Proposed Prairie Creek Mine Access Road

Information Request Round 2

Responses to Oboni Riskope Information Requests dated September 23, 2016

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TABLE OF CONTENTS

APPENDICES

1 BACKGROUND

Canadian Zinc Corporation (CZN) has applied to build an "all season" access road connecting the Prairie Creek Mine to Highway 7. As part of the environmental assessment (EA) process, Allnorth completed an evaluation and submitted a report titled "Proposed Prairie Creek Mine Access Road" on February 27, 2015. Following comments from the Mackenzie Valley Environmental Impact Review Board (MVEIRB) on April 23, 2015, Allnorth submitted a supplementary report in September, 2015. Following this was a round of information requests (IR's) from all parties, and replies by CZN and their consultants.

A Technical Session was completed in Yellowknife, Northwest Territories from June 13 to 16, 2016 involving various government agencies and aboriginal groups supported by their designated consultants and Canadian Zinc supported by their consultants. The session produced a number of "undertakings" for CZN.

Subsequent to the undertaking replies, a second round of IR's has occurred This document provides Allnorth's responses to information requests from Oboni Riskope, consultant to the MVEIRB, on behalf of Canadian Zinc.

2 INFORMATION REQUEST RESPONSE

Response to Information Requests from Oboni Riskope Associates: Cesar Oboni

2.1 Oboni #1: Road Standards and Road Classification

Recommendation

- Question 1a: Is it true that the engineering of the road will exclude damages to the land surface as required by the cited references above and in compliance to the definition of an all-season road?
- Question 1b: Is it fair to conclude from the above that the proposed project constitutes an hybrid solution between a haul road and an access road (due to speed considerations (more than 40km/hr allowed)) and it is not exactly an all season road (due to meteorological and geotechnical considerations).
- Question 1c: Is there any reason to not identify the road as a special road and additionally to identify it with the definition given by the Engineer Reconnaissance, Chapter 5 quoted above?

2.1.1 Response:

Question 1a: As defined by the Northern Land Use Guidelines – Access: Roads and Trails under Section 2.1, Table 2.1 the Prairie Creek Access road would be considered an "All Season - Haul Road". The engineering of the road will be completed so that the road subgrade, base course and surface course protect or exclude the land surface from traffic damage.

Question 1b: As defined by the Northern Land Use Guidelines – Access: Roads and Trails under Section 2.1, Table 2.1 the Prairie Creek Access road would be considered an "All Season - Haul Road" as it is designated to carry heavy trucks and support the project beyond initial access. Seasonal limitations due to meteorological and geotechnical considerations are a function of Barge or Ice Bridge availability, Highway 77 seasonal load restrictions, and operational efficiencies. There will be a winter haul (Ice Bridge) and an 'open water season' haul. The latter would be supported by a barge on the Liard River. The open water season in the north covers parts or all of the spring, summer and fall seasons (the summer season is short). Hence, it is appropriate to consider the road to be an 'all season' road.

Question 1c: Based on review of the TAC Document "Primer-Synthesis of Practices of Geometric Design for Special Roads", the Prairie Creek Access road complies with the definition of a "Special Road" as a low volume resource access road with an Average Daily Traffic volume of 400 vehicles or less and design speed between 30 to 110 km/h. Additionally, the Engineering Reconnaissance definition of a "Type Y" road may not apply as heavy use during adverse weather would not lead to "complete collapse" of the road.

2.2 Oboni #2: Road Width, Traffic Flow, Obstructions, and Width Mitigation

Recommendation

- Question 2a: Is it correct to assume that the high frequency of pull-outs foreseen in the project is proposed as a mitigation to the above referenced obstruction?
- Question 2b: What is proposed to mitigate the sections presenting a 4m width?
- Question 2c: Beside the segments approximately located at 5+400 and 6+200, and 23+000 to 23+700 (700 meters long); 24+900 to 26+100 (1200 meters long) will there be any other section presenting a reduced 4m width?
- Question 2d: If Canzinc do not agree with **Table 1 (attached)**, could they provide a replacement from pertinent public literature describing road width and necessary mitigations for a special road travelled by multiple trailers and tractor trucks (combination vehicles)?

2.2.1 Response:

Question 2a: We are proposing at least 1 pullout per kilometre. Pullouts are a cost effective means to ensure efficient and safe transportation of goods on a single lane road. This approach greatly reduces the overall project cost compared to a 2 lane structure while reducing the environmental footprint of the road. This approach would be consistent with comparable resource roads operated in B.C. and other jurisdictions.

The application of pullouts could be considered as mitigation to an obstruction such as two vehicles passing in opposite directions, or a vehicle passing another in the event of a slow moving maintenance vehicle. Note that haul operations is the main traffic, and will be essentially one-directional most of the day, and radio-controlled at all times to facilitate passing, when needed.

Question 2b: A 5 m wide running surface is the primary and preferred design specification for the road. A 4 m wide running surface will only be utilized in locations which have terrain limitations, such as excessive rock excavation (blasting) and a few short sections which maybe tight or parallel to a stream channel. All bridges will use an industry standard 4.3 m running width.

A number of approaches will be applied to mitigate the effects of a 4 m wide running surface:

- Opportunity exists in the detailed design stage to reduce the length of the 4 m sections, as proposed in the preliminary designs.
- Any horizontal curves located in 4 m sections will be designed with the required widening as specified in the Engineering Manual, which will override and increase the 4 m wide prescription.
- Speed restrictions will be placed and enforced on all narrower sections, tight corners, or line of sight limitations.
- Appropriate signage will be placed either side.
- Pullouts will be placed in close proximity at either end.
- All mine traffic will follow strict use of radios, specifically important at critical sections such as speed reduced, narrow sections, and bridges.

Question 2c: Road located in challenging terrain such as heavy rock excavation, confining terrain, horizontal or vertical alignment challenges, significant stream crossings and bridges were identified early in the process. These locations became focus items during our field investigations, and full preliminary designs were completed reflecting the complexity of these locations. Below is a summary of sections identified to utilize a 4 m running surface:

- 5+400. An existing short road section tight to Prairie Creek.
- 6+200 is a bridge location.
- 23.0 to 23.7. Portions of this section will require significant rock excavation (blasting). Opportunity exists in the detailed road design to reduce the length of the 4 m running surface sections which contain significant rock excavation.
- 25.0 to 26.0. Portions of this section will require significant rock excavation (blasting). Opportunity exists in the detailed road design to reduce the length of the 4 m running surface sections which contain significant rock excavation.
- 28.0 to 28.6. Recent realignment to avoid slope stability issues and double crossing of Sundog Creek. The realigned section is located in close proximity to Sundog Creek and potential rock excavation.

There will be no other sections that should require a reduced running surface of 4 m.

Question 2d: CZN would offer the following more detailed alignment control tables as published by the B.C. Ministry of Forests, Lands and Natural Resources in the Forest Road Engineering Guidebook.

Table 2. Summary of alignment controls for forest roads.

Stabilized Road Width (m)	Design Speed (km/h)	Minimum Stopping Sight Distance[a] (m)	Minimum Passing Sight Distance for 2-Lane Roads (m)	Minimum Radius of Curve (m)	Suggested Maximum Road Gradient[b,c]				
					Favourable		Adverse		
					S	P[d]	S	P[e]	Switchbacks
4	20	40		15	16%	18% for distance <150 m	9%	12% for distance <100 m	8%
5–6	30	65		35	12%	14% for distance <150 m	8%	10% for distance <100 m	8%
	40	95		65					
8+	50	135	340	100	8%	10% for distance <200m	6%	8% for distance <100m	6%
	60	175	420	140					
	70	220	480	190					
	80	270	560	250					

NOTE: These are suggested alignment controls for average conditions on forest roads. Variations can be expected, depending on, for example, site conditions and time of use.

[a] For two-lane and single-lane one-way roads, multiply the minimum stopping sight distance by 0.5.

[b] There are no absolute rules for establishing maximum road gradient. Maximum grades cannot generally be established without an analysis to determine the most economical grade for the site-specific conditions encountered. The maximum grade selected for design purposes may also depend on other factors such as: topography and environmental considerations; the resistance to erosion of the road surface material and the soil in the adjacent drainage ditches; the life expectancy and standard of road; periods of use (seasonal or all-weather use); and road surfacing material as it relates to traction, types of vehicles and traffic, and traffic volume. Apply other grade restrictions in special situations. For example:

- On horizontal curves sharper than 80 m radius, reduce the adverse maximum grade by 0.5% for every 10 m reduction in radius.
- As required at bridge approaches, and at highway and railway crossings.

[c] S – sustained grade; P – short pitch

[d] Design maximum short-pitch favourable grades so that they are followed or preceded by a section of slack grade. The average grade over this segment of the road should be less than the specified sustained maximum.

[e] Design maximum short-pitch adverse grades as momentum grades.

Forest Road Engineering Guidebook

Table 3. Minimum subgrade widths for roads on curves, for pole and tri-axle trailer configurations, and for lowbed vehicles.

Radius of Curve (m)	Pole and Tri-axle Trailer Configuration Minimum Subgrade Width (m)	Lowbed Vehicles Minimum Subgrade Width (m)
180	4.0	4.3
90	4.5	5.3
60	5.0	5.8
45	5.0	6.0
35	5.5	6.5
25	6.0	7.5
20	7.0	8.0
15	8.0	9.0

NOTES:

- The subgrade widths in this table do not allow for the overhang of long logs or any slippage of the truck or trailer due to poor road conditions.
- Apply the widening to the inside of the curve unless the curve has a 60 m long taper section on each end. For widening on the inside, provide a minimum 10 m section on each end of the curve.
- For two-lane roads or turnouts, it is assumed that the second vehicle is a car or single-unit truck. Add 4.0 m for logging trailer configurations and 4.5 m for lowbed vehicles.
- Double-lane any blind curves or provide adequate traffic control devices.

Table 4. Recommended turnout widths, based on stabilized road widths.

Stabilized Road Width[a]	Description	Turnout Width[b] (m)
9+	2-lane off-highway	none
8	2-lane on-highway	none
6	1-lane off-highway	10
5	1-lane on/off-highway	8 to 10
4	1-lane on/off-highway	8

[a] Where no road surfacing is used, the stabilized road width is the width of the road subgrade. Sufficient room should be left on the low side to accommodate debris.

[b] Turnout width includes stabilized road width.

2.3 Oboni #3: Kinetic Energy, Accidents, Runaway, and Signage

Recommendation

- Question 3a: Based on the specific type of cargo (concentrate and hazardous materials), pertinent literature sources and energy considerations developed above could the proponent clarify why runaway lanes and railings will not be required?
- Question 3b: Could the proponent expand on foreseen signage, speed limits and barriers that are foreseen for the all season road?

2.3.1 Response:

Question 3a: As presented in CZN's response to Undertaking 20, 4 different public reference manuals and guidebook publications were used including:

- B.C.FLRO Engineering Manual
- Health, Safety, and Reclamation Code for Mines in British Columbia
- Geometric Design Guide for Canadian Roads (TAC) (used by MOT)
- Northern Land use Guidelines

As previously discussed, all four publications do not provide specific standards related to when and where runaway lanes and/or safety railings are to be applied and utilized.

In addition, review of the TAC Document "Primer-Synthesis of Practices of Geometric Design for Special Roads shows the inconsistency and lack of jurisdictional guidelines with respect to "Special Road" Design and recommends that "Design guides must be non-prescriptive, as the needs of each Special Road are unique. These roads must be designed and treated holistically, on a project-by-project basis, using engineering judgement".

Within the Undertaking 20 response, **Table 1** was provided describing three major sections of the Prairie Creek Access road alignment, where use of runaway lanes or barriers may be warranted due to alignment considerations, and indicated that further review and design would be required at the detailed design stage. CZN has committed to reviewing these sections in detail at the detailed design stage and if required and feasible, will include runaway lanes and barriers into the design. As previously stated, based on our review of the above documents, field investigations, completed road designs and road profiles, at this stage of the design, it is our professional opinion that runaway lanes are not required. CZN has not refined it's analysis to specific types of cargo types or energy considerations as eliminating the hazard of errant vehicles is equivalent despite cargo type and energy rating. Also, all haul trucks will carry concentrate and fuel. It should also be noted that cargo risks were reduced by reducing the fuel tank size from 10,000 L to 5,100 L, and specifying that the tanks will be double-walled with a secondary containment capacity greater than the inner tank.

Question 3b: For maximum effectiveness, signage along the Prairie Creek Access Road will be standardized as per the Province of BC, Ministry of Transportation and Infrastructure to ensure consistency in application and driver understanding. Typical signs may include some of the following:

Figure 2C-1. Horizontal Alignment Signs

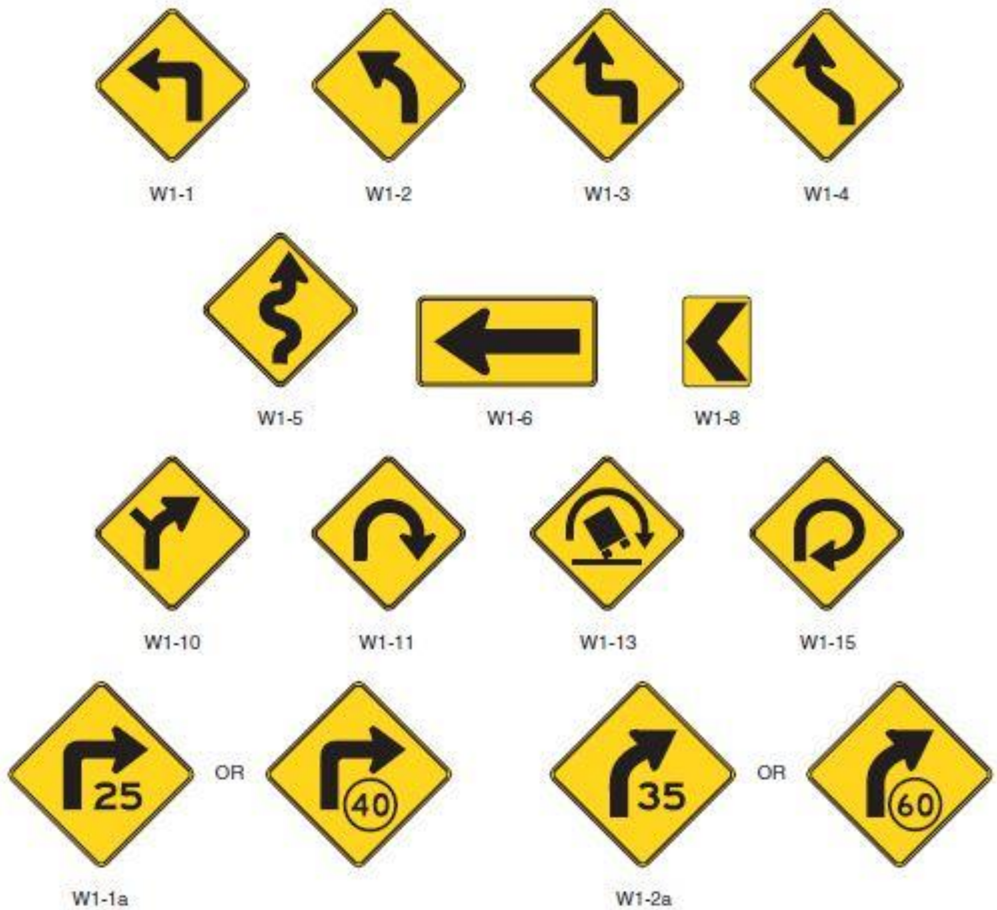
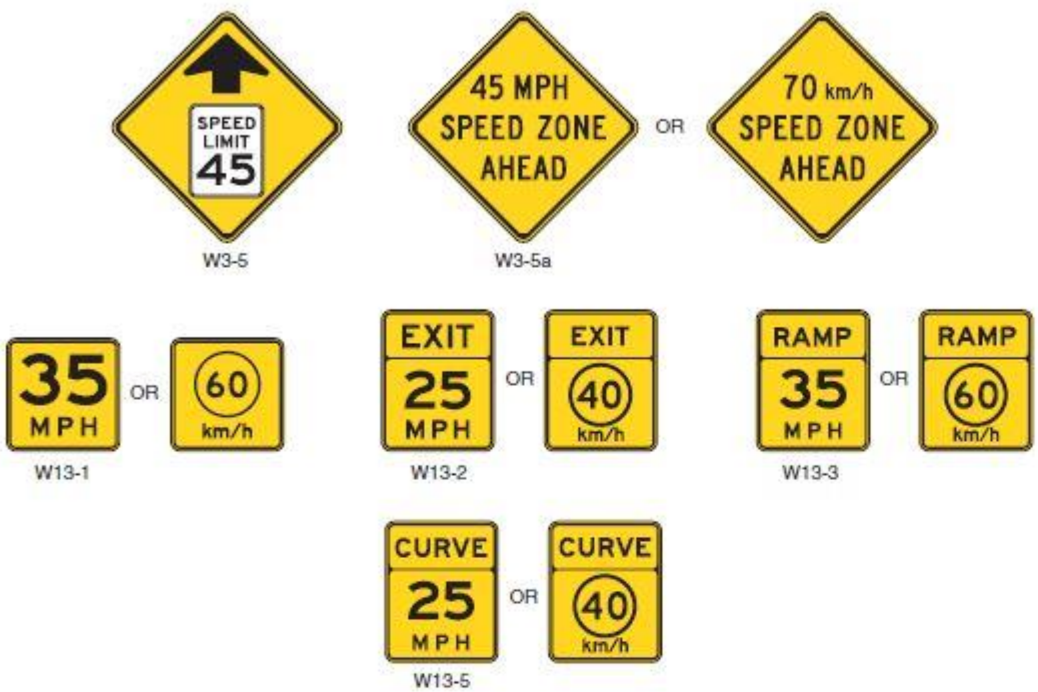


Figure 2C-2. Vertical Grade Signs

Figure 2C-5. Advisory Speed and Speed Reduction Signs



The design speed limit of the Prairie Creek Access Road for haul trucks is 40km/h, unless specific alignment curves, grades or narrow section warrant a speed reduction.

For the purpose of the Prairie Creek Access Road, the two barrier types that will be considered during detailed design are earthen berms and precast concrete barriers.

2.4 Oboni #4: Road Stratification Types

Recommendation

- Question 4a: For the 13.00 to 13.76 segment and the other segments marked with «?» what is the construction stratification type?
- Question 4b: Is it possible to receive information on the stratification type classification for the remaining 89.07% of the road length?
- Question 4c: If additional longitudinal slopes, curves radii, widths, cross sections have been developed could they be made available?

2.4.1 Response:

Question 4a: With reference to Allnorth's submission "*Response to Information Requests*" dated May 10, 2016; Appendix E Updated Tables, Table 5, the 170 km plus road was segregated into 10 different construction categories plus six to seven unique individual segments (alternate vs original alignment). Preliminary road designs were completed on 1 to 2 km portions of each of the 10 construction categories and provide a comparable representation of what to expect regarding general ground conditions, earthwork calculations, and construction approach. The majority of the road, roughly 165 km, was classified in this manner.

The remaining road length was considered unique for a number of reasons including rock excavation (blasting), stream crossing alignment, and close proximity to stream channel (lower Sundog Creek). A preliminary road design was completed for the entire length of any section considered unique and challenging. This included segment 13.0 to 13.76. Therefore, these sections were not classified into the defined 10 road construction categories due to their unique characteristics.

Question 4b: Refer to Allnorth's submission "*Response to Information Requests*" dated May 10, 2016; Appendix E Updated Tables, Table 5.

Table 5, submitted in our above response, does stratify the entire length of the road by either 10 defined road construction types (or categories) based on similar geographic/site conditions or segmented out if considered unique and challenging.

Question 4c: All detailed road alignment data that has been developed has been provided. It is our opinion, at this stage of the process, that the approach taken toward analyzing/estimating earthwork volumes, construction approach, and road design parameters does provide a fair and reasonable assessment of the potential risks and requirements associated with road construction and operation. All sections considered unique and challenging have undergone a full preliminary design. CZN has committed to completing detailed final road designs prior to construction. At that time, all designs will be available and constructive suggestions would be considered.

2.5 Oboni #5: Road Design Sight Distance

Recommendation

- Question 5a: What is the design sight distance selected for the all season road? MIN? MAX? And on which code or assumption was it based?
- Question 5b: What is the design sight distance considered for the project? For each segment or Design Stratification type?

2.5.1 Response

Question 5a and 5b: Refer to Allnorth's submission "*Response to Information Requests*" dated May 10, 2016; Section 3.4 PCA #14 Design and Construction Standards, Item 1. MOFLNR Table 3-2.

The B.C. Ministry of Forests, Lands and Natural Resources Operations Engineering Manual provides the primary design and construction standards which will govern the final road location and design. Line of sight distance is a combination of horizontal and vertical alignment. A safe line of sight distance also considers such things as speed, field conditions, road standards, and weather. Horizontal line of sight can be improved by increasing right of way clearing widths on the inside of a corner.

The "minimum" line of sight (or stopping) distance is the shortest distance required to stop (which includes operator reaction time) a designated vehicle (in this case a heavy commercial truck) in a safe manner under typical operating conditions (in this case, gravel road). This distance would be considered a minimum requirement and it would be preferred to exceed this value. Maximum line of sight is not considered because the greater line of sight, the safer it is. MOFLNR Table 3-2 (in Section 2.2.1 above) provides the "Minimum Stopping Sight Distance" prescribed for a designated speed. A 20 km/hr speed requires a minimum 40 m, 30 km/hr requires 65 m, and 40km/hr requires 95 m. It is Allnorth's professional opinion that these values are attainable throughout the length of the road and speed will be restricted by other design factors such as alignment and road widths. It is a normal process in the design process of the road to incorporate line of sight. At the detailed design stage, using the MOFLNR Engineering Manual standards, sections with restricted line of sight will be speed reduced accordingly and posted.

2.6 Oboni #6: Truck Stopping Distance

Recommendation

- Question 6a: What are the stopping distance and brake fading data for the proposed concentrate vehicles?
- Question 6b: Have braking tests been performed on slippery (wet, muddy, icy, snowy) surfaces, grades, curves? What were the results?

2.6.1 Response:

Question 6a: Various government agencies, federal, provincial and state, both in the U.S. and Canada and other world jurisdictions, collectively work with engineers and institutions to study and analyze braking systems, materials, statistical braking data based on truck configurations and weights, and braking system failures due to heat (fading). This information is then used to develop industry standards and laws which are under the jurisdiction of provincial and territorial Ministry of Transportation. All vehicles, including commercial vehicles, sold and operating on public roads must meet these minimum standards. All commercial vehicles are required to complete annual certifications to ensure they conform to the standards. The stopping distance and brake fade data for the specific haul truck is not available. These units will be manufactured to the current government standard which includes the Canadian Motor Vehicle Safety Standard (CMVSS). The braking systems will be designed and tested to CMVSS 121 Air Brake Systems. The excerpt below is from the CMVSS 121 and is the specific portion of the performance and testing requirements of an airbrake system as tested on a dynamometer:

S5.4.1.1After burnishing the brake pursuant to S6.2.6, retain the brake assembly on the inertia dynamometer. With an initial brake temperature between 51.7ºC and 93.3ºC (125ºF and 200ºF), conduct a stop from 80.5 km/h (50 mph), maintaining brake chamber air pressure at a constant 137.8 kPa (20 psi). Measure the average torque exerted by the brake from the time the specified air pressure is reached until the brake stops and divide by the static loaded tire radius specified by the tire manufacturer to determine the retardation force. Repeat the procedure six times, increasing the brake chamber air pressure by 68.9 kPa (10 psi) each time. After each stop, rotate the brake drum or disc until the temperature of the brake falls to between 51.7ºC and 93.3ºC (125ºF and 200ºF).

S5.4.2 Brake power. When mounted on an inertia dynamometer, each brake shall be capable of making 10 consecutive decelerations at an average rate of 2.72 m/s2 (9 fpsps) from 80.5 km/h (50 mph) to 24.2 km/h (15 mph), at equal intervals of 72 seconds, and shall be capable of decelerating to a stop from 32.2 km/h (20 mph) at an average deceleration rate of4.27 m/s2 (14 fpsps) 1 minute after the 10th deceleration. The series of decelerations shall be conducted as follows:

S5.4.2.1 With an initial brake temperature between 65.6ºC and 93.3ºC (150ºF and 200ºF) for the first brake application, and the drum or disc rotating at a speed equivalent to 80.5 km/h (50 mph), apply the brake and decelerate at an average deceleration rate of 2.72 m/s2 (9 fpsps) to 24.2 km/h (15 mph). Upon reaching 24.2 km/h (15 mph), accelerate to 80.5 km/h(50 mph) and apply the brake for a second time 72 seconds after the start of the first application. Repeat the cycle until 10 decelerations have been made. The service line air pressure shall not exceed 689 kPa (100 psi) during any deceleration.

S5.4.2.2 One minute after the end of the last deceleration required by S5.4.2.1 and with the drum or disc rotating at a speed of 32.2 km/h (20 mph), decelerate to a stop at an average deceleration rate of 4.27 m/s2 (14 fpsps).

S5.4.3 Brake recovery. Except as provided in S5.4.3(a) and (b), starting two minutes after completing the tests required by S5.4.2, a vehicle's brake shall be capable of making 20 consecutive stops from 48.3 m/h (30 mph) at an average deceleration rate of3.66 m/s2 (12 fpsps), at equal intervals of one minute measured from the start of each brake application. The service line air pressure needed to attain a rate of 3.66 m/s2 (12 fpsps) shall be not more than 585.7 kPa (85 psi), and not less than137.8 kPa (20 psi), for a brake not subject to the control of an antilock brake system, or 82.7 kPa (12 psi) for a brake subject to the control of an antilock brake system.

Question 6b: Braking tests will be performed to the standard required by CMVSS 121. This does not include testing the units on slippery surfaces or grades. These units will be equipped with an anti-lock braking system that is compliant with the CMVSS 121. The Anti-lock system is to reduce the potential for a loss of control during a stopping situation. In addition to this, the units will be required to have a parking brake that is capable of holding the entire unit on a 20% grade facing uphill and facing downhill on a smooth, dry, portland cement concrete roadway.

We recognize that braking is more difficult on slippery surfaces. This will be taken into account in the setting of speed limits. Also, during less than optimum haul conditions, the Road Supervisor always has the option to implement further specific or road-wide speed reductions by notification to haul drivers.

2.7 Oboni #7: Topographical Slopes

Recommendation

- Question 7: Is **Table 4 (attached)** agreeable with Canzinc ? If not please propose an alternative based on pertinent published literature.

2.7.1 Response

Question 7: The table as presented is a reasonable segregation and description of slopes.

2.8 Oboni #8: Road Accidents Perceived Proponent's Tolerance Threshold

Please find a completed Table 5 in Appendix A.

2.9 Oboni #11: Mechanical Failures

Recommendation

- Question 11a: How will Canzinc perform and enforce regular maintenance of vehicles, enforce daily reports by drivers on vehicle state and hazardous conditions observed on the road, near misses?
- Question 11b: How will Canzinc ensure cargo safety for all vehicles, including environmentally hazardous cargo?

2.9.1 Response:

Question 11a: CZN will rely on the systems which have been established by the federal and provincial authorities to regulate the safety and performance of the commercial transport industry. In Canada all commercial motor vehicle carriers are required to have National Safety Code Registrations. Part of the requirements of the National Safety code is to ensure the minimum requirements are met with respect to;

- Driver qualifications and regular certification,
- Hours of Service Operations,
- Vehicle Inspections (Daily and semi-annually)
- Pre-trip Assessments
- Maintenance Records and reporting.

The status of an operator can be measured by their National Safety Code Standing. The National Safety Code registration is required to register and insure a commercial vehicle. The status of this is automatically verified when the unit is insured or reinsured on an annual basis. In addition to this, as the status of a carrier changes due to poor performance, accidents or incidents the Commercial Vehicle Safety and Enforcement team will commence with various disciplinary tools available to them including;

- Audits
- Suspensions
- Removal of National Safety Code Registration.

CZN is committed to ensuring the safe transportation of personnel and goods. CZN would adopt, at a minimum, and under the responsibility of a Road Operations Manager, standard industry operating procedures for all vehicles supporting the mine operation. These standards would include:

- Daily tailboard meetings with operators to review any specific or unique road conditions which can impact the safe and efficient operation of the transportation fleet.
- Weekly safety meetings of all personnel utilizing the road regularly
- Radio call procedures
- Daily pre and post trip inspections of all commercial vehicles, which would include brake checks, and inspection reports, completed by the operator
- Reporting procedures for all near misses and incidents and the appropriate actions to follow.
- Procedures for routine inspections of cargo and general truck conditions to be completed during the daily transportation cycle

Question 11b: Cargo safety will be the responsibility of the motor carrier. Cargo safety is regulated by both Transport Canada (Transportation of Dangerous Goods) and the provincial commercial transport regulations. As this haul will be transcending the border into British Columbia, the BC commercial transport act and regulations would be the dominant authority with respect to cargo securement. CZN will ensure that all carriers (including its own) that are transporting dangerous good will provide proof of Transportation of Dangerous training and certification of the drivers. In addition, it will be confirmed that the operators of the unit possesses appropriate TDG containment and response equipment. For the non-categorized dangerous good, CZN will ensure that all carriers are operating to the minimum standard of the National Safety Code Cargo Containment, Standard 10.

2.10 Oboni #13: Road Signage and Traffic Calming

Recommendation

- Question 13a: What kind of signage (speed limits, blind curves, hazards, narrow section, do not stop, etc.) is foreseen along the project? At what locations?
- Question 13b: How will traffic be "calmed" and protected in the narrow sections?

Question 13a: As referenced above, for maximum effectiveness, signage along the Prairie Creek Access Road with be standardized as per the Province of BC, Ministry of Transportation and Infrastructure to ensure consistency in application and driver understanding. A detailed catalogue of typical signs that may be applied to this project can be found at the Ministry website.

http://www.th.gov.bc.ca/publications/eng_publications/geomet/geometsigns.htm

Question 13b: Traffic will be calmed through the use of signage and speed reductions to ensure safety.

We trust this report satisfies your requirements at this time and thank you for the opportunity to work with you on the project. If you have questions or concerns do not hesitate to contact our office.

Yours truly,

ALLNORTH CONSULTANTS LIMITED

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Appendix A Oboni Table 5

Road and Environment features are:		Proposed Comments	Frequency	Do you agree with the tolerable number	For each box where you replied NO in the prior column	Your comments
ENVIRONMENTALLY SENSITIVE TARGETS[1]	DOMINANT CROSS SECTION/ TERRAIN (Downhill of road) SLOPE[2]	[3] DIESEL FUEL COULD:		Reply below **YES or NO** at each line	propose your values (one per line)	
NOT IN POTENTIAL REACH	Fair with fill less than 3m high	be easily contained and recovered **Class 1**	32	No	75	These incidents are common and would be consistent with a truck having one wheel off the road, or have driven into a low slope ditch. The dominant cross section slope being fair would reduce the probability of a release of fluid or material. Have increased the occurrence of these as they are by far the most likely to occur.
	Moderate with fill less than 2m high	be contained and recovered with some effort **Class 2**	30	No	20	I would equate this to an incident where the vehicle has ended up on an angle or on its side due to the dominant crosss section. Although not common, it can be expected to occur once per year based on professional experience.
	Significant even if fill height <1m	be contained and recovered with greater effort **Class 3**	28	No	10	I would equate this to an incident where the vehicle rolled over due to the dominant crosss section. My experience hauling in similair situations is this may occur once every couple of years, but is not common.
WITHN REACH Intersect environ- mentally sensitive target Or Contain- ment and recovery require specific salvage equipment	Fair with fill less than 3m high	be contained and recovered **Class 4**	16	No	10	These incidents are not as common as class 1 due to the required proximity to a sensitive target. It is reasonable to assume that this could happen once every two years.
	Moderate with fill less than 2m high	be contained and recovered in difficult conditions **Class 5**	9	No	5	These incidents are not as common as class 2 due to the required proximity to a sensitive target. It is reasonable to assume that this could happen once every four years.
	Significant even if fill height <1m	be contained and recovered in very difficult conditions **Class 6**	5	No	2	These incidents are not as common as class 3 due to the proximity to a sensitive target. It is reasonable to assume that this could happen twice in the project life.
BRIDGE/WALL PRESENT						
WITHIN **IMME DIATE** REACH Intersect the environ- mentally sensitive target. Contain- ment and recovery require specific salvage equipment	Low Bridge/ culvert/wall (less than 2m from bottom)	be contained and recovered **Class 7**	2	No	1	My experience operating a large commercial transport company would suggest that these are very uncommon. There is an opportunity for this to occur but it is estimated to only be once for the duration of the project.
	Moderate high bridge/culver t/wall (2-3m from bottom)	be contained and recovered in difficult conditions **Class 8**	0.5	No	0.1	There is a possibility of this occurring, but the probability is extremely low.
	Higher bridge/culver t/wall (more than 3m from bottom)	be contained and recovered in very difficult conditions **Class 9**	0.1	No	0.1	There is a possibility of this occurring, but the probability is extremely low.

Table 5. List of accident scenarios and associated proposed frequencies (completed by Allnorth)