PROJECT DESCRIPTION
FOR THE PROPOSED SHELL CANADA LTD.
WINTER 2001/2002 AKLAVIK 2D SEISMIC PROGRAM
WATER LICENSE APPLICATION

Prepared for:

Shell Canada Ltd.
Calgary, Alberta

Prepared by:

Inuvialuit Environmental & Geotechnical Inc.

Calgary, Alberta and Inuvik, Northwest Territories

August 2001
Project #5026-01

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FOR THE PROPOSED SHELL CANADA LTD.
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400-4th Avenue S.W.
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DISTRIBUTION:

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30 Copies	Indian and Northern Affairs Canada Inuvik, Northwest Territories
20 Copies	NWT Water Board Yellowknife, Northwest Territories
4 Copies	Inuvialuit Environmental Inc. Calgary, Alberta Inuvik, Northwest Territories

EXECUTIVE SUMMARY

Shell Canada Ltd. (Shell) is applying for a water licence in support of their winter 2001/2002 2D seismic program within the Mackenzie River Delta region of the Northwest Territories. The proposed project entails withdrawal of water from channels of the Mackenzie River for the purpose of supplying water for use at a sleigh camp in the project area and for preparing access on the 2D seismic program. This project description has been prepared solely for the purpose of obtaining a water licence for the seismic program. This project description has not been prepared to seek approval for the seismic program itself. The proposed seismic program is located within Exploration Licence #403, and extends onto Langley Island and Inuvialuit 7(1)(a) lands. The sleigh camp will be located within the 2D project area in EL 403 and will not enter 7(1)(a) lands. Pending regulatory approval, road construction for Shell's seismic program will commence in December 2001.

Inuvialuit Environmental & Geotechnical Inc. (IEG) has been commissioned by Shell to prepare this project description for the proposed Winter 2001/2002 Seismic Acquisition Program Water Licence. The project description has been prepared to meet the requirements of the NWT Water Board and Indian and Northern Affairs Canada (INAC) and to fulfill the Operating Guidelines and Procedures of the Environmental Impact Screening Committee (EISC).

The proposed locations of the sleigh camp are in a delta environment. The topography in the project area is flat to gently rolling. Vegetation in the area is limited mainly to grasses, shrubs and willows up to approximately 2.5 m tall. Some small coniferous stands are found in the southern portion of the program area.

Potential environmental impacts to water resources that result from water withdrawal for the operation of the sleigh camp include: drawdown of waterbodies, accidental spills of fuel, and discharge of treated wastewater. Protection measures designed to mitigate the potential impacts are presented in this Project Description in Table 10. No significant residual impacts are identified. Shell and their contractors are committed to following these measures in order to minimize the risk of potential environmental impacts.

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1.0 CONTACT NAME AND ADDRESS

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2.0 REGULATORY APPROVALS

Shell Canada Ltd. (Shell) is applying to withdraw water from channels of the Mackenzie River for a sleigh camp and access preparation in their 2D seismic program area in the Mackenzie Delta in the Northwest Territories (Figure 1). The proposed sleigh camp will be located on Crown Lands in the Inuvialuit Settlement Region (ISR) and therefore falls under Territorial and Inuvialuit environmental regulatory jurisdiction. The primary regulatory agency with jurisdiction over the water withdrawal associated with the seismic program is the NWT Water Board in regard to Water License requirements. Indian and Northern Affairs Canada (INAC), the Inuvialuit Land Administration (ILA), and the National Energy Board (NEB) are the primary agencies with jurisdiction in regard to project approvals for the accompanying seismic program. A Canadian Wildlife Service Permit will be required for operations in the Kendall Island Bird Sanctuary. The application for seismic activities will be submitted as a separate project description in September 2001.

Other agencies with regulatory interest in the approval process include: Fisheries and Oceans Canada (DFO) with reference to potential effects on fish and fish habitat; the Government of the Northwest Territories (GNWT) Resources, Wildlife and Economic Development (RWED), regarding wildlife and associated habitat; the Prince of Wales Northern Heritage Centre (PWNHC) for an archaeological and historical resources review and Environment Canada (EC) in regard to pollution prevention.

The Environmental Impact Screening Committee (EISC) is an advisory committee responsible for screening all proposed projects on Crown Land. When a screening occurs, the EISCs responsibilities are set out in clause 11(13) of the Inuvialuit Final Agreement (IFA), which reads:

> 11(13). On receipt of a project description, the Screening Committee shall expeditiously determine if the proposed development could have a significant

negative environmental impact and shall indicate in writing to the government authority competent to authorize the development that, in its view:

(a) the development will have no such significant negative impact and may proceed without environmental impact assessment and review under this Agreement;

(b) the development could have significant negative impact and is subject to assessment and review under this Agreement; or

(c) the development proposal has deficiencies of a nature that warrant a termination of its consideration and the submission of another project description.

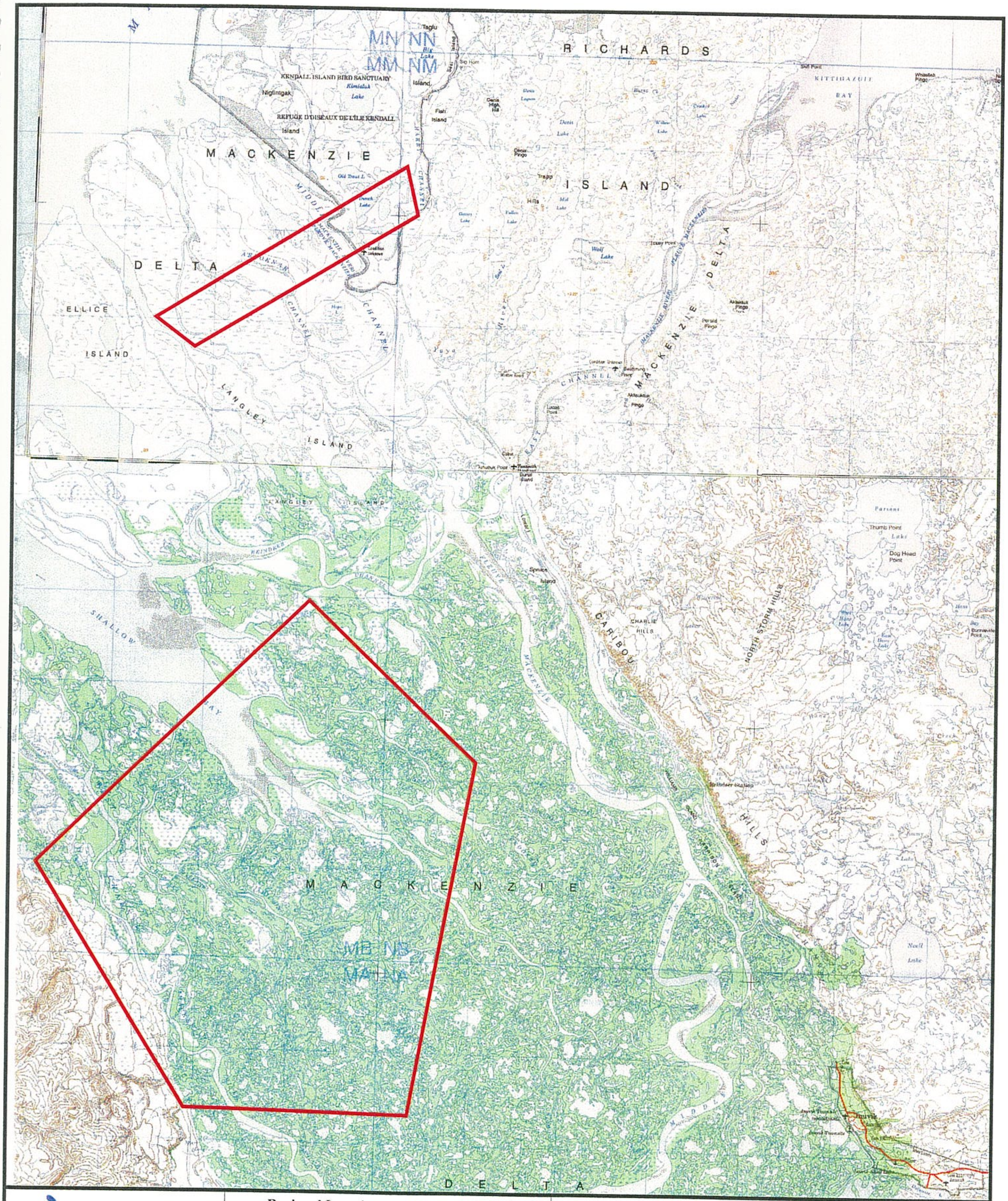
Should the EISC determine that the project may have a significant negative impact, the Project Description will be referred to the Environmental Impact Review Board (EIRB) or other equivalent environmental review process for a public assessment and review pursuant to clause 11(24).

Approvals required for this project are summarized in Table 1. Shell will contact the agencies listed as appropriate, and will satisfy any requirements they may have in their respective areas of jurisdiction.

TABLE 1

REGULATORY APPROVALS

Agency	Approval Required *Governing Legislation*	Status
Linda Graf Secretary Environmental Impact Screening Committee P.O. Box 2120 Inuvik, NT X0E 0T0	Approval of Project Description *Inuvialuit Final Agreement*	Submitted by August 27, 2001
Gordon Wray Chairman Northwest Territories Water Board 4920 – 52nd Street P.O. Box 1500 Yellowknife, NT X1A 2R3	Class B Water Licence *NWT Waters Act* *NWT Waters Regulations*	Submitted by August 27, 2001



Inuvialuit Environmental & Geotechnical Inc.

Regional Location of Shell Canada Ltd. Winter 2001/2002 Seismic Program

0 2 4 6 8 10 15 20
Kilometres

Sources: Topographic Map of Mackenzie Delta, NWT 107C and Aklavik, NWT 107B

LEGEND

General Location of Seismic Program

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Figure 1

3.0 TITLE

Shell Canada Ltd. Winter 2001/2002 Aklavik 2D Seismic Program Water Licence Application

4.0 DEVELOPMENT SUMMARY

4.1 Project Scope

Shell proposes to utilize a sleigh camp to support their winter 2001/2002 2D seismic operations in the Mackenzie Delta. Shell is applying to withdraw water from channels of the Mackenzie River to support camp operations and access preparation for the seismic program. Water will be required at the camp for cooking, cleaning, and sanitary purposes. Water will be treated with a Filterboxx water treatment system prior to discharge from the sleigh camp. Pending regulatory approval, seismic operations will begin in December 2001 and are anticipated to be complete by late April 2002. Shell will also be occupying the Arctic Star barge camp to support seismic operations. The Arctic Star will be located on Napoiak Channel. Shell holds a Water Licence for the Arctic Star that is valid for this operating season. Shell will apply for an amendment to that water licence due to the location change. The water licence for the sleigh camp is a separate application.

4.2 Camp Details

Arctic Oil and Gas Services Inc. has been contracted to provide the sleigh camp to Shell for their seismic program. The camp will be assembled and towed in three strings of five or six trailers each and transported to locations throughout the program area by a front-end loader or a Delta 3. Transport will occur on frozen channels of the Mackenzie River. The camp location is expected to be adjacent to the location of the Arctic Star barge camp but will potentially move to two other locations in the proposed program area as a contingency (Figure 2). The following coordinates denote the potential locations for the camp within the proposed program area:

TABLE 2

CAMP LOCATIONS

Sleigh Camp Locations	Longitude	Latitude
Location 1 (Arctic Star)	68° 39' 00" N	134° 55' 40" W
Location 2	68° 28' 38" N	135° 33' 27" W
Location 3	68° 33' 31" N	135° 18' 47" W

The sleigh camp will be located on frozen channels of the Mackenzie River. The camp will not be located on land, unless ice thickness is insufficient to support the camp on channels. Should this situation arise, INAC will be informed of proposed locations prior to camp move.

Maximum occupancy of the camp is 60 people. The camp is expected to accommodate approximately 50 people from January 1, 2002 to April 30, 2002.

4.3 Water Withdrawal

Water will be pumped directly from channels of the Mackenzie River for treatment in the camp's water treatment plant. The Filterboxx system will treat fresh water withdrawn from the Mackenzie River with a combination of filtering and ultraviolet treatment. The expected water requirements are 190 litres per person per day. At a 60 person capacity, the maximum occupancy of the camp, the requirement for treated water would be 11,400 litres per day (11 m^3).

Shell anticipates the use of less than 75 m^3 of water per day during access construction activities. Water for this purpose will be withdrawn at points throughout the seismic program area. Total water usage will not exceed 100 m^3 per day for all combined activities on the seismic program.

Intakes used for withdrawing water will be fitted with screens to prevent the entrainment or impingement of fish. Shell will comply with DFO's *Freshwater Intake End of Pipe Fish Screen Guideline (1995)* when selecting a screen size appropriate to the size of the pump.

4.4 Wastewater Treatment and Disposal

The proposed wastewater treatment equipment that will be installed at the sleigh camp has been designed to accept and treat the total daily volume of raw camp wastewater (black and grey water) from an industrial camp having a resident capacity of not more than 60 individuals along with the associated bathroom and kitchen facilities.

The proposed equipment is designed to meet government-regulated guidelines for wastewater discharge within the Northwest Territories as outlined in the *Guidelines for the Discharge of Treated Municipal Wastewater in the Northwest Territories*. Treated effluent will be discharged to channels of the Mackenzie River. The effluent will have a Biological Oxygen Demand (BOD) less than 80 mg/L, Total Suspended Solids (TSS) less than 100 mg/L and fecal coliform concentrations less than 10E4 CFU (Colony Forming Unit)/dL. These guidelines are specific to discharge of treated effluent to a river or stream where the dilution ration is greater than 100:1 and less than 1000:1.

4.4.1 Equipment and Process Description

The sleigh camp will be equipped with a Filterboxx™ physical treatment snow fluent treatment system. The system will be designed to accept an average flow rate capacity of 12 m^3 of wastewater per day. Average influent values are expected to be 300 mg/L TSS and 400 mg/L. The system will consist of the following components:

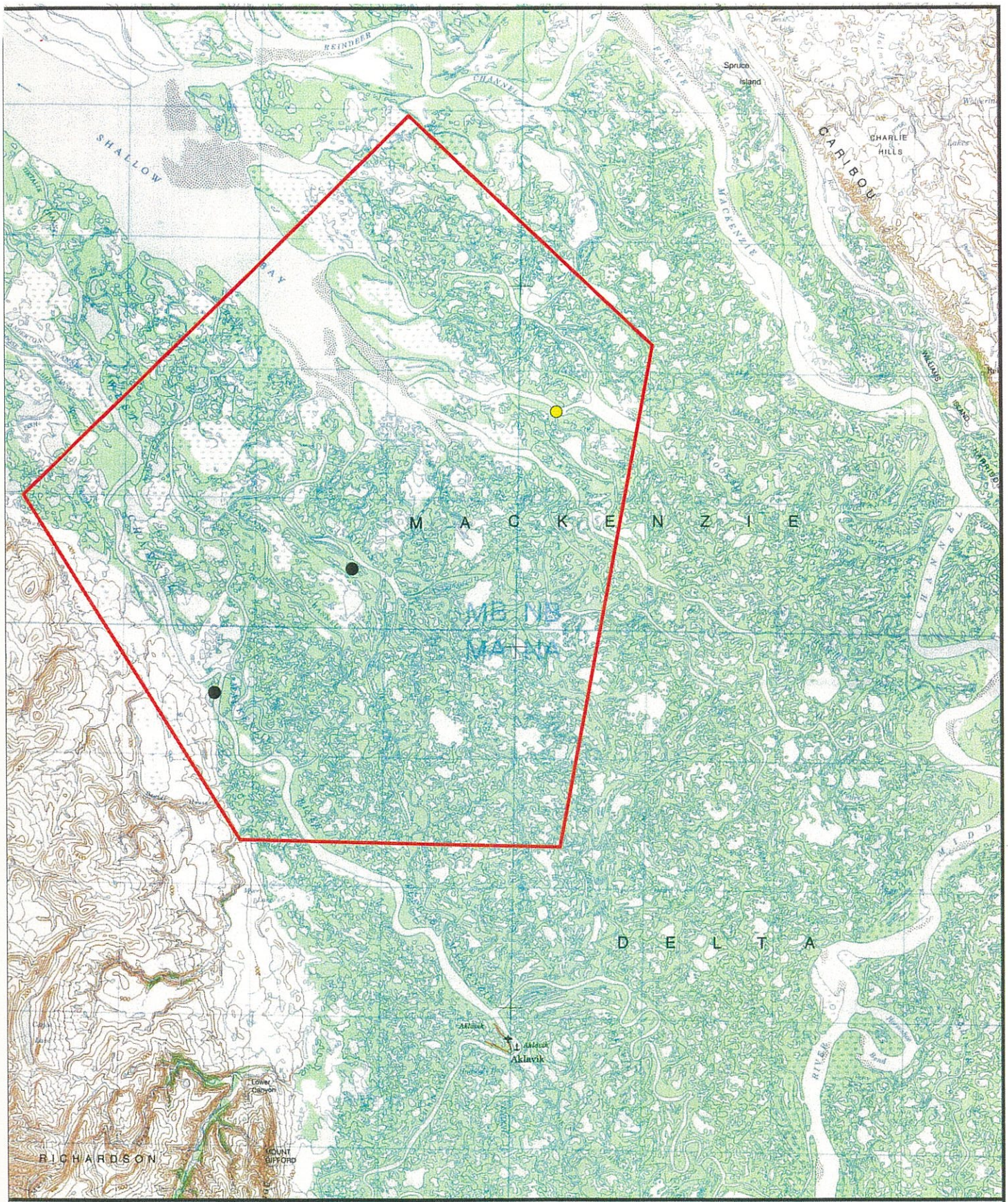
- 1 Filterboxx™ 36"-wide static screen with 3 mm pore size.
- 1 Equalization Tank
- 1 Grinder pump.
- 1 Static flow mixer with chemical dosing pump.
- 1 Pressurized clarifier
- 6 Carbon filter cartridges
- 1 Treated effluent retention tank
- 1 Leitner snowmaking snowgun
- Sludge handling and screening bins and bags for sludge disposal.

The Filterboxx system is a commercial-grade engineered system designed to handle the unique requirements of a mobile sleigh camp in an Arctic environment. The wastewater is treated with a physical treatment system and then converted to snow for disposal.

The raw sewage is pumped from the camp to the head works where large solids are removed with a 3 mm static screen. The screened solids are dropped into a storage bin. The screened sewage is gravity-flowed to the equalization tank. From there, the screened sewage is pumped with a grinder pump to a static flow mixer where a polymer is added. The sewage is then placed under pressure in a chemical retention tank where solids are separated and the water is clarified. The clean water is pressured to the surface and is drawn off. The sludge remaining at the bottom of the tank is removed with a sludge blowdown valve, and is sent to the sludge screening bin at the head works. The clarified water is sent under pressure to carbon filters for polishing and BOD reduction. The final treated water is placed into a retention tank from which it will be drawn to the snow-making system. The snow making process atomizes the treated water and sprays it into the atmosphere. The crystallization process during freezing kills any remaining bacteria in the treated water. It is expected that removal of solids from the system will be necessary approximately once every two weeks.

4.5 Fuel Storage

Two fuel sloops will be located at the sleigh camp. Each sloop consists of 2 x 83,280 litre (22,000 gal) tanks for a total capacity of 333,120 litres (88,000 gal). The tanks will be double walled and the sloops will be bermed to provide containment of 110% of the tank capacity.



Inuvialuit Environmental & Geotechnical Inc.

Regional Location of Shell Canada Ltd.
Winter 2001/2002 Seismic Program

0 2 4 6 8 10 15 20
Kilometres

Sources: Topographic Map of Aklavik, NWT 107B

Legend

- General Location of Seismic Program
- Camp Locations
- Arctic Star Barge Camp

N
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5026-01

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Figure 2

5.0 ALTERNATIVES AND CONTINGENCIES

Should the water treatment system not meet criteria for discharge of treated wastewater, Shell will be prepared to truck the wastewater to Inuvik for disposal. Shell anticipates locating the sleigh camp adjacent to the Arctic Star barge camp. Other locations will be used as contingencies, depending on weather and ice conditions. If waterbodies do not freeze sufficiently to support the sleigh camp, alternate land locations will be selected and provided to INAC and the NWT Water Board.

6.0 CUMULATIVE EFFECTS

Cumulative effects refers to impacts that result from past, existing and imminent projects and activities. This broad interpretation of cumulative effects under the *Canadian Environmental Assessment Act* includes both environmental and socio-economic considerations. The socio-economic interactions are more fully discussed in Section 8.0 Traditional and Other Land Uses. The causal agents of cumulative effects may include several causes, multiple effects, effects of activities in more than one locale and recurring events. The bounding for the cumulative effects assessment has been adapted to address spatial and temporal overlap of impacts of previous, current and imminent activities within, and in the vicinity of, the proposed program.

As an initial assessment of the cumulative effects associated with the Shell 2D seismic program, the study area was based upon the subregional footprint of effects of the proposed seismic program of approximately 400 linear kilometres. This program is currently scheduled to occur in Shallow Bay/Kendall Island between December 2001 and April 2002. The significance, extent, duration, magnitude, and residual effects criteria used in this section are defined in Section 12.0, Proposed Mitigation and Anticipated Environmental Impacts.

Approved activities occurring or completed within the vicinity of the Shell's proposed program include: a biophysical inventory for the Producers Group (Exxon Mobil, Imperial Oil Resources, Shell Canada Ltd., and Gulf Canada Resources Ltd.) and a biophysical and heritage inventory for the Operators Group (AEC West Ltd., Anderson Resources Ltd. BP Canada Energy Company, Burlington Resources Canada Energy Ltd., Chevron Canada Resources, Gulf Canada Resources Ltd. (now Conoco Canada Ltd.,), Petro-Canada, and Shell Canada Ltd.) as well as the Cape Bathurst Caribou Habitat Use and Grizzly Bear Denning studies that are being conducted by RWED. A short term aquatics study for the Operators Group is also currently being reviewed for possible implementation early this fall. The field seasons for the biophysical, heritage, aquatics and grizzly bear studies will be completed before the proposed program is set to begin.

The Petro-Canada quarry and the airstrip and lease expansion for AOGS at Swimming Point are approved and ongoing. Shell's West Channel Remediation Program is expected to be complete before the proposed program begins. Additional oil and gas activities will take place in the vicinity of the sleigh camp locations during winter 2001/2002.

Proposed programs currently before the EISC or in the planning stages include: the seismic programs for AEC, Anderson, Chevron, Gulf (Conoco), and Petro-Canada; the drilling programs of Anderson and Petro-Canada, and the research activities of the Operators Group. Spatial and/or temporal overlap of the projects identified above is summarized in Table 3.

AEC, Anadarko, Anderson, AOGS, Chevron, Conoco, ExplorData, and Petro-Canada are all expected to seek approvals for projects within the next year. The scope and timeline for these projects and their contribution to cumulative effects cannot be determined at this time.

TABLE 3

OTHER CURRENT AND IMMINENT LAND USE ACTIVITIES WITHIN THE PROJECT VICINITY

Proponent	Activity	Distance from Project Area* (km)	% Overlap of Shell's 2D	Temporal Overlap (Y/N)	Duration	Areal Extent	Magnitude of Cumulative Effect
Current Projects							
Operators Group	Biophysical/ Heritage Inventory	0	< 1%	N	Summer 2001 – Fall 2001 Short Term	Subregional	Low
Operators Group	Aquatics Study	6	0 %	N	Fall 2001 Short Term	Subregional	Low
Producers Group	Biophysical Inventory	0	3 %	N	Summer 2001- Summer 2002 Medium term	Subregional	Low
Japex	Drilling Program	24	0 %	Y	Winter 2001/2002 Short term	Subregional	Low
RWED	Grizzly Bear Denning Study	0	< 1%	N	Spring 2001 Short term	Subregional	Low
RWED	Cape Bathurst Caribou Herd Satellite Tagging Program	28	0 %	Y	Year-round, Multi-year Fall 2001 – Winter 2004 Medium Term	Subregional	Low
Shell	West Channel Remediation	0	100 %	N	Summer 2001 Short term	Local	Low

Table 2 Cont'd

Proponent	Activity	Distance from Project Area* (km)	% Overlap of Shell's 2D	Temporal Overlap (Y/N)	Duration	Areal Extent	Magnitude of Cumulative Effect
Imminent Projects							
AEC	Burnt Lake 2D Seismic	16	0 %	Y	Winter 2001/2002 Short term	Subregional	Low
Anderson	Drilling	74	0 %	Y	Winter 2001/2002 Short term	Subregional	Low-moderate
Anderson	3D Seismic	79	0 %	Y	Winter 2001/2002 Short term	Subregional	Low
AOGS	Lease Extension and Airstrip Expansion	26	0 %	N	Fall 2001 Medium-Long term	Subregional	Moderate
Chevron	Ellice, Langley Mallik 3D Seismic	1	0 %	Y	Winter 2001/2002 Short term	Subregional	Low
Chevron	Tumma, Inuvik 2D, Ogruknang	<1	0 %	Y	Winter 2001/2002 Short term	Subregional	Low
Conoco	3D Seismic	39	0 %	Y	Winter 2001/2002 Short term	Subregional	Low
Petro-Canada	Quarry	26	0 %	N	Fall 2001 Short term	Local	Moderate
Petro-Canada	Nuna 3D Seismic	53	0 %	Y	Winter 2001/2002 Short term	Subregional	Low-moderate
Petro-Canada	Kurk/Kugpik Drilling	0	<1%	Y	Winter 2001/2002 Short term	Subregional	Low-moderate
Petro-Canada	Napartok/Kurk Drilling	0	<1%	Y	Winter 2001/2002 Short term	Subregional	Low-moderate

* Distance from project area at nearest point.

The following discussion of cumulative effects is designed solely for issues of consideration for the water licence. A complete cumulative effects assessment will be provided in the project description for the seismic program to be submitted in September 2001.

The incremental increase of impacts of Shell's proposed seismic program in combination with other projects in the study area will likely be restricted to: minor drawdown of waterbodies; increased traffic levels; and minor alteration of vegetation related to walking down and compaction of the vegetation layer by the ice roads. The cumulative effects to water are considered to be local and short-term in nature given the water regime in the region. However increases in exploration activity in the region are associated with increased water requirements.

Traditional land use activities are anticipated to be ongoing during Shell's operations. Access to traditional use areas for goose hunts and popular fishing locations from Inuvik and Aklavik are likely to be overland due to the shorter distance for travel. This routing would traverse this and neighbouring programs currently under review and is likely to use the same routes as those to be created for seismic operations. To mitigate cumulative effects relating to land use conflict in traditional use areas, Shell is working with local communities and Hunters and Trappers Committees, to identify sensitive areas and times to minimize or avoid activities. Special management areas and locations of harvested species habitats with respect to the proposed project area are discussed in Section 8.0, Traditional and Other Uses.

Discussions regarding Cumulative Effects Assessment have been initiated with the Joint Secretariat and industry representatives, on how to best quantify the cumulative impacts of development within the Mackenzie River Delta on a regional scale over a longer time frame. The EIRB and EISC are cooperating with Kavik Axys Ltd. to prepare guidelines for quantitatively assessing cumulative effects (Chernoff Pers. Comm.). Workshops to provide guidance on the application of the guidelines are planned for this fall. The workshops, coupled with the biophysical inventory, will help to build the capacity for quantitatively assessing ecosystem quality and the effects of oil and gas activities.

Residual cumulative effects from this project are predicted to be low in magnitude and local in extent. If seismic results are positive, future operations within the project vicinity may include more seismic exploration, exploratory well sites and eventually, development of oil resources. Future development will be planned with consideration of environmental impacts and appropriate mitigative measures.

7.0 LOCATION

The proposed sleigh camp locations are located on Crown lands in the Mackenzie Delta region of the Northwest Territories between 68° 28' 38" and 68° 39' 00" N and 134° 55' 40" and 135° 33' 27" W. The southern boundary of the project area is located approximately 15 km north of Aklavik in EL #403.

8.0 TRADITIONAL AND OTHER LAND USES

Land use in the region includes subsistence trapping, hunting and fishing as well as nature, adventure and eco- tourism. The proposed Shell Canada Limited 2D winter seismic program falls within the Aklavik, Inuvik, and Tuktoyaktuk Conservation Planning Areas as defined by the respective Community Conservation Plans (AICCP, IICCP, and TCCP 2000). The Plans

identify two categories of lands designated Management Category C and D that coincide with Shell's proposed project area (AICCP, IICCP, and TCCP 2000). These categories are:

> Category C: Lands and waters where cultural or renewable resources are of significance and sensitivity at particular times of year, and are to be managed so as to guarantee the conservation of these resources.
>
> Category D: Lands and waters where cultural or renewable resources are of significance and sensitivity throughout the year, and are to be managed so as to guarantee the conservation of these resources.

The proposed sleigh camp locations lie within, or adjacent to, five Special Management Areas. The location of these areas is outlined in Table 4, and their significance is discussed below. Mitigative measures are discussed in Section 12.0, Proposed Mitigation and Anticipated Environmental Impacts.

TABLE 4

SPECIAL MANAGEMENT AREAS SURROUNDING OR NEAR THE PROPOSED PROJECT

Special Management Area and Protective Status Category	Name	Location Description	Location with Respect to Proposed Project
312C	Fall Goose Harvesting Areas	All of the coastline from the Yukon/Alaska border in the west, to the Mason River in the east, including sites on the Anderson River and Crossley Lakes.	Surrounds northern program and the northern tip of the southern part of the program.
715C	Mackenzie River Delta Key Migratory Bird Habitat	Mackenzie River Delta, including Shallow Bay, Olivier and Ellice Islands, Pelly Island, and part of Richards Island.	Surrounds proposed project area.
716C	Mackenzie Bay and Shallow Bay	Mackenzie Bay and Shallow Bay.	Overlaps with southern portion of the project area.
718D	Central Mackenzie Estuary	Lands and waters defined by the eastern edge of Mackenzie Bay, bordered to the south by Reindeer Channel, with the eastern border as Main Channel, with an extension along the East Channel.	Overlaps with northern portion of project area.
719C	Inner Mackenzie Delta	The boundary is marked by the western edge of the Mackenzie Delta, along Shallow Bay, with the northern border being Reindeer Channel, the eastern border being East Channel, and the southern border being the ISR boundary line.	Overlaps with southern portion of project area.

*Adapted from AICCP, IICCP, and TCCP 2000

The proposed project area is habitat for several wildlife species. The region provides key breeding and nesting habitat for birds from May through September (Site No. 715C) (AICCP, IICCP, and TCCP 2000). The Mackenzie and Shallow Bays (Site No. 716C) are also an overwintering habitat for anadromous coregonids, a feeding and nursery area for young fish, and a concentration area for belugas from late June to early August. The Central Mackenzie Estuary (Site No. 718D) provides a transit area between Shallow and Kugmallit Bays that is used extensively by feeding anadromous coregonids, for overwintering and nursing areas for many fish and as a concentrating area for belugas (TCCP 2000). The Inner Mackenzie Delta (Site No. 719C) provides habitat for fish spawning, feeding, nursery, and overwintering habitat throughout the Delta (AICCP, IICCP, and TCCP 2000). In particular, the Peel, East, Husky, and West channels are important migration and spawning areas for numerous fish species (AICCP, IICCP, and TCCP 2000). The waters of the Mackenzie Delta are listed as important habitat for eight fish species (AICCP, IICCP, and TCCP 2000).

Shell's proposed project coincides with important subsistence use areas. Fall goose harvesting areas (Site Nos. 312C) occur within Shell's proposed program area.

Assessing the level and permanency of the impacts of the proposed project is made difficult by the lack of comprehensive analysis to show the intensity of traditional harvesting of various species, by season and by location. The Joint Secretariat has data for Harvest Studies conducted throughout the area and would like to analyze the available data to determine the intensity of traditional harvesting but the continued uncertainty regarding the future of the Harvest Study has delayed further analyses (Slack pers. comm.).

The Shell seismic program will be conducted during the winter months, minimizing impacts to fish and seasonally abundant wildlife. Shell will work with local Hunters and Trappers Committees in order to make individuals aware of ongoing exploration activities that may impact their traditional activities.

9.0 DEVELOPMENT TIMETABLE

TABLE 5

DEVELOPMENT SCHEDULE

PROJECT ACTIVITY	ESTIMATED TIME FRAME
Planning	May 2001- ongoing
Ice road construction	December 15, 2001-April 30, 2002
Line clearing	January 2-March 30, 2002
Survey	January 2-March 30, 2002
Drilling	January 10-March 15, 2002
Recording	March 1-April 30, 2002
Final clean-up	April-May 2001

10.0 NEW TECHNOLOGY

The Filterboxx treatment system that will be installed on the sleigh camp is a new technology for Mackenzie Delta operations. A description of the system is provided in Section 4.4.1. This technology has been proven in other jurisdictions.

11.0 ENVIRONMENTAL OVERVIEW

11.1 Physiography and Bedrock Geology

The sleigh camp locations are within the Mackenzie Delta Ecoregion of the Taiga Plains Ecozone. The Mackenzie Delta Ecoregion is composed of the southern two-thirds of the distinctive Mackenzie River Delta. The Delta is a complex area of peat-covered deltas and fluvial marine deposits. The present delta is unique for its multitude of lakes and channels. Wetlands extend over 50% of the ecoregion, and are characteristically polygonal peat plateau bogs with ribbed fens (ESWG 1995).

11.2 Soils

Characteristic soil types of the proposed program area have resulted from prolonged cryoturbation, low temperatures and low permeabilities in the typical fine-textured soils (Timoney et al. 1992). The dominant soils of the Mackenzie Delta Ecoregion are Regosolic Static and Gleysolic Static Cryosols with Organic Cryosols developed on level fluvioglacial,

organic and marine deposits (ESWG 1995). An extensive discontinuous layer of permafrost underlies these soils.

11.3 Climate

The Mackenzie Delta is classified as having a low arctic ecoclimate (ESWG 1995) and experiences very long cold winters and short cool summers. The mean annual temperature ranges from approximately –11.5°C to –9.5°C , with a mean summer temperature ranging from 4.5°C to 8.5°C and a mean winter temperature of approximately –26.5°C (ESWG 1995). Winters in this area tend to be quite long as there is a period of approximately two months during which the sun does not rise above the horizon. During this period very cold conditions prevail and may last for several weeks at a time. When temperatures reach such lows, the ability of the air to contain moisture is limited and very little precipitation falls. Precipitation mainly falls as rain, and while it is highly variable in the coastal and delta regions, there is a general increase from the coast southwards. The mean annual precipitation ranges from 125-200 mm to 200-275 mm to 200-300 mm, respectively (ESWG 1995).

Snow and freshwater ice persist for six to eight months of the year. When the sun begins to rise above the horizon (January), the increased amounts of heat dissipate the high-pressure centre and storms prevail. By June most of the snow has melted, though lake ice may persist until July. The mean annual number of frost-free days is 70 days at Aklavik and 50 days at Inuvik (Dome et al. 1982a).

11.4 Hydrology

The Mackenzie River is the longest river in Canada, flowing northwest over a stretch of 1700 km from its headwaters in Great Slave Lake to its mouth at the Beaufort Sea (Bigras 1990). The poorly formed levees of the estuarine Mackenzie Delta were formed largely from sediments transported by the Mackenzie River over the last 13,000 years. The southwest sector of the delta also receives sediment from the Peel and Rat rivers. The delta is active and builds forward into the Beaufort Sea during the open water season from June to October (Bigras 1990).

The delta is a dynamic complex of lakes and ponds, islands and tidal flats, braided channels and oxbows. The Mackenzie River is the main driving force, introducing large amounts of water, sediment and energy to the delta. The major channels appear largely unchanged in the last century, with the Middle, East, and West channels primarily controlling the hydrologic regime of the delta lakes (MRBC 1981). However, the main channel water level regimes vary significantly over the north-south and east-west extent of the delta due to changes in levee heights, ice jamming and inflow to the delta (Marsh and Hey 1989). The hydrologic regime is the primary

factor controlling vegetation and wildlife habitat in the area (MRBC 1981) and the productivity of the delta ecosystem (Marsh and Hey 1989). Flooding of the Mackenzie River, precipitation, and evaporation control the water levels of approximately 25,000 delta lakes. Changes in these controlling factors particularly affect sensitive high elevation lakes; without flooding, these lakes would dry up rapidly. Spring flooding of the delta by the Mackenzie River adds sediments and nutrients to the lakes (Marsh and Lesack 1996). While these lakes are generally shallow (few exceeding 3 m in depth), they play a significant role in the ecology of the delta, affecting the distribution of permafrost, supporting populations of fish, waterfowl and mammals, and providing storage for water, sediment and pollutants (RWED 1999).

Water levels in the Mackenzie River and adjoining channels vary dramatically with climatic changes and ice regimes. Spring break-up in the delta is the most dynamic and important hydrological event of the year, dominating the hydrologic regime of delta lakes (Bigras 1990). A short-term rise in water level occurs with initial freeze-up, followed by low levels persisting for the remainder of winter. The water levels then rise rapidly due to snow-melt in the southern part of the delta and from ice jams in the main channels of the delta (Marsh and Hey 1989). Depending on the strength of local ice jams during the spring break-up period the peak water levels can last from 3 to 45 hours (Bigras 1990). Once the ice jams fail there is a downstream surge of floodwater, and lake levels begin to drop rapidly (Bigras 1990). The Mackenzie Delta lakes store large volumes of water during the spring break-up period (Marsh and Hey 1989). The magnitude of the spring flood varies greatly from year to year, and as a result not all lakes are flooded annually (Marsh and Hey 1989). Whereas the spring break-up period is dominated by snow-melt runoff and ice jamming, the summer period is mainly controlled by rainfall runoff (Marsh and Hey 1989). During summer, water levels may rise in response to rainstorms upstream and along the delta, and some lakes may be flooded again during these rain-induced peaks (Marsha and Hey 1989). Some lakes lose more water to summer evaporation than is received through precipitation, causing them to have a negative annual water balance until flooding occurs (Bigras 1990). Water levels in the northern portion of the delta may also change due to tidal activity and storm surges of the Beaufort Sea (RWED 1999). Storm surges result from wind stress on the water surface, causing a strong net displacement of water and resulting in either a rise or fall of the water surface. The largest storm surges occur during the open water season, but surges have also been observed during the ice-covered period (Marsh and Schmidt 1993). During winter the lake-connecting channels are generally filled with ice and snow, preventing water movement between the main channels and most of the delta lakes (Marsh and Hey 1989). The shallow lakes are ice covered for up to 8 months of the year (Bigras 1990).

Lakes of the delta can be considered either connected or perched, depending on their geomorphic or hydrologic characteristics (Bigras 1990). A connected lake is one with a well-defined, water-

filled channel connecting it to the main delta channel from break-up to freeze-up. These lakes are constantly interchanging water with delta channels and the lake level is similar to the distributary channel throughout the open water period. A perched lake is one that is not directly connected by a channel, is isolated atop levees, and is cut off from other lakes and channels except during flooding (Bigras 1990). The hydrologic regime of connected lakes is more complex than perched lakes due to the connection to the main delta channels. Discharge through distributary channels is responsible for the majority of the annual water loss rather than evaporation (Bigras 1990). Due to present climatic and hydrologic conditions most perched lakes are flooded with a frequency of between 2 and 10 years and only have a slightly negative water balance between floods (Marsh and Lesack 1996). Connected lakes do experience occasional summer flooding as a result of high flow events or storm surges (Bigras 1990).

11.5 Permafrost

Permafrost is defined in terms of temperature as sediments that remain below 0°C for two or more years (Taylor et al. 1996). Permafrost occurs beneath all terrestrial and many subaqueous areas of the Mackenzie Delta, Yukon Coastal Plain, and Tuktoyaktuk Coastal Plain ecoregions. In the Mackenzie Delta, permafrost is discontinuous with low to medium ice content, while parts of the proposed program area in the Yukon Coastal Plain and Tuktoyaktuk Coastal Plain is underlain by continuous permafrost with low to high ice content (ESWG 1995). The widespread occurrence of permafrost in the area raises concerns for development, as ice-bonding in the soil matrix can dramatically alter the physical, geophysical and engineering properties of frozen sediments (Todd and Dallimore 1998).

In all areas where permafrost is prevalent, permafrost-related processes such as solifluction and soil creep, ice wedge formation, frost shattering of boulders, pingo formation and the heaving of areas formerly covered by water bodies, have a major effect on shaping the landscape (Rampton and Bouchard 1975). Repeated freezing and thawing of these soils creates features on the surface that include cell-like polygons, bulging hummocks, and bare mud boils where the soil is so active that no plants can take root. Intense frost heaving often splits apart the underlying bedrock and forces large angular boulders to the surface (ESWG 1995).

A number of factors influence the mean annual ground surface temperatures, including past glaciation events, climate change, sea level variation, proximity to heat sources such as rivers, channels or lakes, the formation of seasonal ice in areas of standing water, and the effects of vegetation (Taylor et al. 1996, Todd and Dallimore 1998). Thaw of ice rich permafrost typically results in varying degrees of ground subsidence, collapse of hummocky microrelief, addition of

thaw water to the bottom of the active layer and rapid growth of water-loving vegetation such as sedges, alders and willows.

11.6 Vegetation

Although it is in a zone of extensive discontinuous permafrost, the Mackenzie Delta has a relatively complex flora. It is a northward extension of the boreal forest due to the warming influence of the Mackenzie River (Gill 1973). There is a distinct succession of plant species that result on the Delta, which is initiated by flooding.

Gill (1973) describes five successional stages on the Delta. They are perpendicular to the shore of main river channels, distributaries, and tributaries. The first stage, which is closest to the water, occurs when water horsetail (*Equisetum fluviatile*) colonizes freshly deposited sediments. It is replaced further inland by a *Salix-Equisetum* association, in which willow (*Salix* spp.) forms the canopy and common horsetail (*Equisetum arvense*) dominates the understorey. These early stages of succession are maintained by frequent flooding.

After the *Salix-Equisetum* association builds up to a maximum height through alluviation, it is replaced inland by a *Populus* association (Gill 1973). The *Populus* association consists of a Balsam poplar (*Populus balsamifera*) overstorey, with an understorey of willow spp. (*Salix alaxensis*, *S. glauca*, *S. pulchra*, and *S. arbusculoides*), and an herb layer consisting of alpine hedysarum (*Hedysarum alpinum*), arctic bearberry (*Arctostaphylos rubra*), wormwood (*Artemesia tilesii*), and *Equisetum arvense*. Inland from the *Populus* association are low areas caused by channel shifting. These low areas are moist, and the vegetation therefore undergoes some changes to form the decadent *Populus* association. In this association, the poplars die because the soils are too wet, whereas the number of willow species increases (*Salix alaxensis*, *S. abrbusculoides*, *S. richardsonii*, *S. glauca*, and *S. barclayi*). The herb layer includes *Equisetum arvense* and cottongrass (*Eriophorum angustifolium*). There is also a thin moss layer made up of golden moss (*Tomenthypnum nitens*), sickle moss (*Drepanocladus uncinatus*), and erect-fruited iris moss (*Distichium capillacem*).

Lastly, the *Picea* association forms well above flood levels, and farthest from the water (Gill 1973). The Picea association consists of a white spruce (Picea glauca) overstorey. It is associated with an understorey of green alder (*Alnus crispa*), smooth willow (*Salix glauca*), shrubby willow (*S. arbusculoides*), diamond-leaf willow (*S. pulchra*), *S. alaxensis*, Richardson's willow (*S. richardsonii*), and Barclay's willow (*S. barclayi*). The herb layer is dominated by *Arctostaphylos rubra* and large-flowered wintergreen (*Pyrola grandiflora*), and also includes *Hedysarum alpinum*, valerian (*Valeriana capitata*), alpine bearberry (*Arctostaphylos alpina*),

prickly rose (*Rosa acicularis*), and one-flowered pyrola (*Moneses uniflora*). There is also a thin layer of mosses including *Tomenthypnum nitens*, feathermoss (*Hylocomium splendens*), *Drepanocladus uncinatus* and *Distichium capillaceum*.

Spruce forests are long-lived, with more than half the trees being older than 200 yr (Pearce et al. 1998). However, when the trees do eventually senesce and die, they are rarely replaced by other spruce trees. The insulating effect of the vegetation, which has built up over centuries, decreases soil temperatures making it too cold for spruce trees to germinate (Hobbie and Chapin 1998). Consequently, the areas once occupied by spruce forests are colonized by a cold tolerant, tundra-like community of plants to become open spruce/lichen-heath or spruce/bog woodlands (Pearce et al. 1998). Maintenance of spruce forests requires some sediment deposition from flooding, which is unlikely given its height above flood level (Pearce et al. 1998).

11.7 Wildlife

11.7.1 Mammals

The aquatic habitats in and around the proposed program support mammals such as beaver and muskrat. These mammal species of concern, identified as such due to their importance for subsistence, COSEWIC designation, and priority for research are listed in Table 6 if they are potentially found in the vicinity of the program area.

TABLE 6

MAMMALS OF CONCERN FOUND IN THE VICINITY OF THE PROPOSED PROGRAM

Species	Habitat	Program Interaction	COSEWIC [1]
MAMMALS			
Beaver[2] (*Castor Canadensis*)	Shallow lakes and streams of the Tuktoyaktuk Coastal plain, Mackenzie Delta lowlands. Restricted in Beaufort Sea coastal areas to selected river valleys with significant woody vegetation.	Shallow lakes and streams with significant woody vegetation throughout program area..	Not listed
Muskrat[2] (*Ondatra zibethicus spatulatus*)	Mackenzie Delta, Mackenzie River Valley, coastal Beaufort region. Lakes and ponds with aquatic vegetation where water does not freeze to the ground.	Lakes and ponds of program area.	Not listed

Notes:
1. Committee on the Status of Endangered Wildlife in Canada 2001.
   Not listed A species which does not appear in COSEWIC documentation.
2. Species are included due to their listing in Community Conservation Plans as species of interest or declining in population.

Muskrat (*Ondatra zibethicus spatulatus*)

In the ISR, muskrats occur in particular concentrations in the Mackenzie Delta and coastal Beaufort region, and along the Mackenzie River Valley (Dome et al. 1982a, 1982b, TCCP 2000). This species is likely most abundant in standing water habitats of the upper Mackenzie Delta and adjacent areas (Dome et al. 1982a, Martell et al. 1984).

Muskrats burrow into the banks of lakes and streams in areas where aquatic plants are accessible for food and building materials (Dome et al. 1982a, 1982b, Jelinski 1989). While muskrats are not migratory animals, seasonal differences in habitat use do occur. In the spring and summer virtually all suitable waterbodies are occupied (Westworth 1977). Severe climate in the arctic restricts the number of waterbodies suitable for muskrats (Dome et al. 1982a). The optimum depth of water required to support muskrat in winter is between 1.2 m and 3 m (Hawley 1974 *in* Dome et al. 1982a). Prior to the onset of winter, muskrats relocate to areas of deeper water, and burrow in higher, steeper banks (Dome et al. 1982a). This shift appears to maintain the accessibility of food, and allows muskrats to forage on high-energy roots and rhizomes of submerged aquatic vegetation, thereby increasing overwinter survival. Muskrats are able to swim considerable distances under the ice to reach foraging areas. The winter range is often extended by the construction of pushups, which are small mounds of vegetation and mud built over holes in the ice that provide cover for feeding (Dome et al. 1982a, 1982b, Martell et al. 1984). During the spring muskrats are highly mobile, feeding on submergent aquatic vegetation (Jelinski 1989).

Beaver (*Castor canadensis*)

Beavers are at the northernmost limit of their range in the Mackenzie Delta region (Hawley and Aleksiuk 1974 *in* Dome et al. 1982a). Beaver activity has been observed between the East Channel and Husky Lakes (Slaney 1974a *in* Dome et al. 1982a), likely in shallower lakes and streams of the Tuktoyaktuk Coastal Plain. The streams and lakes of the Mackenzie Delta also constitute important habitat (AICCP 2000).

Beaver habitat suitability is determined by the physical characteristics and the dominant vegetation communities of an area (Slough and Sadlier 1977 *in* Dome et al. 1982a). Beavers will only colonize slow moving streams and rivers, as fast flowing water may wash away dams and food caches (Banfield 1974, Standfield and Smith 1971 *both in* Dome et al. 1982a). They usually live in streams that have gradients less than 6%, and are most successful in wide valleys with meandering streams and rivers (Retzer et al. 1956 *in* Dome et al. 1982a). Creeks and small rivers are often dammed to create deep ponds with stable water levels (Banfield 1974, Retzer et al.1956 *both in* Dome et al. 1982a). This allows continuous access to food caches and transport routes during freeze-up. Rivers with widely fluctuating water levels and significant ice scour of shorelines in spring are considered poor beaver habitat (Nash 1951 *in* Dome et al. 1982a).

Preferred lake habitat is shallow with gently sloping shores that support aquatic and terrestrial vegetation (Hall 1971, Standfield and Smith 1971 *both in* Dome et al. 1982a). Prime habitat is found in marshes and ponds with appropriate food supplies.

Beavers construct nesting dens in the form of riverbank burrows or lodges, for shelter and protection against predators. Beaver dams built in subarctic wetlands will alter the hydrologic landscape by creating ponds and diversion channels. Dams can last for years, during which they perpetuate the new drainage pattern they have created (Woo and Waddington 1990).

A family consisting of five or six individuals may require half a hectare of dense poplar trees for its winter food supply (CWS 2000). In mid to late August, beavers start to accumulate material into a food cache for the winter. These caches are partially submerged rafts of branches and saplings anchored close to their dens (Martell et al. 1984). The presence of alder, willow, and aspen is the most important factor in predicting beaver use of an area (Slough and Sadlier 1977 *in* Dome et al. 1982a).

Beavers are monogamous and remain together following breeding (Martell et al. 1984), which occurs in the water during late winter (February and March) (TCCP 2000). After spring breakup, three or four kits are born in May or June following a 100-day gestation period. At birth, kits are well-furred, have teeth cut, and can see, walk and swim, remaining in the lodge for at least one month (CWS 2000).

11.7.2 Birds

Very few species of birds are adapted to overwinter in the Mackenzie Delta and surrounding areas. The vast majority migrate into or through the area to nest, raise young, moult, and accumulate fat reserves, and then migrate south in the fall to overwinter in other regions (Martell et al. 1984). Migrating species are not likely to be found in the program area during the time proposed, as they generally move south for winter by early September and do not generally arrive in spring until mid May. Therefore, program interaction is limited to the transient periods of migration and impacts to habitat. Bird species of concern, identified as such due to their importance for subsistence, COSEWIC designation, and priority for research are listed in Table 7 if they are potentially found in the vicinity of the program area.

TABLE 7

BIRD SPECIES OF CONCERN FOUND IN THE VICINITY OF THE PROPOSED PROGRAM

Species	Habitat	COSEWIC [1]
Canada goose[2] (*Branta canadensis*)	Small islands in ponds, lakes, streams, or rivers. Nesting in outer Mackenzie Delta, western delta for moulting.	Not listed
American wigeon[2] (*Anas americana*)	Dry areas, south of the treeline, extending away from water. Mackenzie Delta, Old Crow Flats, Richards Island, Anderson Deltas.	Not listed
Mallard[2] (*Anas platyrhynchos*)	Polynas and leads on open water, nearshore forested areas of the Mackenzie Delta.	Not listed
Scoters[2] (*Melanitta spp.*)	Dense cover areas including forested and shrubby areas with 200 m of water. Mackenzie Delta east to Bathurst Peninsula.	Not listed
Tundra swan[2] (*Cygnus columbianus columbianus*)	Lowland tundra near, or on islands, in ponds, lakes and slow-flowing rivers, near sheltered tidal waters. Kendall Island Migratory Bird Sanctuary, main channel of the Mackenzie Delta.	Not listed

Notes:
1. Committee on the Status of Endangered Wildlife in Canada 2000.
   Not at risk = A species that has been evaluated and found to be not at risk.
   Not listed = A species which does not appear in COSEWIC documentation.
2. Species are included due to their listing in Community Conservation Plans as species of interest or declining in population.

Waterfowl

Various species of waterfowl utilize the Mackenzie Delta and environs as migratory staging and nesting grounds. Waterfowl migrating into the Mackenzie Delta region use staging areas in the spring for resting and feeding. Depending on the location of their overwintering areas, waterfowl may reach the Delta area by inland or coastal migratory routes. Most species of waterfowl arrive at their nesting grounds by early June (Johnson and Herter 1989). Tundra swans (*Cygnus columbianus*) begin to arrive on nesting grounds in mid May (Stewart and Bernier 1989). Mallards (*Anas platyrhynchos*) arrive in the area from mid to late May (Johnson and Herter 1989). Loons (*Gavia* sp.) and white-fronted geese (*Anser albifrons frontalis*) begin to arrive in late May and early June (Dome et al. 1982a, Bailey et al. 1933 *in* Johnson and Herter 1989).

Waterfowl generally start to move to staging areas in preparation for fall migration by about mid-August (Martell et al. 1984). Some waterfowl do not leave the area until most waterbodies are frozen in late September (Johnson and Herter 1989). The migration of white-fronted geese from the area is gradual, beginning possibly as early as mid August and continuing until late September or early October (Barry 1967 *in* Dome et al. 1982a). Mallards are one of the last migratory birds to leave the Mackenzie Delta with records of fall sightings into late September (Johnson and Herter 1989).

11.7.3 Fish

A large number of fish species occur within the freshwater and marine environments of the mainland western Arctic. Fish species of concern, identified as such due to their importance for subsistence, COSEWIC designation, and priority for research are listed in Table 8 if they are potentially found in the vicinity of the program area. Species discussed include those with known overwintering habitat within the vicinity of the proposed program or area that the program may affect.

TABLE 8

FISH SPECIES OF CONCERN FOUND IN THE VICINITY OF THE PROPOSED PROGRAM

Species	Habitat	Spawning Period	COSEWIC [1]
Arctic cisco[2] (*Coregonus autumnalis*)	Mackenzie River and estuary, tributaries to the Mackenzie (spawning habitat - inland lakes).	Fall	Not listed
Broad whitefish[2] (*Coregonus nasus*)	Several overwintering areas in East Channel and Whitefish Bay. Tuktoyaktuk Harbour, Mason Bay, Mallik Bay, Shallow Bay, streams of Tuktoyaktuk Peninsula, spawning throughout the Mackenzie system.	October, November	Not listed
Burbot[2] (*Lota lota*)	Mouths of creeks. Winter and spring may be abundant in fresh or brackish waters of Kugmallit Bay's coastal embayment.	January – March	Not listed
Deepwater sculpin (*Myoxocephalus thompsoni*)	Habitat preferences are not known. Spawning areas are not known.	May and June	Threatened
Dolly Varden[2,,3] (*Salvelinus malma*)	Fish Hole, Rat River, Big Fish River, Fish Creek, Babbage River, Peel River, Shingle Point, occasionally travel the Mackenzie near Inuvik and Aklavik. Travel from stream to stream along the Beaufort Coast.	August, early September	Not listed
Fourhorn sculpin (*Myoxocephalus quadricornis*)	Lakes and streams of the Arctic archipelago.	May and June	Special Concern
Inconnu[2] (*Stenodus leucichthys*)	Mackenzie River and estuary (rearing habitat). Turbid lakes on Richard Island throughout summer, Mallik and Mason Bays.	Late September – early October	Not listed
Lake trout[2] (*Salvelinus namaycush*)	Outer delta lakes (including minor channels) with high oxygen levels, a good connection to adjacent water bodies, small to moderate volumes available and poor to moderate water quality.	Fall	Not listed
Lake whitefish[2] (*Coregonus clupeaformis*)	Lakes and large rivers, brackish coastal waters	Late September	Not listed
Least cisco[2] (*Coregonus sardinella*)	Mackenzie River and estuary, tributaries to the Mackenzie (spawning habitat), inland lakes. Inner Shallow Bay / Niakunak Bay and Kugmallit Bay are important overwintering and nursery areas.	Early October	Not listed
Northern pike[2] (*Esox lucius*)	Tributaries, creeks and shallow lakes in Mackenzie delta.	Early spring	Not listed
Pacific herring[2] (*Clupea spp.*)	Mackenzie River and estuary, tributaries to the Mackenzie, inland lakes.	Late June	Not listed

Notes:
1. Committee on the Status of Endangered Wildlife in Canada 2001.
   Threatened = A species likely to become endangered if limiting factors are not reversed.
   Special Concern = A vulnerable species because of characteristics that make it particularly sensitive to human activities or natural event
   Not listed = A species which does not appear in COSEWIC documentation.
2. Species are included due to their listing in Community Conservation Plans as species of interest or declining in population.
3. Historically, fish of the genus Salvelinus caught along the Beaufort Sea coast have been identified as Arctic char (Salvelinus alpinus). Haas and McPhail (1991) note that Dolly Varden char (*Salvelinus malma*) are formally separated from the Arctic char complex.

Fish populations are most sensitive to environmental disturbance during spawning, incubation, emergence, rearing, overwintering and migration (Dome et al. 1982a). Overwintering success of any fish species in the arctic is influenced primarily by the amount of overwintering habitat available and the quality of the habitat in terms of its ability to support fish. Many of the water bodies in the arctic coastal plain are too shallow to support fish during the winter, when ice depth can approach 2 m. Fish that remain in water that is less than 2 m deep after ice formation will likely perish (Reynolds 1997 *in* Truett and Johnson 2000). Increased survival rates are seen in species that feed in warm, shallow water during the summer and overwinter in deeper water (Truett and Johnson 2000).

In the context of this section, the term "anadromous" refers to fish that either spend most of their lives in the sea and migrate to freshwater to spawn (i.e. salmon and Arctic cisco) or to fish that migrate from freshwater to the sea regularly in some stage of their life cycle for purposes other than spawning (i.e. Dolly Varden and least cisco).

Broad Whitefish (*Coregonus nasus*)

Broad whitefish are commonly found in coastal habitats with an extensive freshwater influence (Percy 1975, Bond 1982, Lawrence et al. 1984, Bond and Erickson 1991, 1992). The life-history pattern of broad whitefish in this area is dominated by the fact that the Mackenzie River is the only river that flows into the Beaufort Sea year round; all other rivers stop flowing during the winter months (Bond 1982, Lawrence et al. 1984). This continuous flow allows young-of-the-year broad whitefish to move in late winter within the freshwater plume under the landfast ice, eastward along the Tuktoyaktuk Peninsula, arriving at mouths of freshwater streams along the Tuktoyaktuk Peninsula during breakup (Bond 1982, Lawrence et al. 1984, LGL 1990). These yearlings then enter freshwater lakes along the peninsula where they spend 3 to 4 years before beginning a lifelong cycle of moving to coastal waters for summer feeding, and returning to overwintering sites in the Mackenzie Delta (Bond 1982, Lawrence et al. 1984). In the coastal waters, primary food sources are crustaceans, small bivalves, and insect larvae (Dome et al. 1982a). Coastal areas and bays along the Tuktoyaktuk Peninsula, as well as Mackenzie Bay, Mallik Bay, and the south coast of Kugmallit Bay, are important rearing areas for older juvenile and both spawning and non-spawning adult broad whitefish (Percy 1975, Kendel et al. 1975 in

Dome et al. 1982a, Lawrence et al. 1984, LGL 1990). In August and September, the spawning portion of the population moves into the Mackenzie Delta prior to migrating to spawning habitat in October (Dome et al. 1982a). Broad whitefish mainly overwinter in lower Mackenzie drainage areas and along the Tuktoyaktuk Peninsula (Dome et al. 1982a, Sekerak et al. 1992), including West Channel and Shallow Bay, located within the vicinity of the proposed program.

Lake Whitefish (*Coregonus clupeaformis*)

The lake (or humpback) whitefish inhabits lakes and large rivers, as well as brackish coastal waters. Little is known about the spring movement of lake whitefish, and they are relatively sedentary throughout the summer. Adult lake whitefish eat large invertebrates, smaller fish, and plant material (Martell et al. 1984). In late summer or early fall the population leaves the summer feeding areas in an upstream, pre-spawning migration run. Spawning may begin as early as mid-September in northern lakes, and usually occurs in shallow water over a hard or stony bottom, although spawning has been observed over sandy substrate (Lawrence et al. 1984). Following hatching, lake whitefish larvae tend to form aggregations along shorelines, but generally leave the shallow inshore waters for deeper water by early summer (Lawrence et al. 1984). Identified overwintering habitat, located within the isolated northern area of the proposed program, includes Harry Channel (Sekerak et al. 1992). The West Channel of the Mackenzie River that crosses through the main program area has also been identified as Lake whitefish overwintering habitat (Sekerak et al. 1992).

Inconnu (*Stenodus leucichthys*)

Inconnu, commonly known as 'coney', are the largest member of the whitefish family. The species is often anadromous, making long migrations between freshwater and coastal areas. However, exclusively freshwater populations do reside in some lakes (TCCP 2000). The preferred spawning habitat is characterized by gravel substrate in relatively shallow, fast-flowing, and clear water. Spawning usually occurs in late September, approximately 2 to 3 weeks prior to the average date of first ice formation. Important overwintering habitat for both immature and mature inconnu in the lower Mackenzie Delta area includes the main channels and deeper parts of the outer delta (Sekerak et al. 1992). This includes West Channel, which crosses through the main program area. It is unclear if inconnu also overwinter in rivers (Howland et al. 2000).

Burbot (*Lota lota*)

Commonly known as 'loche', burbot is a freshwater species also found in brackish coastal waters, ranging from Herschel Island to Atkinson Point, with concentrations in the Kendall Island area (Percy 1975, Martell et al. 1984). This species generally prefers deep lakes (Martell et al. 1984). They are bottom-feeding predators, consuming sculpins, other burbot, smelt, and mysids on the coast (Percy 1975). The burbot spawns in late fall and early winter under the ice of lakes and rivers (Martell et al. 1984, TCCP 2000). Identified overwintering habitat includes

West Channel (Sekerak et al. 1992), located within the vicinity of the main program area. A segment of Middle Channel, crossing the isolated northern area of the proposed program, has also been identified as burbot overwintering habitat (Sekerak et al. 1992). In late winter and early spring, burbot move into tributary rivers before continuing on to deeper water in the summer, including the fresh or brackish waters of Kugmallit Bay (TCCP 2000).

Northern Pike (*Esox lucius*)

The northern pike is primarily a freshwater fish, found in the warm waters of shallow lakes and bays or quiet rivers. Northern pike are found throughout the Mackenzie Drainage area and likely most of the Eastern Coastal Drainage area. In addition, pike frequent the brackish coastal waters near the mouths of rivers off Tuktoyaktuk Peninsula and Richards Island (Martell et al. 1984). Northern pike spawn in the spring following ice melt, about mid June to early July. Spawning mainly occurs in heavily vegetated marshes, lakes and river floodplains (Scott and Crossman 1973). Following spawning, pike generally remain in shallow, warm waters for the duration of summer. Mature pike feed mainly on small fish, including small pike, and on small mammals and invertebrates. Pike move out of shallow waters to wintering habitats during the period between mid August and freeze-up, often concentrating at the mouths of creeks in November and December. They require deep channels and lakes for overwintering (Martell et al. 1984), such as West Channel (Sekerak et al. 1992), located within the vicinity of the main program area.

12.0 PROPOSED MITIGATION AND ANTICIPATED ENVIRONMENTAL IMPACTS

Shell's 2D winter seismic program has been designed to acquire geophysical data, while mitigating impacts to the environment and land users. Shell is proposing to withdraw water from channels of the Mackenzie River for camp use and for access preparation. For the purposes of this water licence application, predicted effects on aquatic resources are the focal point with a more complete assessment of the entire program to be submitted in September 2001. Table 10 identifies any potential environmental impacts that may arise from the water withdrawal, recommended mitigative measures to avoid or mitigate the potential impacts, and the significance of the residual impacts.

Shell's proposed program is localized and will be conducted during the winter months, thereby minimizing most potential impacts associated with water withdrawal. However, the potential exists for certain environmental impacts identified through ongoing public consultation and a review of existing literature and maps. Potential environmental impacts resulting from the construction of the camp may include: minor water withdrawal from waterbodies; disturbance of

fish due to water withdrawal; temporary alteration of vegetation that may destabilize riparian zones at the water access point; and potential leakage or spills associated with camp equipment.

Less than 15 m^3 of water will be withdrawn on a daily basis for camp purposes. Less than 75 m^3 will be withdrawn for access preparation. All intake lines will be fitted with mesh screens, in accordance with DFO's *Freshwater Intake End-of-Pipe Fish Screen Guideline*, to avoid the entrainment of fish and to prevent damage to channel bottoms.

The water access point is vulnerable to trampling of the herbaceous layer. During spring melt these sensitive areas may be more prone to erosion. Maintaining vegetation in riparian zones is essential for preventing erosion. Access to water will occur at a level location to minimize disturbance. Frozen ground conditions, snow cover and tracked vehicles will minimize impacts to vegetation communities and associated stream banks.

Pumps, generators and other machinery will be maintained to reduce risks of potential leaks. Fuel will not be stored within 100 m of a waterbody, where feasible, and secondary containment will be employed to prevent fuel escape. Refuelling and servicing of machinery will also be limited to a minimum of 100 m from waterbodies, where feasible. Spills will be recovered immediately with the location, type of pollutant and volume unrecovered recorded, and treated in-situ where appropriate. In addition, personnel will be trained in spill response procedures and equipment use.

Wastewater produced by the camp will be treated with the Filterboxx treatment system to comply with discharge guidelines.

The assessment criteria and definitions used in assessing the significance of each potential impact are provided in Table 9. It is predicted that the implementation of the proposed mitigative measures by Shell and their contractors will ensure that no significant residual impacts will occur as a result of the project.

TABLE 9

SIGNIFICANCE CRITERIA

AREAL EXTENT

Local:	Impacts are limited to the seismic rights-of-way and camp.
Subregional:	Impacts may extend beyond the limits of the rights-of-way and camp, but are limited to within 1 km of the rights-of-way and camp.
Regional:	Impacts may extend beyond 1 km from the rights-of-way and camp.

MAGNITUDE

Negligible:	No discernible impact.
Low:	Impacts would be restricted to a few individuals or only slightly affect the resource or parties involved; factors related to species' population levels would not be affected.
Moderate:	Impacts would affect many individuals or noticeably affect the resource or parties involved; factors related to a species' population levels would be affected to a degree that a change within natural limits of variability will occur; impacts would be socially tolerated.
High:	Impacts would affect numerous individuals or affect the resources or parties involved in a significant manner; factors affecting species' population levels would be altered to a degree that a change beyond natural limits of variability will occur.

DURATION

Immediate:	Impact duration is limited to less than two days.
Short-term:	Impact duration is longer than two days but less than one year.
Medium-term:	Impact duration is one year or longer but less than ten years.
Long-term:	Impact duration extends ten years or longer.

FREQUENCY OF OCCURRENCE

Isolated:	Occurrence confined to specified period.
Accidental:	Occurs rarely over assessment period (*i.e.*, life of the project).
Occasional:	Occurs intermittently and sporadically over assessment period.
Periodic:	Occurs intermittently but repeatedly over assessment period.
Continuous:	Occurs continually over assessment period.

PROBABILITY OF OCCURRENCE

Low:	Unlikely.
High:	Likely.

LEVEL OF CONFIDENCE

Low:	Based on incomplete understanding of cause-effect relationships and incomplete data pertinent to project area.
Moderate:	Based on good understanding of cause-effect relationships using data from elsewhere or incompletely understood cause-effect relationships using data pertinent to project area.
High:	Based on good understanding of cause-effect relationships and data pertinent to project area.

PERMANENCE OR REVERSABILITY

Reversible in short-term:	Impact can be reversed in less than one year.
Reversible in medium-term:	Impact can be reversed in 1 year or more, but less than 10 years.
Reversible in long-term:	Impact can be reversed in 10 years or more.
Irreversible:	Impact is permanent.

TABLE 10

POTENTIAL ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS, MITIGATION AND RESIDUAL IMPACTS

Concern/Impact	Mitigative Measures	Areal Extent	Magnitude	Duration	Frequency	Probability	Confidence	Reversibility	Residual Impact Balance	Residual Impact Significance
1. Terrain and Soils										
1.1 Disturbance to erosion prone banks and slopes.	.1 Snow/ice ramps will be constructed on riverbank slopes to prevent equipment disturbance and erosion. .2 Sensitive areas will be avoided by using detours. .3 If surfaces are disturbed in an area where drainage or erosion is a possibility, such as channels, lakes or oxbows, erosion control measures may include utilizing salvaged slash as rollback.	Local	Low	Short term	Occasional	Low	High	Reversible in short term	Neutral	Not significant
1.2 Disturbance to drainage	.1 Drainages will be left free of debris.	Local	Low	Short term	Accidental	Low	High	Reversible in short term	Neutral	Not significant
2. Aquatic Resources										
2.1 Erosion of stream banks and destabilization of slopes	.1 Snow ramps will be designed to minimize erosion and/or destabilization of slopes. .2 Detours will be utilized to avoid any steep slopes where activity may increase the erosion potential. .3 Tracked units and dozers will be equipped with mushroom shoes to reduce the possibility of surface disturbance. .4 Clean ice bridges will be constructed if ice thickness tests reveal that ice cannot support equipment loads.	Local	Low	Short term	Accidental	Low	High	Reversible in short term	Neutral	Not significant
2.2 Erosion of stream banks and destabilization of slopes	.1 If the surface is disturbed in an area such as channels or lakes where drainage or erosion is a possibility, control measures may include using earth breaks or cross ditches. Slash may also be used as rollback for erosion control. .2 Channel crossings will be made at a level location wherever possible. Crossings will be scouted in advance and will be constructed at 90 degree angles. .3 When access routes parallel lakes or streams, the access will be more than 30 m from a waterbody, where feasible.	Local	Low	Short term	Accidental	Low	High	Reversible in short term	Neutral	Not significant

TABLE 10 Cont'd

Concern/Impact	Mitigative Measures	Areal Extent	Magnitude	Duration	Frequency	Probability	Confidence	Reversibility	Residual Impact Balance	Residual Impact Significance
2.3 Disturbance to fish or fish habitat	.1 Waste materials and debris will not be disposed of in or on waterbodies. .2 Fuel will be stored in double walled tanks and will be bermed. Secondary containment will provide 110% of the capacity of the largest tank. .3 Water intake from waterbodies will utilize screens on intake hoses to prevent disturbance to stream or lake bottoms and to prevent the entrainment of fish. Shell and its contractors will comply with the DFO *Freshwater Intake End-of Pipe Fish Screen Guideline*. .4 Water use will not exceed 100 m^3 per day.	Local	Low	Immediate	Accidental	Low	High	Reversible in short term	Neutral	Not significant
2.4 Introduction of oil, fuel or other pollutant to waterbody	.1 Liquid fuels and oils will be stored in a closed system during transportation. .2 Where fuel is stored within 100 m of a waterbody, secondary containment will be employed to prevent fuel escape. .3 Refueling hoses will be fitted with locking fuel nozzles to prevent fuel leakage and spill during transfer.	Regional	Moderate	Immediate to medium term	Isolated	Low	High	Reversible in medium term	Neutral	Not significant
	.4 Access routes will be on ice channels and down the lines. When access routes parallel lakes or streams, the access will be more than 30 m from the waterbody to prevent deleterious material from entering the waterbody and to prevent disturbance of banks that can result in sedimentation. .5 Any deleterious material that accidentally falls into a waterbody will be removed.									
2.5 Introduction of oil, fuel or other pollutant to waterbody	.1 In the event of a spill, the Fuel Spill Contingency Plan will be followed (Appendix A). .2 Spills will immediately be reported to Shell's Environmental, Health and Safety Coordinator, and the ILA. All accidental spills will be reported to the NWT Emergency Spill Response Line (867-920-8130), ILA, INAC and to John Korec, the Environmental Assessment Officer with the National Energy Board (403-292-6614). .3 Shell and their contractors will be trained in spill response procedures and equipment use.	Regional	Moderate	Immediate to medium term	Isolated	Low	High	Reversible in medium term	Neutral	Not significant

TABLE 10 Cont'd

Concern/Impact	Mitigative Measures	Areal Extent	Magnitude	Duration	Frequency	Probability	Confidence	Reversibility	Residual Impact Balance	Residual Impact Significance
2.6 Snow fills/ ramps/ bridges can act as dams during break-up resulting in impacts to channels and banks	.1 Snow fills/ramps/ice bridges will be removed by V-notching upon completion of seismic operations and prior to break-up.	Local	Low	Short term	Accidental	Low	High	Reversible in short term	Neutral	Not significant
3. Health or Environmentally Threatening Emergency										
	.1 In the event of an emergency, Shell's Emergency Response Plan will be implemented (Appendix A).	N/A	N/A	N/A	Isolated	Low	High	N/A	Neutral	N/A
4. Abandonment and Restoration										
	.1 All equipment and materials will be removed from area immediately following project completion, prior to spring break up. .2 All garbage will be transported to an approved waste management facility. No waste will be left in the program area.	Local	Low	Short term	Isolated	Low	High	Reversible in short term	Neutral	Not significant

13.0 EMERGENCY RESPONSE PLANS

In the event of an emergency, Shell's Emergency Response Plan (Appendix A) will be followed and INAC and the NEB will be contacted immediately. In the event of a spill, the Fuel Spill Contingency Plan will be followed and INAC, the NEB, and the NWT Spill Response Line will be contacted immediately.

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

Upon completion of the seismic program, all debris will be removed for the program area and transported to Inuvik for disposal.

15.0 OTHER ENVIRONMENTAL ASSESSMENT

IEG (formerly Inuvialuit Environmental Inc.) prepared a previous environmental assessment for the Shell South Kugpik Winter 2000/2001 2D and 3D seismic program. The Project Description is on file with the EISC and the NEB. A number of assessments in the vicinity of the project area have been approved or will be submitted by IEG for approval. A separate project description is being prepared for Shell's proposed winter 2001/2002 2D seismic activities. The seismic project description will be submitted to the EISC by September 30, 2001.

16.0 COMMUNITY CONSULTATION

Shell initiated public consultation with the communities and regional organizations potentially affected by the seismic program in June 2001. Government representatives were also informed of the proposed project. The consultation provided Shell with the opportunity to present the program to the various groups, obtain information on the area from local residents, and hear concerns raised during the consultation meetings.

Shell sent an initial project notification along with a request for comments to all pertinent territorial, federal, and Inuvialuit agencies with jurisdiction in the project area. The purpose of the notification was to provide agency representatives with an overview of the project prior to consultation meetings with Shell representatives, and to offer the opportunity for early comments or identification of concerns.

At the meetings, project information was presented to the various individuals and groups and input related to issues, concerns, or questions was invited. A schedule of meetings is provided in Table 11. John Brown (Shell), Bessie Inuktalik (IEG), and Erin Bradley (IEG) were in attendance at all meetings in Inuvik, Tuktoyaktuk, and Aklavik. During the week of June 19, John Brown attended meetings in Fort McPherson and Tsiigehtchic. At the meetings in Tuktoyaktuk, Jim Guthrie (AOGS) also made a presentation regarding the airstrip and lease extension at Swimming Point. The issues outlined in Table 12 were those raised with regards to water resources. A full listing of community concerns will be provided in the seismic program project description.

TABLE 11

COMMUNITY CONSULTATION MEETINGS

Date	Consultation Group	Location
June 19, 2001	Fort McPherson Community Meeting	Fort McPherson
June 19, 2001	Tsiigehtchic Community Meeting	Tsiigehtchic
June 24, 2001	ILA	Inuvik
June 24, 2001	Inuvik Community	Ingamo Hall, Inuvik
June 25, 2001	Tuktoyaktuk Community Corporation and Elders	Pingo Park Lodge, Tuktoyaktuk
June 25, 2001	Tuktoyaktuk Community	Kitti Hall, Tuktoyaktuk
June 26, 2001	INAC	Inuvik
June 26, 2001	Aklavik HTC, CC, Elders	Aklavik
June 26, 2001	Aklavik Community	James Storr Building, Aklavik

TABLE 12

COMMUNITY CONSULTATION ISSUES AND RESPONSE

Community	Proponent
You are using lots of little channels and lakes. It would be good to have some fish habitat information.	We are talking with FJMC, DFO, and the ILA about requirements and needs for aquatics studies.
You said you will use casing rigs on waterbodies not frozen to bottom.	It is a DFO regulation. Last year, we rarely had more than a foot or two of water under ice. We did not drill on the channels where it was too deep.
What are you going to do with the sewage on the Arctic Star?	Until we get the treatment system running to spec, we will truck it out and we will do the same thing with the sleigh camp. We will start with a tank available this year in case we have to use it to store wastewater.
You have a lot of fuel storage and diesel tanks that will be in the Delta. What steps is Shell taking to ensure that the environment is protected.	Fuel spills are our single biggest risk. Our fuel storage is state-of-the – art double-walled, and fully contained. We have our own tank checking program. The environmental monitors also check the tanks. The tanks are the best money can buy. Even the Arctic Star is fully contained. We berm everything when it's out there.

Table 12 Cont'd

Community	Proponent
Are personnel trained? Employees need to be trained for oil spills. WesternGeco's training program includes giving a spill response booklet and that's the end of it.	Everyone who fuels up is oriented around the fuel tank. It is basic. We don't have booms. The spills that we have had are small spills. We check three or four times per day. In the NWT you have to report every spill and every suspected spill. We had equipment going through the ice last year. Even though we didn't see a sheen, we knew it was possible so we reported it.
The tank on the barge- is it closed in? So you have to remove snow from it everyday?	No it is not closed in. If necessary.
Will the sleigh camp be moved on the ice all the time- not overland?	Yes, but I said to DIAND that we will pick a spot on land and on ice in case the ice never gets thick enough.
You will haul waste to the sewage lagoon until you are sure it is working. Who will make sure it is working right?	Samples have to be sent to a lab and to the DIAND inspector.

17.0 PERSONAL COMMUNICATIONS

Inuvialuit Environmental wishes to acknowledge the following people for their assistance in supplying information and comments incorporated into this report.

Chernoff, Eric. EIRB Secretary, Joint Secretariat – Inuvialuit Renewable Resources Committees, Inuvik, NT.

Slack, Todd. GIS Specialist, Joint Secretariat, Inuvik, NT.

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APPENDIX A

EMERGENCY RESPONSE PLAN
FUEL AND OIL SPILL CONTINGENCY PLAN

SHELL CANADA LIMITED

EMERGENCY RESPONSE PLAN (ERP)

FOR

MACKENZIE DELTA SEISMIC PROGRAM

THIS IS A CONTROLLED DOCUMENT

Date	Revision	Signature
October 26, 2000	01	SMK, JHB

CONTROLLED DOCUMENT DISTRIBUTION:

Copy 1	John Brown, Shell Canada
Copy 2	Stacey Kelley, Shell Canada
Copy 3	Dave Berry, Shell Canada (Consultant)
Copy 4	Erin Bradley, Inuvialuit Environmental Inc.

Approved by: Emergency Response Coordinator

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1.0 EMERGENCY PREPAREDNESS

1.1 SCOPE

This Emergency Response Plan (ERP) addresses a Mackenzie Delta Operations Emergency. The ERP is a bridged version of the Resources Standard / Model Emergency Response Plan (ERP) intended for use by individuals trained and familiar with that ERP. For complete details regarding Emergency Activation, Action Plans, Organization, Responsibilities and Communication, consult the Resources Standard / Model ERP.

The ERP will be supplied to the controlled document distribution list and updated as required. This document will be located in the WOS ERP Manual under a tab called "Regional Data – Miscellaneous Area".

1.2 PURPOSE

An Emergency is any sudden, abnormal or unplanned incident which requires immediate attention and has the potential to endanger human life, the environment or have an adverse effect on Shell/public assets.

Criteria utilized to classify an Emergency Incident includes:

- Risk to life/public safety
- Environmental damage
- Physical site situation

The purpose of the ERP is to have controls and methods of recovery in place to minimize the impact of an emergency, which results in injury to crew, damage to property or the environment.

The ERP cover all possible emergencies and rely on the resources of the crew and the crew's equipment for the most part. However additional assistance may be required from other sources and or the Rescue Coordination Center.

1.3 OBJECTIVE

The objective of the ERP is to develop, implement and maintain a system, including drills and procedures, which when activated in an emergency situation will minimize the effects on:

- Injury or health to persons
- The environment
- Contractor and or third party property
- Image or reputation

Emergency planning began with identifying and assessing the hazards associated with the business activities of the crew. Hazards were then considered in terms of their potential for loss and severity. The Safety Management System activities establish the means of recovery and control of these hazards.

1.4 REFERENCES:

Shell Canada Limited:

- Resources Standard / Model Emergency Response Plan [ERP].
- Geophysical Operations Safety Manual
- Well Construction & Geophysical Operations Site Specific Emergency Response Plan - ***this document.***

2.0 INCIDENT COMMAND SYSTEM (ICS]

2.1 INCIDENT COMMAND SYSTEM

ICS is an all-risk system that is flexible and adaptable to all Emergencies.

To define the specific situations, events have been grouped into three levels in order of their risk or potential risk to personnel, public, environment, property, media and/or public attention or corporate business/reputational impacts.

Circumstances or the perception of a particular stakeholder could cause the incident to be defined at a higher or lower level.

Always consider the "actual" and/or "perceived" risks/health impacts when responding to the public needs.

No two (2) incidents are the same. The response and resources need to be evaluated and assessed on every emergency. THE LEVELS ARE A MINIMUM GUIDE.

This Section 2.0 is ICS and Support Information summarized from Resources Standard / Model ERP.

Emergency situations where personnel, environment or equipment could be at risk and external support is required:

- Field Based Command Post shall be the Arctic Star Barge Camp or some accommodation / office in Inuvik
- Field Based Command Post Incident Commander shall be Shell Representative on Site.
- Local EOC shall be the Calgary office.

2.2 CLASSIFICATION (LEVELS) OF EMERGENCIES

RESPONSE LEVEL	RESPONSIBILITY	DESCRIPTION OF INCIDENT	EXAMPLES
LEVEL 1 **FIELD INCIDENT** **LOW IMMEDIATE** **IMPACT OR** **UNCONFIRMED**	• Local emergency response team(s)	• An incident has occurred • The incident can be managed by the local emergency response team(s) • The incident is contained onsite • Report after the fact • Note. A Level 1 Emergency may have the potential to escalate to a Level 2 or a Level 3 Emergency • Some characteristics of a Level 1 incident are: ✓ Immediate control of the hazard/source ✓ No threat to public safety ✓ Negligible environmental impacts ✓ No reputation impacts ✓ No business impacts ✓ No media interest ✓ No supporting government actions required	• Small, contained, controllable fire/explosion. • Small, contained, controllable hazardous material spill. • Single person medevac. • Overdue aircraft with which communication cannot be established • Severe weather that could result in process shutdown or the isolation of personnel (ie personnel required to remain in camp). • Any threat of criminal or hazardous act. • Damage equipment. • Wildlife encounters.

RESPONSE LEVEL	RESPONSIBILITY	DESCRIPTION OF INCIDENT	EXAMPLES
LEVEL 2 **EMERGENCY INCIDENT** **SIGNIFICANT IMPACT** **OR POTENTIAL**	• Local emergency response team(s) with assistance from the Calgary office	• An incident with seious to significant impact to the safety of persons, environment, property or production • The incident cannot be managed by the local emergency response team(s) alone • The incident has the potential for escalation or to continue for an extended period of time • Some characteristices of a Level 2 incident are: ✓ Imminent control of the hazard ✓ Some threat to public safety ✓ Moderate environmental impacts ✓ Local reputational impacts ✓ Local/Regional media interest ✓ Beyond the capability of local resources ✓ Minor government involvement	• Fire and/or explosion as a result of a hazardous material spill. • A hazardous spill occurs and overflows onto / into the MacKenzie river. • An incident where 2 or more persons have been seriously injured requiring medevac • Any serious injury where treatment is required above first aid equivalent and where medevac is not likely (ie. severe weather) • A helicopter crash where there may be injuries but no fatalities • A helicopter landing in open water • Overdue aircraft with which communication cannot be established after an unreasonably long period of time • Camp fire • Adverse weather that jeopardizes the safety of personnel in the field (i.e. whiteout conditions) • Ice Rescue • Any criminal action • Personal injury / equipment damage causes by shallow gas.

RESPONSE LEVEL	RESPONSIBILITY	DESCRIPTION OF INCIDENT	EXAMPLES
LEVEL 3 **CRISIS INCIDENT** **MAJOR IMPACT OR HAZARD TO PUBLIC**	• Local emergency response team(s) with assistance from the Calgary office.	• An incident where control of the situation has been lost presenting a definite hazard for the people or environment • An incident with extreme impact or the impact requires full Corporate response to control, mitigate and bring to conclusion • Some characteristics of a Level 3 incident are: ✓ Uncontrolled hazard ✓ Public safety jeopardized ✓ Significant and ongoing environmental impacts ✓ Corporate reputational impacts ✓ Corporate business impacts ✓ National/International media interest ✓ Immediate multi-agency government involvement ✓ Assistance from outside parties	• Major fire or explosion • Uncontrolled spill of hydrocarbon or hazardous product/chemical. • Death of a worker • Crash and destruction of a helicopter • Terrorist acts

EMERGENCY RESPONSE PLAN

SUBJECT: ICS POSITION SUMMARY

REFERENCE: 503 (5.3)

0

COMMAND STAFF

INCIDENT COMMANDER (IC)
- Person in Charge

SAFETY
- Overall Safety

LIAISON
- Government Agencies

PUBLIC INFO OFFICER (PIO)
- Media

LOGISTICS
- Orders Resources (both Manpower and Equipment)

OPERATIONS
- Actual Working Operations

STAGING
- Pre-deployment Area

RECORDER
- Records All Events

RECON
- Eyes of the Command Staff

PLANNING
- Involved in/prepares Planning aspects

FINANCE
- Procurement, Time and Costs

OPERATIONS

AIR OPERATIONS
- Air activities, Supervision and Coordination

PIPELINE REPAIR
- Responsible for all Pipeline Repair

FIRE ATTACK
- Provide Fire Attack

SPILL GROUP
- Spill Containment and Clean-Up

OPERATIONS (cont'd)

HAZARDOUS MATERIALS GROUP
- Define and Manage all activities in the
- Hot and Warm Zones

MONITORING
- Assist donning of PPE
- Walking Dictionary/Resource Material

HazMat REFERENCE
- Ensure Safety of Responders within Zones

HazMat SAFETY
- Ensure Safety of Responders within Zones

DECON
- Decontaminate Victims and Responders

SITE ENTRY
- Safe Entry, Search and Rescue

SOURCE CONTROL
- Perform Tactical Control

IGNITION UNIT
- Ignition of Releases

ROADBLOCK
- Establish Roadblocks

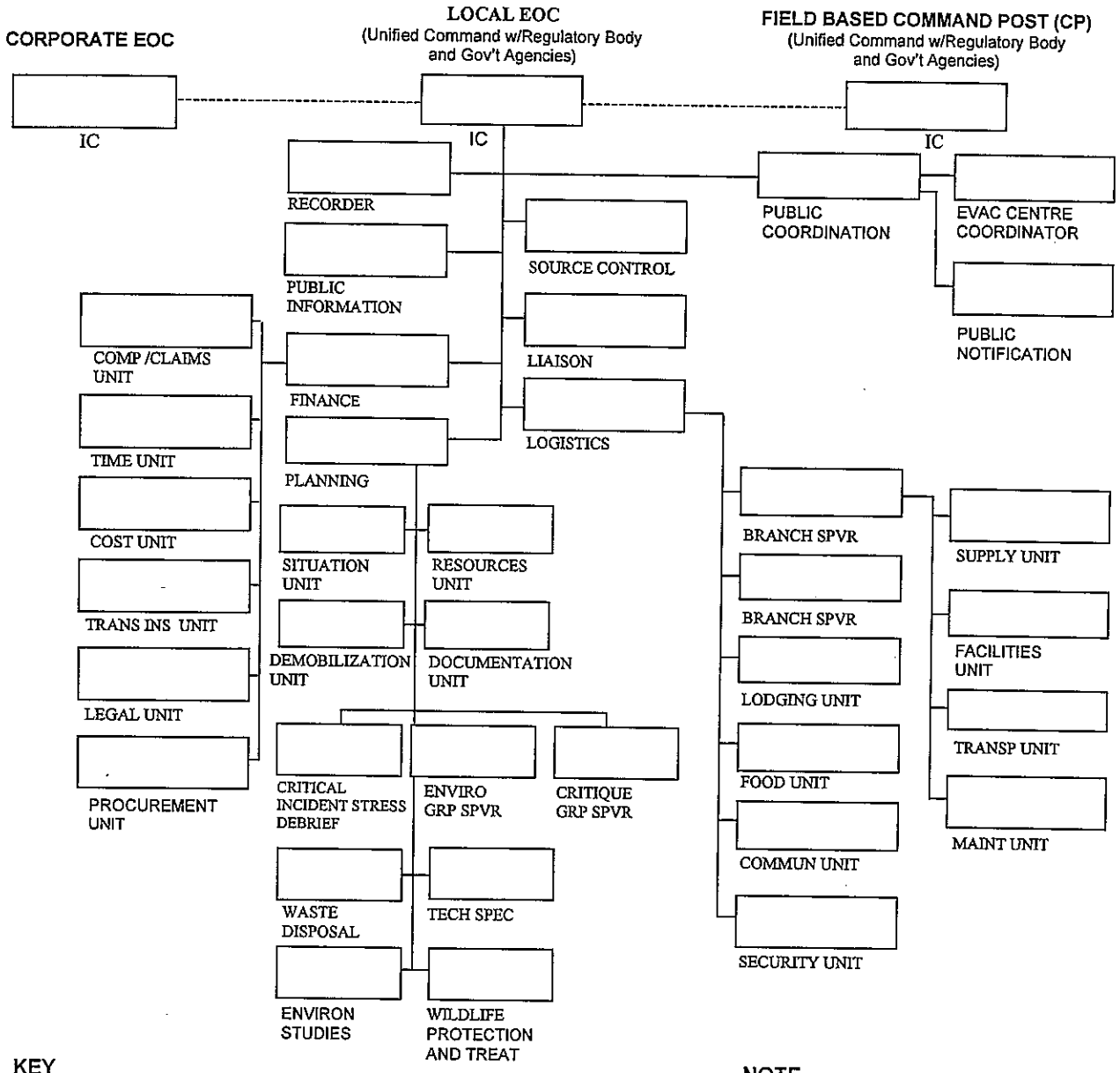
EVAC /SEARCH
- Co-ordinate Evacuation/Search

MEDICAL
- Medical Services and Equipment

TRIAGE
- Prioritize Treatment of Patients

TRANSPORT
- Medical Transportation Needs

MEDICAL SUPPLIES
- Maintain Supplies



KEY

- Dotted lines represent communications /support information
- Solid lines represent organizational authority

SEC = Section
GRP SPVR = Group Supervisor
LDR = Leader

NOTE

- It is not mandatory to assign all positions
- Assign positions only as necessary
- Some positions may not require activation depending on the actual emergency

2.6 GLOSSARY

CORPORATE EMERGENCY OPERATIONS CENTRE [EOC]:
Provides support to the Local EOC. This includes logistical, planning, liaison, financial, business impact, legal, and public information support. Additionally, serves as the liaison link between coordination of Corporate Business impact needs and Local EOC activities.

The Corporate Emergency Operations Centre [EOC] is activated upon request of the Local EOC Incident Commander [IC]**or** the Crisis Evaluation Group [CEG].

- Corporate EOC / CMT, Classroom 5 Shell Centre, Calgary.
- Public Affairs Room, Classroom 4 Shell Centre, Calgary.

EMERGENCY:
A situation that has the potential to result in serious adverse effects on the health and /or safety of employees, the community or the environment. An emergency may be the result of process upsets, uncontrolled reactions, fires, explosions, threats, unplanned releases of hazardous materials, including third party, natural disasters such as tornadoes, hurricanes, earthquakes, floods and winter storms.

EMERGENCY PLANNING ZONE [EPZ]:
Pre-defined area surrounding a potential source of sour gas from which the Public may be evacuated if there is a sour gas release.

EVACUATION CENTRE:
Primary control point for the initial reception of evacuees. Personnel will provide registration, first aid, accommodation and information for evacuees.

FIELD BASED COMMAND POST [CP]:
Location from which direct Command and Control of the Emergency is carried out.

INCIDENT COMMANDER [IC]:
Individual responsible for the overall management of all incident activities including the development and implementation of strategy and for approving the ordering and release of resources.

LOCAL EMERGENCY OPERATIONS CENTRE [EOC]:
Activated to provide initial and on-going source control, public notification, monitoring, reconnaissance, safety and support services for the Field Based Emergency. This includes operational, logistical, planning, liaison, financial, safety and public information support resources.

THE LOCAL EOC PROVIDES SUPPORT TO THE FIELD BASED COMMAND POST [CP].

PUBLIC:
Are people within a defined area [EPZ] for emergency response planning that are generally referred to by industry in the following categories:

- **Resident** - individuals who lives at a fixed location and maintains occupancy on a full time basis.
- **Transient** - individuals who frequents an area (hunters, trappers)
- **Industry** - operators of trade, business, production, or manufacturing.

3.0 NOTIFICATIONS

Introduction

These notification procedures must be followed for Shell field operations in the event of the following emergencies:

- Serious injury or fatality
- Explosive mishap
- Dangerous goods mishap
- Natural disaster
- High potential incident/accident
- Group II incidents according to the Potential Risk Matrix

The following information must be provided to the person(s) being notified:

- Location of incident/accident
- Type of incident/accident
- Person(s) involved
- Time of occurrence
- Action already taken
- Further action planned
- Assistance required

INCIDENT COMMANDER (IE. FIELD SUPERVISORY STAFF) RESPONSIBILITIES

RCMP

In the event of the previously mentioned emergencies, the RCMP must be notified immediately. The RCMP will, if asked, notify the following:

- Local fire chief
- Local hospital and ambulance service
- Local wrecker

DANGEROUS GOODS EMERGENCY

In the event of a dangerous goods occurrence, the following agencies must be notified immediately:

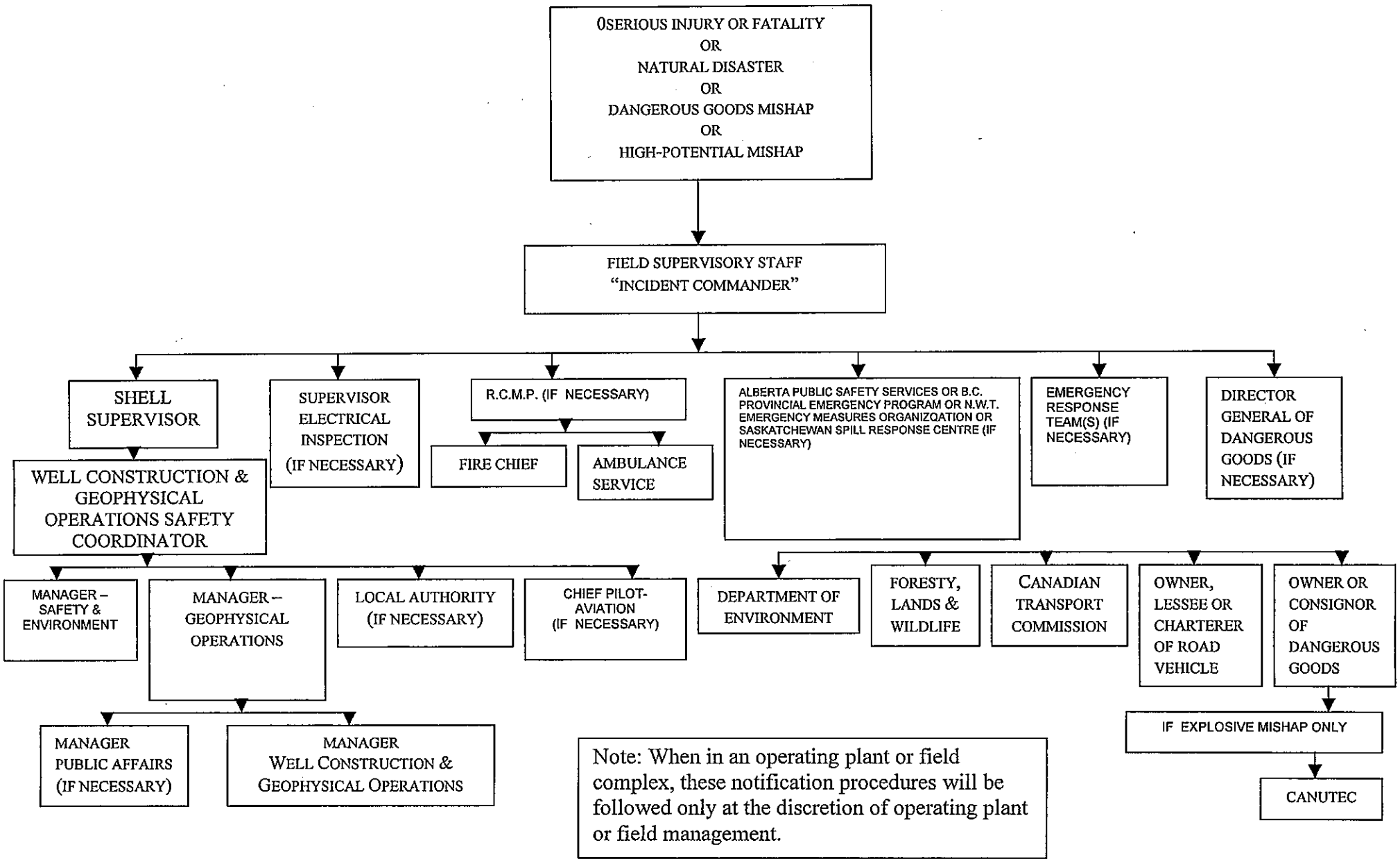
- Alberta Public Safety Services, or
- B.C. Provincial Emergency Program, or
- N.W.T. Emergency Measures Organization, or
- Saskatchewan Spill Response Centre

These agencies will, if asked, notify the following government agencies:

- Department of Environment
- Forestry, Lands and Wildlife
- Canadian Transport Commission

These agencies will also provide assistance in notifying, evacuating and finding temporary shelter for people.

NOTIFICATION PROCEDURES



Note: When in an operating plant or field complex, these notification procedures will be followed only at the discretion of operating plant or field management.

4.0 TELEPHONE NUMBERS / CONTACTS *(all telephone numbers to be confirmed before program start)*

SHELL CANADA LTD.

Shell Canada Resources	1-800-661-7378
Crisis Evaluation Group (CEG) Leader (Pager #44204)	403-245-9900
Crisis Evaluation Group (CEG) (Cellular)	403-607-6667
Crisis Evaluation Group (CEG) (Pager #44298)	403-245-9900
Pim van de Pypekamp (Cellular)	403-818-7091
Pim van de Pypekamp (Office)	403-691-3128
Pim van de Pypekamp (Pager #44218)	403-245-9900
Pim van de Pypekamp (Residence)	403-241-2649
John Brwon (Office)	403-691-3502
John Brown (Cellular)	403-861-1352
John H. Brown (Residence)	403-285-3786
Bill Westwood (Office)	403-691-3168
Bill Westwood (Cellular)	403-818-9428
Bill Westwood (Residence)	403-286-2740
Stacey Kelley (Office)	403-691-2240
Stacey Kelley (Cellular)	403-815-5136
Stacey Kelley (Residence)	403-288-5443

CAMP COMMUNICATIONS:

	To be Updated when active	

LOCAL AUTHORITY

RCMP (Alberta)	Dial "0", Ask for Zenith 50000
Local Police (Sask.)	Dial "O", Ask for Zenith 50000
Local Police (B.C.)	Dial "O", Ask for Zenith 50000
Local Police (N.W.T.)	Dial "O", Ask for Zenith 50000

DANGEROUS GOODS EMERGENCY CONTACT

Public Safety Services (Alberta)	1-800 272-9600
24 Hour Emergency/Disaster Response	
Spill Response Centre (Saskatchewan)	1-800 667-7525 or
24 Hour Emergency/Disaster Response	(306) 777-7000
Provincial Emergency Program (B.C.)	1-800 663-3456 or
24 Hour Emergency	(604) 387-5956
Emergency Measures Organization	(867) 873-7554
(N.W.T.) - 24 Hour Emergency	

SAFETY

Department of Occupational Health & Safety (Alberta)	(403) 297-2222
Department of Occupational Health & Safety (Sask.)	(306) 787-4480
Workers' Compensation Board (B.C.)	(604) 561-3700

NEB (N.W.T.)	(403) 299-3868

FORESTRY

Department of Forestry, Lands &	(403) 427-3473
Wildlife - 24 Hour - Edmonton Office	
Regional Dispatch (Sask.)	(306) 787-4527
Ministry of Forests (B.C.)	Dial "0", Ask for Zenith 5555
Territorial Forest Fire Centre	1-800 661-0800

ELECTRICAL

Electrical Inspection Branch (Alberta)	(403) 427-6868
Saskatchewan Power	(306) 787-4527
Electrical Inspection Branch (B.C.)	(604) 660-6261
Electrical Inspection Branch (N.W.T.)	(403) 873-7473

OTHER SERVICES

Ace Explosives	(403) 291-4300
Explosives Limited	(403) 255-7776
C.A.G.C. Emergency Response	(403) 245-5883
Canadian Transport Commission	(819) 997-7707
CANUTEC	(613) 996-6666
Edmonton Poison (24 Hour)	1-800-332-1414
Energy, Mines and Resources – Ottawa	(613) 995-3065
Explosives Division Calgary	(403) 292-4766
Vancouver	(604) 666-0366
Rescue Co-ordination Centre	1-800-661-5631

CONTACT PHONE NUMBERS (TO BE COMPLETED ON LOCATION)

Hospital Emergency Number _____

24 Hr. Emergency Hospital Number: _____

Local Helicopter Charter Number: _____

Local R.C.M.P. Detachment Number: _____

Local Fire Emergency Number: _____

Forest Service Number: _____

Crew Office Number: _____

Party Manager's Mobile Number: _____

Recording Truck Mobile Number: _____

Cat Push Mobile Number: _____

Drill Push Mobile Number: _____

Shell Supervisor Number: _____

Shell Safety Representative: _____

Vacuum Truck _____

NOTE: These phones are to be updated at the start of each new job.

Dangerous Goods Emergency Response Plan

Information Centre (Alberta)	1-800 272-9600
Information Centre (Sask.)	1-800 667-7525 or
	(306) 777-7000
Information Centre (B.C.)	1-800 663-3456 or
	(604) 387-5956
Information Centre (N.W.T.)	(867) 873-7554
C.A.G.C. Emergency Response Plan	(403) 245-5883
CANUTEC	(613) 996-6666
NWT Emergency Spill Respone Line	(867) 920-8130
National Energy Board	(403) 292-6614

5.0 Training Exercises

The success of any emergency response plan depends on adequately trained personnel. The level of training has to be tailored to the functions to be performed and the skill levels of the individual.

Training in the areas of SCL Incident Command System is provided to the individuals who are responsible for implementing this plan.

Exercises are equally important to the success of any ERP implementation. The purpose of the Exercises is to reinforce the formal training through tabletop exercises and mock drills. They are intended to evaluate the ability of supervisor to carryout key roles within the Incident Command System and identify additional training requirements.

Appendix 2 - MEDEVAC PROCEDURES

INTRODUCTION

The hazards and the potential for high severity injury to our employees and contractors at seismic locations requires that, as far as is practical, the training and resources to treat and transport the sick or injured are provided.

Furthermore, the Occupational Health and Safety Act states that "An employer must ensure that emergency conveyance is readily available to any work site where his workers are engaged". In many seismic locations, municipal or commercial ambulance services cannot be utilized and an Industrial First Aid Attendant with an emergency conveyance vehicle (ECV) is necessary.

SELECTION OF SERVICE

To aid in the decision about what type of service or combination of services would be adequate, the following points will dictate when a Medic and/or Industrial First Aid Attendant with an emergency conveyance vehicle are required.

- Hazard Assessment
  - helicopter support, conventional drills, camps and heliportable work
- Distance from a hospital
  - if over 1 hour surface travel time

In the instance of most serious injuries (i.e. major respiratory distress, severe burns or bleeding, etc.) it is imperative that response time to medical treatment be kept to a minimum and proper first aid be administered to prevent patient condition from becoming worse and to promote recovery.

Upon startup of a seismic crew (i.e. cats, drills, recording, etc.) contact must be made with the local authorities and services to obtain phone numbers for Emergency Response. The following medevac procedures must be posted in the office and made readily available to all supervisory personnel.

Medevacs

In the event of a medical emergency in the field, the first aid attendant must ensure that the following equipment are carried to the casualty:

- Portable oxygen bottle and mask
- Skied
- Personnel files for the casualty

When use of a helicopter is available, the first aid attendant must also bring a stretcher with blankets and pillows.

The helicopter is to remain with the casualty until transportation is required. Only the pilot, first aid attendant and casualty are permitted in the helicopter during transport.

Note: During medevac all operations serviced by the first aid attendant and/or helicopter are to cease and radio silence enforced.

MEDIVAC PROCEDURES

CITY/TOWN:_____
PROSPECT: _____

FOR AIR EVACUATION, FIXED WING OR HELICOPTER, CALL:
CHARTER:_____
CHARTER:_____

TELL THEM:

- MEDEVAC REQUIRED
- YOUR LOCATION – INCLUDE LANDING AREA OR AIRSTRIP CO-ORDINATES

LATITUDE:_____
LONGITUDE:_____

- LANDING AREA OR AIRSTRIP CONDITION – INCLUDE LIGHTING, WIND SPEED AND DIRECTION
- ANY OBSTRUCTION OR HAZARDS TO BE AWARE OF ON LANDING
- LOCAL WEATHER CONDITIONS
- YOUR PHONE NUMBER RADIO FREQUENCY:

PHONE NUMBER: _____
RADIO FREQUENCY:_____

UPON CONTACT TO FIXED WING OR HELICOPTER CHARTER, MEDICAL CONTACT IS MANDATORY TO ENSURE THAT PROPER FACILITIES AND ATTENTION IS GIVEN TO PATIENT. IF AVAILABLE AND POSSIBLE, THE FIRST AID ATTENDANT SHALL CALL THE LOCAL HOSPITAL.

FOR MEDICAL ATTENTION AND SERVICE CALL:
HOSPITAL EMERGENCY:_____
24 – HOUR HOSPITAL EMERGENCY:_____
AMBULANCE SERVICE:_____

TELL THEM:

- MEDEVAC IN PROGRESS
- TYPE OF ASSISTANCE REQUIRED - HELIPAD OR AIRSTRIP LOCATION
  - AMBULANCE TO TRANSPORT PATIENT FROM AIRCRAFT TO HOSPITAL

***NOTE:** **GET DIRECTIONS TO HOSPITAL AND/OR HELIPAD/AIRSTRIP LOCATIONS.**

- NATURE OF INJURY OR ILLNESS, INCLUDING - AGE AND SEX OF PATIENT
  - BRIEF DESCRIPTION OF ACCIDENT
  - DESCRIPTION OF INJURIES OR ILLNESS
- YOUR POSITION AND QUALIFICATIONS
- TYPE OF MEDICAL AID ALREADY ADMINISTERED
- YOUR PHONE NUMBER
- ESTIMATED TIME OF ARRIVAL

Appendix 3 – SHALLOW GAS

Introduction
This is an area of possible shallow gas and gas hydrate deposits. The operation must be familiar with Section 19, Drilling Shot Holes for Charges, in the Canadian Oil and Gas Geophysical Operations Regulations and Section 7, Shell Canada Limited, Geophysical Operations Safety Manual. All necessary precautions shall be made while drilling shotholes to ensure that any released gas is not ignited.

In the event of a shallow gas encounter the following must be adhered to:

- Immediately shut the rig off (i.e. kill switch)
- Immediately vacate area and walk to next rig to report encounter
- Never use the radio in your cab
- When blow has subsided return to the shotpoint and abandon hole
- Move to next shot point and commence drilling

Appendix 4 – AIRCRAFT

Introduction

The safe and efficient movement of helicopters within geophysical operations require the presence of a reliable network of communication, both in the air and on the ground. The size, location and terrain of the operations area can cause problems in the establishment and maintenance of an effective communication network. Radio channel congestion, due to the limited number of channels available to geophysical operations, must be kept to a minimum, by using strict radio procedures.

The helicopter must not be parked in a communications "blind spot" so as to avoid delays in the helicopter responding to any emergencies that may occur during operations. Also, this rule should help avoid needless activation of the Aircraft Accident Response Plan.

FLIGHTWATCH PERSON

A person with sufficient training and knowledge must be designated to assume responsibility for the tracking and coordination of all helicopters and passenger movements during the day, maintaining required radio contact with the helicopter and all applicable field personnel, and to initiate the Aircraft Accident Response Plan when required.

The flightwatch person is responsible for the completion of the flightwatch control/manifest form.

Note: A separate flightwatch control/manifest form is to be used for each helicopter, and retained until job completion (refer to page 8).

The flightwatch person or a designated substitute person, must be on duty continuously during helicopter operations.

The flightwatch person or designated substitute person must initiate the Aircraft Accident Response Plan when:

- There is reasonable indication of a helicopter accident (i.e. observations by field personnel) or distress radio messages from the helicopter.

OR

- The helicopter is overdue and communication cannot be established using all available sources.

OR

- More than sixty minutes has elapsed since the last communication has been received from the helicopter.

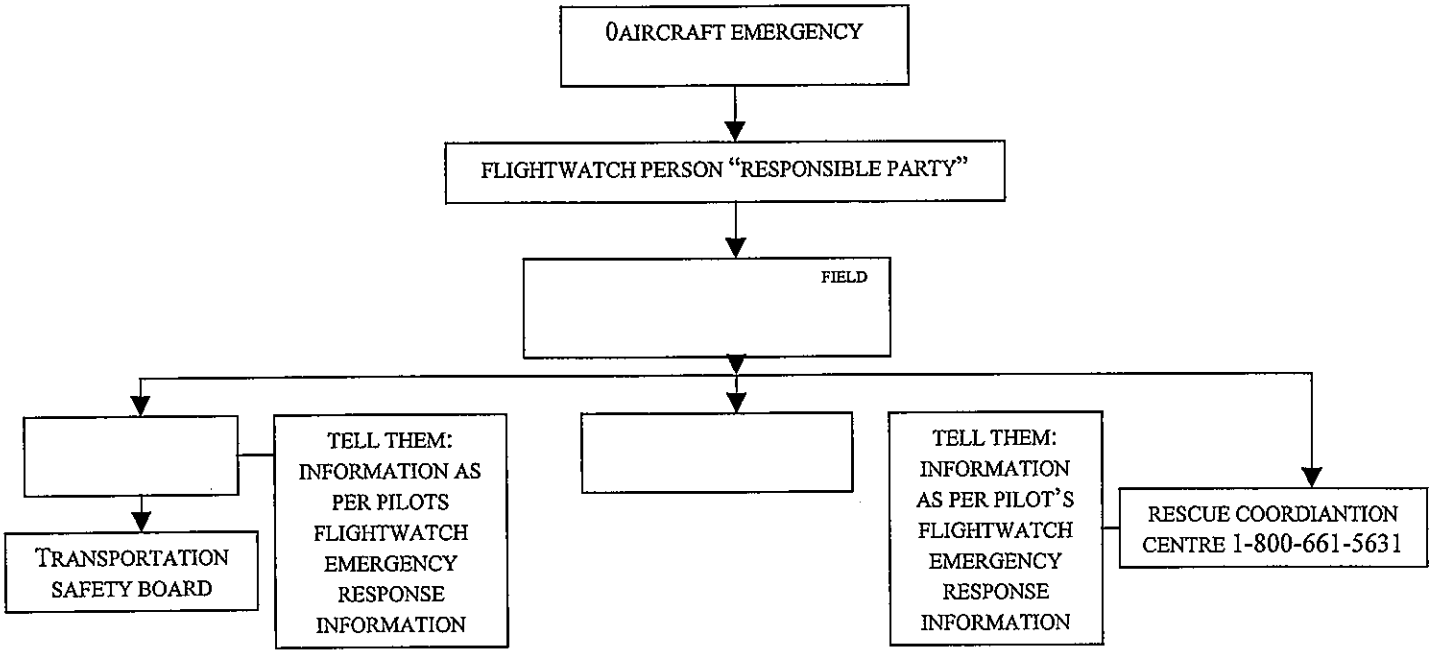
HELICOPTER PILOT

The helicopter pilot must provide the flightwatch person with the pilot's flightwatch emergency response information as shown on page 7 of this section.

The helicopter pilot must ensure that the flightwatch person, at all times, knows who is on board the helicopter.

The helicopter pilot must not operate within the operations area for more than one hour without communication with the appropriate flightwatch person.

RESPONSE FLOW CHART



0PILOT'S FLIGHTWATCH

AIRCRAFT COMPANY	AIRCRAFT REGISTRATION	AIRCRAFT TYPE	AIRCRAFT COLORS
_____	_____	_____	_____

TYPE OF EMERGENCY LOCATOR TRANSMITTER	COMMUNICATION EQUIPMENT	NAVIGATION AIDS
_____	VHF ____ HF ____ OTHER ____	ADF ____ VOR ____ OTHER ____

TRUE AIRSPEED	PILOT NAME AND LICENSE NUMBER	PILOT SIGNATURE
_____KNOTS	_____ _____	_____

Appendix 5 - FIRE AND OR EXPLOSION

Introduction

Fires can spread and destroy an entire trailer camp in minutes due to trailer composition and spacing. Fire assessment, control and extinguishment must be prompt. In the event of a campfire, certain procedures must be followed. It is vital that personnel under your supervision are aware of these procedures and of their responsibilities for the Emergency Response Plan to work effectively.

- An incident commander (i.e. field supervisory staff) must be designated to administer and initiate the Emergency Response Plan.
- Muster Area must be designated. Document area in Fire Procedures Form.
- Emergency Response Team(s) must be designated by the incident commander to respond to and assist in emergency situation(s). Document Team members on Fire Procedures Form.
- Incidents/Accidents involving dangerous goods are to be reported to the incident commander immediately.

JOB RESPONSIBILITIES

All Personnel Including Visitors

- Report to the incident commander upon arrival to and departure from camp.
- Familiarize yourself with the location of pull stations, fire extinguishers, exits, helipad and muster area.
- No unauthorized personnel in camp.

Medic

- Always ensure that the emergency conveyance vehicle (ECV) is ready for transportation of patient(s) at all times.
- Familiarize yourself with the operation of a hand-held radio.
- Treat injuries according to severity.
- After determining that an air medevac is necessary, co-ordinate the air medevac using medevac procedures.

Incident Commander (i.e. field supervisory staff)

- Conduct at least one fire drill per month.
- Do a visual check of all fire equipment weekly.
- Familiarize yourself with the operation of a hand-held radio.
- In the event of an alarm, notify the Emergency Response Team(s).
- If required, assist in fire fighting and search and rescue.
-

Emergency Response Team (i.e. Camp Attendant)

- Be familiar with and know the location of fire equipment, breakers and power plant generator.
- Familiarize yourself with the operation of a hand-held radio.
- Respond to emergencies at the request of the incident commander only.

Appendix 6 – DANGEROUS GOODS

INCIDENT/ACCIDENT PROCEDURES

An incident/accident involving dangerous goods is anything that represents a danger to health and safety, property or the environment. In the event of an incident/accident involving dangerous goods, certain procedures must be followed. It is vital that personnel under your supervision are aware of these procedures and of their responsibilities for the Emergency Response Plan to work effectively.

- An incident commander (i.e. field supervisory staff) must be designated to administer and initiate the Emergency Response Plan.
- Emergency Response Team(s) must be designated by the incident commander to respond to and assist in emergency situation(s). For serious large spills, the Shell Emergency Response Team can be activated. (see Map page 13)
- Incidents/Accidents involving dangerous goods are to be reported to the incident commander immediately.
- The incident commander must put the Emergency Response Plan into effect (refer to attachments for Emergency Response Plans for various products starting on page 18).
- Incidents/Accidents involving explosives or injuries due to a release of dangerous goods must be reported to the Director General of Dangerous Goods in Ottawa within 30 days of the incident/accident. Information must be present on Schedule IX, Form 2 (refer to page 14-16) Located in the Geophysical Operations Safety Manual.

  Director General
  344 Slater Street
  14th Floor
  Ottawa, Ontario
  K1A ON5

  The CAGC explosives emergency response number is: **ERP2-0150-091**
  (403) 245-5883 (24 hours)

INCIDENT/ACCIDENT RESPONSIBILITIES

Employee

- Notify the incident commander immediately.
- Barricade the hazardous area and await the incident commander and/or Emergency Response Team(s).
- Evacuate to pre-determined area of safety as defined by the Emergency Response Plan.

Incident Commander

- Evacuate to pre-determined area of safety as defined by the Emergency Response Plan.
- Notify the appropriate Emergency Response Team(s) to respond to the particular emergency situation(s).
- Notify the appropriate dangerous goods emergency contact number for the province or territory you are in. Numbers are listed in this module under Other Emergency Contact Numbers. (pages 28-30)
- Notify the RCMP.
- Notify your supervisor and/or a Shell Supervisor.
- When a railway vehicle is involved, notify the Canadian Transport Commission.
- When an aircraft is involved or the occurrence takes place at an airport, notify the Canadian Air Transportation Administration of the Department of Transport.
- Notify the owner, lessee or charterer of a road vehicle when a road vehicle is involved.
- Notify the owner or the consignor of the consignment of dangerous goods.

Emergency Response Team(s)

- Must be familiar with potential hazards that may occur involving dangerous goods and the emergency action required for these hazards.
- Each member must have a valid first aid ticket.
- Respond to and assist in emergency situations at the request of the incident commander.

Appendix 7 - Fuel / Oil Spill Contingency Plan

1.0 Sleigh Camp:

The sleigh camp will have two diesel fuel sloops with total capacity of 88,000 gallons.. Fuel to engines will be pumped directly from the 20,000-gallon steel bermed tank.

2.0 Transportation

Liquid fuels and oils will be stored in a closed system during transportation. Access routes will be on ice channels and down seismic lines. When access routes parallel lakes or streams, the access will be more than 30 metres from the waterbody to prevent deleterious material from entering the waterbody and to prevent disturbance of banks that can result in sedimentation.

3.0 Maintenance And Control

This contingency plan is project specific and will be reviewed:

1) As changes to applicable environmental legislation come into effect
2) During any on-site training exercises; and
3) After each and every fuel / oil spill incident.

Changes to phone numbers and names of those individuals identified in this contingency plan will be made on an as and when required basis.

4.0 Notification

Spills will be immediately be reported to the following organizations:

- Shell's Environmental, Health and Safety Coordinator,
- Indian Northern Affairs Canada
- North West Territory's Emergency Spill Response Line
- National Energy Board

5.0 Spill Response

- Receive or make the initial assessment
- Assess the spill area and eliminate all sources of ignition
- Keep the public away from the area.
- Initiate the emergency plan at the assessed level as per section 2.2, classification of emergency's
- Establish and maintain contact with appropriate emergency services and external agencies
- Deliver 'stand-down' instructions to all external services when they are no longer required to support the emergency situation.

6.0 Containment

- deploy the on-site spill containment equipment as required
- notify and request assistance if required from external NWT Emergency Spill Response line.
- erect barriers to minimize the migration of the spill

7.0 Recovery

The goal of recovering the spilled fuel is to ensure that as much as possible is recovered as soon as possible therefore minimizing the impact on the environment.

- ensure that the spill has been adequately contained before starting recovery procedures
- depending on the characteristics of the spill, containment and recovery may be done simultaneously
- if required, set up a decontamination site so that individuals involved with containment/recovery operation don't spread the material beyond its contained limits.
- assess which recovery method is most suitable/efficient for the circumstances, taking into account the amount of fuel to be recovered, where the spill has occurred and the anticipated dangers to human life and the natural environment.

9.0 Recovery Methods

DIRECT SUCTION TECHNIQUES

The direct suction technique will be utilized as part of the initial response to the spill. A vacuum truck supplier will be identified prior to program start.

USE OF ABSORBENT MATERIAL

Absorbents are materials that soak up fuel either by absorption or adsorption. They are commonly used for final cleanup and recovery of small amounts of fuel. They are effective in recovering thin layers of fuel. The Arctic Star camp will have sorbent pads on location to be used for soaking up the small spills or residue. The saturated sorbent pads will be placed in open drums. When a drum is full, it will be closed up and sent to Hay River for furtherance to Alberta for final disposition.

EMERGENCY CONTACTS

CONTACT	LOCATION	PHONE NUMBER
RCMP	Inuvik	(867) 777-2935
AMBULANCE	Inuvik	(867) 777-4444
HOSPITAL	Inuvik	(867) 777-2955
FOREST FIRE	Inuvik	(867) 777-3333 or (24 hr) 1-800-661-0800
NWT EMERGENCY SPILL RESPONSE LINE	Yellowknife	(867) 920-8130
NATIONAL ENERGY BOARD	Calgary	(403) 299-2792
CANADIAN HELICOPTERS LTD.	Inuvik	(867) 777-2424