NORTHROCK RESOURCES LTD.

DEVELOPER'S ASSESSMENT REPORT

for

NORTHROCK RESOURCES LTD.

SUMMIT CREEK B-44 DRILLING PROGRAM
SAHTU REGION NORTHWEST TERRITORIES

May 2, 2003

Prepared by:

Northrock Resources Ltd.
3500, 700 - 2 Street S.W.
Calgary, Alberta
T2P 2W2

P: 403-213-7600
F: 403-232-4650

For Submission to:

Mackenzie Valley
Environmental Impact Review Board
Box 938, 200 Scotia Centre, (5102-50th Avenue),
Yellowknife, NT X1A 2N7
Phone: (867) 766-7050 Fax: (867) 766-7074

NESL Reference No. 1536NT02

Executive Summary

Northrock Resources (Northrock) has prepared this Developer's Assessment Report (DAR) in accordance with the ***Terms of Reference and Workplan*** issued by the Mackenzie Valley Environmental Impact Review Board for the assessment of the Northrock Summit Creek B-44 Exploratory Well drilling program proposed for the Tulita District of the Sahtu Region in the Central Mackenzie Valley. The DAR has been prepared to support the environmental review of the proposed activity.

Background

The Summit Creek B-44 drilling program has been proposed to assess the hydrocarbon potential on exploratory licence EL 397 currently held by Northrock and its partners. EL397 is located in the Flintstone Range west of Stewart Lake and approximately 60km south of the Hamlet of Tulita, NT (see enclosed map). Northrock conducted an environmental assessment of the project including access routing, water crossings, water sources, and the wellsite location.

Northrock has proposed the use of a staging site on the west bank of the Mackenzie River at the confluence with the Keele River where road building equipment can be offloaded from a barge during the summer. The equipment will be stored on site until freeze-up when work on the access construction would commence allowing an early start to the operation before an ice bridge can be constructed over the Mackenzie River. The route to the wellsite would follow existing cutlines west to the south shore of Stewart Lake, west across Tertiary Creek to the location on the south flank of the Flintstone Range (see accompanying map). Drilling equipment would be moved across the ice bridge and to the location on the access. Water sources will be required for road construction, drilling processes and camp water. Water bodies along the access route and in the vicinity of the wellsite were assessed for this purpose.

After reviewing all routing options for the access, a route using existing cutlines from the mouth of the Keele River (Keele River Route) west past Stewart Lake to the wellsite was determined to be the most economically, logistically and environmentally sound route. An alternative route from the mouth of the Little Bear River (Little Bear Route) and south to Stewart Lake was also considered but deemed to be impractical due to extensive road building associated with the route (the Keele River Route is 82km shorter allowing a shorter construction period). This route was used by Northrock in 2001 to mobilize seismic equipment into the area. During consultations with the Tulita Land and Financial Corp. and the Fort Norman Métis Land Corp., members of these organizations indicated a preference for the Little Bear Route. While respecting the point of view of these parties, Northrock was and is convinced that the Keele River Route is the most environmentally sound choice.

In September 2002, Northrock submitted an application for a Land Use Permit and Water Licence to the Sahtu Land and Water Board. During the preliminary screening, the Sahtu Land and Water Board indicated that all environmental concerns relating to the project had been addressed. However, correspondence from the Tulita District Land Corp., the Fort Norman

Métis Land Corp., and the Tulita Renewable Resources Council indicated persisting concern with the Keele River Route. Issues presented to the Sahtu Land and Water Board included unresolved trapper's compensation issues, disturbance to areas of cultural significance and the preference for use of the existing staging site at the Little Bear River and the existing access route. In its review of the Northrock application, the Sahtu Land and Water Board indicated that all of the concerns relating to environmental impacts have been addressed. Issues relating to trapper and harvester compensation were deemed to be out of the Board's jurisdiction. Concerns relating to the disturbance of culturally and archaeological significant areas were, in the Board's opinion, not substantiated. However, the SLWB was of the opinion that "Significant Public Concern does remain from the Tulita District Land Corp., the Fort Norman Métis Land Corp., and the Tulita Renewable Resources Council."

Any communication regarding this assessment should be referred to:

Northrock Resources Ltd.
3500, 2700 - 2 Street SW
Calgary, Alberta T2P 2W2

Phone: 403213-7441; Fax: 213-7487

Attention: Matt Law
law@Northrock.nb.ca

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B Developer

B-1 Company Corporate History

Northrock Resources

Northrock Resources is an Alberta Partnership represented by its managing partner Northrock Resources Ltd. Northrock Resources Ltd. is a wholly owned subsidiary of Unocal Corp. of Houston, Texas. Northrock Resources Ltd. was incorporated in December, 1986. Northrock Resources Ltd. and Northrock Energy Ltd. (a wholly owned subsidiary of Northrock Resources Ltd.) entered into a partnership, Northrock Resources, in September 1993. The Northrock Resources partnership holds substantially all the assets of Northrock Resources Ltd., including the assets in the Northwest Territories and more particularly Exploration Licence 397. All the outstanding shares of Northrock Resources Ltd. were acquired by Unocal Corp. in June, 2000. The company continues to operate under the name Northrock Resources Ltd. (Northrock).

NWT Land Holdings and Operations

Northrock has held a land position in the Sahtu Region of the Central Mackenzie Valley since 1998 when it earned an interest in Exploration Licence 391 and a Freehold Lease comprised of 9 parcels, all from International Frontier Resources Ltd. Subsequently Northrock participated in the acquisition of Exploration Licences 397 and 401 at the July 2000 Call for Bids, and participated in the acquisition of Exploration Licence 416 at the September 2001 Call for Bids. Northrock operated and drilled the Mackay I-77 and Fallstone F-01 wells on Exploration Licence 391 in 1999, and participated with EOG as operator of the Devo Creek P-45 well on Exploration Licence 401 in 2001. Northrock has operated three seismic programs to gather data over Exploration Licences 391 & 397. Expenditures to date on these projects are in excess of $25,000,000 gross and in excess of $7,000,000 net. In the Central Mackenzie Valley, Northrock holds an interest in 457,096 gross hectares (128,670 net hectares).

B-2 Proposed Development Ownership

Partners

Northrock has three partners in the Summit Creek Project. EOG Resources Canada Inc., Pacific Rodera Ventures Inc. and International Frontier Resources Corp. will share costs with Northrock in proportion to their working interests as follows:

Northrock	48.148%
EOG	38.889%
International Frontier Resources	8.0556%
Pacific Rodera Ventures Inc.	4.9047%
Total	100%

EOG Resources Canada Inc. 38.8889% Working Interest
EOG Resources Canada Inc. ("EOGRCI") is a wholly owned subsidiary of EOG Resources, Inc. whose headquarters are in Houston, Texas. EOGRCI and its predecessor companies have always maintained a Canadian head office in Calgary and have been operating in Western Canada since 1964.

In August of 1999, Enron Oil & Gas Company became fully independent of Enron Corp. (2 years prior to the collapse of Enron Corp.) which resulted in the formation of a new company known as EOG Resources, Inc. trading independently as 'EOG' on the NYSE. Our company was at this time renamed EOG Resources Canada Inc. and continues to operate today as a wholly owned subsidiary of EOG Resources Inc. with properties in Alberta, Saskatchewan, Manitoba, B.C., Nova Scotia and the Northwest Territories.

International Frontier Resources Corporation 8.0556% Working Interest
International Frontier Resources Corporation was incorporated under the name 761523 Alberta Ltd. pursuant to a Certificate of Incorporation dated November 24, 1997, issued under the provisions of the Business Corporations Act (Alberta). Pursuant to a Certificate of Amendment dated March 20, 1998, the corporation changed its name to International Frontier Resources Corporation and removed its private company restrictions.

Until December 31, 2000 the corporation had one subsidiary, International Frontier Resources Ltd. which was a wholly owned subsidiary and which held all of the Corporation's oil and gas interests. Effective December 31, 2000, International Frontier Resources Ltd. was wound up and all of the property interests which it previously held were assigned to International Frontier Resources Corporation.

The corporation shares are listed on the TSX Venture exchange trading under the symbol "IFR". IFR is a junior oil and gas exploration company exploring in the Central Mackenzie Valley area of the Northwest Territories

Pacific Rodera 4.9047% Working Interest
Pacific Rodera Ventures Inc. was formed by the amalgamation, in British Columbia, of Pacific Royal Ventures Ltd. and Rodera Diamond Corp., on March 1, 1999. The company is publicly traded on the TSX Venture Exchange and is engaged in the exploration and development of oil and natural gas. The company's properties are primarily located in the Fort Norman area of the Northwest Territories in Canada. In addition, the Company has minor interests in the provinces of British Columbia and Saskatchewan, Canada and is endeavoring to develop oil and natural gas reserves through exploratory drilling and subsequent development of these properties.

B-3 Organizational Structure

The following individuals will be involved in the program and will represent Northrock in activities related to the project.

Brian Merchant, Northrock Drilling Manager
(403) 213-7450 Direct
(403) 213-7600 Main

Jim Watson Trout Creek Consulting - Construction Supervisor,
Norman Wells & Onsite
(867) 587-2640 (Office)

Kevin Kerwin Drilling Consultant, Calgary
(403) 266-7478 (Office)
(403) 861-3747 (Cellular)

Brian Merchant represents Northrock and will assume overall responsibility for the operation. Jim Watson will act as the Northrock Base Manager and Construction Supervisor and will report to Brian Merchant. Kevin is Northrock's drilling consultant and involved with the planning and logistics of the project. The onsite Drilling Supervisor will not be known until closer to the drilling date. Kevin Kerwin and the onsite drilling supervisor will report to Brian Merchant.

B-4 Environmental Performance Record

Northrock has an established Health, Safety and Environmental Policy that commits the corporation to maintaining high standards of health, safety and environmental management while exploring for and producing petroleum and natural gas reserves.

Northrock is an active exploration and development company that is active throughout Western Canada and the Northwest Territories.

Northrock Resources Ltd. is committed to maintaining high standards of health, safety and environmental management while exploring for and producing petroleum and natural gas reserves. Excellent performance is expected in relation to health, safety and environmental protection and is achieved through the support and active participation of management, employees and contractors.

An integrated, internet web-based management system that includes our drilling, completions, construction and production operations is used to ensure compliance with regulatory requirements and internal Northrock standards. For the past two years, Northrock has received 100% satisfactory ratings for both our drilling and service rig inspections conducted by Alberta Energy and Utilities Board (AEUB). Northrock Resources was also recently audited by the AEUB for our 2002 drilling waste management and we received a 100% satisfactory result in this area. Northrock Resources holds the highest level available (Platinum) as a participant within the Canadian Association of Petroleum Producer's Environment, Health and Safety Stewardship Program. We are also a certified member of the Alberta Partnership in Health and Safety Program. Northrock has been an active participant in the federal government's Voluntary Climate Change Challenge since 1998 and we have achieved a silver level of recognition for our continuing efforts in reducing greenhouse gases throughout our operations.

C Development Description

C-1 Timing

The following timelines for project components are anticipated:

Table 1: Project Timelines

Activity	Time Required	Estimated Dates
Barging construction equipment to staging area.	3 days	September 7 to 10, 2003
Road Construction	60 days	November 15 to January 15, 2004
Rig and camp move-in	5 days	January 15 to 20, 2004
Drilling	45 days	January 20 to March 6, 2004
Move rig and camp out to winter road for transport to Hay River; or,	5 days	March 6 to11, 2004
Move drilling rig and equipment to storage site at KP160 valve station and barging to Hay River after breakup	5 days	April 6 to 11, 2004
Reclamation	To be determined	Inspection in early summer

C-2 Access Road and Wellsite

Coordinates of Significant Features

Coordinates of significant features are detailed in Table 2 below.

Table 2: Coordinates of Significant Features

Feature	Latitude (DMS-NAD27)	Longitude (DMS-NAD27)
Staging Area	N 64º 25’ 40.7370”	W 124º 47’ 31.4750”
Water Source – Mackenzie River	N 64º 25’ 09.8525	W 124º 47’ 56.7285”
Water Source – Lake 5	N 64º 24” 15.5326”	W 124º 55’ 21.7918”
Water Source Stewart Lake	N 64º 20’ 07.6292”	W 125º 21’ 16.0472”
Water Source – Lake 3	N 64º 21’ 10.9156”	W 125º 34’ 36.9705”
Water Source – Lake 2	N 64º 24’ 20.3238”	W 125º 50’ 17.0126”
Water Source – Lake 1	N 64º 23’ 33.6674”	W 125º 53’ 09.7869”
Stewart Lake Airstrip	N 64º 19’ 57.7471”	W 125º 22’ 16.8110”
B-44 Well Site	N 64º 23’ 03.3744”	W 125º 53’ 18.7845”
Water Crossing Tertiary Creek	N 64º 20’ 59.1041”	W 125º 23’ 49.8691”
Water Crossing Stewart Lake Outflow	N 64º 20’ 07.6140”	W 125º 21’ 16.2946”

Access

The Summit Creek B-44 drilling location is approximately 60km SSW of Tulita. The wellsite will be accessed using the winter road, an ice bridge across the Mackenzie River and existing cutlines. Total developed access is 73.12 kilometres and will utilize 56 kilometres of the access used for the Tertiary Creek 2D Seismic Program recorded in the winter of 2001. The route traverses the Mackenzie River valley through the Flintstone Mountains uplands. 15.82 kilometres of the access passes through a recent burn area (circa. 2001). Another 17 kilometres crosses older burn areas (circa. 1975-1979). (See Forest Fire History Map, Appendix 6).

Northrock will construct and remove the ice bridge across the McKenzie River and the crossing of the outflow from Stewart Lake and Tertiary Creek in accordance with the guidelines set out in "*DFO Protocol for Temporary Winter Access Water Crossings for Oil and Gas Activities in the Northwest Territories"* to ensure habitat disturbance is limited.

Wellsite

The B-44 wellsite is located on seismic line J99YN293. The site is moderately well drained with typical sub-alpine species. A test hole was hand augured to determine the nature of the soils at the site and to assess the permafrost conditions. The test hole encountered a 15cm organic layer overlying 30 cm of clay. Below the clay a wet silty clay was found from 45cm to 2m to be overlying permafrost located at 2 metres below the surface.

C-3 Construction Methods

The access will be 10metres wide to allow for the movement of heavy equipment and rig components. Some intersections will require additional clearing to allow large loads to maneuver around corners. Widths of up to 15 metres will be required on tow hills to allow room for the tow cats to operate. Access will be cleared using bulldozers. To reduce the potential for damage to the vegetative mat, the blades of the bulldozers will be equipped with shoes to prevent ripping and tearing. Slash will be windrowed with 7-metre breaks every 400 metres to permit the passage of wildlife. The cleared access will be watered to provide a hard surface for the movement of heavy equipment. An ice bridge will be required on the Mackenzie River and may be required at the outflow from Stewart Lake. Culverts will be placed as required where the access crosses local draws and minor streams.

A 120 x 120 metre lease will be constructed at the B-44 location. This will involve the clearing of scrub spruce and shrubs, stripping of topsoil and leveling the lease. If feasible the corners of the wellsite will be rounded to soften the appearance of the clearing. Topsoil will be double stripped and conserved for replacement during reclamation. Water will be used to freeze the surface and create a stable platform for the rig. The site will be bermed and the berms frozen to contain accidental spills on site. A sump (approximately 30m x 20m) will be constructed to contain drilling wastes.

C-4 Operations

Traffic volumes on the access will vary with the stages of the operation. Traffic will be heaviest during the mobilization and demobilization of the drilling rig and associated equipment to and

from the wellsite. During drilling operations, traffic volumes will be limited to fuel and water hauling, catering supply and crew changes, and miscellaneous support vehicles. The number of two-way trips has been estimated and has been broken out as follows:

Period	Activity	Traffic Volume
January 1 to 15, 2004	Move in drilling rig, camp and equipment	152 trips
January 15 to March 15	Drilling operations	127 trips
March 1 to March 15	Move out drilling rig, camp and equipment	113 trips
	Total two-way trips	**392 trips**

The use of construction equipment to maintain the access has not been included in this estimate. There will likely be three or four pieces of heavy equipment (graders, bulldozers, water trucks) maintaining the road during each day of operation. This equipment would be making only partial trips on any given day and would be present on different sections of the road each day.

C-5 Waste Management

Drilling Waste

Drilling waste is anticipated to consist of freshwater-based gel-chem mud and rock cuttings. The gel-chem mud consists of fresh water and bentonite along with chemical stabilizers and conditioners. Weight material in the form of barite may be incorporated if required. Lost circulation material will be available on site to be used if required. Drilling waste will be contained within a sump to be constructed on-lease. The sump will be excavated to a level below the permafrost. Upon completion of the drilling program, the drilling waste will be analysed, and, if it meets the requirements of the Alberta Energy and Utility Board's G-50 Drilling Waste Management Guidelines, will be mixed, buried and covered and frozen into the permafrost in the sump. The sump will be covered with sufficient material to allow for settling.

Camp Waste

Camp blackwater will be disposed in a sump. Solid waste and refuse will be incinerated. Non combustible waste will be hauled to Tulita for disposal. Sumps will be fenced to protect wildlife.

Blackwater from the sleigh camp used in access road construction will be spread for disposal.

C-6 Water Use

Water will be required for ice bridge construction, road construction and drilling operations. Approximately 100m^3 of water will be required for each kilometre of access development. Access construction is estimated to require 7030m^3. Water volumes required for drilling (boilers, make up water for mud system, miscellaneous use) are estimated at 835m^3. A potable water supply of 225m^3 will also be required for camp use. Water sources that have been identified include the Mackenzie River, the outflow from Stewart Lake and smaller unnamed lakes along the route of access and in the vicinity of the wellsite. Four small lakes were sounded to obtain depth readings for calculation of water volumes and the potential impact water

withdrawals would have on the lakes. Calculations of the impact of water withdrawal are based on the following assumptions:

- Water depths were determined by averaging depth soundings;
- Surface area was calculated using GPS coordinates of the lake shore;
- Average available winter water depths assume a 1m ice thickness; and,
- 90% of the lake surface area was used to account for shore effects.

Lakes identified as water sources have been identified on the map accompanying this report.

The results of the calculations are presented in Table 3. The impact of water withdrawals from the Mackenzie River and the outflow of Stewart Lake were not assessed as the water volumes withdrawn will be insignificant in relation to the sizes of the water bodies.

Table 3. Water Sources and Impact to Water Bodies

Water Source	Length of Access	Volume Required	Impact
Mackenzie River	8km	800m^3	Insignificant
Lake 5	14km	1400m^3	Water level drop-0.2cm
Stewart Lake outflow	20.5km	2050m^3	Insignificant
Lake 3	18.5km	1850m^3	Water level drop-2.4 cm
Lake 2	9.3km	930m^3	Water level drop-3.1cm
Totals		**7030m^3**	
Rig + Camp Supply			
Lake 1	none	**1060m^3**	Water level drop-1.7cm

At the time of initial assessment, the "*DFO Protocol for Water Withdrawal for Oil and Gas Activities in the Northwest Territories"* had not been introduced. Since this project has been delayed by one drilling season, Northrock will re-evaluate the water sources in accordance with the protocol.

C-7 Abandonment and Restoration

Lease and access clean-up will take place after the rig has been moved out.

- Drilling sumps will be closed using mix-bury-cover techniques. Any debris will be cleaned up and the any slash will be spread on the lease. A roach of approximately 100cm will be maintained on the sump to allow for settling.
- Topsoil will be replaced.
- The campsite will be cleaned up and the sump covered.
- Culverts will be removed from the access.
- Ice bridges will be notched to prevent damming during break up.
- Slash on the access will be left windrowed so that the access can be used by local community members. 7-metre wide breaks will be left in the windrows every 400 metres and at all existing cutlines, game trails and traditional trails.

All slash not windrowed will be bucked to lie flat to the ground, thereby promoting decay and reducing the potential for erosion. The access and wellsite will be inspected in the late summer/early fall. Areas of ground disturbance will be repaired and reseeded with an approved seed mix. Areas prone to erosion, such as steep slopes, will be stabilized through the spreading of slash over the topsoil if required.

C-8 Other

Not applicable.

D Effects of the Environment

D-1 Description of Effects

Snow Cover

Lack of snow cover in late fall or early winter will slow access construction activity. Snow is used to provide a base for roadbed construction. Lack of a sufficient snowpack may result in increased pressure on water bodies

Ice Conditions

Poor ice conditions on the Mackenzie River may result in delays in the construction of an ice bridge. If sufficient ice thickness is not present, or cannot be achieved through flooding until late in the winter, delays will occur for mobilizing the drilling rig to the wellsite.

Overflow

Overflow occurring at creek crossings may require additional maintenance to ensure access remains passable.

Warm Weather

Unseasonably warm weather at any time during the project may result in adverse impacts to the access resulting in degraded access conditions. Soft or rutted access would impede the transport of supplies and equipment to the wellsite.

Early/Late Freeze-up

- Early freeze-up will allow an earlier start to access construction and would widen the drilling window.
- Late freeze-up has the potential to delay access and/or ice bridge construction. Should this occur, the project timeline would be negatively impacted and the drilling window would be narrowed.

Early/Late Breakup

- Early breakup may result in a reduced drilling window and the inability to achieve total depth in the well.
- Late breakup will permit the drilling program to be completed with all equipment removed to a pre-existing storage site the east bank of the Mackenzie River.

D-2 Changes to Development

The following modifications may be required if the effects of the environment, as described above, are present during the project timeframe.

Modification to ice crossing – movement up or downstream

Should ice thicknesses in the vicinity of the proposed river crossing site vary from that required for ice bridge construction, the site of the crossing may be moved up or downstream to a location with suitable ice conditions. The points of access and egress to the river will remain unchanged.

Use of increased water volumes for road construction

Should the snow available for winter road construction be less than that normally required, additional water volumes may be required to prepare the roadbed. This will place additional pressure on the water sources and water budgets will require close monitoring to ensure that the impacts to water bodies remain within recommended guidelines.

Stacking rig for shipping by barge in spring

Should an early breakup occur, the drilling season will be shortened to allow sufficient time to mobilize the rig across the Mackenzie River to the east bank. Should this be the case, the drilling rig will then be transported and stored at the Enbridge KP160 remote valve site near the landing strip and depending upon an evaluation of the project, would be barged out of the area or brought back across the river the next fall after freeze-up to complete the well.

Addition of culverts in low spots along road to facilitate drainage

Should overflow conditions be present at creek crossings or should early spring conditions result in thawing conditions, temporary installation of culverts (after consultation with DFO) may be required to maintain the access route.

E Alternatives

E-1 Access

During the environmental assessment of access routes for the Summit Creek Drilling Program, two alternatives were considered. One route (Little Bear Route) followed existing seismic cutlines from a river crossing immediately south of Tulita to a point south and east of Stewart Lake and then followed cutlines and trails west to the program area. This route was previously used in 2001 for Northrock's Tertiary Creek Seismic Program.

The primary route (Keele River Route), which was evaluated for the land use permit application, follows existing seismic cutlines from the mouth of the Keele River and meets the Little Bear Route at a point south and east of Stewart Lake. The Keele River Route is approximately 82km shorter than the Little Bear Route and uses portions of existing cutlines and trails used by the Tertiary Creek seismic program to access the drilling location at B-44.

The alternative route (Little Bear Route) would start from a staging area near the confluence of the Little Bear and Mackenzie Rivers and would follow existing cutlines south for 82 kilometres to cutlines and trails south and east of Stewart Lake. At that point both routes utilize existing trails westward to the wellsite. The Little Bear Route would not follow the access used by for the Northrock Tertiary Creek seismic program, but would follow a more direct route using existing cutlines that would be closer to potential sources of water to be used for road construction (see accompanying map).

The Keele River Route was selected as the preferred route for the following reasons:

1. The Keele River Route results in a reduced environmental footprint. Access development is decreased by 82 kilometres if Keele River Route is used as opposed to the Little Bear Route and will require a footprint of approximately 78 hectares vs. 155 hectares respectively.

2. While the Little Bear Route was acceptable for access by seismic equipment, significant upgrading of the access is required for the transport of drilling equipment. The access will require the application of significant amounts of water to create an ice road capable of supporting the heavy loads of drilling equipment that will be hauled into the drilling location. Both access routes were examined for water sources capable of supporting the withdrawal of the estimated volumes required for road construction. The Keele River Route has reasonable access to water sources. The volumes of water required for the Little Bear Route would be substantially greater due to the increased length. As well, acceptable water sources with sufficient volume that would not be significantly affected by withdrawals do not appear to be present along the route between the Mackenzie River and the point where the Little Bear Route and the Keele River Route meet. Although the Little Bear Route has been widened to accommodate the movement of a rig move down to the G-18 location north of Stewart Lake, the new protocol for water withdrawals and the assessment of water bodies issued by the Department of Fisheries and Oceans will most likely preclude the use of smaller water bodies as sources of water that may have been used in the past.

3. Repeated use of one access route has the potential to increase the levels of compaction that may already be present from previous use. The use of an alternative access (Keele River Route) will result in less cumulative impact to the Little Bear Route and will increase the potential for natural re-growth.

4. The additional time to develop the access using the Little Bear Route will jeopardize the project schedule. The Keele River Route was selected as part of a project program that included spotting equipment at the mouth of the Keele River prior to freeze-up. The purpose of this is to have equipment available to begin construction on the access as soon as is practical, but before the ice on the Mackenzie River is thick enough to support the crossing of road building equipment. The Keele River Route, being shorter, will require less time to construct than the Little Bear Route and would be available for transporting equipment to the site sooner. Northrock's drilling plans are to drill a 3000m exploratory well and the early access development is crucial for meeting the timeline for drilling and demobilizing the rig and related equipment to the east bank of the Mackenzie River prior to breakup.

   If Northrock is forced to use the Little Bear Route, the timeline available for drilling the Summit Creek well will be shortened and will not permit the project to be completed in one drilling season (see Table in Section H-2). If the drilling is delayed to the point that the equipment may become trapped on the west bank of the river, the drilling program will be suspended and the rig and related equipment will be moved out and stacked on the west bank of the Mackenzie River at the Little Bear staging area.

5. Should economic reserves of hydrocarbons be encountered at the B-44 location, pipeline routing would closely follow the Keele River Route to a river crossing point underbore near the mouth of the Keele River. Any additional drilling and/or development would also consider the Keele River Route as the more economically feasible due to reduced winter construction costs. With this consideration in mind, the selection of the Keele River Route would also eliminate further use of the Little Bear Route and would permit natural re-growth to take place along those cutlines.

6. The Little Bear Route has been selected as the preferred route by some of the local community residents. However, this route crosses more traditional use lands than the Keele River Route and thus will have more impact on traditional lifestyles. While more convenient temporary access might be created to the cabins of local residents, the environmental benefit of the selected route, as described above, outweighs the potential benefit.

7. The Little Bear Route passes through a "Special Management Area" (Stewart Lake/Tate Lake and Little Bear River) as described in the Sahtu Preliminary Draft Land Use Plan. This is considered an intensive traditional use area. The selection of the Keele River Route would avoid this area with the exception of a portion of the route that runs along the south shore of Stewart Lake. The Keele River Route passes through the Mackenzie River Management Area but would occupy less of the management area than the Little Bear Route.

8. The estimated cost for the Summit Creek drilling project has been calculated to be $18.5 million if the Keele River Route is used for access. The use of the Little Bear Route would add an estimated $5.9 million to the overall project costs.

In conclusion, the selection of the Keele River Route is the preferred route that results in the least amount of impact when the factors of environmental footprint, project timing and economics are considered.

E-2 Wellsite

The location of the wellsite was determined from an interpretation of seismic data that was acquired in 2001. As B-44 drilling location is an exploratory well, explorations have selected a location that has the best chance of success considering geological information obtained from the seismic records. Alternative locations are possible with current drilling technology. However, no environmental or cultural concerns were apparent at the selected location and there was no evidence of a traditional trail observed at the wellsite during the environmental review. Northrock has committed to an archaeological survey of the access route and wellsite during the summer of 2003. The access rout and the wellsite location will be amended to account for any findings which require avoidance of activity.

E-3 Waste Management

While drilling methods can be employed that reduce the volume of waste water generated, a certain amount of drilling waste will be generated regardless of the technology employed. Northrock plans to employ solids control equipment that will conserve water for reuse in the drilling system. Drilling waste solids will be disposed of into a sump. Any liquid waste (primarily freshwater) remaining at the end of the program will be disposed of down hole if possible, or in the sump with the solids and, after proper analysis, will be mixed, buried and covered. The freshwater gel-chem mud system proposed for the drilling program is non-toxic and will not create an adverse environmental impact.

The use of alternative drilling waste management techniques including sumpless drilling and the use of tanks to replace the sump have been considered. While this is a practical method for handling the solid waste components, there will still be logistical difficulties in disposing of the recovered water. Costs associated with trucking waste water to a licenced facility for disposal are prohibitive for this location.

E-4 Water Use

Water sources are limited along the Keele River Route but have been assessed as adequate. The program calls for water withdrawals from a number of source including the Mackenzie River, Stewart Lake/outflow and a number of small lakes (see Section C-6). Withdrawal of water from major water bodies (Mackenzie River, Stewart Lake/outflow) would result in an insignificant impact. There are few alternatives to the other selected water sources that have been identified and evaluated. Should the re-evaluation of the water sources eliminate any water body, Northrock will make up water budget shortfalls by drawing from the Mackenzie River or Stewart Lake/outflow.

Water bodies along the Little Bear Route have not been evaluated for suitability as water sources for use during road construction. A review of mapping for the area suggests that usable water bodies are also scarce along this route.

To facilitate access to water sources and to eliminate several tow hills, a route parallel to the original Little Bear access route (used for the 2001 seismic program) has been considered (see Alternate Little Bear Route on accompanying map).

F Regulatory Regime

Permit	Issued by	Date	Comments
Land Use Permit	SLWB	To be issued	
Water Licence	SLWB	To be issued	
Exploration Licence	DIAND	August 16, 2000	EL397
Operating Licence	NEB	April 1, 2002	No. 1007
Benefits Plan	TLFC	November 27, 2000	
Access Agreement	TLFC	September 29, 2000	

G Public Consultation

G-1 Records

July 18, 2002 Meeting Minutes

Summit Creek B-44
Public Consultation Meeting
Tulita Hamlet Chambers
July, 18, 2002

A notice of the meeting was circulated in the hamlet by the Tulita District Land Corporation. A catered lunch was prepared for attendees and the meeting commenced at 1 PM. Approximately 12 to 15 community members attended with some individuals coming and leaving throughout the meeting.

Attendees included:

Gordon Yakeleya
Franklin Andrews
Junior McPherson
Rita Doctor
Maurice Mendo (Elder)

Matt Law – Northrock
Brian Merchant – Northrock
Darcy Redding – Northrock
Tom Logan – NL Fisher
Bob Raina - Northern EnviroSearch

Gary Yakeleya
Valerie Yakeleya
Lorraine Doctor
Wilbur
Michael Widow

The meeting opened with a prayer led by Maurice Mendo.

Matt Law presented the winter drilling program proposed at Summit Creek. He indicated that at the time of the meeting, partner approval had not been obtained but stressed the need to get the approval process underway. It was noted that the application was split into two parts; Part 1 was to deal with the selection of a staging area required to spot equipment on the west bank of the Mackenzie River prior to the end of the barging season. Part 2 would deal with the access route and drilling location.

The proposed drilling program would involve the drilling of a 3000metre well. A drilling rig would be trucked in by winter road from the south as the rigs available locally were not capable of drilling to the required depth.

Staging Area

Satellite images of ice conditions on the Mackenzie River, in the vicinity of the mouth of the Keele River in past years. While there has been open water in the area, it appears that there are areas of good ice that can be used to develop an ice bridge to the staging area.

The staging area will be set up for construction equipment that will be used to construct the access and wellsite. The drilling rig will not be stored at staging but will be trucked up on the winter road. The construction crew will be housed in a camp that will move with the crew along the access. A smaller camp would remain at staging to house the crew maintaining the ice bridge. The type of equipment that would be stored on site was discussed including the placement of fuel tanks.

A small camp will be required at staging to provide security for the equipment and to house the crew that will construct and maintain the ice bridge. Ice bridge construction will take place in January.

Questions and Comments

Q. When will staging be put in?
A. *The staging area will be constructed in September*
Q. How big is staging?
A. *An area of 100m by 50m will be required and will be oriented to parallel the riverbank.*
Q. How will the area be cleared?
A. *The willows will be walked down by a bulldozer.*
Q. Could a clearing be created for local use by boaters as a campsite?
A. *Yes. The community will be consulted prior to construction.*

- Meeting participants assured Northrock that there is usually sufficient water depth on the west bank to permit barge offloading.
- The stronger currents are found on the east side of the river.
- The staging site had been used in the past.
- The willow bank is completely submerged during breakup so equipment will have to be removed before then.

Archie Lennie, who has a camp on the east bank of the Mackenzie River, directly opposite the staging area was asked if he had any concerns. Archie stated that the site had been used to stage equipment in the past and that he had no problem with the site or the proposed activity.

It was suggested that Brian Wrigley, a camp neighbour to Archie Lennie, also be consulted. Brian is away for the next month.

Access and Wellsite

Matt Law was asked about the timing for the rig move and when the rig would be moved out of the area. He indicated that the rig would be moved directly to the location in January and that the rig would be moved out by March 15. Drilling is expected to take approximately 45 days. However, if ice conditions permitted and drilling was not complete by mid-March, there is a contingency to stay until April.

Frank Andrews (Chief) stated that he was frustrated about the lack of benefit the oil and gas activity is having for his people. The gist of the complaint centred around the fact that the selected access route would not directly benefit the people who had cabins on the west side of the river near Old Fort Point. Frank indicated that his people have no objection to the access and drilling location on traditional land but some benefit such as opening access from the winter road to the riverbank opposite Old Fort Point be provided.

Matt Law responded that Northrock would consider this. However he also indicated that there were issues around land use permits and costs that would play a factor in any decision that is made. This request was subsequently refused by Northrock.

Gordon Yakeleya commented that local involvement in decisions such as the selection of access routes needs to be considered as the proposed access route has changed since the previous meetings that discussed this project.

Matt Law stated that an area scout since that meeting had identified other options that could be more economic to Northrock. He also indicated that the purpose of this meeting was to solicit local involvement and input into the revised access plan. If this plan is not acceptable, further meetings would be held to find solutions that are acceptable to everyone.

Questions and Comments

Q. What about alternate routes including entry from Old Fort Point, Police Island and the route used in previous years?

A. *These routes were considered but all would entail more extensive access construction*.

Q. What if the weather does not cooperate?

A. *Weather conditions are important. The program could be cancelled if the weather is unusually warm*.

Access would be good for people using the area.

Users need to be consulted.

Northrock will arrange for flyovers for users and elders prior to the TK workshop.

A Traditional Knowledge workshop needs to take place.

Northrock will return for a TK workshop.

Note. There was some confusion about the 2 parts of the program; the staging application and the access/drilling application. This was clarified and Northrock gained confirmation that the meeting attendees did not have any concern with the staging site.

Following the above discussion, the Bid Document for services that would be required for the project was presented by Brian Merchant. A TK workshop was scheduled for July 30.

July 30, 2002 Meeting Minutes

Resources, Wildlife and Economic Development
investing in our future

TO: Matt Law – Northrock Resources Ltd.
Todd McCauley – EMLC
Rocky Norwegian – Fort Norman Métis Land Corporation
Gordon Yakeleya – Tulita District Land Corporation

CC: Lorraine Doctor – Tulita District Land Corporation
Peter Dragunas – Sahtu Land and Water Board
Eddy McPherson - Fort Norman Métis Land Corporation
Celina Stroeder – RWED Regional Superintendent

FROM: Chris Baker – Sahtu Region Petroleum Business Manager

DATE: Wednesday July 31, 2002

RE: Notes from July 30, 2002 Meeting in Tulita

Following are notes I made during the meeting. Please accept my apologies if I have made any erroneous statements.

- Meeting commenced at 11:35 hours with an opening prayer. Introductions were made, and the attendee list will be forwarded under separate cover.
- Gordon noted that many people were absent due to being wind bound outside of Tulita.
- The purpose of the meeting was to discuss Traditional Environmental Knowledge with respect to the Northrock program (map of proposed access road for EL397 posted on wall, in addition to satellite images and aerial photographs of the proposed access route). Northrock was looking for information that would assist along the proposed route to ensure they don't trespass on spiritual / resource / sacred sites. It was explained that this information would be part of the application process, and would become a public document as part of the regulatory review process unless they are instructed not to disclose it. Northrock encouraged the people of Tulita to speak up regarding the privacy or propriety nature of any TK information that would be provided during the meeting.
- Prior to the land claim, TK was shared with the government, but now, the Tulita District Land Corporation has retained a company called Greenpipe who is gathering TK information on their behalf. This TK is proprietary.
- Northrock provided an update on the status of the project since the last community consultation. There are 4 other partners involved in the well, and they are still waiting on partner approval which they anticipate +/- Aug. 15. The plan is to spot heavy equipment, fuel, ice bridge building equipment and 6-man camp at a staging area where the Keele meets the Mackenzie River. Once conditions are favourable, they will build a 75 km access road to the wellsite at the base of the Flint Stone Mountains near Summit Creek. They also plan to build an ice bridge across the Mackenzie River to access the winter road near the Enbridge Pumping Station. The well will be one of the deepest drilled in the area for the last 20 – 30 years, so a bigger rig than Akita #51 is needed in order to drill the hole. This rig must be brought up from the South via the winter road. The well is planned for 45 days. If drilling is not completed in time to de-mob the rig via the winter road, the rig will be racked at the same staging area and barged south later in the year (June).
- A question was asked regarding how the access road would be built? It will follow existing cutlines into Stewart Lake that were used to access the seismic program from 2 years ago. They plan to detour around the steepest hills (9 in total), and will cross several lakes along the way, but will use the existing seismic road as much as possible.
- Water for road construction and drilling operations will come from Stewart Lake, 3 smaller lakes along the access road and the Mackenzie River (part of the approval process). Department of Fisheries and Oceans involved in this approval process.
- There was much discussion on historical, burial and sacred sites in the area that will not be recorded on this document, but were captured on the wall map. This information will be consolidated and reviewed by the people, particularly those who were not able to attend the meeting.

- Northrock does not intend to return until they submit the proposal unless it is required. The access plan requires the Land Corp's approval prior to proceeding, and the SLWB approval process includes public consultation.
- Once the access road is complete, there will be fuel, the rig, cats, drilling mud chemicals, camp, associated drilling operation equipment and pick-up truck traffic on the road. The plan is for a 10m wide road, with some 15m wide sections at steeper hills to allow room for towing equipment.
- The rigsite will be 120m x 120m, and the campsite will be 50m x 50m. Drilling fluids and sewage will be stored in sumps onsite (dealing with Steve Deschene with Indian and Northern Affairs).
- Will the access road be private? The agreement states that it is a Northrock road, but there will be no problem for the Tulita folks to use it. Northrock asked that anyone wanting to use the road ensure that communication is established with Jim Watson and the appropriate rig supervisor to ensure there will be no safety issues (collisions, etc.) associated with drilling rig traffic. There will also be monitors employed for the access road as has been done in the past.
- There was discussion about whether an alternate access road could be made from just south of Tulita through Old Fort Point into the wellsite (this issue has been discussed in the past). The decision will be Northrock's subject to Traditional Environmental Knowledge sensitivities. A new road would cost +/- 20% more per km in construction costs vs. accessing an existing cleared road, and a road through Old Fort Point adds an extra 30 – 40 kms.
- In terms of reclamation, the public requested that they wanted the roads left open (i.e. do not put brush back on roads) as it makes it much easier to access by skidoo for the hunters and trappers.
- A question was raised about the drilling mud and disposal in the sump. Northrock explained that the fluid was a water-based system that is routinely spread on farmer's fields as fertilizer in the South following rig activity. The only issue is whether the mud would be contaminated with salt, but this was not anticipated from this well. All fluids will be analysed and approval received prior to disposal.
- It was asked whether there was anyone actively trapping in the area? Archie Lennie used to trap up to the first rise, but had not done so for a couple of years. David Etchinelle had also been into the wellsite area 2 years ago.
- A consensus could not be reached to approve the access route as proposed because many community representatives and elders were not able to attend the meeting (a few had already flown the proposed route with Jim Watson in the past). Gordon will work with these people and communicate with Northrock (Bob Raina).
- Meeting adjourned at 12:40 hours.

March 5, 2003 Meeting Minutes

Date: **March 5, 2003**
Time: **9:30 – 12:00 p.m.**
Purpose of Meeting: **To discuss the Summit Creek B-44 Access**
Chairman: **Matt Law**

PARTICIPANT	COMPANY
Matt Law	Northrock Resources
Art Stirrett	Northrock Resources
Brian Merchant	Northrock Resources
Travis Bouchard	Northrock Resources
Louie d'Abadie	EOG
Pat Bowswell	International Frontier
Tiger Williams	Pacific Rodera
Mike Barton	Pacific Rodera
Gordon Yakeleya	Tulita/Norman Wells
Danny Yakeleya	Tulita/Norman Well
Eddie (Junior) McPherson	Tulita/Norman Wells
Todd McCauley	Tulita/Norman Wells
Dan Masterson	Sandwell Engineering

AGENDA

- INTRODUCTION
- PRESENTATION OF ICE-BRIDGE CONSTRUCTION
  - Dan Masterson Sandwell Engineering
- REVIEW OF SUMMIT CREEK B-44 GEOLOGY
  - Art Stirrett – Northrock
- PRESENTATION REGARDING SUMMIT CREEK B-44 WELL LOGISTICS
  - Travis Bouchard & Brian Merchant – Northrock
- DISCUSSION REGARDING ACCESS
- OTHER BUSINESS

INTRODUCTION

Everyone went around the room and introduced themselves and what company they were from.

PRESENTATION ON ICE BRIDGE CONSTRUCTION – DAN MASTERSON

- Mr. Masterson is an ice engineer by trade.
- Spent over 30 years in the artic building ice bridges and ice islands.
- They have had no problem with any bridges built so far.
- He has conducted investigations for GNWT Highways for construction of bridges over the Mackenzie for the winter road, and designed and constructed the pumps for flooding.
- Gave a brief description of the construction of the ice bridge.
- The currents are high because of the Mackenzie River.
- As long as there is no significant constriction of the Mackenzie River channel, construction should be attainable. Considering the volume of water flow, he does not foresee a problem.
- Northrock will conduct a profile of the river and get back to the committee regarding the channel depth and current ice thickness.
- Northrock will have to establish a thickness of 6 feet (for the ice) in order to be able to move the equipment across to the site.
- There are several hot spring sources on some of the winter roads north of Yellowknife which cause problems with road construction
- Where Northrock plans on constructing the bridge he believes there is no source of hot springs.
- Little Bear Staging Area: Open Leads at Little Bear area
- Ice thickness at the Keele River crossing was taken on December 20, 2002. They were 17", 27", 42", 36" and 12" from east to west with the thickest ice 42" & 36" just downriver of the two open leads.
- It is fair to say the current is not an issue in the construction or maintenance of the ice bridge.
- Northrock needs to establish at least 30" of ice in order for it to be worked on safely. It will take at least 1 month of construction depending on the weather. If the weather remains cold there can build between 1 and 2 inches of ice a day. The target date for everything to be across river is January 15, 2004.
- Ice rubble on the surface of the river can be utilized in construction of the ice bridge, as can modest levels of snow. Thick snow cover has to be cleared before flooding.
- The two openings at the Keele River crossing look like they are caused by tension in the frazzle ice at freeze-up.
- Current is 8km/hr on the Mackenzie River at Tulita. It is likely to be faster where the river is constricted at the Keele River crossing.

REVIEW OF SUMMIT CREEK B-44 GEOLOGY – ART STIRRETT

The frontier team consists of:

Darcy Reding	–	Engineer
Matt Law	–	Landman
Art Stirrett	–	Geologist
Stephen Goddard	–	Geophysicist

A much different climate than today

- Approximately 400 million years ago the Norman Wells and Tulita areas were covered by a shallow warm inland ocean located within 20 degrees of the earth's equator.
- The climate was tropical
- During that time reef forming conditions existed
- Thick deposits of calcareous muds, shells and reefs were deposited
- This was later transformed into rock by pressure and heat
- We now call those potential reservoir rocks

The source of the oil

At the end of the period the oceans deepened, killing reef growth and depositing thick black muds deep on the ocean floor

A reservoir is formed

Approx 350 million years ago as a result of mountain building and volcanic events, a large amount of hot salt water, rich in minerals was injected eastward in the shallow basins.

- Through a process called dolomitization, much of the original fossil material was dissolved by the hot brines to create holes in the rock (porosity). The porosity varies from small pinhole openings to holes as large as cave size.
- This dolomitization has created the potential reservoir formations in the Tulita area.

Oil and Gas Generation

Approx 50 million years ago, great thickness of sands, gravel, coal and mud were shed into the basin from the emerging Mackenzie mountain uplift.

- Those thick sediments overlying the previously deposited sediments exerted enough pressure and temperature on those very early black source rock shales to convert the organic material entrained within them to oil and gas.
- As the oil is generated the increasing pressure forces the fluid out of the host rock and it migrates to areas of lower pressure.
- Hopefully for us the oil will have migrated into the reservoir rock previously created.

Flintstone Hills Area

In this area the Devonian formations have been buckled by the same forces that created the Mackenzie Mountains. This mountain building event has created a large elongated dome like structure that hopefully has accepted the oil generated from the same source rocks that provided the oil for the Norman Wells oil field.

- Significant studies of those source rocks point to the Summit Creek prospect as being an oil, not gas, prospect.

SW-NE Seismic Line through the B-44 location

An estimated 670 metres of four-way closure of Early to Middle Devonian Bear Rock formation fractured dolomites thrusted over 150 metres of oil mature proven source beds (Bluefish, Hare Indian & Canol shales) and sealed by 990metres of Devonian Imperial shale.

SUMMIT CREEK B-44 LOGISTICS – BRIAN MERCHANT

Operations Timeline

January 5 – 20 truck rig and move equipment to location up the winter road

- Jan 20 – end of month anticipated well spud – this will be roughly 45 days of drilling
- March 5-15 tear out and move out off location

Surveying

Access route and wellsite surveyed

Lease and Road preparation

75 km access road

- road maintenance required
- slashing crew
- base repair shop
- ice bridge construction

Trucking

Rig move

- Trucking of rig and camp into location on winter roads (Jan '04)
- Trucking out of rig and camp on winter roads (about March 10)
- Tow hills – tow cats required
- Trucking and Hauling
- Water hauling and vacuum truck required
- 2 water trucks for the rig, water for the camp

Fuel

Anticipating being stored on location and some at the Keele River Staging Area

- Fuel will be trucked in from the winter road

Camps

Camp – 3 camps required

- Base camp
- Rig camp
- Sleigh camp
- Meals for all crews

Contract services

This entails well monitors, rig watch, support services

- Communication – satellite, rig intercom
- Safety and first aid – shack on location

Drilling

Drilling Day work – rig boilers and accessories

- Directional services – this well will be directionally controlled. Mobilize them from where ever their base is.
- Equipment rentals
- Loader
- Fuel and water
- Drill pipe

- Transportation
- Casing and Accessories – surface casing, intermediate casing, production liner
- Site cleanup and restoration – disposal of cuttings and mud cleanup of wellsite encapsulation of cuttings required
- Drill bits – required
- Casing cement – done for all strings
- Drilling mud – using a gel/chem. system.
- Environmental studies have been done and are in place
- Misc. – Insurance
- Abandonment costs.
- Overhead engineering costs all go into the AFE.

Temperature rates – Brian presented a chart of monthly temperatures at Norman Wells since 1997 and identified the anomalously warm fall in 2002. Time and weather conditions are a big factor in trying to track and figure out if Northrock can build enough ice, construct the access and wellsite, and get a rig up and back on the winter road with sufficient time to drill this well.

Total cost for this well is $18.5 MM.

DISCUSSION REGARDING ACCESS

- Danny Yakeleya argued the point that Northrock should be using the existing Little Bear access road and staging area. He doesn't want any more land being opened up.
- The Keele River access route to the wellsite is 80km shorter than the Little Bear route. Northrock has conducted an environmental assessment. All applications have been forward to the Sahtu Land and Water Board. If Northrock's application gets rejected by the board, Northrock will need to look at other alternatives.
- Northrock believes that it would add a cost of another $2 MM in staging costs alone if they used the existing access road at the Little Bear. In addition, because of the extra time to construct the access, the project may not be logistically possible.
- Water is a major problem in building this project. The Department of Fisheries and Oceans have changed their protocol. They are restricting use to larger water sources. Some of the water sources that have been used in the past on the Little Bear access will not be available to Northrock on this project.
- The time required to build the access road is very crucial in this project. It is a major concern for Northrock. If access construction takes too long, it may prevent Northrock from carrying through with the project.
- The Little Bear route to the wellsite is over 150 km from the winter road requiring and intermediate camp as it is more than one day's drive for trucking from the winter road to the wellsite.
- The Keele River route has a smaller environmental footprint.
- Gordon Yakeleya was very concerned about the disturbance of moose at the Keele River crossing. Moose is a major source of meat for the community. The community cannot

afford to purchase meat at the store. The area at the confluence of the Keele River and the Mackenzie River is good moose habitat. The disturbance of the willows at the Keele River staging area, and the activity in the area in general will disturb the moose and make it more difficult to hunt moose. The proposed access road will not be useful for hunting moose.

- The Little Bear route puts the project at risk from a logistical perspective.
- If weather becomes a problem then postponing the project may have to be an option.
- Danny Yakeleya stated that if the well was successful, then it would be okay to open an alternative access (Keele River Route) for development of the project.
- Northrock would rather take the risk of a late winter road opening with the Keele River access road than use the Little Bear route which would guarantee the staging of the rig, if the operation was possible at all.
- Timing is a big factor. This project is a completely different kind of operation from past drilling. The rig is bigger and more equipment is required. This well will be among the three or four deepest wells ever drilled in the Sahtu. It is not being drilled in the same area as the previous wells.
- The Tulita representatives were not aware that there were cost and logistical reasons why Northrock did not want to use the Little Bear route.
- Northrock is to provide the committee with a cost comparison between using the Little Bear access route and the Keele River access route.

Individual Consultations

(Bob, something here) Jim Watson, construction consultant for Northrock, met individually with some community members who traditionally use the area for hunting and gathering and who have cabins and camps in the area. These included: Archie Lennie, Glenda Lennie, David Etchinelle, Gabe Horassi, Jim Widow, Gary Yakelaya, Junior McPherson and Gordon Yakelaya. As well, Archie Lennie contacted Brian Wrigley on behalf of Jim Watson. Jim Watson also invited Archie Lennie, Glenda Lennie, Gabe Horassi, Junior McPherson and Gary Yakeleya to view the proposed access route by helicopter. The following information was obtained from Jim's consultations:

- Gary Yakelaya had no concerns with the proposed work program but stated his support for a river crossing closer to Tulita.
- Archie Lennie, Glenda Lennie and Brian Wrigley all have cabins on the east side of the Mackenzie River across from the staging site and have no concerns with Northrock's work plan.
- David Etchinelle, who has a cabin on Stewart Lake, had no concerns with the proposed access. He also spoke for Jim Widow, a long time user of the land in the Stewart Lake area. Both stated a preference for an access route closer to Tulita but appeared to understand the rationale for the shorter route.

Traditional Knowledge Study

Community members were consulted on a number of occasions during the assessment of the access route, the staging area, and the wellsite location. Jim Watson, construction consultant for Northrock, met with community members with cabins in the project area or who have traditionally used the area for hunting, fishing and trapping. The project was also discussed at Public Meetings held in Tulita on July 18 and July 30, 2002 and a Traditional Environmental Knowledge (TEK) Workshop was scheduled for August 7, 2002 in Tulita. The workshop on August 7 was conducted primarily in Slavey with translations being provided by Gordon Yakeleya and Theresa Etchinelle. Attendees included: Gordon Yakelaya, Maurice Mendo, Gabe Horassi, Archie Lennie, David Etchinelle, Gary Yakeleya, Theresa Etchinelle and Frank Andrew.

The following TEK information was obtained from these consultations:

- The families of Gabe Horassi, David Etchinelle and Archie Lennie traditionally use this area.
- Maurice Mendo pointed out a number of cabins, campsites and burial sites on the shores of Tate and Stewart Lakes, none of which will be impacted by the use of existing access.
- Tate Lake and Stewart Lake – both lakes have spiritual value. David Etchinelle requested that no water be removed from Stewart Lake for road building. However, he was comfortable with water being removed from the outflow from Stewart Lake.
- Archie Lennie had no knowledge of any traditional sites near the access route or wellsite that would be affected by the project.
- Gabe Horassi mentioned a trail that was once used to travel through the mountains. The trail runs west of Stewart Lake in a southerly direction on the west side of the proposed access route but should not be impacted by the proposed operations. This trail is known as the Dene Trail to the Mountains.
- Frederick Andrew Junior who attended the public meeting on July 30, pointed out the location of his father's cabin, near the staging area at the mouth of the Keele River, but thought that it had fallen into the river some time in the past. Frederick was interested in using the ice bridge over the Mackenzie River to move a cabin into the area.
- It was requested that slash be left windrowed along the access to allow future use of the access by community members.
- Gordon Yakelaya pointed out a sacred site on the east side of the Mackenzie River downstream from the access point on Little Smith Creek. Proposed activities would not affect the site.
- A number of traditional trails are crossed by the proposed access route. Care should be taken to ensure that none of these trails are blocked with slash during road construction. The environmental monitor appointed for the project should be familiar with the area to ensure these trails are identified and kept clear.

- There were requests for Northrock to open up additional access from the winter road to cabins across the Mackenzie River south of Tulita and access to points on the Keele River from Stewart Lake.

The community expressed concern with the manner in which the TEK information would be used. From discussions regarding the presentation of TEK it was agreed that the information would not be presented in graphical form. As a result, TEK was not presented on a map for the submission of the Land Use Permit application.

G-2 Issues

Generally, the project has been well received by the community. Two outstanding issues remain.

1. **Access Route**
   Despite continued discussions with the Land Corporations and community members, Northrock has been unsuccessful in obtaining a consensus for the selected access route (Keele River Route). Members of the Tulita Land and Financial Corp. and the Fort Norman Métis Land Corp. as well as some community members continue to express a strong preference for the Little Bear Route.

2. **Harvester Compensation**
   Northrock has requested information on harvester information so that compensation can be addressed. To date, Northrock has been able to identify only two individuals who have trapped in the vicinity of the program. These individuals have not trapped in the area for the past two or three years.

H Assessment Boundaries

H-1 Spatial

Access development for the Keele River Route includes a linear reduction of 82 kilometres and reduces the footprint from approximately 155 hectares estimated for the Little Bear Route down to 78 hectares.

H-2 Temporal

Table 4 below compares the timeline estimates for the two routes. The additional construction time required to open up the Little Bear Route extends the project timeline by 16 days for the drilling component and pushes the demobilization of the equipment into April. This scenario assumes normal cold weather winter conditions and leaves no allowance for late freeze-up or early warming conditions. Should either of these conditions occur, it is unlikely that the drilling program could be completed during one drilling season if the Little Bear Route was used and would require two mobilizations and demobilizations resulting in an escalation of overall cost.

Table 4: Timeline Estimate Comparison for the Proposed Routes

CROSSING AT LITTLE BEAR	CROSSING AT MACKENZIE/ KEELE
Truck Equipment to Hay River; Barge Rig, Camp, Rentals, Construction Equipment, Fuel and Rig Moving Trucks to the Little Bear Staging Area Sept 1 - Sept 18	Barge & Stage Construction Equipment at the Mackenzie/Keele River Staging Area Sept 15 -Nov 25
Build the Access Road, Lease and Ice Bridge Dec 1 - Jan 20	Build the Access Road, Lease and Ice Bridge Nov 25 - Jan 5
Move the Rig, Camp, Rentals from the Staging Area to the Wellsite and Rig Up Jan 20 - Feb 5	Assemble Equipment in NAB Truck Rig, Camp, Rentals from Edm & RU Jan 5 - Jan 20 Jan 5 - Jan 20
Spud to RR Feb 5 - Mar 22	Spud to RR Jan 20 - March 6
Move the Rig, Camp Rentals, Construction Equipment and Rig Moving Trucks from the Wellsite to the Staging Area March 22 - April 6	TO & Truck, Rentals, Camp, Construction Equipment Rig to Edm Inspect Equipment in Edmonton March 6 - March 21
Stage all Equipment and Barge down the Mackenzie in the Summer April 6 - June 15	

I Wildlife Harvesting

I-1 Efforts

Northrock has had correspondence and discussions with the Tulita Renewable Resource Council with respect to trapper compensation. A facsimile sent to Northrock by the Tulita Renewable Resources Council advised Northrock that the activities of ten trappers would be affected by the proposed activity. This disclosure appeared to be at odds with the information obtained through the public consultations held in Tulita that indicated only two local residents (Archie Lennie Sr. and David Etchinelle) had trapped in the project area in the recent past. These individuals also indicated that they had not trapped in the area for the past two to three years.

Northrock responded to the correspondence in a letter dated September 17, 2002 in which they requested the names of other individuals from the community that used this area for trapping to facilitate further consultation. To date, names have not been forthcoming. Northrock again attempted to engage the resource council to resolve the issue of compensation in a letter dated December 19, 2002. In this letter, Northrock relayed information obtained from the public record of fur harvesting in the Tulita District for the trapping seasons of 2000-2001 and 2001-2002. Although individual records are not available and the location of harvested furs is not

identified, the total number of harvested furs for all species in the district was 305 and 248 respectively for the two seasons. Northrock again requested the identities of the affected trappers but received a response that the information was not available. Until the identity of the affected trappers and the effect of Northrock's activity on wildlife harvesting can be determined, Northrock is unable to address the compensation request.

I-2 Construction

Construction of the proposed access will have a neutral or positive impact on wildlife harvesting. Although activity relating to construction may cause sensory disturbances to species of interest, the effect will be local, temporary and transitory in nature. The creation of berms due to snow clearing has the potential to create artificial barriers to wildlife movement. This can be mitigated by the clearing of game trails and the creation of breaks in the windrows and berms at regular intervals. The creation of improved access has the potential to facilitate the harvesting of wildlife through easier access to the area for traditional land users.

Construction of the wellsite will be limited to a 120m x 120m area at the west end of the access. Sensory disturbance may impact species of interest but the effect will be local and temporary in nature. The wellsite is located in an area that is not normally used for wildlife harvesting during the winter.

I-3 Operation

Operations along the access will be limited to vehicle traffic to and from the wellsite and to heavy equipment used to maintain and plow the trail. Activity will be local, temporary and transitory. There is the additional potential for traffic conflicts with wildlife crossing or using the access in preference to traveling through deeper snow. Northrock will ensure that company and contractor vehicles travel at a safe speed to ensure the potential for accidents with wildlife are reduced.

I-4 Cumulative Effects

This project will utilize previously existing cutlines and trails for access to the B-44 wellsite. No additional linear disturbance will be created. Should the drilling program fail to encounter economical reserves of oil and gas, the wellsite and access will be abandoned and reclaimed as necessary. The clearing of willow that has re-grown on portions of the line may result in improved access to the area in the future for traditional land users and wildlife harvesters.

Should the drilling program encounter economical reserves of oil and gas, further development is anticipated and could include; a pipeline, improved access, additional drilling programs and additional seismic programs. If the proposed access is used for future development in the area, the resulting environmental footprint and length of linear disturbance will be significantly less than the Little Bear Route and will result in the least long-term impact to the traditional use of the area.

Table 5: Table of Effects – Wildlife Harvesting

Environmental Feature	*Potential Impact*	*Proposed Environmental Protection and Mitigative Measures*	*Direction*[1]	*Magnitude*[2]	*Areal Extent*[3]	*Duration*[4]	*Frequency*[5]	*Probability*[6]	*Reversibility*[7]	*Significance*[8]
Construction and Operation of Access and Wellsite	Game species effects	• The disturbance to game species from construction is limited in that the activity is short in duration and localized. • Breaks in windrows will allow passage of wildlife. • No firearms will be permitted.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
	Sensory Disturbances	• Noise from construction will be limited to the access road and wellsite. Noise will be transient (along access) and local and temporary (access and wellsite). • The wellsite is located in an area that is not normally used for wildlife harvesting during the winter.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
	Wildlife movement restriction	• Artificial barriers (berms) will be cleared at game trails and breaks will be created on windrows at regular intervals.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
		• The creation of improved access has the potential to facilitate the harvesting of wildlife through easier access to the area for traditional land users.	Beneficial	Low	Local	Medium-term	Isolated	Low	Short-term	Not Significant Positive
	Traffic Conflicts with wildlife	• Northrock will ensure that company and contractor vehicles travel at a safe speed to ensure the potential for accidents with wildlife are reduced.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant

J Cultural and Heritage Resources

J-1 Local Resources

A review of heritage sites on record with the Prince of Wales Northern Heritage Centre in Yellowknife indicates that there are six recorded archaeological sites located along the access route. All of these sites appear to be prehistoric sites where lithic materials, bone fragments and other materials were found. These sites are located along the southern shoreline near the southern outflow of Stewart Lake.

Near the proposed staging site at the mouth of the Keele River, a post-war trapper's cabin was noted in the record of historical sites. A search for this cabin was not successful. Subsequent conversations with local residents suggest that the cabin was washed away some years ago.

The Mountain Dene Trail to the Mountains passes through the Flintstone Range in the vicinity of the B-44 wellsite. Local residents identified the trail along Summit Creek, which is to the west of the wellsite location.

J-2 Direct Impacts

The access route in the vicinity of Stewart Lake runs along the south shore and passes close to the archaeological sites identified above. The access is pre-existing and has been used in the recent past to facilitate oil and gas exploration in the area. The use of this access will not create any direct impacts on these sites.

J-3 Indirect Impacts

There will be no additional indirect impact from the use of the proposed access route.

J-4 Cumulative Effects

Should the area be subject to future development, there should be little or no additional impact to the identified archaeological sites. Future access to the area would be along the existing and established routes using pre-existing cutlines and trails. Current and future exploration and development programs, if any are focused in the area west of Stewart Lake. The existing heritage sites should not be impacted by future oil and gas exploration.

K Access Road

K-1 Erosion

The proposed access will use existing cutlines and trails. Some new clearing for detours will be required on steep slopes west of Tertiary Creek. Although the access will be utilized under frozen and snow-covered conditions, there is the potential for erosion on steep slopes. Bulldozer blades will be equipped with mushroom shoes to ensure the blades are sufficiently elevated to minimize damage to the duff layer. There is also the potential for rutting along the access in the event of unseasonably warm weather conditions. Every effort will be made to conduct

operations during frozen ground conditions. The roadbed will be built on a base of ice and snow that will further protect the vegetative cover.

K-2 Wildlife Disturbances

Wildlife disturbances will be restricted to the vicinity of the access route and wellsite. Wildlife may be affected by the traffic movement and noise associated with the project. The creation of snow berms and/or slash from snowplowing and clearing has the potential to restrict travel along established game trails and may form barrier to the normal movement of ungulates. The effects of the project will be temporary and transitory in nature. Restrictions can be mitigated by creating breaks in snow berms and/or slash at existing game trails and every 400 metres.

K-3 Cumulative Effects

Cumulative impacts will be mitigated to some degree through the use of existing cutlines to access the wellsite. Past activities, seismic exploration, drilling programs, fire fighting, etc. have created sufficient access in the area that additional required clearing will be minimal and restricted to snow clearing, widening and detours on steep hills to the west of Stewart Lake.

Should the well prove to be unsuccessful, no significant additional impacts are anticipated. Should the well prove up economical reserves of hydrocarbons, there is the potential for additional drilling, seismic and pipeline construction. If development continues in the area in future years the access may be subject to increased traffic volumes and a resulting increase in sensory disturbance in terms of both duration and intensity. Increased activity may also result in the creation of additional linear and local disturbances, and, over the longer, term could lead to habitat fragmentation.

Table 6: Table of Effects – Access Road

Environmental Feature	*Potential Impact*	*Proposed Environmental Protection and Mitigative Measures*	*Direction*[1]	*Magnitude*[2]	*Areal Extent*[3]	*Duration*[4]	*Frequency*[5]	*Probability*[6]	*Reversibility*[7]	*Significance*[8]
Erosion		• Bulldozers will have protective shoes to elevate the blade, leaving some snow cover to build up the road base, to protect vegetative mat and, thereby, reduce potential for erosion. • Access will use existing cut lines. Clearing will primarily involve the removal of willows. Access widths will be maintained at 10m or less except on tow hills where 15m widths will be required. • Spreading of slash and seeding will be utilized to control erosion on slopes. • If ground disturbance does occur, it will be re-contoured and reseeded with an approved mix immediately and inspected within one full growing season. • Access will be monitored for rutting and damage during warming conditions.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
Wildlife Disturbance	Breeding disturbances	• Program conducted during winter conditions to avoid critical periods for wildlife (late spring and early fall).	Adverse	Low	Local	Short term	Isolated	Low	Short-term	Not Significant
	Noise increase	• Noise will be limited to the access road and drill site. Noise will be transient (along access) and local and temporary (access and wellsite). • The program will be conducted during the winter to minimize activity during critical periods for wildlife (spring and fall).	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant

Table 6: Table of Effects – Access Road (continued)

Environmental Feature	*Potential Impact*	*Proposed Environmental Protection and Mitigative Measures*	*Direction*[1]	*Magnitude*[2]	*Areal Extent*[3]	*Duration*[4]	*Frequency*[5]	*Probability*[6]	*Reversibility*[7]	*Significance*[8]
	Habitat changes / effects	• No endangered species have been identified. • Crews will be restricted to movement along the access road. • Slash will be windrowed with 10m breaks every 400m to allow passage of wildlife.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
	Game species effects	• The disturbance to game species is limited in that the activity is short in duration and localized. • Breaks in windrows will allow passage of wildlife. • No firearms will be permitted.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
	Wildlife may be attracted to garbage or harmed by debris from operations	• Garbage will be incinerated on site or removed from the program area to Tulita or Norman Wells where it will either be burned or hauled to the nearest approved disposal site. • If sumps are used, they will be fenced-off.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
	Reduction / removal of keystone or endangered species	• Caribou habitat has been identified on the Flint Stone Range above the tree line. Disturbance will be limited to the wellsite and existing access.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant
	Removal of wildlife corridor or buffer zone.	• Slash will be windrowed with 7m breaks every 400m to allow passage of wildlife.	Adverse	Low	Local	Short-term	Isolated	Low	Short-term	Not Significant

-126 15' -126 00' -125 45' -125 30' -125 15' -125 00' -124 45'

65 00' 64 50' 64 40' 64 30' 64 20' 64 10' 64 00'

WINTER ROAD
ENBRIDGE P/L
WINTER ROAD
WINTER ROAD
WINTER ROAD
WINTER ROAD
WINTER ROAD
WINTER ROAD
WINTER ROAD
WINTER ROAD
WINTER ROAD
ENBRIDGE P/L

BEAR ROCK
NORMAN RANGE
(FORT NORMAN)
TULITA
MACKENZIE RIVER
Gaudet I.
Windy I.
Police Island
Seagull Island
Old Fort Point
Dry Island
Saline Island
Burnt Point
Tate Lake
Rusty Lake
Stewart Lake
Mcl Lake
Loon Lake
Sandy Lake
Lake Tatalui
Fish Lakes
Bluefish Lake
Burton Lake
Lake Tatalui

EL 391
EL 391
EL 391
EL 397
EL 397
EL 397
EL 397
EL 397
EL 397

SAHTU LANDS
SAHTU LANDS
SAHTU LANDS
SAHTU LANDS
SAHTU LANDS

ALL
Former Tertiary Creek Seismic Program Access
Little Bear Alternate Route
Keele River Route

MACKAY RANGE
FLINT STONE RANGE
MOUNTAIN ROUTE TO THE MOUNTAINS
GROUND SQUIRREL MOUNTAIN
SUMMIT CREEK B-44
RED DOG MOUNTAIN
RED DOG MOUNTAIN
CANYON RANGES (MACKENZIE MOUNTAINS)
MOOSE PRAIRIE
KEELE RIVER
KEELE RIVER
KEELE RIVER
REDSTONE RIVER

M
B
C
D
W
M1

WS

WELL LEGEND

BOTTOM HOLE LOCATION
- BITUMEN
- LOCATION
- SUSPENDED
- DRY & ABANDONED
- WATER INJECTED
- ABANDONED WATER INJ.
- SUSPENDED OIL & GAS
- SERVICE
- ABANDONED OIL & GAS
- DRILLING

- GAS
- OIL & GAS
- ABANDONED GAS
- SUSPENDED GAS
- CAPPED GAS
- OIL
- ABANDONED OIL
- SUSPENDED OIL
- CAPPED OIL
- STANDING

SURFACE HOLE LOCATION

HERITAGE SITES
- ABANDONED CABIN
- AIRSTRIP
- CABIN
- GRAVE / BURIAL SITE
- SPIRITUAL SITE
- TENT FRAME
- KP 160 - REMOTE VALVE
- PROPOSED CAMPSITE
- FUEL TRANSFER SITE

PARAMETERS

GROUP INT.	20 m
SHOT POINT INT.	120 m
CHARGE/DEPTH	3 kg @ 15 m
TOTAL KMS.	54.4 kms.

CONTOUR INTERVAL -
* WEST OF 126 DEGREES 67 FEET
* EAST OF 126 DEGREES 100 FEET

TRANSPORTATION
- PROPOSED ACCESS
- HERITAGE ROUTE
- TRAIL
- TRAPLINE
- WINTER ROAD
- NEW CUT

SCALE 1:150,000

KILOMETRES 20 10 0 20 40 60 80 100

MILES 10 5 0 10 20 30 40 50 60

TRANSVERSE MERCATOR PROJECTION (CM129 / ZONE 9) NAD27

LAND USE SITES

WILDLIFE
- M – MOOSE
- W – WATERFOWL
- C – WOOD LAND CARIBOU
- B – BEAVER
- ALL – BEAVER, MUSKRAT, MOOSE & WATERFOWL

RECREATION & TOURISM
- ARCHAEOLOGICAL SITE
- COAL SITE
- LODGE / CAMP
- CAMPING
- GEOLOGICAL FEATURE
- HISTORICAL SITE

FISH RESOURCES
- EXISTING OR POTENTIAL FISH SPAWNING AREA
- FISH MIGRATION ROUTE
- IMPORTANT AREA FOR DOMESTIC FISHING
- OTHER GENERAL COMMENTS

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NORTHROCK

SUMMIT CREEK 2003

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