APPENDIX 4-AJ
KSM PROJECT 287 KV TREATY CREEK TRANSMISSION LINE

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SEABRIDGE GOLD INC.
KSM PROJECT
287 KV TREATY CREEK TRANSMISSION LINE

Rev. 1 - December, 2012

EXECUTIVE SUMMARY

The electric power supply for the KSM project will hinge on an interconnection with the BC Hydro NTL transmission line that that is currently being constructed adjacent to Highway 37. This report reviews the interconnecting KSM transmission line routing; design, costs, and power transfer requirements and provides a path forward to the completion of the project. In addition, project information requirements are addressed as may be required for planning, permitting and future work.

It is concluded that the construction of the KSM 287 kV branch transmission line, generally following the access road right-of-way from Highway 37 to the KSM Treaty plantsite, presents no undue problems.

A companion report by BGC Engineering Inc. titled “KSM Project, Treaty Creek Transmission Line, Geotechnical Assessment” (BGC Report) reviews the geotechnical issues and hazards that are associated with the subject transmission line and provides recommendations. All recommendations and design features as included in the BGC Report have been incorporated into the transmission line design. The BGC Report, included in Appendix C herewith, also includes detailed route maps, geohazards maps and snow avalanche maps with all transmission line structure locations shown.

The project will require construction of the Treaty Creek Switching Station on the NTL transmission line to be located near Highway 37, a short distance north of where the mine access road starts. As of November 2012 Seabridge Gold Inc. (Seabridge) have committed to BC Hydro the expenditures necessary so that the NTL transmission line, now under construction, can accommodate the future addition of the Treaty Creek Switching Station. The modifications include such features as adding two new dead-end structures to the NTL. The switching station will be owned and constructed by BC Hydro and is not part of the KSM project.

The BC Hydro NTL transmission project, which involves a 344 km long 287 kV single circuit transmission line from the Skeena Substation near Terrace, B.C. to Bob Quinn, is currently under construction (November 2012) with completion scheduled for May, 2014.

The KSM transmission line from the Treaty Creek Switching Station to the Treaty plantsite Substation No.1 generally follows the mine access road and the upper North Treaty cut-off ditch such that, for the most part, it shares the right-of-ways with the Treaty Creek road and North Treaty cut-off ditch so as to minimize the environmental impact. The use of steel monopole (un-guyed) construction will facilitate construction of the line next to the somewhat winding road.

The construction of the KSM transmission spur line will not commence until KSM project year two. Hence, the construction will make use of the access roads, camps, and other construction infrastructure already in place at that time.

The project is currently scheduled such that the KSM Transmission Line and the Treaty Creek Substation No. 1 would be completed and ready for energization as per the following schedule:

- Project year 2 transmission line construction.
- Project year 3 - Q3 Energize Transmission Line and Treaty Plant Substation No.1 and supply 15 MW construction power.
- Projects years 4 and Q1 and Q2 of year 5, supply construction power.
- Project year 5 - Q3 and Q4, supply up to 75 MW commissioning loads.
- Project year 6, supply total plant load.

The project year three quarter 3 (Q3) date for supply of construction power depends on BC Hydro completing the NTL transmission line and the Treaty Creek Switching Station by this date. The NTL is scheduled for completion in May 2014 and its completion is thus judged not critical for the KSM project. If the switching station completion were to be late, the only consequence would be that the Treaty Plant diesel construction power station would have to operate for a longer period of time.

The transmission line right-of-way (ROW) would be 40 m wide and, for most of its length, be coincident with one side of the access road or cut-off ditch right-of-ways.

A vegetation management zone, to deal with tall “danger trees,” would extend typically 15 metres on both sides of the right-of-way.

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1.0 INTRODUCTION

1.1 General

This Design Brief was prepared by WN Brazier Associates (Brazier) as requested by Seabridge Gold Inc. (Seabridge) and is an update of the 2010 transmission line report to account for the new Treaty Creek route. This revised report describes the KSM mine and process plant transmission interconnection with the proposed Treaty Creek Switching Station on the BC Hydro NTL transmission line that is currently under construction. This brief summarizes the project requirements, design assumptions and makes reference to the field conditions as discussed in the BGC Report. The purpose is to confirm the technical feasibility of the line design and route and provide information for the KSM Project environmental assessment and permitting activities and to support project decision-making. The technical design basis of this report are the applicable CSA Standards, British Columbia statutory requirements and BC Hydro Engineering Standards as applicable.

The KSM transmission line project will consist of a 30 km long, 287 kV, transmission line extension from the Northwest Transmission Line (NTL) proposed Treaty Creek Switching Station (located near Highway 37) to the KSM No. 1 Substation at the KSM Treaty Plantsite. The Treaty Creek Switching Station will be the electric service Point Of Interconnection (POI) with BC Hydro and will be the point where metering is installed. The route is shown in detail on the drawings included with the BGC Report.

The KSM line extension, in accordance with the BC Hydro tariffs, would be part of the mine infrastructure and BC Hydro would not build or assume ownership of this line. The KSM project will be responsible for all costs.

The planned transmission line is 30 km long, 287 kV, single circuit line utilizing steel self supporting monopole structures (tubular steel structures ranging from 25 to 38 m high) that would be supported by concrete pier foundations. The line will generally follow the mine access road in order to minimize right-of-way requirements and limit environmental impacts. Monopole structures will be used, without guys. This type of structure is ideal for use in a narrow right-of-way, where minimizing permanent land disturbance is a goal, or where transmission lines must follow a road. Constructing the transmission line adjacent to the access road has several advantages including:

- Lower line construction access road costs.
- Easy access for maintenance.
- One services corridor, less environmental impact.

The environmental approval for this line is being obtained as part of the KSM mine EA process.

Monopole, un-guyed sectional steel poles are the selected structure type. This type of structure is ideal for a high voltage transmission line that follows a road.

The necessary temporary infrastructure to support constructing the transmission line will, to a large extent, consist of infrastructure otherwise required for the KSM road and process plant construction. As the transmission line construction will not commence until year 2 of the project, after the mine access road is largely complete, the use of existing infrastructure is both reasonable and economical.

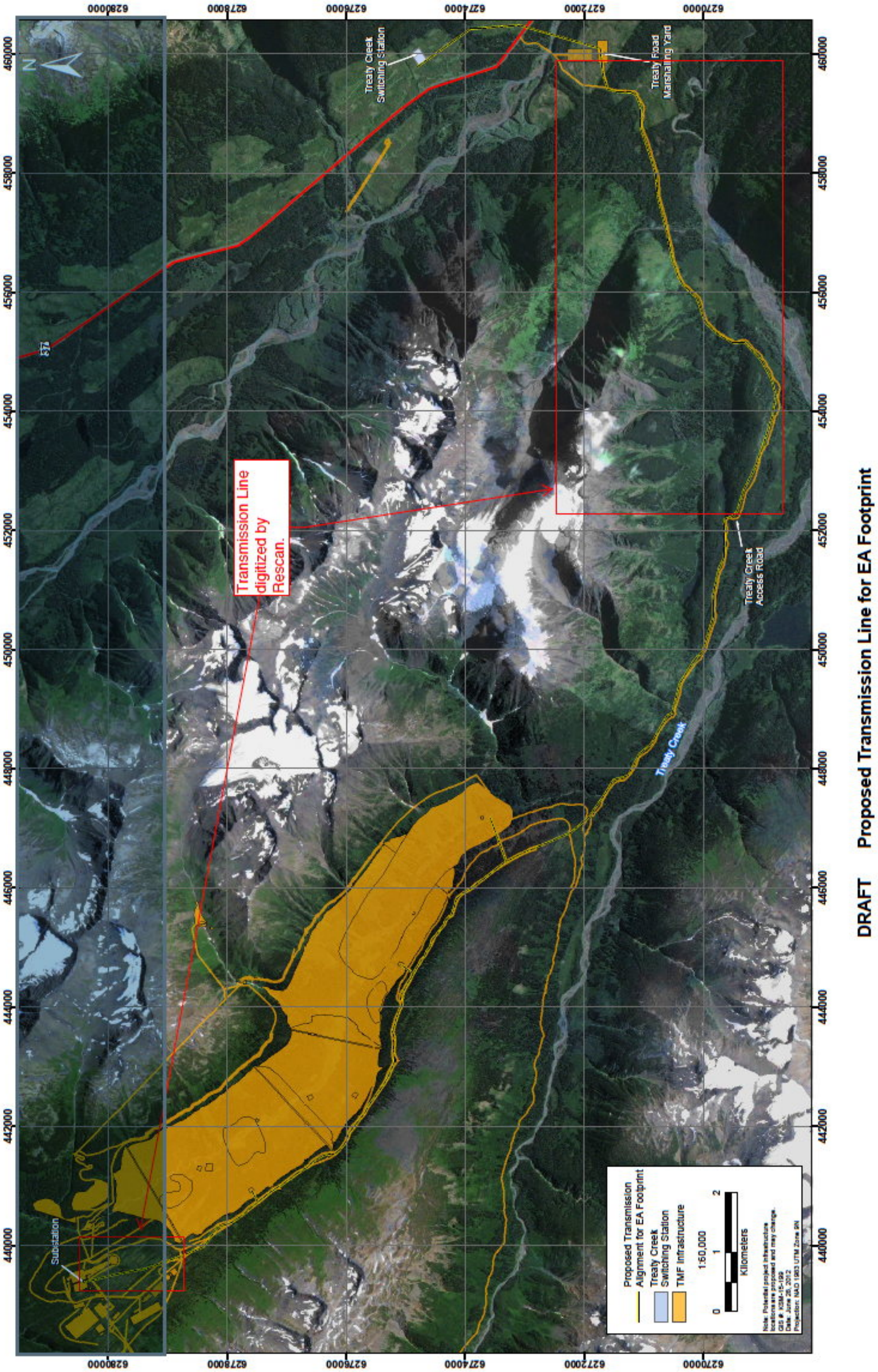
A transmission voltage of 287 kV has been selected as the NTL voltage is 287 kV, a high transmission voltage is required for the large KSM load, and stepping down to a lower voltage would require double transformation increasing capital costs and power system losses.

Potential geohazards and snow avalanche hazards to the integrity of the line are identified in BGC report along with recommended mitigating measures. All of these measures and design features have been incorporated into the transmission line design.

The following KSM transmission line key plan shows the general route from the Treaty Creek Switching Station to the Treaty Plantsite Substation No. 1. For detailed route maps refer to the BGC Report included in Appendix C herewith.

Alternative power supply options, other than connection to utility grid via the BC Hydro NTL transmission line, have been considered and were rejected, as utility supply is much more economically attractive.

Figure 1.1 -1 Transmission Line Key Plan



2.0 TRANSMISSION LINE ROUTING AND RIGHT-OF-WAY

2.1 General

Determining a route for any transmission line is typically a challenging task in mountainous terrain. However, as the KSM spur transmission line generally follows the Treaty Creek access road and the North Treaty Creek cut-off ditch, the transmission line design has been largely handled by the road surveyors and designers, McElhanney Consulting Services Ltd (McElhanney).

The 30 km long, 287 kV transmission line from the proposed Treaty Creek Switching Station near Highway 37 will generally follow the KSM access road up Treaty Creek, then transition to following the cut-off ditch above North Treaty Creek to the Treaty plantsite main Substation No. 1. Closely following the access road and cut-off ditch will serve to reduce the environmental impact, greatly reduce costs for access to structures during construction, and it will tend to keep the transmission line off the avalanche prone slopes.

WN Brazier Associates Inc. (Brazier) plotted a preliminary transmission line route adjacent to the KSM access road, based on the mapping available including Lidar, low-level aerial photography, and with use being made of Google Earth Pro. Subsequently, Brazier went to the field with the geotechnical engineers from BGC and the route was "ground trothed." This was an interactive process and the current route, as detailed in the BGC Report, is the result of revising the transmission line route based on geotechnical issues and snow avalanche hazard avoidance, to the extent practical. Where hazards cannot be completely avoided the transmission line detailed design will include mitigating measures to protect against avalanches, debris flows and other risks all in accordance with the recommendations in the BGC report.

2.2 Land Easements/Right-Of-Ways & Permits

The transmission line requires:

- A Licence Of Occupation (this is the land tenure that Seabridge has advised will be requested).
- Occupant License to Cut (Ministry of Forests, Lands and Natural Resource Operations).
- Permit to cross Highway 37.
- Approval for crossing of the Bell-Irving River (Navigable Waters).

No special electrical permits are required.

A Certificate of Public Convenience and Necessity (CPCN) is not required.

A forestry licence to cut (FLTC) normally requires a cutting permit application to include cruise and appraisal information compiled according to specified manuals. An FLTC document will also normally require that all timber removed from the licence area must be scaled in accordance with the requirements of the Forest Act and the Scaling Regulation and all licences to cut are subject to the Forest and Range Practices Act (FRPA) practice requirements.

2.3 Environmental

The Environmental Assessment (EA) review of the transmission line is part of the entire KSM mining project EA and is based on the route selection and other data as previously provided.

The transmission line has been routed to avoid vulnerable (Blue Listed) ecosystems as identified by the project environmental consultants.

2.4 Alternate Routes

For environmental reasons the transmission line follows the KSM access road and the North Treaty cut-off ditch as closely as possible. Therefore, based on the concept of one service corridor, line alternatives are minimal.

2.5 Route Specifics

Transmission line routing normally involves trade-offs among a variety of factors. Landscape features (topography such as major ridge lines, floodplains, etc.) that affect the route of the line are the most significant factor in route selection. The usual issues considered in the routing process are line length, terrain (landscape issues), avoidance of wetlands, river/creek crossings, highway crossings, existing right-of-ways, land cover (forest), seismology, visual impacts, hazards, access for construction, and land ownership issues.

In the case of the KSM line a primary objective of the route selection process was to keep the transmission line adjacent to the mine access road so as to require only one main utilities and access right-of-way, thus minimizing overall environmental impacts. Other major issues were avoidance of wetlands and minimizing the impact of transmission line construction access. Hence, the major additional transmission line routing work only involved delineating deviations as necessary where it was not possible to exactly track the road.

The structure (pole) placement along the route has largely been based on geotechnical and ease of construction considerations for each pole location. Whereas transmission line designers often concentrate on keeping the transmission line segments straight, this has not been the overriding requirement for this line. As un-guyed steel monopoles are being used there is not a great additional cost impact for small deviations and thus selection of the best structure locations has been the paramount concern, not undue concern with keeping the line perfectly straight.

The route selection, to a large extent, imposes limits on the other transmission line design variables. In general, the transmission line design “ruling” span length (consider this as the prevailing span) for each dead-ended line section has been selected in consideration of the frequent bends in the road and the required height of structures, which in turn is directly related to the selected span lengths. The required structure strengths and foundation requirements are dependent on the spans and angles. The preliminary design follows a general rule, which is that the spans in the line should not be more than twice the ruling span, or less than half of the ruling span. It has also been considered that for the KSM case, the required height of transmission line structures (monopoles) will be adjusted in the final design-vetting phase (after road construction is complete) based on the final pole positions as staked and the necessary clearance requirements. Considering the fact that the line generally follows the road, conductors over the roadway are being avoided to the extent possible, but where necessary spans will be allowed over the road. The height of the structures is the primary remaining variable that can be adjusted when the road details are known and the transmission line design is finalized.

There are, several negative aspects of constructing a high voltage transmission line next to a road including:

- Line construction can be more costly, as following a road closely usually precludes the use of guyed structures.
- More structures are required.
- More costly tall steel monopoles may be required for long spans over avalanche tracks.

Usually, although often not true, the shortest transmission line length is considered to represent the least capital cost option, provides the least electrical impedance and thus is the favoured solution. However, consideration of the cost of environmental impacts and for access tracks to structure sites for line construction (or alternate helicopter costs) often change this equation.

The complete avoidance of avalanches areas was not possible while still meeting the other objectives, such as following the road, so mitigating measures have been proposed for certain structures. Refer to the BGC Report.

Brazier provided an initial transmission line route centre line and structure locations based on contour and road drawings provided by McElhanney. Brazier accompanied the BGC geotechnical engineers during the transmission site investigations (ground truthing). This allowed the route and structure locations to be immediately modified in the field based on the geotechnical investigation. The route as presented in the BGC Report and included in the environmental assessment application is the result of this process and includes all practical revisions.

2.6 Possible Future Route Revisions

As the transmission line route closely follows the access road and the North Treaty cut-off ditch, any minor revision to the alignment of either the access road or cut-off ditch resulting from fields conditions (when they are constructed) may require some minor transmission line revisions to accommodate the road as constructed. Otherwise, route revisions are not anticipated.

2.7 Survey

The complete transmission line route has been surveyed by Lidar methods as part of the KSM project, in particular the road survey. No further survey work is required for planning and design. The installation contractor would be required to provide survey services for structure location and marking the right-of-way boundaries (line staking). A final post construction legal transmission line survey would also be required.

2.8 Route Description

A very detailed route description, complete with mapping, is included in the BGC Report. Please refer to this comprehensive report including the centre line drawings, geohazards information, etc.

Brazier has produced a detailed AutoCad drawing model of the line route including the centre line, structure locations, and the extent of the ROW. This is a very large design file as it contains contour information as obtained from Lidar mapping and has not been included herewith. The BGC Report already includes this data ported out in a series of drawings, except for the limits of the ROW. The transmission centre line is shown by McElhanney on the KSM access road drawings.

Brazier has prepared the necessary drawings from the AutoCad model for transmission line land tenure applications, future transmission line clearing, and for highway and river crossing applications.

2.9 Transmission Line Construction Access And Staging

Access along the transmission line right-of-way for construction and maintenance would almost exclusively use the access road and the cut-off ditch track. In several areas short access tracks will be required, as discussed elsewhere herein.

During construction of the transmission line there would be temporary pulling and tensioning sites, material staging sites, etc. Concrete would be from the plantsite batch plant.

2.10 Highway & River Crossings

A permit will be required from the BC Ministry of Transportation and Infrastructure for the Highway 37 crossing south of where the Treaty Creek access road meets Highway 37, as shown in the BGC Report. Appropriate line design features will be incorporated into the design to comply with permit requirements. This detailed work will be completed as part of the project final feasibility study.

The Highway 37 crossing will be designed and constructed in accordance with the Province of British Columbia Ministry of Transportation and Infrastructure, Highway Planning Branch, Utility Policy Manual, Section 10.0 Overhead Power and Communications Lines, in particular Clause 10.7.

The crossing of the Bell-Irving River, as it is navigable river, will require approval under the Canada “Navigable Waters Protection Act.” The Navigable Waters Protection Program in the Pacific Region will do the review and approval. No problems are anticipated for the transmission line river crossing, as long as clearances are maintained.

As the river is wider than 15 m, the aerial crossing will be considered a “Large And Complex” project and it will require a detailed project descriptions that covers all aspects of the project. Standards include:

- Navigable Waters – CSA C22.3 No. Table 2, TP 14596 DFO – operational statements.

As a matter of course the line crossing over Navigable Waters (The Bell-Irving River) will also be referenced to the Transport Canada Regulations In particular reference will be made to Transport Canada AGA - 6.0 Obstruction Marking and Lighting, Clause 6.7 Suspended Cable Span Markings. The project will be submitted to Nav Canada for aerial hazard assessment.

2.11 Obstruction Marking

Transmission line marker balls would be installed on the line at river and highway crossings, in valley crossing with air traffic, and any other areas where it may be required for safety reasons. Regulations include:

- Transport Canada – Aviation Safety Standard 621.19 - Standards Obstruction Markings

2.12 Right-Of-Way Width And Clearing

The transmission line basic ROW will be 40 m wide. The vegetation will be cleared from the ROW area only as required for line clearance and construction. Small lower tress and bushes will be left in place to prevent erosion and to avoid the appearance and impacts of a total clear-cut. In addition to the 40 m wide ROW a vegetation management zone, typically 15 m wide, would be required on both sides.

During the initial construction phase, tall danger trees would be removed on each side of the main ROW in a vegetation (tree) management corridor as required to ensure that no trees could fall on the line during a windstorm. During the operation phase, this area would also be managed and trees trimmed that in future years grow to a height such that if they fall towards the line they could cause an outage. The width of this area will vary depending on the types and height of trees and the terrain but typically it would be an additional 15 m on either side of the right-of-way.

The clearing program will balance the need for reliable power supply while respecting the natural environment. Every effort will be made to preserve the natural habitat along the route, especially for small animals and birds.

The KSM overhead transmission line will be run adjacent to, and parallel with, the access road and can cross the road provided the required vertical clearances listed below are maintained as a minimum and the poles are located outside of the road required clear zone. Also, the transmission line may be strung over and coincident with this private access road driving lanes where and if necessary as long as the minimum BC Hydro and CSA vertical clearances are maintained. Note that running transmission lines over any buildings and other structures would require special permission from the British Columbia Safety Authority, but this is not anticipated to be required for this project.

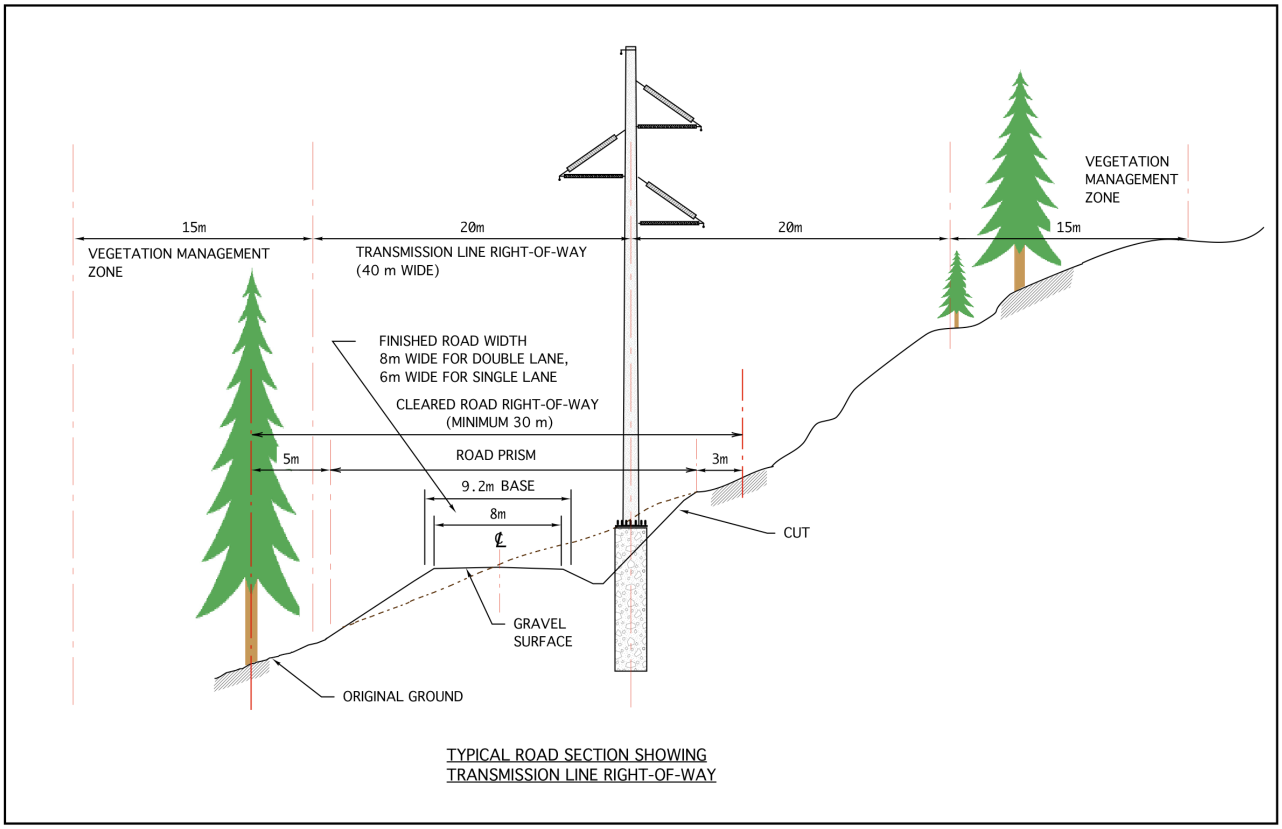
A clearing specification will be prepared as part of the transmission line detailed design. The concept is to carry out minimum clearing and not to clear-cut the ROW.

If the transmission line ROW clearing is to be included with road clearing contract, then these specific requirements must be added to the contract.

The right-of-way clearing should comply with the document "Transmission Vegetation Management NERC Standard FAC-003-2 Technical Reference." This standard requires management of vegetation growth along the path of the transmission line to prevent trees or other vegetation from contacting the power line, but does not mandate clear- cutting or any other particular method of vegetation management.

Figure 2.12-1 Examples of ROW Minimal Clearing

Figure 2.12 - 2 Typical Right-of-way Cross Sections (287kV)



2.13 Tree Management Zone

The tree (vegetation) management zone covers the area outside the 40 m wide ROW where, due to tree height and topography, it is necessary to remove tall "danger tress" that could fall on the line and cause an outage. The required width of this zone is variable and depends upon (a) tree height and (b) topography as danger trees on the uphill side of the line may have to be removed that are a greater distance from the line than if they were on the down hill side.

Typically, the tree management zone would be an additional 15 m on both sides of the basic right-of-way.

2.14 Line Clearances

Transmission line clearances to ground, roadways, adjacent structures, etc. will be maintained as per the following Codes and Standards.

Vertical clearances of overhead lines from the ground surface or road crown will conform to BC Hydro Transmission Engineering, Technical Procedures Manual – 5.2 Table K Minimum Clearances for New Construction on AC Power Lines (these are typically greater than Code requirements). BC Hydro considers that the clearances specified in CAN/CSA-C22.3 No. 1-01 are minimum requirements and in certain situations these standards are considered too low and have therefore been modified by BC Hydro to suit conditions in BC. It is noted that vertical clearances should be increased accordingly if there is any possibility of future under building with another power line or a communications line is to be installed. A copy of Table K from the BC Hydro Transmission Design Manual is shown below.

The final line design will consider the effects of deep snow when selecting line clearances.

Where the transmission line crosses the local roads the same clearances would be maintained as per highway requirements. Under worst-case conductor sag conditions (typically hot weather at max. load) the clearance over the roadway will be based on the BC Hydro Power Line Design Manual 5.2 Table K, “Minimum Clearance for New Construction Of AC Power Lines.”

Figure 2.14 - 1 Clearances To Ground As per BC Hydro Table K

5.2 - TABLE K

MINIMUM CLEARANCES FOR NEW CONSTRUCTION ON AC TRANSMISSION LINES (m)

	Nominal Line to Line Voltage					
Crossing Over*1 *10	69 kV	138 kV	230 kV	287 kV	345 kV	500 kV
LAND*6 Accessible to:						
Vehicles & Equipment*11	6.2	6.5	7.1	7.5	7.8	9.6*8
Pedestrians Only*2 *9	5.0	5.4	6.0	6.4	6.7	7.7
ROADS						
Where no provision is made for future powerlines along:						
• Minor Roads	6.9	7.3	7.9	8.3	9.4*8	14.2*8
• Highways	9.5	9.9	10.5	10.9	11.2	14.2*8
Where provision is made for future powerlines up to 25 kV along minor roads and highways:	12.4	13.0	13.6	14.1	14.6	15.2
• Logging & Mining Roads*3	L+2.5	L+2.9	L+3.5	L+3.9	L+4.2	L+5.2
RAILWAYS*7	8.4	8.7	9.3	9.7	10.0	11.0
PIPELINES	8.6	9.0	9.6	10.0	10.3	11.3
WIRES*4 (STRUCTURES)*5						
0 - 25 kV	1.4(1.4)	2.0(2.0)	2.6(2.6)	3.1(3.1)	3.5(3.5)	4.2(4.2)
69 kV	1.4(1.4)	2.0(2.0)	2.6(2.6)	3.1(3.1)	3.5(3.5)	4.2(4.2)
138 kV		1.5(2.3)	2.1(2.9)	2.7(3.4)	3.0(3.8)	4.2(4.5)
230 kV			2.4(2.8)	3.0(3.3)	3.4(3.7)	4.5(4.4)
287 kV				3.1(3.3)	3.6(3.7)	4.7(4.4)
345 kV					3.7(3.3)	4.9(4.0)
500 kV						5.4(3.7)

Refer to Table J for notes.

In general, minimum distances between electrical power lines and any highway structure or equipment should conform to WCB regulations; the distances are summarized below. The same principles will be applied to the KSM line. When working near transmission lines special precautions and proper work procedure must still be followed even if minimum clearance distances are maintained.

Figure 2.14 - 2 WCB Clearances

Voltage (Phase to Phase)	Minimum Distance (Meters)
0 to 750	1.0
Over 750 to 75,000	3.0
Over 75,000 to 250,000	4.5
Over 250,000 to 550,000	6.0

Minimum WCB Clearances from Overhead Lines

Minimum highway and road clearances shall be in accordance with BC Hydro Standards, in particular BC Hydro Table H as included below.

Figure 2.14 - 3 BC Hydro Table H

TABLE H

HIGHWAY CLEARANCES

(When no allowance is made for underbuilding of future powerlines)

Nominal Voltage	69 kV	138 kV	230 kV	287 kV	345 kV	500 kV
Basic Clearance (m)	9.0	9.0	9.0	9.0	9.0	
Electrical Clearance (m)	0.6	0.9	1.5	1.9	2.2	
Total (m)	9.6	9.9	10.5	10.9	11.2	14.2*1

*1 This clearance is due to induction from a tractor trailer assuming a 525 kV normal operating voltage and a 5 mA "let go" current.

(c) Other Crossings

For all other crossings, the MOC is considered sufficient for new construction.

BC Hydro policy does not permit placing a distribution circuit (25kV or less) on the same structures as 138kV and higher voltage transmission lines. Any parallel overhead distribution line would have to be on the opposite side of the access road. Any communications cables strung along the 287 kV transmission line would have to be ADSS (all dielectric fibre-optic) or of the optical ground wire ((OPGW)) type. The purpose of the two foregoing requirements is to avoid unsafe induction voltages on the distribution or communications systems.

Any metallic pipelines would have to be separated from the transmission line by 10m minimum horizontally as per CAN/CSA22.3 No.6. This is to provide adequate working space for pipeline maintenance. Also, there are special pipeline grounding and bonding Codes, Standards and Requirements that must be adhered to for installations parallel to high voltage transmission lines. Brazier has dealt with similar problems concerning hydroelectric plant steel penstocks running parallel to a 230 kV transmission line and notes that the special requirements cover both the pipeline construction and operating phases.

In very heavy snow areas, such as is anticipated in the vicinity of the KSM mine, snow removed from the road should not be piled or ploughed directly under the transmission line to a depth that would reduce clearances below code clearances for a person standing on the snow bank.

Over height equipment moved along the Treaty Creek road could be a problem with regards to vertical separation. The problems that normally relate to line crossings would now also be a concern continuously along one side of the road. The transmission line design has taken these considerations into account.

2.15 Visual Impacts

Transmission line visual impacts are considered high when a transmission line is the dominant feature where most viewers will see the line or ROW in the foreground or middle-ground. (When the line is close to the viewer it is in foreground, and middle-ground starts from the foreground to perhaps 7 or 8 km from the viewer. The view is considered background when the line is further away.) The impacts are moderate when the line is clearly visible to the viewer, but not a focal point in the view, and when most viewers see the line in the middle-ground. The impacts are low when a line is visible but are not apparent to the viewer and to most viewers the line is primarily seen in middle-ground and background.

In the case of the subject transmission line the primary area of visual impact to the general public would be the Highway 37 crossing. As the crossing is at right angles to the Highway 37, visual impact will be low. The remainder of the KSM transmission line is in a valley bottom along a “private” road or along the side of a valley next to the cut-off ditch and will not be normally visible to the general public. Furthermore, the use of steel mono-pole structures, reduces transmission line visual impacts to the lowest practical level for an overhead transmission line.

2.16 Road Traffic

The Treaty Creek access road is a limited speed 50 to 60 kph roadway, not a high speed highway. This reduces many concerns. Monopole 230 kV transmission lines run beside streets in the Lower Mainland where common speeds are usually considerably above the 50 and 60 kph speed limits, and undue problems have not been reported.

The monopole type construction has no guy wires, which greatly reduces potential problems. Concrete no-post curbs will be installed in front of structures as appropriate. The monopoles bolt to circular concrete foundations which will extend at least 1000 mm above ground level in hazardous areas so as to protect the poles from vehicular impact.

2.17 Road Snow Removal Issues

In very heavy snow areas, such as along Treaty Creek, snow removed from the road should not be piled directly under the transmission line to a depth which would reduce clearances below code clearances for a person standing on the snow bank. The pole height and line clearances will be selected accordingly.

2.18 Construction Access

As the transmission line from Treaty Creek to the mine will parallel the access road, construction access requirements will be minimal. To ensure protection of the environment KSM will develop and implement a contractor construction access plan prior to construction of the transmission line. The plan will be designed to ensure that the transmission line construction contractor follows the environmental and other access requirements. The transmission line design will identify all required line access tracks and structure construction areas. Helicopter construction may also be used for some structures where normal access presents undue problems.

2.19 Right-Of-Way (ROW) Restoration

After line construction is complete, ROW restoration would include such items as re-depositing stockpiled topsoil, seeding and contouring slopes and disturbed areas, etc.

Where re-planting is carried out, plants consistent with native species would be selected where practical, although with consideration of their growth rates and mature plant heights. In some areas, the ROW must remain passable by land vehicles for line inspections.

Seeding would generally be conducted using on the ground manual hand-held seed broadcasters or hand planting of trees.

2.20 Buildings

In some countries high voltage transmission lines are commonly strung over buildings. Not so in Canada, although high voltage transmission lines may be run down streets relatively close to buildings.

Running transmission lines over buildings (i.e. construction facilities along the road or buildings at the plantsite) will require special permission from the British Columbia Safety Authority, which is not typically granted.

3.0 CODES AND STANDARDS

3.1 Statutory Requirements

BC Mines Act and Regulations

- Including the Health, Safety and Reclamation Code for Mines in British Columbia.

Government of B.C., Safety Authority

- Overhead Lines Guideline, Information Bulletin No: B-E3 090312 1.
- The BC Electrical Code (C22.1-12 - Canadian Electrical Code, Part I (22nd Edition), “Safety Standard For Electrical Installations,” as adopted for use in B.C.

3.2 Primary CSA Standards For Transmission Lines

- CAN/CSA Standard C22.3 NO. 1-06, “Overhead Systems,” Including Updates No. 1 and No. 2 (2007). (This standard covers the requirements for construction of overhead transmission lines).
- C22.3 No. 60826-10, “Design Criteria of Overhead Transmission Lines.” This is the second edition which is an adoption, with Canadian deviations, of the identically titled CEI/IEC (Commission Électrotechnique Internationale / International Electrotechnical Commission) Standard 60826 (third edition, 2003-10).
- C83 – Communication and Power Line Hardware

3.3 General Standards

- TB 324 Sag-Tension Calculation Methods for Overhead Lines TB 273 Overhead Conductor Safe Design Tension with Respect to Aeolian Vibrations.
- American Society of Civil Engineers Guidelines for Electrical Transmission Line Structural Loading - Manual 74.
- USDA 1724E-200 Design Manual for High Voltage Transmission Lines.
- Guidelines for Electrical Transmission Line Structural Loading, ASCE Manual 74 – 200.
- ASCE Standard 48-05 (previously ASCE Manual Design of Steel Transmission Pole Structures).
- IEEE Guide to the Installation of Overhead Transmission Line Conductors, IEEE Std. 524, 1992.
- IEEE Guide for Transmission Structure Foundation Design, IEEE Std. 691, 2001.
- IEEE 951 Guide to the Assembly and Erection of Metal Transmission Structures.
- 738-2006 - IEEE Standard for Calculating the Current-Temperature of Bare Overhead Conductors.
- Other CSA Standards as applicable.

3.4 BC Hydro Requirements

The following BC Hydro transmission line design requirements and standards will be followed.

BC Hydro Customer Requirements:

- BC Hydro document titled “69 kV to 360 kV, Technical Interconnection Requirements For Load Customers.”
- BC Hydro reports for the KSM Project titled “System Impact Study” and “Facilities Study” (these studies are now under way).

BC Hydro Transmission Engineering Standards – ES 41 series

- BC Hydro Transmission Engineering: Technical Procedures would normally be used for design purposes because it has more stringent requirements than CAN/CSA 22.3. (The BC Hydro Transmission Engineering: Technical Procedures would normally be used for design purposes because it has more stringent requirements than CAN/CSA 22.3. The BC Hydro standards are also more detailed than the CAN/CSA 22.3 and as such are an excellent guideline for those designing a transmission line.)

- BC Hydro Transmission Engineering: Technical Procedures – Vertical Clearances for Overhead Lines on BC Hydro Transmission Systems covers the minimum vertical clearance of AC transmission lines crossing over land, roads, railways, pipelines and other wires. Since BC Hydro’s standards for vertical clearance are more stringent than CAN/CSA-C22.3 No. 1-01, BC Hydro Technical Procedures are recommended.

- Occupational Health and Safety Regulations: WorkSafe BC regulations cover minimum distances between exposed, energized high voltage electrical equipment and conductors and any worker, work, tool, machine, equipment or material. Although WorkSafe BC regulations are not directly applicable to the KSM mining project they are none-the-less valuable guidelines.

- CAN/CSA-C22.3 No. 3-98 Electrical Coordination which covers the principles and practices applicable for the purpose of effecting electrical coordination between organizations that operate electrical supply or communication systems. It addresses power system influences due to electrical, magnetic and conductive coupling between the two systems during normal power system operation as well as abnormal or fault conditions. This Standard also provides guidelines to mitigate these power system influences thereby reducing shock hazards and equipment failures. When dealing with transmission lines 230kV and above it is likely only fibre optic cables can be installed in the right-of-way as they will not be impacted by the transmission lines.

- CAN/CSA-C22.3 No. 5.1-93 Recommended Practices for Electrical Protection - Electric Contact Between Overhead Supply and Communication Lines covers the principles and general practices of electrical protection applicable to overhead supply systems operating at more than 750V but less than 50kV phase to phase and communication systems. When these principal are applied it is intended to minimize the risk associated with electrical contact. However, if contact does occur it ensures that the contact voltage does not exceed a predetermined limit therefore providing a degree of protection to people, property and equipment. When dealing with transmission lines 230kV and above it is likely only fibreoptic cables can be installed in the right-of-way as they will not be impacted by the transmission lines.

- CAN/CSA-C22.3 No. 6-M91 Principles and Practices of Electrical Coordination Between Pipelines and Electric Supply Lines which covers methods of electrical coordination between pipelines and power lines having line-to-ground voltages greater than 35kV (60kV phase to phase). This Standard describes mutual interference effects and specifies methods that will reduce these effects.

4.0 ELECTRICAL ENVIRONMENTAL EFFECTS

4.1 Electrical And Magnetic Fields

The requirements for the KSM transmission line are based on BC Hydro requirements and recommendations. Particular reference is made to the BC Hydro study titled “Effects of High Voltage Transmission Line In Proximity of Highways” by DMD & Associates Ltd. Surrey, BC 1369-05 September 30, 2005. The KSM line design will generally match the design for the NTL and be in accordance with BC Hydro standards.

The electrical and magnetic fields associated with transmission lines increase with the operating voltage of the line. At 287 kV these effects are significant.

Transmission line electric and magnetic fields and their possible influence on health is a complex and controversial issue. As this line is along a private road not generally accessible by the public, and there is no nearby habitation, consideration of electric and magnetic fields have not been considered critical in route selection. Design limits are:

Electric fields:

The line shall be designed to limit the electric field in accordance with IEEE Standard Standard C95.6-2002 as follows:

- 10 kV/m at 1 metre above ground within the transmission ROW under ultimate load for normal operating conditions; and
- 5 kV/m at 1 metre above ground at the transmission line ROW edge under emergency operating conditions.

Magnetic Fields:

- The line shall be designed such that under emergency operating conditions, the magnetic field on the ROW shall be limited to not exceed 9000 milligauss (mG) at 1 meter above ground.

4.2 Induced Currents And Voltages

Electromagnetic fields from transmission lines can induce electric currents in metal objects in the proximity of a transmission line. These can cause a shock hazard, in particular for metallic pipelines, penstocks, fences, etc. in parallel with the transmission line.

CSA Standards including C22.3 No. 3, "Inductive Coordination" (and the associated handbook), and CAN/CSA-C22.3 No. 6-M91 "Principles And Practices of Electrical Coordination Between Pipelines and Electric Supply Lines" specify mitigation measures required in such cases.

In certain circumstances the electric field under a transmission line can result in a small nuisance shock or spark discharge to a person touching a metallic object, such as a vehicle, under the line.

Vehicle fueling could be an issue for large (long) vehicles parked on the road parallel to the transmission line. Such instances could occur for future road maintenance or similar. The induced voltage between a large truck or other equipment and a fuel truck could conceivably be large enough to cause a spark. Connecting a ground wire between the two vehicles before refueling to discharge any static charges can easily eliminate this problem. For personnel and equipment safety during the life of the project vehicle-fueling facilities should not be located under or immediately adjacent to the high voltage transmission line.

In general, an important safety consideration is that any metallic pipelines should be located on the opposite side of the roadway or right-of-way from a high voltage transmission line. Specifically, the recommendations in Standard CAN/CSA-22.3 No.6-M91 are that any pipeline be located a minimum of 10m from high voltage power line footings and other (below ground) fault current discharge facilities.

The proposed route crosses or parallels not existing electrical facilities. Any new KSM mine site power and communications lines will be designed and constructed taking into account all features and hazards associated with the 287 kV transmission line.

As per BC Hydro standards: Any metallic object near a high voltage transmission line will become electrically charged. The magnitude of the induced voltage depends on the size of the object and the distance from the transmission line conductor. The resulting current that flows through the body of a person or animal making contact with the object must be kept within safe limits. The objects that are potentially hazardous include:

- Metallic Fences.
- Metallic Buildings.

- Metallic Objects.
- Vehicles and Machinery (especially re-fueling operations).
- Irrigation Sprinkler Systems (and metallic pipe lines).
- Parallel power lines and cables.

The transmission line detailed specifications will address the necessary corrective action and safety measures required to mitigate the above referenced hazards.

In summary, any metallic pipelines must be separated from the transmission line by 10 m minimum horizontally to provide adequate working space for pipeline construction and maintenance as per CAN/CSA22.3 No.6. In addition, appropriate grounding, bonding and safety standards must be followed, especially during construction.

4.3 Electromagnetic Interference

Electromagnetic interference is a design issue with high voltage transmission lines. Corona and gap discharges are the main sources of electromagnetic interference.

The line minimum conductor size and other design features have been specified such as to reduce corona and thus radio interference in accordance with Federal Regulations.

4.4 Corona

The transmission line corona inception voltage is the lowest voltage at which continuous corona of specified pulse amplitude occurs as the applied voltage is gradually increased.

Corona is the result of ionization of the air near an energized high voltage conductor. It is caused when the voltage gradient (volts per metre) close to the conductor is high enough to break down the resistance of the air by pulling off electrons from the air molecules to form ions. The high voltage gradient when this happens is the "corona inception gradient." The maximum voltage gradient of a POWERLINE conductor should be below the corona inception gradient, at least in dry weather (some corona in wet weather is to be expected). This is to avoid radio interference and also power loss. If the corona level is too great, the power loss can become very significant. (There have been a private transmission line built in British Columbia where, to save money, a small conductor size was used and it turned out that the capital cost savings were small compared the cost of the consequent power losses.)

The high electric fields that cause corona are typically the result selecting a conductor with too small in diameter (thus the field strength at the surface is higher), sharp projecting points on fittings, lack of corona abatement "rings," etc. Wet weather also increases corona and hoarfrost on the conductors in winter greatly increases corona losses. At higher altitudes the air is thinner, at lower pressure, has less resistance and thus corona is worse. On the other hand, bundled conductors (two or four conductors separated by spacers) serve to make a larger effective conductor diameter and thus reduce electrical stress levels and corona.

Based on detailed calculations a conductor size has been selected to keep the maximum voltage gradients below the positive corona inception point and thus ensure that corona (and radio interference) will not be a problem.

4.5 Radio Interference

Primarily due to corona, transmission lines cause radio interference. The transmission line will be designed to comply with BC Hydro and CSA standards for Maximum Allowable Radio Interference.

Radio interference (Maximum RI fair weather limit) will be limited to not more than 53 dBμV/m given a CISPR meter at 0.5 MHz and at 15 m horizontal distance from the outermost conductor all generally as per BC Hydro Transmission Standards.

4.6 Audible Noise

Transmission line construction activities such as movement of heavy equipment, erection of structures and stringing of conductors result in modest noise levels around the right-of-way (ROW). As the line route is not in a populated area, human impact of noise levels will be minor. Environmental impacts on wildlife are covered in the project environmental assessment.

Another source of noise from transmission lines is corona, but this is mostly an issue for transmission lines of 345 kV and above and is more prominent in wet weather conditions. With reasonable conductor size, at a 287 kV voltage level, corona noise is not significant. In any event audible noise is not a significant issue on a typical rural road or highway and is usually only a concern in residential areas where local noise bylaws are present. In summary, if the corona level is held within acceptable limits, especially on transmission lines such as the KSM line, which is below 345 kV, then noise would not normally be an issue. In addition, the audible noise from the transmission lines would be far less impacting than the sound from the traffic itself.

5.0 DESIGN

5.1 General

The KSM transmission line and Treaty Plantsite Substation No. 1 will be designed and constructed in accordance with the Codes and Standards listed in Section 3 herein. In particular the design shall be comply with CSA Standard C22.3 No. 60826:06, Design Criteria for Overhead Transmission Lines.

The line design includes all mitigating features as included in the BGC Report such as berms, riprap and raised foundations in areas of potential flooding or debris flow and special avalanche resistant high pier type concrete foundations where there is avalanche risk.

The line conductor, insulators, hardware and foundations shall be designed to perform without damage at least up to the 100-year storm loading forces.

The transmission line will be designed to provide electrical clearances during maximum weather conditions and to have the necessary strength to support storm loads during construction and/or maintenance. Load factors and strength reduction factors will be defined at the detailed engineering phase.

The line will be designed for avalanche forces as identified in the BGC Report and as discussed elsewhere herein.

The line will also be designed for energized live-line maintenance. Further design, including the line sag-tension calculations, clearance to ground verification, etc. will be completed as part of the project Final Feasibility Study.

Construction specifications will be prepared after the KSM mine project approval. The transmission line construction is in project year 2 so it is not anticipated that these documents would be required prior to project approval. These specifications will not only include technical requirements but will ensure the construction contractor follows all project environmental requirements.

The electrical characteristics of the KSM spur line are included in the BC Hydro "System Impact Study."

5.2 Structural Design Criteria

<u>Loading Conditions</u>

CSA Heavy Condition:	400 Pa wind 12.7 mm radial ice @ -20oC
Ice Only:	25 mm radial ice @ 0°C
Wind Only:	115 km/h (640 Pa) Gust Wind @ 4oC
Max. Conductor Temperature:	90°C
Every Day Temperature (EDT):	4°C
Average Min. Temperature:	-40°C

5.3 Line Voltage Selection

A transmission voltage of 287 kV has been selected, as the NTL voltage is 287 kV. Also, a high transmission voltage is required for the large KSM load. Not withstanding this, stepping down to a lower voltage (138 kV) would require double transformation increasing capital costs and power system losses. The selection of 287 kV as the transmission voltage in this case is a decision that can be made by an experienced electrical engineer simply by inspection and a detailed trade-off study is not required.

Higher voltage lines provide increased power transfer capability and significant improvements in power delivery efficiency. As conductor I^2R power losses are proportional to the square of the line current and as the line current is in turn proportional to line voltage, the conductor losses are significantly less at higher transmission voltages resulting in more efficient and economic power system operation. In summary, losses decrease by the square of the voltage increase.

The surge impedance loading capability (SIL) of a transmission line is a useful index for determining the quantity of power that can be transferred over a transmission line without adversely impacting system performance. The SIL is a function of the line voltage and conductor geometry. When the power transferred equals the line SIL, the line series inductance is balanced by the line shunt capacitive reactance and voltage drop is minimal. If the level of power flow on a line exceeds its SIL, system voltage regulation and electrical stability may become problems unless supplemental voltage support apparatus is installed to compensate for this condition.

The SIL of a 287 kV line is in the neighbourhood of 230 MW, while that of a 138 kV line is only about 50 MW. The current KSM load is in the range of 170 MW. Although the SIL of a transmission line is only a rough guide to acceptable power transfer levels (i.e. capacity) it is still a useful guide.

The initial BC Hydro System Impact Study required a 20 MVA Static Var Compensator (SVC) at the KSM plant site. BC Hydro engineering have recently indicated that in the future it is quite possible they will require Static Var Compensation at the Treat Creek Switching Station, as part of their system. A static VAR compensator (SVC) at KSM has already been identified as a requirement in BC Hydro studies. As two nearby SVCs present serious control issues the KSM compensation equipment will probably be moved to the Treaty Creek Switching Station. Thus, this further dictates the requirement for a “firm” high voltage interconnection between the Treaty Creek Switching Station and the KSM Substation No. 1.

5.4 Electrical Design Criteria

Electrical design criteria shall be similar to the NTL (BC Hydro circuit 2L102) where appropriate.

Nominal system voltage: 287 kV
Normal system operating voltage: 302 kV
Maximum continuous operating voltage: 316 kV
Required insulation: minimum suspension 15
Insulators (146 x 254) or equivalent
Electrical clearance between conductor and supporting structure: min. 1.78 metres
A switching surge level of 2 per unit
Minimum continuous line rating: 600 amps at 287 kV with 1.0 P.F.
Maximum conductor operating temperature: 90ºC;
Service life: Min. 70 years.
Line transpositions: Not required.
Required insulation: minimum 15 insulators (146 x 254);
Electrical clearance between conductor and supporting structure: 1.78 metres;
A switching surge level: 2 per unit;
Minimum continuous line rating: 400 MW (for KSM spur line)

5.5 Electrical Design Requirements

The transmission line electrical design will be in compliance with the Codes and Standards listed in Section 3.0 herein.

The line extension has been modeled using SKM Power tools load flow and short circuit software, as part of the mine load flow study.

The electrical clearances phase to phase, phase to ground and to the right of way edge are selected to at least meet the most stringent requirements of both CSA Standard CAN/CSA-C22.3 No. 1-01 Overhead Systems and the BC Hydro requirements as specified in Engineering Standard 41K (Electrical Design Parameters) and Engineering Standard 41C (Right of Way Design and Clearing).

The design reliability requirement will also be the same as the NTL from which it is fed, namely:

- The transmission line will be designed for weather load events based on a return period of 1-in-100 years and a seismic event based on a return period of 1-in-2,475 years. The line shall be designed for no significant damage under the 1-in-100 year weather-related loads and no service interruption (i.e., maintain electrical clearances) under the 1-in-50 year return weather loads.

The transmission line will be designed and constructed so that under the specified mechanical and electrical operating conditions the maximum sag of the wire or conductor shall not result in a clearance or separation less than that specified in CSA C22.3 No. 1-06 and as per BC Hydro standards.

Equipment mounted on poles and structures shall have a minimum separation from ground greater of the requirements given in CSA C22.3 No. 1-06 and the phasing separations given in the BC Electrical Code, Section 36.

Lines shall be constructed so as to maintain vertical and horizontal clearance from buildings, signs, lamp standards, and other structures such that the clearance shall be the greater of requirements given in CSA C22.3 No.1- 06 or placing clearances given in the BC Electrical Code.

Structures will be of sufficient height to accommodate all circuits for which they are intended, and to maintain clearances under maximum sag and loading conditions between circuits and between the lowest conductor and ground. Clearances shall be in accordance with CSA C22.3 No. 1-06, BC Hydro standards and the BC Electrical Code.

Line insulators will comply with CSA C22.3 No.1-06, Rule 8.18.

Splices for transmission lines will meet the requirements of CSA C57-98 (R-2002) for Mechanical Duty Class 1 and Electrical Duty Class A. (5) Transmission line jumper terminals shall meet the requirements of CSA C57-98 (R-2002) for Mechanical Duty Class 2 and Electrical Duty Class A.

Hardware will be of strength and type suitable for the application, shall meet the requirements of CAN/CSA C83-M96 (R2000) and shall meet Charpy impact tests as specified for the service temperatures applicable.

Conductor Sag will meet the following requirements:

- Conductors, wires and cable will be sagged in such a manner so as to meet the loading and clearance requirements of Section 104 and of CSA C22.3 No. 1-06.
- Transmission line conductors and wires will be sagged to data produced from detailed calculations prepared by a professional engineer.
- Conductor and wire tension limits, and minimum clearances under service conditions will be in accordance with CSA C22.3 No. 1-06.
- A professional engineer must approve the use of vibration dampers to increase allowable line tension.

5.6 Lightning Protection

The operation and performance of any transmission line is affected by lightning strikes. However, the incidence of lightning in most parts of B.C. is relatively low and, following BC Hydro practice for the NTL, shield wires need not be provided for, except in the vicinity of the mine Substation No. 1 and the Treaty Creek switching Station.

Substation equipment will, or course, be protected by station class lightning arresters.

All transmission structures (steel poles) will be appropriately grounded.

The use of an optical ground wire (OPGW), which is a combined fibre-optic and ground (guard) wire, when placed in the top (and most secure) most position on the transmission line will shield the phase conductors from lightning while at the same time provide a telecommunications path. Optical Ground Wire is a dual functioning cable, meaning it serves two purposes. It is designed to replace traditional static / shield / earth wires.

5.7 Wind And Ice Loading

The transmission line will be designed in accordance with “Heavy Loading” conditions for this area of B.C.

In addition to designing for projected and wind loads, the line support structures will be designed to withstand longitudinal and torsional loading from unbalanced line tensions due to conductor ice shedding at maximum design icing levels. In addition, the line will be dead-ended at frequent intervals.

5.8 Selection Of Structure Type

Typically, un-guyed steel monopoles (tapered tubular sectional steel structures) have been considered an expensive solution and typically have only been used in urban areas where their minimal space requirement and better aesthetics could justify the cost.

However, steel monopole construction has become much more common in rural areas. For instance, the author has recently seen 230 kV monopole transmission line construction in rural areas in the Philippines and BC Hydro are planning on the use of steel monopoles for the 230 kV lines in the DECAT project near Dawson Creek. Also, a literature search has shown that many recent transmission projects, either planned or constructed, in Canada and the US utilize steel monopoles.

For the KSM transmission line, where the concept is to follow the access road, the selection of steel monopole construction was easily justified. A further consideration was the very long projected life of the KSM project.

In the several locations (for instance where the line transitions from the Treaty Creek road to the North Treaty cut-off ditch) where access is difficult and helicopter installation may be considered, sectional steel poles can be employed without having to resort to very large heavy lift helicopters.

The poles selected will be dulled hot dip galvanized steel. These poles blend into the environment and have a very long service life. Painted steel transmission poles soon rust (examples can be provided of such installations in BC). Galvanized poles can be made even less conspicuous by using paint over galvanized (powder coat or liquid) steel. The weathering steel type of poles are very unattractive in appearance and have not been considered. The poles will be fabricated of steel suitable for the low temperatures as experienced along the route. Charpy V-notch test requirements will be specified as part of the detailed design.

Steel monopoles structures can be of the line post insulator, davit arm with suspension insulators, or of the strut (horizontal vee) type.

Steel poles shall be provided with lugs for McGregor type detachable climbing ladders, or similar.

Figure 5.7 -1 Typical Steel Monopole Structure Photos

230 kV Monopole Line (287 kV Clearances Will Be Slightly Greater)

230 KV Monopole Line, Urban Setting Richmond, B.C.

230 kV Monopole In-Line Dead-End

90 Degree Deviation Structures

For several of the KSM line structures that are well off the road, such as structures in the area of structure numbers KSM-73 to KSM-76AN, the use of alternate structure types, such as guyed lattice vee structures, will be investigated during the detailed design phase.

5.9 Structure Locations & Access

Reference should be made to the drawings in the BGC report and to McElhanney access road drawings. Brazier also has a combined drawing showing the road as provided by McElhanney, the transmission line centre line, 1 m map contours, the transmission line right-of-way boundaries and all structure locations. This very large dwg file is available upon request. Additionally, structure location data sheets have been produced showing structure coordinates, ground elevations, span ahead, deviation angles, etc.

Along the first section of line, from the Treaty Creek Switching Station until the Highway 37 crossing, the transmission line will lead down (southeast) from the switching station across the old clear-cut to Highway 37. The transmission line joins the mine access road at structure KSM-13, about 3 km south of the proposed Bell-Irving River crossing. Refer to the drawings in the BGC Report or Section 7, Figure 7.3-2 herein. The first structure, KSM-1N may be relocated to suit the exact switching station design, when drawings are received from BC Hydro. Access to all structures in this area is easy. On the north side of Highway 37 an old logging road (recently traveled) leads off the highway and connects to other old roads in the old clear-cut to provide access. On the South side of the Bell-Irving River there are also old roads in this previously clear-cut area and the new proposed mine access road is nearby.

Along the Treaty Creek access road the structures, from KSM-13 - KSM-69, generally follow the road although there is a deviation off the road, due to the terrain, for structures KSM-39 - KSM-47. Refer to the drawings in the BGC report. An access track, going both ways from structure KSM-44, will have to be constructed plus access may also be gained by building a track from KSM-47.

Structures KSM-69 to KSM-73N are either adjacent to the various roads or can be accessed by short tracks off of the otherwise required roads.

The structures from KSM-73 to KSM-76AN bridge the gap between the Treaty Creek access road and the south end of the North Treaty cut-off ditch. This section of line also is located to avoid an avalanche zone. It traverses the steep nose of a ridge (refer to the mapping in the BGC report). It will be built with helicopter support or by winching down equipment from the top of the hill (structure 76AN).

Along the North Treaty Cut-off ditch the structures will be located between the road and the ditch as shown in Figure 6.8 below. The road may be slightly widened at pole locations if/as required. All of these structures from KSM-76AN to KSM-121 at the plantsite are accessible from the North Treaty access road and the cut-off ditch access road (before the main access road meets the cut-off ditch).

The access road and cut-off ditch might require minor revisions due to the actual field conditions encountered during construction. In such cases there may be minor transmission line structure relocations based on the final road and cut-off ditch as-built locations.

Figure 5.8 – 1 Structures Along North Treaty Roads & Cut-off Ditch (From McElhanney)

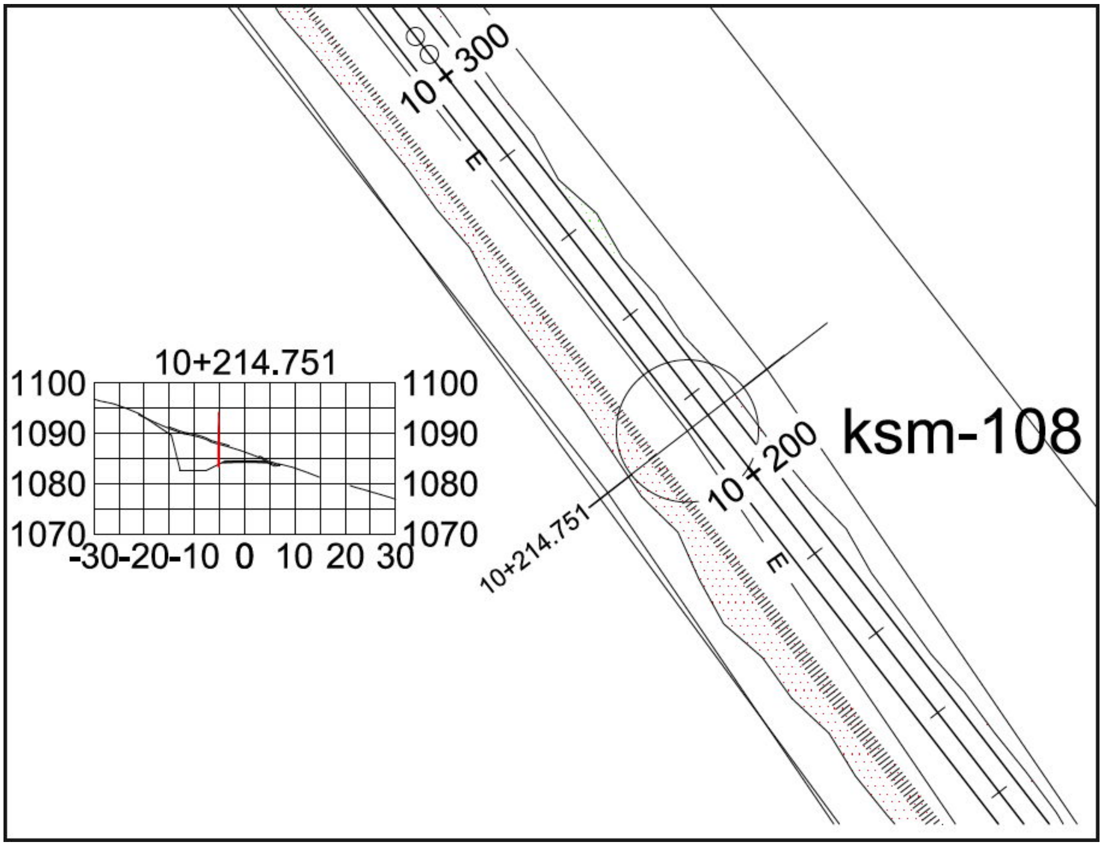
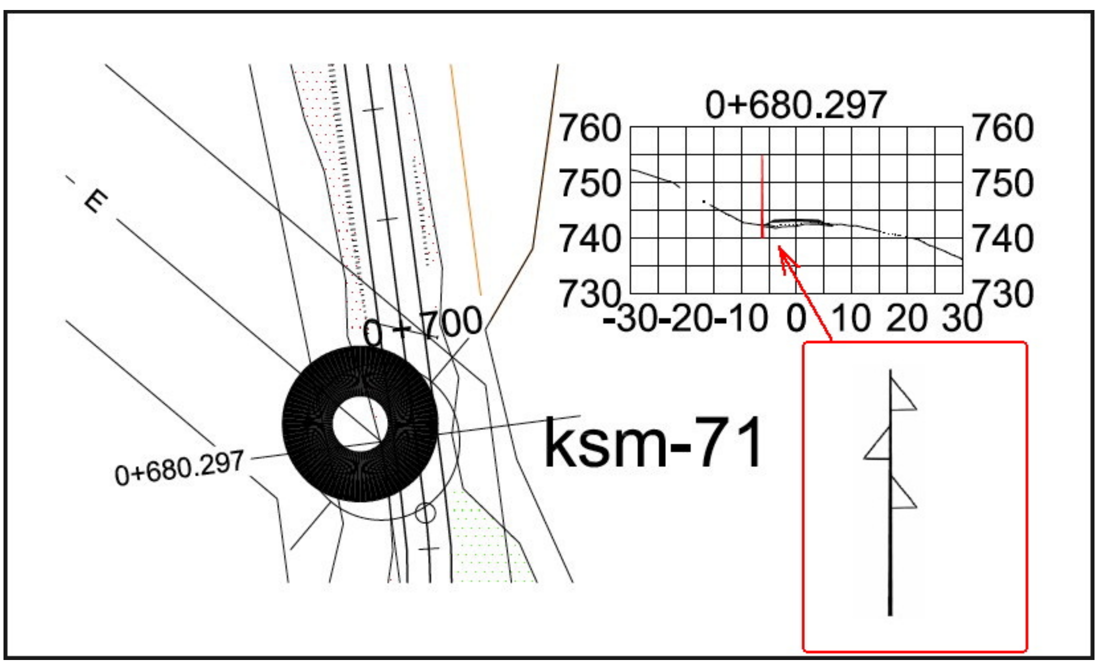


Figure 5.8 – 2 Typical Structure Along Lower Treaty Creek Road (McElhanney)



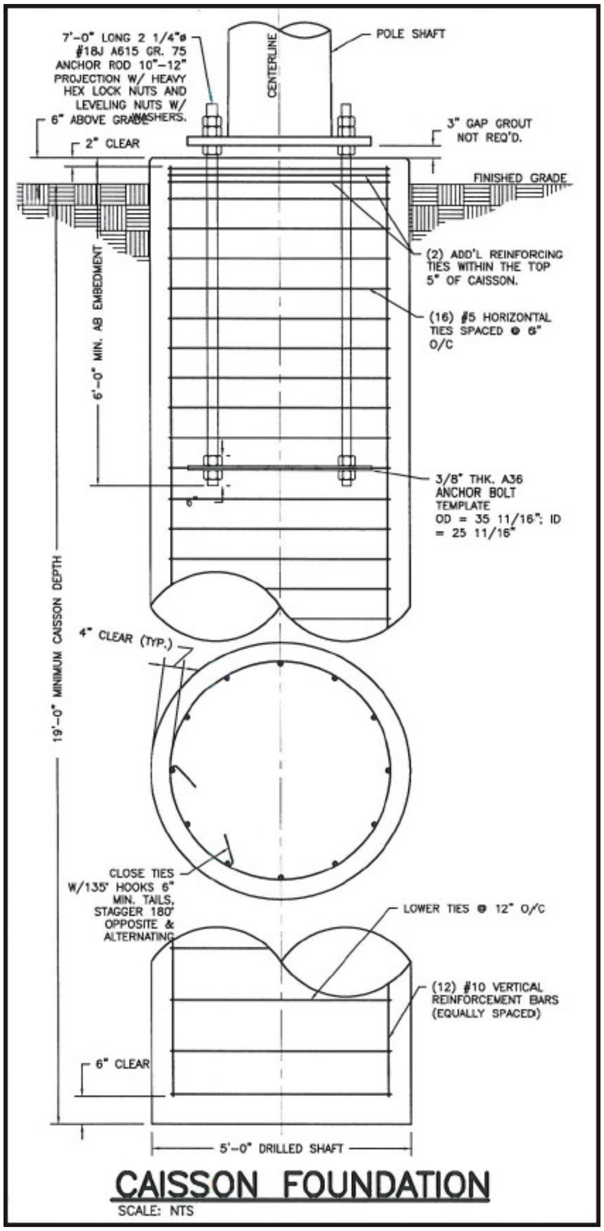
5.10 Monopole Foundations

Several types of foundations will be used, depending on the geotechnical conditions. These will include drilled caisson foundations, caisson foundation with blasting excavation, small concrete foundations anchored to solid rock, concrete spread footings on piles or micro-piles etc., as appropriate for each structure site. Typically, the installation contract would include a variety of foundation designs, with the appropriate foundation picked in each case by the Contractor, subject to approval by the Owner's geotechnical engineer.

During road construction much more foundation information will be gained and there will be the opportunity to do additional geotechnical field-work. This would include drilling test boreholes as may be justified. However, obtaining complete, definitive information at all foundation locations is usually not practical or economical for a transmission line and the normal practice is to have unit rates for different types of foundations. In summary, at the time of construction the geotechnical engineer will confirm which type of foundation is required, as described above.

For additional detailed foundation information refer to the BGC Report. The transmission line design is based on the geotechnical information as obtained in the extensive field investigations.

Figure 5.9 – 1 Caisson Type Foundation

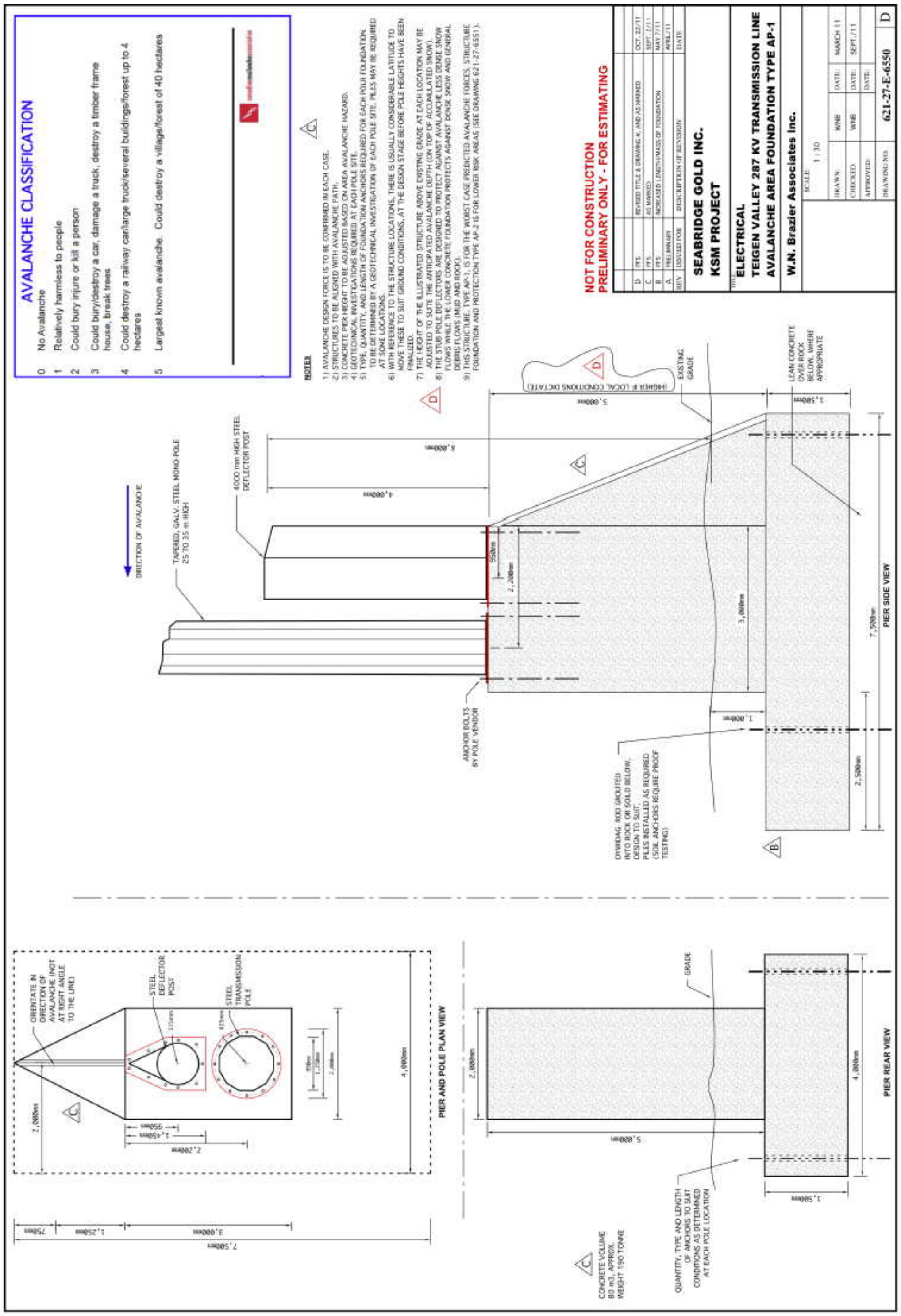


5.11 Avalanche Design Issues

The BGC Report (Clause 3.4) investigates the snow avalanche hazard and provides impact pressures and other information as required for design. For the most part, the transmission line misses significant hazard areas, but as it follows the road some structures are in avalanche run-out zones. These structures will be designed appropriately, primarily be raising their concrete foundations 2 to 6 metres above grade. Large concrete pier type foundations as designed for the previous Teigen Creek route, as shown in Figure 6.7-1 below, may be required in several locations.

Refer also to Section 8.0 herein. All BGC requirements have been incorporated in the transmission line design.

Figure 5.10 -1 Previous Teigen Creek Severe Avalanche Area Foundations



In addition to designing the structures for avalanche forces, the structure design will also consider snow creep loading in areas of high snow depth (4 to 5 metres or more) where the ground slopes exceed 15 degrees.

The transmission line design (wind load) will be selected to suit the wind velocity and increased air density (due to entrained snow) as identified in the BGC Report in areas of avalanche run-out. For some sections of line this may require significantly increased structure, conductor, and hardware strength.

5.12 Structure Spotting And Staking

Selection of structure locations has been primarily governed by the design concept of paralleling the mine access road as discussed elsewhere herein. Of primary consideration in spotting structures has been the selection of appropriate foundation sites, avalanche conditions, and avoidance of wetlands, debris flows, etc. Optimizing span length versus structure height and cost has been a secondary concern. Refer to the BGC Report.

Structures will be permanently numbered in the form of kilometer / structure number in line km from the Treaty Creek Switching Station.

5.13 Span Lengths

When further design is undertaken, at the project feasibility stage, final ruling spans will be established. The preliminary design is based on the use of steel monopoles and ruling spans of under 250 metres, although with monopole construction ruling spans up to at least 325 m could be accommodated without undue cost.

Long spans, such as the Bell-Irving River, will use 3 pole structures and will be dead-ended.

Refer to the drawings included in the BGC Report that include structure placement thus showing spans lengths, etc.

5.14 Insulators

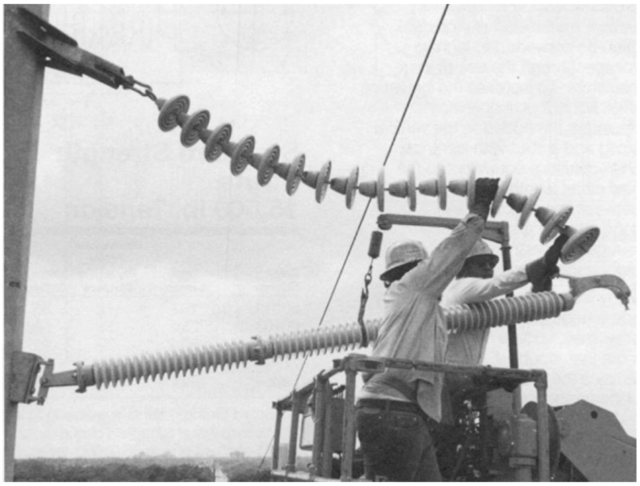
Transmission line insulators may be porcelain, glass or polymeric.

Modern composite polymeric insulators, consisting of a glass reinforced resin core rod and elastomeric sheds, have overcome previous UV and weathering problems and offer many advantages. The commonly used materials are EDPM rubber and silicone rubber. The metal end fittings are usually crimped onto the fiberglass rod with the required seals being a critical design and fabrication issue as water entry into the glass fibres can cause brittle failure. Major advantages are up to a 90% weight reduction and vandal resistance.

The KSM area is a low pollution area with low UV levels and thus insulator selection is not critical and high quality polymeric insulators are a good choice. Insulators selected with a creepage length selected for a medium severity installation would be economical, but have a large safety factor.

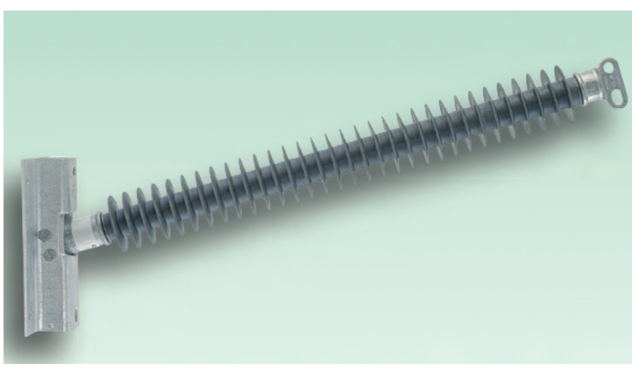
The selected insulators will, for the most part, be suspension insulators on davit arms or strut type. Line post insulators will be used to support line jumpers around poles and similar.
The mechanical loads applied on insulators by dead loads and live loads will be increased by a load factor of 2.0.

Figure 5.13 -1 Strut Type Insulators



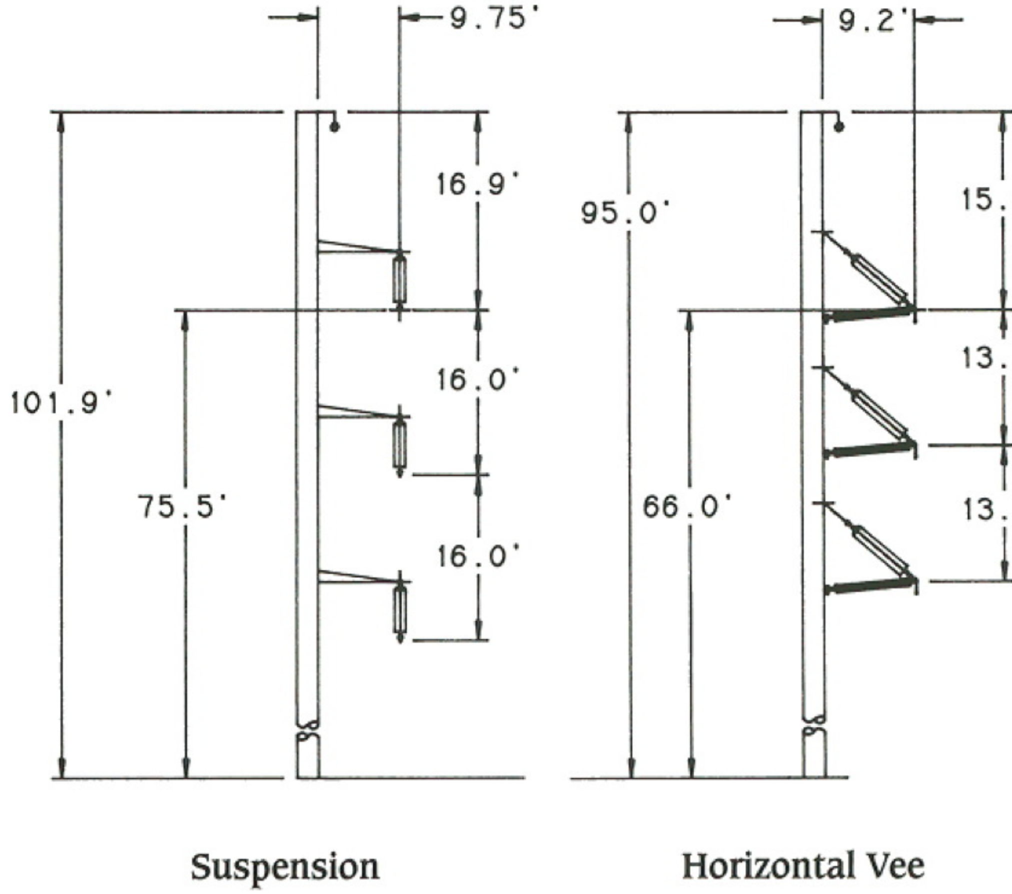
The use of (high strength) strut (Horizontal Vee) insulators allows for smaller structures with a more compact arrangement relative to davit arms and suspension insulators, as insulator swing does not have to be allowed for. The horizontal vee type construction is usually a little less costly than the davit arm and suspension insulator option. Similar spans are possible.

Figure 3.13 – 2 Typical Line Post Type Insulator



Line post insulators are an alternative to davit arms with suspension insulators or strut type insulators. They are generally not as strong. Like the strut type (horizontal vee) insulators they prevent insulator swing and thus result in more compact structures taking up less right-of-way space.

Figure 5.13 – 3 Davit Arm Versus Horizontal Vee (Strut) Insulators



The above figure is typical for 230 volt lines. At 287 kV the clearances will be somewhat greater. Also as the KSM line is single circuit, for both cases the centre conductor may be put on the opposite side of the pole to reduce the required pole height and better balance loading. The designs as shown (all conductors on the same side of the structure) may be preferred for some structures as where the line is on the shoulder of the road, the conductors can all be held on the opposite side of the pole away from the traveled road surface. Also, putting the centre phase on the opposite side eliminates the problem of ice-unloading where the lower conductor flips up and shorts out to the higher conductor when it sheds its ice load.

5.15 Hardware

Transmission line hardware shall meet the following requirements:

Standards - Canadian Standards Association (CSA)

- C83 Communication and Power Line Hardware
- C411.1 AC Suspension Insulators
- G40.20 General Requirements for Rolled or Welded Structural Quality Steel
- G40.21 Structural Quality Steel
- G164 Hot Dip Galvanizing of Irregularly Shaped Articles
- W59 Welded Steel Construction (Metal – Arc Welding)

- CSA-ISO-9002 QA Program.

Standards of the American Society for Testing and Materials (ASTM) will apply where:

- As referenced in CSA Standards.
- Where no CSA standards exist.

All ferrous materials shall be hot dip galvanized (as per CSA G164) unless specifically specified otherwise.

All steel components subject to conductor loads, except nuts, washers and unstressed components, are subject to Charpy V-notch impact tests, energy values will be specified as part of the detailed design. In no case shall Charpy ‘V’ notch impact average energy absorption values be less than of 20 joules at minus 20 °C. Refer to CSA Standard C83, Clause 6.2.4, Energy Absorption/Toughness.

All bolts will conform to CSA Std. C83.96, latest revision.

All welds shall conform to CSA W59. All steel welds shall be inspected by the fluorescent magnetic particle method or by other approved methods. Forged steel components, cold bends, bent bolts and bolts having a diameter of 30 mm or more shall be magnetic particle inspected before galvanizing in accordance with ASTM A275 on 100 percent of the surfaces.

All hardware assembly shall be tested to prove corona free operation at the nominal operating line voltage plus 10%, or as may otherwise be specified.

The mechanical loads applied on hardware and fittings by dead loads and live loads will be increased by a load factor of 2.0.

5.16 Conductors

Overhead transmission line conductors shall be in accordance with the most recent revision of CAN/CSA Standard – C61089.

Conductor selection for the KSM line is based primarily on the conductor size required to limit corona. A conductor selected on this basis will have adequate thermal capacity. A single conductor per phase will be used rather than two bundled conductors per phase.

The possible conductor types include ACSR, AAC or AAAC.

For the purposes of this report, 1033.5 kcmil ACSR code name Ortolan or Curlew is assumed (depending on strength requirements). A final selection of the conductor will be made at the detailed design stage.

Conductor transposition and phase arrangements will be addressed at the detailed design stage.

Typically for single conductor 287 kV type construction in British Columbia vibration dampers are generally not required, though maintaining lower conductor working tensions (in accordance with BC Hydro Standards). Armour rods will be provided for all suspension assemblies. The long Bell-Irving River crossing will be reviewed at the design stage but it is probably this dead-ended section will be provided with conductor vibration control.

For phase conductors within 45 degrees or less of horizontal, and spans less than 450 m, phase to phase clearance shall be checked for a conductor condition of bare @ 15oC and shall not be less than permitted by CAN/CSA. C22.3 No.1-01, Clause 4.9.1 and Table 17.

Overhead ground (shield) wire, if not combined with the fibre-optic cable, would be as per normal BC Hydro practice Size 9 7W Grade 1300, or similar.

5.17 Tower Grounding

Tower grounding is most critical on the spans adjacent to the Treaty Creek Switching Station and the KSM Substation No. 1. In these areas the shielded sections, near the terminals, are designed to prevent back-flashovers. Hence, the tower grounding resistance has to be quite low to limit the ground potential rise associated with lightning strikes in these areas. The ground target resistance of structure for several spans adjacent to the stations is 10 ohms. Counterpoises will be installed as required to meet this requirement.

Grounding requirements will be provided as part of the transmission line detailed design.

5.18 Detailed Design

The transmission line detailed design will be carried out at a later stage of the project.

For this report it is assumed, except where noted otherwise, that all design as a minimum will in accordance with the Codes and Standards as listed in Section 3.0 herewith, in particular BC Hydro Transmission Standards, ES 41D. In general, the BC Hydro requirements are more stringent than the CSA Standards and are thus to be adhered to.

Brazier has prepared a structure summary, listing all structures from Treaty Creek to KSM Substation No. 1. This has been used as the basis of a Tables A-1, B-1 and C-1 in the BGC Report, with notes on the field investigation at each structure site, geohazards, snow avalanche hazards, etc. The Brazier Structure Data Tables have been provided for reference (re: line location) as has been shown in the EA application.

5.19 Communications & Protection

BC Hydro requires fibre-optic telecommunications infrastructure to be incorporated into the KSM line such that BC Hydro system protection can be coordinated with KSM line and substation protective relaying.

Consequent to the above, ADSS or OPGW fibre will be installed from the Treaty Creek Switching Station to the KSM Substation No.1 for a length of approximately 30 km. The fibre would be installed on the new 287kV transmission line structures. Installation work would be done in conjunction with conductor installation for the transmission line. Mid-way optical repeaters are not required for this single mode fibre due to the relatively (for single mode fibre) short distance. Refer to Clause 5.5 “Lightning Protection” herein.

BC Hydro has relocated their NTL communications repeater to Treaty Creek. Thus, a communications connection point will be available for the KSM fibre at the Treaty Creek Switching Station.

5.20 Treaty Creek Substation Connections

The line termination and slack span connection at the Treaty Creek Switching Station will be as advised by BC Hydro when their design is complete.

6.0 CAPITAL COST ESTIMATE

6.1 General

The transmission line capital costs as included herein are based on the KSM 2012 pre-feasibility study (PFS) estimates. Details may be found in the KSM 2012 PFS, in particular Appendix K capital cost estimate. These include design, survey, clearing, and supply and installation of structures, conductors, insulators, all line hardware, stringing, QA/QC inspection, commissioning, and all other construction costs.

6.2 Total Cost

The total estimated capital cost for the KSM transmission line project is approximately US $25,778,000. Refer to the KSM 2012 PFS update, in particular Appendix K, Cost Code N17.

The above listed capital cost does not include a total of US $10,176,000 contribution for the Treaty Creek switching station as detailed under Cost Codes N11. A related payment to BC Hydro for the “Basic Line Extension” is US $5,760,000 included in Appendix K Cost Code N15. These latter costs represent the KSM project contribution towards the Treaty Creek Switching Station and are preliminary estimates of BC Hydro Costs. Seabidge has commissioned a Facilities Study by BC Hydro that will be completed in 2013. This study will include detailed costs estimates for the Treaty Creek Switching Station. It is to be noted that as BC Hydro plan on the future installation of some of their equipment at Treaty Creek, they will fund some (small part) of the construction cost. Also note, Cost Code N12-1.13-4888.00 includes US $2,876,000 for a Static Var Compensator (SVC) that, in line with current discussions, may be installed at Treaty Creek. Hence this budget may be transferred to the BC Hydro account. Thus, the total current allowance for the Treaty Creek Switching Station is US $18,812,00 in 2012 dollars.

The above capital cost estimates are exclusive of the required capital contributions towards the NTL. These are included in a separate project cost code and do not relate directly to the KSM transmission line construction.

6.3 Clearing Costs

As the transmission line route closely follows the mine access road, some part of the transmission line right-of-way clearing costs are included in the road clearing costs. The remaining clearing costs are included in the transmission line budget.

6.4 Environmental

The cost of environmental studies, submissions, approvals and costs are covered under the KSM mine environmental process and are not included in the transmission line cost estimates.

7.0 NTL

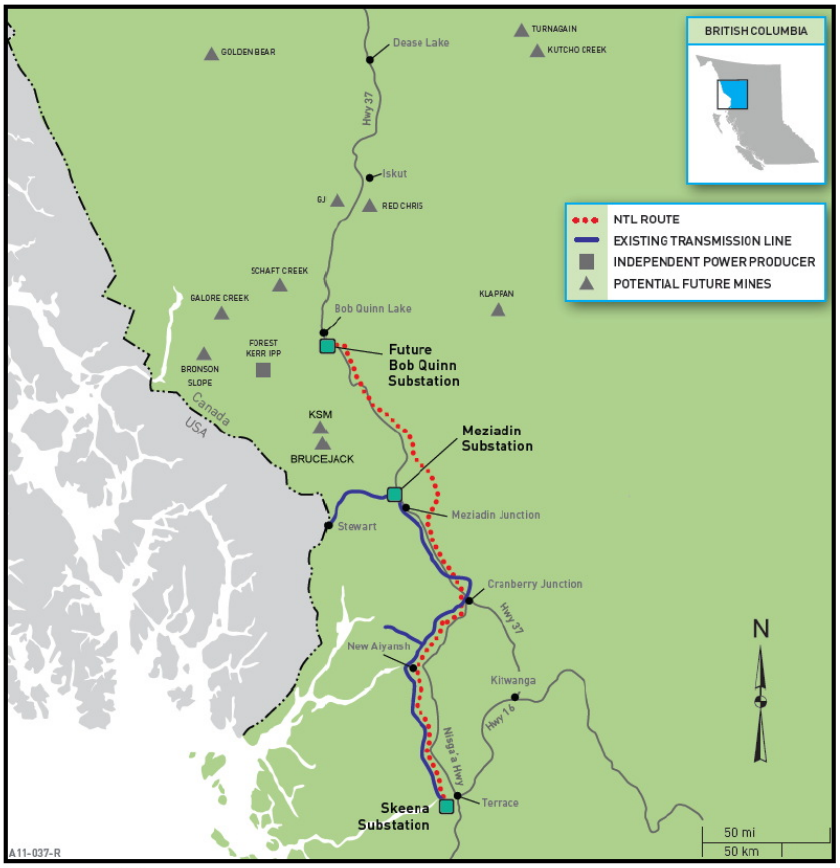
7.1 General

The source for the 287 kV spur line to the KSM project is the BC Hydro NTL transmission line that is currently under construction. This 287 kV single circuit transmission line runs 344 km from the Skeena Substation at Terrace, B.C. to Bob Quinn located along Highway 37 north of the proposed KSM project. The NTL is currently under construction with a scheduled completion date of May, 2014.

7.2 NTL Route

The NTL route is shown in the figure below.

Figure 7.2 -1 NTL Route Map (As per BC Hydro)



Source: BC Hydro.

7.3 Treaty Creek Switching Station

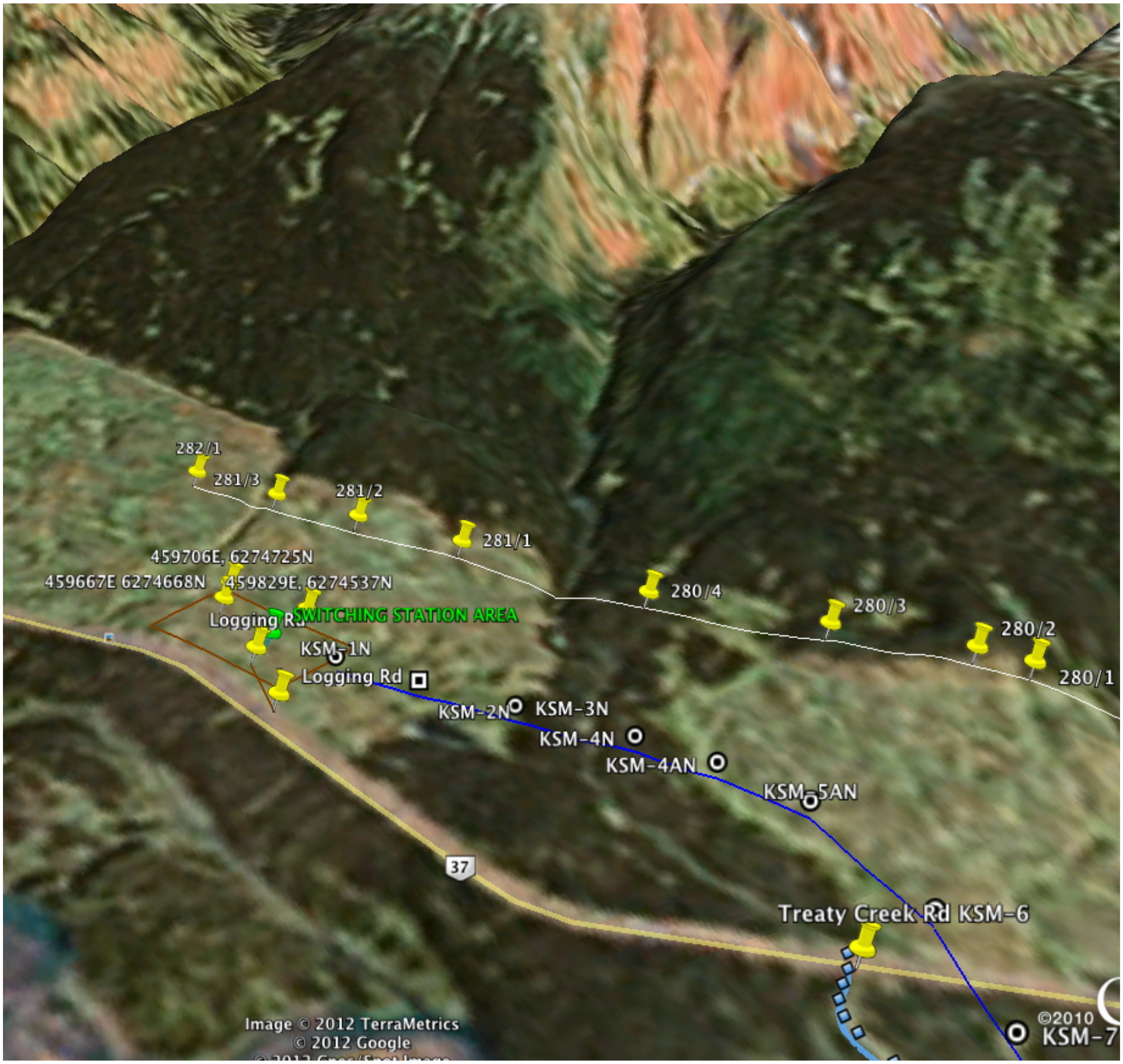
To provide a connection to the KSM transmission line a switching station is required on the NTL. A location near where the KSM Treaty Creek access road intersects Highway 37 has been agreed to.

To accommodate this future switching station several basic changes to the NTL design are required including the installation of two dead-end structures. As of October 2012, Seabridge has committed to BC Hydro to cover the resultant costs that must be expended in the immediate future. The NTL structures being changed are numbers 280/4, 281/1, 281/2, 281/3 and 282/2.

The switching station will be located between Highway 37 and the NTL. Coordinates are shown in the figure below.

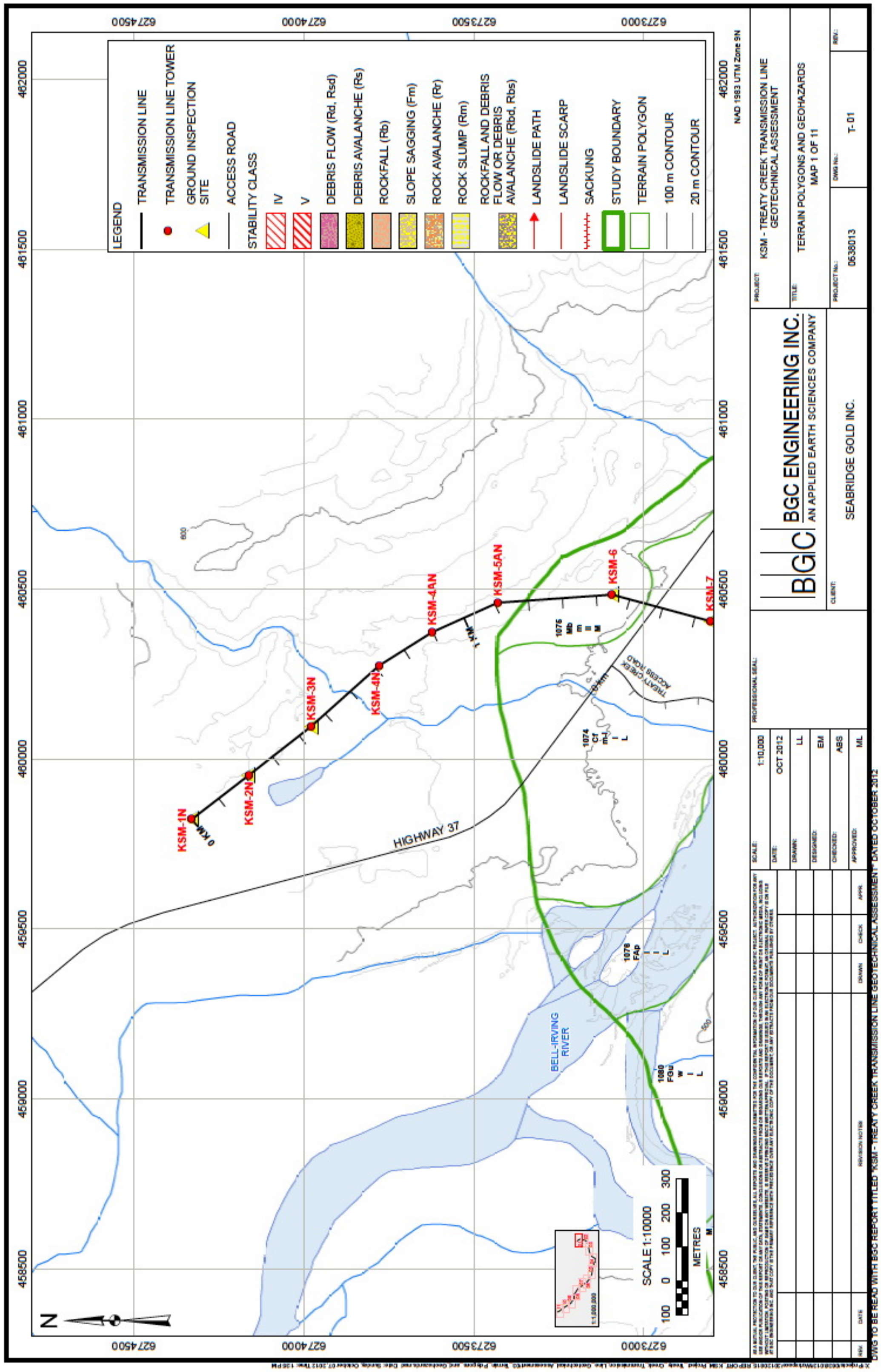
The Treaty Creek switching station will include equipment as shown in Figure 7.3 – 3 following.

Figure 7.3 – 1 Treaty Creek Switching Station Location



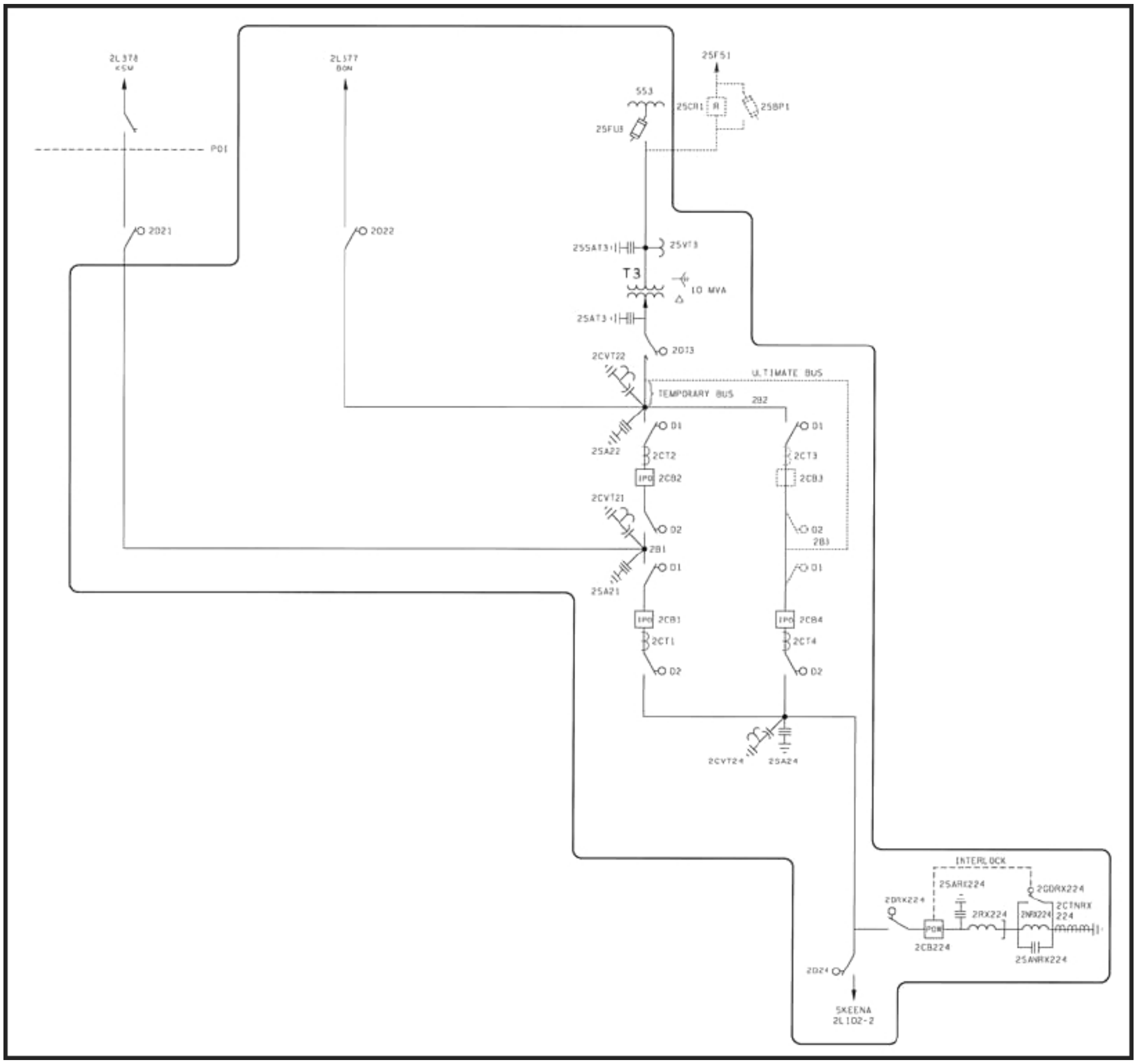
Switching station approximate UTM coordinates are shown in the figure above. Switching Station plan drawings are not available at this time from BC Hydro.

Figure 7.3 – 2 End Of KSM Line At Switching Station (From BGC Report)



The Treaty Creek switching station is located past the last KSM line structure as shown above. At this time plan drawings have not been received from BC Hydro.

Figure 7.3 – 3 BC Hydro Treaty Creek Switching Station (Proposed 1 Line)



8.0 GEOTECHNICAL ASSESSEMENT

8.1 General

The "KSM Project, Treaty Creek Transmission Line, Geotechnical Assessment," (the BGC Report). This report covers the geotechnical aspects of the transmission line project. This transmission line report and the route selection are both based on revisions made as a result of the BGC Report. Please refer to the BGC Report included in Appendix C herewith for complete details. In particular refer to the BGC Report, Appendix C, "Treaty Creek Transmission Line Geohazard Risk Assessment."

In summary, the BGC Report assesses the terrain and expected ground (foundation) conditions, geohazard risks with recommendations for reduction, provides preliminary estimates of snow avalanche impact pressures and snow depths for use in feasibility level structure design and provides recommendations for further work prior to construction. The report also includes maps that show the transmission line on terrain, geohazards, snow avalanche hazards, and slope angles.

The acceptable level of transmission line avalanche risk depends on the economic impacts of line failure. In the case of the KSM project, the occasional momentary transmission line outage caused by avalanche events blowing line conductors together to cause a simple circuit breaker trip can be occasionally tolerated. A short (say 1 hour) outage once every winter is judged not to be onerous. But more frequent even short outages in winter and any lengthy outages lasting a day or more are unacceptable. Suitable line routing and design measures have been/will be taken as required in order to eliminate any such occurrences.

The transmission line route selection has avoided most of the obvious avalanche hazard, but exposure remains as the road is located in the run-out area of several avalanche tracks. Several structures, beside the access road, are in avalanche run-out zones. The transmission line will be designed to withstand the avalanche forces.

All BGC design requirements and recommendations have been included in the KSM transmission line design.

8.2 General Mitigating Design Measures

The transmission line is, to a large extent, routed to miss avalanche tracks, but complete avoidance is not possible. Long transmission spans can be used over avalanche tracks, but it has to be kept in mind that avalanches are accompanied by clouds of snow and high, localized winds that can also affect the line. Even if the snow does not reach the conductors, the high resultant winds will often blow the conductors together which will result in a circuit breaker trip and a short power outage (breakers would have to be re-closed and the milling operations restarted).

The impact from flowing snow avalanches, entrained rocks and timber will, of course, cause bending forces in the impacted structures. In wood poles, failures will commonly occur as fractures above ground level. The wind pressures and “the snow powder blast” created by avalanches acting on the line conductors can also cause large bending moments on the support structures, adding to the thrust on the structures caused by the flowing snow. H frame type structures in avalanche areas can be strengthened by extra cross bracing and by steel channels bolted to the poles.

Figure 8.2 -1 Avalanche Protected H Frame Structure In Colorado

In avalanche areas the preferred structure type would be large single pole steel as these present_less areas for avalanches to act against and can be designed with considerable strength. Various additional design measures can also be taken to protect and strengthen structures against avalanche damage. As is sometimes seen at ski resorts at lift towers, additional snow break poles can be erected just in front of the line structure. As has been done for a transmission line in Iceland, large concrete foundations can also be used to lift the structure above most of an avalanche. Refer to the figures 8.2- 2 and 8.2 – 3 below.

With the transmission line located relatively close to the road, repair after an avalanche will at least be expedited, as road clearance will facilitate access for transmission line repair. This will also reduce the risk to repair crews.

Figure 8.2 - 2 Avalanche Area Pole Foundation

Figure 8.2 - 3 Single Pole Structure On Foundation (Iceland)

Avalanche forces on structures (steel poles) and conductors can be calculated. The undersigned has design data on file. However, due to the special nature of this work, final design would be by an expert in the field. When calculating the avalanche force it must be recognized that avalanches often bring with them a lot of material other than snow. The pole foundations shown in the Figure 8.2 - 2 were designed for the area in question, to elevate the base of the pole above the main mass of any avalanche. Similar design concepts could be used for the KSM line where and if necessary.

Avalanche diversion structures can also be built as shown in the figure 8.2 - 4 below. In 2009 Alaska Electric Light & Power built this avalanche "diverter" to protect a transmission tower. As shown in the construction photo, the diverter is a "V" shaped structure, designed to direct the force of an avalanche away from the base of an existing tower.

Figure 8.2 - 4 Diverter Structure In Alaska

The relatively nearby Kemano-Kitimat 287 kV transmission line (built by Alcan), the BC Hydro Meziadin-Stewart 138 kV transmission line and the BC Hydro Terrace-Prince Rupert 287 kV transmission line were all designed (or had added) avalanche protective measures.

The Kemano line includes earth deflector berms and splitters to protect the transmission line towers in avalanche runout zones and tower bases are also reinforced to resist avalanche impact forces. Additionally, a catenary system was recently constructed to lift the line above valley bottom, eliminating approximately ten structures exposed to avalanche hazard. The 138 kV Stewart line initially suffered outages, but large single steel poles were installed in certain areas, etc. and this line is now reasonably secure with no recent reported outages due to avalanches.

8.3 KSM Line Design Measures

Over-sizing the monopole circular concrete foundations and extending them 2 to 6 metres or more above ground level can mitigate, for the most part, the avalanche forces on the line structures. Steel deflector poles may also be used. Details will be worked out at the next phase of the project. It is anticipated that in several locations large concrete pier foundations may be required as were originally planned for the previous Teigen Creek route (now abandoned). Refer to Figure 5.10 – 1.

In debris flood areas BGC has recommended extending the concrete foundations 3 m above final grade. In these areas V-berms and larger concrete pole foundations will also be considered for protection against debris floods. BGC identified 4 structures (KSM-21N, KSM-22, KSM-23N and kSM-24) with ‘High’ debris flood risk where these measures would be appropriate.

8.4 Avalanche Control

Avalanche control measures, as detailed in other document, are planned along the road right-of-way. Typically such measures include:

- Helicopter bombing.
- Avalaunchers (pressurized gas propelled explosive projectiles)
- GazEx: remote controlled propane exploders.
- Artillery or mortar type explosives projectiles.

Use of any of the avalanche control methods will consider the transmission line.

9.0 CONSTRUCTION

9.1 General

The transmission line construction should be covered under a separate general contract and not included as a subcontract to any process plant contracts. It should also have it’s own management team. Transmission line work is much different than process plant construction and generally contractors and construction managers familiar with plant work are not experienced in transmission line construction.

All construction activities would be timed so as to limit environmental impacts.

9.2 Construction Infrastructure

Additional temporary infrastructure such as constructions camps, staging areas, fuel storage, etc. will probably not be required for the transmission line construction as the facilities put in place for road construction or the facilities at the mine construction site will be utilized.

In summary, temporary infrastructure to support constructing the transmission line will be considerably less extensive and costly than normal as the construction camps at the KSM mine site would be utilized as would existing laydown or staging areas. In general, the transmission line access will be from the adjacent access road. Some short access tracks will be required but difficult to access structure sites could utilize helicopter construction methods. Helicopters may be used for stringing wire, setting poles, and placing crews and tools in areas that are otherwise inaccessible or where the construction of access track is very costly or environmentally undesirable.

9.3 Roads, Stream Crossings, Etc.

For the most part construction access is provided by the Treaty Creek access road and the cut-off ditch access track, as discussed elsewhere herein. These roads, complete with bridges, will be finished and in service before transmission line construction commences.

Stream crossings will not be required for transmission line access, as these would be provided by the mine access road. The 287 kV transmission line will exclusively use tension-stringing methods, where the conductors never touch the ground. Pilot ropes will be flown in by helicopter, in particular where the line itself must cross streams.

The transmission line ROW clearing will, in general, be minimized relative to common practice. Where ROW clearing intersects streams best practice will be followed and all environmental requirements adhered to, as outlined in other project documentation.

9.4 Construction Activities

Construction activities would include:

- ROW Survey (Lidar survey already complete).
- Clearing (that was not completed as part of the mine access road work).
- Access track construction (after mine access road construction is complete).
- Structure pegging.
- Foundations.
- Pole setting, dressing, etc.
- Stringing and sagging.
- Line testing and commissioning.
- ROW restoration and waste removable.
- As built survey.

9.5 Schedule

The transmission line construction is scheduled for the second year of the project. At that time the main access road and the cut-off ditch track are to be at the useable stage, if not totally complete.

A detailed transmission line construction schedule will be provided after a detailed road and cut-off ditch schedule are available, as of course the transmission line schedule depends on this other work. A general outline schedule includes:

- Transmission line detailed design would be completed in year one of the project and material ordered for availability in year 2. After the road is pioneered, some transmission line design updates would be required.
- Clearing would be completed along with the roadwork, all prior to year 2.
- Transmission construction would start in the spring of year 2.
- Transmission line and substation construction would be complete by end Q2 of year 3.

- The line and the plantsite main substation would be commissioned and energized by Q3 of year 2, the substation being the controlling factor.

The reason for completion in year 3 is so that the Treaty Plantsite construction can be taken off diesel generators. However, if delays are encountered, such as BC Hydro not finishing the Treaty Creek Switching Station, the construction diesel power plant could remain in operation.

9.6 Construction Safety

The transmission line construction safety program would generally follow the KSM plant safety program with, of course, modifications to suit transmission line construction. Whereas BC Hydro “Power System Safety Protection” (PSSP) certification would be advantageous, the line does not fall under BC Hydro jurisdiction so these requirements are not formally applicable.

10.0 TRANSMISSION LINE OPERATION AND MAINTENANCE

10.1 Transmission Line Commissioning And Operation

Energizing and de-energizing the KSM transmission spur from the Treaty Creek Switching station will be carried out by BC Hydro as they will own and control the Treaty Creek switching Station.

BC Hydro will, as line construction nears completion and commissioning is immanent, provide a document titled “BC Hydro Real Time Operations, Operating Order ----, Commissioning Procedure For Generators, Station and Transmission Projects.” The BC Hydro Transmission and Distribution department (BC Hydro T&D) requires the referenced commissioning process to be adhered to. For installations owned by others (such as the KSM line) the document primarily spells out the required documentation to be provided to BC Hydro.

Before the KSM transmission line and No.1 Substation can be energized, the BC Inspector of Mines, Electrical, will require letters of assurance from the design engineer(s) of record for these two installations. The Electrical Inspector will also review operating procedures, draft switching orders, etc.

The commissioning of the KSM transmission line and substation would be in accordance with the ANSI/NETA document “ATS-2009 American National Standard For Acceptance Testing Specifications For Electrical Power Equipment and Systems” and other specific requirements as applicable.

During normal operation, the KSM transmission line would require very little intervention.

An operating manual would be provided for the KSM Transmission Line and Substations that would include operating procedures, safe work practices, draft switching orders and general safety requirements to be followed by electrical operating personnel.

Upon completing the commissioning phase, the Project would enter into the general operations phase. Operation will be covered by a document titled “BC Hydro Real Time Operations, Operating Oder # XXX, KSM Mine Substation” or similar. The purpose of this operating order will be to describe the energization and de-energization of the KSM transmission line and the isolation procedures that are to be followed in order to work on boundary equipment between the KSM No. 1 Substation and its connected transmission line and the BC Hydro electrical system. BC Hydro will be the operating authority for all Treaty Creek Switching Station equipment located within the switching station perimeter fence. KSM will be the operating authority for 287 kV spur line located outside the switching station perimeter fence and KSM Substations. It is to be noted that energization and de-energization of the KSM transmission line will be, of necessity, under BC Hydro control.

10.2 Vegetation Management

Once the structures are installed and conductors strung and other construction work is complete, the vegetation within the ROW and the vegetation management zone would be regularly trimmed, but only as required to maintain line clearance. A local contractor would be retained for this work.

10.3 Transmission Line Maintenance

Upon completion of the transmission line construction phase, the general operation and maintenance phase would commence.

KSM will institute a program of line maintenance based on regular inspections to ensure that the transmission line structures, insulators and conductors are maintained in a safe and effective manner.

KSM would retain an experienced transmission line contractor and a vegetation management contractor to carry out the required regular maintenance activities. The major activities would include:

- ROW vegetation management.
- Structure foundation maintenance, in particular berms for protection from debris flows, riprap for erosion protection, etc.
- Structure maintenance.
- Line hardware, insulator and conductor maintenance.
- Fibre-optic system maintenance.

Patrols of the KSM transmission line to identify any potential problems including tree issues would occur on a regular and frequent schedule. As much of the transmission line is easily accessible from the access road the patrols for the most part would be easy. Some short sections, especially in winter, would probably be inspected by helicopter.

The normally infrequently required transmission line maintenance should have little impact on road transport and road maintenance should not impact transmission line operation.

10.4 Spares

The process plant warehouse would stock spare conductor, insulators, line hardware, monopoles, fibre-optic cable and electronics, etc. as required.

10.5 Operational Safety

Safety during transmission line activities is critical and would generally follow the KSM Project safety standards, but as transmission line work is very specialized involving work with which KSM personnel would not be familiar, the maintenance contractor would be required to develop a comprehensive and specific safety program. An operating manual would be provided complete with safe work practices, draft switching orders, etc.

CSA Standard Z462-08 "Workplace Electrical Safety" will be applicable.

11.0 CLOSURE

11.1 General

There is no closure plan for the transmission line as it will be required after mine closure to provide power for the water treatment facilities and/or connect to the site hydro electric generation facilities that will remain operational after mine closure.

W.N. Brazier

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PROVINCE OF BRITISH COLUMBIA
W. N. BRAZIER

W.N. Brazier, P.Eng.
December 4, 2012

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12.0 APPENDIX A – ROUTE PHOTOGRAPHS

The following are typical photos taken along the transmission line route.

TREATY CREEK SWITCHING STATION AREA

AT STRUCTURE # KSM-8 NEAR BELL – IRVING RIVER

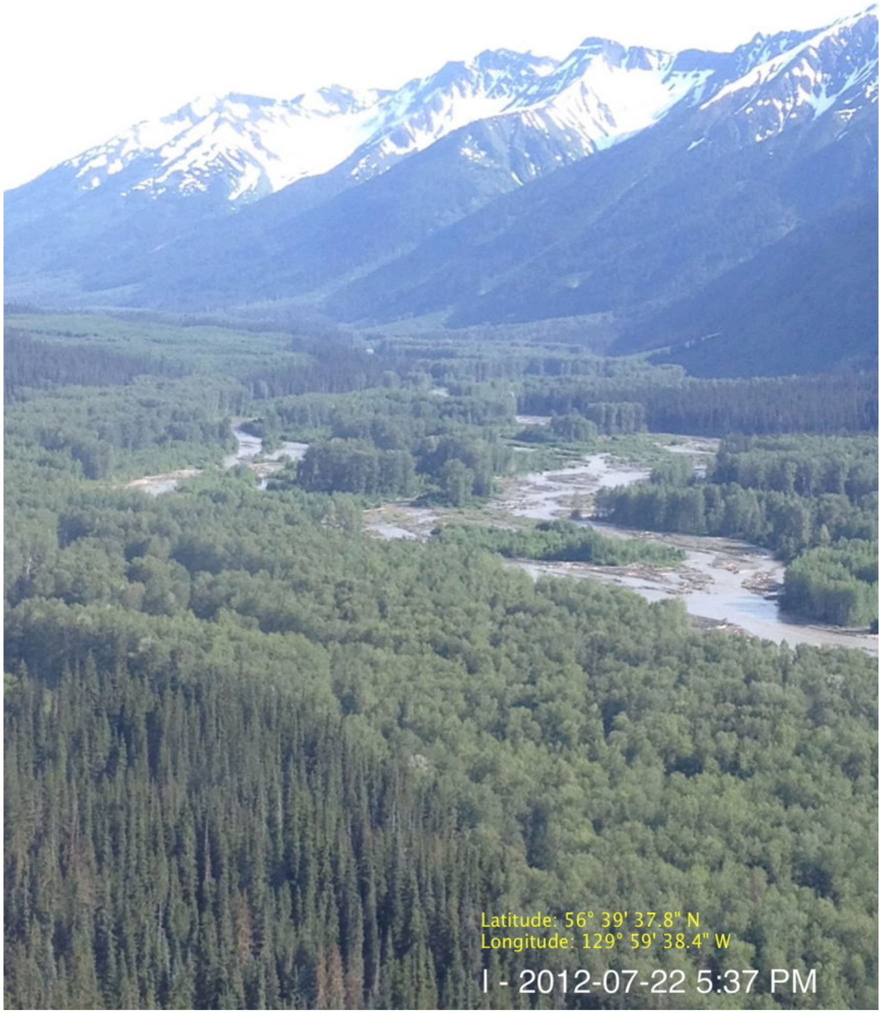
OVERVIEW OF TREATY CREEK

NEAR STRUCTURE # KSM-29N

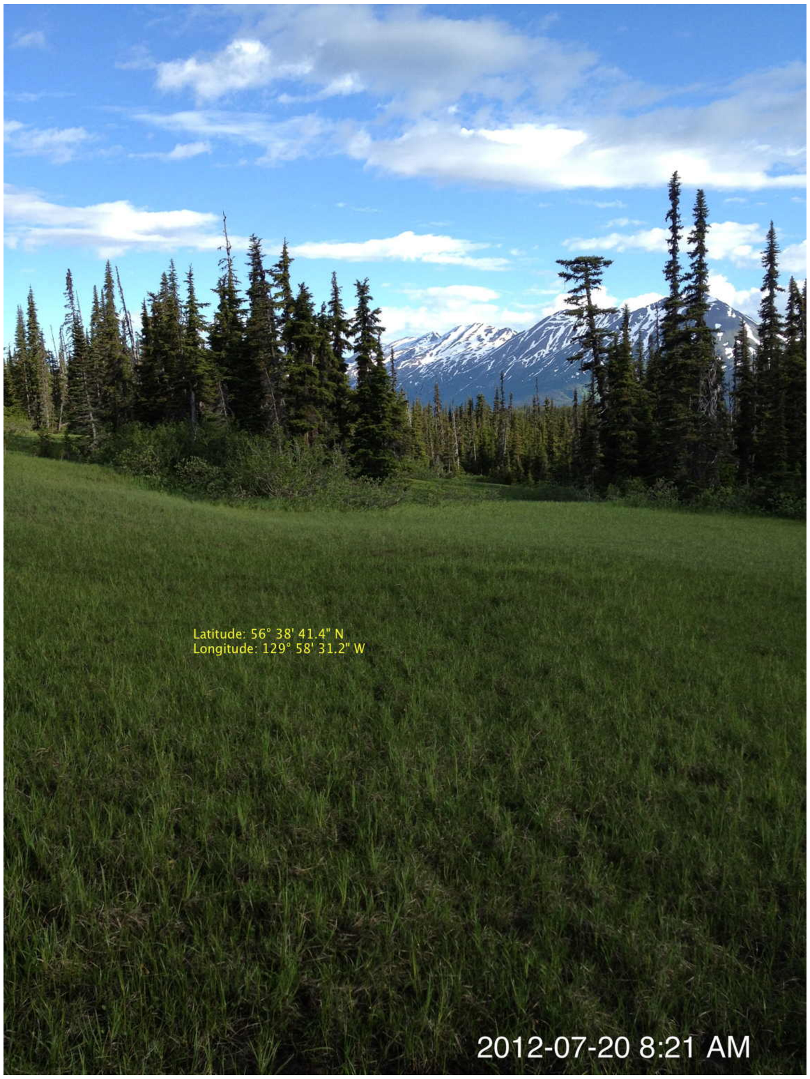
NEAR STRUCTURE # KSM 45

NEAR STRUCTURE # KSM-47

NORTH TREATY CREEK



BETWEEN STRUCTURES KSM 112 AND 113 APPROACHING PLANTSITE



13.0 APPENDIX B – STRUCTURE DATA SHEETS

The following data sheets provide the coordinates of the transmission line structures.

SHEET 1 OF 3 - KSM PROJECT, 287 KV TRANSMISSION LINE FROM TREATY CREEK SWITCHING STATION TO KSM SUBSTATION NO.1, STRUCTURE LOCATIONS, SPAN LENGTH, ETC.

STRUCTURE EASTING	STRUCTURE NORTHING	LATITUDE	LONGITUDE	STRUCTURE Latitude	STRUCTURE Longitude	GROUND ELEVATION, m	STRUCTURE NO.	PIER HEIGHT m (above grade)	POLE BASE ELEVATION, m (Ground plus	CONDUCTOR HEIGHT, m (Low	POLE LENGTH,	POLE	SPAN AHEAD, METRES (Great circle ellipsoid	SPAN AHEAD, METRES (Great Circle))	SPAN AHEAD, METRES (Approx.)	CHAINAGE (HORIZONTAL, APPROX.)	STRUCTURE TYPE	BEARING, DEGREES to next	LINE DEVIATION, DEGREES	BEARING, DEGREES TO NEXT POLE (Great Circle)	BEARING, DEGREES TO NEXT POLE (Approx.)	MINUTES	SECONDS	AVALANCHE FOUNDATION YES/NO&D TYPE OF PROTECTION	STRUCTURE TYPE NO.	NOTES -FOR STRUCTURE FOUNDATION DETAILS SEE BGC REPORT	REV./DATE
459,823.2	6,274,329.7	56.611471	129.6545689	N56:36:41.2963	W129:39:16.448		KSM-1N	0	0.00					210.84	210.75	0.0		142.3248		141.78	142	19	29.38			3 pole deadend structure	
459,952.0	6,274,162.9	56.609984	129.6524446	N56:36:35.9412	W129:39:8.8005		KSM-2N	0	0.00					232.42	232.33	210.8		142.0331	0.3	141.49	142	1	59.13				
460,095.0	6,273,979.7	56.60835	129.6500879	N56:36:30.0616	W129:39:0.3166		KSM-3N	0	0.00					268.95	268.85	443.1		138.0741	4.0	137.53	138	4	26.72				
460,274.6	6,273,779.7	56.606569	129.6471309	N56:36:23.6475	W129:38:49.6714		KSM-4N	0	0.00					185.92	185.85	711.9		147.9116	9.8	147.37	147	54	41.81				
460,373.3	6,273,622.2	56.605163	129.6454986	N56:36:18.5852	W129:38:43.795		KSM-4AN	0	0.00					211.35	211.27	897.8		155.6914	7.8	155.15	155	41	28.98				
460,460.3	6,273,429.7	56.60344	129.6440526	N56:36:12.3848	W129:38:38.5893		KSM-5AN	0	0.00					338.30	338.17	1,109.1		176.0135	20.3	175.48	176	0	48.56				
460,483.8	6,273,092.4	56.600412	129.6436181	N56:36:1.4818	W129:38:37.0252		KSM-6	0	0.00					299.10	298.98	1,447.2		195.2239	19.2	194.69	195	13	25.88				
460,405.3	6,272,803.9	56.597813	129.6448526	N56:35:52.128	W129:38:41.4694		KSM-7	0	0.00					462.91	462.74	1,746.2		196.2323	1.0	195.69	196	13	56.35			3 pole structure with berm & riprap around all	
460,276.0	6,272,359.6	56.593811	129.6468909	N56:35:37.72	W129:38:48.8072		KSM-8	0	0.00					303.72	303.61	2,208.9		197.0205	0.8	196.48	197	1	13.63			3 pole structure	
460,187.1	6,272,069.3	56.591196	129.6482933	N56:35:28.3041	W129:38:53.8561		KSM-9	0	0.00					348.86	348.73	2,512.6		195.7161	1.3	195.17	195	42	57.96				
460,092.6	6,271,733.6	56.588172	129.6497796	N56:35:17.4188	W129:38:59.2067		KSM-10	0	0.00					295.38	295.27	2,861.3		229.2808	33.6	228.74	229	16	51.03				
459,868.8	6,271,541.0	56.586422	129.6533933	N56:35:11.1206	W129:39:12.2159		KSM-11	0	0.00					282.47	282.36	3,156.6		228.6541	0.6	228.11	228	39	14.80				
459,656.9	6,271,354.4	56.584729	129.6568153	N56:35:5.0227	W129:39:24.5352		KSM-12		0.00					277.32	277.21	3,438.9		229.5985	0.9	229.05	229	35	54.44				
459,445.8	6,271,174.8	56.583096	129.6602238	N56:34:59.1465	W129:39:36.8057		KSM-13	0	0.00					241.98	241.89	3,716.1		229.1793	0.4	228.63	229	10	45.46				
459,262.7	6,271,016.6	56.58166	129.6631788	N56:34:53.9758	W129:39:47.4435		KSM-14	0	0.00					256.61	256.51	3,958.0		258.4294	29.3	257.88	258	25	45.93				
459,011.4	6,270,965.2	56.581176	129.6672613	N56:34:52.2331	W129:40:2.1407		KSM-15	0	0.00					182.07	182.00	4,214.5		256.5899	1.8	256.03	256	35	23.48				
458,834.4	6,270,923.0	56.580781	129.6701365	N56:34:50.8122	W129:40:12.4912		KSM-16	0	0.00					193.72	193.65	4,396.5		259.7584	3.2	259.20	259	45	30.25				
458,643.8	6,270,888.5	56.580455	129.6732328	N56:34:49.6384	W129:40:23.6382		KSM-17	0	0.00					242.43	242.33	4,590.2		258.3006	1.5	257.74	258	18	2.06				
458,406.5	6,270,839.4	56.579993	129.6770876	N56:34:47.9737	W129:40:37.5155		KSM-18N	0	0.00					283.39	283.29	4,832.5		275.8330	17.5	275.27	275	49	58.63				
458,124.7	6,270,868.2	56.580226	129.6816796	N56:34:48.8146	W129:40:54.0465		KSM-19	0	0.00					215.89	215.81	5,115.8		257.3367	18.5	256.77	257	20	12.16				
457,914.1	6,270,820.9	56.579782	129.6850993	N56:34:47.2167	W129:41:6.3574		KSM-20	0	0.00					230.19	230.10	5,331.6		257.5825	0.2	257.01	257	34	56.87			Provide berm with riprap	
457,689.4	6,270,771.4	56.579318	129.688749	N56:34:45.5438	W129:41:19.4965		KSM-21N	0	0.00					237.98	237.89	5,561.7		256.6840	0.9	256.11	256	41	2.55			Provide berm with riprap	
457,457.9	6,270,716.6	56.578805	129.692508	N56:34:43.6965	W129:41:33.0288		KSM-22	0	0.00					227.74	227.66	5,799.6		256.8660	0.2	256.29	256	51	57.52			Provide berm with riprap	
457,236.2	6,270,664.9	56.57832	129.696108	N56:34:41.951	W129:41:45.9889		KSM-23N	0	0.00					213.59	213.51	6,027.2		257.1484	0.3	256.57	257	8	54.22			Provide berm with riprap	
457,028.1	6,270,617.4	56.577874	129.6994883	N56:34:40.3467	W129:41:58.1579		KSM-24	0	0.00					248.56	248.46	6,240.8		257.3269	0.2	256.74	257	19	36.74			Provide berm with riprap	
456,785.6	6,270,562.9	56.577362	129.7034248	N56:34:38.5037	W129:42:12.3292		KSM-25	0	0.00					307.59	307.47	6,489.2		257.5056	0.2	256.92	257	30	19.99			Provide berm with riprap	
456,485.5	6,270,496.4	56.576737	129.7082995	N56:34:36.2526	W129:42:29.8784		KSM-26	0	0.00					285.70	285.59	6,796.7		250.1083	7.4	249.52	250	6	29.71			Avalanche foundation	
456,216.9	6,270,399.2	56.575839	129.712654	N56:34:33.0202	W129:42:45.5544		KSM-27	0	0.00					195.49	195.42	7,082.3		231.4739	18.6	230.88	231	28	26.03				
456,064.0	6,270,277.5	56.574731	129.7151216	N56:34:29.0323	W129:42:54.4377		KSM-28	0	0.00					176.28	176.22	7,277.7		232.1897	0.7	231.59	232	11	23.10				
455,924.8	6,270,169.4	56.573748	129.717369	N56:34:25.4916	W129:43:2.5284		KSM-29N	0	0.00					150.29	150.23	7,453.9		244.3508	12.2	231.51	244	21	2.72			Avalanche foundation	
455,806.2	6,270,077.2	56.572908	129.7192828	N56:34:22.4674	W129:43:9.418		KSM-29B	0	0.00					259.00	258.91	7,604.1		241.9425	2.4	250.82	241	56	32.98			Avalanche foundation	
455,560.8	6,269,994.7	56.572143	129.7232625	N56:34:19.716	W129:43:23.745		KSM-30N	0	0.00					208.09	208.01	7,863.1		230.1175	14.2	229.51	230	7	3.17				
455,401.2	6,269,861.3	56.57093	129.7258372	N56:34:15.3479	W129:43:33.0138		KSM-31	0	0.00					267.80	267.70	8,071.1		218.8467	11.3	218.24	218	50	47.98				
455,233.3	6,269,652.8	56.569041	129.7285336	N56:34:8.5478	W129:43:42.721		KSM-32	0	0.00					205.42	205.35	8,338.8		205.5374	13.3	204.40	205	32	14.50				
455,146.5	6,269,466.7	56.567361	129.7299139	N56:34:2.4995	W129:43:47.69		KSM-32BN	0	0.00					338.61	338.49	8,544.1		218.5007	13.0	205.25	218	30	2.35				
454,998.9	6,269,162.1	56.564611	129.7322634	N56:33:52.5981	W129:43:56.1482		KSM-33	0	0.00					254.32	254.22	8,882.6		235.4404	29.9	234.83	235	26	25.45				
454,789.5	6,269,017.9	56.563295	129.7356447	N56:33:47.8619	W129:44:8.3208		KSM-34N	0	0.00					205.05	204.97	9,136.8		235.7502	0.3	235.14	235	45	0.65				
454,620.1	6,268,902.5	56.562242	129.7383811	N56:33:44.0723	W129:44:18.172		KSM-35N	0	0.00					241.55	241.46	9,341.8		235.4471	0.3	234.83	235	26	49.62				
454,421.2	6,268,765.6	56.560993	129.7415926	N56:33:39.574	W129:44:29.7332		KSM-36N	0	0.00					212.61	212.54	9,583.3		268.8191	33.4	268.20	268	49	8.92				
454,208.7	6,268,761.2	56.560933	129.7450488	N56:33:39.358	W129:44:42.1756		KSM-37N	0	0.00					126.81	126.77	9,795.8		269.0553	0.2	268.43	269	3	19.18				
454,082.0	6,268,759.1	56.560902	129.7471105	N56:33:39.2458	W129:44:49.5978		KSM-38N	0	0.00					224.05	223.96	9,922.6		291.0684	22.0	290.45	291	4	6.13				
453,873.0	6,268,839.6	56.561604	129.7505249	N56:33:41.7758	W129:45:1.8895		KSM-39	0	0.00					214.95	214.87	10,146.5		335.8672	44.8	335.24	335	52	1.96				
453,785.1	6,269,035.7	56.563357	129.7519891	N56:33:48.0863	W129:45:7.1606		KSM-40N	0	0.00					193.42	193.35	10,361.4		292.8982	43.0	292.27	292	53	53.50				
453,607.0	6,269,111.0	56.564016	129.7549004	N56:33:50.456	W129:45:17.6413		KSM-41N	0	0.00					302.77	302.65	10,554.7		285.7240	7.2	278.92	285	43	26.34			3 pole structure	
453,328.0	6,269,228.3	56.565042	129.7594604	N56:33:54.1522	W129:45:34.0575		KSM-42N	0	0.00					347.66	347.54	10,857.4		279.0812	6.6	278.91	279	4	52.15			3 pole structure	
452,985.3	6,269,286.0	56.565526	129.7650471	N56:33:55.8938	W129:45:54.1697		KSM-43N	0	0.00					354.44	354.30	11,204.9		278.6211	7.1	277.98	278	37	16.04			3 pole structure	
452,635.0	6,269,339.1	56.565968	129.7707565	N56:33:57.4847	W129:46:14.7235		KSM-44N	0	0.00					194.55	194.5	11,559.2		301.6297	23.0	300.99	301	37	46.91			3 pole structure	
452,469.4	6,269,441.1	56.566867	129.7734695	N56:34:0.7228	W129:46:24.4904		KSM-45	0	0.00					160.23	160.2	11,753.7		302.9370	1.3	302.29	302	56	13.35				
452,335.0	6,269,528.2	56.567636	129.7756729	N56:34:3.4902	W129:46:32.4225		KSM-46N	0	0.00					221.97	221.9	11,913.9		299.4602	3.5	298.81	299	27	36.55				
452,141.8	6,269,637.3	56.568597	129.7788368	N56:34:6.9487	W129:46:43.8124		KSM-47	0	0.00					285.68	285.6	12,135.8		269.9258	29.5	269.28	269	55	32.75				1
451,856.2	6,269,636.9	56.568564	129.7834835	N56:34:6.8316	W129:47:0.5407		KSM-48	0	0.00					281.20	281.1	12,421.3		269.8859	0.0	269.23	269	53	9.09				
451,575.1	6,269,636.4	56.56853	129.7880575	N56:34:6.7094	W129:47:17.007		KSM-49	0	0.00					216.31	216.2	12,702.4		287.6691	17.8	287.01	287	40	8.62				
451,369.1	6,269,702.0	56.569099	129.7914224	N56:34:8.7552	W129:47:29.1205		KSM-50N	0	0.00					183.13	183.1	12,918.7		288.1321	0.5	287.47	288	7	55.50				1
451,195.1	6,269,759.0	56.569592	129.794264	N56:34:10.5326	W129:47:39.3503		KSM-51	0	0.00					161.33	161.3	13,101.7		277.6719	10.5	277.01	277	40	18.78				1
451,035.3	6,269,780.5	56.569769	129.7968689	N56:34:11.169	W129:47:48.7279		KSM-52N	0	0.00					141.96	141.9	13,263.0		284.4877	6.8	283.82	284	29	15.71				1
450,897.9	6,269,816.0	56.570074	129.7991113	N56:34:12.2654	W129:47:56.8006		KSM-53	0	0.00					246.84	246.7	13,404.9		273.7877	10.7	273.12	273	47	15.58				1
450,651.7	6,269,832.3	56.570194	129.8031209	N56:34:12.6996	W129:48:11.2352		KSM-54	0	0.00					193.65	193.6	13,651.7		279.7706	6.0	270.46	279	46	14.14				1
450,458.2	6,269,836.1	56.570208	129.806271	N56:34:12.7494	W129:48:22.5757		KSM-55N	0	0.00					229.17	229.1	13,845.2		287.7626	8.0		287	45	45.38				
450,239.2	6,269,903.3	56.570789	129.8098477	N56:34:14.8402	W129:48:35.4516		KSM-56N	0	0.00					249.38	249.3	14,074.3		288.4030	8.6	287.73	288	24	10.69				
450,002.6	6,269,982.0	56.571471	129.8137121	N56:34:17.2948	W129:48:49.3634		KSM-57	0	0.00							14,323.6		184.1051	104.3	184.41	184	6	18.48				1
		0	133.4887439	N0:0:0	W133:29:19.478									Great Circle	Approx.			#VALUE!			#VALUE!	####	#####				
														Line Length This Section		#REF!					0	0	0.00				
TRANSMISSION LINE LENGTH THIS SECTION:														14,329.0	14,323.6	#VALUE!		#VALUE!			#VALUE!	####	#####	3.00			
														m, exact	m, approx.	#REF!					0	0	0.00	10.00			
NUMBER OF STRUCTURES THIS SECTION:														60	#VALUE!	#VALUE!		#VALUE!			#VALUE!	####	#####				
																#REF!					0	0	0.00				

GENERAL NOTES

1) For structure geotechnical information refer to BGC report: "Treaty Creek Transmission Geotechnical Assessment," September 2012. The design shall meet the BGC requirements.
2) In general, structures are un-guyed steel momopole although some may be guyed lattice V type.
3) Refer to WN Brazier Associates Inc. Report "287 KV Treaty Creek transmission Line."
4) Total transmission line length is 30 km with 126 structures.

SEABRIDGE GOLD INC. KSM PROJECT
WN BRAZIER ASSOCIATES INC.
287 KV TREATY CREEK TRANSMISSION LINE REPORT
APPENDIX B - FIGURE 1 REV. 2

SHEET 2 OF 3 - KSM PROJECT, 287 KV TRANSMISSION LINE FROM TREATY CREEK SWITCHING STATION TO KSM SUBSTATION NO.1, STRUCTURE LOCATIONS, SPAN LENGTH, ETC.

STRUCTURE EASTING	STRUCTURE NORTHING	LATITUDE	LONGITUDE	STRUCTURE Latitude	STRUCTURE Longitude	GROUND ELEVATION, m	STRUCTURE NO.	PIER HEIGHT m (above grade)	POLE BASE ELEVATION, m (Ground plus pier)	CONDUCTOR HEIGHT, m (Low / Mid / Upper)	POLE LENGTH, m	POLE CONCRETE FOUNDATION DEPTH, m	SPAN AHEAD, METRES (Great circle ellipsoid, ignoring elevation)	SPAN AHEAD, METRES (Great Circle)	SPAN AHEAD, METRES (Approx.)	CHAINAGE (HORIZONTAL, APPROX.)	STRUCTURE TYPE	BEARING, DEGREES to next	LINE DEVIATION, DEGREES	BEARING, DEGREES TO NEXT POLE (Great Circle)	BEARING, DEGREES TO NEXT POLE (Approx.)	MINUTES	SECONDS	AVALANCHE FOUNDATION YES/NO&D TYPE OF PROTECTION	STRUCTURE TYPE NO.	NOTES -FOR STRUCTURE FOUNDATION DETAILS SEE BGC REPORT	REV./DATE
450,002.6	6,269,982.0	56.571471	129.8137121	N56:34:17.2948	W129:48:49.3634		KSM-57	0	0.00					264.71	264.61	0.0		307.0249		306.35	307	1	29.75				1
449,791.4	6,270,141.4	56.57288	129.8171808	N56:34:22.3666	W129:49:1.8509		KSM-58	0	0.00					306.32	306.21	264.6		304.2007	2.8	303.52	304	12	2.61			3 pole structure	
449538.10	6270313.50	56.574399	129.8213358	N56:34:27.8351	W129:49:16.8089		KSM-59N	0	0.00					323.07	322.95	570.8		294.4056	9.8	293.72	294	24	20.28			3 pole structure	
449,244.0	6,270,446.9	56.575566	129.8261481	N56:34:32.0364	W129:49:34.1332		KSM-60N	0	0.00					308.60	308.49	893.8		285.4346	9.0	284.74	285	26	4.68			3 pole structure	
448,946.7	6,270,529.0	56.576271	129.8310038	N56:34:34.5753	W129:49:51.6137		KSM-61	0	0.00					182.97	182.90	1,202.3		305.9088	20.5	305.22	305	54	31.54			Avalanche foundation	
448,798.5	6,270,636.3	56.577218	129.833436	N56:34:37.9863	W129:50:0.3696		KSM-62	0	0.00					226.79	226.71	1,385.2		305.5374	0.4	304.84	305	32	14.58			Avalanche foundation	
448,614.0	6,270,768.1	56.578382	129.8364647	N56:34:42.175	W129:50:11.2728		KSM-63	0	0.00					298.45	298.34	1,611.9		298.6457	6.9	297.95	298	38	44.57			Avalanche foundation	
448,352.2	6,270,911.1	56.579638	129.8407546	N56:34:46.6967	W129:50:26.7165		KSM-64	0	0.00					239.42	239.33	1,910.2		319.2681	20.6	318.57	319	16	5.14			Avalanche foundation	1
448,196.0	6,271,092.5	56.58125	129.8433328	N56:34:52.4998	W129:50:35.998		KSM-65	0	0.00					209.64	209.56	2,149.5		291.7517	27.5	291.05	291	45	5.96			Avalanche foundation	1
448,001.4	6,271,170.1	56.581926	129.8465166	N56:34:54.9338	W129:50:47.4597		KSM-66	0	0.00					200.15	200.08	2,359.1		318.9477	27.2	318.24	318	56	51.70			Avalanche foundation	
447870.00	6271321.00	56.583267	129.8486858	N56:34:59.7606	W129:50:55.2689		KSM-67N	0	0.00					275.06	274.96	2,559.2		330.6185	11.7	329.91	330	37	6.68			Avalanche foundation	1
447,735.1	6,271,560.6	56.585404	129.8509301	N56:35:7.4547	W129:51:3.3483		KSM-68	0	0.00					304.43	304.31	2,834.1		298.7691	31.8	298.06	298	46	8.90				
447,468.4	6,271,707.1	56.58669	129.8553022	N56:35:12.0839	W129:51:19.0881		KSM-69	0	0.00					216.74	216.66	3,138.4		349.2398	50.5	348.53	349	14	23.37				
447,427.9	6,271,919.9	56.588597	129.856004	N56:35:18.9509	W129:51:21.6143		KSM-70	0	0.00					200.59	200.51	3,355.1		349.1048	0.1	348.39	349	6	17.14				1
447,390.0	6,272,116.8	56.590362	129.856661	N56:35:25.3032	W129:51:23.9796		KSM-71	0	0.00					229.76	229.68	3,555.6		311.4699	37.6	310.75	311	28	11.56				1
447217.90	6272268.90	56.591709	129.859494	N56:35:30.1524	W129:51:34.1784		KSM-72N	0	0.00					238.95	238.86	3,785.3		310.5857	0.9	309.87	310	35	8.46				
447036.50	6272424.30	56.593085	129.8624793	N56:35:35.1042	W129:51:44.9255		KSM-73N	0	0.00					234.33	234.24	4,024.2		309.9778	0.6	309.26	309	58	40.15				
446857.00	6272574.80	56.594416	129.8654329	N56:35:39.8982	W129:51:55.5584		KSM-74N	0	0.00					253.66	253.56	4,258.4		324.3210	14.3	323.60	324	19	15.61				
446,709.1	6,272,780.8	56.59625	129.8678834	N56:35:46.4986	W129:52:4.3801		KSM-75N	0	0.00					221.47	221.39	4,512.0		337.5599	13.2	336.83	337	33	35.63				
446,624.6	6,272,985.4	56.598078	129.8693017	N56:35:53.0815	W129:52:9.4862		KSM-76AN	0	0.00							4,733.4		184.0725	153.5	54.98	184	4	20.92				
				N0:0:0	W0:0:0			0	0.00					14,859,899.00	0.00	4,733.4		#DIV/0!	#DIV/0!	270.00	#DIV/0!	#DIV/0!	#DIV/0!				1
		0	133.4887439	N0:0:0	W133:29:19.478			0	0.00					#VALUE!	0.00	4,733.4		#DIV/0!	#DIV/0!	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!				
		0	133.4887439	N0:0:0	W133:29:19.478			0	0.00					#VALUE!	0.00	4,733.4		#DIV/0!	#DIV/0!	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!				
		0	133.4887439	N0:0:0	W133:29:19.478			0	0.00					#VALUE!	0.00	4,733.4		#DIV/0!	#DIV/0!	#VALUE!	#DIV/0!	#DIV/0!	#DIV/0!				
		0	133.4887439	N0:0:0	W133:29:19.478									Great Circle	Approx.			#VALUE!			#VALUE!	######	#VALUE!				
														Line Length To TP 41-1		#REF!					0	0	0.00				
								TRANSMISSION LINE LENGTH THIS SECTION:						4,735.1	4,733.4	#VALUE!		#VALUE!			#VALUE!	######	#VALUE!	3.00			
														m, exact	m, approx.	#REF!					0	0	0.00	10.00			
								NUMBER OF STRUCTURES THIS SECTION:						20	0.0	#VALUE!		#DIV/0!			#DIV/0!	#DIV/0!	#DIV/0!				
																#REF!					0	0	0.00				

NOTES

1) FOR GENERAL NOTES SEE SHEET 1 (FIGURE 1)

SEABRIDGE GOLD INC. KSM PROJECT
WN BRAZIER ASSOCIATES INC.
287 KV TREATY CREEK TRANSMISSION LINE REPORT
APPENDIX B - FIGURE 2 REV. 2

SHEET 3 OF 3 - KSM PROJECT, 287 KV TRANSMISSION LINE FROM TREATY CREEK SWITCHING STATION TO KSM SUBSTATION NO.1, STRUCTURE LOCATIONS, SPAN LENGTH, ETC.

STRUCTURE EASTING	STRUCTURE NORTHING	LATITUDE	LONGITUDE	LATITUDE-Degrees	LATITUDE-Minutes	LATITUDE-Seconds	LONGITUDE-Degrees	LONGITUDE-Minutes	LONGITUDE-Seconds	STRUCTURE Latitude	STRUCTURE Longitude	GROUND ELEVATION, m	STRUCTURE NO.	PIER HEIGHT m (above grade)	POLE BASE ELEVATION, m (Ground plus pier)	CONDUCTOR HEIGHT, m (Low / Mid / Upper)	POLE LENGTH, m	POLE CONCRETE FOUNDATION DEPTH, m	SPAN AHEAD, METRES (Great circle ellipsoid, ignoring elevation)	SPAN AHEAD, METRES (Great Circle))	SPAN AHEAD, METRES (Approx.)	CHAINAGE (HORIZONTAL, APPROX.)	STRUCTURE TYPE	BEARING, DEGREES to next	LINE DEVIATION, DEGREES	BEARING, DEGREES TO NEXT POLE (Great Circle)	BEARING, DEGREES TO NEXT POLE (Approx.)	MINUTES	SECONDS	AVALANCHE FOUNDATION YES/NO&D TYPE OF PROTCTION	STRUCTURE TYPE	NOTES -FOR STRUCTURE FOUNDATION DETAILS SEE BGC REPORT	REV./DATE
446624.60	6272985.40	56.598078	129.8693017	56	35	53.0815	129	52	9.4862	N56:35:53.0815	W129:52:9.4862		KSM/76AN	0	0.00					162.64	162.58	0.0		336.4687		335.74	336	28	7.30				
446,559.7	6,273,134.5	56.59941	129.8703895	56	35	57.8753	129	52	13.4023	N56:35:57.8753	W129:52:13.4023		KSM/77	0	0.00					203.70	203.62	162.6		332.4471	4.0	331.72	332	26	49.49				1
446,465.5	6,273,315.0	56.601021	129.8719608	56	36	3.6748	129	52	19.0587	N56:36:3.6748	W129:52:19.0587		KSM/78	0	0.00					264.66	264.56	366.2		321.4762	11.0	320.75	321	28	34.17				1
446,300.7	6,273,522.0	56.602861	129.8746873	56	36	10.3005	129	52	28.8742	N56:36:10.3005	W129:52:28.8742		KSM/79	0	0.00					231.32	231.24	630.8		320.9695	0.5	320.24	320	58	10.13				1
446,155.1	6,273,701.6	56.604458	129.8770963	56	36	16.0494	129	52	37.5467	N56:36:16.0494	W129:52:37.5467		KSM/80	0	0.00					219.46	219.38	862.0		326.8634	5.9	326.13	326	51	48.09				1
446,035.2	6,273,885.3	56.606095	129.8790878	56	36	21.9404	129	52	44.7160	N56:36:21.9404	W129:52:44.716		KSM/81	0	0.00					182.04	181.97	1,081.4		323.4125	3.5	322.67	323	24	44.89				
445,926.7	6,274,031.4	56.607394	129.8808852	56	36	26.6201	129	52	51.1869	N56:36:26.6201	W129:52:51.1869		KSM/81A	0	0.00					156.95	156.89	1,263.4		300.8891	22.5	322.68	300	53	20.66				1
445,833.2	6,274,157.4	56.608515	129.8824346	56	36	30.6556	129	52	56.7646	N56:36:30.6556	W129:52:56.7646		KSM/82	0	0.00					232.77	232.69	1,420.2		285.9160	37.5	285.18	285	54	57.49				1
445,609.4	6,274,221.2	56.609063	129.886093	56	36	32.6258	129	53	9.9347	N56:36:32.6258	W129:53:9.9347		KSM/83	0	0.00					225.97	225.88	1,652.9		306.5757	20.7	305.84	306	34	32.37				
445,428.0	6,274,355.8	56.610251	129.8890762	56	36	36.9027	129	53	20.6744	N56:36:36.9027	W129:53:20.6744		KSM/84N	0	0.00					258.94	258.85	1,878.8		304.5367	2.0	303.79	304	32	12.05				
445,214.8	6,274,502.6	56.611544	129.8925807	56	36	41.5589	129	53	33.2907	N56:36:41.5589	W129:53:33.2907		KSM/85	0	0.00					138.27	138.22	2,137.7		307.6078	3.1	306.86	307	36	27.96				
445,105.3	6,274,586.9	56.612289	129.8943824	56	36	44.2405	129	53	39.7767	N56:36:44.2405	W129:53:39.7767		KSM/86	0	0.00					184.89	184.82	2,275.9		298.9458	8.7	296.84	298	56	44.84				1
444,941.5	6,274,672.5	56.613039	129.897069	56	36	46.9395	129	53	49.4485	N56:36:46.9395	W129:53:49.4485		KSM/86A	0	0.00					182.04	181.97	2,460.7		300.0291	1.1	299.57	300	1	44.71				1
444,784.4	6,274,764.4	56.613846	129.8996476	56	36	49.8439	129	53	58.7314	N56:36:49.8439	W129:53:58.7314		KSM/87N	0	0.00					200.69	200.62	2,642.7		299.7637	0.8	299.01	299	45	49.16				1
444,610.3	6,274,864.0	56.61472	129.902506	56	36	52.9906	129	54	9.0217	N56:36:52.9906	W129:54:9.0217		KSM/88N	0	0.00					225.61	225.53	2,843.3		304.4990	4.7	303.75	304	29	56.30				
444424.40	6274991.70	56.615845	129.9055616	56	36	57.0423	129	54	20.0217	N56:36:57.0423	W129:54:20.0217		KSM/89N	0	0.00					264.32	264.23	3,068.8		297.5426	7.0	296.79	297	32	33.41				1
444,190.1	6,275,113.9	56.616915	129.9094048	56	37	0.8931	129	54	33.8575	N56:37:0.8931	W129:54:33.8575		KSM/90	0	0.00					225.28	225.20	3,333.1		270.4860	27.1	269.73	270	29	9.44				
443,964.9	6,275,115.8	56.616905	129.9130741	56	37	0.8582	129	54	47.0669	N56:37:0.8582	W129:54:47.0669		KSM/91	0	0.00					203.56	203.49	3,558.3		293.2603	22.8	292.50	293	15	37.20				
443,778.0	6,275,196.2	56.617605	129.9161375	56	37	3.3763	129	54	58.0949	N56:37:3.3763	W129:54:58.0949		KSM/92	0	0.00					220.38	220.30	3,761.7		284.0602	9.2	283.29	284	3	36.77				
443,564.3	6,275,249.7	56.61806	129.9196309	56	37	5.0145	129	55	10.6712	N56:37:5.0145	W129:55:10.6712		KSM/93	0	0.00					288.70	288.59	3,982.0		266.0062	18.1	265.24	266	0	22.27				
443,276.4	6,275,229.6	56.617844	129.924317	56	37	4.2394	129	55	27.5413	N56:37:4.2394	W129:55:27.5413		KSM/94	0	0.00					247.84	247.75	4,270.6		271.5658	5.6	270.79	271	33	57.02				
443,028.7	6,275,236.3	56.617875	129.9283536	56	37	4.3502	129	55	42.0728	N56:37:4.3502	W129:55:42.0728		KSM/95N	0	0.00					233.00	232.91	4,518.4		294.6439	23.1	293.87	294	38	37.96				
442,817.0	6,275,333.5	56.618722	129.9318242	56	37	7.3980	129	55	54.5671	N56:37:7.398	W129:55:54.5671		KSM/96	0	0.00					259.31	259.21	4,751.3		300.3151	5.7	299.54	300	18	54.53				
442,593.3	6,275,464.3	56.61987	129.9354992	56	37	11.5306	129	56	7.7970	N56:37:11.5306	W129:56:7.797		KSM/97	0	0.00					238.14	238.06	5,010.5		304.7235	4.4	303.94	304	43	24.48				1
442,397.6	6,275,599.9	56.621064	129.9387174	56	37	15.8293	129	56	19.3826	N56:37:15.8293	W129:56:19.3826		KSM/98	0	0.00					287.64	287.54	5,248.6		303.9111	0.8	303.13	303	54	40.07				1
442,159.0	6,275,760.3	56.622475	129.9426415	56	37	20.9111	129	56	33.5095	N56:37:20.9111	W129:56:33.5095		KSM/99N	0	0.00					216.64	216.56	5,536.1		311.6700	7.8	310.88	311	40	12.04				1
441,997.2	6,275,904.3	56.623749	129.9453098	56	37	25.4951	129	56	43.1154	N56:37:25.4951	W129:56:43.1154		KSM/100	0	0.00					296.80	296.69	5,752.7		299.0730	12.6	298.28	299	4	22.75				1
441,737.9	6,276,048.5	56.625012	129.9495678	56	37	30.0415	129	56	58.4443	N56:37:30.0415	W129:56:58.4443		KSM/101N	0	0.00					201.05	200.98	6,049.4		294.5796	4.5	293.79	294	34	46.62				
441,555.1	6,276,132.1	56.62574	129.9525651	56	37	32.6630	129	57	9.2344	N56:37:32.663	W129:57:9.2344		KSM/102N	0	0.00					276.84	276.74	6,250.3		354.7068	60.1	353.91	354	42	24.44				
441,529.6	6,276,407.6	56.628212	129.9530435	56	37	41.5626	129	57	10.9567	N56:37:41.5626	W129:57:10.9567		KSM/103	0	0.00					228.47	228.39	6,527.1		327.0899	27.6	326.29	327	5	23.73				
441,405.5	6,276,599.4	56.629919	129.9551093	56	37	47.7072	129	57	18.3936	N56:37:47.7072	W129:57:18.3936		KSM/104	0	0.00					280.57	280.46	6,755.5		321.3676	5.7	320.57	321	22	3.47				1
441,230.4	6,276,818.5	56.631865	129.9580129	56	37	54.7132	129	57	28.8466	N56:37:54.7132	W129:57:28.8466		KSM/105	0	0.00					200.58	200.51	7,035.9		324.5201	3.2	323.72	324	31	12.44				
441,114.0	6,276,981.7	56.633317	129.959947	56	37	59.9407	129	57	35.8093	N56:37:59.9407	W129:57:35.8093		KSM/106	0	0.00					205.48	205.41	7,236.5		323.7739	0.7	322.97	323	46	26.06				1
440,992.6	6,277,147.4	56.63479	129.9619634	56	38	5.2441	129	57	43.0684	N56:38:5.2441	W129:57:43.0684		KSM/107N	0	0.00					317.09	316.98	7,441.9		325.1347	1.4	324.33	325	8	5.06				1
440,811.4	6,277,407.5	56.637103	129.9649766	56	38	13.5722	129	57	53.9158	N56:38:13.5722	W129:57:53.9158		KSM/108	0	0.00					232.43	232.35	7,758.8		321.9622	3.2	321.16	321	57	43.78				
440,668.3	6,277,590.5	56.638729	129.9673525	56	38	19.4248	129	58	2.4689	N56:38:19.4248	W129:58:2.4689		KSM/109	0	0.00					224.09	224.01	7,991.2		318.4094	3.6	317.60	318	24	33.72				
440,519.6	6,277,758.1	56.640215	129.9698151	56	38	24.7747	129	58	11.3344	N56:38:24.7747	W129:58:11.3344		KSM/110N	0	0.00					233.97	233.89	8,215.2		323.0605	4.7	322.25	323	3	37.91				
440,379.0	6,277,945.0	56.641877	129.9721497	56	38	30.7556	129	58	19.7390	N56:38:30.7556	W129:58:19.739		KSM/111N	0	0.00					246.70	246.61	8,449.1		341.6716	18.6	340.86	341	40	17.70				
440,301.5	6,278,179.1	56.64397	129.9734682	56	38	38.2903	129	58	24.4855	N56:38:38.2903	W129:58:24.4855		KSM/112	0	0.00					270.06	269.97	8,695.7		323.3207	18.4	322.51	323	19	14.48				
440,140.2	6,278,395.6	56.645894	129.9761476	56	38	45.2176	129	58	34.1312	N56:38:45.2176	W129:58:34.1312		KSM/113	0	0.00					242.86	242.78	8,965.7		335.9371	12.6	335.12	335	56	13.59				
440,041.2	6,278,617.3	56.647872	129.9778131	56	38	52.3406	129	58	40.1271	N56:38:52.3406	W129:58:40.1271		KSM/114	0	0.00					259.84	259.74	9,208.4		317.2904	18.6	316.47	317	17	25.30				
439,865.0	6,278,808.2	56.649564	129.9807303	56	38	58.4312	129	58	50.6289	N56:38:58.4312	W129:58:50.6289		KSM/115	0	0.00					249.31	249.22	9,468.2		317.6719	0.4	316.85	317	40	18.75				1
439,697.2	6,278,992.4	56.651198	129.9835098	56	39	4.3116	129	59	0.6354	N56:39:4.3116	W129:59:0.6354		KSM/116	0	0.00					238.93	238.84	9,717.4		319.5678	1.9	318.75	319	34	4.20				
439,542.3	6,279,174.2	56.652811	129.9860784	56	39	10.1186	129	59	9.8822	N56:39:10.1186	W129:59:9.8822		KSM/117	0	0.00					245.11	245.02	9,956.3		327.9413	8.4	327.18	327	56	28.76				
439,412.0	6,279,381.7	56.654658	129.988252	56	39	16.7680	129	59	17.7072	N56:39:16.768	W129:59:17.7072		KSM/118	0	0.00					245.10	245.01	10,201.3		327.9158	0.0		327	54	56.72				
439,282.2	6,279,589.5	56.656508	129.9904178	56	39	23.4272	129	59	25.5039	N56:39:23.4272	W129:59:25.5039		KSM/119	0	0.00					247.96	247.87	10,446.3		327.8231	0.1	327.00	327	49	23.17				
439,150.2	6,279,799.3	56.658375	129.9926201	56	39	30.1499	129	59	33.4323	N56:39:30.1499	W129:59:33.4323		KSM/120	0	0.00					271.79	271.7	10,694.2		0.0000	327.8	359.17	0	0	0.00				
439,150.2	6,280,071.0	56.660816	129.9926842	56	39	38.9359	129	59	33.6632	N56:39:38.9359	W129:59:33.6632		KSM/121	0	0.00					6,289,992.18	6,295,406.6	10,965.9		184.0000	184.0	184.20	184	0	0.16			3 pole deadend	
		0	133.4887439	0	0	0.0000	133	29	19.4780	N0:0:0	W133:29:19.478									Great Circle	Approx.			#VALUE!			#VALUE!	####	#####				

NOTES

1) FOR GENERAL NOTES SEE SHEET 1 (FIGURE 1)

	Line Length To TP 41-1		#REF!		0	0	0.00		
THIS SECTION TOTAL TRANSMISSION LINE LENGTH EQUALS:	10,969.8	10,965.9	#VALUE!	#VALUE!	#VALUE!	####	#####	3.00
	m, exact	m, approx.	#REF!		0	0	0.00	10.00
THIS SECTION TOTAL NUMBER OF STRUCTURES EQUALS:	48	0.0	#VALUE!	#DIV/0!	#DIV/0!	####	#####	

SEABRIDGE GOLD INC. KSM PROJECT
WN BRAZIER ASSOCIATES INC.
287 KV TREATY CREEK TRANSMISSION LINE REPORT
APPENDIX B - FIGURE 3 REV 2

14.0 APPENDIX C – BGC REPORT

This report (KSM Project, 287 kV Treaty Creek Transmission Line) shall be read in conjunction with the attached report by BGC Engineering Inc. titled “Seabridge Gold Inc., KSM Project, Treaty Creek Transmission Line, Geotechnical Assessment.”

All design requirements as outlined in this report have been included in the transmission line design.

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

SEABRIDGE GOLD INC.

KSM PROJECT

TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

FINAL

PROJECT NO:	0638-013-63	DISTRIBUTION:	
DATE:	October 22, 2012	SEABRIDGE:	2 copies
DOCUMENT NO:	KSM 12-32	BGC:	2 copies
		WN BRAZIER:	1 copy

14.0 APPENDIX C – BGC REPORT

This report (KSM Project, 287 kV Treaty Creek Transmission Line) shall be read in conjunction with the attached report by BGC Engineering Inc. titled “Seabridge Gold Inc., KSM Project, Treaty Creek Transmission Line, Geotechnical Assessment.”

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY
#500-1045 Howe Street
Vancouver, B.C.
Canada V6Z 2A9
Tel: 604.684.5900
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October 22, 2012
Project No: 0638-013-63

Brent Murphy, M.Sc., P.Geo.
Seabridge Gold Inc.
106 Front Street East
Toronto, Ontario, M5A 1E1

Dear Mr. Murphy,

Re: Treaty Creek Transmission Line Geotechnical Assessment

Please find attached a copy of the above referenced report dated October 22, 2012.

Should you have any questions or comments, please do not hesitate to contact the undersigned. We appreciate having the opportunity to continue working on such an interesting and challenging project.

Yours sincerely,

BGC ENGINEERING INC.
per:

Kris Holm, M.Sc., P.Geo.
Project Manager

EXECUTIVE SUMMARY

This report documents the geotechnical and geohazard risk assessment of the proposed 287 kV Treaty Creek Transmission line at the KSM project. It provides the following for proposed transmission line structures:

- Summary of terrain type and expected ground conditions (Appendix A, B);
- Summary of potential geohazards (Appendix A, B);
- Preliminary snow avalanche impact pressures and snow depths for use in feasibility level structure design (Section 3.4);
- Geohazard relative risk ratings (Appendix C);
- Recommendations for reducing geohazard risk (Section 4.1);
- Recommendations for more detailed geotechnical investigations and design prior to construction (Section 4.2); and
- Drawings that show the transmission line overlaid onto terrain and geohazard, snow avalanche, and slope angle maps.

No geotechnically unfavorable ground conditions were identified during this assessment that would preclude construction of the proposed Treaty Creek Transmission Line. Ground conditions in all sections of the transmission line are expected to be compact to dense soil or bedrock, and drilled piers in soil or rock socketed piers in bedrock are expected to be suitable foundation types.

The following transmission line structures are exposed to “High” geohazard risk:

- KSM 21N, 22, 23N, 24 (debris flood hazard); and
- KSM 65, 66 (snow avalanche hazard)

Conceptual risk reduction measures for each hazard include the following:

- Debris flood: Protect tower base from scour and impact by extending the concrete foundation 3 m deeper than typical and 3 m above the surface as impact protection. Protect the concrete pedestal with engineered rip rap.
- Snow Avalanche: Design tower base and foundation to resist the snow avalanche impact forces provided in Table 3-1, and static snow loads provided in Table 3-3.

The following work is recommended during subsequent phases of design, prior to construction:

- Review the location of each transmission line structure in the field following access road construction, and re-position as required to integrate with the as-built access road, cut-off ditch, and other infrastructure.

- Characterize the expected subsurface conditions at each structure by surface mapping and mapping of adjacent road cuts. Consider boreholes or testpits at structures where the project wants to reduce uncertainty in ground conditions prior to construction. Ground conditions will typically be more uncertain at structures located far from the access road.
- Further characterization of debris flood and snow avalanche hazards to provide input to detailed design of protective measures.
- Develop a series of standard foundation designs that are suitable for the expected ground conditions.

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LIMITATIONS

BGC Engineering Inc. (BGC) prepared this document for the account of Seabridge Gold Inc. The material in it reflects the judgment of BGC staff in light of the information available to BGC at the time of document preparation. Any use which a third party makes of this document or any reliance on decisions to be based on it is the responsibility of such third parties. BGC accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this document.

As a mutual protection to our client, the public, and ourselves, all documents and drawings are submitted for the confidential information of our client for a specific project. Authorization for any use and/or publication of this document or any data, statements, conclusions or abstracts from or regarding our documents and drawings, through any form of print or electronic media, including without limitation, posting or reproduction of same on any website, is reserved pending BGC's written approval. If this document is issued in an electronic format, an original paper copy is on file at BGC and that copy is the primary reference with precedence over any electronic copy of the document, or any extracts from our documents published by others.

Although modern methods were applied in the avalanche analysis, snow avalanche runout distance, return periods, and impact pressures cannot be predicted with precision due to incomplete knowledge of the behavior of large avalanches. This should be taken into consideration when selecting design parameters and factors of safety for the transmission line.

1.0 INTRODUCTION

1.1. General

BGC Engineering Inc. (BGC) was retained by Seabridge Gold Inc. (Seabridge) to carry out a conceptual level geotechnical and geohazard risk assessment for the proposed Treaty Creek 287 kV Transmission Line, which is part of the Kerr-Sulphurets-Mitchell (KSM) project in northwestern British Columbia. This report documents the assessment and provides the following at each of the proposed transmission line structures:

- Summary of terrain type and expected ground conditions;
- Summary of potential geohazards;
- Preliminary estimates of snow avalanche impact pressures and snow depths for use in feasibility level structure design;
- Estimates of potential static snow loads;
- Geohazard relative risk ratings;
- Recommendations for reducing geohazard risk;
- Recommendations for further geotechnical assessments prior to construction; and
- Drawings that show the transmission line on terrain and geohazard, snow avalanche, and slope angle maps.

The scope of work for this assessment was defined in the BGC proposal to support the pre-feasibility update and environmental approval, dated December 20, 2011 (BGC, 2011). The format and methodology of this assessment follow the previous BGC assessment of the proposed Teigen Creek Transmission Line (BGC, 2012a).

Routing and design of the transmission line is being led by W.N. Brazier and Associates Inc. (Brazier). Assessment of snow avalanche hazard, risk, and feasibility level design parameters presented in this report are provided by Alpine Solutions Avalanche Services (Alpine Solutions).

This assessment uses the terrain mapping and geohazard risk assessment methodology presented in the KSM project wide geohazard risk assessment (BGC, 2012b), and information collected during the concurrent terrain stability field assessment study of the Treaty Creek access roads (BGC, 2012c).

All geotechnical comments, drawings, and appendices provided in this report refer to the transmission line alignment Revision 0, submitted by Brazier to Seabridge via the KSM Sharepoint site on September 26, 2012.

This current report version supersedes the previous Draft version issued by BGC on September 12, 2012.

1.2. Work Scope

The following tasks were carried out as part of this assessment:

- Preliminary office review: An initial transmission line alignment proposed by Brazier (dated July 18, 2012) was compared with available terrain, geohazard, snow avalanche (BGC, 2012b), and proposed access road information (BGC, 2012c), and divided into sections that were prioritized for field review.
- Field inspection: Visual field inspection of the initial proposed transmission line was carried out over a period of 7 days, including helicopter fly-over of the entire alignment and ground traverse of key geological and transmission line locations.
- Alignment refinements: Geotechnical comments and recommendations to move individual structures to limit geohazard exposure and facilitate structure construction were provided to Brazier. Several iterations of structure location updates were made before arriving at the Revision 0 alignment, dated September 26, 2012, referred to in this report. Tower foundation loads, designs, and foundation performance criteria have not been assessed in this stage.
- Summary Report: This report documents the assessment and provides drawings and summary recommendations for the Revision 0 transmission line alignment.

1.3. Field Inspections

Field inspection of the proposed alignment was carried out by Alex Strouth, P.E. (Colorado), and Elliot Matthews of BGC between July 19 and July 25, 2012. BGC personnel were accompanied by the transmission line lead designer, Neil Brazier, P.Eng., of WN Brazier and Associates. Brian Gould, P.Eng., of Alpine Solutions, accompanied BGC and Brazier on July 23 for a review of avalanche hazard areas.

The entire length of the transmission line alignment was visually inspected by helicopter, and 36 of 123 proposed structure sites, as per the July 18 initial alignment, were visually inspected on the ground (see Table A-1, Drawings T01 to T11). Field inspection of every structure was not within the scope of this work. Proposed transmission line structure sites were prioritized for ground inspection so that a representative site in each terrain type was visited, focusing on sites located:

- adjacent to or on slopes over 30°;
- within terrain showing evidence of slope instability;
- on debris flood fans; and
- adjacent to or within potential snow avalanche paths;

The primary purposes of the ground inspections were to visually check at representative sites within each terrain section the:

- terrain classification;

- expected subsurface conditions; and
- geohazard exposure that was initially mapped during the airphoto interpretation (BGC 2012b).

No subsurface investigations were attempted except for hand-dug pits up to a maximum of 0.15 m deep at ground inspection sites where the subsurface materials was concealed by organic ground cover.

2.0 SITE AND TRANSMISSION LINE DESCRIPTION

2.1. Geologic and Geomorphic Setting

The geohazard risk assessment report (BGC, 2012b) and access road TSFA reports (BGC 2012c) provide a description of the climate, geology, and geomorphic setting of the study area.

In summary, the Treaty Creek and Upper Treaty Creek valleys are broad, steep-sided basins with forested lower valley slopes. The area was glaciated repeatedly during the Quaternary Period (past 2.6 Ma), with the most recent glaciation lasting until approximately 10,000 years ago (BGC, 2012b). Glaciation has stripped away layers of weathered bedrock and deposited glacial till both as a thin veneer that mimics the bedrock surface topography, and as a thicker blanket that hides underlying bedrock topography. Colluvium is typically present on and at the toe of valley side slopes. Fluvial sand and gravels are present on alluvial fans and at the Bell Irvine River crossing. Bedrock is exposed in many locations along the alignment, typically on steep slopes and near topographic high points. Bedrock has been mapped previously as interbedded sandstones and siltstones of the Bowser Lake Group (Massey et al., 2005).

2.2. Transmission Line Alignment

The proposed Treaty Creek 287 kV transmission line is 30 km long with 123 proposed structures. It is routed to closely follow the proposed Treaty Creek access roads from Highway 37 to the proposed plant site in North Treaty Creek Valley (Drawings T01 to T11). The access roads have been designed by McElhanney Consulting Services (McElhanney), and assessed for terrain stability in BGC (2012c).

The proposed transmission line would connect with BC Hydro's planned Northwest Transmission Line at a proposed switching station. The location of the proposed switching station was still in planning at the time of the field inspection, but is expected to be located in a previously logged area that is within 150 meters east of Highway 37 and approximately 16.5 kilometers south of Bell II Lodge, at proposed KSM transmission line tower KSM/1N (Drawings T-01, S-01, A-01).

As shown in Drawings T-01 to T-11, the transmission line ascends gradually from Highway 37, at near EL. 500 m, along the north edge of the Treaty Creek valley, to the confluence of Treaty Creek and North Treaty Creek. At the confluence, the transmission line ascends a ridgeline from Treaty Creek Access Road to the Cut-Off Ditch Access Road, near EL. 1200 m and about 200 m below tree line. The alignment continues to follow the Cut-Off Ditch, then Upper and Lower North Treaty Access Roads until reaching the plant site at approximately EL. 1050 m.

2.3. Transmission Tower Structures and Construction Plan

Brazier proposes steel (un-guyed) monopole structures with typical span length on the order of 250 m to 300 m. Longer spans, for example at the Bell Irvine River crossing, will use three parallel monopoles to support the three conductors for spans up to about 450 m. The steel pole is bolted to a concrete foundation block that extends above the ground surface.

BGC understands that Brazier's design concept is to position the transmission line as close as possible to the access road. This reduces the project right-of-way and environmental impact, and facilitates construction; however it also results in an alignment with numerous angles (changes in direction). Typically the transmission line is proposed on the up-slope side of the proposed road with the foundation blocks positioned in the ditch at the toe of cut slopes. The alignment deviates from the road to avoid snow avalanche paths, structures located on steep slopes, and hanging the conductors over the road.

Currently the project plans are to construct the access roads in the first year of construction, and follow in the second year with transmission line construction along the roads. This construction sequence is beneficial for the transmission line because the roads provide construction access, and road cuts provide valuable exposures of the subsurface conditions prior to construction.

Tower foundation loads, designs, and foundation performance criteria have not been detailed for this design stage. However BGC understands that the preferred foundation type is a drilled pier foundation that is on the order of 1 m to 2 m diameter and 6 m deep in soil, or a rock socketed pier about 3 m deep into rock. This foundation type is preferred due to its ease of construction along the access road.

3.0 GEOTECHNICAL ASSESSMENT

3.1. Summary Tables and Drawings

Table A-1 in Appendix A displays the proposed (Revision 0) location of each transmission line structure, as provided by Brazier to Seabridge on September 26, 2012. This revision incorporates refinements to structure locations that resulted from the July 19th to 25th field inspections and subsequent office-based geotechnical/geohazard assessment. Several structures were re-positioned within about 50 m of the initial location, typically to avoid features of the micro-topography, such as locally steep slopes and small drainages. These revisions were made to reduce geohazard exposure while still achieving the design objective of following the proposed access road alignment. Additionally for each structure, Table A-1 summarizes terrain unit details from previous terrain mapping (BGC, 2012b), slope angles estimated from digital elevation models, approximate distance from proposed access road center line, and geotechnical comments.

In Table B-1 in Appendix B, the proposed transmission line has been divided into sections delineating where structures are exposed to similar foundation conditions and geohazards. Geotechnical comments provided in the last column of Table B-1 are intended to apply to all structures within or re-located into the given section.

Table C-1 in Appendix C documents the geohazard risk assessment results. The format of the table is consistent with other geohazard risk assessment tables provided in the project wide geohazard risk assessment (BGC, 2012b).

Three series of drawings are provided that display the Revision C proposed transmission line alignment over terrain, geohazard, snow avalanche, and slope information, as follows:

- T00 to T11: Terrain polygons and geohazards;
- A00 to A11: Snow avalanche hazards; and
- S01 to S11: Slope angle (degrees)

Terrain polygons and snow avalanche areas shown on the drawings are consistent with those provided in BGC (2012b), except for updates to terrain polygon 1115, and avalanche areas TRN 1, 2, 3, 13, and 14.

3.2. Expected Ground Conditions

No geotechnically unfavorable ground conditions were identified during this assessment that would preclude construction of the proposed Treaty Creek Transmission Line. The preferred foundation type proposed by Brazier, which is a drilled pier in soil or rock socketed pier, is expected to be a suitable foundation option along the entire alignment.

Table B-1 provides estimated ground conditions in each section of the alignment. No subsurface investigations of soil and rock conditions, groundwater conditions, or material testing were completed as part of this assessment. However, based on surface observations, all sections of the line are expected to be composed of either compact to dense soil or bedrock. Soils range from compact, fluvial sand and gravels to compact to dense till that is composed of sandy silt with gravel, cobbles and boulders. Colluvium soils are typically composed primarily of compact silty sand or sandy silt. Bedrock has been mapped by Massey et al. (2005) as interbedded sandstones and siltstones. In many sections, till and colluvium overburden has been deposited as a thin veneer (possibly 1 m to 3 m thick) that mimics the underlying bedrock topography, with thicker deposits filling hidden bedrock depressions (Appendix B, Drawings T01 to T11). In these sections, the depth to bedrock is variable, but is generally expected to be encountered before the typical soil foundation depth of 6 m. In these sections, bedrock is expected to be relatively close to the surface on slopes that are steeper than about 30° (Drawings S01 to S11). Structure foundations on these steep slopes may present construction access difficulties, and have therefore been avoided, where possible, with the Revision 0 alignment.

Groundwater depths are unknown across the entire alignment. Perched groundwater tables on top of shallow bedrock with significant seasonal variation should be expected in all till and colluvium veneer sections.

Future road cuts from access road construction are expected to provide valuable information that can be relied on to improve estimates of bedrock depth, soil composition, and groundwater depths.

3.3. Geohazards

The following structures may be subject to river erosion and/or debris flood hazard, with further details provided in Appendices A, B, and C:

- KSM 7: This structure site is located on an alluvial fan some 300 m perpendicular from the current channel. BGC estimates that there is Low likelihood that the watercourse could avulse upstream of the structure and erode the structure foundation.
- KSM 20 to KSM 25: This structure site is located on a debris flood fan with evidence of recent (within the past two years) debris floods, channel avulsions, and channel scour up to 1.5 m deep. Boulders and cobbles on the fan surface are typically less than 0.3 m diameter, and rarely larger than 0.5 m diameter. Additionally there appears to be abundant debris in the catchment upstream of the fan. This fan is further described in BGC (2012b), Section 3.5.1. Transmission line structures could be damaged by debris impact or rapid scour erosion. A preliminary estimate of potential debris impact height is between 0 and 2 m above the existing ground surface, and a preliminary estimate of potential scour depth is between 0 and 2 m below the existing ground surface.

Seepage, seepage erosion, gully erosion and shallow (less than 1 m thick) surface instabilities was observed in the area between structures 75N and 107N (Drawings T-07 to T-10). Several of these proposed structures that were inspected in the field were re-located to take advantage of micro-topography to avoid drainages, seepage zones, and shallow slope instabilities. Most structures in this zone are planned to be constructed in the access road cut slope ditch. The access road cut slope will likely remove or introduce different geotechnical hazards and potential consequence to the transmission line structures, and more clearly expose the soil and groundwater conditions. As such, the geohazard risk for these structures has not been assessed, and these shallow slope instability hazards should be assessed following road construction.

3.4. Snow Avalanche Hazards

Alpine Solutions has assessed the snow avalanche hazards and risks, and determined the preliminary design parameters presented in this section. Snow avalanches may impact tower structures and the adjacent conductor segments.

Table 3-1 lists transmission line structures that are subject to estimated ‘Moderate’ or ‘High’ snow avalanche risk, including estimates of return period of avalanches reaching the site, and potential snow avalanche impact pressures that are suitable for feasibility-level design of transmission line structures. Impact pressures are estimated to act on structures approximately 2 m to 6 m above the ground level. Preliminary snow impact pressures are based on conservative velocities calculated from numerical modeling analysis and assume a density consistent with large flowing avalanches.

Table 3-1. Snow avalanche hazards and preliminary design parameters.

Structure	Avalanche Path	Estimated Return Period(1) (Years)	Design Snow Impact Pressure(2) (kPa)	Unmitigated Risk Rating
KSM-26	TRN 1	10	40	Moderate
KSM-29N	TRN 2	10	100	Moderate
KSM-29B	TRN 2	10	100	Moderate
KSM-62	TRN 14	10	40	Moderate
KSM-63	TRN 14	30	40	Moderate
KSM-64	TRN 14	30	40	Moderate
KSM-65	TRN 14	30	40	High
KSM-66	TRN 14	30	100	High
KSM-67N	TRN 14	30	100	Moderate

Notes:

(1) Estimated return period based on current information. An order of magnitude range is implied i.e. 10-year return period may range from 3 to 30 years. 30 year return period may range from 10 to 100 years.

(2) Pressure applied to the structure between 2 m and 6 m above ground level. Assumes up to 4 m flow depth for dense flowing mass, and a 1 m tower width.

In addition to the dense flowing mass, the airborne component of large avalanches (called the 'powder component') may affect conductors, which are assumed to be located 20 m to 30 m above the ground surface. The powder component can produce impact pressures in the range of 1 to 30 kPa. Table 3-2 provides potential powder component impact pressures to specific segments along the transmission line.

Table 3-2. Potential powder component impact pressures on conductors.

Span	Estimated Return Period(1) (Years)	Design Powder Component Impact Pressures on Conductors (kPa)
KSM-26 to KSM-27	10	3
KSM-28 to KSM-30	10	5
KSM-62 to KSM-63	10	5
KSM-63 to KSM-65	30	5
KSM-66 to 68	30	10

Notes: (1) Estimated return period based on current information. An order of magnitude range is implied i.e.10 year return period may range from 3 to 30 years. 30 year return period may range from 10 to 100 years.

As a rare occurrence, large snow avalanche events, or consecutive events, may result in avalanche deposit depths exceeding 10 m to 15 m above the existing ground surface. Snow avalanche debris may impact the conductors if the conductor clearance is less than 15 m above the ground surface.

3.5. Static Snow Loading on Structures

The Treaty Creek area is located in a heavy precipitation zone, and as a result the snowpack is relatively deep most winters, typically ranging from 2.5 m to 4 m, depending on elevation. The settled snowpack that forms on mountain slopes over the winter may be considered a viscous medium that slowly deforms and moves downslope due to the effect of gravity. As a result, downslope forces may be generated on narrow obstacles oriented perpendicular to the slope, such as transmission line structures.

Potential static snow pressures on towers may be calculated provided reasonable assumptions are made regarding the uniformity of the landscape and extent of ground roughness. Inputs for calculation include slope incline, a design snowpack depth, an assumed value for snowpack density, and a gliding factor that is determined based on slope aspect and ground cover roughness (Margreth, 2004). Due to field travel limitations, this analysis is based primarily on remotely sensed information which has limited application for determining ground roughness, and 'micro-terrain' landscape uniformity. As a result there is some uncertainty in the values, and therefore they have been calculated conservatively.

An analysis of maximum snowpack depth for the region was completed based on local climate data provided by Rescan (2010), and regional snow pillow data archived by the British Columbia Ministry of Forests Lands, and Resource Operations. The 100 year return period snowpack depth is considered for this analysis. Table 3-3 provides a summary of estimated force for all structures that have potential for static snow loading, based on slope inclines of 30° or greater, up-slope of the structure. The structures are assumed to be 1 m in diameter. Although there may be some variation in the loading due to local conditions, the snow pressure (or force per meter) is assumed to be uniformly distributed over the snow thickness.

Table 3-3. Potential static snow loading on structures.

Structure	Elevation (m)	Slope Incline (°)	Snowpack Depth (m)	Force per Metre of Snowpack (kN/m)	Total Force on Tower (kN)
KSM-38	568	30	3.57	37	132
KSM-39	582	30	3.59	37	134
KSM-52N	682	30	3.74	40	150
KSM-58	649	40	3.69	46	170
KSM-59N	666	30	3.72	40	147
KSM-69	650	30	3.70	39	145
KSM-74N	1061	30	4.33	52	224
KSM-75N	1168	30	4.47	55	246
KSM-76AN	1174	40	4.47	64	288
KSM-77	1165	35	4.47	64	286
KSM-80	1155	35	4.45	60	267
KSM-83	1162	30	4.46	55	245
KSM-84N	1160	30	4.46	55	245
KSM-85	1162	30	4.46	55	245
KSM-86	1153	30	4.45	55	243
KSM-87N	1142	35	4.43	59	264
KSM-88N	1146	35	4.44	60	265
KSM-98	1118	35	4.40	59	258
KSM-99N	1112	30	4.39	53	233

3.6. Geohazard Risk Assessment

Geohazard risk has been assessed for all structures where a geohazard or snow avalanche hazard has been identified. The assessment considers the unmitigated risk only, assuming that no avoidance or protection measures are implemented. The risk assessment methodology follows that described in the KSM project wide geohazard risk report (BGC, 2012b). Criteria used to evaluate the hazards and consequences, as well as the limitations of the risk assessment, are described in that report. In summary, the methodology involves the following:

- Identifying geohazards that could damage a transmission line structure and cause a service interruption.
- Estimating the likelihood that a given geohazard will occur and reach the transmission line structure.
- Estimating the consequences of a given geohazard. In this assessment, only geohazards that have potential to impact and damage a structure and then cause service disruption were considered, and it is assumed that this service disruption results in a ‘major’ economic consequence, on the order of several weeks business interruption.
- Combining the geohazard likelihood and potential consequence using a semi-quantitative risk matrix (Table C-2) to arrive at a relative risk ranking that ranges from Very Low to Very High.

Results of the geohazard risk assessment are provided in Table C-1 (Appendix C). The following structures are exposed to “High” geohazard risk:

- KSM 21N, 22, 23N, 24 (debris flood hazard); and
- KSM 65, 66 (snow avalanche hazard)

4.0 RECOMMENDATIONS

4.1. Geohazard Risk Reduction

Seabridge has previously advised BGC that geohazard risk estimates of High are not considered tolerable, and therefore have asked BGC to propose risk reduction strategies that reduce the estimated residual risk to Moderate or less, where 'residual risk' is defined as risk remaining after implementation of mitigation measures.

Towards that goal, the following risk mitigation concepts are recommended. These concepts should be further evaluated as more information becomes available in future more detailed stages of assessment, design and construction:

- <u>Debris flood</u>: Extend the concrete drilled pier foundation an additional 3 m deeper than the typical design depth to provide protection against potential river erosion. Also, extend the concrete foundation 3 m above the final grade, and surround the foundation with engineered rip rap to provide protection to the steel mono-pole from potential boulder and log impact.
- <u>Snow Avalanche</u>: The structures susceptible to snow avalanches should be designed to withstand impact forces listed in Table 3-1 up to 6 m above the ground surface. Snow avalanche impacts higher than 6 m and potentially up to 10 m or 15 m high are possible, but are considered unlikely. A concrete pier with a steel deflector post facing the snow avalanche impact direction that extends above the ground surface was proposed previously by Brazier for the Teigen Creek Transmission Line (BGC, 2012a) and is still a suitable conceptual mitigation design for avalanche impact on the mono-pole. The effect of the avalanche powder component pressures on the conductors as listed in Table 3-2 should also be considered in the design.

4.2. Further Geotechnical Investigation and Design Prior to Construction

This current assessment provides geotechnical input for defining the transmission line alignment, as required for the Pre-Feasibility Update and Environmental Approval. However, more detailed geotechnical input will be required prior to final design and construction. The following geotechnical investigations and design input are recommended:

- Review the location of each transmission line structure in the field following access road construction. Re-position structures to integrate with the as-built access road and cut-off ditch, and make use of micro-topography, avoiding shallow instabilities, surface water drainages, seepage zones, and other unfavorable terrain features. Develop detailed designs to protect specific structures from these unfavorable terrain features, as required. Design concepts may include extending the foundation depth, engineered rip rap protection around the structure base, drainage blanket at seepage zones, French drains, or other slope stabilization measures.
- Characterize expected sub-surface conditions at each transmission line structure as required to select the typical foundation type and dimensions, prior to foundation

construction. As a minimum, surface mapping at each structure location and mapping of adjacent access road cut slopes is recommended to improve estimates of bedrock depth, material type, and groundwater depth. Additional investigations, including test pits or exploratory boreholes may be required where the project wants to reduce uncertainty in ground conditions prior to construction. Ground conditions will typically be more uncertain at structures located far from access roads.

- Characterize the debris flood hazard potentially affecting structures KSM 21N, 22, 23N, and 24, where unmitigated risk from debris floods is ‘High’. This characterization should include frequency-magnitude relationships, avulsion potential across the fan, potential impact velocities, debris size, flow depths, and scour potential. Basic engineering design of debris flood protection for transmission line structures would follow this more detailed hazard characterization.
- Characterize the snow avalanche hazard at structures KSM 65 and 66, where unmitigated risk from snow avalanches is ‘High’, and at other structures where the project desires to reduce snow avalanche risk (see Table 3-1 and Table C-1). The characterization should include estimates of snow depth, impact pressures, and powder component pressures suitable for basic engineering design. Development of snow avalanche protection for transmission line structures would follow.
- Develop typical foundation designs that are suitable for the range of expected subsurface conditions and foundation design loads. Include the reduction in bearing capacity that results from foundations located on or near steep slopes.

4.3. Transmission Line and Access Road Design Integration

As shown in Table A-1, the majority of structures are located within 25 meters of a proposed Treaty Creek access road, and many of these structures are intended to be located in the road ditch at the toe of cut slope. The exact location of the transmission line structures, in particular those located along the cut-off ditch (KSM 74N to KSM 91), will be subject to further review once the roads and diversion ditch are constructed. It is expected that the road and ditch will be subject to minor relocation, and preferred locations for transmission line structures will become more apparent after the road and other infrastructure are complete. Changes to transmission line structure locations are expected to be minor, but will occur of necessity as part of the transition from initial design to construction. Structure locations should be integrated with the as-built access road, cut-off ditch, and other project infrastructure as soon as practical following road construction.

Access road drainage structures, including culverts and ditches, divert and concentrate surface water flow that could cause surface water erosion around transmission line structures. This is most likely to occur at structures that are located downslope of the access road, but could also occur at structures located in the access road ditch. Structures should either be located away from potential surface water concentrations or otherwise protected from erosion.

5.0 CLOSURE

We trust the above satisfies your requirements at this time. Should you have any questions or comments, please do not hesitate to contact us.

Yours sincerely,

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APPENDIX A
INDIVIDUAL TRANSMISSION LINE STRUCTURE SUMMARY

TABLE A-1. INDIVIDUAL TRANSMISSION LINE STRUCTURE SUMMARY FOR KSM TREATY CREEK TRANSMISSION LINE (ALIGNMENT REV. 0, SEPT 26 2012)

TOWER ALIGNMENT AND STRUCTURE DETAILS FROM WN BRAZIER[1]				TERRAIN UNIT DETAILS[2,3] (BLANK IF NONE)								AVERAGE SLOPE[5] (DEG)		STRUCTURE LOCATION RELATIVE TO ROAD ALIGNMENT[6]		BGC COMMENTS		
STRUCTURE NO.	EASTING (m)	NORTHING (m)	GROUND ELEVATION (m)	TERRAIN SYMBOL[2,3]	GEOMORPHIC PROCESSES[2,3]	DRAINAGE CLASS[2,3]	TERRAIN STABILITY CLASS[2,3]	EROSION POTENTIAL[2,3]	GEOHAZARD PROCESS	SNOW AVALANCHE PATH[4]	UNMITIGATED RISK	10 m UP-SLOPE	10 m DOWN-SLOPE	ROAD	DISTANCE (m)	INSPECTION TYPE[7]	GROUND INSPECTION DATE	TOWER SITE OBSERVATIONS / COMMENTS
KSM-1N	459,823	6,274,330	535									0-10	0-10	Highway 37	240	Ground	21/7/2012	Glaciofluvial sand and gravel expected to full foundation depth; bedrock outcrop observed on adjacent steep slopes.
KSM-2N	459,952	6,274,163	537									0-5	5	Highway 37	265	Ground	21/7/2012	Glaciofluvial sand and gravel expected to full foundation depth.
KSM-3N	460,095	6,273,980	535									10	5	Highway 37	400	Ground	21/7/2012	Glaciofluvial sand and gravel expected to full foundation depth.
KSM-4N	460,275	6,273,780	533									0-5	10	Highway 37	500	Aerial		Glaciofluvial sand and gravel expected to full foundation depth. Located on terrace above alluvial fan to avoid stream avulsion & erosion hazard.
KSM-4AN	460,373	6,273,622	531									5	5	Highway 37	460	Aerial		
KSM-5AN	460,460	6,273,430	535									5	5	Highway 37	390	Aerial		
KSM-6	460,484	6,273,092	508	Mb		m	II	M				5	5	Highway 37	115	Ground	24/7/2012	
KSM-7	460,405	6,272,804	489	Cf		m-i	I	L	River Avulsion & Erosion		LOW	0-5	0-5	Highway 37	170	Ground	24/7/2012	On alluvial fan ~300 m laterally from main stream channel with potential for the stream to avulse and erode around foundation.
KSM-8	460,276	6,272,360	497	Ft		w-m	I	L				5	5	TCAR	330	Ground	22/7/2012	
KSM-9	460,187	6,272,069	537	Mbu		m-w	I	L				5	5	TCAR	490	Ground	22/7/2012	Structures KSM-9 to KSM-13 deviate from road around a proposed camp. Terrain is an undulating till blanket that has been previously logged, in part. Till expected to full foundation depth.
KSM-10	460,093	6,271,734	559	Mbu		m-w	I	L				0-5	0-5	TCAR	635	Aerial		
KSM-11	459,869	6,271,541	562	Mbu		m-w	I	L				0-5	0-5	TCAR	420	Aerial		
KSM-12	459,657	6,271,354	560	Mbu		m-w	I	L				0-5	0-5	TCAR	260	Aerial		
KSM-13	459,446	6,271,175	556	Mbu		m-w	I	L				0-5	0-5	TCAR	65	Aerial		
KSM-14	459,263	6,271,017	543	Mbu		m-w	I	L				0-5	0-5	TCAR	65	Aerial		
KSM-15	459,011	6,270,965	539	Mbu		m-w	I	L				15	10	TCAR	55	Aerial		
KSM-16	458,834	6,270,923	546	Mbu		m-w	I	L				10	5	TCAR	110	Aerial		
KSM-17	458,644	6,270,889	550	Mbu		m-w	I	L				5	15	TCAR	85	Aerial		
KSM-18N	458,407	6,270,839	546	Mbu		m-w	I	L				10	10	TCAR	25	Aerial		
KSM-19	458,125	6,270,868	551	Mb/Ov|Mv		m-i	I	L				5	10	TCAR	50	Aerial		Transmission line crosses to north side of road.
KSM-20	457,914	6,270,821	550	Ff	Rd2	m-i	II	M	Debris Flood		MODERATE	3	3	TCAR	65	Aerial		Located on extreme margin of debris flood fan. Debris flood impact and stream avulsion & erosion is possible, but less frequent than other areas of the fan.
KSM-21N	457,689	6,270,771	559	Ff	Rd2	m-i	II	M	Debris Flood		HIGH	3	3	TCAR	25	Aerial		Located on debris flood fan adjacent to active portion of fan. May be subject to debris flood impact and/or stream erosion.
KSM-22	457,458	6,270,717	565	Ff	Rd2	m-i	II	M	Debris Flood		HIGH	3	3	TCAR	20	Aerial		Located in most active portion of debris flood fan. May be subject to debris flood impact and/or stream erosion.
KSM-23N	457,236	6,270,665	568	Ff	Rd2	m-i	II	M	Debris Flood		HIGH	5	5	TCAR	30	Ground	22/7/2012	Located in most active portion of debris flood fan. May be subject to debris flood impact and/or stream erosion.
KSM-24	457,028	6,270,617	566	Ff	Rd2	m-i	II	M	Debris Flood		HIGH	5	5	TCAR	25	Aerial		Located on debris flood fan. May be subject to debris flood impact and/or stream erosion.
KSM-25	456,786	6,270,563	559	Ff	Rd2	m-i	II	M	Debris Flood		MODERATE	5	3	TCAR	30	Aerial		Located on lateral margin of debris flood fan. May be subject to debris flood impact and/or stream erosion.
KSM-26	456,486	6,270,496	561	Cv.Rsk		w	IV	M	Snow Avalanche	TRN 1	MODERATE	25	25	TCAR	15	Aerial		Located within avalanche path.
KSM-27	456,217	6,270,399	566	Cv.Rsk		w	IV	M				25	25	TCAR	30	Aerial		Located adjacent to avalanche path TRN 1, and avalanche impact considered unlikely.
KSM-28	456,064	6,270,278	559	Cb		m	III	L				25	20	TCAR	30	Aerial		Located adjacent to avalanche path TRN 2, and avalanche impact considered unlikely.
KSM-29N	455,925	6,270,169	568	Cb		m	III	L	Snow Avalanche	TRN 2	MODERATE	10	10	TCAR	65	Ground	23/7/2012	Located within avalanche path.
KSM-29B	455,806	6,270,077	565	Cb		m	III	L	Snow Avalanche	TRN 2	MODERATE	5	10	TCAR	40	Ground	23/7/2012	Located within avalanche path.

TABLE A-1. INDIVIDUAL TRANSMISSION LINE STRUCTURE SUMMARY FOR KSM TREATY CREEK TRANSMISSION LINE (ALIGNMENT REV. 0, SEPT 26 2012)

TOWER ALIGNMENT AND STRUCTURE DETAILS FROM WN BRAZIER[1]				TERRAIN UNIT DETAILS[2,3] (BLANK IF NONE)								AVERAGE SLOPE[5] (DEG)		STRUCTURE LOCATION RELATIVE TO ROAD ALIGNMENT[6]		BGC COMMENTS		
STRUCTURE NO.	EASTING (m)	NORTHING (m)	GROUND ELEVATION (m)	TERRAIN SYMBOL[2,3]	GEOMORPHIC PROCESSES[2,3]	DRAINAGE CLASS[2,3]	TERRAIN STABILITY CLASS[2,3]	EROSION POTENTIAL[2,3]	GEOHAZARD PROCESS	SNOW AVALANCHE PATH[4]	UNMITIGATED RISK	10 m UP-SLOPE	10 m DOWN-SLOPE	ROAD	DISTANCE (m)	INSPECTION TYPE[7]	GROUND INSPECTION DATE	TOWER SITE OBSERVATIONS / COMMENTS
KSM-30N	455,561	6,269,995	566	Cb		m	III	L				10	10	TCAR	25	Ground	23/7/2012	Located adjacent to avalanche path TRN 3, and avalanche impact considered unlikely.
KSM-31	455,401	6,269,861	562	Cb		m-i	I	L				5	5	TCAR	25	Aerial		
KSM-32	455,233	6,269,653	562	Cb		m-i	I	L				5	5	TCAR	25	Aerial		
KSM-32BN	455,147	6,269,467	562	Cb		m-i	I	L				5	5	TCAR	30	Aerial		Located 10 m upslope from a 4 m high waterway cut bank.
KSM-33	454,999	6,269,162	571	Mw			III	M				15	35	TCAR	45	Aerial		Located on side slope 24 m (vertical) above road. Difficult construction access. Slope between road and structure may be bedrock.
KSM-34N	454,790	6,269,018	576	Mw			III	M				25	25	TCAR	10	Aerial		Located on side slope 6 m (vertical) above road.
KSM-35N	454,620	6,268,903	568	Cv/Rsk		w	IV	M				25	25	TCAR	15	Aerial		Located on side slope 4 m (vertical) above road.
KSM-36N	454,421	6,268,766	559	Cv/Rsk		w	IV	M				20	10	TCAR	20	Aerial		Located on side slope 4 m (vertical) above road.
KSM-37N	454,209	6,268,761	556	Cv/Rsk		w	IV	M				25	25	TCAR	10	Aerial		Located on side slope 5 m (vertical) above road.
KSM-38N	454,082	6,268,759	568	Cv/Rsk		w	IV	M				30	30	TCAR	10	Aerial		Located on side slope 3 m (vertical) above road.
KSM-39	453,873	6,268,840	582	Cv/Rsk		w	IV	M				30	25	TCAR	15	Aerial		Located on side slope 7 m (vertical) above road.
KSM-40N	453,785	6,269,036	717	Cv/Rsk		w	IV	M				5	15	TCAR	195	Aerial		Located at bench on top of ridge. Line deviates from road to avoid foundations on steep slope and interactions with access road rock cuts. Access by pioneer road from KSM-44N.
KSM-41N	453,607	6,269,111	726	Cv/Rsk		w	IV	M				5	15	TCAR	215	Aerial		
KSM-42N	453,328	6,269,228	732	Cv/Rsk		w	IV	M				15	15	TCAR	200	Ground	21/7/2012	
KSM-43N	452,985	6,269,286	715	Mw|Ru		m	III	L				5	5	TCAR	165	Ground	21/7/2012	
KSM-44N	452,635	6,269,339	690	Mw|Ru		m	III	L				10	10	TCAR	45	Ground	21/7/2012	
KSM-45	452,469	6,269,441	704	Mw|Ru		m	III	L				5	5	TCAR	100	Ground	21/7/2012	
KSM-46N	452,335	6,269,528	696	Mw|Ru		m	III	L				5	10	TCAR	125	Ground	21/7/2012	
KSM-47	452,136	6,269,637	656	Mv.Cvb		w-m	III	M				20	15	TCAR	15	Ground	21/7/2012	
KSM-48	451,856	6,269,637	658	Mv.Cvb		w-m	III	M				10	5	TCAR	20	Aerial		
KSM-49	451,575	6,269,636	659	Mv.Cvb		w-m	III	M				15	10	TCAR	10	Aerial		
KSM-50N	451,369	6,269,704	666	Mv.Cvb		w-m	III	M				30	25	TCAR	20	Aerial		Located on side slope 7 m above road. Bedrock may be encountered near surface.
KSM-51	451,162	6,269,772	675	Mv.Cvb		w-m	III	M				25	15	TCAR	20	Aerial		Located on side slope 7 m above road. Bedrock may be encountered near surface.
KSM-52N	451,037	6,269,791	682	Mv.Cvb		w-m	III	M				35	35	TCAR	15	Aerial		Located on side slope 11 m above road. Bedrock may be encountered near surface. Check interaction with road cut.
KSM-53	450,898	6,269,816	673	Mv.Cvb		w-m	III	M				15	5	TCAR	10	Aerial		
KSM-54	450,651	6,269,825	686	Mv.Cvb		w-m	III	M				10	25	TCAR	10	Aerial		
KSM-55N	450,458	6,269,836	690	Mv.Cvb		w-m	III	M				15	5	TCAR	10	Aerial		
KSM-56N	450,239	6,269,903	676	Mv.Cvb		w-m	III	M				20	5	TCAR	10	Aerial		
KSM-57	449,999	6,269,978	663	Mv.Cvb		w-m	III	M				15	25	TCAR	15	Aerial		Located on bench above road.
KSM-58	449,791	6,270,141	649	Cv/Rks		w-r	IV	M				40	30	TCAR	20	Ground	19/7/2012	Bedrock visible at surface 50 m upslope of proposed location.
KSM-59N	449,538	6,270,314	655	Cv/Rks		w-r	IV	M				30	25	TCAR	20	Ground	19/7/2012	Located on side slope 10 m above road.
KSM-60N	449,244	6,270,447	682	Cv		w	III	M				20	30	TCAR	45	Ground	19/7/2012	Located on slope crest 30 m above debris flood fan. Well above debris flood hazard.
KSM-61	448,947	6,270,529	668	Cv		w	III	M	Snow Avalanche	TRN 13	LOW	15	15	TCAR	50	Ground	19/7/2012	Located on slope crest 30 m above debris flood fan. Well above debris flood hazard. Exposed to snow avalanche hazard.
KSM-62	448,799	6,270,636	648	Cvb		w-m	III	M	Snow Avalanche	TRN 14	MODERATE	5	10	TCAR	15	Aerial		At lateral margin of snow avalanche path.
KSM-63	448,614	6,270,768	649	Cvb		w-m	III	M	Snow Avalanche	TRN 14	MODERATE	10	15	TCAR	15	Aerial		At lateral margin of snow avalanche path.

TABLE A-1. INDIVIDUAL TRANSMISSION LINE STRUCTURE SUMMARY FOR KSM TREATY CREEK TRANSMISSION LINE (ALIGNMENT REV. 0, SEPT 26 2012)

TOWER ALIGNMENT AND STRUCTURE DETAILS FROM WN BRAZIER[1]				TERRAIN UNIT DETAILS[2,3] (BLANK IF NONE)								AVERAGE SLOPE[5] (DEG)		STRUCTURE LOCATION RELATIVE TO ROAD ALIGNMENT[6]		BGC COMMENTS		
STRUCTURE NO.	EASTING (m)	NORTHING (m)	GROUND ELEVATION (m)	TERRAIN SYMBOL[2,3]	GEOMORPHIC PROCESSES[2,3]	DRAINAGE CLASS[2,3]	TERRAIN STABILITY CLASS[2,3]	EROSION POTENTIAL[2,3]	GEOHAZARD PROCESS	SNOW AVALANCHE PATH[4]	UNMITIGATED RISK	10 m UP-SLOPE	10 m DOWN-SLOPE	ROAD	DISTANCE (m)	INSPECTION TYPE[7]	GROUND INSPECTION DATE	TOWER SITE OBSERVATIONS / COMMENTS
KSM-64	448,344	6,270,904	665	Cvb		w-m	III	M	Snow Avalanche	TRN 14	MODERATE	15	15	TCAR	15	Aerial		Located in trees at distal extent of snow avalanche path.
KSM-65	448,192	6,271,088	657	Cvb		w-m	III	M	Snow Avalanche	TRN 14	HIGH	15	10	TCAR	15	Aerial		Located within snow avalanche path.
KSM-66	448,001	6,271,170	646	Cvb		w-m	III	M	Snow Avalanche	TRN 14	HIGH	15	20	TCAR	15	Ground	23/7/2012	Located within snow avalanche path.
KSM-67N	447,870	6,271,321	655	Cvb		w-m	III	M	Snow Avalanche	TRN 14	MODERATE	10	15	TCAR	35	Ground	23/7/2012	Located in trees at distal extent of snow avalanche path.
KSM-68	447,735	6,271,561	657	Cvb		w-m	III	M				15	15	TCAR	30	Aerial		Beyond distal extent of snow avalanche paths.
KSM-69	447,468	6,271,707	650	Cv		w	II	M				30	35	TCAR	5	Aerial		Located on steep slope uphill of access road. Slope maybe composed of bedrock. Check interaction with access road cut design.
KSM-70	447,419	6,271,920	713	Cv		w	II	M				10	10	NTCL	95	Aerial		Located between access roads with construction access across 10 to 20 deg slopes.
KSM-71	447,393	6,272,122	742	Cv		w	II	M				20	5	NTCL	5	Aerial		Adjacent to North Treaty Lower Access road.
KSM-72N	447,218	6,272,269	820	Cv		w	II	M				5	15	NTCU	110	Aerial		Located above avalanche path on ridge between access roads. Difficult construction access across slopes up to 25 deg.
KSM-73N	447,037	6,272,424	925	Cvb		m	IV	M				25	35	NTCU	120	Aerial		Located above avalanche path on ridge between access roads. Difficult construction access across slopes up to 35 deg.
KSM-74N	446,857	6,272,575	1061	Cv.Rs		w-r	IV	L				30	30	COD	180	Aerial		Located above avalanche path on ridge between access roads. Difficult construction access across slopes up to 35 deg.
KSM-75N	446,709	6,272,781	1168	Cvb		m	IV	M				30	35	COD	5	Aerial		Located above avalanche paths at end of cut off ditch access road.
KSM-76AN	446,625	6,272,985	1174	Cvb		m	IV	M				40	45	COD	5	Aerial		
KSM/77	446,563	6,273,130	1165	Cvb		m	IV	M				35	40	COD	5	Aerial		
KSM/78	446,470	6,273,311	1161	Cv.Mw		m-i	III	M				25	25	COD	5	Aerial		
KSM/79	446,307	6,273,519	1159	Cv.Mw		m-i	III	M				25	25	COD	5	Aerial		
KSM/80	446,160	6,273,699	1155	Cv.Mw		m-i	III	M				35	35	COD	5	Aerial		
KSM/81	446,035	6,273,885	1154	Cv	V	m	IV	H				20	25	COD	5	Ground	20/7/2012	No gully erosion observed in vicinity of tower during ground inspection.
KSM/82	445,815	6,274,043	1202	Mw//Rk		w	III	M				25	25	COD	100	Ground	20/7/2012	
KSM/83	445,586	6,274,207	1162	Mw//Rk		w	III	M				30	25	COD	25	Aerial		
KSM/84N	445,411	6,274,334	1167	Mw//Rk		w	III	M				30	30	COD	30	Aerial		
KSM/85	445,194	6,274,474	1162	Mw//Rk		w	III	M				30	30	COD	40	Aerial		
KSM/86	445,024	6,274,584	1153	Mw//Rk		w	III	M				30	30	COD	20	Aerial		
KSM/87N	444,865	6,274,687	1147	Mw//Rk		w	III	M				35	35	COD	5	Aerial		
KSM/88N	444,647	6,274,829	1146	Mw//Rk		w	III	M				35	30	COD	10	Aerial		
KSM/89N	444,414	6,274,977	1137	Mw//Rk		w	III	M				20	20	COD	10	Ground	20/7/2012	Wet ground with numerous seeps and streams at time of ground inspection. Re-evaluate erosion and shallow landslide hazard following access road construction.
KSM/90	444,232	6,275,027	1150	Mwb		m-i	III	M				10	10	COD	60	Ground	20/7/2012	Wet ground.
KSM/91	444,017	6,275,094	1129	Mwb		m-i	III	M				15	15	COD	5	Aerial		
KSM/92	443,770	6,275,117	1149	Mwb		m-i	III	M				15	15	NTCU	85	Ground	20/7/2012	Wet ground.
KSM/93	443,523	6,275,141	1144	Mb	V	m	IV	H				15	10	NTCU	105	Ground	20/7/2012	Wet ground.
KSM/94	443,273	6,275,165	1140	Mb	V	m	IV	H				10	15	NTCU	70	Aerial		
KSM/95N	443,010	6,275,197	1132	Mwb		m	IV	M				10	15	NTCU	50	Aerial		
KSM/96	442,813	6,275,326	1119	Mwb		m	IV	M				20	20	NTCU	15	Aerial		
KSM/97	442,603	6,275,462	1116	Mw.Cv		m-i	IV	M				25	20	NTCU	5	Aerial		
KSM/98	442,396	6,275,598	1118	Mw.Cv		m-i	IV	M				35	30	NTCU	10	Aerial		

TABLE A-1. INDIVIDUAL TRANSMISSION LINE STRUCTURE SUMMARY FOR KSM TREATY CREEK TRANSMISSION LINE (ALIGNMENT REV. 0, SEPT 26 2012)

TOWER ALIGNMENT AND STRUCTURE DETAILS FROM WN BRAZIER[1]				TERRAIN UNIT DETAILS[2,3] (BLANK IF NONE)								AVERAGE SLOPE[5] (DEG)		STRUCTURE LOCATION RELATIVE TO ROAD ALIGNMENT[6]		BGC COMMENTS		
STRUCTURE NO.	EASTING (m)	NORTHING (m)	GROUND ELEVATION (m)	TERRAIN SYMBOL[2,3]	GEOMORPHIC PROCESSES[2,3]	DRAINAGE CLASS[2,3]	TERRAIN STABILITY CLASS[2,3]	EROSION POTENTIAL[2,3]	GEOHAZARD PROCESS	SNOW AVALANCHE PATH[4]	UNMITIGATED RISK	10 m UP-SLOPE	10 m DOWN-SLOPE	ROAD	DISTANCE (m)	INSPECTION TYPE[7]	GROUND INSPECTION DATE	TOWER SITE OBSERVATIONS / COMMENTS
KSM/99N	442,164	6,275,755	1112	Mw.Cv		m-i	IV	M				30	25	NTCU	5	Ground	20/7/2012	Steep slope complicates construction access. Integrate with access road design. May require increased pole height due to access road cut slope.
KSM/100	442,012	6,275,896	1109	Mw.Cv		m-i	IV	M				20	20	NTCL	5	Ground	20/7/2012	
KSM/101N	441,736	6,276,027	1107	Mw.Cv		m-i	IV	M				25	20	NTCL	10	Ground	20/7/2012	Wet ground with numerous seeps and streams at time of ground inspection. Re-evaluate erosion and shallow landslide hazard following access road construction.
KSM/102N	441,555	6,276,132	1117	Mk.Cv	V	m-i	IV	H				25	25	NTCL	45	Ground	20/7/2012	Wet ground with numerous seeps and streams at time of ground inspection. Re-evaluate erosion and shallow landslide hazard following access road construction.
KSM/103	441,530	6,276,408	1102	Cv/Mw	Fu	m-i	IV	H				15	20	NTCL	5	Ground	20/7/2012	Bedrock expected within 1 m of surface.
KSM/104	441,412	6,276,596	1096	Cv/Mw	Fu	m-i	IV	H				25	25	NTCL	5	Aerial		
KSM/105	441,212	6,276,745	1121	Cv/Mw	Fu	m-i	IV	H				20	20	NTCL	60	Aerial		
KSM/106	441,091	6,276,967	1102	Cv/Mw	Fu	m-i	IV	H				20	20	NTCL	35	Aerial		
KSM/107N	440,994	6,277,142	1087	Mka		m	III	H				15	20	NTCL	10	Aerial		
KSM/108	440,811	6,277,408	1088	Mb		m-i	III	M				20	20	NTCL	5	Aerial		
KSM/109	440,668	6,277,591	1084	Mb		m-i	III	M				15	10	NTCL	5	Aerial		
KSM/110N	440,525	6,277,756	1083	Mb		m-i	III	M				15	15	NTCL	5	Ground	20/7/2012	
KSM/111N	440,379	6,277,945	1083	Mb		m-i	III	M				10	10	NTCL	25	Ground	20/7/2012	
KSM/112	440,325	6,278,188	1078	Mw|Rm/Rm		w-m	II	L				5	10	NTCL	5	Ground	20/7/2012	Undulating bedrock visible at surface, with soil infilling bedrock depressions from KSM/112 to KSM/121.
KSM/113	440,149	6,278,398	1074	Mw|Rm/Rm		w-m	II	L				10	10	NTCL	15	Aerial		
KSM/114	440,063	6,278,623	1071	Mw|Rm/Rm		w-m	II	L				10	0-5	NTCL	5	Aerial		
KSM/115	439,860	6,278,803	1074	Mw|Rm/Rm		w-m	II	L				0-5	0-5	NTCL	10	Aerial		
KSM/116	439,697	6,278,992	1078	Mw|Rm/Rm		w-m	II	L				5	5	NTCL	10	Aerial		
KSM/117	439,542	6,279,174	1081	Mw|Rm/Rm		w-m	II	L				5	5	NTCL	10	Aerial		
KSM/118	439,412	6,279,382	1081	Mw|Rm/Rm		w-m	II	L				5	5	NTCL	10	Aerial		
KSM/119	439,283	6,279,590	1079	Mw|Rm/Rm		w-m	II	L				5	5	NTCL	10	Aerial		
KSM/120	439,150	6,279,799	1075	Mw|Rm/Rm		w-m	II	L				0-5	0-5	NTCL	10	Aerial		
KSM/121	439,150	6,280,071	1063	Mw|Rm/Rm		w-m	II	L				5	5	NTCL	10	Aerial		

NOTES:
1. Transmission line alignment details from WN Brazier, Excel File 'Copy of KSM Treaty Creek Trans 1, 2, 3, REV 0, submitted by Brazier to KSM Sharepoint on Sept 26 2012.
2. Data Source: BGC (2012b), Drawing 03, Treaty Creek Terrain Map and Landslide Geohazards, with updated extent and geomorphic process at polygon 1115.
3. See Drawing 01 for a Description of Terrain Symbols.
4. Data Source: BGC (2012b), Drawing 09, Treaty Creek Avalanche Geohazards, with updated extent of avalanche areas TRN 1, 2, 3, 13, and 14.
5. Slope angle estimated from digital elevation models, based on 1 m LiDAR contours for structures KSM/1N to KSM/74N, and 10 m KCBL January 2012 contours for structures KSM/75N to KSM/121.
6. *Treaty Creek Access Road (TCAR)*, *(NTCU) North Treaty Upper* and (NTCL) *Lower* Access Road alignments from McElhanney May 17, 2012 P-Line road, and (COD) *Cut-off Ditch* access road from McElhanney July 6, 2012 P-Line road. Distance with respect to proposed centerline.
7. Field inspections reviewed transmission line alignment from WN Brazier, Excel Treaty Creek Transmission File 1, 2, 3 dated July 17 to 19, 2012.

APPENDIX B
TRANSMISSION LINE SECTION GEOTECHNICAL SUMMARY

TABLE B-1. TRANSMISSION LINE SECTION GEOTECHNICAL SUMMARY FOR KSM TREATY CREEK TRANSMISSION LINE (ALIGNMENT REV.0, SEPT 26 2012)

SECTION ID	SECTION	STRUCTURE ID		NUMBER STRUCTURES IN SECTION	TERRAIN DESCRIPTION	SLOPE CLASS[1]	ANTICIPATED SUBSURFACE CONDITIONS	RECOGNIZED GEOHAZARDS	STRUCTURE PROXIMITY TO ACCESS ROAD	GEOTECHNICAL COMMENTS[2]
		FROM	TO							
A	North side of HWY 37	1	6	6	Till blanket and fluvial terraces, gentle undulating slopes	Gentle	Typically soils > 3 m deep; bedrock < 1m deep may be encountered typically on moderate slopes; moderate drainage		Upslope 300 m from HWY 37	Plan for drilled pier foundations in soil; bedrock may be encountered.
B	Bell Irving River Valley	7	-	1	Alluvial fan	Gentle	Soils > 3 m deep; moderate drainage	River avulsion and erosion	Downslope 200 m from HWY 37	Drilled pier foundation in soil; consider stream avulsion and erosion protection.
C	Mouth of Treaty Creek Valley	8	19	12	Till blanket, gentle undulating slopes	Gentle	Soils > 3 m deep; moderate drainage		Structures 8 to 12 south of access road 200 - 800 m; Structures 13 to 19 within 100 m of access road	Drilled pier foundation in soil.
D	Treaty Valley Fan	20	25	6	Alluvial fan with multiple inactive channels	Gentle	Soils > 3 m deep; moderate to imperfect drainage	River avulsion, erosion, and debris flood	Upslope 20 - 30 m from Treaty Access Road	Drilled pier foundation in soil; consider stream erosion and debris flood protection.
E	Treaty Valley North Slope	26	30N	6	Colluvial blanket at toe of valley slope	Gentle to Moderately Steep	Typically soils > 3 m deep; bedrock < 1 m deep may be encountered on moderately steep slopes; moderate drainage	Snow avalanches	Upslope 20 - 60 m from Treaty Access Road	Plan for drilled pier foundations in soil; bedrock may be encountered; consider snow avalanche protection.
F	Treaty Valley Colluvial Slope	31	32BN	3	Colluvial blanket	Gentle	Soils > 3 m deep; moderate drainage		Upslope 20 - 30 m from Treaty Access Road	Drilled pier foundation in soil.
G	Treaty Valley Ridge Base	33	39	7	Colluvial veneer at toe of ridge slope	Gentle to Moderate	Typically soils 1 to 3 m deep; bedrock < 1 m deep may be encountered on moderate slopes; well drained		Upslope 10 - 40 m from Treaty Access Road	Drilled pier foundation in soil and rock.
H	Treaty Valley Ridge Top	40	46	7	Till or colluvial veneer over undulating bedrock	Gentle	Typically soils 1 to 3 m deep; bedrock < 1 m deep may be encountered on moderate slopes; moderate drainage		Upslope 40 - 200 m from Treaty Access Road	Drilled pier foundation in soil and rock.
I	Treaty Valley Ridge Top	47	57	11	Till and colluvial veneer over undulating bedrock; benched topography	Gentle to Moderate	Typically soils 1 to 3 m deep; bedrock < 1 m deep may be encountered on moderate slopes; moderate to well drained		Upslope 10 - 20 m from Treaty Access Road	Drilled pier foundation in soil and rock.
J	Treaty Valley North Slope	58	59	2	Colluvial veneer and rock at toe of valley slope	Moderately Steep to Steep	Soils < 3 m deep and bedrock; well drained		Upslope 20 m from Treaty Access Road	Drilled pier foundation in soil and rock.
K	Treaty Valley North Slope	60	68	9	Colluvial blanket at toe of valley slope	Moderate	Soils > 3 m deep; moderate drainage	Snow avalanches	Upslope 10 - 50 m from Treaty Access Road	Drilled pier foundation in soil; consider snow avalanche protection.
L	North Treaty Confluence	69	71	3	Colluvial veneer over bedrock	Gentle to Moderately Steep	Typically soils 1 to 3 m deep; bedrock < 1 m deep may be encountered on moderate slopes; well drained		Between Treaty and North Treaty Lower Access Roads	Drilled pier foundation in soil and rock.
M	North Treaty Ridge Climb	72N	74N	3	Colluvial veneer over bedrock along moderately plunging ridgeline	Moderate to steep	Soils < 3 m deep and bedrock; well drained		Between North Treaty Lower and Cut Off Ditch Access Roads; difficult access due to steep slopes	Drilled pier foundation in soil and rock; structures located adjacent to snow avalanche initiation zones.
N	North Treaty Cut Off Ditch	75N	88N	15	Colluvial and till veneer over bedrock on an undulating, benched side slope	Moderately Steep to Steep	Soils < 3 m deep and bedrock; imperfect to well drained		Within 10 m upslope of Cut Off Ditch Access road	Drilled pier foundation in soil and rock
O	North Treaty Upper Access	89N	96	8	Till blanket on benched moderate to gentle side slope	Gentle to Moderate	Soils > 3 m deep; moderate to imperfect drainage	Seepage and gully erosion, suficial slumping	Upslope 5 - 100 m from Cut Off Ditch and North Treaty Upper Access Roads	Drilled pier foundation in soil; review potential for seepage, gully erosion, and surficial slumping following road construction.
P	North Treaty Lower Access	97	107N	11	Colluvial and till veneer over bedrock on an undulating, benched side slope	Moderately Steep to Steep	Soils < 3 m deep and bedrock; imperfect to well drained	Seepage and gully erosion, suficial slumping	Upslope 5 - 65 m from North Treaty Upper and Lower Access Roads	Drilled pier foundation in soil and rock; review potential for seepage, gully erosion, and surficial landslides following road construction.
Q	North Treaty Lower Access	108	111N	4	Till blanket to veneer on a moderate to gentle, benched slope	Gentle to Moderate	Typically soils > 3 m deep; bedrock < 1 m may be encountered; moderate to imperfect drainage		Upslope 5 - 30 m from North Treaty Lower Access Road	Drilled pier foundation in soil and rock.
R	Plant Site	112	121	10	Till veneer over undulating bedrock	Gentle	Soils < 3 m deep and bedrock; poor to moderate drainage		Within plant site area	Drilled pier foundation in soil and rock.

NOTES:

(1) Slope Classes: (Plain: 0-3°) (Gentle: 3-15°) (Moderate: 15-26°) (Moderately Steep: 26-35°) (Steep: 35-45°) (Very Steep: > 45°)

(2) No detailed investigation of subsurface soil, rock, and groundwater conditions has been carried out. Terrain conditions and geotechnical comments are preliminary, based on surface observations. Foundation conditions should be further evaluted through subsurface investigations with results incorporated into design.

APPENDIX C
TREATY CREEK TRANSMISSION LINE GEOHAZARD RISK ASSESSMENT

TABLE C-1 TREATY CREEK TRANSMISSION LINE GEOHAZARD RISK ASSESSMENT (ALIGNMENT REV. 0, SEPT 26 2012)

HAZARD IDENTIFICATION				ANNUAL HAZARD FREQUENCY		ANNUAL PROBABILITY OF UNWANTED OUTCOME						CONSEQUENCE ESTIMATION (OPERATION)					UNMITIGATED
Facility	Structure	Hazard Process	Direct Consequence	F (min)	F (max)	$P_{S:H}$	$P_{T:H}$	V	$P_{(min)}$	$P_{(max)}$	Likelihood	Safety	Environment	Economic	Reputation	*Max Cons.*	RISK
Treaty Creek Transmission Line	KSM-1N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-2N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-3N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-4N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-4AN	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-5AN	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-6	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-7	Stream Avulsion/ Erosion	Damage to tower & service interruption	0.001	0.01	0.1	1	0.5	0.00005	0.0005	Very Unlikely	5	5	3	4	3	LOW
	KSM-8	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-9	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-10	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-11	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-12	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-13	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-14	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-15	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-16	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-17	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-18N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-19	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-20	Debris Flood (Size 3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-21N	Debris Flood (Size 3)	Damage to tower & service interruption	0.01	0.1	0.3	1	0.5	0.0015	0.015	Moderate	5	5	3	4	3	HIGH
	KSM-22	Debris Flood (Size 3)	Damage to tower & service interruption	0.01	0.1	0.5	1	0.5	0.0025	0.025	Moderate	5	5	3	4	3	HIGH
	KSM-23N	Debris Flood (Size 3)	Damage to tower & service interruption	0.01	0.1	0.5	1	0.5	0.0025	0.025	Moderate	5	5	3	4	3	HIGH
	KSM-24	Debris Flood (Size 3)	Damage to tower & service interruption	0.01	0.1	0.3	1	0.5	0.0015	0.015	Moderate	5	5	3	4	3	HIGH
	KSM-25	Debris Flood (Size 3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-26	Snow Avalanche (Size 2-3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-27	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-28	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-29N	Snow Avalanche (Size 3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-29B	Snow Avalanche (Size 3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-30N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-31	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-32	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-32BN	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-33	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-34N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-35N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-36N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-37N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-38N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-39	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-40N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-41N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-42N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-43N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-44N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-45	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-46N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-47	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-48	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-49	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-50N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-51	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-52N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-53	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-54	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-55N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

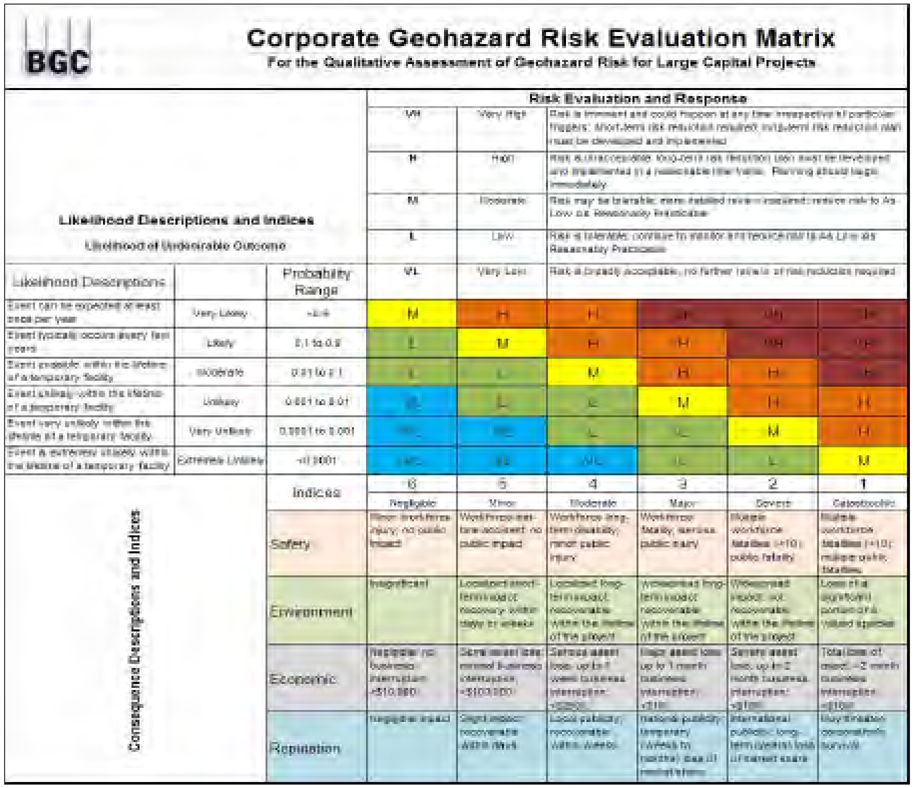
TABLE C-1 TREATY CREEK TRANSMISSION LINE GEOHAZARD RISK ASSESSMENT (ALIGNMENT REV. 0, SEPT 26 2012)

HAZARD IDENTIFICATION				ANNUAL HAZARD FREQUENCY		ANNUAL PROBABILITY OF UNWANTED OUTCOME						CONSEQUENCE ESTIMATION (OPERATION)					UNMITIGATED
Facility	**Structure**	**Hazard Process**	**Direct Consequence**	**F (min)**	**F (max)**	**$P_{S:H}$**	**$P_{T:H}$**	**V**	**$P_{(min)}$**	**$P_{(max)}$**	**Likelihood**	**Safety**	**Environment**	**Economic**	**Reputation**	***Max Cons.***	**RISK**
Treaty Creek Transmission Line	KSM-56N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-57	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-58	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-59N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-60N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-61	Snow Avalanche (Size 4)	Damage to tower & service interruption	0.001	0.01	0.1	1	0.5	0.00005	0.0005	Very Unlikely	5	5	3	4	3	LOW
	KSM-62	Snow Avalanche (Size 2-3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-63	Snow Avalanche (Size 2-3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-64	Snow Avalanche (Size 2-3)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-65	Snow Avalanche (Size 3-4)	Damage to tower & service interruption	0.01	0.1	0.3	1	0.5	0.0015	0.015	Moderate	5	5	3	4	3	HIGH
	KSM-66	Snow Avalanche (Size 3-4)	Damage to tower & service interruption	0.01	0.1	0.3	1	0.5	0.0015	0.015	Moderate	5	5	3	4	3	HIGH
	KSM-67N	Snow Avalanche (Size 3-4)	Damage to tower & service interruption	0.01	0.1	0.1	1	0.5	0.0005	0.005	Unlikely	5	5	3	4	3	MODERATE
	KSM-68	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-69	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-70	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-71	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-72N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-73N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-74N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-75N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM-76AN	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/77	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/78	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/79	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/80	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/81	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/82	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/83	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/84N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/85	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/86	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/87N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/88N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/89N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/90	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/91	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/92	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/93	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/94	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/95N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/96	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/97	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/98	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/99N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/100	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/101N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/102N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/103	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/104	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/105	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/106	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/107N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/108	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/109	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/110N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/111N	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/112	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-1 TREATY CREEK TRANSMISSION LINE GEOHAZARD RISK ASSESSMENT (ALIGNMENT REV. 0, SEPT 26 2012)

HAZARD IDENTIFICATION				ANNUAL HAZARD FREQUENCY		ANNUAL PROBABILITY OF UNWANTED OUTCOME						CONSEQUENCE ESTIMATION (OPERATION)					UNMITIGATED
Facility	Structure	Hazard Process	Direct Consequence	F (min)	F (max)	$P_{S:H}$	$P_{T:H}$	V	$P_{(min)}$	$P_{(max)}$	Likelihood	Safety	Environment	Economic	Reputation	*Max Cons.*	RISK
Treaty Creek Transmission Line	KSM/113	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/114	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/115	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/116	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/117	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/118	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/119	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/120	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	KSM/121	None identified	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

TABLE C-2 GEOHAZARD RISK EVALUATION MATRIX USED IN TREATY CREEK TRANSMISSION LINE RISK ASSESSMENT



BGC

Corporate Geohazard Risk Evaluation Matrix

For the Qualitative Assessment of Geohazard Risk for Large Capital Projects

Risk Evaluation and Response

VH	Very High	[illegible]
H	High	[illegible]
M	Moderate	[illegible]
L	Low	[illegible]
VL	Very Low	[illegible]

Likelihood Descriptions and Indices

Likelihood of Undesirable Outcome

Likelihood Descriptions		Probability Range						
[illegible]	Very Likely	[illegible]	M	H	H	VH	VH	VH
[illegible]	Likely	0.1 to 0.9	L	M	H	H	VH	VH
[illegible]	Moderate	0.01 to 0.1	L	L	M	H	H	VH
[illegible]	Unlikely	0.001 to 0.01	VL	L	L	M	H	H
[illegible]	Very Unlikely	0.0001 to 0.001	VL	VL	L	L	M	H
[illegible]	Extremely Unlikely	<0.0001	VL	VL	VL	L	L	M
Consequence Descriptions and Indices		Indices	6	5	4	3	2	1
			Negligible	Minor	Moderate	Major	Severe	Catastrophic
		Safety	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Environment	Insignificant	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Economic	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
		Reputation	Negligible impact	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Very High	0
High	6
Mod	9
Low	2
Very Low	0
TOTAL	17

DRAWINGS

LEGEND

- TRANSMISSION LINE TOWER
- TRANSMISSION LINE
- ACCESS ROAD

STABILITY CLASS

- IV
- V
- GROUND INSPECTION SITE
- LANDSLIDE PATH
- LANDSLIDE SCARP
- SACKUNG
- 100 m CONTOUR
- 20 m CONTOUR
- STUDY BOUNDARY
- DEBRIS FLOW / FLOOD (Rd, Rd2, Rsd)
- DEBRIS AVALANCHE (Rs)
- ROCKFALL (Rb)
- SLOPE SAGGING (Fm)
- ROCK AVALANCHE (Rr)
- ROCK SLUMP (Rm)
- ROCKFALL AND DEBRIS FLOW OR DEBRIS AVALANCHE (Rbd, Rbs)
- TERRAIN POLYGON

R" RAPID LANDSLIDE (INITIATION ZONE)
R RAPID LANDSLIDE (RUNOUT ZONE)
F" SLOW LANDSLIDE (INITIATION ZONE)
F SLOW LANDSLIDE (RUNOUT ZONE)

NOTES:

1. THIS MAP SHOULD BE READ WITH THE ACCOMPANYING REPORT.
2. SMALL MAGNITUDE GEOHAZARDS EXIST (E.G. LOCALIZED ROCKFALL) THAT WERE TOO SMALL TO MAP.
3. ARROWED LANDSLIDE PATHS SHOW GENERAL SLIDE TRAJECTORIES. THEY DO NOT SHOW HAZARD EXTENTS. PATH ARROWS EXTEND INTO THE GENERAL RUNOUT ZONE BUT DO NOT REPRESENT THE MAXIMUM RUNOUT LIMIT.
4. LANDSLIDE HAZARD EXENTS ARE SHOWN BY SHADED POLYGONS. THEY SHOW EXISTING LANDSLIDE HAZARD INITIATION ZONE AND RUNOUT AREAS. POLYGON BOUNDARIES SHOULD BE REGARDED AS TRANSITIONS, NOT SHARP BOUNDARIES.
5. RUNOUT ZONES OF POTENTIAL LARGE LANDSLIDES (E.G. ROCK AVALANCHES) ARE NOT SHOWN ON THE MAP. WHERE EXISTING, THESE ARE DESCRIBED AS RISK SCENARIOS IN THE TEXT.
6. THIS MAP IS A SNAPSHOT IN TIME. CHANGES IN LAND USE (E.G. DEVELOPMENT, GLACIAL RETREAT) MAY WARRANT RE-DRAWING OF CERTAIN AREAS.
7. ROAD ALIGNMENTS FOR THE PROPOSED TREATY CREEK, NORTH TREATY LOWER, NORTH TREATY UPPER, TUNNEL ADIT AND TUNNEL ADIT SPUR ACCESS ROADS FROM MCELHANNEY (MAY 17, 2012). ROAD ALIGNMENT FOR THE PROPOSED CUT-OFF DITCH ACCESS ROAD FROM MCELHANNEY (JULY 6, 2012).

POLYGON LABELS

Polygon number	123
Terrain symbol	Cv/Rs – R"b
Drainage class	w
Terrain stability class	V
Surface erosion potential	M

TERRAIN SYMBOLS

Simple Terrain Symbols: Used when one surficial material is present within a polygon

Example: Cb – Rb

Surficial Material — Geomorphological process sub-type
Surface expression — Geomorphological process (up to 3 may be assigned)

Composite Terrain Symbols: Used when 2 or 3 terrain types are present within a polygon

Cv.Mv	indicates that 'C' and 'M' are roughly equal in extent
Cv/Mv	indicates that 'C' is greater in extent than 'M' (about 60:40)
Cv//Mv	indicates that 'C' is much greater in extent than 'M' (about 80:20)

Stratigraphic Terrain Symbols

Cv|Mj	indicates that 'Cv' overlies 'Mj'
/Cv|Mj	indicates that 'Cv' partially overlies 'Mj'

Surficial Material Types

C	Colluvium	R	Bedrock	LG	Glaciolacustrine
L	Lacustrine	M	Glacial Till	FG	Glaciofluvial
F	Fluvial	O	Organic		

Surface Expressions

p	Plain (0-3°)	v	Veneer (0-2 m thick deposit)
j	Gentle Slope (4-14°)	b	Blanket (>2 m thick deposit)
a	Moderate Slope (15-26°)	w	Variable Thickness Deposit)
k	Moderately Steep Slope (27-35°)	m	Rolling
s	Steep Slope (>35°)	h	Hummocky
c	Cone (>15°)	f	Fan (<15°)
r	Ridge	u	Undulating
t	Terrace		

Geomorphologic Processes

R	Rapid landslide (runout zone)	V	Gully erosion
R"	Rapid landslide (initiation zone)	F"	Slow landslide (initiation zone)
U	Flooding		

Geomorphological Process Subtypes (May be Combined)

b	Rockfall	e	Earthflow	a	Channel Avulsion
d	Debris flows	r	Rock slides (Rr, R"r)	c	Soil creep
d2	Debris floods	s	Debris avalanches	m	Slump

Examples

/Cv|Mb	Partial cover of a Colluvial Veneer over a till blanket
Rs//Cv – VR"bd	Steep bedrock with <20% cover of a colluvial veneer; gullied with initiation zones for rockfall and debris flows.

Drainage

r	Rapid	w	Well	m	Moderate
i	Imperfect	p	Poor	vp	Very Poor

Surface Erosion Potential (Assigned to polygons intersecting proposed access roads)

VL	Very low potential - Flat or gently sloping terrain, organic soils, floodplain
L	Low potential - Gentle slopes, short slopes
M	Moderate potential - Moderate steep slopes and long slopes; erodible (fine-textured) soils
H	High potential - Moderate steep slopes and highly erodible soil textures
VH	Very high potential - Steep slopes with erodible soil textures, active surface/gully erosion

Terrain Stability Class (Assigned to polygons intersecting proposed roads and fixed facilities)

I	No significant stability problems exist.
II	There is a very low likelihood of landslides following road construction. Minor slumping is expected along road cuts, especially for 1 or 2 years following construction.
III	There is a low likelihood of landslide initiation following road construction. Minor slumping is expected along road cuts, especially for 1 or 2 years following construction.
IV	Expected to contain areas with a moderate likelihood of landslide initiation following road construction.
V	Expected to contain areas with a high likelihood of landslide initiation following road construction.

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DRAWN:	LL	APPROVED:	ML

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: TERRAIN POLYGONS AND GEOHAZARDS LEGEND

CLIENT: SEABRIDGE GOLD INC.

PROJECT No.:	DWG No.:	REV.:
0638013	T-00	

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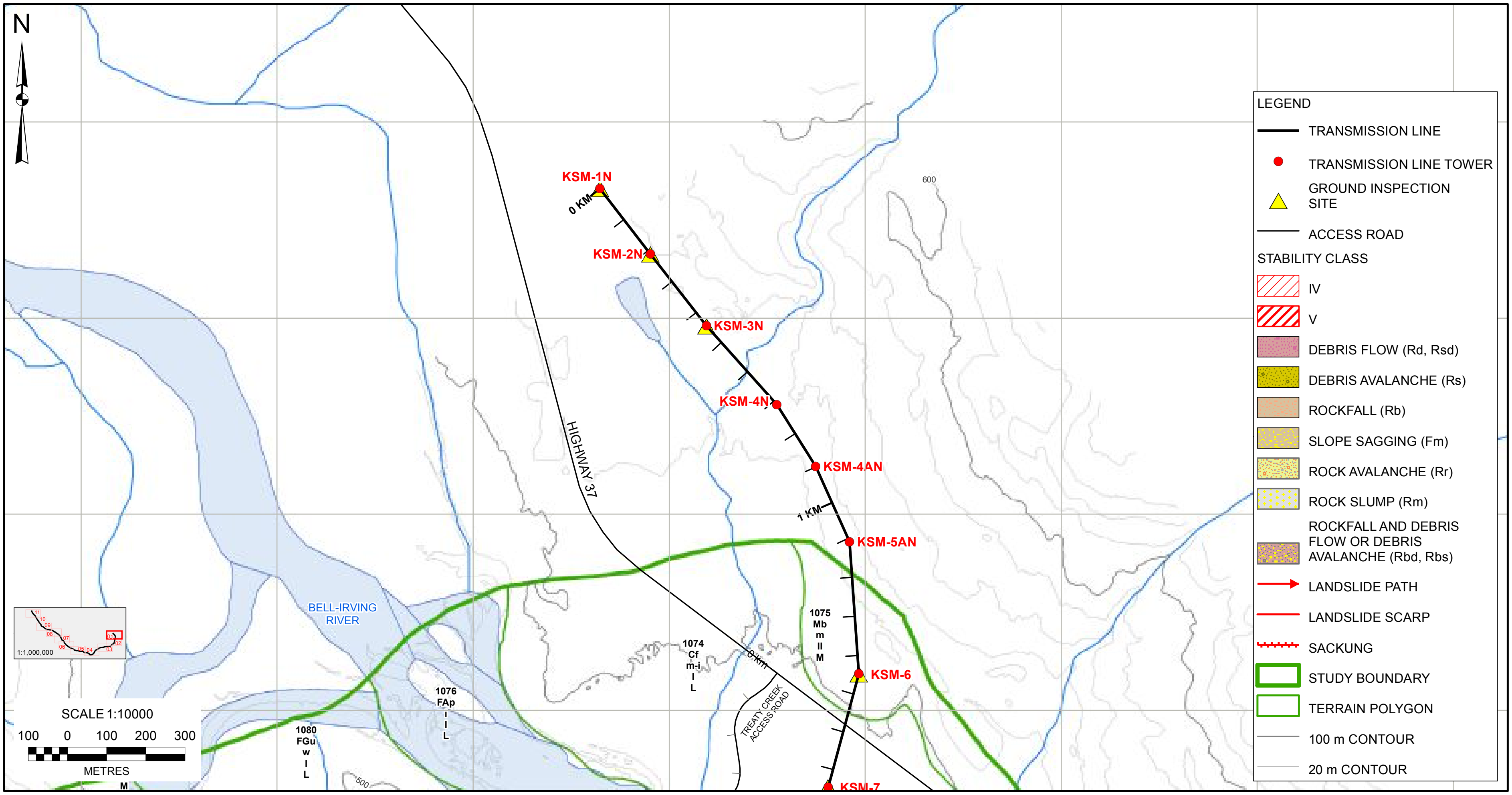

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 1 OF 11

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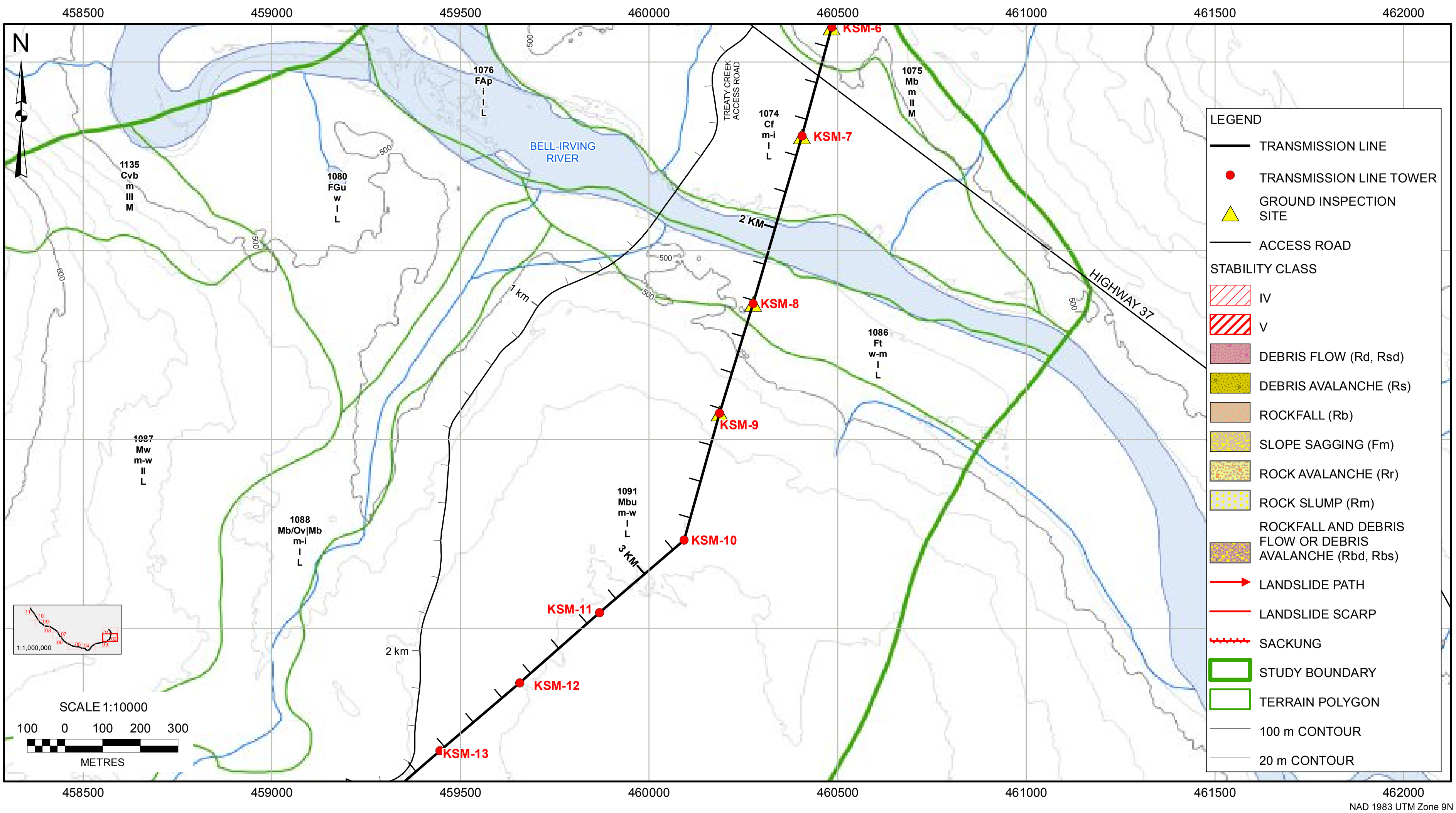

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 2 OF 11

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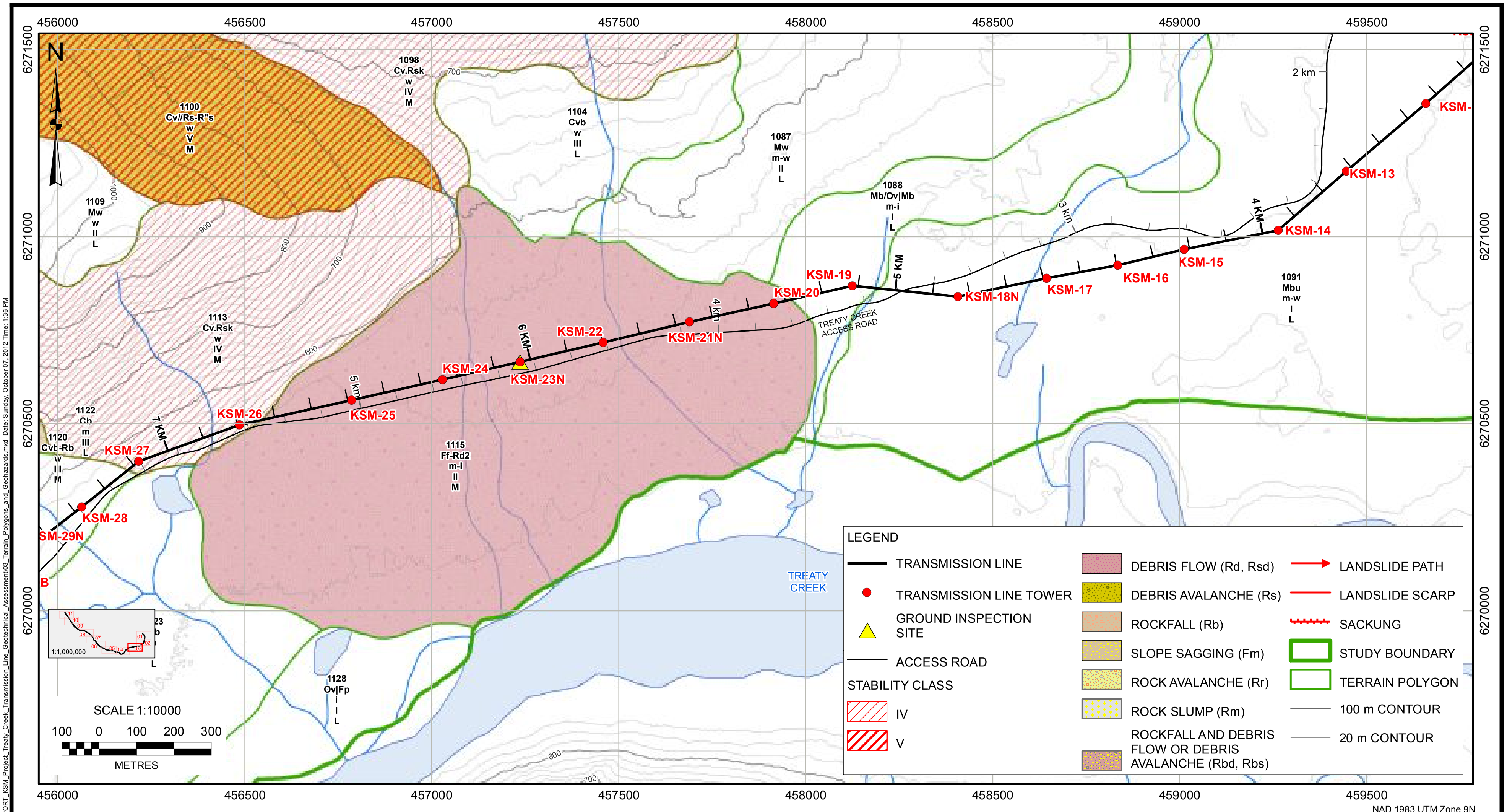

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 3 OF 11

PROJECT No.: 0638013

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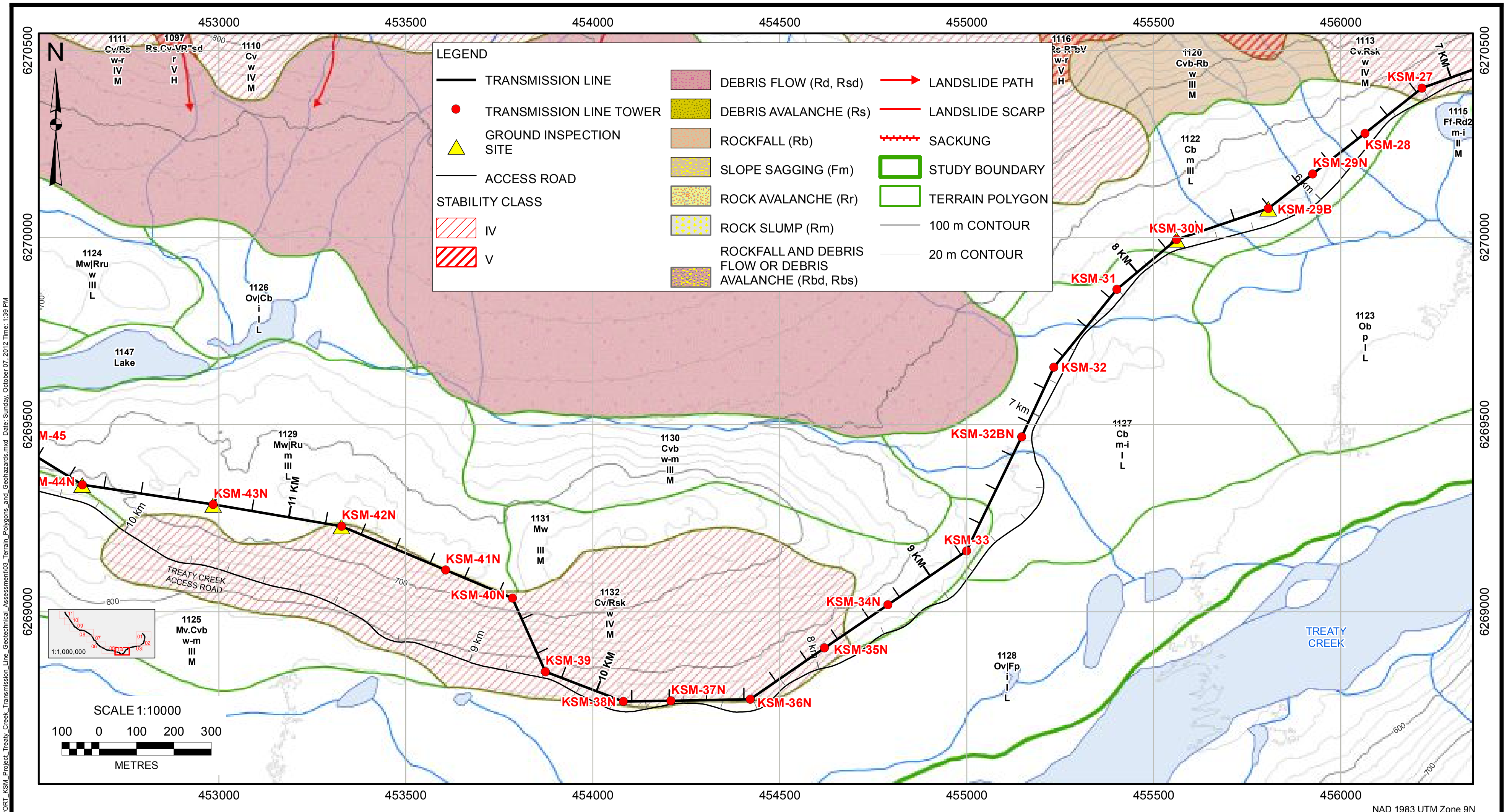

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 4 OF 11

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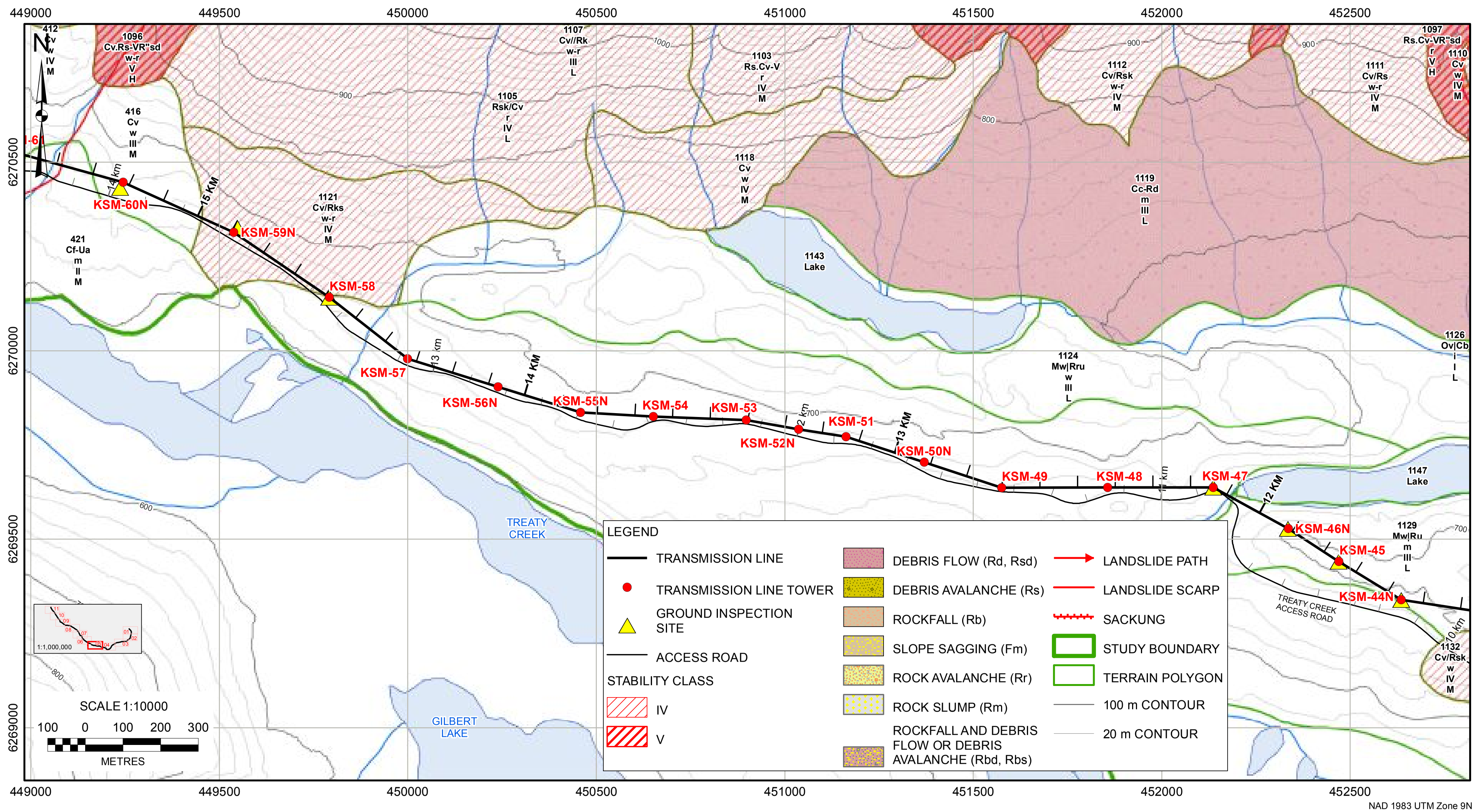

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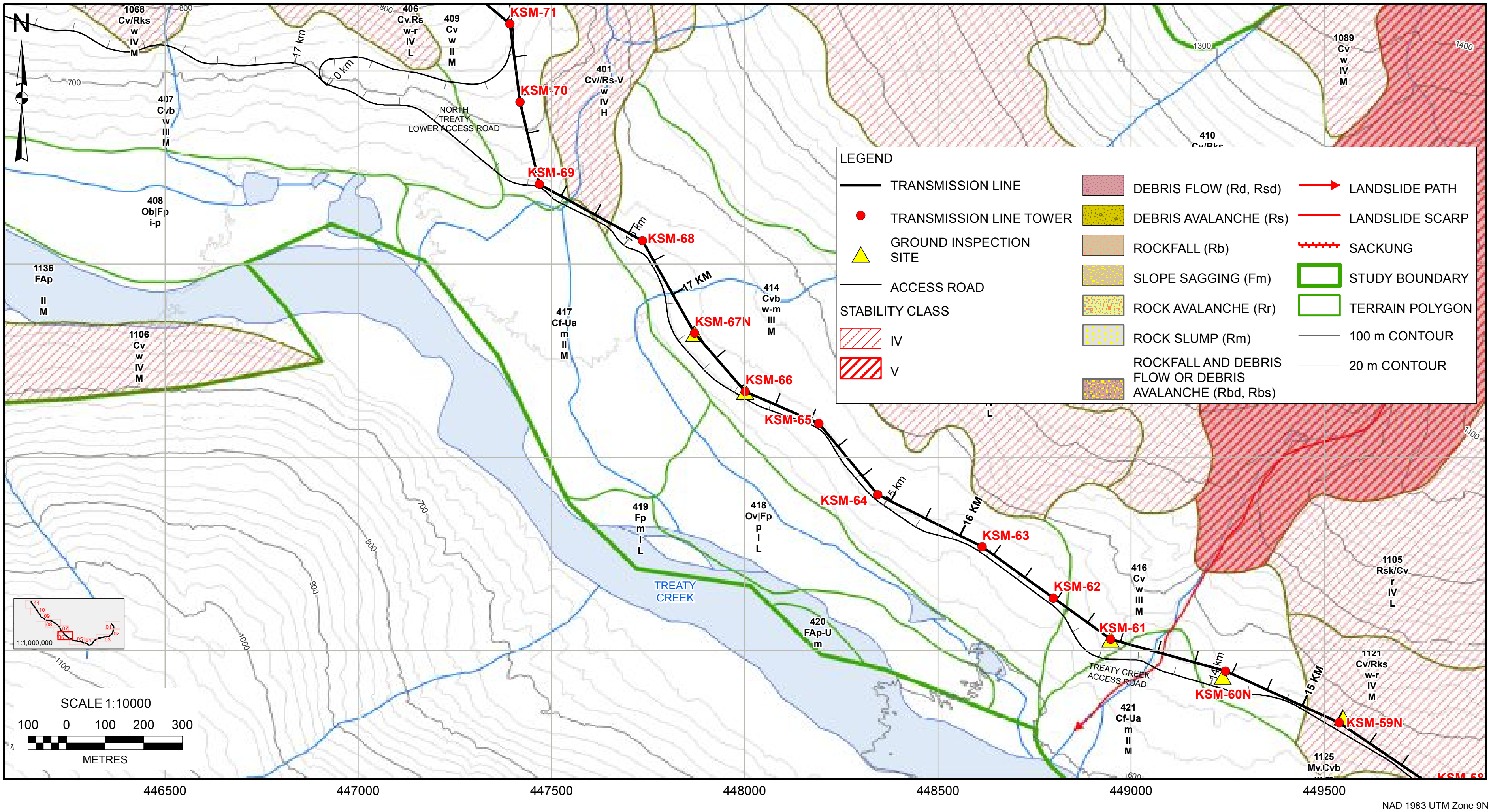

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 6 OF 11

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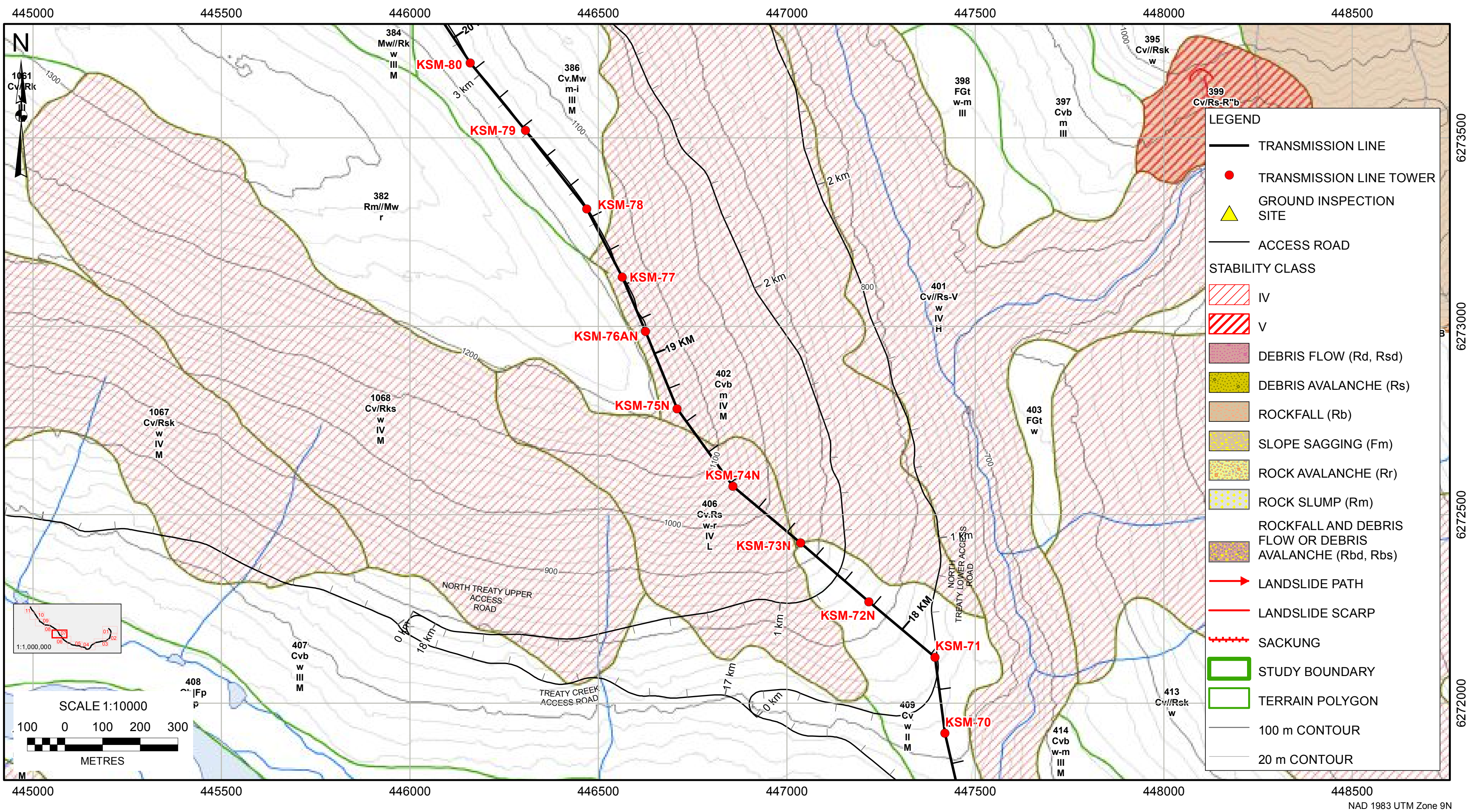

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 7 OF 11

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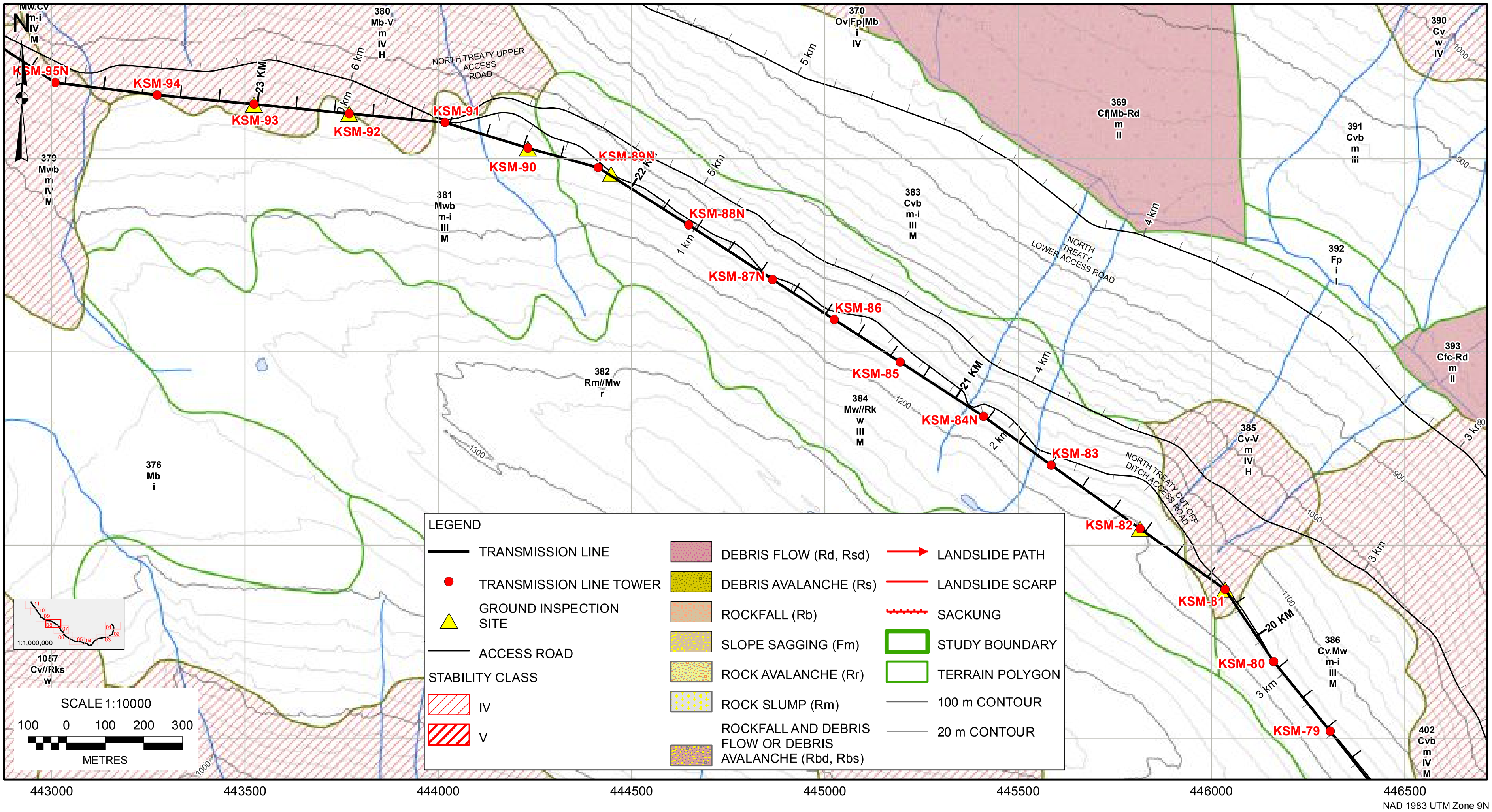

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 8 OF 11

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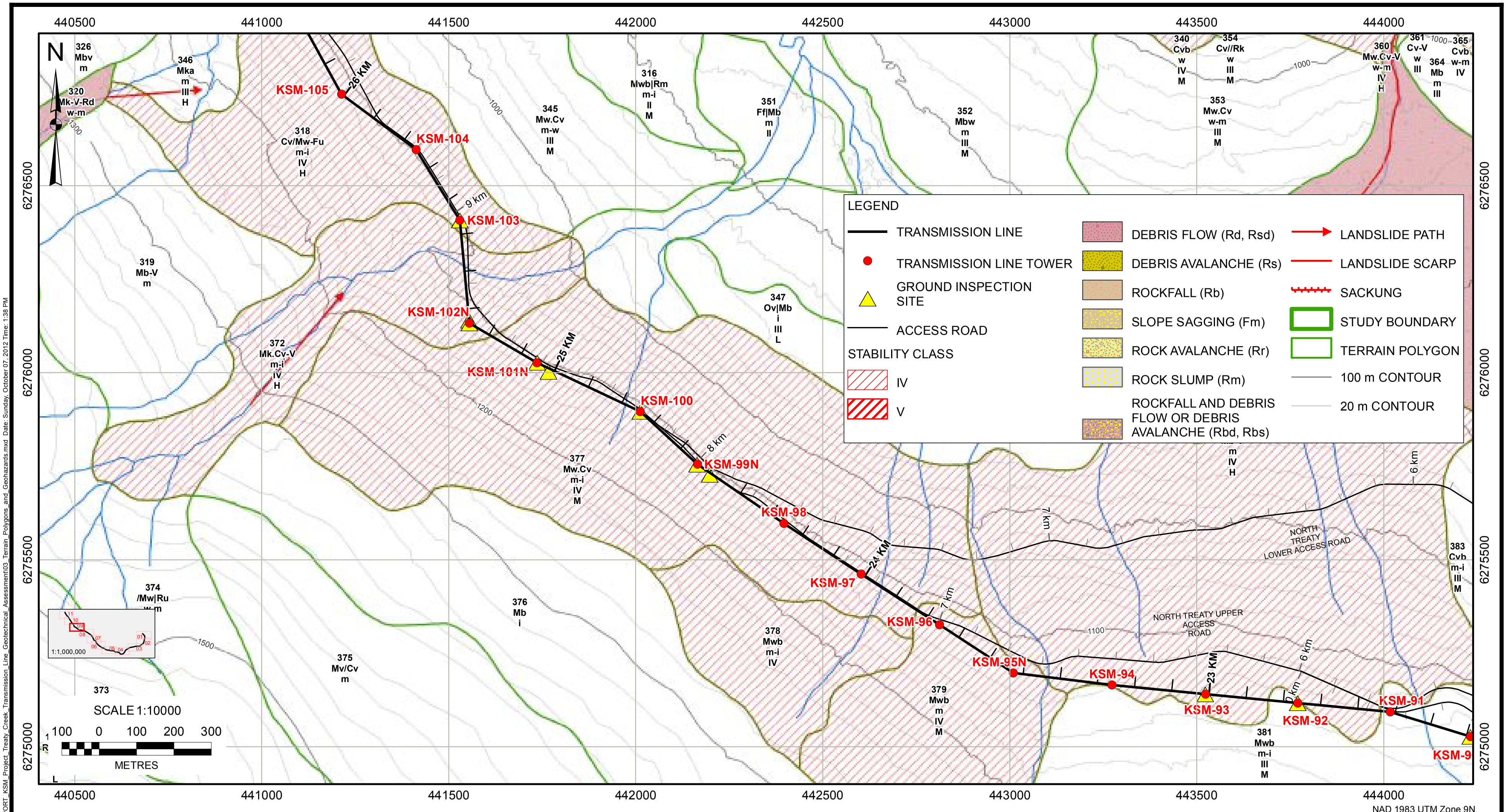

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 9 OF 11

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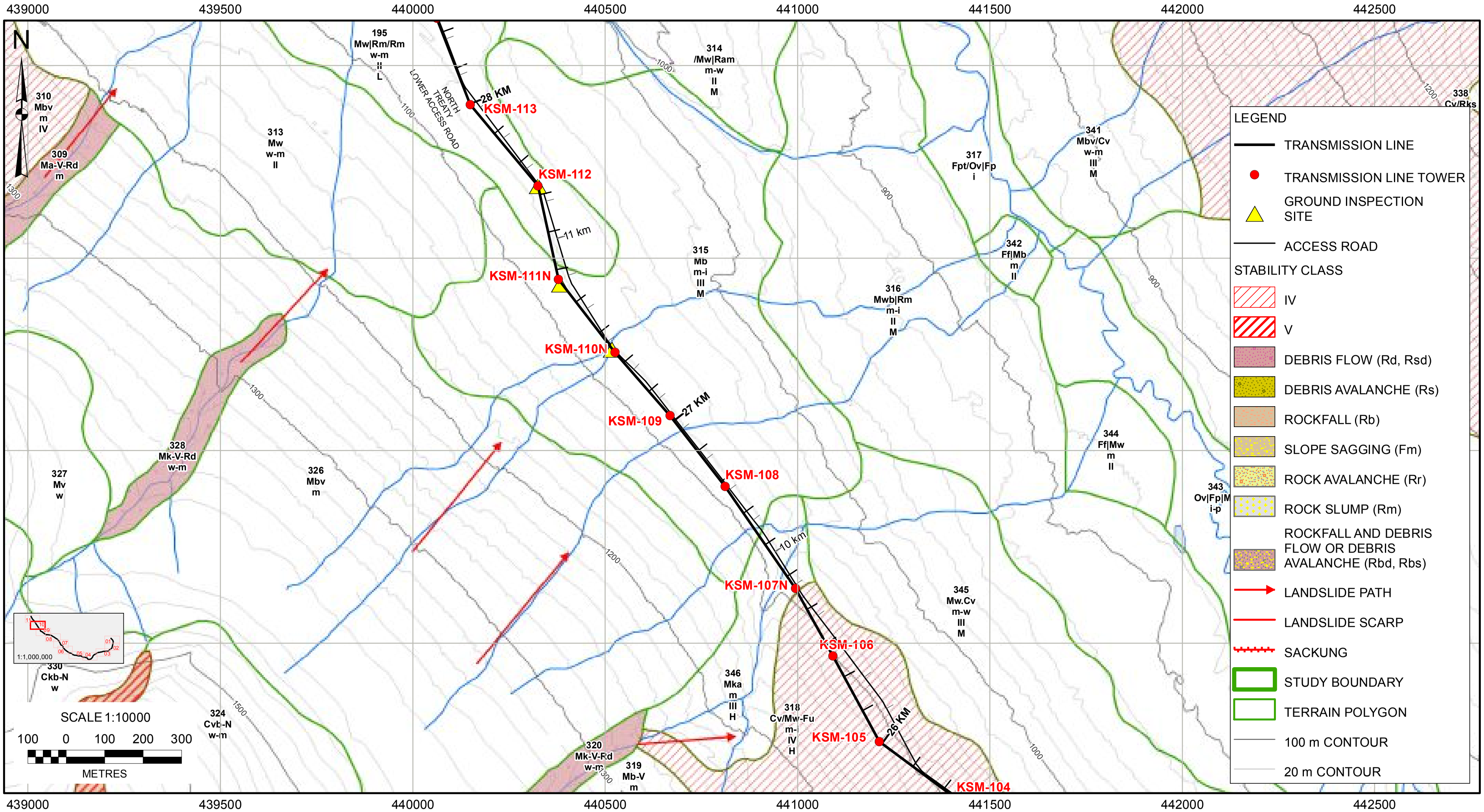

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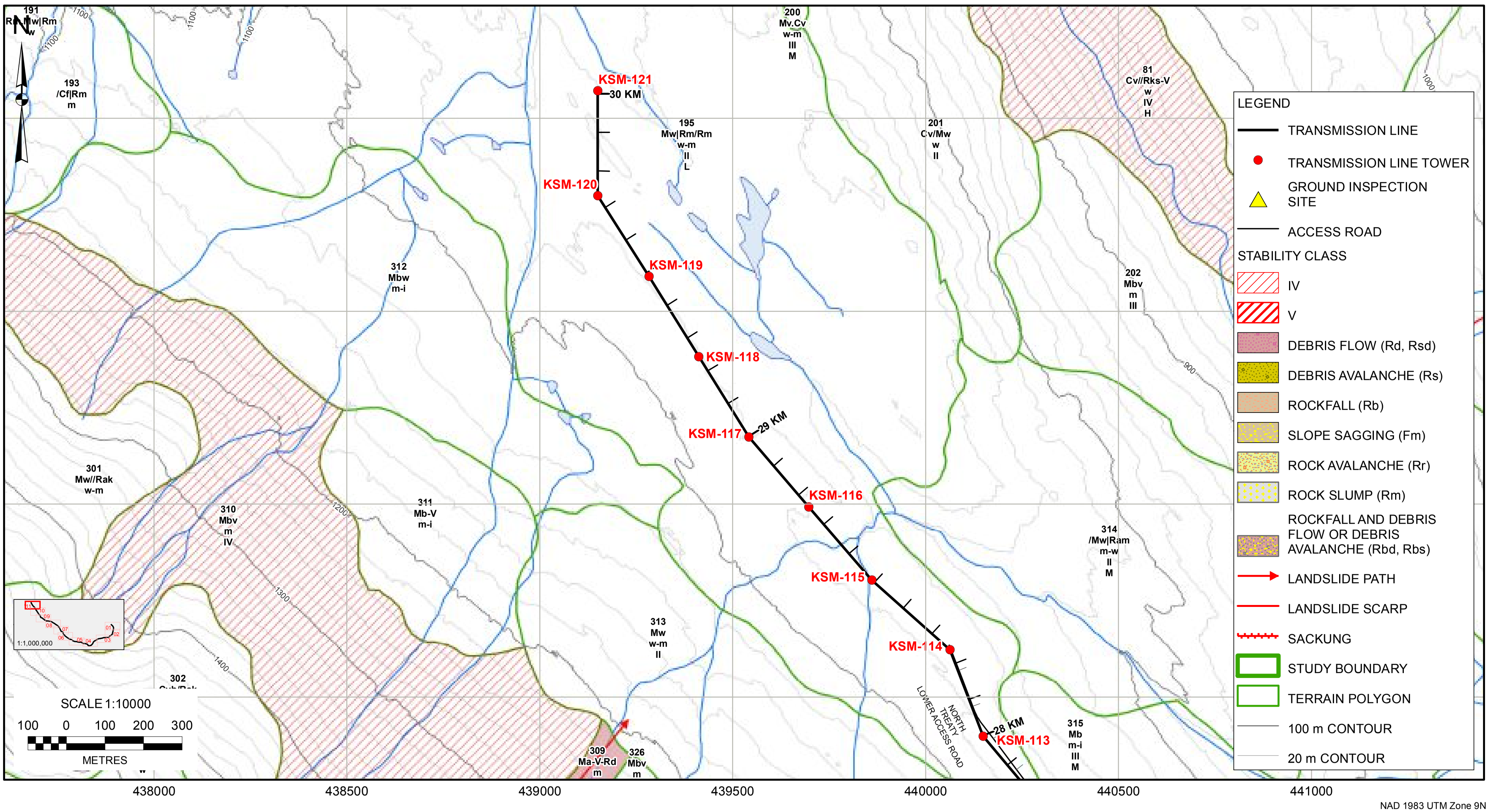

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TITLE: TERRAIN POLYGONS AND GEOHAZARDS MAP 11 OF 11

PROJECT No.:	DWG No.:	REV.:
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LEGEND

- TRANSMISSION LINE TOWER
- GROUND INSPECTION SITE
- TRANSMISSION LINE
- ACCESS ROAD
- 100 M CONTOUR
- 20 M CONTOUR
- FLOW DIRECTION
- SNOW AVALANCHE AREA

NOTES:

1. THIS MAP SHOULD BE READ WITH THE ACCOMPANYING REPORT.
2. AVALANCHE HAZARD INTERPRETATIONS WERE PROVIDED BY ALPINE SOLUTIONS AVALANCHE SERVICES LTD.
3. FACILITIES ARE PROPOSED, NOT EXISTING.
4. SMALL AVALANCHE PATHS (SIZE ≤2) EXIST OUTSIDE THE AREAS DELINEATED, BUT ARE TOO SMALL TO BE MAPPED AT THIS SCALE.
5. BOUNDARIES OF INDIVIDUAL AVALANCHE HAZARD AREAS ARE APPROXIMATE AND REPRESENT A TRANSITION FROM HAZARD TO NO HAZARD.
6. AVALANCHE AFFECTED LOCATIONS MAY BE AFFECTED BY MORE THAN ONE PATH. DASHED LINES WITHIN SELECTED AVALANCHE AFFECTED AREAS INDICATE APPROXIMATE INDIVIDUAL PATH BOUNDARIES WITHIN AREAS THAT OVERLAP.
7. AVALANCHE AREAS ARE MAINLY SHOWN IN THE STUDY AREA IN WHICH FACILITIES ARE PROPOSED. ANY NEW FACILITIES OR RELOCATION OF EXISTING FACILITIES SHOULD BE RE-EXAMINED WITH RESPECT TO AVALANCHE HAZARDS.
8. THIS MAP IS A SNAPSHOT IN TIME. CHANGES TO TOPOGRAPHY THROUGH FILL PLACEMENT, CUTSLOPES, GLACIAL RETREAT OR ADVANCE, LANDSLIDING AS WELL AS TREE REMOVAL MAY REQUIRE REDRAWING OF AVALANCHE PATHS IN THOSE AREAS.
9. ROAD ALIGNMENTS FOR THE PROPOSED TREATY CREEK, NORTH TREATY LOWER, NORTH TREATY UPPER, TUNNEL ADIT AND TUNNEL ADIT SPUR ACCESS ROADS FROM MCELHANNEY (MAY 17, 2012). ROAD ALIGNMENT FOR THE PROPOSED CUT-OFF DITCH ACCESS ROAD FROM MCELHANNEY (JULY 6, 2012).

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: SNOW AVALANCHE AREA LEGEND

PROJECT No.:	DWG No.:	REV.:
0638013	A-00	

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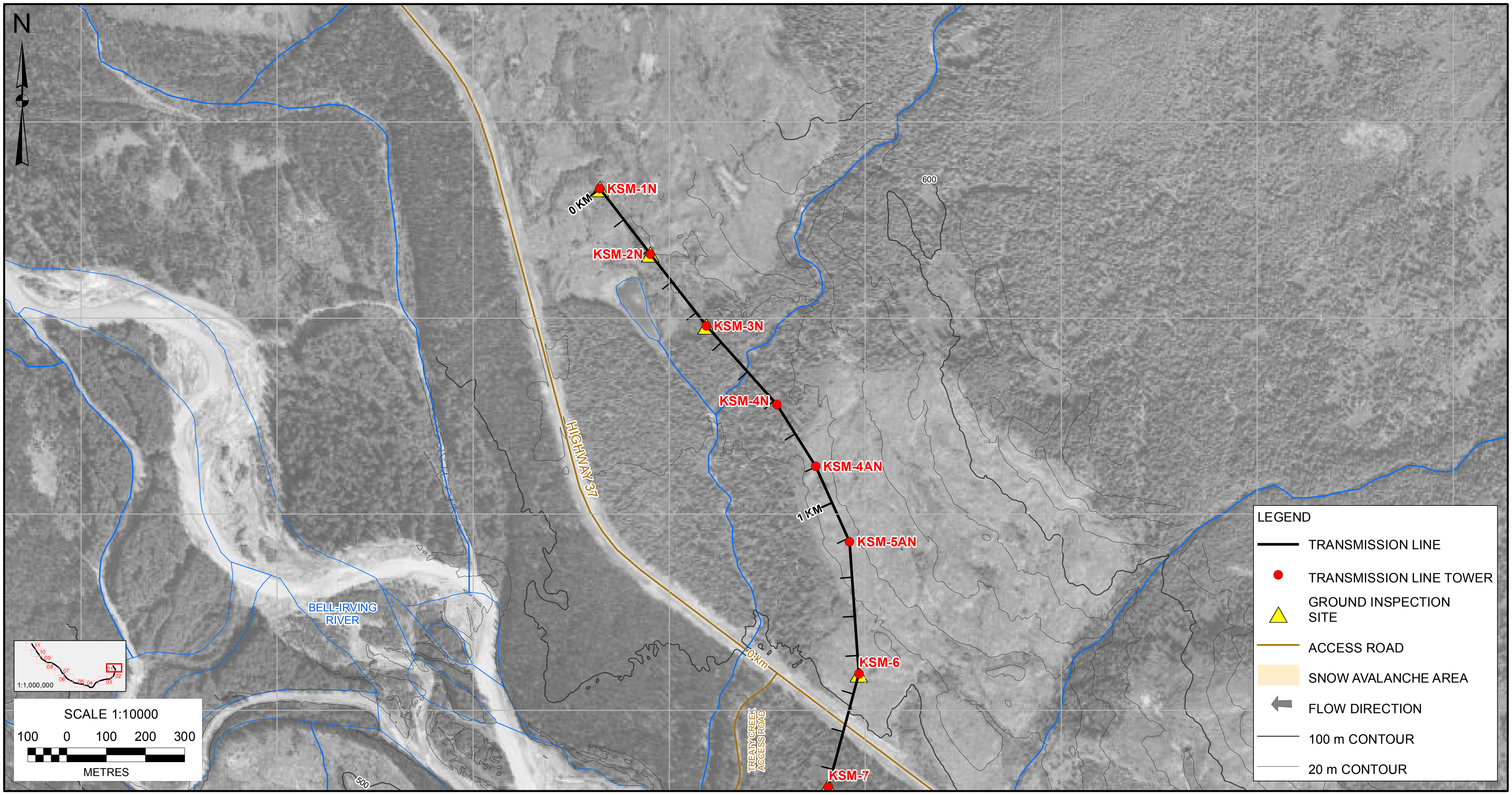

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TITLE: SNOW AVALANCHE AREA MAP 1 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	A-01	

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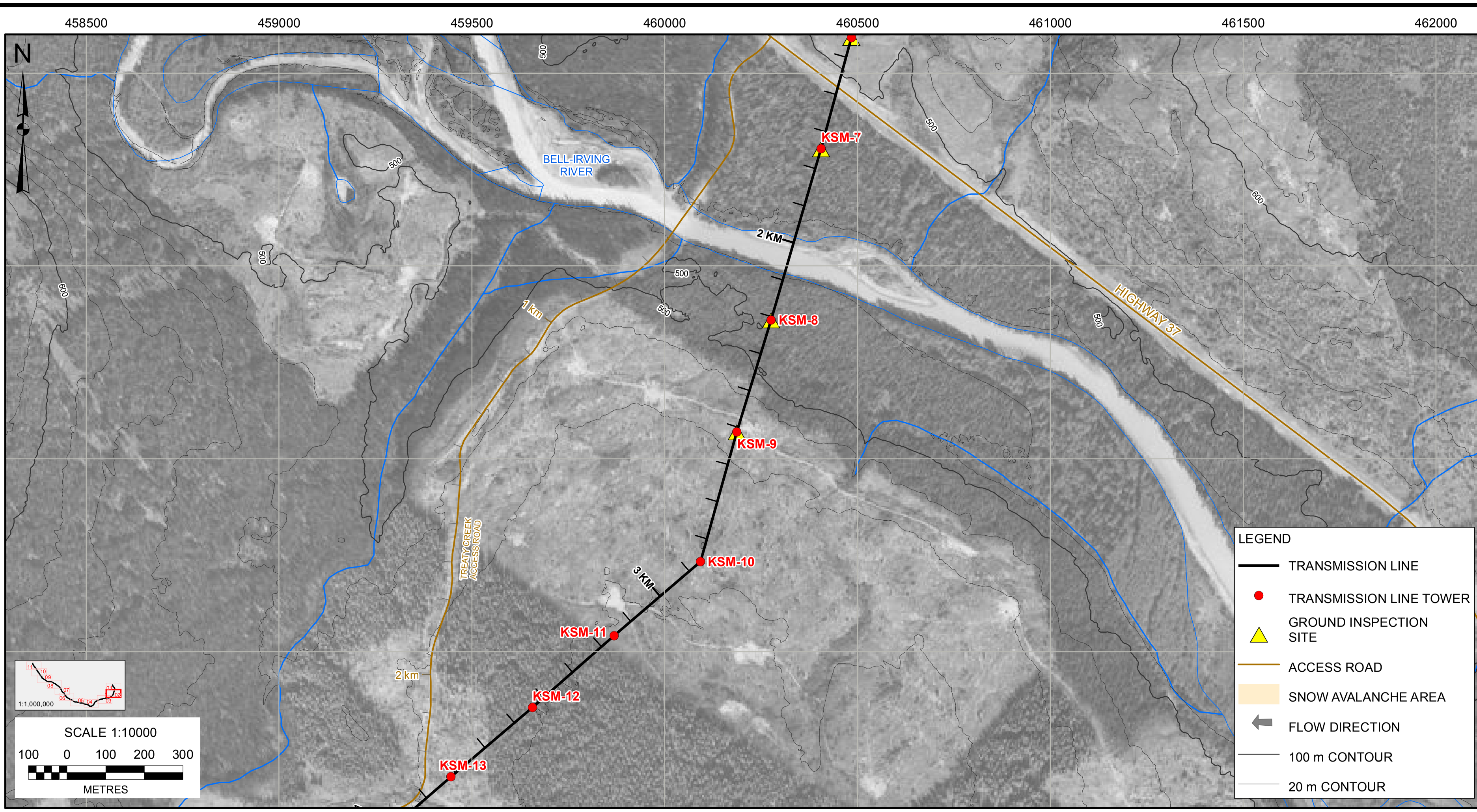

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TITLE: SNOW AVALANCHE AREA MAP 2 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	A-02	

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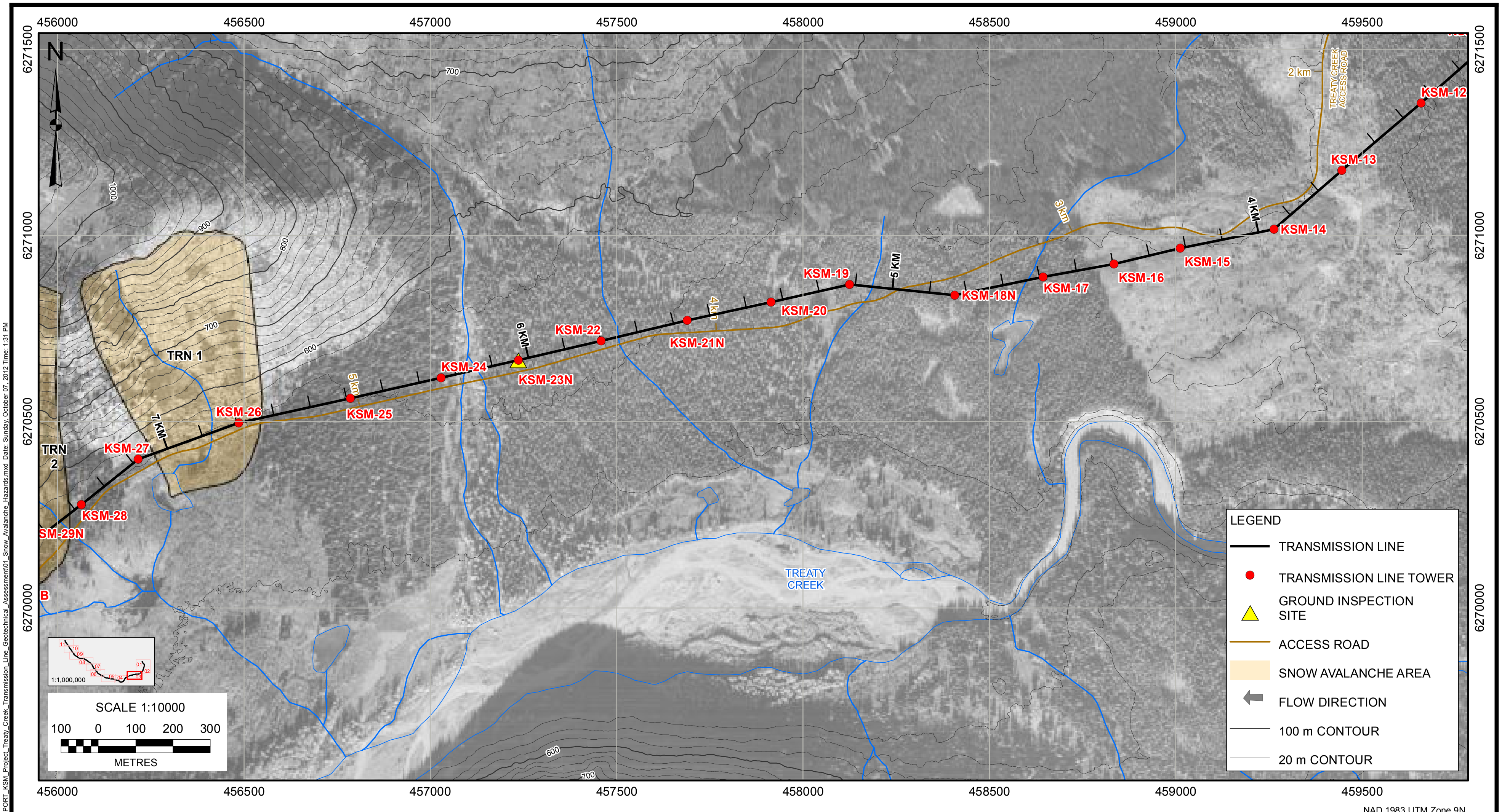

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TITLE: SNOW AVALANCHE AREA MAP 3 OF 11

PROJECT No.:	DWG No.:	REV.:
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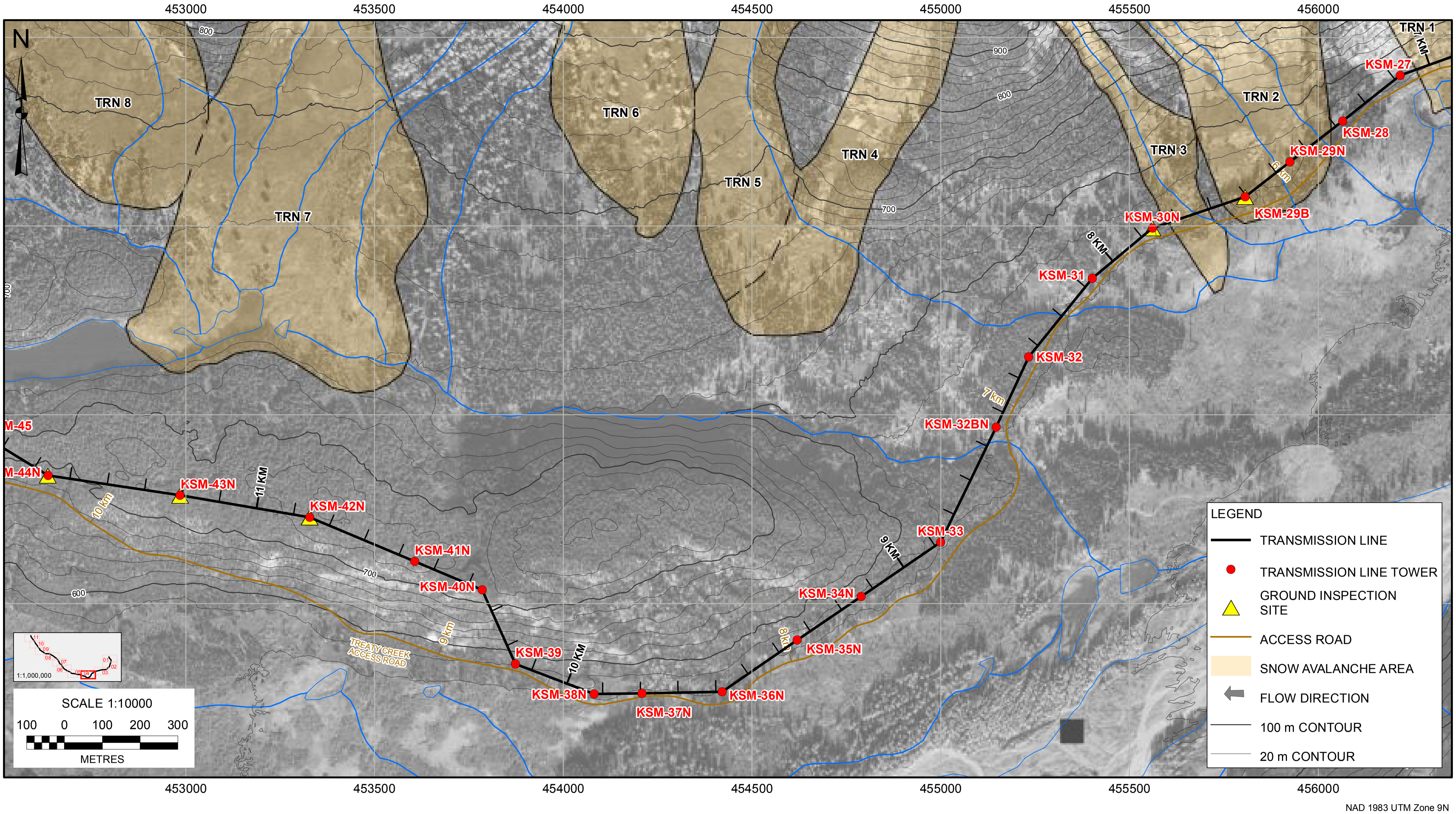

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TITLE: SNOW AVALANCHE AREA MAP 4 OF 11

PROJECT No.: 0638013

DWG No.: A-04

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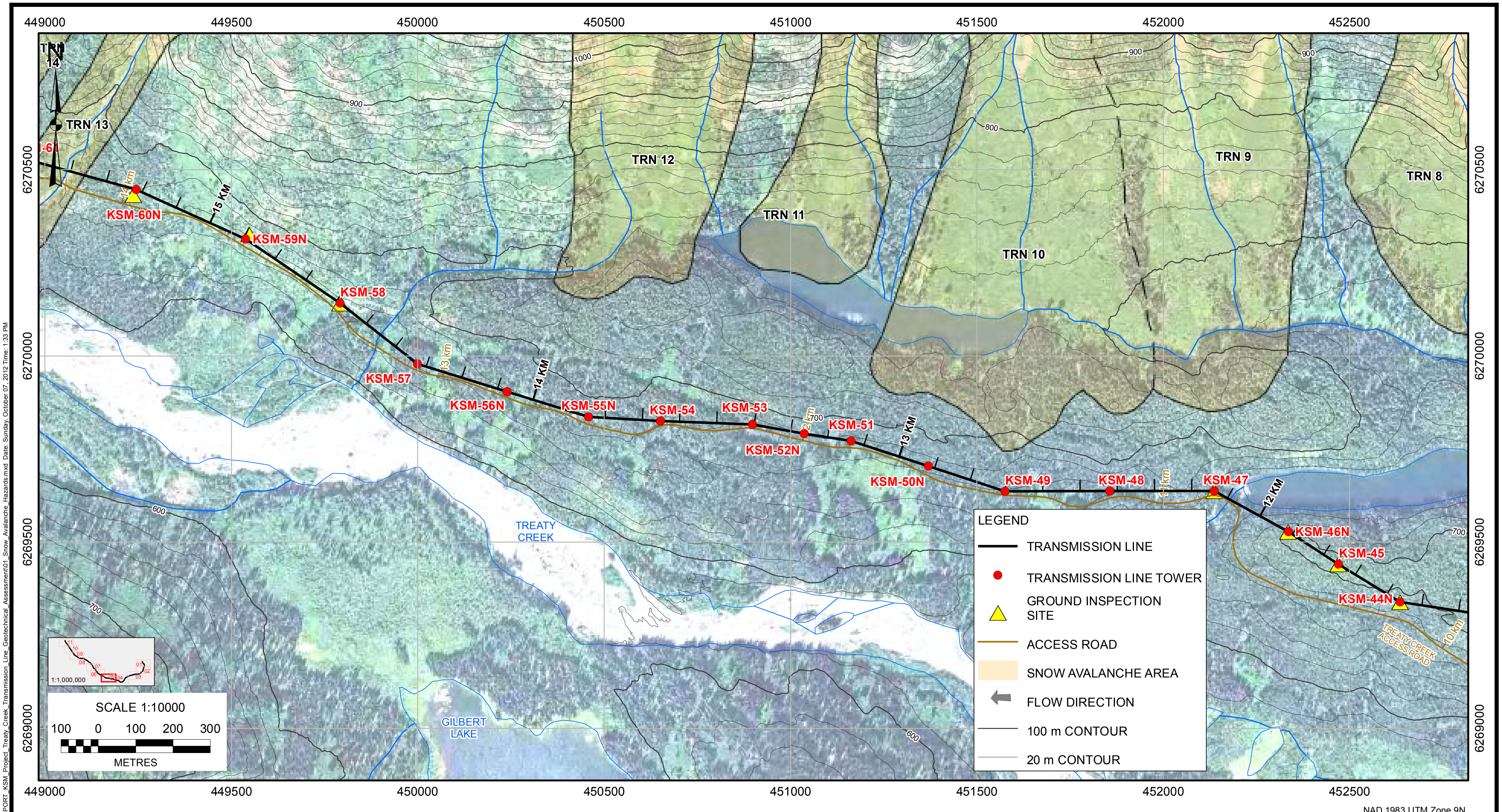

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TITLE: SNOW AVALANCHE AREA MAP 5 OF 11

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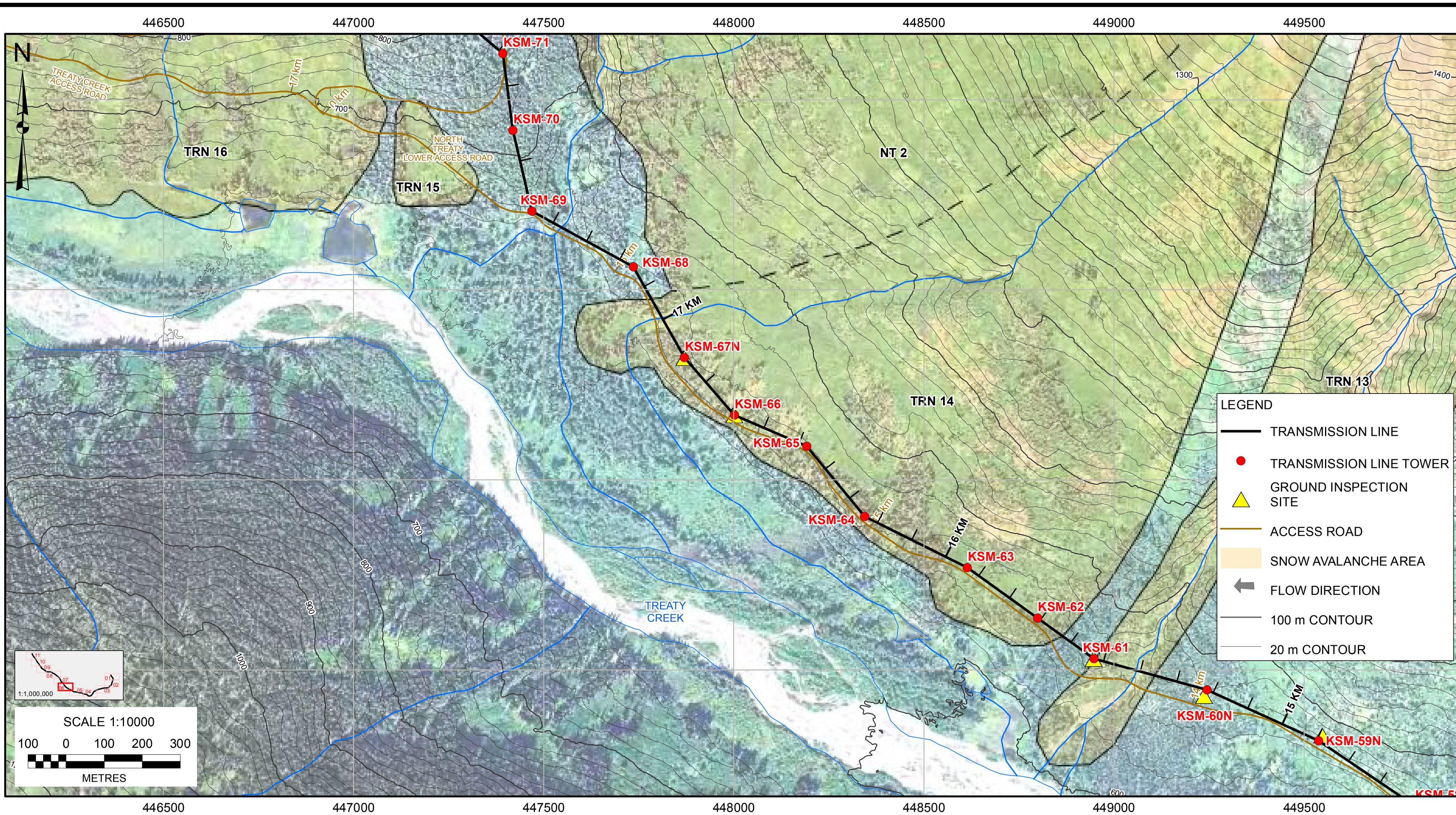

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TITLE: SNOW AVALANCHE AREA MAP 6 OF 11

PROJECT No.:	DWG No.:	REV.:
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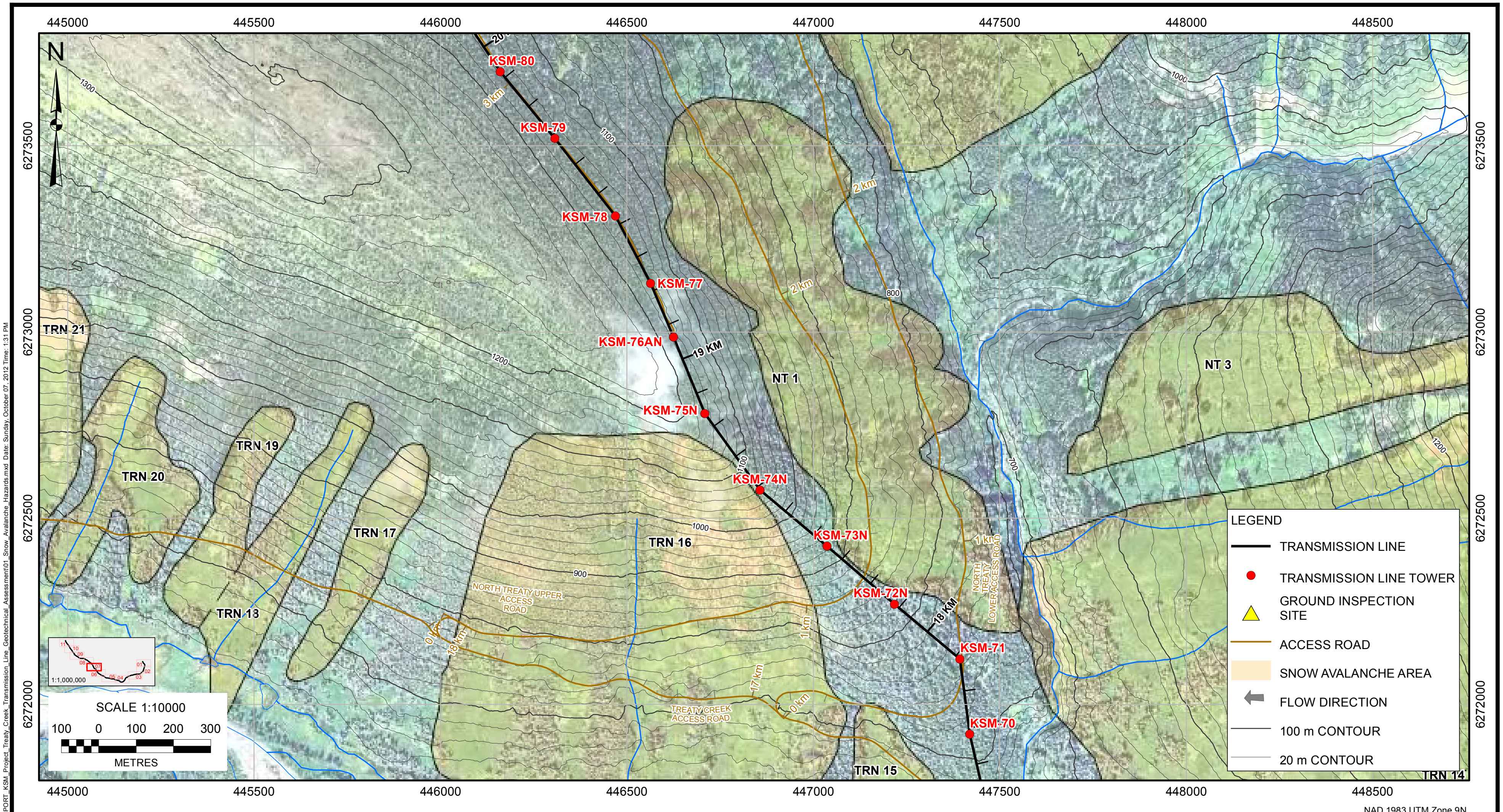

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TITLE:
SNOW AVALANCHE AREA
MAP 7 OF 11

PROJECT No.:	DWG No.:	REV.:
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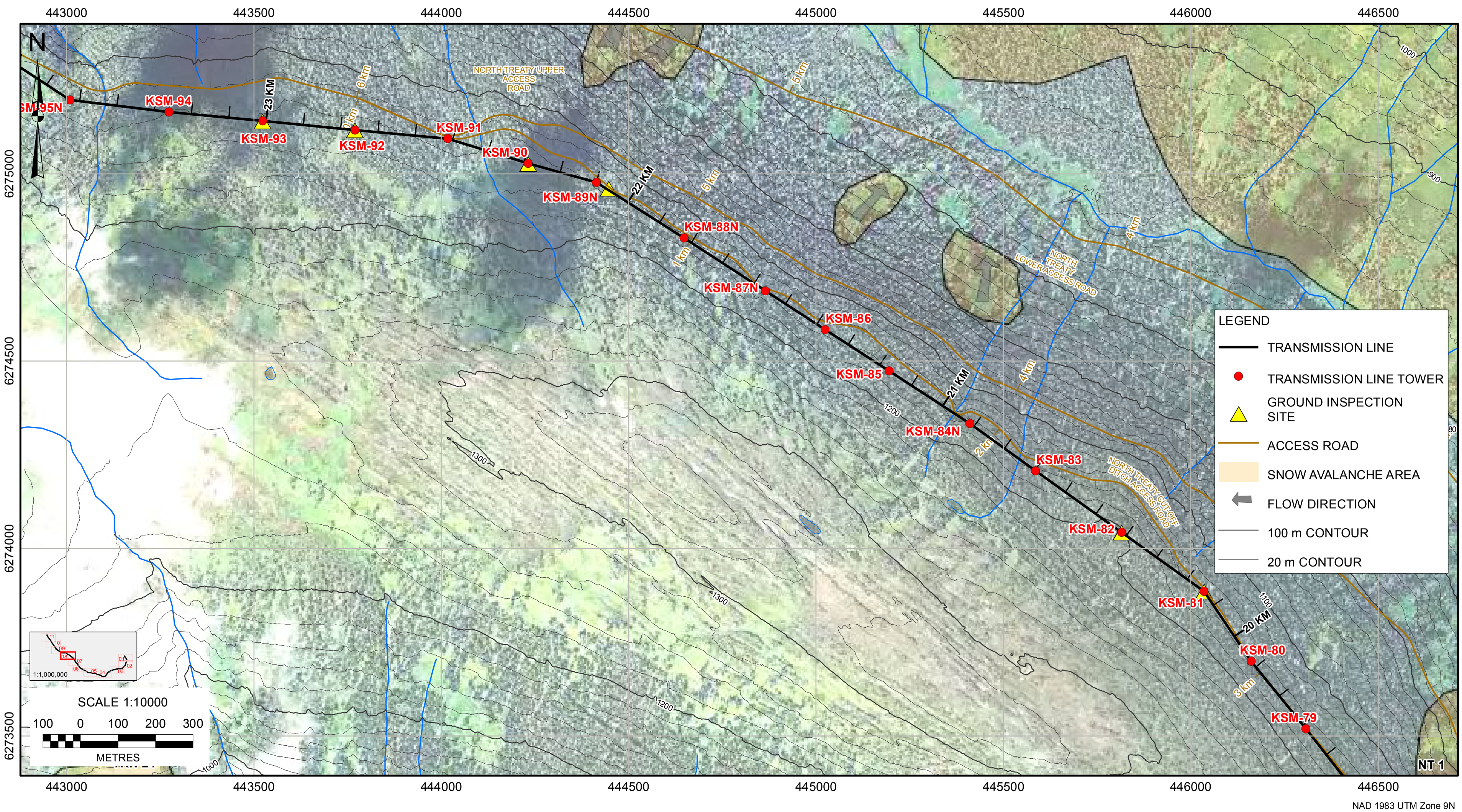

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TITLE: SNOW AVALANCHE AREA MAP 8 OF 11

PROJECT No.:	DWG No.:	REV.:
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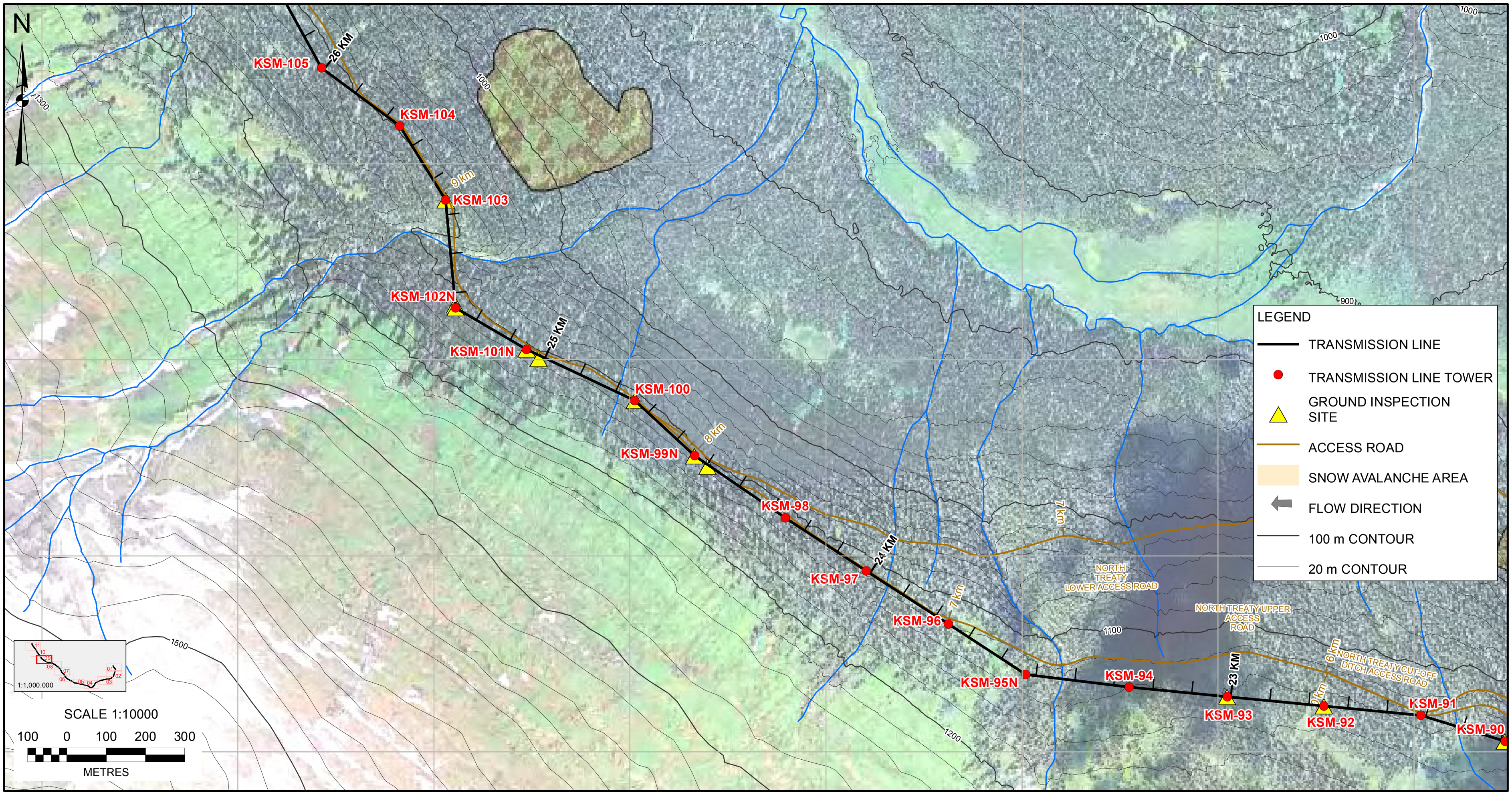

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TITLE: SNOW AVALANCHE AREA MAP 9 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	A-09	

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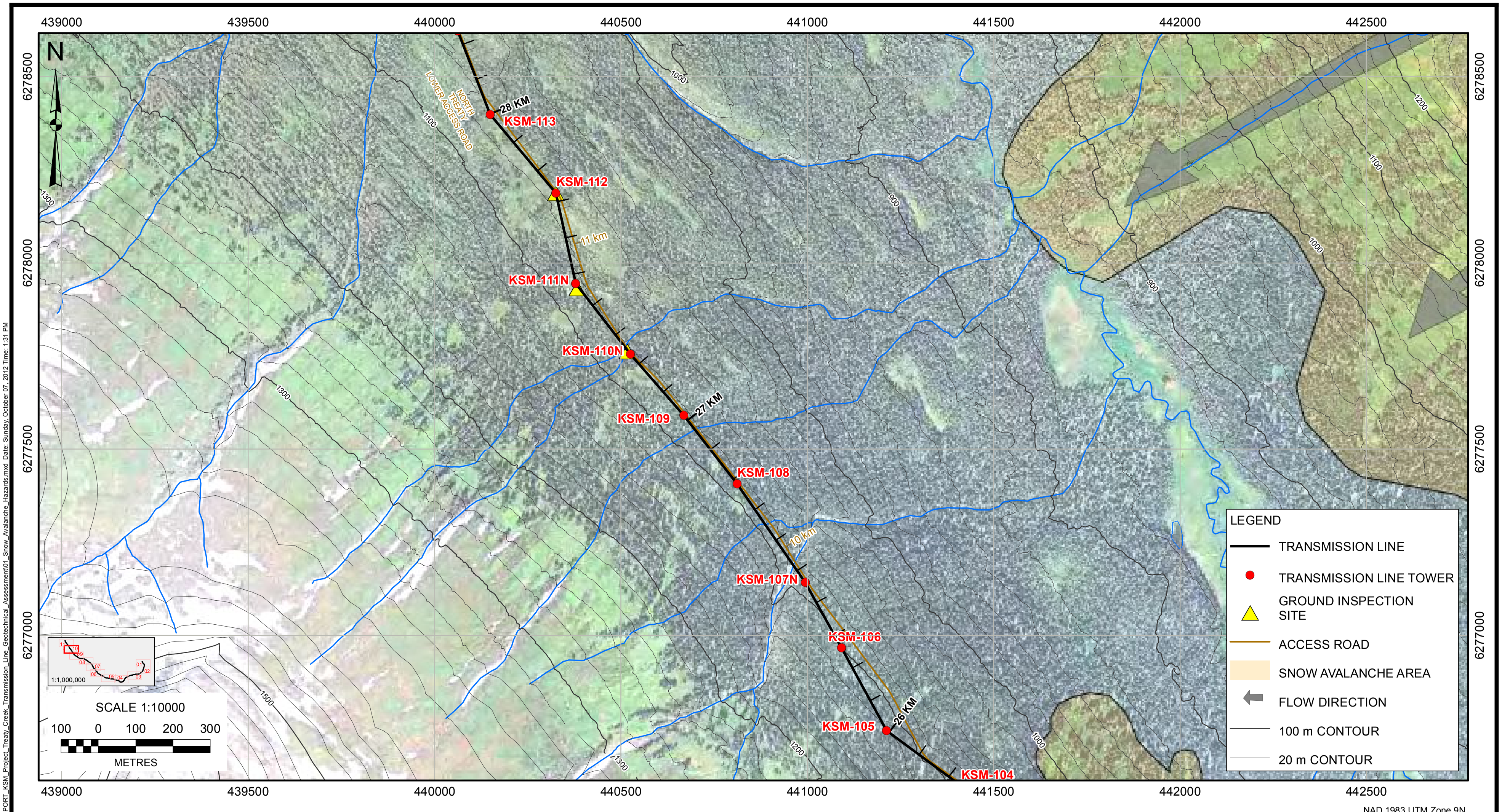

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TITLE: SNOW AVALANCHE AREA MAP 10 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	A-10	

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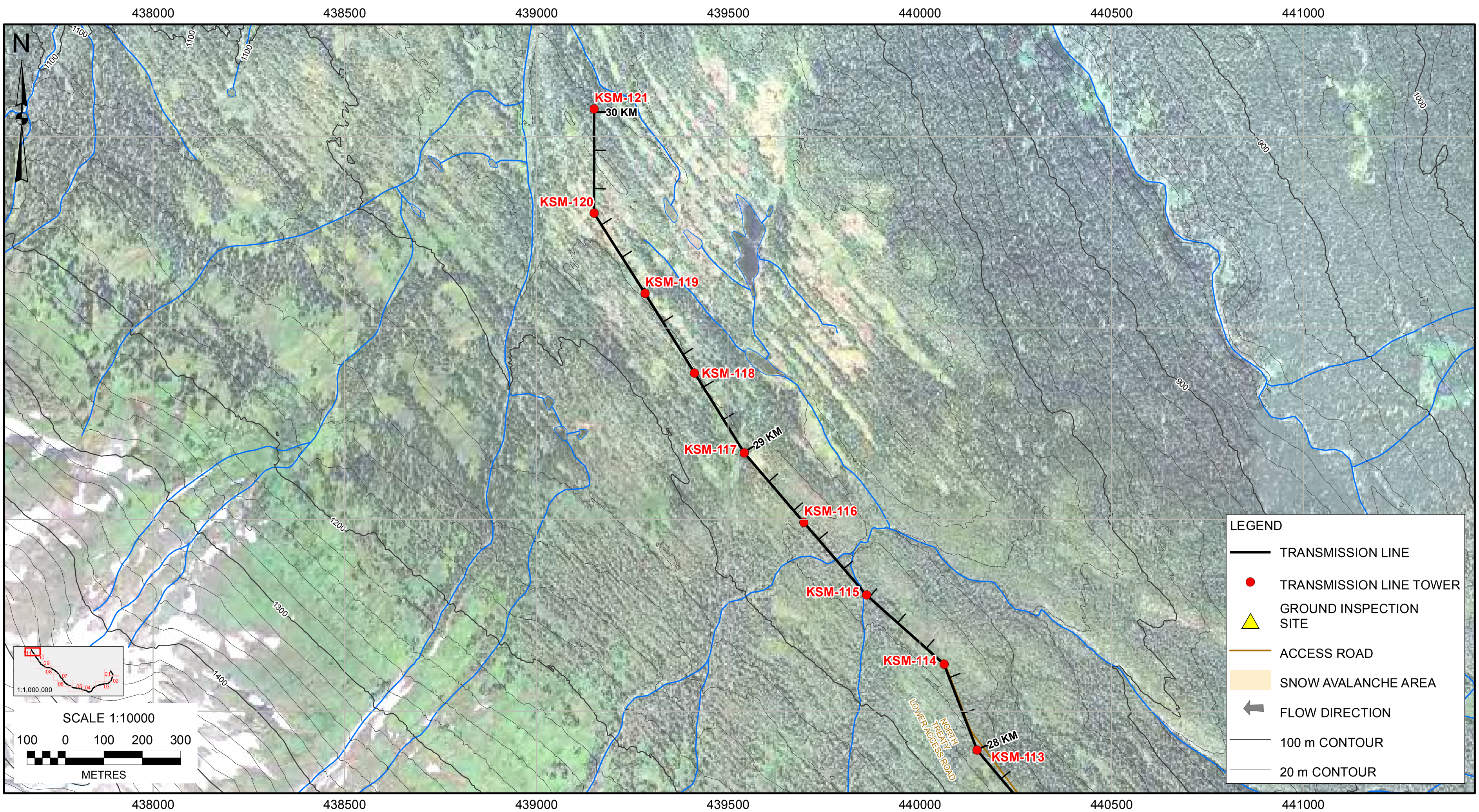

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GEOTECHNICAL ASSESSMENT

TITLE:
SNOW AVALANCHE AREA
MAP 11 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	A-11	

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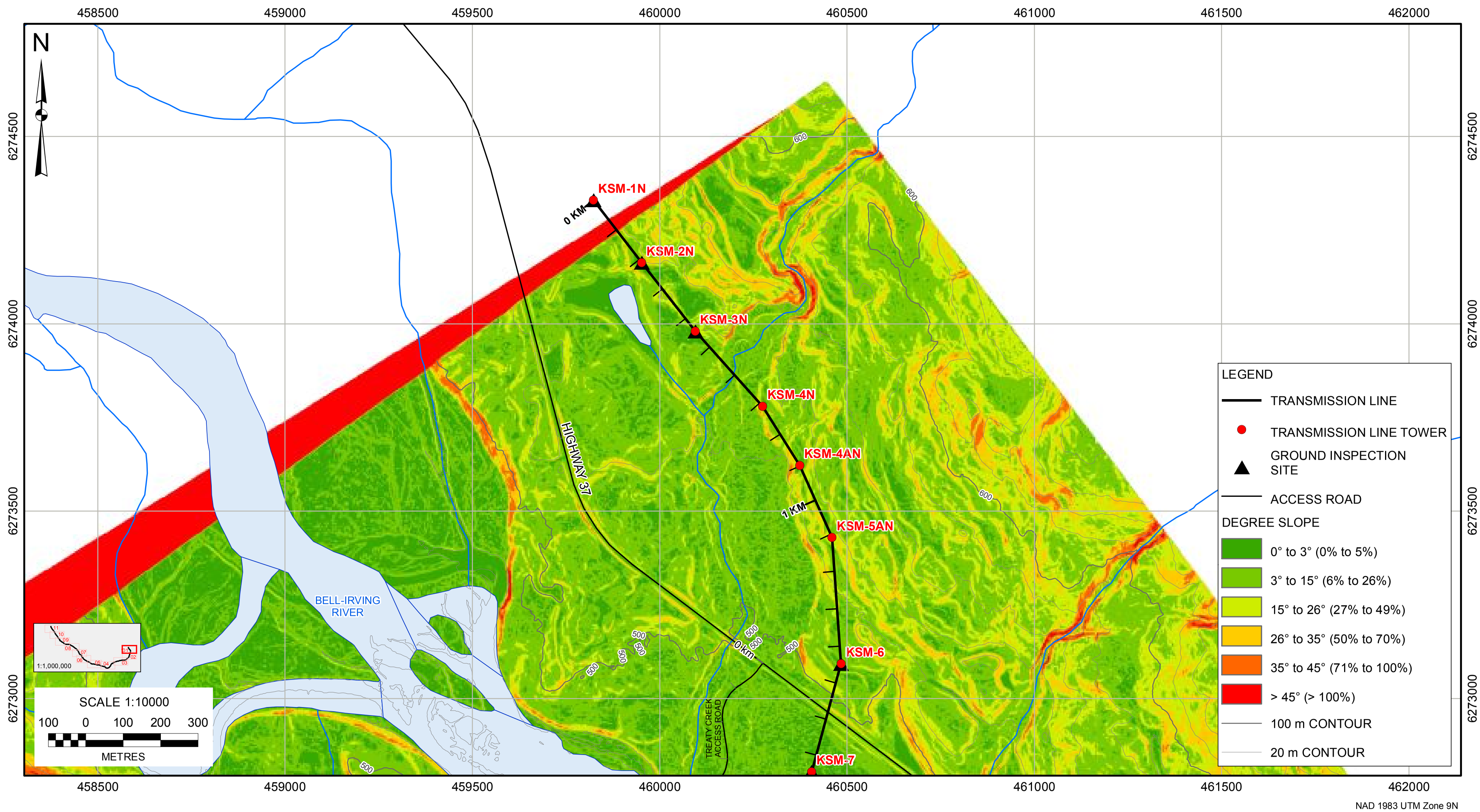

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: SLOPE ANGLE
MAP 1 OF 11

PROJECT No.:	DWG No.:	REV.:
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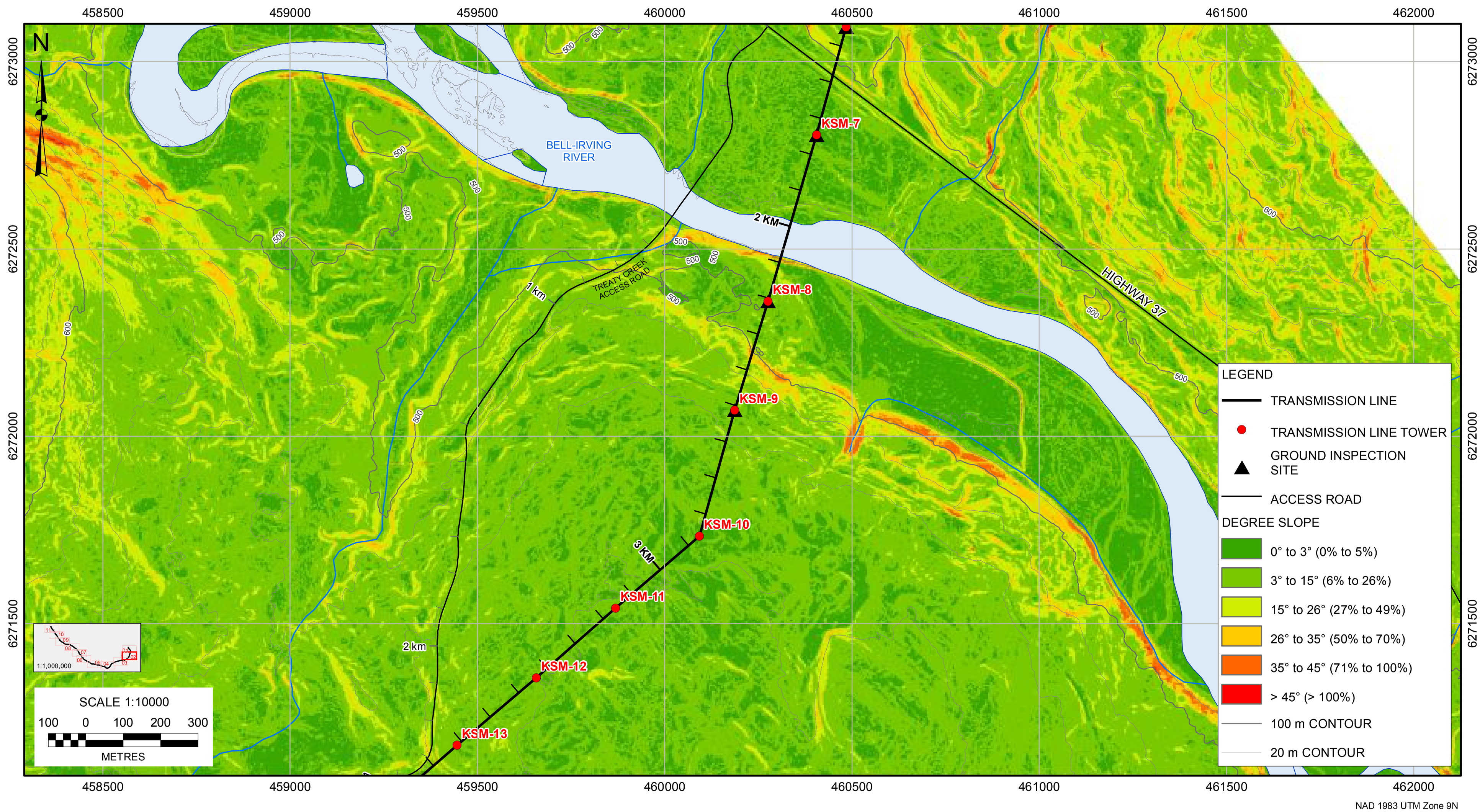

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TITLE: SLOPE ANGLE MAP 2 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	S-02	

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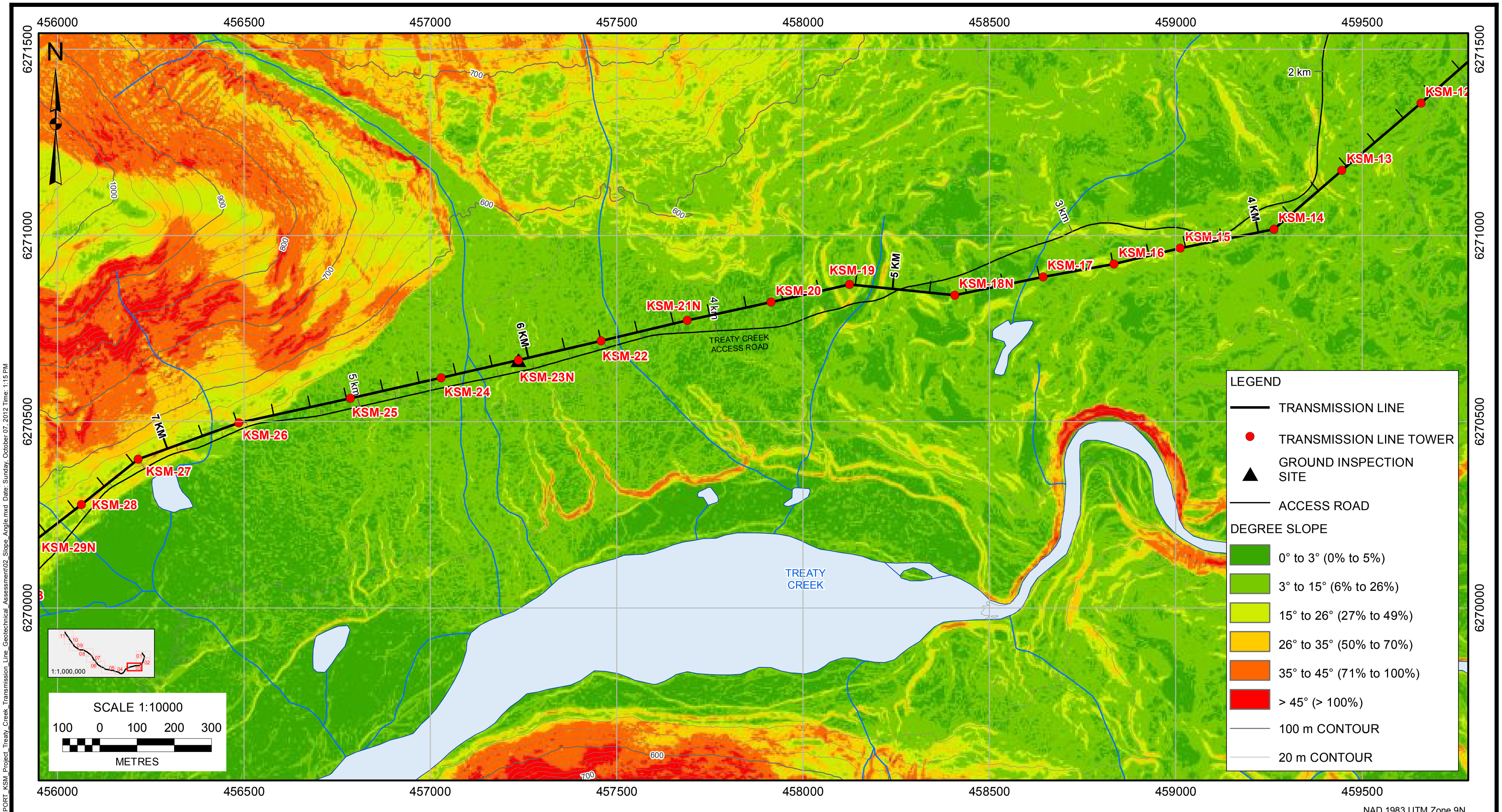

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TITLE: SLOPE ANGLE MAP 3 OF 11

PROJECT No.:	DWG No.:	REV.:
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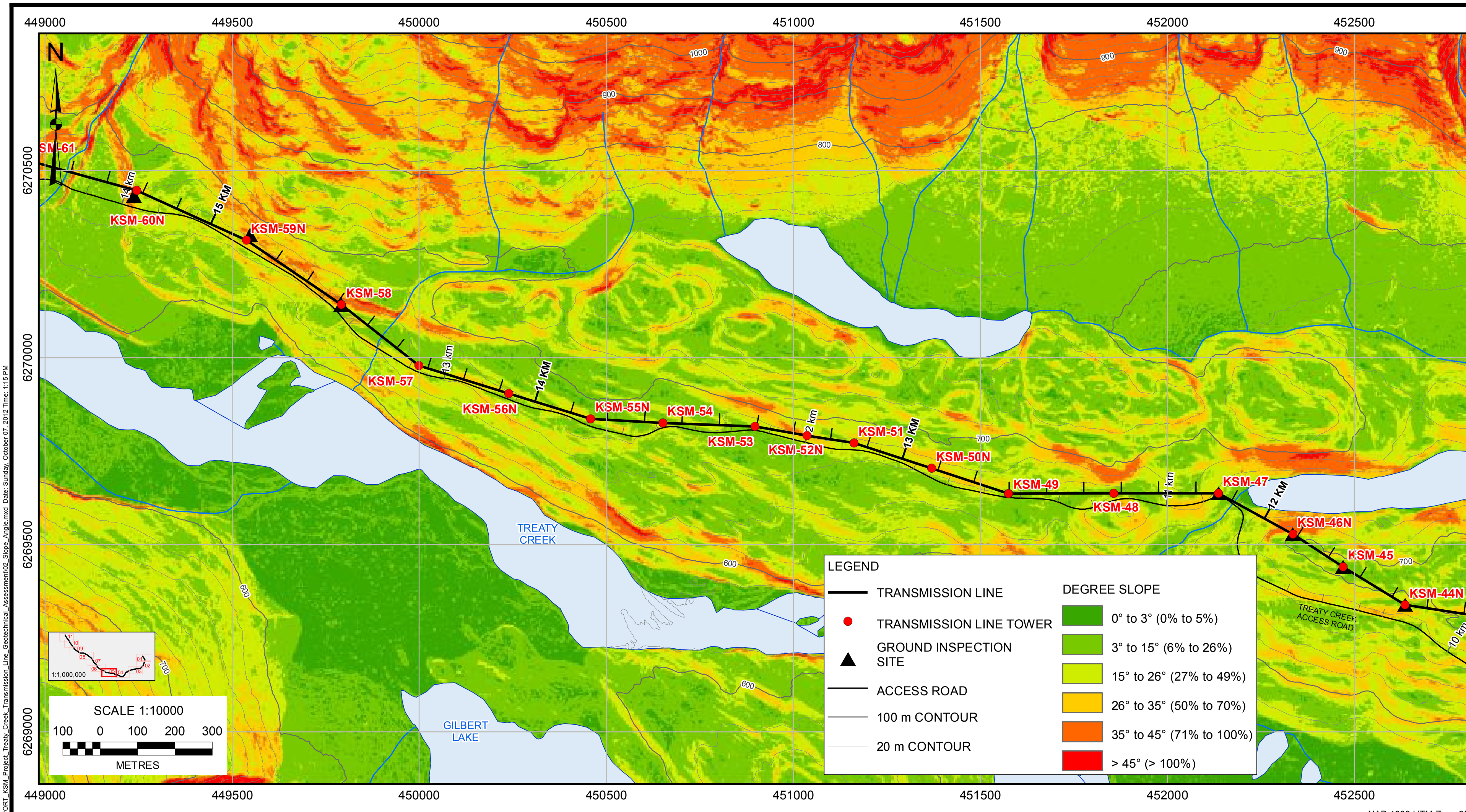

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TITLE: SLOPE ANGLE MAP 5 OF 11

PROJECT No.:	DWG No.:	REV.:
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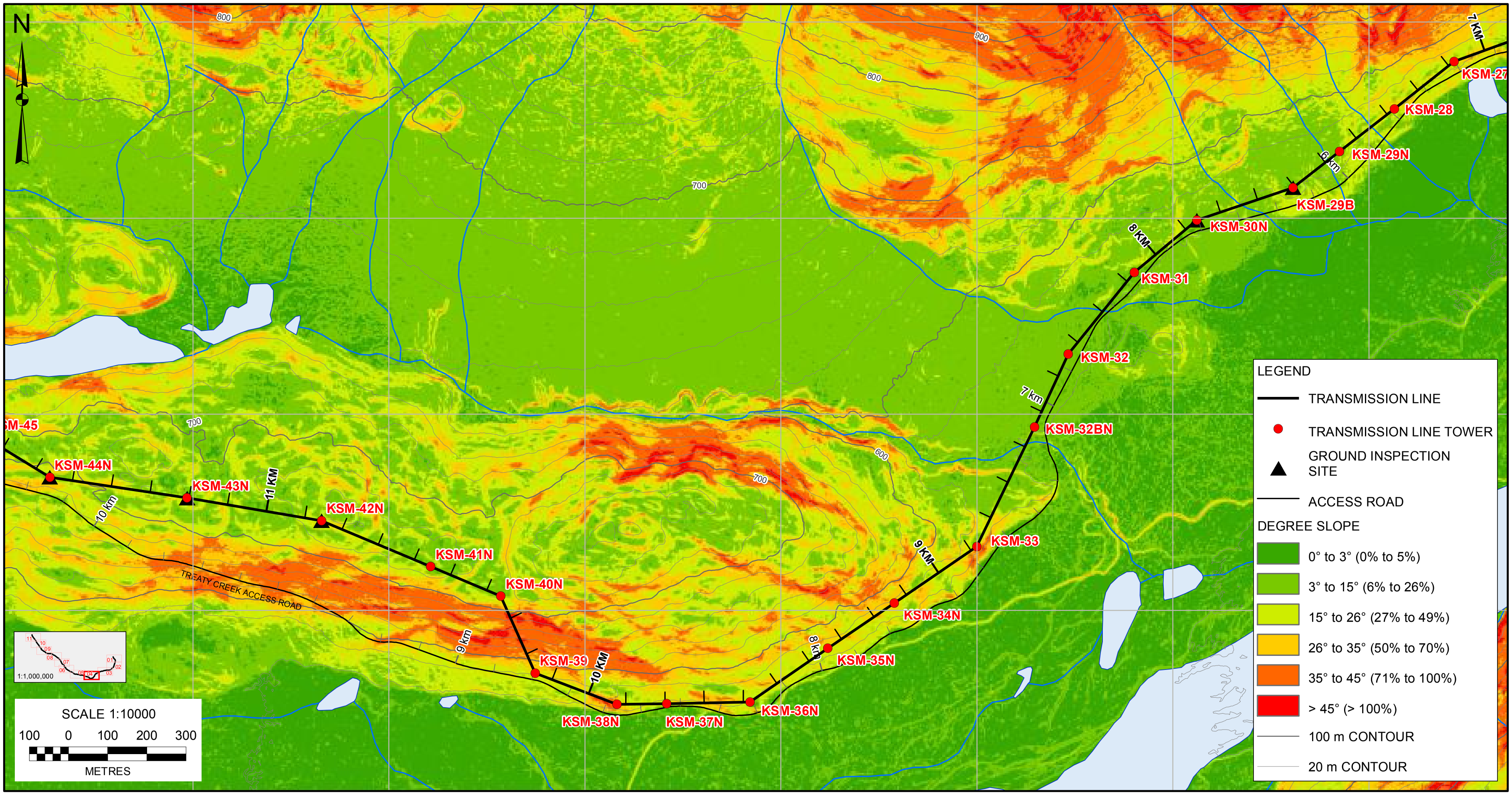

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: SLOPE ANGLE MAP 4 OF 11

PROJECT No.:	DWG No.:	REV.:
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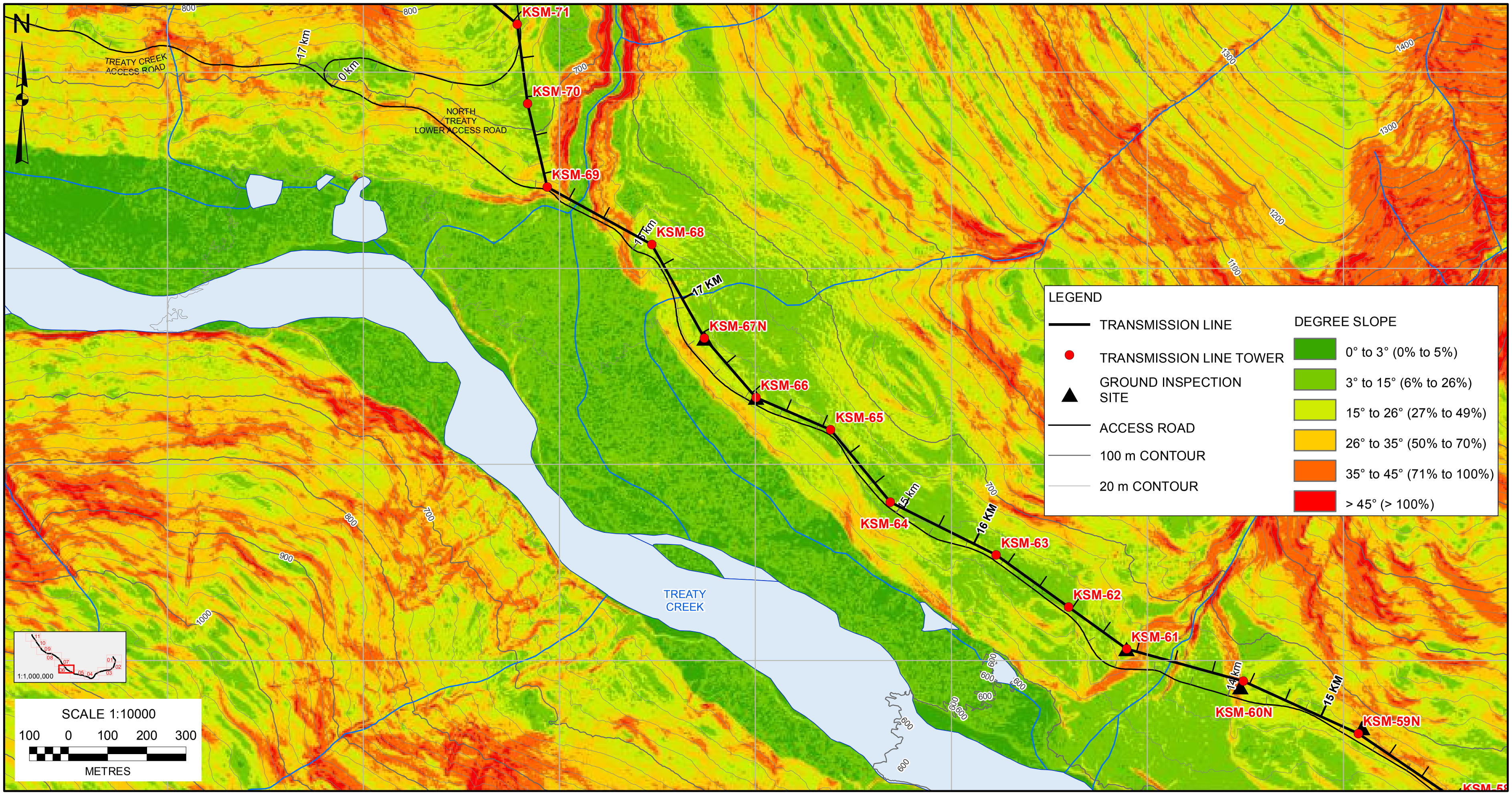

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TITLE: SLOPE ANGLE MAP 6 OF 11

PROJECT No.:	DWG No.:	REV.:
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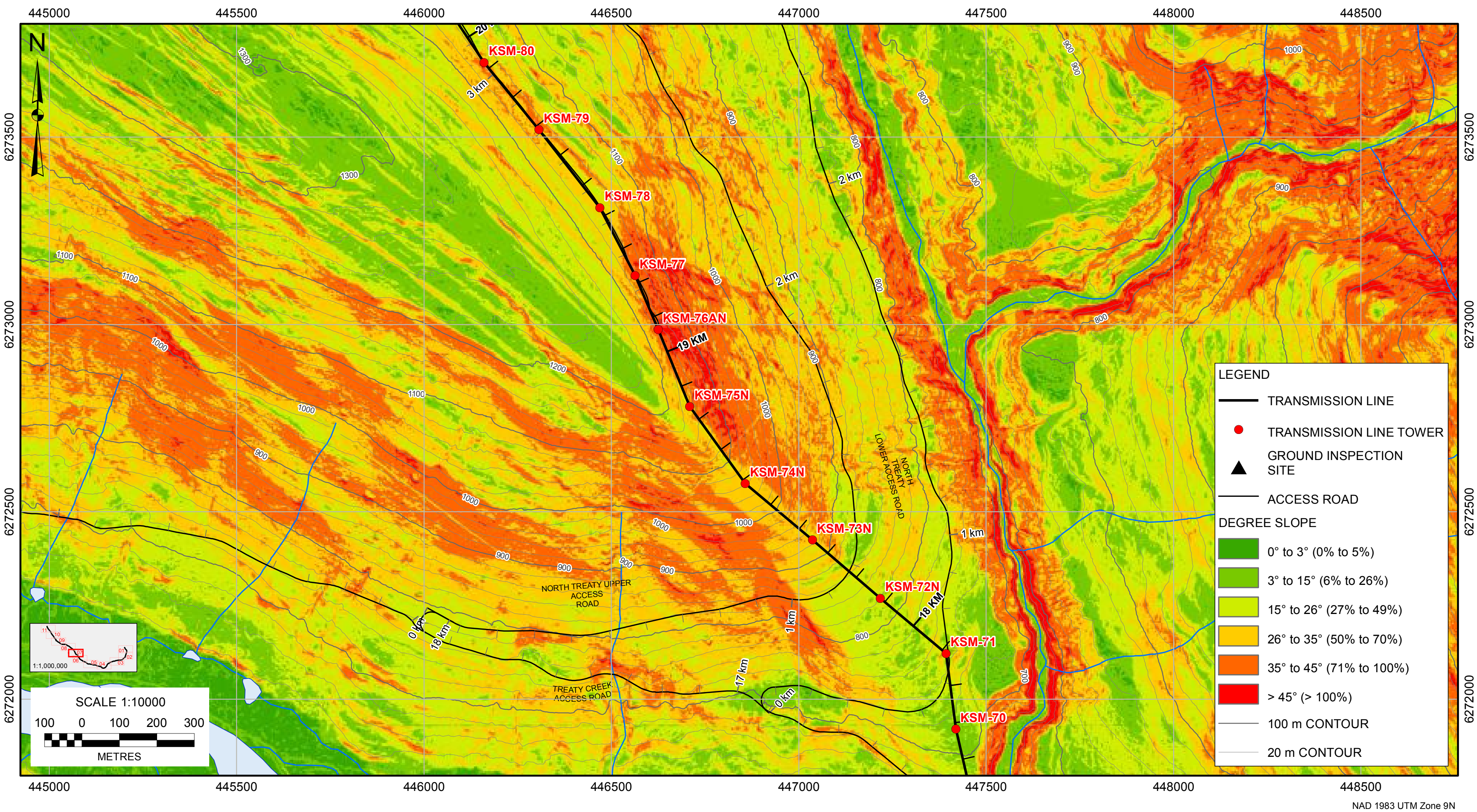

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AN APPLIED EARTH SCIENCES COMPANY

CLIENT: SEABRIDGE GOLD INC.

PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: SLOPE ANGLE MAP 7 OF 11

PROJECT No.:	DWG No.:	REV.:
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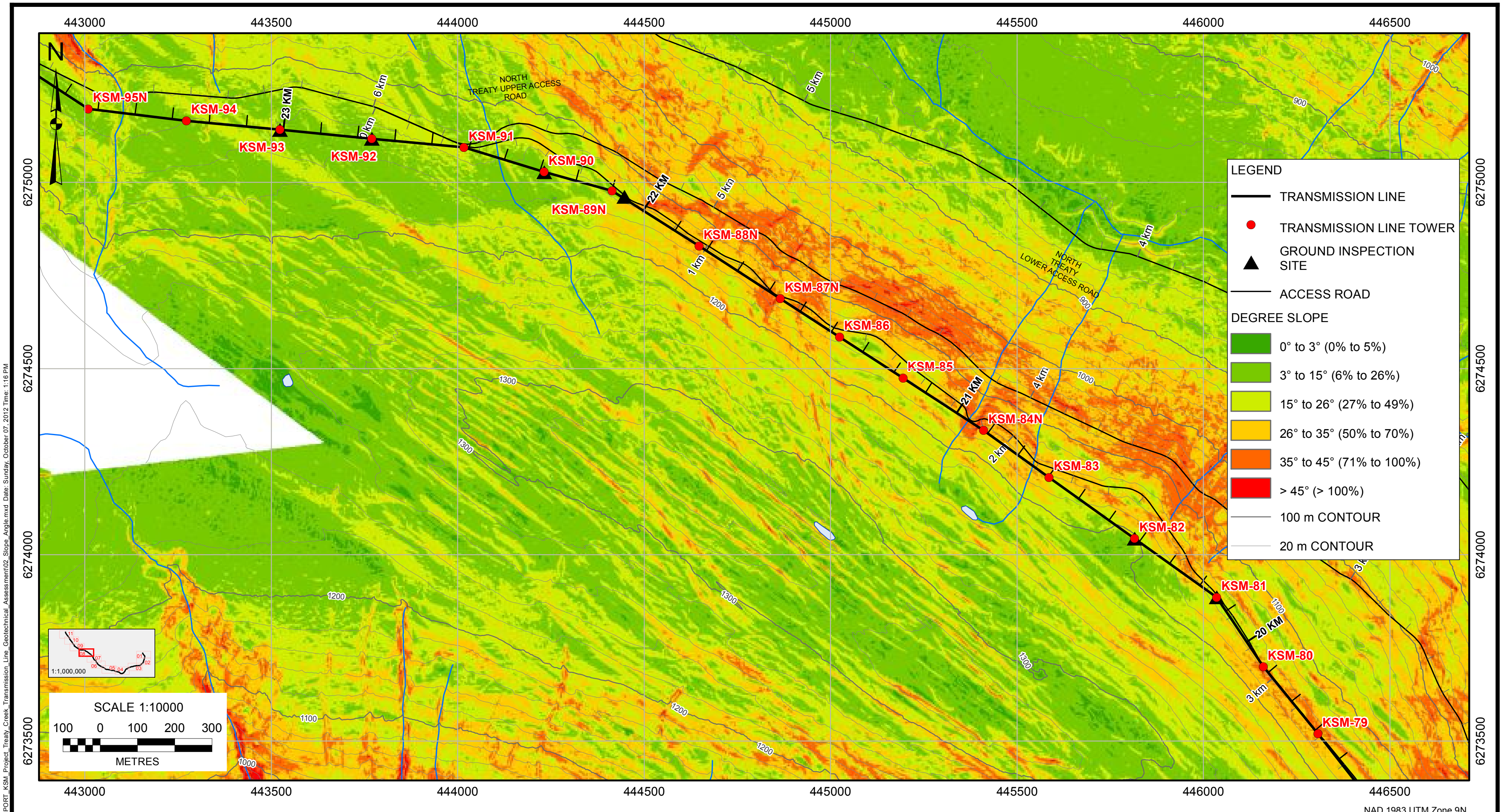

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: SLOPE ANGLE
MAP 8 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	S-08	

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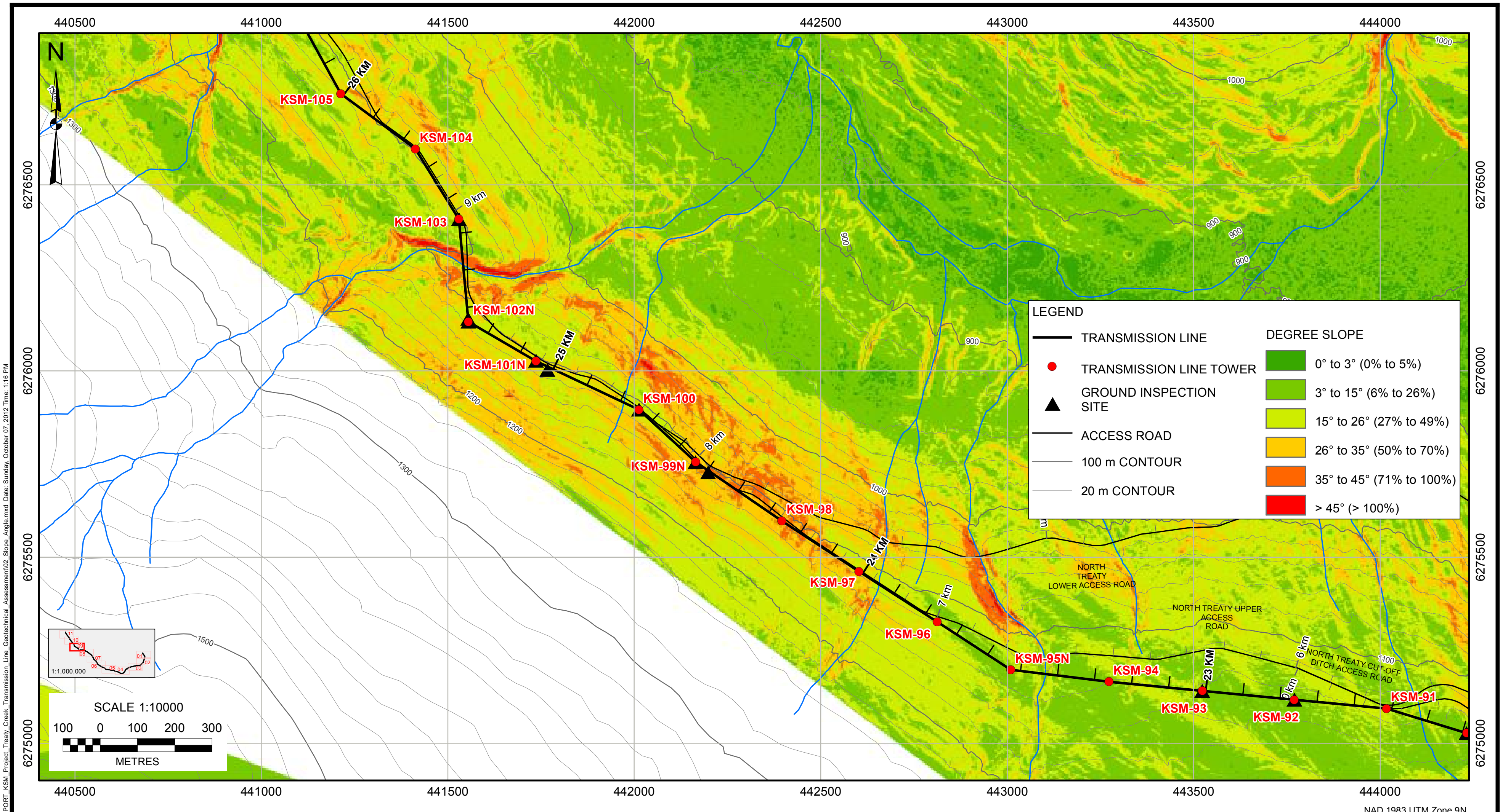

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: SLOPE ANGLE MAP 9 OF 11

PROJECT No.:	DWG No.:	REV.:
0638013	S-09	

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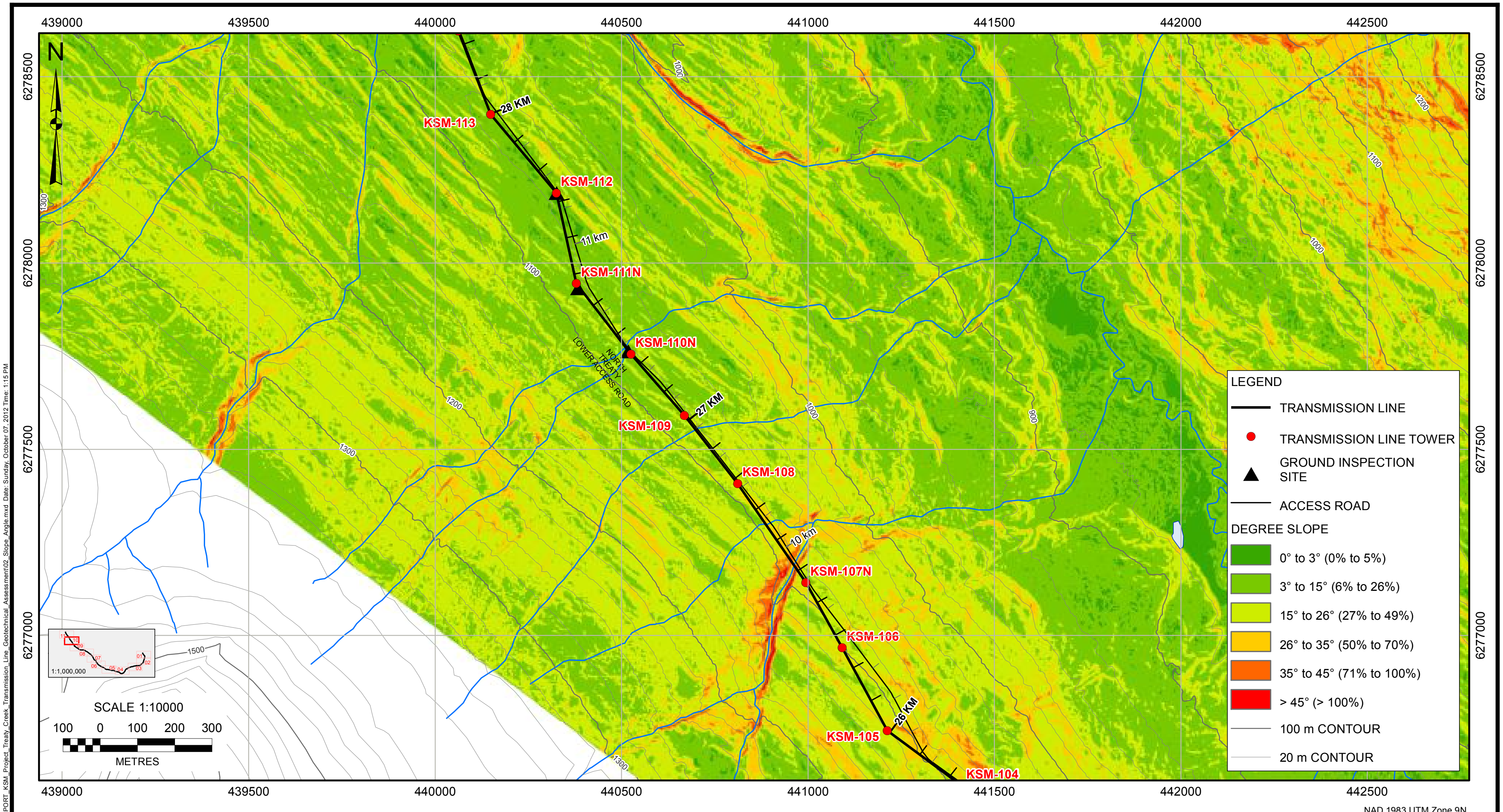

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PROJECT: KSM - TREATY CREEK TRANSMISSION LINE GEOTECHNICAL ASSESSMENT

TITLE: SLOPE ANGLE MAP 10 OF 11

PROJECT No.:	DWG No.:	REV.:
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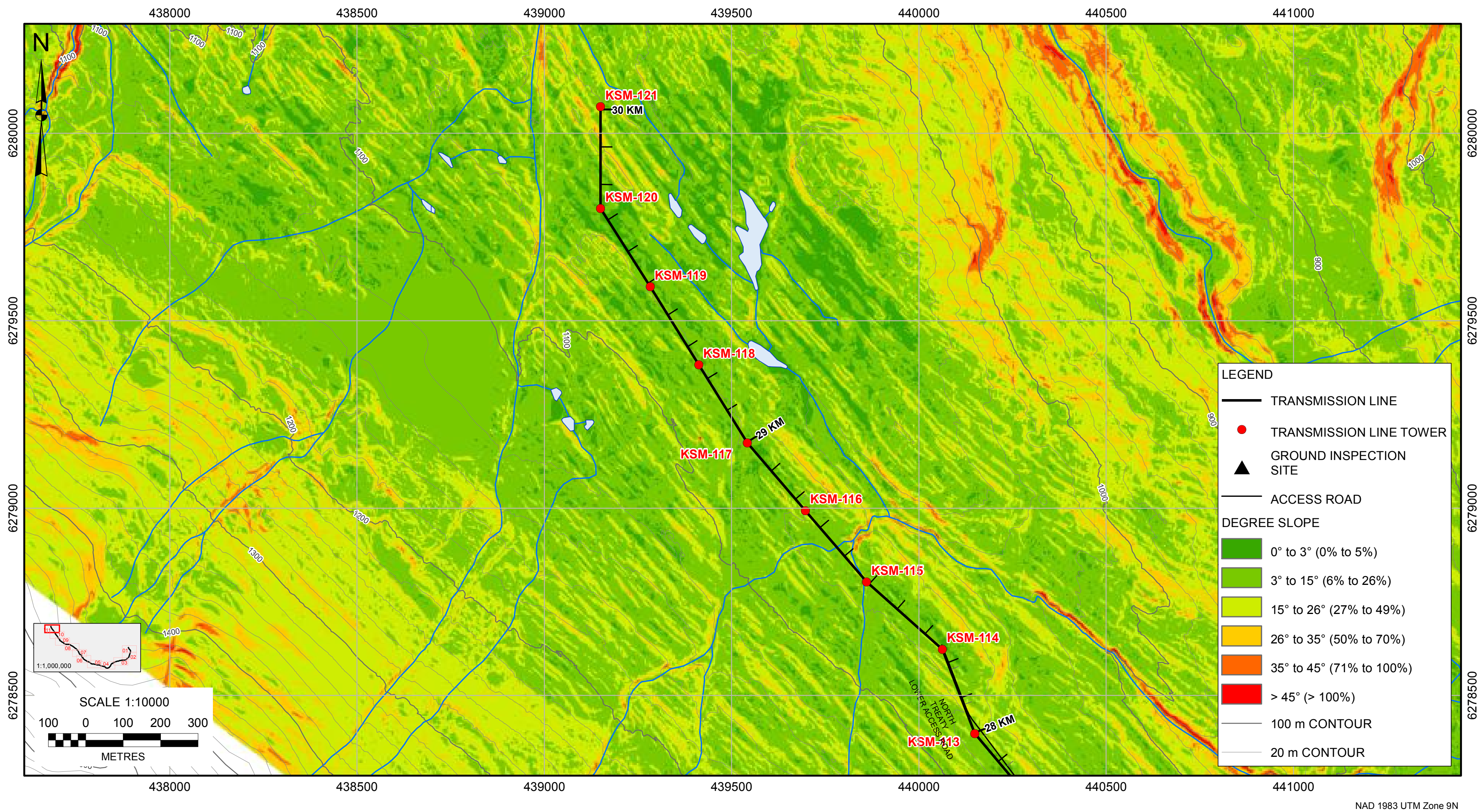

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TITLE:
SLOPE ANGLE
MAP 11 OF 11

PROJECT No.:	DWG No.:	REV.:
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