February 7, 2017

Mr. Mark Cliffe-Phillips
Executive Director
Mackenzie Valley Environmental Impact Review Board
5102 50th Avenue,
Yellowknife, NT
X1A 2N7

Dear Mr. Cliffe-Phillips

RE: <u>Environmental Assessment EA1415-001, Prairie Creek Mine All Season Road Information Request - Oboni Riskope</u>

We refer to the November 18, 2016 risk assessment (RA) report completed by Oboni Riskope, their December 14, 2016 reply to Canadian Zinc Corporation's (CZN's) review comments dated December 5, 2016, and to the December 28, 2016 reply by Oboni to CZN's December 16 information request.

This letter presents CZN's second reply to Oboni's risk assessment. As noted previously, we were disappointed that Oboni dismissed all of our many comments and concerns listed in our December 5 letter, and in our opinion, did not properly address the issues raised. There remain many points of disagreement regarding estimation of accident probabilities and assumptions of consequence which have a direct influence on the overall assessment of risks. However, we are in agreement that it is beneficial to review the project in order to mitigate perceived residual risks so that there is confidence that "the final project will perform with risks mitigated to a satisfactory level".

In order to define and focus on those residual risks requiring mitigation, consensus is needed that those risks, by road section, have been defined accurately. Therefore, for this purpose, it is necessary to consider Oboni's results further. CZN has done this to extract what we consider to be fair and reasonable versus that which we feel is lacking in foundation. Accordingly, the first section below provides further comments on Oboni's risk assessment. The second section then provides additional evidence supporting CZN's conclusions. Lastly, the third section integrates our comments on the results and describes potential additional mitigations to arrive at a final project that "will perform with risks mitigated to a satisfactory level".

Further Comments on Oboni's Risk Assessment

Further to Oboni's December 14 reply to our interim response to the RA on December 5, nothing in Oboni's reply would cause us to alter any of the comments we made. As such, those comments should be read in conjunction with this second response.

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Regarding the many points of disagreement, we do not believe it will serve any useful purpose to examine all of these in detail. Instead, we comment further on what we believe to be the key items in terms of accident probability, consequences of accidents, and the resulting risks posed by the combination of these two components.

In Oboni's December 14 submission, we were pleased to receive confirmation that no risks from man-made slopes were included in the assessment (p. 6, these risks will addressed during detailed design), and that risks from the so called 'b' and 'c' type accidents are not significant (p. 7, we believe accidents from these scenarios to be highly unlikely). However, Oboni's commentary regarding summer verses winter risks is confusing (p. 13). We agree with a general expectation of a higher probability of off-road excursions due to snow/ice slippery conditions in winter i.e. summer driving is inherently safer than winter. But, in terms of separating winter and summer risk results, Oboni says that "the difference is small and certainly well between the margins of uncertainty of a project with so many unresolved information gaps". We assume Oboni is saying that, after adjusting the predicted number of excursions for the number of seasonal haul days, the total number of excursions in summer and winter is similar. This may be true, but it obscures the important conclusion that all season road use, with the majority of hauling conducted in summer, will likely result in a much lower probability of accidents and, therefore, risks are much lower overall compared to winter only road use. It appears that Oboni and CZN are in agreement on this, and thus perhaps it is not important to pursue definition of the differing seasonal risks further.

Oboni downplays the estimation of the summer versus winter difference by referring to "unresolved information gaps". CZN's engineers have provided preliminary design details for every characteristic section of the road, and extrapolated those design details to the full length of the road. This was made clear during the Technical Session (see Oboni's December 14 reply, p. 4) and is consistent with the level of engineering which would normally be completed on such a project. It seems Oboni wanted something more than a preliminary design, and for the entire road, for the purpose of their risk assessment. This desire is not reasonable considering the stage of the project (i.e. in environmental assessment and prior to detailed design). If Oboni feels that their risk assessment has been compromised as a result, perhaps they should have been clear on this point at the outset. It seems to us that Oboni was at a disadvantage because they essentially had to rely on the road drawings for their assessment, in the absence of a detailed appreciation of the terrain from ground survey, which our engineers were able to acquire from multiple, extended visits. CZN is on record stating 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". In our opinion, a lack of site familiarity was Oboni's limitation rather than the level and extent of road design.

<u>Accident Probability</u>

Considering vehicles and cargo first, the vehicles will be custom built to specifications so that they will be the most suitable and safest for the task. Similarly, industry standard best approaches for cargo safety would be adopted. Our previous point regarding concentrate transport in winter is that, since the trucks would be loaded overnight in order that they are ready for travel in the morning, the material will be frozen, reducing the risk of spread from a spill. We agree that

"three tonne ice balls" (p. 16) are not 'ideal'. The bags would be tied-down to resist separation from the trailer bed, as would all other goods. We previously noted that fuel delivery will be via 5,100 L dedicated double-walled tanks integrated into the trailers. This integration will be in a location to protect the tank in the event of an accident.

Regarding driver behavior and "seed" for more critical accidents, we have previously noted the intention to employ rigorous control of driver selection, training, suitability and condition prior to travel, and to reinforce these on a daily basis. Oboni's reply (p. 36) says they know better based on the 'real world' and two decades of risk assessments, but what 'real world' are they referring to, and what assessments are being referred to? We believe these are not directly comparable to Prairie Creek. CZN is relying on transport professionals from Allnorth with more than three decades of experience in the north of Canada who indicate that modern transport management systems are designed to avoid the "seed" situation.

Regarding road design, we noted that the "final detailed design will conform to B.C.MFLNR standards which have been well established and proven". Road design incorporates horizontal and vertical road alignments that provide for user safety. This involves establishing critical elements founded on established engineering principles for private and public roadways in Canada. The Manual of Geometric Design Standards for Canadian Roads, published by the Roads and Transportation Association of Canada (RTAC), provides design standards that can be used for forest roads and are in agreement with the B.C.MFLNR standards. Oboni's reply (p. 29) was that the use of standards is not "an insurance that risks are under control". The standards are not assumed to be insurance, however those noted are established as an acceptable design standard for road safety. Oboni then cites the Mount Polley failure as an example where standards failed. The Mount Polley failure (of a tailings pond dyke) is not an appropriate example for comparison to a road, and in any event, improper detection and characterization of a weak soil layer underlying the dyke was the cause of the failure, not an absence of following standards.

Regarding road width, Oboni's position is that 5 m does not allow for any "slippage" (p. 29). We provided rationale as to why 5 m is a superior width compared to normal highway lanes with much higher traffic speeds (90 km/h versus 30 km/h on average). In addition, the road bed would be sloped into the bank or the lowest risk area so that any slipping due to loss of traction will not lead to an excursion. Oboni's reply is that this is a "perfect world conception". Similarly, Oboni regards of our confirmation that the road surface will be gravel and maintained, not soil, as not achievable. Oboni's reply is that the surface will become contaminated. It seems here, as in many other places, that Oboni is simply being defensive of their prior assumptions without giving due and proper consideration of our comments.

We were critical of the examples Oboni's used to justify their estimation of accident probability, indicating that they are not likely to be directly comparable. However, it is difficult to confirm this due to the cited confidentiality limitations (p. 27). We also noted that we felt it was incorrect for Oboni to exclude the Red Dog and Wolverine examples, for reasons we do not believe were valid. We believe those examples were more likely to generate more realistic accident projections. Regarding Red Dog, Oboni cited a 40 t concentrate spill and provided a link, implying that the Red Dog example would also indicate high risks. On review, we note that the

spill occurred on December 31, 2000 (i.e. in winter) during poor driving (blowing snow) conditions. In the Prairie Creek situation, hauling would likely be suspended during such conditions. Therefore, care is needed extrapolating from one example to another. We provide further comment on accident projections in the 2nd main section below.

Consequences of Accidents

Oboni based consequence on relative energy, spread of contaminants and recovery (p. 7), stating that this approach was chosen due to the paucity of extant data related to highly sensitive potential spill areas. We noted that this information was indeed available in the DAR and DAR Addendum. Oboni contends that the 'energy, spread of contaminants and recovery' approach "avoids complex toxicological reasoning". The approach has some merit in terms of the potential for contaminant distribution and longevity, but has little relation to the actual impact of the contamination on the environment. Therefore, we do not consider it to be a true consequence assessment.

Oboni defined consequence classes in Table 14 of ORA-11-18. Note that classes 1-3 relate to environmentally sensitive targets "not in potential reach". Oboni then assigned consequence classes to the stratifications (road sections) in Table 15 based on Table 14 and the comments column in Table 15. We noted previously that many of the comments in Table 15 were incorrectly based largely on a Parks Canada submission. Oboni's reply was to defer to the 'energy, spread of contaminants and recovery' approach (p. 7) (i.e. not properly addressing CZN's comment). See the attached road drawings for the locations of stratifications.

There are incorrect assumptions in Table 15. Road kms 13-13.76 and 23-23.7 are not fish-bearing, yet class 6 consequences (environmentally sensitive targets within reach) were assigned. Fish are present downstream of these road sections, but CZN has proposed spill control points to ensure downstream migration to these areas does not occur. Hence, the consequence classes assigned should be 1-3.

The consequence class assignment for Stratification 5 is also not correct. The comment indicates "sensitive drainages & wildlife". This seems to be a reflection of the incorrect characterization by Parks Canada. This road section crosses Tetcela River twice, and part of the Fishtrap wetland. The former is fish bearing, the latter is not. All crossings are in generally flat, easy terrain which is typical of the whole road section. Apart from the crossings, the road is not proximal to water, and the habitat is not overly sensitive in relation to other areas. Accidents are unlikely, and any spill would be easily contained and recovered. As such, the assignment of consequence class 7 is incorrect, and leads to a false assumption of significant risk in this area. It should be class 1.

The assignment of consequence class 5 to Stratification 8 is also not considered to be correct. Oboni has perhaps been unduly influenced by the presence of karst terrain (km 53-64) which we indicated should not be of high consequence because the road avoids karst features and there is several metres of soil cover. Oboni claimed that the borehole data we provided may not be representative. In fact, the boreholes were advanced in the km 53-64 area and so they are directly representative. We also noted that vegetation indicates that the soil cover thickens to the east. The consequence class for Stratification 8 should be 2 or less, except for the Polje crossing.

Other incorrect assumptions (e.g. caribou presence) may have led to other incorrect consequence class assignments.

Resulting Risks

We remain uncertain as to how risks were determined using ORE. We consulted the reference provided for examples (p. 12). Unfortunately, this was no more illuminating than Oboni's report. Oboni has not provided a simple, layman's explanation of how the accident probabilities and consequences were integrated with other variables to derive the risk results. This is a concern because we are not able to verify the procedure, and we have significant concerns with the results, as we will now explain.

Regarding the stratifications, Oboni appears to be confused in terms of road section locations. Allnorth provided revised tables in their September 2015 report, Appendix E, for the alternate road alignment between Wolverine Pass and Grainger Gap which was subsequently adopted, but did not alter the road km's east of the alternate alignment. For clarity, we attach a stratification section summary based on the alternate alignment.

Oboni provided off-road excursion projections in Figure 28A. We will not comment further on the magnitude of the predicted excursions at this point (further comment is made in the next section regarding accident statistics), but we will comment on the stratification order (highest to lowest) and whether this makes sense.

We note that the stratification with the highest predicted number of excursions is 7. Stratification 7 extends from km 39.4 to 143.1 in 10 sub-sections, crossing essentially flat, wooded terrain with gentle slopes above and below (apart from a short sub-section (7-5) from km 53.9 to 59.1 which traverses sparsely vegetated ground with a cross slope). It is not conceivable that there would be any significant number of accidents along this relatively easy terrain. However, Stratification 7 is the longest by total km, therefore we assume this is the reason for the highest number of accidents. Hence, accident probability has evidently been assigned on a per km basis without proper consideration of the terrain, which points to Oboni's lack of familiarization with the project and terrain, and inappropriate reliance on drawings.

The stratification with the next highest number of accidents is 2. This stratification is much shorter at 16.7 total kms. We deduce then that there is a large weighting component related to the terrain that results in the high accident number. Sub-section 2-1 traverses flat terrain, but sub-section 2-2 traverses sloping terrain with grade separation to the valley bottom from km 13.8 to 16.5, so there is some justification for the weighting based on sub-section 2-2.

The next highest stratification is 9. This stratification starts at km 143.1 and ends at km 173, crossing essentially flat, wooded terrain, so again, a significant number of accidents is inconceivable. The stratification is the 2nd longest at 29.3 km, and thus this appears to be the reason for the ranking.

The next highest stratification is 10, 6.2 km in length. This stratification traverses the western slope of the Silent Hills. The slope itself is steep, but the road grade is relatively gentle with wide turns such that the accident rating seems unreasonably high for this relatively short stratification.

The next highest stratification is 1, 6.5 km long. This stratification traverses the toe of some steep side slopes adjacent to Prairie Creek in places, but the road itself is flat and for the most part adjacent to wide, flat areas. As such, the accident rating is not justified.

The remaining stratifications have quite similar accident projections, including the special sections which were determined by Oboni to have some of the highest risks. Therefore, the accident projections seem overly biased by per km rates, and do not properly reflect those sections of the road which we would intuitively consider to be more prone to accidents due to grade, slopes and terrain.

Oboni's Figures 28B and 28C provide the off-road excursions by stratification and consequence class. The figures on p. 11-12 of their December 28 response are of better resolution which we appreciate. Obviously, the higher consequence classes are more important in terms of potential impact. For class 6 and above, the special sections and stratification 5 are indicated as having the highest potential consequences. The special sections comprise multiple sections which Oboni has now broken-out. We will return to these below. The stratification 5 risk ranking is a direct result of the incorrect consequence ranking (7, see above).

Regarding classes 4-5, stratifications 1, 2, 7 and 8 are flagged. We agree that there are potential consequences associated with Stratifications 1 and 2 where they are adjacent to fish-bearing streams (2-2 isn't), although as noted previously, the terrain is flat or gentle (except for 2-2) and accidents are unlikely, certainly nothing approaching the excursions predicted by Oboni. As noted above, Stratification 7 extends from km 39.4 to 143.1 in 10 sub-sections, crossing essentially flat, wooded terrain with gentle slopes above and below. The stratification is not near fish-bearing streams or other sensitive areas (it is sufficiently distant from Polje Creek which can be fish-bearing). Hence, the consequence rating and resulting risk definition are not justified. Similarly, Stratification 8 extends from km 50.9 to 126.3 in 3 sub-sections totalling 6 km, and includes the Polje Creek and Fishtrap crossings and the western side of the Ram Plateau. The stratification risk ranking is a direct result of the incorrect consequence ranking of 5 for karst, as noted above.

Oboni's December 28 reply broke-out the special sections (SS) separately (p. 13). This allows us to note that SS a) relates to a Grainger River crossing on the original alignment (km 122.7-123.4) which has now been eliminated. SS's 1 and 2 are predicted to have high excursions, while the others do not.

SS's 1 and 2 are kms 13-13.8 (non-fish bearing Funeral Creek crossing) and 23-23.8 (non-fish bearing Sundog Creek crossing), neither of which represents particularly challenging terrain to navigate, although the valley bottom is some distance below the road in places. We note that these SS's are assigned consequence classes 3 and 6, 9 for the Sundog crossing. We believe the consequence class assignment of 6 to be incorrect because fish are not present, and for SS 2, caribou are rarely present. A correct lower consequence class will mean lower risk. We also

believe the class 9 'flags' for SS's 2, 3 and 5-1 to be false in that, as we noted previously, we expect stream crossings to be relatively safe locations with very low speeds and crossing guards, and also bear in mind that Allnorth's transportation expert indicated that he has no knowledge of any accidents occurring at crossings in all his years of experience.

We are not intending to imply that there are low risks in all areas, on the contrary, we recognized there are higher risk sections in our own risk assessment (see the DAR Addendum), but these are generally in areas not properly highlighted by Oboni. The foregoing commentary is merely intended to indicate that the risk focus defined by Oboni's assessment in terms of location, magnitude and severity is, in our opinion, not correct. This is consistent with our disagreement with Oboni's input assumptions and our belief that, in most cases, Oboni's results are inconsistent with actual terrain knowledge.

Additional Evidence

There is disagreement between Oboni and Allnorth in the estimation of off-road excursions. Allnorth does not agree with the examples and approach Oboni used which resulted in a prediction of accident numbers that Allnorth believes is not realistic. Allnorth have since completed a review of forest road accident statistics, attached. This review indicates, based on several years' data, that Oboni's accident numbers are approximately one order of magnitude too high, which is consistent with Allnorth's previous review comments. Oboni deflected these comments by noting that concentrates pose a higher consequence than logs (p. 32). We would agree, however the issue under discussion was accident probability, not consequence.

In the risk assessment we completed in the DAR, we indicated that the concentrates are not significantly leachable, such that even if they directly entered receiving waters following a spill, the impacts would be short term and limited. In 2008, CZN undertook geochemical studies in preparation for operating permit applications. This included leach testing on concentrates. Results were reported in MESH, April 2008. Reference to this report can be found on the Registry for EA0809-002, document #4. Leach results based on a 3:1 water-solid test ratio were as follows:

	Pb mg/L	Zn mg/L
Pb Sulphide Concentrate	2.81	28.0
Zn Sulphide Concentrate	1.04	14.8
Pb Oxide Concentrate	1.03	4.5

The advice from the consultant in their report was "the concentrate leachate is not representative of expected concentrations, since it is extremely unlikely that the concentrate would be mixed and agitated in water, as occurs in the leach extraction tests". Therefore, we can consider the leach results a 'worst case', and they validate our statement regarding short term and limited impacts from a spill.

Integration of Results and Mitigation Proposals

We have indicated previously that all sections of the road will be reviewed for design, safety and appropriate speeds (seasonally and in both directions) during the detailed design phase and subsequent pre-operations planning. To further consider the results of the risk assessments, and apply these to the consideration of additional mitigations, it is necessary to integrate the results and the comments we made above in terms of a revised risk appraisal by road section in order to focus the effort. We provide a tabulated summary below.

Km from	Km to	Comment
0	7	Parallel to Prairie Creek. Very low accident probability but potentially high consequence (fish). No down slope. Easy recovery.
7	12.3	Parallel to Funeral Creek. Very low accident probability but potentially high consequence (fish). No down slope. Easy recovery.
12.3	17	Parallel to Funeral Creek. Moderate accident probability, low consequence (no fish, control point downstream). Significant down slopes. Potentially difficult recovery.
17	25.2	Parallel to Sundog Creek. Low accident probability, low consequence (no fish, control point downstream). No significant down slopes. Relatively easy recovery.
25.2	28.7	Parallel to Sundog Creek. Moderate accident probability, moderate to high consequence (fish down slope or adjacent). Significant down slopes. Potentially difficult recovery.
28.7	39.5	Parallel to Sundog Creek. Very low accident probability, moderate to high consequence (gravel floodplain, fish). No significant down slopes. Easy recovery.
39.5	53.5	Sundog-Polje watershed forest. Very low accident probability, low consequence (no fish). No significant down slopes. Easy recovery.
53.5	57.4	Ram western slope. Low to moderate accident probability, low to moderate consequence (karst, no fish). Some down slopes. Moderate recovery.
57.4	82	Ram. Low accident probability, low consequence (covered karst, no fish). No significant down slopes. Easy recovery.
82	96	Tetcela and Fishtrap lowland. Very low accident probability, low consequence (no fish). No down slopes. Easy recovery.
96	101.7	Silent Hills slope. Moderate accident probability, low consequence (no fish). Significant down slope in forest. Easy to moderate recovery.
101.7	118.8	Un-named lowland. Very low accident probability, low consequence (no fish). No down slopes. Easy recovery.
118.8	123	Grainger drainage. Very low accident probability, low to moderate consequence (fish). No down slopes. Easy recovery.
123	179.9	Front Range and Liard lowland. Very low accident probability, low consequence (no fish). No significant down slopes. Easy recovery.

Based on the above summary, the road sections we believe require further review for additional mitigations are kms 12.3-17 and 25.2-28.7, with some consideration also of km 53.5-57.4.

Driver and environmental safety and protection are paramount considerations for road haul operations. During the detailed design phase and subsequent pre-operations planning, CZN proposes to consider the following additional mitigations:

- Typical cab safety belts are designed to restrain occupants for forward collisions. Given the risk of an off-road excursion, which may lead to a rollover and sideways occupant motion, it is appropriate to consider additional operator restraint devices, and possibly modified seat-belt arrangements. We will also review other safeguards, such as a mechanism that prevents the operation of the unit if the seatbelt is not engaged.

- Cargo safety, particularly anchoring, will be reviewed in detail. We will review options that stabilize the bases of items to be transported, as well as 'top-down' anchoring. The potential for forward and sideways energy will be considered. With respect to concentrate in bags, unless all concentrate is in bulk, we will look at a base design that will limit the opportunity for sideways, forward and backward movement, in addition to top straps to allow top-down forward and sideways anchoring.

- For the road sections noted as requiring further review for additional mitigations, we propose to look into moderate widening (0.5-1 m) of the normal road width (5 m) in those locations considered to be specifically at risk of an off-road excursion. Widening should be feasible for the km sections 12.3-17 and 53.5-57.4. Widening of km 25.2-28.7 will be difficult because of the common occurrence of upslope rock cuts. Widening of this section in places may still be possible by steepening the downslope, for example by the use of gabions anchored onto underlying rock. CZN successfully used this approach to restore the road bed in several sections along Prairie Creek after the 2006 and 2007 floods.

- The road sections to be reviewed for additional mitigations will be considered for perimeter barriers in locations where they are deemed necessary, which may or may not be the same locations selected for widening. Barriers could take the form of an earth berm if space is suitable, or narrower barriers such as cables or guardrails.

- Following the completion of road construction, and before operations commence, an operational level risk assessment will be completed with the road team including supervisors, operators and maintenance staff. Additional risk mitigation measures will be considered.

If you have any questions, please contact us at 604 688 2001.

Yours truly,
CANADIAN ZINC CORPORATION

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CANADIAN ZINC
CORPORATION

PRAIRIE CREEK MINE ROAD
STRATIFICATION CODING
km 0+000 to km 180+000

DRAWING LIST		
DRAWING NO	**DRAWING TITLE**	**REVISION**
16GP0041-000-1000-001	STRATIFICATION CODING km 0+000 to km 57+000	
16GP0041-000-1000-002	STRATIFICATION CODING km 57+000 to km 115+000	
16GP0041-000-1000-003	STRATIFICATION CODING km 115+000 to km 162+000	
16GP0041-000-1000-004	STRATIFICATION CODING km 162+000 to km 179+535	
16GP0041-035-1000-001	PLAN VIEW km 0+000 to km 21+000	
16GP0041-035-1000-002	PLAN VIEW km 21+000 to km 39+000	
16GP0041-035-1000-003	PLAN VIEW km 39+000 to km 57+000	
16GP0041-035-1000-004	PLAN VIEW km 57+000 to km 73+000	
16GP0041-035-1000-005	PLAN VIEW km 73+000 to km 93+000	
16GP0041-035-1000-006	PLAN VIEW km 93+000 to km 112+000	
16GP0041-035-1000-007	PLAN VIEW km 112+000 to km 128+000	
16GP0041-035-1000-008	PLAN VIEW km 128+000 to km 143+000	

DRAWING LIST		
DRAWING NO	**DRAWING TITLE**	**REVISION**
16GP0041-035-1000-009	PLAN VIEW km 143+000 to km 158+000	
16GP0041-035-1000-010	PLAN VIEW km 158+000 to km 180+000	

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

Allnorth

DESCRIPTION: ISSUED FOR REVIEW
ISSUE DATE: 17/01/10

CLIENT NO:	-	DRWN:	TMM	DATE:	17/01/04
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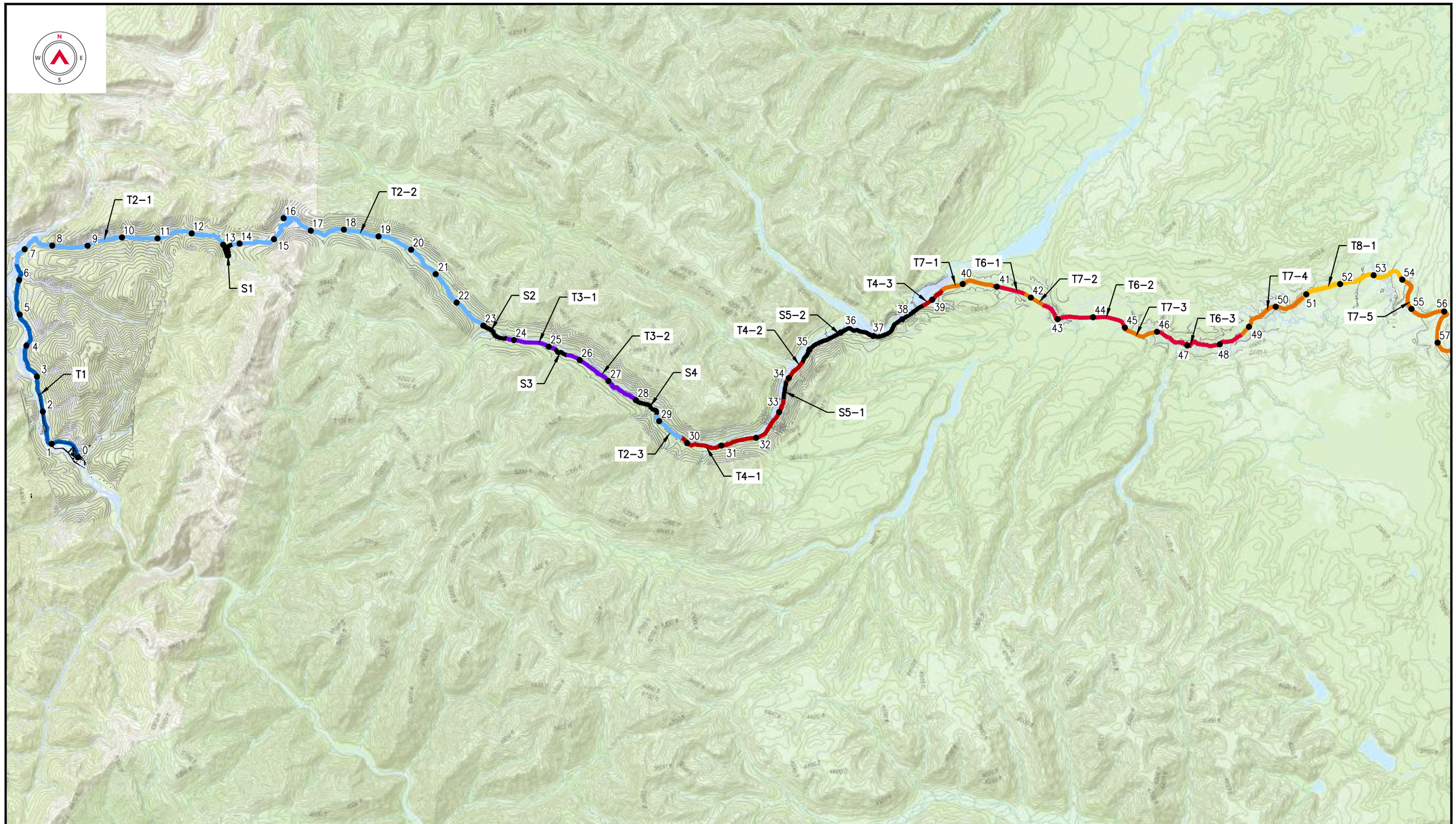

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- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

STRATIFICATION CODING
km 0+000 to km 57+000

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
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PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING

DWG NO: **16GP0041-000-1000-001**

REV: **0**

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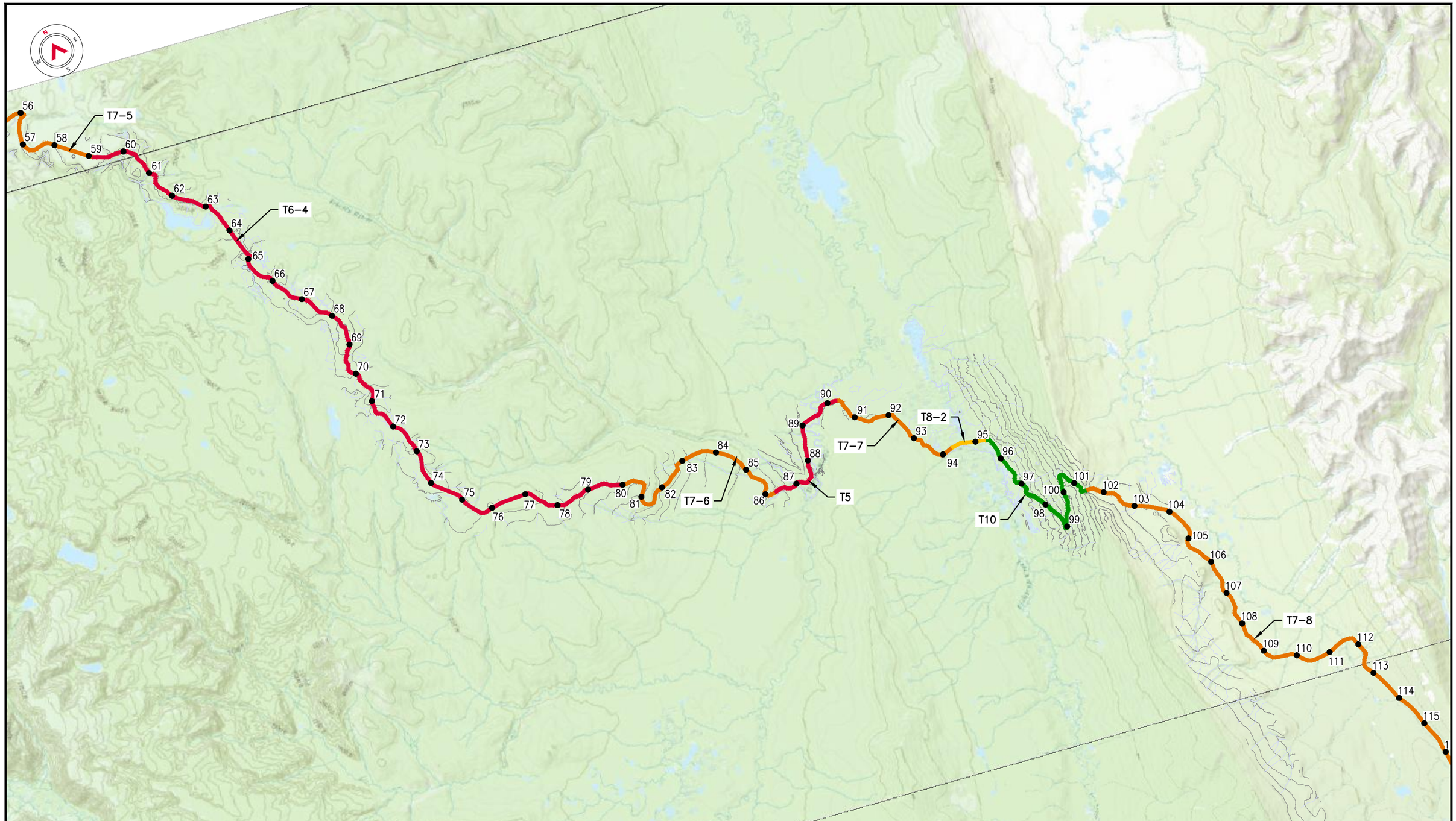

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- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE: **STRATIFICATION CODING km 57+000 to km 115+000**

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
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PROJECT: **PRAIRIE CREEK MINE ROAD STRATIFICATION CODING**

DWG NO: **16GP0041-000-1000-002** REV: **0**

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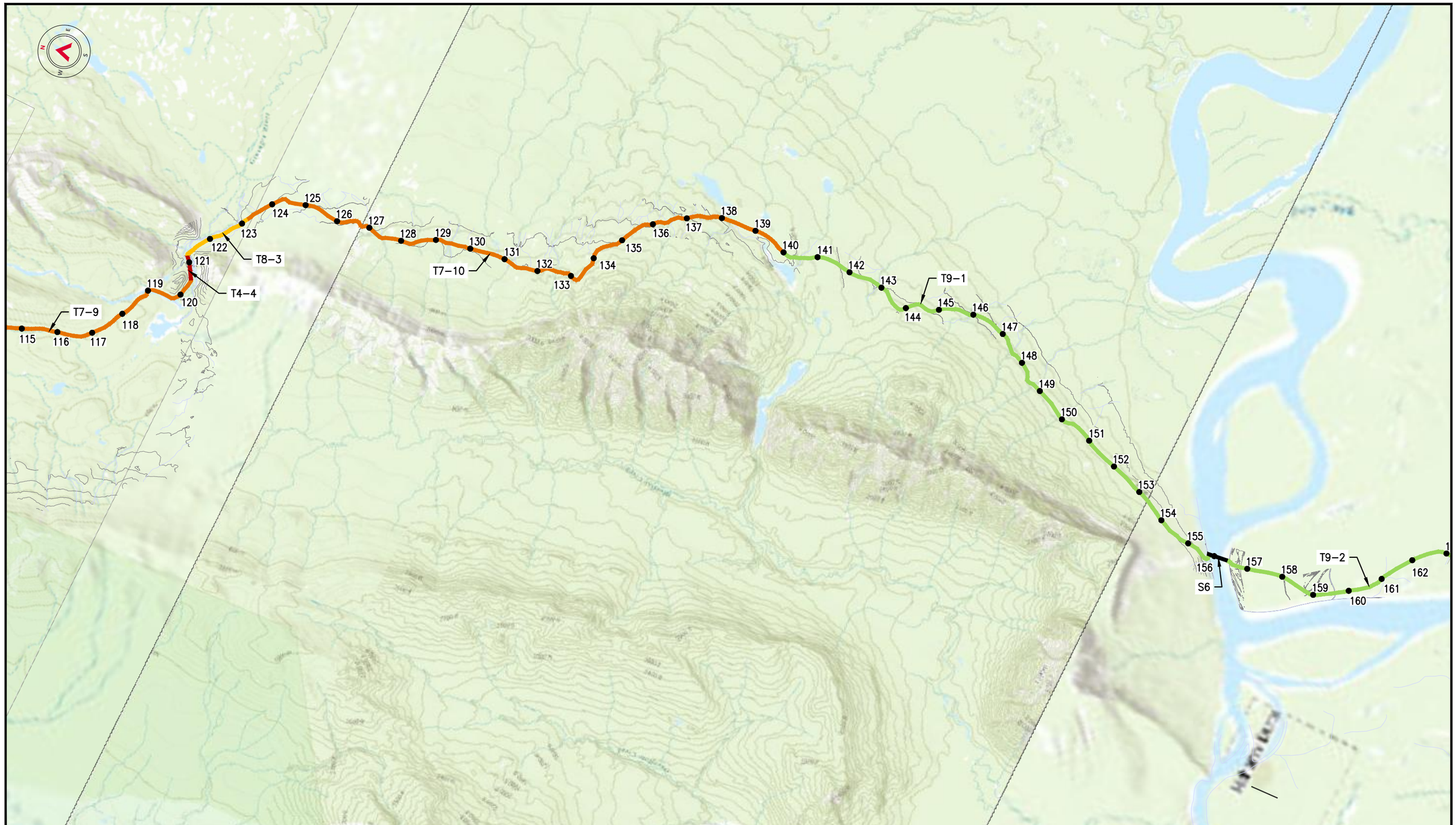

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- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

STRATIFICATION CODING
km115+000 to km 162+000

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:100000	APVD:	EK	DATE:	17/01/09

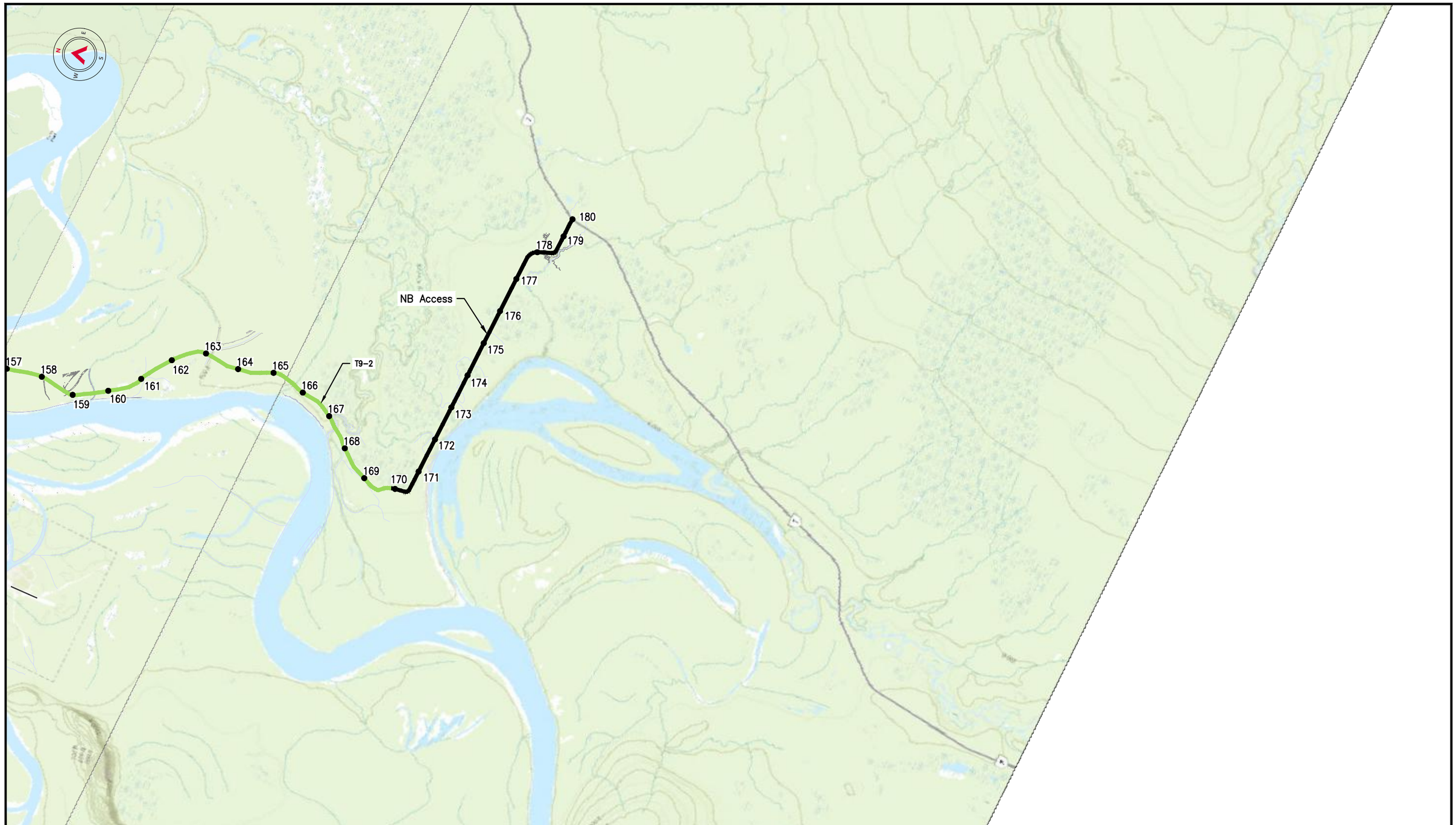
PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING

DWG NO: **16GP0041-000-1000-003**

REV: **0**

Date: 2017/01/09 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-000-1000-003 | Layout: 003 | Paper Size: 558.8mm x 431.8mm



LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

STRATIFICATION CODING
km 162+000 to km 179+535

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:100000	APVD:	EK	DATE:	17/01/09

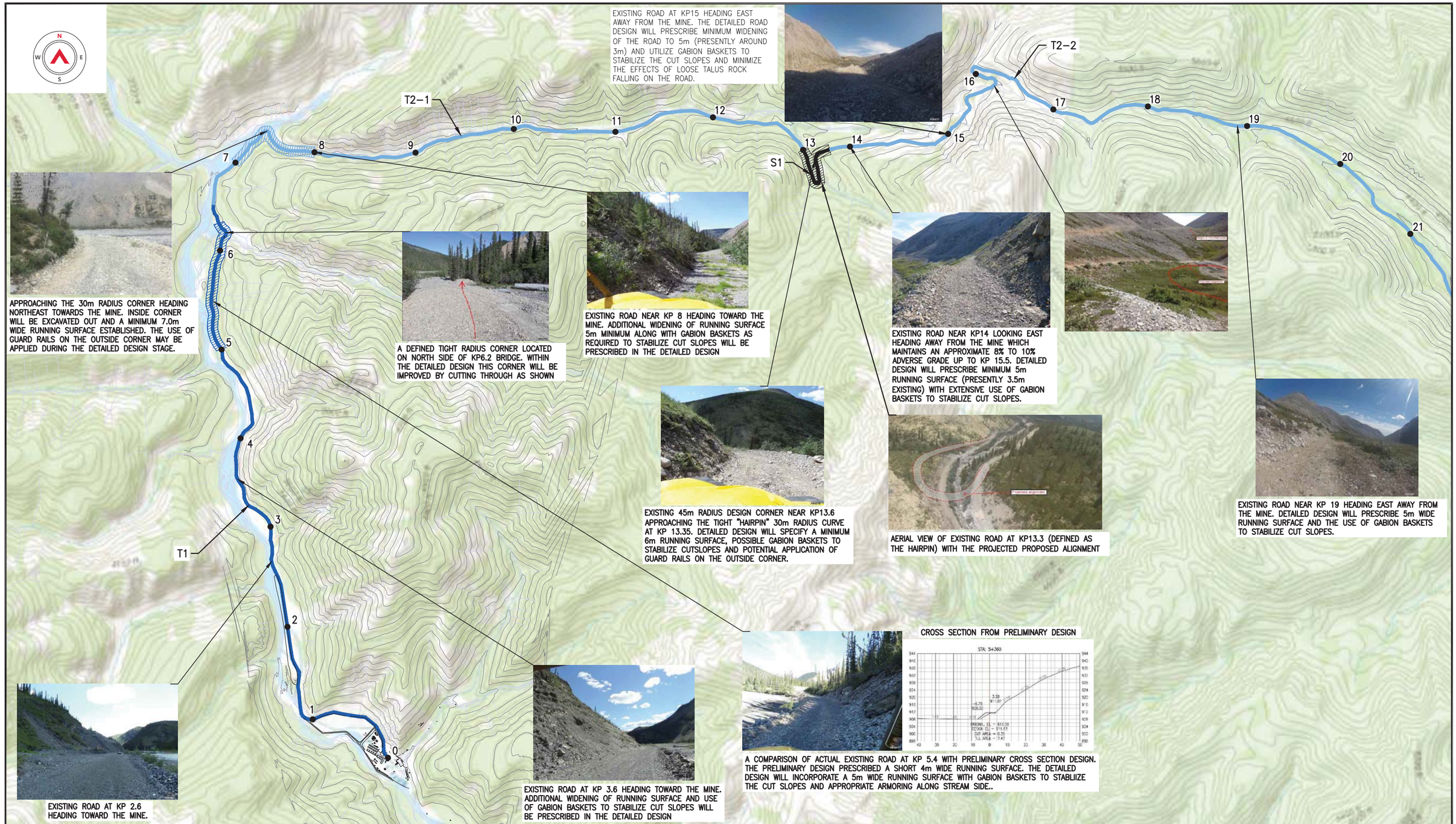
PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING

DWG NO: **16GP0041-000-1000-004**

REV: **0**

Date: 2017/01/09 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-000-1000-004 | Layout: 004 | Paper Size: 558.8mm x 431.8mm



LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

DESIGN SECTIONS.
km 5+140 to km 6+260
km 7+000 to km 8+000
km 13+000 to km 13+500

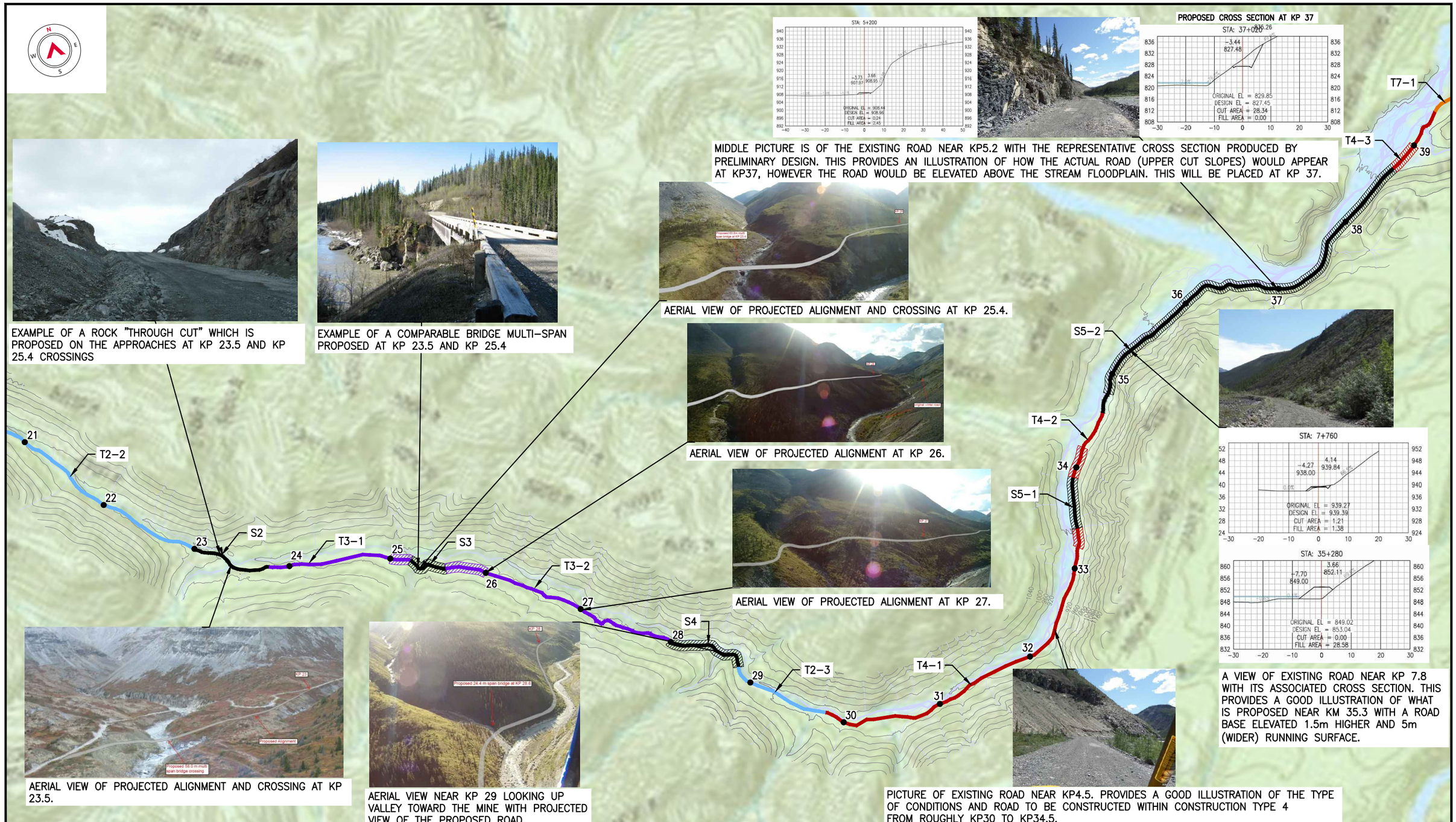
CLIENT NO:	-	DRWN: TMM	DATE: 17/01/03
PROJECT NO:	16-GP-0041	DSGN: -	DATE: -
DRAWING SIZE:	ANSI "B"	CHKD: EK	DATE: 17/01/09
SCALE:	1:35000	APVD: EK	DATE:17/01/09+

PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 0+000 to km 21+000

DWG NO: **16GP0041-035-1000-001** REV: **0**

Date: 2017/01/10 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-001 | Layout: 001 | Paper Size: 558.8mm x 431.8mm



EXAMPLE OF A ROCK "THROUGH CUT" WHICH IS PROPOSED ON THE APPROACHES AT KP 23.5 AND KP 25.4 CROSSINGS

EXAMPLE OF A COMPARABLE BRIDGE MULTI–SPAN PROPOSED AT KP 23.5 AND KP 25.4

MIDDLE PICTURE IS OF THE EXISTING ROAD NEAR KP5.2 WITH THE REPRESENTATIVE CROSS SECTION PRODUCED BY PRELIMINARY DESIGN. THIS PROVIDES AN ILLUSTRATION OF HOW THE ACTUAL ROAD (UPPER CUT SLOPES) WOULD APPEAR AT KP37, HOWEVER THE ROAD WOULD BE ELEVATED ABOVE THE STREAM FLOODPLAIN. THIS WILL BE PLACED AT KP 37.

AERIAL VIEW OF PROJECTED ALIGNMENT AND CROSSING AT KP 25.4.

AERIAL VIEW OF PROJECTED ALIGNMENT AT KP 26.

AERIAL VIEW OF PROJECTED ALIGNMENT AT KP 27.

A VIEW OF EXISTING ROAD NEAR KP 7.8 WITH ITS ASSOCIATED CROSS SECTION. THIS PROVIDES A GOOD ILLUSTRATION OF WHAT IS PROPOSED NEAR KM 35.3 WITH A ROAD BASE ELEVATED 1.5m HIGHER AND 5m (WIDER) RUNNING SURFACE.

AERIAL VIEW OF PROJECTED ALIGNMENT AND CROSSING AT KP 23.5.

AERIAL VIEW NEAR KP 29 LOOKING UP VALLEY TOWARD THE MINE WITH PROJECTED VIEW OF THE PROPOSED ROAD.

PICTURE OF EXISTING ROAD NEAR KP4.5. PROVIDES A GOOD ILLUSTRATION OF THE TYPE OF CONDITIONS AND ROAD TO BE CONSTRUCTED WITHIN CONSTRUCTION TYPE 4 FROM ROUGHLY KP30 TO KP34.5.

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/04	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE: **DESIGN SECTIONS**
km 25+000 to km 26+000
km 28+000 to km 28+800
km 32+200 to km 34+200
km 34+800 to km 39+000

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	
SCALE:	1:35000	APVD:	EK	DATE:	-

PROJECT:
PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 21+000 to km 39+000

DWG NO: **16GP0041-035-1000-002**

REV: **0**

Date: 2017/01/12 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-002 | Layout: 002 | Paper Size: 558.8mm x 431.8mm

AERIAL VIEW AND PROJECTION OF THE PROPOSED ROAD NEAR KP 45 LOOKING EAST HEADING AWAY FROM THE MINE. A COMPARABLE ROAD IN SIMILAR ROLLING TERRAIN TO HELP ILLUSTRATE WHAT THE OPERATIONAL ROAD MAY LOOK LIKE THROUGH THIS SECTION.

EXAMPLE OF AN EXISTING BRIDGE WITH SIMILAR CHARACTERISTICS TO BE ENCOUNTERED AT POLJIE CREEK CROSSING KP53.2

T7–1 39 40 T6–1 41 42 T7–2 43 T6–2 44 45 T7–3 46 47 T6–3 48 49 T7–4 50 51 T8–1 52 53 54 55 T7–5 56 57

AN AERIAL VIEW OF THE PROPOSED LOCATION OF MINE ACCESS ROAD LOOKING EAST NEAR KP49 AND AN EXAMPLE OF A COMPARABLE EXISTING ROAD CONSTRUCTED IN SIMILAR TERRAIN.

LEGEND

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

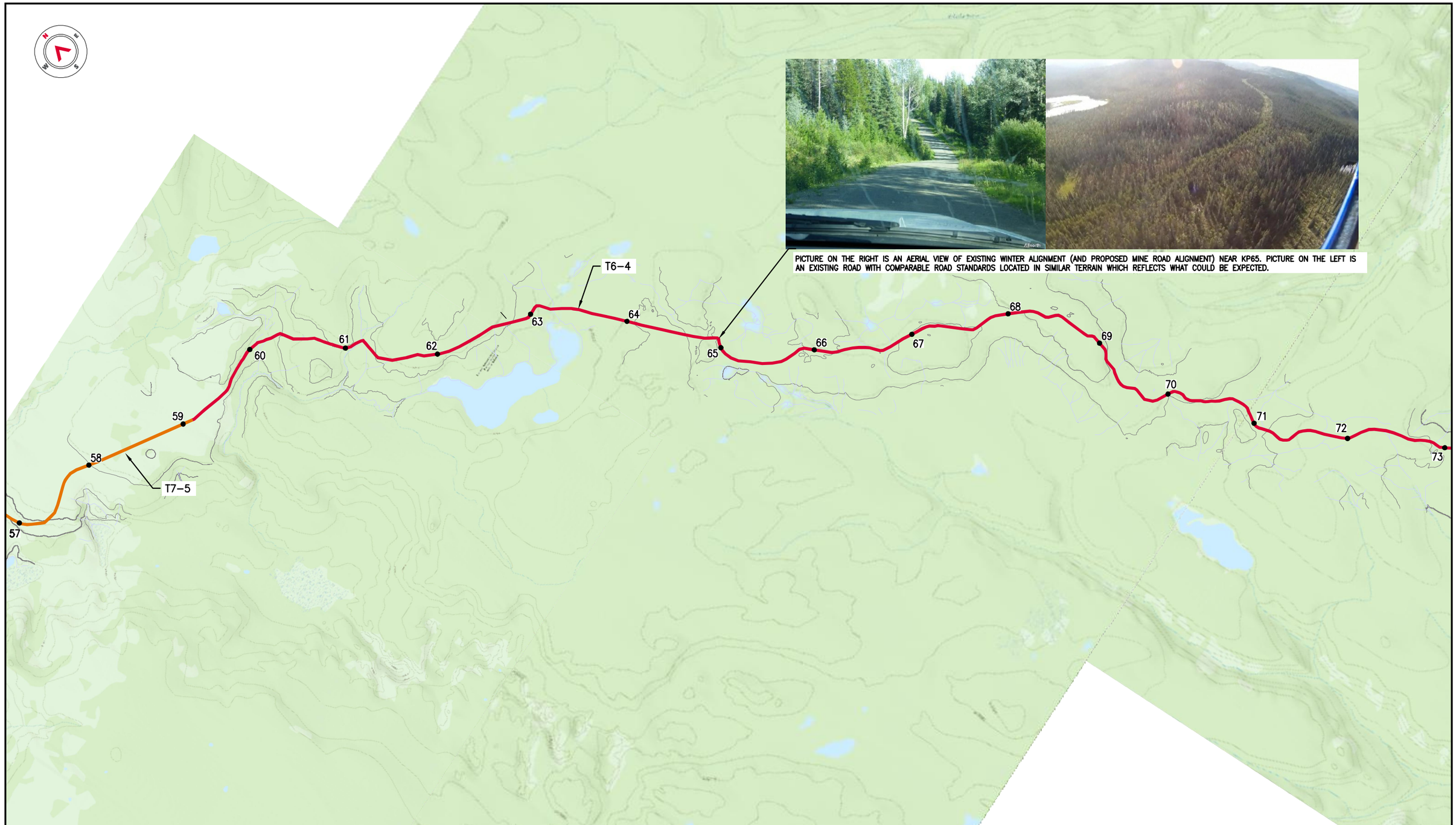
TITLE: **PLAN VIEW km 39+000 to km 57+000**

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:35000	APVD:	EK	DATE:	17/01/09

PROJECT: **PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 39+000 to km 57+000**

DWG NO: **16GP0041-035-1000-003** REV: **0**

Date: 2017/01/10 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-003 | Layout: 003 | Paper Size: 558.8mm x 431.8mm



PICTURE ON THE RIGHT IS AN AERIAL VIEW OF EXISTING WINTER ALIGNMENT (AND PROPOSED MINE ROAD ALIGNMENT) NEAR KP65. PICTURE ON THE LEFT IS AN EXISTING ROAD WITH COMPARABLE ROAD STANDARDS LOCATED IN SIMILAR TERRAIN WHICH REFLECTS WHAT COULD BE EXPECTED.

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

PLAN VIEW
km 57+000 to km 73+000

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:35000	APVD:	EK	DATE:	17/01/09

PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 57+000 to 73+000

DWG NO: **16GP0041-035-1000-004**

REV: **0**

Date: 2017/01/19 | User: Teena Major | File: P:\GP\2016\00\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-004 | Layout: 004 | Paper Size: 558.8mm x 431.8mm

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

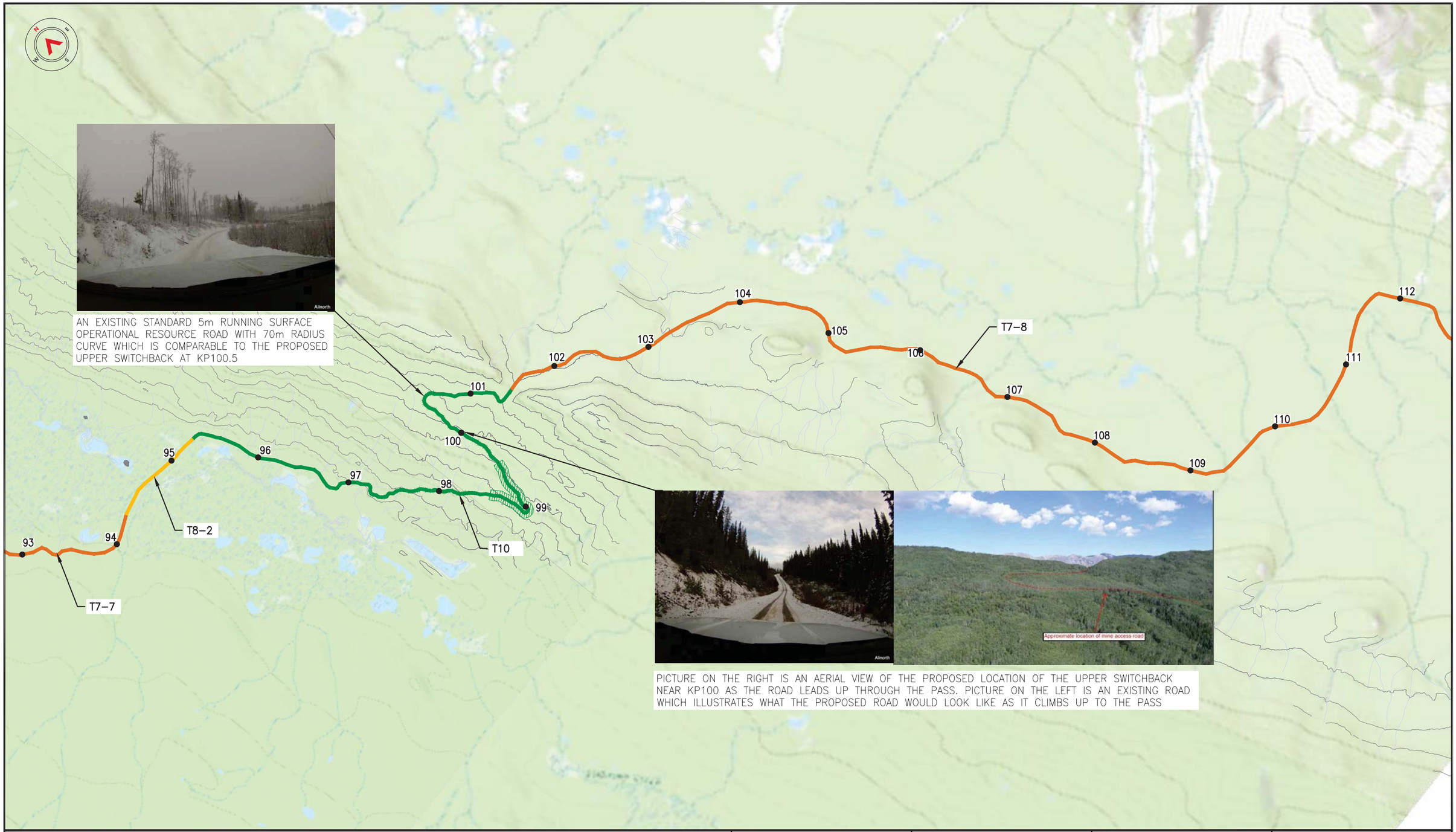
TITLE: **DESIGN SECTION km 88+000 to km 89+000**

CLIENT NO:	-	DRWN: TMM	DATE: 16/12/22
PROJECT NO:	16-GP-0041	DSGN: -	DATE: -
DRAWING SIZE:	ANSI "B"	CHKD: EK	DATE: 17/01/09
SCALE:	1:35000	APVD: EK	DATE: 17/01/09

PROJECT: **PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 73+000 to km 93+000**

DWG NO: **16GP0041-035-1000-005** REV: **0**

Date: 2017/01/10 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-005 | Layout: 005 | Paper Size: 558.8mm x 431.8mm



AN EXISTING STANDARD 5m RUNNING SURFACE OPERATIONAL RESOURCE ROAD WITH 70m RADIUS CURVE WHICH IS COMPARABLE TO THE PROPOSED UPPER SWITCHBACK AT KP100.5

PICTURE ON THE RIGHT IS AN AERIAL VIEW OF THE PROPOSED LOCATION OF THE UPPER SWITCHBACK NEAR KP100 AS THE ROAD LEADS UP THROUGH THE PASS. PICTURE ON THE LEFT IS AN EXISTING ROAD WHICH ILLUSTRATES WHAT THE PROPOSED ROAD WOULD LOOK LIKE AS IT CLIMBS UP TO THE PASS

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

DESIGN SECTION
km 98+500 to km 99+500

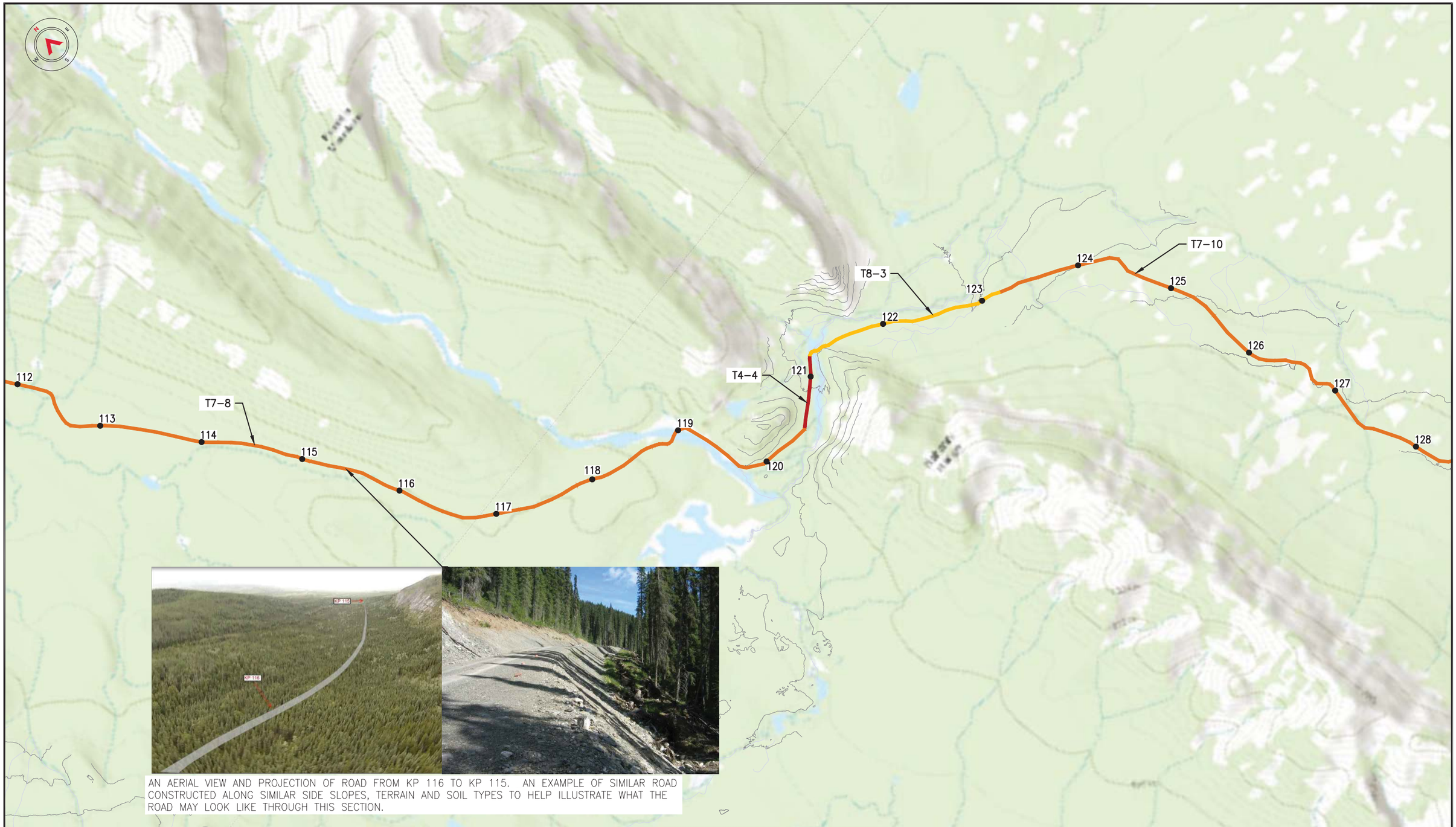
CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:35000	APVD:	EK	DATE:	17/01/09

PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 93+000 to km 112+000

DWG NO: **16GP0041-035-1000-006** REV: **0**

Date: 2017/01/12 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-006 | Layout: 006 | Paper Size: 558.8mm x 431.8mm



AN AERIAL VIEW AND PROJECTION OF ROAD FROM KP 116 TO KP 115. AN EXAMPLE OF SIMILAR ROAD CONSTRUCTED ALONG SIMILAR SIDE SLOPES, TERRAIN AND SOIL TYPES TO HELP ILLUSTRATE WHAT THE ROAD MAY LOOK LIKE THROUGH THIS SECTION.

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

PLAN VIEW
km 112+000 to km 128+000

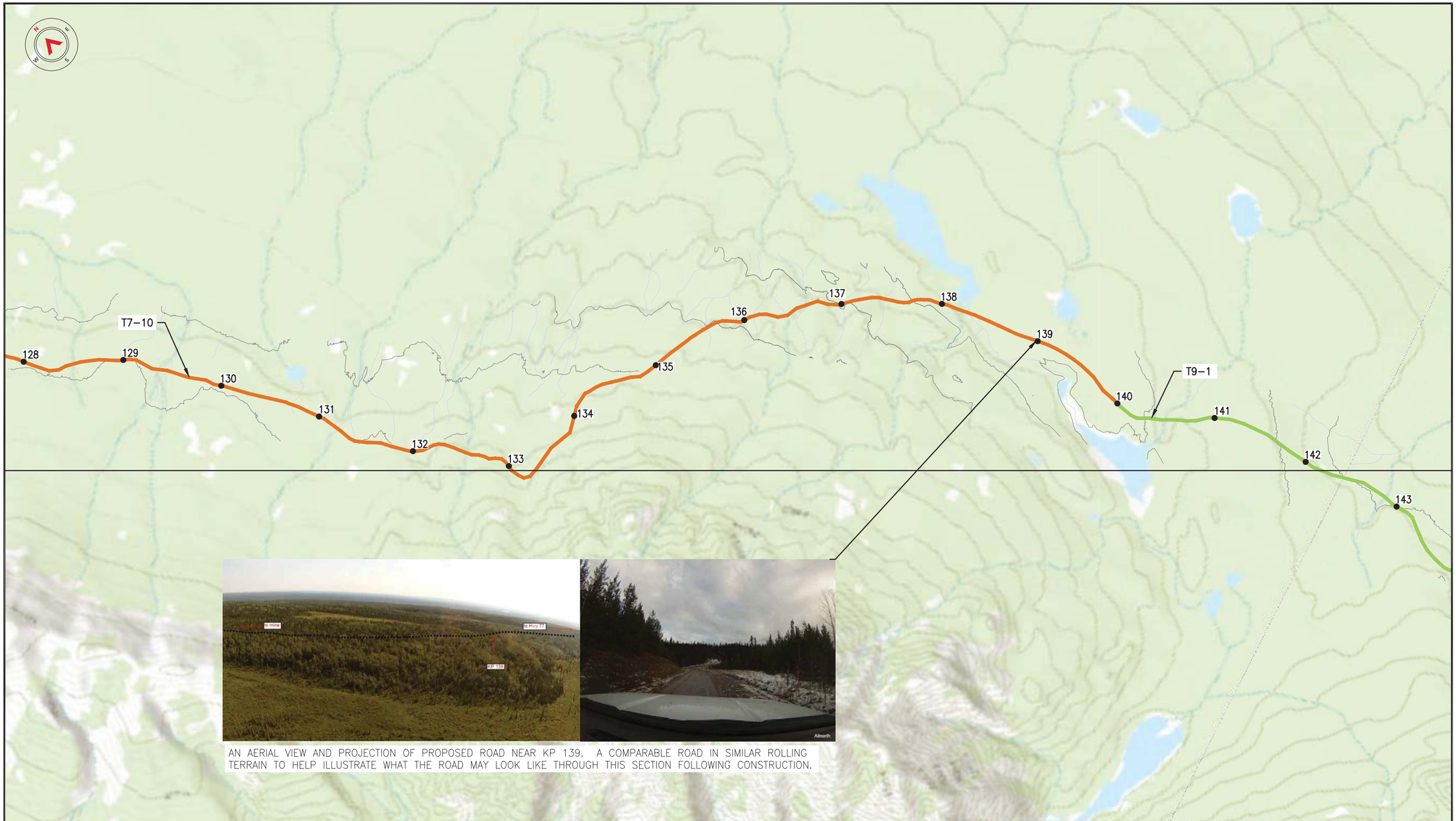
CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:35000	APVD:	EK	DATE:	17/01/09

PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 112+000 to km 128+000

DWG NO: **16GP0041-035-1000-007** REV: **0**

Date: 2017/01/10 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-007 | Layout: 007 | Paper Size: 558.8mm x 431.8mm



AN AERIAL VIEW AND PROJECTION OF PROPOSED ROAD NEAR KP 139. A COMPARABLE ROAD IN SIMILAR ROLLING TERRAIN TO HELP ILLUSTRATE WHAT THE ROAD MAY LOOK LIKE THROUGH THIS SECTION FOLLOWING CONSTRUCTION.

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

PLAN VIEW
km 128+000 to km 143+000

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:35000	APVD:	EK	DATE:	17/01/09

PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 128+000 to km 143+000

DWG NO: **16GP0041-035-1000-008**

REV: **0**

AN AERIAL VIEW AND PROJECTION OF PROPOSED ROAD NEAR KP 148 LOOKING NORTH TO KP 147. A COMPARABLE ROAD IN SIMILAR ROLLING TERRAIN TO HELP ILLUSTRATE WHAT THE ROAD MAY LOOK LIKE THROUGH THIS SECTION FOLLOWING CONSTRUCTION.

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

DESIGN SECTION
km 147+000 to km 149+000

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:35000	APVD:	EK	DATE:	17/01/09

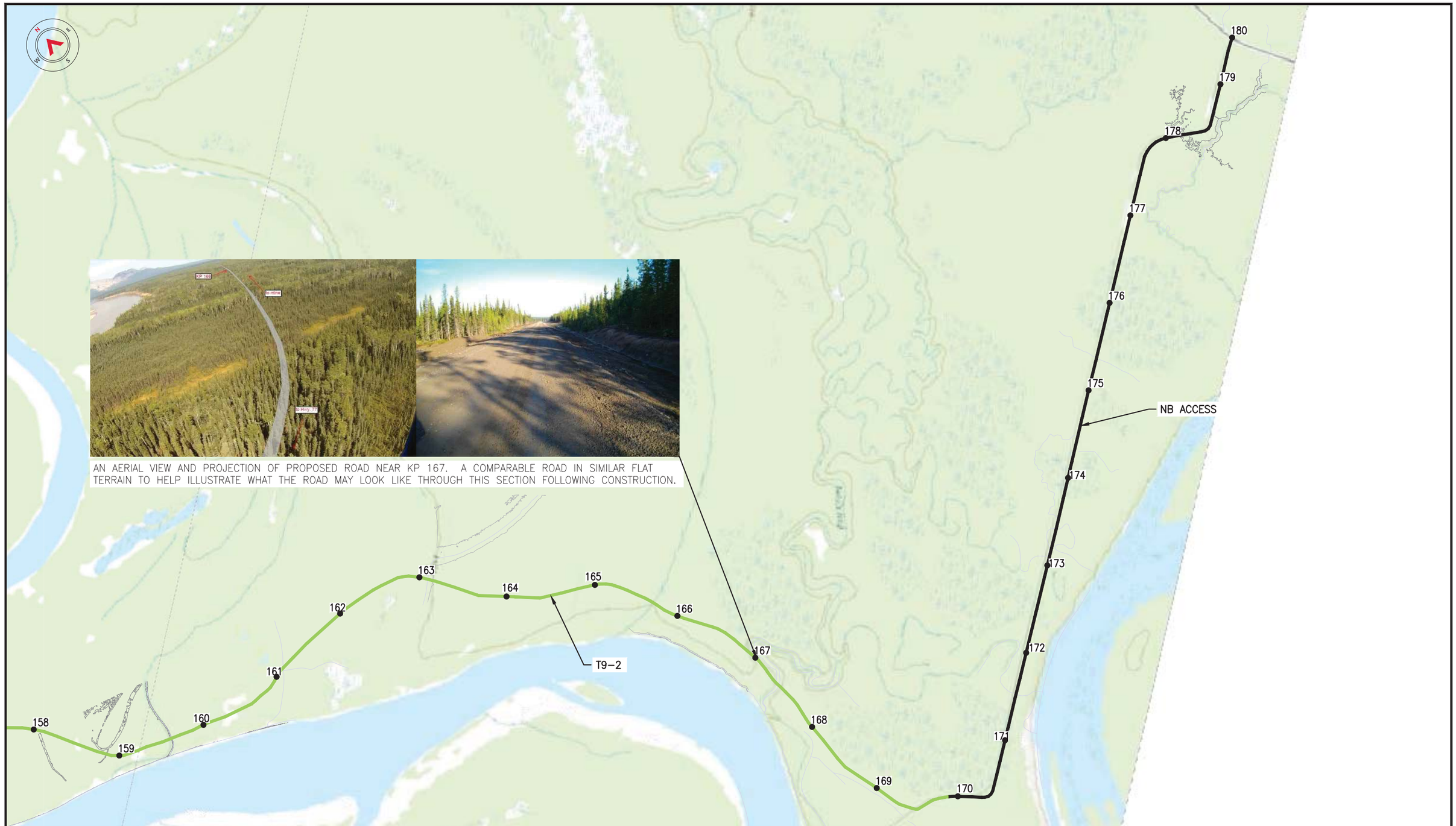
PROJECT:

PRAIRIE CREEK
MINE ROAD
STRATIFICATION CODING
km 143+000 to km 158+000

DWG NO: **16GP0041-035-1000-009**

REV: **0**

Date: 2017/01/10 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-010 | Layout: 009 | Paper Size: 558.8mm x 431.8mm



AN AERIAL VIEW AND PROJECTION OF PROPOSED ROAD NEAR KP 167. A COMPARABLE ROAD IN SIMILAR FLAT TERRAIN TO HELP ILLUSTRATE WHAT THE ROAD MAY LOOK LIKE THROUGH THIS SECTION FOLLOWING CONSTRUCTION.

LEGEND

- T1
- T2
- T3
- T4
- T5
- T6
- T7
- T8
- T9
- T10
- SPECIAL SECTIONS

REV	YY/MM/DD	DESCRIPTION	DRWN	APVD
0	2017/01/10	ISSUED FOR REVIEW	TMM	EK

CLIENT: CANADIAN ZINC CORPORATION

Allnorth

TITLE:

PLAN VIEW
km 158+to km 180+000

CLIENT NO:	-	DRWN:	TMM	DATE:	16/12/22
PROJECT NO:	16-GP-0041	DSGN:	-	DATE:	-
DRAWING SIZE:	ANSI "B"	CHKD:	EK	DATE:	17/01/09
SCALE:	1:40,000	APVD:	EK	DATE:	17/01/09

PROJECT:

PRAIRIE CREEK MINE ROAD STRATIFICATION CODING km 158+000 to km 180+000

DWG NO: **16GP0041-035-1000-010** REV: **0**

Date: 2017/01/10 | User: Teena Major | File: P:\GP\2016\000\16GP0041 Canadian Zinc-LowerSundogRealignment\1000-Drawings\1011-Civil\01-Production_Risk Assessment Drawings\16GP0041-035-1000-010 | Layout: 010 | Paper Size: 558.8mm x 431.8mm

ROAD STRATIFICATIONS BASED ON ALTERNATE ALIGNMENT

Stratification	Length (km)	From	To	Description
TYPE I	6.5	0.0	6.5	Prairie
TYPE II-1	6.5	6.5	13.0	Funeral
Special 1	0.8	13.0	13.8	Funeral hairpin
TYPE II-2	9.2	13.8	23.0	Funeral/Sundog pass
Special 2	0.8	23.0	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	28.0	Sundog terrace
Special 4	0.8	28.0	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	46.0	Polje forest
TYPE VI-3	2.7	46.0	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	80.0	Ram
TYPE VII-6	6.3	80.0	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	120.5	121.2	Grainger Gap
TYPE VIII-3	2	121.2	123.2	Front Range muskeg
TYPE VII-10	16.8	123.2	140.0	Front Range muskeg
TYPE IX-1	15.8	140.0	155.8	Front Range forest
Special 6	0.6	155.8	156.4	Liard River
TYPE IX-2	13.5	156.4	169.9	Liard logging road
NB access	10	169.9	179.9	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		

PRAIRIE CREEK MINE ACCESS ROAD

STATISTICAL COMPARISON OF LOGGING TRUCK ACCIDENTS IN BRITISH COLUMBIA AND PROPOSED PRAIRIE CREEK MINE ACCESS ROAD

Summary:

The prediction of accident frequency by Oboni is based on three examples and a relatively limited sample size (see Oboni report, section 7.2). Allnorth previously indicated that these examples are likely not comparable to the Prairie Creek situation because of differing traffic speeds, less administrative controls or poorer road conditions. Oboni's response was to claim this is not the case, but did not provide supporting evidence, claiming 'confidentiality'. Therefore, Allnorth provides accident statistics below based on the BC logging industry which represent a much larger sample size, provided by reports prepared by the established and recognized "BC Forest Safety Council" and which, in our opinion, are much more likely to be representative of the Prairie Creek situation.

Estimated number of accidents for Proposed Prairie Creek Mine Access Road (applying BC Forestry Statistics) compared to Oboni RA report.

Accident Type (for resource roads only)	B.C. Logging Truck Accidents		Prairie Creek Mine Access Road (applying BC Forestry statistics for 16 year mine life)*		Oboni RA (as reported in Fig. 28C) assuming 16 year operation*
	Trip	Km	Trip	Per Km	
Total All Accidents B.C Forestry Industry (2000 to 2004) 356 per 1.61 million loads delivered / 161 million km (based on data)	1 for every 4,577 trips	1 for every 452,247 km	**11.2**	**44.2**	**743** 1 for every 68.4 trips 1 for every 26,918 km
Total Major Accidents B.C Forestry Industry (2000 to 2004) 67 per 1.61 million loads delivered / 161 million km (prorated from 2008 to 2014 data)	1 for every 24,030 trips	1 for every 2,402,985 km	**2.1**	**8.3**	**58** 1 for every 876 trips 1 for every 344,828 km

					(Includes Class 5 to 9)
Total Minor Accidents B.C Forestry Industry (2000 to 2004) 289 per 1.61 million loads delivered / 161 million km (difference)	1 for every 5,571 trips	1 for every 557,093 km	**9.1**	**35.9**	**685** 1 for every 74.2 trips 1 for every 29,197 km (Includes Class 1 to 4)

*Based on Oboni RA calculations of 20 M km total operational distance for 16 year operation and/or 3,177 trips per year, 50832 trips total for a 16 year operation.

The above table and statistical comparison indicates that Oboni's estimates of accidents for the Prairie Creek project are approximately an order of magnitude greater than those based on BC forestry road statistics. While most forestry roads may be wider or of similar width to the proposed Prairie Creek road, most forestry roads carry two-way traffic with less administrative controls than will be imposed in the Prairie Creek situation, and most importantly, forestry road traffic is more intensive, operates at considerably higher speeds, and contains significant component of public use. The terrain traversed is generally similar. Therefore, overall, we believe BC forestry road data are an accurate basis to predict accident probabilities for Prairie Creek, and may in fact over-estimate these probabilities.

Facts Regarding the B.C. Logging Industry

- 69 million cubic metres or 1.41 million loads of timber was delivered in the British Columbia in 2014
- 282 million km of road travelled per year, based on a conservative estimate of 200 km per trip
- An estimated fleet of 2,800 logging trucks operate in B.C.
- The majority of the logging truck fleet consists of smaller independent, owner/operator style businesses, operating 1 to 3 trucks.
- A large majority of the resource roads operating in B.C. are also utilized by other user groups including recreationalists, mining, and oil/gas industry.

The statistical analysis was prepared using the following reports (located in Appendix A):

(A) A report entitled "Overview of Forestry Truck Crashes in BC, prepared by BC Forest Safety Council, dated October 20, 2005 found:

- An average of 741 accidents per year occurred in the 5 year period from 2000 to 2004, detailed month to month reporting of logging truck accidents for all BC (2000 to 2004)

- Five year average, 741 accidents occurred per year for 1.61 million loads delivered or an estimated 322 million km
- 48% accidents occur on resource roads
- Identifies 30% accidents result in rollover (based on ICBC data base)
- 36% accidents driver judgement considered the primary contributor
- 25% accidents mechanical problems considered primary contributor
- 23% accidents road conditions/poor maintenance considered primary contributor

(B) A report entitled "Logging Trucks in British Columbia, Safety Backgrounder & Statistics, prepared by BC Forest Safety Council, found:

- Average of 120 claims per year related to STD (Short Term Disability), LTD (Long Term Disability), and Fatality claims per average 67.1 million cubic metres harvested, an estimated 1.4 million loads delivered or 280 million km, for log haulers (based on WorkSafe B.C statistics 2008 to 2014)

Clarifications/Assumptions:

- Within the report "Overview of Forestry Truck Crashes in BC", the total accidents reported contain all accidents, minor and major, in which property damage and/or personal injury occurred.
- The 120 claims per year reported by WorkSafe B.C. represent the majority of "major or significant" accidents. We calculated the minor accidents by subtracting the major accidents from the total reported accidents.
- The data only provides the total number of loads delivered based on the annual reported timber harvested divided by average cubic metres of timber per load (48.6 m^3).
- Based on our experience, we assume a conservative estimate of 200 km round trip per load. We split the haul operation 50/50 related to highway/public road operation vs resource road operation.
- The "resource" road operation would occur on a mix of road standards, from simple/low grade roads to higher speed, double lane roads. As the 5 m design standard proposed for the Prairie Creek Mine Access Road is a common standard road utilized in the forest industry, we expect it is proportionately representative of the "resource" road category.

Based on the above publications, we prepared the following statistical analysis of the B.C. Forest Transportation industry and as it relates to the proposed Prairie Creek Mine Access Road. This was the basis for the summary table above.

Total Average Logging Truck Accidents in B.C. per year "all roads" (2000 to 2004 industry statistics)	741 per 1.61 million loads delivered / 322 million km
Total Average "Major" Logging Truck Accidents in B.C. per year "all roads" (based on WorkSafe B.C statistical claims 2008 to 2014)	139 per 1.61 million loads delivered / 322 million km (pro-rated @ 120 per 1.4 million

	loads delivered / 280 million km)
Total Average "Minor" Logging Truck Accidents in B.C. per year "all roads" (all accidents–major accidents) (pro-rated)	602 per 1.61 million loads delivered / 322 million km
Total Average Logging Truck Accidents in B.C. per year "resource roads" (2000 to 2004 industry statistics)	356 (48%) per 1.61 million loads delivered / 161 million km
Total Average "Major" Logging Truck Accidents in B.C. per year "resource roads" (based on WorkSafe B.C statistical claims 2008 to 2014)	67 per 1.61 million loads delivered / 161 million km (48%) (pro-rated @58 per 278 million km)
Total Average "Minor" Logging Truck Accidents in B.C. per year "resource roads" (all accidents–major accidents) (pro-rated)	289 per 1.61 million loads delivered / 161 million km
Statistical Comparison Prairie Creek Mine Access Road based on Km	
Total estimated operational km for Prairie Creek Mine Access Road based on 16 year operation (as per Oboni RA)	20 million km
Total estimated number of "all" accidents for the Prairie Creek Mine Access Road	**44.2**
Estimated number of "Major" accidents for the Prairie Creek Mine Access Road	**8.3**
Estimated number of "Minor" accidents for the Prairie Creek Mine Access Road	**35.9**
Statistical Comparison Prairie Creek Mine Access Road based on number of trips	
Total estimated average round trips per year Prairie Creek Mine Access Road (3082 + 39 + 33 + 23 as per Oboni RA)	3,177
Total estimated number of "all" accidents for the Prairie Creek Mine Access Road based on 16 yr operation	**11.2**
Estimated number of "Major" accidents for the Prairie Creek Mine Access Road based on 16 yr operation	**2.1**
Estimated number of "Minor" accidents for the Prairie Creek Mine Access Road based on 16 yr operation	**9.1**

Conclusions:

Based on the reports from BC Forest Safety Council, found in Appendix A, and the statistical analysis, we can conclude:

(1) The contained reports provide an accurate and statistically sound representation of the operations of B.C. Forest transportation industry.

(2) The proposed Prairie Creek Mine Access Road will be operated in similar terrain, with the same engineered road standards, utilizing comparable truck weights and configurations, involving similar "professional driving" personnel and operating in a comparable regulatory environment. However, administrative controls will be greater on the Prairie Creek road, and traffic intensity and speeds much less. Therefore, it is reasonable to assume the statistical probabilities based on forest roads can be applied to the Prairie Creek Mine Access Road to estimate the maximum number of probable accidents.

Supporting Documents:

The following information is appended to this document:

- Logging Trucks In British Columbia-Safety Backgrounder & Statistics – Appendix A
- Overview of Forestry Truck Crashes in BC –BC Forest Council – Appendix B

Prepared By:

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Reviewed by:

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Reviewed by:

Don Watt, General Manager Mining

Appendix A - Logging Trucks In British Columbia-Safety Backgrounder & Statistics

Logging Trucks in British Columbia

SAFETY BACKGROUNDER & STATISTICS

Compiled by the BC Forest Safety Council on behalf of the Trucking Advisory Group.

HISTORY

Logging trucks have been on our Public BC Provincial and Private Resource Roads for many years, evolving with each technological advancement to be safer, more effective and efficient.

Photo credit: The Terrace and Region Archives

ROLE OF LOGGING TRUCKS IN FORESTRY

Logging trucks play a critical transportation role in moving logs from remote off road locations, to sawmills and other plants across the province. Without logging trucks the forest industry would grind to a halt, putting thousands of people out of work and costing our Province many millions of dollars in lost revenue and negative cascading economic effects.

58,000 people work in forestry in BC, with an average wage per employee (2012) of $68,575. The approximately 2,800 log haulers are an integral part of making the forestry cycle work, moving wood to mills and markets.

HOW LOGGING TRUCK INDUSTRY WORKS

The BC forestry industry is made up of many small, mid-size and large companies. More than 85% of forestry companies in the Province are small operations employing five or less people or are owner-operators.

The same is true of logging truck operations. Some of the major companies own their own logging trucks, but the majority are much smaller contractors who contract their services to the major licensees. Many log truck drivers are owner-operators with one, two or more trucks, with their partner providing administration and other support – real mom and pop, back-bone of BC's economy small business people.

Some log truck drivers are second and third generation. Their rigs represent a major financial investment, given that the average price of a new truck and trailer costs between $200,000 to $250,000; annual maintenance and service costs can run between $30,000 to $40,000 (less on newer trucks); and insurance costs can run $10,000 a year depending on age of truck, driver experience, history, routes travelled and loads carried, etc.

All log truck drivers are committed and focused to getting each and every load to its destination safely, because unsafe is not only unacceptable, a major safety incident often results in a major financial impact cost for the driver, his family and his company.

LOGGING LOADS BY THE NUMBERS

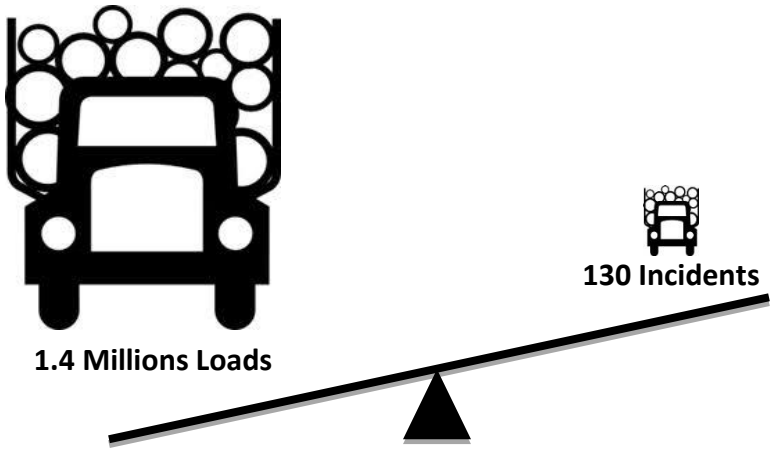
In 2014, the number of loads carried = approx. 1.4 million

In 2014, number of estimated logging trucks on and off public highways = 2,800

In 2014, that means about 500 loads carried on average by each logging truck

Amount of wood carried = approx. 68 million m^3

The number of incidents reported both on and off highways that resulted in short term disability and long term disability claims to WorkSafeBC was approximately 130 in 2014. For the first time in many years there were no direct fatalities related to log hauling. This means that of the approximately 1.4 million loads of timber hauled in 2014, 99.99% were hauled without a short term disability or long term disability.



Infographic shows the small percentage of log trucks that are actually involved in an incident.

*STD, LTD and fatality WSBC Log Hauling CU data 2014

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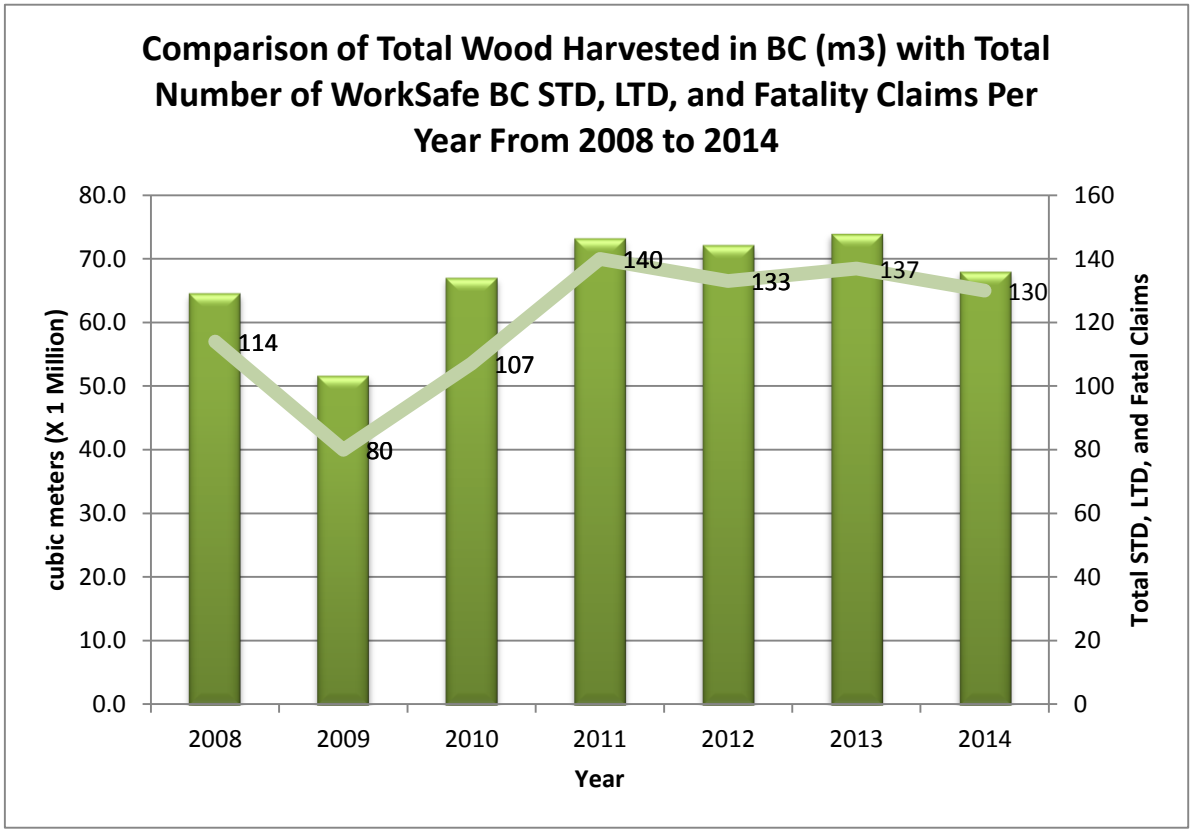


Rate of short term disability, long term disability and fatality claims per cubic meter of wood harvested for log haulers (WorkSafeBC Classification Unit No.: 732044)

TRUCKING ADVISORY GROUP (TAG)

TAG was formed in 2014 following a highly unusual number of unrelated logging truck incidents (five) over a couple of weeks in the fall of 2013. One such incident resulted in the death of a motorcyclist on a public highway near Whistler. An inquest into that death is scheduled to happen in 2015.

Industry was very concerned about the incidents and felt that it needed to take increased action to firstly understand what had caused these individual incidents and examine whether there was a need to better address any determined emerging issue.

TAG MEMBERS

TAG's 16 members include licensees, contractor associations, a log hauling contractor, a representative from the Log Truck Technical Advisory Committee, and a BC Forest Safety Council representative:

Kerry Douglas, West Fraser
Nick Arkle, Gorman Bros.

Mike Falkiner, BC Timber Sales
David Elstone, Truck Loggers Association
Larry Price, Interfor
Wayne Lintott, Interior Logging Association
Barry Gladders, Tolko Industries
Jerry Moonen, Tolko Industries
Ken Pederson, Canfor
Peter Baird, Canfor
Shawn Clerke, Gorman Bros.
Scott Marleau, West Fraser
Jason Stafford, BC Timber Sales
Marty Hiemstra, LoBar Log Transport
Vern Woods, LTTAC representative
Dustin Meierhofer, BCFSC

"Industry knows: safety is not only the right thing to do, it's also good business. Profitability & reputation depend on every load being delivered safely."

PURPOSE OF TAG

To determine the type, frequency and factors relating to log truck safety incidents and take appropriate actions to improve safety performance by reducing injuries and fatalities.

CURRENT FOCUS OF TAG

Safety data collection and analysis
Log Truck Overweights
Education/training of log haulers, loader operators and supervisors
Mechanisms to improve driver behaviors and safety performance
Improving communications within and outside of industry

REGULATIONS THAT GOVERN LOGGING TRUCKS AND DRIVERS

Log truck driving – or log hauling – is highly regulated. It falls under the jurisdictions of the following authorities:

CVSE – Commercial Vehicle Safety and Enforcement (Ministry of Transportation); Responsible for several key program areas promoting compliance of safety regulations for commercial transportation.

Through administration of the National Safety Code, Vehicle Inspections and Standards, Commercial Transport, Compliance and Enforcement as well as ITS Initiative (Technology) CVSE mandate is improve road safety, protect the highway infrastructure and promote economic growth.

CVSE's authority and mandate does not include resource or industrial roadways.

RCMP – Responsible for compliance and enforcement of Motor Vehicle Act, the Commercial Vehicle Act, and other legislation and laws, including Criminal Code Offenses. NOTE: Impaired Driving and Dangerous Driving Causing Death (Criminal Negligence) are Criminal Code offenses. The RCMP usually won't attend an incident on a resource road unless there are Criminal Code offenses involved or suspected (drugs & alcohol, weapons, etc.)

WorkSafeBC (WSBC) – Responsible for compliance and enforcement of Workers Compensation Act and OHS regulations. Sections relevant to driving include Part 26, and the parts around mobile equipment, and worker supervision.

Insurance Corporation of BC (ICBC) – Responsible for licensing, insuring and registering commercial drivers and vehicles.

Ministry of Forests, Lands and Natural Resource Operations (FLNRO) – Natural Resource Officers (previously known as Compliance and Enforcement); responsible for monitoring and enforcement on BC's resource roads – speed, radio use, timber marking, vehicle/load weight, general road safety etc.

Ministry of Environment – Has regulations and requirements relating to spills, spill response, etc.

Transport Canada (under the Motor Vehicles Act) – Also has a hand in regulating truckers, including safe design regulations.

Additional compliance – Employers and Licensees have extensive safe work procedures that are practiced and enforced.

LOG TRUCK DRIVERS' DAILY REQUIREMENTS & ROUTINE

Start of day: Driver must do a **pre-trip inspection**.
He/she must walk around the truck, check brakes, stakes, bunks, lights, etc.; must note small things and report these to his/her supervisor; big things need to be fixed right away before the hauling day begins. Driver must sign off on log book that it has been done.

Log Book hours begin as soon as the pre-trip starts, and the key is turned. In addition to on-duty time, log haulers track their off-duty time in their log books so drivers can demonstrate they have not exceeded hours of service, and they have had an adequate rest period.

Wrappers, bunks and stakes must be visually checked before loading on the block. Weights must be checked using on-board scales as the truck is loaded or once it has been loaded.

Once loaded, the load needs to be wrapped. While many truckers are still throwing wrappers by hand (potentially causing shoulder injuries) an emerging practice is for the loader to drop

the wrappers on top of the load, secure the load and then let the driver grab them from below and cinch them up when it is safe to do so.

Once wrapped, the truck usually moves off the landing or roadside loading area, to the place where the stamp hammer is kept; the load is timber marked, and again, the driver checks wrappers, brakes, lights, etc.

From there, the next check is before leaving the resource road and entering the highway. This requirement is mandatory under regulation, section 10 of NSC Cargo securement, which states that the driver of a vehicle transporting logs, before the vehicle enters a highway from a private road, shall:

(a) inspect the vehicle, the logs and the securing devices to ensure compliance with this Standard, and
(b) make necessary adjustments to the securing devices, including adding more securing devices.

This is the basic legal requirement. But, depending on a variety of criteria, truckers need to check and tighten their wrappers more frequently than this – they have to maintain load securement for the duration of the trip, no matter how many stops that entails.

After 3 hours or 240 km (whichever comes first), the truck is required to pull off the road, and check wrappers again. It must also stop at all mandatory brake checks.

Once they get to the mill yard, and unload, trailers need to be loaded and secured on the truck.

After the work day is done, **a post trip inspection** is performed in order to determine if any maintenance or repairs are required prior to the following shift.

Got questions for the Transportation Advisory Group?

Or, would you like a presentation about logging truck safety, initiatives, economic impact to your municipality or community of forestry operations?

Please contact TAG at:

Transportation
BC Forest Safety Council
1-877-741-1060
or email TAG@bcforestsafe.org

Appendix B- Overview of Forestry Truck Crashes in BC –BC Forest Council

Overview of Forestry Truck Crashes in BC

Prepared by the BC Forest Safety Council

BC **Forest Safety** Council

Unsafe is Unacceptable

October 20, 2005

Introduction

While evidence indicates an overall reduction in crashes involving commercial trucks in BC, the number of incidents involving forest hauling trucks, logging trucks in particular, is still alarming. With the uptake in harvesting volumes due to the mountain pine beetle devastation comes a corresponding increase in volumes of trucks hauling forestry products on BC roads, often interfacing with private vehicles on public highways.

"We are facing the "Perfect Storm"

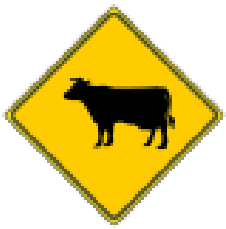
The "interface" between the traveling public and the north's major resource industries (forestry, oil & gas and mining) will continue to increase for the next decade as the circumstances of the mountain pine beetle infestation brings unprecedented volumes of traffic in the forest harvesting and transportation sector, coupled with tremendous increases in the oil & gas industry as well as a revitalization of northern BC's mining activities due the world's unrelenting demand for resources.

- Logs are being hauled farther and spending more time on highways, often criss-crossing to reach mills in both directions.
- The annual harvest of beetle killed timber in BC will increase by over 5 million m^3. Each increase of a million cubic meters means 22,000 additional log loads, two extra contractors with 30 operators, fuel trucks and low-beds on an already taxed road system.
- Oil and gas exploration is increasing resource road use @ 80-120 loads per rig movement.
- The Winter Olympics in 2010 are fuelling a large push to increase tourism in the north half of BC.
- Resource roads were not designed for the current levels of use and highways were not designed for the increased weights. (hence the "ruts" in heavily traveled areas)
- The seasons for hauling are compressed because of reduced winter ground in beetle killed areas and stumpage rate strategies.
- More money in oil and gas, and retirements is lowering the proportion of experienced driver numbers.
- Bigger trucks; more axles and heavier loads.
- Inconsistent radio protocols
- Unresolved road maintenance issues.

Overview

This report is not intended to be a comprehensive or complete analysis, but rather a tool that provides baseline data and outlines the major issues. As such, it illustrates crash trends and common causes. The data has been assembled from a variety of sources, and due to differing methods of collection and analysis may not always be consistent. However, the information provided in this report has been properly sourced, researched and verified.

BC Roads



Roads in Northern BC fall under many classifications and jurisdictions; provincial highways, municipal roads, city streets, forest service roads, resource roads, and private roads, each with differing levels of maintenance requirements and policing.

Sharing these roads, and the uses they are put to, is a major issue. Roads designed for resource use to haul industrial materials and machines quickly become new exploration avenues for RV users, ATV users, snowmobilers, fishers and hunters, creating congestion and risk. Most resource roads are radio controlled, and industry has established road safety policies, albeit inconsistently. Commercial/industrial drivers carry radios and are skilled at negotiating resource roads. However, many private motorists are not used to the rough conditions or sharing the roads with huge industrial vehicles, and may not be equipped properly to be on them. Multiple uses and users of resource roads greatly increase the risk of crashes.

Maintenance

As well, the increasingly heavy use of public roads by industry has exacerbated the breakdown of BC's aging roads. The Ministry of Transportation & Highways estimates it now spends 30-40% of its annual budget to upgrade public roads for industry, and is under increasing pressure to bring main feeder" roads up to year-round industrial capability, which would eliminate the weight restrictions normally faced in the spring resulting from "break up". For information on highways and maintenance standards see www.bcforestsafe.org/trucksafe/about.asp and click on "Information Clearing House."

Jurisdictional issues

Another challenge around northern BC roads is jurisdiction- whose responsibility is road maintenance? So-called "bush" roads, which are gravel roads built for forest harvesting, are under the jurisdiction of the Ministry of Forests, and maintenance is the responsibility of the licensee (the company harvesting the timber). The Ministry of Highways has no responsibility for those roads, nor are they patrolled by police.

Did you know?

Driving for 17 hours in a day produces the same level of impairment as a .05 blood alcohol reading.

~New England Journal of Medicine, Sept, 1997

There's no such thing as an "accident"

For the purpose of this report, and Forestry TruckSafe, the word "crash" will be used, rather than "accident".

[Canadians] do not see the risk in their everyday lives. If they do not see the risk, they cannot take measures to navigate that risk in order to prevent potential injury.

Why can't Canadians see the risk in their lives? The problem stems from a universal misunderstanding and misuse of the word 'accident.' Injuries sustained by falls or motor vehicle crashes are not seen as the result of predictable events but rather the result of 'accidents' or 'acts of fate'. Yet when someone suffers from heart disease or cancer, high cholesterol and smoking are identified as the predictable causes. *It is time to acknowledge that injuries are predictable and preventable. Injuries are not accidents, and investing in injury prevention can save money and lives* [*italics mine*].[1]

- SmartRisk Foundation, 2004

Other sources also discuss the psychological implications of using the word "accident" rather than "crash":

The opportunities to reduce harm will increase if we keep uppermost in our thinking that "the fault is not in our stars, but in ourselves".[2]

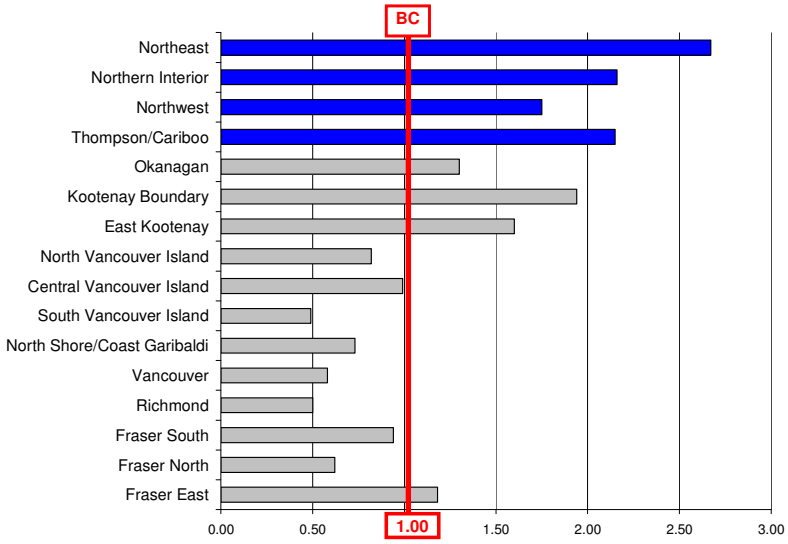
-British Medical Journal

Crashes are preventable. Many factors contribute to crashes occurring, but they, too, are largely preventable by making good behavioral choices – observing the rules of the road, driving at a safe speed, not consuming drugs or alcohol prior to driving, getting enough rest, having proper tires, etc. The risk from those factors over which a driver has no control, such as inclement weather, poor road conditions, unexpected appearance of wildlife, or dangers presented by other drivers can also be reduced with due care & attention

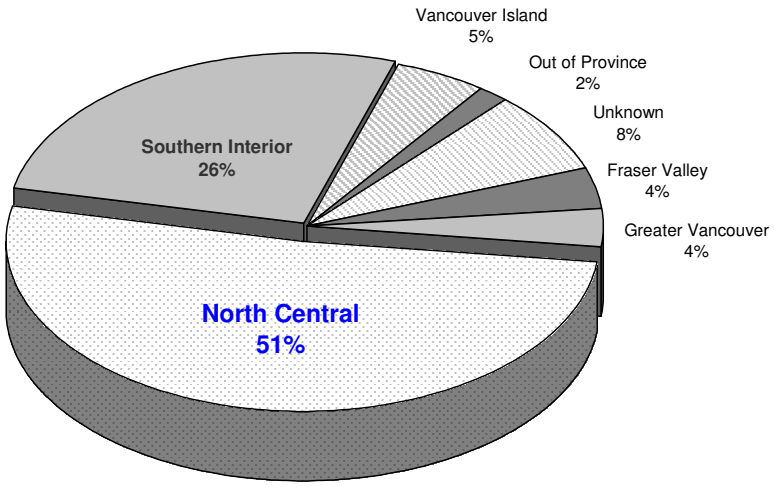
Crash Data

MV Crash Mortality Rates by Health Services Delivery Area

1.00 is BC's average. Everything to the right of the line is over the provincial average.



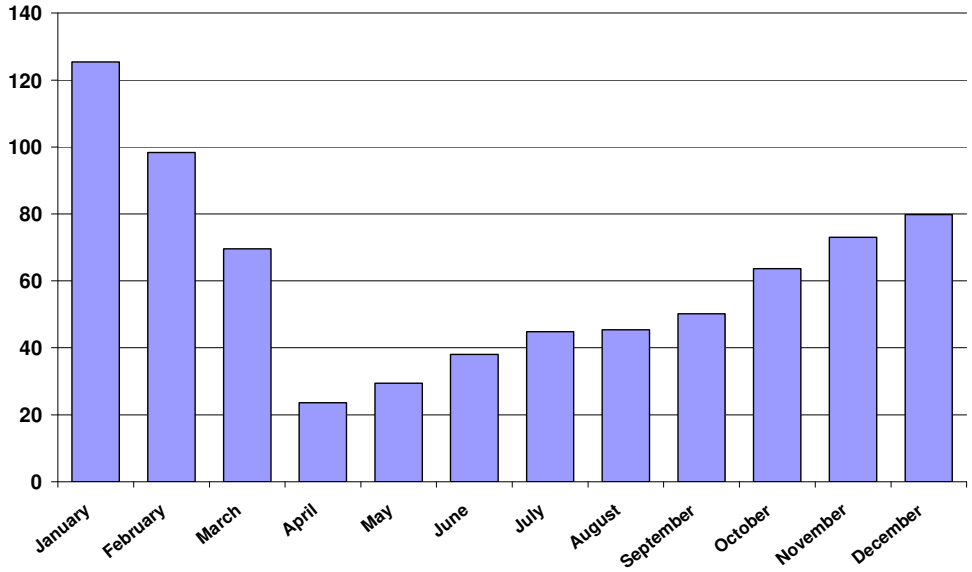
Geographic Location of Logging Truck Crashes by Region
2000 - 2004



Summary of Logging Truck Accidents by Month

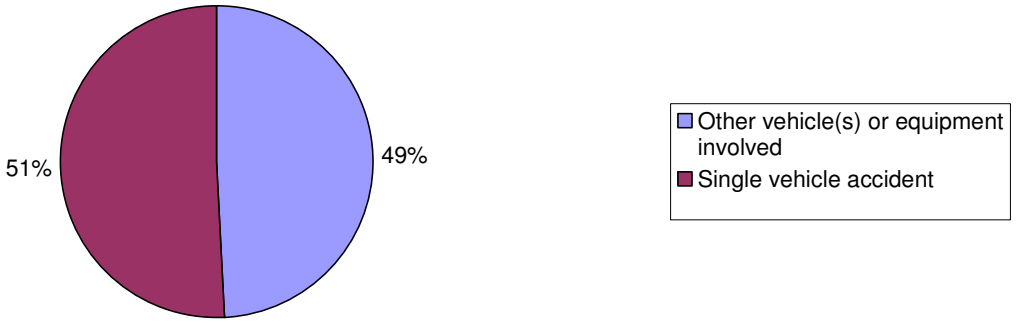
	Jan	Feb	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec	TOTAL
2000	125	114	56	23	39	36	41	44	62	73	66	65	744
2001	116	97	59	16	26	38	44	50	48	60	59	83	696
2002	132	99	82	34	33	52	55	49	51	59	61	71	778
2003	129	98	86	23	20	27	40	37	39	61	94	92	746
2004	125	84	65	22	29	37	44	47	51	65	85	88	742
Total	**627**	**492**	**348**	**118**	**147**	**190**	**224**	**227**	**251**	**318**	**365**	**399**	**3706**
Average	**125**	**98**	**70**	**24**	**29**	**38**	**45**	**45**	**50**	**64**	**73**	**80**	**741**
% of Total	***16.9***	***13.3***	***9.4***	***3.2***	***4.0***	***5.1***	***6.0***	***6.1***	***6.8***	***8.6***	***9.8***	***10.8***	***100.0***

Average Number of Monthly Logging Truck Crashes
British Columbia 2000 - 2004



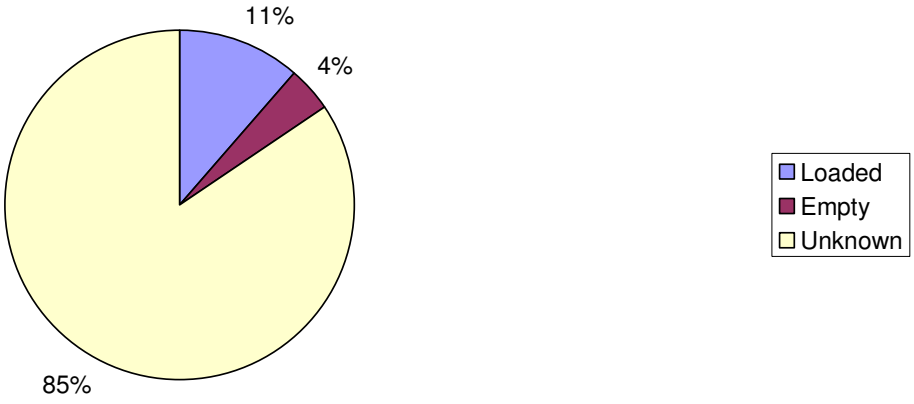
Involvement of Other Vehicles and Equipment in Logging Truck Accidents

January-March 2005 Logging Truck Accidents (Percentages)
Source: Insurance Corporation of B.C. Database
Total of 212 Accidents



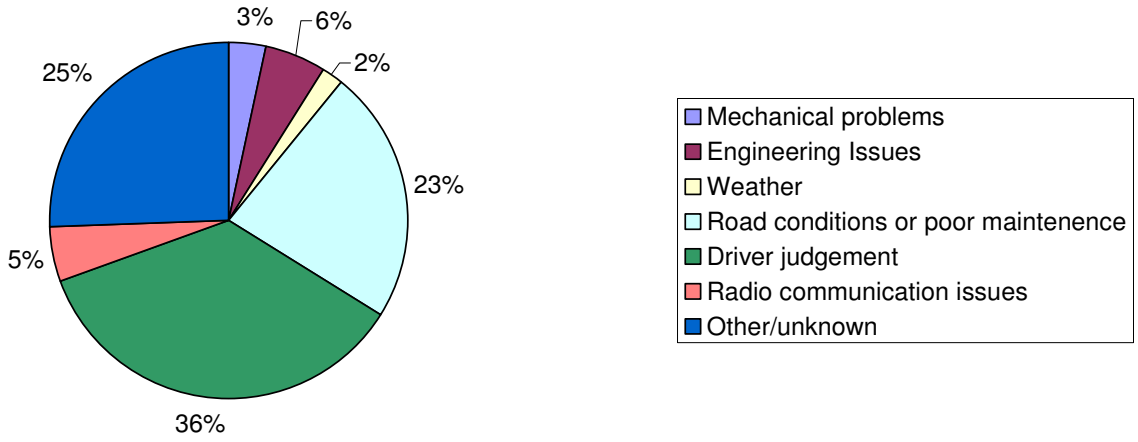
Percentages of Logging Truck Accidents Involving Loaded/Unloaded Trucks

January-March 2005 Logging Truck Accidents (Percentages)
Source: Insurance Corporation of B.C. Database
Total of 212 Accidents



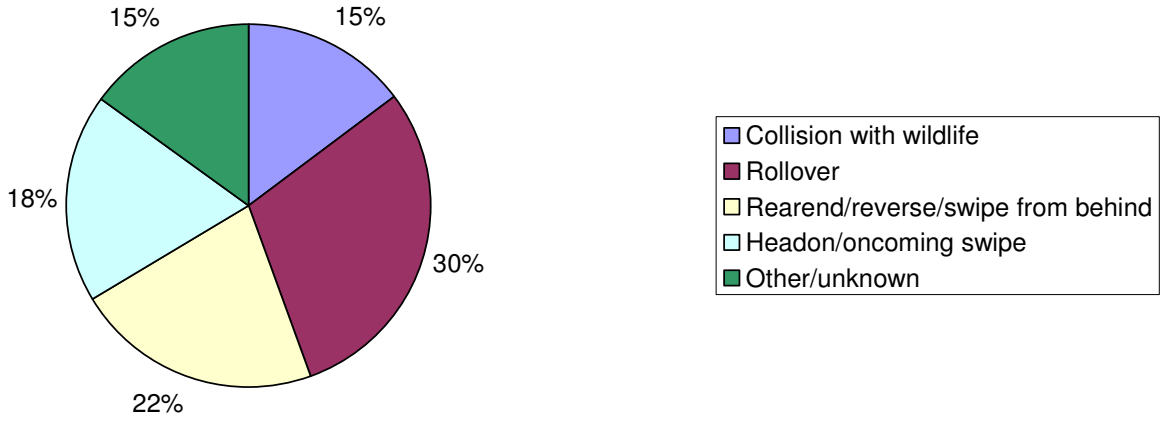
Primary Contributors to Logging Truck Accidents

January-March 2005 Logging Truck Accidents (Percentages)
Source: Insurance Corporation of B.C. Database
Total of 212 Accidents



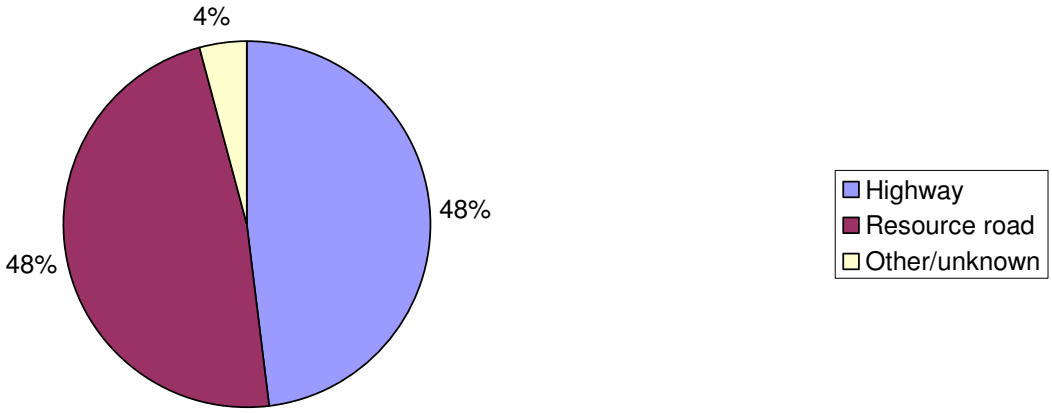
Prevailing Types of Logging Truck Accidents

January-March 2005 Logging Truck Accidents (Percentages)
Source: Insurance Corporation of B.C. Database
Total of 212 Accidents



Sites of Logging Truck Accidents

January-March 2005 Logging Truck Accidents (Percentages)
Source: Insurance Corporation of B.C. Database
Total of 212 Accidents



Aboriginal Peoples

Motor vehicle crashes, including snowmobile and ATV crashes, account for 40 per cent of unintentional injury fatalities among Aboriginal people. In Canada as a whole, automobile-related deaths in Aboriginal people are several times higher than in the general population.

Motor Vehicle Crashes are a major contributor to the relatively poor health status and lower life expectancies experienced by Aboriginal people in BC. While the determinants of health such as income and education and social control clearly underlie health outcomes including, motor vehicle injuries and deaths, some factors more specific to the North are worth considering.

Did you know?

A recent study in British Columbia showed that Aboriginal peoples were 9.3 times more likely to die due to motor vehicle accident injuries than other residents of the province.

Distance from health care facilities & urban centres

In common with other Northerners, Aboriginal people often have to drive long distances to carry out daily and weekly activities and when crashes do occur, they are likely to be at considerable remove from emergency response and treatment facilities.

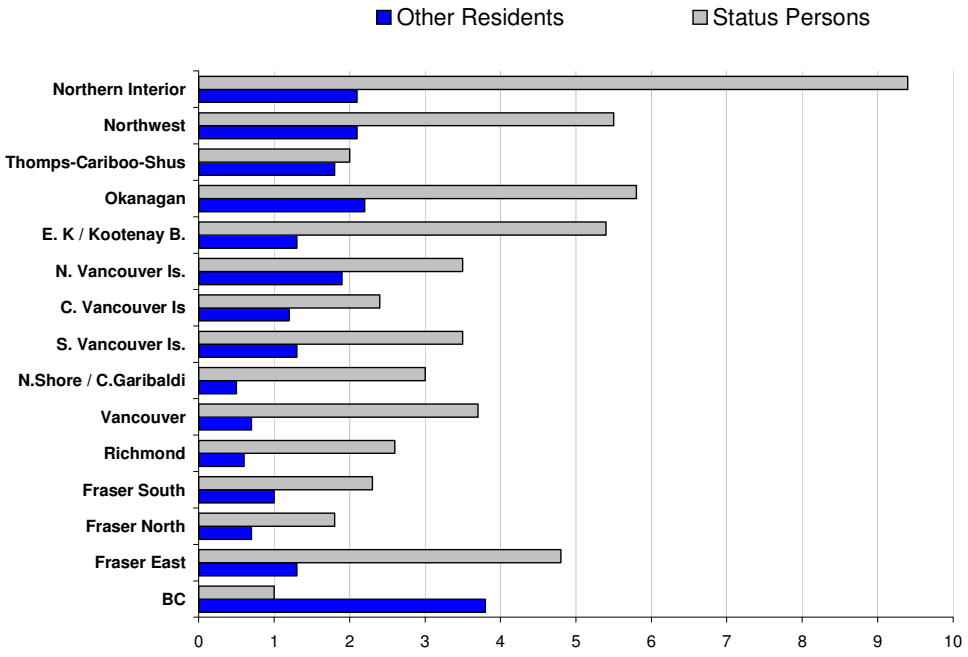
Isolation – Living at the End of a Resource Road

The First Nations communities of BC are spread across a massive geographic area, and many are only accessible by resource roads, which are poorly maintained and rarely policed. Crashes involving wildlife are also more common on so-called “bush roads”. Inadequate vehicle maintenance is not only related to poverty but to the

reality that many smaller, remote communities have no mechanical services available. Gravel and forest service roads are rough, and increase the likelihood of mechanical breakdown for all vehicles. It has been noted that on reserve especially, vehicles may be overloaded, seat belts a not utilized, and children not properly secured in child safety seats,. Access to the nearest town which acts as a service centre to the First Nations community can be a challenge for many First Nations people who don't own a reliable vehicle.

Age Standardized Mortality Rates for Motor Vehicle Fatalities
by Health Service Delivery Area
Status Indian Persons and Other area residents
1992 – 2002

Source: Regional Analysis of Health Statistics for Status Indians in British Columbia, BC Vital Statistics April 2004



Age Standardized Mortality Rate (ASMR) per 10,000 population

For all areas in BC, the Status Indian ASMRs for Motor Vehicle crashes were higher than those for other residents in the same geographic area – The Northeast had the widest gap in rates and also the highest ASMR for Status Indians. Note: Age standardized mortality rates (ASMR), allow for direct comparison between populations with different age structures.

Did you know?

The economic and social consequences of road crashes are profound - estimated to be $25 billion a year. This figure includes not only the direct and indirect costs but the estimated costs of pain and suffering.

Commercial Drivers

The major economic growth currently being experienced in the forest, mining, gas & oil and exploration sectors of Northern BC is translating into higher volumes of traffic and increased incidents of commercial crashes, especially those which involve collisions between commercial and private vehicles. E Division (BC) RCMP Inspector Norm Gaumont believes that commercial drivers are involved in 50% of all crashes in BC.[3]

Seat belts- lack of seat belt wear. A mythology exists among many truckers that wearing a seatbelt will hinder them from escaping their trucks in a crash. As a result, in many crashes involving commercial vehicles, the wrecked truck still contained "liveable life space", but the driver was deceased. By self-report, only about 30% of truck drivers wear their seatbelts.

Did you know?

A recent informal survey of Hwy 97 north from Cache Creek to Prince George counted commercial trucks southbound. Trucks from the forestry sector counted more than double all other commercial vehicles combined:

70 Log trucks
54 Chip trucks
91 Lumber trucks
215

101 All others

Over 452 kms, that works out to one truck every 2.2 kms. At 100 kmph, that's one every 1.6 minutes!

Alcohol & Drugs- crash investigations are finding an increasing amount of drugs and alcohol as causal factors in commercial crashes. Autopsy toxicology reports indicate that a large number of commercial driver who died in crashes were legally impaired by alcohol, marijuana, cocaine and/or crystal meth.

Fatigue- Driver fatigue is a major concern in the commercial vehicle crash picture. It is one of the 4 top causal factors. One of the issues that drivers constantly refer to is rates of pay, which translates into drivers over-extending themselves, log book violations, vehicle maintenance issues, and fatigue.

Speed- excessive speed and aggressive driving contribute to all crashes, but even more to commercial vehicles because of vehicle weights and the subsequent increased amount of time and distance needed to stop safely. Other factors related to speed include overdriving the headlights, night driving, and road conditions. Driving the posted road speed is still dangerous when road or weather conditions are poor.

In collisions, the sheer size of some trucks puts car occupants at a disadvantage. Many drivers are intimidated when they must share the road with large trucks, and not without reason. According to BCAA, people in passenger vehicles account for 98% of the deaths in fatal two-vehicle crashes involving a car and a truck over 10,000 pounds. However, the

survey found that in most cases, police, survivors or witnesses identified at least one unsafe act by the car driver.

A maneuver by a car near a large truck may be more dangerous than the same maneuver near another car. Similarly, a large truck may perform a maneuver that carries low risk of a crash near another truck in the traffic stream, but a higher risk when performed near a smaller vehicle.

A study by the University of Michigan Transportation Research Institute, found that drivers who get involved in fatal crashes probably drive the same way around trucks as they do around other cars. It identified five driving behaviors that were factors in most of the fatal crashes:

- failing to stay in the lane or running off the
- road;
- failing to yield the right of way;
- driving too fast for conditions or above the speed limit;
- failing to obey signs and signals;
- driver inattention.

Where do crashes happen?

Rural vs. Urban

Most of Northern BC is considered “rural”, which for the traveling public means a number of things: longer distances to medical care, inadequate communications infrastructure, and longer wait times to get help if a crash occurs.

The chart below illustrates that though there are far more crashes in urban areas than in rural regions, the ratio of fatalities to injuries demonstrates that collisions in rural areas are more likely to be fatal than in urban areas. One in every 136 (1:136) crashes in an urban area of Canada resulted in a fatality in 2002, according to Transport Canada, compared to 1 in 25 crashes in rural areas (1:25). Reasons for the increased fatality rates in rural areas include the higher rates of speed traveled on highways, increased public interface with commercial and resource vehicles, emergency response times, distance to hospitals, and multiple victims in a single crash.

Injuries & Fatalities in Canada by Location

No one agency or sector holds a cure, but individuals, groups, agencies and governments working together can and will make a difference.
~ David Bowering, CMO, NHA

Location	Fatal	Personal Injury
Urban [1]	805	109,405
Rural [2]	1,599	40,206
Not stated	29	2,224
Total	**2,433**	**151,835**

[1] Urban includes: (a) metropolitan roads and streets and other urban areas, or

(b) A speed limit at the collision site of 60 km/h or less.

[2] Rural includes: (a) primary or secondary highways, as well as local roads, or

(b) a speed limit at the collision site exceeding 60 km/h.

Intersections and parking lots are also the scenes of many crashes. People cut corners; try to get through yellow lights, change lanes in intersections and so on. Parking lots don't seem to have "rules" and there is so much to watch for while seeking that parking place – pedestrians, other vehicles coming and going, vehicles backing up, and often, poor visibility and inadequate space.

It has been observed that most crashes in intersections occur within the first two seconds of a light changing to green – drivers coming from the wrong direction trying to make a last second "sneak" through the intersection before the oncoming traffic gets moving. It would make sense for the first driver at the intersection to count to 2 after the light changes before starting to move.

When do crashes happen?

Crash Trends in the North – by month 2002-2005

Table 1: Source ICBC

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Totals
2002	1852	1435	1560	1098	1114	1322	1308	1270	1219	1485	1650	1625	16938
2003	1827	1449	1490	1052	1111	1185	1220	1180	1177	1490	1814	1789	16784
2004	1829	1260	1153	929	1051	1096	1186	1138	1120	1523	1602	1709	15596
2005	1864	1151	1145	999	1098	986							7243

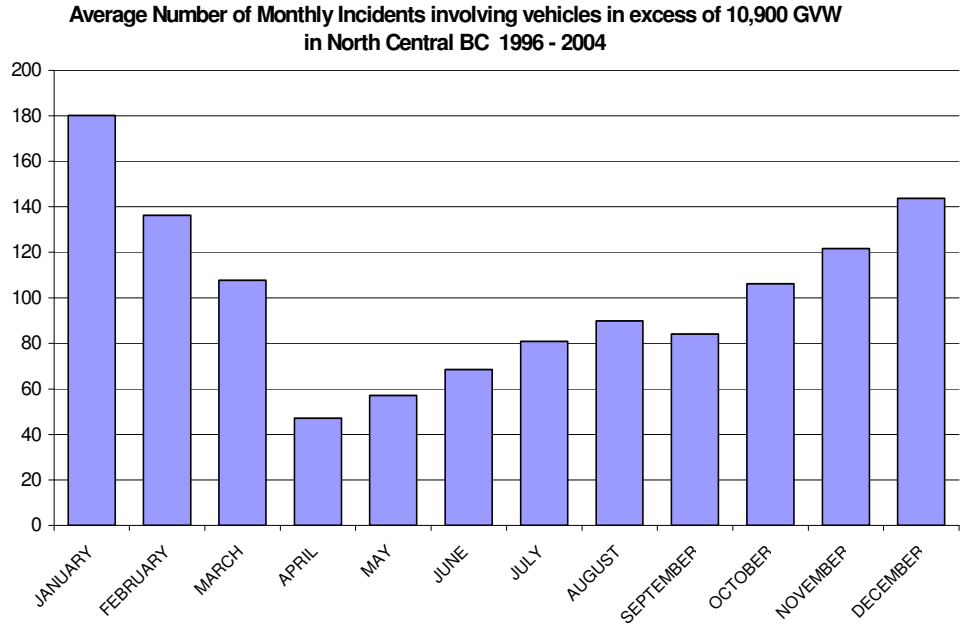
Winter Driving

From this data, several trends become evident:

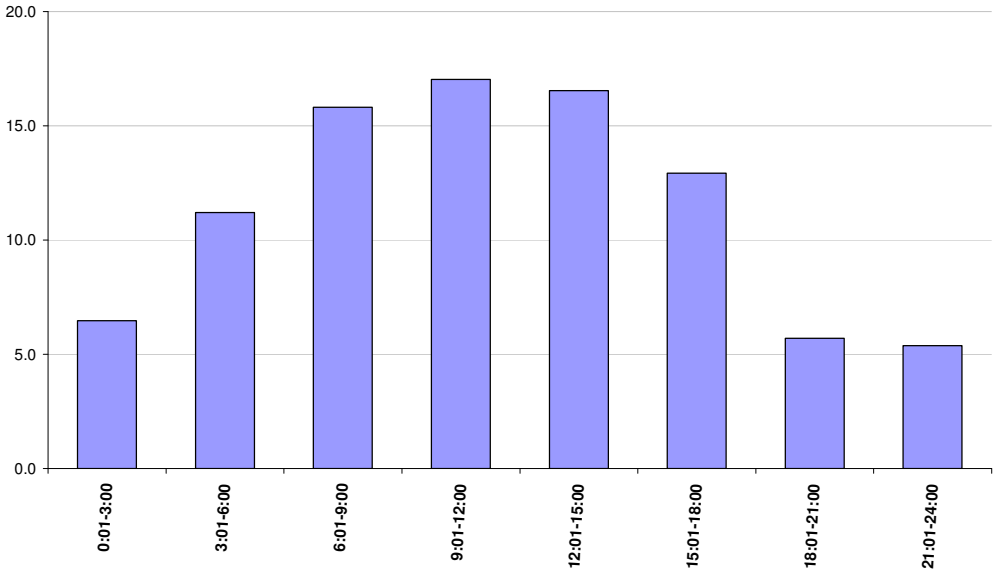
- January is consistently the worst month for crashes, followed by December and November
- Crash levels have slowly decreased over the past few years
- The winter "shoulder" months (October/March) are higher than summer months, possibly due to seasonal weather and road condition transitions.

The number of crashes involving heavy commercial vehicles is also effected by seasons – the winter log hauling season, and as the graph below clearly illustrates, "break-up"- the months of April & May when fewer forestry related vehicles are on the road.

Source: ICBC



Northern crashes by time of day, averaged over a 5 year period



Why do crashes happen?

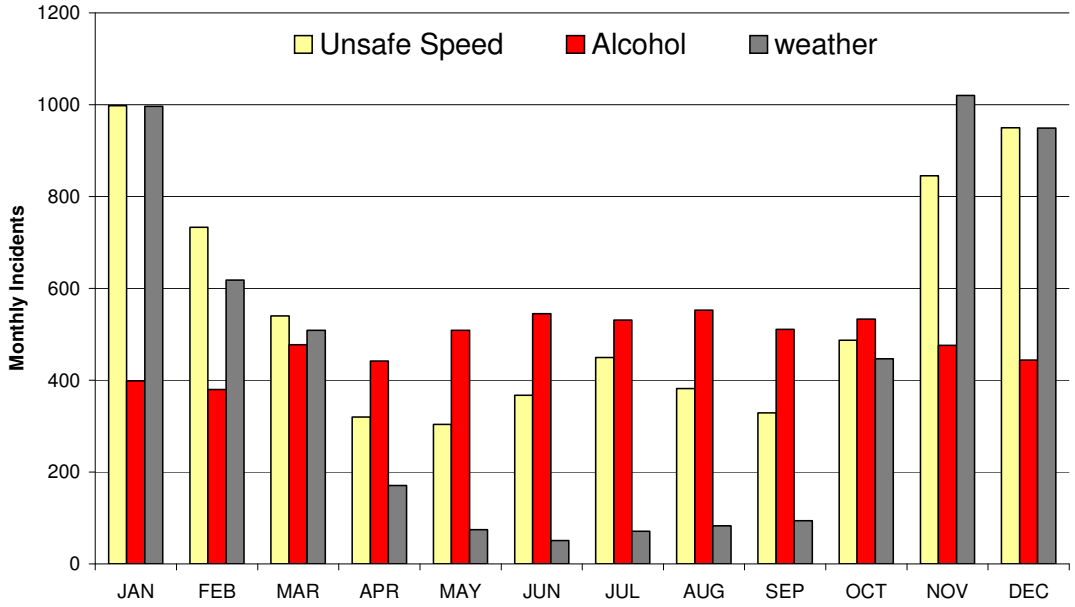
Contributing Factors:

During the period 1996 – 2005 there 22,122 Motor vehicle incidents in Northern BC where contributing factors were noted:

- *Unsafe speed* was noted as a contributing factor in 6704 incidents
- *Alcohol* was noted as a contributing factor in 5800 incidents
- *Weather* was noted as a contributing factor in 5084 incidents
- *Following too closely* was noted as a contributing factor in 1981 incidents
- *Ignoring Traffic Control* was noted as a contributing factor in 1248 incidents
- *Fatigue* was noted as a contributing factor in 1222 incidents
- *Illegal Drugs* were noted as a contributing factor in 83 incidents

Source: TAS Stats – July 2005 – ICBC Stats

Top 3 Contributing Factors to Motor Vehicle Incidents during a calendar year based on 22,1222 cases recorded from 1996 - 2005 in North Central BC



SOURCE: ICBC Monthly TAS Report

"Booze, belts & speed"

According to a veteran RCMP officer, the top 3 contributing factors to injuries and fatalities due to motor vehicle crashes are "booze, belts and speed". Impaired drivers still wreak havoc on our roadways. People still don't put their seat belts on. And people still drive too fast for road conditions, traffic conditions and regulations, and their own levels of skill and control.

Sadly, or fortunately, depending on how one views it, these same three factors are entirely changeable, through enforcement, education and engagement. People need to take personal responsibility for how fast they drive, the conditions in which they drive, and whether or not they utilize the devices that have been resoundingly proven to save lives and reduce injuries.

Not Just Booze

A M.A.D.D. Canada report (2004) states 14% of Canadians reported using cannabis in the past year, double the rate reported in 1994 (7.4%). Reported youth rates show almost 30% of 15-17 year olds and just over 47% of 18-19 year olds used cannabis in the past year. (Health Canada, November 2004)

In British Columbia, autopsies on 227 fatally injured drivers found 31% positive for only alcohol, 9% positive for drugs and 11% positive for both.

In Ontario, 1996 and 1997 surveys found people reporting driving within an hour of cannabis use in the past 12 months was 1.9% among the entire population; however, 9.3% among 18-19 year olds. Among cannabis users, the percentage reported driving within an hour of cannabis use was 22.8% (13.4% female and 28.2% male).

In Quebec, a study of fatally injured drivers (April 1999 to November2001) indicated 22.6% were positive for only alcohol, 17.8% were positive for only drugs, and 12.4% were positive for both.[4]

Did you know?

Allowing yourself enough time for a journey when the road conditions are less than ideal can save lives.

A good rule of thumb, give yourself 7 minutes more time to reach your destination for every 10kms/hr you need to slow down to get there safely.

Weather

In British Columbia we seem to experience two driving seasons – winter and summer. The spring and the fall seasons are transitional, and depending on location and elevation, can still experience severe winter or summer conditions. Indeed, because Northern Health covers such a vast geographic area, a driver can encounter both sets of conditions in the same day!

Fog, severe rain and wind storms, and sticky wet snow are the main weather experiences of the coastal areas, often limiting visibility and making road conditions treacherous.

The North experiences bitter cold, strong winds, and dry blowing snow. The wind and snow blowing across the roads can "polish" a

snow or ice covered roadway, like a sheet of glass, making it extremely slippery.

In the Interior, fog, heavy rains, sticky wet snow, or dry blowing snow, and freezing rain are all common occurrences. A driver must be prepared to deal with every situation.

According to enforcement and investigative agencies, drivers tend to put too much faith in their 4-wheel drives, their tires and their headlights. RCMP members cite many incidences of people overdriving their headlights (going faster than what their headlights can illuminate ahead), or relying on 4 wheel drive in order to maintain normal summer speeds on winter condition roads.

Proper vehicle maintenance becomes critical for safe driving in severe weather conditions. All season radial tires just are not sufficient for driving on snow and ice. Proper tires, inflated to proper pressures, are absolutely necessary – they are the vehicle's only contact with the road. Windshield wipers in poor condition reduce visibility, thereby increasing risk.

Driving to suit weather and road conditions requires common sense, and discretion on the part of the driver, to assess the risk of travel, and the rates at which travel would be safe. The RCMP/Ministry of Highways closes roads upon occasion when conditions are very severe, but even though a road may be open, there still can be treacherous sections, or unexpected slippery spots (shade, over bridges, etc)

Ultimately it is the driver's responsibility to decide if travelling is safe, at what speed, in what condition of vehicle, and at what time of day. Sometimes the best decision would be to delay the travel rather than take the risk. Unfortunately, inexperienced drivers don't have the appropriate knowledge and judgement needed to safely drive in harsh conditions, and as a result, are more likely to end up in crashes.

Following too closely

Following too closely is listed among the top 3 contributing factors to crashes in many of the communities in BC (ICBC: Community Crash Profiles, www.icbc.com). The distances needed to stop safely depend on the speed of travel and the reaction time of the driver and the weight of the vehicle being driven. Drivers need to be aware of the distance they need between themselves and the vehicles or obstacles in front of them.

There are three things that add up to total stopping distance: ***Perception Distance + Reaction Distance + Braking Distance = Total Stopping Distance***

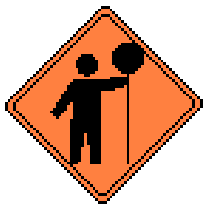
Perception distance. This is the distance the vehicle travels from the time the eyes see a hazard until the brain recognizes it. The perception time for an alert driver is about 3/4 second. At 90 kmph, the vehicle travels 60 feet in 3/4 second.

Reaction distance. The distance traveled from the time the brain tells the foot to move from the accelerator until the foot is actually pushing the brake pedal. The average driver has a reaction time of 3/4 second. This accounts for an additional 60 feet traveled at 90 kmph.

Braking distance: The distance it takes to stop once the brakes are put on. At 90 kmph on dry pavement with good brakes it can take a heavy vehicle about 170 feet to stop. It takes about 4 1/2 seconds.

Total stopping distance: At 90 kmph it will take about 6 seconds to stop and the vehicle will travel about the distance of a football field. (60 + 60 + 170 = 290 feet).

Ignoring Traffic Controls



Stop means stop. Yet every day drivers "roll through" stop signs, try to rush through a late yellow light at an intersection, and otherwise ignore the traffic controls that are put in place to regulate traffic flow.

Roadways are engineered to be travelled at certain speeds. Exceeding those speeds increases the risk of losing control of the vehicle. Curves often have control signs indicating the maximum safe speed at which the curve should be negotiated, yet drivers will "cut to the inside" or try to take the corner as fast as they can.

Did you know?
A "microsleep", one of those naps that last 4 or 5 seconds, is long enough for you to travel more than the length of a football field at highway speed.
~ Worksafe Alberta: Exhausted or Drunk, Behind the Wheel it Makes No Difference

Construction zones are flagged a good distance before the actual location of the work being done in order to give the driver plenty of warning of obstruction, narrowing to single lane traffic, slow-downs or possible delays. Yet every year crashes occur in construction zones, when a vehicle approaches a construction area too quickly, or smashes into a line-up of vehicles waiting to get through. The ultimate irony in drivers ignoring traffic controls are the deaths of "flag-persons", the traffic controllers who stand in the roadway to direct traffic.

Fatigue

Driving long hours can make a person feel tired, sleepy, irritable, depressed, or giddy. Fatigued persons tend to react more slowly, fail to respond to things going on around them, are unable to respond correctly, are not able to concentrate, exercise poor judgement, and have a greater tendency to take risks.[5]

The long distances and hours many northerners drive create potential dangers due to driver fatigue. An article in the New England Journal of Medicine, "The Perils of Drowsy Driving", states that "studies have identified fatigue as the leading cause of truck crashes".[6]

The U.S. National Highway Traffic Safety Administration has long recognized drowsy driving as a "significant and complex public health threat".[7] The effect of lost sleep accumulates over time and does not dissipate. This means that with the same insufficient amount of sleep each day, the strength of the tendency to fall asleep while driving progressively increases.[8]

Did you know?
One man in the US had so many accidents related to food on his driving record. That a "restraining order" had been issued against having anything edible within his reach while driving.
- Insure.com

A study of long-haul truckers and sleep deprivation concludes, "long-haul truck drivers obtained less sleep than is required for alertness on the job."[9] Other studies have shown that drivers who drive long distances over long periods of time (1 year or more) are more likely to experience daytime fatigue, daytime tiredness, unrestorative sleep, hypertension and overweight.[10]

Sleep apnea is a condition in which breathing stops or hypoventilation occurs during sleep. People with sleep apnea are typically overweight, have loud irregular snoring, and are tired during the day because of their disturbed sleep patterns. The relationship between sleep apnea and traffic accidents has been found to be significant[11], even when other circumstances such as alcohol consumption, age, body-mass index, driving experience, sleep schedule, use of drugs and personal driving history are factored in. Study results show that the rate of crashes among persons with sleep apnea is three to four

times the rate among persons without the condition. Unfortunately, an estimated 80% of cases of sleep apnea are undiagnosed.

Many professional drivers, particularly logging truck drivers, work upwards of 12 hours per day. WorkSafeBC and the BC Forest Safety Council's Forestry TruckSafe Initiative are currently surveying logging truck drivers in order to identify issues and strategies to reduce trucker fatigue.

Wildlife

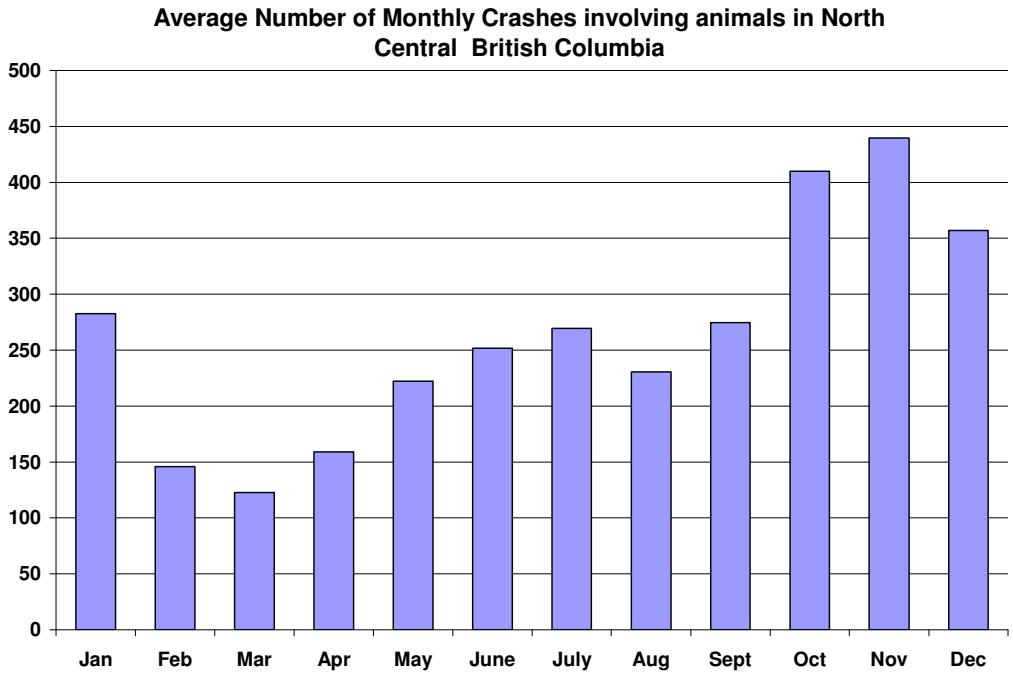
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	
2002	296	135	121	122	215	285	297	265	266	448	443	327	**3220**
2003	295	172	123	173	255	246	244	215	283	439	456	430	**3331**
2004	257	130	124	182	197	224	267	212	275	343	420	314	**2945**
2005	225	131	176	192	248	226							**1198**

Interaction with wildlife is part of BC living. Drivers are well aware of the dangers presented by wildlife crossing the road, yet crashes involving wildlife continue at an average rate of 3000 per year. The numbers below reflect reported animal crashes in the north by month for the past 4 years.

An Average Year: Past wildlife- vehicle collision records demonstrate that in a typical year in BC*:

- 3 people are killed
- 247 motorists are injured
- 9,300 wildlife vehicle accident claims are received by ICBC. This number increased to 10,200 claims in 2003.
- $20 million dollars is spent by ICBC on vehicle damage claims, plus additional costs for personal injury and "swerve to miss" claims.
- $600,000 is spent by the Ministry of Transportation for highway clean-up
- 4,300 animals are recorded as killed
- 13,000 animal deaths go unrecorded

**All figures are mathematical averages, obtained from past records of the Insurance Corporation of British Columbia and the British Columbia Ministry of Transportation.*



A Concern for Wildlife

Northern BC has some of the highest risk highways for wildlife-vehicle collisions in BC. 7 out of the 10 highest ranked stretches of highway in BC for moose-vehicle collisions are in north/central BC (data from the Ministry of Highways).

A detailed study of animal caused fatalities from the BC Vital Statistics Agency of BC (1969-1997) says that during that time, moose were the single greatest cause of animal-vehicle collision fatalities. 59% of all moose related fatalities in BC occurred in or around Prince George. An additional 20% of the fatalities were on Highways 16 near Terrace and Smithers.

Some estimates are that there is a human fatality in one out of every 500 moose vehicle collisions.

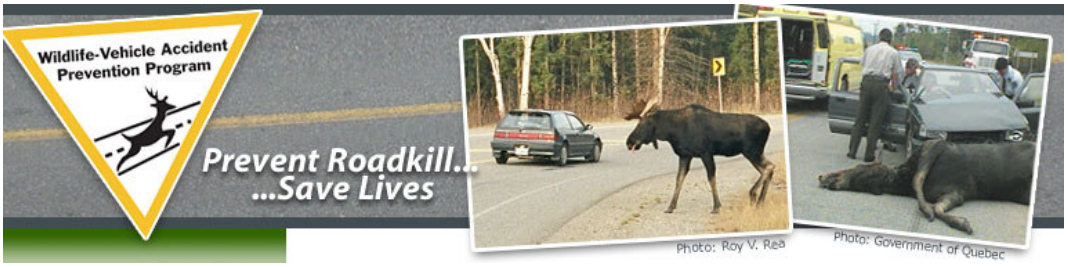
BC Ministry of Transportation (MoT) statistics show that from 1992 to 2002, 45,096 animals were reported killed on BC highways. MOT estimates that this number may represent only 25% to 35% of the real number of wild animals killed. The actual total of wild animals killed in the ten year period from 1992 to 2002 could be as high as 128,846 or more.

Approximately 80% of wildlife-vehicle collisions involve deer. Moose, elk, bears, coyotes and other wildlife make up the remaining 20%. Collisions with smaller wildlife species are extremely common, but as they cause less damage to private property or human life, they rarely appear in official statistics.

Common factors of road stretches with high numbers of wildlife-vehicle collisions include:

- Where creeks and drainages intersect roads
- Good habitat and forage near the roadside
- Water source nearby

- Long, wide, straight stretches of road



The first three factors are self evident. The availability of forage and water close to the road is likely to increase the presence of animals.

The fourth factor is more troublesome. One assumption is that when there are good road conditions - long, wide and straight - motorists tend to feel safer and more confident, and therefore accelerate. This increase in speed reduces the reaction time of the driver when an animal is seen on the road.

Distractions

Driving requires alertness and concentration. Yet on long trips drivers tend to add extra activities to their trip to relieve boredom, or to help them stay awake. Studies show that distractions of any kind, even talking to passengers in the vehicle, reduce concentration and slows reaction time. With new technologies being added to vehicles, the number of activities requiring the driver's attention has increased, to the point where drivers are paying attention to everything but the road.

Distractions in cars are considered the cause in 25 percent of the more than 6.3 million auto crashes in the US. According to NHTSA, "distraction was most likely to be involved in rear-end collisions in which the lead vehicle was stopped and in single-vehicle crashes." What makes distraction such a problem is the confluence of the distraction, such as eating, and the unexpected occurrence of events on the road, such as a sharp curve or a driver stopped ahead of you.

According to a State Farm Insurance Survey, eating while driving ranks as the No. 2 driving distraction. Fifty-seven percent of drivers surveyed say they eat and drive. The No. 1 distraction noted by 62 percent of surveyed drivers is tuning the radio, and No. 3, noted by 56 percent of drivers, is turning around to talk with passengers. Interestingly, only 29 percent of drivers surveyed listed talking on a cell phone as a distracting activity.[12]

Did you know?

There are three things that add up to total stopping distance:

Perception Distance +

Reaction Distance +

Braking Distance =

Total Stopping Distance

Did you know?

Eating while driving is dangerous, but what you eat while on your travels can be dangerous too.

Many people eat junk food as they travel, and drink coffee or pop. Junk food is full of sugar and carbohydrates, which elevate your blood sugar levels which lead to a surge in insulin followed by low blood sugar… and you get sleepy.

Drink water, and stop every couple of hours to stretch your legs and get some fresh air. The few minutes it will take could save a life.

Cell phones (and radios, other communication devices)
The risk of a crash when using a cell phone is 4.3 times greater than the risk when a cell phone is not being used, according to a 1997 study.[13] Cell phone use has proliferated since 1997, and several countries have banned the use of cell phones while driving. Not only is the risk present during the actual call, but this same study of 26,798 calls found that the risk is considerably increased close to the time around the call itself (4.8 for calls placed within 5 minutes of the crash, compared to 1.3 for calls placed more than 15 minutes before the collision). The use of hands-free technology offered no safety advantage over hand-held units. But the cell phones came in handy post-crash, to call for help!

Sound systems
Today's sound systems are more complex and louder than ever. Tuning a radio or satellite radio, installing cd's or cassettes, searching for the desired track, adjusting volumes, all take the driver's eyes and attention off the road. To offset this concern, many automobile designers are now installing volume and search controls in the steering wheel.

Volume levels are of particular concern. Often one can hear a vehicle coming long before one sees it – and it's not the sound of the vehicle's engine that's heard. So called "boom boxes" have volume and base level capabilities far beyond what's necessary to hear the music. And the driver and passengers inside can't hear what's going on outside their vehicle, such as the air horn of a commercial truck, a train whistle, or the sirens of emergency vehicles.

Eating
Eating while driving means that the driver does not have one, or even both, hands on the wheel. Hot food and beverages spill, and drivers react by trying to clean up, even while driving. The automatic human response is to jerk away and tend to the injury.

More than 70% of drivers surveyed by State Farm Insurance said they eat while they drive. Vehicles with standard transmissions require one hand working the shifter. If the driver has food in one hand, and the other on the shifter, what's holding the wheel?

The quality of food eaten during travel is also a concern. Too many carbohydrates and sugar contribute to high blood sugar levels which are quickly followed by low blood sugar and sleepiness. Too much caffeine and salt contributes to high blood pressure. Too much cholesterol (greasy food) contributes to heart disease. Many crashes are attributed to emergent health events such as strokes and heart attacks, and the driver's diet and lifestyle are major contributing factors to those events. For commercial drivers or drivers whose job requires a great deal of road travel, nutrition and exercise are key to road safety and road health.

What Works?

Common themes among world leaders' road safety strategies

- ***Engineering***- road design, removal of hazards, enhancing signage, rumble strips, safety of curbs, road maintenance
- ***Enforcement***- seat belts, speeding, drunk driving, targeted strategies based on research, child safety seats
- ***Education*** – improved driver training & certification, proper use of child safety seats, helmet use, pedestrian awareness, cyclist awareness, commercial driver certifications, seat belt use
- ***Engagement & collaboration***- coalitions of government, public and private sectors, and citizens; sharing responsibilities for the roads among road users; partnering on every aspect of transportation, from engineering, cost sharing and usage.
- ***Research***- building a repository of information, research and analysis for sharing best practices and outcomes of specific strategies.
- ***Promotion of a culture of road safety***- in the words of the BC Forest Safety Council's TruckSafe motto, "unsafe is unacceptable". When the general population begins to embrace a culture of road safety, and further to that, "road health", pressure builds on government, industry and every road user group to come up with solutions, both legislative and regulatory, and in the area of personal behaviour changes.

What are some of the other provinces doing about the issue?

- **Ontario** set up its road Safety Think Tank in October 2004, which consists of the ministries of Transportation and Labour, the Insurance Bureau of Canada, the Transportation Health and Safety Association of Ontario, and the Ontario Workplace Safety and Insurance board. This consortium is collaborating to focus on social marketing, education, legislation, enforcement, and infrastructure.
- **Nova Scotia's** Workers' Compensation Board is partnering with the Nova Scotia Trucking Safety Association to administer a Certificate of Recognition to good performers in the province's trucking industry. The Nova Scotia Trucking Safety Association facilitates the deliver of quality, effective training programs to ensure a safe working environment and a skilled workforce in the trucking industry, in compliance with industry and government regulation (2002). WCB Nova Scotia now jointly signs the Certificate of Recognition (2004). Over the past 8 years WCB rates have been reduced by 40% in the forestry sector.
- **Alberta** released the report "Saving Lives on Alberta's roads" (June 2004), which details recommendations for a comprehensive approach to road safety, with links among education, awareness, enforcement, engineering, legislation and standards, and social policy areas. Alberta's Ministry of Transportation is now implementing a voluntary, one year diver training program, which will certify participants as professional truck drivers. The program will provide skills in driving, cargo securement, fatigue management, dangerous goods management, vehicle maintenance, and safe operation in all types of terrain and weather.

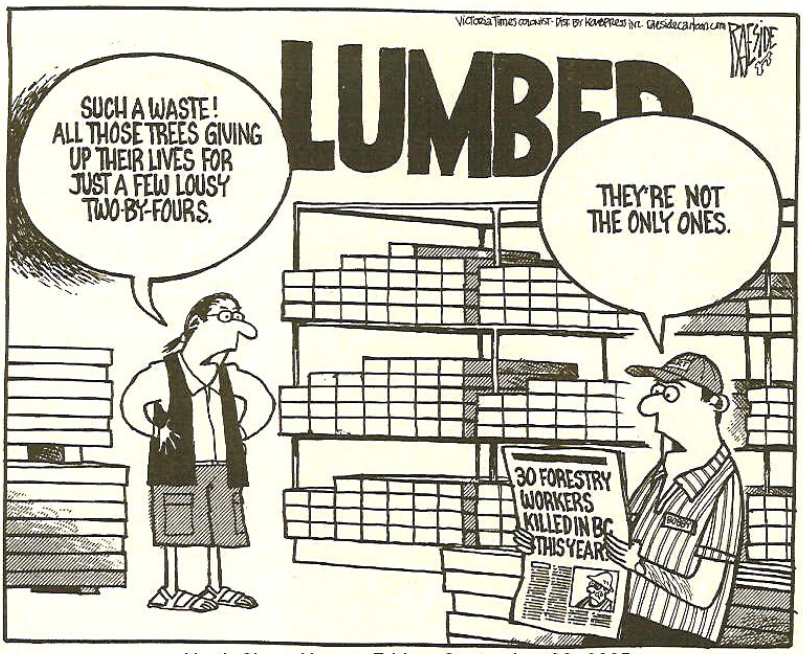
Did you know?

Passenger car drivers were found to have contributed to fatal car-truck crashes 74.1% of the time.
-University of Michigan Transportation and Satety Institute

What are other countries doing about the issue?

- The **United Sates** is focusing considerable enforcement efforts on increasing seat belt use and decreasing drinking and driving. Their target is a 20% reduction in total road user fatalities and injuries by 2008 compared with 2000 figures and a 50% reduction in commercial vehicle related deaths and injuries by 2010.

- **Great Britain** has set up a year-round road safety, public awareness campaign called THINK!, which focuses on child safety, vulnerable road users, drinking and driving, and related road use issues.
- **Sweden's** Vision Zero program (which is also the country's long-term goal) focuses on special safety measures for the most dangerous roads and safer traffic movement in built-up areas, emphasizing road user responsibility, safer cycling conditions, and compulsory use of studded winter tires.
- The **Netherlands** has focused on sharing of costs and responsibilities among the national, provincial, and municipal governments as well as the private sector. Some key activities include modifying all road user behaviour, improving road and motorway infrastructure, improving driver training, enhancing police enforcement, and reinforcing the safety culture.
- **Norway,** like Sweden, is implementing the Vision Zero concept. Norway is targeting measures to regulate driver behaviour such as reducing speed limits on the most dangerous roads, banning the use of hand-held cell phones while driving, and increasing the demerit points for driving offences.



North Shore News - Friday, September 30, 2005

FAQ's from WorkSafeBC

Why is the trucking industry important to BC and Canada?
In 2002, BC's trucking industry:

- Represented about 15.7% of Canada's commercial transportation industry
- Contributed 5.4% of B.C.'s GDP

In 1999, more than 90,000 people in BC worked in the transportation and storage industry, with trucking representing 28% of this industry sector's workforce. Most of the industries within this group are involved in the transportation of either freight or passengers.

What are some of the factors that contribute to serious injuries and fatalities?

- Unrealistic scheduling demands on trucking firms, drivers, or shippers and receivers
- Driver fatigue
- Overexertion
- Falls from elevation
- Inadequate facilities for safe transfer
- Improperly secured truck loads
- Roads design and maintenance
- Truck maintenance frequency
- Driving without due care
- Unsafe speed
- Failing to yield right of way

What are the general claims and fatality statistics for the trucking industry?
In the years 2000 and 2004, truck driver injuries in BC represented about:

- 114 fatalities. Nine of these were young workers
- 533 serious injuries
- 21,700 time loss claims. These are claims that have had costs such as wage loss or a permanent disability award. Medical aid only claims are not included.
- 650,900 work days lost. When prior years' claims are included, the total work days lost is 1,181,000.
- $101 million in claims costs. These claim costs reflect the actual payments and awards from 2000 to 2004, not the full (e.g., does not include administrative) and future cost (liabilities) of claims. When prior year costs are included, this total is $298 million in claim costs.

Did you know?

*At **100 kmph** it takes **100 meters** for a loaded tractor-trailer unit to stop.*

A straight truck (less than 33,000 lbs) needs 95 meters to stop.

A smaller commercial vehicle, such as a 5 ton cargo van, needs 65 meters to stop safely at 100 km/ph speeds.

Empty trucks actually require greater distances to stop because empty vehicles have less traction and are more likely to bounce or have the wheels lock up

- Stopping Power, by Paul Hartley

How is safety climate defined?
The safety climate of a company is an assessment of employees' perceptions (or shared understanding) of the company's safety policies and procedures, compared to actual safety practices and behaviours. It indicates how workers' perceive the priority given to safety over production in their workplace.

"Safety culture" and "safety climate" are sometimes used interchangeably. Safety culture can be defined as the shared values, beliefs, assumptions, and norms that govern how a company makes decisions about safety and the attitudes of individuals and groups toward

safety. Some regard safety climate as a measure of the safety culture of an organization because it examines workers' perceptions of the priority of safety in their workplace.

Research has found a link between a company's safety climate and employees' safety behaviour and injuries. Company leaders create safety climate and culture. Therefore, managers and supervisors are key to improving safety culture and reducing workplace injuries in an organization.

Won't this plan cost trucking companies more money at a time when costs are already high?

Although profit margins are narrow in the trucking, it has been proven that health and safety programs add to the profit margin. As employers and drivers adopt and implement Codes of Practice or safety performance agreements, economic incentives will reward well-performing trucking companies committed to health and safety, and encourage improvements in the performance of other trucking companies.

Influencing personal choices

Probability of Loss Triangle

The Probability of Loss Triangle demonstrates the pyramid effect that begins with people making risky behaviour choices. The laws of probability show that for every 9600 risk-taking behaviours, there will be 600 misses, there will be 30 incidents of property damage, 10 injuries, and 1 fatality.

When calculations are made in reverse, based on current NH crash figures, the results are staggering. The *77 fatalities* of 2004 means that there were an incredible *42,600 near misses*, resulting from *739,200 risk taking behaviour choices*! These are choices made by everyday drivers, passengers and pedestrians – you and me. We need to change our attitude towards safety, health, and make different choices.

NORTHERN DRIVERS FATIGUE SURVEY TOP 5's

My fatigue is caused by:

1. not enough sleep (13)
2. long shifts (11)
3. not enough rest breaks (11)
4. weather conditions (10)
5. waiting to load or unload (10)

My lack of sleep is caused by:

1. extended work hours (13)
2. work-related stress (12)
3. family worries (9)
4. lack of exercise (5)
5. sleep disorders (5)

When I feel tired or not alert I:

1. drink caffeine such as coffee or coke (13)
2. use medication or drugs (11)

3. open windows (10)
4. take a brisk walk or exercise (7)
5. turn up the radio or sing (7)

In the past month my fatigue has resulted in:

1. slow reaction time (6)
2. a near miss (5)
3. late braking or tailgating (5)
4. crossing over lanes (4)
5. missed road signs (2)

What I know about fatigue:

1. I hear that truck drivers are concerned about fatigue (12)
2. I feel that fatigue can cause injuries and accidents while driving (12)
3. My fatigue affects the safety of my work-related driving (12)
4. I recognize the symptoms of fatigue while driving (12)
5. I am concerned about fatigue (10)
6. I am able to manage/cope with fatigue (10)

24 hour schedule (highest scores only)

1. Before work I normally sleep 5-6 hours
2. I normally work nightshift (majority)
3. In 24 hours I usually drive 15 – 16 hours
4. The number of days that I usually work in a row are 4-5
5. In the past month I worked more than 12 hours a day more than 13 times

Driver profile:

Male, average age: 45-64; 21 years + experience.
½ are employees, ½ are owner-operators, paid by weight
On average they drive 201-500 kms per day, driving semi trailers, b-trains, super-b's.

Resources

Crash Prevention Information

www.smartriskfoundation.ca
www.canadian-health-network.ca
www.icbc.com
www.rcmp-grc.gc.ca
www.phac-aspc.gc.ca
www.tc.gc.ca/roadsafety
www.carsp.ca
www.ccmta.ca
www.driveandstayalive.com
www.tsf-bcaa.com

Wildlife Crashes

www.wildlifeaccidents.ca

Impaired Driving Prevention

www.madd.org
www.sadd.org
www.rrid.org
www.icbc.com

www.cancelled.ca

Commercial Vehicles
www.cantruck.com
www.bctrucking.com
www.safety-council.org
www.worksafebc.ca
www.bcforestsafe.org

Best Practices
www.safespeed.org (UK)
www.thinkroadsafety.gov.uk (UK)
www.ntf.se/engl/english.htm (Sweden)

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[12] http://info.insure.com/auto/badfood402.html

[13] "Association between Cellular Telephone Calls and Motor Vehicle Collisons, New England Journal of Medicine, Volume 335:453-458, February 13, 1997