

From: Allan.Carlick@gov.yk.ca
To: kdbergh@gmail.com
Subject: RE: Meeting with LFN
Date: April-15-15 9:02:02 AM

Hi Kelli

Sorry to have missed you at Watson lake, but look forward to meeting some other time in the near future.

Allan Carlick
First Nation Liaison Officer
Mineral Resources
PH: 667-8708

-----Original Message-----

From: Kelli [<mailto:kdbergh@gmail.com>]
Sent: Friday, April 10, 2015 4:44 PM
To: Allan.Carlick
Subject: Meeting with LFN

Hi Allan

I finally was able to chat with Cindy. We booked a meeting for 1:30 on Monday. Thanks very much for helping me arrange the meeting. I really appreciate it. Maybe I will see you in Waston.

Regards,

Kelli
778-233-7058

From: Kelli Bergh
To: chiefladue@gmail.com; dmorris@kaska.ca; cporter@kaska.ca; [email addresses redacted] [email addresses redacted]
Subject: Kudz Ze Kayah - EMP for Exploration
Date: August-12-15 9:28:39 AM
Attachments: [Environmental Management Plan - KZK Exploration Project - July 6 2015 - Reduced.pdf](#)

Hello

When we met earlier this year I committed to providing you with BMC's Environmental Management Plan which is intended to mitigate and/or reduce environmental impacts during the exploration program,

Please let me know if you have any questions regarding the attached.

Best regards,
Kelli Bergh BSc, MET RP Bio
Environmental Manager
778-233-7058

From: Kelli Bergh
To: dmorris@kaska.ca; cporter@kaska.ca
Subject: BMC Minerals - Kudz Ze Kayah Project Update Meeting
Date: December-14-15 12:41:51 PM

Hello Chief Morris and Councillor Porter

In follow-up to our meeting last April where Scott Donaldson provided an overview of BMC's exploration plans for Kudz Ze Kayah, we would like to provide you with an update of what we accomplished at the site during the 2015 field season. Are you available for an in person meeting at your office on the afternoon of January 13th?

Note - we are planning to hold our first community meeting that evening at the rec center and dinner will be provided.

Please let me know your availability on the 13th.

Best regards,
Kelli Bergh, Environmental Manager

BMC Minerals (No. 1) Ltd.
Suite 530, 1130 West Pender St.
Vancouver, BC V6E 4A4
778-233-7058

From: Kelli Bergh
To: cporter@kaska.ca
Cc: [email addresses redacted]
Subject: BMC Minerals Community Meeting
Date: December-14-15 1:38:53 PM

Hi Cindy

In follow up to our brief conversation, BMC Minerals is planning to hold our first community meeting in Watson on January 13th. I have booked the Community Hall for the meeting and they said they have a kitchen.

Can you please send the names of your recommended caterers?

The meeting will be open to LFN members and the general community of Watson Lake. I was thinking that maybe 50 people would attend? If you think more people might attend then I will need to let the caterer know.

I have sent yourself and Chief Morris a separate email regarding a project update meeting with Chief and Council for the 13th. If this date does not work, please let me know an alternative date.

Dorothy Dick has been cc'd here as she is BMC's Community Facilitator and is helping organize our community meetings. We are currently planning: Faro (Jan 11th), Ross River (Jan 12th), Watson (Jan 13th), Whitehorse (Jan 14th).

Best regards,
Kelli
778-233-7058

From: Kelli Bergh
To: dmorris@kaska.ca; cporter@kaska.ca
Cc: [email addresses redacted]
Subject: RE: BMC Minerals - Kudz Ze Kayah Project Update Meeting
Date: December-14-15 2:01:37 PM

Hi Chief Morris and Councillor Porter

My apologies for the mix up in dates (below), but we have booked the community hall in Watson for the 14th of January not the 13th. Are you available to meet on the 14th?

Best regards,
Kelli
778-233-7058

From: Kelli Bergh [mailto:kdbergh@gmail.com]
Sent: December 14, 2015 12:42 PM
To: dmorris@kaska.ca; cporter@kaska.ca
Subject: BMC Minerals - Kudz Ze Kayah Project Update Meeting

Hello Chief Morris and Councillor Porter

In follow-up to our meeting last April where Scott Donaldson provided an overview of BMC's exploration plans for Kudz Ze Kayah, we would like to provide you with an update of what we accomplished at the site during the 2015 field season. Are you available for an in person meeting at your office on the afternoon of January 13th?

Note - we are planning to hold our first community meeting that evening at the rec center and dinner will be provided.

Please let me know your availability on the 13th.

Best regards,
Kelli Bergh, Environmental Manager

BMC Minerals (No. 1) Ltd.
Suite 530, 1130 West Pender St.
Vancouver, BC V6E 4A4
778-233-7058

BMC Minerals

Community Dinner and Presentation

- BMC Minerals will be hosting a community dinner on January 14th in Watson Lake at the Community Center followed by an update on our work in 2015 on the Kudz Ze Kayah Project
- Dinner will start at 5 pm and the presentation at 6 pm

For additional information please contact Kelli Bergh at kdbergh@gmail.com or 778-233-7058



BMC Minerals (No.1) Ltd

October 20, 2016

Liard First Nation
PO Box 328
Watson Lake, YT Y0A 1C0

ATTENTION: Chief Daniel Morris

Re: Request for Meeting November 17 regarding Kudz Ze Kayah Project

Dear Chief Morris,

Now that we have completed the technical studies to support our Prefeasibility Study on the Kudz Ze Kayah Project, BMC is planning another round of community consultations with all affected First Nations and residents of affected communities. As part of this process, we would like to suggest a meeting with yourself and your Council from 3:00 to 5:00 on November 17, 2016. This meeting would also include Kaska Dena Council Chair George Miller and KDC Board members. Following this meeting we are proposing to conduct a community Open House at the Watson Lake Rec. Centre from 6:30 to 8:30.

We will soon be sending you a copy of our Project Overview document, which provides details about the Kudz Ze Kayah Project Proposal, so that you may have an opportunity to review the document and be prepared to discuss the Project at our meeting.

We would appreciate you circulating this notice to your Council, and I will call you next week to discuss and hear if you will be available for this important meeting.

Sincerely,

A handwritten signature in black ink, appearing to read 'Rob McIntyre', with several overlapping strokes.


Rob McIntyre, Senior Advisor
BMC Minerals

From: [Rob McIntyre](#)
To: dmorris@kaska.ca
Cc: [Kelli Bergh](#); [Scott Donaldson](#); nancy@resourcestrategies.ca; "Cindy Porter"
Subject: request for meeting November
Date: October 21, 2016 1:41:54 PM
Attachments: [Letter mtg. request to LFN C&C Oct. 1916.docx](#)

Chief Morris

Please see attached letter requesting a meeting in November. We will be in touch with you early next week to confirm your availability.

Regards,
Rob McIntyre

	Robert L. McIntyre	Senior Advisor
	BMC Minerals (No. 1) Limited	
	E: robm@bmcminerals.com	M: (867) 336-3537
	W: http://bmcminerals.com	



INVITATION TO PARTICIPATE IN COMMUNITY ENGAGEMENT Kudz Ze Kayah Mine Project

COMMUNITY TOUR NOV. 14 – NOV. 18, 2016

BMC Minerals is continuing community engagement regarding the proposed Kudz Ze Kayah Mine Project. With the technical studies and engineering work to support our Pre-feasibility Study of the Kudz Ze Kayah Project complete, BMC Minerals is preparing a Project Proposal for submission to the Executive Committee of YESAB early next year. In support of the development of that submission, BMC has prepared a Project Overview.

Members of our project team are hosting a series of community meetings. You can provide feedback and learn more about the project by: Attending a community meeting (see schedule below); Calling: 867-336-3537; Providing a written submission by email: robm@bmcm minerals.com or Mail: # 530-1130 West Pender Street, Vancouver, BC V6E 4A4.

For more complete project information, or to view a copy of the Project Overview document, please visit www.kudzzekayah.com

Nov. 14	PRESENTATION AND OPEN HOUSE	6:30-8:30	ROSS RIVER HOPE CENTRE
Nov. 15	PRESENTATION AND OPEN HOUSE	6:30-8:30	FARO REC. CENTRE
Nov. 16	PRESENTATION AND OPEN HOUSE	6:30-8:30	WHITEHORSE, HIGH COUNTRY INN
Nov. 17	PRESENTATION AND OPEN HOUSE	6:30-8:30	WATSON LAKE REC CENTRE

CKRW Radio advertising:

To run 15 times, 3xday from Nov. 2 to Nov. 14

BMC Minerals is holding a series of Community Open Houses between November 14th and 18th in Ross River, Faro, Whitehorse, and Watson Lake. Each community's open house begins at 6:30pm, and presentations include an outline of the Project Plan for the BMC Minerals Kudz Ze Kayah Mine project, followed by a poster session allowing one-on-one interaction with member of the BMC team. For more information on the KZK Project and the upcoming open houses, visit [kudz ze kayah dot com](http://kudzze.kayah.com).

Radio Ads for Dec 6/16 Ross River Open House

Radio spots to run Dec. 2, 5 and 6 – 3 x day (9 spots) in the top spots morning, noon and end of day.

BMC Minerals invites all residents of Ross River to it's Community Open House for Dinner, Presentation and Discussion Period on Tuesday, December 6 from 5:30 to 7:30 at the Ross River Hope Centre.


The presentation will include an outline of the Project Plan for the BMC Minerals Kudz Ze Kayah Mine project, followed by a poster session which will allow one-on-one interaction with members of the BMC team. The KZK project is a proposed open pit zinc copper mine, and is located approximately 110 km SE of Ross River, and 24 km S of Finlayson Lake. More information on the KZK Project and the upcoming open houses can be obtained by visiting kudzzekayah.com.

From: [Rob McIntyre](#)
To: dmorris@kaska.ca
Cc: [Kelli Bergh](#); [Scott Donaldson](#); nancy@resourcestrategies.ca; "Cindy Porter"
Subject: request for meeting November
Date: October 21, 2016 1:41:54 PM
Attachments: [Letter mtg. request to LFN C&C Oct. 1916.docx](#)

Chief Morris

Please see attached letter requesting a meeting in November. We will be in touch with you early next week to confirm your availability.

Regards,
Rob McIntyre

	Robert L. McIntyre	Senior Advisor	
	BMC Minerals (No. 1) Limited		
	E: robm@bmcminerals.com	M: (867) 336-3537	
	W: http://bmcminerals.com		

Environmental Management Plan

Kudz Ze Kayah Exploration Project

BMC Minerals (No. 1) Ltd.

Yukon Business Registration No. 636056

530-1130 West Pender Street Vancouver, BC V6E 4A4

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1 INTRODUCTION

1.1 Purpose

The Kudz Ze Kayah (KZK) Exploration Project is located approximately 110 km southeast of Ross River, Yukon. The Property is accessible by a 24 km long all weather gravel road south of the Robert Campbell Highway, near Finlayson Lake. The project is within the traditional territory of the Kaska Nation. The Kaska Nation in the Yukon is comprised of the Ross River Dena Council (RRDC) and the Liard First Nation (LFN).

Planned exploration work for the 2015 season is primarily diamond drilling and airborne geophysical surveys. Diamond drilling will comprise approximately 30,000 m from 100 sites, with 20,000 m designated for the ABM deposit and the remaining 10,000 m allocated to other targets, including the GP4F deposit. Progressive drill site reclamation will be completed on sites that are no longer needed. Drill holes penetrating massive sulphide will be grouted and collars will be cemented. Sumps will be sloped to allow for personnel and wildlife to exit safely, and will be back-filled after they are no longer needed and drained of water.

Environmental protection through adherence to applicable legislation, regulatory approvals, and best management practices is an important component of the KZK Exploration Project. Proper planning and implementation of an Environmental Management Program contributes to ongoing environmental protection and greatly reduces potential for adverse environmental effects through mitigation measures, including delineation of environmentally and culturally sensitive areas, establishment of communications and reporting protocols, and implementation of environmental compliance monitoring and reporting programs.

The purpose of the Environmental Management Plan (EMP) is to assist BMC and its Contractor(s) in adhering to applicable environmental legislation and recommended environmental mitigation measures. The EMP provides performance-based environmental requirements, standard protocols, and mitigation measures which are intended to reduce potential for adverse environmental effects during the Exploration Project. The EMP describes how environmental risks are to be managed during exploration activities and, in the event of an environmental incident, how emergency response procedures, mitigation measures, and reporting protocols are to be implemented.

1.2 BMC Environmental Policy

The KZK Exploration Project will be undertaken in accordance with BMC's Environmental Policy which states the Company is committed to:

- Minimising the environmental footprint of our operations as far as is practicable;
- Establishing environmental programmes based upon risk assessments that set and review environmental targets and objectives;
- Developing and implementing sound management systems that are designed to minimise pollution while supporting the Company in meeting or exceeding the specified environmental targets and objectives for each project;
- Ensuring that stakeholders are considered when developing project systems;
- Ensuring that heritage sites are recognised, managed and protected as a fundamental part of our environmental culture;
- Integration of environmental issues into site inductions, training and ongoing workplace communication processes and procedures;

- Regularly evaluating and reviewing subcontractor and supplier environmental performance;
- Promoting the efficient use of energy and continually improving our processes to minimise waste so as to conserve natural resources;
- Encouraging continual improvement in environmental performance through establishment of planning, training, monitoring, inspection and reporting systems; and
- Ensuring that exploration rehabilitation outcomes target the establishment of self-sustaining ecosystems.

BMC is committed to conducting its Exploration activities in a manner that supports environment, social, economic, health and heritage values. To meet these objectives BMC requires its employees and contractors to:

- Comply with project environmental conditions as communicated through the induction and ongoing communications;
- Support continual improvement of project environmental performance; and
- Communicate environmental incidents and actively participate in rectification.

1.3 Reference Documents Guidelines and Standards

Mitigation measures and other requirements specified in the EMP for the Exploration Project are based on the following:

- Kudz Ze Kayah Tote Road and Gatehouse Lease (Lease Number 105G07-001);
- Kudz Ze Kayah Water Use Licence (Water Licence Number QZ97-026);
- The approved Initial Environmental Evaluation for the Kudz Ze Kayah Mine Project (Cominco, 1996);
- Legislative requirements (Section 1.3.1);
- Management practice guidelines and industry standards (Section 1.3.2); and
- BMC's Environmental Policy (Section 1.2).

1.3.1 Legislation

Legislation referenced within and used to develop the EMP include (but are not limited to):

- Canada Fisheries Act (R.S., 1985, c. F-14);
- Canada Migratory Birds Convention Act, 1994 (1994, c. 22);
- Canada Navigable Waters Protection Act (R.S., 1985, c. N-22);
- Canada Species at Risk Act (2002, c. 29);
- Canadian Environmental Protection Act, 1999 (1999, c. 33);
- National Fire Code of Canada (2005);
- Yukon Historic Resources Act;
- Yukon Archaeological Sites Regulations;
- Yukon Environmental Protection Act;
- Transportation of Dangerous Goods Act;
- Yukon Waters Act (SY 2003, c.19; amended by SY 2007, c.6); and
- Quartz Mining Act Mining Land Use Regulations (for exploration)
http://www.gov.yk.ca/legislation/regs/oic2003_064.pdf;

1.3.2 Management Practise Guidelines and Industry Standards

Management practice guidelines, industry standards and other documents used to develop this EMP include (but are not limited to):

- Canadian Council of Ministers of the Environment (CCME) Canadian Environmental Quality Guidelines (2013);

- CCME Environmental Code of Practice (Update) for Above Ground Storage Tanks Systems Containing Petroleum Products and Allied Petroleum Products (1994);
- Workplace Hazardous Materials Information System (WHIMIS);
- DFO's Measures to Avoid Causing Harm to Fish and Fish Habitat (DFO, 2013);
- Guidelines for Industrial Activity in Bear Country (MPERG, 2008a);
- Staying Safe in Bear Country (Safety in Bear Country Society, 2007);
- Flying in Caribou Country (MPERG, 2008b);
- Flying in Sheep Country (MPERG, 2008c);
- E3 Environmental Excellence in Exploration standards developed by the Prospectors and Developers Association of Canada;
- Quartz Mining Act Mining Land Use Regulations (for exploration) http://www.gov.yk.ca/legislation/regs/oic2003_064.pdf;
- Yukon Chamber of Mines' Yukon Mineral and Coal Exploration Best Management Practices and Regulatory Guide http://www.yukonminers.ca/images/BMP_RG_October28_REVISIED_WebFile.pdf;
- Best Management Practices for Works Affecting Water in Yukon http://www.env.gov.yk.ca/publications-maps/documents/bestpractes_water.pdf; and
- Proponent's Guide: Assessing and Mitigating the Risk of Human-Bear Encounters http://www.env.gov.yk.ca/publications-maps/documents/proponents_guide_bear_risk.pdf.

1.4 Structure and Organization

The contents of the EMP includes the following:

- **Section 1: Introduction** – Provides general background information on the purpose and organization of the EMP;
- **Section 2: Roles and Responsibilities** – Describes roles, responsibilities, and reporting relationships of the BMC team (including their contractors, environmental professionals and monitors);
- **Section 3: Environmental Monitoring** – Describes the environmental monitoring, reporting requirements, and incident reporting standards; and
- **Section 4: Environmental Requirements** – Describes the mitigation measures, actions, and precautions applicable to the work.

1.5 Living Document

This Environmental Management Plan (EMP) is a 'living' document that will be reviewed and updated prior to and during exploration activities. When new or additional information is known, the EMP will be revised and updated to account for this new information. Mitigation measures and site-specific details will also be refined during detailed planning for the exploration project and through additional information available from Kaska Nation and regulatory agencies.

Mitigation and monitoring requirements will be re-evaluated during the course of exploration based on the following:

- Environmental monitoring conducted during exploration;
- Observations made by the Project Geologist; and
- Consultations with the Kaska Nation regarding the exploration activities.

2 ROLES AND RESPONSIBILITIES

2.1 BMC Project Manager

Roles and responsibilities of the BMC Project Manager include the following:

- Providing the resources to ensure the implementations and control of this EMP;
- The delegation of authority necessary to carry out the elements of the EMP;
- Reporting on the performance of the EMP;
- Instigating action required to correct any non-conformances; and
- Undertaking a management review which will address the need for changes to the EMP in light of site specific conditions, changing circumstances, monitoring results of the Exploration Project, and the commitment to continual improvement.

2.2 Project Geologist

Roles and responsibilities of the Project Geologist include the following:

- Communicating the relevant environmental requirements of the EMP to the exploration team and contractors (i.e. personnel on site) through site orientation meetings, tailgate meetings etc.;
- Ensuring work activities comply with the EMP;
- Manage and conduct the exploration activities in a manner that reduces the likelihood of environmental incidents; and
- Preparing reports and/or reviewing the reports provided by the Environmental Monitor.

2.3 Contractors/Employees

All contractors and employees will be responsible for conducting their work in manner which will achieve the required level of environmental protection including: conducting themselves in a responsible and polite manner at all times, respecting the community life, their values, rules, customs, and local traditions. BMC contractors and employees will be required to follow the requirements of this EMP.

2.4 BMC Environmental Manager

Roles and responsibilities of the Environmental Manager include the following:

- Providing updates when required to the EMP;
- Development of site-specific Environmental Protection Plans (if required);
- Providing on-site training to the Environmental Monitor;
- Communication of the EMP to the Project Manager, Project Geologist, Environmental Monitor and other relevant parties;
- Assisting in emergency situations to minimize adverse environmental effects;
- Identification of sensitive environmental areas;
- Providing notification to applicable environmental regulators, if required, related to environmental aspects of the Exploration Project (if requested);
- Manage pre-exploration environmental surveys (if required);
- Conduct at least one site inspection per month during active exploration activities; and
- Preparation of an environmental completion report at the conclusion of exploration activities.

2.5 Environmental Monitor

Roles and responsibilities of Environmental Monitor include the following:

- Participate in HSE meetings, as necessary;
- Monitor the efficacy of the mitigation and management practises being undertaken by the contractor (described herein);
- Provide recommendations for modifying and/or improving environmental mitigation measures, as necessary;
- Notify the Project Geologist and Environmental Manager on spills of hazardous materials and other environmental incidents;
- Prepare environmental documentation for BMC, including weekly environmental reports on environmental measures that are being undertaken at the Site as described in the EMP;
- Liaise with and report to the Project Geologist and Environmental Manager with respect to issues that may require communication with regulatory agencies, Kaska Nation and other key stakeholders;
- Assist in emergency situations to minimize adverse environmental effects;

2.6 Key Lines of Communication

Figure1 presents the Key lines of communications for the KZK EMP.

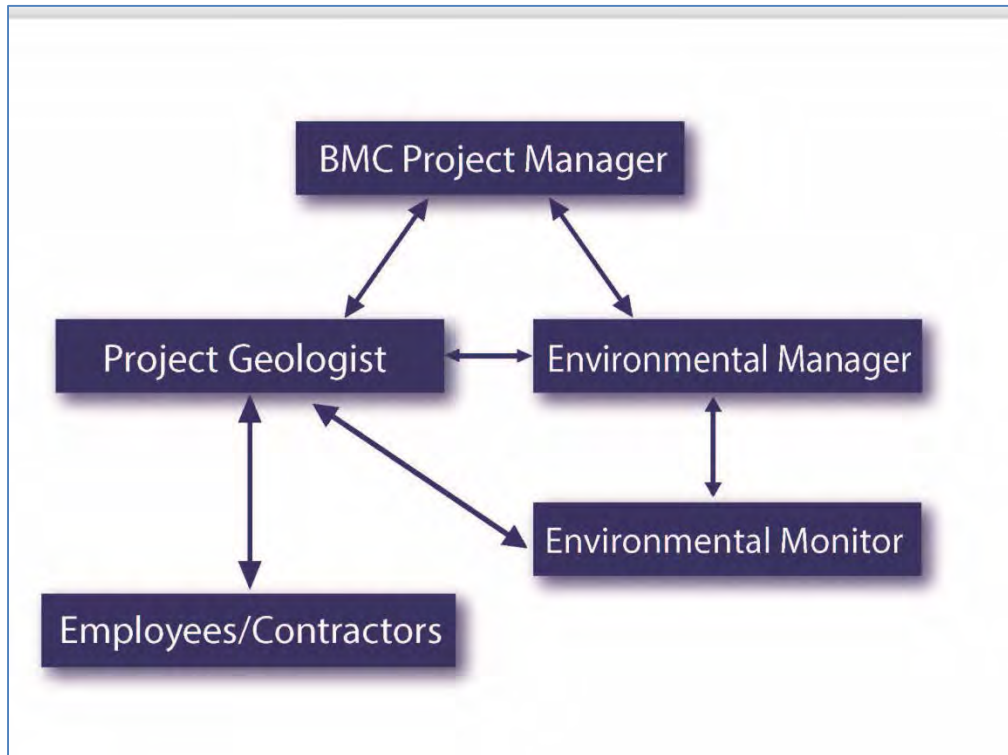


Figure 1. Key Lines of Communication for the KZK Exploration Project

3 ENVIRONMENTAL MONITORING PROGRAM

3.1 General

All on-site personnel will be required under the Company policies to report to the Project Geologist any activities and/or situations of concern that have the potential to impact the environment. The Project Geologist in collaboration with the Environmental Monitor (EM) will monitor all project activities and will provide an updated progress report on environmental matters in accordance with Company reporting standards

3.2 Monitoring Frequency

The environmental monitor will conduct environmental monitoring of the site weekly (at least one to two days per week) throughout the exploration project. The Environmental Manager will conduct inspections at least once each month for the duration of Exploration. An environmental monitoring report template and an environmental site inspection form, are included in Appendix A and B, respectively.

3.3 Reporting

The EM will provide weekly written progress reports to the Environmental Manager in the form of the environmental monitoring report and site inspection form. The reports will include the status of exploration-site environmental related items and activities, any property damage, environmental incidents (with details of product spilled, volume and soil clean-up undertaken) and regulatory action (if any). All environmental monitoring reports will be reviewed and signed off by the Environmental Manager weekly and will be provided to BMC's Project Manager once per month. Copies of all environmental records will be included as attachments in weekly environmental monitoring reports, (e.g., copies of environmental orientation records, copies of completed inspection checklists, results of water quality testing).

BMC's Project Manager shall be notified of environmental incidents as early as possible after any incident occurs. The target deadline for environmental incident reporting is within 24 hours following an incident.

3.4 Records

Records will be maintained by the Project Geologist with the site job file and retained for training, audit and review by BMC.

Records kept will include but not be limited to:

- Copies of minutes of HSE meetings;
- HSE induction and training records;
- Supporting documentation relating to incidents; and

3.5 Incident and Near Miss Reporting and Investigation

All incidents resulting in the following will be reported immediately to the Project Geologist who will report it without delay to BMC's Project Manager and the Environmental Manager:

- Release of any volume of hazardous material;
- Any violation of EH&S legislation;

- Non-compliance with the EMP;
- Wildlife incidents, collisions or mortalities;
- Any unplanned loss of fish habitat or damage to fish bearing watercourses;
- Receipt of notice of any alleged violation of any EH&S legislation or any action by a government authority;
- Any inspection or notice of inspection by a government authority;
- Any legal proceedings for EH&S alleged violations or releases; and
- A situation drawing media attention or requiring immediate assistance in respect of environmental resources.

All incidents occurring on the exploration site will be investigated by the Project Geologist, following the protocol outlined below:

1. Identify the root cause / concern;
2. Propose and implement corrective action(s);
3. Implement and modify controls to avoid repetition;
4. Take action and record changes if necessary to written procedures;
5. Communicate the changes and/ or required actions to staff and subcontractors; and
6. Communicate the results and changes to BMC – a written investigation report must be submitted to BMC within 72 hours of the occurrence.

All potential hazards and near misses will be reported to the Project Geologist.

4 ENVIRONMENTAL REQUIREMENTS

This section of the EMP provides the environmental requirements for the Exploration Project including the following:

- Wildlife Disturbance Mitigation Plan
- Sediment and Erosion Control Plan
- Water Quality Management Plan
- Fish Habitat Protection and Management Plan
- Metal Leaching and Acid Rock Drainage Prediction and Prevention Plan
- Vegetation Management Plan
- Air Quality and Dust Control Plan
- Noise Management Plan
- Archaeological Chance Find Procedure
- Equipment Management Plan
- Spill Prevention Plan
- Waste Management Plan
- Site Restoration Plan

Note that the section of the EMP does not include emergency response procedures (including spill prevention and forest fire response procedures, as these items have already been adequately documented in the Contractor's (Equity Exploration Consultants Ltd) Emergency Response Plan.

4.1 Wildlife Disturbance Mitigation Plan

The objective of this Wildlife Disturbance Mitigation Plan is to avoid and/or minimize the potential impacts of exploration activity to fish, wildlife and their habitat. To meet this objective, the plan targets the following goals:

- Avoid interactions with wildlife;
- Reduce potential wildlife disturbance;

- Reduce and mitigate habitat disturbance; and
- Prevent wildlife mortalities.

Development of the Wildlife Disturbance Mitigation Plan is based on key guiding principles from sources which include the following:

- Guidelines for Industrial Activity in Bear Country (MPERG, 2008a);
- Staying Safe in Bear Country (Safety in Bear Country Society, 2007);
- Flying in Caribou Country (MPERG, 2008b);
- Flying in Sheep Country (MPERG, 2008c);
- Yukon Waters Act (SY 2003, c.19; amended by SY 2007, c.6);
- Standard operating practices; and
- Information obtained from the Kaska Nation during the previous work on the Kudz Ze Kayah Advanced Exploration Project in the 1990s.

4.1.1 Wildlife Resources

Wildlife resources in the project area and surroundings include the Finlayson caribou herd, moose, black bear, grizzly bear, wolf, fox, coyote, wolverine, marten, mink, river otter, beaver, several raptors, ptarmigan, various waterfowl, and a variety of other birds. The lakes and small ponds/wetlands provide breeding and migratory habitats for waterfowl and other aquatic birds. The Finlayson Lake/River area and the east slope of the Pelly Mountains are also known as a migration corridor for waterfowl and other waterbirds (including trumpeter swans and sandhill cranes).

A program of wildlife studies for the Kudz Ze Kayah Project was initiated in November 1994 (Cominco, 1996). Initial studies focused on the immediate project area and were subsequently expanded to address a broader study area occupied by the Finlayson caribou herd. Detailed studies focused on the regionally significant Finlayson caribou herd. The Ross River Dena's reliance on this herd for sustenance was an important factor in development of this Wildlife Disturbance Mitigation Plan.

The Finlayson caribou herd has been the subject of a significant management effort by the Yukon Government since the early 1980s. Recent studies have been conducted by the Yukon Government and Yukon Zinc (to support the Wolverine Project Environmental Assessment and more recently their Operations Monitoring Program) (Adamczewski et al, 2010; Hegel, 2013; and Yukon Zinc Corporation, 2014). Studies have included detailed population surveys and radio collaring. This herd has substantial value as a subsistence base for the Ross River Dena, for resident sport hunters, and for the Yukon guiding industry.

The caribou surveys conducted previously for the Kudz Ze Kayah Project found that rutting occurs in October on the ridges and plateaus to the east and west of Geona Creek and caribou remain in the project area until at least mid-November in most years. Caribou migrate through the Geona Creek valley from their summer and fall ranges to the south and move northward to their winter ranges in the Pelly lowlands to the north, adjacent to the Robert Campbell Highway. The Wildlife Disturbance Mitigation Plan includes mitigation measures to minimize impacts to wildlife and wildlife habitat (including caribou).

4.1.2 Regulatory Requirements

The following regulatory requirements apply to the Wildlife Disturbance Mitigation Plan.

4.1.2.1 Species at Risk Act

The *Species at Risk Act (SARA)* (Government of Canada, 2002) identifies wildlife species considered at risk, categorizing them as Threatened, Endangered, Extirpated, or of Special Concern, and prohibits a number of specific activities related to listed species, including killing or harming the species, as well as the destruction of critical habitat which has been identified in any of the plans required under the *SARA*.

The protections in the *SARA* currently apply throughout Canada to all aquatic species and migratory birds (as listed in the *Migratory Birds Convention Act, 1994* [Government of Canada, 1994]), regardless of whether the species are resident on federal, provincial, public, or private land. This means that if a species is listed in the *SARA* and is either an aquatic species or a migratory bird, there is a prohibition against harming it or its residence. For all other listed species, the protections of the *SARA* only apply on federal lands, including National Parks and Indian Reserves.

A list of the potential species at risk or of concern that might be in the exploration area have been included in Appendix C. If these species or sign of their presence are identified/encountered in the project area, the regional Biologist in Watson Lake (867-536-3214) should be contacted for advice on possible mitigations.

4.1.2.2 Migratory Birds Convention Act, 1994

The following federal laws apply to all actively nesting birds in the proposed Project area. Federal migratory bird protection under section 6 of the *Migratory Birds Convention Act, 1994* states that "subject to subsection 5(9), no person shall:

- disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird; or
- have in his possession a live migratory bird, or a carcass, skin, nest or egg of a migratory bird except under authority of a permit. SOR/80-577, s. 4" (Government of Canada 1994).

Issues related to the *Migratory Birds Convention Act, 1994* might arise during land clearing or works related to the proposed Project within riparian set-back areas (if required).

4.1.2.3 Yukon Wildlife Act

Environment Yukon manages wildlife under to the *Yukon Wildlife Act (2002)* and in accordance with First Nation Final Agreements.

The *Yukon Wildlife Act (2002)* defines "wildlife" as any vertebrate animal of any species or type that is wild by nature, and includes wildlife in captivity, but does not include fish or a species of animal prescribed by the regulations not to be wildlife. This *Act* provides rules for hunting and trapping, outfitting and guiding, licensing, enforcement, and habitat protection. It also gives authority to make various regulations, such as identifying specially protected wildlife, setting measures to protect those species, prescribing areas to be wildlife sanctuaries, methods of hunting and trapping, licensing and permitting conditions, and the submission of harvest information.

The *Yukon Wildlife Act (Regulations Section 5)* lists several species as "specially protected" including:

- Cougar
- Gyrfalcon
- Peregrine Falcon
- Trumpeter Swan
- Chisana Caribou Herd

4.1.3 Wildlife Disturbance Mitigation

The following general management principles are based on review of the key guiding principles described in the introduction section of this Plan. These management principles provide a framework for the development of detailed measures described in the proceeding sections of this Plan.

Unless stated otherwise, the following management principles refer to all parts of the exploration Project:

- Manage wildlife-human interactions;
- Include provisions for wildlife in transportation and access management;
- Prohibit hunting and fishing;
- Prohibit feeding of wildlife;
- Manage waste to minimize wildlife attractants;
- Maintain a bear awareness program;
- Provide employee and contractor training;
- Manage wildlife habitat where appropriate;
- Avoid areas and times of heightened wildlife sensitivity;
- Establish wildlife reporting and monitoring procedures; and
- Conduct pre-exploration surveys for presence of nesting birds (as required).

4.1.4 Management of Wildlife-Human Interactions

To minimize potential effects to wildlife, it is essential that work activities be carried out in a safe and responsible manner at all times. Many procedures contained in this Plan directly or indirectly reduce the likelihood of wildlife-human interactions. General procedures will include the following:

- As part of safety training, all personnel and contractors will be provided wildlife safety and awareness training, including bear awareness and how to avoid disturbing sensitive species such as caribou.
- Personnel and contractors will not attempt to handle nuisance or problem wildlife without specific direction from the Conservation Officer (district office in Faro 867-994-2862 or Watson Lake 867- 536-3210).
- All field personnel will carry bear repellent spray with them at all times, as well as functioning radios, with scheduled check-in times to ensure worker safety.
- Harassment of wildlife will not be tolerated. This includes attempts to chase, catch, divert, follow, or otherwise harass wildlife by on- or off-road vehicles, aircraft, or on foot (excluding situations where diversion for human safety is required).
- All work areas will be kept free of garbage and spills. All uncontained garbage or spills will be cleaned up immediately. Improperly disposed garbage, especially food or camp wastes, will be cleaned up and reported to the Project Geologist as soon as possible. With proper waste management, bears will be less likely to be attracted to the camp and work areas.
- The construction of new roads will be avoided to the extent possible.
- Trenches and drill site cuts will be sloped to allow for personnel and wildlife to exit safely. Trenches will be back-filled once investigated and sampled.
- If ungulates, bears or wolverines, are encountered while carrying out project activities, the activities shall stop, as long as it is safe to do so, until the animal(s) has left the area. Wildlife shall be given the right of way.
- Wildlife observation forms will be filled out and added to the wildlife log (the forms have been included in Appendix D). The log will be maintained to provide information regarding presence of wildlife and potential changes in use of areas over time.
- Wildlife interactions (e.g., traffic accidents) and nuisance or problem animals will be reported to the project geologist immediately. Observations of wildlife behaving abnormally will be reported within 24 hours. A wildlife incident form is included in Appendix D.

If bears become a nuisance, the Contractor shall contact the Conservation Officer to determine if an electric fence around the camp is warranted.

4.1.5 Species at Risk

In addition to the management and mitigation measures described in this EMP, if species at risk are identified in the exploration area the following will be implemented:

- Maintain a distance from wildlife;
- Record sightings and presence (time, location, activity of wildlife) of wildlife on or near worksites or roads and communicate to other workers on site (Appendix D contains the observation form to be filled out);
- Avoid worksites where sensitive species have been seen until the wildlife moves away; and
- Den and nest sites: if discovered during work, locations must be recorded and avoided until no longer in use by wildlife.

4.1.6 No Hunting / No Fishing

FA "no hunting/no fishing" policy will be enforced for all personnel in all exploration areas (including the tote road and access trails). This policy will be communicated to all employees and contractors during the site orientation.

4.1.7 No Fire Arm Policy

All firearms are prohibited at the BMC Minerals (No. 1) Ltd, Kudz Ze Kayah site unless otherwise authorized by BMC Management. Firearms are to only be used for the protection of personnel and property in the event of dangerous wildlife. All authorized firearms at the Kudz Ze Kayah Project site are under direct control of the BMC Management or an employee(s) designated by BMC Management. As described in the Yukon Occupational Health and Safety Regulations "any worker who is required to use, handle or otherwise have control of a firearm shall:

- have successfully completed the Canadian Firearms Safety Course, as given by an instructor who is designated by a chief firearms officer, and
- have demonstrated proficiency with that firearm to the employer."

Every designated employee who handles firearms in the course of their duties, must hold a valid Federal Firearms Possession License with non-restricted acquisition privileges.

All firearms must be handled and stored in accordance with the federal Firearms Act. This includes, but is not limited to, locking mechanisms on all firearms when not in use and proper storage of ammunition.

4.1.8 No Recreational Use of ATVs and Snowmobiles

Recreational use of all-terrain vehicles (ATVs) and snowmobiles is prohibited on BMC Minerals Exploration sites.

Use of the tote road to access recreational areas for ATVing and snowmobiling is strictly prohibited.

4.1.9 No Feeding of Animals

A "no feeding of animals" policy will be enforced for all personnel in all exploration areas. This policy will be communicated to all employees and contractors during the site orientation. Contractors will also be required to adhere to this policy as part of their contractual agreements with BMC.

4.1.10 Waste Management

Domestic waste will be managed to reduce the risk of wildlife-human interactions. Mitigation measures to minimize wildlife attraction will include, but are not limited to the following:

- Implementing a Bear Awareness Program.
- Storing wastes in wildlife-proof containers, including trash cans and dumpsters with a bear-resistant design and removable plastic liners to contain odours.
- The garbage disposal area will be kept at least 100m from sleeping quarters.
- Food and kitchen waste will be managed as follows:
 - Frozen food will be kept in freezers, with fresh food kept in refrigerators.
 - The camp and kitchen areas will be kept clean, and free of refuse.
 - While waiting to be burned, garbage will be kept in a sturdy plywood box with a lid and latch so that bears will not be able to access it.
 - Garbage will be burned in an incinerator daily whenever possible, to prevent the accumulation of waste.
 - The incinerator will likely be the highly effective “SmartAsh” model Cyclonic Barrel Burner incinerator, which can be used as fuel-fired or forced-air depending on the type of garbage being burned. Ash from the incinerator will be disposed of in outhouses, as required, or buried.
 - Non-combustible garbage (e.g., cans, tins, metal, recycling) will be back-hauled offsite by helicopter and disposed of at the municipal dump and/or recycle centre.
- If food is taken out into the field (i.e., in lunches) field crews will bring all garbage back with them for disposal.
- All food and cooking supplies will be stored securely in the containers or removed from site during times when the camp is closed.
- Grey water (i.e., from showers and the kitchen) will be disposed of in a sump. Once the sump water drains at the end of the season, the sediment will be buried.
- The *Yukon Waters Act* (2003) will be followed, to prevent any potential water contamination.
- Any flagging tape used to carry out project activities must be removed once the activities are completed, unless bio-degradable tape is utilised.

With proper waste management, electric fencing is not anticipated to be required.

4.1.11 Bear Awareness Program

Training will orient employees to correct waste disposal procedures and reporting guidelines. All employees will be given Bear Awareness training (both in-house training and watching the educational video “Staying Safe in bear Country”). The Project Geologist onsite will also give in-field training to employees, as needed. No field personnel shall attempt to feed any animals. The training will have the following objectives:

- Eliminating bear deaths and relocations as a result of them being attracted into the exploration area due to garbage, fruit, compost, and other human-generated attractants;
- Increasing worker understanding of the negative implications on bears and humans when bears become habituated to camps for food;
- How to use the bear deterrent devices (i.e. bear spray); and
- Maintaining domestic areas as litter-free as possible.

4.1.12 Wildlife Habitat Management

Specific habitat management measures are recommended to minimize the risk of changes in habitat suitability. Standard operating practices for the Project will include the following:

- The KZK Camp location will be chosen for its proximity to the desired exploration areas, and also so as to minimize proximity to natural wildlife habitats (the camp location will avoid critical caribou habitat such as rutting areas). In addition, the camp will be greater than 30 m from the high water mark of any water body.
- Trenches and drill site cuts will be sloped to allow for personnel and wildlife to exit safely. Trenches will be back-filled once investigated and sampled.
- If exploration activities are to occur along the existing tote road, revegetate with non-palatable vegetation at drill sites.
- Ongoing reclamation from all exploration activities will be undertaken.
- Only biodegradable synthetic drilling fluids will be utilised at the drill.
- Bulk fuel systems, sub-caches of smaller containers (e.g. 205 L drums) and other fuel or waste fuel storage areas will be on stable ground and set back greater than 30 metres from the high water mark of any water body. Bladder bulk fuel systems and all sub-caches will be placed in synthetic berms. Earthen berms will act as a third containment barrier for double-walled fuel tanks.
- If nests, dens or mineral licks are encountered the Contractor will contact the Environmental Manager who will contact Watson Lake Regional Biologist for information on appropriate setback distances. Any new mineral licks found will be reported to the Watson Lake Regional Biologist.
- Where construction of trails cannot be avoided, the Contractor shall construct trails as narrow as possible and avoid straight lines where possible.

4.1.13 Helicopter Operation

The guidelines developed by the Mining and Petroleum Environmental Research Group (MPERG) have been adapted to minimize potential wildlife harassment from aircraft and helicopter over flights. All personnel, pilots and contractors will be asked to follow the guidelines as set out in "Flying in Caribou Country: How to minimize disturbance from aircraft" (MPERG, 2008b). These guidelines will be provided to aircraft and helicopter service providers. Key mitigation measures will include the following:

- Flight path routes will be determined to best avoid disturbing wildlife and active hunting areas. Consultation with the Kaska Nation and Outfitters will be ongoing throughout the field season to aid in avoiding sensitive areas. Flying will be avoided over areas where wildlife has been observed in past seasons (based on publically available information from the Yukon Zinc Studies in the vicinity of the Project and Yukon Government data), and areas sensitive to wildlife at certain times will be avoided.
- Flights will be conducted at minimum of 300 m (1000 ft.) above ground level elevations to minimize disturbance to wildlife, except where required for work, safe landing approaches/ flight path, etc.
- Flying height for airborne geophysical surveys will likely be below 300 m, but the surveys will be timed so as to not interfere with caribou rutting/calving seasons etc.
- The airborne geophysics program will not be carried out during critical periods for caribou, which is May to July for calving and post-calving and mid-September to mid-October for rutting. The airborne geophysics program will be conducted during late August.
- The helicopter exploration activities during critical periods for caribou will be avoided if caribou are present within 1 km of the active work area during these times (May to July for calving and post-calving and mid-September to mid-October for rutting). Helicopter exploration activities shall cease until the caribou have left the area.
- Purposefully flying towards, hovering and circling wildlife will not be permitted.

4.1.14 Access Management

Increased access to the traditional range of the Finlayson caribou herd, especially along their migration route to winter range, has been identified as the primary concern by Yukon Government and the Ross River Kaska Dena (Cominco, 1996). The security station and gate at the access to the tote road from the Robert Campbell Highway has been

seasonally manned and maintained by a member of the Ross River community since 1995, and only authorized vehicles are allowed on the tote road. Over the winter period the gate is locked. Access along the tote road will continue to be managed in this fashion.

In addition:

- Minimum traffic levels will be maintained to the extent possible.
- A site vehicle access register will be maintained at the gatehouse.
- Wildlife will have the right-of-way along the entire tote road.
- If caribou or moose are encountered on the tote road, the equipment and/or activity is to be halted until the wildlife has left the immediate area.
- The authorized use of on-road and off-road vehicles will be restricted to established roads and designated trails at the exploration site except to access monitoring sites and remote communications equipment. Use of private and recreational vehicles will be prohibited at all times.
- All wildlife observations on access corridors will be recorded in the Wildlife Observation Form and added to the Wildlife Log.

4.1.15 Reporting Procedures

Reporting procedures for wildlife-human interactions, wildlife observations and wildlife features (i.e. nest, den, mineral lick, species at risk etc.) will be included in employee and contractor orientations. Reporting procedures will also include reporting wildlife incidents (i.e. close or aggressive encounters, unusual or erratic behaviour, traffic accidents or near misses, and dead or injured wildlife). Records will be managed by the Project Geologist. The records will be used to provide an indication of the effectiveness of wildlife mitigation measures and to allow an adaptive management approach to improve the performance of the mitigation measures. Forms for Wildlife Observations, Wildlife Incidents and a project Wildlife Log are included in Appendix D. The wildlife log will be provided to the Regional Biologist and District Conservation Office on an annual basis.

In the unlikely event that wildlife fatalities (i.e. caribou, moose, bear, or species at risk) occur along the tote road or at the exploration site the incident will be reported to the Conservation Officer (district office in Faro 867-994-2862 or Watson Lake 867- 536-3210).

4.1.16 Employee and Contractor Orientation

Employee and contractor orientation will be an important element of the exploration project. Orientation will include the following topics of relevance to wildlife management:

- Tote road use protocols;
- A "no hunting/no fishing" policy;
- Bear Awareness;
- Waste management procedures;
- Wildlife observation and interaction reporting procedures;
- Wildlife sensitive locations/timing, as applicable;
- Helicopter management practises; and
- Access management practises.

4.2 Sediment and Erosion Control Plan

The tote road licence requires the lessee to not do anything which will cause erosion of the banks of adjacent water bodies, and requires the Lessee to provide necessary controls to prevent such erosion. Consequently, the following mitigation strategies will be used, when deemed necessary, to prevent sediment and erosion:

- Stage work sites or dill hole locations to minimize the exposure of sensitive soils to surface runoff.
- Minimize clearing.
- Retain natural vegetation and ground cover in and around creeks and in areas where sensitive soils exist;
- Before and during Project work activities the following erosion and sediment control supplies will be on hand to construct, install and maintain erosion and sediment control measures:
 - i. Sediment fencing
 - ii. Mulch covers
 - iii. Geotextiles
 - iv. Straw bales (certified weed free)
 - v. Clean crushed rock or gravel
 - vi. RECP (Coco mats)
 - vii. Polyethylene sheeting
- Erosion and sediment control measures will be installed before proceeding with potentially erosion or sediment-generating project work activities
- Strip organic material and topsoil and stockpile it in an approved location for reuse during reinstatement and rehabilitation works, if practicable.
- Overburden and soil, if required to be stored on site, will be stored in a manner to minimize potential for entry into streams and watercourses. No materials will be stockpiled with 15 m of the top of the bank of any watercourse or wetland, unless otherwise reviewed by the EM and deemed to pose a low risk of sediment entry into any waterbody. Soil stockpiles will be bermed, sloped and seeded or tarped to minimize erosion, wherever possible.
- Suspend activities potentially resulting in excessive runoff during and immediately following intense rainfall events, at the discretion of the Project Geologist or under instruction from the EM;
- Inspect and maintain any erosion and sediment control measures so that they remain fully functional;
- Remove erosion and sediment control measures following reclamation.

The EM will work with the Project Geologist to select and advise on the appropriate type of sediment and erosion control measures that are required at each site. The EM will also:

- Conduct regular inspections of erosion and sediment control measures before and during the activities and any deficiencies will be immediately reported to the Project Geologist; and
- Implement any actions arising from inspection of sediment and erosion control structures to ensure they are appropriately installed and maintained.

4.3 Water Quality Management Plan

The EM will conduct water quality monitoring for turbidity plumes (visual) and with a turbidity meter, hydrocarbon sheens from oil and grease (visual), and iron bacteria/ochre (visual) during all work in the vicinity of any watercourse, ditches or wetland. If oil or grease is suspected in the water, a sample will be collected and submitted to an accredited laboratory for chemical analysis. Meters will be immediately available on site for real-time temperature, pH, dissolved oxygen, turbidity and conductivity measurements. The water quality will be monitored 25 m upstream and 25 m

downstream of work areas by the environmental monitor. The applicable water quality guidelines are included in Table 4-1.

If impacts are noticed monitoring will occur at 25 m increments downstream. Appendix E contains the water monitoring form that will be filled out for each measurement.

Monitoring will be conducted daily until the activity near the waterbody has been completed.

Table 4-1. Water Quality Guidelines for the Protection of Freshwater Aquatic Life

Parameter	Maximum Allowable
Suspended Solids	<p>CCME - Increase of 25 mg/L above background at any one time for a duration of 24 hours in all waters during clear flows or in clear waters. Increase of 5 mg/L above background at any one time for a duration of 30 days in all waters during clear flows or in clear waters. Increase of 25 mg/L above background at any time when background is 25 – 250 mg/L during high flows or in turbid waters. 10% increase when background is >250 mg/L at any time during high flows or in turbid waters.</p> <p>Water Licence – 15 mg/L</p> <p>Note – Background concentrations were measured at <4 mg/L in 2010 and 2012.</p>
Turbidity	<p>CCME - Increase of 8 NTU above background at any one time for a duration of 24 hours in all waters during clear flows or in clear waters. Increase of 2 NTU above background at any one time for a duration of 30 days in all water during clear flows or in clear waters. Increase of 8 NTU above background at any time when background is 8 – 80 NTU during high flows or in turbid waters. 10% increase when background is >80 NTU at any time during high flows or in turbid waters.</p> <p>Water Licence – no value provided</p> <p>Note – Turbidity is typically very low at the site (the highest value measured was 9.5 NTU in 1995 and the average is approximately 2.2 NTU)</p>
pH	<p>CCME - 6.5 – 9.0</p> <p>Water Licence - 6.5-9</p>
Oil and Grease	<p>Water Licence – none visible</p>

4.4 Fish Habitat Protection and Mitigation Plan

The project site has had extensive exploration activities in the past, subsequently the activities that will occur through the current program will use the previous trails established on the site, to the extent practical. The setback areas for the protection of fish and fish habitat for the project are 30 m for fish bearing-streams and 15 m for non-fish bearing –streams. However, some drill holes may need to be drilled within 30 m of a watercourse. The fish bearing and non-fish bearing streams at the site were previously identified in the Initial Environmental Evaluation (Cominco, 1996) and have been subsequently monitored in 2010 and 2012 (Laberge 2011 and 2012). Studies from the 1990s found Geona Creek and the small ponds overlying the ABM deposit generally to have low abundances of fish (Cominco, 1996), containing just a few slimy sculpin (*Cottus cognatus*) and young arctic grayling (*Thymallus arcticus*). Somewhat further downstream, adult arctic grayling and burbot (*Lota lota*) occur in Finlayson Creek.

Any unmapped streams and waterbodies in the area are not likely to be fish-bearing or to provide fish habitat, and accordingly, activity around these types of features could likely be undertaken with implementation of mitigation measures described below, at the discretion of the Project Geologist and Environmental Manager.

No in stream work is planned to be conducted during course of exploration. If in stream work needs to be conducted, proper regulatory agencies, BMC and the Environmental Manager will be notified, and a proper mitigation plan will be submitted, and implemented prior to the commencement of the planned activity.

4.4.1 Mitigation Measures

In order to prevent and minimize the degradation of fish, fish habitat, and waterbodies within 30 m of a fish bearing waterbody or 15 m of a non-fish bearing waterbody, the following mitigation measures will be followed:

- All exploration holes will be completed through helicopter (rather than skid) support in order to avoid using heavy machinery (e.g. bulldozer, excavator) within the buffer zone.
- The Erosion and Sediment Control Plan and Waste Management Plan (presented in this EMP) and the Emergency Response Plan (including Spill Prevention Plan) (presented under a separate cover), will be implemented to prevent sediment and deleterious substances from entering watercourses.
- The deposition of deleterious substances into aquatic environments will be avoided by removing waste material from work sites and preventing debris from entering watercourses.
- All mobile equipment will be equipped with spill kits. A single large spill kit will also be kept on-site for larger spills.
- All machinery and motorized tools, will be refueled away from all water bodies;
- Pumps will have a drip tray underneath (to collect any fuel or lubricant drips). Fuel tanks associated with the pumps will be double-walled and within a constructed berm such that all refueling is conducted in a contained area.
- Hazardous waste, in particular, any spent grease cartridges and/or rags contaminated with oil/fuel/hydraulic fluid will be stored in a water tight container and removed from work site. These materials will be disposed of at an appropriate waste management location at the camp.
- No drilling activities will be conducted during heavy rainfall events within the 30 or 15 m setback areas. This will reduce issues of siltation into fish-bearing and non-fish bearing waterbodies.
- When temporary riparian vegetation clearing or disturbances from temporary access construction occurs, these areas will be reclaimed following completion of drilling.
- The disturbance of riparian areas (within 15 m of the top of bank of any watercourse or wetland) will be minimized and adjusted to avoid particularly sensitive habitats, where possible. The measures will include:
 - Minimizing removal and disturbance of low-growing shrub, herb, or grass species;
 - Avoiding grubbing;
 - If falling of trees is required, tree falling will be directed away from the water body and falling will occur outside the breeding bird window (unless a survey has been completed for breeding birds).
- Preserving root structure and stability of topped trees located on the bank of a water body to help bind soil and encourage rapid colonization of low-growing plant species.

The following mitigation measures will apply to water course crossings:

- Design and install temporary culverts, bridges, or temporary fords according to current industry best management practices for all watercourse crossings when machinery requires permanent, seasonal, or temporary access during the exploration program. This includes:
 - DFO Regional Operational Guidelines for Culvert Maintenance (DFO, 2007);
 - DFO Operational Statement for Clearspan Bridges (DFO, 2007);
- Only crossing watercourses if an existing crossing at another location is not accessible. If an additional crossing is required, it will be limited to a 1-time event (over and back) and will adhere to appropriate fisheries timing windows for fish-bearing streams. Such crossings will adhere to DFO's Operational Statement for Temporary Ford Stream Crossings (DFO, 2007).

- Access to drill locations will be located and designed to avoid or minimize the number of watercourse crossings required.
- If replacement rock reinforcement/armoring are required to stabilize eroding inlets and outlets of a culvert, the following measures will be incorporated:
 - Adhering to fisheries timing windows;
 - Placing appropriately-sized, clean rocks into the eroding areas associated directly with the inlet or outlet;
 - Not obtaining rocks from below the high water mark of any watercourse;
 - Avoiding the use of rock that is acid-generating and avoiding the use of rock that fractures and breaks down quickly when exposed to the elements;
 - Installing rock at a similar slope to maintain a uniform stream bank and natural stream alignment; and
 - Not placing rock where it interferes with fish passage or constricts the channel width.

4.4.2 Drill Cuttings Management

The main objective in drill cuttings management is to ensure that deleterious substances do not enter water courses and that drill activities result in no increased sediment load to water courses during or after drilling. Drill cuttings returned in drilling fluids during diamond drilling activities will be handled differently for each of four situations:

1. exploration drilling (i.e. outside of the ABM deposit area)
2. ABM deposit drilling while coring un- or weakly mineralized hangingwall or footwall rocks
3. ABM deposit drilling while coring portions of the massive sulfide resource
4. Any ABM deposit drill sites within 30 m of water courses

For exploration drill holes the drill return fluids will be directed into sumps. These sumps may be hand dug pits or natural depressions but they will need to be large enough to effectively capture the quantity of return water and may not be allowed to overflow. A series of two or more sumps is acceptable to handle overflow. Sediment control measures such as straw bale "walls" may be used to guard sump edges. Once drilling has ceased, sumps should be allowed to drain and then be promptly back-filled.

Drilling at the ABM deposit will result in significant coring of base-metal-rich massive sulfide. Because there is an extensive database from the 1990s, intersections of massive sulfide will be predictable. During coring of weakly or un-mineralized rock above or below the massive sulfide lenses, drill cuttings can be deposited in sumps as described above for exploration-type drilling.

While coring massive sulfide, however, extra precautions need to be taken to ensure that metal-rich cuttings material does not enter water courses. As such, a cuttings collection circuit will be utilized by the drill crew. This may involve a series of settling tanks or a centrifugal system. The Project Geologist will communicate the drill holes depths over which cuttings will need to be collected in writing prior to collaring each hole and this will form part of the overall plan for each drill hole. If possible, the returned cuttings will be pumped as far away from water courses as practicable for cuttings collection. Additionally, cuttings collection apparatus may be established at a few sites which may service several 10s of drill holes if pumping of returned drilling fluids 100-200 m is readily possible. These sulfide cuttings will be trucked away from the ABM deposit to a centralized site for burial using the onsite excavator.

The fourth cuttings control situation involves drill set-ups that occur within 30 m of watercourses (ponds or streams). Ideally, no drilling will occur within this buffer but if avoiding this situation is not possible, then the cuttings collection

circuit will be used for the entire length of drill hole. That is, cuttings will be collected for both the un-mineralized rock and massive sulfide rock.

4.4.3 Timing Windows

Fish habitat can be adversely affected by instream work that occurs during certain periods in their life history or at certain life stages. Life history periods or life stages susceptible to disturbances from instream work include the following:

- Spawning and egg incubation;
- Movements to or from spawning or overwintering areas; and
- Eggs and newly hatched fry.

Timing works to avoid sensitive life history periods or life stages is an effective means of mitigating potentially adverse effects. Windows of least risk are identified to protect all fish species that are known to occur in a stream. The Project's windows of least risk are provided by DFO for the Yukon. Table 4-2 summarizes the least risk timing windows for fish species present within the Liard River Basin and that have been identified at the site during the monitoring period from 1995 to 2014).

Table 4-2. Reduced Risk Work Windows for Fish Previously Identified at the Site

Species	Reduced Risk Work Window	
	Start date	Finish date
Arctic Grayling	June 15	April 15

Adapted from: DFO Freshwater Timing Windows Identified for the Yukon (<http://www.dfo-mpo.gc.ca/pnw-ppe/timing-periodes/yk-eng.html>, accessed January 5 2015).

Activities in fish streams as well as tributaries that have a risk of depositing sediment into fish streams will follow the timing window of least risk to fish and fish habitat (Table 4-2) unless one of the following conditions can be met:

- If the stream channel is naturally dry (no flow) or frozen to the bottom at the worksite and the instream activity will not adversely impact fish habitat; and
- If construction of a winter crossing is proposed and such works does not adversely impact the stream channel (including stream banks), fish habitat or fish passage.

4.5 Metal Leaching and Acid Drainage (ML/ARD) Management Plan

In order to mitigate the potential for Metal Leaching and Acid Rock Drainage (ML/ARD) the following mitigation and management measures will be implemented:

- Drill holes penetrating massive sulphide will be grouted and collars cemented;
- Core stored on site will be covered to prevent water access and leaching; and
- Water quality is currently being sampled monthly throughout the exploration area, the results will be reviewed each month and compared to historical data set, to confirm that exploration activities are not impacting the site.

4.6 Vegetation Management

The objective of the vegetation management plan is to:

1. Minimize loss and degradation to vegetation and ecosystems, with emphasis on Ecosystems of Concern (listed, alpine and wetter subalpine vegetated ecosystems, riparian vegetation, old forests, and pine-lichen forests that serve as potential pine mushroom habitat);
2. Maintain healthy ecosystems and vegetation; and
3. Revegetate disturbed areas in a manner that meets the reclamation objectives and establishes natural, self-maintaining ecosystems.

4.6.1 Minimization of Unavoidable Effects

Efforts will be made to use already disturbed sites. For example, the existing trails/cut lines will be used during exploration activities which will minimize disturbances to vegetation. Minimizing vegetation clearing limits and ground disturbance is the best way to minimize effects to vegetation. Soil compaction and erosion control measures will be implemented to support the minimization of effects to ecosystems and vegetation. These measures are outlined in the Erosion and Sediment Control Management Plan. In addition, mechanical damage to trees will be avoided wherever possible so as to not introduce damaging insects and disease that can get introduced via tree damage.

4.6.2 Management of Invasive Species

The Contractor shall familiarise themselves with Yukon invasive species and how to manage them by referring to the Yukon Invasives Species Council document.

To prevent the spread of invasive plants, all heavy equipment and vehicles shall be clean and free of seed and plant material before entering the project area.

If invasives are identified at the site that are listed in the Yukon Invasives Species Council document, they should be reported to the Regional Biologist.

4.6.3 Reclamation

See the site Restoration Plan (Section 4.12).

4.7 Air Quality Management

4.7.1 Idle Restrictions

Idling of vehicles and equipment will be reduced whenever possible. Idling times will be restricted during periods of inactivity, such as when vehicles are stopped in a queue, off-road equipment and heavy machinery is not being used. This will be conveyed to all personnel and contractors during the site orientation.

4.7.2 Burning/Incinerating

Combustible garbage will be stored in a lockable bin and burned in an incinerator on a daily basis to prevent its accumulation. The incinerator will likely be a "SmartAsh" model Cyclonic Barrel Burner, which can be used as fuel-fired or forced-air depending on the type of garbage being burned. The incinerator will be optimally located downwind of the predominant wind direction so that the incinerator emissions have a negligible effect on air quality in the camp area.

451BLighting of fires is not permitted without first having obtained, in writing, permissions from the Yukon Fire Management Zone office in Ross River (867-969-2243).

4.7.3 Dust Control

There is low potential for dust to be generated from vehicle traffic along the tote road (due to the minimal use of the road during exploration). However, where the tote road adjoins the Robert Campbell Highway, there is the potential for material to be tracked onto the highway. If material is tracked onto the public highway, and is creating dust, the road will be cleaned (i.e. tracked material will be removed from the surface). The maximum speed along the tote road will be 30 km per hr, which will decrease the potential for dust generated along the tote road.

4.8 Noise Management Plan

The following procedures will be in place to minimize the noise generated during various heavy equipment, generators, helicopters, trucks, and general traffic:

- Equipment shall be maintained in good working order.
- Standard practices and the use of 'Best Available Control Technologies' for noise control on equipment such as mufflers and silencers will be used.
- Wildlife, disturbance will be minimized to the extent possible;
 - Mitigation measures for helicopter operation (Section 4.1.10) will be implemented to reduce noise impacts to wildlife; and
 - Idling restrictions (Section 4.6.1) will also reduce noise impacts to wildlife.
- Affected stakeholders will be consulted regarding the flight paths of the helicopter(s), the discussions will include preferred paths and scheduling of flights (i.e. time of day and season).

4.9 Archaeological Chance Find Procedure

This Archaeological Chance Find Procedure provides the procedures to identify, protect and manage undiscovered archaeological and heritage sites within the project area during exploration activities. The project area is within the traditional territory of the Kaska Nation which is comprised of the Ross River Dena Council (RRDC) and the Liard First Nation (LFN). The Kaska people, traditionally called the Kaska Dena, have lived on the land in their traditional territory since time immemorial.

A heritage resource survey was undertaken (between May 4 to 24, 1995) as part of the Environmental Assessment for the Kudzu Ze Kayah Advanced Exploration Project. The study was completed in two phases: Phase 1 was the resource assessment of the tote road from the Robert Campbell Highway to the project site; and Phase 2 was an assessment of the proposed mine development area. The survey, undertaken by Doug Rutherford and a field assistant from the Ross River Kaska Dena, consisted of an archaeological reconnaissance of the proposed road alignment and the mine development areas to assess the potential and test for the presence of archaeological resources. Concurrently, an oral history was conducted to determine traditional land use within the project area by an elder of the Ross River Dena Council. Seven elders were interviewed during the project. A final report was prepared by Rutherford and submitted to the Heritage Branch, Government of Yukon in early July of 1995 (Rutherford, D.E., June 1995, Archaeological Reconnaissance of the Kudzu Ze Kayah Project, Central Yukon, Phases 1 and 2).

No cultural material was observed in the surface survey during the Phase 1 and 2 assessments. A total of 15 areas were tested along the tote road route prior to construction and an additional 6 in the previously proposed mine development area. Sites tested were selected as having the greatest potential for cultural material based upon maps, air photos, with helicopter and foot surveys of the study area. Sampling sites selected also considered geographical factors such as proximity to water (including consideration of landscape change over time), drainage, and level

surfaces for comfortable living or camping conditions. No evidence of cultural material or features were observed during the archaeological assessment within the area of the mine project.

In 1995 an airstrip was also proposed for a site near the tote road and the Robert Campbell Highway. This area is adjacent to the surveyed mine site area that was found to have a low potential for heritage resources, but was not surveyed at the time of the first work. Additional survey work was completed in July 1996 to ensure that no heritage resources will be impacted with construction of the airstrip.

The oral history interviews from the Rutherford study (1995) indicates that the traditional use of the project area is primarily related to subsistence hunting, trapping and fishing activities. Locations of summer and winter trails, cabins and camping areas were compiled by the RRDC. The hunting of caribou, moose, sheep and small game, as well as fishing in the areas of North Lakes, Wolverine Lake and Finlayson Lake, were identified. The project area likely was used as one of the routes of travel to the North Lakes.

Although no cultural material or features were identified during the Rutherford study, there is the potential for the exploration activities to impact unidentified heritage and archaeological sites. For instance activities that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

The purpose of this document is to address the possibility of chance archaeological finds within the project area and to provide protocols to follow to ensure that archaeological sites are documented and protected as required.

4.9.1 Relevant Legislation and Regulations

Implementation of this Chance Find Procedure will ensure that the requirements of the *Yukon Historic Resources Act* and *Yukon Archaeological Sites Regulations* are met. It is a requirement in the Yukon that historic (heritage) and archaeological sites not be disturbed or artifacts removed. If a new site is found, it must be reported.

Archaeological resources, including historical burials, are protected under the *Heritage Conservation Act (1996)* and may not be altered, damaged, moved, excavated, or desecrated in any way without a permit issued under Section 12 or 14 of the *Act*.

According to the *Yukon Archaeological Sites Regulations*, an artifact is an object of archaeological or historical interest that is older than 45 years and that has been abandoned. It is against the law to remove an artifact from an archaeological or historical site without a permit.

4.9.2 Materials

There are several common criteria that may indicate the presence of archaeological materials, burials or other archaeological sites. Common site indicators that may be encountered in the project area include the presence of artifacts, rectangular depressions (cache pits or burials), and rock cairns.

Artifact Scatters

Stone artifacts, either isolated or in concentrations (consisting of the actual tools themselves as well as the detritus from their manufacture), butchered and/or worked mammal bones. These artifacts can be located both on the surface and subsurface. They will be comprised of one or more of the following materials:

- Obsidian: volcanic glass ranging from opaque to transparent with color varying between dark/light blacks, grays and banded blues. Chance findings could be whole to partial points (“arrowheads”) or minute flakes resulting from manufacturing.
- Chert: sedimentary rock found as pebbles in conglomerate fragments commonly light green with possible banding. Chance findings could be large to small flakes resulting from manufacturing. Flakes will have curved aspects and possible sharp edges.
- Andesite: volcanic rock found as isolated pieces. Chance findings could be large to small flakes resulting from manufacturing.

Note that chert and andesite are common rock types and are only considered to be archaeological artifacts if they have been worked by humans at a time that predates 1846. Similarly, animal bones from modern hunting are not considered archaeological artifacts.

Burials and Associated Evidence

The material and/or features associated with mortuary practice, including human remains, burial pits, mounds, cairns, as well as grave goods and grave markers. Potentially present as rectangular mounds or depressions, possibly lined with rock or wood.

Cairns

Rock cairns may also be found in this area and are characterized by the structured placement of rocks in piles. One of the traditional uses of rock cairns are for the marking or defining a trail/route, however they may also be used mark boundaries or graves (as described above).

Cache Pits

Cache pits which were used to store dried foods for periods of time. They are characterized by small rectangular depressions generally not more than 3 by 2 m wide by 2 m deep found in well drained areas.

Other Archaeological Site Indicators

Archaeological sites are often identified by the presents of things that do not naturally occur in an area. Some other indicators of archaeological sites may include: concentrations of burnt bone, charcoal, and fire cracked rock.

4.9.3 Chance Find Procedure

If you believe that you may have come upon evidence of past human occupation or archaeological materials, such as those described above:

- STOP work in the area immediately
- MARK the area with flagging tape
- NOTIFY the project geologist
- AVOID area until further notice

Once the project geologist has been informed he/she will complete the Archaeological Chance Find Report Form (Appendix F). The project geologist will notify the Vice President of Equity Exploration, BMC’s Project Manager and BMC’s Environmental Advisor who will notify the Kaska Representative(s), Energy, Mines and Resources, the Yukon Archaeology Department and RCMP (if human remains are discovered). The relevant contact information has been included in Table 4-3.

Potential significance of the materials will be assessed by a qualified archaeologist in collaboration with the Archaeology Department and Kaska Representative(s) and mitigative options will be identified. BMC’s Project

Manager and Environmental Advisor and will work with the Kaska Representative(s) to ensure that any further action needed is taken.

Table 4-3. Chance Find Procedure: Contact List

Name	Contact Information
Equity Exploration Consultants	
Neil Perk, MBA, P.Geo Vice President	Phone: 604-688-9806, Ext. 107 Cell: 604-355-1849 Fax: 604-688-0235 E-mail: neilp@equityexploration.com
BMC Minerals (No. 1) Ltd.	
Robin Black, MSc Exploration Manager	Cell: 1-778-386-5213 E-mail: robinb@bmcminerals.com
Environmental Manager Kelli Bergh, BSc, MET, RP Bio	Cell: 778-233-7058 Fax: 604-221-6575 E-mail: kdbergh@gmail.com
Kaska Nation (Ross River Dena Council)	
Heritage Contact Norman Sterriah - TK Coordinator	Phone: [telephone numbers redacted] Cell: [telephone numbers redacted] E-mail: [email addresses redacted]
Energy, Mines and Resources	
Judy St.Amand	Phone: 867-456-3961 Fax: 867-456-3899 E-mail: judy.stamand@gov.yk.ca
Yukon Archaeology	
Jeff Hunsten - Manager Heritage Resources Unit, Department of Tourism and Culture	Phone: 867-667-5363 Fax: 867-667-6456 E-mail: Jeff.Hunston@gov.yk.ca
RCMP (if human remains are suspected/discovered)	
Ross River Detachment,	Phone: 867-969-2677 Fax: 867-390-2905

4.10 Equipment Management

Prior to bringing any equipment into the Exploration site, the operator will:

- a) Clean the equipment.
- b) Conduct an inspection of the equipment and provide documentation to the Project Geologist which will ensure that:
 - i. Equipment is clean (free of mud, dirt, vegetation, oil);
 - ii. Equipment is in good working order;
 - iii. Drip/containment tray is available for equipment and is stored on site readily available;
 - iv. Equipment has a spill kit, and fire extinguisher on board; and
 - v. Mufflers or acoustic cladding is correctly fitted.

In addition, the Contractor will:

1. Check to ensure all maintenance logs for equipment are up to date before deployment.

2. Provide daily inspections of all equipment in drill pad locations, ensuring the equipment remains in good working conditions and is leak-free.
3. Keep daily records, documenting observations needing follow up with the Project Geologist; and
4. Pay special attention to the condition of equipment's hydraulic, fuel and lubricating systems. Equipment found to have a fuel or fluid leaks shall be prohibited from entering the exploration area. Identified leaks will be immediately repaired and not operated until the repair is complete.
5. Environmental monitor on site will provide initial heavy equipment inspections in the weekly environmental monitoring reports.
6. All machinery operating at the exploration site will be free of excess oil and grease.
7. Where equipment with hydraulic lines are working, hydraulic lines will be in good working order and comply with manufacturers' specifications.
8. Emergency spill equipment will be available on site at all times.
9. Portable generators and pumps will be stationed with secondary containment (such as spill trays) that provides 110% volume of the largest tank to prevent release of hydrocarbons to the environment.

4.11 Spill Prevention/Spill Response and Reporting

The project will adhere to the Equity Exploration Spill Prevention and Response plan. This plan will be communicated to all contractors on-site.

4.12 Waste Management Plan

This plan describes the procedures in place to address the collection, containment, transportation and disposal or recycling of wastes generated by the Project.

The Contractor(s) will ensure the necessary resources for hazardous and non-hazardous waste management and control. This includes, but is not limited to the following practices:

- Provision of appropriate waste segregation, classification and storage;
- Adherence to reuse and recycling principles;
- Good housekeeping to remove waste from work areas at the end of each shift and ensure the Project site, all temporary work areas, and any storage areas are tidy and well-maintained;
- Food wastes to be collected as described in the Wildlife Management Plan;
- Ensure personnel are responsible for any litter found, which shall be collected and disposed of in appropriately marked waste bins;
- Completing duty of care documentation for all waste transfers and waste manifests when transporting hazardous waste.
- No dumping of rubbish, fuels or other pollutants will be allowed on land or into water bodies.

4.12.1 Domestic Waste and Non-hazardous Waste

Waste water from the kitchen, laundry and shower facilities (i.e. greywater) will be treated by a septic field installed according to the remote, seasonal camp guidelines defined by Yukon Health and Social Services (YHSS, 2012) that are specific to septic fields excluding human waste. A conventional system comprising subsurface soil absorption is proposed given that the camp will be road accessible and heavy equipment (e.g. excavator) will be onsite. On-going communication with Environmental Health Services will occur to get approval for the septic system design and installation. Upon completion of the project, the septic field will be decommissioned.

Waste generated from camp and drilling operations will be sorted into combustible (e.g. food scraps, cardboard boxes, scrap lumber) and non-combustible (e.g. scrap metal) types. Combustible waste will be placed in lockable bins and incinerated daily on the project site to minimize the build-up of waste and chance of attracting wildlife. Ash will be buried in deep (>1 m) pits or trucked to the Whitehorse Landfill. Non-combustible waste will also be stored in lockable bins and sent to Whitehorse Landfill or recycling depots at regular intervals (generally weekly) throughout the program.

4.12.2 Special Waste

Special wastes predicted to be generated includes:

- Oils and fluids from equipment maintenance (lubricants, hydraulic oil, antifreeze);
- Used oil filters;
- Rags or sorbents contaminated with solvents, paint thinners, other flammable liquids or oils;
- Contaminated water in drip trays; and
- Containers associated with any of the above (drums, barrels, etc.).

Waste fuel and oil will be collected in specially marked 205 litre steel drums and stored in a synthetic berm. Periodically, Small's Expediting of Whitehorse (Special Waste Permit 42-108) will transport waste fuel to a regulated disposal facility (e.g. KBL Environmental or Special Waste Management in Whitehorse). In the case of a spill, contaminated soil will be dug up and placed in drums, then transported to a regulated facility for disposal. Used batteries will also be shipped to a regulated disposal facility.

Additionally:

- Solvents, acids and caustic liquid waste will be collected separately;
- Waste coolant will be stored in steel or plastic barrels with adequate secondary containment and tight fitting screw top bungs;
- Used oil filters and containers will be stored separately; and
- Incompatible hazardous wastes will be stored separately.

Rags or sorbents contaminated with solvents, paint thinners, or other flammable liquids are regulated under the Special Waste Regulation and Transportation of Dangerous Goods Act as flammable solids. Oil contaminated sorbents will be segregated from sorbents contaminated with flammable liquids. Used rags or sorbents contaminated with oil or flammable liquids will be collected in open-top drums fitted with self-closing lids and placed on a raised vented bottom. Full drums of oily rags will be stored with lids secured away from combustible materials and labelled with "Used rags/sorbents containing (Substance X)".

Rags contaminated with non-flammable oil are regulated under the Solid Waste Regulation as waste oil, while rags contaminated with flammable substances are regulated under the Transportation of Dangerous Goods Act.

4.13 Site Restoration Plan

To minimize areas requiring restoration, the following procedures will be followed:

- Clear only the minimum ground area necessary for exploration;
- Maintain a low shrub, herbaceous layer and avoid root grubbing in areas where soil disturbance is not required;
- Minimize activities and damage to retain vegetation including sensitive areas (i.e. riparian areas);
- Minimize extent and duration of soil exposure;

- Where possible, the vegetation and organic mat will be separated from the underlying rock, stockpiled, and replaced when the site is no longer needed; and
- Avoid placing debris and brush across wildlife trails and riparian areas.

Areas that have been disturbed (i.e. exploration trails and drill sites) will be reseeded with an appropriate seeding mix. The Government of Yukon, Compliance, Monitoring and Inspections will be contacted to verify the appropriate seed mix. Any suggestions for vegetation types from local organisations will also be taken into account. Ground cover will be re-established on disturbed areas as soon as possible.

The progressive reclamation of exploration trails will involve re-contouring/stabilizing and cutting ditches and bars to ensure run-off flows across the trail rather than down it. At the drill sites, once the sump water will drain, the sump will be buried and the area reseeded.

The EM will conduct follow-up monitoring of the progressive reclamation (likely post freshet of each year and before winter of each to determine if the re-seeding and other reclamation activities were successful in re-establishing the vegetative mat and community. If it was not successful additional reclamation will be recommended.

At the end of the exploration activities, all equipment, camp gear and fuel will be removed prior to permit expiry and any wood structures will be broken down and burned (once the appropriate permits have been obtained). Drill core will remain on site, stored in a safe and secure manner to preserve integrity of this valuable archive. All waste materials will be transported to a municipal dump and or recycling centre as appropriate. Septic tanks will be left in the ground and the sewage tank will be removed. All sumps and pit privies will be back-filled.

5 TRAINING, AWARENESS AND COMPETENCE

BMC is aware all personnel on this Project have the potential to create an impact on the environment and as such require appropriate training. All staff will attend the Site Orientation before being allowed to commence work. The Project Geologist will conduct a training assessment based on the job tasks to determine training requirements.

Pre-job environmental meetings and tool-box talks will be held to brief staff before the start of each new job, or before working in a new area or when the job scope changes.

General tool box talk will be held on a regular basis to communicate general and task-specific environmental requirements. Emphasis will be placed during tool box training on:

- Conformance with the procedures and requirements presented in the EMP;
- The significant environmental impacts; actual or potential, of work activities and the environmental benefits of improved personal performance;
- The roles and responsibilities in achieving conformance with the procedures and requirements of the EMP including emergency preparedness and response;
- The potential consequences of not following the procedures in the EMP; and
- Spill notification and clean-up procedures.

Any changes to the EMP will be communicated to all Project staff and contractors.

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APPENDICES

Appendix A	Weekly Monitoring Report Template
Appendix B	Environmental Audit Checklist
Appendix C	Species of Concern Fact Sheet
Appendix D	Wildlife Forms
Appendix E	Water Monitoring Template
Appendix F	Archaeological Chance Find Form

Appendix A Weekly Monitoring Report Template

BMC Minerals (No. 1) Ltd.

530-1130 West Pender Street, Vancouver, BC V6E 4A4

Weekly Environmental Monitoring Report

Owner:	BMC Minerals (No.1) Ltd.	Date:	
Project:	Kudz Ze Kayah Exploration Project	Report#:	
Location:	Yukon Territory	Environmental Monitoring Period:	
Contractor:	Equity Exploration Consultants Ltd.	Environmental Monitor:	
		Reviewed & Approved by:	

Weather	
Temperature Max./Min.	
Precipitation	

Weekly Progress, Tasks Completed

Weekly activities:

Observations & Recommendations:

Wildlife Sightings:

Water Monitoring:

Planned Works:

Issues:

Photo Log:

Photo 1. (Provide description of the photo and insert it here)

Appendix B Environmental Audit Checklist

**Environmental Audit Checklist
Kudz Ze Kayah Exploration Project**

BMC Minerals (No. 1) Ltd

Date: _____

Environmental Monitor Name: _____

Report #: _____

Weather: _____

Environmental Monitor Signature: _____

Site Control	Yes	No	Maintenance Required/Notes	Location	Repair Date
Is site access blocked/detours in place?					
Are they practicing good house keeping?					
Material stockpiles are in suitable areas?					
Are there garbage containers?					
Waste/recyclable material stored correctly?					
Hazardous material is stored correctly?					
Is MSDS information accessible?					
Adequate fire extinguishers available?					
Are there adequate spill kits?					
Are the fueling areas well maintained?					
Is there mud tracking?					
Are dust controls needed/utilized?					
Is water managed effectively on site?					
Are wildlife sightings being reported?					
Are invasive flora or fauna being brought to site?					
Erosion and Sediment Control	Yes	No	Maintenance Required	Location	Repair Date
Land disturbance has been minimized?					
Is vegetation protection in place?					
Is topsoil/seeding done as required?					
Have trees or shrubs been planted?					
Are erosion controls in place on slopes?					
Are straw bale barrier/berms in place?					
Silt fences are in place/good condition?					
Is there erosion taking place?					
Water Quality Monitoring	Yes	No	Maintenance Required	Location	Repair Date
Fish/Amphibian habitat identified?					
Watercourse monitored?					
Turbid water addressed?					
Are the stream directions maintained?					
Are the stream slopes protected?					
Assessments & Inspections	Yes	No	Maintenance Required	Location	Repair Date
Daily inspection records are available?					

Additional Notes: _____

Project Geologist Name: _____

Project Geologist Signature: _____

Appendix C Species of Concern Fact Sheet

Species of Concern Fact Sheet for Kudz Ze Kaya Project

Introduction

In order to identify species of concern that could be at the exploration site, the mineral claim areas were sent to the Yukon Conservation Data Centre for their review of the Yukon's database (January 19, 2015). It was requested that species of concern that could be within the study area or within 20 km of the study area be identified. The Yukon Conservation Data Center's Biologist responded with the following list:

- Bank Swallow
- Caribou (Northern Mountain)
- Collared Pika
- Common Nighthawk
- Grizzly Bear
- Gypsy Cuckoo Bumble Bee
- Little Brown Myotis (bat)
- Northern Myotis (bat)
- Olive-sided Flycatcher
- Red-necked Phalarope
- Rusty Blackbird
- Short-eared Owl
- Western Bumble Bee, mackayi ssp
- Wolverine
- Woodchuck

In addition, on March 17, 2015 Environment Canada provided comments for YESAB's Screening of the Class 3 Exploration Permit Application for the KZK project. Environment Canada identified (in addition to those identified above) two more bird species:

- Barn Swallow
- Horner Grebe

Fact Sheets for these species have been included herein. If these species are observed during exploration activities, they will be recorded in the project wildlife observation form and wildlife log.

Information on rare plants expected in the area can be found at the following website: http://www.env.gov.yk.ca/animals-habitat/documents/SEJan2014_small.pdf (Rare Plants of the Southeast Yukon). Following a review of the document it was determined that none are known within the project area. However, Leafy Thistle and Mount Sheldon Ragwort might be expected to occur in the area. Therefore, fact sheets for these two rare plants have also been included.



Photo: Cameron Eckert

Bank Swallow

Riparia riparia

THREATENED

This widespread species has shown a severe long-term decline of 98% of its Canadian population (now estimated at 1.4 million) over the last 40 years. As with many other aerial insectivores, the decline continues, albeit at a slower rate since the 1980s. Data from 2001-2011 indicate a potential loss of 31% of the population during that 10-year time period.

Description

The Bank Swallow is the smallest swallow in the Americas. Total body length averages 12 cm and they weigh 10-18 g. Sexes are similar in size and plumage. Bank Swallows have a grey-brown head, a pale

forehead, white underparts, a distinctive brown upper breast-band, and a long notched tail. In flight, the Bank Swallow is best distinguished by its small size, distinctive breast-band, and its quick and flicking wing-beats.

Typical Habitat

The Bank Swallow breeds in a wide variety of natural and artificial sites with vertical banks, including riverbanks, lake and ocean bluffs, aggregate pits, road cuts, and stockpiles of soil. Sand-silt substrates are preferred for excavating nest burrows. Breeding sites tend to be somewhat ephemeral because of bank erosion. Breeding sites are often situated near open habitat used for aerial foraging (e.g., grasslands, meadows, rivers or lakes). Large wetlands are used as communal



Bank Swallow Range

nocturnal roost sites during post-breeding and migration periods.

Potential Threats

The reasons for the declines are not well understood, but are likely driven by the cumulative effects of several threats. These include loss of breeding and foraging habitat, destruction of nests during aggregate excavation, collision

with vehicles, widespread pesticide use affecting prey abundance, and impacts of climate change.

DID YOU KNOW?

- The Bank Swallow has an extensive global distribution, occurring on every continent except Australia and Antarctica.
- In Yukon, Bank Swallows are among the most numerous birds encountered by river travellers.



Photo: Gord Court

Barn Swallow

Hirundo rustica

THREATENED

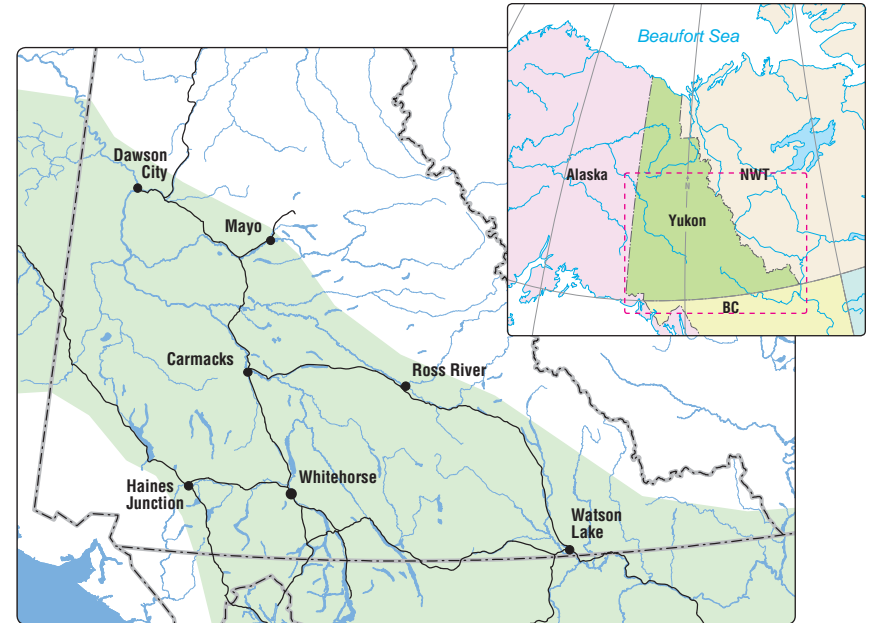
The Barn Swallow is the most widespread species of swallow in the world, and has become closely associated with human rural settlements. Despite its cosmopolitan distribution and close ties with humans, it has suffered recent, significant declines that began somewhat inexplicably in the mid 1980s. In the last ten years alone, populations have declined about 30% in Canada. Causes of this decline are not clearly understood, but the Barn Swallow is an insectivorous, long-distance migrant, and may be suffering primarily from troubles on its tropical wintering ground and migration routes.

Description

The Barn Swallow is a small, slender bird easily recognized by its steely-blue back, cinnamon belly, chestnut throat and forehead, and by its deeply forked 'swallow' tail.

Typical Habitat

- Following European settlement, nesting sites of Barn Swallows have shifted almost completely from natural sites (caves and crevices in cliff faces) to manmade structures. Structures most commonly used include barns and other outbuildings, garages, houses, bridges, and road culverts.
- Barn Swallows prefer various types of open habitats for foraging, including grassy fields, wetlands, farmyards and croplands, lake and river shorelines, cleared rights-of-way, sand dunes, and alpine tundra.



Barn Swallow Range

Potential Threats

- Nests may be lost through intentional or incidental destruction on buildings and bridges.
- Yukon's Barn Swallows may also be threatened during their migration by loss of foraging habitat, and exposure due to pesticides at tropical wintering grounds.

DID YOU KNOW?

- The Barn Swallow is perhaps the only Yukon breeding bird that occasionally breeds in South America during the boreal winter.
- The Barn Swallow is found on every continent except Antarctica.
- Scientific studies have shown that female Barn Swallows prefer males with longer, more symmetrical tails.



Photo: Trish Loretz

Woodland Caribou, Northern Mountain population

Rangifer tarandus caribou

SPECIAL CONCERN

Typical Habitat

- In general, the habitat of Woodland Caribou is lichen-rich, mature and old coniferous forest in a matrix with one or more of alpine/subalpine, subarctic taiga, peatlands, or lakeshores.
- Northern Mountain Caribou spend the summer in alpine and upper subalpine ranges and in winter move down to the forest in lower areas where ground lichens are abundant and snow cover is relatively shallow.

Potential Threats

- Loss or degradation of habitat as a result of rural land use and industrial development.
- Habitat changes that result in an increased risk of predation or hunting, as well as unregulated hunting itself.
- Human disturbance (e.g. snow machines, exploration).
- Highway collisions are a threat for some herds.
- Climate change threatens Woodland Caribou in several ways:
 1. It may cause an increase in the frequency and severity of forest fires, eliminating winter forage habitat for 50 to 60 years;
 2. It will cause shrinkage of summer alpine tundra habitat; and
 3. It may cause spring icing events.

DID YOU KNOW?

- Caribou are the only members of the deer family where both sexes grow antlers.
- Twenty-six Northern Mountain Caribou Herds occur at least partially within Yukon. The Finlayson Herd may be the largest.
- Historically Woodland Caribou inhabited the forests of the northern US states from Maine to Washington. The last herd in the southern US has been reduced to 35 animals that live in the Selkirk Mountains of northern Washington and Idaho.



Woodland Caribou, Northern Mountain population Range



Left photo: Ryan Agar. Top photo: Jared Hobbs. Bottom photo: Kieran O'Donovan

Collared Pika

Ochotona collaris

SPECIAL CONCERN

The Collared Pika is a small relative of rabbits. Its bleating calls are familiar to hikers who venture into rocky alpine country in Yukon. The Collared Pika is a species that evolved in unglaciated Beringia, and is restricted to northwestern North America. Close to 50% of their range is in Yukon. Pikas have been deemed “harbingers of climate change” because of their sensitivity to climate patterns, and may be adversely affected by high snowfall and late snowmelt.

Description

Collared Pikas look like small, short-eared rabbits. They are about the size of a small squirrel, and are grey with paler grey patches on their napes and shoulders, which are

reminiscent of a collar around the neck.

Typical Habitat

Collared Pikas are restricted to alpine talus slopes interspersed with small meadows. The talus-meadow combination offers access to both forage and shelter from predators and weather. Pikas typically do not stray more than 10 m from the edge of the talus slope when foraging.

Threats

Because climate change in the Yukon is predicted to bring a greater variability in precipitation, the pika’s sensitivity to deep snowpacks and late snowmelt is of concern. This sensitivity, coupled with the fact that their alpine habitat will decline substantially in area as the climate warms, means that the potential for future population declines is substantial.



Collared Pika Range

DID YOU KNOW?

- Even though they live above treeline in Yukon, Collared Pikas do not hibernate.
- Pikas eat plants, but collect two types of diets in the summer—the first they eat right away, while the second is stored in ‘haypiles’ within the talus rocks for consumption during winter.
- They are solitary animals and defend individual territories.
- Juveniles emerge to the surface at one month of age and disperse to a new territory within days. They reach near-adult size during their first summer and must establish their own haypile before winter.
- Pika are often heard before they are seen. Listen for their weak “meep” alarm call when near or crossing rock piles.



Photo: John Meikle

Common Nighthawk

Chordeiles minor

THREATENED

Despite their 'common' name, declines approaching 50% have been recorded for Common Nighthawks across Canada in the last ten years. Substantial threats likely occur at the southern edge of their breeding range, and on their winter range in South America.

They are late migrants, usually arriving in Yukon in the first week of June. Two eggs are laid directly on soil, sand, gravel or bare rock. Nestlings remain in the nest until late summer.

Description

Common Nighthawks are medium-sized birds, with mottled, dark brown plumage. They have long, slender wings and a long tail. The head is

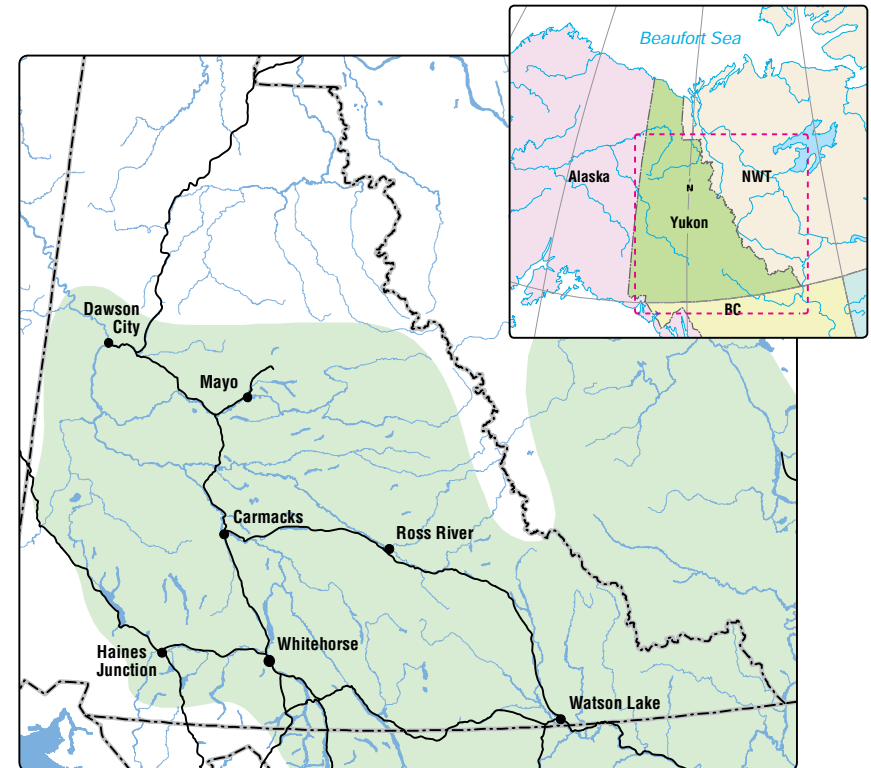
large and broad, with large eyes and a wide mouth. In flight, adults show a white patch on the wings.

Typical Habitat

- Common Nighthawks nest in a variety of habitats such as mature pine forests, old burned forests, open forests, and wetlands.
- Wetlands, lakes and rivers can be an important source of abundant flying insects.
- They are also known to nest on sand dunes and beaches, forest clearings including recently logged areas, rocky outcrops, peatlands, marshes, lakeshores, river banks, gravel roads and quarries, and the open areas around airstrips.

Potential Threats

- Reductions in insect prey due to pesticides.
- Habitat loss and degradation.



Common Nighthawk Range

- Human activities that result in increased numbers of predators such as domestic cats, ravens, gulls, and foxes.
- Collisions with motor vehicles, particularly on gravel roads.

DID YOU KNOW?

- Common Nighthawks actively pursue flying insects in the long summer twilight.
- The sexes can be distinguished by the colour of their throat: white in males and buff in females.
- Common Nighthawks are long-distance migrants, wintering in South America.
- During the breeding season, males perform an aerial courtship display. They dive straight down from a great height, then pull up—the air rushing through their wingtips at the bottom of the dive makes a deep booming sound.



Photo: Jared Hobbs

Grizzly Bear

Ursus arctos

SPECIAL CONCERN

Yukon is home to healthy populations of grizzlies, but they are vulnerable to threats that have reduced or eliminated populations elsewhere. These bears are slow to reproduce; female grizzlies mature at 6-8 years of age, have small litter sizes (commonly 1 or 2 cubs), and have long intervals between cub births (3 to 5 years). These factors make it difficult for them to recover from population declines. Increasing conflicts between bears and humans will likely result in the death of more bears.

Description

Typically, Grizzly Bears are larger than Black Bears and are more heavily built. They can be recognized by their prominent shoulder hump. Their colour varies from light gold to almost black.

Typical Habitat

- Grizzlies are most common in open tundra and subalpine terrain, but also range through the boreal forest.
- Concentrations occur where salmon spawn, such as in the Fishing Branch and southern Klwane areas.



Grizzly Bear Range

Potential Threats

- Increasing industrial development and expanding human habitation in Yukon could lead to an increase in bear-human conflicts. Bears are often relocated or killed in such situations.

DID YOU KNOW?

- Bears are more powerful than people—learn to avoid conflicts with bears and always travel in groups.
- Grizzlies can travel long distances and use very large areas of habitat. One bear that was tracked with a radio transmitter traveled 471 km (292 miles) in 23 days.



Description

The length of the queen is around 18 mm or 0.7 in, with a round face and a short proboscis. The male is quite smaller than the queen. The bumblebee has a pale yellow collar, often yellow hairs on the first tergite (abdominal segment), pale yellow sides on the third tergite and a white tail on an otherwise almost black abdomen.

James Lindsey at Ecology of Commanster

Bumble Bee, Gypsy Cuckoo

Bombus bohemicus

Conservation Status

COSEWIC Assessment: A2abce Endangered (May 2014)

Behaviour

The species is a cuckoo bumblebee, having *Bombus lucorum* as a host, killing or subduing its queen and taking over its nest. It feeds on various flowering plants, such as, among others, thyme, scabious, and thistles for the male, and willow, dandelion, clover, bilberry, and raspberry for the female.

Reason for Designation

This large and distinctive bee is a nest parasite of other bumble bees. It had an extensive range in Canada and has been recorded from all provinces and territories except Nunavut. Although not known to be abundant, there has been a large observed decline in relative abundance in the past 20-30 years in areas of Canada where the species was once common. Significant search effort throughout Canada in recent years has failed to detect this species, even where its hosts are still relatively abundant. Primary threats include decline of hosts (Rusty-patched Bumble Bee, Yellow-banded Bumble Bee, and Western Bumble Bee), pesticide use (particularly neonicotinoids), and the escape of non-native, pathogen-infected bumble bees from commercial greenhouses.



Photo: Donna Dewhurst, USFWS

Horned Grebe

Podiceps auritus

SPECIAL CONCERN

Although limited trend information is available from Yukon, Horned Grebes have suffered a 30% decline across Canada between 1986 and 2006, and a significant decline of 65% has been reported for Alberta. Horned Grebes are still relatively common on small lakes and wetlands in southern Yukon, but become less common as one travels north. Early migrants arrive in late April, but numbers quickly rise, peaking in the second week of May—up to 250 have been seen on Swan Lake, near Whitehorse. Between one and six eggs are laid in closely-guarded, floating nests. Horned Grebes feed on aquatic insects and small fish and frogs. The

last fall migrants have usually left the territory by the end of October.

Description

The Horned Grebe is a small waterbird with striking breeding plumage: bright golden feathers flare out behind the startlingly red eye, contrasting with a chunky, black head and back. The underparts are a rich, rusty brown.

Typical Habitat

- Horned Grebes nest on ponds and small lakes with marshy margins. The adults dive for food in open water, but the floating nests are anchored in shallow water in the midst of dense stands of sedge, reeds, or horsetails.

Potential Threats

- Wetland loss and degradation.



Horned Grebe Range

DID YOU KNOW?

- Unlike ducks, grebes do not have fully webbed feet; instead, each toe has its own lobe of skin that helps the grebe swim through the water.
- Baby Horned Grebes have striking, black-and-white zebra stripes on their heads and necks.
- Horned Grebes are aggressive

defenders of their nesting territories, so they usually nest as single pairs. But if the lake is large enough or food plentiful enough, several pairs may share the shoreline.

- Breeding Horned Grebes engage in a series of complex and spectacular ceremonial displays.



Photo: Graham Forbes

Little Brown Myotis

Myotis lucifugus

ENDANGERED

Description

The Little Brown Myotis is likely the most common bat species in Canada. Yukoners will probably recognize these bats because they often use buildings as day-roosts and forage in open areas, such as over lakes. Maternal colonies have been studied in the communities of Whitehorse, Watson Lake, and Haines Junction.

Typical Habitat

Little Brown Myotis are not yet known to hibernate in Yukon. Individuals arrive in late April and leave through September. They roost in buildings, rock crevices, tree

cavities, and under tree bark within the boreal forest zone, usually close to water.

Potential Threats

White-nose Syndrome (WNS) is caused by a fungal pathogen (*Pseudogymnoascus destructans*) that likely was brought from Europe



Photo: Graham Forbes



Little Brown Myotis Range

and was first recorded in US in 2006 and in Canada in 2010. Since then, population declines of more than 90% in northeastern US and 94% in eastern Canada have been reported. Mixing of bats during autumn swarming events and transmission by people may help spread WNS

across the species' range. Rate of spread has averaged 200-250 km/yr and WNS is predicted to infect the entire Canadian range by 2026-2030. Other threats include wind turbines, colony eradication due to public concerns, and other conflicts and disturbances.

DID YOU KNOW?

- Little Brown Myotis can live up to 34 years (the oldest known in Yukon is 12 years).
- The colonies in Yukon are some of the most northerly occurring bats in North America.

- They weigh about as much as a toonie.

For more information on Yukon bats see: www.env.gov.yk.ca/publications-maps/documents/yukonbats_brochure.pdf

MOUNT SHELDON RAGWORT WATCH LIST

Senecio sheldonensis

Composite Family (*Asteraceae*)

Habitat: Turfy places in subalpine meadows. Wet to moist meadows and forest openings in montane to alpine zones

DISTRIBUTION

Yukon: South and central Yukon

North America: Yukon, Northwest Territories, British Columbia

World: Endemic to mountains in NW Canada.

CONSERVATION RANK

Global rank: Vulnerable (G3)

Canadian rank: Vulnerable (N3)

Yukon rank: Imperilled to Vulnerable (S2S3)

Distinguishing features: It is separated from *S. triangularis* by its smaller stature (30-60cm tall), broadly lanceolate leaves (not triangular-hastate) and margins that are shallowly sinuate or wavy denticulate (not denticulate). Lacks basal leaves.



B. Bennett



Illustration L. Mennell - YG



B. Bennett



B. Bennett

For more information, contact the Yukon Conservation Data Centre at 867-667-3684 or yukoncdc@gov.yk.ca.





Photo: Graham Forbes

Northern Myotis

Myotis septentrionalis

ENDANGERED

Description

Very little is known about the Northern Myotis in Yukon. It was first recorded from the LaBiche River in 2004 and from the Watson Lake area in 2007. Its range covers much of North America but is absent in the mid-western US and rare in the southeastern US. The species appears more common in the northern parts of its range.

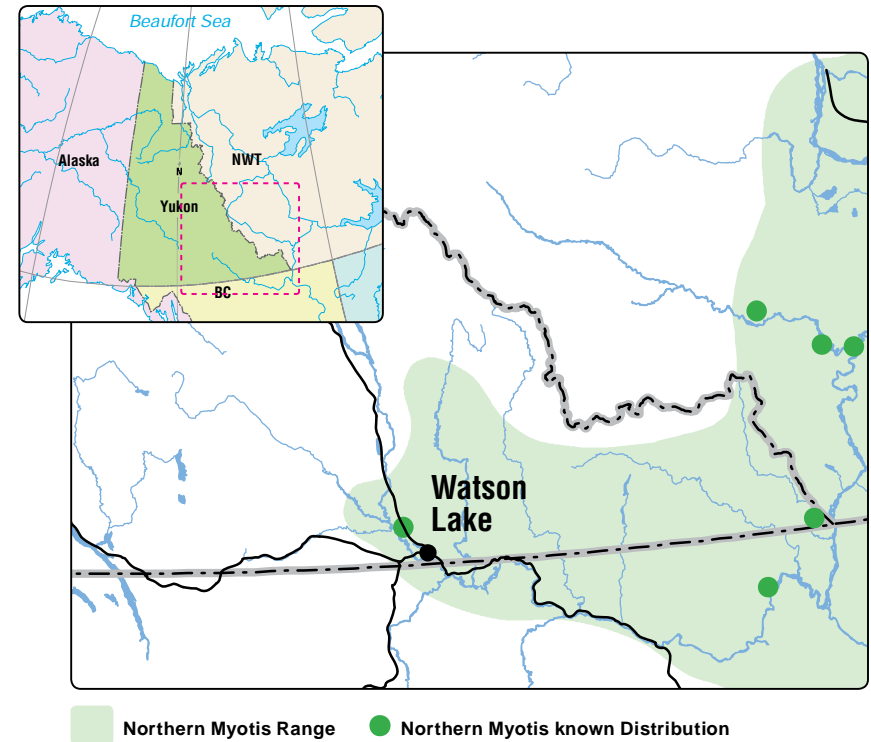
Typical Habitat

Northern Myotis are not known to hibernate in Yukon. They are less cold tolerant than Little Brown Myotis. In Yukon, they have been found only in the Liard River

drainage in older White Spruce dominated forests. Northern Myotis rarely use human-made structures for roosting and are strongly associated with older trees. Maternity colonies in eastern Canada are usually in larger trees, ranging from 25-44 cm diameter.

Potential Threats

White-nose Syndrome (WNS) is caused by a fungal pathogen (*Pseudogymnoascus destructans*) that likely was brought from Europe and was first recorded in US in 2006 and in Canada in 2010. Since then, population declines of more than 90% in northeastern US and 94% decline in hibernating populations of Myotis bats in hibernacula in Eastern Canada have been reported. Mixing of bats during autumn swarming events and



transmission by people may help spread WNS across species range. Rate of spread has averaged 200-250 km/yr and WNS is predicted to infect the entire Canadian range by 2025-2028. Other threats include wind turbines, colony eradication due to public concerns regarding disease transmission, and other conflicts and disturbances.

DID YOU KNOW?

- Northern Myotis are rarely seen, even in areas where they are common, because they are generally solitary and prefer to stay within the forest canopy.
- This species is also known to feed by gleaning (taking insects directly off leaves and tree bark).

This species is also known to feed by gleaning (taking insects directly off leaves and tree bark).



Photo: Ted Murphy-Kelly

Olive-sided Flycatcher

Contopus cooperi

THREATENED

Like the Common Nighthawk, the Olive-sided Flycatcher is an insectivorous bird that makes long migrations between Canada and South America. For unknown reasons, but perhaps related to its migratory or wintering habitat, it has shown a widespread population decline over the last 30 years; the Canadian population is estimated to have declined by 79% from 1968 to 2006.

Description

This large flycatcher is between a bluebird and robin in size. It has a dark face and back, and dark olive sides on its chest.

Typical Habitat

- Found in a wide variety of open forests and woodlands, especially along edges of burns or peatlands with standing dead trees.

Potential Threats

- Fire suppression can create closed forests that these birds avoid.
- Clearcut logging removes breeding habitat.
- Habitat alteration and loss on the wintering grounds of this migratory bird may also pose serious threats to these birds' populations.

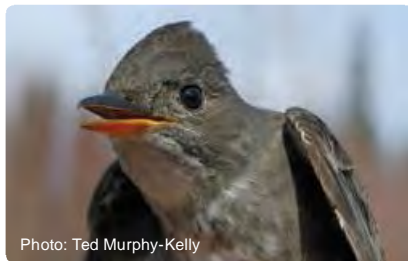


Photo: Ted Murphy-Kelly



Olive-sided Flycatcher Range

DID YOU KNOW?

- The Olive-sided Flycatcher is one of the very few Yukon songbirds that migrate as far south as South America—others in this exclusive club include Swainson's Thrush, Blackpoll Warbler, and Cliff, Barn, and Bank swallows.
- The male's loud, ringing song has been transcribed as "Quick, three

- beers!" or the shorter "Free beer!" A "pip-pip-pip" call is believed to be given in close proximity to the nest.
- Although they attack many flying insects, the most common prey recorded in a central Alaska study were yellowjacket wasps and small dragonflies.



<http://www.herpindiego.com/Red-neckedPhalarope.html>

Red-necked, Phalarope

Phalaropus lobatus

Conservation Status

COSEWIC Assessment: Special Concern (November 2014)

Description

Red-necked phalarope is about 18 cm (7.1 in) in length, with lobed toes and a straight, fine bill. The breeding female is predominantly dark grey above, with a chestnut neck and upper breast, black face and white throat. They have a white wing stripe which helps distinguish this bird from the similar Wilson's phalarope. The breeding male is a duller version of the female. They have lobed toes to assist with their swimming. Young birds are grey and brown above, with buff underparts and a black patch through the eye. In winter, the plumage is essentially grey above and white below, but the black eyepatch is always present. They have a sharp call described as a whit or twit.

Behaviour

The red-necked phalarope is a small wader. This phalarope breeds in the Arctic regions of North America and Eurasia. It is migratory, and, unusually for a wader, winters at sea on tropical oceans.

Reason for Designation

This bird has declined over the last 40 years in an important staging area; however, overall population trends during the last three generations are unknown. The species faces potential threats on its breeding grounds including habitat degradation associated with climate change. It is also susceptible to pollutants and oil exposure on migration and during the winter. This is because birds gather in large numbers on the ocean, especially where currents concentrate pollutants.



Photo: Cameron Eckert

Rusty Blackbird

Euphagus carolinus

SPECIAL CONCERN

Rusty Blackbirds live in boreal forest wetlands across North America, from Alaska to Newfoundland. In Yukon, they can be found right up to the tundra's edge. Not much is known about their numbers in Yukon, but there has been a 90% reduction in the overall North American population over the last 30 years.

Description

Females are brownish-grey with no gloss; males are glossy black. Both sexes have white eyes. In August, both sexes moult into their winter plumage, which is brown and black

In August, both sexes moult into their winter plumage, which is brown and black due to the rusty and beige feather edges, which wear off by spring.

due to the rusty and beige feather edges, which wear off by spring.

Typical Habitat

- Present in Yukon from April to October, Rusty Blackbirds live throughout the boreal forest in brushy wetland areas.

Potential Threats

- Many Rusty Blackbirds have been killed during control programs for Red-winged Blackbirds in agricultural areas in southern agricultural areas.



Rusty Blackbird Range

DID YOU KNOW?

- Rusty Blackbirds usually nest alone or in small, loose colonies, and pair with the same mate every year.
- Blackbirds are some of the few migratory birds (along with pelicans, cormorants, and raptors) not protected by the *Migratory Birds Convention Act*.



Photos: Ian Routley

Short-eared Owl

Asio flammeus

SPECIAL CONCERN

Short-eared Owls are owls of open country that are active in the daytime, especially at dawn and dusk. In Yukon, breeding is tied to population cycles of lemmings and voles, causing their distribution and numbers to change markedly from year to year. In southern Canada, large-scale destruction of native prairie grasslands has been particularly hard on them, and natural wetland drainage, urban expansion and increasingly intensive farming have contributed to their decline. They are exposed to danger from predators and agricultural machinery because they nest on the ground. Shooting, collisions with aircraft, trains, cars, barbed wire and farm machinery are added factors.

Description

Short-eared Owls are medium-sized, long-winged owls with small, feather “ear tufts”, and black bands that frame their yellow eyes. Females are larger and darker with heavier streaking than males.

Typical Habitat

- Nesting on the ground in grasslands, tundra, bogs, marshes and other open forest areas with abundant small mammals.

Potential Threats

- There are limited threats to Short-eared Owls in Yukon. Their primary limiting factor is loss of their native habitat to agricultural crops or pastureland. However, these owls are sensitive to human disturbances during egg laying and incubation as females easily desert the nest if disturbed.



- The collision of adults with vehicles, utility lines and barbed-wire fences, may also contribute to population decline.
- Concentrations of pesticides, particularly organochlorines, have been detected in Short-eared Owl eggs; the effects of these contaminants are not yet well known.

DID YOU KNOW?

- One of the best ways to identify a Short-eared Owl is to watch its distinct moth-like flight when hunting (deep wing-beats, occasional hovering, and cutting low over patches of grassland or marsh).
- Short-eared Owls are the only owls that build their own nests.
- They typically search for food during dusk and dawn.

LEAFY THISTLE

Cirsium foliosum

Composite Family (*Asteraceae*)

Synonyms: *Cardus foliosus*

Habitat: Moist soil, grasslands, meadows, edges and openings in boreal forest, riverbanks

DISTRIBUTION

Yukon: Southern Yukon south of 63°N

North America: Cordilleran, Yukon to Wyoming

World: North America

CONSERVATION RANK

Global rank: Secure (G5)

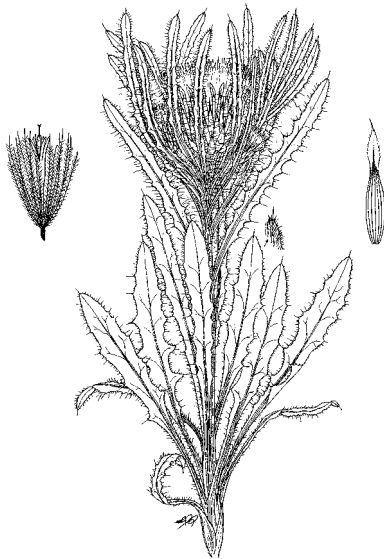
Canadian rank: Apparently Secure (N4)

Yukon rank: Imperilled (S2)

Distinguishing features: This biennial species has the largest flowers in Yukon. It can be separated from *C. arvense* by having a large taproot.



R. Rosie



© Province of British Columbia



P. Long



P. Long

For more information, contact the Yukon Conservation Data Centre at 867-667-3684 or yukoncdc@gov.yk.ca.





Diane Wilson

Bumble Bee mckayi subspecies, Western

Bombus occidentalis mckayi

Conservation Status

COSEWIC Assessment: Special Concern (May 2014)

Description

It is a medium-sized (1 – 2 cm) bumble bee with a short head. The abdomen is colour variable, but all individuals have a transverse band of yellow hair on the thorax in front of the wing bases, and the tip of the abdomen is almost always white.

Behaviour

In the spring, the Western Bumble Bee queen emerges from her overwintering site and searches for a suitable nest site in which to lay eggs. The eggs develop into female worker bees. The workers gather pollen and nectar for the colony and also take care of the nest and larvae. In late summer, reproductive bees (males and new queens) are produced. They leave the colony and mate. The mated queens enter hibernation; the old queen, workers and males are killed by frost. The new queens will emerge the following spring and establish new colonies.

Reason for Designation

This subspecies ranges in Canada from northern British Columbia (north of approximately 55-57°N) through southern Yukon and westernmost Northwest Territories; at least 50% of its global range is in Canada. Recent surveys in northwestern Canada and Alaska suggest that it is still common. However, the southern subspecies of the Western Bumble Bee is experiencing a serious, apparently northward-moving decline, and because the causes of this decline are unknown, the northern subspecies faces an uncertain future. Recent studies in Alaska suggest that this subspecies has among the highest parasite loads (particularly the microsporidian *Nosema bombi*) of any bumble bee species in North America. Other potential threats include the unknown transmission of disease from exotic bumble bee species introduced for pollination in greenhouses (ongoing in the Yukon), pesticide use (including neonicotinoid compounds), and habitat change.



Photo: Damian Power

Wolverine

Gulo gulo

SPECIAL CONCERN: Western population

Wolverine populations in Yukon are believed to be stable. However, their low density and secretive nature make them difficult and expensive to inventory, so information on populations is limited. Elsewhere they have declined or even disappeared in the face of human expansion into wilderness. They are sensitive to disturbances, only breed every two years or more, have small litters, and juveniles and kits can have high mortality rates.

Description

The Wolverine resembles a small, stocky bear. Colour varies from brown to black, often with a pale facial mask and a yellowish or tan

stripe running along the sides from the shoulders and crossing at the tail.

Typical Habitat

- Wolverines can travel long distances (over 350 km) and use large areas of habitat. They also can live in a wide variety of habitats, from the boreal forest to alpine tundra and barren-lands, as long as they have large wilderness areas with adequate year-round food supplies.

Potential Threats

- Wolverines avoid areas of human activity, especially near denning sites.
- Wolverines are reluctant to cross active roads; elsewhere, roads can form a significant barrier to movement and cause high mortality.
- Habitat loss and alteration.



Wolverine Range

DID YOU KNOW?

- Track counts and aerial surveys in Vuntut National Park have documented a relatively dense population estimated at 9.6 animals/1000 square kilometres.
- Wolverine fur is frost- and ice-resistant, and highly valued for parka trim.
- Wolverines have large paws that help them move easily on top of crusted snow.
- Wolverines have strong jaws that allow them to crush bone and frozen food.



IEC photo



Distribution in Yukon


Woodchuck

Marmota monax

Length 55 cm

Weight 4 kg

Lifespan 6 years

Habitat 

Predators Wolves, Coyotes, foxes, bears, large hawks dogs

Conservation Status

Yukon S2S3 - (Imperilled/Vulnerable)

Global G5 (Secure)

Yukon population estimate: Not determined

Description

- Medium sized rodent with short legs, stocky body, small ears
- Brownish with grizzled hair appearance
- Prominent slightly flattened bushy tail

Behaviour

Woodchucks use powerful digging claws to excavate burrows. When alarmed, they use a high-pitched whistle to warn the rest of the colony, hence the name "whistle-pig". They escape predators by diving into their burrows, but may also swim or climb trees. Woodchucks are true hibernators.

Appendix D Wildlife Forms

BMC Minerals (No. 1) Ltd.

530-1130 West Pender Street, Vancouver, BC V6E 4A4

WILDLIFE OBSERVATION FORM

Each time wildlife or wildlife sign (e.g. tracks, scat, dens, nests, mineral licks, etc.) are seen by BMC personnel or contractors, the observation will be reported in writing on the following Wildlife Observation Form or verbally with the information recorded on the form.

WILDLIFE OBSERVATION FORM
Observer:
Date:
Time:
Weather (Temp, Precipitation, Wind etc):
Wildlife Species:
Number of Animals (if known record the number of adults male/female and juveniles):
Wildlife Activity (i.e. feeding, running, walking, swimming, flying, etc):
Location (i.e. GPS location, road km, camp etc):
Type of Habitat (i.e. road, camp wetlands etc):
Other comments (i.e. behaviour, reaction to disturbance etc):

BMC Minerals (No. 1) Ltd.

530-1130 West Pender Street, Vancouver, BC V6E 4A4

WILDLIFE LOG

The form provided below shows the general format for the electronic Wildlife Log for tracking incidental wildlife information (e.g., wildlife observations from the Wildlife Observation Form) collected by project personnel and contractors.

DATE	TIME	OBS	WEATHER ¹			SPECIES	NO. ANIMALS ²					LOCATION ³	WILDLIFE ACTIVITY ⁴	HABITAT ⁵	OTHER COMMENTS ⁶
			TEMP (OC)	PRECIP	WIND		TOTAL	F	M	UNC	JUV				

Notes:

¹ Weather Codes – Wind: N (none), L (light), M (moderate), S (strong); Precipitation – N (none), M (misty rain), LR (light rain), HR (heavy rain), S (snow)

² No. Animals: Total (of all animals seen), F (adult female), M (adult male), Uncl (unclassified adult, unable to determine gender), Juv (juvenile or young animals)

³ Location: GPS coordinate, road km or site infrastructure (e.g., tailings facility, mill site, mine portal, camp, landfill, etc)

⁴ Wildlife Activity Codes: W (walking), R (running), F (foraging or feeding), S (swimming), R (resting or bedded down), FL (flying), N/D (on nest or in den), O (other activity, specify in comments)

⁵ Habitat: describe what type of area was the animal(s) seen (e.g., wetland, mineral lick, along road, etc)

⁶ Comments – include information animal behaviour, reaction to disturbance, and other useful information

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WILDLIFE INCIDENT REPORT

Each time a wildlife incident is observed by BMC personnel or contractors, it must be reported to the Project Geologist immediately or at the end of the shift. An incident report will be completed by the Project Geologist within 24 hrs of the incident occurring.

INCIDENT REPORT FORM
GENERAL INFORMATION
Employee/Contractor Name:
Date/Time of Incident:
Reported Incident to (Project Geologist Name):
Date of Report:
DETAILS OF INCIDENT
Wildlife Species:
Number of Species:
Incident Type (i.e. vehicle collision, near miss, encounter nuisance/problem interaction, or other). If vehicle involved specify type (truck, ATV, side-by-side, heavy equipment, aircraft or helicopter):
Location (i.e. GPS location, road km, camp etc):
Incident Outcome (i.e. injury, mortality, defensive behaviour, no injury, management action or other):
Description of Incident and Outcome:
Activity of wildlife before incident:
Type of Habitat (i.e. road, camp wetlands etc):
Could the incident have been prevented? (yes, no, uncertain):
If yes, describe how:

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MANAGEMENT REVIEW AND REPORT DISTRIBUTION FORM
MANAGEMENT REVIEW
Completed By:
Signature:
Date:
COPIES OF REPORT SENT TO (YES OR NO)
Yukon Environment:
Yukon EMR:
Conservation Officer:
Ross River Dena Council:
Liard First Nation:

Note: If a wildlife mortality occurs along the access road, it must be reported to Yukon Environment (as per the Access Road Lease (Number 105G07-001).

Appendix E Water Monitoring Template

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Surface Water Monitoring Form
Kudz Ze Kayah Exploration Project

Date: _____
 Environmental Monitor Name: _____

Body of water	Location ID	WPT	Sampler Name	Date	Time (24Hr)	Water temp (°C)	Air Temp (°C)	pH	Cond (us/cm)	Turbidity (NTU)			Visual Observations/Comments	Weather*
										Sample 1	Sample 2	Sample 3		
Upstream														
Downstream														
Upstream														
Downstream														
Upstream														
Downstream														
Upstream														

Weather*: P/C=P/Cloudy, S= Sunny, R=Rain, C=Cloud, SN= Snow

Comments: _____

Appendix F Archaeological Chance Find Form

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ARCHAEOLOGICAL CHANCE FIND REPORT FORM
Recorders name:
Date, time of discovery, time work stopped in area:
Location (site name, co-ordinates, depth below surface):
Access (describe how to get to site):
Description of find:
Photographs:
Estimated weight and dimensions:
Who was contacted (i.e. BMC representatives, Archaeology Branch, Kaska Representatives). Record the name, date, time, phone number and details of conversation:
Any protective measures to be taken:
Further action required:
Printed name and signature of the Project Geologist:
Date submitted:

Kudz Ze Kayah Project Planned Baseline Studies

BMC Minerals (No. 1) Ltd.

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Appendix A. Updated Hydrogeology Workplan

1. INTRODUCTION

1.1 Overview

BMC Minerals (No. 1) Ltd. (BMC) acquired the Kudz Ze Kayah (KZK) property in January 2015 from Teck Resources. KZK is a prefeasibility study (PFS) zinc-copper-gold-silver-lead development asset with a resource upside (KZK is a VMS-type deposit).

BMC plans to: drill development targets; complete the required environmental and socio-economic studies; complete permitting; and complete a bankable feasibility study (BFS) on KZK.

The Kudz Ze Kayah project is located approximately 260 km northwest of Watson Lake, 110 km southeast of Ross River and 24 km south west of the Robert Campbell Highway near Finlayson Lake, Yukon (Figure 1). The coordinates are 61°28'N Latitude and 130°32'W Longitude.

1.2 Project History

Baseline environmental and socio-economic studies for the KZK project were completed in 1994/1995 to support the Initial Environmental Evaluation (submitted for regulatory review in March 1996 and approved in December 1997). These studies included evaluations on: climate and hydrology; surface water and groundwater quality; stream sediment quality, aquatic resources (fish, benthic invertebrate and zooplankton characterisation); vegetation and terrain mapping; wildlife; archaeological investigations; and, socio-economic data collection. Additional baseline studies were conducted in 1996 to support the Water Licence Application for the KZK project (Licence QZ97-026, approved in December 1998 and valid until September 2018). All aforementioned studies are publically available for review at the Yukon Energy, Mines and Resources Library. Since the regulatory approvals were received, subsequent baseline studies have been conducted (in part) to meet the requirements of the water licence. Surface water quality, fish, and benthos have been collected every two years since 2000. The more recent data are publically available on the Yukon Water Board's website.

1.3 Yukon Environmental and Socio-Economic Assessment Act

Although the KZK project received environmental approval in 1997 and a water licence in 1998, the regulatory requirements in the Yukon have changed since the 1990s. The environmental assessment cannot be grandfathered in under the new *Yukon Environmental Socio-economic Assessment Act* (YESAA, 2003).

Therefore, the project must go through the Yukon's environmental assessment process prior to obtaining a Quartz Mining Licence. This process will involve the submission of a Project Proposal (Environmental and Social Impact Assessment) to the Yukon Environmental and Socioeconomic Assessment Board for an Executive Committee Screening.

In addition, BMC understands that there have been changes in the Yukon Water Board's Type A Water Licence application requirements. Consequently, an amendment or renewal of the existing water licence may also be required prior to construction.

1.4 Objectives

BMC is currently seeking input from regulatory agencies and interested parties regarding the planned environmental and socio-economic studies. BMC would like to ensure that any baseline requirements are included in the 2015/2016 program so that there are no data gaps or delays in the assessment process. In order to facilitate the review by agencies and interested parties, this document provides:

1. A summary of the existing environmental and socio-economic information related to the Kudz Ze Kayah project; and
2. A data gap analysis and identification of additional environmental and socio-economic studies that are planned to support the development of the Project Proposal. Note - the data gap analysis and planned studies were based on the mine plan from the 1990's being the exact same as the mine plan that will be carried forward in the Project Proposal.

2. SUMMARY OF EXISTING ENVIRONMENTAL AND SOCIO-ECONOMIC INFORMATION

The following provides a brief summary of the environmental and socio-economic conditions of the project area.

Terrain

The KZK project occurs within the Pelly River and Pelly Mountain ecoregions. It is located within the northern foothills of the Pelly Mountains of the Yukon Plateau, on the east side of the divide between the Pelly River and the Liard River drainage basin. The topography of the area consists of rolling hills, with ponds and lakes occupying valley bottoms.

The project area was glaciated and bedrock exposures typically occur only in deep ravines or on steep slopes where post-glacial erosion removed overburden. Valley bottoms are covered with till and glaciofluvial sediments that are locally overlain by alluvial fan sediments. Colluvial apron sediments are also common. The project is located within the discontinuous but widespread permafrost zone, with permanent ice typically within ~2 m of the surface. The deepest ice occurs on valley slopes and likely exceeds 15 m thickness (Geo-Engineering, 2000).

Climate and Air Quality

The climate is cold continental with a mean daily summer temperature of 15° C and a mean daily winter temperature of -25° C. The mean annual precipitation is 655 mm which falls evenly throughout the year, predominantly as rain from May through September and then snow for the balance of the year. The air quality in the project area is excellent.

Vegetation

The project area lies within the sub-alpine and alpine vegetation zones, with boreal forest predominant in the lower parts of the property grading into shrub- and herb-dominated areas at higher elevation. Black spruce and sub-alpine fir are predominant within forest environments whereas tall shrub vegetation types (e.g., dwarf birch, dwarf willow birch) predominate higher up. At the highest elevations, vegetation types consist mostly of willow dwarf and alpine dwarf shrubs, in addition to herb vegetation types. Feathermoss dominates the understory in dense coniferous stands whereas sedge or sphagnum tussocks are common in wetlands and under black spruce.

Wildlife

Several large species of mammal inhabit the KZK project and surrounding area. The Finlayson caribou herd has been the subject of a significant management and monitoring effort by the Yukon Government since the early 1980s. The studies have included detailed population surveys and radio collaring. In 1994/1995 several detailed population studies were also undertaken by Cominco to support the Initial Environmental Evaluation (Cominco, 1996). It is understood that monitoring by the Yukon Government is ongoing (Adamczewski et al., 2010; Hegel, 2013). The studies to date have shown that the Finlayson herd inhabits the uplands around the project area from spring to fall and the lowlands of the Pelly River in the winter. These caribou provide a valuable food source for the Ross River Kaska Dena people and are also of economic significance to sport hunters and the guiding industry.

Moose are also a significant wildlife resource. Data on moose distribution and numbers were obtained through aerial surveys flown in March and November 1995, to document late-winter and post-rut distribution. Additional data on moose were obtained during the course of caribou surveys. Some calving occurs in the upper part of the informally named "Geona Creek" valley. Moose are well dispersed in the project area during summer and early fall and congregate in post-rut groups in the upper elevations of the project area. The information indicates that moose spend early winter in the project area and may remain into late winter during some years.

A population of Stone Sheep inhabits the higher elevations to the south of North Lakes (approximately 7 km south of the previous KZK camp) and toward the west side of Wolverine Lake (approximately 15 km south-east of the previous KZK camp). This population is located outside of the KZK project boundaries.

Hydrology

The baseline surface hydrology of the KZK project area was characterized with data from six monitoring stations installed on area drainages, and by regional analysis using data from Water Survey of Canada (WSC) and DIAND hydrometric stations in the region (Cominco, 1996). Based on regional data, maximum monthly runoff usually occurs in June, with the peak in the hydrograph occurring in late May or early June, due to snow-melt. Site records have also shown significant peaks during summer months due to rainfall events. The minimum runoff usually occurs in March or April just prior to the snow-melt freshet.

Groundwater

Groundwater flows and elevations have been described based on data collected from piezometers and boreholes in 1995 (Cominco, 1996). The groundwater table is characterized as a subdued replica of

topography, with shallow depths to groundwater in the valleys and much deeper depths below slopes. The depths to water in the piezometer installations ranged from 0.1 metres below ground surface (mbgs) to 33.2 mbgs. The "Geona Creek" valley bottom is a discharge area for groundwater from upslope. Hence, artesian conditions were observed in many boreholes drilled.

The hydraulic conductivity estimated at the site (based on falling and rising head tests) ranges from 1.32×10^{-5} to 2.63×10^{-8} m/s.

In between periods of high runoff induced by either spring snow-melt or summer rain storms, the contribution of base-flow to creeks from groundwater is likely to be a significant proportion of the total creek flow. The valley overburden deposits likely act as a sponge, soaking up water during periods of infiltration and then releasing it at a declining rate after the infiltration period has passed. In late winter, and during dry summer spells, creek flow may be almost entirely groundwater discharge, mostly from the overburden deposits.

The groundwater pH is similar to that of surface water. Alkalinity, total dissolved solids and hardness are slightly higher in groundwater than in surface water, reflecting the higher concentrations of dissolved ions that are typical of groundwater. Sulphate concentrations are variable, with two wells (one shallow, one deep) having sulphate concentrations more than double the concentrations in surface water and the remaining three having concentrations more similar to surface water.

For the most part, metal levels in both shallow and deep groundwater are low. In particular, copper and lead concentrations in all groundwater samples were equal to or lower than the concentrations in surface water. Exceptions to the pattern of low metals were elevated levels of arsenic and iron in the three deep (bedrock) wells that penetrated the ABM massive sulphide deposit as well as elevated arsenic, iron, cadmium and zinc in one well from the overburden.

Surface Water Quality and Aquatics

The ABM deposit lies within an elevated north-south trending valley that drains to the north and south into the Liard River. A series of three small ponds inhabit the saddle of this valley in a swampy area near the north-south drainage divide. The north flowing outlet creek is informally referred to as "Geona Creek" whereas the southern outflow lacks even an informal name. Several other small creeks, ponds and lakes occur throughout the property. Water in the main tributaries flows continuously through the frost-free

season whereas the upper parts of the drainages are intermittent, flowing only in early summer and after rainfall events.

Studies from the 1990s found Geona Creek and the small ponds overlying the ABM deposit generally have low abundances of fish (Cominco, 1996), containing just a few slimy sculpin (*Cottus cognatus*) and young arctic grayling (*Thymallus arcticus*). Somewhat further downstream, adult arctic grayling occur in Finlayson Creek. Larger rivers and lakes in the area host grayling, lake whitefish, lake trout, burbot and dolly varden.

A baseline water quality study of creeks and ponds near the ABM deposit (Cominco, 1996) found naturally elevated sulphate, iron (Fe), zinc (Zn), copper (Cu) and selenium (Se), especially near the ABM mineralized body.

More recent baseline aquatics studies were conducted every other year since 2000 (Laberge and Can-Nic-A-Nick, 2010, 2013). The water samples collected throughout the study area indicated similar results as the previous studies with generally good water quality for the support of freshwater aquatic life. The waters of Finlayson Creek were hard to very hard, slightly alkaline and had low metal concentrations. The CCME guidelines for cadmium, zinc and iron were slightly exceeded at the Geona Creek sites. The chemistry of North River is markedly different from the Finlayson drainage with water that was very soft, had low alkalinity and very low concentrations of metals.

The watersheds of the study area drain a mineralized area and this is reflected in the stream sediment quality (Laberge and Can-Nic-A-Nick, 2010, 2013). Frequently the applicable CCME guidelines were exceeded at all of the sites for one or more of the metals examined. High levels of arsenic are prevalent throughout the Finlayson watershed with very high concentrations in the stream sediments of East Creek.

Benthic invertebrate populations were generally robust, diverse, and had good representation from the major groups of organisms that are usually present in lotic waters. A high number of sensitive taxa were identified at the majority of the sites (Laberge and Can-Nic-A-Nick, 2010, 2013).

Densities, distribution and diversity of fish species found in Finlayson Creek were consistent with the previous assessments. Analogous to past studies, slimy sculpin (*Cottus cognatus*) and arctic grayling (*Thymallus arcticus*) were captured in Finlayson Creek; however, burbot (*Lota lota*), a species not previously collected in the study area. Slimy sculpin were common in the upper reach of Finlayson Creek but less

commonly captured downstream, even though habitat was more favourable. Results to date are indicative of ecological stability and aquatic conditions that continue to provide suitable habitat for fish in this system. Metals were analyzed in the tissues of benthic invertebrates and in slimy sculpins to determine baseline concentrations in the aquatic biota of the Finlayson drainage. The background levels in the tissues of benthic invertebrates and slimy sculpin from Finlayson Creek appear to be relatively consistent over time. It appears that the high levels of some of the metals within the stream sediments are not bioavailable to the resident biota (Laberge and Can-Nic-A-Nick, 2010, 2013).

Archaeology and Heritage Resources

There are no special land designations in the area of the project; however, initial discussions with the Ross River Dena Council have indicated that they have submitted a Draft Land Use Management Plan for their asserted traditional territory to Yukon Energy, Mines and Resources for review and discussion. The status of the review is uncertain. Details from the Draft Land Use Management Plan, which may be relevant to environmental protection in the KZK project area, have been requested.

In 1995, a heritage study was conducted in collaboration with the Ross River Dena Council (RRDC) as part of the Initial Environmental Evaluation. The study identified no cultural materials or features (Rutherford, 1995); however, a review of the oral history provided by Kaska members indicates that the project area was used for subsistence hunting, trapping and fishing, and as an access route to the North Lakes (Rutherford, 1995). In 1996, an additional study for cultural materials was undertaken at a proposed airstrip location (Geo-Engineering, 2000). No cultural materials were identified in this follow-up study. BMC has committed to discussions with the RRDC regarding the potential need for additional traditional use studies of the KZK project area. The discussions are on-going.

Land and Resource Use

The project area is within the asserted traditional territory of the RRDC who, along with four other First Nations, form the Kaska Dena Council of north-central British Columbia and the southern Yukon. The property adjoins an area of Interim Protected Land that is referred to as an R-Block.

Land use in the immediate area consists primarily of subsistence hunting, fishing and trapping by First Nations people and some recreational hunting and fishing associated with local lodges and outfitters. Previous and current mines in the region include Sa Dena Hes near Watson Lake, Ketzka River near Ross

River, Anvil Range at Faro and the recently closed Wolverine Mine, which is located just ~25 km west of the KZK project.

The KZK project occurs within hunting concession #20, single trap line concession #250 and group trap line concession #405. The hunting concession is held by Yukon Big Game Outfitters (YBGO) and the group trap line is held by the RRDC, both of whom have been contacted by BMC. At this time BMC does not know who holds trap line concession #250 but will continue to make efforts to find out who it is so that they can be engaged.

Socio-economic Conditions

The community of Ross River lies 350 km from the territorial capital of Whitehorse and 10 km east of the Robert Campbell Highway, along the Canol Road near the junction of the Ross and Pelly Rivers. In 2011, the population of Ross River was 352 (Statistics Canada, 2012a), just slightly above the 2001 population of 337 (Statistics Canada, 2001). The 2006 census shows that the inhabitants are predominantly First Nation (87.1%) with an employment rate of 55.6% and median income of \$40,100 per year (Statistics Canada, 2007a), which in both cases is lower than the Yukon Territory as a whole (70.7% employment rate and \$60,100 median income, respectively). The primary employment sectors were "other services" followed by "agriculture and other resources-based industries" (Statistics Canada, 2007a), which would include mineral exploration and mining.

Watson Lake is located along the Alaska Highway, near the border with British Columbia and lies 440 km from Whitehorse. The 2011 population of Watson Lake was 802 (Statistics Canada, 2012b), ~5% less than the 2006 population of 846 (Statistics Canada, 2007b). The 2006 census indicates that Watson Lake is 63.9% non-aboriginal, 71.4% employed and earned a median salary of \$60,100 per year, all more-or-less in line with Territory-wide averages. The primary employment sectors are "health care and social services" and "educational services", followed by "business services" and "agriculture and other resource-based industries" (Statistics Canada, 2007b).

Consultation

Extensive consultation was undertaken in the 1990s as part of the Initial Environmental Evaluation process and Water Licence hearings.

3. DATA GAP ANALYSIS AND PLANNED BASELINE STUDIES

A comprehensive baseline study program will be required to provide the necessary information to support the development of the Project Proposal and inform project design (including the closure plan). A data gap analysis has been conducted on the existing data sets to identify the additional information that will need to be collected to support the development of the Project Proposal. The results of the data gaps analysis and the subsequent planned baseline work programs are presented in the following sections. For the baseline study design it has been assumed that the project footprint and mine design as previously proposed, will not change.

3.1 General Physiography

Based on a review of the previous studies, the physiography of the project area has already been adequately characterized. No additional baseline data is required for this discipline.

3.2 Surficial Geology and Soils

3.2.1 Data Review

Surficial geology information is available from the work conducted in the 1990s. This work included some terrain analysis based on air photo interpretation.

3.2.2 Scope of Work

The existing surficial geology and baseline soil information will need to be collated in order to provide insights into a wide range of topics including evaluation of soil landscape and morphology along with soil classification and thickness. The surficial geology and soils baseline will include an update of the existing overburden assessment and permafrost assessment with supplemental field data collected in connection with the hydrogeological and geotechnical field programs.

The baseline report will include the following information:

- review and summary of the physiographic setting, including generalized geology and landscape features (slopes using TRIM and other contour data) of existing information on local the physiographic landscape including slope information.

- Terrain mapping using aerial photo interpretation to identify types and extent of surficial materials to develop terrain (surficial) material maps (or confirmation that the previous assessment remains valid).
- An evaluation of soil landscape (slopes, drainage, surficial material) and morphology (horizon depth, soil texture, coarse fragment content), and soil classification and soil thickness data.
- A sampling program from representative soil locations for chemical analysis for metals and suitability parameters (i.e., organic carbon content, reaction, salinity, sodicity, and select indicators of fertility).
- Soil map for the mine site area.
- Overburden assessment.
- Permafrost assessment.
- Assess the capability of the soil to support potential site reclamation activities.

3.3 Terrain Hazards

3.3.1 Data Review

A high level terrain hazards analysis, based primarily on air photo interpretation, was completed in connection with the 1996 Initial Environmental Evaluation (IEE) (described in Section 3.7). The results of the air photo interpretation are presented on Figure 3-27 of the same report. Additional insights into of terrain evaluation are also mentioned in various appendices of the IEE.

Based on the detailed level of design completed for the 1996 IEE, and the fact that the proposed mine plan will remain essentially unchanged since that time, it is assumed that any significant terrain hazards would have been identified and flagged if they were deemed to posed a risk to the proposed mining infrastructure.

3.3.2 Scope of Work

The project will require a terrain hazard evaluation to support siting and design of mining infrastructure and closure planning.

The scope of work will include a review of available and/or new air photos and cross referencing with the LiDAR survey that is expected to be available by late summer 2015. Special attention will be paid to areas of potential for wetland treatment as it is possible that these areas may not have been considered in detail during the previous evaluation.

An updated terrain hazard map will be generated following the review of the above mentioned information.

3.4 Climate

3.4.1 Data Review

Two meteorological stations were installed at the site in 1995 and collected 6 months of continuous data. These data were used with the more long term regional data sets from the government stations in the region to support the Initial Environmental Evaluation. No site-specific data have been collected since the mid-1990s.

3.4.2 Scope of Work

A Meteorological Station will be installed at a select location at the project site. It is anticipated that one station will suffice, assuming it is located in a representative location (e.g. near the median elevation of the site, away from potential influences, etc.).

Site selection will be based on the following criteria:

- Site access;
- Level and open area (at least 9 m in diameter);
- Representativeness of the site conditions;
- No obstructions around the site such as tall trees and buildings (distance of at least ten times the height of any nearby obstruction); and
- No activities near the site susceptible of affecting the conditions (e.g. high traffic area, etc.).

A field reconnaissance will be carried out to determine the location of the weather station. The weather station will include a 10-meter mast, datalogger, satellite communication remote and base stations, total precipitation gauge, wind sensor, temperature and relative humidity sensor, barometric pressure sensor, pyranometer and all mounting accessories. Evapotranspiration will be calculated from other parameters. A

manual evaporation pan will also be provided where regular maintenance and measurements will be required. After reception of the meteorological equipment, datalogger programming and sensor testing will be carried out prior to installation in the field.

Once the station is up and running, monthly inspections and maintenance will be conducted to ensure that the station is in good working order. Items that will be inspected /maintained are as follows:

- Ensure that the solar panel is free of frost, snow or debris.
- Ensure that the solar radiation sensor is free of frost, snow or debris. If the sensor is wiped, note date and time at which it was done.
- Ensure that the precipitation gauge funnel is free of debris.
- Make sure that the antifreeze level of the precipitations gauge is adequate (if applicable). Top up if necessary and note date and time at which this was done.
- Empty the container in which the antifreeze-water mixture drains if it is getting full and dispose of antifreeze mixture according to procedure in place for hazardous materials (if applicable).
- Inside the enclosure, ensure that all the wires are properly connected to the datalogger.
- Ensure that the light on the datalogger is blinking at proper interval to indicate it is active.
- Replace desiccant in enclosure.
- Observe for any sign of damage to the station by animals, wind, etc. Pay particular attention to sensor cables and guy wires. Tighten guy wires if necessary.
- Data is validated regularly and if a problem with a sensor is identified through data validation, the sensor is inspected, repaired or replaced at the next site visit to minimize data loss.
- Components will be calibrated according to manufacturer's recommendations.

In addition to the collection of precipitation data, snow pack observations will be made to account for spatial variation within in the project area. Snowmelt accounts for approximately half of the annual water input in Yukon and as such snowpack quantification is a critical component for water balance modelling. Monthly monitoring of a snow course near the meteorological station will be conducted. The snow course monitoring will use the standard format used by the British Columbia and Yukon governments of 10 sample

points spaced roughly 10 meters apart and sampled according to the British Columbia Snow Survey Sampling Guide. The course will be staked with 2-3 m high 1" PVC markers for ease of identification of sample sites in winter. Two similar courses will be situated at higher and lower elevations on the same aspect and will also be sampled monthly.

Additionally, a minimum of three additional transects will be completed as close to peak snow pack as possible, typically around April 1st. These transects will sample the 3 aspects not covered by the monthly surveys, at median elevation within the project area. The peak survey will allow the characterization of the spatial variability of the snowpack with aspect while the monthly snowpack will characterize both the monthly variability and variability with elevation.

The baseline report will include the following:

- Baseline meteorological data collected at the local meteorological station will be validated and compiled. Means, extremes and totals, as well as seasonal variations will be analyzed and reported in the baseline conditions report.
- Long term regional conditions and trends will be summarized from the nearest Environment Canada climate stations, the Environment Yukon Snow Survey stations and from the Wolverine Mine data (if available).
- The baseline conditions report, including one annual cycle of local data and long term regional data for temperature, precipitation, snow depth and snow-water equivalent, wind speed and direction, relative humidity and evaporation, will be appended to the YESAB Project Proposal document.
- No effects assessment will be conducted for climate, however meteorological data will feed into development of the water balance, which will in turn feed into the water quality modeling and predictions. Water quality predictions will be used for the fisheries and aquatic resources effects assessment. Meteorological data will also be used as input into the air dispersion model and modeling results will be the basis for the air quality effects assessments.

Update: A site reconnaissance was conducted in June 2015 and a preferred as well as an alternate location for the meteorological station were identified (Figure 2).

3.5 Air Quality

3.5.1 Data Review

It is understood that the closest air-quality monitoring station is the Environment Canada (EC) National Air Pollution Surveillance Network (NAPS) station in Whitehorse, Yukon. Since Whitehorse has many more anthropogenic emission sources than the project area, it is assumed that this station is not representative of the air quality at the site. There are no other industrial activities in the project area so any existing air contaminants will have natural sources or be the result of long distance importation. Therefore, due to the remote location, baseline gaseous air-contaminants should be minimal. Any baseline air-contaminants are likely to be PM_{2.5} as only fine particulate matter will survive long range transport.

3.5.2 Scope of Work

At this point in time baseline air quality will be assumed to be similar to other remote exploration projects in Canada and, therefore, no on-site air quality monitoring stations are being planned. The extent of the baseline requirements will be to summarize background levels of criteria air contaminants (CACs) at similar remote locations.

BMC would like verification from the regulatory agencies that air quality does not need to be monitored from dust-fall monitoring stations, based on the rationale provided above.

3.6 Noise Levels

3.6.1 Data Review

Because the project is located in a remote wilderness area, noise levels are assumed to be quiet and dominated by sounds of nature (e.g., wind, rustling of vegetation, chirping birds etc.). There are no permanent residents or seasonally used cabins in the project area.

3.6.2 Scope of Work

The extent of the noise baseline study will involve summarizing the ambient day time and night time sound levels for other remote areas similar to the project site.

BMC would like verification from the regulatory agencies that baseline air quality monitoring is not required, based on the rationale provided above.

3.7 Vegetation and Soils

3.7.1 Data Review

Vegetation surveys, mapping and metals analysis of vegetation were conducted in the 1990s. Specific information and data gaps related to vegetation and soil baseline data collection are presented below. The aspects of soil that are relevant and discussed are nutrient, moisture and mineralization. These aspects pertain to the growth conditions available to plants and influence the type of plant communities that can be sustained in the project area.

Vegetation

- Successional changes to vegetation communities will have occurred over the intervening 19 years since 1996 vegetation map was completed by Norecol, Dames and Moore. Vegetation polygons will need to be updated and reclassified according to Yukon Ecological Landscape Classification (ELC) system to produce a terrestrial ecosystem map (TEM). The TEM classification provides more information per polygon such as: dominant plant species, structural stage, parent surficial material, soil texture, soil moisture and nutrient regimes.
- The study area needs to be large enough to show overall trends in ecosystem types and distribution of wildlife utilization patterns, as well as incorporate control areas that are not influenced by mine development. The project study area for TEM, soil classification and vegetation metal uptake will centre on the tailings impoundment and will radiate out to approximately 6 km in either direction. This extension of the study zone will capture parallel drainages to the west and east for control areas.
- Previous vegetation mapping was done along the length of the 24 km long access road. Mapping was on average 2 km on either side of the road alignment. This linear corridor will need to be updated using TEM. Where high value wildlife habitat (caribou post-calving and rutting, possible dens) is found adjacent to road corridor study area the TEM mapping will be extended to include these areas to aid in developing wildlife habitat suitability assessments.
- As mine planning advances, areas to be directly affected by development need more scrutiny, so habitat/ecosystem types at pit, tailings storage and waste dump sites will be described in more detail. This is critical for a proper effects assessment of ecosystems/wildlife habitat loss. This data

will also be key in developing reclamation criteria for closure planning, as well as a plant species list for future revegetation efforts.

- No permanent ecosystem plots were established during initial baseline studies to monitor change over time within project site nor were any control plots established outside the area of mining influence for comparison studies.
- Unique ecological areas such as old growth, rock outcrops and wetland complexes, especially in association with rare plants and/or high value wildlife sites, need to be better defined and highlighted on a map so locations are easily recognized during development planning.
- Wetlands are important biological areas and are also natural filters for surface water runoff. All wetlands will be surveyed and classified according to the Canadian Wetland Classification System (CWCS). Vegetation, soil and water samples will be collected to determine metal concentrations and metal uptake into semi-aquatic plants (*Carex* and *Juncus* spp.).
- Rare plant surveys in project area and along access road will need to be done, especially in areas where disturbance is anticipated. If rare plants or rare plant assemblages are found, locations will be mapped and protective measures developed.
- Invasive plants that may have colonized in previously disturbed areas, along the access road and in the project site, will be located and identified to inform an invasive plant management plan (invasive plants will also be appropriately disposed of if found) .
- Relate seasonal wildlife survey observations with habitat types derived from ecosystem mapping, so a habitat suitability map can be produced for focal wildlife species such as caribou and moose (this is a crossover task for the wildlife section).
- Vegetation metal uptake target plant species need to be reviewed as do the parts of plants studied:
 - Lead (Pb) concentrates in the root systems, and not leaves;
 - Cadmium (Cd) and Zinc (Zn) concentrate in leaves and twig meristems;
 - Cd hyperaccumulates in willow leaves; and
 - Terrestrial lichens do not uptake metals from soils, but absorb airborne particles.

- Metal uptake by plants and consumption patterns by animals and humans need to be considered in sampling design with attention to local food web concerns. Input from Kaska First Nation is needed to discern traditionally harvested plants and uses.
- Volume and density estimates for forest stands were not conducted. Estimates can be derived from aerial photography and ground truthed during the ecosystem survey. Stand densities can be associated broadly within ecozone (i.e. Boreal High) rather than each polygon.

Soils

Note: Surficial materials, terrain stability, and permafrost attribute studies are not part of this section. The primary interest of this gap analysis is the characterization of top soils and influences that affect plant growth:

- A topsoil classification map is needed in the project site area. This would provide an overview of soil orders, great groups and sub groups within the study area. Soil classification can be partly integrated into the terrestrial ecosystem mapping study which would measure: humus type, mineral horizons, slope, aspect, presence of permafrost, depth, coarse fragment content, drainage, texture, seepage, erosion potential, plus nutrient and moisture regimes. This information would help in planning for borrows and reclamation soil sources.
- The vegetation metal uptake study completed in 1997 was based on only a small set of floristic samples. Most sampling was done mainly within riparian corridors. Also, soils samples need to be taken with plant samples so mineral uptake can be analyzed in relation to soil metal concentrations in the plant rooting zone.
- Nutrient and metal concentrations levels were not characterized for soils within the project study area. This is important baseline information that is needed to elucidate plant growth conditions. Metal analysis of representative soil types would provide a profile of natural occurring background mineralization. This baseline is useful in ascertaining if soil metal content is derived from mining or is a natural occurrence. Knowing both mineral and nutrient characteristics of soils and the species of plants that are associated with certain soil conditions will aid in planning and implementing future revegetation efforts.

One significant additional requirement for vegetation and soils is related to Clause 46 in the Terms and Conditions of Water Use Licence QZ97-026, which specifically states: "The Licensee shall design, construct, operate and maintain a pilot wetland polishing treatment project ... ". The natural latent capacity of the site to contribute to construction of wetland treatment areas does not appear to have been specifically addressed in previous site investigations. Primary characterization work is necessary to provide "proof of concept" to identify the natural latent capacity of potential treatment wetland areas and materials (plants, soils, microbes), and to facilitate the conceptual design, sizing and costing of treatment wetlands in connection with developing the reclamation and closure plan and associated cost estimates for closure.

3.7.2 Scope of Work

The vegetation and soil baseline work can be broken down into five components:

1. TEM mapping of project site and along access road
2. Rare plant surveys
3. Soil and plant tissue sampling
4. Stand density and volume estimates
5. Survey of invasive plants along roads and camp areas
6. Treatment Wetland Evaluation

Prior to vegetation and soil studies, input from local communities and the Ross River Dena will need to be solicited so concerns and ideas can be incorporated into survey plans.

1. TEM Mapping

The 1996 vegetation polygons will be updated using recent aerial photography and labelled according to TEM standards. The mapping area around the project site will be extended to include creek drainages to the west and east that provide control areas at similar elevations and aspects (Figure 3). Through ongoing monitoring and comparison studies these outlying areas will be useful in determining the extent of development impacts regarding ecosystem functioning and wildlife habitat utilization. The access road corridor map will be updated to TEM standards.

Specific activities that are planned for this work element

- Gathering of remote imagery for the study area;
- Develop preliminary vegetation/ecosystem map from remote imagery data and 1996 vegetation map;
- Field truth vegetation/ecosystem polygons on draft TEM map;
- Establish network of permanent/control ecological plots for monitoring changes over time; and
- Analysis of field data, development of final TEM and completion of report.

Deliverables

- High level TEM map with labelled polygons and permanent plot locations marked; and
- Final report.

2. Rare Plant Survey

Rare plant surveys will be done in conjunction with the TEM field work. As rare plants are difficult to find even when extant, this will be a presence or non-detection search. The best approach is to identify the type of habitat that is associated with the rare plants of interest and check if these types of habitats are in areas that are likely to be disturbed by mine development or road works. These areas will be surveyed during the field component. Microsites that could host rare plants that are encountered during field work will also be surveyed, as well as in ecosystem plots. In areas of high plant diversity, a transect search will be conducted.

Specific activities that are planned for this work element

- Gather list of candidate rare plant species from Yukon CDC with habitat descriptions;
- Delineate habitats from aerial photos and maps that could potentially host rare plant species;
- Refine search sites from on ground observations;
- If rare plant is located, location is to be fixed by GPS and marked with flagging tape. Photographs taken for further verification (if there are a number of plants, a voucher specimen could be taken and pressed), habitat features will be noted as well as associated vegetation;

- Rare plant location will be mapped and protective measures will be developed to preserve plants and their immediate habitat; and
- If found, locations of rare plants or rare plant communities will be denoted on TEM map as well.

Deliverables

- Memo report on results of rare plant surveys and location(s) mapped; and
- Locations of rare plants or rare plant communities, if found, will be denoted on TEM map.

3. Soil and Plant Tissue Sampling

The soil and plant tissue sampling program objective is to better understand the uptake of metals contained in soils by vegetation. Of concern are the heavy metals often present at highly mineralized sites that could accumulate in plants and move to higher trophic levels through the local food web. This preliminary investigation would provide baseline information as to which metal elements are present and to what degree they are being translocated into selected plant species before mining activities begin. The plant species will be selected based on the dietary preferences of moose, caribou, resident birds and FN harvest species. The sampling program will include:

- Plants consumed by wildlife that in turn are hunted and consumed by humans e.g. moose.
- Plants used for traditional medicinal purposes.
- Plants well distributed over the district so they are easy to find within the selected study areas.
- Semi aquatic plants from wetlands and riparian floodplains will also be selected to determine metal uptake potential and their capacity for bioremediation in constructed wetlands.
- Soil and vegetation sampling will be done at all permanent ecosystem plots established during TEM field component so monitoring can continue and changes to soil/vegetation interface can be documented. Additional soil and vegetation uptake sampling will be conducted at other points of interest which will be marked in the field and mapped.
- Soil samples will be taken from the rooting zone of the plants to ascertain if a relationship exists between metal uptake in plants and soil metal concentrations.

- Soil samples will include nutrient as well as metal analysis to determine local growth conditions. Samples will be taken in locations that represent the different vegetation communities present within the study area. This information will provide a baseline of local background mineralization to help track changes in metal uptake by plants during and after mining activities.
- Nutrient and metal concentration analysis of samples will be undertaken by a certified lab.

Specific activities that are planned for this work element

- Planning for plant/soil sampling sites;
- Field work, gathering soil and plant samples; and
- Interpretation of lab analysis of nutrient and metal concentrations in plant and soil samples.

Deliverables

- Final report; and
- Map of sample locations.

4. Stand Density and Volume Estimates

Stand density and volume estimates gives an indication of potential timber quantity and also carbon storage. The main focus of this survey will be along the access road and lower elevations at the project site, where there is forest cover.

Specific activities that are planned for this work element

- Aerial photography or LiDAR interpretation to determine number of stems per hectare, leading tree species and height estimates.
- The field component requires actual measurements of tree height, diameters at breast height (DBH) and age determination (increment coring) of leading and secondary species to check desktop estimates. This simplified timber cruise can be done in conjunction with the ecosystem plots for cost efficiencies. Also combining timber measurements with the permanent ecosystem plots allows changes in tree growth and species composition to be monitored over time.

Deliverables

- Final report and stand information on TEM map for forested polygons.

5. Survey of invasive plants along roads and camp areas

Invasive plants are defined as plants that are not native and have negative effects on our environment, health and economy. In order to develop a strategy for combating invasive plants, a baseline inventory is required to determine the plant species, locations of infestation and vectors. The biology of each species is important in determining the treatment. In order to be properly assigned, a treatment must assess the degree of damage and species distribution.

Specific activities that are planned for this work element

- Invasive plant species typically establish themselves in disturbed areas such as roadsides and clearings, therefore surveys efforts will concentrate on along the access road and disturbed areas around the project site. It would be also informative to quickly survey along the Robert Campbell Highway within a kilometer in either direction of the junction with the KZK access road.
- The invasive plants will be identified to species level. Further information on each species encountered will be retrieved from the Yukon Invasive Species Council.
- This information will be needed in developing an invasive plant species management plan.

Deliverables

- Report and map on status of invasive plants; and
- Invasive Plants Management Plan.

Update: Vegetation surveys were conducted at lower elevations along the site access road in June, and the higher elevations surveys were conducted as described above during the week of July 27th.

6. Treatment Wetland Evaluation

The existing water licence QZ-97-026 was also reviewed to determine if the Terms and Conditions have bearing on the required work plan. As discussed below Clause 46 adds the requirement that the Licensee shall design, operate and maintain a pilot wetland polishing treatment project.

The potential for the incorporation of constructed wetland treatment systems (CWTS) into mine waste management planning will be re-evaluated as part of the vegetation survey program.

Information will be gathered to understand the overall treatability of water by a CWTS. During the site assessment, potential borrow sites for hydrosols and wetland plants will be identified, and natural wetlands at and around site will be assessed. Moreover, explanatory parameters will be defined in order to assess the natural latent capacity for passive water treatment at the KZK site. As appropriate for identified seeps and runoff areas (or natural water sources bearing elevated concentrations of constituents of potential interest to treatability), in situ and laboratory testing of the water, plants, and sediments may be conducted. The site assessment analyses will determine the range of parameters in which wetland plant species native to the site can survive, as well as determine the types of natural processes that could facilitate treatment and currently occur at the KZK site. Natural treatment would not only provide proof-of-concept for passive treatment for regulatory aspects of the Project, but it would also provide additional insight into putative CWTS designs and footprint for the KZK site-specific testing and associated rationale.

Water

Water samples will be collected and analyzed for select parameters. This will be performed at locations with plants that could be potentially used for CWTS, and also at sites with seepage or elevated concentrations of constituents of concern (e.g., water impacted from natural deposit outcroppings), if appropriate to the project.

Sediments

Sediment samples will be collected by grab sample and subjected to a panel of tests. The exact tests to be conducted will be refined based site-specific considerations. In situ testing for oxidation-reduction potential may be performed to determine the range associated with different wetland plant species, beneficial microbial communities, soil types, or water sources.

Plants

Local plant species will be identified for potential use in the CWTS. Evaluating local ecovars is important to determine aspects such as: physiology (e.g., radial oxygen loss [ROL], water depth tolerance), abundance on site, biomass production per year versus decomposition rate (to allow for accretion), bioconcentration tendencies, effective plant density (i.e., shoots per m² to aid in flow distribution), flow rate tolerance, structural capacity and prevention of sediment resuspension, evapotranspiration rate, provision for microbial habitat, socio-cultural importance (e.g., traditional medicine or food), and consideration of

impact on local animal species (e.g., key food source for local animals). Potential plant species will be identified and logged.

Microbial characterization

Microbes can be thought of as renewable catalysts in a CWTS that drive the removal of constituents from water through biogeochemical cycling. Careful CWTS designing can therefore mimic the environmental conditions that are known to enhance both the abundance and metabolic activity of beneficial microbes. Samples (e.g., sediment, plant roots) collected during the site visit will be tested for microbial community composition by microbiome analyses (DNA-based community profiling) at CSL. Total heterotrophic organisms and microbes involved in relevant biogeochemical cycling processes will be enumerated by growth-based most-probable number methods. This testing will facilitate plant and soil selection for the CWTS.

Technical Memo

A technical memo will be assembled reporting on Phase 1 CWTS Development and will contain:

- Results of a team (Biologists and BMC Engineers) meeting to determine and identify:
 - specific project objectives and goals,
 - timelines,
 - requirements,
 - site/scientific restrictions,
 - information gaps,
 - development of initial plans, etc.
- Potential plant species for use based on site-specific information,
- Baseline quantification of water samples in the context of CWTS remediation,
- Baseline quantification of hydrosols and plants in the context of CWTS remediation,
- Assessment of latent remediation potential of site (microbiological, geochemical, biogeochemical).

3.8 Wildlife

3.8.1 Data Review

Wildlife surveys for the project were conducted in the 1990's and more recent government data exists for some species (i.e., the Finlayson caribou herd). A review of the data is provided below along with an assessment of the need for additional field surveys. The wildlife baseline information collected for the KZK project will need to be updated and study areas adjusted to assess 'zone of influence' in relation to potential access road and mine site activities.

The most significant gap is temporal, in that the project-specific wildlife surveys were conducted nineteen years ago and need to be updated. The other gap is spatial, as larger mammals have seasonal preferences for habitat requirements and will range across large areas during the year. The previous surveys were fairly localized concentrating on the access road and project site. Expansion of survey areas for large mammals will provide for control areas outside of the 'zone of influence'. The study areas need to be of an appropriate size to quantify baseline conditions and assess project-specific effects on wildlife with small to mid-sized ranges, as well as larger ranging species (i.e. moose, grizzly bear and Stone sheep). Although this gap analysis focuses on wildlife, it overlaps with relevant aspects of habitat suitability. Wildlife-specific gaps are described below.

Caribou

The population status of the Finlayson caribou herd has been a concern for decades. Between 1983 and 1989, the local wolf population was reduced from 215 wolves to 29 wolves in an attempt to restore herd numbers. The Finlayson caribou herd grew from about 2000 animals in 1982 to nearly 6,000 in 1990. The estimated herd size in March 2007 was 3,077 +/- 5.6%. Fall surveys from 1999 to 2007 have averaged poor calf:cow ratios, indicating declining herd population.

A portion of the herd's summer and fall range extends across alpine areas south of the Robert Campbell Highway, into the KZK project area. While the herd's winter range does not usually enter the project area, the 2007 late-winter census shows a concentrated population of caribou bulls around the access road south of Finlayson Lake. This may have been a result of an unusual snowpack which was shallow further east of Ross River than in prior survey windows.

The results of the post-calving aggregation survey done in June 1995 for the KZK project area show that 472 caribou were counted: 184 cows, 120 calves, 117 immature bulls and 51 mature bulls. The calf:cow ratio was 65:100, which is high and indicates a positive trend for the portion of the herd counted. However these numbers were not in context with the regional studies done by YG biologists and instead may show a highly productive post-calving area.

Moose

Data on moose distribution and numbers were obtained through aerial surveys flown in late winter (March 1995) and post-rut (November 1995), to document late-winter and post-rut distribution. During a reconnaissance flight in early December nine moose were seen in the upper Geona Creek near the proposed project site. The late winter survey in March showed that most moose were in sub-alpine basins (1500 to 1600m a.s.l.) west of Geona Creek in small groups of four to seven. Other sightings of moose were dispersed along Finlayson, Geona and North creeks. Eight moose were observed at North Lake. In total 43 moose were counted, 20 bulls, 20 cows and 3 calves.

During the post rut survey in mid-November a total of 82 were observed again most were found in sub-alpine areas in small aggregates: 36 cows, 30 bulls and 15 calves. The highest density of moose were found at the west end of North Lake where 46 were counted. Both surveys were done about four years after the wolf management program had finished, which may account for the number moose observed.

The closest recent moose census was completed in the November 2011 for the Faro Area which is approximately 160 km northeast of the KZK project site. YG used a stratified block survey method over a regional size area (~6000km²). The survey area was divided into rectangular 'blocks' assigned high, medium or low 'strata,' based on the quality of moose habitat. Blocks to be surveyed were randomly selected in each stratum. The resulting data gives information on abundance, distribution, composition, and population trend of the regional moose population.

It would make sense to coordinate with YG biologists to conduct another regional census that overlaps the KZK project site so local moose counts are put in to a large-scale perspective. The larger moose population data set would be better suited in assessing cumulative effects.

The KZK project baseline post-rut and late winter survey needs expanding west to Big Campbell Creek and east to the upper reaches of East Creek, plus North Lakes to the south of the claim boundary. This will

provide control areas that are not immediately influenced by mine development and will ensure changes in seasonal moose population distributions can be detected.

Stone Sheep

Stone sheep are not found in project area, but are indicated on the YG Wildlife Key Areas map. Of particular importance is the lambing area approximately 13 km southeast near Money Creek and directly south near Fire Lake. In 1995 Sheep were seen about 7 km south of project area in the mountains SE of North Lake. Another population of sheep were seen at the headwaters of Money Creek. No Stone Sheep studies are required, however they will be recorded if observed during the other studies. Confirmation of Stone sheep locations will aid in determining air traffic routes that avoid sheep.

Grizzly Bear

Denning habitats have not been identified for the project area, as winter denning sites are typically in microsite habitat not easily discerned from remote imagery or mapping. A den survey is planned for the spring of 2015 in late April and early May. Tracks can be seen in the remaining snow at this time of year and traced back to den locations.

Wolverine

Wolverine were observed in the spring of 1995, but there is lack knowledge of potential denning sites. Simple winter tracking surveys are planned.

Beavers

Beavers were considered "moderately abundant" and observed in Finlayson, Geona and North Lake drainages. There was no quantifiable data collected. A localized beaver lodge and sign survey can be done for the upper Geona Valley where mining development will impact and may displace resident beavers.

Raptors

Twenty-six golden eagle observations were made in May of 1995, likely coinciding with caribou calving and sheep lambing seasons. One pair of gyrfalcons was sighted south east of Wolverine Lake and one bald eagle was documented at North Lake. Although, there is a significant presence of raptors no nests or nesting terrain were identified.

Songbirds

There are a number of bird species at risk likely present in the project area, but no focal species surveys were conducted.

A breeding bird point count needs to be done, especially in the area of impact where vegetation is going to be removed or there will be disturbance. Incidental data is not considered sufficient, as Environment Canada has required other project submissions (ex. Eagle Gold Project) to conduct point count surveys to identify potential species at risk, after their project submission to YESAB.

Waterfowl

Some observations of waterfowl were documented in the 1995 wildlife report. Again this appears to be incidental observations and no systematic methodology was used. The study area was not delineated, so it is assumed it was quite localized. No surveys were conducted to determine if there are important waterfowl molting areas/staging areas for migrating waterfowl. Smaller microsite habitats, especially along the access road, that Trumpeter swans could use were not captured and it is unknown if breeding occurs.

Small- and Medium-sized Mammals

Other than caribou, and some limited moose work, all existing wildlife work is based on incidental, non-focused surveys. Besides caribou and moose, the project footprint will clearly remove habitat for beaver, marmot, and possibly pika (COSEWIC special concern). There appears to be no project-derived information on distribution or abundance for these species

There is no survey data for collared pika (listed as special concern by COSEWIC), hoary marmot, river otter, lynx, fox or others aside from incidental information. There are potential project interactions with these species' habitat in alpine and subalpine areas.

There is no data for bats (in particular little brown myotis, COSEWIC endangered).

Amphibians

Ground-based surveys of beaver ponds will be a sufficient method to show that BMC is aware of concerns. Northern Wood Frog is the only likely amphibian to occur in study area at lower elevations along access road in wetlands and off-channel riparian sections.

3.8.2 Scope of Work

The wildlife surveys will:

- Have consistent spatial and temporal coverage that is appropriate for all the important aspects of the life history (rut/post-rut, wintering, calving) of the species examined. Spatially, surveys will provide complete coverage of the relevant habitat and timing for the species examined over a regional study area that will be defined either by a buffer set on the claims block boundary or the planned development footprint.
- Temporally, surveys will be conducted for each species so that surveys overlap with the rut or post-rut, wintering, calving/lambing, and post-calving/lambing seasons. The survey methodology or protocol to be used will offer consistent and complete species relevant coverage, and be repeatable across years.

Caribou Survey

The study area for caribou will be expanded east from the area surveyed in 1995 and west to capture more post-calving and rutting habitat (Figure 4). The north portion of the 1995 study was dropped as it is not high potential habitat for caribou seasonal requirements during these two seasonal periods.

Seasonal caribou survey observations will be correlated with habitat types derived from ecosystem mapping, so a habitat suitability map can be produced. Where area extends past TEM, Earth Observation for Sustainable Development (EOSD) imagery can be used to extend habitat suitability mapping.

Total area to be surveyed for caribou is approximately 3,000 km². The study is divided into four areas: first area contains the project site and access road as well as, the uplands immediate to the south (Figure 4). This area is considered the core area and is the most likely to experience direct impact from proposed mine activity. The other three areas are to the W, SW and SE of the mine site area. These three areas are considered references, far enough away from the project site that direct impacts are not a concern, but indirect impacts, such as changes in caribou migration utilization patterns may be seen.

In the post-calving period the caribou aggregate in sub-alpine to alpine areas where remnant snow patches still exist, young herbaceous food is available and predators can be seen from afar. The helicopter with a navigator and two observers will contour the mountain blocks at subalpine to alpine elevations in each

study area to find caribou aggregates. For each group of caribou observed, location, total number, and sex and age composition will be recorded.

The data collected for caribou will include:

- Post-calving aerial surveys (June/July) (**Update:** Completed for 2015);
- Rut aerial surveys (early October); and
- Late-winter aerial surveys (late February/early March in 2015 and 2016) will focus on lower elevations near Finlayson Lake and access road (**Update:** Completed for 2015).

There is a known mineral lick at the north end of North Lake which will have a motion sensor video camera installed to record use and wildlife species attracted to the site. If additional mineral licks are observed during the baseline studies, motion sensor video cameras will be installed at these locations.

Update: Cameras temporarily installed at wetland locations around site. Mineral lick location now confirmed, camera was installed the week of July 27th.

Update: An aerial survey was completed March 25–27, 2015 to document the late winter distribution of caribou and moose relative to the proposed Kudz Ze Kayah mine project. The survey area was defined by the Yukon Government's Game Management Area (GMA) 1007. A biologist from YG participated in the survey. The report has been provided to YG.

Moose

The study area for moose will be expanded from the area surveyed in 1995. This will be done to capture more late winter and post-rut habitat and include control areas not effected by road or mine infrastructure. This will allow for comparison studies for before and after mine development effects.

YG Biologists may be interested in combining efforts for a late winter (2016) moose census in the region overlapping the project area, which is situated in the Game Management Sub-unit 1007. YG will be contacted to determine the interest in combining efforts.

Seasonal moose survey observations will be correlated with habitat types derived from ecosystem mapping so a habitat suitability map can be produced.

Two aerial surveys will be conducted for moose population and distribution analysis:

- Early-winter (post-rut) aerial surveys (early November); and

- Late-winter aerial surveys (late February/early March).

The study area for post-rut moose survey will focus around the project site in radius of 6 km to determine where the high value early winter habitat is located (Figure 5). The access road corridor will also be flown. This corridor is approximately 4 km wide, where there is high value winter moose habitat the survey will be extended to cover this vegetation type (willow shrub-land).

The late winter moose survey will cover the same study area as the post-rut.

As the moose survey area is relatively small (130 km²) the whole area will be covered using a helicopter flying transects, 500 m apart, that run perpendicular to the access road and Geona Creek.

The surveying crew will consist of navigator and two observers. During the post-rut the location, total number, gender and age composition will be recorded. During the late winter survey gender is sometimes difficult to discern as the bulls have lost their antlers, so secondary features, such as size, colour, vulva patch will be relied on.

Grizzly Bears

The project area and access road have the potential for wolf, black bear and grizzly bear denning habitat. Aerial surveys to locate grizzly bear den sites will commence in late April 2015 with two follow up surveys conducted in early May to cover the emergent period for bears. Potential denning areas will be defined prior to flying the survey.

A grizzly bear den survey will be conducted for the spring of 2015. At this time of year tracks can be easily seen in the remaining snow and traced back to possible den locations.

Aerial surveys will consist of two or three 1-day surveys, spaced at approximately 10 day intervals to cover the emergence period from late April to mid-May. The main steps involved will be:

- Mapping of high to moderate suitable denning habitat in project area will done prior to fieldwork based on slope and vegetation cover type;
- The survey area will be centered (roughly) on the KZK project site and suitable habitat that is found within a 10 km radius will be surveyed;

- The surveys will be flown alongside of mountain blocks in areas predetermined to be of good denning habitat suitability, and adjusted based on conditions observed at the time of surveying;
- When bears tracks are located, the crew will determine the travel direction and follow the tracks backwards to locate the den;
- All active dens, bear sign and other significant wildlife observations will be documented and mapped. A memo report will be completed after the last den survey which will include mapped locations of observations.

During other wildlife surveys and the TEM field component, observations of bear sign (diggings, scat, track, and rub trees) will be recorded. Where there are clear signs of repeated use within or near the project area, such as diggings for arctic ground squirrels, it will be deemed grizzly habitat.

Update: *Completed 3 surveys in May, one bear den located SW of the project site, well outside of the immediate zone of project disturbance.*

Raptors (Golden Eagles, Gyrfalcons, Peregrine Falcons)

A raptor nesting area search will be conducted in conjunction with the caribou post-calving aerial survey. Potential nesting sites (i.e. rocky cliffs) near the project site or near commonly used flight paths will be identified. Then, if possible, observation for raptor activity will be made by telescope. If there is no visual, a helicopter will be used to ascertain presence of nests. Any nests found will be mapped, so a buffer (no-fly) zone can be assigned.

Raptors can be inconspicuous and may be difficult to detect due to their relatively large territories. To increase detection, incidental observations of raptors will be noted on a continuous basis to cover different periods of the day and a variety of habitat. The ground components will allow identifying focal areas which can subsequently be surveyed from an aircraft, as nests are often more easily located from the air.

Given the nature of the terrain in the study area, it not expected to represent a significant nesting habitat for raptors but it is likely being used as foraging ground. Rocky cliffs, rocky outcrops and steep embankments will be surveyed for signs of presence (roosting sites, whitewash, pellets). Although this monitoring effort makes it difficult to quantify the raptor population, it will provide information on the species utilizing the area. The protocol may then be refined based on the findings.

There are no waterfowl, raptor or grouse Wildlife Key Area key areas identified by Yukon Environment directly in the study area. However, key areas for peregrine falcon, bald eagle and waterfowl are present approximately 35 km east and northwest from site. During the 1995 Cominco Ltd. Study, no sensitive habitat was identified. The potential occurrence of sensitive habitat will again be assessed during this field trip.

Update: *completed in June, no significant sightings. Incidental observations have identified a few golden eagles, and these observations will continue to be noted.*

Songbirds

Ground based breeding bird point counts will be conducted in June within and around the project site where habitat removal and disturbance will occur. This will give an indication of avian diversity. Sites where COSEWIC-listed bird species are found will be described and mapped.

In June 2015 surveys will primarily be focused on birds breeding directly on the project footprint where prospective construction of mine infrastructure will take place. The location of the proposed mine infrastructure will be surveyed using a grid containing eleven point count surveys. This will allow for bird species description and distribution to be confirmed before construction of the mine infrastructure is started, so mitigation measures can be developed.

Update: *completed in June.*

Waterfowl

All wetlands and lakes within TEM study area will be visited to record observations and locate possible breeding, molting and staging areas for waterfowl. Additionally, ground based counts of beaver lodges, dams and evidence of tree cutting will be collected as part of the waterfowl surveys to assess habitat quality.

The watercourses in the vicinity of the project will be surveyed for aquatic and riparian birds. Given the extent of the wetlands, a complete count of the water birds should be achievable. Up to six locations accessible by air will be potentially visited. These locations include the wetlands of South Creek, Geona Creek, North River and North Lakes.

Two control areas, including wetlands, to the east and west of the potential mine infrastructure footprint have been identified in desktop analysis and will be further investigated while on site to determine suitable locations for point count surveys. It is anticipated that there will be four to five surveys conducted in each control area.

Subsequently, target areas of the access road identified on the map will be examined to identify sensitive species and/or habitat. A maximum of six areas of interest such as water crossing or wetland proximity were identified and are presented on the map.

Update: *partially completed in July.*

Habitat Suitability/Availability

A habitat suitability index map will be developed for caribou based on the quality of rutting and post-calving caribou habitat within the survey area. Moose late winter habitat and post-rut habitat will also be assessed and mapped. Observations of these two species will be correlated with the TEM map and EOSD imagery to model seasonal habitat selection.

Pika

There is no survey data for collared pika (listed as special concern by COSEWIC). Assessment of colony potential from aerial photographs and helicopter reconnaissance will be performed before on-ground searches are conducted. The pikas live in stable talus deposit in subalpine to alpine zones. There also needs to be meadow areas nearby so they can forage within easy reach of cover. Aerial survey would be limited to the upper Geona Creek watershed, if potential habitat is confirmed or found personnel will land to confirm presence through call surveys.

Update: *Completed in July.*

Bats

There is no data for bats (in particular little brown myotis, COSEWIC endangered). Two bat acoustic detectors will be set up in potential flight paths (i.e. over stream channels and wetlands) for three nights in August within the project footprint. This is a relatively simple cost effective means of determining the presence of bats. Bat surveys will be conducted using echo-locators strategically placed around the project area.

The wildlife baseline report(s) will:

- Describe abundance and distribution characteristics of major wildlife species within the project area and vicinity. Include information on mammals, amphibians, birds, and reptiles (including rare/endangered species).
- Describe the habitat classifications used in the project area, and any implications concerning the distribution and abundance of habitat types that may influence the project.
- Provide a map showing the spatial arrangement of habitats of special interest.
- Identify and describe transportation corridors and critical, key, and sensitive habitats. Include periods of habitat use in the project area and vicinity.
- Identify any species listed on the COSEWIC (Committee on the Status of Endangered Wildlife in Canada) and Species at Risk lists.
- Describe any special management requirements due to vulnerability, threatened, or endangered status.
- Identify and describe any ongoing studies and/or monitoring programs with respect to wildlife in the project area and vicinity.
- Added emphasis will be placed on describing wildlife interactions with water resources, as well as the effects of the water use on wildlife and its habitat, as per section 14.8.4.1 of the First Nation Final Agreements.
- Describe similarities and/or differences between the data collected previously and the data collected in 2015/2016.

3.9 Surface Water Quality

3.9.1 Data Review

Summary of Initial Environmental Evaluation (IEE) and Water Licence Application Information

Cominco initiated a baseline water quality monitoring program in July, 1994. The program was expanded in December, 1994, continuing through to September, 1995. During that 14 month period, samples were

collected from 22 stream locations and 6 pond sites, a total of 28. From April, 1995, onwards, sites in the Geona, South, Finlayson and East Creek catchments were sampled (Figure 3-3 of the IEE).

East Creek was included to give a better indication of baseline conditions, and because the valley had potential locations for tailings disposal. The water quality monitoring sites on Geona Creek include five sites on the mainstem creek, three ponds on the mainstem creek, and four tributaries, two flowing from the west and two from the east. The frequency of sampling varied between sites. Sampling of several lakes occurred only in the summer. Table 1 summarizes the sampling locations and sampling frequency at each site. The monitoring program was designed to record seasonal (flow related) variations in water quality at all stream sites. Thus, all accessible sites were sampled in December, 1994, April, June, August and September, 1995 and April, June and August 1996. Sites assumed to be key for the impact assessment (downstream of the site on Geona and Finlayson Creeks) were selected for more intensive study. These locations were sites 5/7, 13, 15, 16, 21 and 26. Initially, Site 5 on Geona Creek was part of the intensive program because it was believed to be downstream of the proposed tailings dam. The intensive study changed to Site 7 further downstream in August, 1995, when it became apparent that Site 5 would be upstream of the dam. The "intensive" sites were sampled once a month from April through July, 1995. Beginning August 15, 1995, samples were collected weekly for four weeks in order to estimate within-site variability. The final sampling of all 27 sites was undertaken on September 12. Thus, there were actually five consecutive weekly samples at the "intensive" sites.

Table 1. Summary of Baseline Surface Water Quality Sampling Program (1994/1995)

SITE	DESCRIPTION	SAMPING DATES								
		Jul-94	Aug-94	Dec-94	Apr-95	May-95	Jun-95	Jul-95	Aug:-95	Sep-95
1	headwaters of South Creek between 2 lakes	√	√	√			√		√	√
2	"Fault Creek" (west-side trib. to Wolf Lake)	√	√	√	√		√		√	√
3	unnamed west-side trib. to upper lake in Geona Creek	√	√				√		√	√
4	Geona Creek in ore zone (between 2 small lakes)	√	√	√			√		√	√
5	Geona Creek downstream of ore zone	√	√	√		√	√	√	√	√
6	unnamed east-side trib. of Geona Creek downstream of ore zone	√	√	√	√		√		√	√
7	Geona Creek downstream of confluence with Site 6 trib.	√	√	√	√		√		4	√
8	Geona Creek 0.5km downstream of Site 7	√	√				√			
9	lower Geona Creek 2km downstream of Site 7	√	√	√	√		√		√	√
10	lowermost small lake in upper Geona Creek	√	√				√		√	√
11	uppermost headwater lake in Geona Creek	√	√		√		√		√	√
12	uppermost lake in South Creek	√	√		√		√		√	√
13	South Creek downstream of the headwater lakes			√	√	√	√	√	4	√
14	North River downstream of South Creek confluence			√			√		√	√
15	Finlayson Creek downstream of Geona Creek confluence			√	√	√	√	√	4	√
16	Finlayson Creek upstream of Geona Creek confluence				√	√	√	√	4	√
17	lower Geona Creek upstream of Finlayson Creek confluence			√	√		√		√	√
18	unnamed east-side trib. of Geona Creek				√		√		√	√
19	upper East Creek						√		√	√
20	middle East Creek				√		√		√	√
21	lower East Creek				√	√	√	√	4	√
22	upper (eastern) North Lake				√		√		√	√
23	lower (southern) North Lake						√		√	√
24	second small lake in upper South Creek						√		√	√
25	second small lake in upper Geona Creek						√		√	√
26	lower Finlayson Creek at Robert Campbell Hwy.				√	√	√	√	4	√
27	North Lakes Creek below eastern North Lake				√		√		√	√
28	small lake in mid-reach of East Creek						√		√	√

Notes: √ = Collected

4 = Sampled over four successive weeks

Summary of Data Collected to Fulfill Part F of the Water Licence

The following table summarizes the data collected to date in order to fulfill the water licence requirements. These reports are available for review on the Water Board’s website.

Table 2. Aquatics Data Collected (2002 to 2014)

Site	Water Quality	Stream Sediments	Benthic Invertebrates	BI Tissues	Fish	Fish Tissues
KZ-7	√	√				
KZ-9	√	√	√			
KZ-15	√	√	√	√	√	√
KZ-16	√	√	√	√	√	√
KZ-17	√	√	√			
KZ-21	√	√	√			
KZ-26	√	√	√	√	√	√
KZ-27	√	√	√			

NOTE: Years of data collection were 2002, 2004, 2006, 2008, 2010, 2011, 2012, and 2014
 Due to flooding by beavers, site KZ-17 could not be sampled in 2010, 2012 and 2014.
 Due to beaver activity, the location of KZ-9 has been relocated a few times but is in the general area as indicated on the map in the report.

Identified Gaps

Monthly continuous monitoring for at least one year is required to fully characterize seasonal variability within the local and regional study area including: Geona Creek, Finlayson Creek and South Creek catchments. Historic data will need to be compiled a data quality assessment will be performed to validate use of historic data in baseline report.

Dissolved organic carbon (DOC) was absent from the analytical suite in both the 1990’s baseline program and Water Licence monitoring. Monitoring for DOC will be essential to understand the potential toxicity of copper and other metals and to develop site specific water quality objectives (i.e. biotic ligand model, if required).

In addition, cyanide (both total and WAD) should be re-instated in the baseline – included in IEE baseline, but not in WUL monitoring.

3.9.2 Scope of Work

Baseline study for surface water quality will be undertaken on a monthly frequency for monitoring of the 10 stations presented in Figure 6 and described as follows:

Station	Description
KZ26	Finlayson Creek at Robert Campbell Highway
KZ22	Finlayson Creek 100m downstream of East Creek
KZ21	East Creek at Mouth
KZ16	Finlayson Creek immediately upstream of confluence with Geona Creek
KZ15	Finlayson Creek 100 m downstream of confluence with Geona Creek
KZ17	Geona Creek at Mouth. This site is currently flooded due to a beaver dam constructed since 2008. A new sampling station will be re-established as close as possible to the original KZ17 site
KZ7	Geona Creek near proposed tailings impoundment discharge location
KZ9	Upper Geona Creek near open pit
KZ2	Fault Creek
KZ13	South Creek near mouth

Artesian seeps will also be sampled since these may form important point sources of naturally elevated metals to the surface waters if they derive from mineralized lenses in the subsurface.

Field parameters to be collected include: pH, Specific conductivity, Temperature, Oxidation-reduction potential (ORP), and Dissolved oxygen.

Parameters to be measured in the laboratory: pH, Specific conductivity, Colour, Total suspended solids, Anion scan (chloride, fluoride, sulphate, nitrate and nitrite, Alkalinity and acidity, Ammonia, Dissolved organic carbon (DOC), Total metals (ultra-low level metals package including hardness, phosphorous and

mercury), Dissolved metals (ultra-low level metals package including hardness, phosphorous and mercury), Total and WAD cyanide.

QA/QC procedures will include the collection of field and a trip blanks in order to evaluate and identify sources of potential contamination during sample collection and transportation, respectively. A replicate sample will also be collected at one of the 10 field sites sampled each month to determine field repeatability of the data and identify any natural fluctuations in the water chemistry. All such blank and replicate samples will be submitted "blind" to the laboratory using anonymized labelling to ensure they are treated in the same fashion as the water samples. In addition, any laboratory will follow their own established QA/QC procedures, which will include:

- Replicate analyses of samples to establish analytical precision;
- Analysis of certified reference materials to establish analytical accuracy;
- Analysis of laboratory blanks to identify sources of laboratory-based contamination (e.g. carry-over from previous samples); and
- Analysis of spiked samples to establish analyte recovery and identify if any sample matrix-related interferences with the measurements.

As a further part of the QA/QC program, the monthly data received from the laboratory will be reviewed to ensure data quality and flag any potential issues (e.g. outliers due to high TSS, data quality issues from the information provided by the lab, ensure data are charge balanced – typically <5%, etc). Additionally, the QA/QC program will include a review of the relative percent difference in replicates and parameters measured in field blanks and trip blanks to assess data quality.

All samples will be shipped to Maxxam Analytical in Burnaby BC for analysis.

A dedicated EQWIN database, populated with historic water quality data by the end of May 2015, will be updated within one week of receiving the monthly surface water quality results each month.

An EQWIN database will be developed in incorporating the previous data collected in 1994/1995, and during the biannual water licence sampling (2006 – 2014) that has been digitised by BMC. Where available, further data collected by government agencies such as Environment Canada will also be

incorporated into the database. Data will be organized, a data quality assessment (DQA) will be undertaken, and an outlier analysis conducted. This will ensure data integrity is established before proceeding with the addition of new data.

Water quality data will be evaluated for spatial and geochemical differences, typically comparing upper and lower watershed groupings. Potentially influenced stations will be identified, along with timing of influences. Aquatic resources and specific protection requirements will be considered. A set of presentations/meetings is anticipated at this point (two meetings in Whitehorse) to relay these findings to stakeholders and regulators, signaling our intention for data manipulation and effects assessment going forward. Final data groupings will be selected.

Data groupings statistics will be used to compare with guideline values. This may be conducted on either a total or dissolved constituent basis, and will include an evaluation of suspended sediment concentrations and variability.

The baseline water quality report will include a spatial and statistical characterization of surveyed surface water quality in the KZK study area. It will summarise the water quality of the site, examining seasonal trends and identifying constituents of concern based on comparison with regulatory guidelines (CCME, BMCOE). Previous data collected in 1994/1995 (IEE), during the biannual water licence sampling (2006 – 2014), and any other sources (e.g. Environment Canada in 2000) will also be included in order to evaluate any longer term changes in water chemistry.

Update: *Monthly sampling at the 10 stations identified above was initiated in April 2015. A dedicated EQWIN database was created and populated with historic water quality data, and is updated monthly. A QA/QC review has been conducted on the historical data. A seep survey was conducted in June 2015, and water samples were collected from 5 seeps in the Geona Creek drainage.*

3.10 Surface Water Quantity

3.10.1 Data Review

Surface water flow data were collected for 5 to 6 month in 1995 from four manual measurement sites and two automated sites, shown in Table 3 with the associated surface water quality station and the drainage area of each creek at the point of measurement.

Table 3. Historical Kudz Ze Kayah Hydrological Station Locations

Station	Associated WQ Station	Drainage Area (km ²)	Station Type
South Creek	KZ13	9.82	Manual
Fault Creek	KZ2	1.94	Manual
Geona Creek	KZ17	26.2	Continuous
East Creek	KZ21	73.4	Manual
Upper Finlayson Creek	KZ22	153	Manual
Lower Finlayson Creek	KZ26	191	Continuous

In addition, data from 16 Water Survey of Canada (WSC) hydrometric stations and two Department of Indian and Northern Affairs hydrometric stations (now maintained by Yukon Government (YG)) were utilized in the analysis of annual runoff, monthly runoff distribution, flood flows, and low flows in 1997. These are shown in Table 4 with the available years of record for each station.

Table 4. Regional Hydrometric Stations Utilized in Past Assessment

Station ID	Station Name	Drainage Area (km ²)	Years of Record
<u>YG</u>			
29AE003	Partridge C.	63.7	1978 - 1994
29BA002	180 Mile C.	83.1	1975 - 1993
<u>WSC</u>			
10AB003	King C.	13.7	1975 - 1988
09BC003	Rose C.	208	1966 - 1969
09AD002	Sidney C.	372	1982 - 1994
10AA002*	Tom C.	435	1974 - 1993
10AA005	Big C.	1010	1989 - 2014
09BB001	South MacMillan R.	997	1974-1996
10AD002	Hyland R.	2150	1976 - 1994
09BA002	Pelly R. below F.C.	5020	1986 - 2013
10AA004	Rancheria R.	5100	1985 - 2012
09BA001	Ross R. at R.R.	7310	1960 - 2013
09AD001	Nisutlin R.	8030	1979 - 1995
10AB001	Frances R.	12800	1962 - 2013
09BC002	Pelly R. at R.R.	18400	1954 - 2013
09BC004	Pelly R below V.C.	21900	1972 – 2013

09AE001	Teslin R. at Teslin	30300	1944 - 1994
10AA001	Liard R. at U.C.	32600	1960 - 2013
*Operated by YG from 1999 to present			

Identified Information Gaps

The following data gaps were identified during:

- YESAB requires the provision of measurements of water quantity relevant to the project on a minimum monthly basis for a minimum period of one year to estimate seasonal variability. It is recommended that sensitivity/uncertainty analyses and multi-year sampling should be considered to estimate inter-annual variability. The surface water quantity data collection to date presented in the 1997 licencing submission includes 5 to 6 months of sampling and does not include winter measurements. Regional analyses have been undertaken to expand on the data collected. With one year of sampling from April 2015 to April 2016 in addition to the updating of regional analyses this requirement will be met.
- YESAB requires the identification of annual dates for watercourse/body freeze-up and break-up, and the recording of locations that are consistently early or late for break-up or freeze. No freeze-up dates were recorded as part of the 1997 licencing submission. Careful observation of freeze-up and break-up timing on watercourses during the year of sampling from April 2015 to April 2016 should allow the proponent to meet this requirement, though a commitment to continued monitoring will likely be a YESAB requirement.
- YESAB requires the capture of timing and flow information surrounding spring freshet, annual peak and winter low flow/zero flow conditions. Winter low flows were not collected as part of the 1997 licencing submission. Sampling in late winter during the April 2015 to April 2016 sampling period should allow the proponent to meet this requirement.
- YESAB requires the characterization of runoff conditions for the catchment areas using runoff coefficients, etc, and the modelling of extreme flow conditions for both wet and dry events. While an analysis was conducted to determine the catchment and resulting probable maximum flood for the tailings dam impoundment, no station or data are available on Geona Creek directly below the proposed tailings dam location to provide validation of the flood predictions. The addition of

a hydrometric station at KZ9 will provide these data, and provide redundancy on the main stem of Geona Creek.

- A desktop review of the water quality monitoring network determined station KZ15 as a critical location for modelling impacts on Finlayson Creek. As such, a hydrometric station will be established at KZ15 to assist the development of the water quality prediction model to evaluate the potential impacts on Finlayson Creek immediately downstream of the confluence with Geona Creek.
- For wetlands, ponds and lakes, YESAB requires the provision of estimates of water body volume as well as inputs and outputs, estimates of retention time for the water body, demonstration of if and when the water body stratifies and when the water column mixes (turnover), and demonstration of any monthly/seasonal patterns of water movement near proposed points of project discharge. This characterization was not present in the 1997 licencing submission, apart from the calculation of the area and mean depth of lakes for the calculation of morphoedaphic indices (Table 3-18, KZK 1997 Licencing Submission, Section 3 Environmental Baseline Conditions), but will be executed as part of the fisheries and aquatic resources baseline studies.

3.10.2 Scope of Work

Eight continuous data collection hydrometric stations will be installed.

Six of the stations will be located on the same reaches as the historical stations (listed in the following table). Additional stations will be located on Geona Creek at KZ9 and on Finlayson Creek at KZ15. Recent annual reports have indicated the presence of beaver damming at KZ9 and KZ17, so these installations will be subject to a reconnaissance.

Station	Associated WQ Station
South Creek	KZ13
Fault Creek	KZ2
Geona Creek	KZ17
East Creek	KZ21
Upper Finlayson Creek	KZ22
Lower Finlayson Creek	KZ26

Hydrology stations will be set up with continuous stage logging instruments, staff gauges, and local survey controls. Hydrometric monitoring stations will consist of a metal cribbing structure with a Water Survey of Canada staff gauge and PVC stilling well affixed. A Solinst Levellogger will be placed in the stilling well with a direct read interface cable and will be paired with a Solinst Barologger nearby for compensation. Vertical movement in the staff gauge will be tracked with bi-annual surveys to three locally established benchmarks. Discharge measurements paired with precise direct stage observations are required to develop a stage-discharge relationship. Once established, the stage-discharge relationship (or rating curve) allows for the computation of a continuous discharge record giving a precise record of flow volumes.

The stations will be installed prior to freshet 2015. After freshet the station locations will be re-evaluated to ensure that hydrometric data can be reliably be collected in the measurement reach.

Manual stream discharge gauging will be conducted at all hydrometric stations monthly between April 2015 and April 2016 to develop/expand the stage/discharge relationship for each station.

Manual stream discharge gauging will be undertaken at all hydrometric monitoring sites monthly in conjunction with the baseline water quality monitoring program. These monthly visits will include downloading and maintaining the automated Solinst water level recorders.

In addition, manual stream discharge gauging at water quality stations KZ-7 and KZ-16 will be undertaken to provide spot measurements of discharge at these sites.

Seeps and artesian conditions will be evaluated at the mine site area (with respect to flow directions).

The surface water quantity baseline is designed to meet YESAB executive council submission requirements and will consist of the following components:

- Processing of automated water level data and management of stream discharge data using the Aquarius Software, including quality control and maintenance of stream discharge database.
- Continuous water level data, manual stream discharges, and survey results will be imported into the Aquarius Database so that rating curves can be established for each station and a yearly record of stream discharge created.
- All previously collected data from site stations and regional stations will be compiled and imported into the Aquarius Database so that a regional review of hydrology can be undertaken
- Preparation of a draft baseline surface water hydrology report to be appended to the YESAB Project Proposal document.
- The surface water hydrology baseline will contain individual discharge measurements as well as mean daily and monthly flow values computed from the 2015/16 continuous flow records, in addition to the presentation of the 1995 historical data.
- The report will also contain statistics satisfying the requirement of the YESAB Guidelines including characterizations such as annual runoff, monthly runoff, annual peak, winter low flows, freeze-up and break-up dates.

- Return period flood and low flows will be calculated resulting in the updating of the runoff characterization and flood analyses completed as part of the 1997 licence submission.
- Comparisons will be made and statistics extrapolated from nearby WSC and YG hydrometric stations with longer term data to assist with the hydrological analyses as needed.
- No effects assessment will be conducted for surface water quantity, however hydrological data will feed into the development of the water balance, which will in turn feed into the water quality modeling and predictions.

Update: Monthly manual discharge measurements were initiated in April 2015. Hydrometric stations were installed in May 2015 at the following locations: KZ-26, KZ-22, KZ-16, KZ-15, KZ-9, KZ-2 and KZ-13. These station are presented on Figure 6. Conditions at KZ-17 (extensive damming/flooding) do not allow for an adequate continuous flow gauging station.

3.11 Aquatic Ecosystems and Resources

3.11.1 Data Review

Fish

Fish studies were completed along the access road in 1994 and at the project site in 1995 (in early spring, late spring, summer and fall). Table 2 summarizes the fish sampling program that has been conducted to meet the water licence requirements.

Sediment

Sediment samples were collected at 8 water quality sites in 1994 and 6 water quality sites in 1995. Table 3 summarizes the sediment sampling program that has been conducted to meet the water licence requirements.

Benthic Invertebrates

A benthic invertebrate sampling program was conducted at 12 of the water quality sites in 1995. Table 3 summarizes the sediment sampling program that has been conducted to meet the water licence requirements.

Zooplankton

In 1995, planktonic invertebrates were sampled in the lakes and ponds of the project area including the headwater ponds in Geona Creek and the large ponds/lakes in upper South Creek, the natural lake in mid-East Creek and in two of the North Lakes to establish the background range of species in the drainage systems. In total, 7 sites were sampled. Zooplankton monitoring is not a requirement of the water licence.

Identified Information Gaps

Existing stream sediment and zooplankton data are deemed generally adequate as a basis for proceeding with effects assessment and the YESAB process. Additional sampling for fish tissue is not deemed necessary for baseline characterization or effects assessment given the sampling that has been conducted as part of the water licence.

Additional sampling for fish presence, distribution and abundance in Geona Creek is recommended, as the only information available was collected 20 years ago and may not be representative of current conditions. Stream systems can change significantly over decades: barriers can degrade or new ones form, changing habitat access and use. It is critical that this drainage be characterized in detail as it will be directly impacted by the mine development. A reach assessment should also be conducted in order to better understand the quality and quantity of fish habitat available.

Fault Creek should also be sampled for fish presence/absence, since it will be diverted to the south as part of the mine development. Additional sampling for fish presence, distribution and abundance is also recommended in the North Lakes systems, more specifically in the vicinity of where the diverted Fault Creek will come in, as existing aquatic resources could be impacted by a change in the flow regime.

Information collected through this baseline data collection program will be of direct use for the effects assessment as well as for the development of a Fish Habitat Compensation Plan.

In addition, YESAB's requirements include the documentation of "critical and sensitive habitats, including relevant spawning, over-wintering and migration periods and locations, rare and/or endangered species and habitats". It is therefore recommended that additional studies aimed at delineating spawning and over-wintering habitat in Geona Creek, Finlayson Creek and the North Lakes system be undertaken. In

particular, a detailed reach assessment should be conducted in Geona Creek in order to better understand the quality and quantity of fish habitat available.

Benthic invertebrate data should be collected in the section of Geona Creek where habitat will be lost as a result of the mine development (i.e. upstream of the proposed tailings dam). This information will support the effects assessment as well as the development of a Fish Habitat Compensation Plan.

No periphyton data are available for the project area. However, YESAB Sector-Specific Additional Information Requirements for Hardrock (Quartz) Mining Projects include the following: "Provide a summary inventory of benthic invertebrates and periphyton baseline data for affected drainages including, where applicable, sample site descriptions, species abundance, spatial distribution, taxonomy, biomass, and chlorophyll contents."

It is therefore recommended that periphyton sampling be carried out in Geona Creek, Finlayson Creek as well as in the North Lakes system in order to meet YESAB's requirements.

3.11.2 Scope of Work

Fish and fish habitat

Additional sampling for fish presence, distribution and abundance in Geona Creek will be conducted, as the only information available was collected 20 years ago. A reach assessment will also be conducted in order to better understand the quality and quantity of fish habitat available.

Fault Creek will also be sampled for fish presence/absence, since it will be diverted to the south as part of the mine development. Additional sampling for fish presence, distribution and abundance will also be conducted in the North Lakes systems, more specifically in the vicinity of where the diverted Fault Creek will come in, as existing aquatic resources could be impacted by a change in the flow regime.

In addition, YESAB's requirements include the documentation of "critical and sensitive habitats, including relevant spawning, over-wintering and migration periods and locations, rare and/or endangered species and habitats". Therefore, additional studies aimed at delineating spawning and over-wintering habitat in Geona Creek, Finlayson Creek and the North Lakes system will be undertaken. In particular, a detailed reach assessment will be conducted in Geona Creek in order to better understand the quality and quantity of fish habitat available.

Fish sampling methods may include electrofishing, minnow trapping, beach seining, angling, visual observations, boat and diver surveys depending on the type of habitat being sampled and the conditions of that habitat. To the extent possible, sampling sites used in 1995 will be repeated (this will allow an evaluation of changes since then), as well as additional sites deemed relevant to characterize fish use and distribution. All fish captured will be identified and enumerated, measured for fork length (mm) or total length, weighed, observed for abnormalities, and released at the location of capture. Results will be reported as of Catch Per Unit Effort (CPUE) to enable spatial and temporal comparisons. Additional supporting information that will be collected include: physical description and photo documentation of sampling locations, *in situ* water parameters (temperature, dissolved oxygen, conductivity) as well as weather conditions at time of sampling. A scientific collection licence that allows for fish sampling will be obtained from the DFO prior to sampling. A final report will be prepared and submitted to DFO at the termination of the assessment period as will be required as a condition of the permit.

A reach assessment will be carried out on Geona Creek, concurrent with one of the fish sampling events. The reach assessment will provide a more detailed description of channel characteristics, stream morphology, substrate quality, riparian vegetation, bank material and other instream features that are important in quantifying fish habitat for different life stages of focal species. The assessment will also identify barriers that isolate fish habitat. Some barriers may need to be confirmed through sampling (i.e. plunges less than 0.5 m for example), while others may be obvious (1.0 m +). If obvious barriers are encountered, efforts to trap to conduct habitat assessment upstream will be minimal.

Benthic invertebrates

Benthic invertebrate data will be collected in the section of Geona Creek where habitat will be lost as a result of the mine development (i.e. upstream of the proposed tailings dam). This information will support the effects assessment as well as the development of a Fish Habitat Compensation Plan.

Benthic invertebrate sampling methods will be kept consistent with the requirements of the Water License (and previous sampling) to enable meaningful comparisons of results. Suitable sampling site(s) in upper Geona Creek will be identified by the field crew once on site. Benthic samples are collected during one annual event in late summer/early fall when communities are well established, and sent to an accredited

laboratory for enumeration and identification. Benthic invertebrate reporting will include all species captured and identified to the lowest taxonomic level possible. Details with respect to community structure and density will be evaluated along with a number of other diversity and evenness indices and relevant supporting information.

Periphyton

Periphyton sampling will be carried out in Geona Creek, Finlayson Creek as well as in the North Lakes system in order to meet YESAB's requirements.

Periphyton samples will be collected from suitable substrate from a variety of habitats (i.e. pools, riffles) through scraping or brushing. Samples from each respective station will be combined to form one representative composite sample. Once collected samples will be placed in jars and stored in a dark cool location prior to shipping to a plant (algae) taxonomist for identification. Analysis and reporting may include an evaluation of the types collected, chlorophyll a and relative sensitivities to possible contaminants, along with supporting information.

Baseline Report

All previously collected data, as well as data collected during the 2015 field season will be combined. From this, a fisheries and aquatic resources baseline report characterizing past and current conditions as well as trends over time will be developed for fisheries, benthic invertebrates, periphyton and stream sediments. This baseline report will be appended to the YESAB Project Proposal.

Update: *A first fisheries sampling trip was carried out in June 2015, with a focus on Geona Creek and Fault Creek, and used minnow traps and electrofishing.*

3.12 Groundwater

3.12.1 Groundwater Quantity Scope of Work

The hydrogeological assessment will form the basis for the groundwater baseline and effects assessment that are required as part of the submission under YESAA. In addition, the hydrogeological baseline assessment will be designed to also provide necessary groundwater information for the mine design. The scope will satisfy the hydrogeology-related requirements of an Executive Committee level review under

YESAA and will meet the requirements of the Yukon Water Board for granting or renewing a Type A Water Licence.

Site Reconnaissance

The hydrogeological field program will significantly depend on the conditions of the existing monitoring wells that were mostly installed at the site in 1995/96. A site reconnaissance visit will assess the conditions of the existing monitoring wells. The site reconnaissance will include the following:

- Documenting the overall physical setting and access around the project area;
 - Inspecting the existing monitoring wells, including:
 - Inspecting the wellhead and casing conditions above surface;
 - Photographic log and hand-held GPS coordinates of the well location;
 - Measuring the depth to groundwater and well depth to identify if the well is still open to the original depth or may have been compromised;
 - Redevelopment of the monitoring wells.
- Inspect potential locations for additional monitoring wells to be installed as part of the summer 2015 field program;
- Inspect and document any groundwater seeps or springs within the study areas; and
- Evaluate access needs for proposed new monitoring wells and large diameter test wells, and evaluate where diamond drill holes (DDH) or air rotary drilling methods could be used for the well installation.

Field Program

The scope of the field program may change as a result of the outcome of the site reconnaissance. For the purpose of this Scope of Work it is assumed that all existing monitoring wells can be redeveloped and are still functional.

The scope of the hydrogeological field program in the different areas of proposed mine infrastructure is further described below.

Open Pit

A total of 14 monitoring wells have been installed across the area of the proposed open pit including one nested well. Five monitoring wells are completed within the overburden aquifer whereas the remaining wells are completed within bedrock (three completed in shallow bedrock and six completed in the deeper competent bedrock). The existing monitoring wells appear to provide suitable spatial coverage except for the eastern area of the proposed open pit.

Falling and rising head tests were carried out on some of the existing monitoring wells to characterize near-well hydraulic conductivities. However, the bulk hydraulic conductivities of the different hydrostratigraphic units (especially those of the permeable overburden and shallow fractured bedrock) need to be better determined to further constrain the estimated dewatering rates. Long-term pumping tests will be required to determine bulk hydraulic conductivities and ultimately, more accurate dewatering rates for the design of suitable dewatering infrastructure. A long-term pumping test will also provide the opportunity to identify aquifer boundaries that are likely present given the topography in the vicinity of the proposed open pit. Hydraulic response tests (falling/rising head tests), packer tests, or short-term pumping tests are typically not be suitable to identify aquifer boundaries because of their small radius of influence.

Since all monitoring wells are completed with small diameter (32 mm) PVC standpipes, the wells are not suitable for conducting short or long-term pumping tests. Therefore, two large diameter (200 mm) test wells to carry out long-term constant rate pumping tests will be installed. One well will be completed within the overburden aquifer (estimated depth of about 10 m) to determine the bulk hydraulic conductivity of the shallow sand and gravel aquifer. The other test well will be completed within the shallow fractured bedrock (estimated depth of about 25 m) to determine the bulk hydraulic conductivity of the shallow bedrock aquifer. The test wells will be located so that they can be used for future dewatering of the open pit. The location of the test wells will be optimized so that the existing monitoring wells can be used as observation wells during the long-term pumping test.

In addition to the long-term pumping tests, additional packer tests will be conducted in exploration boreholes throughout the proposed open pit to better determine the hydraulic conductivity of different

lithological units encountered as well as fault and shear zones that may contribute significantly or greatly reduce groundwater inflow to the open pit.

In summary, the following is the hydraulic testing program for the proposed open pit:

- Packer tests (constant head injection tests) during well drilling in select exploration boreholes. The test holes will be selected based on BMC's exploration program and a review of the structural geology of the open pit area. Selected exploration boreholes will also be completed as permanent monitoring wells with either vibrating wire piezometers (VWPs) or conventional PVC standpipe depending on the conditions encountered and dip of the borehole. The diamond drill and the rig's water pump will be required for the packer tests.
- Hydraulic response (falling and rising head) tests will be conducted in all existing and new monitoring wells to indicate near-well bulk hydraulic conductivity values.
- Step-drawdown and constant-rate pumping tests will be conducted in two large diameter (200 mm) test wells to give far-field bulk hydraulic conductivity for overburden and shallow fractured bedrock and to identify aquifer boundaries. It is understood that the current Type A Water Licence allows a maximum of 1,100 m³/day of groundwater withdrawal and we therefore expect that the pumping tests can be conducted under the existing Water Licence. The water will be discharged to ground away from the test and observation wells as to not interfere with the pumping test. Discharged water will not be allowed to flow directly into surface water in accordance with the Waters Act.
- It is assumed that the constant rate tests will be conducted for 48 hours in overburden and 72 hours in shallow bedrock. Well water levels will be monitored using pressure transducers with datalogger for a continuous data record.

Waste Dumps

Limited hydrogeological information is currently available for the area of the two proposed waste dumps. The baseline and effects assessment requires monitoring wells to be installed up- and down-gradient of the facilities. The existing monitoring wells BH95G-32 and BH95G-33 are located down-gradient of the Weakly Potentially Acid Generating (WPAG) dump, and monitoring wells BH95G-31 and BH95G-30 are

located down-gradient of the Potentially Acid Consuming (PAC) dump. Assuming these wells can be redeveloped and are still functional, no additional down-gradient wells are required.

Two additional monitoring wells in the area of the WPAG dump (one up-gradient, one within the facility's footprint near the down-gradient edge) and four additional monitoring wells in the area of the PAC dump (one up-gradient, two within the facility's footprint, and one down-gradient) will be installed. Where an overburden aquifer is present, monitoring wells will be completed as nested wells with a deeper piezometer within the bedrock aquifer and a shallow piezometer within the overburden aquifer.

Hydraulic response tests will be conducted on all existing and new monitoring wells in the area of the proposed waste dumps.

Tailings Facility

There are currently eight monitoring wells in the area of the proposed tailings dam (Dam Site D), five of which are nested installations with shallow (overburden) and deeper (shallow bedrock) piezometers. Monitoring well BH95G-12 is located immediately down-gradient of the proposed dam whereas all other existing monitoring wells are located within the proposed dam footprint.

There is currently insufficient information available with respect to the bulk hydraulic conductivity of the overburden and shallow bedrock hydraulic conductivities that would control potential seepage from the tailings facility underneath the dam. Even though the current design of the tailings dam includes a seepage cut-off wall within the underlying overburden, the seepage analysis that forms part of the effects assessment will require information on the bulk hydraulic conductivity of the overburden and shallow bedrock beneath the tailings facility.

Two large diameter (200 mm) test wells immediately down-gradient of the tailings dam. One well will be completed within the overburden aquifer, whereas the second well will be completed within the shallow fractured bedrock. Long-term pumping tests (48 hours in overburden, 72 hours in shallow bedrock) will be conducted on both test well to determine the bulk hydraulic conductivities of the overburden and shallow bedrock aquifer as well as their hydraulic connectivity. An additional nested monitoring well (shallow piezometer in overburden and deeper piezometer in shallow bedrock) down-gradient of the

tailings dam will also be required. This new monitoring well and the existing well BH95G-12 can be used as observation wells during the pumping test.

The large diameter test wells will be located and completed so that they can be used as extraction wells in the future. It is likely that BMC will be required to have extraction wells in place down-gradient of the tailings dam to be able to intercept potentially contaminated groundwater that does not meet water quality standards during operation and after closure of the mine.

No monitoring wells have been installed within the footprint of the tailings pond as part of the previous investigations. Two nested monitoring wells within the footprint of the tailings pond to assess seepage through the base of the tailings pond will be required. Hydraulic response tests will be conducted at these two nested wells as well as all other existing monitoring wells within the area of the proposed tailings dam.

Summary

Table 5 summarizes the new monitoring and large diameter test wells that are will be installed at the KZK site. The monitoring wells in Table 5 are preliminary and will be refined during the site reconnaissance. The locations of the wells are presented in Figure 7.

In addition to the new monitoring wells presented in Table 5, artesian wells encountered during exploration/geotechnical drilling at the site will be completed with a suitable wellhead completion that includes a pressure gauge for monitoring artesian pressures and a valve for water sample collection if possible.

Table 5. Summary of Proposed New Monitoring Wells

Well ID	Location	Drill Method	Hole Diameter (mm)	Well Casing Diameter (mm)	Overburden/Bedrock	Well Depth (m bgs)	Rationale
MW15-03	WPAG Dump	DD/RC/AR	100	50	Shallow Bedrock (nested if overburden aquifer is present)	20	Groundwater monitoring up-gradient of WPAG Dump
MW15-04	WPAG Dump	DD/RC/AR	100	50	Nested	10/30	Groundwater monitoring down-gradient of WPAG Dump near BH95G-32; hydraulic testing of overburden and bedrock underneath the WPAG Dump
MW15-01	PAC Dump	DD/RC/AR	100	50	Shallow Bedrock (nested if overburden aquifer is present)	20	Groundwater monitoring up-gradient of PAC Dump
MW15-02	PAC Dump	DD/RC/AR	100	50	Overburden	10	Groundwater monitoring down-gradient of PAC Dump near BH95G-30
MW15-06	PAC Dump	DD/RC/AR	100	50	Nested	10/30	Hydraulic testing of overburden and bedrock underneath the PAC Dump
MW15-09	PAC Dump	DD/RC/AR	100	50	Nested	10/30	Hydraulic testing of overburden and bedrock underneath the PAC Dump
MW15-05	Tailings Pond	DD/RC/AR	100	50	Nested	20/40	Groundwater monitoring down-gradient of tailings pond

Well ID	Location	Drill Method	Hole Diameter (mm)	Well Casing Diameter (mm)	Overburden/Bedrock	Well Depth (m bgs)	Rationale
MW15-07	Tailings Pond	DD/RC/AR	100	50	Nested	10/30	Hydraulic testing of overburden and bedrock underneath the tailings pond
MW15-08	Tailings Pond	DD/RC/AR	100	50	Nested	20/40	Hydraulic testing of overburden and bedrock underneath the tailings pond
WW15-01	Open Pit	AR	200	200	Overburden	10	Long-term pumping test to infer bulk hydraulic conductivity of the overburden in the area of the open pit. Can be used as dewatering well during mine operation.
WW15-02	Open Pit	AR	200	200	Shallow Bedrock	30	Long-term pumping test to infer bulk hydraulic conductivity of the shallow bedrock in the area of the open pit. Can be used as dewatering well during mine operation.
WW15-03	Tailings Pond	AR	200	200	Overburden	20	Long-term pumping test to infer bulk hydraulic conductivity of the overburden immediately down-gradient of the tailings dam. Can be used as extraction well during mine operation.

Well ID	Location	Drill Method	Hole Diameter (mm)	Well Casing Diameter (mm)	Overburden/Bedrock	Well Depth (m bgs)	Rationale
WW15-04	Tailings Pond	AR	200	200	Shallow Bedrock	40	Long-term pumping test to infer bulk hydraulic conductivity of the shallow bedrock immediately down-gradient of the tailings dam. Can be used as extraction well during mine operation.

Notes: AR – Air Rotary, DD – Diamond Drilling, RC – Reverse Circulation

Groundwater Elevation Monitoring

Groundwater levels in monitoring wells will be measured by hand with electrical water level tapes and with electronic down-well data loggers in selected MWs (assume a total of eight data loggers, plus one barometric logger will be needed). An initial full suite of manual groundwater level measurements will be taken at the end of the installation field program, at a time when all the wells have rested undisturbed for at least a week. This provides a hydraulic “snapshot” of groundwater levels at the site, which is useful for baseline hydrogeological characterization and for numerical model calibration.

Subsequent groundwater monitoring events would include quarterly measurements of groundwater levels and data logger data recovery.

Groundwater monitoring will include all functional monitoring wells (existing and new) at the site. All existing monitoring wells will be redeveloped prior to the first monitoring event to ensure proper hydraulic connection with the aquifer that the monitoring well is completed in.

Update: The field reconnaissance was conducted in May 2015 and the modified workplan based on the reconnaissance is attached as Appendix A. The only change from the modified workplan is the two large diameter wells that were planned downgradient of the tailings facility will be completed in 2016 rather than in 2015.

3.12.1.1 Groundwater Quality

Scope of Work

Baseline groundwater quality has to be characterized throughout the project area using monitoring wells that provide a reasonable spatial and hydrostratigraphic coverage. The monitoring well network will include locations up- and down-gradient of all major proposed mine infrastructure (e.g., open pit, waste rock dumps, tailings facility) that may have an impact on down-gradient groundwater quality. Seasonal monitoring is required to identify seasonal changes in groundwater quality and quantity. The required monitoring frequency depends on the local hydrogeological conditions and typical groundwater residence time within the aquifer(s). Typically, quarterly monitoring is sufficient to identify seasonal changes and based on our experience with similar projects, quarterly monitoring has also been acceptable to YESAB and the Water Board. If significant changes in groundwater quality were detected between sampling events, more frequent sampling may be required to adequately assess seasonality. The groundwater quality data will be reviewed after each sampling event and we will make recommendations regarding changes to the sampling program (including sampling frequency) if necessary.

Groundwater quality information collected as part of the IEE in 1995 is relatively sparse and mostly focused on groundwater within the area of the proposed open pit. Additional sampling stations up- and down-gradient of the waste rock dumps and the tailings facility will have to be added to adequately characterize groundwater baseline conditions.

The program will include monitoring wells summarized in Table 6 in the quarterly sampling for groundwater quality. It is assumed that the existing monitoring wells in Table 6 can be redeveloped and are still functional.

Table 6. Groundwater Quality Monitoring Stations

Well ID	Location	Existing MW	New MW	Overburden	Bedrock	Location/Rationale
BH95G-29	South of Open Pit	X		X		Background MW; up-gradient of site
95-135	Open Pit	X			X	Deep MW in open pit
95-146	Open Pit	X			X	Deep MW in open pit
BH95G-22	Open Pit	X		X		Shallow overburden well down-gradient of open pit
BH95G-23	Open Pit	X		X		Shallow overburden well cross-gradient of open pit
BH95G-25	Open Pit	X		X	X	Overburden and shallow bedrock well in open pit
BH95G-30	PAC Dump	X			X	Down-gradient of PAC dump
BH95G-31	PAC Dump	X			X	Down-gradient of PAC dump
MW15-01	PAC Dump		X	X	X	Up-gradient of PAC dump
MW15-02	PAC Dump		X	X		Down-gradient of PAC dump
BH95G-32	WPAG Dump	X			X	Down-gradient of WPAG dump
MW15-03	WPAG Dump		X	X	X	Up-gradient of WPAG dump
MW15-04	WPAG Dump		X	X		Down-gradient of WPAG dump
BH95G-33	WPAG Dump	X		X	X	Down-gradient of WPAG dump
BH95G-35	Mill	X			X	Mill area
MW15-05	Tailings Pond		X	X	X	Down-gradient of tailings pond
BH95G-12	Tailings Pond	X		X		Down-gradient of tailings pond
BH95G-6	North of Tailings Pond	X		X	X	North of tailings pond; down-gradient of mine site (far field)

In addition to the sampling stations summarized in Table 6 any seeps or springs identified in the area of proposed mine infrastructure will also be sampled and analyzed for the same suite of parameters indicated below.

Groundwater quality samples will be analyzed for a similar laboratory analytical suite as for surface water baseline studies at this site. These parameters will include:

- Field parameters: specific conductance, pH, dissolved oxygen, and temperature; and
- Laboratory suites:
 - Routine parameters – specific conductance, pH, TDS, hardness, alkalinity, major anions and cations;
 - Nutrients; and
 - Total and dissolved metals.

The monitoring wells will be (re)developed and then rested for at least a week prior to groundwater sampling to better sample true formation water. All sampled monitoring wells or piezometers will be purged to a point where field parameters stabilize to less than 10% variability prior to sampling. Sampling will be scheduled to avoid potential problems of shipping and handling to the lab. Groundwater samples will be placed in coolers with ice packs, and handled with a written chain of custody. All samples will be submitted to the Maxxam Analytics lab in Burnaby, BC.

QA/QC

The monitoring program will include a comprehensive QA/QC program to ensure validity of the data collected. The QA/QC program will include:

- All field staff will be familiar and follow work methods for groundwater monitoring and sample collection that are based on generally accepted best industry practices. The sampling procedures include measures to avoid sample contamination in the field, as well as during sample handling and shipping.

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- In addition to the QA/QC program carried out for sample analysis by the laboratory, we will collect split duplicates (1 per 10 samples) and field/travel blanks during each sampling event.
 - Following each sampling event, we will review all analytical results and QA/QC results (blanks and Relative Percent Difference values for all duplicates) and identify any potential issues that may require follow up and further investigation.
 - The QA/QC program will be documented and included in the hydrogeology baseline report.

Update: *Nine of the existing monitoring wells were redeveloped and sampled in May 2015.*

Baseline Report

The hydrogeology baseline report will include the methods, results, findings, analysis, conclusions and recommendations. It will include a conceptual hydrogeological model for the site, including the following:

- Hydrostratigraphic units (overburden and bedrock);
- Baseline groundwater chemistry (including comparison to the data collected in the 1990s);
- Aquifer characteristics and hydraulic properties;
- Groundwater flow directions and gradients (horizontal and vertical, where possible);
- Indications of groundwater divides and boundary conditions;
- Locations and characteristics of any identified seeps/springs;
- Locations and implications of permafrost areas on groundwater conditions. It is assumed that permafrost will be assessed as part of the geology/terrain baseline task or geotechnical assessment, which are outside the current scope of work;
- Locations of all major mine components (e.g., open pits, tailings facility, waste rock storage, fuel and chemical storage) potentially affecting or affected by groundwater flow; and
- Expected seasonal variation of physical and chemical hydrogeological parameters.

3.13 Geochemical Characterization

3.13.1 Data Review

Norecol, Dames and Moore (NDM, 1996) performed a geochemical characterization study of the deposit in support of the water licence application (Cominco, 1996) in which they performed acid-base accounting (ABA) analyses on 273 samples collected every few metres from four diamond drill cores. Extensive kinetic testing was also conducted, using humidity cells predominantly, but also trickle leach cells and subaqueous columns for tailings material and some waste rock types.

The NDM (1996) work represents a credible and thorough geochemical characterization consistent with the state of practice at the time. It is considered that most of this work should be applicable to the current program; indeed, work required in 2015 should demonstrate that the 1990's samples are relevant to today. However, there are some significant gaps in the previous work, leading to additional requirements. The key advances that should be included address these opportunities include:

- Recognition that the classification of "geochemical units" for waste rock management should consider alteration more explicitly, rather than simply the lithological or structural definitions on which much of the waste rock characterization and, in turn the waste rock management analytical values, were based;
- Detection limits need to be lower in the static (shake flask extraction) and kinetic laboratory testing for key water quality parameters of potential impact (e.g. As, Se, Cd, Zn, Cu);
- Laboratory kinetic testing performed over a longer duration than the curtailing period (typically ≤ 22 weeks) used in the NDM (1996) work. Price (2009) – the industry standard acid rock drainage and metal leaching (ML/ARD) document – recommends a minimum of 40 weeks of humidity cell data be collected before such a kinetic test can be terminated, and then only when the levels of constituents of interest have stabilized. Therefore, although the NDM (1996) kinetic testing can provide insights into the short term leaching behaviour of waste rock and tailings material, further longer term kinetic testing is included in this program to develop source terms for water quality models and to validate the earlier NDM (1996) work;

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- Re-evaluation of some of the kinetic data to extract more information on the potential longer term behaviour of those columns (and therefore field predictions), combined with testing of the old core and possibly accelerated leach tests;
 - Integration of the revised geologic modelling and rock classifications (including the geometallurgy) into classification of geochemical units. This should at least in part explain and therefore reduce the apparent variability and uncertainty of sulphide and carbonate content reported for the lithologic/structural/alteration units used in the previous work; and,
 - Field barrel testing, which has become more expected by regulators and reviewers. Such work can yield invaluable information on ML/ARD behaviour of waste rock storage areas at scales closer to those anticipated during operation and closure and provide a valuable comparator for scaling procedures from laboratory-based kinetic tests.

The 2015 program is designed such that data from shake flask extraction tests and early kinetic testing results can be used in concert with the NDM (1996) dataset to allow the assessment of water quality in advance of the "conventional" 40 week dataset or the longer field program that will be required for permitting. The data gleaned from the geochemical testing will be used to determine geochemical controls on acid generation and/or metal leaching behaviour and refine the waste segregation and management plan that was developed in the 1995/96 proposal.

3.13.2 Scope of Work

Sampling Program

Optimization of Sampling Program

Before samples from both new and historic drill cores can be selected, the existing static testing data from the NDM (1996) work will be harmonized with the revised lithological/structural/alteration classification of rock types.

Specific intervals from the 2015 drill program will be selected from which samples are required for complete representation of the spatial and geochemical variability of the deposit, as well as the waste and the pit wall rock.

The geochemist will work with the exploration geologist to allow integration of the geochemical controls (as currently understood) with the core logging classifications. The intent is to ensure that the rock classifications for geology and geometallurgy also reflect the environmental geochemical units. It will also provide an opportunity to harmonize the sample analyses for the 2015 exploration program (where appropriate).

Once these tasks have been completed, samples can be selected for static testing from both the new and old drill core.

Sample Selection

Waste Rock

Until there is more detailed knowledge of the sample coverage by rock units (geochemical units) from the previous NDM (1996) work, it is difficult to confirm how many further samples are required for static testing. An estimate of 100 samples is estimated based on the existing database and initial discussions on the distribution of samples and rock types. This will be reviewed once the sampling coverage and revised rock classification have been addressed. These samples should also provide sufficient representative material to be used for kinetic testing.

Rock types and sulphide/carbonate concentrations, as well as spatial distribution will be selected from for drill core samples. Samples will comprise both freshly drilled core and archived core from the mid 1990's drilling program that has been stored under cover but still exposed to the atmosphere. Sampling will be performed in order to adequately represent both the spatial extent and lithological diversity of the planned open pit area. In order to provide further confidence and validation of the NDM (1996) static testing results, a portion (10 – 15%) of the samples tested will be subjected to confirmatory reanalysis. Furthermore, shake flask leach testing of this material will provide insights into the stored soluble metal load that has accumulated as this core has weathered.

Ore

Up to ten representative samples of ore material of variable metal sulphide content will undergo static testing. In addition, one conventional humidity cell confirm the previous test data.

Concentrate and Tailings

A metallurgical test program will be completed during 2015 and ore, concentrates, and tailings material from this program may be available for testing. Concentrate will require testing to optimize their disposal and long term storage strategy. Concentrate samples will undergo some static testing as part of the metallurgical testing. As such, nominal geochemical characterization of concentrate and tailings samples is required for this program including ten static and four shake flasks on concentrate and one tailings sample for static and kinetic (humidity cell and flooded column).

Sample Requirements

Approximately 0.5 – 1 kg of sample is required to perform the static tests discussed in subsequent sections. A further 1.5 – 2 kg of material is required for the laboratory based humidity cell kinetic testing and approximately three to five kg for subaerial and subaqueous column laboratory testing. Construction of field barrels generally requires either 50 or several hundred kg of rock, although this can be tailored to the availability of material at site.

Laboratory Testing

Static Testing

All samples will be subjected to acid-base accounting procedures, which include measurements of paste pH, neutralization potential (NP), total inorganic carbon, and acid potential (AP) based on total sulphur analysis. Aqua regia ICP metals will also be performed on all samples if such data are not available from the exploration program or historic testing in order to help identify elevated metal(loid) concentrations that may provide an initial screen to identify constituents of potential concern (COPCs). NDM (1996) showed that there was little sulphate-sulphur present in fresh drill core, so total sulphur measurements will be used to calculate acid potential (AP) without the need for further determination of sulphate-sulphur. Sulphate-sulphur will be determined for the weathered core from the 1990's drilling program to evaluate the build-up of metal sulphide oxidation products.

Past static testing employed the standard Sobek method (Sobek et al., 1978) to determine the neutralization potential (NP). This method can overestimate NP if iron and/or manganese carbonates make up a significant portion of the metal carbonate inventory. Iron carbonates have been identified as

significant component of the carbonate mineralogy present in the proposed open pit area and although the NDM (1996) work presented some evidence that their Sobek NP analysis was not significantly impacted by the presence of iron carbonates, a siderite-corrected NP analysis would be prudent. If it is considered necessary after the geologic interpretation, a comparison of siderite-corrected versus standard Sobek NP procedures can be performed on a subset of samples that contain a range of iron carbonate contents as determined by Rietveld X-ray Diffraction (XRD). Correlations between NP and ICP (Ca+Mg) concentrations may allow for NP assessments to be extended to the full assay database.

Following NP and total sulphur screening, a subset of 25 waste rock samples will be selected for shake flask extraction (SFE) to assess element leachability, including the weather core samples. Approximately 20 samples across key lithological units will also be selected for mineralogical characterization by XRD and petrography, which will help identify mineralogical hosts of NP, AP and COPC's however BMC will either complete these tests or provide existing information.

Further more detailed analysis by electron microprobe may also be warranted to help identify the relative proportions of acid neutralizing (primarily Ca- and Mg-bearing carbonates) and net non-neutralizing (Fe-, Mn-bearing carbonates under aerobic conditions) carbonates in solid solutions that bulk XRD may have difficulty resolving. Such work may also provide further information regarding COPC partitioning and relative mobility. Electron microprobe analysis is not costed in this work plan; if its use is later determined to be warranted, an amendment can be drafted with a cost estimate for such work.

Between 5% and 10% of the static ABA testwork will comprise duplicate samples to evaluate sample heterogeneity.

It is anticipated that such testwork will further refine and constrain the criteria used to segregate waste rock types during operations.

Kinetic Testing

Kinetic tests are longer term experiments that typically run for a minimum of 40 weeks, with sampling events taking place weekly. Other field based kinetic tests (e.g. field barrels) can also be used to help refine the understanding of drainage chemistry and weathering over time, but because of much slower weathering rates (especially for Yukon's northern climate) these tests tend to be more time consuming

than humidity cells, typically spanning several years. The laboratory-based kinetic tests for this scope of work will include humidity cells subaerial leach columns, which can be considered the laboratory surrogates for the field barrels, and flooded column tests, which can be used to model kinetic weathering of materials which are submerged in water (i.e. tailings).

ABA, ICP metals and XRD mineralogy static testing of the material used in each laboratory-based kinetic test will be conducted both pre- and post-operation to aid the interpretation of the kinetic data and provide post-test validation of the results. This will also help determine the consumption times of acid generating and neutralizing minerals, and COPC-bearing phases. Such data will assist the determination of the likely time to onset of acid generation and the probable extent of COPC leaching from waste rock and tailings materials.

The time period required for kinetic testing, which provides the data for source term characterization and water quality predictions is typically 40 weeks. Recognizing the time constraints of obtaining samples, the schedule has allowed for preliminary assessments at key project milestones (i.e. and then a revision after the 40 week testing period).

Laboratory Kinetic Testing

The kinetic testing will provide information regarding the rates of sulphide oxidation, NP depletion and metal(loid) leaching. Samples for kinetic testing will be selected based on the static testing results, targeting lithological/alteration units that would be representative of the various waste rock type classifications and/or susceptible to ML/ARD. In this way, the data obtained can guide mine planning (e.g. waste rock management and storage) and provide indications of water chemistry that can be expected during operations and post-closure.

Ore and concentrate samples will also be selected for kinetic testing to develop metal and acid generation rates for any ore stockpiles such that mitigation plans can be developed in the event that such stockpiles are left unprocessed for longer than anticipated periods. Tailings samples provided by contemporaneous metallurgical studies conducted by BMC will also be subjected to kinetic testing to determine acid and metal production rates under conditions anticipated during operations and following closure to inform management of tailings contact waters.

It is difficult to determine how many kinetic tests will be required until both the results of the static testing have been evaluated and the rock unit classification currently undergoing refinement by BMC geologists has been completed. An estimate of six subaerial leach columns for waste rock and ore and three humidity cells for waste rock (2) and tailings (1) based on the currently available information. A further two subaqueous cells have also been included for testing of tailings and strongly potentially acid generating waste rock that are planned for underwater disposal under the current waste management plan.

Although past kinetic testwork performed by NDM (1996) was expansive in terms of the number of tests performed, the water chemistry detection limits and limited test duration (typically ≤ 22 weeks) limits their utility. A testing period of forty weeks for the humidity and sub-aqueous cells is the minimum recommended duration (Price, 2009), however, the testing may be extended if the concentration of constituents of interest has not stabilized. In order to reduce costs, analysis of the cell leachate will be stepped down from weekly to biweekly following 20 weeks of operation. In order to extract the maximum value from the limited duration kinetic testing performed by NDM (1996), some of the kinetic cells will comprise similar samples to those that underwent historic kinetic testing. These will serve as a check on release rates and source terms derived from NDM (1996), and if comparable would support the use of the extensive (in terms of test numbers) NDM (1996) kinetic testwork.

Field Barrel Kinetic Testing

The barrels will be charged with new core, for ease of sample collection. However, if suitable representative samples can be identified from the historic core, these can be used to charge the barrels also; this might be necessary depending on the timing of the drilling program.

Samples will be collected up to twice per month during ice-free conditions. There will be eight water quality analysis in the first year (to June 2016) for six field barrels.

Source Term Development

Source terms required for water quality model development will be derived for different waste rock types, tailings and pit walls based on the static and kinetic testing data, making adjustments for differences in particle size, temperature and flow regimes. Such work depends on information from other tasks such as hydrology, mine planning and the design of closure facilities.

There is no single standard model for drainage water chemistry prediction, however there are approaches that are standard of practice and documented in guidelines and texts i.e. the use of both static and kinetic test data, characterization by rock type of source terms, followed by waste management planning that integrates the mine design information. Static and kinetic analytical data, combined with information on mineral types and exposures from drill core data, will be used to calculate loading terms (dissolved concentrations of the parameters of interest) over time by rock type. Water balance and construction information will be used to estimate flushing rates from the rock types and estimate drainage water chemistry. Standard geochemical models will be used to interpret the equilibrium and solubility constraints. Mixing models will provide information on the effects of drainage and loading to the water courses (within the hydrology and site water quality modelling in other tasks). These techniques have been used for both regulatory reviews and also mine design and operations; they are based on industry good practice and reflect the approaches used previously for this project. A similar approach was used in the NDM (1996) predictions.

3.14 Heritage Resources

3.14.1 Data Review

In 1995, a heritage study was conducted in collaboration with the Ross River Dena Council (RRDC) as part of the Initial Environmental Evaluation. The study identified no cultural materials or features (Rutherford, 1995); however, a review of the oral history provided by Kaska members indicates that the project area was used for subsistence hunting, trapping and fishing, and as an access route to the North Lakes (Rutherford, 1995). In 1996, an additional study for cultural materials was undertaken at a proposed airstrip location (Geo-Engineering, 2000). No heritage materials were identified in this follow-up study.

A review of the previous report indicate that there was an inadequate amount of testing, and it is unclear if soils were screened the just sifted with a shove and trowel or hand sorted. In addition, the previous report indicates approximately half of the places that were tested were hindered by frozen soils. Therefore, some re-work will be required to meet the Heritage Branch's requirements.

3.14.2 Scope of Work

A Heritage Resource Impact Assessment of the Proposed KZK Mine Site, Access Road and Ancillary Components will be conducted. The assessment will include the following activities:

- Detailed background review and field mapping prep to get UTM's on past testing and any other known areas of concern from First Nations, or high potential areas from a desktop review.
- In-field review of the 1995 and 1996 assessment efforts and re-testing as needed.
- Testing high potential areas in and near each of the known component footprints as they are, or if they change; and assessment and testing of additional high potential areas within the larger study area.
- As per the class 3 exploration permit (an archaeological inventory of alpine localities zones, particularly in or near ice patch features, shall be completed in advance of any drilling or trail construction in these areas).
- Prior to conducting the field work a Class 2 permit will be obtained from the YG Heritage branch.
- Prior to conducting the field work a meeting will be held with the project archaeologist, project environmental manager and Kaska Traditional Knowledge Coordinator to discuss and finalize the field program.
- Following the field program an interim report will be prepared.
- Any sites or artifacts identified will be analysed upon completion of the field season in the fall of 2015, and a final report will be prepared. The interim report will be submitted to the Company, Kaska Nation, YG Heritage Branch, and to YESAB (but without site location information for YESAB). The final report will be submitted as part of the Project Proposal.

3.15 Socio-economic Baseline Studies

3.15.1 Data Review

The baseline socio-economic data collected in the 1990's is now considered out of date and new studies are required.

3.15.2 Scope of Work

The scope of work will be determined through:

- Identifying which communities, governments, organizations, and individuals have an interest in the project;
- Identifying what those interested parties' value in the socio-economic context (their VCs); and
- Participation by the socio-economist in First Nations, other government and community engagement.

Preliminary study areas will include:

- Local Study Area - Ross River, Faro, Watson Lake
- Regional Study Area – Yukon Territory
- Study areas will be confirmed/refined through meetings with the appropriate regulatory agencies and initial community meetings.

Once the above has been completed a baseline report will be prepared based on the VCs and the indicators that are identified which may include (but are not limited to):

- Land and resource use;
- Traditional activities and culture;
- Employment and economy;
- Infrastructure and services; and
- Human health and well-being.

Data on the communities and for the Yukon that make up the baseline will be selected to provide useful indicators for measuring the anticipated effects on each of the identified VCs for the proposed development, operation and closure of the KZK project. Based on the team's experience with other mining project submissions to YESAB the following are data sources that will likely be used for the socio-economic baseline:

-
- YG Environment harvest data for traplines and large animal harvest;
 - Yukon Bureau of Statistics data for GDP, community population fluctuations over time, percentage of children in community populations and community cost of living differentials;
 - Statistics Canada Census and National Household Survey data for a variety of labour market statistics (including disaggregated data for First Nations and women), education levels and numbers of speakers of Kaska;
 - Statistics Canada data for health and crime indicators;
 - Revenue Canada locality code statistics for community level data on incomes and broad sources of income and GST collected by community;
 - YG Education for data on school enrolments and school completion; and
 - YG Highways for traffic count data and accident rates.

3.16 First Nations, Government and Community Consultation

BMC recognizes the importance of consultation with Kaska First Nation, potentially affected communities and other stakeholders/interested parties as an integral aspect of KZK project planning, development and operation.

A Consultation and Engagement Plan (CEP) plan will be developed and undertaken to meet Yukon's legislative requirements under the *Yukon Environmental Assessment and Socioeconomic Assessment Act* (YESAA) for formal project consultation. The plan will set out the tools, techniques and context for consulting with the entire suite of agencies, organizations and stakeholder groups with whom BMC will engage to support assessment and eventual licensing of the Kudz Ze Kayah project.

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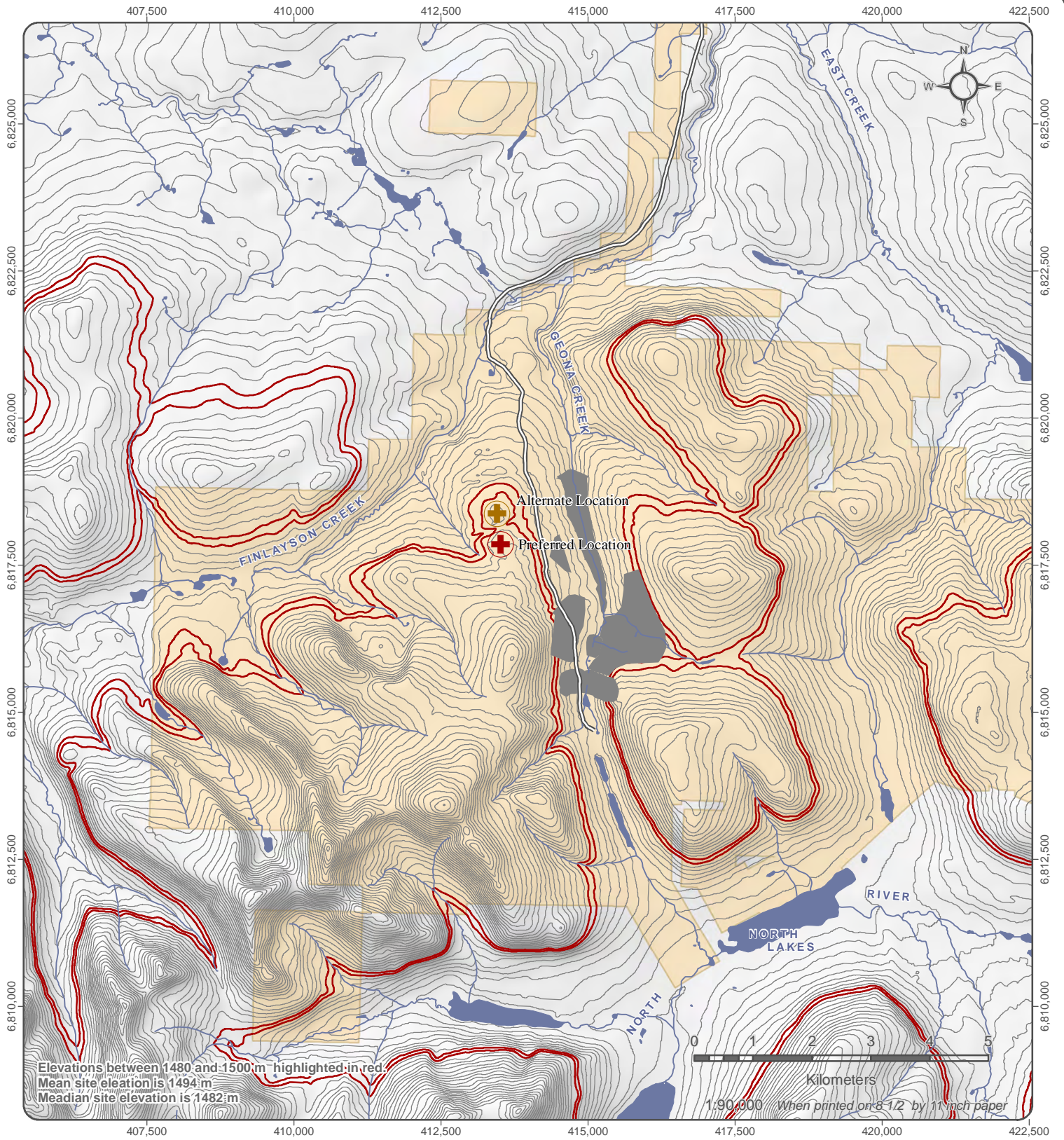










**PROJECT
LOCATION**

**KUDZ ZE KAYAH
PROJECT**

**FIGURE 1
PROJECT LOCATION**





-  Preferred Meteorological Station
-  Alternate Meteorological Station
-  Contours (20 meters)
-  Elevations 1480m to 1500m
-  Watercourse
-  Waterbody
-  Approximate Location of Mine Infrastructure
-  BMC Minerals (No. 1) Ltd. Claims

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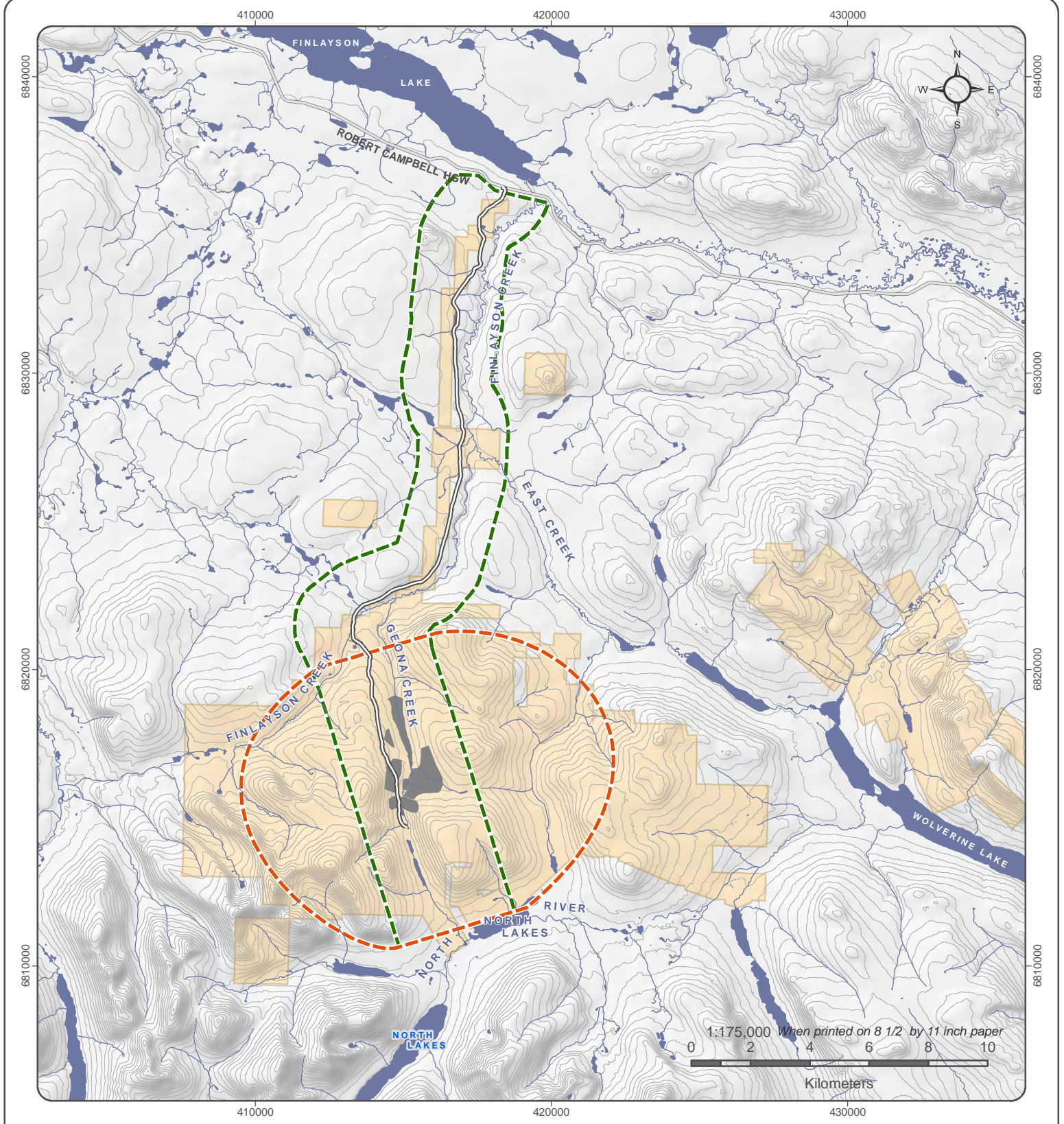
KUDZ ZE KAYAH PROJECT

FIGURE 2

PROPOSED WEATHER STATION LOCATION

JULY 2015

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- - - Approximate area of Norecol 1996 vegetation map
- - - Proposed TEMS extension
- = Access Road
- Contour (40m interval)
- Watercourse
- Waterbody
- Approximate Location of Mine Infrastructure
- BMC Minerals Ltd. Claims

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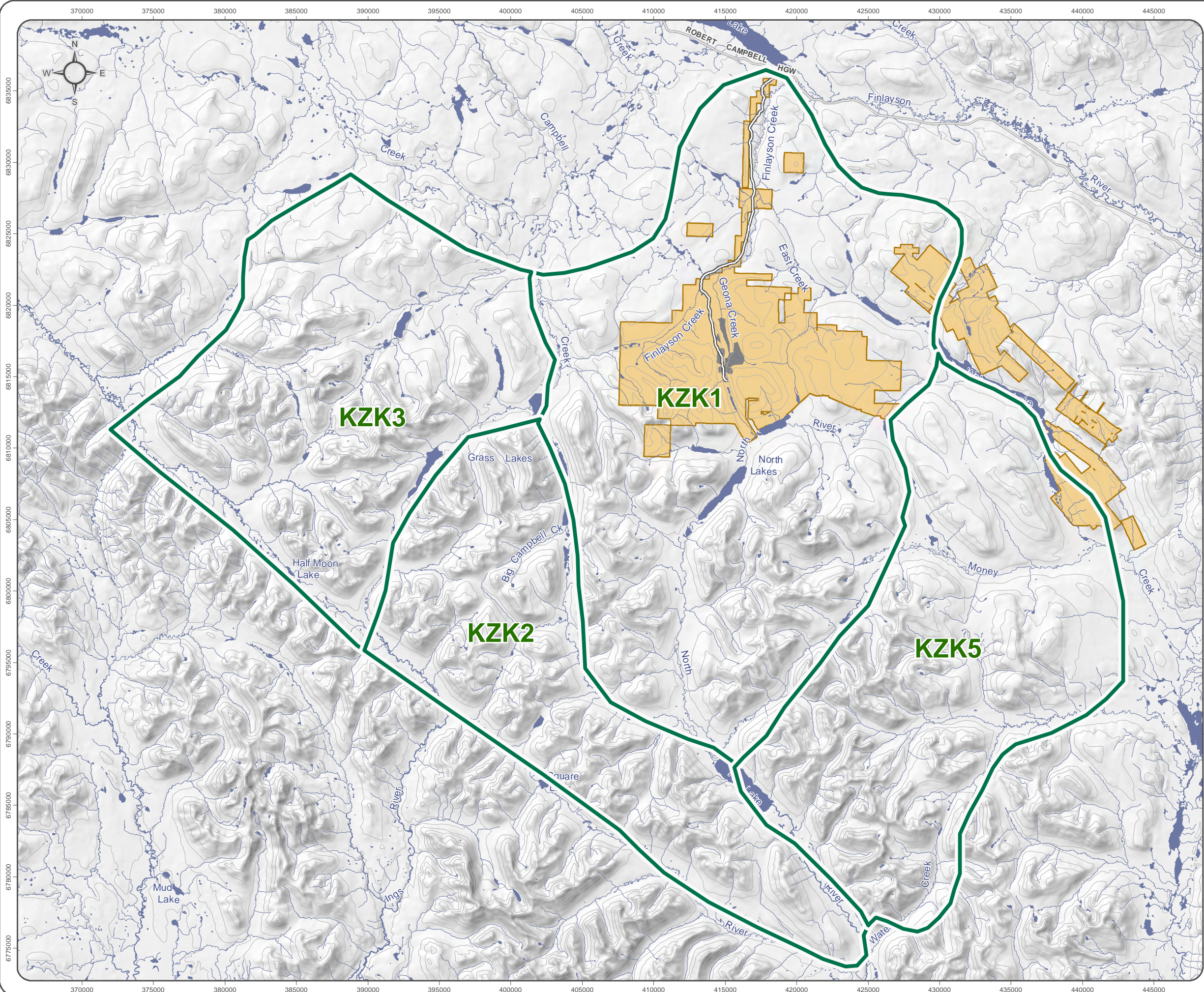
KUDZ ZE KAYAH PROJECT

FIGURE 3

PROPOSED TERRESTRIAL ECOSYSTEM MAPPING STUDY AREA

JULY 2015








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KUDZ ZE KAYAH PROJECT



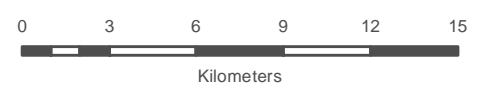
FIGURE 4 PROPOSED CARIBOU SURVEY STUDY AREA

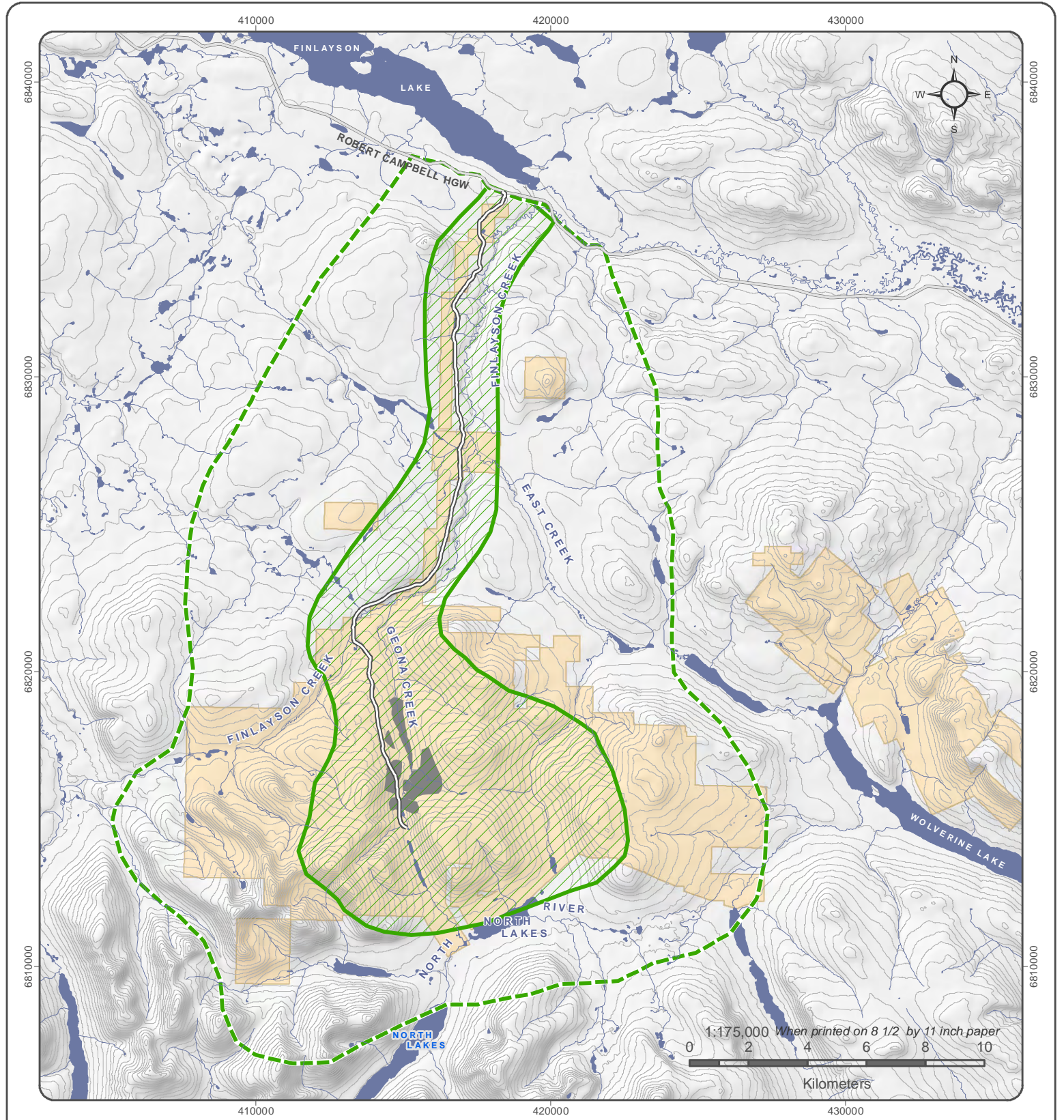
-  Caribou Study Area Block
-  Access Road
-  Contours
-  Watercourse
-  Waterbody
-  Approximate Location of Mine Infrastructure
-  BMC Minerals (No. 1) Ltd. Claims











Digital elevation model created by the Yukon Department of the Environment interpolated from the digital 1:50,000 Canadian National Topographic Database (NTDB Edition 2) contour and watercourse layers. Obtained from Geomatics Yukon.
 Canvec compiled by Natural Resources Canada at a scale of 1:10,000 - 1:50,000. Reproduced under license from Her Majesty the Queen in Right of Canada, as represented by the Minister of Natural Resources Canada. All rights reserved.
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- | | | | |
|--|----------------------------------|---|---|
|  | 1995 Norecol Survey Study Area |  | Watercourse |
|  | Proposed Extension of Study Area |  | Waterbody |
|  | Access Road |  | Approximate Location of Mine Infrastructure |
|  | Contour (40m interval) |  | BMC Minerals (No. 1) Ltd. Claims |



KUDZ ZE KAYAH PROJECT

FIGURE 5

PROPOSED MOOSE SURVEY STUDY AREA

JULY 2015

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FIGURE 6
WATER QUALITY AND HYDROLOGY
FIELD PROGRAM

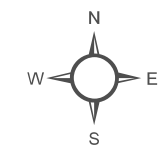
JULY 2015

- Hydrometric Station
- Water Quality Sampling Location
- Water Quality and Hydrometric Station
- Access Road
- Primary road
- Contour (40m interval)
- Watercourse
- Waterbody
- Approximate Location of Mine Infrastructure
- BMC Minerals (No.1) Ltd. Claims

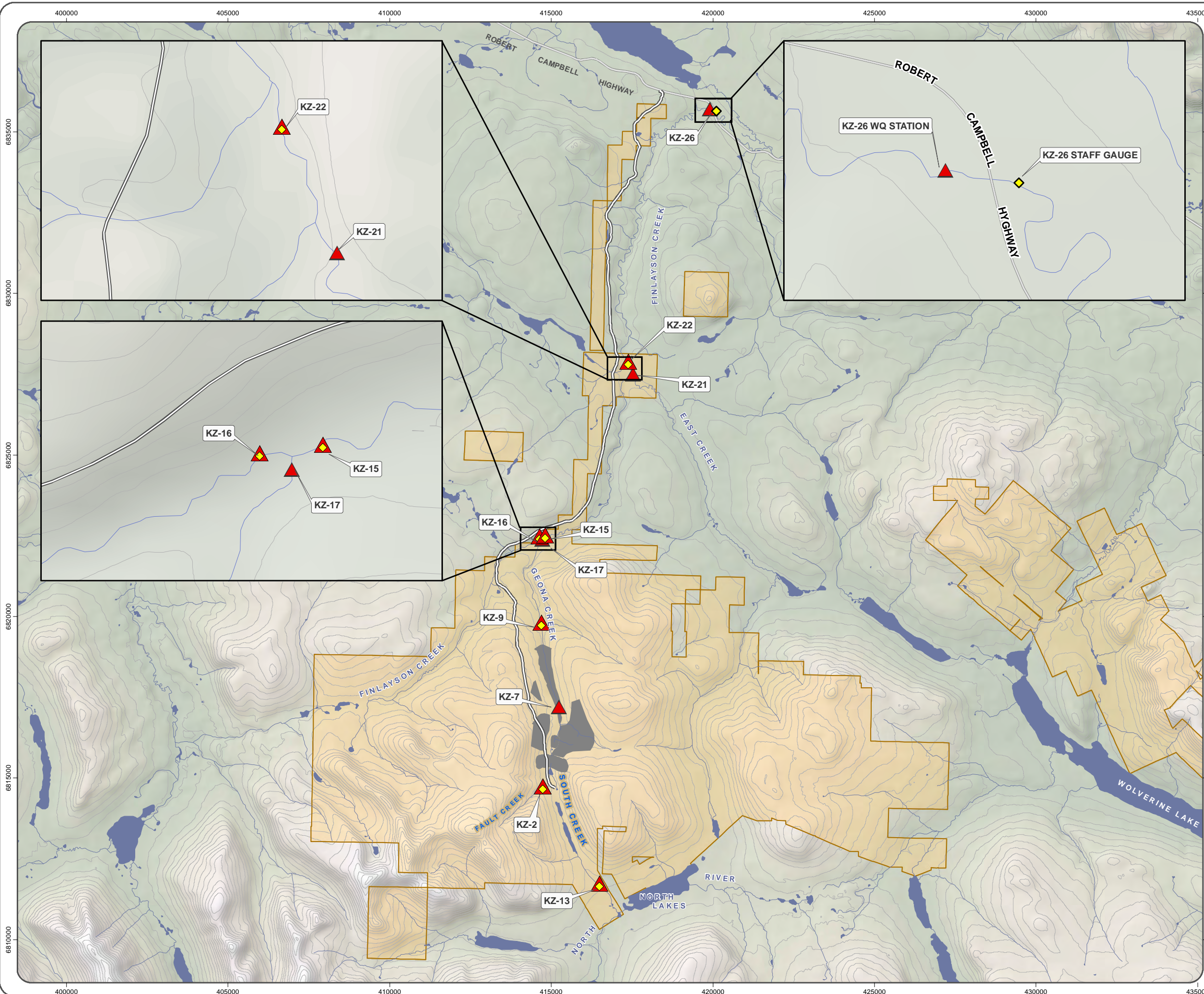
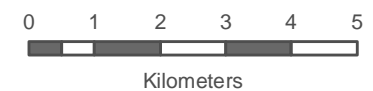


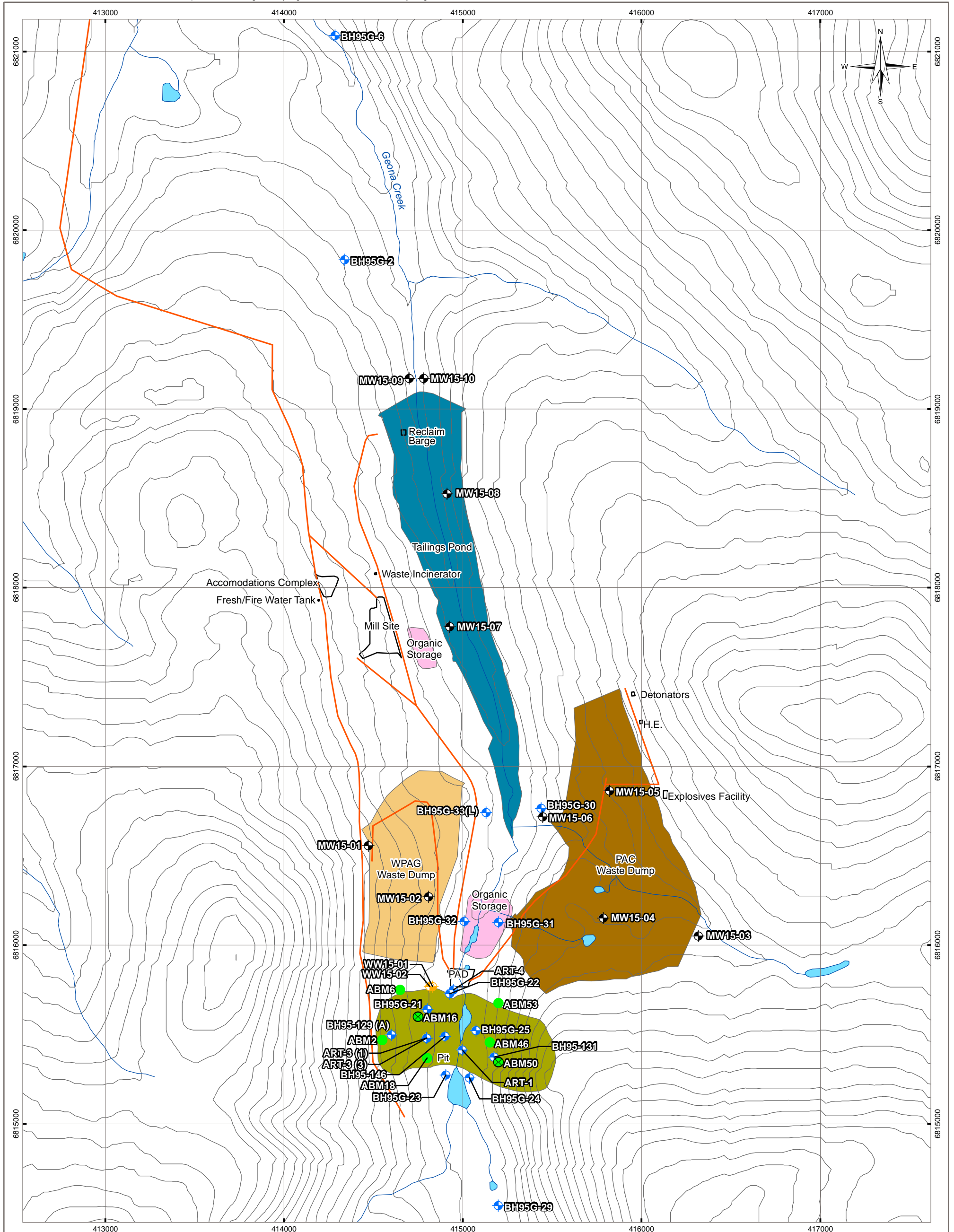
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LEGEND

- + Existing Monitoring Well
 - + New Monitoring Well
 - + Large Diameter Test Well
 - + Exploration Hole with Packer Testing
 - + Exploration Hole with Vibrating Wire Piezometer Installation
- Proposed Mining Infrastructure**
- PAC Waste Dump
 - WPAG Waste Dump
 - Organic Storage
 - Pit
 - Tailings Pond
 - Building/Structure
 - Road
- Contour (20 m)
 - Watercourse
 - Waterbody

NOTES
 1. Base data source: CanVec 1:50,000
 2. Some locations are approximate

ENVIRONMENTAL BASELINE AND PERMITTING KUDZ ZE KAYAH, YK

Monitoring Wells for Hydrogeological Assessment

PROJECTION UTM Zone 9	DATUM NAD83	CLIENT BMC Minerals (No.1) Ltd.
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PROJECT NO. ENVMIN03071-01	DWN MEZ	CKD SL
OFFICE Tt EBA-VANC	APVD SK	REV 0
DATE August 11, 2015		Figure 7

STATUS
ISSUED FOR REVIEW

APPENDIX A

UPDATED HYDROGEOLOGY WORKPLAN



To:	Kelli Bergh	Date:	June 17, 2015
c:	Chris Hughes, Kristina Gardner	Memo No.:	HG-1
From:	Stephan Klump	File:	704-ENVMIN03071-01
Subject:	Updated Work Plan for Hydrogeological Field Program, Kudz Ze Kayah Property		

This 'Issued for Review' document is provided solely for the purpose of client review and presents our interim findings and recommendations to date. Our usable findings and recommendations are provided only through an 'Issued for Use' document, which will be issued subsequent to this review. Final design should not be undertaken based on the interim recommendations made herein. Once our report is issued for use, the 'Issued for Review' document should be either returned to Tetra Tech EBA or destroyed.

1.0 INTRODUCTION

Tetra Tech EBA Inc. (Tetra Tech EBA) is pleased to provide this updated work plan for the baseline hydrogeology assessment at the Kudz Ze Kayah property to BMC Minerals (No.1) Ltd. (BMC). The work plan presented herein is based on the scope of work outlined in our proposal dated April 2015 and has been updated based on information collected as part of the site reconnaissance completed in May 2015.

2.0 EXISTING MONITORING WELLS

Figure 1 shows the locations of the existing monitoring wells at the site. Table 1A summarizes the completion details of the existing monitoring wells as well as their current condition. Table 1B summarizes all existing monitoring wells that are proposed to be included in ongoing groundwater monitoring at the site along with the proposed well upgrades. None of the existing monitoring wells were completed with a proper steel protective casing and all monitoring wells are currently in poor condition. Those wells that will be used in the future for ongoing monitoring will need to be upgraded. Upgrades will include extending the existing PVC standpipe, capping the standpipe, and protecting the wellhead with a steel protective casing.

Note that we assumed that all monitoring wells included in Table 1B that are frozen or have Waterra tubing stuck in the PVC pipe will thaw in the summer and will still be functional for ongoing monitoring; however, this will be confirmed during our field program

3.0 NEW MONITORING WELLS

3.1 Monitoring Well Drilling and Completion

Table 2 summarizes the completion details of the proposed new monitoring wells. These monitoring wells will be required in addition to the existing monitoring wells (Table 1B) to properly characterize the hydrogeological baseline conditions in the areas of proposed mine infrastructure. Figure 2 shows the location of the proposed new monitoring wells along with the existing monitoring wells relative to the proposed mine infrastructure.

The monitoring wells will be completed as follows:

- All monitoring wells will be drilled using a diamond drill (HQ = 96 mm hole diameter).
- The wells will be completed with nested piezometers (one in bedrock, one in overburden).
- The wells will be completed with 1.25-inch diameter Schedule 40 PVC standpipe.
- The well screen will consist of 10-slot screen; screen length will be determined based on conditions encountered (approx. between 10 and 30 ft).
- The annulus surrounding the well screen will be backfilled with clean filter sand.
- The remaining annulus will be sealed with bentonite.
- The monitoring wells will be completed above surface with a steel protective casing.

3.2 Hydraulic Testing

Packer tests will be conducted in each borehole to infer bedrock hydraulic conductivities. The test intervals will be determined by the field hydrogeologist based on conditions encountered and observations from inspection of the drill core. On average, about three packer tests will be conducted in each borehole. Depending on the depth of the test interval, each test is estimated to take about 1.5 to 2 hours.

In addition, hydraulic response tests (falling and rising head tests) will be conducted on the completed monitoring wells to infer the hydraulic conductivity over the screened interval of the well.

4.0 EXPLORATION BOREHOLES (ABM DEPOSIT)

4.1 Instrumentation Installation

Vibrating Wire Piezometers (VWP) will be installed in two exploration boreholes (see Table 3 and Figure 2) to determine in situ pore pressure and temperature, as well as vertical hydraulic gradients. Exploration holes for VWP installation have to be drilled with HQ diameter.

Table 3: Exploration Holes with VWP Installation

Well ID	Hole Diameter	Easting	Northing	Hole Depth (m)	VWP-1 Depth (m)	VWP-2 Depth (m)	VWP-3 Depth (m)
ABM16	HQ	414750	6815600	200	200	125	50
ABM50	HQ	415200	6815345	300	300	175	50

Each hole will be completed with three VWPs installed at different depths to assess vertical hydraulic gradients. VWPs will be attached to a 1-inch diameter Schedule 80 PVC pipe and grouted in place using a cement-bentonite grout. The boreholes will be completed above surface with a steel protective casing.

4.2 Hydraulic Testing

Hydraulic packer tests will be conducted in selected exploration boreholes (see Table 4 and Figure 2) to infer the hydraulic conductivity of the bedrock aquifer. Packer tests can be conducted in either NQ or HQ size boreholes.

Table 4: Exploration Holes with Packer Testing

Well ID	Hole Diameter	Easting	Northing
ABM2	NQ or HQ	414550	6815470
ABM6	NQ or HQ	414650	6815750
ABM16	HQ	414750	6815600
ABM18	NQ or HQ	414800	6815370
ABM46	NQ or HQ	415150	6815455
ABM50	HQ	415200	6815345
ABM53	NQ or HQ	415200	6815675

The packer tests will be conducted on representative test intervals that will be determined by the field hydrogeologist based on conditions encountered and observations from the drill core inspection. On average, about four to five packer tests will be conducted in each exploration borehole.

5.0 LARGE DIAMETER TEST WELLS

We propose the installation of four large diameter (200 mm) test wells to carry out long-term constant rate pumping tests in the area of the proposed open pit and downgradient of the proposed tailings facility. Two wells will be completed within the overburden aquifer to determine the bulk hydraulic conductivity of the shallow sand and gravel aquifer. The other two test wells will be completed within the shallow fractured bedrock to determine the bulk hydraulic conductivity of the shallow bedrock aquifer. The test wells will be located so that they can potentially be used for future dewatering of the open pit or extraction wells for non-compliant seepage from the tailings facility, respectively. Figure 2 shows the location of the proposed large diameter test wells.

Table 5 summarizes the proposed well completion details for the large diameter test wells. Detailed specifications for the drilling, completion, and testing of the large diameter test wells are appended to this memo. All supplies for the drilling, installation, and testing of the large diameter test wells will be provided by the drilling contractor.

6.0 WELL SUPPLIES

Table 6 lists the well supplies required to upgrade the existing monitoring wells (Table 1B), install the new monitoring wells (Table 2), and install VWP's in two exploration boreholes (Table 3).

We usually source these supplies from Rice Engineering in Edmonton. It typically takes about 7-10 days for delivery of these materials to Whitehorse.

Table 6: Well Supplies for Monitoring Well Completion

Item	Quantity	Description
1	198	10' x 1" SCH80 MXF F480 THR
2	2	1" SCH80 SW CAP - Top of Well
3	2	1" SCH80 FEMALE F480 THR CAP - Bottom of Well
4	2	1" SCH80 F480 Pick-up Sub
5	12	10' x 1.25" SCH80 MXF F480 THR
6	45	10' x 1.25" SCH40 MXF F480 THR - SLT .010
7	131	10' x 1.25" SCH40 MXF F480 THR
8	5	1.25" SCH40 SW CAP - Top of Well
9	22	1.25" SCH40 FEMALE F480 THR CAP - Bottom of Well
10	3	1" SCH40 Coupling
11	40	1.25" SCH40 Coupling
12	2	10' x 3/4" SCH80 MXF F480 THR
13	2	5' x 3/4" SCH80 MXF F480 THR
14	4	3/4" SCH80 FEMALE F480 THR CAP - Bottom of Well
15	4	3/4" SCH80 F480 Pick-up Sub
16	72	Filter Sand 10-20 (50 lb sack)
17	30	Bentonite Chips 3/8" (50 lb sack) HOLEPLUG
18	20	Bentonite Pellets 1/4" (50 lb pail)
19	40	Coated, Time-release Bentonite Pellets 1/4" (50 lb pail)
20	35	1.25" Well Plug (e.g., J-Plug)
21	27	4" x 5' Steel Casing Protector c/w Lockable Lid
22	72	Portland Cement Type 1 (20 kg sack)
23	16	Bentonite (Powder) (50 lb sack) QUIK-GEL
24	30	Concrete Mix (20 to 30 kg sack)

A quote for the well supplies listed in Table 6 from Rice Engineering is attached to this memo.

Table 7 lists the VWP's required for the instrumentation of ABM16 and ABM50. The VWP's should be sourced from RST Instruments Ltd. in Maple Ridge, BC (typical shipping time is about 2 weeks).

Table 7: Vibrating Wire Piezometers (RST Instruments Ltd.)

Item	Quantity	Description	Pressure Rating (MPa)	Cable Length
1	1	VW2100	3	203
2	1	VW2100	3	128
3	1	VW2100	3	53
4	1	VW2100	3	178
5	1	VW2100	3	53
6	1	VW2100-HD	5	303

A quote for the VWP's listed in Table 7 from RST Instruments is attached to this memo.

As mentioned above, all necessary supplies for the installation of the large diameter test wells will be provided by the drilling contractor retained to drill these wells.

7.0 DIAMOND DRILLING CONTRACTOR REQUIREMENTS

The following provides a list of requirements of the Diamond Drilling contractor:

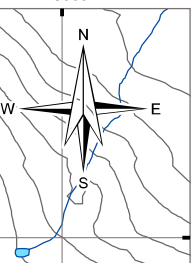
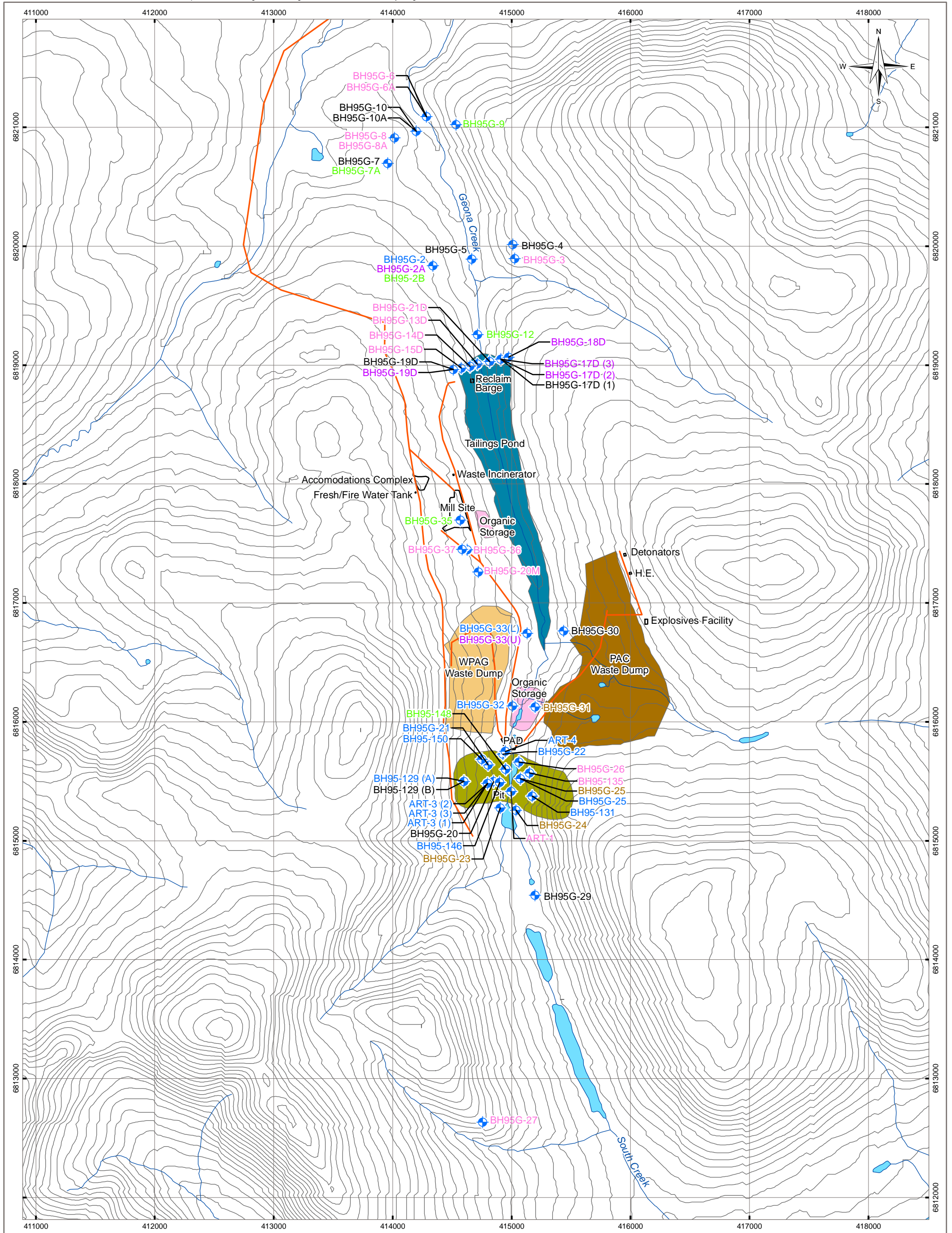
- Drilling contractor has to be able to grout boreholes using a cement-bentonite grout.
- Equipment needed:
 - Grout plant including double mixing tank, hopper and grout pump (this would be ideal!); or,
 - Use piston pump on drill but need mixing tank and mixer.
- Have to be able to monitor and control pressure during grouting.
- Have to be prepared to grout through drill rods and 1" Schedule 80 PVC pipe with F480 threads (will need adapter from grout plant to 1" PVC pipe).
- It may also be beneficial if the drilling contractor had a couple of Van Ruth plugs available in case it is decided to drill the hole deeper than anticipated and we have to install the VWP's at a shallower depth than the bottom of the hole.

8.0 LIMITATIONS OF MEMO

This memo and its contents are intended for the sole use of BMC Minerals (No.1) Ltd. and their agents. Tetra Tech EBA Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BMC Minerals (No.1) Ltd., or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated Tetra Tech EBA's General Conditions that are attached to this memo.

Attachments:

- Figure 1: Existing Monitoring Wells
- Figure 2: Monitoring Wells for Hydrogeological Assessment
- Table 1A: Existing Monitoring Wells
- Table 1B: Existing Monitoring Wells to be Included in Ongoing Monitoring
- Table 2: New Monitoring Wells
- Table 5: Large Diameter Test Wells



LEGEND

- ◆ Existing Monitoring Well
- Monitoring Well Status**
- ◆ BH95-XX Destroyed
- ◆ BH95-XX Dry
- ◆ BH95-XX Frozen
- ◆ BH95-XX Functional
- ◆ BH95-XX Not Found
- ◆ BH95-XX Waterra Stuck
- Proposed Mining Infrastructure
- WPAG Waste Dump
- Organic Storage
- Pit
- Tailings Pond
- Building/Structure
- Road
- Contour (20 m)
- Watercourse
- Waterbody

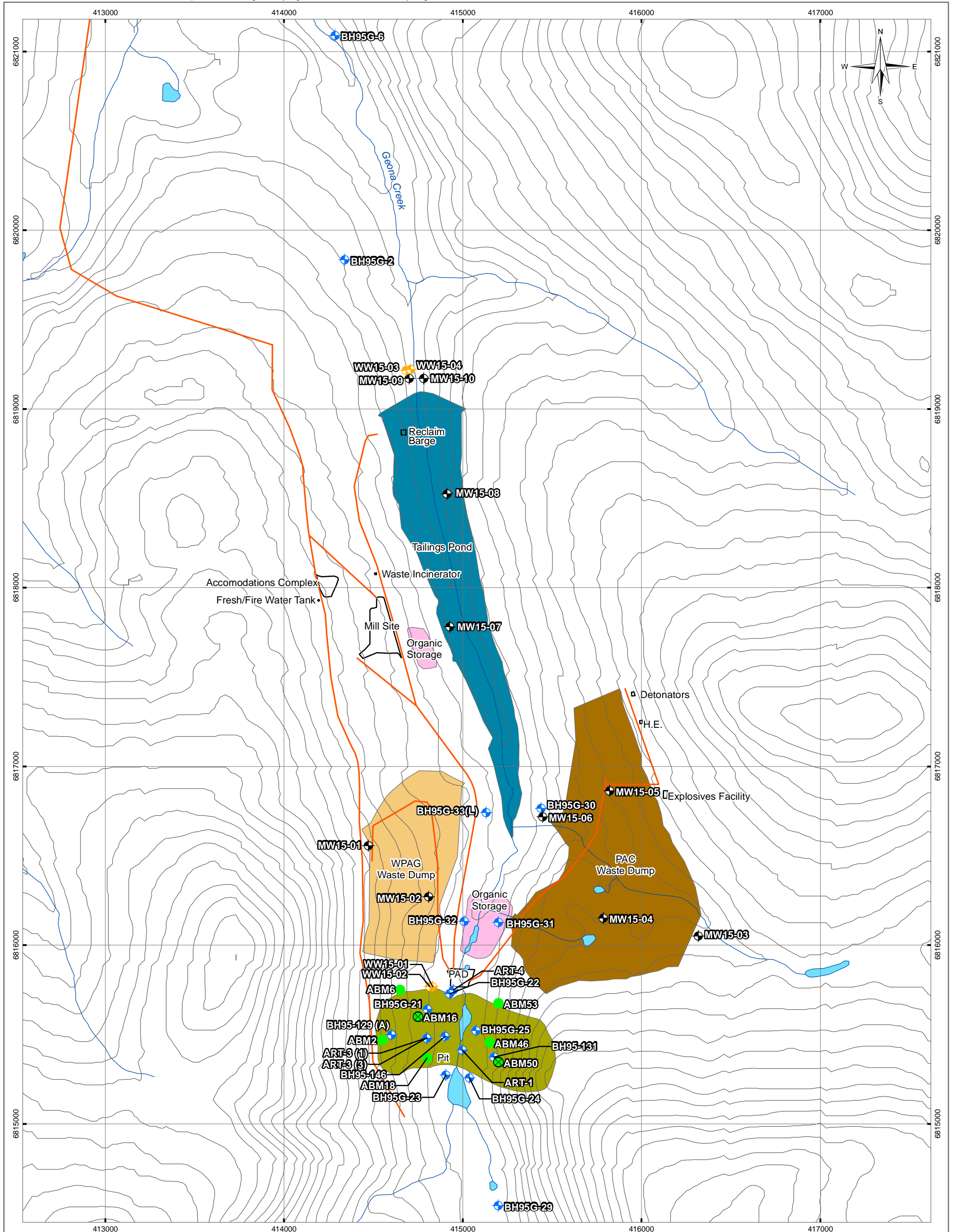
NOTES
 1. Base data source: CanVec 1:50,000
 2. Some locations are approximate

ENVIRONMENTAL BASELINE AND PERMITTING KUDZ ZE KAYAH, YK

Existing Monitoring Wells

PROJECTION UTM Zone 9	DATUM NAD83	CLIENT BMC Minerals (No.1) Ltd.
Scale: 1:30,000 <div style="display: flex; justify-content: center; align-items: center;"> <div style="width: 100px; border-bottom: 1px solid black; margin-right: 5px;"></div> <div style="margin-right: 5px;">500</div> <div style="width: 20px; border-bottom: 1px solid black; margin-right: 5px;"></div> <div style="margin-right: 5px;">250</div> <div style="width: 20px; border-bottom: 1px solid black; margin-right: 5px;"></div> <div style="margin-right: 5px;">0</div> <div style="width: 20px; border-bottom: 1px solid black; margin-right: 5px;"></div> <div style="margin-right: 5px;">250</div> <div style="width: 20px; border-bottom: 1px solid black; margin-right: 5px;"></div> <div style="margin-right: 5px;">500</div> </div> Metres		
FILE NO. MIN03071-01_Figure01_ExistingMW.mxd		
PROJECT NO. ENVMIN03071-01	DWN MEZ	CKD SL
OFFICE TlEBA-VANC	APVD SK	REV 0
DATE June 18, 2015		Figure 1

STATUS
ISSUED FOR REVIEW



LEGEND

- + Existing Monitoring Well
 - + New Monitoring Well
 - + Large Diameter Test Well
 - + Exploration Hole with Packer Testing
 - + Exploration Hole with Vibrating Wire Piezometer Installation
- Proposed Mining Infrastructure**
- PAC Waste Dump
 - WPAG Waste Dump
 - Organic Storage
 - Pit
 - Tailings Pond
 - Building/Structure
 - Road
- Contour (20 m)
 - ~ Watercourse
 - Waterbody

NOTES
 1. Base data source: CanVec 1:50,000
 2. Some locations are approximate

**ENVIRONMENTAL BASELINE AND PERMITTING
 KUDZ ZE KAYAH, YK**

**Monitoring Wells for
 Hydrogeological Assessment**

PROJECTION UTM Zone 9	DATUM NAD83	CLIENT BMC Minerals (No.1) Ltd.
Scale: 1:20,000		



FILE NO. MIN03071-01_Figure02_HydrogeoWells.mxd				
PROJECT NO. ENVMIN03071-01	DWN MEZ	CKD SL	APVD SK	REV 0
OFFICE Tl:EBA-VANC	DATE July 15, 2015			

Figure 2

STATUS
ISSUED FOR REVIEW

Table 1A: Existing Monitoring Wells

Well ID	Location	Northing	Easting	Borehole	Well	Overburden	Bedrock	Well Status	Sampled in May 2015	Future Use	Proposed Well Upgrades
				Depth mbg	diameter mm						
BH95G-2	North of Dam Site D	6819834	414339	21.33	32		X	Functional, sampled	X	X	Extend PVC casing; steel casing protector
BH95G-2A	North of Dam Site D	6819834	414339	6.09	32		X	Dry			
BH95-2B	North of Dam Site D	6819834	414339		32			Destroyed			
BH95G-3	North of Dam Site D	6819896	415028	27.43	32		X	Not Found			
BH95G-4	North of Dam Site D	6820015	415012	22.86	32		X	Frozen			
BH95G-5	North of Dam Site D	6819891	414667	68.88	75.7		X	Destroyed			
BH95G-6	North of Dam Site D	6821090	414285	67.05	32		X	Not Found		X	Extend PVC casing; steel casing protector
BH95G-6A	North of Dam Site D	6821090	414285	18.3	32	X		Not Found			
BH95G-7	North of Dam Site D	6820695	413959	53.34	32		X	Frozen			
BH95G-7A	North of Dam Site D	6820695	413959	19.8	32	X		In pond			
BH95G-8	North of Dam Site D	6820912	414015	32.3	32		X	Not Found			
BH95G-8A	North of Dam Site D			22.3	32	X		Not Found			
BH95G-9	North of Dam Site D	6821024	414533	24.68	32		X	Destroyed			
BH95G-10	North of Dam Site D	6820967	414198	40.23	32	X		Frozen			
BH95G-10A	North of Dam Site D	6820967	414198		32			Frozen/Blocked			
BH95G-12	Immediately north of Dam Site D	6819257	414715	22.56	32	X		Destroyed			
BH95G-13D	Dam Site D	6819010	414712	50.3	32		X	Not Found			
BH95G-13D	Dam Site D	6819010	414712	50.3	32	X		Not Found			
BH95G-14D	Dam Site D	6818988	414652	28.65	32		X	Not Found			
BH95G-14D	Dam Site D	6818988	414652	28.65	32	X		Not Found			
BH95G-15D	Dam Site D	6818976	414576	22.56	32		X	Not Found			
BH95G-17D (1)	Dam Site D	6819051	414911	16.46	32			Frozen			
BH95G-17D (2)	Dam Site D	6819051	414911	16.46	32		X	Dry			
BH95G-17D (3)	Dam Site D	6819051	414911	16.46	32		X	Dry			
BH95G-18D	Dam Site D	6819067	414977	11.9	32		X	Dry			
BH95G-19D	Dam Site D	6818964	414510	22.56	32		X	Frozen			
BH95G-19D	Dam Site D	6818964	414510	22.56	32	X		Dry			
BH95G-20M	Mill	6817263	414723	12.5	32		X	Not Found			
BH95G-21D	Dam Site D	6819031	414815	24.7	32		X	Not Found			
BH95G-21D	Dam Site D	6819031	414815	24.7	32	X		Not Found			
BH95G-20	Open Pit	6815496	414849	10.06	32		X	Frozen			
BH95G-21	Open Pit	6815640	414802	10.06	32		X	Functional, sampled	X	X	Extend PVC casing; steel casing protector
BH95G-22	Open Pit	6815728	414928	7.47	32	X	X	Functional, sampled	X	X	Extend PVC casing; steel casing protector
BH95G-23	Open Pit	6815275	414906	14.63	32	X		Waterra stuck		X	Extend PVC casing; steel casing protector
BH95G-24	Open Pit	6815257	415038	9.75	32	X	X	Waterra stuck		X	Extend PVC casing; steel casing protector
BH95G-25	Open Pit	6815521	415074	22.25	32		X	Waterra stuck			
BH95G-25	Open Pit	6815521	415074	22.25	32	X		Functional, sampled	X	X	Extend PVC casing; steel casing protector
BH95G-26	Open Pit	6815661	415061	14.63	32	X	X	Not Found			
BH95G-27	South Creek	6812634	414758	19.8	32	X	X	Not Found			
BH95G-29	South of Open Pit	6814542	415198	19.2	32	X		Frozen		X	Extend PVC casing; steel casing protector
BH95G-30	PAC Dump	6816765	415439	19.2	32		X	Frozen		X	Extend PVC casing; steel casing protector
BH95G-31	PAC Dump	6816127	415200	10.06	32		X	Waterra stuck		X	Extend PVC casing; steel casing protector
BH95G-32	WPAG Dump	6816133	415009	16.15	32		X	Functional, sampled	X	X	Extend PVC casing; steel casing protector
BH95G-33(L)	WPAG Dump	6816743	415130	13.1	32		X	Functional, sampled	X	X	Extend PVC casing; steel casing protector
BH95G-33(U)	WPAG Dump	6816743	415130	13.1	32	X		Dry			
BH95G-35	Mill	6817696	414570	16.15	32		X	Destroyed			
BH95G-36	Mill	6817445	414627	10.06	32		X	Not Found			
BH95G-37	Mill	6817449	414584	13.11	32		X	Not Found			
BH95-129 (A)	Open Pit	6815500	414600	160	32		X	Functional, purged, slow recovery		X	Extend PVC casing; steel casing protector
BH95-129 (B)	Open Pit	6815500	414600	32	32			Frozen			
BH95-131	Open Pit	6815375	415175	128	32		X	Functional, purged, slow recovery		X	Extend PVC casing; steel casing protector
BH95-135	Open Pit	6815570	415150	194.5	32		X	Not Found			
BH95-146	Open Pit	6815490	414900	138.7	32		X	Artesian flow around outside of casing, sampled	X	X	Grout annulus; extend PVC; steel casing protector
BH95-148	Open Pit	6815600	414950	209	32		X	Destroyed			
BH95-150	Open Pit	6815685	414750	178.9	32		X	Functional, purged, slow recovery			
ART-1	Open Pit	6815414	414996		78		X	Well could not be opened		X	Cap with valve
ART-3 (1)	Open Pit	6815481	414798	13.7	78		X	Artesian Flow		X	Cap with valve
ART-3 (2)	Open Pit	6815481	414798	3.92	78		X				
ART-3 (3)	Open Pit	6815481	414798	27.1	78		X	Artesian Flow, Sampled	X	X	Cap with valve
ART-4	Open Pit	6815750	414947	9.8	78		X	Artesian Flow, Sampled	X	X	Cap with valve

Note:

m asl - meters above sea level
 mbg - meters below ground
 mm - millimeters
 m - meters
 m btoc - meters below top of casing
 blank indicates information not available

Functional
Destroyed
Frozen
Dry
Not found

Table 1B: Existing Monitoring Wells to be Included in Ongoing Monitoring

Well ID	Location	Northing	Easting	Borehole	Well	Overburden	Bedrock	Well Status	Sampled in May 2015	Proposed Well Upgrades
				Depth mbg	diameter mm					
BH95G-2	North of Dam Site D	6819834	414339	21.33	32		X	Functional, sampled	X	Extend PVC casing; steel casing protector
BH95G-6	North of Dam Site D	6821090	414285	67.05	32		X	Not Found		Extend PVC casing; steel casing protector
BH95G-21	Open Pit	6815640	414802	10.06	32		X	Functional, sampled	X	Extend PVC casing; steel casing protector
BH95G-22	Open Pit	6815728	414928	7.47	32	X	X	Functional, sampled	X	Extend PVC casing; steel casing protector
BH95G-23	Open Pit	6815275	414906	14.63	32	X		Water stuck		Extend PVC casing; steel casing protector
BH95G-24	Open Pit	6815257	415038	9.75	32	X	X	Water stuck		Extend PVC casing; steel casing protector
BH95G-25	Open Pit	6815521	415074	22.25	32	X		Functional, sampled	X	Extend PVC casing; steel casing protector
BH95G-29	South of Open Pit	6814542	415198	19.2	32	X		Frozen		Extend PVC casing; steel casing protector
BH95G-30	PAC Dump	6816765	415439	19.2	32		X	Frozen		Extend PVC casing; steel casing protector
BH95G-31	PAC Dump	6816127	415200	10.06	32		X	Water stuck		Extend PVC casing; steel casing protector
BH95G-32	WPAG Dump	6816133	415009	16.15	32		X	Functional, sampled	X	Extend PVC casing; steel casing protector
BH95G-33(L)	WPAG Dump	6816743	415130	13.1	32		X	Functional, sampled	X	Extend PVC casing; steel casing protector
BH95-129 (A)	Open Pit	6815500	414600	160	32		X	Functional, purged, slow recovery		Extend PVC casing; steel casing protector
BH95-131	Open Pit	6815375	415175	128	32		X	Functional, purged, slow recovery		Extend PVC casing; steel casing protector
BH95-146	Open Pit	6815490	414900	138.7	32		X	Artesian flow around outside of casing, sampled	X	Grout annulus; extend PVC; steel casing protector
ART-1	Open Pit	6815414	414996		78		X	Well could not be opened		Cap with valve
ART-3 (1)	Open Pit	6815481	414798	13.7	78		X	Artesian Flow		Cap with valve
ART-3 (3)	Open Pit	6815481	414798	27.1	78		X	Artesian Flow, Sampled	X	Cap with valve
ART-4	Open Pit	6815750	414947	9.8	78		X	Artesian Flow, Sampled	X	Cap with valve

Note:

m asl - meters above sea level
 mbg - meters below ground
 mm - millimeters
 m - meters
 m btoc - meters below top of casing
 blank indicates information not available

Functional
Destroyed
Frozen
Dry
Not found

Table 2: New Monitoring Wells

Well ID	Easting	Northing	Location	Drill Method	Hole Diameter	Well Casing Diameter	Overburden/Bedrock	Well Depth	Rationale
					(mm)	(mm)		(m bgs)	
MW 15-01	414409	6816426	WPAG Dump	Diamond	96	32	Shallow Bedrock (nested if overburden aquifer is present)	20	Groundwater monitoring up-gradient of WPAG Dump
MW 15-02	414808	6816270	WPAG Dump	Diamond	96	32	Nested	10 / 30	Groundwater monitoring down-gradient of WPAG Dump near BH95G-32; hydraulic testing of overburden and bedrock underneath the WPAG Dump
MW 15-03	416380	6816118	PAC Dump	Diamond	96	32	Shallow Bedrock (nested if overburden aquifer is present)	20	Groundwater monitoring up-gradient of PAC Dump
MW 15-04	415786	6816154	PAC Dump	Diamond	96	32	Nested	10 / 30	Hydraulic testing of overburden and bedrock underneath the PAC Dump
MW 15-05	415822	6816864	PAC Dump	Diamond	96	32	Nested	10 / 30	Hydraulic testing of overburden and bedrock underneath the PAC Dump
MW 15-06	415447	6816719	PAC Dump	Diamond	96	32	Overburden	10	Groundwater monitoring down-gradient of PAC Dump near BH95G-30
MW 15-07	415166	6817458	Tailings Pond	Diamond	96	32	Nested	10 / 30	Hydraulic testing of overburden and bedrock underneath the tailings pond
MW 15-08	414839	6818359	Tailings Pond	Diamond	96	32	Nested	20 / 40	Hydraulic testing of overburden and bedrock underneath the tailings pond
MW 15-09	414700	6819171	Tailings Pond	Diamond	96	32	Nested	20 / 40	Groundwater monitoring down-gradient of tailings pond
MW 15-10	414760	6819171	Tailings Pond	Diamond	96	32	Nested	20 / 40	Groundwater monitoring down-gradient of tailings pond

Table 5: Large Diameter Test Wells

Well ID	Easting	Northing	Location	Drill Method	Hole Diameter	Well Casing Diameter	Overburden/Bedrock	Well Depth	Rationale
					(mm)	(mm)		(m bgs)	
WW15-01	414831	6815768	Open Pit	Air Rotary	200	200	Overburden	10	Long-term pumping test to infer bulk hydraulic conductivity of the overburden in the area of the open pit. Can be used as dewatering well during mine operation.
WW15-02	414815	6815768	Open Pit	Air Rotary	200	200	Shallow Bedrock	30	Long-term pumping test to infer bulk hydraulic conductivity of the shallow bedrock in the area of the open pit. Can be used as dewatering well during mine operation.
WW15-03	414684	6819215	Tailings Pond	Air Rotary	200	200	Overburden	20	Long-term pumping test to infer bulk hydraulic conductivity of the overburden immediately down-gradient of the tailings dam. Can be used as extraction well during mine operation.
WW15-04	414709	6819220	Tailings Pond	Air Rotary	200	200	Shallow Bedrock	40	Long-term pumping test to infer bulk hydraulic conductivity of the shallow bedrock immediately down-gradient of the tailings dam. Can be used as extraction well during mine operation.