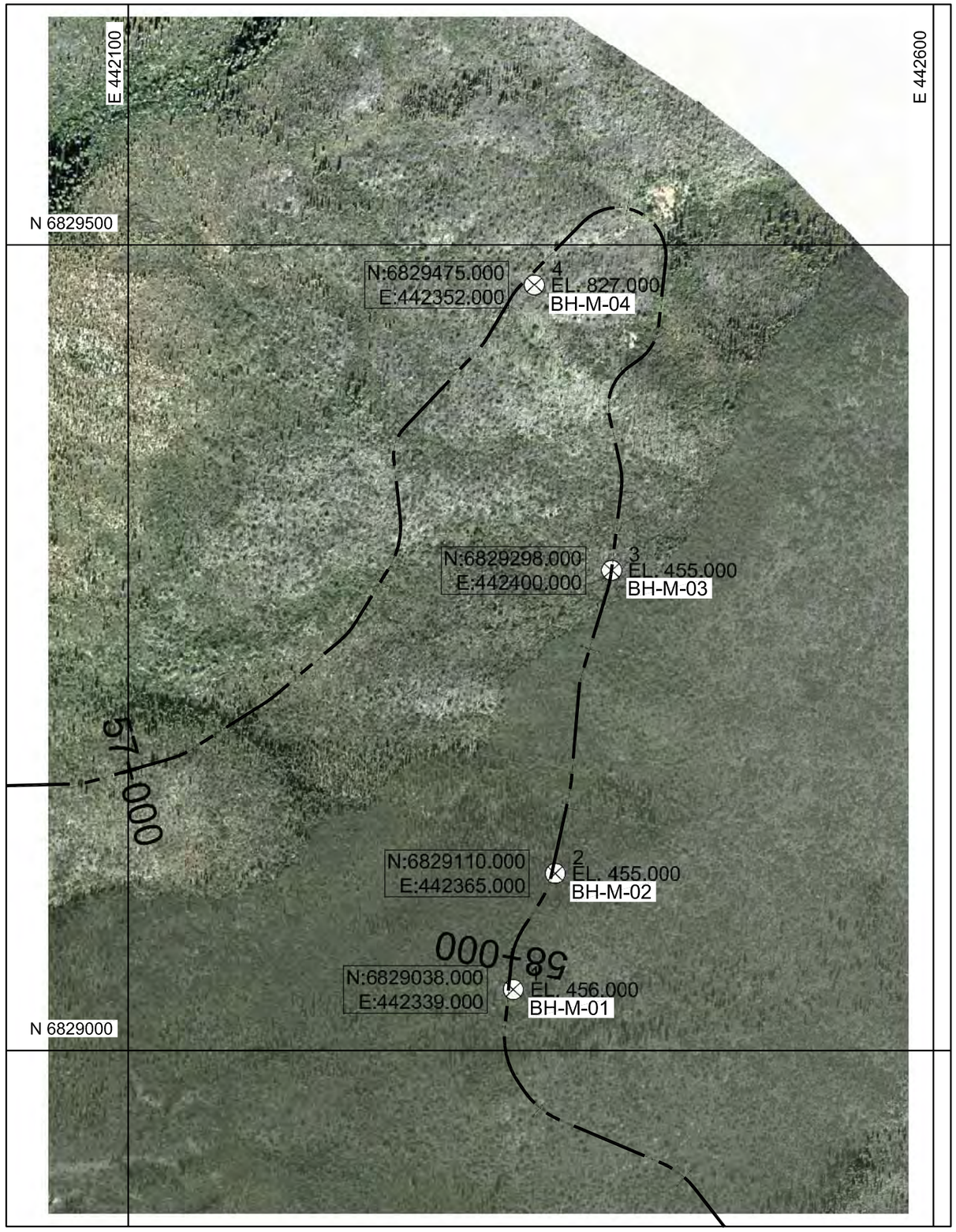
| 126 | Last para., what is meant by "review the cargo safety rules"? CZN has and will continue to endeavour to make cargos as safe as possible. |
| 132 | 5th para., there is no km 122.7-123.4 special section on the final alignment. That was on an alignment replaced by an alternate. |
| 133 | Last para., the main deviations from tolerance are due to an incorrect assumption of environmental sensitivity. |
| 152 | Assumption 15, "crossings and junctions are not considered to represent a noteworthy hazard". What, then, is the basis for consequence classes 7-9? |
| **Page** | **Comments on Cover Letter** |
| 4 | 1st. para., Oboni notes that the real life accidents in their examples were driver-related, and not due to hazards. They also state that they "found a similar result in this study". This conflicts with their comments elsewhere regarding landslides and rock falls, in which they say these can cause accidents, e.g. 2nd. last para., "high velocity, small volume events can generate high risks". It is again worth noting that the evidence indicates that these events are not currently thought to be significant, but if they are found to be, upslope protection would be implemented. |
| 4 | 2nd last para., stating that "man-made slopes generate frequent and damaging slides and rock falls which have not been evaluated to date due to lack of information" implies that there is significant risk attached to these. We do not expect this, hence the absence of detailed evaluation to date. These slopes will be subject to evaluation and appropriate mitigation during detailed design. That is an assumption Oboni can and should make, rather than implying risk. |
| 5 | 2nd para., while km 6.5-13 would be a high consequence location, accident probability is very low due to the gentle grade and generally small grade separation difference between the road and stream. For km 23.8-39.4, for the most part, either the accident probability is low or the consequence is low. Sundog Creek is not potentially fish-bearing until km 25. From 23.8-28, the road will be on a relatively flat bench, apart from a tributary crossing. From km 28.8-39.4, the road is mostly on old floodplain and distant from the creek with very little grade separation, although some portions are adjacent to the creek. Oboni's comments indicate an insufficient understanding of site conditions, which we believe is understandable given they have not made a site inspection. |
| 5 | 2nd para., we appreciate Oboni's attempt to provide more detail in terms of the locations of 'risky' areas, however, we need to see that and more detail in the results for subdivided Stratifications in order to better understand the assumptions leading to the determination of excursion probability and consequences, and to respond to those in terms of review and adaptive design, as necessary. |
| 5 | Last para., Oboni is asked to review his conclusion that the mitigations proposed to date are not sufficient to bring the risks within the accidental tolerance based on: a more broader and appropriate consideration of the environmentally sensitive context of the project; a better understanding of the local topography (see Allnorth letter); reconsideration of road width issues (see Allnorth letter); and, an assumption that man-made slope and rock fall risks will be mitigated appropriately during detailed design. |




NOTES:

1. ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED.

LEGEND:

⊗ BOREHOLE

0 1:1500 60

CANADIAN ZINC CORPORATION

CLIENT CANADIAN ZINC CORPORATION

CLIENT DWG. NO.

SNC·LAVALIN



PROFESSIONAL ENGINEER | NAME | NO.

TITLE
PRAIRIE CREEK MINE PROJECT
M – SWITCHBACK AREA
BOREHOLE LOCATIONS
PLAN

| | NAME (PRINT) | INT. | DATE |
|---|---|---|---|
| DESIGNED | M-P. LACHANCE | | 12/11/16 |
| DRAWN | K. MOLOGUINE | | 12/11/16 |
| CHECKED | K. HOJKA | | 12/11/16 |
| APPROVED LEAD ENG. | | | |
| APPROVED ENG MAN. | | | |
| APPROVED AREA MAN. | | | |
| APPROVED ENG. COORD. | | | |
| APPROVED AREA MAN. | | | |

SCALE AS SHOWN

| PROJECT NO. | AREA | DISC. | DOC. | DRAWING NUMBER | LOC. | REVISION NUMBER |
|---|---|---|---|---|---|---|
| 610984 | 5300 | 4G | DD | 0003 | 2 | PA |

Format 'A1' Sheet Size

| DWG. NO. | REFERENCES | DWG. NO. | REFERENCES | NO. | DATE | REVISIONS | BY | CHK | LEAD DISC. | ENG. MAN. | AREA MAN. | CLIENT ENG. COORD. | CLIENT AREA MAN. |
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DATE: 2012/11/16 – 1:57pm
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# Borehole Log

Project **Prairie Creek, Northwest Territory**
Contract **610984**

| | | | |
|---|---|---|---|
| Drilling Company | **Rocky mountain** | Borehole ID | **BH-M-01** |
| Method | **2 inch Pionjar** | Page | **1 of 1** |
| Location | **M Switchbacks** | Start Date | **2012-09-24** (yyyy-mm-dd) |
| Logged/Reviewed by | **MP Lachance** | End Date | **2012-09-24** (yyyy-mm-dd) |
| Coordinates | 6829038 N, 442339 E | Elevation (m) | **456 m** |

**Sample Condition**
Disturbed | Undisturbed | Lost

**Sample Types**
SS - Split Spoon; ST - Thin Walled Open (Shelby); RC - Rock Core
CS - Core Sample; WS - Wash Sample; BU - Bulk
AU - Auger

**Abbreviations**
PP - Pocket Penetrometer; RQD - Rock Quality Designation; SPT - Standard Penetration Test
PT - Standard Proctor Test; DS - Direct Shear; Q test - Triaxial Compression Test (UU)
K - Hydraulic Conductivity (cm/s); GS - Grain Size Analysis; U - Wet Unit Weight (kN/m$^3$)

| Depth (m) | Elevation (m) / Depth (m) | Description | Stratigraphic Plot | Piezometer Installation and Water Level | Field Undrained Shear $C_u$/Lab Tests | Sample Condition | Type & Number | SPT Blow Counts | N-value (# blows/0.3m) | Recovery % | RQD % | Gr Sa Si/Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **456.00** | Ground Surface | | | Lab UCS ■ Q Test □ P.P. (US) ○ — Field Vane: Intact ▲ Remold ◆ — Lab. Vane: Intact △ Remoulded ◇ — 100 200 300 400 kPa; Water Content (%) ⊗ — Plastic Limit (%) — Liquid Limit (%) — 20 40 60 80 | | | | | | | |
| | 455.9 / 0.2 | SILT<br>Loose, grey and light brown, SILT, slightly moist | | | | | | | | | | |
| | 455.3 / 0.7 | CLAY<br>Silty CLAY, trace shale, organic, slightly moist | | | | | | | | | | |
| 1 | | SAND<br>Brown, coarse, gravelly SAND, trace silt and shale, organic, moist<br>Some silt and shale | | | | | | | | | | |
| | 454.0 / 2.0 | Some gravel | | | | | | | | | | |
| | | END of BOREHOLE at 1.98 m<br>2 inch and 3 inch Pionjar refusal at 1.98 m | | | | | | | | | | |

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# Borehole Log

Project **Prairie Creek, Northwest Territory**
Contract **610984**

| | | | |
|---|---|---|---|
| Drilling Company | **Rocky Mountain** | Borehole ID | **BH-M-02** |
| Method | **3 inch Pionjar** | Page | **1 of 1** |
| Location | **M Switchbacks** | Start Date | **2012-09-24** (yyyy-mm-dd) |
| Logged/Reviewed by | **MP Lachance** | End Date | **2012-09-24** (yyyy-mm-dd) |
| Coordinates | 6829110 N, 442365 E | Elevation (m) | **455 m** |

**Sample Condition**
Disturbed | Undisturbed | Lost

**Sample Types**
SS - Split Spoon; ST - Thin Walled Open (Shelby); RC - Rock Core
CS - Core Sample; WS - Wash Sample; BU - Bulk
AU - Auger

**Abbreviations**
PP - Pocket Penetrometer; RQD - Rock Quality Designation; SPT - Standard Penetration Test
PT - Standard Proctor Test; DS - Direct Shear; Q test - Triaxial Compression Test (UU)
K - Hydraulic Conductivity (cm/s); GS - Grain Size Analysis; U - Wet Unit Weight (kN/m$^3$)

| Depth (m) | Elevation (m) / Depth (m) | Description | Stratigraphic Plot | Piezometer Installation and Water Level | Field Undrained Shear $C_u$/Lab Tests | Sample Condition | Type & Number | SPT Blow Counts | N-value (# blows/0.3m) | Recovery % | RQD % | Gr Sa Si/Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **455.00** | Ground Surface | | | Lab UCS; Q Test; P.P. (US); *Field Vane* Intact, Remold; *Lab. Vane* Intact, Remoulded; 100 200 300 400 kPa; Water Content (%); Plastic Limit (%); Liquid Limit (%); 20 40 60 80 | | | | | | | |
| | 454.7 / 0.3 | TOPSOIL<br>Black and brown, organics and gravelly organic clay, trace shale, moist, cold | | | | | | | | | | |
| 1 | | SAND<br>Brown, coarse SAND, trace shale, moist, cold | | | | | | | | | | |
| 2 | | Frozen at 1.96 m | | | | | | | | | | |
| 3 | | | | | | | | | | | | |
| | 451.2 / 3.8 | END of BOREHOLE at 3.8 m | | ▼ | | | | | | | | |

PRAIRIE CREEK 610984 PRAIRIE CREEK.GPJ GEOTECH.GDT 11/14/12

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# Borehole Log

Project **Prairie Creek, Northwest Territory**
Contract **610984**

| | | | |
|---|---|---|---|
| Drilling Company | **Rocky Mountain** | Borehole ID | **BH-M-03** |
| Method | **3 inch pionjar** | Page | **1 of 1** |
| Location | **M Switchbacks** | Start Date | **2012/23/09** (yyyy-mm-dd) |
| Logged/Reviewed by | **MP Lachance** | End Date | **2012-09-23** (yyyy-mm-dd) |
| Coordinates | 6829298 N, 442400 E | Elevation (m) | **455 m** |

**Sample Condition**
Disturbed | Undisturbed | Lost

**Sample Types**
SS - Split Spoon; ST - Thin Walled Open (Shelby); RC - Rock Core
CS - Core Sample; WS - Wash Sample; BU - Bulk
AU - Auger

**Abbreviations**
PP - Pocket Penetrometer; RQD - Rock Quality Designation; SPT - Standard Penetration Test
PT - Standard Proctor Test; DS - Direct Shear; Q test - Triaxial Compression Test (UU)
K - Hydraulic Conductivity (cm/s); GS - Grain Size Analysis; U - Wet Unit Weight (kN/m$^3$)

| Depth (m) | Elevation (m) / Depth (m) | Description | Stratigraphic Plot | Piezometer Installation and Water Level | Field Undrained Shear $C_u$/Lab Tests | Sample Condition | Type & Number | SPT Blow Counts | N-value (# blows/0.3m) | Recovery % | RQD % | Gr Sa Si/Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **455.00** | Ground Surface | | | Lab UCS; Q Test; P.P. (US); Field Vane Intact/Remold; Lab. Vane Intact/Remoulded; 100 200 300 400 kPa; Water Content (%); Plastic Limit (%); Liquid Limit (%); 20 40 60 80 | | | | | | | |
| 1 | 453.7 / 1.3 | TOPSOIL<br>Black, TOPSOIL, some clay, some gravel, moist | | | | | | | | | | |
| 2 | 452.4 / 2.6 | GRAVEL<br>Dark grey, GRAVEL, some coarse sand, trace silt, moist | | | | | | | | | | |
| | | END of BOREHOLE at 2.57 m<br>3 inch Pionjar Refusal | | | | | | | | | | |

SNC·LAVALIN

# Borehole Log

Project **Prairie Creek, Northwest Territory**
Contract **610984**

| | | | |
|---|---|---|---|
| Drilling Company | **Rocky Mountain** | Borehole ID | **BH-M-04** |
| Method | **3 inch Pionjar** | Page | **1 of 1** |
| Location | **M Switchbacks** | Start Date | **2012-09-24** (yyyy-mm-dd) |
| Logged/Reviewed by | **MP Lachance** | End Date | **2012-09-24** (yyyy-mm-dd) |
| Coordinates | 6829475 N, 442352 E | Elevation (m) | **827 m** |

**Sample Condition**
Disturbed | Undisturbed | Lost

**Sample Types**
SS - Split Spoon; ST - Thin Walled Open (Shelby); RC - Rock Core
CS - Core Sample; WS - Wash Sample; BU - Bulk
AU - Auger

**Abbreviations**
PP - Pocket Penetrometer; RQD - Rock Quality Designation; SPT - Standard Penetration Test
PT - Standard Proctor Test; DS - Direct Shear; Q test - Triaxial Compression Test (UU)
K - Hydraulic Conductivity (cm/s); GS - Grain Size Analysis; U - Wet Unit Weight (kN/m³)

| Depth (m) | Elevation (m) / Depth (m) | Description | Stratigraphic Plot | Piezometer Installation and Water Level | Field Undrained Shear $C_u$/Lab Tests | Sample Condition | Type & Number | SPT Blow Counts | N-value (# blows/0.3m) | Recovery % | RQD % | Gr Sa Si/Cl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **827.00** | Ground Surface | | | | | | | | | | |
| | 826.8 / 0.2 | TOPSOIL<br>Soft, black and light brown, organics and organic silt, trace shale, moist | | | | | | | | | | |
| | | SILT<br>Very loose, light brown, grey, SILT | | | | | | | | | | |
| 1 | 826.1 / 0.9 | Some shale | | | | | | | | | | |
| | | SAND<br>Loose, black, coarse silty SAND, some shale, moist | | | | | | | | | | |
| 2 | | Dark grey and brown<br>Cold | | | | | | | | | | |
| | | Some gravel and shale | | | | | | | | | | |
| 3 | | Large gravel | | | | | | | | | | |
| | 823.5 / 3.5 | END of BOREHOLE at 3.35 m | | | | | | | | | | |

Lab UCS; Q Test; P.P. (US) — Field Vane: Intact, Remold — Lab. Vane: Intact, Remoulded — 100 200 300 400 kPa
Water Content (%); Plastic Limit (%); Liquid Limit (%) — 20 40 60 80

| Stratification | Length (km) | From | To | Description |
|---|---|---|---|---|
| TYPE I | 6.5 | 0 | 6.5 | Prairie |
| TYPE II-1 | 6.5 | 6.5 | 13 | Funeral |
| Special 1 | 0.8 | 13 | 13.8 | Funeral hairpin |
| TYPE II-2 | 9.2 | 13.8 | 23 | Funeral/Sundog pass |
| Special 2 | 0.8 | 23 | 23.8 | Sundog trib (canyon) crossing |
| TYPE III-1 | 1.4 | 23.8 | 25.2 | Sundog terrace |
| Special 3 | 0.4 | 25.2 | 25.6 | Sundog trib (shoot) crossing |
| TYPE III-2 | 2.4 | 25.6 | 28 | Sundog terrace |
| Special 4 | 0.8 | 28 | 28.8 | Sundog trib & rock cut |
| TYPE II-3 | 1 | 28.8 | 29.8 | Sundog flats, 2 debris fans |
| TYPE IV-1 | 3.6 | 29.8 | 33.4 | Sundog flats |
| Special 5-1 | 0.5 | 33.4 | 33.9 | Sundog flats talus toe |
| TYPE IV-2 | 0.7 | 33.9 | 34.6 | Sundog flats |
| Special 5-2 | 4.1 | 34.6 | 38.7 | Sundog flats talus toe |
| TYPE IV-3 | 0.7 | 38.7 | 39.4 | Sundog flats |
| TYPE VII-1 | 1.5 | 39.4 | 40.9 | Sundog forest |
| TYPE VI-1 | 0.9 | 40.9 | 41.8 | Sundog forest |
| TYPE VII-2 | 0.6 | 41.8 | 42.4 | Sundog forest |
| TYPE VI-2 | 2.7 | 42.4 | 45.1 | Sundog forest |
| TYPE VII-3 | 0.9 | 45.1 | 46 | Polje forest |
| TYPE VI-3 | 2.7 | 46 | 48.7 | Polje forest |
| TYPE VII-4 | 2.2 | 48.7 | 50.9 | Polje forest |
| TYPE VIII-1 | 3 | 50.9 | 53.9 | Polje forest |
| TYPE VII-5 | 5.2 | 53.9 | 59.1 | Ram slope |
| TYPE VI-4 | 20.9 | 59.1 | 80 | Ram |
| TYPE VII-6 | 6.3 | 80 | 86.3 | Ram slope forest |
| TYPE V | 4 | 86.3 | 90.3 | Tetcela forest |
| TYPE VII-7 | 4 | 90.3 | 94.3 | Tetcela-Fishtrap muskeg |
| TYPE VIII-2 | 1 | 94.3 | 95.3 | Fishtrap |
| TYPE X | 6.2 | 95.3 | 101.5 | Silent Hills slope forest |
| TYPE VII-8 | 9.9 | 101.5 | 111.4 | Un-named muskeg WP-GG |
| TYPE VII-9 | 9.1 | 111.4 | 120.5 | Grainger forest |
| TYPE IV-4 | 0.7 | 123.6 | 124.3 | Grainger Gap |
| TYPE VIII-3 | 2 | 124.3 | 126.3 | Front Range muskeg |
| TYPE VII-10 | 16.8 | 126.3 | 143.1 | Front Range muskeg |
| TYPE IX-1 | 15.8 | 143.1 | 158.9 | Front Range forest |
| Special 6 | 0.6 | 158.9 | 159.5 | Liard River |
| TYPE IX-2 | 13.5 | 159.5 | 173 | Liard logging road |
| NB access | 10 | 173 | 183 | Nahanni access road |
| TOTAL | 179.9 | | | |

| | | | |
|---|---|---|---|
| TYPE I | 6.5 | TYPE VII | 56.5 |
| TYPE II | 16.7 | TYPE VIII | 6 |
| TYPE III | 3.8 | TYPE IX | 29.3 |
| TYPE IV | 5.7 | TYPE X | 6.2 |
| TYPE V | 4 | Specials | 8 |
| TYPE VI | 27.2 | | |

Attn. Mr. Chuck Hubert

Environmental Assessment Officer

Mackenzie Valley Environmental Impact Review Board
Box 938, 5102-50th Ave,

Yellowknife, NT X1A 2N7

Project Number: 16GP0041

**RE: Response** "**EA1415-01-Phase 2 Risk Assessment Technical Report Prairie Creek All Season Road"**

We have completed a review of the recently released Risk Assessment completed by Oboni Riskope Associates based in Vancouver, B.C. On a project such as this, it is always useful to receive 3rd party review to identify possible overlooked aspects of the project. Though this process, objectives can be clarified and enhanced to improve the overall safety and efficiency of the project.

In advising Canadian Zinc (CZN) through the advancement of their project, we have drawn from our past engineering and operational experience working throughout North America on similar resource projects. Specific experience of our team members includes the operation and growth of a resource transport company which operated in Western North America. This includes the management of 150 on and off highway commercial transport trucks, road construction and maintenance activities, as well as compliance with regulations on a provincial and federal level.

The engineering members of our team have significant experience in the location, design and construction of resource extraction roads throughout North and Central America. This included roads in similar conditions to those that would be experienced on the Prairie Creek Mine Road. In total, Allnorth and their people have completed thousands of kilometres of resource roads for various resource activities including mining, industrial construction and forestry. The design specifications that have been developed and used for the Prairie Creek Mine Road are based on this cumulative knowledge and experience.

After reviewing the report, we believe there are many incorrect assumptions used to assess the risk or probability of accidents, and in respect of the severity of risks associated with construction and operation of the road system. As a result, the assessment does not properly reflect the situation related to the proposed haul road. The mistaken assumptions translate to a higher risk probability related to the hauling operation, and this is not realistic. Examples of mistaken assumptions

include those relating to road width, discounting the applicability of forest engineering standards to concentrate hauls, and an emphasis on international accident examples (Switzerland, the Americas) that are unlikely to be suitable for comparison while discrediting local examples (Wolverine and Red Dog mine) which are suitable. In addition, there appears to be misconceptions regarding road design and built-in mitigations for difficult road sections, which indicates an unfamiliarity with road engineering for resource roads. We provide a description of these items below, followed by more detailed comments according to page number.

**Probability of Accidents**

Oboni's assumptions of the probability of incidents along the haul route were based on examples of operations which are significantly different from the operation proposed by CZN. We strongly believe that the statistics from operations which exhibit similar climatic and regulatory conditions, including driver requirements, licensing and training, would better reflect an incident rate and severity which may be realized on the Prairie Creek road. It is referenced in Oboni's report that driver qualifications and experience are leading factors in the probability of an accident and incident. We agree with this. The regulation and training of commercial transport drivers in Canada and the United States is some of the most onerous in the world. It could be easily envisaged that the number and severity of accidents in the 'Americas' (assumed to mean Latin America) are correlated with lower levels of training and controls (e.g. speed) and not comparable types of haul. It is unclear to us why the Wolverine (Yukon Zinc) and Red Dog examples were excluded. In our opinion, these examples are more directly relevant than the examples selected. We have knowledge that the accidents reported for the Wolverine Mine road are accurate in terms of the number of accidents that occurred. We believe Red Dog is a suitable example despite the fact that it may be "flatter, less turns, wider" because the traffic is likely faster and drivers are as prone to distraction and fatigue as they would be on other roads. Further attributes of the Red Dog haul include the fact that the gross vehicle weights (GVW) are three to four times higher than those proposed for the Prairie Creek haul, thus increasing the difficulty of the haul from an operational perspective and discrediting the belief that it is easier due to the gentle topography and wide grade.

It should also be noted that the equipment being used (e.g. those in Fig 20 and 21 and those in the 'Americas' examples) are significantly different in design and function from those proposed in the Prairie Creek Mine Haul. The units are not designed to meet the requirements of Canadian Motor Vehicle Safety Standard and are likely not maintained to the same standard as is required by the Commercial Motor Vehicle regulations in Canada and the US.

Therefore, based on both the technical equipment details and, more importantly, the driver training and speed controls, we would correlate the Prairie Creek Haul with the Red Dog and Yukon Zinc

hauls and accident rates, and not those of operations which do not have climate, topography, culture and regulatory similarities.

**Road Width**

The report contains eleven (11) references to narrow or sub-standard road width. The road design specifications reflect the terrain considerations, road footprint, and traffic volume while balancing safe and efficient transportation of materials. The standards which will be utilized in the final detailed design will conform to B.C.MFLNR standards which have been well established and proven.

The proposed 5 metre width of the haul road, with some special 4 metre sections and widening out in corners to over 6 metres, is wider than a standard provincial highway lane in northern BC. A typical highway lane in northern BC measures 3.6 metres from the centreline to the fog line plus an additional 0.5 metre shoulder for a total, safe operating width of 4.1 metres which provides a typical safe operating speed of 90 to 100 km/hr under appropriate alignment conditions. On a typical highway lane, the areas beyond the surface shoulder and the area to the left of the road centreline are generally not used due to the potential consequence, effectively limiting the total area of use to 4.1 metres.

For the proposed Canadian Zinc Road, the width of 5 metres is well beyond the standard provincial lane width including a paved shoulder and will be operated at a speed that is approximately 1/3 the designated highway speeds.

It is also important to understand that sections of the road that may be built to a 4 metre width (less than 1.1%) will have the following attributes:

- Widened where required (horizontal curves) to accommodate the flow of traffic and vehicle tracking.
- Full stabilized grade (the entire 4 m). Within these sections, blasted rock will primarily be the road base material providing a solid, compacted, and stabilized operating surface with excellent traction qualities.
- Incorporate further speed reduction zones to less than 1/3 of the speed which would be driven on a standard highway.

Our approach is to operate at low speeds through sensitive or difficult terrain, implementing a comprehensive road maintenance program, and establishing and enforcing thorough operating procedures and controls to minimize the risk to property, environment, and life. It is not uncommon to see highways in northern B.C. with no shoulder, Highway 37 and Highway 77 for example with little to no reduction in general operating speeds.

Therefore, we do not agree that the proposed Prairie Creek road normal width of 5 m is narrow or substandard.

**Road Standards and Speeds**

Oboni noted that "Slippery Condition" and "Road Speeds" are contributing factors in the occurrence of off road excursions. This relates to the probability and the severity of such incidents, as mentioned in Oboni's cover letter. The design of the road and the operation is based on implementing standard controls to reduce either the severity of the incident if it is to occur, or preferably the probability that it will occur, to an acceptable level. Allnorth anticipates the use of both engineering and administrative controls which will reduce the frequency and severity of accidents, providing for a lower overall number of accidents and risk. Many of these controls have been indicated in our submissions and many are standards within the industry, and/or minimum regulatory requirements.

Oboni refers to excessive speed or 'bravado' as a significant factor in road accidents. This occurrence is very unlikely on the Prairie Creek road for a number of reasons, primarily of which is GPS tracking and the recording and review of time cards. Also, there will be road monitors and supervisors spot checking speeds. For the most part, trucks will travel in convoy and speed differential will not be possible. As such, there will be no incentive to speed, on the contrary, there will be administrative penalty if it occurs.

**Administrative Controls**

Administrative controls will be implemented focussing on drivers, with the proven expectation that these will reduce the probability of a negative occurrence. Specific controls that will be in place include;

- Driver Training – All drivers on the haul will complete on-site training, including the identification of hazards at specific areas along the road.
- Seasonal two-way signage - Utilized to accentuate areas of specific risk or hazard.
- Standard Operating Procedures e.g. travelling in convoys, two way radio use, mandatory chain up based on road conditions, speed zones, no stopping areas and stipulated separation distances.

**Engineering Controls**

There are two important misconceptions in Oboni's report that directly relate to the probability of excursions. The first has to do with the road surface. Oboni refers to slippage or loss of traction on wet, muddy roads. It is important to note that the Prairie Creek road will have a gravel surface. The entire road surface will be finished with a crushed rock road surface which will provide significant traction in dry and wet conditions. In winter, this will be further supported through the use of a crushed rock gravel/ sand material to provide additional traction, with the use of tire chains as necessary. The second misconception is that trucks could 'slide-off' the road surface and roll down

an embankment. The road surface will be suitably sloped inwards so that any loss of traction will result in arrest in a perimeter ditch or against the inner slope.

In terms of the 4 metre road width, 4 sections amount to 2.1 kilometres of the proposed 180 kilometre road (1.1 %). Road designs were completed on all identified critical/unique terrain areas, so no additional 4 metre prescriptions are expected. There will be an opportunity to reduce the total 2.1 kilometre length significantly during the detailed design stage. Also, the length could be reduced further by incrementally widening any curvature with a radius less than 180 metres to allow for proper tracking of longer truck configurations. The net result of these refinements could reasonably reduce the total 4 metre wide prescription to 1 kilometre or less.

**Application of Forest Engineering standards to concentrate haul**.

The Oboni report questions the applicability of Forest Engineering standards to this type of concentrate haul. Many truck configurations used in forestry, particularly the BCL-625, are based on the Super B style configuration and maximize operating weights at 63,500 kg as per MOT standards (CL-625). It should also be noted that logging trucks have a considerably higher centre of gravity compared to concentrate trucks, and travel at considerably higher speeds. Further, the traffic volume experienced on a standard forestry operation would be similar or greater than the proposed volume on the Prairie Creek haul plus greater component of public and other industrial road users. Also, many forest operations experience high intensity traffic for a shorter duration of time. The intensity of use could be up to ten times that of the prescribed Prairie Creek operation. Therefore, not only do we believe that the forest engineering standards are suitable for the concentrate haul, we consider them to be very conservative and carry an expectation of greater safety and a lower probability of accidents on the Prairie Creek road.

**Man-Made Cuts**

Oboni makes frequent reference to man-made cuts in their report, and imply potential for risk. The comments also suggest that there will be a propensity of large cuts. In actuality, a total of 18 cuts are planned of various lengths and sizes (see the attached table and cross-sections). It is our expectation that CZN's geotechnical engineers will have input into cut slope design and any associated control requirements such that risks will be minimized.

**Additional Comments Regarding Cover Letter dated November 30, 2016.**

Page 2, Last paragraph. Page 3, 3rd and 4th paragraph. Reference to narrow road base that cannot accommodate barriers, if required. Our submissions stated that, at this stage of planning, the use of barriers is not foreseen, however they could be considered during the detailed design stage if it

is determined to be beneficial. If barriers are required, then one option is to expand the road width to accommodate them. A standard jersey barrier is 0.61 m wide. This approach is consistent with standard resource operating rules and guidelines. Other, narrower, options include steel or cable barriers. Therefore, it is not accurate to say that barriers are not feasible.

Page 2, Cross section example. The summary utilizes one cross section located at 36+900, and, by this single example, could leave the reader to believe that this is common place or a normal representation of the road. However, this cross section represents a "worst case" scenario and very small component of the road. This particular cross section was extracted from an earlier submission and does not reflect the latest, updated preliminary design. Note also that the vertical scale is exaggerated. Refer to the expected cut cross sections which accompany the attached table in Appendix A.

Page 3, 4th paragraph, Page 5, 3rd paragraph 3rd bullet. References such as "no U turn design", "so called Special Sections" and "lack of cross sections", implies uncertainty in designs. We provided preliminary road designs for representative portions of terrain and construction situations within the whole road length. These sections were identified by field investigation completed by 3 senior road location/construction specialists over a combined period of one month, summer and fall seasons, both on the ground and using intense low elevation helicopter reconnaissance. Within our responses to Information Requests, we identified the sections which are considered greater risk due to terrain considerations, road grades, and design. There are no additional sections providing a level of uncertainty not represented by the provided road designs. It appears to us that, since Oboni did not visit the site, they are finding it difficult to cross reference the provided road designs with the available LiDAR contour data and orthophoto imagery, and thus derive satisfaction that the difficult road sections have been designed accordingly with appropriate mitigation. It would likely be of assistance to Oboni if Allnorth provided additional drawings showing imagery for the difficult mountain section between km 6.5 and 28.8 with cross references to the designs. This could be provided in approximately 1 week.

"U" turns, to be located at approximately 10 km intervals along the route, are considered to be a minor issue. These are typically adopted as the road design process progresses, and existing disturbed areas such as borrow pit access roads would be utilized.

Page 4, 2nd paragraph. "Minor (of little concern, but may be the "seed" for more critical accidents as getting used to small recurring events, not adjusting to act on them, will lead to catastrophic events)". Again, this implies a lack of understanding of modern transport management systems. Such systems include review and adjustment for any type of concern, no matter how little, such that the idea of accepting such a situation without adjustment is incomprehensible.

Page 4, Last paragraph. With reference to "Residual risks could be brought to accidental tolerance level if detailed analyses of mitigations is carried out and mitigations are then implemented and monitored", in the first instance, as explained above, the presumption that residual risks exist is a function of incorrect assumptions. In the second instance, the described process is a standard element of the detailed design process.

**Additional Comments Regarding Report dated November 18, 2016**

Page 22, 23, 135: "The priority risks to consider/manage are those deriving from the systemic mechanisms described in the prior point. The audacious interpretation of codes developed for other traffic (forestry vs. Concentrate cargo) has lead to select a unforgiving road base width which generates risks that should be considered and managed as a priority, at least in environmentally sensitive areas". Page 36: "specifications of Table 2 constitute a selection of the flexible rules defined by B.C. Ministry of Forests, Lands and Natural Resources Operations Engineering Manual for average conditions on forest roads where vehicles are generally lighter, not as complex (Super B double trailers, as discussed in Section 1.2.2) and cargo is wood (not concentrate or hazmat) as considered in this project".

There is a misconception that road design standards developed primarily for "forestry" operations are not necessarily applicable to concentrate hauling. During the last two decades, the majority of Highway log hauling truck configurations (BCL-625) are comparable to the "Super B" style trailer configurations. This was a result of most modern sawmills preferring shorter logs and the efficiency of super B style trailers. The majority of delivered loads in forestry operations do operate at maximum legal axle loading (to maximize efficiency). In the case where "off highway" forestry operations exist, operating loads are much higher (90,680kg to 149,700kg) than the 63,500 kg limits imposed by MOT. Another consideration is the operating height of the vehicles. The typical log hauling configuration operates at a maximum allowable height of 13'6", whereas the proposed concentrate trailer height is slightly greater than 10'. Consequently, the load "centre of gravity" is much lower for concentrate. Also, shorter double trailers navigate bends more easily and safely than a larger single trailer. Therefore, we believe the road design standards within the BCFLNR are applicable and are conservative for mine haul roads.

Page 23, 135: "Climate change is certainly a major one which could alter the number of "slippery road" days, avalanche patterns and drainage, flooding, etc. Given the statements related to JMS, and preventative road closure approach, climate change could, in the negative effect side, cause more closures. The obvious reaction would be to increase traffic to "make-up the missed days" as soon as the conditions allow. There would then be an increase of rotations, but not an increase of the total number of loads. During that period the "one way haul" concept may not work, and colliding trucks accidents, not considered in the study, could occur, on top of low speed off-the-

road excursions, if pullouts are not exclusively used. It is hard to see that such conditions would alter in a significant way the results of the study, but should conditions significantly deviate, a reassessment should be performed."

Given the length of the road and the proposed traffic volume, if it became necessary to increase the total number of trucks temporarily, the road operations would still be well within the operating capacity of the road. It is our opinion that potential incidents would not increase as a result of an additional number of trucks.

Page 31, 58: For locations with high consequence event potential, the approach taken is that operating speeds will be set accordingly, greatly reducing the probability of a "high consequence" event. This approach is applicable to 4 metre wide sections, horizontal or vertical alignment restrictions, bridge crossings and environmentally sensitive areas. The language used may lead the reader to believe a "high consequence" event will occur at a greater probability than what is likely. The approach of reducing speeds in these areas will actually significantly reduce the probability of these occurring, and the severity of the potential incident.

Page 33: For 4 metre wide sections and bridge crossings, the design standards applied conform with the BCMFLNR Engineering Guidebook and within the parameters defined in the "Single Lane" category identified in "Oboni's Table 1". Also, in our extensive operating experience, we cannot recall any significant accident occurring at a crossing.

Page 34: "We note that 5m or 4m wide running surface with no shoulders correspond to a narrower effective road, in particular with respect to the selected slopes of the fills." See our previous comments re road width and reduction of 4 m wide sections. Regarding close proximity (tight) or parallel to streams, only one section (KP 5.36 to 5.48) has a 4 m wide running surface. This section is located within a 65 m radius curve. In this situation, the final design would incorporate a 5.8 m wide surface to accommodate trailer off-tracking.

Page 52: "for the sake of this study we will consider the following "general" speeds:

- 30km/h on average with
- typical speed of 40~50 km/h and
- max of 60km/h in some sections for the concentrate and other heavy traffic."

Based on detailed calculations completed in Allnorth's Transportation Study, the following is considered more definitive:

- Average speed loaded 34 km/hr summer, and 31 km/hr winter
- Top speed loaded 40km/hr
- Top speed empty 50km/hr
- In prescribed (difficult/sensitive) sections, top speed loaded 20 to 35 km/hr

Page 61: "In the Alps accidents have occurred due to climate change where bridges have been blown away during flash floods"

Hauling operations will not be conducted during major weather events, and inspections would be undertaken prior to operations continuing. Again, the language suggests a "high consequence" event will occur, which is unnecessarily alarmist and unlikely.

Page 62: "dust represents a major safety hazard to the vehicle operator in that it can become so dense that visibility is severely reduced. When subjected to heavy wetting, non stabilized earthen roads become extremely slick and may be severely defaced by erosion. Thus, reduced vehicular controllability from a slippery surface creates a safety hazard"

Dust is a controllable hazard during the limited dry periods in summer. Operationally, trucks will be spaced out accordingly to minimize visibility issues. Dust suppression would only be sufficient to wet the surface. The all season road will be surfaced with an appropriate quality and quantity of gravel material. Non-stabilized earth roads will not be used.

Page 83: "If two occurrences of this type would occur on average (there is no way to state with any certainty that this would be the case) then Prairie Creek road could see 32 such accidents over its service life. These accidents were certainly not the worst case scenario, and, at the other end of the spectrum, it is reasonable to believe that many more accidents occurred of lesser consequence (non reportable accidents in the Yukon)."

This statement is un-verified supposition and should be deleted. As noted, our direct knowledge is that the two occurrences were all that occurred on the Wolverine access road, and they were not high consequence events. JMS procedures for Canadian mines require all incidents to be reported.

Page 87: "skilled truck drivers interviewed during the development of this study have confirmed it is rare to see a truck accident where the truck does not turn on its side or capsize".

The report identified a 1:3 probability of a roll over or capsize. Literature provided by the BC Safety Authority confirms that statistic[1]. Oboni should use reliable statistics and avoid "hearsay".

Page 96: "Let's also note that reportedly the Red Dog mine access road does not have any comparable feature to Prairie Creek access road (flatter, less turns, wider) and could not be used as a comparison."

Statistics from mines operating in the Americas are not considered to be suitable for comparison because they operate under different regulatory rules (reduced operating standards) and

[1] "Overview of Forestry Truck Crashes in BC" BC Forest Safety Council, October 20, 2005.

geographic conditions. We believe the Red Dog and Wolverine mine operations provide a better representation of the Prairie Creek mine operation.

In summary, the Oboni report contains many incorrect assumptions and therefore the risk or probability of accidents is over-estimated. As a result, the assessment does not properly reflect the situation related to the proposed Prairie Creek haul road, and is not realistic.

Yours truly,

Allnorth

Prepared By:

Ernest Kragt

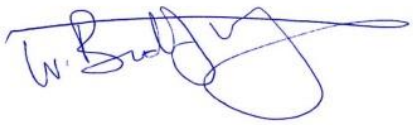
Project Coordinator

Prepared By:

Don Watt

General Manager - Mining

Reviewed By:



Bradley Major, P.Eng

Division Manager – Grande Prairie

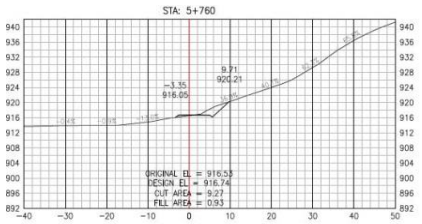
**Appendix A**

## Proposed Cuts - Prairie Creek Mine Access Road

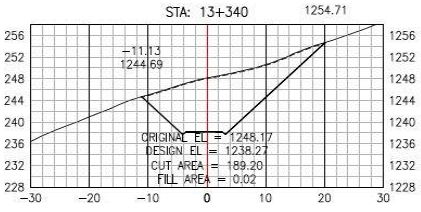
| Section | Length (m) | Road Width (m) | Construct. Type | Cuts (m) | | | Cut Slope Angle run:rise | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Max. | Avg. | | |
| 5.71 to 5.78 | 70 | 5 | I | 1 | 4 | 2.5 | 1:1 | Minor cut prescibed on upslope side of road. Expect gravels/fragmented rock. Gabien baskets may be utilized. |
| 13.07 to 13.35 | 280 | 5 | N/A | 2 | 16 | 8 | 1:1 | Cut through expecting gravels/fragmented rock. Gabien baskets may be utilized. |
| 13.41 to 13.6 | 190 | 5 | N/A | 2 | 8 | 5 | 1:1 | Cut prescibed on upslope side of road. Expect gravels/fragmented rock. Gabien baskets may be utilized. |
| 23.36 to 23.44 | 80 | 4 | N/A | 2 | 5 | 3.5 | 0.25:1 | Through cut prescibed. Expect fragmented/solid rock cut. |
| 23.53 to 23.61 | 85 | 4 | N/A | 2 | 12 | 9 | 0.25:1 | Through cut prescibed. Expect fragmented/solid rock cut. |
| 25.21 to 25.33 | 120 | 4 | III | 1 | 7 | 5 | 0.25:1 | Through cut prescibed. Expect fragmented/solid rock cut. |
| 25.42 to 25.5 | 80 | 4 | III | 2 | 9 | 6 | 0.25:1 | Through cut prescibed. Expect fragmented/solid rock cut. |
| 30.0 to 30.02 | 20 | 5 | IV | 0 | 6 | 3 | 1:1 | Minor cut prescibed on upslope side of road. Expect gravels/fragmented rock. Gabien baskets may be utilized. |
| 35.17 to 35.22 | 50 | 5 | N/A | 0 | 10 | 4 | 1:1 | Cut prescibed on upslope side of road. Expect gravels/fragmented rock. Gabien baskets may be utilized. |
| 35.64 to 35.75 | 110 | 5 | N/A | 0 | 10 | 6 | 1:1 | Cut through expecting gravels/fragmented rock. Gabien baskets may be utilized. |
| 36.51 to 36.58 | 70 | 5 | N/A | 0 | 10 | 6 | 1:1 | Through cut prescibed. Expect fragmented/solid rock cut. |
| 36.66 to 36.76 | 100 | 5 | N/A | 0 | 10 | 6 | 0.25:1 | Through cut prescibed. Expect fragmented/solid rock cut. |
| 36.9 to 37.1 | 200 | 5 | N/A | 1 | 10 | 7 | 0.25:1 | Through cut prescibed. Expect fragmented/solid rock cut. |
| 37.1 to 37.26 | 160 | 5 | N/A | 0 | 12 | 6 | 1:01 | Cut prescibed on upslope side of road. Expect gravels/fragmented rock. Gabien baskets may be utilized. |
| 49.91 to 49.93 | 20 | 5 | VII | 1 | 5 | 2.5 | 1.5:1 | Minor cut prescibed on upslope side of road. Expect sand load type material. Gabien baskets may be utilized. |
| 50.0 to 50.06 | 60 | 5 | VII | 2 | 5 | 3 | 1.5:1 | Minor cut prescibed on upslope side of road. Expect sand load type material. Gabien baskets may be utilized. |
| 80.3 to 80.41 | 110 | 5 | V | 2 | 4 | 3 | 1.5:1 | Minor cut prescibed on upslope side of road. Expect sand load type material. |
| 98.8 to 98.9 | 100 | 5 | X | 2 | 7 | 4 | 1.5:1 | Cut prescibed on upslope side of road. Expect sand load type material. |

# Proposed Cut Cross-Sections - Prairie Creek Mine Access Road

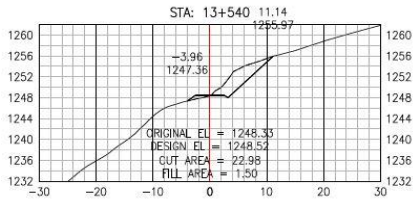
5.71 to 5.78



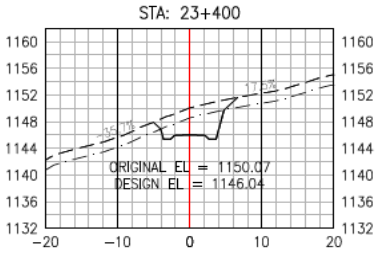

13.07 to 13.35



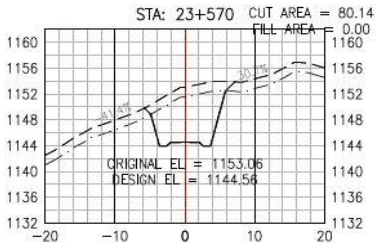

13.41 to 13.6



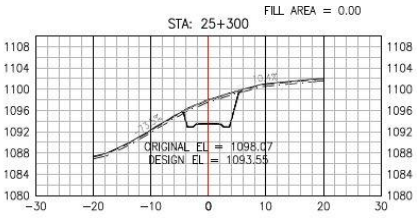

23.36 to 23.44




23.525 to 23.610

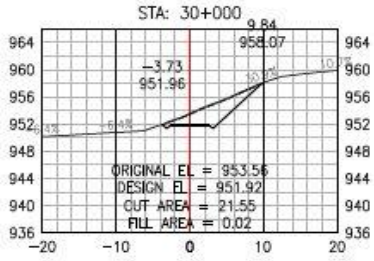



25.21 to 25.33

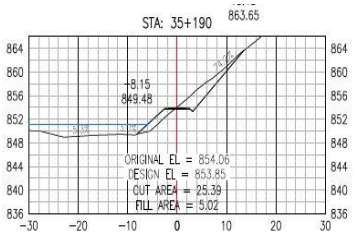



25.42 to 25.5

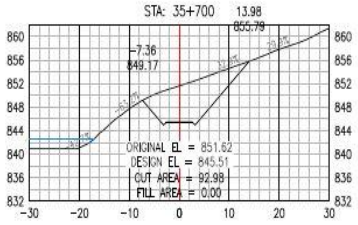

30.0 to 30.02



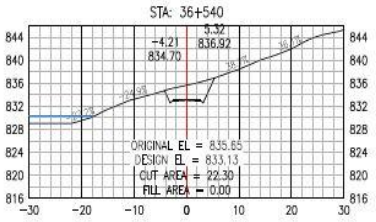

35.17 to 35.22



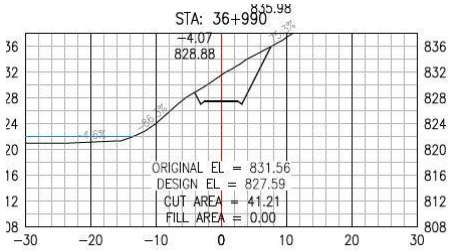

35.64 to 35.75



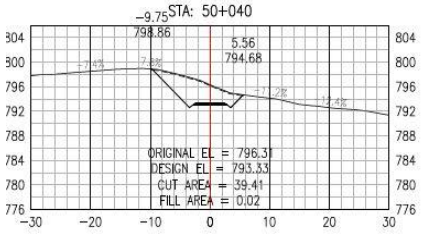

36.51 to 36.58




36.9 to 37.1

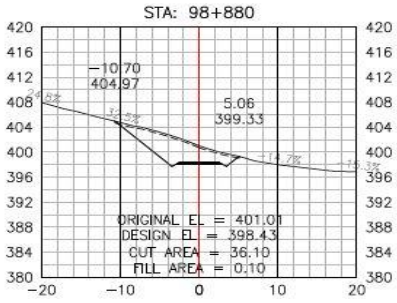



50.0 to 50.06




80.3 to 80.41


98.8 to 98.9




36.66 to 36.76

see STA. 36+540 for an example

37.1 to 37.26

see STA. 35+700 for an example.

49.91 to 49.93

See STA. 50+400 for an example