Class A Land Use Permit Application for 2003 Winter Field Geotechnical Investigation Program in the Inuvialuit Settlement Region

submitted to Inuvialuit Land Administration (ILA)

submitted by Imperial Oil Resources Ventures Limited on behalf of the Mackenzie Gas Project

November 2002

Index s' Return









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Imperial Oil Resources

237 Fourth Avenue S.W. P.O. Box 2480, Station "M" Calgary, Alberta Canada T2P 3M9

November 12, 2002

Inuvialuit Land Administration P.O. Box 290 Tuktoyaktuk, Northwest Territories X0E 1C0

ATTENTION: Mr. James Thorbourne Chief Land Administrator

Dear Mr. Thorbourne:

Re: Class A Land Use Permit Application Temporary Rights-of-Way ILA Rules and Procedures Field Geotechnical Investigation Program

Imperial Oil Resources Ventures Limited (IORVL), on behalf of the Mackenzie Valley Aboriginal Pipeline Limited Partnership, ConocoPhillips Canada (North) Limited, Shell Canada Limited and ExxonMobil Canada Properties, encloses eight copies of an application made pursuant to the Inuvialuit Land Administration (ILA) Rules and Procedures for a Class A land use permit and temporary rights-of-way. These authorizations are required to permit activities associated with a Field Geotechnical Investigation Program (the Program), to be conducted on Inuvialuit private lands during the winter of 2003. The objective of the Program is to gather information which will assess the soil and ground conditions at potential granular borrow sites, stream and river crossing locations, and other locations, along a potential pipeline right-of-way. The information obtained from the Program will be used in assessing the feasibility of a pipeline in the Inuvialuit Settlement Region (ISR) and the Mackenzie Valley and for preparing subsequent regulatory applications if the Mackenzie Valley pipeline project proceeds.

IORVL has engaged ColtKBR to plan and direct all field work for the Program. The proposed field work will be carried out by subcontractors of ColtKBR.

IORVL is currently engaged in discussions with the Inuvialuit Land Corporation and the ILA related to a participation/access agreement for the Program. IORVL expects that a participation/access agreement will be concluded in December and will be submitted to the ILA at that time.

IORVL is concurrently applying to the Department of Indian and Northern Affairs Canada (INAC) for a Class A land use permit pursuant to the Territorial Land Use Regulations authorizing geotechnical work, similar to the Program, which will be carried out on Crown lands within the ISR.

Activities proposed for the winter of 2003 will consist of geotechnical work on a total of 60 sites, of which 17 sites will be on Inuvialuit private lands and 43 sites will be on Crown lands.

P.D. (Peter) Grout Manager, Regulatory Affairs Mackenzie Gas Project Tel. (403) 237-3984 Fax. (403) 237-2102 Concurrent with the filing of this application, IORVL is also planning to file applications and notices with the following organizations:

- Environmental Impact Screening Committee has been provided with a project description respecting the Program in order that this application might be assessed to determine if preliminary environmental screening is required
- Canadian Wildlife Services for access permission within the Kendall Bird Sanctuary
- Department of Fisheries and Oceans for approval to conduct the proposed in-stream and river crossing work
- Aurora Research Institute application for a Scientific Research Licence
- NWT Department of Resources, Wildlife and Economic Development (RWED) for approval of the method of clearing, disposing and salvaging timber

IOVRL needs to obtain regulatory approvals by December 20, 2002, to enable ColtKBR to award the subcontracts for the Program by the end of the year and mobilize to the field in January 2003.

If required, IOVRL and ColtKBR representatives are available to meet with you to discuss the enclosed application.

A cheque for \$10,952.91 for the application fee, plus an estimate of the required temporary rightof-way, is enclosed. We understand that this fee will be adjusted later to reflect the actual rightof-way use.

Please direct any questions relating to technical matters to Larry Graburn at (403) 258-8053, facsimile (403) 258-5825. For all other matters, please contact Nezam Amoozegar (403) 232-5916, facsimile (403) 237-2197.

Yours truly, Imperial Oil Resources Ventures Limited

Altrout

Peter D. Grout Manager, Regulatory Affairs

Enclosures

IMPERIAL OIL RESOURCES VENTURES LIMITED Class A Land Use Permit Application For 2003 Winter Field Geotechnical Investigation Program In the Inuvialuit Settlement Region Submitted to Inuvialuit Land Administration (ILA)

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LAND USE APPLICATION FORM

ILA Application # _____

All Rights applied for are subject to the Inuvialuit Final Agreement (IFA), Inuvialuit Land Administration (ILA) Rules and Procedures and the Laws of General Application.

LOCATION/LOCAL NAME:

See attached Index Summary Sheets under Tab B of this application for locations for each of the sites.

(campsites, wellsites, etc.)	
<u>See Tab B</u> N	W
N	E
N	W
N	E
N	w
N	E
	(campsites, wellsites, etc.)NNNNNNN

If a heading does not apply to your application, please indicate N/A. If insufficient space, please attach a separate sheet(s).

1. Applicants name and mailing address: Imperial Oil Resources Ventures Limited 237 Fourth Avenue S. W. P.O. Box 2480, Station M Calgary, Alberta Canada T2P 0H6

Peter D. Grout Manager, Regulatory Affairs Mackenzie Gas Project Telephone: 403-237-3984 Fax: 403-237-2102

Address of Applicants Head Office: Same as above Contact Person: See names listed below

_ __ __

Telephone and Fax Numbers:		
Nezam Amoozegar, IORVL	Tel:	403-232-5916
Regulatory	Fax:	403-237-2102
Al Kennedy, IORVL	Tel:	403-237-3485
Environmental & Socio-Economic	Fax:	403-237-2102
Larry Graburn, ColtKBR	Tel:	403-258-8053
Technical	Fax:	403-258-5825

2. Type of Right(s) applied for: (Note: if a Right-of-Way forms part of the general activity applied for, make a separate application for the Right-of-Way.)

Class A Land Use Permit

3. Type and summary of Operation(s) to be carried out (describe purpose, nature and location of all activities):

The objective of the winter field geotechnical investigation program described in this application is to obtain information with respect to subsurface conditions along a preliminary pipeline route, at proposed or potential river crossings and within potential borrow sources. This information is required in order to confirm the engineering and construction feasibility of a Mackenzie Valley pipeline system and for the preparation of subsequent regulatory applications should the Mackenzie Valley Pipeline proceed.

The work will be conducted by sub-contractors, under the direction of ColtKBR, who will be responsible for directing all operations and liaising with the local community representatives and regulatory authorities.

SITE ACCESS OPERATION

An access crew will mobilize in early January 2003 and commence activities subject to receipt of all necessary permits and approvals. The access crews will mobilize and operate from local communities and/or from a mobile camp. They will prepare access to the various borehole and test pit sites, at the sites shown on the attached maps. Disturbance to new areas will be minimized by the use of existing winter roads, rights-of-way and existing cut lines, where practical. New winter roads may be constructed, as required, to access sites. The roads will be constructed consistent with typical ice road construction specifications and guidelines likely by local contractors. Care will be taken to avoid steep slopes, side hills and environmentally sensitive areas while maintaining a direct route to the site. Efforts will be made to retain riparian vegetation and minimize disturbance to stream banks along the constructed access at points where access intersects watercourse crossings.

All field activities are expected to be completed by spring break-up.

The geotechnical crews will begin site investigation operations at the sites shown on the attached maps upon completion of access crew activities. Individual site reports and maps are included under Tab B, sub-tabs 1-16 for private lands. Accompanying the maps are site reports identifying proposed numbers of boreholes and test pits per site. Where the number of boreholes and/or test pits have not been specified, a total estimated number has been shown. The actual number will be

determined at the time of the proposed work. The geotechnical crews may conduct operations from existing communities, existing camps or mobile camps.

SITE INVESTIGATION EQUIPMENT

Site investigations will be carried out using some or all of the following types of equipment:

- Auger drill rigs
- Air rotary drill rigs
- Mud rotary drill rigs
- Coring rigs
- Backhoes

The selection of equipment at each test hole site depends on the expected ground conditions and the data collection requirements at the particular test hole site. These geotechnical rigs will either be mounted on a rubber-tracked carrier, low-ground-pressure wheeled vehicles or they will be transported by helicopter.

Auger Rigs

In locations where the ground does not contain bedrock or boulders, the test holes will be drilled with solid or hollow stem augers. If solid stem augers are used, soil samples are taken off the augers as the hole is advanced. In the event that there is sloughing of the walls of the test hole, hollow stem augers will be used and samples will be taken at selected intervals from inside the hollow stem augers. In frozen silts and clays, undisturbed samples may be taken with specialty core samplers. This method does not require drilling fluids. The practical limit of drilling in frozen ground with auger rigs is to a depth of about 10 metres. Following field assessment test holes will be backfilled to the ground surface with cuttings.

Air Rotary Drill Rigs

In locations where bedrock or boulders are encountered or the ground is frozen, the hole may be drilled with an air rotary drill. Compressed air will be forced down the centre of the drill string and will blow the cuttings to the surface in the space between the walls of the test hole and the outside of the drill string. This method of drilling does not require drilling fluids. The practical limit of drilling in frozen ground with air rotary drills ranges from a depth of 15 to 30 metres, depending on the size of the air compressor supplied with the drill. On completion, the test holes will be backfilled to ground surface with drill cuttings.

Mud Rotary Drill Rig

In a few locations, it may be necessary to use a mud rotary drilling rig to stabilize the walls of the test hole. In these instances, the drilling mud will consist of a non-toxic bentonite slurry. The bentonite slurry is pumped down the center of the drill string to the bit and flows to back to the surface in the space between the wall of the hole and the outside of the drill string. The slurry is contained in an above ground steel tank. The volume of drilling mud used for each test hole will be minimal (approximately: 1 to 3 cubic metres) and will not contain any hazardous materials or hydrocarbons. Upon completion the drilling fluid and cuttings will be backfilled into the test hole. Excess drilling mud will be disposed of at an approved facility.

Coring Rigs

These rigs may be used in locations where it is necessary to recover frozen core samples. Chilled brine will be used as the drilling fluid, to prevent thawing of the permafrost. The brine will be

pumped down the centre of the drill string to the bit face. The brine and cuttings will be flushed up the outside of the drill string and into an above ground steel tank and then the brine will be recirculated into the test hole to minimize waste fluids. Waste brine will be stored in tanks and hauled to an approved disposal facility. The recovered core will be logged in the field and selected samples are retained for laboratory testing. Upon completion the hole will be backfilled to the ground surface with fresh water, which will freeze.

Backhoes

Backhoes will be used to excavate test pits at potential sources of granular borrow material sites. The test pits are required to recover samples of the granular materials for testing. If topsoil is present at the test pit location, the topsoil will be stripped and kept separate from the inorganic soils. The test pits will be excavated to a maximum of 5 metres long and 5 metres wide, and 5 metres in depth, depending on the stability of the walls of the test pit. The test pit will be backfilled upon completion of the sampling, the ground surface will be returned to the original grade and stripped topsoil replaced.

SITE INVESTIGATION PROCEDURES

Rivers and Streams

Special procedures will be used to drill test holes on valley slopes. In these instances, to avoid cutting an access road into these drill sites, a small area around the test hole site will be cleared by hand, which minimizes clearing of vegetation on the slopes. Log cribbing will be constructed to support helicopter transportable drill rigs, which may be used to drill the test holes in these areas. These rigs are placed on the drill platform using a helicopter.

It is planned to drill test holes in the river or stream. It may be necessary to construct an ice bridge in these cases, depending on the weight of the drill rig that is used. The drill hole will be cased through the ice and water and through any pervious deposits below the riverbed. Drilling will then be carried out from inside the casing, so that drilling fluids and cuttings from the drill hole will not be released into the water. Boreholes will be drilled to a total depth of about 30 metres. Upon completion of sampling, any portion of the borehole located in rock will be backfilled with cement grout.

Topographic Survey

Survey cross-sections across river valleys will be carried out to determine the crossing design. The topography of all, or portions of the various borrow sources will be used as the basis for estimating volumes of granular material. It will be necessary to clear some vegetation along each of the survey sections so that this work can proceed. Clearing of the sections will be carried out by hand, to minimize disturbance to the vegetation.

Thermistors

The ground temperature information is required as input to the design of pipeline systems. A thermistor is a small bead about 3 mm in diameter. The electrical resistance of the bead varies with temperature. The bead will be connected to a two-strand insulated wire lead, which will be brought to the ground surface. The resistance will be measured by passing a low voltage current (less than 1 volt) through the wire allowing the resistance of the bead and hence the ground temperature at its location to be measured. Thermistor strings may be installed in up to 50 percent of the frost heave and/or overland test holes. These are used to measure ground temperatures. The

number of beads to be installed in each selected test hole may vary from 1 to 10. The thermistor will remain in the borehole.

Geophysical Surveys

Shallow geophysical surveys will be used at river crossings, in borrow sources and at other selected sites in order to provide information on subsurface conditions. Geophysical survey methods being considered include ground-penetrating radar, electro-magnetic and electrical resistivity survey. The survey equipment will be either carried by hand or towed in a small sled behind a snowmobile. All of the methods will be non-intrusive. The use of explosives will not be required, either at ground surface or below the surface.

4. Planned duration of activities:

From: January 2003 To: April 2003 (spring break-up)

Please attach a detailed Schedule of Operation.

The exact timing and sequence of the field operations will be adjusted as required from day to day, depending on weather and other factors that cannot be predicted. The period of operation will be from January 2003 through to spring break-up (April 2003), subject to the receipt of all required approvals. A detailed schedule will be prepared with the field geotechnical subcontractors when the contracts have been awarded.

5. Personnel requirements (subcontractors, company staff, etc.):

Subcontracts for the field geotechnical program have not been awarded. It is expected that these contracts will be awarded covering the following services; all subject to Colt KBR supervision and control:

- <u>Geotechnical Consultant Responsible for directing the geotechnical aspects of the</u> investigation program.
- <u>Geotechnical Drilling Subcontractor</u> Responsible for drilling test holes as directed by the geotechnical consultant.
- <u>General Subcontractor</u> Responsible for site clearing, access road construction and similar work.
- <u>Camp and Catering Subcontractor</u> Responsible for providing mobile camps, meals and accommodation. This subcontract will only be necessary on a site-specific basis.
- <u>Land Surveyor</u> Responsible to survey test hole locations, survey access roads to be cleared and conduct topographic surveys.
- o Geophysical Surveyor Responsible for shallow geophysical surveys.
- <u>Safety and Environmental Supervisors</u> Responsible for providing safety briefings, enforcing of procedures and compliance with the Environmental Protection Plan.
- <u>Helicopter Subcontractor</u> Responsible for providing emergency and routine services, as required.
- Fixed Wing Aircraft Subcontractor Responsible for providing emergency and routine fixed wing support, as required.
- <u>Local Representative</u> Responsible for providing information on community issues and concerns.
- <u>Telecommunications</u> Responsible for providing local and long-distance communications between mobile equipment and offices.
- o <u>Emergency Medical Technician</u> Responsible for medical emergency support services.

The number of personnel required at each site to be investigated is estimated to range between 4 and 8, at any one time.

6. Total Number of Inuvialuit employed:

The number of Inuvialuit to be employed for this project will depend on the companies or business entities awarded the subcontract work and the capabilities.

7. Names, addresses and functions of Inuvialuit and subcontractors:

The process of selecting subcontractors for this field geotechnical program has not been completed at this time; therefore this information is not available.

8. Names, addresses and functions of non-Inuvialuit subcontractors:

The process of selecting subcontractors for this field geotechnical program has not been completed at this time; therefore this information is not available.

9. Attach a concluded or proposed Participation and/or Access Agreement.

Imperial Oil Resources Ventures Limited is currently engaged in discussions regarding Participation and/or Access Agreements.

10. Planned surface requirements for land use/occupancy in hectares (ha):

See attached Site Reports in Tab B for the total land use expected at each site.

The sites are shown on the attached maps and the final access will be ground truthed and may change to minimize environmental and other impacts.

Attach a 1:50,000 NTS map, or equivalent, showing the location and a preliminary plan showing area, measurements and location of all buildings, work areas, etc.

Maps for sites located on the Inuvialuit private lands, at a scale of 1:50,000, are included under Tab B.

11. Planned length of Right-of-Way in kilometers (km):

Not Applicable

Attach a 1:50,000 NTS map showing the location of the route.

Not Applicable.

12. Proposed disposal methods:

a) Garbage:

Any garbage generated on site will be collected and hauled back to camp in an enclosed container for incineration. The remnants of incineration will be hauled to the nearest approved solid waste disposal facility. If applicable, camp kitchen waste that is not incinerated will be stored in animal-proof containers for shipment to an approved disposal site.

b) Sewage (Sanitary and Grey Water):

All sewage generated from all camps will have a sump dug to accept the sewage wastes. The sumps will be treated, as per the *General Sanitation Regulations*. All camps will consist of less than 50 persons.

In the event that sumps are not viable, grey water from sinks, showers and similar sources will be released near the closest poorly drained area, such as bogs. Sewage will be contained in holding tanks and disposed of at an approved facility. The local inspector will be provided with the locations of sumps and discharge sites of grey water resulting from the activities during this geotechnical program.

c) Brush and trees:

Clearing of vegetation will be minimized by using existing winter roads, rights-of-way and cut lines. Clearing of vegetation and regrowth may be required along some of the older cut lines and previously undisturbed areas. Should clearing be required, brush cutters, dozers and/or other methods may be used to remove vegetation.

d) Overburden (Organic soils, waste material, etc.):

Disturbance to organic topsoil will be minimized. Overburden will only be stripped on test pit locations.

13. Equipment, vehicles, and facilities to be used:

Table 13-1 identifies the possible equipment types that may be used to conduct the proposed activities. The equipment indicated is subject to change depending on the availability of the equipment and selection of equipment to be used by the contractors.

Type & number	Size	Proposed Use
Bulldozers	D5, D6, D7, D8 or equivalent	Remove snow, clear brush and trees, provide access to sites and tow mobile camps
Graders	12H, 14H, 140 or equivalent	Level working surfaces, provide access to sites and maintain access roads
Backhoes	235, or equivalent	Move material, dig test pits and assist other activities
Drill Rigs on Tracks	Auger Drills, Air Drills, or equivalent	Obtain borehole data
Tracked Personnel Carriers	Passenger Type Nodwell, or equivalent	Transport crews and materials to and from worksites, camps and settlements
Snowmobiles	One and two person models	Transport crews and materials
4x4 Pick-Ups	Half and three-quarter ton trucks	Transport crews and materials
Tracked Fuel Carriers	Nodwell 240, Nodwell 320, or equivalent	Provide fuel to equipment and peripherals
Brush Cutter	BC 604, BC 705 or equivalent	Clear overgrown cut lines or small brush for
	To Be Determined	access
Generators (camps)	To Be Determined, upon awarding of subcontract	Provide power at camp sites
Water Pump (camp)	To Be Determined, upon awarding of subcontract	Supply water from holding tanks
Drill Pumps	To Be Determined, upon awarding of subcontract	Circulate the necessary fluids during drilling, if required
Helicopter	To Be Determined, upon awarding of subcontract	Deliver supplies and support emergency evacuations, if required
Tractor Trailers	Lowboy and highboy models	Transport equipment and materials via main roads and winter roads
Tandem Axle Trucks	Various models	Transport fuel or water
Water Trucks	Various sizes, depending on contractor	Support construction of ice roads, access and haul potable water to camps

Table 13-1 Proposed Equipment

14. Fuels to be used:

Table 14-1 identifies types of fuel and typical containers that may be required to conduct the geotechnical investigation. The fuels indicated are subject to change depending on the fuel requirements of the subcontractors.

Fuels	Number of containers	Capacity of containers	Location
Diesel	Slip Tanks, Fuel Trucks, Tracked Fuel Carriers Number to be determined	Slip Tanks 150 - 300 Gallons Fuel Trucks / Tracked Fuel Carriers 3500 Gallon	On Pick-ups, bulk fuel sleds for camps, on fixed fuel carriers.
Gasoline	Slip Tanks, Fuel Trucks, Tracked Fuel Carriers Number to be determined	Slip Tanks 150–300 Gallons	On Pick-ups, bulk fuel sleds for camps, on fixed fuel carriers.
Aviation fuel	Determined by aviation contractor	45 Gallon Drums may be required	Existing fuel caches owned and operated by the aviation contractor
Propane	3-4 Tanks to accompany the sleigh camps	400lb tanks or equivalent depending on requirements	Secured to a portable skid near the camp

Table 14-1 Proposed Fuel Types and Typical Containers

The exact number of containers, fuel types and locations has not been finalized. The requirements will depend on the type of equipment and the size of the sleigh camps to be used. The numbers above are preliminary and are subject to change. Envirotanks will be used n the fuel sleds.

15. Method of fuel transfer (i.e.: hand or electric pump):

The method of fuel transfer will be dependent on the type, the location, the source and the quantity. Fuel tanks will be filled by electrical or mechanical pumps.

16. Please attach FUEL/OIL SPILL CONTINGENCY PLAN.

All contractors will be required to comply with the Environmental Protection Plan. See Attachment 1.

17. Communication Equipment with Identification/Call #:

A communication plan will be provided prior to commencement of field activities, in consultation with subcontractors, once selected.

18. Emergency First Aid Facilities:

An emergency response plan will be provided prior to commencement of field activities, in consultation with the subcontractor(s) upon selection.

19. Potable Water Requirements:

Potable water requirements for each mobile camp will depend on personnel numbers.

20. Summary of potential impacts to the land, environment, Inuvialuit Culture and Inuvialuit Businesses. Use separate page if necessary:

The Project Description and Environmental Protection Plan that have been submitted to the Environmental Impact Screening Committee are included as Attachment1.

21. Proposed restoration and reclamation plan (use a separate page if necessary):

See Attachment 1 and Section 3 above.

22. Where the applicant applies for a Right pursuant to Subsection 7(18) of the IFA, attach copy of the right or interest granted by Canada on the basis of which this application is being made.

Not Applicable

23. Fee calculations (based on ha and/or km as per current 2002/03 ILA Fee Schedule(s)):

TOTAL	\$10,952.91
GST	\$ 716.55
Subtotal	\$10,236.36
Plus 25.303 km. @ \$120/km.	<u>\$ 3,036.36</u>
Temporary Right of Way	\$ 1,200.00
Application Fee	\$ 6,000.00

Peter Grout Manager, Regulatory Affairs Mackenzie Gas Project

Name of Representative and Title

rout

Signature of Representative

Imperial Oil Resources Ventures Limited 237 Fourth Avenue S. W. P.O. Box 2480, Station M Calgary, Alberta Canada T2P 0H6

Company Name

12 2002 Nev

Date

Signature of Land Administrator

Date

Location

Issuing ILA Office:

Inuvialuit Land Administration P.O. Box 290 Tuktoyaktuk, NT X0E 1C0 Telephone: 867/977-2202 Fax: 867/977-2467 IMPERIAL OIL RESOURCES VENTURES LIMITED Class A Land Use Permit Application For 2003 Winter Field Geotechnical Investigation Program In the Inuvialuit Settlement Region Submitted to Inuvialuit Land Administration (ILA)

ATTACHMENT 1

PROJECT DESCRIPTION and ENVIRONMENTAL PROTECTION PLAN

Project Description

For

2003 Winter Field Geotechnical Investigation Program In the Inuvialuit Settlement Region

Submitted to the

Environmental Impact Screening Committee (EISC)

By

Imperial Oil Resources Ventures Limited

November 2002

EXECUTIVE SUMMARY

Imperial Oil Resources Ventures Limited ("IORVL") on behalf of Mackenzie Valley Aboriginal Pipeline Limited Partnership, ConocoPhillips Canada (North) Limited, Shell Canada Limited and ExxonMobil Canada Properties, has prepared this project description respecting activities associated with a Field Geotechnical Investigation Program (the Program) to be carried out on Inuvialuit private lands and crown lands in the Inuvialuit Settlement Region (ISR) during the winter of 2003. The objective of the Program is to gather information, which will assess the soil and ground conditions at potential granular borrow sites, stream and river crossing locations and other locations along a potential pipeline right of way. This information obtained from the Program will be used in assessing the feasibility of a pipeline in the ISR and the Mackenzie Valley and for preparing subsequent regulatory applications if the Mackenzie Valley pipeline project proceeds.

IORVL has engaged ColtKBR to plan and direct all fieldwork for the Program. The proposed fieldwork will be carried out by subcontractors of ColtKBR.

IORVL is concurrently applying to the Inuvialuit Land Administration (ILA) for a Class A land use permit and temporary rights of way pursuant to the Inuvialuit Rules and Procedures for activities associated with the Program to be carried out on Inuvialuit private lands.

IORVL is concurrently applying to the Department of Indian and Northern Affairs Canada (INAC) for a Class A land use permit pursuant to the Territorial Land Use Regulations for activities associated with the Program to be carried out on Crown lands in the ISR.

Concurrent with the filing of this project description, IORVL is also planning to file filing applications and notices with the following organizations:

- Canadian Wildlife Services for access permission within the Kendall Bird Sanctuary;
- Department of Fisheries and Oceans for approval to conduct the proposed in-steam and river crossing work

- Aurora Research Institute application for a Scientific Research Licence;
- NWT Department of Resources, Wildlife and Economic Development (RWED) request for approval of method of clearing, disposal and timber salvage requirements, if any.

IOVRL needs to obtain regulatory approvals by December 20, 2002 to enable ColtKBR to award subcontracts for the Program by the end of the year and mobilize to the field in January 2003.

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1.0 TITLE

Winter 2003 Field Geotechnical Investigation Program

2.0 CONTACT NAME AND ADDRESS

Imperial Oil Resources Ventures Limited 237 Fourth Avenue S. W. P.O. Box 2480, Station M Calgary, Alberta Canada T2P 0H6

Peter D. Grout Manager, Regulatory Affairs Mackenzie Gas Project Tel. 403-237-3984 Fax. 403-237-2102

Other Contacts:

Regulatory and other Matters: Nezam Amoozegar, IORVL Tel. 403-232-5916 Fax. 403-237-2102

Environmental and Socioeconomic Matters: Al Kennedy, IORVL Tel. 403-237-3485 Fax 403-237-2102

Technical Matters: Larry Graburn, ColtKBR Tel. 403-258-8053 Fax. 403-258-5825

3.0 REGULATORY APPROVALS

The following list of approvals, licenses and permits are required from regulatory agencies, government departments or private landowners in order to proceed with the proposed activities.

Region	Authority	Approval Type	Contact
Inuvialuit Settlement Region	Inuvialuit Land Administration (ILA)	Land Use Permit	James Thorbourne/Jim Taggart (867) 977-2202 Tuktoyaktuk
U	Inuvialuit Land Administration (ILA)	Land Access Permission – Private Lands	Felix Horne (867) 777-7089
	Joint Secretariat – Inuvialuit Renewable Resource Committees	Environmental Impact Screening	Linda Graf (867) 777-2828
	Department of Indian Affairs and Northern Development (DIAND)	Land Use Permit and Land Access Permission – Crown Lands	Rudy Cockney/Rob Walker (867) 777-3361
	Resource, Wildlife and Economic Development (RWED)	Approve method of clearing and waste disposal	Ron Morrison (867) 777-7286 Bill Mawdsley (867) 872-7725
	Department of Fisheries and Oceans – Habitat Management and Coast Guard (DFO-CCG)	Approval to drill in streambed using casing	Julie Dahl (867) 669-4941 - Yellowknife Barry Putt (519) 383-1863 – Sarnia
	Canadian Wildlife Service (CWS)	Approval to access Kendall Bird Sanctuary	Paul Latour (867) 669-4700
	Aurora Research Institute (ARI)	Scientific Research Licence	Michelle Crossfield (867) 777-4029

4.0 LOCATION

A large-scale site map (1:500,000) has been included under Tab E for general site identification and for an overview of the proposed regional activities. Site-specific maps, which have a 1:50,000 scale are included under Tab B and Tab C. These maps provide a more accurate characterization of the sites on private and crown lands, respectively in the Inuvialuit Settlement Region.

The locations of all the geotechnical sites are outlined in the Index Summary under both Tab B and Tab C. Each site has been assigned a site-specific tab number. Individual site reports and maps are included under Tab B, sub-tabs 1 to 16 for private lands and Tab C, sub-tabs 17 to 59 for crown lands. The site reports contain latitude and longitude, land ownership and an estimate of boreholes and test pits to be investigated. At sites where the number of boreholes or test pits has not yet been determined, an estimate of the combined total of boreholes and test pits has been shown.

The sites and the access indicated on the maps will be ground verified. The exact locations may deviate from that shown on the map to reflect proper location and/or minimization of environmental impacts.

5.0 DEVELOPMENT SUMMARY

The objective of the winter field geotechnical investigation program described in this project description is to obtain information with respect to subsurface conditions along a preliminary pipeline route, at proposed or potential river crossings and within potential borrow sources. This information will be used to confirm the engineering and construction feasibility of a Mackenzie Valley pipeline system in the Inuvialuit Settlement Region (ISR) and for the preparation of subsequent regulatory applications, should the Mackenzie Valley Pipeline proceed.

The work will be conducted by subcontractors, under the direction of ColtKBR, who will be responsible for directing all operations and liaising with the local community representatives and regulatory authorities.

Access crews will mobilize in early January 2003 and commence activities, subject to receipt of all necessary permits and approvals. These crews will mobilize and operate from local communities and/or from a mobile camp. They will prepare access to the various bore hole and test pit sites, at the locations shown on the attached maps. Disturbance to new areas will be minimized through the use of existing winter roads, existing right-of-ways and existing cut lines, where practical. New winter roads may be constructed, as required, to access sites. The roads will be constructed consistent with typical ice road construction specifications and guidelines, likely by local contractors. Care will be taken to avoid steep slopes, side hill and environmentally sensitive areas while maintaining a direct route to the site. Efforts will be made to retain riparian vegetation and minimize disturbance to stream banks along the constructed access at points where access intersects watercourse crossings.

Upon completion of access crew activities, geotechnical drilling crews will begin site investigation operations at the sites shown on the maps under tabs attached to this report. The geotechnical drilling crews may conduct operations from existing communities, existing camps or mobile camps.

Contracts for the field geotechnical program have not been awarded. It is expected that contracts will be awarded to provide the following services, all subject to ColtKBR supervision and control:

- <u>Field Superintendent</u> Responsible for supervising the entire field program, including all personnel and activities.
- <u>Geotechnical Consultant</u> Responsible for directing the technical aspects of the investigation program.
- <u>Geotechnical Drilling Contractor</u> Responsible for drilling test holes as directed by the geotechnical consultant.
- <u>General Contractor</u> Responsible for site clearing, access road construction and similar work.
- <u>Camp and Catering Contractor</u> Responsible for providing mobile camps, meals and accommodation. This contract will only be necessary on a site-specific basis.

- <u>Land Surveyor</u> Responsible for locating test holes and conducting topographic surveys.
- <u>Geophysical Surveyor</u> Responsible for bathymetric surveys and shallow geophysical surveys.
- <u>Safety and Environmental Inspectors</u> Responsible for providing safety briefings, enforcement of procedures and environmental monitoring.
- <u>Helicopter Contractor</u> Responsible for providing emergency and routine services, as required.
- <u>Fixed Wing Aircraft Contractor</u> Responsible for providing emergency and routine fixed wing support, as required.
- <u>Local Representative</u> Responsible for providing information on community issues and concerns.
- <u>Telecommunications</u> Responsible for providing local and long-distance communications between mobile equipment and offices.

5.1 Site Investigation Operations

Site investigations will be carried out using some or all of the following types of equipment:

- Auger drill rigs
- Air rotary drill rigs
- Mud rotary drill rigs
- Diamond drill rigs
- Backhoes

The selection of equipment at each test hole location depends on the expected ground conditions and the data collection requirements at the particular test hole location. The drill rigs will either be mounted on a rubber-tracked carrier, low ground pressure wheeled vehicles or they may be transported by helicopter.

5.1.1 Auger Drill Rigs

In locations where the ground does not contain bedrock or boulders, the test holes will be drilled with solid or hollow stem augers. If solid stem augers are used, soil samples are taken off the augers as the hole is advanced. In the event that there is sloughing of the walls of the test hole, hollow stem augers will be used and samples will be taken at selected intervals from inside the hollow stem augers. In frozen silts and clays, undisturbed samples may be taken with specialty core samplers. This method of drilling does not require drilling fluids. The practical limit of drilling in frozen ground with auger drill rigs is to a depth of about 10 metres. Upon completion, test holes will be backfilled to the ground surface with drill cuttings.

5.1.2 Air Rotary Drill Rigs

In locations where bedrock or boulders are encountered and the ground is frozen, the hole may be drilled with an air rotary drill. Compressed air is forced down the centre of the drill stem and blows the cuttings to the surface in the space between the walls of the test hole and the outside of the drill stem. This method of drilling does not require drilling fluids. The practical limit of drilling in frozen ground with air rotary drills ranges from a depth of 15 to 30 metres, depending on the size of the air compressor supplied with the drill. On completion, the test holes will be backfilled to ground surface with drill cuttings.

5.1.3 Mud Rotary Drill Rig

In a few locations, it may be necessary to use a mud rotary drilling rig to stabilize the walls of the test hole. In these instances, the drilling mud will consist of a non-toxic bentonite slurry. The drilling mud is pumped down the center of the drill stem to the bit face and flows to ground surface in the space between the wall of the hole and the outside of the drill stem. The drilling mud is contained in an above ground steel tank. The volume of drilling mud used for each test hole will be minimal (approximately: 1 to 3 cubic metres) and will not contain any hazardous materials or hydrocarbons. Upon completion, the drilling mud and cuttings will be backfilled into the test hole. Excess drilling mud will be transported to an approved disposal facility.

5.1.4 Coring Rigs

These rigs may be used in locations where it is necessary to recover frozen core samples. Chilled brine is used as the drilling fluid, to prevent thawing of the permafrost. The brine is pumped down the centre of the drill stem to the bit face. The brine and cuttings are flushed up the outside of the drill stem and into an above ground steel tank and then the brine is recirculated into the test hole to minimize waste fluids. Waste brine will be stored in tanks and hauled to an approved disposal facility. The recovered core is logged in the field and selected samples are retained for laboratory testing. Upon completion, the hole will be backfilled to the ground surface with fresh water, which will freeze.

5.1.5 Backhoes

Backhoes will be used to excavate test pits at potential granular borrow material sites. The test pits are required to recover samples of the granular materials for testing. If topsoil is present at the test pit location, the topsoil will be stripped and kept separate from the inorganic soils. The test pits will be excavated to a maximum of 5 metres long and 5 metres wide, and 5 metres in depth, depending on the stability of the walls of the test pit. The test pit will be backfilled upon completion of the sampling, the ground surface will be returned to the original grade and stripped topsoil replaced.

5.1.6 Rivers and Streams

Special procedures will be used to drill test holes on valley slopes. In order to minimize clearing of vegetation on the slopes, helicopter transportable drill rigs may be used to drill the test holes in these areas. A small area around the test hole site will be cleared by hand, and log cribbing will be constructed to support the drill rig. A helicopter might be used to place the rig on the drill platform, so that there will be no requirement to cut an access road into these drill sites.

In some cases, it is planned to drill test holes within the river. It may be necessary to construct an ice bridge in these cases, depending on the weight of the drill rig that is used. The drill hole will be cased through the ice and water and through any pervious deposits below the riverbed. Drilling will then be carried out from inside the casing, so that drilling fluids and cuttings from the drill hole will not be released into the water. Boreholes will be drilled to a total depth of about 30 metres. Upon completion of sampling, any portion of the borehole located in rock will be backfilled with cement grout.

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5.1.7 Topographic Survey

Survey cross-sections across river valleys will be carried out to determine crossing design. Topography of all, or portions of the various borrow sources will be carried out to provide a basis for estimating volumes of granular material. It will be necessary to clear some vegetation along each of the survey sections so that this work can proceed. Clearing of the sections will be carried out my hand, to minimize disturbance to vegetation.

5.1.8 Thermistors

The ground temperature information is required as input to the design of pipeline systems. A thermistor consists of a small bead about 3 mm in diameter. The electrical resistance of the bead varies with temperature. The bead is connected to a two-strand insulated wire lead, which extends to the ground surface. The resistance will be measured by passing a low voltage current (less than 1 volt) through the wire allowing the resistance of the bead and hence the ground temperature at its location to be measured.

Thermistor strings may be installed in up to 50 percent of the frost heave and/or overland test holes. They are used to measure existing ground temperatures. The number of beads to be installed in each selected test hole may vary from 1 to 10. The thermistor will remain in the borehole.

5.1.9 Geophysical Surveys

Shallow geophysical surveys will be used at river crossings, in borrow sources and at other selected locations in order to provide information on subsurface conditions. Geophysical survey equipment being considered includes ground penetrating radar, electro-magnetic and electrical resistivity methods. The survey equipment will be either carried by hand or towed in a small sled behind a snowmobile. All of the methods are nonintrusive. The use of explosives will not required, either at ground surface or below the surface.

5.2 Camps

Field investigation activities will be directed and carried out, to the greatest extent practical, from existing facilities in local communities. Camps will be required when one-way travel times between investigation sites and local communities and accommodations become excessive (i.e. 1 to 1.5 hours). The anticipated camp type is a mobile sleigh camp that will have no more than 50 persons, which will move frequently from site to site (approximately every 2-4 days).

5.3 Proposed Disposal Methods

5.3.1 Garbage:

Any garbage generated on site will be collected and hauled in an enclosed container back to camp for incineration. The remnants of incineration will be hauled to the nearest approved solid waste disposal facility. If applicable, camp kitchen waste that is not incinerated will be stored in animal-proof containers for shipment to an approved disposal site.

5.3.2 Sewage (Sanitary & Grey Water):

All sewage generated from all camps will have a sump dug to accept the sewage wastes. The sumps will be treated, as per the *General Sanitation Regulations*. All camps will house less than 50 persons.

In the event that sumps are not viable, grey water from sinks, showers and similar sources will be released near the closest poorly drained area, such as bogs. Sewage will be contained in holding tanks and disposed of at an approved facility. The local inspector will be provided with the locations of sumps and discharge sites of grey water resulting from the activities during this geotechnical program.

5.3.3 Brush & Trees:

Clearing of vegetation will be minimized by using existing winter roads, right-of-ways and cut lines wherever practical. Clearing of vegetation and regrowth may be required along some of the older cut lines and previously undisturbed areas. Should clearing be required, brush cutters, dozers and/or other methods may be used to remove vegetation.

5.3.4 Overburden (Organic soils, waste material, etc.):

Disturbance to organic topsoil will be minimized. Overburden will only be stripped on test pit locations.

5.4 Equipment List

The following list identifies the possible equipment types that may be used to conduct the field geotechnical investigation The equipment indicated is subject to change depending on the availability of the equipment and selection of equipment to be used by the contractors.

Proposed Equipment			
Type & number	Size	Proposed Use	
Bulldozers	D5, D6, D7, D8 or equivalent	Remove snow, clear trees and provide access to sites	
Graders	12H, 14H, 140 or equivalent	Level working surfaces and to	

		provide access to sites
Backhoes	235, or equivalent	Move material, dig test pits and assist other activities
Drill Rigs on Tracks	Auger Drills, Air Drills, or equivalent	Obtain borehole data
Tracked Personnel Carriers	Passenger Type Nodwell, or equivalent	Transport crews, materials
Snowmobiles	1 & 2-man models	Transport crews and materials
4x4 Pick-Ups	¹ / ₂ ton & ³ / ₄ ton trucks	Transport crews and materials
Tracked Fuel Carriers	Nodwell 240, Nodwell 320, or equivalent	Provide fuel to equipment and peripherals
Brush Cutter	BC 604, BC 705 or equivalent	Clear overgrown cut lines or small brush for access
Generators (camps)	TBD, upon awarding of subcontract	Provide power at camp sites
Water Pump (camp)	TBD, upon awarding of subcontract	Supply water from holding tanks
Drill Pumps	TBD, upon awarding of subcontract	Circulate the necessary fluids during drilling, if required
Helicopter	TBD, upon awarding of subcontract	Deliver supplies and emergency evacuations, if required
Tractor Trailers	Lowboy and Highboy models	Transport equipment and materials
Tandem Axle Trucks	Various models	Transport fuel or water
Water Trucks	Various sizes depending on contractor	Support construction of ice roads and access

5.5 Fuel Requirements and Transfer Methods

Fuel requirements for the field geotechnical investigation program are listed below. The number of containers and the exact volumes required are not available at this time. The capabilities of the contractor will determine how much fuel will be required and how many containers will be used to meet these fuel demands. The fuel tanks located on fuel sleighs will be enviro-tanks.

The method of fuel transfer will be dependent on the type, the location, the source and the quantity. Fuel tanks will be filled by electrical or mechanical pumps.

A fuel/spill contingency plan will be required from the contractor prior to the commencement of activities. However, attached in the Environmental Protection Plan is a spill contingency plan that will be required to be met, at a minimum, by the contractor.

The table that follows identifies the fuels that may used to conduct the geotechnical investigation. The fuels indicated are subject to change depending on the fuel requirements of the contractors.

Proposed Fuel Types and Typical Containers				
Fuel Type	0	Number of containers (per crew)	Capacity of containers	Location
Diesel		Slip Tanks, Fuel Trucks, Tracked Fuel Carriers Number to be determined	Slip Tanks 150 to 300 Gallons Fuel Trucks / Tracked Fuel Carriers 3,500 Gallon	On Pick-ups, bulk fuel sleds for camps, on fixed fuel carriers.
Gasoline		Slip Tanks, Fuel Trucks, Tracked Fuel Carriers Number to be determined	Slip Tanks 150 to 300 Gallons	On Pick-ups, bulk fuel sleds for camps, on fixed fuel carriers.
Aviation Fuel		Determined by aviation contractor	5 Gallon and 45 Gallon Drums may be required	Existing fuel caches owned and operated by the aviation contractor
Propane		3 to 4 Tanks to accompany the sleigh camps	400lb tanks or equivalent depending on requirements	Secured to a portable skid near the camp

6.0 **DEVELOPMENT TIMETABLE**

The activities are scheduled to begin in January of 2003, subject to receipt of all approvals and licenses required to conduct all the necessary activities. All field activities are expected to be completed by spring break-up. The exact timing and sequence of the field operations will be adjusted from day to day, depending on weather and other factors that cannot be predicted.

7.0 **NEW TECHNOLOGY**

Standard techniques will be used during this field geotechnical investigation program.

8.0 ALTERNATIVES

The winter field geotechnical investigation program is designed to gather information to determine the feasibility of a pipeline in the Northwest Territories and Northern Alberta. Public and historical data has been utilized in developing this plan. The site locations have been selected during summer reconnaissance to verify that further investigation is required to assess size, quantity and quality of potential granular materials, soil characteristics at potential river crossings and overland routing and ice content of the permafrost.

9.0 TRADITIONAL AND OTHER LAND USES

The proposed Winter Field Geotechnical Investigation Program area was overlaid on Inuvialuit 7(1)a and 7(1)b lands, as well as sensitive areas as defined in the Community Conservation Plans. Sensitive areas were defined as Class B through Class E lands. The proposed program area does not overlap with any Class E lands.

The proposed Winter Field Geotechnical Investigation Program will occur in the following Inuvialuit areas, as defined in the Aklavik, Inuvik and Tuktoyaktuk Community Conservation Plans (2000):

- 314C Winter wolverine harvesting area (Tuktoyaktuk)
- 315C Winter caribou harvesting area (Tuktoyaktuk)
- 316C Winter fishing area (Tuktoyaktuk)
- 322C Critical grizzly bear denning areas
- 323C Mainland coastal polar bear denning area
- 701B Parsons Lake: Bluenose West Caribou herd winter range
- 706D Kendall Island Bird Sanctuary

ColtKBR, under the direction of IORVL will work closely with the Hunters and Trappers Committees to avoid traditional harvesting areas and camps that are in use during the proposed activity period. By also working with federal and territorial agencies to avoid or minimize potential disturbances within sensitive environmental areas, it is predicted that there will be no detrimental effects on community uses or wildlife and fish.

The proposed program area will overlap a number of other sensitive land use areas, listed below. However, the timing of the Winter Field Geotechnical Investigation Program will mean that there is no conflict in timing with the use by the community or use by wildlife or fish. These areas include:

• 307C Summer Fishing Areas - Tuktoyaktuk

- 310C Fall Fishing Areas Tuktoyaktuk
- 312C Fall Goose Harvesting Areas Tuktoyaktuk
- 702B Caribou Hills: Unique Plant Life and Habitat, Berry Picking
- 704C Fish Lakes and Rivers
- 712C Beluga Management Zone 2
- 715C Mackenzie River Delta Key Migratory Bird Habitat
- 718D Central Mackenzie Estuary
- 302C Parsons Lake: Spring Caribou Harvesting Areas (Tuktoyaktuk)
- 303B Parsons Lake: Spring Moose Harvesting Area (Tuktoyaktuk)
- 304C Spring Goose Harvest Areas (Tuktoyaktuk)
- 305C Spring Fishing Area (Tuktoyaktuk)

As the proposed Winter Field Geotechnical Investigation Program is not expected to result in any substantial damage to the soils, vegetation, water or habitats, no detrimental effects on community uses or wildlife/fish use are expected to occur.

Discussions will continue with the Hunters and Trappers Committees to further identify these areas of overlap and to develop approaches for minimizing or avoiding interference with traditional harvesting, cultural and spiritual areas as well as sensitive ecological areas. Communications with federal and territorial agencies such as the Canadian Wildlife Service and the NWT Department of Resources, Wildlife and Economic Development will be maintained to ensure any outstanding environmental concerns associated with the Winter Field Geotechnical Investigation Program are addressed.

10.0 COMMUNITY CONSULTATION

A report that summarizes the consultation that has been completed to date is included under Tab D.

11.0 ENVIRONMENTAL AND SOCIO-ECONOMIC OVERVIEW

11.1 Environmental Overview

This environmental setting describes generally the biophysical conditions at the locations of the borehole and test pit locations planned for the 2003 Winter Field Geotechnical Investigation Program in the Inuvialuit Settlement Region. Climate, physiography and soils, permafrost, vegetation, wildlife, hydrology and fish and fish habitat are addressed.

The sites are situated in the Tuktoyaktuk Coastal Plain Ecoregion, of the Southern Arctic Ecozone (Ecological Stratification Working Group 1995). This zone includes the outer Mackenzie Delta and adjacent mainland from the Beaufort Sea south to the Inuvik area.

11.1.1 Climate

The area of the proposed Winter Field Geotechnical Investigation Program is classified as a high subarctic ecoclimate and is marked by very cold winters and cool summers. Mean temperatures range from -27.6°C in January to 14.2°C in July. The mean annual precipitation is 249 mm (Environment Canada 2002). Average daily temperatures during the proposed activity period (January to March) historically range from -31.9°C to -17°C. The mean precipitation for the proposed activity period is 36.4 mm

11.1.2 Physiography and Soils

The topography in the Tuktoyaktuk Coastal Plain Ecoregion is generally level, with elevations ranging from sea level in the delta to 150 metres above sea level (asl) toward Parsons Lake.

The area south and west of Big Lake is characterized by wetlands, lakes, active alluvial channels and estuarine deposits. The surficial geology within this area comprises recent level alluvial deposits from the Mackenzie Delta with much of the elevations less than 15 metres. Much of the surface sediments are expected to be silty sand and fine to medium-grained sand deposited by the Mackenzie River, with some silt sediments deposited during storm tides near the Beaufort Sea. These areas are low-lying, very poorly drained and subjected to flooding near arms of the Mackenzie River. Thermokarst ponds and lakes show sign of active thawing and numerous retrogressive flow slides contribute to the expansion of the lakes. Ice wedges are well-represented and appear as part of low or high centre polygonal peatlands. Massive ice bodies are also present in pingos.

West of the East Channel, the mainland topography is rolling and consists of morainal deposits overlying older fluvial and deltaic sandy sediments. East of the channel, the topography is hummocky to rolling with elevations up to 150 m near the Parsons Lake lease. Surficial sediments consist predominantly of hummocky glacial till. The till is fine-grained, poorly drained and ice-rich. Thermokarst lakes and ponds cover up to 32% of the land surface. Glaciofluvial sand and gravel deposits contain less ice. The North Caribou Hills, west of Parsons Lake, have a veneer of till or colluvium over the poorly lithified bedrock.

Organic and Turbic Cryosols are the dominant soils in the ecoregion with Regosol static Cryosols predominating in the active delta portion of the production area.

11.1.3 Permafrost

Historically, both the outer Mackenzie Delta and mainland portions of the proposed investigation area are within the zone of continuous permafrost (>90% permafrost soils), containing a high ice content in the form of ground ice, ice layers, ice wedges and pingos (Ecological Stratification Working Group 1995). Recent reclassifications (Heginbottom 1998) describe the outer delta area (Niglintgak, Taglu and portions of Richards Island near to the seacoast) as being discontinuous permafrost (with only 35-65% permafrost beneath land areas). Permafrost thickness of more than 600 m has been documented under Richards Island and of more than 400 m near Inuvik. In the Mackenzie Delta, however, permafrost thickness is significantly less, generally between 74 m and 90 m, where present.

The depth of the active layer generally ranges from 30-100 cm but is largely a function of ground surface insulation and thermal conditions (vegetation cover, level of ground disturbance and winter snow cover). In some cases, deeper unfrozen zones called taliks exist (unfrozen zones adjacent to or beneath water bodies), in the order of tens of metres thick, below or near large lakes and rivers. In the delta area, the presence and extent of the taliks is related primarily to the age, size and depth of the lake or river channel. The presence of the unfrozen zones under lakes and the Mackenzie River arms may affect the potential for frost heave, water table changes and groundwater flow conditions.

Low ice content is expected in well-drained, coarse-grained sediments that are often clast supported, and above the local groundwater table, such as gravel and gravelly sand in glacial deposits such as eskers. Ice-rich permafrost is more commonly associated with sand and gravel below the local water table (alluvial sand and gravel in the delta areas), silt clay and fine sand deposits, such as fine-textured moraine, glaciolacustrine and lacustrine sediments as well as organic soils. The ice content may be very high if the deposits are located in poorly drained areas. Ice veins, lenses and massive ground ice are common.

11.1.4 Vegetation

The ISR covers portions of three of Canada's ecozones as defined by the Ecological Stratification Working Group (ESWG) (1995): Southern Arctic, Taiga Plains and Taiga Cordillera. The Mackenzie Delta itself is the northern tip of the Taiga Plains Ecozone, and Richards Island and the area to the west of Inuvik is considered Southern Arctic. Overall, the Southern Arctic Ecozone represents the shift from the taiga forest to the south to the tundra in the north. In the northwest tip of the ecozone, where the production area is located, this shift is more rapid (Timoney et al. 1992) and the tree line transition is more abrupt. There is a gradient of change from coniferous-dominated vegetation types, to shrub and graminoid vegetation types. Abundant low shrubs, sedges and mosses characterize tundra. Primary forest species include black spruce, white spruce and tamarack with alder and willow shrubs and a ground cover of herbs, sedges, cotton grass, moss and lichens (AMEC 2000).

Vegetation communities in the production area grow on a thin veneer of unfrozen organic or granular substrate overlying the permafrost boundary. The mosaic of vegetation types includes dwarf shrub heath on both granular and organic substrates, with increasing shrub height to 1m tall in suitable microsites. Wetter areas have high centered and low centered polygons of patterned ground. Ericaceous shrubs are found in the dryer areas whereas wetter areas in the pattern support sedges, cotton grasses and sphagnum. Riparian communities have wet sedge communities and taller shrubs up to 2 m. Holmes Creek has outliers of black spruce. Vegetation types on the floodplain of the Mackenzie River, in the program area, include shrub communities and wet sedge – cottongrass meadows.

Uncommon vegetation types occur on fluvial areas (river and stream banks), eroded areas (embankments, natural disturbance), saturated areas (seeps, thermokarst action) and other terrain anomalies.

Borrow sources or gravel deposits tend to be terrain features such as eskers, kames, outwash, gravel till deposits and fluvial gravel-dominated sediments. These represent a small portion of the overall landscape. They exhibit different permafrost dynamics; the well-drained and dry areas of eskers have a deeper active layer over the permafrost than their surroundings and recent fluvial deposits can still be saturated and affected by flowing water. Till deposited gravel, usually present on eroded morainal hills, can also be well-drained. These site conditions support characteristic and unique vegetation communities that are characterized by dwarf heaths, lichens, more abundant and diverse grasses and forbs, and the presence of certain species which are not likely to be found elsewhere in the area (Beak 1976).

Six endemic rare plant species known to occur in the Mackenzie Delta are Yukon Indian paintbrush (Castilleja yukonis), Mackenzie River dwarfprimrose (Douglasia arctica), Yukon fleabane (Erigeron yukonensis), floodplain alkaligrass (Puccinellia poacea), Arctic seashore willow (Salix ovalifolia var. arctolitoralis), and alpine smelowskia (Smelowskia calycina). There are also ten nationally rare species (including three of the endemic species) recorded for the northern portion of the Mackenzie Valley. Information on 34 rare vascular plant species with potential to occur in the Production Area is summarized in Table 1. Reconnaisance level rare plant surveys were conducted in the Inuvialuit Settlement Region in summer 2002. These surveys located several occurrences of the rare plant Yukon sitchwort (Minuartia yukonensis) on exposed granular substrates in the Parsons Lake area. In particular site 2.029P, a previously disturbed gravel source, is adjacent to high potential areas for rare plants on adjacent exposed granular substrates.
Table 1

Mackenzie Delta Region Rare Vascular Plant Species

Latin Name	Common Name	Habitat	Rarity
Antennaria friesiana spp. alaskana	Fries' pussytoes	Alpine ridges and snowbeds (3, 4). Arctic and Alpine tundra on fellfields and frost boil (6).	rare (3) NATIONALLY RARE
Arabidopsis salsuginea	Saltwater cress	Salt plains and sandy beaches (3, 4).	rare in Delta (3)
Athyrium felix-femina	Lady-fern	Around hot springs and wet meadows (6).	undetermined (4)
Botrychium minganense	Mingan Island grapefern	Grassy Meadows (3).	rare (3)
Calamagrostis holmii	Holm's reedgrass		rare (3)
Carex laxa	Weak sedge	Wet tundra bogs (3, 4, 6, 7).	rare (3) NATIONALLY RARE
Castilleja yukonis	Yukon Indian paintbrush	Spruce woods, treed bogs, and grassy slopes (2, 3). Hillsides and silt and gravel of river banks (6, 7).	rare (3) ENDEMIC
Coeloglossum viridis	Long-bracted green orchid	Moist meadows and tundra (6).	undetermined (4)
Cryptogramma stelleri	Fragile rockbrake	Moist shale slopes (3, 4, 7). Moist and shaded calcarious crevices and cliffs (6).	rare (4)
Cypripedium acaule	Stemless lady's slipper	Moist moss or sandy woodland and bogs (7).	undetermined (4)
Cystopteris montana	Mountain bladder fern	Cool moist woods, rocky slopes in mainly calcarious areas (6, 7).	undetermined (4)
Douglasia arctica	Mackenzie River dwarf-primrose	Rocky arctic and alpine slopes (3, 6, 7).	rare in Delta (3) ENDEMIC
Dryopteris carthusiana	Shield fern sp.	Moist to wet woodlands, thickets and stream banks (3, 6).	undetermined (4)
Erigeron yukonensis	Yukon fleabane	Calcareous, stony slopes (3, 4, 6, 7).	rare (3) ENDEMIC
Festuca lenensis Syn: F. ovina spp. alaskana	Tundra fescue	Dry tundra (3, 4). Alpine tundra and rocky slopes (6).	rare in delta (3) NATIONALLY RARE
Gentianopsis detonsa ssp. detonsa	Windmill fringed gentian	Wet coastal meadows and brackish mud flats (3).	rare (3) NATIONALLY RARE
Gymnocarpium dryopteris	Oak fem	Cool rocky woods, swamp margins, shaded slopes (6). Rich and mainly deciduous woods (7).	undetermined (4)
Koeleria asiatica	Eurasian Junegrass	Dry tundra and shale scree slopes (3, 4, 7) and ground squirrel burrows (6).	rare (3) NATIONALLY RARE
Liparis loeselii	Loesel's twayblade	Fens (3, 7).	rare (4)
Listera cordata	Heart-leaved twayblade	Moist woodlands (6).	undetermined (4)
Malaxis monophylla	White adder's mouth	Damp, calcareous fens (2).	undetermined (4)
Malaxis paludosa	Bog adder's mouth	Treed bog (3). Sphagnum in black spruce muskeg (6, 7).	rare (4)
Matteuccia struthiopteris	Ostrich fern	Alluvial terraces (7). Damp shaded places near hot springs (6).	undetermined (4)
Minuartia yukonensis	Yukon stitchwort	Alpine scree slopes (3, 4, 6).	rare (3)

Latin Name	Common Name	Habitat	Rarity
Phegopteris connectilis	Beech fern	Subalpine slopes (3). Alpine cliff ledges and rocky slopes (6). On rich humus in shade (7).	undetermined (4)
Platanthera dilatata	White orchid	Around hot springs, in muskegs and in grassy meadows (6).	undetermined (4)
Polystichum Ionchitis	Holly fern	Limestone cliffs, moist rocky slopes, talus slopes (6, 7).	undetermined (4)
Potamogeton subsibiricus syn: P. porsildiorum	Yenisei River pondweed	Shallow streams and ponds (1, 3, 4, 6).	rare (3) NATIONALLY RARE
Puccinellia poacea	Floodplain alkaligrass	shallow depressions with salt accumulations on river banks, floodplains, and tidal flats (3).	rare (3) ARCTIC ENDEMIC, NATIONALLY RARE
Ranunculus turneri	Turner's buttercup	Subalpine meadows (3 7), and moist steam banks (6).	rare (3) NATIONALLY RARE
Salix chamissonis	Chamisso's willow	Tundra (3, 4, 5). Moist alpine meadows, banks of alpine streams / lakes and below late snow patches (5, 6).	rare (3)
Salix ovalifolia var. arctolitoralis	Arctic seashore willow	Sand beaches and terraces (3, 4, 7). Coastal beach rare (3) ENDEMIC, ridges, sand pits and tundra meadows (5, 6). NATIONALLY RARE	
Smelowskia calycina	Alpine smelowskia	Stoney slopes and lake shores (3, 4). Alpine ridges and rare (3) ENDEMIC, scree slopes (6, 7). NATIONALLY RARE	
Woodsia alpina	Northern woodsia	Rock crevices and rock screes, usually on calcareous undetermined (4) or nonacid rocks (1,2,6).	

Cody 1996. GNWT (Internet Site), 2000a. McJannet *el al.* 1995. GNWT (Internet Site), 2000b. Argus 2001. Cody 2000. Porsild and Cody 1980.

2 3 4 5 6 7

11.1.5 Wildlife

The Mackenzie Delta provides important habitat for many different species of migratory birds. Numerous waterfowl and waterbirds use the delta annually for staging, nesting, breeding and moulting. Waterfowl and waterbirds include ducks, swans, geese, loons, cranes, shorebirds, seabirds and gulls. Many of the waterfowl species and some waterbirds are important food sources for local residents. Several species of raptor, passerine and ground-dwelling birds are also present in the area. Of the birds found in the Mackenzie Delta area, Eskimo curlew, short-eared owl, Ross' gull and two subspecies of peregrine falcon are considered to be at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Since the vast majority of birds that are found in and around the Mackenzie Delta are migratory, they are not expected to be present at the time of the Winter Field Geotechnical Investigation Program.

Terrestrial mammals present in the area include a variety of ungulates, bears, and furbearers. These species include caribou, polar bear, barrenground grizzly bear, black bear, moose, muskrat, beaver, fox (red and Arctic), wolf, marten, lynx, wolverine, snowshoe hare and several species of small rodents. Caribou and muskox may be found anywhere in the region, whereas most of the other species can be found in shrub and treed communities along channels in the Mackenzie Delta and the riparian areas across the upland portion of the Inuvialuit Settlement Region. Polar bear are typically restricted to areas with sea ice. However, maternity dens and secondary winter habitat occur along the coastline of the Mackenzie Delta, Richards Island and the Tuktoyaktuk Peninsula. The outer Mackenzie Delta, particularly Richards Island, provides excellent habitat for Arctic fox.

Several of these species are economically important to the surrounding communities. Caribou are an important food source for all of the communities within the area, while smaller mammals such as marten, lynx and muskrat, are trapped for their fur. The grizzly bear and the wolverine are currently the only terrestrial mammal species that are considered to be at risk by COSEWIC, however, information on some species, such as the grey wolf and polar bear, is insufficient to make an accurate determination.

Granular deposits in the ISR provide important habitat for wildlife throughout the year. The loose strata of gravel and sand provides prime denning sites for various animals. Other important denning habitats are southerly facing embankments above lakes and streams.

In addition to providing denning habitat, granular deposits act as transportation corridors in an otherwise wet or frozen landscape. They can also be important food sources, providing a profusion of berries and other edible plants in locations and at times of the year when other food sources are not available. During the period of the proposed Winter Field Geotechnical Investigation Program (Mid January to mid April), wildlife activities will be limited. Wildlife that may be present at this time include non-migratory birds (such as ptarmigan), over-wintering caribou, arctic fox, some furbearers (such as lynx and wolverine) and denning grizzly or polar bears.

11.1.6 Aquatics

Hydrology

The Mackenzie River generally exhibits a spring snowmelt-dominated, mean-monthly flow pattern classified as a subarctic, nival flow regime. The maximum mean monthly discharge occurs in the May to July period, mainly due to snowmelt.

In the open-water season, water in the Mackenzie River takes 15-20 days to flow from the outlet of Great Slave Lake to the Beaufort Sea, at an average flow rate ranging from 3.5-4.7 km/h.

Freeze-up progresses fairly regularly upstream from the mouth of the Mackenzie River to Great Slave Lake and appears to be more orderly than breakup. The Athabasca, Great Slave and Great Bear lakes have important roles in the hydrologic system of the Mackenzie basin. Lake storage is a main source of streamflow over the winter months and directly contributes to groundwater recharge.

The Middle Channel flows approximately 180-280 km north to large distributary channels around Ellice Island and west of Richards Island, before entering the Mackenzie Bay. In addition to the three main channels in the delta, there are numerous smaller channels. The sizes and shapes of the delta channels are proportional to the discharge carried. The Middle Channel carries the highest percentage of delta inflow, while the East Channel typically carries between 25-35% of the total. In contrast, the channel that extends northwest from Tununuk Point carries only about 1% of total delta inflow (HIMS 1999). Channels are fairly symmetrical in straight reaches and asymmetrical in bends.

Fish and Fish Habitat

Many fish species utilize the Mackenzie River and its tributaries to fulfill various life-cycle requirements (e.g., for migration, spawning, rearing, etc.). Fish species likely to be present in the Mackenzie Delta (see Table 2) were identified using historical and technical references. Species listed in bold have been identified in the Inuvik Inuvialuit Community Conservation Plan as species important to local communities for subsistence, spiritual and cultural values (The Community of Inuvik et al 2000). Most fish species select shallow water habitats to spawn in spring or fall when water temperatures are relatively cool (Richardson et al. 2001). Therefore the channels of the Mackenzie River are unlikely to provide significant spawning habitat. However, the Mackenzie River provides important migration routes for many fish species, including seasonal migrations to spawning areas. The shoreline habitat of the Mackenzie River provides juvenile rearing and adult resting habitat, with the presence of slack water areas and cover components (e.g., shoreline vegetation). Due to the flow and depth, the channels of the Mackenzie River have been identified as an important overwintering area for least cisco, broad whitefish, burbot and longnose sucker.

Niglintgak Channel

Detailed assessments were conducted by TeraAGA of the Niglintgak Channel of the Mackenzie River at two locations in July 2002, approximately 1 km upstream (NC-2) and 0.9 km downstream (NC-3) of the proposed Winter Field Geotechnical Investigation Program location. Similar habitat was present at the two sites, and the surveys encompassed the proposed program location. In this area, the Niglintgak Channel has near laminar flow and high channel uniformity. Wetted widths ranged from approximately 300-900 m, with maximum depths ranging from 11-20 m. The substrate was comprised entirely of silt. Cover for fish is provided primarily by depth/turbulence (including turbidity). Banks were vegetated with sedges (0-3 m from the shoreline), and were stable for the majority of the reach. The riparian vegetation (3-25 m from bank) is open tundra.

Summer sampling at these sites captured inconnu, northern pike, longnose sucker and trout-perch. The channel is considered to provide good habitat for rearing, feeding/holding, and overwintering habitat due to the slow-moving run habitat, but is unlikely to provide suitable spawning habitat for sport fish species due to the silt substrate. Water temperature during summer sampling was ~17°C, with dissolved oxygen concentrations being suitable for fish (7.7-8.6 mg/L).

Harry Channel

TeraAGA conducted a detailed assessment on Harry Channel on July 28, 2002, approximately 250 m downstream of the proposed Winter Field Geotechnical Investigation Program location. In this area, the channel has near laminar flow and high channel uniformity. Bankfull widths were approximately 130-175 m, with corresponding wetted widths from 120-170 m. Maximum depth was approximately 6.5 m. Substrate was comprised entirely of silt. Cover for fish is provided primarily by depth/turbulence (including turbidity). Banks were partially to fully vegetated with grasses (0-3 m from the shoreline), with some instability observed throughout the reach. Riparian vegetation (3-25 m from bank) is open tundra, with bare areas present.

Summer sampling at this site captured inconnu. The channel is considered to provide good habitat for rearing, feeding/holding, and overwintering habitat due to the slow-moving run habitat, but is unlikely to provide suitable spawning habitat for sportfish species due to the silt substrate. Water temperature during summer sampling was ~14°C, with dissolved oxygen concentrations being suitable for fish (~9.0 mg/L). Turbidity was quite high at 250 NTU.

East Channel

TeraAGA conducted a detailed assessment on the East Channel of the Mackenzie River on July 30, 2002, next to Holmes Creek and Swimming Point Camp, at the approximate location of the East Channel B Winter Field Geotechnical Investigation Program location. In this area, the East Channel has near laminar flow and high channel uniformity. The wetted width was approximately 920 m, with maximum depths ranging from 12-22 m within this reach. Substrate was comprised entirely of silt. Cover for fish is provided primarily by depth/turbulence (including turbidity). Banks were partially vegetated with some instability observed throughout the reach. Shoreline vegetation (0-3 m from the shoreline) was composed of shrubs/grasses on the left downstream bank, but was generally bare on the right downstream bank. Riparian vegetation (3-25 m from bank) is open tundra.

No fish were captured in a short-set (~3 hours) gill net at this site. However, the East Channel is considered to provide good habitat for rearing, feeding/holding, and overwintering habitat due to the slow-moving run habitat, but is unlikely to provide suitable spawning habitat for sportfish species due to the silt substrate. Water temperature during summer sampling was 12 to 16°C, with dissolved oxygen concentrations being suitable for fish (9.1 to 9.6 mg/L). Turbidity was quite high at 284 NTU.

Water Quality

Waters in the Mackenzie drainage basin flow through varied lithology and receive drainage waters from subdrainage basins (e.g., Mackenzie, Athabasca, Peace, Liard, Hay, Great Bear and Great Slave river basins) in the Western Cordillera and the Precambrian Shield. The waters of the Mackenzie River sub-basin typically have higher levels of turbidity and moderately low total dissolved solids (TDS) concentrations and conductivity. These parameters are influenced by the discharge regime. For example, values of turbidity and colour are low over the winter, highly variable in spring and peak over the summer. Conversely, conductivity and TDS levels are highest in the winter and decline in the open water period. Concentrations of metals in the Mackenzie River Basin are mainly associated with suspended sediments so that levels of metals show seasonal variations in response to discharge and suspended sediment regimes. Water quality parameters for the middle channel of the Mackenzie River are summarized in Table 3. Water quality for other delta channels is expected to be similar. The channels and lakes of the delta are well supplied with nutrients; however, the productivity of these waterbodies appears to be controlled by turbidity, substrate stability, abrasion and climate, rather than by nutrients (Brunskill et al. 1973).

Table 3

Parameter	Units	Value		
Field measured				
pН		7.85-8.2 ^(a,b)		
specific Conductance	uS/cm	279-298 ^(b)		
temperature	°C	0-1 ^(c)		
dissolved Oxygen	mg/L	10.2-13 ^(c)		
Conventional Parameters				
total Alkalinity	mg/L	98-125 ^(a,b)		
total Organic Carbon	mg/L	6-16 ^(a,b)		
total Suspended Solids	mg/L	1.6-4.4 ^(b)		
Major Ions				
bicarbonate	rng/L	109-130 ^(c)		
calcium	mg/L	26-42 ^(c)		
chloride	mg/L	12-19 ^(c)		
magnesium	mg/L	7-20 ^(c)		
potassium	mg/L	7-12 ^(c)		
sodium	mg/L	7-12 ^(c)		
sulphate	mg/L	29-35 ^(c)		

Summary of Mackenzie River Middle Channel Water Quality

^(a) Based on information collected for the period of January to April 1974 (F.F Slaney 1974a).

^(b) Based on information collected in August 20, 1973 (F.F. Slaney 1974b).

(c) Based on information collected in April 1973 (McCart et al. 1974).

11.2 Heritage Resources Overview

Within the Inuvialuit Settlement Region, a total of 60 sites may be visited as part of the Winter Field Geotechnical Investigation Program. Activities at most of these sites are limited to boring, which will require minimal ground surface disturbance. However a number of test pits, no larger than $5 \times 5 \times 5$ m, are proposed to be excavated at potential granular resource sites. All of this work is proposed to be completed under frozen, winter conditions.

The archaeological assessment of the proposed Winter Field Geotechnical Investigation Program involved a number of activities. During summer 2002, a reconnaissance level survey was conducted to identify sites of high archaeological potential. More detailed investigations were also undertaken at some sites. Based on these activities, the archaeological potential of each proposed activity site for the Winter Field Geotechnical Investigation Program has been determined. This information, as well as any heritage resource concerns, is provided in Table 4.

11.2.1 River Crossings

Four boreholes are proposed at the Niglintgak Channel of the Mackenzie River. Two of these will be situated on the upper terraces and two in the channel. Most of the heritage resource sites in this area would be expected to be small and indicative of short-term occupations of the region. The two lower (channel) boreholes will have low to no potential for heritage resources. The upper two sites will have a moderate potential for heritage resources. An overflight of the location did not identify any heritage resources but ground-truthing was not carried out at this exact location.

Four boreholes are also proposed at the Harry Channel of the Mackenzie River, north of the Taglu tower. The terrain at this location is low-lying, but has considerable deposition. Although deposition is relatively high at this location, the potential for heritage resources is thought to be low to moderate. A preliminary ground assessment was made at this location as well as a low level overflight. No heritage resources were noted.

Two sites for Winter Field Geotechnical Investigation are located on the East Channel of the Mackenzie River. These are East Channel South (near Swimming Point) and East Channel North (Northeast of Swimming Point). The terrain at the East Channel north location is low lying on the west bank and slightly elevated on the east bank. This site has high potential for heritage resources, particularly on the east bank. Several sites with extremely high heritage resource values are known on the East Channel. A helicopter overflight of the location did not identify any concerns from the air, but no ground truthing was conducted at this location.

The terrain at the East Channel South location is low lying on the west bank and is elevated on the east bank. This crossing has the highest potential for heritage resources of any sites considered here, particularly on the east bank. Up to seven boreholes are planned for this river crossing location. There are no known heritage concerns for the west side of the river, or within the river channel itself. However several locations with extremely high heritage resource values were noted on the east side of the East Channel within a distance of one kilometre from the river edge.

11.2.2 Overland and Granular Source Borehole Locations

The overland borehole sites are primarily situated within the 1 km wide corridor that was examined as part of the focused reconnaissance phase of the heritage resources program. The centreline of the corridor was inspected by air and the ground investigations were conducted at several sites thought to have moderate to high potential for heritage resources. Based on these investigations, there are no direct conflicts with known heritage resources for any of the overland borehole sites. Several granular source sites that will be tested during this program were partially assessed during the heritage resources program completed in the summer of 2002. The heritage resource potential for the granular resource sites is variable. It ranges from low to high, although the majority of the granular resource sites were investigated during the 2002 assessment and were found to be devoid of cultural materials.

Table 4

Heritage Resource Potential at Winter Field Geotechnical Investigation Program Locations

Site ID*	Activity	Heritage Resource Potential	Heritage Resource Concerns
Nig Channel	River Crossing	Low to moderate	No known concerns
Harry River Channel	River Crossing	Low to moderate	No known concerns
East River Channel A	River Crossing	Moderate to High	No known concerns
	<u>_</u>		HRV at risk within 2 km of the
East River Channel B	River Crossing	Very High	borehole location
GM4P*	Borrow Site	Low to moderate	No known concerns
1.008P	Borrow Site	Moderate	No known concerns
1.009P	Borrow Site	Low	No known concerns
2.017P	Borrow Site	Moderate to high	HRV** at risk within 2 km of the borehole location
2.018BP	Borrow Site	High	HRV at risk within 2 km of the borehole location
2.019EP	Borrow Site	Low to moderate	No known concerns
2.020P	Borrow Site	Low to moderate	No known concerns
2.022P	Borrow Site	Low	No known concerns
2.024P	Borrow Site	Moderate	No known concerns
2.025P	Borrow Site	Low to moderate	No known concerns
2.027P	Borrow Site	Moderate	No known concerns
2.028P	Borrow Site	Moderate	No known concerns
			HRV at risk within 2 km of the
2.029P	Borrow Site	Moderate to high	borehole location
20.038P	Borrow Site	Low	No known concerns
N5	Overland Borehole	Unknown	Unknown
N4	Overland Borehole	Low	No known concerns
<u>N3</u>	Overland Borehole	Low	No known concerns
<u>N2</u>	Overland Borehole	Low	No known concerns
<u>N1</u>	Overland Borehole	Low	No known concerns
1	Overland Borehole	Low	No known concerns
2	Overland Borehole	Low	No known concerns
3	Overland Borehole	Low	No known concerns
4	Overland Borehole	Low	No known concerns
5	Overland Borehole	Low	No known concerns
6	Overland Borehole	Low	No known concerns
7	Overland Borehole	Low	No known concerns
8	Overland Borehole	Low to moderate	No known concerns

Site ID*	Activity	Heritage Resource Potential	Heritage Resource Concerns
9	Overland Borehole	Low	No known concerns
10	Overland Borehole	Low to moderate	No known concerns
11	Overland Borehole	Low	No known concerns
12	Overland Borehole	Low	No known concerns
13	Overland Borehole	Low	No known concerns
14	Overland Borehole	Low to moderate	No known concerns
15	Overland Borehole	Low	No known concerns
16	Overland Borehole	Low	No known concerns
17	Overland Borehole	Low	No known concerns
18	Overland Borehole	Low	No known concerns
19	Overland Borehole	Low to moderate	No known concerns
20	Overland Borehole	Low	No known concerns
21	Overland Borehole	Low	No known concerns
22	Overland Borehole	Low	No known concerns
23	Overland Borehole	Low	No known concerns
24	Overland Borehole	Low	No known concerns
25	Overland Borehole	Low	No known concerns
26	Overland Borehole	Low	No known concerns
27	Overland Borehole	Low	No known concerns
28	Overland Borehole	Low	No known concerns
29	Overland Borehole	Low	No known concerns
30	Overland Borehole	Low	No known concerns
31	Overland Borehole	Low	No known concerns
32	Overland Borehole	Low	No known concerns
33	Overland Borehole	Low	No known concerns
34	Overland Borehole	Low	No known concerns
35	Overland Borehole	Low	No known concerns
36	Overland Borehole	Low	No known concerns
37	Overland Borehole	Low	No known concerns

* Bolded site_ID locations are those locations at which some ground based heritage resource reconnaissance was completed.

** HRV -- Heritage Resource Values

11.3 Socio-Economic Overview

The Inuvialuit Settlement Region includes the communities of Tuktoyaktuk, Aklavik, Sachs Harbour, Holman and Paulatuk within its boundaries. The population within the Inuvialuit Settlement Region totals approximately 2,700 people and, with the exception of Aklavik, the population in the communities is almost entirely Inuvialuit. Although Inuvik is not within the boundaries of the Inuvialuit Settlement Region, a number of Inuvialuit businesses and administrative bodies are located there, along with federal and territorial government offices. The proposed Winter Field Geotechnical Investigation Program will include visits to 60 sites to conduct boring (up to 150 boreholes total) and excavation of up to 10 test pits in total. Boreholes will be conducted at most sites and test pits will only be located at potential borrow sites. The winter program will generate 5 to 8 separate contracts with a potential estimated total value of \$3 million to \$4 million. The winter program and associated activities is proposed to occur over a 50 to 70 day period from mid January to early April in 2003.

It is anticipated that the Winter Field Geotechnical Investigation Program will require a crew of about 30 people and a mobile camp that will be moved from site to site. The 30-person crew will include heavy equipment operators involved in the access, site clearing, and pit excavation, land and geophysical surveyors, borehole drilling operators and helpers, environment and safety inspectors, a local knowledge representative and the camp and catering staff. In addition, there will be a field office in Inuvik with an estimated staff of 3-4 people, and a single fuel delivery truck and driver. The number of local people to be hired for this project will depend on the companies or business entities awarded the contract work and the capabilities of their labour force. The contracts have not yet been awarded.

As stated earlier, the winter program will span a period of 50-70 days. The work schedule will likely be 12-hour work days, 7 days a week throughout this period. Workers will probably be on a 21-day-in and 7-day-out work rotation schedule. The final work schedule will be determined following award of contracts.

12.0 PROPOSED MITIGATION AND ANTICIPATED ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

12.1 Environmental Impacts and Mitigation

This section outlines potential environmental impacts that may arise due to the Winter Field Geotechnical Investigation Program, as well as proposed mitigation to prevent or minimize these impacts. These are provided in Table 5. These mitigation measures are also included in the Environmental Protection Plan that has been written for this program. The Environmental Protection Plan is presented in Appendix A.

Table 5

Potential Environmental Impacts and Proposed Mitigation

Potential Impact	Mitigation
Physiography and Soils	
Clearing and use of tracked vehicles: Possible disruption of ground cover vegetation could trigger long-term permafrost degradation, surface subsidence and sediment transfer into streams or ponds	Clear minimum amounts of vegetation without disturbing ground cover vegetation to reduce potential permafrost degradation. Activities will be carried out only when the ground is frozen to minimize surface disturbance.

Potential Impact	Mitigation
Clearing and other activities on steep slopes: possible disturbance of ice-rich sediments on steep slopes	Activities will be helicopter supported, so no new access will be required on steep slopes.
could trigger erosion, unstable slopes and increased sediment load in streams.	Site will be hand cleared if required. The vegetation mat will not be disturbed.
Soil contamination by fluids/fuel/waste	 Safe handling and disposal of brine/waste from diamond drill rigs will be used to avoid soil contamination.
	An emergency spill containment contingency plan will be in place to respond to any fuel leaks/ losses to the surface.
Excavation at granular sites; disturbance of ground cover vegetation and preservation of permafrost in areas surrounding granular sites	Strippings will be salvaged and replaced following completion of excavation at the site.
Vegetation	
Loss of rare or uncommon vegetation	Avoid known potential rare plant sites by confirming their location with the botanist prior to conducting work at this site.
	Minimize clearing of trees by using existing access or cutlines.
Damage to surface vegetation and exposing of organic soils	Activities will be carried out only when the ground is frozen to help minimize surface disturbance.
Wildlife	
Disruption of active den sites of grizzly bear, fox and wolverine	Potential denning habitat will be identified prior to the initiation of activities at each site. If identified, the site will be avoided.
Disturbance of sensitive lichen communities, which are critical winter feeding areas for caribou.	Areas showing evidence of frequent caribou activity will be avoided, if possible.
Disturbance of important wildlife habitat during access construction	New clearing will be minimized by using existing cutlines and cleared areas to the greatest extent possible.
Aquatic Resources	
Increased total suspended sediment concentrations during boring	Casing will be used to prevent cuttings and fluids from entering the water column.
	No cuttings or debris will be left on the ice
Disturbance of overwintering fish	Casing will be used to prevent fluids and cuttings from entering the watercourse.

Potential Impact	Mitigation
Introduction of deleterious substances to watercourse	Casing will be used to prevent fluids and cuttings from entering the water column when boring into the river bed.
	Appropriate measures will be taken during refueling operations, <i>i.e.</i> refueling 100 m back from watercourses, use of refueling mats and carrying a spill kit with the fuel truck at all times.
	A spill contingency plan will be in place for the Winter Field Geotechnical Investigation Program.
	Ice thickness and strength will be checked at watercourse crossings to ensure it is appropriate for machinery; if any equipment falls through the ice, it will be removed as quickly as possible.
	Only ice and snow will be used to construct ice bridges; the use of debris will not be allowed.
Damage to riparian vegetation, bank stability	Existing access will be used wherever possible.
	Gently sloping banks will be used for access; approaches of snow and ice will be of sufficient thickness to protect riverbanks; and banks will not be cut to improve access.
	Removal of riparian vegetation will be minimized.
The potential for silt-laden surface runoff as a result of surficial disturbance.	Erosion control measures will be implemented where there is a risk of silt entering a waterbody.
Heritage Resources	
Disturbance of heritage resources	Should unexpected heritage resources be encountered during activities, all work in the immediate area will cease until an archaeologist is able to examine the find and develop an appropriate site management plan.

12.2 Heritage Resource Impacts

Most known heritage resource sites are greater than two kilometers from the area of the proposed Winter Field Geotechnical Drilling Program. Prior to the commencement of the proposed Winter Field Geotechnical Investigation Program, the Prince of Wales Northern Heritage Information Centre will be consulted to identify if any additional locations of known heritage resources are in the vicinity of proposed activities. In addition, consistent with the intent of the Northwest Territories Act and the Archaeological Sites Regulations, should unexpected heritage resources be encountered during activities, all work in the immediate area will cease until an archaeologist is able to examine the find and develop an appropriate site management plan. The project personnel conducting the Winter Field Geotechnical Investigation Program will be provided with the contact names and numbers for a program archaeologist as well as the name and number of the Territorial archaeologist at the Prince of Wales Northern Heritage Information Centre in Yellowknife.

Several locations with extremely high heritage resource values were noted in proximity to the East Channel South location. It is recommended that none of the planned drilling be completed on the east side of the East Channel South location of the Mackenzie River within a distance of one kilometre from the river edge. It is further recommended that no vehicle traffic be allowed in this area and the one kilometre set back from the river.

12.3 Socio-Economic Impacts

In terms of project-related economic effects, it is estimated that \$3 million to \$4 million in subcontracts will be awarded for the winter program in the Inuvialuit Settlement Region. It is anticipated most of the successful subcontractors will make project-related purchases in the region (fuel and lubricants, vehicle rentals, food, beverage, toiletries and cleaning supplies). These purchases would benefit a number of other local businesses. Although the increased revenues and employment generated would be modest and temporary, it should stimulate further rounds of spending in local communities.

Modest and temporary increase in consumer business revenues would be generated through the spending of disposable income by the workers hired from within the Inuvialuit Settlement Region. If these people were unemployed or underemployed prior to their involvement in the winter program, the earned income could improve the quality of life of the worker and their families over the short-term.

Work-imposed isolation of northern workers from their families could temporarily detract from family relationships and parenting responsibilities. However, with communications that will be available at the camp and the proposed worker rotation schedule, the adverse effects should be minimal.

An undetermined number of the winter program borehole and pit excavation sites may be located within designated trapping areas and the work will be scheduled during the winter trapping season. As a result, there is potential for adverse effects on the resource harvesters in the form of temporary dispersion of furbearers, reduced trapping revenues and destruction or loss of traps and other equipment. These potential impacts need to be examined further during the consultation and land use permitting process. Communications with the Hunters and Trappers Committees and the affected hunters and trappers will help to minimize or eliminate potential adverse effects. By plotting trapline locations on the program site map sheets and drawing upon the capabilities of the local representative, it should be possible for the access routes and program sites to avoid existing traplines.

13.0 CUMULATIVE EFFECTS

Based on a review of recent applications to the Environmental Impact Screening Committee and the Environmental Impact Review Board, a number of industrial activities and developments within the eastern Mackenzie Delta and the area extending south to Inuvik have been identified. These are summarized in Table 6. In addition, some research may be underway at the time of the proposed Winter Field Geotechnical Investigation Program.

Table 6

Summary Of Other Activities That Will Be Conducted In The Vicinity Of The Proposed Winter Geotechnical Investigation Program

(within a 15 km distance of the proposed winter geotechnical investigation program sites)

Primary Activity Type	Responsible Organization	Location	Timeframe	Details
Seismic	Petro-Canada	Napoiak Located on EL 405, with a small portion extending onto EL 396	Dec 2002 – April 2003	2D winter seismic program; consists of 17 lines for a total length of 276 km
Seismic	EnCana Corp.	Kugmallit Richards Island and the Tuktoyaktuk Peninsula, west of Parsons Lake ~38 km SW of Tuktoyaktuk and 48 km north of Inuvik in EL 384, EL 385 and SDL 32	15 Jan – 15 April 2003	2D winter seismic program; 630 km of seismic data with surveyed lines covering ~3 ha of 7(1)(a) lands, 125 ha 7(1)(b) lands and 500 ha Crown land
Drilling	Devon Canada Corp.	SDL 62 69°06'50.0"N, 133°27'21.4"W	Jan – April 2003	Winter 2003 drilling program Access construction, connecting with Petro-Canada's ice road
Drilling	Devon Canada Corp.	Naparok ~47 km from Inuvik, ~30 km from Aklavik	17 Nov 2002 – 15 April 2003	Winter drilling program Access and lease construction; drilling; well test; demobilization & clean-up
Drilling	Petro-Canada	Nuna On tundra uplands >20 km NW of Husky Lakes estuary Nuna #1: 69°09.57'N, 133°20.91'W, (UTM: Zone 8 571256E 7666553N) Nuna #2: 69°05.28'N, 133°20.42'W, (UTM: Zone 8 571812E 7660991N) Nuna #3: 69°07.33'N, 133°17.71'W, (UTM: Zone 8 572549E 7663244N)	Oct 2002 – April 2003	Winter 2003 drilling program Access and lease construction, camp, fuel storage, drilling, well testing, disposal of produced fluids, clean-up, reclamation, and suspension/ abandonment of wells. Area: ~ 3.6 ha / drill pad + associated facilities

Primary Activity Type	Responsible Organization	Location	Timeframe	Details
Drilling	Chevron	Northern Langley Island, Mackenzie River Delta region; 1 of 2 locations: 69°19'8,03"N, 135°36'39.15W (Langley E-30), or 69°18'45.29"N, 135°36'51.29W (Langley D-30)	January – April 2003	Winter drilling program; exploratory well; surveying and access route construction in January 2003, drilling to be completed by April 2003, including well-testing; clean-up, reclamation, disposal and decommissioning. Area at each drilling location=~4.60-4.65 ha
Clean-up of Abandoned Kittigazuit Army Camp Site	Inuvialuit Projects, Inc. (subcontractor: E. Gruben's Transport Ltd.)	Kittigazuit waste metal site 69°16'55.71"N, 133°54'31.80W	late winter/ early spring 2003	Construction of: ice road to the site. Demolition, transportation and disposal of non-hazardous materials and debris to disposal site in Tuk and/or Inuvik, ~750 m3 of granular materials will be quarried and transported to fill areas of excavation. Use of water from Mackenzie River and/or Shallow Bay.
Proposed dock construction	EGT Inuvik Ltd.	On the waterfront within the Town of Inuvik; located on the East Channel of the Mackenzie River 68°22'N, 133°45'W	late winter/ early spring 2003	Dock for a new shipping and staging facility Phase 1 - creation of dyke and removal of water.
Reindeer herding	Kuññek Resource Development Corporation	Winter range (between Tuktoyaktuk and Inuvik); main winter outpost camp at Jimmy Lake (68°38.75'N, 133°30.5'W) (range covers a much larger area)	Year-round	

The primary project-specific effects that could potentially occur as a result of the proposed Winter Field Geotechnical Investigation Program are:

- environmental impacts as a result of Winter Field Geotechnical Investigation Program activities;
- sensory disturbance from aircraft and human activity on the ground; and
- intrusion on important cultural or spiritual sites.

While there is small potential for wildlife mortality resulting from human protection from problem, training of all staff and operational procedures will be used to minimize this potential.

Interactions of these project-specific effects with other projects and activities (Table 2) could result in cumulative effects such as:

- increased sensory disturbance of wildlife within the program area due to aircraft overflights and landings, human activities on the ground (e.g., vehicles, camps), seismic and drilling activity and other activities. This could result in energetic stress to wildlife, displacement or, in a worst case, seasonal abandonment of habitat;
- interference with traditional activities as a result of aircraft overflights and human activities on the ground; and
- intrusion on important cultural or spiritual sites as a result of aircraft overflights and human activities.

To minimize the potential for these cumulative effects to occur, the following measures will be employed:

Use of Appropriate Mitigative Measures and Procedures: An Environmental Protection Plan has been developed that provides mitigative measures to minimize and prevent adverse environmental impacts during most stages of the Winter Field Geotechnical Investigation Program. This plan will be applied throughout the Winter Field Geotechnical Investigation Program, and has been included in the mitigative measures section of this document.

Scheduling of Activities: The schedule for the proposed Winter Field Geotechnical Investigation Program will be designed to minimize impacts to other industrial activities and investigations in the region. This will include programs for which details are not currently available (e.g., applications for research programs or industry projects which have been submitted for the upcoming meeting of the Environmental Impact Screening Committee).

Avoidance of Traditional Harvesting, Cultural and Spiritual Areas: Prior to the start of the Winter Field Geotechnical Investigation Program, the Inuvik, Aklavik and Tuktoyaktuk Hunters and Trappers Committees will be contacted to reconfirm whether any harvesting activities are ongoing or will be started within the area during the proposed investigation period. Locations of sensitive cultural and spiritual sites will also be confirmed. Methods to avoid these areas (e.g., avoidance of specific sites or portions of specific sites) will be discussed with the Hunters and Trappers Committees.

With these measures in place, and due to the short duration of the proposed program, it is predicted that any disturbance effects caused to wildlife or traditional users will be short-term (i.e., hours to several days within any specific geographic region of the investigation area) and localized to the vicinity of the investigations. Avoidance of important harvesting areas and cultural sites by changes in the Winter Field Geotechnical Investigation Program will minimize effects on traditional activities and cultural sites. As a result, no significant cumulative effects are anticipated.

14.0 EMERGENCY RESPONSE PLANS

An Emergency Response Plan will be submitted prior to the commencement of any field activities.

15.0 CLEANUP, RECLAMATION, DISPOSAL, AND/OR DECOMMISSIONING PLAN

Please refer to the Environmental Protection Plan in Appendix A of this document.

16.0 OTHER ENVIRONMENTAL ASSESSMENT

There is no other environmental assessment.

17.0 LITERATURE CITED

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Appendix A Environmental Protection Plan for the 2003 Winter Field Geotechnical Investigation Program

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1.0 INTRODUCTION

This Environmental Protection Plan (EPP) describes the environmental protection measures to be used during the Winter Field Geotechnical Investigation Program (the program) to be conducted by ColtKBR. The protection measures provided in the EPP will minimize the potential environmental impacts that have been identified. The ColtKBR Field Supervisor and the ColtKBR Environmental Supervisor will be responsible for ensuring the protection measures described in the EPP are adhered to during the conduct of the geotechnical investigation program.

The geotechnical investigation program will be conducted during the winter of 2003. Clean-up at all sites will be conducted immediately following the completion of the activity.

2.0 GENERAL ENVIRONMENTAL PROTECTION MEASURES

General environmental protection specifications are provided below. These are followed by detailed specifications for each phase of the program.

Protection Measures

EPP and Contract	1.	The EPP shall form part of the contract documents with the subcontractors for the Winter Field Geotechnical Investigation Program.
Construction Documents	2.	All ColtKBR supervisory staff will be provided with the EPP and copies of all permits and approvals, including any recent updates and revisions.
Licenses and Permits	3.	All necessary licenses and permits shall be obtained prior to the commencement of the program.
Government Liaison	4.	Liaison with government and regulatory agencies will be the responsibility of ColtKBR and Imperial Oil Resources Ventures Limited.
Environmental Inspection	5.	A ColtKBR Supervisor, as well as an Environmental Supervisor will be present during the program.
Orientation	6.	All field personnel will receive an environmental and cultural orientation prior to commencing work on the program.
Scheduling	7.	A plan is in place to have all activity, clean-up of the sites completed and equipment mobilized out of the area prior to spring break-up.
Wet/Warm Conditions	8.	In order to minimize terrain disturbance and soil structure damage, equipment travel shall be suspended in the event of wet or thawed soils until conditions improve (<i>i.e.</i> , refreeze), except when required to transport field workers back to camp.
	9.	The decision to postpone activities due to wet/warm conditions will be made by ColtKBR's Supervisory staff. Factors influencing a decision to postpone start-up or shut-down work include: the weather forecast; program schedule; and availability of non-problem areas (<i>i.e.,</i> frozen soils). ColtKBR will plan daily activities to avoid any wet or thawed areas.
Weeds	10.	All equipment shall be in a clean condition prior to mobilization to the program to minimize the risk of weed introduction. Any equipment mobilized in a dirty condition shall not be utilized on the program until it has been cleaned, to the satisfaction of ColtKBR Supervisory staff, at a suitable location.
Spill Prevention	11.	Each subcontractor shall ensure that during the course of the program no fuel, lubricating fluids, hydraulic fluids, methanol, antifreeze, or other hazardous materials are spilled, dumped or discharged on the ground or into or onto any watercourse. In the event of a spill, the Spill Contingency Plan shall be implemented.
Equipment Refueling and Servicing	12.	A tarpaulin, which is impervious to all liquids, will be used under all equipment during servicing or maintenance to contain spills.
	13.	Any maintenance, oil changes, refueling and lubricating of mobile equipment shall be conducted a minimum of 100 metres from waterbodies and watercourses (lakes and streams) to minimize the potential for water pollution. Special measures will be taken if refueling or servicing of immobile equipment is required within 100 metres of a waterbody or watercourse to ensure that accidental spills are contained. Spent oils, lubricants and filters, etc., shall be collected and disposed of at an approved location. Fuel and service vehicles shall carry a minimum of 10 kg of suitable commercial sorbent material.
	14.	Ensure that operators or foremen and responsible supervisory personnel are trained to contain spills or leakage from equipment.

	15.	No fuel, oil or hazardous material storage will be allowed within 100 metres of a watercourse or waterbody.		
	16.	Fuel will be stored in a bermed area or other secondary containment with a holding capacity of 110% of the largest volume of fuel to be stored at the site.		
	17.	Equipment shall be well maintained to minimize air pollution and unnecessary noise.		
	18.	Equipment or machinery will not be washed in watercourses or waterbodies.		
Potable Water Supply	19.	Potable water shall be obtained from a source approved by the appropriate regulatory agency.		
Garbage	20.	All garbage shall be continuously collected and incinerated, where permitted, at the nearest camp in an enclosed container. Remnants of incineration as well as all waste material that will not be incinerated will be hauled to and disposed of at an approved facility.		
Roads and Access	21.	Traffic shall be restricted to existing roads, approved access trails and the activity sites. All existing roads damaged by vehicles and equipment required for the program shall be repaired to similar conditions that existed prior to the commencement of the activities. All traffic safety and road closure regulations shall be followed.		
Erosion and Siltation	22.	Soil erosion and water siltation shall be prevented or controlled by using appropriate measures. ColtKBR will provide personnel and equipment to control erosion, when warranted.		
Wildlife	23.	Wildlife shall not be harassed or fed. With the exception of bear monitors, personnel shall not be permitted to have dogs or firearms on the site. The recreational use of all terrain vehicles and snowmobiles by personnel is prohibited. Any incidents with wildlife or collisions with wildlife will be reported to the appropriate regulatory agency and the local RCMP detachment.		
Fires	24.	All personnel shall be made aware of proper disposal methods for cigarette butts and other hot or burning material.		
	25.	Smoking shall not be permitted in the open on the activity sites if the fire hazard is high. At these times, smoking will only be permitted within vehicles or the portable camp.		

26. Exhaust and engine systems of equipment shall be in good working condition.

3.0 NOTIFICATION OF CONCERNED PARTIES

Objective:

Notification prior to the commencement of the Winter Field Geotechnical Investigation Program ensures that interference with other industrial or traditional land uses is minimized and that relevant communities and government personnel are kept informed of all industrial activities occurring within their jurisdiction.

Measures

Regulatory Authorities	1.	Notify the appropriate regulatory agencies a minimum of ten working days prior to the commencement of the program. Contact shall be maintained until program completion.
Communities	2.	Notify communities a minimum of two weeks prior to the commencement of the program.
Road Use	3.	Notify appropriate communities, companies or regulatory agencies, if required, by road use agreements.

4.0 CLEARING

Objective:

Disturbance to timber, vegetation and the ground mat shall be kept to a minimum. Trees and shrubs shall be removed from the program sites, as required to facilitate boring and excavation activities.

Protection Measures:

Vehicle/Equipment Crossings	1.	ColtKBR's Supervisory staff will assess stream crossings prior to the commencement of clearing access trails. Appropriate locations (<i>i.e.</i> gently sloping banks) and protection measures for stream crossings will be decided upon in the field.
	2.	Ice bridges will be constructed if stream crossings are necessary on access trails or where operations on river ice will occur. Ice bridges will be constructed of snow and ice; no other material (<i>e.g.</i> timber) will be permitted for use in the ice bridge.
Rare Plants	3.	ColtKBR,s Supervisory staff, in consultation with a botanist, will identify known locations of rare plant communities to ensure that they will not be disturbed during the geotechnical investigation program.
Wildlife Habitat	4.	Potential denning habitat will be identified prior to the initiation of activities at each investigation site. Those areas identified will be avoided.
	5.	Areas showing evidence of frequent caribou activity will be avoided, if possible.
Timber Clearing	6.	Clear vegetation and timber along the access trails, test pits, campsites and activity sites with a bulldozer equipped with a cutter blade with mushroom shoes or a hydroaxe or other mechanized clearing equipment. Cut the vegetation to as close to the ground as possible to facilitate equipment and vehicle travel to the work area.
	7.	The removal of riparian zone vegetation shall be minimized to the extent possible.
	8.	Timber cleared by a bulldozer that is not required for salvage shall be windrowed to one side of the clearing and walked-down.
	9.	Hand clear timber on slopes to create a line of sight to facilitate survey activities. Fall all timber onto the line of sight.
	10.	Hand clear timber at program sites on slopes that will be bored using a heli-portable rig.
Salvage	11.	Select timber shall be salvaged and hauled to the nearest community, if required.
	12.	Retain an appropriate amount of timber to construct a berm across newly created access, if required.
Leaning and Damaged Trees	13.	Fell all trees damaged during clearing activities immediately. Do not postpone felling of damaged trees until clean-up.

5.0 BORING AND EXCAVATION SITES

Objective:

Measures shall be implemented to minimize ground disturbance and reduce the risk of releasing boring fluids into the environment.

Protection Measures:

- The boring or excavation subcontractor shall conduct all activities during Scheduling 1. frozen conditions to minimize ground disturbance. Complete all geotechnical investigations and demobilize prior to spring 2. break-up. 3. Ensure all equipment is onsite prior to commencing activities to avoid delays. If boring instream, case through ice, water and into the riverbed to a Casing 4. sufficient depth to ensure that fluids and cuttings will be contained within the hole. Salvage strippings (organic material and the upper layer of mineral soil), if 5. Test Pits - Strippings Salvage present, to a maximum depth of 15 cm at all test pit locations. Store strippings at the edge of the allocated workspace for the test pit. Replace strippings evenly over all disturbed areas once the test pit has been backfilled. In the event that a heritage resource site is encountered during test pit Heritage Resource 6. Site Discovery excavation, the subcontractor shall immediately cease work and contact the Environmental Supervisor. Excavation will not be allowed to resume until an archaeologist is able to examine the find and develop an appropriate site management plan and approval to proceed has been granted by the appropriate regulatory agency. Cuttings Disposal 7. Cuttings shall be backfilled into the test holes at locations where boring fluid was not used. 8. Boring Fluid Disposal Used drilling fluid and cuttings shall be back-filled into the test hole if there is sufficient capacity in the hole to contain it. Otherwise, fluid should be hauled to an approved disposal facility.
 - 9. Waste brine shall be hauled to an approved disposal facility.

6.0 CLEAN-UP, RECLAMATION, DISPOSAL OF WASTE AND DECOMMISSIONING

Objective:

Waste materials shall be removed and access to the activity sites will be controlled to the satisfaction of community and/or the appropriate regulatory agencies.

Protection Measures:

Scheduling	1.	Commence clean-up immediately following the completion of a borehole. Ensure that clean-up at all locations is complete prior to spring break-up.	
	2.	Postpone work on excessively wet soils until the soils refreeze.	
Grey Water	3.	Dispose of grey water in poorly drained wetlands as approved by the Environmental Supervisor and the appropriate regulatory agency. Grey water will not be disposed of in fish-bearing watercourses.	
Sewage Disposal	4.	All sewage generated from all camps will have a sump dug to accept the sewage wastes. The sumps will be treated, as per the <i>General Sanitation Regulations</i> . Where sumps are not permitted, sewage shall be hauled to the nearest community for disposal at an approved facility.	
Debris	5.	Remove all remaining waste material and debris from the program site.	
	6.	Remove all cuttings, fluids and debris from the snow and ice at all locations where operations were set up on river ice.	
Access Control	7.	Restrict access to all program sites unless otherwise requested by the communities.	
Contaminated Soils	8.	Remediate any areas of contamination onsite, if feasible, or remove contaminated soil and dispose it at an approved facility.	
Reclamation	9.	Reclamation procedures will be determined through discussion with regulatory agencies, Hunters and Trappers Committees and the Project Management Team.	

INDEX SUMMARY SHEET- Inuvialuit Settlement Region Private Lands

Tab ID	Site ID	Land Owner	Activity Type	Latitude	Longitude
1	OL10	Private	Overland Borehole	69.17611557970	-134.46315845000
2	OL11	Private	Overland Borehole	69.15357589770	-134.42647177200
3	OL12	Private	Overland Borehole	69.17766945830	-134.43327656300
4	OL13	Private	Overland Borehole	69.16735092730	-134.38884201000
5	OL14	Private	Overland Borehole	69.15338635190	-134.36042492600
6	OL15	Private	Overland Borehole	69.10737001500	-134.27904393300
7	OL16	Private	Overland Borehole	69.08349629720	-134.26879592100
8	OL17	Private	Overland Borehole	69.08906863710	-134.34111763800
9	OL18	Private	Overland Borehole	69.06494099190	-134.31214290900
10	OL19	Private	Overland Borehole	68.99151980390	-134.10731572100
11	OL26	Private	Overland Borehole	69.03767719920	-134.15533981800
12	OL27	Private	Overland Borehole	69.00636331630	-134.07526309200
13	1.008P	Private	Borrow Site	69.10249283970	-134.61892198600
14	1.009P	Private	Borrow Site	69.09776062170	-134.69992921000
15	2.017P	Private	Borrow Site	68.79295839180	-134.16235117000
16	East Channel River North	Private	River Crossing	69.13381321990	-134.32790202600
16	East Channel River South	Private	River Crossing	69.38359563212	-134,966297

Site ID OL10

Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

<u>ACTIVITY</u>

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.17611557970 Longitude: -134.46315845000

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:

Access to the proposed investigation site has yet to be finalized, however all efforts will be made to utilize existing trails, winter roads and cutlines when and where feasible. Where existing trails, winter roads and cut lines do not exist, new access will be constructed using approved methods under the appropriate regulations for the region. Care will be taken to avoid steep slopes, sidehill and environmentally sensitive areas, while maintaining a direct route to the site. Efforts will be made to retain riparian vegetation and minimize disturbance to streambanks along the constructed access at points where access intersects watercourse crossings.



Site ID OL11

Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

<u>ACTIVITY</u>

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.15357589770 Longitude: -134.42647177200

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:

Access to the proposed investigation site has yet to be finalized, however all efforts will be made to utilize existing trails, winter roads and cutlines when and where feasible. Where existing trails, winter roads and cut lines do not exist, new access will be constructed using approved methods under the appropriate regulations for the region. Care will be taken to avoid steep slopes, sidehill and environmentally sensitive areas, while maintaining a direct route to the site. Efforts will be made to retain riparian vegetation and minimize disturbance to streambanks along the constructed access at points where access intersects watercourse crossings.



Site ID OL12

Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.17766945830 Longitude: -134.43327656300

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:

Access to the proposed investigation site has yet to be finalized, however all efforts will be made to utilize existing trails, winter roads and cutlines when and where feasible. Where existing trails, winter roads and cut lines do not exist, new access will be constructed using approved methods under the appropriate regulations for the region. Care will be taken to avoid steep slopes, sidehill and environmentally sensitive areas, while maintaining a direct route to the site. Efforts will be made to retain riparian vegetation and minimize disturbance to streambanks along the constructed access at points where access intersects watercourse crossings.


Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.16735092730 Longitude: -134.38884201000

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.15338635190 Longitude: -134.36042492600

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.10737001500 Longitude: -134.27904393300

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:

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Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.08349629720 Longitude: -134.26879592100

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.08906863710 Longitude: -134.34111763800

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

<u>ACTIVITY</u>

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.06494099190 Longitude: -134.31214290900

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type: C Personnel Required: 4 Proposed Date(s): W

Overland Borehole 4 Winter 2003

LOCATION

Latitude: 68.99151980390 Longitude: -134.10731572100

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.03767719920 Longitude: -134.15533981800

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.01
Boreholes:	1
Test Pits:	0
Boreholes/Test Pits*:	0

ACTIVITY

Proposed Type:	Overland Borehole
Personnel Required:	4
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.00636331630 Longitude: -134.07526309200

ACCESS (m)**

New Access: N/A Existing Access: N/A

• Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Site ID 1.008P

Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.06
Boreholes:	0
Test Pits:	0
Boreholes/Test Pits*:	6

ACTIVITY

Proposed Type:	Borrow Site
Personnel Required:	8
Proposed Date(s):	Winter 2003

LOCATION

Latitude: 69.10249283970 Longitude: -134.61892198600

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Site ID 1.009P

Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.2
Boreholes:	0
Test Pits:	0
Boreholes/Test Pits*:	20

ACTIVITY

Borrow Site Proposed Type: Personnel Required: 8 Proposed Date(s):

Winter 2003

LOCATION

Latitude: 69.09776062170 Longitude: -134.69992921000

ACCESS (m)**

New Access: N/A Existing Access: N/A

Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Site ID 2.017P

Inuvialuit Settlement Region

LAND USE

Land Owner:	Private
Land Use Area (ha):	0.04
Boreholes:	0
Test Pits:	0
Boreholes/Test Pits*:	4

ACTIVITY

Borrow Site Proposed Type: Personnel Required: 8 Proposed Date(s):

Winter 2003

LOCATION

Latitude: 68.79295839180 Longitude: -134.16235117000

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



Site ID East Channel River North Inuvialuit Settlement Region

LAND USE

Land Owner:PrivateLand Use Area (ha):0.07Boreholes:7Test Pits:0Boreholes/Test Pits*:0

ACTIVITY

Proposed Type:River CrossingPersonnel Required:4Proposed Date(s):Winter 2003

LOCATION

Latitude: 69.13381321990 Longitude: -134.32790202600

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:

Site ID East Channel River South Inuvialuit Settlement Region

LAND USE

Land Owner:PrivateLand Use Area (ha):0.07Boreholes:7Test Pits:0Boreholes/Test Pits*:0

ACTIVITY

Proposed Type:River CrossingPersonnel Required:4Proposed Date(s):Winter 2003

LOCATION

Latitude: 69.38359563212 Longitude: -134.966297

ACCESS (m)**

New Access: N/A Existing Access: N/A

* Indicates the planned number of boreholes and/or test pits at the proposed site. The actual number of boreholes and test pits will be determined in the field when the work is conducted.

**N/A under Access means lengths are not available at this time, however will be determined and included in the final plan.

Comments:



CONSULTATION REPORT INUVIALUIT SETTLEMENT REGION

Class A Land Use Permit Application for 2003 Field Geotechnical Investigation Program

Community or Group	Contact	Telephone No	Meeting Date
Communities			meeting Date
Communities			
Hamlet of Aklavik	Acting Mayor	867-978-2351	September 5, 2002
Town of Inuvik	Peter Clarkson, Mayor	867-777-2607	October 11, 2002
Tuktoyaktuk			Workshops held on November 8 and 9, 2002 ¹
Hunters' and Trappers' (H	TC) Committees		
Aklavik HTC	Dennis Arey, Vice- President	867-978-2723	October 9, 2002
Inuvik HTC	Richard Binder, Chair	867-777-2478	November 4 and 5, 2002 ¹
Tuktoyaktuk HTC	Frank Pokiak, Chair	867-977-2457	Workshops held on November 8 and 9, 2002 ¹
Game Council		867-777-2828	October 9, 2002
Regional Councils			
Inuvialuit Regional Corporation	Roger Connelly, Chief Operating Officer	867-777-3109	October 3, 2002
Inuvialuit Land Administration	Jim Thorbourne, Land Use Officer	867-977-2202	October 3, 2002
Inuvik Elders Committee			November 4 and 5, 2002 ¹
Tuktoyaktuk Elders Committee			November 8 and 9, 2002 ¹
Joint Secretariat	Robin Fonger	867-777-2828	October 9, 2002

held in the week of November 4.

CONSULTATION SUMMARY

The following information about the Winter Field Geotechnical Investigation Program was provided to those consulted:

- potential field geotechnical program sites were shown on a 1:250,000 map
- site investigation would involve using the following types of equipment:
 - augers (auger holes would be 3 to 4 m (9 to 12 ft.) deep)
 - air rotary drills
 - mud rotary drills
 - backhoes
- ice roads would likely have to be built to provide access
- all data gathered will be given to the Inuvialuit Land Administration
- additional work might have to be done at, for example, Tuktoyaktuk

- track or truck-mounted drills will be required. Tracked drills are most likely.
- the plan is to be ready for screening by the Environmental Impact Screening Committee (EISC), which is meeting on December 15 and 16
- to obtain information about soil and bank stability, and subsurface composition, samples will be taken by:
 - drilling 41 boreholes at locations along proposed rights-of-way. Boreholes will have cores 10 to 15 cm (4-6 inches) in diameter, and will be potentially 65 m (213 ft.) deep.
 - drilling 14 cores at river crossings
 - taking surface samples at five borrow sites.
- up to six rigs could be used, depending on approved activity
- about a dozen support vehicles with mobile camps could be required
- the program could last six to eight weeks

COMMUNITY COMMENTS AND QUESTIONS	CHANGES TO PROGRAM AS A RESULT OF COMMUNITY INPUT
A 25-year-old study done on a gravel site northwest of Aklavik exists. Can the project consider gathering some data on this site during the investigations?	None – ILA has advised that it has conducted its own investigation.
Community residents would like to see specifics of the project work and how the equipment will access the sites when ready. The residents would also like to see maps at a scale of 1:50,000.	None — Maps at a scale of 1:50,000 will be sent to the residents when the maps are complete.
Pictorial before-and-after records should be kept of all river and stream crossings.	None — Keeping pictorial records of river and stream crossings will be included in the program.
The Inuvialuit Land Administration is responsible for its own assessment of granular resources in conjunction with INAC (Indian and Northern Affairs Canada) (formerly DIAND) within the Inuvialuit Settlement Region (ISR). This overlaps with the work being proposed as part of the Winter Field Geotechnical Investigation Program. Opportunities might exist to use the same contractors, such as EBS, for both assessment programs.	None — Options have been discussed with the ILA to avoid duplication of work and to co-ordinate activities in ILA and INAC lands.
Who will do the contracting and manage the program?	None — ColtKBR will do the contracting and manage the program.
 The following areas are off limits: GM4P borrow site 1002P Swimming Point 	These areas will likely be removed from the program.
YaYa borrow site must be used as major source of gravel.	None — This site will likely be a part of the granular resource plan in the Inuvialuit Settlement Region.
The granular resource investigation program could start as soon as weather permits.	None — The program would start after permits were received, weather permitting.
INAC does not want the project to use sources of granular material on Crown land. They want to reserve these sources for themselves, including Parsons Lake sources.	None — The Crown land sources might be a part of the granular resource plan in the ISR.



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