Appendix V3-3I

Hope Bay Project: Madrid-Boston All-Weather Road Preliminary Design

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Memo

To:	John Roberts, PEng, Vice President Environment	**Client:**	TMAC Resources Inc.
From:	Kaitlyn Kooy, EIT Megan Miller, PEng	**Project No:**	1CT022.004
Reviewed By:	Maritz Rykaart, PhD, PEng	**Date:**	November 26, 2016
Subject:	Hope Bay Project: Madrid-Boston All-Weather Road Preliminary Design		

1 Introduction

1.1 General

The Hope Bay Project (the Project) is a gold mining and milling undertaking of TMAC Resources Inc. The Project is located 705 km northeast of Yellowknife and 153 km southwest of Cambridge Bay in Nunavut Territory, and is situated east of Bathurst Inlet. The Project comprises of three distinct areas of known mineralization plus extensive exploration potential and targets. The three areas that host mineral resources are Doris, Madrid, and Boston.

The Project consists of two phases; Phase 1 (Doris project), which is currently being carried out under an existing Water Licence, and Phase 2 which is in the environmental assessment stage. Phase 1 includes mining and infrastructure at Doris, while Phase 2 includes mining and infrastructure at Madrid and Boston located approximately 10 and 60 km due south from Doris, respectively.

Phase 2 includes the design and construction of a 51 km long all-weather road connecting Madrid and Boston. The primary function of the road is to link the mining areas to allow year-round transport of supplies and equipment.

1.2 Objective

This memo provides the preliminary design details for the Madrid-Boston all-weather road.

2 Design Concept

2.1 Approach

The overall design concepts for the Madrid-Boston all-weather road, and associated infrastructure (quarries and quarry access roads), is based on the same principles used for existing roads at Doris. Road alignments will be designed to minimize crossings and unfavorable foundation conditions. The Madrid-Boston all-weather road will be administered and controlled entirely by TMAC.

2.2 Road Components

The Madrid-Boston all-weather road will consist of the main road, turnouts to allow for passing, and stream crossings. Quarries and quarry access roads are also associated with the road.

2.3 Topographic data

Design of the Madrid-Boston all-weather road is based on topographic contour maps with 1.0 m vertical resolution, and aerial photography produced from 2012 satellite imagery supplied by Hope Bay Mining Limited. Detailed ground surveys have not been completed.

2.4 Foundation Conditions

Detailed studies and site inspections have not been performed along the entire length of the proposed all-weather road. The Doris, Madrid and Boston areas; however, have been well studied, and it is expected that foundation conditions and geology along the road length are similar. For details on the foundation conditions refer to SRK (2016c).

Permafrost at the Project area extends to depths of about 570 m and are absent beneath some large lakes. The ground temperature near the depth of zero annual amplitude ranges from −9.8 to −5.6°C, with an average of −7.6°C. Active layer depth based on ground temperatures measured in overburden soil averages 0.9 m with a range from 0.5 to 1.4 m. The average geothermal gradient is 0.021°C/m.

Permafrost soils are comprised mainly of marine clays, silty clay and clayey silt, with pockets of moraine till underlying these deposits. The most prevalent rock type on site with surface exposure is mafic volcanics, predominantly basalt. The marine silts and clays contain ground ice on average ranging from 10 to 30% by volume, but occasionally as high as 50%. The till typically contains low to moderate ice contents ranging from 5 to 25%.

Overburden soil pore water is typically saline due to past inundation of the land by seawater following deglaciation of the Project area. The salinity typically ranges from 37 to 47 parts per thousand which depresses the freezing point and contributes to higher unfrozen water content at below freezing temperatures.

2.5 Environmental Setbacks

The following environmental setbacks have been applied when selecting the location of the road:

- Minimum 31 m setback from waterbodies, 51 m setback where ever possible;
- Minimum 30 m buffer zone from known rare plants; and
- Minimum 30 m buffer zone from known archeological sites.

While priority was given to avoid these areas, in some cases the minimum buffer around archeological sites could not be maintained. In these instances, the archeological site will be mitigated in accordance with the Archeological Management/Mitigation Plan.

3 Alternatives

3.1 Level of Development

TMAC considered a number of alternative methods to access the Boston mining area. The alternatives considered are described in Table 3.1. Development of an all-weather road was selected as the preferred option due to its flexibility.

While a winter road is not the preferred alternative, it may be required to access Boston until the Madrid-Boston all-weather road has been constructed.

Table 3.1: Alternative Levels of Development

Alternative	Details
Winter road access	Consideration was given to access the area using only seasonal winter roads. Seasonal access will significantly limit development at Boston, requiring complex annual shut-downs, and excessive seasonal manpower loads.
Air access	A temporary airstrip has been constructed in the Boston area and a permanent airstrip is planned, but is not intended to be the sole method of access to Boston. Road access is still needed for transport of supplies and equipment, most of which would be delivered to the Hope Bay site via the annual sea-lift.
All-weather road access	The Boston Mine can be linked to the rest of the Hope Bay development by extending the Madrid South all-weather road to the Boston mining area. This would allow year-round vehicle access, limit further tundra damage from winter roads, and allow for increased exploration activity along the road corridor.

3.2 All-weather Road Alignment

Preliminary design and routing of an all-weather road to the Boston mining area has been studied numerous times since 1992. Two alternative all-weather road alignments were considered, these are described in Table 3.2 and Figure 1. The PND/SRK route was selected as the preferred route as it has more favorable foundation conditions. Additional optimization of this preferred alignment was performed based on the currently available data.

Table 3.2: All-weather Road Alignment Alternatives

Alignment	Details
EBA 1997 Route	This route was first proposed by EBA in 1993 and refined in 1997. It extends south from the Madrid South all-weather road following topographic lows until terminating at Boston. The topographic lows also correspond to wet areas and permafrost polygons, which make construction and surface water drainage for this alignment difficult.
PND/SRK Route	This route was first developed by SRK in 2006 to minimize areas with unfavorable foundation conditions (wet areas and permafrost polygons). The route was further refined by PND in 2009 and again by EBA in 2011. It extends south from the Madrid South all-weather road to the west of the EBA 1997 route.

4 System Design

4.1 Road Design

4.1.1 Design Criteria

The road is designed to be a single lane haul road with turnouts to allow for passing, except between the Boston tailings management area (TMA) and Boston infrastructure (Stations 51+900 to 52+000), where the road will be a dual lane haul road to allow for transport of filtered tailings. It will therefore be designed to the haul road standards set out in the Nunavut Mine Health and Safety Regulations (2015), with an understanding that an exemption would be pursued from the Mines Inspector to allow the road to be a single lane road due to the low frequency of haul trucks travelling the road. The road design criteria are as follows:

- The design vehicles will be crew cab trucks, personnel transfer busses, Super B-fuel trucks, Super B-trucks, and lowbed trucks. In addition, construction equipment will periodically travel the road, which is expected to include CAT 988 loaders, CAT 16H graders, and CAT 730 and CAT 773 haul trucks;
- The maximum design speed for any vehicle will be 50 km/hr;
- The minimum allowable radius of curvature for the road is 100 m; however, at this radius the maximum speed is reduced to 35 km/hr. The maximum radius of curvature while maintaining a maximum speed of 50 km/hr is 231 m. Wherever possible, corners with wider radii of curvature should be targeted;
- Minimum fill thickness of 1 m over permafrost soils and 0.3 m over bedrock;
- The minimum crest road width will be 8 m for single lane traffic and 11 m for dual lane traffic;
- The maximum allowable grade is 10%; however, wherever possible, grades less than 4% should be targeted;
- Turnouts shall be included at a frequency of at least one per kilometer. Each turnout shall be at least 30 m long and 4 m wide;
- The road shall be crowned at 0.5% to allow for water drainage;
- The road side slopes shall be 1.5H:1V when the road is less than 2 m thick and 2H:1V when the road is greater than 2 m thick; and
- Where road thickness is greater than or equal to 3 m safety berms or barriers will be placed along the road edge, and the road crest will be widened to accommodate the berms.

4.1.2 Design

The selected road alignment extends south from the Madrid South all-weather road and roughly follows the east side of Aimaokatalok Lake before terminating in the Boston mining area. The road alignment is presented in Drawings MBR-01 and MBR-02 (Attachment 2). This alignment has been altered slightly from the PND/SRK alignment presented in Section 3.1 to avoid cultural and environmentally sensitive areas and to reduce the bridge spans at stream crossings. Figure 1 displays the final alignment in comparison to the PND/SRK alignment.

Thermal modelling was completed to determine fill thickness required to preserve permafrost under infrastructure. Thermal modelling details can be found in SRK (2016a). Four typical fill thicknesses (Bedrock Zone, Zone 1, Zone 2, and Zone 3), ranging from 0.3 to 2.0 m were identified based on observed performance of roads previously constructed on site and supported by conclusions drawn from thermal modelling. Fill zones are assigned based on site specific ground conditions, identified through air photo interpretation:

- Bedrock Zone is exposed bedrock outcrop that may be blasted if necessary and has a minimum fill thickness of 0.3 m;
- Zone 1 is even, un-patterned ground and in this zone the road has a minimum fill thickness of 1 m;
- Zone 2 is transitional, un-patterned ground with indications of drainage areas, but no frost polygons. This zone has a minimum fill thickness of 1.5 m; and
- Zone 3 is patterned ground with observable frost polygons or wet areas. This zone has a minimum fill thickness of 2 m.

The road will consist of 0.15 m of surfacing material overlying a layer of run-of-quarry (ROQ) material of varying thickness depending on the zone classification. Typical cross sections can be seen in Drawing MBR-35 (Attachment 2).

The landowner requires designated animal crossings to be constructed along any linear structures to allow relatively unhindered passing of migrating animals. Animal crossings will generally be located at major horizontal bends in the road alignment and at junctions, with the final location of animal crossings to be determined by elders after construction has been completed. Animal crossings will consist of 10 m wide sections of the roadway where the shoulders are flattened to 5H:1V and topped with surfacing material. Typical plans and cross sections can be seen in Drawing MBR-36 (Attachment 2).

4.2 Stream Crossings

4.2.1 Design Criteria

SRK has defined a stream in this memo as a preferential flow path for surface freshet melt water and rainfall such that it may contain water seasonally or permanently and frequently links permanent water bodies. Site recognisance of the proposed crossings was performed in 2011 (EBA 2011). In addition, crossing locations and features are based on air photo interpretation, topography, available hydrology data, and photos and descriptions from previous studies. Four different crossing types have been identified as culverts, fish bearing culverts, clear span bridges with pile foundations, and clear span bridges with frozen abutment foundations.

General design criteria for stream crossings are listed below.

- Stream crossings confirmed not to be fish habitat will be spanned using culverts if the peak flow is sufficiently low;
- Large fish-bearing streams will be spanned using clear span bridge structures;

- Fish-bearing streams of very low flow will be spanned using culverts sized for passage of the expected fish species, during normal flow conditions (1:2 year, 24-hour storm event);
- Streams have been identified as fish bearing or non-fish bearing based on baseline assessments (personal communication Philip Lee of ERM April 19, 2016); and
- To be consistent with crossings on the existing road (SRK 2010), crossings will be designed for loaded CAT 773 haul trucks.

Design criteria for clear span crossings are based on the Northwest Territories Clear-Span Bridges Operational Statement prepared by Fisheries and Oceans Canada (2007), and thermal modelling criteria (SRK 2016a). The clear span crossing design criteria are listed below:

- The underside of the bridge deck must be a minimum of 2 m above the ordinary high water mark (HWM);
- Abutments must be a minimum of 1.5 m from the HWM on either side of the stream;
- The HWM is defined as the usual or average level to which a body of water rises at its highest point and remains at this level long enough to change the land characteristics. For rivers and streams, this is the flow generated from a 1:2 year, 24-hour storm;
- For ease of construction and material transportation, all clear-span structures are assumed to have a maximum deck length of 20 m;
- The minimum road fill thickness at the bridge abutments is 2.0 m;
- Bridges should have solid decks to prevent material from falling into the stream; and
- For frozen abutment bridges the abutment shall consist of:
  - A concrete sill (designed by others) sitting on a bridge support pad. The bridge support pad should extend a minimum of 3 m beyond the concrete sill; and
  - Minimum slopes of 1.5H:1V (34°).

4.2.2 Design

Previous studies have identified thirteen potential crossings along the proposed road alignment. Descriptions and photos of these stream crossings are available in EBA (2011). SRK has refined the crossing locations and lengths. Two crossings identified in previous work have been relocated to more favorable locations, which allow for shorter, more easily constructed bridges. These changes to the road alignment have resulted in the need for one additional culvert crossing. Table 4.1 and Drawings MBR-18 to MBR-34 (Attachment 2) provide details on the 14 crossings.

Low flow stream crossings confirmed not to be fish habitat will be spanned using two 1 m diameter culverts. Drawing MBR-32 (Attachment 2) shows a typical section for non-fish bearing crossings. For fish bearing streams with minimal flow, culverts that have been sized to allow fish passage will be used. A typical fish bearing culvert will have a minimum diameter of 1 m and riprap will be placed inside the culvert to dampen the flow velocity to allow the passage of fish. A schematic design is shown in Drawing MBR-32 (Attachment 2). Culvert diameter and riprap size will vary depending on the catchment area reporting to the crossing and the type of fish expected.

Currently, no frozen abutment bridge crossings have been specified (Table 4.1); however, should detailed design determine crossings currently identified as fish bearing culverts cannot meet the requirements for fish passage, then frozen abutment bridges will be used instead.
Drawing MBR-33 (Attachment 2) provides a typical plan view and cross section.

Table 4.1 identifies seven end bearing pile bridges. End bearing bridges were selected for these locations based on stream characteristics, abutment geometry, and topography. Frozen abutment bridges could not meet the stream exclusion zone requirements without exceeding the maximum bridge length. End-bearing pile bridges will consist of end-bearing piles extending to bedrock, and road fill material will be held in place by a gabion wall. Drawing MBR-34 (Attachment 2) provides a typical schematic design.

For the first few years after construction, silt fences will be installed along the toe of the roadway to ensure that sediments do not enter the streams. The silt fences will start a minimum of 3 m before the abutment of the clear-span structure.

To monitor the performance of the bridge abutments, one 7 bead thermistor will be installed in each bridge abutment. These thermistors would measure temperatures within the bridge abutments and the foundations. A typical thermistor section is provided in Drawing MBR-34 (Attachment 2).

Table 4.1: Stream Crossing Details

Crossing ID	Crossing Type	Minimum Span Length* (m)	Comments
C-MBR-7	End bearing pile bridge	15 m	Assumed fish-bearing
C-MBR-8	End bearing pile bridge	14 m	Assumed fish-bearing
C-MBR-9	End bearing pile bridge	20 m	Assumed fish-bearing
C-MBR-10	Culvert	N/A	Generally wet area; preferential flow path not identified; investigate for presence of fish
C-MBR-11	Fish-bearing culvert	N/A	Generally wet area; preferential flow path not identified; fish presence confirmed (Slimy Sculpin)
C-MBR-12	End bearing pile bridge	20 m	Assumed fish-bearing
C-MBR-13	Fish-bearing culvert	N/A	Very small stream; fish presence confirmed (Ninespine Stickleback & Arctic Grayling)
C-MBR-14	Fish-bearing culvert	N/A	Very small stream; fish presence confirmed (Ninespine Stickleback)
C-MBR-15	End bearing pile bridge	12 m	Assumed fish-bearing
C-MBR-16	End bearing pile bridge	10 m	End bearing pile span would reduce the required width; assumed fish-bearing
C-MBR-17	Culvert	N/A	Very small stream; investigate for presence of fish

Crossing ID	Crossing Type	Minimum Span Length* (m)	Comments
C-MBR-18	Culvert	N/A	Generally wet area; preferential flow path not identified; investigate for presence of fish to size culvert
C-MBR-19	End bearing pile bridge	12 m	Assumed fish bearing
C-MBR-20	Fish-bearing culvert	N/A	Very small stream; fish presence confirmed (Ninespine Stickleback & Slimy Sculpin)

*Typical supplier bridge span lengths will be used where possible to avoid custom manufacturing

5 Quarries

5.1 Design Criteria

To allow for efficient road construction, haul distances should be less than 5 km; therefore, quarries should be located at a maximum spacing of 10 km along the road alignment. Quarry material should be non-acid generating and suitable for construction (i.e. competent rock).

5.2 Design

Twenty potential quarries have been identified along the Madrid-Boston all-weather road (Drawings MBR-01 and MBR-02, Attachment 2), based on air photo interpretation and geological maps of the area (Sherlock 2002). Geochemical testing has been performed on 15 of the identified quarries (SRK 2012). The remaining quarries are typically located within well studied rock types, which are expected to be suitable for construction. Details of the expected geochemistry of the quarries is provided in SRK (2016b).

The 20 identified quarries have been ranked and classified as preferred and non-preferred based on environmental and social sensitivities, rock type and geochemistry (Attachment 1). Based on this assessment the preferred quarry locations are:

- Quarry M;
- Quarry N;
- Quarry O;
- Quarry P;
- Quarry S;
- Quarry T;
- Quarry U;
- Quarry V;
- Quarry X;
- Quarry AA; and
- Quarry AB.

Quarry depth will vary based on rock outcrop height and surrounding topography. The quarries will be drilled and blasted in benches, with 3 to 5 m high benches and 80° high wall slopes. Quarry floors should be sloped at a minimum of 1% to shed water. These parameters will be adjusted as needed based on observed rock quality during quarry development. Prior to drilling and blasting all overburden material shall be stripped from the rock surface.

Surface runoff (rain and snowmelt) management will consist of an upstream quarry berm to prevent runoff from outside of the quarry footprint from entering the area, as well as a downstream berm to contain surface runoff within the quarry footprint. The rock will be quarried near to the elevation of the surrounding topography, but not below that elevation to avoid creating permanent ponds at closure.

6 Construction

All construction fill materials will be obtained from geochemically suitable permitted quarries, or geochemically suitable waste rock. Management and monitoring of these quarries will be according to the quarry monitoring plan which will be submitted under another cover. Surfacing (32 mm minus), and transition (150 mm minus) materials will be produced at an on-site crusher located within the permitted quarries.

The estimated construction quantities are provided in Drawing MBR-36 (Attachment 2). These volumes are estimated to neat lines and do not account for tundra embedment. Assuming a minimum quarry depth of 3 m and 10% tundra embedment, a quarry area of 32 ha would be required.

Based on previous surface infrastructure construction on the Project, it is assumed that the construction fleet will consist of CAT 730 haul trucks, CAT 773 haul trucks, CAT D8 dozers, CAT C330 excavator(s), CAT CS563 compactor(s) and a crusher.

The road construction is expected to proceed either from north to south or from both north and south, simultaneously working off existing site roads. Construction is expected to be completed in one year.

Prior to construction, the road alignment should be cleared of snow and ice. At no time will disturbance of the tundra vegetation or soils be allowed outside of the road footprint, and no permafrost disturbance will be allowed. Construction fill will be placed by end-dumping on the existing road surface and pushing the dumped material with a bulldozer. Surfacing material will not be placed until the ROQ material layer is at design grade and level. All construction should be performed in accordance with the technical specifications (SRK 2011).

Construction of the clear span bridges should not impact the stream or stream banks. Both bridge abutments will be constructed before the bridge is installed. To construct abutments on the far side of stream crossings, temporary winter roads will be constructed. The clear-span structure and its components will be installed by excavator or crane (using a sling), standing on the end of the constructed road to ensure no disturbance of original ground or stream. For the first few years after construction, silt fences will be installed along the toe of the roadway to ensure that sediments do not enter the streams. The silt fences will start a minimum of 3 m before the abutment of the clear-span structure.

Wherever possible, the road will be constructed in the winter to ensure the foundation materials remain frozen. Summer construction may be required to meet development schedules. Winter and summer construction techniques will be identical; however, summer construction will result in the use of more construction material as greater imbedding of material into the active layer will occur. Summer construction will also require careful screening of the site for nesting birds, and modifications to the construction schedule may be required to avoid disturbing nesting populations.

7 References

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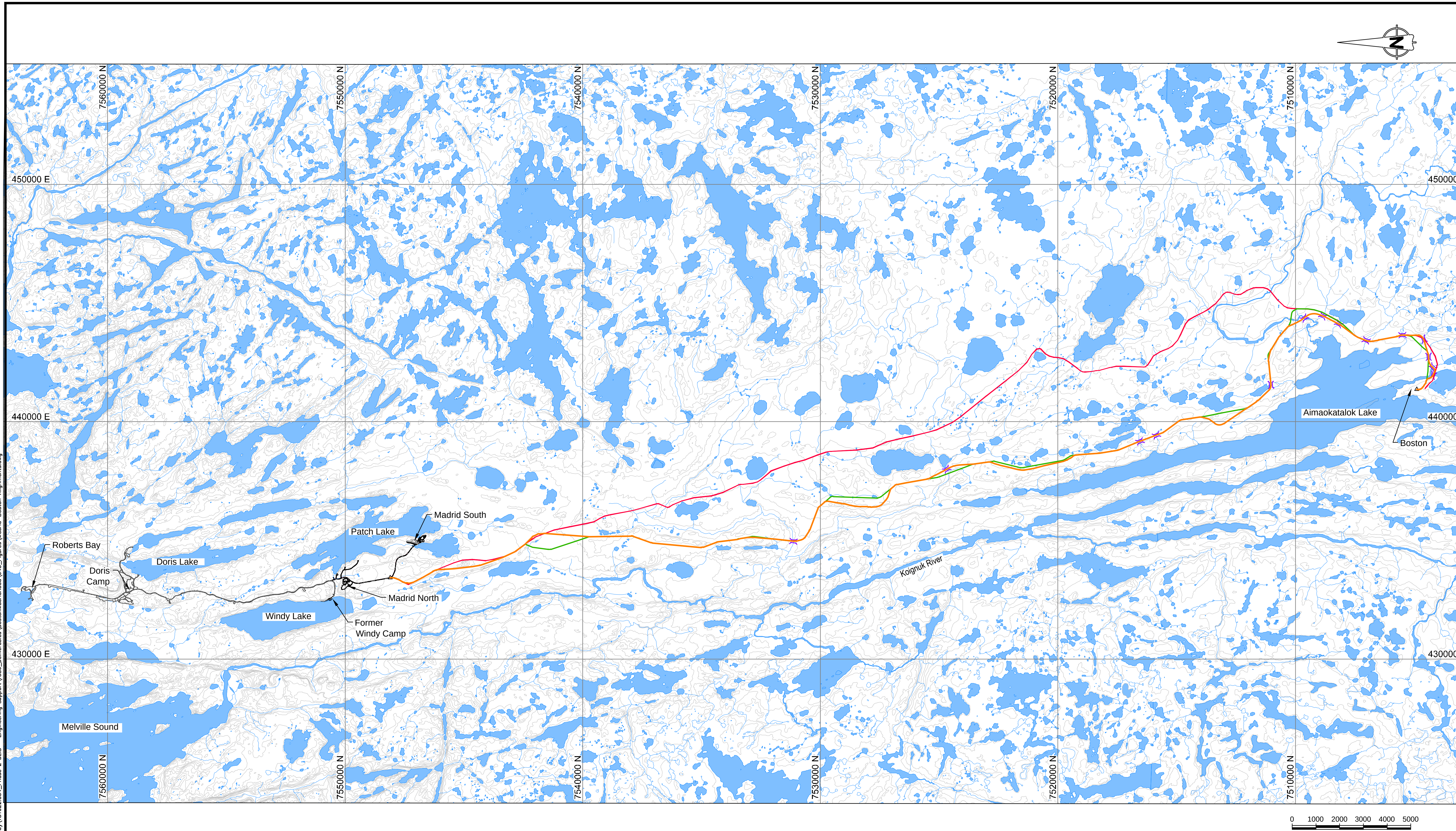
Figure



LEGEND

- Madrid-Boston AWR Alignment (2016)
- PND/SRK Madrid-Boston Alignment (2011)
- EBA Madrid-Boston Alignment (1997)
- Proposed Bridge Location
- Exisiting Infrastructure

REFERENCE

1. Topographic contour data shown is from NTS maps, 1:50,000 scale. Contour intervals are 10m.

NOTES

1. The co-ordinate system is UTM NAD 83, Zone 13.
2. All dimensions are in metric units, unless otherwise specified.

srk consulting

MAC RESOURCES

Hope Bay Project

Madrid-Boston All-Weather Road

Madrid-Boston All-Weather Access Road Alignments

SRK JOB NO.:	1CT022.004
FILE NAME:	Madrid–Boston Alignments.dwg

DATE:	APPROVED:	FIGURE:
May 2016		1

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Attachment 1: Identified Quarries

ID	Ranking	Notes
Quarry G	Not Preferred	Environmental sensitivities identified within the proposed footprint and likely cannot be avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry H	Not Preferred	Madrid South Mine portal. Development will be constrained by requirements of mine infrastructure pads, not a road production quarry. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry J	Not Preferred	Very far from road, long access road required. Environmental sensitivities identified within the proposed footprint but can be easily avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry L	Not Preferred	Environmental sensitivities identified within the proposed footprint and likely cannot be avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry M	Preferred	No environmental sensitivities noted in the area. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry N	Preferred	No environmental sensitivities noted in the area. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry O	Preferred	One environmental sensitivity noted in the area but can be easily avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry P	Preferred	One environmental sensitivity noted in the area but can be easily avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry Q	Not Preferred	Environmental sensitivities identified within the proposed footprint and likely cannot be avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry R	Not Preferred	Environmental sensitivities identified within the proposed footprint and likely cannot be avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry S	Preferred	Environmental sensitivities identified within the proposed footprint but can be easily avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry T	Preferred	Environmental sensitivities identified within the proposed footprint but can be avoided by developing only a portion of the quarry. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry U	Preferred	Environmental sensitivities identified within the proposed footprint but can be avoided by developing only a portion of the quarry. Rock is expected to be suitable for construction use (SRK 2016b).
Quarry V	Preferred	Environmental sensitivities identified within the proposed footprint but can be easily avoided. The rock had been characterized as suitable for construction use (SRK 2016b).
Quarry W	Not Preferred	No sensitive sites identified. Geochemical testing has been performed but additional mineralogical test work required to confirm construction suitability of this granitoid rock unit (SRK 2016b).
Quarry X	Preferred	No environmental sensitivities noted in the area. Rock is expected to be suitable for construction use (SRK 2016b).
Quarry Z	Not Preferred	Environmental sensitivities identified within the proposed footprint, but can be avoided by developing only a portion of the quarry. The rock is not recommended for construction (SRK 2016b).
Quarry AA	Preferred	No environmental sensitivities noted in the area. Rock is expected to be suitable for construction use (SRK 2016b).
Quarry AB	Preferred	No environmental sensitivities noted in the area. Rock is expected to be suitable for construction use (SRK 2016b).
Quarry AD	Not Preferred	The rock is not recommended for construction (SRK 2016b).

Note(s)

1. Environmental sensitivities consist of known archeological sites, and known rare-plants or raptor nests.

Attachment 2: Engineering Drawings

Engineering Drawings for the Madrid-Boston All-Weather Road
Hope Bay Project, Nunavut, Canada

ACTIVE DRAWING STATUS

DWG NUMBER	DRAWING TITLE	REVISION	DATE	STATUS
MBR-00	Engineering Drawings for the Madrid-Boston All-Weather Road, Hope Bay Project, Nunavut, Canada	B	Nov. 18, 2016	Issued for Discussion
MBR-01	Madrid-Boston All-Weather Access Road General Arrangement with Orthophoto	B	Nov. 18, 2016	Issued for Discussion
MBR-02	Madrid-Boston All-Weather Access Road General Arrangement	B	Nov. 18, 2016	Issued for Discussion
MBR-03	Road Alignment Plan and Profile (1 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-04	Road Alignment Plan and Profile (2 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-05	Road Alignment Plan and Profile (3 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-06	Road Alignment Plan and Profile (4 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-07	Road Alignment Plan and Profile (5 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-08	Road Alignment Plan and Profile (6 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-09	Road Alignment Plan and Profile (7 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-10	Road Alignment Plan and Profile (8 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-11	Road Alignment Plan and Profile (9 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-12	Road Alignment Plan and Profile (10 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-13	Road Alignment Plan and Profile (11 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-14	Road Alignment Plan and Profile (12 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-15	Road Alignment Plan and Profile (13 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-16	Road Alignment Plan and Profile (14 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-17	Road Alignment Plan and Profile (15 of 15)	B	Nov. 18, 2016	Issued for Discussion
MBR-18	Stream Crossing C-MBR-7 (End Bearing Pile Span)	B	Nov. 18, 2016	Issued for Discussion
MBR-19	Stream Crossing C-MBR-8 (End Bearing Pile Span)	B	Nov. 18, 2016	Issued for Discussion
MBR-20	Stream Crossing C-MBR-9 (End Bearing Pile Span)	B	Nov. 18, 2016	Issued for Discussion
MBR-21	Stream Crossing C-MBR-10 (Culvert Crossing)	B	Nov. 18, 2016	Issued for Discussion
MBR-22	Stream Crossing C-MBR-11 (Culvert Crossing)	B	Nov. 18, 2016	Issued for Discussion
MBR-23	Stream Crossing C-MBR-12 (End Bearing Pile Span)	B	Nov. 18, 2016	Issued for Discussion
MBR-24	Stream Crossing C-MBR-13 (Culvert Crossing)	B	Nov. 18, 2016	Issued for Discussion
MBR-25	Stream Crossing C-MBR-14 (Culvert Crossing)	B	Nov. 18, 2016	Issued for Discussion
MBR-26	Stream Crossing C-MBR-15 (End Bearing Pile Span)	B	Nov. 18, 2016	Issued for Discussion
MBR-27	Stream Crossing C-MBR-16 (End Bearing Pile Span)	B	Nov. 18, 2016	Issued for Discussion
MBR-28	Stream Crossing C-MBR-17 (Culvert Crossing)	B	Nov. 18, 2016	Issued for Discussion
MBR-29	Stream Crossing C-MBR-18 (Culvert Crossing)	B	Nov. 18, 2016	Issued for Discussion
MBR-30	Stream Crossing C-MBR-19 (End Bearing Pile Span)	B	Nov. 18, 2016	Issued for Discussion
MBR-31	Stream Crossing C-MBR-20 (Culvert Crossing)	B	Nov. 18, 2016	Issued for Discussion
MBR-32	Culvert Crossings Typical Sections	B	Nov. 18, 2016	Issued for Discussion
MBR-33	Typical Frozen Abutment Bridge Crossing Plan and Section	B	Nov. 18, 2016	Issued for Discussion
MBR-34	Typical End Bearing Pile Section and Thermistor Bead Spacing Detail	B	Nov. 18, 2016	Issued for Discussion
MBR-35	Typical Road Plan and Sections	B	Nov. 18, 2016	Issued for Discussion
MBR-36	Animal Crossing Plan and Section and Material List and Quantity Estimates	B	Nov. 18, 2016	Issued for Discussion

TMAC RESOURCES

srk consulting

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Drawing MBR-00