
Photo A: Gravel/cobble/boulder substrate.

Photo B: Facing upstream at right downstream bank.

Photo C: Facing downstream at right downstream bank.

Photo D: Facing left downstream bank from proposed crossing.

Note:
1. Channel measurements include:
   - Wetted Width
   - Bankful Width
   - Maximum Depth
2. Detailed stream habitat data available in attachment.
3. Channel width not to scale.
4. See reverse for legend.

Reference:
NTS Mapsheet 66A/8
NAD83 Zone 14

PROJECT

KIGGAVIK PROJECT

TITLE

**HABITAT MAP**
**THELON RIVER (CROSSING 18)**
**2008**

DRAFT

Golder Associates
Saskatoon, Saskatchewan

| | | | |
|---|---|---|---|
| PROJECT | 09-1362-0610 | | FILE No. |
| DESIGN | | | SCALE AS SHOWN REV. 0 |
| CADD | AJL | 22/04/09 | |
| CHECK | FA | 05/10/09 | **FIGURE: 1** |
| REVIEW | JDH | 05/10/09 | |

C:\2009\1362\09-1362-0610 AREVA Kiggavik Baseline and EIA\CAD\ Drawing file: 09-1362-0610-1110-Additional Streams Habitat Maps.dwg Oct 05, 2009 - 3:40pm

# Legend - Rivers and Streams

| Substrate Types | |
|---|---|
| Cl | Clay |
| Si | Silt |
| Sa | Sand |
| Gr | Gravel |
| Co | Cobble |
| Bo | Boulder |
| Bd | Bedrock |
| Or | Organic |

| Habitat Features | | |
|---|---|---|
| XXXX | BD | Beaver Dam |
| | MD | Man-Made Dam |
| | BL | Beaver Lodge |
| | BG | Boulder Garden |
| | | Bridge |
| | | Culvert |
| | DP | Debris Pile |
| | EM | Emergent Vegetation |
| | | Flow Direction |
| | ISC | Instream Cover |
| | IV | Instream Vegetation |
| | INV | Inundated Vegetation |
| | LWD | Large Woody Debris |
| | LE | Ledge |
| | LJ | Log Jam |
| | LS | Landslide |
| | MIL | Multiple Island |
| | OHV | Overhanging Vegetation |
| | OHC | Overhead Cover |
| | RW | Root Wad |
| | | Sand Bar |
| | SIL | Singular Island |
| | SWD | Small Woody Debris |
| | SM | Submergent Vegetation |
| | UCB | Undercut Bank |
| | USB | Unstable Bank |

| Sample Type Symbols | | |
|---|---|---|
| | | Water |
| | | Sediment |
| | | Benthic |
| | | Fish |

| General | |
|---|---|
| C | Photo Location/Direction |
| | Habitat Type Divider |
| | Fish Bearing/Potential Bearing Watercourse |
| | Width |
| | Depth |

**Site Summary Symbol**

River (R) or Stream (S)
Average Wetted Width (m)
Average Bankful Width (m)
Average Depth (m)
Habitat Classification
Substrate Type

Fish Species

Notes:
m = metres

| Bank/Upland Vegetation Types | | |
|---|---|---|
| | BA | Bare Ground |
| | OT | Open Tundra |
| | MU | Muskeg/Bog |
| | DF | Deciduous Forest |
| | CF | Coniferous Forest |
| | MW | Mixedwood Forest |
| | GS | Grassland |
| | GF | Grass/Forbs |
| | GF/SH | Grass/Forbs/Shrubs |
| | SE | Sedge |
| | SH | Shrubs |
| | MO | Moss |
| | OR | Organic |

| Bank Slope | |
|---|---|
| | Shallow Slope (0-5%) |
| | Intermediate Slope (6-30%) |
| | Steep Slope (31-70%) |
| | Very Steep Slope (>70%) |

| Bank Instability Ratings | |
|---|---|
| A | Aggrading |
| E | Eroding |
| S | Slumping |
| G | Gullying |

| Capture Methods | | |
|---|---|---|
| | BP | Electrofishing - Backpack |
| | EF | Electrofishing - Boat |
| | GN | Gill Net |
| | SN | Seine |
| | FF | Fish Fence |
| | MT | Minnow Trap |
| | AN | Angling |
| | HN/TN | Hoop Net/Trap Net |

| Habitat Classification and Rating System | | | |
|---|---|---|---|
| Fast Water | Turb. | FA | Falls |
| | | CA | Cascade |
| | | CH | Chute |
| | | RA | Rapids |
| | | RF | Riffle |
| | | RF/BG | Riffle/Boulder Garden |
| | Non-Turb. | R | Run (glide) |
| | | R1 | Run Class 1 |
| | | R2 | Run Class 2 |
| | | R3 | Run Class 3 |
| | | FL | Flat |
| Slow Water | Pool | P | Pool |
| | | P1 | Pool Class 1 |
| | | P2 | Pool Class 2 |
| | | P3 | Pool Class 3 |
| | Impound (dammed pool) | IP | Impound |
| | | IP1 | Impound Class 1 |
| | | IP2 | Impound Class 2 |
| | | IP3 | Impound Class 3 |
| Other Features | | BW | Backwater |
| | | SN | Snye |
| | | BG | Boulder Garden |
| | | SH | Shoal |
| | | SL | Slough, Oxbows |

# Gebauer & Associates
## ENVIRONMENTAL CONSULTANTS

6387 Larch Street, Vancouver, B.C. V6M 4E8
Tel/Fax: (604) 261-2716; Email: gebauer@telus.net

**To:** Diane Martens, Areva Resources Canada

**From:** Martin Gebauer, Gebauer & Associates Ltd.

**Date:** 05 October 2009

**Re:** Thelon River Surveys

**Date: 11 July 2009**

**Survey Type:** Waterbird Nesting Survey
**Observers:** Kevin Martee and Joe Putumiraqtuq
**Location:** Mapsheet G, L37 and L38
**Time:** 1507-1545
**Results:**

| Observation | Comments |
|---|---|
| **Wildlife** | |
| American Pipit | 4 observed at L37; 4 observed at L38 |
| Canada Goose | 2 observed at L37 |
| Common Redpoll | 1 observed at L38 |
| Herring Gull | 1 observed at L38 |
| Hoary Redpoll | 1 observed at L37 |
| Lapland Longspur | Nest with 4 chicks and 2 observed at L37 |
| Savannah Sparrow | 2 observed at L37 |

**Date: 15 July 2009**

**Survey Type:** Thelon River Shoreline Survey
**Observers:** Martin Gebauer and Darren Itkilik
**Location:** Start = 14W 0624161 7147718; End = 14W 0625630 7143383
**Time:** 1030-1246

**Results:**

| Observation | Comments |
|---|---|
| **Wildlife** | |
| Caribou | 56+ bulls on south side of river |
| American Pipit | 3 observed |
| Bald Eagle | I immature bird flying along south side of river |
| Greater White-fronted Goose | 2 adults and 5 chicks, swimming down river |
| Herring Gull | 7 observed; several roosting along edge of river |
| Lapland Longspur | 16 observed |
| Redpoll sp. | 4 observed |
| Red-breasted Merganser | 1 male observed |
| Rough-legged Hawk | 1 observed |
| Savannah Sparrow | 3 observed |
| White-crowned Sparrow | 5 observed |
| **Archaeological Sites** | |
| Fish Cache | Small likelihood that moving ice could have made this feature |
| Tent Ring #1 | Coordinates available |
| Tent Ring #2 | Coordinates available |

**Date: 28 July 2009**

**Survey Type:** Waterbird Molting Survey
**Observers:** Ivan Rossman and Kevin Martee
**Location:** Mapsheet G, L39 and L40
**Results:**

| Observation | Comments |
|---|---|
| **Wildlife** | |
| Herring Gull | 2 observed at L39 |
| Peregrine Falcon | Pair observed at nest at L39 |

**Date: 11 August 2009**

**Survey Type:** Thelon River Shoreline Survey
**Observers:** Kevin Martee and Daniel Martee
**Location:** Start = 14W 0624161 7147718; End = 14W 0625630 7143383
**Time:** 1400-1539
**Results:**

No waterbirds were observed. A few feathers from a Herring Gull and Canada Goose (3 or 4 feathers each) were found along the beach.

**Date: 28 August 2009**

**Survey Type:** Thelon River Shoreline Survey
**Observers:** Shannon McFadyen and Kevin Martee
**Location:** Start = 14W 0624161 7147718; End = 14W 0625630 7143383
**Time:** 0737-0900
**Results:**

No bird activity. One fresh bear scat observed.

| | | | |
|---|---|---|---|
| **TO:** | Nicola Banton, P. Eng<br>Areva Resources Canada Inc. | **DATE:** | October 7, 2009 |
| **C:** | | **MEMO NO:** | |
| **FROM:** | Graham Wilkins, P. Eng<br>EBA Engineering Consultants Ltd. | **FILE:** | V33101016 |
| **SUBJECT:** | **Site Reconnaissance at Thelon River Crossing Location** | | |

## 1.0 INTRODUCTION

This memo summarizes the field reconnaissance completed by EBA Engineering Consultants Ltd. (EBA) at potential Thelon River crossing locations. There have been 4 main reconnaissance visits conducted by EBA and our sub-consultants to date. These include:

- Air and ground reconnaissance
- Spring ice observations and consultation with local elders
- Bathymetric survey
- Ground penetrating radar and Ohm Mapper survey

Other information at the site has been collected by others and is not included in this memo such as a LiDAR survey (Summer 2009), orthophotography (Summer 2009), and environmental surveys/studies(ongoing).

## 2.0 AIR AND GROUND RECONNAISSANCE

EBA sent a field team to study different access road options from the Kiggavik site to a potential port on Baker Lake. The team was on site From July 28th, 2008 to August 4th, 2008 and investigated potential Thelon River crossing sites as part of the investigation. The team consisted of a Senior Geotechnical Engineer and a Senor Transportation Engineer with extensive Northern/Arctic experience.

The team focused their attention on the crossing location identified in the 2007 Pre-Feasibility study prepared by EBA which was completed with large scale mapping and satellite imagery and did not include any field investigation. During the reconnaissance the team identified an alternate crossing location. Both locations are illustrated in figure 1. The second location was identified because of potential concerns with slope stability, and uncertainty of ground conditions and bedrock depth at the first location.



EBA Engineering Consultants Ltd.
p. 604.685.0275 • f. 604.684.6241 • Oceanic Plaza, 9th Floor
1066 West Hastings Street • Vancouver, British Columbia V6E 3X2 • CANADA

The team recommended that both locations be studied further and that a field program using ground-penetrating radar (GPR) supplemented by a drilling program both in the river and on land. The location of the bridge will be based on a number of factors including, hydraulics, geometrics, costs, geotechnical and environmental constraints.

## 3.0 ICE OBSERVATIONS

EBA employed Northwest Hydraulics Consultants Ltd. as a subconsultant to survey ice conditions during spring break-up on the Thelon River. Mr. David Andres, M.Sc.,P. Eng. was on site from June 18-20, 2008. He completed several trips to along the Thelon River making ice observations as well as consulted with local Elders.

A summary of the visit is appended to this memo.

## 4.0 BATHYMETRIC SURVEY

EBA completed a Bathymetric survey of the Thelon River crossing locations being considered on August 3, 2008. The survey was completed by 2 EBA staff along with a local guide/boat driver. The extent of the survey is sown on figure 1.

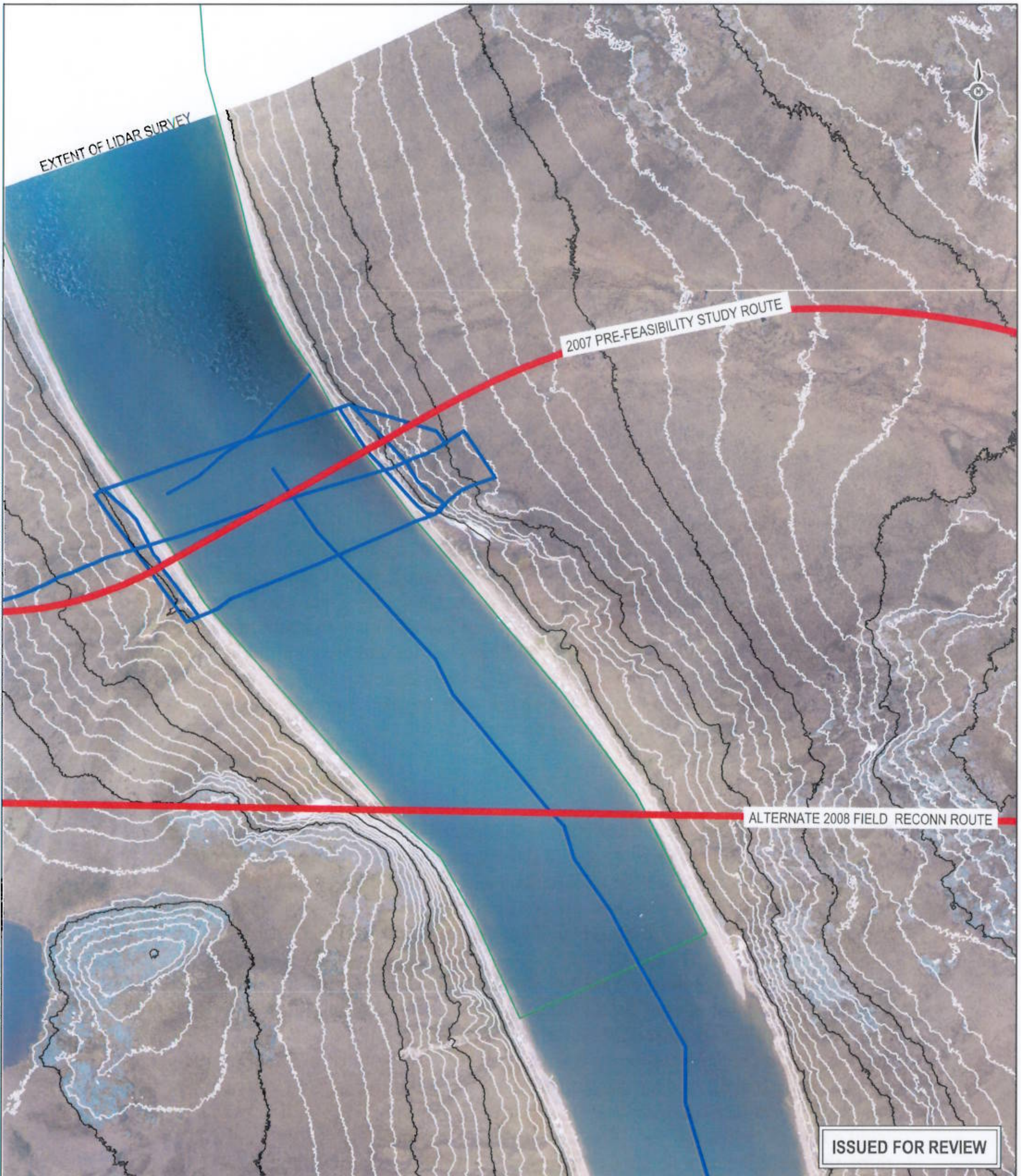
## 5.0 GEOPHYSICAL SURVEYS (GPR AND OHM MAPPER)

In conjunction with the Bathymetric survey in August 2008 EBA also collected data with a GPR unit. The same EBA geophysicist returned to the Thelon River in April 2009 to collect additional GPR information and also collected information with an Ohm Mapper. The data collection lines are illustrated on figure 1.

Initial analysis of the data was inconclusive in many areas indicating that bed rock may be deep or a layer of non conductive material was interfering with the collection in this area. The team recommends calibrating the data collected with confirmatory drill holes.

Sincerely,
EBA Engineering Consultants Ltd.

Graham Wilkins, P. Eng.
Project Director
Transportation Practice
gwilkins@eba.ca




**LEGEND:**

- POTENTIAL ROUTE
- GPR SURVEY LINE
- BATHYMETRIC SURVEY EXTENTS

CONTOUR INTERVAL= 2m

SCALE 1:7500

50 0 50 150 300m

CLIENT

AREVA

EBA Engineering Consultants Ltd.

**KIGGAVIK PROJECT**

**RECONNAISSANCE WORK AT POTENTIAL THELON RIVER CROSSING SITES**

| PROJECT NO. | DWN | CKD | REV |
| --- | --- | --- | --- |
| V33101016 | DCD | GEW | 0 |
| OFFICE | DATE | | |
| VANC | October 8, 2009 | | |

**Figure 1**

O:\Vancouver\Transportation\V331\Projects\V33101016 - Areva\CADD\2009 Conceptual Design\Design Files\624-627\Bridge Alignment Comparison Sketch.dwg [FIGURE 1] October 08, 2009 - 10:34:01 am (BY: DREW DAVIDGE)

**Summary of Activities**

**Visit to Thelon River near Baker Lake**
**June 18-20, 2008**

**D.D. Andres, M.Sc., P. Eng.**
**Northwest Hydraulic Consultants Ltd.**

**June 30, 2008**

**June 18, 2008**

Traveled to Baker Lake on Canadian North via Yellowknife and Rankin Inlet, arriving at about 17:00 hours.

Immediately upon arrival, after having been met by Jeff Hart, undertook a two hour reconnaissance flight by helicopter over the Thelon River from Baker Lake to Schultz Lake, accompanied by Elders Samson and Robert, videographer Martin, and AREVA community liaison officer and interpreter William Noah. The river was in the process of breaking up, with much of the upper reach (from Schultz Lake to about midway down to Baker Lake) having undergone thermal melting with limited ice jamming evident. In the lower section of the river, two short ice jams were evident punctuated by stretches of intact ice. The water level increase associated with the jams appeared top about 3 to 4 m – relatively low compared to historical norms.

**June 19, 2008**

Met with Elders Samson and Robert, videographer Martin, and AREVA community liaison officer William Noah to explain the purpose of my visit, record the concerns of the Elders, and summarize their experiences with ice and the river. They provided good solid factual information that does not conflict with our ideas about ice-related processes and their severity on the Thelon River. The session was taped by Martin.

Undertook another reconnaissance late in the day to assess ice conditions along the lower part of the river upstream of Baker Lake. There was very little change from the previous day. Landed on the shore and measured the thickness of ice floes stranded along the bank upstream of the area where the jams were located. The ice floes were composed of both frazil and thermal ice and varied in thickness from 1.0 to 1.5 m. Experience suggests that (1) the ice thickness could reach 2.0 m in severe winters and (2) high jam-related water level could be between 6 and 10 m above normal summer open water levels. The Elders think that peak breakup levels would be about 7 m above normal summer open water levels.

Circled the proposed location of the bridge and inspected the markers set up by the Elders to assess the maximum breakup level. At the time of the flight, the ice cover at the bridge had not yet broken up and ice levels were well below even the lowest marker.

The lake ice was still largely intact but with open leads developing along the north shore of the lake. The ice had not yet moved significantly, but ridges appeared to be forming out in the middle of the lake due to the differential movement of the large ice plates. There was little ice action along the shore line by which to assess the local severity of ice conditions at the potential dock locations.

**June 20, 2008**

Met with William Noah and Martin in the morning. Participated in a more formal interview to (1) recap the events of the previous two days, (2) summarize the purpose of the visit and the value of the information that was collected, and (2) identify future work that needed to be undertaken. Indicated that both channel bathymetry data at the proposed bridge would be required, additional breakup observations would be needed, and considerable hydraulic analyses would be undertaken to establish the design parameters for the bridge and/or to assess its feasibility with respect to other crossing alternatives. There was some discussion about the uniqueness of the ice conditions on the Thelon River within the framework of other bridges that have been designed/constructed in Canada's north.

Left Baker Lake on Calm Air and returned to Edmonton on Canadian North via Rankin Inlet and Yellowknife.

David Andres, M.Sc., P.Eng.
Northwest Hydraulic Consultants Ltd.

# Best Management Practice (BMP-011)
# Drilling on Ice

## General Introduction:

Many exploration programs involve drilling on ice in the search for mineral deposits. Because potential risks increase from drilling on ice, special attention is given to all drilling phases to prevent or minimize adverse impacts to the environment. Operations may vary between drill rigs or even between holes as situations demand; however, decisions must reflect the requirements outlined in this guideline to reduce potential impacts to the aquatic ecosystem. This best management practice does not apply to land-based drilling programs (see BMP-010).

## Background:

The following information is provided to describe the various precautionary steps taken to protect the environment when drilling on ice.

### Description of a Diamond Drill

Diamond drills come in a variety of shapes and sizes. Although there are a number of different sizes, manufacturers, and types of drills they generally adhere to a few simple rules. Diamond drills are almost always primarily powered by a diesel engine. All drills have at least some secondary drive mechanisms that are hydraulic. Typically drill rigs are small, about the size of a small recreational vehicle. The drill is transported to the site on a low bed tractor-trailer and is moved around the site using a dozer/skidder. The drill pipe or "rod " will have a diameter of anywhere from five inches to as small as two inches. Drills are capable of drilling to 300 meters or more, depending on the size of the drill and drill rod string used.

Drilling on ice goes through three basic phases: setting up, drilling, and tearing down.

All three of these operations are outlined in detail below:

### Setting Up

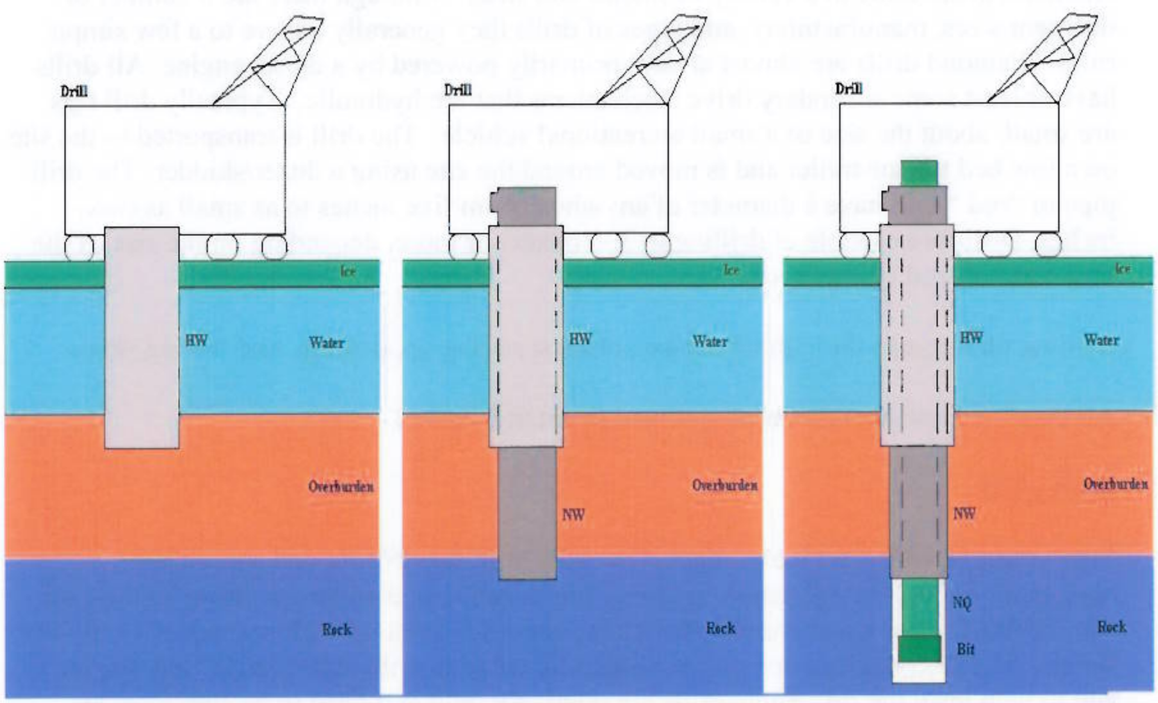
There must be sufficient ice to support the weight of the drill rig and associated equipment during transportation to the drilling location and when operating on the drill site. If insufficient ice is present, the ice is commonly built up with a series of local floods. The drill is supported on untreated timbers to distribute its weight over the ice and to help level the rig. Some drills are relatively light and need to be stabilized by using ice screws or freezing in anchors. Associated drilling equipment, which includes: drill rods, pumps, mixing tanks, and mechanical support equipment, is brought to the site and usually stored on sleds. Fuel and petroleum products necessary for maintenance and operation are temporarily brought to the drill site when required.

Drilling

The first step in drilling is "casing" the hole. This means sealing the hole from bedrock to surface using a large diameter pipe or "rod". This is a necessary step to ensure that the hole can be located again if any subsequent drill rods need to be removed during the operation. When casing the hole, one factor to contend with may be the depth of the water, or the distance between the drill and something solid. If the water is deep, the drillers will drop their largest rods first (rod size referred to as HW in *Figure 1*). The HW rod will be pushed and turned as far as it will go into the lake bottom manually and then anchored to the drill. Some disturbance of lake bottom sediments will result from this initial stage, however it is minimal and localized. If the lake bottom is bedrock there will be virtually no disturbance at all. If however consolidated sediments exist then some disturbance to organic matter at the bottom of the lake should be expected.

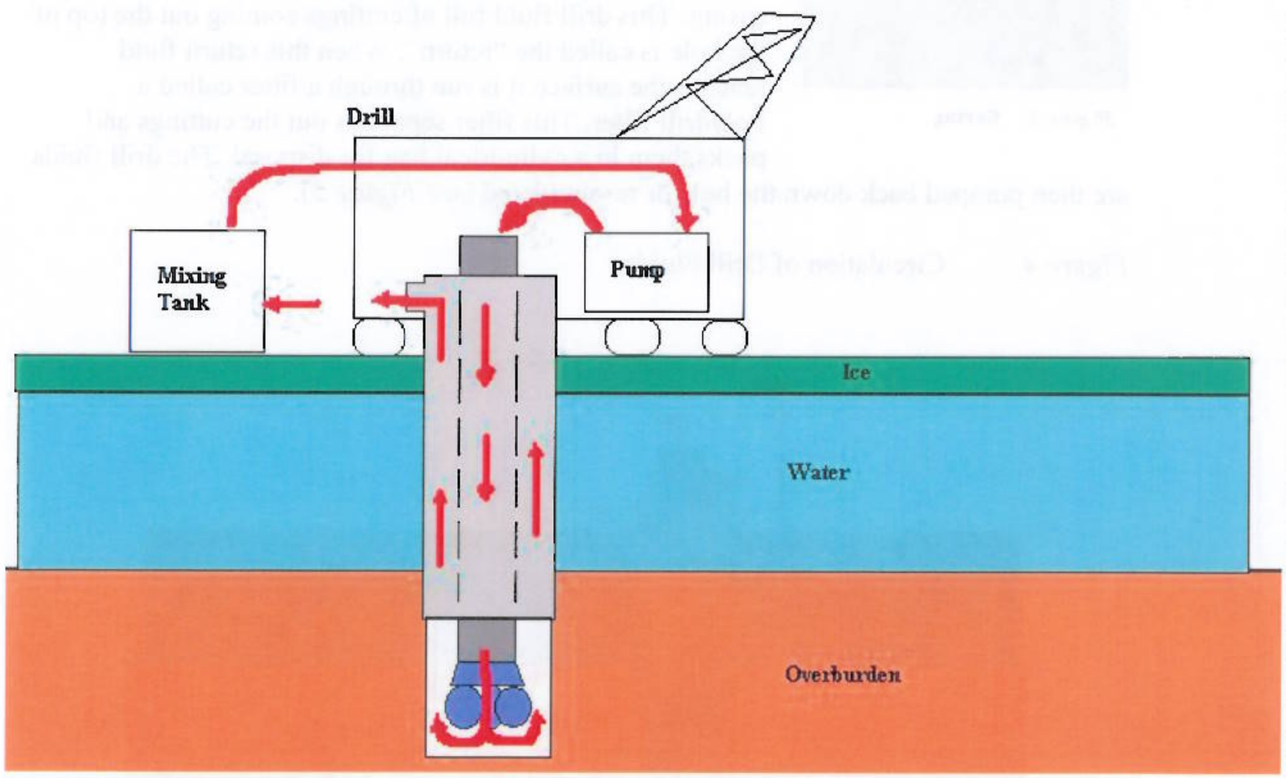
If the HW encounters bedrock then the next smallest size casing referred to as NW will be lowered inside the HW. The NW rod will be drilled into the rock to form a seal between the rock at the bottom of the lake and the drill at the surface. Once the NW rod is in place the next smaller "NQ" rods can be lowered into the hole.

*Figure 1.* Setting Casing




If the NW rod doesn't hit bedrock when it is initially lowered into the hole, it will commence hollow core drilling through the lake sediment or "overburden". If the overburden is deep, or the drilling is difficult, then the drillers will probably switch to a type of drill bit called a tricone. Tricones do not hollow core drill; instead they simply grind their way through everything they encounter. Triconing produces a lot of sand and silt and this abrasive material must be removed from the bottom of the hole or it will plug up the tricone and stop the drilling. Because this material is very coarse and heavy, drillers will commonly add a substance called bentonite to the drilling water to float the coarse sand away from the tricone and out the top of the hole. Mixing bentonite with water forms thick slurry that is able to float out the coarse sand produced by the tricone, when pumped down with enough pressure. This drilling mixture is pumped down through the rods, out through the tricone, back up the outside of the hole into the HW rod, and thus back to the surface. When the bentonite reaches the surface it is contained in a large mixing tank, likely the same tank that was used to mix it in the first place, where the coarse sand can settle. The bentonite is then reused or re-circulated back down through the hole (*see Figure 2*). After the NW rods are sealed with the bedrock, the hole is considered "cased". Once the hole is cased the next step is the actual drilling. For this process, the drillers use the next smaller size rods called NQ.

*Figure 2* Re-circulation During Triconing



"Coring" is the process by which rock is extracted using a hollow bit drill (*see Figure 3*) Coring is achieved by the drill supplying a great deal of pressure and a high-speed rotation. This process generates heat so drilling fluid must be circulated through the bit to keep it from melting. In most cases water will suffice as a drill fluid, but in some cases additives must be used for additional reduction in friction and/or better cooling. If water is used it will be pumped directly from the lake down the hole. If additives are necessary, they are mixed and contained in tanks before pumping the mixture down the hole.

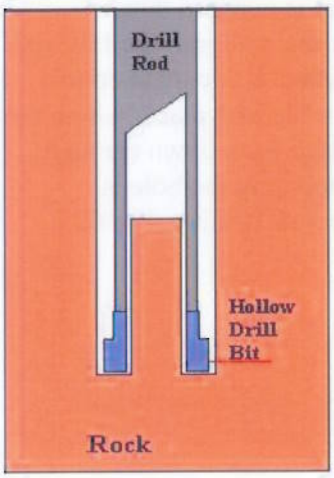



*Figure 3.* **Coring**

Water or drill fluid is pumped down the hole, through the bit, and back up the outside of the NQ rod, but because the hole is sealed it returns to the surface inside the NW casing (*see Figure 4*). While coring, the drill fluids are under pressure forcing the "cuttings" (a gritty mud from the bit cutting the rock) away from the bit and out the top of the casing. This drill fluid full of cuttings coming out the top of the hole is called the "return". When this return fluid reaches the surface it is run through a filter called a Polydrill filter. This filter separates out the cuttings and packs them in a cylindrical bag for disposal. The drill fluids are then pumped back down the hole or re-circulated (*see Figure 5*).

*Figure 4.* Circulation of Drill Fluids

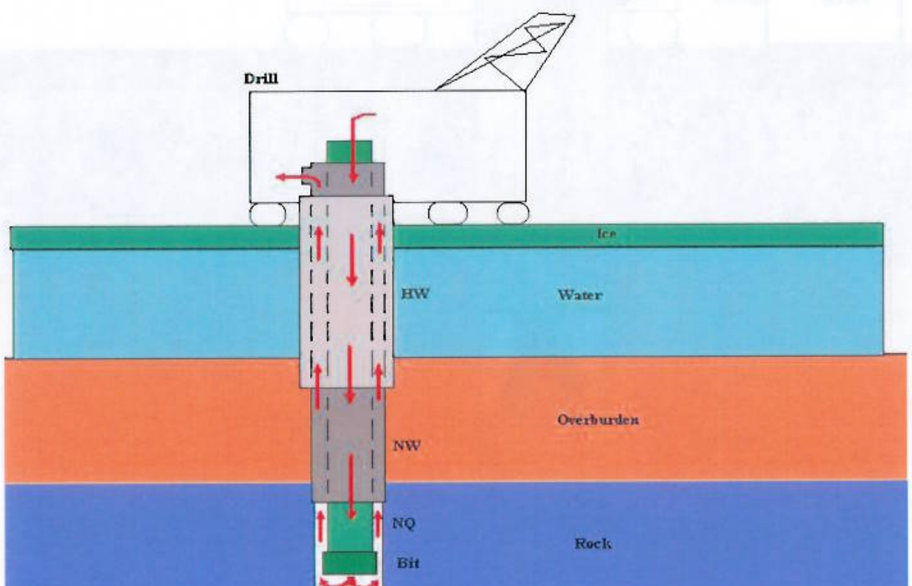
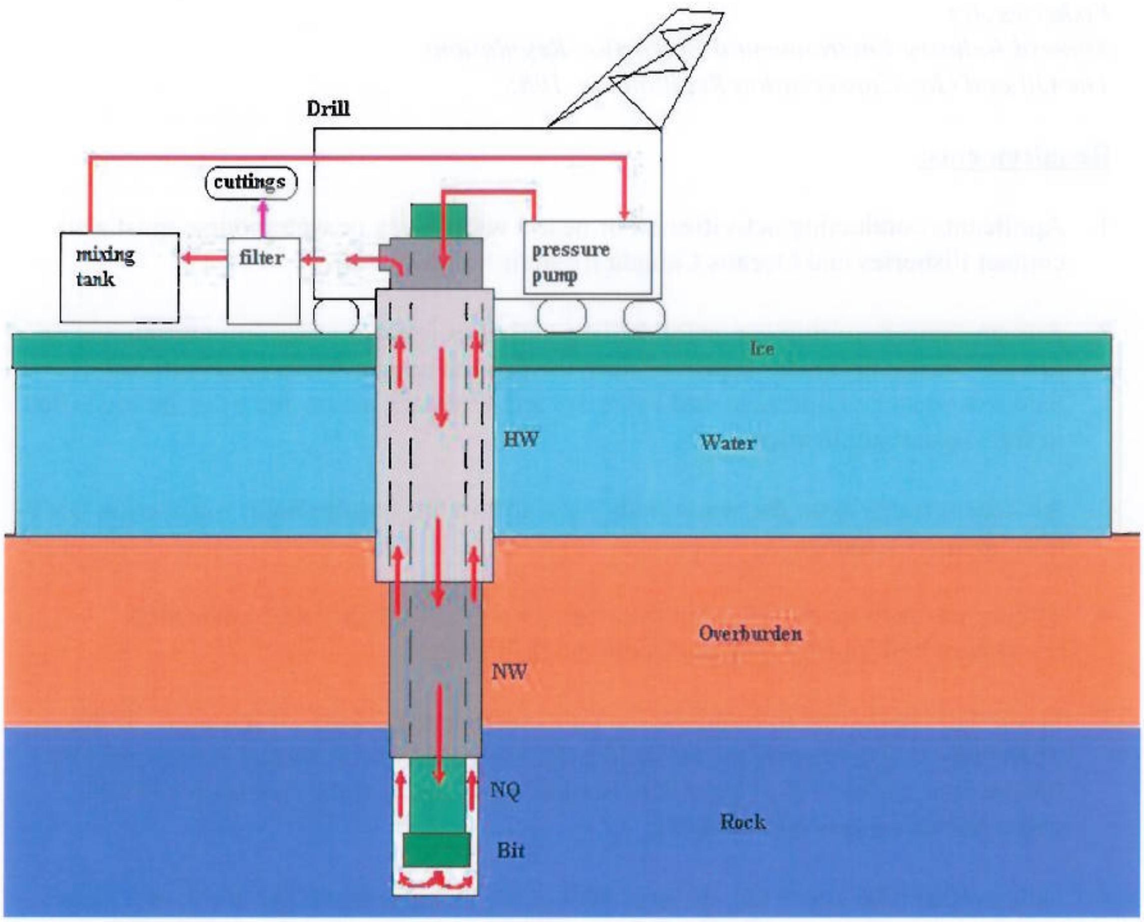


*Figure 5.* Recirculating Drill Fluids




## Tearing Down

Once drilling has been completed, clean water is circulated through the hole to remove any drill additives and remaining cuttings. The hole is then sealed as per requirements to prevent any of the lake water from being inadvertently drained into any aquifer or mine workings (past or future) and to prevent any impure water (salty, mineralized) from entering the lake through underground sources. The hole is sealed for cementing by pumping down a properly sized safety plug and regular Portland cement is pumped down the hole to form a watertight seal.

As the hole is being cemented, all the rods are extracted from the hole in the reverse order they went in. As they are withdrawn any remaining cement will settle to the bottom of the hole. The amount of cement deposited on the lake bottom will be minor as the drillers follow a formula to determine the exact amount of cement they will require to seal a hole. All drill and support equipment is then removed from the lake. The goal is to leave the ice surface in the same condition as it was prior to moving onto the site.

**Authority**:

*Fisheries Act*
*Mineral Industry Environmental Protection Regulations*
*The Oil and Gas Conservation Regulations, 1985*

**Requirements:**

1. Applicants conducting activities on or near a water body or watercourse must also contact Fisheries and Oceans Canada for their review.

2. Any program requiring water for drilling activities (except water from municipal or private sources) requires approval from the Saskatchewan Watershed Authority, Saskatchewan Environment and Fisheries and Oceans Canada and must be identified in the original application.

3. All access routes onto the water body must follow the requirements outlined in BMP-008 "Water Crossings".

4. The ice needs to be of sufficient thickness to support the drill and associated equipment both during transportation and drill setup.

5. Flooding is permitted to build the ice up to sufficient thickness if required. If the waterbody is fish bearing the intake for the pump must be screened to meet DFO's Freshwater Intake End-of-Pipe Fish Screen Guideline and the fuel source for the pump has secondary containment.

6. Unless otherwise approved, drilling shall occur in water depth greater than 2 meters, including ice thickness. Additional site assessment and mitigation information will be required if the applicant plans to drill in a water depth less than 2 meters. Contact Fisheries and Oceans Canada and Saskatchewan Environment for information requirements.

7. Untreated timber or local cut timber can be used to support the drill. If local timber is used, a Forest Products permit authorizing this use is required before any timber harvesting is permitted. All timbers must be removed on completion of drilling operations.

8. The use of ice screws or freezing in anchors is permitted but must be removed once the drilling operation is completed.

9. Fuel shall be stored at a shore cache a minimum100 meters from the high water mark. A limited supply of fuel can be temporarily brought to the site to support the drill. Fuel stored on site must be stored in a secondary containment system; either a large tray or an ice/snow bermed containment area lined with an impervious liner to the product being stored.

10. Absorbent matting or drip trays must be used where accidental spills may occur during fueling. Contaminated material is to be removed from the site for proper disposal immediately after cleanup has been completed. Refer to BMP-005 "HSWDG" for further requirements regarding fuel handling, storage and spills.

11. The drilling crew is to be trained to respond to a spill should the need arise.

12. External pumps or motorized equipment used in the drill operation and sitting on the ice shall have secondary containment (e.g. impermeable liner resistant to the product being used, plastic drip trays, etc).

13. Any water intake used in fish bearing waters is to have a fish screen that meets DFO's 1195 Freshwater End-of-Pipe Fish Screen Guideline to prevent the impingement or entrainment of fish during pumping activities.

14. Noise abatement devices including mufflers and shrouding are to be used near populated areas.

15. The applicant must identify in the application any drilling additives that will be used down the hole during drilling. All drilling additives must be biodegradable and accompanied by an MSDS sheet. Drill additives should only be used if required and in minimal amounts.

16. If mixing tanks for drill muds are being used, they must be placed on an impervious liner and any spills are to be cleaned up with absorbent material and contained.

17. All drilling operations shall use a "closed loop" recycling system with no discharge to the water or ice. In some cases, approval may be given to allow the return fluid to be pumped back to shore and into a natural or constructed sump located 100 meters or greater from the water (in these cases re-circulating drill fluids would not be required).

18. Drill cuttings must be collected through a filter system and disposed of in a SE approved landfill or alternatively the drill mud, return fluid and cuttings can be disposed of in a land-based sump placed 100 meters above the high water mark. Any requirements in BMP-010 (Drilling) addressing operation and handling of the land-based sump must be followed.

19. The drill area is to be kept orderly and any garbage is to be removed daily from the area to an approved disposal site. The ice surface is to be kept clean at all times. Once drilling is complete, all material is to be removed from the ice and the site left in a safe and clean state.

20. Once drilling is completed, clean water must be circulated through the hole to remove any remaining drill fluids and cuttings.

21. Drill holes must have all rods and casing removed prior to abandoning the hole.

22. Drill mud solids or cuttings with a uranium concentration greater than 0.05 % are to be disposed of down the drill hole and sealed.

23. Any drill hole that encounters uranium mineralization with a content greater than 1.0% over a length of more than 1 meter with a meter-percent concentration greater than 5.0 will be sealed by cementing (grouting) over the entire length of the mineralization zone and not less than 10 meters above or below each mineralization zone.

24. Drill holes are to be sealed by cementing (grouting) the upper 30 meters of bedrock or the entire depth of the hole, whichever is less.

25. Companies wishing to drill in the Western Canada Sedimentary Basin are required to contact the Mines Branch of Saskatchewan Industry and Resources (SIR) prior to drilling. SIR will advise of any precautions that are required.

26. The closure report must provide site assessment, drilling operation, and abandonment information for each drill hole. See the "Closure Report" document for further information.

**<u>Contacts</u>**:

Saskatchewan Environment
Fisheries and Oceans Canada
Saskatchewan Watershed Authority
Saskatchewan Industry and Resources, Mines Branch