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# NORTHWEST TERRITORIES WATER BOARD

WATER LICENCE APPLICATION QUESTIONNAIRE

FOR

OIL AND GAS EXPLORATION: DRILLING



prepared by

Department of Indian Affairs and Northern Development  
Water Resources Division  
August 2002

## **INTRODUCTION**

The purpose of this questionnaire is to solicit supplemental information from an applicant to support their application for a Water Licence (or renewal). It is anticipated that the completion of this questionnaire will reduce delays arising from the Northwest Territories Water Board having to solicit additional information after an application has been submitted. This information will be used during the environmental assessment and screening of your application, which must be undertaken prior to the approval of a Water Licence.

The applicant should complete the questionnaire to the best of their ability, recognizing that some questions may not be relevant to the proposed project. For questions that do not relate to the operation, the applicant is requested to indicate "N/A" (not applicable). For information from other sources, please fully reference the material cited, including the title of the document and the page numbers referred to.

If any questions arise while completing the questionnaire, the applicant may wish to contact the Northwest Territories Water Board at (867) 669-2772. If your question is of a technical nature, please contact the Policy and Assessment Section of the Water Resources Division, Department of Indian Affairs and Northern Development (DIAND) at (867) 669-2658.

Chairman  
Northwest Territories Water Board

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## SECTION 1: APPLICANT INFORMATION

- 1.1 **Applicant:** Aurora Research Institute (ARI), Aurora College  
**Address:** P.O. Box 1450  
Inuvik, NT, X0E 0T0  
Canada
- 1.2 **Project Name:** 2006-2008 Mallik Gas Hydrate Production Research Project  
**Property Name:**  
**Exploration Licence Number:** SDL 060  
**Closest Community (s):** Tuktoyaktuk (~65 km east of the project)  
**Min/Max Latitude of Project Area:** 69°27'38"N  
**Min/Max Longitude of Project Area:** 134°39'42"W
- 1.3 **Primary Company Contact:** Andrew Applejohn  
**Title:** Director, Aurora Research Institute, Aurora college  
**Contact Number:** 867-777-3298 ext.22  
**Alternate Contact Numbers:** 867-777-3298  
**Fax:** 867-777-4264
- 1.4 **Field Contact:** Doug Ashford  
**Title:** Business Development Manager, Inuvialuit Oilfield Services  
**Contact Number:** 403-509-4284  
**Alternate Contact Numbers:** 403-828-1725  
**Fax:** 403-509-4016

\* Based on the project extents, including access requirements

**1.5 List the contractors (ie. Major, sewage, water) that will be involved in the project:**

<b>Company Name:</b>	Akita Equitak Drilling Ltd.
<b>Primary Contact:</b>	Dave Kennedy
<b>Title:</b>	Rig Manager
<b>Contact Number:</b>	867-777-7903 (Inuvik)
<b>Alternate Contact Numbers:</b>	780-917-7774 (Rig)
<b>Fax:</b>	867-777-4963 (Inuvik) / 780-917-7774 (Rig)
<b>Company Name:</b>	Filterboxx Packaged Water Treatment Solutions
<b>Primary Contact:</b>	Kevin Slough
<b>Title:</b>	Engineering Director
<b>Contact Number:</b>	403-203-4747
<b>Alternate Contact Numbers:</b>	780-910-4995
<b>Fax:</b>	403-203-4774
<b>Company Name:</b>	Others yet to be determined

**1.6 List all other permits or authorizations applied for:**

- An Approval from the Environmental Impact Screening Committee (EISC)
- A Land Use Permit from Indian and Northern Affairs Canada (INAC)
- An Authorization to Drill a Well, an Approval to Alter Condition of a Well, a drilling Program Authorization and a Geophysical Operation Authorization from the National Energy Board (NEB)
- A NWT Scientific Research Permit from Aurora Research Institute (ARI)
- A Wildlife Research Permit from the Department of Environment and Natural Resources (ENR)
- A Highway Access Permit from the Department of Transportation (DOT)

## **SECTION 2: PRE-SITE ASSESSMENT**

- 2.1 Please complete the following chart for those items that currently exist in the project area - a snapshot of the area before your project commences. Attach a map depicting all of the indicated items in the project area, as well as the surface drainage patterns and elevation contours.**

Please, see the enclosed 2006-2008 Mallik Gas Hydrate Production Research Project Description (hereafter referred to as the "Project Description") for detailed site assessment. Figure 4-1 of the Project Description provides an overview of the Project area. Figures 4-2 of the Project Description shows Project site contours and surface elevations as well as the proposed layout of drilling operation components with items indicated in Section 2 of this questionnaire.

**SECTION 2: PRE-SITE ASSESSMENT (Continued from previous page)**

	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>	Description
<b>A. well sites</b>			
	<input checked="" type="checkbox"/>		1) The existing Mallik 2L-38 well site. 2) The existing Mallik 3L-38 well site. 3) The existing Mallik 4L-38 well site. 4) The existing Mallik 5L-38 well site
		<input type="checkbox"/>	latitude: 1) 69.45972 2) 69.45905 3) 69.45957 4) 69.45931
		<input type="checkbox"/>	longitude: 1) -134.65847 2) -134.66162 3) -134.66017 4) -134.66088
<b>B. waste dumps</b>	<input type="checkbox"/>		latitude:
	<input type="checkbox"/>		longitude:
<b>C. fuel and chemical storage areas</b>	<input type="checkbox"/>		latitude:
	<input type="checkbox"/>		longitude:
<b>D. sump areas</b>	<input checked="" type="checkbox"/>		1) An existing sump from previous exploration by Imperial Oil (1972), 2) An existing sump from previous exploration by Japex (1998) 3) An existing sump from previous exploration by Japex (2002)
	<input checked="" type="checkbox"/>		latitude: 1) 69.45878 2) 69.45997 3) 69.45981
		<input type="checkbox"/>	longitude: 1) -134.65846 2) -134.65848 3) -134.65720
<b>E. wastewater discharge locations</b>	<input type="checkbox"/>		latitude:
	<input checked="" type="checkbox"/>		longitude:
<b>F. camps</b>	<input type="checkbox"/>		latitude:

No	<input checked="" type="checkbox"/>	longitude:	
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G. transportation routes	Yes	<input type="checkbox"/>	latitude:	
	No	<input checked="" type="checkbox"/>	longitude:	
H. pingos	Yes	<input type="checkbox"/>	latitude:	None identified
	No	<input checked="" type="checkbox"/>	longitude:	
I. staging areas	Yes	<input checked="" type="checkbox"/>	latitude:	69°22'16"N
	No	<input type="checkbox"/>	longitude:	134°53'30"W
J. seismic lines	Yes	<input type="checkbox"/>	latitude:	
	No	<input checked="" type="checkbox"/>	longitude:	
K. parks and/or protected areas	Yes	<input type="checkbox"/>	latitude:	
	No	<input checked="" type="checkbox"/>	longitude:	
L. wildlife management areas	Yes	<input checked="" type="checkbox"/>	latitude:	See Table 9 -1 of Section 9 of the Project Description.
	No	<input type="checkbox"/>	longitude:	
M. bird sanctuaries	Yes	<input type="checkbox"/>	latitude:	Although the KIBS boundary is adjacent to the Project site, the Project activities will not occur in the KIBS.
	No	<input checked="" type="checkbox"/>	longitude:	
N. trap lines	Yes	<input type="checkbox"/>	latitude:	
	No	<input checked="" type="checkbox"/>	longitude:	
O. other	Yes	<input type="checkbox"/>	latitude:	
	No	<input checked="" type="checkbox"/>	longitude:	

## SECTION 3: WATER USE AND WASTE DISPOSAL

### 3.1 Water Use

<b>Maximum quantity per day (m<sup>3</sup>):</b>	400 m <sup>3</sup> Average daily water withdrawal during construction is expected to be approximately 200 m <sup>3</sup> for both Year 1 and Year 2. After construction is completed, daily water requirements will be substantially reduced to support camp and drilling operations. Maximum daily water withdrawal will not exceed 400 m <sup>3</sup> .
<b>Total quantity for project (m<sup>3</sup>):</b>	18,000 m <sup>3</sup>
<b>Planned uses of water:</b>	Construction & maintenance of ice access and drilling ice pad; for use in camps
<b>Operating capacity of the pump:</b>	To be determined
<b>Size of intake screen:</b>	All water intakes will be screened according to <i>DFO Guideline</i> (DFO 1995) to prevent the entrainment of fish
<b>Source of potable water:</b>	Water will be drawn from Harry Channel and the mouth of Swan Channel of the Mackenzie River for camp use. Bottled water for drinking will be brought from Inuvik.

#### 3.1.2 Please provide information for each water source as required by the Department of Fisheries and Oceans: "Protocol for Water Withdrawal for Oil & Gas Activities in the Northwest Territories".

Water will be withdrawn from the Harry Channel and the mouth of Swan Channel of the Mackenzie River for ice road and pad construction, drilling/testing operations and camp use. All water intakes will be screened according to DFO guidelines to prevent the entrainment and entrapment of fish. An access road will be constructed from the Project site to the Swan Channel for exclusive use by a water truck for obtaining water.

Please, see Section 5 and 5.5.1.1 of the attached 2006-2008 Mallik Gas Hydrate Production Research Project Description for details.

### 3.2 Waste Disposal

3.2.1 Will a camp(s) be provided? Yes  No

If yes, indicate the maximum number of people that will be accommodated

Capacity: 120.

An ice pad for the 64-person drilling camp will be used for Year 1. The ice pad for the 48-person testing camp will be used in Year 2. The ice pad for the 36-person sleeper annex will be constructed to accompany the drilling camp in Year 1.

Maximum Accommodated: Maximum 90 at one time

**3.2.2 Will the camp remain in one place for the duration of the project, or move around? Please describe the camp type (e.g. sleigh camp) and attach diagrams of the proposed layout.**

During the construction, a 30-person sleigh camp (about seven 12 m x 4 m units) will be used for ice road/pad construction. The construction crews will be accompanied by fully-equipped, self-contained camp units, portable workshops with generators, and their own fuel and oil supply. The camp units will be moved along with the progression of the ice road and stationed at the Project site during construction of the site ice pads and access roads. For a drilling operation, a stationary rig camp will be used. A 64 person drilling camp (50m x 18 m) will be used in Year 1 and a smaller 48 person testing camp will be used for Year 2. In addition, a 36-person sleeper annex (18 m x 18 m) will accompany the drilling camp in Year 1.

For further details see Figure 4-2 (the proposed layout), Sections 5.5.3 and 5.5.3.3 of the Project Description.

**3.2.3 What is the proposed method of sewage and greywater treatment/disposal?**

Wastewater at the camps will be treated using a Filterboxx system.

**Please describe the treatment process.**

Filterboxx is an extended aeration activated sludge biological wastewater treatment system. A Wastewater is pumped from the collection liftstation to the inlet of the solids separation tank to trap settleable solids, as well as oil and grease. The influent then flows into the equalization tank that attenuates the peak flows and pre-aerates the wastewater. From the equalization tank, the influent is pumped into the aeration tank.

The main treatment will take place in the SF<sup>2</sup>-MBR process aeration tank. The aeration zone will be filled to 60 to 70 percent capacity with FilterBoxx biological growth media retained in the SF<sup>2</sup>-MBR tank by a stainless steel retention screen. The SF<sup>2</sup>-MBR process is an attached growth biological treatment process that uses aerobic (oxygen-using) bacteria to remove organic contaminants through a process of biological oxidation. The air required to meet the oxygen demands of the system and to facilitate the mixing of the mixed liquor-suspended solids is supplied via a central blower system and fine pore bubble diffusers. The influent flows from the aeration zone of the SF<sup>2</sup>-MBR tank to the membrane tank where the final effluent is processed through the Spirasep membranes. The waste rejected by the membranes is continuously recycled to the solids removal tank.

The final treated effluent is drawn through the Sprisep membranes by the permeate/backwash pump and discharged into the permeate compartment of the membrane zone. The permeate is used to periodically backflush the Spirasep membranes via the permeate/backwash pump by reversing the position of the three-way control valves. The process air blower is also used to provide aircour for the membranes. The membranes will undergo a daily flux enhancement cleaning with hypochlorite that is dosed once per day into the backwash stream.

The final effluent overflows from the permeate compartment to the dosing compartment of the membrane tank where it is pumped via the dosing pumps to the final disposal unit. The complete treatment system is skid mounted and installed in an industrial trailer unit complete with lights and heating. The treatment system is ready to operate upon delivery to the site.

**What is the maximum capacity per day (in m<sup>3</sup> and people) of the treatment system?**

- Flow design 18 m<sup>3</sup>/day or maximum 100 people/day

**Please attach a diagram(s) of the treatment system labeling all of the major components.**

Please see attached.

**3.2.4 Describe the manner in which the treated effluent will be disposed/discharged to the environment:**

Upon meeting licensed criteria, treated wastewater will be spread on ice roads as part of the routine access maintenance.

**3.2.5 What other back-up methods are available for sewage and greywater treatment/disposal (i.e. contingency)?**

As a contingency, if treated wastewater does not meet regulatory requirements, sewage and greywater will be contained in vacuum trucks and trucked to Inuvik for disposal.

### 3.2.6 What is the proposed method of solid waste disposal?

Garbage will be contained in bins with heavy lids to keep out wildlife and prevent the scattering of materials by the wind. The camps will use incinerators to burn combustible materials and food wastes on a daily basis. The incinerator ash will be trucked out and disposed of in the Inuvik landfill. A garbage compacting unit will be used to compact all garbage material that cannot be disposed of by a high temperature incinerator. The material will be transported and disposed of at an approved waste disposal facility in Inuvik. The amount of incinerated material will be comparable with similar projects and emissions are not expected to exceed standards for Dioxins, Furans and Mercury, and the incineration methods will comply with Northwest Territories Used Oil and Waste Fuel Management Regulations.

An on-site waste segregation system will be used for metals, plastics, refined oils and oily waste. Separated recyclable materials and plastics will be offered to local communities for recycling and re-use whenever possible.

### 3.2.7 List all hazardous materials that will be used during the project as defined under the *Transportation of Dangerous Goods Regulations*.

During operations, limited quantities of hazardous materials (e.g., oil filters and oily rags—some of the chemicals listed in Appendix D) required by various service companies will be onsite. Limited amounts of glycol, methanol and low-dose hydrate inhibitors<sup>1</sup> will be stored onsite.

### 3.2.8 Fuel storage

Type of Fuel	Amount (L)	Method of Storage/ Containment	Location
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For each year, a fuel storage area will be constructed at the Project site. In Year 1, 70 m<sup>3</sup> capacity tanks will be used to store fuel. The tanks will be placed in a bermed ice pad with a liner to ensure containment in the unlikely event of a fuel spill. In Year 2, Envirotanks will be used. The Envirotanks will be stored on the fuel storage pad without a liner or berm, since they have built-in secondary containment. Refueling will be done by trained personnel following established safety procedures, including the use of drip trays during all fuel transfers. Vehicles used to transport fuel will also be equipped with drip trays and fuel containment equipment including absorbent materials. All employees will be trained in fuel spill prevention as per the Spill Prevention Plan in Appendix A of the Project Description.

A small amount of gasoline will be stored onsite for snowmobiles and emergency vehicles. A small cache of aircraft fuel will be stored at the Project site as well.

### 3.2.9 What is the proposed method of hazardous waste disposal?

MSDS sheets will be maintained onsite for all hazardous materials, and the necessary handling and disposal precautions taken. ARI will have onsite a Spill Prevention Plan (Appendix A).

## SECTION 4: DRILLING PROGRAM INFORMATION

### 4.1 What is the time frame of this project? Will this project be carried out and completed during frozen ground conditions?

*Schedule for 2006 to 2007 Project Activities*

Estimated Time Frame	Project Activity
Late November to early December 2006	Road construction mobilization from Inuvik/ Tuktoyaktuk to Tununuk Point
December 2006 to January 25, 2007	Ice road construction from Tununuk Point to Mallik; construction of site ice pads and access roads
January 25, 2007	Project equipment and crew mobilization from Tuktoyaktuk and Inuvik
January 26 to February 10, 2007	Camp and rig set-up at Project site
February 11 to March 25, 2007	Production well re-entry, completion and production testing
February 24 to March 20, 2007	Monitoring well spudding, drilling and completion
February 15 to 20, 2007	Contingency disposal well re-entry
March 26 to April 15, 2007	All wells suspended, decommissioning, clean-up and inspection; demobilization from land bases sites to Inuvik/Tuktoyaktuk

*Schedule for 2007 to 2008 Project Activities*

Estimated Time Frame	Project Activity
September 2007	Barge staging and equipment storage at staging site; barge demobilization to Inuvik
Late November – Early December 2007	Set up of small camp to house construction crews. Ice road construction from staging site to Mallik; construction of site ice pads and access roads
December 15 – 25, 2007	Project equipment and crew mobilization from staging site; camp and rig set-up at Mallik
December 25, 2007 – March 19, 2008	Completion and production testing on Mallik 2L-38
March 20 – April 15, 2008	Suspend testing, plug and abandon wells, decommissioning, site inspection and clean-up, demobilization to Inuvik/Tuktoyaktuk

### 4.2 Please describe the methods in which equipment will be brought to the project area and provide a list of heavy equipment that will be transported to the site.

All equipment and supplies will be mobilized from Inuvik and Tuktoyaktuk in Year 1 via ice roads. An ice road will be constructed from Tununuk Point to the Project site (Figure 4-1) to bring equipment and supplies to the Project site.

In Year 2, equipment and supplies will be mobilized from Inuvik by barge and offloaded at the staging site on Harry Channel. The ice road will be constructed from the staging site to the Project site. The road construction crew will be demobilized to the staging site and will begin construction of an ice road to

Tununuk Point. Once this ice road is constructed, operations will be intermittently supported by trucks, tractor-trailers and other construction equipment as required. Where possible, ice road access will be shared with other operators.

Please, refer to Section 5.6 of the Project Description for further details – *Equipment and Personnel*

*Equipment List Summary for 2006 to 2007 Operations*

	Construction	Drilling	Testing
Vehicles and related equipment	Pick-up trucks and crew vans	Pick-up trucks and crew vans	Pick-up trucks and crew vans
	1 front end loader	2 wheeled loaders or forklifts	1 wheeled loader or forklift
	4 1-ton auger trucks	Oilfield cement pumper truck and cement	2 crew cabs (for crew transfer)
	1 grader	1 Vacuum truck	2 quads (or similar)
	2 3-ton snowploughs	Rig-moving trucks, trailers and equipment	1 emergency vehicle
	1 D41 Cat	1 emergency vehicle	Miscellaneous other small vehicles
	2 Snow cats	Miscellaneous other small vehicles	
	3 water trucks		
	1 pump house		
	1 service truck		
	1 small fuel truck		
	3 trucks with oilfield floats		
	Miscellaneous other small vehicles		
Miscellaneous Equipment	1 ice profiler	Drilling Rig (Akita/Equiak Rig 62) complete with boilers	Service Rig (Western Oilfield Services Rig #3)
	2 Delta 3's	1 wireline skid unit	Testing equipment (ESP (2), meter runs, flare stack and monitoring house)
		2 70 m <sup>3</sup> fuel storage tanks	3 70 m <sup>3</sup> fuel storage tanks
		2 70 m <sup>3</sup> water storage tanks and pumps	2 70 m <sup>3</sup> water storage tanks and pumps
		200 sea cans	2 boilers
		2 storage silos	
Camp	30-person camp	64-person camp complete with generator, wastewater treatment and waste incinerator systems	64-person camp complete with generator, wastewater treatment and waste incinerator systems
		36-person sleeper annex	36-person sleeper annex
Equipment Rentals	Oilfield service equipment rentals, as required		
Accessory and Support Equipment	6 Trailer Light Poles		
	All accessory and support equipment such as generators, light towers and tanks.		

*Equipment List Summary for 2007 to 2008 Operations*

	Construction	Servicing and Testing
Vehicles and related equipment	Pick-up trucks and crew vans	Pick-up trucks and crew vans
	1 front end loader	1 wheeled loader or forklift
	4 1-ton auger trucks	2 Crew cabs (for crew transfer)
	1 grader	2 quads (or similar)
	2 3-ton snowploughs	1 Vacuum truck
	1 D41 Cat	Rig-moving trucks, trailers and equipment
	2 snow cats	1 emergency vehicle
	3 water trucks	Miscellaneous other small vehicles
	1 pump house	
	1 service truck	
	1 small fuel truck	
	3 trucks with oilfield floats	
	Miscellaneous other small vehicles	
Miscellaneous Equipment	1 ice profiler	Service Rig (Western Oilfield Services Rig #3)
	2 Delta 3's	Testing equipment (ESP (2), meter runs, flare stack and monitoring house)
		1 vibroseis unit
		2 injection pumps
		20 sea cans
		3 Envirotank fuel storage tanks
		2 70 m <sup>3</sup> water storage tanks and pumps
	2 boilers	
Camp	30-person camp	48-person camp complete with generator, wastewater treatment and waste incinerator systems
Equipment Rentals	Oilfield service equipment rentals, as required	
Accessory and Support Equipment	6 Trailer Light Poles	
	All accessory and support equipment such as generators, light towers and tanks.	

**4.3 Describe any access routes and their method of construction. How many streams will be crossed? Will any stream crossings greater than 5 m be required?**

See Figure 4-1 of Project Description for proposed access routes.

No stream crossings are expected. Access over river channels will be constructed by blading and overflooded of the ice surface. The minimum ice thickness to ensure safe passage on all ice roads will be calculated and vehicle movement will proceed only when conditions are verified safe for passage. Channel ice depth will be profiled using electronic (ground penetrating radar) and physical ice profiling. Ice depth will be tested throughout the Project to ensure safe travel. Where conditions allow, ice roads over water will be about 30 m wide. No heavy loads will be moved over the ice roads until late January or early February, after sufficient ice thickness has been achieved to allow safe transit. Maintenance



snow ploughing of all roads as required will ensure reliable ground vehicle access for the duration of the Project.

Water for all ice road and pad construction will be withdrawn from the Mackenzie River (Harry Channel and Swan Channel) and/or treated wastewater will be used (see Section 5.5.5.3). Water will be withdrawn according to applicable guidelines and conditions of the Project Water License for each Project year. Section 5.5.1.1 outlines the water requirements for ice road construction.

The access routes outlined herein are subject to refinement, thus, before the commencement of activities, ENR will be contacted for bear denning site information and a denning survey will be done before Project start-up, so as to avoid interactions with or negative effects on denning bears in the area.

**4.4 Please provide the name, latitude and longitude, and UTM coordinates for all proposed well sites.**

The Project will involve three wells in total: two existing wells (Mallik 2L-38 and 3L-38) and one new well (the monitoring well).

NAME	LAT	LONG	UTM (EASTING)	UTM (NORTHING)
3L-38	69.45905	-134.66162	513250	7705586
2L-38	69.45972	-134.65847	513374	7705662
Proposed Monitoring Well	69.45965	-134.65946	513335	7705654

Please, see the Figures 4-1 and 4-2 for the Project well site locations

**4.5 Indicate the total estimated volume of drilling wastes in cubic metres.**

The Project is estimated to require less than 500 m<sup>3</sup> of drilling fluid. Table 5-4 presents the estimated volumes of mud and drill cuttings produced during the Project.

*Estimated Volumes of Drilling Mud and Cuttings Produced During the Project*

	Drilling Waste Streams	
	Drilling Mud	Drill cuttings
Mallik 2L-38	0 m <sup>3</sup> (drilling mud will be recycled for use on the monitoring well)	70 m <sup>3</sup>
Monitoring Well	250 m <sup>3</sup> (150 m <sup>3</sup> after dewatering)	140 m <sup>3</sup>
Mallik 3L-38	0 m <sup>3</sup>	5 m <sup>3</sup>

**4.6 Indicate methods for the disposal of drilling wastes and attach a management plan.**

- Sump
- Remote Sump
- Down Hole
- On-site Treatment
- Off-site
- Other \_\_\_\_\_

**4.7 What is the capacity in cubic metres of the sump? Attach a drawing to scale of the layout of the proposed sump.**

There will be no construction and/or use of sump in the Project.

**How will the sump berms be protected from erosion?**

N/A

**Provide information on the soil type, permeability and depth of the active layer at the proposed sump location.**

N/A

**How will water used for drilling be recycled/reclaimed?**

A full liquid recovery system will be placed onsite to minimize total waste volume. In Year 1, the drilling fluid from operations on the production well will be used for the drilling of the monitoring well. The drill cuttings will be dewatered using shale shakers and loaded into plastic-lined sea-cans. Drill cuttings will be trucked regularly from the Project site to Inuvik for temporary storage in the Northwest Transport Ltd. yard, and transported to Fort Nelson in the summer. Drilling fluids will be transported in vacuum trucks directly to Fort St. John after the monitoring well is cased.

**What measures are contemplated for surface drainage controls?**

N/A

**What are the planned abandonment procedures for sumps?**

N/A

**4.8 Mud System Type(s): Check all that apply:**

- Gelchem
- Invert
- KCL
- Other \_\_\_\_\_

**Please provide a complete list of all planned drilling mud additives.**

Please, refer to the Appendix D – *Drilling Mud Materials* of the Project Description for the list and details.

**4.9 Indicate any potential for encountering artesian aquifers or lost circulation within the surface hole (to casing depth):**

N/A

**4.10 Describe the surficial geologic and hydrogeologic conditions in the immediate vicinity of the well site.**

The Mallik L-38 site is composed of flat, low-lying deltaic silts, with elevation less than 2 masl (Figure 11-1). It is subject to sedimentation from the Mackenzie Delta. Because of its low-lying coastal position, the Project site is subject to inundation during storm surge events and sea spray during periods of high winds. Permafrost is present at the Project site and extends to more than 600 m depth (Collett, T.S. and Dallimore, S.R. 2002. *Integrated Well Log and Reflection Seismic Analysis of Gas Hydrate Accumulations on Richards Island in the Mackenzie Delta, Northwest Territories., Canada.* CSEG Recorder. October 2002). The Mallik L-38 lease site includes several anthropogenic features related to previous exploration and gas hydrate research projects. These include five wellheads and four sumps. North and east of the L-38 lease are tidal mudflats. These areas will be crossed by winter access roads.

Waterbodies in the Project area include the Middle Channel of the Mackenzie River, Mallik Bay, Harry and Swan Channels, and a number of smaller streams and lakes. Mallik Bay is a coastal embayment on Richards Island, located in the outer Mackenzie River Delta. Harry and Swan Channels are outer channels in a fluvial plain environment and are part of the Mackenzie River. The area also has a high abundance of thermokarst lakes that are generally shallow (although some exceed 10 m in depth). Large tidal flats also occur. Mallik Bay and the nearshore Beaufort Sea areas for more than 2 km north from the Mallik L-38 site are generally shallow and largely freeze to the bottom in winter. Deeper areas of Mallik Bay are not groundfast and provide over-wintering fish habitat. During winter, shallow ponds, lakes and streams in the vicinity of the Mallik L-38 are also likely to freeze to the bottom.

For more detailed description of geologic and hydrogeologic conditions in the vicinity of the well site can be found in Sections 11.1 - *Terrain Description* and 11.3 *Hydrology and Water Quality* of the Project Description.

**SECTION 5: CONTINGENCY, ABANDONMENT AND RESTORATION PLANNING**

**5.1 Attach the proposed or existing contingency plan which describes course of action, mitigative measures and equipment available for use in the event**

**of system failures and spills of hazardous materials (in compliance with NWT Water Board Guidelines for Contingency Planning, 1987).**

In the event of an emergency or spill, ARI's Emergency Response Plan (See the attached ERP) and Spill Prevention Plan (Appendix A) for the Project will be followed.

**5.2 Outline the planned abandonment and restoration procedures.**

Following the 2006 to 2007 operations, the three wells will be suspended and two small shacks will remain to house the surface cable ends of the monitoring equipment. Wellheads will be marked and protected following National Energy Board (NEB) regulations.

Following the 2007 to 2008 operations, the three wells will be plugged and abandoned as per NEB regulations. The wells will be capped below ground level.

Upon completion of the Project, the well site, camp areas, fuel and sea-cans storage areas will be inspected for hydrocarbon spills as equipment is removed from the site. All contaminated ice and snow will be trucked to an approved disposal site. Areas of potential impacts will be inspected, documented, reported and photographed for further assessment and clean-up as necessary. All equipment (including the wellheads and shacks), survey stakes and construction debris associated with the operations will be removed upon completion of operations in 2007 to 2008. All materials will be removed from onshore areas by the end of the Project. No equipment or infrastructure will remain at the Project site upon completion of Project activities in April 2008.

Demobilization of all equipment and supplies will be facilitated by truck via the ice road to Tuktoyaktuk, Inuvik and Alberta.

A helicopter and small crew will visit the Project site to inspect the site and monitoring equipment three to five times during the summer 2007. In summer 2008, a helicopter and small crew will complete a final site inspection of the Project site.

## SECTION 6: ENVIRONMENTAL ASSESSMENT AND SCREENING

### 6.1 Has this project ever undergone an initial environmental assessment, including previous owners? If yes, by whom/when:

Portions of the Project were previously submitted to the EISC in March 2006 by IEG Environmental (IEG) on behalf of Canadian Petroleum Engineering Inc. (submission # 03/06-04). Geophysical and subsurface Environmental Site Investigation on the sumps in Mallik L-38 site has been conducted by Kiggiak-EBA Consulting Ltd. in November 2005 and included in the previous EISC submission (submission # 03/06-04) by IEG (February 2006). The current submission of the Project Description is redesigned after the previous EISC screening.

### 6.2 What baseline data has been collected for the water bodies you intend to cross, do seismic in, or draw water from in the area? Please attach data.

See Section 11.3 and 11.4 of the Project Description.

### 6.3 What baseline data has been collected and evaluated with respect to the biophysical components of the environment potentially affected by the project (wildlife, soils, air quality, etc.)? Please attach data.

Swan Channel has been used as a water source for past drilling operations at the site. See Section 11 and Section 12.3 of the Project Description for further details.

### 6.4 What community consultation has been done in regards to this project? Provide details of the program.

Community consultation on the proposed Project was conducted from July 17 to July 20, 2006 in Inuvik, Aklavik and Tuktoyaktuk respectively. Community representatives and local organizations were invited to the consultations. Public notification of the Inuvik open house was posted in public locations and faxed to community representatives, local organizations and government agencies before the meeting. At the meetings, newsletters containing a brief project description, time frame, detailed location map of the proposed Project were provided to the attendees. Contact information was also provided in the newsletters for the community members to provide additional feedback and place inquiries. During the meetings, Douglas Ashford (Inuvialuit Oilfield Services) provided an overview presentation of the Project. Individuals representing the project participants including ARI, JOGMEC, NRCan, Inuvialuit Oilfield Services and Kavik-AXYS have attended each meeting.

Table 10-2 in Section 10 of the Project Description summarizes the issues raised during the consultations and the corresponding responses and lists sections where these concerns have been addressed in this document. Complete community consultation results can be found in Appendix H of the enclosed Project Description.

Please refer to the Section 10 – *Community Consultation* of the Project Description for further details.

### 6.5 Please provide the following information:

- a) **description of the environment (including known historic sites, results of any archeological assessments, location of survey monuments, wildlife, waterbodies, etc.)**

See Sections 9 and 11 of the Project Description.

- b) **potential environmental impacts (including cumulative and socio-economic effects)**

See Sections 12 and 13 of the Project Description.

- c) **proposed mitigation to potential environmental impacts.**

See Sections 12 and 13 of the Project Description.

- d) **any follow-up or monitoring programs to be implemented to verify effectiveness of mitigation measures.**

Upon completion of the Project, a helicopter and small crew will visit the Project site to inspect the site and monitoring equipment three to five times during the summer 2007. In summer 2008, a helicopter and small crew will complete a final site inspection of the Project site.

See Sections 5.5.6 and 5.5.7 of the Project Description for final decommissioning, clean-up and disposal at the Project site – *Development Summary*.

## SECTION 7: LIST OF ATTACHMENTS

The following is the list of attachments with this application.

Reference to Question #	Title	Page / Section Number
3.2.3	Diagram of FilterBoxx Treatment System	Enclosed (1 copy)
5.1	Emergency Response Plan	Enclosed (1 copy)
6.1	Geophysical and Subsurface Environmental Investigation 2005, JOCMEG Mallik L-38 Site – Kiggiak-EBA	Enclosed (1 copy and 1 digital copy)
	2006-2008 Mallik Gas Hydrate Production Research Project Description	Enclosed (25 copies and 1 digital copy)

The following references to the listed questions are described in the enclosed 2006-2008 Mallik Gas Hydrate Production Research Project Description.

Reference to Question #	Title	Page / Section Number
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2.1	Project Description	Page 4-1, Figures 4-1; Page 4-2 Figure 4-2
2.1 Table	Project Description	Page 9-1, Table 9-1
3.2.2	Project Description	Page 5-11, Section 5.5.3; Page 5-13, Section 5.5.3.3; Page 4-2 Figure 4-2
3.2.9	Project Description	Appendix A; Appendix D
4.3	Project Description	Page 4-1, Figures 4-1; Page 5-20, Section 5.5.5.3; Page 5-6 Section 5.5.1.1
4.10	Project Description	Page 11-2, Figure 11-1; Pages 11-1 to 11-2, Section 11.1; Pages 11-4 to 11-5, Section 11.3
5.1	Project Description	Appendix A
6.2	Project Description	Pages 11-4 to 11-5, Section 11.3 ; Pages 11-5 to 11-6, Section 11.4
6.3	Project Description	Pages 11-1 to 11-10, Section 11; Pages 12-1 to 12-4, Section 12.3
6.4	Project Description	Pages 11-1 to 11-4, Section 10; Appendix H
6.5 a)	Project Description	Pages 12-1 to 12-4, Section 12.3
6.5 b)	Project Description	Pages 9-1 to 9-4, Section 9; Pages 11-1 to 11-10, Section 11
6.5 c)	Project Description	Pages 12-1 to 12-14, Section 12; Pages 13-1 to 13-5, Section 13
6.5 d)	Project Description	Page 5-22, Sections 5.5.6 and 5.5.7