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PROJECT DESCRIPTION FOR THE PROPOSED CHEVRON CANADA RESOURCES MACKENZIE DELTA INUVIK BLOCK 1 & 2 WINTER SEISMIC PROGRAM

Prepared for:
Chevron Canada Resources
Calgary, Alberta

Prepared by:

Inuvialuit Environmental Inc.

Calgary, Alberta and Inuvik, Northwest Territories

October 2000
Project # 700-00

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Submitted by:

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EXECUTIVE SUMMARY

Chevron Canada Resources (Chevron) is applying to conduct a winter 2000/2001 seismic program within the Mackenzie River Delta region of the Northwest Territories. The project entails the 2D seismic exploration of approximately 650 linear kilometres of line in the Inuvik 1 and Inuvik 2 blocks, with lines extending to Exploration Licences #385 and #395. The proposed program encompasses approximately 4200 km^2 of land, located primarily along the Middle and East Channels of the Mackenzie River, and extending to the southern portion of Richards Island and the southeast portion of Langley Island. These blocks of land are located on Inuvialuit 7(1)(a) private lands and Crown lands within the Inuvialuit Settlement Region (ISR). The proposed seismic program falls under Federal, Inuvialuit and Territorial regulatory jurisdiction. Pending regulatory approval, the program is scheduled to mobilize in December 2000, with seismic exploration scheduled to commence January 2001.

Inuvialuit Environmental Inc. (IEI) has been commissioned by Chevron to prepare this Project Description for the Inuvik Block 1 & 2 Winter Seismic Program. The Project Description has been prepared to meet the requirements of Indian and Northern Affairs Canada (INAC), and the Inuvialuit Land Administration (ILA), and fulfill the operating guidelines and procedures of the Environmental Impact Screening Committee (EISC).

The proposed project is located in both upland tundra and lowland delta environments within the Mackenzie River Delta. The topography in the project area is flat to gently rolling, with moderate to steep slopes adjacent to waterbodies and along the East Channel of the Mackenzie River. Vegetation in the upland area is limited mainly to grasses, shrubs and willows up to approximately 2.5 m tall. Lowland delta vegetation consists primarily of black spruce, northern willow, horsetail and water sedge. It is anticipated that some clearing of trees and tall shrubs may be required on seismic lines located west of the East Channel.

The winter seismic program has been developed with the consideration of minimizing impacts on the environment and land users. Seismic technology will be employed to mitigate potential environmental impacts on fish habitat specifically. The potential exists for temporary alteration of mature vegetation and wildlife habitat; elevated noise, emissions and traffic levels resulting in short-term wildlife displacement; temporary disruptions to traditional land use in the vicinity of the project and disturbance to permafrost.

Protection measures designed to mitigate the potential environmental impacts are presented in this Project Description and in Table 11. No significant residual impacts are identified. Chevron and its contractors are committed to following these measures in order to minimize the risk of potential environmental impacts and disturbance of culturally and historically significant areas.

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2.0 REGULATORY APPROVALS

Chevron is applying to conduct a winter 2000/2001 seismic program in the Mackenzie River Delta region of the Northwest Territories. The project entails the 2D seismic exploration of approximately 650 linear kilometres of line primarily within the Inuvik 1 and 2 blocks. The proposed program encompasses approximately 4200 km^2 of land, located along the Middle and East Channels of the Mackenzie River, and extending to the southern portion of Richards Island and the southeast portion of Langley Island (Figure 1). These blocks of land are located on Inuvialuit 7(1)(a) private lands and Crown lands within the Inuvialuit Settlement Region (ISR), and therefore the project falls under Federal, Inuvialuit and Territorial regulatory jurisdiction. The primary agencies with jurisdiction over the project include the Inuvialuit Land Administration (ILA), Indian and Northern Affairs Canada (INAC), the National Energy Board (NEB), and the Northwest Territories Water Board. Chevron is seeking Land Use Permits from the ILA and INAC, a Geophysical Operation Authorization from the NEB, and a Water Licence from the NWT Water Board.

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; and Environment Canada for pollution prevention. The Environmental Impact Screening Committee (EISC) is an advisory committee responsible for screening all proposed projects on Crown Land and will be responsible for screening projects on private land, should an Inuvialuit organization refer a project to the EISC. When a screening occurs, the EISC's 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 governmental authority competent to authorize the development that in its view:
>
> the development will have no such significant negative impact and may proceed without environmental assessment and review under this Agreement;
>
> the development could have significant negative impact and is subject to assessment and review under this Agreement; or
>
> the development proposal has deficiencies of a nature that warrant a termination of its consideration and the submission of another Project Description.

If the EISC determines 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).

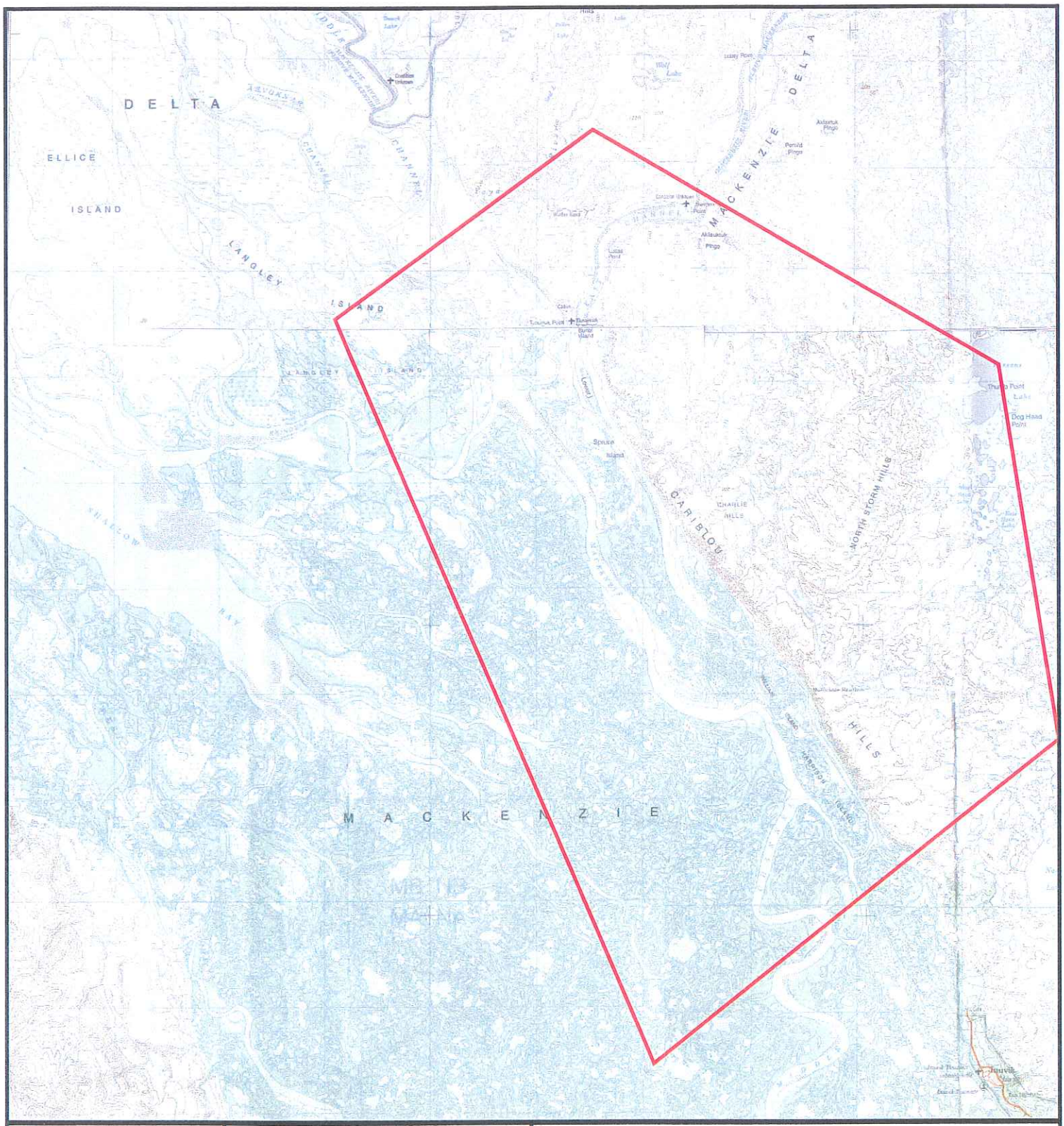
The NEB is the governmental authority competent to authorize the development within the meaning of the IFA. The NEB is also required to conduct an environmental screening of the project pursuant to the *Canadian Environmental Assessment Act* (CEAA), and to consider environmental impacts under its jurisdiction to approve the development under the *Canadian Oil and Gas Operations Act* (COGOA) and applicable regulations.

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

TABLE 1

APPROVALS REQUIRED

Agency	Approval Required/*Governing Legislation*	Status
Rudy Cockney District Manager, North Mackenzie District Indian and Northern Affairs Canada P.O. Box 2100 Inuvik, NT X0E 0T0	Land Use Permit *Territorial Lands Act* *Territorial Land Use Regulations*	Submitted October 22, 2000
Hans Arends Land Administrator Inuvialuit Land Administration P.O. Box 290 Tuktoyaktuk, NT X0E 1C0	Class A Land Use Permit *Inuvialuit Final Agreement*	Submitted October 22, 2000
Linda Graf Secretary Environmental Impact Screening Committee P.O. Box 2120 Inuvik, NT X0E 0T0	Approval on Project Description/Environmental Protection Plan *Inuvialuit Final Agreement*	Submitted October 22, 2000
Rick Turner Exploration and Production National Energy Board 444 - 7th Avenue SW Calgary, Alberta T2P 0X8	Geophysical Operation Authorization *Canadian Environmental Assessment Act* *Canadian Oil and Gas Operations Act*	Submitted October 22, 2000
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 October 22, 2000



Inuvialuit Environmental Inc.	Legend Proposed Seismic Location	**Proposed Chevron Canada Resources Project Location**			
		Scale 1:250,000	700-00	October 2000	Figure 1

3.0 TITLE

Chevron Canada Resources Mackenzie Delta Inuvik Block 1 & 2 Winter Seismic Program.

4.0 DEVELOPMENT SUMMARY

4.1 Project Scope

The project proposed by Chevron entails the acquisition of 650 km of 2D seismic data within approximately 4200 km^2 of land, located in the Inuvik 1 and Inuvik 2 blocks on the Mackenzie River Delta (Figure 1). These blocks of land are located on Inuvialuit 7(1)(a) private lands within the Inuvialuit Settlement Region (ISR), with some lines extending onto Crown lands. During winter 2000/2001, Chevron plans to shoot 22 seismic lines. These lines vary in length, ranging from approximately 14 km to 53 km, and are spaced at intervals exceeding 1 km. The results of the seismic program will be used to delineate potential exploratory drill sites and additional exploratory seismic programs.

Schlumberger Oilfield Services (Schlumberger) has been contracted to manage the seismic operations on behalf of Chevron. Schlumberger will provide the geophysical survey team and equipment required to conduct the seismic program. The seismic crew will be housed in a mobile sleigh camp that will move to predetermined locations as the program progresses (Section 4.3). Seismic operations will commence in January and are anticipated to be complete by late April or May 2001. Mobilization of equipment may begin as early as November, weather and ice access permitting.

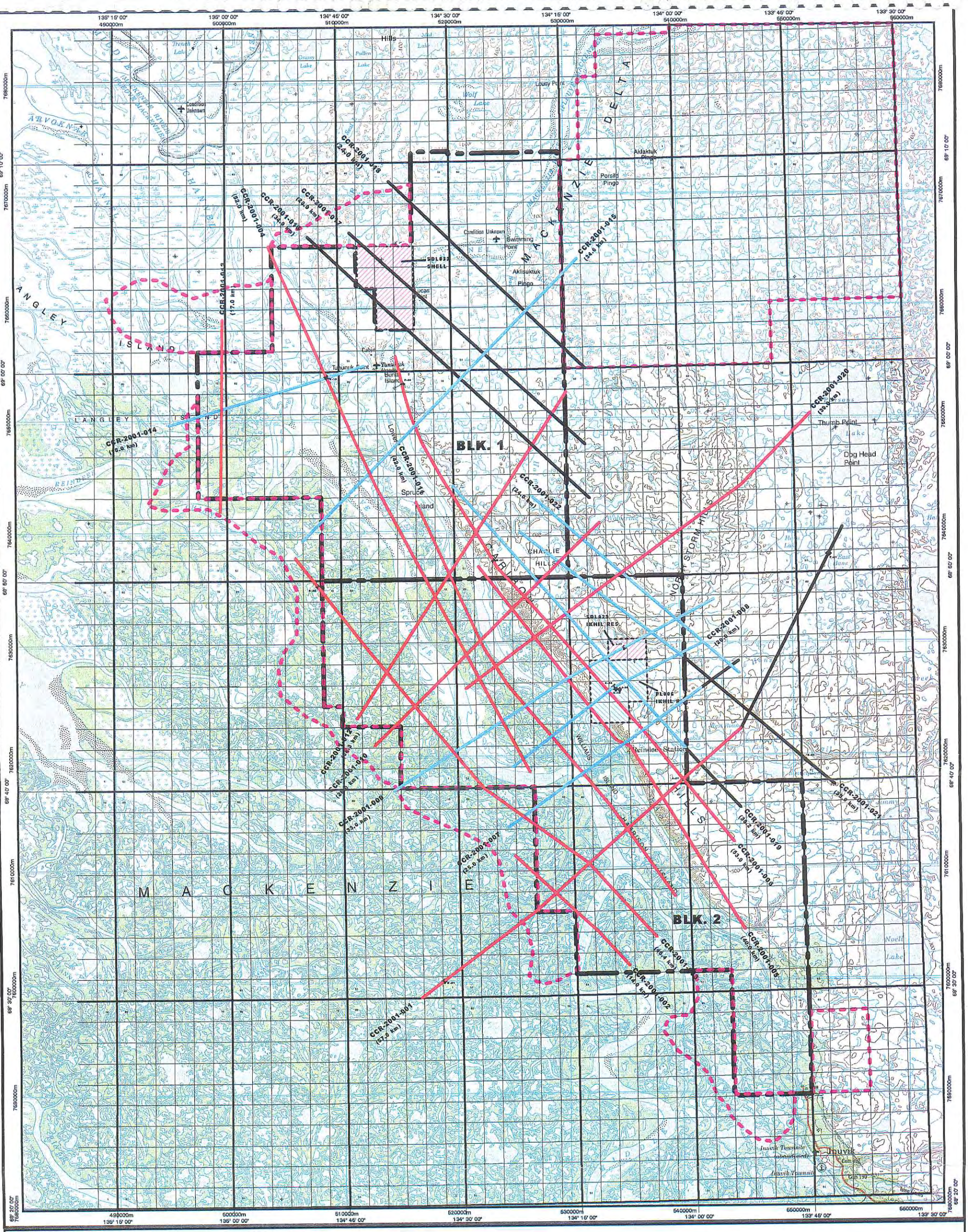
Chevron is proposing to use the dynamite explosive technique as the source of seismic input signal into the ground. To allow calculation of refraction statistics, shot holes will be drilled every 80 m with receivers located every 20 m. In addition, Chevron is proposing to conduct seismic under lakebeds within the project area. Various seismic techniques will be employed to mitigate any impact on habitat and fish within waterbodies during the course of the program. The proposed seismic line sets are outlined in Table 2 and illustrated in Figure 2.

TABLE 2

SEISMIC LINE SET DETAILS

Land Ownership Designation								
	Crown [1]		7(1)(a) [2]		7(1)(b) [3]			
Line	Length (km)	Area (ha)	Length (km)	Area (ha)	Length (km)	Area (ha)	Total Length (km)	Total Area (ha)
CCR-2001-001	17.6	14.08	17.6	14.08	1.8	1.44	37	29.6
CCR-2001-002	-	-	11.5	9.2	2.5	2	14	11.2
CCR-2001-003	-	-	30.4	24.32	5.6	4.48	36	28.8
CCR-2001-004	0.5	0.4	51.5	41.2	-	-	52	41.6
CCR-2001-005	-	-	40	32	-	-	40	32
CCR-2001-006	-	-	53	42.4	-	-	53	42.4
CCR-2001-007	1.7	1.36	16.4	13.12	2.9	2.32	21	16.8
CCR-2001-008	1.9	1.52	18.1	14.48	-	-	20	16
CCR-2001-009	3.1	2.48	29.2	23.36	0.7	0.56	33	26.4
CCR-2001-010	3.7	2.96	22.1	17.68	2.2	1.76	28	22.4
CCR-2001-011	-	-	42	33.6	-	-	42	33.6
CCR-2001-012	0.2	0.16	23.8	19.04	-	-	24	19.2
CCR-2001-013	-	-	12.9	10.32	4.1	3.28	17	13.6
CCR-2001-014	1.4	1.12	15.5	12.4	1.1	0.88	18	14.4
CCR-2001-015	-	-	19.3	15.44	1.7	1.36	21	16.8
CCR-2001-016	2.7	2.16	30.1	24.08	1.2	0.96	34	27.2
CCR-2001-017	2.3	1.84	23.8	19.04	1.9	1.52	28	22.4
CCR-2001-018	0.9	0.72	18.7	14.96	4.4	3.52	24	19.2
CCR-2001-019	-	-	31	24.8	-	-	31	24.8
CCR-2001-020	19.8	15.84	16.2	12.96	-	-	36	28.8
CCR-2001-021	1.2	0.96	16.8	13.44	-	-	18	14.4
CCR-2001-022	13.3	10.64	10.7	8.56	-	-	24	19.2
TOTALS	**70.3**	**56.24**	**550.6**	**440.48**	**30.1**	**24.08**	**651**	**520.8**

[1] Crown Land – Federally owned lands.
[2] 7 (1) a lands – Inuvialuit owned lands with surface and subsurface rights.
[3] 7 (1) b lands – Inuvialuit owned lands with surface rights only.



Chevron
CHEVRON CANADA RESOURCES

MACKENZIE DELTA
INUVIK BLKS. 1 & 2
WINTER SEISMIC PROGRAM

NORTHWEST TERRITORIES

EXISTING:	LICENSEE: CHEVRON NO.:
NEWCUT: 737.5 km	PERMITTEE: SCHLUMBERGER NO.:
TOTAL: 737.5 km	EQUIPMENT: TRACKED / HELI-ASSIST
	SOURCE: DYNAMITE
	SCALE: 1:330,000
	IMPACT FILE NO.: 00-313-5651
UTM NAD 27, ZONE 8	NTS MAPS: 107 B/C ('96)
	DATE: Oct. 11, 2000

Line #	ORIENTATION	LENGTH (km)	PRIORITY
CCR-2001-001	SW-NE	57.0	1
CCR-2001-002	SE-NW	14.0	2
CCR-2001-003	SE-NW	46.4	1
CCR-2001-004	SE-NW	52.0	1
CCR-2001-005	SE-NW	40.0	1
CCR-2001-006	SE-NW	53.0	1
CCR-2001-007	SW-NE	25.0	2
CCR-2001-008	SW-NE	20.0	2
CCR-2001-009	SW-NE	33.0	2
CCR-2001-010	SW-NE	28.0	1
CCR-2001-011	SE-NW	42.0	1
CCR-2001-012	SW-NE	34.3	1
CCR-2001-013	S-N	17.0	1
CCR-2001-014	WSW-ENE	16.0	2
CCR-2001-015	SW-NE	35.0	2
CCR-2001-016	SE-NW	34.0	3
CCR-2001-017	SE-NW	28.0	3
CCR-2001-018	SE-NW	24.0	3
CCR-2001-019	SE-NW	38.2	2
CCR-2001-020	SW-NE	39.0	1
CCR-2001-021	SE-NW	35.6	2
CCR-2001-022	SE-NW	24.0	2

LEGEND:

Inuvialuit (Private) Lands: 7(1)(a) 7(1)(b)
Inuvik
Archaeological Sites:
Creek Crossings:
Access:
Production Licence (PL):
Significant Discovery Licence (SDL):

Figure 2

4.2 Seismic Program Description

4.2.1 Line and Access Route Selection

Line locations were based on the interpretation of Chevron's existing seismic and subsurface well data in the delta, and to fulfill the geophysical requirements of the program. Line locations will avoid archaeological sites and other environmentally sensitive areas in keeping with all regulations. To the extent feasible, the lines will be straight, with offsets or skidding used to avoid sensitive areas. Significant changes in line location will be decided upon by the interpreting geophysicists. Setback requirements to be incorporated into the seismic program are summarized in Table 11.

The criteria used for the temporary winter access route selection included:

- utilizing the Inuvik to Tuktoyaktuk winter road as primary access;
- utilizing lakes, the Mackenzie River and its associated channels for ice access;
- utilizing seismic lines for access within the project area;
- minimizing disturbance by avoiding areas of steep slopes for access;
- minimizing disturbance to sensitive wildlife habitat, soil, hydrological and vegetation areas; and
- minimizing new disturbance by managing in-and-out access on the lines so that less overland travel is required.

4.2.2 Access Route Construction

Ice roads will be constructed primarily on lakes and river channels found in the vicinity of the project. Surface preparation will consist of clearing snow from the ice. Where lakes and river channels do not access the project area, overland access routes may be required. Construction of overland access routes will consist of snow compaction along the routes chosen. If thickening of access routes is required, water will be withdrawn from the Mackenzie River or a nearby large waterbody and pumped onto the access route. Water withdrawal methods will meet all regulatory guidelines (Section 4.3.3).

Blading may be required over certain stretches of the route, and depressions along the road filled with snow, to smooth the surface. Dozer blades will be equipped with mushroom shoes to elevate the blade, leaving a minimum of 10 cm snow cover on the access routes and thus preventing disturbance to the organic layer. Where wheeled equipment is used, snow will be

packed and flooded to minimize ground disturbance. Most of the access will be over ice and snow, and overland sections will be kept to a minimum.

Both electronic and physical ice thickness profiling will be employed during the construction and use of access routes, to evaluate ice conditions for safe travel. Access routes will be selected where slopes are minimal. Where slopes are unavoidable, snow and/or ice ramps will be constructed to prevent erosion and disturbance by equipment. Ice ramps will be constructed using water withdrawn from large, local lakes and the Mackenzie River (Section 4.3.3).

4.2.3 Line Production

An initial line survey will be conducted by tracking locations with a Nodwell or equivalent vehicle. Tracking vehicles will be guided using a Global Positioning System (GPS) and will proceed down the line, locating the line and source points as determined by the geophysicists. Along the lines, receiver points and source points will be marked with wooden laths to denote the point and line for the duration of the program. Receiver locations will be set along the line at 20 m intervals, with energy source points located every 80 m. Seismic line widths will be equal to the width of a Nodwell (approximately 6 m) and shall not exceed 8 m. Wooden laths and flagging will be retrieved at the end of recording operations and properly disposed.

Ice profiling methods will be utilized throughout the program to evaluate the thickness of ice (related to support of the equipment) and to establish whether or not waterbodies are frozen to bottom, thus determining potential fisheries locations along the line. Where waterbodies are frozen to bottom, no year-round fisheries potential will be assumed, and the line will continue over the ice and be completed as designed. Shot holes will be drilled through waterbodies frozen to bottom at source points along the line.

Where waterbodies are less than 500 m across and do not contain bottom-fast ice, potential year-round fisheries habitat may be present, and source points may be set back from either side of the waterbody to undershoot the area. Alternatively, drilling methods designed for conducting seismic in lakes may be employed to avoid any disturbance to habitat (Section 4.2.5). Shot hole locations requiring non-traditional seismic technology will be noted during the initial line survey.

Where source points are located on land, standard fisheries setbacks of 50 m from non-frozen to the bottom waterbodies will be maintained. Details of setbacks from waterbodies are provided in Section 4.2.5. These procedures are designed to allow Chevron to achieve the maximum number of shot points along the lines while minimizing environmental disturbance.

4.2.4 Line Clearing

Little to no line clearing will be required on the upland tundra sections of the Chevron seismic program, due to the lack of tall trees and shrubs found east of the East Channel of the Mackenzie River (Plate 1). Bulldozer use is not anticipated, and tracked units only, will be utilized. The units will be walked over the snow and vegetation will be driven over, with the impacts related to crushing restricted to the aboveground woody material, and leaving the remaining root systems intact.

Line clearing will be required during this program on some portions of seismic lines located west of the East Channel where floodplain vegetation includes black spruce and tall shrubs along channels of the Mackenzie River (Plate 2). During clearing, cats will proceed down the marked route to clear tall shrubs and trees, providing safe access for the drilling equipment, line crews and recorder. The cats will be equipped with mushroom shoes, and operators will be instructed to keep the blades a minimum of 10 cm off the ground to avoid topsoil scalping. These mitigative measures will result in trees and shrubs being sheared off at ground level, leaving the organic layer intact to stabilize soil and promote regrowth. No leaning trees will be left along the line, and all trees that are cut will be bucked into 2 m lengths and left in piles along the edge of the right-of-way for salvage as firewood by local residents.

Wherever possible Chevron will employ Low Impact Seismic methods (LIS). This will allow the cats to meander through the larger stands of timber, leaving the taller trees standing. Willows may be cut with a powered brush mower or hand cut. If clearing is required, care will be taken to ensure that there is no organic mat disturbance. Right-of-way width will not exceed 8 m. Any windrows created by clearing and snow removal on the lines will be alternated every 500 m to provide unimpeded wildlife movement. Frozen ground conditions, snow cover and tracked vehicles will minimize impacts to vegetation communities. In the event that access is hampered by high banks along the channels of the Mackenzie, (> 1 metre) it will be necessary to construct clean snow ramps for equipment access.

4.2.5 Energy Source/Shooting

The seismic program will be completed using dynamite as the energy source set at 80 m intervals along all lines. To position the explosive charge in shot holes drilled on land, a 10 cm hole will be dug to a depth of approximately 22 m. Shot holes will be drilled with a combination of air hammer drills and conventional air drills. A small portion of the shot holes are expected to be difficult to drill and will require water to complete. All drilling units will be mounted on Nodwell tracked carriers, Delta's or the equivalent.

Plate 1: View of vegetation on upland tundra where little to no clearing will be required during seismic operations.

Plate 2: View of vegetation on lowland delta where some clearing of tall shrubs and trees may be required.

A 20 kg charge size will be pushed down to the bottom of each shot hole drilled on land. Charge size will meet regulatory requirements. Drill hole cuttings will be stuffed back down the hole to the extent practical, with any remaining cuttings spread out around the hole. After loading as much of the drill cuttings as possible, a plastic plug is pushed down the hole about 0.75 m and then the hole is filled to the surface with remaining cuttings. The wire lead will be tied-off onto the wooden lath and left until shooting. During recording operations, the shooter will travel down the line, connect the leads to the detonation unit and detonate the charges for recording. Excess waste cuttings from shot holes drilled on land adjacent to waterbodies will be spread out on snow a minimum of 30 m away from the edge of the waterbody.

Shot holes located on waterbodies frozen to bottom, or with less than 0.5 m of water under ice, will be drilled conventionally and the process of loading the charge will follow the same procedure as outlined for source points on land. Explosives set in shot holes under lakes with bottom-fast ice, or with less than 0.5 m water, will be pushed to a depth of approximately 22 m from ice surface. Excess waste cuttings from shot holes drilled on waterbodies will be collected from the surface and disposed of a minimum of 30 m away from the waterbody.

Where waterbodies are not frozen to bottom and contain greater than 0.5 m of non-frozen water under ice, one of two methods will be employed to place the explosive charges in such as manner as to avoid potential fish habitat disturbance. The first method involves the use of casing surrounding a conventional auger drilling through non-frozen water to a minimum depth of 16 m below lakebed as per setback requirements outlined in Table 3. To place the drill, a pilot hole is drilled through the ice, large enough to fit the casing. The drill stem is then lowered to the lake or channel bottom. A set of slips, or hydraulic jaws, are used to hold the drill pipe and casing in place. Once the casing is in place, the shot hole can be drilled to depth. Upon completion, the drill stem is removed and dynamite is lowered in place through the casing. When the dynamite is in place, a cone is tied to the cap leads and the casing is removed leaving the cap leads on the surface. The leads are tied to a lath and the shot point is completed.

Cuttings will be brought to the surface through the casing, where the excess will be removed from the waterbody, thereby avoiding suspension of cuttings in water. The shot hole will be filled with cuttings to seal the charge in the shot hole, below the lake bottom. Excess waste cuttings from shot holes drilled on waterbodies will be collected from the surface and disposed of a minimum of 30 m away from the waterbody. The casing will be removed after the shot is loaded.

TABLE 3

ENERGY SOURCE OPTIONS

	Waterbody with Bottom-fast Ice or <0.5 m Water	Waterbody not Frozen to Bottom and >0.5 m Water Under Ice	
		Small Waterbody (< 500 m width)	Large Waterbody (> 500 m width)
Fish Habitat Assessment	Unsuitable habitat for all life stages in the fall.	Potential habitat for all fish life stages.	Suitable habitat for fish spawning, rearing, and/or feeding.
Seismic Energy Source	Dynamite under lakebed.	Dynamite undershot on sides of waterbody, or under lakebed.	Dynamite under lakebed.
Waterbody Setback	22 m below ice surface.	50 m away from waterbody on land, or 16 m below lakebed in waterbody.	16 m below lakebed in waterbody for a 10 kg charge.
Additional Mitigation or Field Work	No debris deposited on ice or in waterbody. No alteration of stream banks or substrate.	Record waterbody location, width and depth. GPS location of source points. No debris deposited on ice or in waterbody. No alteration of stream banks or substrate.	Record waterbody location, width and depth. GPS location of source points. No debris deposited on ice or in waterbody. No alteration of stream banks or substrate.

The second method involves a seismic technology called Vibra-ram to load the charge. The Vibra-ram is inserted into the shot hole once water is reached through conventional auguring, and then utilizes a high frequency hammer / vibration to insert a pipe into the lakebed. The pipe has an explosive charge installed in the end with a plastic drive point located below the charge. Charge size and depth of emplacement will be determined utilizing the setback distance for rock substrate as recommended by DFO (Wright Per. Comm.) and outlined in Table 4. Once the charge is inserted to a minimum depth as per setback requirements, the pipe is extracted, leaving the charge and drive point underground. When the pipe is extracted, a small vacuum is created, causing the lakebed sediments to close back in on the shot hole. No waste cuttings are produced using the Vibra-ram technology, further described in section 10.1.

TABLE 4

SETBACK DISTANCE (M) FROM CENTRE OF DETONATION OF AN EXPLOSIVE TO FISH HABITAT TO ACHIEVE 100 KPA OVERPRESSURE GUIDELINE (Wright and Hopky 1998)

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	**3.6**	**5.0**	**7.1**	**11.0**	**15.9**	**25.0**	**35.6**	**50.3**
Frozen Soil	2.3	3.2	4.5	7.2	14.3	16.0	22.6	32
Ice	1.5	2.1	3.0	4.7	6.6	10.5	14.8	21
Saturated Soil	1.5	2.1	3.0	4.8	6.7	10.0	15.1	21.3
Unsaturated Soil	0.7	1.0	1.4	2.2	3.1	4.9	6.9	9.8

Fisheries and Oceans Canada has requested monitoring of source points drilled on fish bearing waters using the Vibra-ram technology. Chevron is proposing to conduct test measurements of overpressure at source points on a select number of fish bearing lakes prior to recording operations. A hydrophone will be inserted into the water column adjacent to the shot hole, and the amplitude of the resulting pressure wave will be measured and recorded. These test measurements will determine if DFO overpressure guidelines of 100 kPa are exceeded using the Vibra-ram technology. Should test results illustrate that the technology can be used successfully, the remaining shot holes in the program will be drilled and loaded with charges.

4.2.6 Laying-out Lines

The primary mode of cable lay-out and retrieval will be tracked units. Depending on weather and daylight conditions, the lines may also be layed-out with the assistance of helicopters. Each of these two methods or a combination of methods may be used to deploy equipment. The helicopters will drop bags of equipment at pre-determined locations, or the helicopter will move bins of equipment from a Nodwell in one location to a Nodwell in a forward location. Line crews on the ground will unpack the bags of equipment, lay-out the equipment and connect all the appropriate cables to form a continuous seismic line. Subject to helicopter availability and environmental constraints, conventional tracked units may be utilized to lay-out lines. Cable and geophones are layed-out on all lines during 2D programs.

4.2.7 Recording

The recording unit will be positioned on a Nodwell or similar vehicle, and will travel down the line, hooking up to the cable at the appropriate locations. This unit records information collected by the geophones, which are connected by wire to the recording unit. The unit records information as the shot holes are detonated, one at a time. During recording operations, the shooter will travel down the line, connect the leads to the detonation unit and detonate the charges for recording. Recording crews should average a minimum of 5 km of progress per day depending upon weather conditions and recording parameters.

4.2.8 Personnel Required

Advance
1 Advance Party Manager
1 Cat Push
1 Drill Supervisor/Powder Custodian
1 Clerk/Supply
1 Expeditor
1 Environmental/Wildlife Monitor
2 Medics
Line Cutting
1 Cat Foreman
6 Cat Operators (Cutting Cats)
6 Slashers
Drills
1 Drill Crew Foreman/Mechanic
7 Drillers
7 Drill Helpers
Survey
2 Survey Coordinator
3 Surveyors
3 Rodmen
Helicopter
1 Pilot
1 Engineer
Total Personnel: 71

Recording
1 Recording Crew Manager
1 Clerk
1 Senior Observer
1 Junior Observer
1 Shooter
4 Line Truck Drivers/Line Bosses
2 Mechanics
1 Equipment/Staging Coordinator
1 Shooter's Helper
14 Line Crew Helpers
1 Trouble Shooter
2 Cable Repair
2 Fuel Truck Drivers
Support
1 Cat Camp Cook
1 Drill Camp Cook
1 Drill Camp Cook Helper
1 Drill Camp Attendant
1 Recording Camp Cook
1 Recording Camp Cook Helper
1 Recording Camp Attendant
1 Water Truck Driver

4.2.9 Equipment Required

Advance
3 Ford F350 4x4
2 Track Foremost 110 Nodwell
1 Monitor Unit Snowmobile
2 Ambulances
Line Cutting
1 Cat Foreman/Mechanic Unit – Nodwell
6 D6D Cutting Cats
3 Slashing Units
Drills
8 Drill Nodwells
Survey
2 Survey Coordinator Unit Nodwell
3 Survey Support Units Nodwell
1 Bell 206 A-Star

Recording
1 Recording Manager's Unit
1 Recorder
1 Personnel Carrier Foremost Terraflex
1 Shooter's Unit
4 Cable Units
1 Mechanic's Units Foremost Nodwell
1 Battery Charging Unit
1 Equipment Transport Unit
2 Support Units
Support
Fuel Transport Unit Foremost Chieftan
Fuel Sloops
Powder Magazines
1 Water truck

4.3 Mobile Sleigh Camp

Seismic operation crews will be housed in a mobile sleigh camp, which will move with the program. The camp accommodations will consist of 33 sleigh mounted units capable of housing 85 persons. The camp will consist of six strings of sleigh-mounted units, with a maximum number of six units per string. A combination of loaders and D6 Caterpillars will pull the trailer strings along the line. On sloping terrain, the camp strings can be separated into individual trailers and pulled up slopes using a winch system. This will minimize disturbance on slopes that might result from the use of cats pulling equipment on steep terrain.

Where practical, all units will remain together, however where logistics dictate, the sleigh camp may be split into two separate camps consisting of a Cat/Drill camp and a Recording camp. The sleigh camp will move two or three times during the course of the program. No additional clearing is required to accommodate the camp, as it will follow access routes created for seismic lines. Diagrams of the proposed sleigh camp are found in Appendix A.

4.3.1 Fuel Storage

Fuel storage for the camp will consist of two fuel sloops with a capacity of 12,000 gallons each. All tanks will be double walled, enviro-tanks. All tanks and fuelling procedures will adhere to safety standards outlined within Schlumberger's Fuel and Oil Spill Contingency Plan (Appendix B). Spill recovery and fire fighting equipment will be present at all times.

4.3.2 Wastewater Treatment and Disposal

The mobile sleigh camp is equipped with Incinolet toilets that eliminate sewage waste through incineration. The resulting ash is inert and may be spread out on high dry ground near the camp locations or disposed of in approved landfill site. Grey water that includes only shower water, wash water and kitchen water will be steamed off using a grey water steamer, with any sludge hauled away for proper disposal in an approved landfill site.

The mobile camp is additionally equipped with an incinerator. Solid refuse will be disposed of by incineration. Any other non-combustible material will be hauled out and disposed of in an approved landfill site.

4.3.3 Water Use

Drinking water will be trucked to camp from the nearest community and will travel with the camp and crew. Water that is required for ice access, building snow ramps, and possibly as a supplementary camp source, will be obtained from channels of the Mackenzie River. No water

will be taken from a land-locked waterbody where drawdown and related fisheries concerns may be an issue. Water withdrawal rates are not expected to exceed 100 m^3 per day throughout the program. The water will be extracted at a point where the seismic line intersects with the waterbody, and intake hoses will be screened with 1.3 cm (0.5") wire mesh to avoid impingement or entrainment of fish.

5.0 ALTERNATIVES

The seismic line sets have been located to maximize the amount and quality of data collected, in reference to existing data from past seismic programs and geological data from exploratory wells in the project area. Alternative locations may not fulfill the geophysical requirements of the program. However, the lay-out of the seismic lines may be adjusted as necessary to mitigate any potential impact identified prior to or during the program operations. This report provides an environmental assessment of the project, and identifies any sensitive or significant features that should be avoided, as well as determining any site-specific mitigative measures where appropriate. Alternative energy source methods are outlined in Section 4.2.5 and Table 3.

6.0 CUMULATIVE EFFECTS

Cumulative effects refer to the impacts on the environment that result from the combination of past, existing and imminent projects and activities. Causal agents of cumulative effects can include multiple causes; multiple effects; effects of activities in more than one locale; and recurring events. Activities within the vicinity of the proposed project include short-term seismic exploration from winter 1999/2000, as well as long-term land use activities such as trails, cabins and campsites. In addition, oil and gas exploration took place within the region during the 1970s and 80s.

Other oil and gas exploration activities will take place in the area adjacent to the west, north and northwest portions of the Chevron seismic program during the winter 2000/2001 season, specifically seismic programs by AEC West Ltd. (AEC), Petro-Canada and Burlington Resources Canada Energy Ltd. (Burlington), as well as a Petro-Canada drilling program.

AEC will be conducting a winter 2D seismic program in Exploration Licence #384 and #385, north of the Chevron project area from January to April 2001 (Figure 3). Approximately 1755 km^2 of the southern portion of the AEC area, consisting of 11 seismic lines, overlaps the Chevron project area. Chevron and AEC have identified proximal seismic line locations and will determine which lines are redundant, so that only one proponent conducts seismic along these lines. This cooperative effort will minimize impacts to the environment that might result from parallel or overlapping lines.

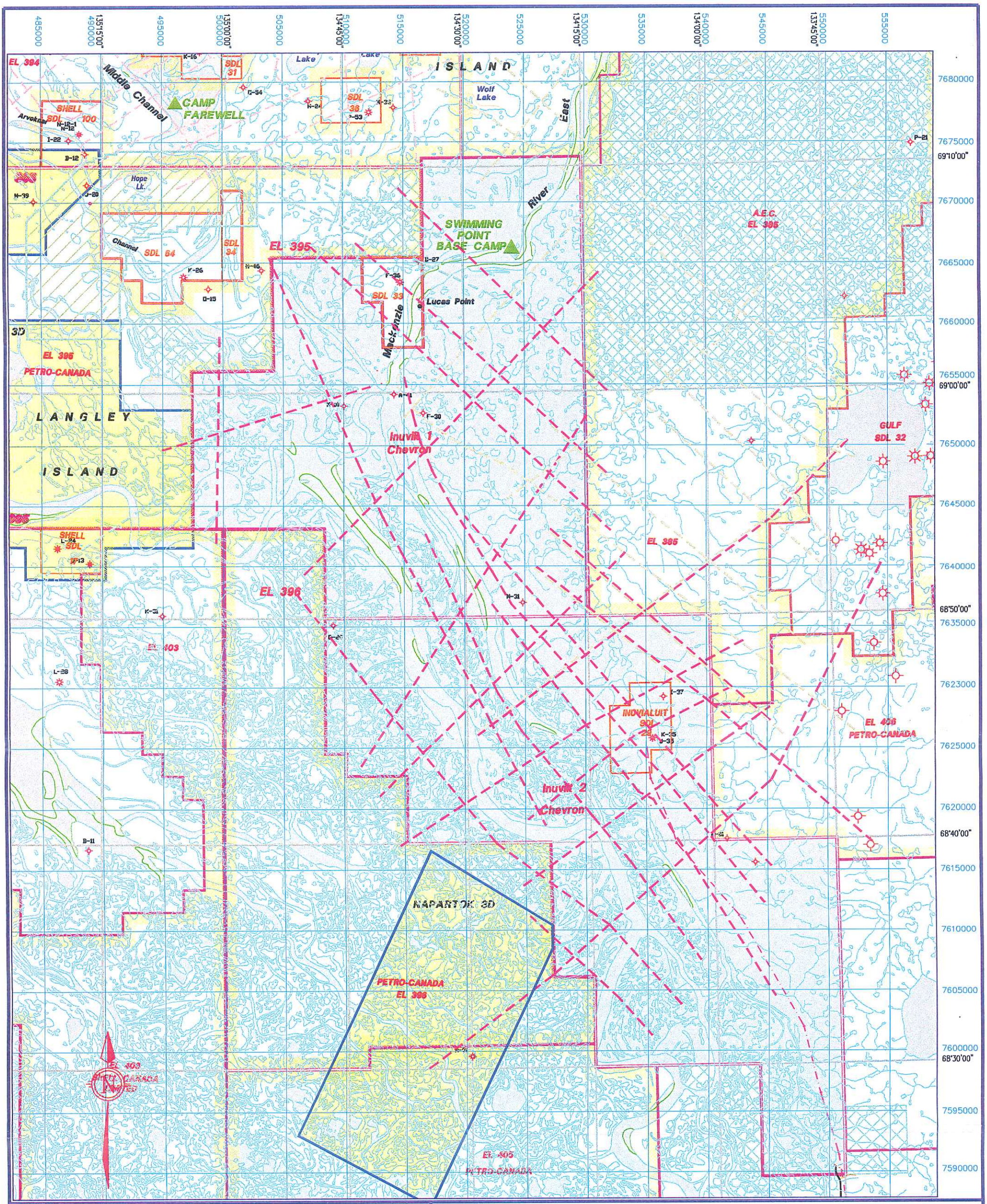
Petro-Canada will be conducting a winter drilling program scheduled for November 2000 to April 2001, with that project area located approximately 5 km northwest of the Chevron project area at its nearest point. In addition, Petro-Canada will be conducting a 3D seismic program in Exploration Licence #395, scheduled for January to April 2001, to the west and northwest of the Chevron project area (Figure 3). The Kurk 3D block is located approximately 12 km northwest of the Chevron Project area at its nearest point. There is no project overlap between the two project areas. The Kugpik 3D block boundary is located less than 1 km west of the proposed Chevron seismic line CCR-2001-013. Chevron's proposed seismic line CCR-2001-014 overlaps a portion of Petro-Canada's 3D Kugpik Block by approximately 4 km on the eastern end of the project area.

In addition, Burlington is proposing to conduct a 2D seismic exploration program scheduled for January – May 2001 in Exploration Licence #393, #394 and #404, north of the Chevron program. The Chevron program does not overlap Phase I of the Burlington seismic project. However, two proposed Phase II Burlington seismic lines do overlap the northernmost portion of the Chevron project area: Line 01-MCK-112 overlaps the Chevron project area by 8.5 km, and Line 01-MCK-130 overlaps the Chevron project area by 2.5 km.

Construction and operation of the winter road to Tuktoyaktuk from Inuvik will be short-term in duration, occurring throughout the seismic program. There will be additional activity on these roads primarily during mobilization and demobilization operations, which are scheduled for September – December 2000, and March – August 2001, respectively. Traffic at other times is expected to be insignificant and infrequent. Previous oil and gas exploration activities, in addition to the currently proposed project are shown in Figure 3. Figure 3 also illustrates future seismic exploration proposed by other oil and gas operators, which may be located in the vicinity of the project.

Traditional land use activities are anticipated to be ongoing during Chevron's project operations. To mitigate cumulative effects on traditional activities in the project vicinity, Chevron and other project proponents are working with local communities and Hunter and Trappers Committees, to identify sensitive areas and times to minimize or avoid activities. Special management areas and the location of harvested species habitats with respect to the proposed project area are discussed in Section 8.0, Traditional and Other Land Uses.

Residual effects from seismic operations are predicted to be low in magnitude, local in extent and temporary. If seismic results are positive, future developments within the project vicinity may include exploratory well sites and additional seismic exploration. In a manner similar to the currently proposed project, future development will be planned with consideration of environmental impacts and appropriate mitigative measures.



LEGEND

- PROPOSED CHEVRON SEISMIC PROGRAM
- PROPOSED 3D SIESMIC PROGRAMS BY OTHER OPERATORS
- PREVIOUS 2D SEISMIC PROGRAMS BY OTHER OPERATORS
- PREVIOUS 3D SEISMIC PROGRAMS BY OTHER OPERATORS
- PROPOSED A.E.C. 2D SEISMIC PROGRAM
- PROPOSED BURLINGTON RESOURCES 2D SEISMIC PROGRAM
- CAMP FAREWELL & SWIMMING POINT BASE CAMPS
- EXPLORATION LEASE (EL) BOUNDARY
- EXISTING WELLSITE SHOWN THUS
- IKHIL GAS PIPELINE

CHEVRON CANADA RESOURCES

FIGURE 3

CUMULATIVE EFFECTS OF OIL AND GAS ACTIVITIES IN THE VICINITY OF THE PROPOSED PROJECT

MACKENZIE DELTA, N.W.T.

SCALE : 1 : 300 000

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