

Orano Canada Inc.

Kiggavik Project Field Program

2018 Annual Report

18-CND-92-01

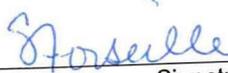
January 2019



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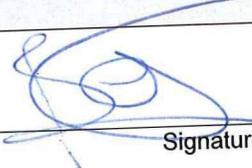
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Approval for Use

Editor:		
Stephanie Forseille	Coordinator, Safety, Health, Environment, and Quality (SHEQ) Exploration	
Name	Title	Signature

Contributions from:

- John Robbins, Manager New Projects
- Mario Blain, Project Geologist

Approver:		
Patrick Ledru	Vice President, Exploration	
Name	Title	Signature

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and responsible manner and were not exposed to adverse effects from uranium exploration activities. There were no lost time incidents involving Orano personnel or contractors.

1 Summary of Kiggavik 2018 Field Program

1.1 General

The Kiggavik uranium exploration project (Kiggavik) is located 80 kilometres (km) west of Baker Lake, Nunavut and is operated by Orano Canada Inc. (Orano). The project includes the Kiggavik and St. Tropez mineral leases collectively termed the Kiggavik Project. During the 2018 field program, Orano performed a site inspection. The Kiggavik camp is in a care and maintenance phase. Operations were conducted from Rankin Inlet with personnel travelling to Kiggavik camp by helicopter for the site inspection. No drilling, geophysics, prospecting, geological mapping, thermistor installation or packer-testing were conducted in 2018.

Main Project contributors are shown in Table 1.1-1.

Table 1.1-1: Kiggavik Project Contributors

Activity	Contributors
Management	Orano
Environment, Safety and Radiation Protection	Orano
Helicopter and Logistics	Custom Helicopters

1.2 Site Inspection/Maintenance

The Kiggavik summer program that took place on July 19, 2018, consisted of a site inspection. The following list identifies the main care and maintenance activities performed during the program:

- Assessment of the drill contractor's laydown area: the area was the site for storage of ancillary drill equipment and maintenance of drilling equipment. All items were removed from the area in 2016. The area was found to be free of debris and showing sparse revegetation. ([Photograph 1](#))
- Aerial inspection of fuel cache; the tanks remain empty and no visual evidence of hydrocarbon contamination was noted. ([Photograph 2](#))
- A tarpaulin covering was added to a berm storing drums of mineralized cuttings in the radioactive compound ([Photograph 3](#)). Water within the berm was sampled and the results are available in Appendix C.
 - The results indicate a slight elevation in Uranium and Radium-226 levels but due to the small amount of water in the berm and the distance to the nearest water body, there is minimal risk to the environment if the water is released from the berm.
 - The results were also reviewed by Sarah Benson, Orano Environmental Scientist, who confirmed the water can be released from the berm with minimal short term impact to the area.

- The berm is estimated to be half full of water with the water volume estimated to be 2,400 litres. The dimensions used to estimate the water volume are 6 metres by 4 metres by 10 centimetres.
- Orano plans to release the berm water during the 2019 inspection to extend the life of the drums.
- The last radiation surveys performed of the radioactive compound and Kiggavik core storage area were conducted in 2016, during the last drilling campaign. No new survey was performed in 2018 but the results of the 2016 surveys are available in [Appendix B](#)



Photograph 1: 2018 Revegetation status of Boart Longyear laydown area



Photograph 2: Fuel cache 2017 (left) and 2018 (right)

1.3 Inspections

No inspections of the field activities were carried out by regulatory agencies in 2018

2 Summary of Planned Activities for 2019

2.1 General

No drilling, geophysics, prospecting, or geological mapping are planned for the 2019 field season.

The plan for the upcoming field season consists of a small summer program of approximately one to two days to inspect the Kiggavik camp. Additional necessary maintenance will be completed if required and the berm water sampled in 2018 will be released. A small crew will commence mobilization in early July. Operations will be conducted from Baker Lake with support provided by helicopter services.

2.2 Environmental Monitoring

The 2019 environmental and wildlife monitoring program will continue to be conducted by Orano staff during the short summer program. Orano staff will be responsible for the implementation of the Management Plans which were designed to ensure compliance with regulatory conditions and internal Orano requirements (see Appendix D).

3 Environmental Monitoring and Protection

Orano is committed to taking every reasonable precaution toward ensuring the protection and conservation of the natural environment. This commitment is reflected in Orano's Environmental Policy and is supported through a comprehensive environmental program for the exploration activities at Kiggavik .

The 2018 field season was conducted in accordance with the ISO 14001:2004 certification for the Exploration Department's Environmental Management System. The ISO 14001 standard outlines the requirements for an Environmental Management System which enable an organization to implement a policy and objectives which address legal requirements and significant environmental aspects. The standard supports environmental protection and prevention of pollution in balance with socio-economic needs.

The following Management Plans (Plans) are submitted to regulatory agencies prior to commencing the field season and included with this report (Appendix D):

- Uranium Exploration Plan
- Waste Management Plan
- Spill Contingency Plan
- Noise Abatement Plan
- Wildlife Mitigation and Monitoring Plan
- Abandonment and Restoration Plan
- Radiation Protection Plan

These Plans ensure compliance with regulatory conditions and internal Orano requirements and guide the development of best management practices and procedures to mitigate any potential adverse environmental impacts. Orano intends to operate in accordance with commitments made in the Plans; however, during the Care and Maintenance phase the Plans are largely not applicable as no activity will be occurring, other than site inspections. The Plans are available to personnel and will remain static during the Care and Maintenance phase. The Plans will be revised prior to changing phase or earlier if conditions warrant. The following sections summarize the applicable portions of the Plans during the Care and Maintenance phase.

3.1 Uranium Exploration Plan

The Uranium Exploration Plan is designed to meet the requirements of the Water Licence issued by the Nunavut Water Board (2BE-KIG1823) and the *Mineral Exploration Guidelines of Saskatchewan*, also referred to as Best Management Practices (BMPs). Although current activities are not regulated by the Canadian Nuclear Safety Commission (CNSC), the Uranium Exploration Plan is designed in accordance with the CNSC Regulations. The plan discusses activities related to uranium exploration including:

- Training requirements
- Drilling practices
- Core storage and logging

- Radioisotopes
- Spills
- Shipping radioactive material
- Site abandonment and restoration

No work occurred in 2018 that is applicable to the Uranium Exploration Plan.

3.2 Waste Management Plan

In accordance with Orano’s Environmental Policy, a Waste Management Plan was developed to guide waste segregation, storage, and disposal while mitigating potential adverse environmental impacts. Orano is committed to ensuring waste generated at the Kiggavik Project site is collected, stored, transported and disposed of in accordance with regulatory requirements.

No work occurred in 2018 that produced waste, except for the domestic waste produced by workers during the day trip to the Kiggavik camp. This waste was hauled to Rankin Inlet with the crew and disposed at the local accommodation.

Drill cuttings with a uranium concentration greater than 0.05 percent previously collected remain stored in the radioactive storage compound for future management (Photograph 3).



Photograph 3: Kiggavik Radioactive Storage Compound (2018)

As outlined in the conditions of the Nunavut Water Board Licence No. 2BE-KIG1823, hazardous waste generated through the course of the operation must be disposed of at a licensed facility. No hazardous waste was disposed of in 2018.

An inventory of all waste and material remaining on site was recorded upon seasonal shutdown and is summarized in [Table 3.2-1](#).

Table 3.2-1 Kiggavik Site End of Season Inventory 2018

Type of Waste/Product	Quantity	Storage Method
Controlled Burn Ashes	2 drums	Stored inside a locked sea container on site.
Large Generator Oil	1 – 20 L pail 15W 40 oil	Stored inside building on secondary containment.
Propane	24 – 100 lb bottles	Upright in a locked fence compound.

3.2.1 Canada Wide Standards

Efforts to meet the *Canada-Wide Standard (CWS) for Dioxins and Furans* and the *Canada-wide Standard for Mercury Emissions* include the development and implementation of a Waste Management Plan involving waste inventory, diversion and sorting prior to incineration. Waste materials incinerated include food waste, paper, untreated wood products and toilet wastes. Remaining wastes are sorted and stored in sea containers on site until they are removed via the winter haul to be shipped to a licensed disposal facility.

3.3 Water Consumption and Management

As outlined in the conditions of the Nunavut Water Board Licence No. 2BE-KIG1823, the domestic camp water is limited to 10 cubic metres per day (m³/day), and the drill water is limited to 289 m³/day for a total maximum consumption of 299 m³/day. Drilling during low flow artesianians was compliant with Part F, Item 7 of the Licence and is further described in Section 4.3.2.

3.3.1 Camp and Drill Water Use

No water was drawn from local sources for the 2018 field program. Water was carried with workers from Rankin Inlet.

3.3.2 Artesians

As per the NWB Licence, Part F, Item 7 (c), Orano must provide information on all artesian flows encountered, with GPS coordinates, dates, and flow rates, depth, permafrost, aquifer and packer testing data with associated water quality analytical results. As no drilling was performed, no artesian flow was encountered.

3.4 Spill Contingency Plan

In accordance with existing legislation and requirements, Orano maintains a Spill Contingency Plan for Kiggavik. The objectives of this plan are to:

- Identify the potential for and the appropriate response to spills at Kiggavik
- Provide procedures for prevention or mitigate adverse environmental effects through effective and efficient response
- Identify personnel and their responsibilities
- Identify emergency contacts
- Describe reporting requirements

No spills occurred during the work period and no spills were noted during inspection of the camp and fuel cache in 2018.

3.4.1 Fuel Cache

The primary fuel storage area is located on an esker 3.5 km southwest of the Kiggavik camp. The fuel cache includes eight, 50,000 L double walled steel Envirotanks that are registered with Environment Canada, they were installed in accordance with Canadian Council for Ministers of the Environment (CCME) – *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products*. Three Envirotanks are used for jet fuel and five for diesel fuel ([Photograph 2](#)).

Fuel was removed from the Kiggavik Project fuel cache during the 2017 winter haul. No fuel remains at the fuel cache or camp.

3.5 Noise Abatement Plan

A Noise Abatement Plan was developed to mitigate the effects from noise generated during camp set-up, camp operation, winter road use, helicopter use, and drilling activities. Noise controls and abatement serve a combination of environmental and occupational health and safety purposes. The focus of the plan is the control of environmental noise for the protection of wildlife.

3.6 Wildlife Mitigation and Monitoring Plan

The Wildlife Mitigation and Monitoring Plan (WMMP) was developed to monitor and reduce disturbance to wildlife, particularly caribou. The plan incorporated recommendations from the Government of Nunavut – Department of Environment (GN-DoE), Environment Canada (EC) and the Beverly and Qamanirjuaq Caribou Management Board (BQCMB); as well as conditions from the NIRB, Kivalliq Inuit Association (KIA), Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and the Nunavut Water Board (NWB). The plan is designed to protect wildlife from activities at Kiggavik, increase the current understanding of wildlife interactions with human development and aid in determining the effectiveness of mitigation measures.

As the Kiggavik Camp was not occupied in 2018, no monitoring activities were performed.

3.6.1 Caribou Migration

During caribou migrations, mitigation measures were implemented as required by the Nunavut Impact Review Board (NIRB) 2007 screening decision and the WMMP. No caribou were noted during the inspection.

3.7 Abandonment and Restoration Plan

The Abandonment and Restoration Plan was developed to address permit conditions, regulations and industry standards for seasonal operation, shut-down and final closure. This plan is frequently reviewed and revised to reflect the expansion of infrastructure, cost estimates, changing field programs and the identification of improved reclamation practices.

The objectives of the plan are to:

- Protect human health
- Reduce or eliminate environmental effects
- Re-establish conditions to similar pre-exploration land use
- Establish physical and chemical stability of disturbed areas

3.7.1 Seasonal Shutdown

As no work was performed and the Kiggavik camp was not opened in 2018, no work was required to place the project into the seasonal shutdown. Current site inventory is documented in Table 3.2-1.

3.7.2 Progressive Reclamation

The Abandonment and Restoration Plan has been implemented to ensure drill site stability. Consistent with the objective to return lands to a state similar to pre-exploration use, Orano intends to implement progressive restoration practices and incorporate new abandonment and/or reclamation methods and procedures, where applicable. Radiologically or chemically contaminated soil or cuttings are collected inside industrial bulk bags and stored in the radioactive storage compound for future management, which may include transfer to an approved site. During the 2016 maintenance and inspection, a gamma radiation survey was performed on the core storage and radioactive storage compound. The gamma radiation survey conducted one meter from the boundary of the radioactive storage compound displays no readings greater than one micro Sievert per hour ($\mu\text{Sv/h}$). The survey results are available in Appendix B.

4 Effects of the Project on Human Health

Orano is committed to providing a healthy and safe work environment for all employees and contractors and to ensuring work is performed in a safe and responsible manner. To meet this commitment, Orano takes every reasonable precaution to ensure the health and safety of personnel to mitigate the potential harmful effects of uranium exploration activities. This commitment is supported through a comprehensive Health and Safety Program.

4.1 Health and Safety Program

The Health and Safety Program ensures work activities are performed in a safe and responsible manner and they are conducted in accordance with the Nunavut *Mine Health and Safety Regulations*, exploration best practices and Orano safety requirements. Orano completed the 2018 field season in accordance with its OHSAS 18001: 2007 certification for the Exploration Department's Health and Safety Management System. The OHSAS 18001 standard provides the minimum requirements for a comprehensive Health and Safety Management System which allows an organization to proactively minimize occupational health and safety risks and to continually improve its health and safety performance. An external audit completed in 2018 concluded that the health and safety program continues to meet all health and safety requirements.

4.2 Radiation Protection

To minimize radiation exposure during drilling, the Radiation Protection program was implemented to ensure work activities were performed in a safe and responsible manner. As no drilling occurred in 2018 there are no radiation monitoring results.

5 Summary of Local Hires and Initiatives

An important aspect of the Kiggavik Project is that it brings employment and business opportunities to local residents. In 2018, there was no work carried out at Kiggavik and therefore no local people were hired; northern companies were successful in winning all issued contracts. In addition to providing direct employment and business contracts, Orano sponsored an award at the Baker Lake High School graduation.

5.1 Local Employment

During active exploration, Kiggavik provided employment to local people by hiring local companies to supply services to the project.

Table 5.1-1 summarizes the employment provided to local Inuit workers for the past ten years.

Table 5.1-1: Local Employment

Year		Orano Employees	Contracted Workers	Total
2009	Inuit Workers	3	31	34
	Hours	2,993	10,205	13,198
2010	Inuit Workers	3	27	30
	Hours	3,076	6,495	9,571
2011	Inuit Workers	2*	17	19*
	Hours	2,044	4,980	7,024
2012	Inuit Workers	3*	10	13*
	Hours	1,830	4,332	6,162
2013	Inuit Workers	3**	19	22**
	Hours	2,059	6,752	8,811
2014	Inuit Workers	1	11	12
	Hours	1,239	3,352.5	4,591.5
2015	Inuit Workers	1	7***	8***
	Hours	1107	3309	4416
2016	Inuit Workers	0	3	3
	Hours	0	695	695
2017	Inuit Workers	0	1	1
	Hours	0	236	236
2018	Inuit Workers	0	0	0
	Hours	0	0	0

* Includes a non-Inuit local Community Relations Assistant from Baker Lake who worked in Baker Lake during the summer.

**Includes Inuit worker hired by Orano to work at the Cluff Lake site.

***Includes six Inuit workers hired by PEL and one non-Inuit worker hired by Kivallingmiut Aviation who worked in Baker Lake during the summer field season.

5.2 Locally Contracted Work

Many goods and services obtained for Kiggavik were contracted to local suppliers. The total value of the contracts to northern vendors in 2018 was \$0.017M, 64% of the total exploration and contract expenditures of \$0.027M. Table 5.2-1 summarizes the value of contracts awarded to northern businesses since 2007. The work contracted to local companies in 2018 consists of:

- Helicopter services
- Meals and accommodations
- Translation services

Table 5.2-1: Kiggavik Project Northern Contracts

	Inuit Owned companies*	Nunavut companies**	Other Northern Companies***	Total Northern Expenditures	Total Contract Expenditures	% spent total northern	% spent Inuit owned Firms
2007	\$1.0M	\$0.90M	\$0.75	\$2.65M	\$8.5M	30%	11%
2008	\$1.75M	\$1.2M	\$1.2M	\$4.15M	\$13.7M	30%	13%
2009	\$1.4M	\$0.76M	\$0.60M	\$2.75M	\$14.5M	19%	10%
2010	\$2.2M	\$1.00M	\$0.33M	\$3.5M	\$12.5M	28%	18%
2011	\$2.4M	\$0.36M	\$0.26M	\$3.03M	\$9.2M	33%	26%
2012	\$2.2M	\$0.5M	\$0.06M	\$2.76M	\$7.1M	39%	31%
2013	\$2.30M	\$0.55	\$0.58M	\$3.43	\$6.8M	50%	34%
2014	\$3.00M	\$0.50	\$0.31M	\$3.79M	\$6.9M	55%	43%
2015	\$2.14M	\$0.34M	\$0.26M	\$2.74M	\$4.2M	65%	51%
2016	\$0.33M	\$0.015M	\$0.006M	\$0.0351M	\$0.059M	60%	56%
2017	\$0.07M	\$0.013M	\$0.005M	\$0.09M	\$1.13M	79%	64%
2018	\$0.000M	\$0.006M	\$0.011M	\$0.017M	\$0.027M	64%	0%
Total	\$18.79M	\$6.14M	\$4.37M	\$29.26M	\$84.13M	35%	22%

*Companies qualifying as Inuit owned Firms

**Companies not Inuit owned Firms but with offices in Nunavut and a significant number of Inuit employees

***Northern based companies from outside of Nunavut

6 Community Engagement

Information sharing and community engagement are requirements of the environmental assessment process as well as one of Orano's corporate commitments. Over the past years engagement was largely focused on the environmental assessment process. The exploration program carried out at Kiggavik was discussed at many of these events. With the federal Minister's Decision (August 2016) to not approve the proposed Kiggavik Project at this time, there will be reduced engagement regarding the project. Should the Kiggavik be revitalized, engagement activities are expected to be increased to coincide with the project advancements and milestones as appropriate.

Information remains available and accessible on the Kiggavik website at www.kiggavik.ca or the Orano company website at www.oranocanada.ca.

Appendix A Compliance with Conditions

Previously, this appendix listed the conditions of the Nunavut Impact Review Board (NIRB) Screening Decision, the Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) Land Use Permit, the Kivalliq Inuit Association (KIA) Land Use Licence and the Nunavut Water Board (NWB) Water Licence for the Kiggavik Project and also described the means by which the project has achieved compliance with these conditions. During Kiggavik's Care and Maintenance phase the conditions of each decision/license/approval will not be contained in the annual report. This section will be limited to a listing of approvals.

A.1 Nunavut Impact Review Board file no. 06AN085

On March 26, 2008 NIRB re-issued the original terms and conditions (April 3, 2007 Screening Decision) along with the additional terms and conditions outlined in the August 30, 2007 and January 9, 2011 letters.

A.2 Nunavut Planning Commission Keewatin Regional Land Use Plan Conformity Determination

The Kiggavik Project received a positive conformity determination for advanced exploration on December 15, 2006

A.3 Crown-Indigenous Relations and Northern Affairs Canada

CIRNAC (issued as INAC) Land Use Permit N2018C0010 (received January 25, 2018, Expires January 24, 2023).

A.4 Kivalliq Inuit Association Land Use Licence

KIA Land Use Licence KVL306C02 (received April 3, 2007; expiry January 12, 2019). Extension request submitted November 1, 2018.

A.5 Nunavut Water Board Licence

NWB licence 2BE-KIG1823 (received June 14, 2018; expiry June 13, 2023) (previous licence No.'s 2BE-KIG1318, 2BE-KIG0812, 2BE-KIG0708 and 2BE-SIS0607).

Appendix B 2016 Gamma Survey Results

Radioactive Material Compound



UTM coordinates (NAD 83 zone 14W)	1	564649 E / 7146825 N	3	564620 E / 7146834 N
	2	564623 E / 7146821 N	4	564647 E / 7146838 N

Kiggavik Camp & Lone Gull Core Storage



Lone Gull Core Storage – Old Section (< 2007)



Lone Gull Core Storage – New Section (2007-2015)



Appendix C Water Sample Results

Date Sampled: Jul 19, 2018
 Sample Matrix: WATER
 Description: 07/19/2018 12:30 (KIGI) KIGGAVIK - MINERALIZED CUTTING BERM WATER

Date Received: Jul 23, 2018

Analyte	Units	Result
Lab Section 2 (ICP)		
Aluminum	mg/L	0.0052
Antimony	mg/L	<0.0002
Arsenic	ug/L	1.1
Barium	mg/L	0.056
Beryllium	mg/L	<0.0001
Boron	mg/L	0.02
Cadmium	mg/L	0.00002
Chromium	mg/L	<0.0005
Cobalt	mg/L	<0.0001
Copper	mg/L	0.0017
Iron	mg/L	1.74
Lead	mg/L	0.0004
Manganese	mg/L	0.0092
Molybdenum	mg/L	0.0007
Nickel	mg/L	0.0012
Selenium	mg/L	<0.0001
Silver	mg/L	0.00007
Strontium	mg/L	0.16
Thallium	mg/L	<0.0002
Tin	mg/L	<0.0001
Titanium	mg/L	<0.0002
Uranium	ug/L	28
Vanadium	mg/L	<0.0001
Zinc	mg/L	0.11

Lab Section 4 (Radiochemistry)

Radium-226	Bq/L	0.77
Radon-222	Bq/L	<5
Thorium-228	Bq/L	<0.01
Thorium-230	Bq/L	0.01
Thorium-232	Bq/L	<0.01

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

Appendix D Management Plans

Abandonment and Restoration Plan

Noise Abatement Plan

Radiation Protection Plan

Spill Contingency Plan

Uranium Exploration Plan

Waste Management Plan

Wildlife Mitigation and Monitoring Plan

***Note: the plans have been updated to reflect the recent corporate name change but no material changes were made to the plans.**

Orano Canada Inc.

Abandonment and Restoration Plan

Exploration Department

Kiggavik Project

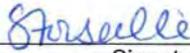
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Approval for Use

Editor:		
Stephanie Forseille	Coordinator, Exploration SHEQ (Safety, Health, Environment and Quality)	
Name	Title	Signature

Approver:		
Patrick Ledru	Vice President, Exploration	
Name	Title	Signature

History of Revisions

Version	Revision	Date	Details of Revision
1	0	March 2007	Original submission
2	0	October 2007	Updated to reflect changes in field activities/capabilities and areas of continual improvement
2	1	May 2008	Updated to reflect comments and conditions received by the Nunavut Water Board associated with the issuance of water licence no. 2BE-KIG0812
3	0	January 2009	Updated to reflect changes in field activities/capabilities and areas of continual improvement
4	0	January 2010	Updated to reflect changes in infrastructure
4	1	May 2011	Updated personnel titles and grammatical changes
4	2	May 2012	Updated to reflect personnel changes.
4	3	May 2013	Updated to reflect personnel title changes, update land ownership details, and input coordinates
4	4	May 2014	Updated infrastructure list and surface land administration
5	0	January 2015	Inclusion of greater detail for reclamation practices, waste disposal, and long-term drill core management. Reformatted to new template
6	0	January 2017	Updated to reflect transition to Care and Maintenance phase
8	0	January 2019	Updated to reflect corporate name change and title changes

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Acronyms and Abbreviations

Term	Definition
Orano	Orano Canada Inc.
CLARC	Community, Land and Resources Committee
HTO	Hunters and Trappers Organization
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
KIA	Kivalliq Inuit Association
NWB	Nunavut Water Board
SHEQ	Safety Health Environment and Quality

1 Preamble

The Kiggavik Project is currently in a care and maintenance phase. The Abandonment and Restoration Plan will be kept in this state during this phase. The care and maintenance phase is an extended seasonal shutdown. The applicable requirements in Section 3 were fulfilled in 2016 and will be considered to be met until the project changes phase. The site will be monitored annually to ensure that the site remains in good condition. This plan will be updated prior to a change in project phase to reflect the most recent information.

The Orano Canada Inc. (Orano) Abandonment and Restoration Plan (Plan) is in effect from the time licences and permits are issued to the expiry date. The Plan applies to the Kiggavik Project located approximately 80 km west of Baker Lake, Nunavut.

1.1 Purpose and Scope

Abandonment and restoration considerations are on-going during the life of the project. Progressive reclamation provides an opportunity to reduce the extent of disturbed land over the life of the project.

The objectives of the Plan are to:

- Protect public health and safety by using safe and responsible reclamation practices;
- Reduce or eliminate environmental effects, such as ground disturbance;
- Following cessation of project activities, re-establish conditions which permit the land to return to a similar pre-exploration land use; and
- Reduce the need for long term monitoring and maintenance by establishing physical and chemical stability of disturbed areas.

The Plan complies with the conditions of permits, licences, regulations and industry standards. The following principles have been established to guide the development of the overall Plan:

- Plan and implement in accordance with regulations;
- Apply cost effective and appropriate abandonment and reclamation practices to reduce environmental risks and allow for traditional use of the land;
- Implement progressive abandonment and reclamation as an integral part of the project; and,
- Incorporate new abandonment/reclamation methods and procedures, when applicable.

1.2 Revisions to Plan

During the active exploration phase, the Abandonment and Restoration Plan is reviewed regularly and updated as required to keep the information current and consistent with regulatory and procedural changes. A History of Revisions can be found at the beginning of this Plan.

1.3 Responsibilities

The Manager – New Projects is responsible to ensure that this Plan is implemented, and the implementation may be completed by:

- Project Geologist
- Coordinator, SHEQ Exploration or designate

The Vice President, Exploration is ultimately responsible for any activity being carried out by Kiggavik Project personnel.

2 Introduction

This Plan applies to the Kiggavik Project which includes advanced exploration activities and occasional environmental work to support the environmental assessment process. Orano is the operator of the Kiggavik Project with the head office located at the following address:

Orano Resources Canada Inc.
817 – 45th Street West
Saskatoon, Saskatchewan S7L 5X2

2.1 Location

The Kiggavik Project includes 37 mineral leases covering 45,639 acres located in the Kivalliq Region of Nunavut. The surface rights for 31 mineral leases on Inuit Owned Land (IOL) are administered by the Kivalliq Inuit Association (KIA) while the remaining six mineral leases are on Crown land. The Crown land covers 3,794 acres of the Jane and Contact prospects of the south-west portion of the Project with surface rights administered by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC).

The St. Tropez area, wholly owned and operated by Orano, is composed of 5 mineral leases covering 16,549.21 ha. The surface rights are administered by the KIA.

There is a temporary exploration camp at the Kiggavik site, which can accommodate approximately 60 people. The Kiggavik camp is located at the following coordinates:

- UTM 14W 564530 E 7146879 N
 - Latitude: 64° 26' 29" N
 - Longitude: 97° 39' 34" W

2.2 Schedule

The Kiggavik Camp is seasonally occupied, and supplies are brought to site by a local contractor on a winter road. The project site is secured and prepared for each seasonal shutdown following completion of exploration field program activities. Final restoration will commence once the exploration/feasibility programs have ceased.

No buildings, equipment or waste will remain beyond the expiration date of permits or licences (i.e., KIA Land Use Licence; CIRNAC Land Use Permit; NWB Water Licence), unless approvals have been obtained permitting the camp to remain. If unforeseen delays in permitting renewals occur, Orano will consult with the agencies to arrange for an agreement regarding site infrastructure pending a permitting decision.

2.3 Infrastructure

The temporary camp was initially capable of accommodating approximately 32 persons in 2007, but was later expanded in 2008 and again in 2009 to accommodate approximately 60 people. Should it be required, further camp expansion and increased personnel would be discussed in permit applications prior to the field season. The camp currently consists of the following:

- One storage shed/back-up generator/shop
- One generator building (housing current generator)
- Helicopter storage/shop
- Three helicopter pads
- One washroom/dry building constructed with separate male/female facilities
- One kitchen with storage
- One wooden office
- 15 wooden sleeping units (one is a first aid shack)
- Wooden boardwalk throughout camp
- Five prospector tents (core logging tents)
- Three weather havens (2 for sleeping units, 1 for office)
- One mechanical services room
- Grey water collection area
- Industrial incinerator
- Core storage
- Radioactive materials storage compound
- Eight bulk fuel storage tanks (50,000 L capacity per tank)

There is a fuel esker containing two sheds and eight bulk fuel tanks. Three bulk tanks are for Jet-B fuel and five are for diesel fuel. Occasionally fuel drums within secondary containment may be stored at the esker.

Currently there is one shed and core storage located near Andrew Lake, and there is core storage at the Kiggavik site and Pointer Lake.

Future additions may include the following:

- New sleeping units
- Additional office space
- Additional core storage racks
- Small core logging sheds/tents

3 Seasonal Shutdown

In 2016 the Kiggavik project was placed in a Care and Maintenance phase. This phase is essentially an extended seasonal shutdown.

3.1 Buildings, Contents and Equipment

Following the completion of each field program, equipment is either removed from site, or stored within buildings or sea containers to ensure they can withstand the winter season. Canvas tents are secured and braced internally so they can withstand snow and wind. All wooden buildings are secured with plywood over the windows and doors to prevent inadvertent opening. Pumps and hoses from the water system are drained and dismantled. Pumps may be removed from site for servicing or put into storage along with the hoses.

3.2 Fuel Cache and Chemical Storage

An inventory is conducted prior to leaving at the end of the field season to track the items that are removed or remain at site. A thorough inspection of all fuel caches is completed, and chemicals are removed from site for storage and or disposal. If any chemical products (CaCl₂) remain on site they are stored in secure buildings or sea containers.

3.3 Waste

The Waste Management Plan and Radiation Protection Plan detail waste handling and are in effect from the time the exploration licence is issued to the time it expires.

Combustible waste includes non-hazardous material and is burned in a Single Chamber Cyclonator Incinerator (Series CY1000) which remains on site for use each year. Incinerator ash is collected in drums and stored until shipped off-site to an approved handling facility.

The grey water from the kitchen and washroom facilities is diverted to the grey water collection sump area that is regularly inspected. The grey water sump consists of a barrel that was punctured with drainage holes and buried to allow drainage and filtration of the water.

3.4 Drill Equipment and Drill Sites

The drill is dismantled into its main components as per the drilling contractor procedure, packaged and secured along with its ancillary equipment and rods. The drill components may winter at site, be removed via the winter road or may be flown out by the drilling contractor. Any remaining waste is taken to camp to be burned or if required, flown off-site to an approved disposal location.

Where possible, residual radioactive materials accumulated during drilling are disposed of down the drill hole; however, where this is not practicable, radioactive drill cuttings are collected and stored in the existing radioactive storage compound for future handling, which may include transfer to an operating mine site. Where collected cuttings are non-mineralized, they are used to re-establish the physical stability of drill sites by levelling depressions that may have formed from permafrost thaw. Drill holes that encounter uranium mineralization with a uranium content greater than 1.0% over a length of more than 1 m with a meter percent concentration greater than 5% are sealed by cementing over the entire mineralization zone; this should be at least 10 m above and below each mineralization zone. Drill holes are sealed by cementing/grouting the upper 30 m of bedrock or the entire depth of the hole, whichever is less or otherwise approved of by the Nunavut Water Board (NWB) in writing.

Drill sites are inspected for fuel stained soil and undergo a radiation survey for radioactive contamination. Should contamination be encountered, the material will be collected and stored for disposal at a licensed facility. To achieve radioactive clearance for each drill site, the gamma dose at 1 m above ground must remain less than 1 micro-Sievert per hour ($\mu\text{Sv/h}$) above background radiation levels. Gamma radiation levels at 1 m from the surface of the core storage area should be reduced to 1 $\mu\text{Sv/h}$ above background and in no instances exceed 2.5 $\mu\text{Sv/h}$. Should the levels be exceeded, Orano would contact the CIRNAC Land Use Inspector for review and approval of handling procedures. If necessary, residual radioactive material may be transported to the McClean Lake Operation for storage and/or disposal.

It is Orano's intention to reclaim disturbed sites in an adequate and acceptable manner. Proper reclamation techniques are currently being investigated and will be implemented under the direction and approval of experienced consultants, community members and regulatory agencies. Restoration work will be completed prior to the expiry of the land use licence. This will include but is not limited to reclaiming surface disturbance to promote the growth of vegetation. Further detail is provided in section 4.3.

3.5 Contamination Clean up

Any soil around camp that has become contaminated and was previously unnoticed is treated as per the Spill Contingency Plan. Before and after photos are taken to document the contamination and the clean-up. Clean-up will be conducted in accordance with Government of Nunavut's Department of Environment - Environmental Guideline for Site Remediation.

3.6 Inspection and Documentation

A full inventory and complete inspection of all areas are conducted prior to seasonal closure. Photos are taken to document the conditions prior to leaving the site for the winter. These photos are included in the annual report submitted to the NWB, CIRNAC and KIA and included in any required spill reporting

4 Final Abandonment and Restoration

Unless further activities or development are anticipated, final abandonment and restoration will be completed upon cessation of the current exploration/feasibility program. The camp site, fuel caches, and drill sites will be reclaimed to a similar pre-exploration state with all wastes removed from site and any contamination treated as per the Spill Contingency Plan. Following completion of restoration, photos will be taken for submission in the final report.

4.1 Buildings, Contents and Equipment

As per the Waste Management Plan, non-treated wood products will be incinerated while the treated wood will be shipped off-site for proper disposal. Buildings in good structural condition will be offered to the community of Baker Lake or the Baker Lake Hunters and Trappers Organization (HTO). Those buildings that are not donated will be dismantled and removed or incinerated. All wooden helicopter pads will be burned or taken off site to an approved disposal facility. The soil around the helicopter pads and buildings will be inspected for contamination, and where the ground has not been altered, scarification will not be necessary. All equipment, including pumps, generators, etc. will be dismantled and removed from site. All wastes that are not incinerated will be removed from site and taken to an approved disposal facility. Shipping containers from site will be transported by winter road to Baker Lake before shipment to a licensed facility during the open water shipping season. A final inspection of the camp site area will be conducted to ensure that there is no waste left behind.

Where sumps were used, they will be properly back-filled at the end of the project and inspected to ensure that there is no leaching, run-off, or radiological and hydrocarbon contamination. Any contaminated material found will be treated as per the Spill Contingency Plan. Sumps will be back-filled and levelled as required and final photos will be taken.

4.2 Fuel Caches and Chemical Storage

The fuel drums, slip tanks, and 50,000 L EnviroTanks will be removed during final abandonment, and all areas used for caching fuel will be thoroughly inspected. Any contamination at fuel cache sites will be cleaned up as well as any debris removed. All chemicals will be removed from site. Areas where chemicals have been stored will be inspected to ensure that there has been no contamination. Should there be any soil contamination the soils will be tested for petroleum hydrocarbons (fraction F1 through F4) as per Canada-Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (2001) and benzene, ethylbenzene, toluene and xylene as per Canadian Soil quality Guidelines for the Protection of Environmental and Human Health (2004). Any contaminated soil will be handled as prescribed by the Spill Contingency Plan. Final photos will be taken of all fuel caches for inclusion in the final report.

4.2.1 Fuel Cache Landing Esker

The esker located at the fuel cache has been used as a landing strip and will be inspected for surface disruption. If necessary, the landing strip will be restored to pre-use conditions to ensure site stability. As there was no vegetation present, the area will be similar to pre-use condition following the leveling of the esker.

4.3 Drill Equipment and Drill Site Abandonment

The drill will be dismantled into its main components as per the drilling contractor procedure, packaged and secured along with its ancillary equipment and rods. The drill may be flown out by the drilling contractor or taken out overland during the winter.

During the course of drilling operations, all drill sites are inspected for radioactive or hydrocarbon contamination with any contaminated material being treated as per the Spill Contingency Plan. The remaining wastes will be incinerated if possible or transported to an approved disposal location.

To re-establish physical stability where drill sites show evidence of permafrost thaw, clean non-mineralized cuttings are used to level depressions. Where inadequate fill material is available, excess material from clean discharge areas or gravel may be used to fill depressions. Orano personnel conduct regular inspections, and prior to final abandonment, Orano will ensure that all drill sites are/have been restored and sumps have been covered and levelled. Orano will implement progressive reclamation practices and incorporate new abandonment and/or reclamation methods and procedures, where applicable. To ensure site stability, Orano is currently investigating reclamation techniques to return lands to a state similar to pre-exploration use.

Challenges surrounding physical reclamation of disturbed surfaces include lack of local knowledge or available information. To minimize the affected footprint and therefore the amount of required physical reclamation there is a focused effort on proper planning of infrastructure placement and drill sites. It was noted by some members of the Baker Lake Community, Land and Resources Committee (CLARC) that natural re-vegetation is the preferred reclamation method.

4.4 Drill Core Management

At the discretion of the surface holder, Orano proposes to retain all drill core on site as the core represents a signature for the land and significant scientific value for the future title holder. This proposal is consistent with the *Saskatchewan Mineral Tenure Registry Regulations* and the *Territorial Land Use Regulations* which permit the retention of drill core at a drill site or centralized core storage facility. The core represents decades of investment and holds the value of the land for development.

4.5 Inspection and Documentation

A complete inspection will be conducted of all areas prior to permanent closure and a final report prepared for all agencies. Photos will be taken to document the conditions prior to leaving the site and to document any contamination and resulting clean up. These photos will make up part of the final report to be submitted to the Water Resource Inspector; the annual report submitted to the NWB, CIRNAC and KIA and will be included in any required spill reporting. All agencies will be contacted and notified once the final cleanup has been completed. Agency contact information can be found in the Exploration Government Contact List accessible for Orano personnel on the [Exploration SHEQ SharePoint site](#).



Orano Canada Inc.
Noise Abatement Plan
Exploration Department
Kiggavik Project

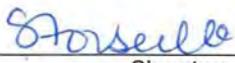
Version 6

January 2019

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Workers' Safety and Compensation Commission	1

Approval for Use

Editor:		
Stephanie Forseille Name	Coordinator, Exploration SHEQ (Safety, Health, Environment and Quality) Title	 Signature

Approver:		
Patrick Ledru Name	Vice President, Exploration Title	 Signature

History of Revisions

Version	Revision	Date	Details of Revision
1	0	March 2007	Original submission
2	0	October 2007	Updated to reflect changes in field activities/capabilities and areas of continual improvement
3	0	January 2009	Updated to reflect changes in field activities/capabilities and areas of continual improvement
3	1	May 2010	Updated to reflect changes in field activities/capabilities and areas of continual improvement
3	2	May 2012	Updated to reflect personnel changes. Made consistent with other Plans.
3	3	May 2013	Updated to reflect personnel titles
4	0	January 2015	Revisions for increased clarity and updated template
5	0	January 2017	Updated to reflect transition to Care and Maintenance phase
6	0	January 2019	Updated to reflect corporate name change and title changes

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Acronyms and Abbreviations

Term	Definition
Orano	Orano Canada Inc.
SHEQ	Safety Health Environment and Quality
WMMP	Wildlife Mitigation and Monitoring Plan

1 Introduction

The Kiggavik Project is currently in a care and maintenance phase. The Noise Abatement Plan will be kept in its current state, but is not considered fully applicable during the care and maintenance phase. This plan will be updated prior to a change in project phase to reflect the most recent information.

This Noise Abatement Plan will be in effect for the duration of the Kiggavik Project and associated activities. The Project is located approximately 80 km west of Baker Lake and is operated by Orano Canada Inc. (Orano).

The Kiggavik camp is a temporary fly-in camp that is seasonally occupied. Exploration activities and occasional environmental studies take place during the summer months. Supplies to operate the camp and field program are moved overland in the winter months. Mobilization of personnel and camp opening typically takes place at the end of May or early June, with the site closed and personnel demobilized usually by September of each year. Noise generation is expected during camp opening and close, throughout exploration operations and during the winter road use.

Noise controls and abatement serve a combination of environmental and occupational health and safety purposes. The focus of this abatement plan is on the control of environmental noise for the protection of wildlife.

1.1 Revision to Plan

During the active exploration phase, the Kiggavik Noise Abatement Plan is reviewed regularly and updated as required to keep the information current and consistent with regulatory and procedural changes. A History of Revisions can be found at the beginning of this plan.

1.2 Responsibilities

The Manager – New Projects is responsible to ensure that this plan is implemented. Implementation may be completed by:

- Project Geologist
- Coordinator, SHEQ Exploration
- Or designate

The Vice President, Exploration is ultimately responsible for any activity being carried out by Kiggavik Project personnel.

2 Activities Requiring Noise Reduction

Small amounts of noise are generated during regular camp activities; however this plan has been developed specifically for drilling rigs, generators, vehicles and aircraft (fixed-wing and helicopters) which are the main contributors of noise during exploration operations. To decrease the amount of noise, the following are implemented:

- Drilling rigs are equipped with mufflers or other appropriate noise abatement equipment;
- Generators are equipped with mufflers; and
- ATVs are equipped with mufflers

To reduce aircraft noise, altitude restrictions are put in place as described in the Wildlife Mitigation and Monitoring Plan (WMMP). During long range flights (i.e., Baker Lake to Kiggavik site) aircraft fly at a minimum of 610 m above ground level, except during take-off and landing, when ceiling conditions do not permit or when safety risks arise. For relatively shorter transportation flights (e.g., movement of staff and equipment between camp and work areas) aircraft fly at a minimum of 300 m above ground level, except during take-off and landing, when ceiling conditions do not permit, or when safety risks arise. Low-flying flights may need to be conducted for geophysical surveys, but these surveys are preceded by reconnaissance survey as described in the WMMP. As per the WMMP, all activities are suspended if 50 or more caribou are within two kilometres of the activity and aircraft do not land within one kilometre of a herd.



Orano Canada Inc.
Radiation Protection Plan
Exploration Department
Kiggavik Project

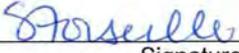
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Approver:		
Patrick Ledru	Vice President, Exploration	
Name	Title	Signature

History of Revisions

Version	Revision	Date	Details of Revision
1	0	March 2007	Original submission
2	0	October 2007	Update to reflect changes in field activities/capabilities and goals of continual improvement
3	0	August 2008	Update to reflect changes in field activities/capabilities and goals of continual improvement
4	0	January 2009	Update to reflect changes in field activities/capabilities and goals of continual improvement
5	0	January 2010	Update to reflect changes in field activities/capabilities and goals of continual improvement
5	1	May 2011	Updated to reflect changes in personnel position titles.
6	0	June 2012	Updated to reflect changes in personnel titles and positions. Grammatical corrections.
6	1	May 2013	Updated to reflect changes in personnel titles
6	2	May 2014	Updated to align with the Exploration IMS Manual
6	3	January 2015	Improved formatting and minor edits for clarity
7	0	January 2017	Updated to reflect transition to Care and Maintenance phase
8	0	January 2019	Updated to reflect Corporate name change and title changes

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Acronyms and Abbreviations

Term	Definition
ALARA	As Low as Reasonably Achievable
Orano	Orano Canada Inc.
CNSC	Canadian Nuclear Safety Commission
IMS	Integrated Management System
NORM	Naturally Occurring Radioactive Materials
SHEQ	Safety Health Environment and Quality
TDG	Transportation of Dangerous Goods
WSCC	Workers' Safety and Compensation Commission

1 Introduction

The Kiggavik Project is currently in a care and maintenance phase. The Radiation Protection Plan will be kept in this state, but is considered not applicable during the care and maintenance phase. This plan will be updated prior to a change in project phase to reflect the most recent information.

This Orano Canada Inc. (Orano) Radiation Protection Plan will be in effect for the duration of the Kiggavik Project located about 80 km west of Baker Lake. The Radiation Protection Program has been prepared to meet the requirements of the Nunavut Occupational Health and Safety Regulations, Mineral Exploration best practices, and the Orano Corporate Integrated Management System (IMS). Although current activities are not regulated by the Canadian Nuclear Safety Commission (CNSC), the Radiation Protection Plan is designed in accordance with the CNSC Regulations.

The Radiation Protection Plan includes the following administrative elements:

- Program documentation
- Training
- Designation of Occupational Workers
- Dose limits and dose levels
- Obligations of Occupational Workers
- Pregnant Occupational Workers

The Radiation Protection Plan includes the following program elements:

- Exposure As Low as Reasonably Achievable (ALARA)
- Radiological monitoring
- Dosimetry monitoring
- Management of radioactive materials
- Shipping of radioactive materials
- Site abandonment and restoration
- Emergency response

1.1 Revisions to Plan

During the active exploration phase, the Kiggavik Radiation Protection Plan is reviewed regularly and is updated as required to keep the information current and consistent with regulatory and procedural changes. A History of Revisions can be found at the beginning of this plan.

1.2 Responsibilities

The Manager – New Projects is responsible to ensure that this plan is implemented. Implementation may be completed by:

- Project Geologist
- Coordinator, SHEQ (Safety, Health, Environment and Quality) Exploration
- Or designate

The Vice President, Exploration is ultimately responsible for any activity being carried out by Kiggavik Project personnel.

2 Administrative Elements

2.1 Program Documentation

The Radiation Protection Program is comprised of a series of key documents, which include the Routine Radiological Monitoring Schedule and procedures for Shipping Radioactive Material. The Radiation Protection Program includes comprehensive work instructions for worker dosimetry, radiological monitoring and the safe handling of radioactive materials.

To ensure occupational exposures are managed in accordance with the ALARA principle, radiological parameters are monitored against defined Action and Administrative levels. The Action and Administrative levels define values of radiological parameters above which intervention may be required and the corresponding mitigative measures to be followed.

2.2 Training

Orano provides necessary training to all its employees and contractors to ensure worker safety and protection of the environment during exploration activities. The training programs provided are designed to meet the requirements of the CNSC *Uranium Mines and Mills Regulations, Workers' Safety and Compensation Commission (WSCC) requirements under the Mine Health and Safety Act and Regulations, ISO 14001:2015 and OHSAS 18001:2007.*

All new employees, including contractors, receive appropriate radiation protection training prior to beginning work. This includes instruction on the origins of ionizing radiation, the types of radiation, health risks, and the principles of radiation safety, protection and regulatory compliance. Training also includes the safe handling, management and disposition of radioactive materials such as drill muds, cuttings, and radioactive core. Training may be in the form of a PowerPoint presentation or interactive display.

All visitors at the Kiggavik site for more than 72 hours, or who will be left without an escort will receive radiation protection training. Visitors who have not received training must be escorted on site at all times.

Personnel supervising the shipment of radioactive materials must possess a valid TDG certificate in accordance with Transport Canada *Transportation of Dangerous Goods Regulations*. If radioactive materials are to be transported by aircraft, TDG training is to include the necessary aviation components for Class 7 materials. If contractors have their own training program they must submit their documentation. Support personnel providing assistance during preparation and shipment of radioactive material do not require TDG training as long as they are working under the direct supervision of trained individuals.

Orano field personnel and contractors establishing temporary work camps and/or handle fuel, lubricants and radioactive material require spill response training. If the contractors have their own training program they

must submit evidence of the training program as per *EXP-820, Training, Awareness and Competence*. Training for Orano employees is provided in accordance with the Spill Contingency Plan. The Spill Contingency Plan is provided to Contractors, and should the contractors not have an acceptable training program in place, Orano will supply the training material and/or provide the training as required.

2.3 Occupational Workers

Workers exposed to Naturally Occurring Radioactive Materials (NORM) as a result of their regular duties are designated as occupationally exposed workers for exploration projects. The designation of a person as an Occupational (NORM) Worker is conducted in accordance with *EXP-740-01, Occupational Worker Assessment*.

2.3.1 Dose Limits and Dose Levels

An Occupational Worker is informed of the risks associated with radiation to which the worker may be exposed in the course of their work, and the applicable dose limits, during radiation protection training. Occupational Workers are limited to a maximum annual effective dose of 50 mSv in a one year dosimetry period, not to exceed 100 mSv in a five year dosimetry period (or 20 mSv/year over five years). Administrative control levels have been defined in *EXP-740-03, DRD Usage/Action and Administrative Levels for Gamma Radiation* to limit dose. Administrative levels are set to less than 0.01 mSv per day and less than 0.05 mSv per week. An Action level is set to 5 mSv per quarter. In the event of an emergency and the consequent immediate and urgent remedial work, the effective dose shall not exceed 500 mSv. A pregnant Occupational Worker is limited to 4 mSv for the balance of the pregnancy once notification has been made to the employer. The relaxation of normal dose limits in emergency situations does not apply to pregnant workers. Occupational Workers are informed of their radiation dose levels in writing, annually.

2.3.2 Obligations of Occupational Workers

Orano exploration workers deemed to be Occupational Workers are obligated to provide information required to identify them to the National Dose Registry (i.e. given name, surname, previous surname, SIN, gender, date and province and country of birth) by completing *EXP-740-01-01, Employee Information Form*.

2.3.3 Pregnant Occupational Workers

Occupational Workers are informed during training of the risks associated with radiation to which the worker may be exposed in the course of their work during orientation training. Occupational Workers are informed of their obligation to inform their employer when they become pregnant and are informed of the applicable effective dose limit of 4 mSv for the balance of the pregnancy.

3 Program Elements

3.1 ALARA

Radiation protection has its foundation in the As Low As Reasonably Achievable (ALARA) principle. The commitment to maintain worker doses ALARA is established through Orano's Radiation Protection policy. This policy is established by senior management and is approved by the President and Chief Executive Officer. This plan and the Radiation Protection Procedures follow the ALARA principle.

3.2 Radiological Monitoring

Routine radiological monitoring consists of dosimetry monitoring and contamination control. Dosimetry monitoring is conducted to determine and document worker exposures to radiological components which include gamma radiation, radon progeny (RnP) and long-lived radioactive dusts (LLRD). Contamination control measures are in place to minimize the spread of radioactive materials into unintended locations. Radiological monitoring is conducted in accordance with the *EXP-740, Routine Radiological Monitoring Schedule* and associated work instructions.

3.3 Management of Radioactive Materials

3.3.1 Radioisotopes

Nuclear materials and radiation devices are used for exploration and instrument calibration. The possession, use, storage, and disposal of nuclear materials and radiation devices are carried out in strict accordance with CNSC *Nuclear Substances and Radiation Devices Regulations* and *EXP-752-02 Safe Handling and Use of Exploration Sources*. The radioisotopes are licensed under the McClean Lake Operating Licence.

3.3.2 Core Storage

In the absence of territorial mineral exploration regulations, the storage and disposal of radioactive materials arising from project activities are to be carried out in accordance with Saskatchewan *Mineral Industry Environmental Protection Regulations, 1996*.

Permanent and long-term storage areas of radioactive material must be located at least 30 metres from the main camp and at least 100 metres from the high water mark of all water bodies.

As required by Crown Indigenous Relations and Northern Affairs Canada (CIRNAC), the gamma radiation dose rates at 1 m from the surface of a storage area should be reduced to 1 $\mu\text{Sv/h}$ and in no instances exceed 2.5 $\mu\text{Sv/h}$. Should the levels be exceeded, the Land Use Inspector must be contacted. Radioactive storage areas must be appropriately labelled with radiation warning signs and fenced.

3.3.3 Disposition of Drill Cuttings

During drilling activities, drill mud solids or cuttings in non-mineralized zones are deposited on the ground, in a selected natural low-lying depression. This natural depression must be located, at a minimum, 31 m beyond the ordinary high level water mark of any nearby water bodies, and where direct flow into the water body is not possible. A radiological survey is conducted before and after drilling to ensure elevated readings are not occurring. If necessary, depressions are backfilled and contoured, as much as possible, back to natural pre-existing conditions.

When mineralized core is intercepted, drill mud and cuttings are collected in appropriate containers and categorized as radioactive through appropriate radiation measurements. Drill mud or cuttings with uranium content greater than 0.05% will be collected and stored at the radioactive storage compound with an appropriate containment system in place. Down hole disposal of cuttings is not often practical at Kiggavik. Drill holes are sealed by cementing/grouting the upper 30 m of bedrock or the entire depth of the hole, depending on the presence of mineralization or otherwise approved of by the appropriate regulatory agencies in writing.

3.4 Shipping of Radioactive Materials

Shipping and receiving radioactive material is carried out in accordance with the CNSC Packaging and Transport of Nuclear Substances Regulations, the Transport Canada Transportation of Dangerous Goods Regulations, and the Orano EXP-752 Shipping Radioactive Material procedure and work instructions. Kiggavik personnel trained in the International Air Transport Association (IATA) Dangerous Goods Regulations complete the packaging and shipment of radioactive materials.

3.5 Site Abandonment and Restoration

Site abandonment and restoration is carried out in accordance with the Abandonment and Restoration Plan. Gamma radiation surveys are conducted at each site prior to drilling and prior to final abandonment. Contaminated soil or cuttings are collected in appropriate containers and stored in the radioactive storage compound for future handling, which may include transfer to an operating mine site. Drill sites are cleaned to ensure that the gamma dose rate at a height of 1 metre from surface is less than 1 $\mu\text{Sv/h}$ above ambient background.

Materials and equipment leaving the Kiggavik site are monitored for contamination in accordance with the *EXP-740, Routine Radiological Monitoring Schedule*. Materials or equipment that cannot be decontaminated to meet unrestricted release criteria are either stored in the radioactive storage compound or shipped to a licensed facility such as the McClean Lake Operation in accordance with the CNSC *Packaging and Transport of Nuclear Substances Regulations*, the Transport Canada *Transportation of Dangerous Goods Regulations*, and the Orano *EXP-752 Shipping Radioactive Materials* procedure and work instructions.

3.6 Emergency Response

Emergencies could include such incidents as spills, lost or damaged radioactive sources and transportation incidents. Emergencies involving radioactive materials are responded to in accordance with the Emergency Response Manual. In the event of an incident involving radioactive material, immediate actions are taken to minimize worker exposures. In the event of any incident involving radioactive material, the Coordinator, SHEQ Exploration or designate is notified immediately, and the incident is reported to the Vice President, Exploration within 24 hours and appropriately investigated. Emergency response is co-ordinated through the corporate Emergency Response and Assistance Plan (ERAP) that details the organization, responsibilities, procedures and mitigative measures to be followed in the event of an offsite emergency involving the transport of radioactive material. Environmental emergencies are secondary to the safety of personnel. In the event of any incident involving a radiation source, federal and territorial agencies are notified in accordance with applicable regulations.

The uncontrolled or accidental release of any radioactive materials including drill mud solids and cuttings is considered a spill. Spills of radioactive material are appropriately reported and responded to in accordance with the Spill Contingency Plan. In the event of a spill, radioactive materials are collected and necessary site remediation undertaken to meet the site abandonment criteria of less than 1 $\mu\text{Sv/h}$ above background at a height of 1 metre. In accordance with the Spill Contingency Plan, in the event of a spill involving radioactive material, actions are taken to contain the spill, limit the spread of contamination and to control access to the spill area. Appropriate radiological and dosimetry monitoring is performed to ensure worker doses remain ALARA. Mitigation measures to be followed include recovery of radioactive material and decontamination of affected areas. Material collected during the clean-up is stored in appropriate containers in the radioactive storage compound for future handling.

In the event a radiation source is damaged, it is removed from service immediately and stored in a secure location. The removal of a damaged source from site is coordinated with the Coordinator, SHEQ Exploration and the McClean Lake Operation Radiation Protection Group as per *EXP-752-02 Safe Handling and Use of Exploration Sources*. If at any time it appears that a radiation source has been lost, misplaced or stolen, the Project Geologist or designate, the Coordinator, SHEQ Exploration, the Vice President, Exploration, and the McClean Lake Radiation Protection Group are notified immediately.

4 References

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Spill Contingency Plan
Exploration Department
Kiggavik Project

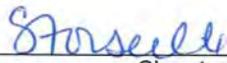
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Stephanie Forseille Name	Coordinator, Exploration SHEQ (Safety, Health, Environment and Quality) Title	 Signature

Approver:		
Patrick Ledru Name	Vice President, Exploration Title	 Signature

History of Revisions

Version	Revision	Date	Details of Revision
1	0	March 2007	Original submission
2	0	October 2007	Update to reflect changes in field activities/capabilities and goals of continual improvement
2	1	May 2008	Updated to reflect comments and conditions received by the Nunavut Water Board associated with the issuance of water licence no. 2BE-KIG0812
3	0	January 2009	Update to reflect changes in field activities/capabilities and goals of continual improvement
4	0	March 2009	Updated to reflect changes in field activities/capabilities and goals of continual improvement
5	0	January 2010	Updated to reflect changes in field activities/capabilities and goals of continual improvement
6	0	May 2011	Updated to reflect personnel titles, grammatical changes, reorganized information and clarified responsibilities. Made consistent with other Plans and Manual and updated to reflect changes in fuel storage and equipment.
7		May 2012	Updated to reflect personnel changes, grammatical changes, reorganized information and clarified responsibilities. Made consistent with other Plans.
7	1	May 2013	Updated to reflect personnel changes, and correction of grammatical errors.
7	2	May 2014	Updated infrastructure list, surface land administration, and proximity to water mark
7	3	January 2015	Minor edits for improved clarity and incorporation of new template
8	0	January 2017	Updated to reflect transition to Care and Maintenance phase
9	0	January 2019	Updated to reflect corporate name change and title changes

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Acronyms and Abbreviations

Term	Definition
Orano	Orano Resources Canada Inc.
CCME	Canadian Council of Ministers of the Environment
CEPA	Canadian Environmental Protection Act
ECOP	Environmental Code of Practice
EC	Environment Canada
FIRSTS	Federal Identification Registry for Storage Tank Systems
GN-DoE	Government of Nunavut, Department of Environment
IOL	Inuit Owned Land
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
KIA	Kivalliq Inuit Association
NWB	Nunavut Water Board
SHEQ	Safety Health Environment and Quality

1 Introduction

The Kiggavik Project is currently in a care and maintenance phase. The Spill Contingency Plan will be kept in this state, but is considered not applicable, with the exception of Sections 3, 4 and 5, during the care and maintenance phase. The site will be monitored annually with a site visit to ensure that containment of the remaining storage remains in good condition. This Plan will be updated prior to a change in project phase to reflect the most recent information.

This Spill Contingency Plan (Plan) applies to the Kiggavik Project located approximately 80 km west of Baker Lake, Nunavut. The Plan is made available at the Kiggavik Site and the Orano Canada Inc.(Orano) Corporate Office.

1.1 Purpose and Scope

The primary objective of the Plan is to help prevent or reduce the potential of spills of pollutants and prevent, reduce or eliminate any adverse effects that may result. As such, the Plan provides information and guidance on actions important for the prevention of spills and procedures to detect and respond to spills if they occur. The Plan evokes a risk management approach when considering potential spill events. By implementing effective spill prevention, the risk of spills can be reduced in magnitude and perhaps avoided.

Furthermore, the purpose of this Plan is to identify safe, effective and efficient response methods. This Plan is intended to satisfy Nunavut R-068-93 *Spill Contingency Planning and Reporting Regulations*. As per the regulations, “spill” is defined as “...a discharge of a contaminant in contravention of the Act or regulations made under the Act or a permit or license issued under the Act or regulations made under the Act.” Orano’s working definition of a spill is defined as any accidental discharge of a hazardous material to the environment.

1.2 Revision to Plan

During the active exploration phase the Plan is reviewed regularly and updated as required to keep the information current and consistent with regulatory and procedural changes. A History of Revisions can be found at the beginning of this Plan.

1.3 Responsibilities

The Manager – New Projects is responsible to ensure this Plan is implemented with the assistance of the following personnel:

- Project Geologist

- Facility and Logistics Coordinator, Kiggavik
- Coordinator, SHEQ Exploration
- Or designates

The Vice President, Exploration is ultimately responsible for any activity being carried out by Kiggavik Project personnel.

2 Site Information

2.1 Location

The Kiggavik site, located in the Kivalliq Region of Nunavut, supports the exploration of the Kiggavik mineral leases and the St. Tropez mineral leases.

Exploration of the Kiggavik mineral leases is a joint venture between Orano and Japan-Canada Uranium Company Limited, with Orano being the operator. The surface rights for 31 mineral leases on Inuit Owned Land (IOL) are administered by the Kivalliq Inuit Association (KIA) while six mineral leases remain on Crown land. The Crown land covers the Jane and Contact prospect on the south-west portion of the Project with surface rights administered by Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC).

The St. Tropez area, which is north-east of the Kiggavik site, is composed of 5 mineral leases covering 16,549.21 ha with surface rights administered by the KIA. The St. Tropez area is wholly owned and operated by Orano out of the Kiggavik site.

There is an existing temporary exploration camp at the Kiggavik site which can accommodate approximately 60 people. The Kiggavik camp is located at the following coordinates:

- UTM 14W 564530 E 7146879 N
 - Latitude: 64° 26' 29" N
 - Longitude: 97° 39' 34" W

In 2007, the temporary camp accommodated approximately 32 persons, was expanded to accommodate approximately 50 persons in 2008 and 60 in 2009. Currently there is one shed and core storage located at the Andrew Lake drill site, as well as core storage at the Kiggavik site and Pointer Lake. Detailed site maps showing topography can be found in **Error! Reference source not found.** The camp currently consists of the following:

- One storage shed/back-up generator/shop
- One generator building (housing current generator)
- Helicopter storage/shop
- Three helicopter pads
- One washroom/dry building constructed with separate male/female facilities
- One kitchen with storage
- One wooden office
- 15 wooden sleeping units (one is a first aid shack)
- Wooden boardwalk throughout camp
- Five prospector tents (core logging tents)
- Three weather havens (2 for sleeping units, 1 for office)

- One mechanical services room
- Grey water collection area
- Industrial incinerator
- Core storage
- Radioactive materials storage compound
- Eight bulk fuel storage tanks (50,000 L capacity per tank)

There is a fuel esker containing one shed and eight bulk fuel tanks. Three bulk tanks are for Jet A-1 aviation fuel and five are for diesel fuel. Additional fuel drums within secondary containment may also be temporarily stored at the esker.

2.2 Petroleum and Chemical Product Storage and Inventory

The table below provides a list of products used, along with the maximum amount stored and type of storage. Orano maintains an inventory of all petroleum and chemical products on site.

Table 2-1 Petroleum and Chemical Storage

Chemical/Material	Amount	Storage Type
Diesel Fuel	250,000 L	EnviroTanks
Jet B Fuel	150,000 L	EnviroTanks
Diesel Fuel	4 x 205 L (820 L)	Secondary Containment
Gasoline	1,025 L	Secondary Containment
Generator Oil	20 x 20L (400 L)	Secondary Containment
Hydraulic Oil	20 x 20L (400 L)	Secondary Containment
Engine Oil	20 x 20L (400 L)	Secondary Containment
Propane	75 x 100 lb (7500 lb)	Secondary Containment
Grease (for grease gun)	5 cases x 12 tubes (60 tubes)	Secondary Containment
Salt	50,000 lbs	Secondary Containment
Cement	15,000 lbs	Secondary Containment

2.2.1 Fuel Storage

To accommodate increased fuel demand and reduce the potential of fuel spills, bulk fuel storage tanks were installed. The eight double-walled steel EnviroTanks, each with a capacity of 50,000 L were installed at the esker located west of the Kiggavik camp. Three tanks on the north side of the esker are for the storage of Jet A-1 fuel, and five tanks on the south side of the esker are for the storage of diesel fuel as shown in Figure 2.1. The coordinates for the fuel cache are UTM 14W 561512E 7145240N.



Figure 2.1 Kiggavik Fuel Cache

The site layout and tanks were designed by a professional engineer and were installed by a registered company/petroleum contractor to ensure compliance with the Canadian Council of Ministers of the Environment (CCME) *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* (CCME COP, 2003). In 2007, Golder Associates (Golder) conducted an engineering assessment to identify potential issues with the installation of storage tanks. Recommendations were provided for the foundation support for the storage tanks. To mitigate the potential issues described in the report, Golder recommended that the tanks be placed on timbers located under each saddle to provide an increased bearing area. The use of timbers is a deviation from the CCME COP, however it should be noted that this is common practice in the area and Orano received permission from the Fire Marshal, Tim Hinds with the Government of Nunavut-Community and Government Services.

The design basis, operation and maintenance requirements for all petroleum storage and handling on site are based on the CCME ECOP for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products and in compliance with the *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations*, under the *Canadian Environmental Protection Act, 1999* (CEPA 1999). The fuel storage system at the Kiggavik site has been registered with Environment Canada (EC) through an online database, the Federal Identification Registry for Storage Tank Systems (FIRSTS).

Double walled steel EnviroTanks and associated pump meet the requirements of secondary containment within their own structure. For further secondary containment, rubberized berms or other suitable lined

structures may be used during fuel transfer to minimize the potential for spills. Absorbent padding may be used to control dripping fuel. Further protection against spills is provided by high level alarms, overfill preventers, and catch basins around each fill pipe.

The fuel is transported to the Kiggavik fuel cache during the winter via ground transport using tundra trucks such as Catapillar Challengers, Case 4-track units, and Delta Foremosts (See

Figure 2.2). With the exception of the Deltas, the fuel is hauled with steel sleighs loaded with 10,000 to 15,000 litre fuel tanks containing P-50 diesel or Jet A-1 fuel respectively. The Deltas do not pull sleighs, but instead have a deck with crane installed for offloading materials. Fuels are then transferred from the tanks to the EnviroTanks located at the Kiggavik fuel cache. Unleaded gasoline and propane cylinders may be brought to the Kiggavik site during the winter haul or by aircraft from Baker Lake.





Figure 2.2 Winter Haul of Materials and Fuel

Diesel fuel is transferred from the EnviroTanks to double-walled fuel tanks for use in camp and/or drill sites. There is also a fuel cache located at the Kiggavik Camp (14W 564464 E, 7146782 N). This fuel cache includes double walled fuel tanks used to supply the generators. All fuel containers are labelled, identifying the contents and the name “AREVA”. Should fuel drums be used, the 205 L drums are stored within secondary containment. Secondary containment is used for all liquid fuels, and lubricants, and drill additives are stored in sea containers to avoid adverse weather conditions. All secondary containment systems being used are capable of containing 110% capacity of the petroleum products and other hazardous materials and hazardous waste products (See Figure 2.3).



Figure 2.3 Fuel berms

Absorbent matting and/or drip pans must be placed under all areas where fuel leaks are likely to occur (e.g. fuel line hose connections, fuelling stations, generators, water pump), and these areas must be inspected regularly.

Waste oil, waste filters, and cleaned-up spill materials are contained in ring top barrels within secondary containment. Degreasing agents used for maintenance of equipment parts and grease are also contained in ring top barrels within secondary containment. These hazardous wastes are stored in the storage shed during the season, and later transferred to a sea container until they are removed from site during the winter haul. The materials are then disposed of at an approved facility.

2.3 Petroleum Product Transfer

To minimize fuel spillage associated with dispensing of product, all dispensing and tank filling operations are attended and involve the use of manually controlled nozzles equipped with automatic shut off mechanisms. Smoking, sparks or open flames are prohibited in fuel storage and fuelling areas at all times. Petroleum transfer operations will be carried out by trained personnel.

2.4 Location and Content of Spill Kits

Spill kits can vary in size and content depending on supplier and manufacturer however to remain consistent and provide adequate spill supplies, Orano has chosen two types of spill kits which are considered to be standard. The kits generally include the following contents, or similar products:

1. Universal Emergency Response Kit 30Gallon/135L

- Sorbant capacity of 96L
- 4 socks (3" X 10')
- 75 pads
- 1 drain cover
- 1 caution tape
- 2 pairs nitrile gloves
- 2 pairs safety goggles
- 2 protective coveralls
- 5 disposable bags
- 1 instruction book

2. Universal Overpack Kits 95 US Gallon Drums

- Sorbant capacity of 275L
- 4 socks (3" x 10')
- 5 socks (3" x 4')
- 50 pads
- 5 pillows
- 1 roll
- 1 drain cover
- 1 caution tape

- 2 pairs nitrile gloves
- 2 pairs safety goggles
- 2 protective coveralls
- 10 disposable bags
- 1 instruction book

A variety of spill kits are available and other kits than those listed above may be purchased for a variety of reasons (availability, intended use, etc.). All spill kits contain an itemized list of its contents and an inventory must be conducted following use and may be completed each season if deemed necessary.



Figure 2.4 Example of Spill Kits available at Project site

In addition, the following spill response material is also readily available in the generator building for spill response:

- Plugging compound
- Bulk supplies of oil absorbent pads and socks
- Aluminium or brass shovels or tools
- Bonding cables

Due to the volume of fuel being stored in the fuel tank storage system and the remote nature of the sites, at least one 95 US Gallon Spill Kit will be present for each 100,000L of fuel being stored.

In addition, at least one empty fuel drum and a pump will be located at each fuel cache and tank storage system in the event of damaged or leaking drums. Fire extinguishers of the proper type, size and number will be stationed in each building, at the fuel tank storage system and near each site where equipment is

normally serviced and anywhere else it is deemed advisable. A supply of sealable 20-litre steel pails or 205-litre drums will be available for the collection and storage of used absorbent materials.

2.5 Orientation

All personnel at camp (Orano employees, contractors, and long term visitors) are given formal orientation upon arrival at camp. The Spill Contingency Plan is reviewed during orientation which includes the location of the Safety Data Sheets, location of spill kits and additional supplies or tools. Personnel are trained to be watchful for any leaks or spills. Where leaks or spills are most likely to occur, personnel are instructed in the proper use of equipment and materials. They are also trained in the onsite spill response and reporting, and how to collect, store and dispose of spilled product.

3 Potential Hazards, Mitigation and Preventative Measures

3.1 Potential Hazards

Potential sources for spills have been identified as follows:

- Drums of P-50 diesel (four drums), gasoline, waste fuel, and waste oil may leak or rupture
- Overfilling of tank(s) at the fuel cache of Jet A-1 or P-50 diesel
- Transfer of fuel between EnviroTanks, drums and fuel tanks
- Transportation of fuel during winter haul
- Fire at the fuel cache
- Collision at the cache
- Vandalism of the fuel cache
- Propane cylinders: propane leaks may occur at the valves
- Refuelling equipment such as diamond drill equipment, helicopters, camp generator, stoves, incinerator, wheeled vehicles, snowmobiles and pumps
- Incidents involving leaking or dripping fuels and oils may occur due to malfunctions, impact damage, lack of regular maintenance, improper storage, or faulty operation
- Damaged lead/acid batteries causing spills of acid
- Improper drilling or transport of cuttings bags causing a spill of radiologically contaminated drill cuttings or drill return water

3.2 Mitigation and Preventative Measures

The Environmental Code of Practice discusses how to conduct activities so as to minimize the risk of spills. In addition, the following measures will further minimize the potential for spills during fuel handling, transfer and storage:

- Fuel transfer hoses with cam lock mechanisms used when transferring bulk fuel deliveries into the bulk storage tanks
- Carefully monitor fuel content in the receiving vessel during transfer
- Always have additional absorbent pads on hand while transferring fuel
- Clean up drips and minor leaks immediately
- Regularly inspect drums, tanks and hoses for leaks or potential to leak and for proper storage
- Create fuel caches that are located at least 31 m from the normal high-water mark of any water body
- Inventory and reconciliation procedures developed to ensure tanks are not overtopped and to ensure that tank leakage is not occurring
- Overfill protection on tanks include visual and audible alarms; catch basins around fill pipe
- Additional secondary containment at transfer locations; corrosion protection

- Train personnel, especially those who will be operators, in proper fuel handling and spill response procedures. This training is to include a “mock” spill, review of spill kit contents and their use and reporting.

3.2.1 Spill of Fuel from Metal Drums on Tundra

Should drums be used, the metal drums are stored in such a manner that they are not susceptible to tipping over, rolling or otherwise being unstable. Care is exercised so that nothing can cause damage to metal fuel drums by falling or rolling onto or into them. The use of a ramp or a cushion (e.g. automotive tire) while unloading metal fuel drums from aircrafts lessens the possibility of damage.

3.2.2 Spill of Fuel from Fuel Cache

To prevent spillage during the filling of the fuel cache system, the following items will be in place:

- Visible and audible high level alarm
- Automatic high liquid shut off device
- Manual dips are conducted in conjunction with the inventory and reconciliation procedures by fuel delivery personnel and site personnel
- Site personnel log all deliveries and fuel dips to coordinate the filling of the EnviroTanks with the contractor delivery personnel
- All tanks are double-walled
- Spill/Overfill protection – catch basins around the fill pipe will collect any liquid spilled during connecting or disconnecting of the fill hose
- Corrosion Protection – provided by painting of the tanks
- Where drums are used, the drums will be placed in appropriated lined structures for fuel transfer from tank to drum

Personnel conducting fuel transfers are to be adequately trained in the procedure and spill contingency. Most releases at a fuel tank storage system are due to piping and line failure. This system of tanks are independent of each other and do not require any piping. Spills or leaks are known to occur due to improper management of tanks prior to installation. All tanks located at the Kiggavik site have been inspected by a qualified person prior to filling and again prior to initial use.

3.2.3 Winter Fuel Hauling

Refer to Winter Road Plan for further details regarding transport, safety and training requirements used to minimize hazards generated during the winter haul.

3.2.4 Leak of Liquid Fuel from Distribution Lines

Stability of all storage tanks and distribution assemblies is of utmost importance to ensure that the risk of damage is minimized. All stands for reservoir tanks and fuel tanks are constructed to strength standards beyond those required. Distribution lines from reservoir tanks and fuel tanks are fitted with appropriate shut-off valves immediately downstream from the tank. All valves are closed when the tank is not in use. All associated distribution lines are installed in such a way to prevent being chafed in the wind, chewed on by animals or tripped on by humans. This is done by securing it to rigid structures, encasing it in armour or any other effective manner. These measures apply broadly to oil, jet fuel, gasoline, and propane set-ups.

3.2.5 Spill of Liquid Fuel into Lake Water

Fuel must be at a minimum of 31 m from ordinary high water mark on stable and level ground unless approved by regulatory agencies. Refuelling must not take place below the high water mark of any water body under any circumstance.

3.2.6 Release of Propane

Propane is stored in certified containers and is inspected and monitored on a regular basis for any signs of deterioration or corrosion. Containers are secured and fastened in an upright position to ensure there is no risk of damage to the regulator in the event of a fall. In the event that larger propane tanks are introduced on site, only qualified gas fitters will connect or disconnect the piping.

3.2.7 Spill of Battery Acid

Acquisition of non-spillable batteries reduces the risk of a spill of this type. These batteries can be shipped by air as they are exempt from UN2800 classification. All batteries are protected from damage by proper securing during transport and safe storage when not in use.

3.2.8 Fire at the Fuel Cache

Grounding cables minimize the potential of static discharge and potential fire, and are available during all transfers of bulk diesel or jet fuel.

3.2.9 Crash at Fuel Storage Tanks

To reduce the risk of a crash at the fuel cache, there is clear communication between aircraft (fixed wing and helicopters), wind socks are used, and further crash protection will be in place should additional vehicles be introduced to the operation.

3.2.10 Spill of Radiologically Contaminated Drill Cuttings

During drilling activities, non-mineralized drill mud solids or cuttings are deposited in low-lying areas. When mineralized core is intercepted, all drill mud and cuttings are collected in appropriate containers and categorized as radioactive through appropriate radiation measurements in accordance with work instructions. A gamma survey is also conducted before and after drilling activities at each hole to ensure there is no radiologically contaminated material at the site.

3.2.11 Spill of Potentially Contaminated Drill Return Water

Return water from drilling activities, including general drainage from the drill footprint, are diverted into low-lying areas to keep these waters from directly entering lakes and streams. Low lying depressions where non-mineralized drill cuttings and drill return water are deposited are monitored while in use.

4 Spill Response

4.1 Response to a Spill – Containment and Clean-Up

In the case of any spill or other environmental emergency, it is necessary to immediately react in the most safe and environmentally responsible manner. No spill or incident is so minor that it can be ignored. The basic steps of the response plan are as follows:

Ensure the safety of all persons at all times

The safety of yourself and others is the most important consideration when responding to a spill. As such, all actions that you perform as part of your spill response must only be undertaken if they can be undertaken in a safe manner. If an action cannot be undertaken in a safe manner, or if you do not feel that you are adequately trained or equipped to respond to a spill, you must evacuate all personnel to a safe area upwind from the spill. You will then request assistance from trained emergency responders with the appropriate resources to manage the spill safely and effectively.

Your responsibilities when responding to a spill are as follows:

- Act safely, using appropriate personal protective equipment and work practice
- Respect the safety of others in the area
- Refuse to perform activities that you feel are unsafe
- Inform those involved or in the area if you believe that their actions, or proposed actions, are unsafe. This includes colleagues, first responders, contractors, members of the public, etc.

Identify and find the spill substance and its source

Individual discovering the spill shall:

- Move upwind of the material
- Call for help – contact direct Coordinatory, SHEQ Exploration and Facility and Logistics Coordinator, Kiggavik (or designates)
- Attempt to stop leak if safe to do so
- Attempt to contain spilled material if safe to do so

Facility and Logistics Coordinator, Kiggavik (or designate) shall:

- Designate responders and proceed to the scene of the spill
- The responders (including the Facility and Logistics Coordinator, Kiggavik if necessary) shall attempt to stop further spillage and contain the spilled material

- Complete documentation of the spill using the Spill Report Form, and contact the NT-NU 24-Hour Spill Report Line immediately as well as the appropriate regulatory agencies (see Section **Error! Reference source not found.** for Spill Reporting requirements).

Coordinator, SHEQ Exploration shall:

- Provide assistance and expertise in the response to a spill
- Once under control, shall interview the individual who discovered the spill. Noting name, time discovered, and details on how the spill occurred, any actions taken by the individual to stop the spill
- Submit Spill Report to regulatory agencies within seven calendar days of the incident
- Submit Detailed Spill Report to regulatory agencies within 30 days of the incident

Responders shall:

- Position themselves upwind of the spill
- Determine what has been spilled
- Consult the Safety Data Sheet (SDS) for the product to determine the appropriate personal protective equipment and to understand the physical properties of what was spilled
- If the spilled substance is flammable (Gasoline or Jet Fuel), eliminate all ignition sources and shut off machinery in the area
- Take actions to ensure the leak or spill has been stopped at the source (i.e. shut off valves, reconnect hoses, etc.)
- Contain spill with appropriate material and equipment (i.e. spill response kit, etc.). Refer to the SDS if this is a controlled substance. Pump large spills into barrels or other suitable container as available
- **Ensure that grounding or bonding cables are used for all flammable product transfers**
- Control access to the spill area and keep all bystanders away. If necessary, barricade the spill area. Do not use flares unless you are certain the spilled material and its vapours are not flammable or explosive.
- Keep spilled material out of waterways. Use aluminium/non-sparking shovels to dig trenches or make soil and sand barriers or use the placement of absorbent socks as barriers
- For fuel or oil spills, place contaminated absorbent and associated materials into steel pails or drums for storage in a sea container for removal from site to an approved facility
- For radioactive material, place material into appropriate container (i.e. cuttings bag or IP3 pail) to be stored in radioactive storage compound
- If a spill has entered flowing water, take a water sample immediately upstream of the spill and downstream (e.g., 50 m, 150 m and 500 m from spill)

The following table outlines spill supplies and their use during spill response. Items not stored in spill kits are available with replacement items in the back-up generator building, more commonly referred to as the Lonegull.

Table 4-1 Spill Response Supplies

Incident	Spill Supplies	Use
Wet Spill	Drums with removable lids that contain bailers	For manual removal of large liquid spills Empty drums
	Folded sweeps and white rolls	Skimming of gas or diesel from water body
	Socks, peat moss	Containment of wet spill on land
	Pads, rolls, bags of dry absorbent	Cleanup of wet spills
Punctured Drum	Overpack (plastic drum) Plug 'n Dyke	Place overpack overtop of leaking drum, lay overpack and drum on its side, then flip upright, or use Plug 'n Dyke or other plugging compounds to seal and stop leak
Dry Spill	Plastic sheet (roll), mallet, spikes, knife	Covering dry spills to protect from wind and rain

If necessary ask for help and wait for others with the appropriate training and/or equipment to arrive. Acting inappropriately can often be dangerous to you, to others, and to the environment.

Implement any necessary cleanup and/or remedial action in a safe manner; this may be coordinated and or conducted by a third party consultant, if necessary.

Report the spill as per Section 5 of this Plan once it is safe to do so. Do not delay reporting as there are legal requirements in this regard.

4.2 Examples of Spill Scenarios

4.2.1 Fuel Spill from Metal Drums or Fuel Tanks

Report the spill to the Facility and Logistics Coordinator, Kiggavik and Coordinator, SHEQ Exploration or designates immediately. A puncture or rupture of containers containing liquid fuels should initially be assessed for risk of ignition. Sources of ignition will be extinguished or isolated from the spill area if safe to do so. While using appropriate personal protective equipment as described in the SDS, efforts should be undertaken to plug punctures with appropriate material from the spill kit (plugging compound or other improvised materials). Ruptures or holes should be high-centered to stop further spillage of fuel. Absorbent materials should be used to absorb spilled fuel. A containment berm should be built using available materials such as soil, snow, absorbent socks, portable berms and/or tarps to contain a large spill.

Remove the spilled products using absorbent material and place all recovered waste material into appropriate containers (metal cans, pails or drums in good condition). All containers will be stored in a sea container until the material can be transported to an approved facility. High-centered ruptures will be used as a point of entry for manually-operated fuel transfer pump suction tubes, and remaining fuel is removed to a sound drum. Small amounts of contaminated soil, vegetation or gravel is removed and placed into sealable steel drums or pail and then disposed of appropriately. Large areas of spilled product on the ground are only to be remediated after consultation with Orano SHEQ personnel and regulators to avoid unnecessary damage to the environment. Before commencing removal of soil or vegetation regulatory agencies will be contacted. If spill of significant volume occurs at one of the fuel storage tanks, attempt to prevent the spread of the fuel and immediately and contact Orano personnel to provide assistance with the spill response and clean-up.

4.2.2 Leak of Liquid Fuel from Distribution Lines

A detected leak from a distribution line assembly is to be initially assessed for risk of ignition. If safe to do so, sources of ignition are to be extinguished or isolated from the leak and the shut-off valve on the tank and/or distribution line is to be turned off. Report the spill to the Facility and Logistics Coordinator, Kiggavik and Coordinator, SHEQ Exploration or designates immediately. Absorbent material is placed on the spilled fuel; if spilled onto snow or ice it is scooped up with an aluminum (non-sparking) shovel and stored in an appropriate sealable steel container. Final disposal of these materials is done after consultation with the SHEQ group and the appropriate regulatory agencies.

4.2.3 Spill of Liquid Fuel into Lake Water

Identify the source of the spill and prevent further release of fuel. Report the spill to the Facility and Logistics Coordinator, Kiggavik and Coordinator, SHEQ Exploration or designates immediately. Never attempt to contain or clean up a spill of gasoline on water, the risk of fire is simply too high. Confinement needs to occur as close to the release point as possible. Prior to attempting any clean up on water, a site specific safety plan needs to be developed that factors in water safety aspects. After vapours have dissipated, the collection of liquid diesel or lubricating oil in lake water is attempted with floating booms of petroleum absorbent material. For larger spills of diesel or lubricating oil, raw liquid can often be removed by skimming. Absorbent pads can be used to collect small spills. All fuel skimmed or wicked off of the water surface as well as spent absorbent materials must be disposed of, in appropriate sealable steel containers. Ultimate disposal of these materials shall only be done after consultation with the SHEQ Group and the appropriate regulatory agencies.

4.2.4 Release of Propane

Where propane has been released, report the spill to the Facility and Logistics Coordinator, Kiggavik and Coordinator, SHEQ Exploration or designates immediately. Personnel shall withdraw from the area immediately upon identifying a leak and shall not return until the leak is stopped and all the vapours have diffused. Contact will be made with the proper agency for disposal instructions of a defective container.

- No attempt should be made to contain a propane release
- Water spray can be used to knock down vapours and to reduce the risk of ignition
- Small fires can be extinguished with dry chemical or CO₂

4.2.5 Fire at Fuel Cache

In the event that a fire occurs at the fuel cache, it is Orano's primary intentions to ensure the safety of the site personnel by allowing the fire to burn. Report the spill to the Facility and Logistics Coordinator, Kiggavik and Coordinator, SHEQ Exploration or designates immediately. Appropriate third party personnel will be contacted to ensure proper response and clean-up occurs. In the event of a fire anywhere on site, the Government of Nunavut, Department of Environment (GN DoE) shall be contacted. This includes the local Conservation Officer in Baker Lake and the Environmental Compliance Manager.

4.2.6 Spill of Radiologically Contaminated Drill Cuttings

Should mineralized drill cuttings be spilled, report the spill to the Facility and Logistics Coordinator, Kiggavik and Coordinator, SHEQ Exploration or designates immediately. Any amount of radioactive materials must be collected into appropriate storage containers (i.e. cuttings bag or IP3 pail). The site will be remediated as much as practical, meeting/exceeding the minimum necessary abandonment criteria of less than 1 µSv/h above background at a height of 1 metre.

4.2.7 Spill of Drill Return Water or Cuttings into Water

In the event of a spill of any amount of potentially contaminated/drill return water or cuttings into a water body, any activities which are the possible cause will cease until a review of the incident has taken place. Report the spill to the Facility and Logistics Coordinator, Kiggavik and Coordinator, SHEQ Exploration or designates immediately. Water and potentially sediment samples will be taken and gamma survey conducted on the affected area. Activities will continue once the Manager – New Projects or designate is satisfied with the corrective measures taken.

5 Spill Reporting Requirements

This Plan is initiated by the Project Geologist or designate, which includes initiating response, documenting associated activities and reporting the spill within 24 hours to the NT-NU 24-HOUR SPILL REPORT LINE. All emergency contact phone numbers are located in **Error! Reference source not found.** Contact List.

Based on Environment Canada's recommendation, all releases of harmful substances, regardless of quantity are immediately reportable where the release is:

- Near or into a water body
- Near or into a designated sensitive environment or sensitive wildlife habitat
- Poses an imminent threat to human health or safety
- Poses an imminent threat to listed species at risk or its critical habitat

The Government of Nunavut *Spill Contingency Planning and Reporting Regulations* consider any spill of flammable liquids greater than 100 L a reportable spill. In addition, any quantity of spilled radioactive material is reportable. The following table (Schedule B) is adapted from the *Spill Contingency Planning and Reporting Regulations* and outlines the quantities of spilled product that requires reporting to the Government of Nunavut-Department of Environment (GN-DoE).

SCHEDULE B

(Section 9)

<i>Item No.</i>	<i>TDGA Class</i>	<i>Description of Contaminant</i>	<i>Amount Spoiled</i>
1.	1	Explosives	Any amount
2.	2.1	Compressed gas (flammable)	Any amount of gas from containers with a capacity greater than 100 l.
3.	2.2	Compressed gas (non-corrosive, non flammable)	Any amount of gas from containers with a capacity greater than 100 l.
4.	2.3	Compressed gas (toxic)	Any amount
5.	2.4	Compressed gas (corrosive)	Any amount
6.	3.1, 3.2, 3.3	Flammable liquid	100 l
7.	4.1	Flammable solid	25 kg
8.	4.2	Spontaneously combustible solids	25 kg
9.	4.3	Water reactant solids	25 kg
10.	5.1	Oxidizing substances	50 l or 50 kg
11.	5.2	Organic Peroxides	1 l or 1 kg
12.	6.1	Poisonous substances	5 l or 5 kg
13.	6.2	Infectious substances	Any amount
14.	7	Radioactive	Any amount
15.	8	Corrosive substances	5 l or 5 kg
16.	9.1 (in part)	Miscellaneous products or substances, excluding PCB mixtures	50 l or 50 kg
17.	9.2	Environmentally hazardous	1 l or 1 kg
18.	9.3	Dangerous wastes	5 l or 5 kg
19.	9.1 (in part)	PCB mixtures of 5 or more parts per million	0.5 l or 0.5 kg
20.	None	Other contaminants	100 l or 100 kg

If you are in doubt as to whether or not a spill is reportable, it is best to report the spill.

5.1 Spill Response Contact List

The Exploration Emergency Contacts is available in **Error! Reference source not found.** of this Plan. The list is also made available in drill rigs and field offices.

5.2 Reporting Requirements

1. Collect Required Information

During spill response, the following information should be generated and reported (complete the Spill Report Form found in **Error! Reference source not found.**):

- Date and time of spill
- Location of spill
- Direction the spill is moving
- Name of contact person at location of spill, and phone number where applicable
- Type and quantity of contaminant
- Cause of spill
- Whether spill is contained or stopped
- Description of the existing contaminant
- Action taken to contain, recover, clean-up and dispose of spilled material

2. Report

It is the responsibility of the senior Orano staff on site to report spills to regulatory agencies. Contractors are asked to report all spills to the Project Geologist or designate immediately who will notify the following agencies/people (See **Error! Reference source not found. Error! Reference source not found.**).

- Project Geologist or designate (if not on site during incident)
- Manager – New Projects Facility and Logistics Coordinator, Kiggavik
- Coordinator, SHEQ Exploration (if not on site during incident)
- NT-NU 24-Hour Spill Report Line (within 24hours) by phone; use the information collected for the spill report form
- Vice President, Exploration
- Manager, Nunavut Affairs and Baker Lake office
- The Nunavut Water Board (NWB) and INAC request verbal notification as soon as possible, however they will also be notified by the spill report line
- A copy of the written Spill Report Form must be submitted to the GN-DoE, INAC (Water Resources Office and Manager of Field Operations), NWB and Environment Canada (EC) within seven calendar days of the incident
- A detailed report must be submitted to the GN-DoE, INAC, NWB and EC within 30 days
- Submit a copy of the Spill Report Form and detailed report to Kivalliq Inuit Association (KIA)

6 Training and Practice Drills

All employees and contractors must be familiar with the resources for spill response which include this Plan, SDS sheets, and training for spill response. Involvement of other employees or third parties may occasionally be required. Annual refreshers are conducted to review the procedures within this Plan. Practice drills are conducted to familiarize field-personnel with emergency response equipment and ensure awareness of product hazards.

7 References

AREVA Resources Canada Inc. 2013. Environmental Code of Practice. June 2013.

AREVA Resources Canada Inc. 2011. Kiggavik Project Winter Road Plan. May 2011.

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<http://env.gov.nu.ca/sites/default/files/NT%20NU%20Spill%20Report%20Form.pdf>

Appendix A Exploration Emergency Contacts

Available at:

[Exploration SHEQ SharePoint site](#)

Appendix B Spill Report Form

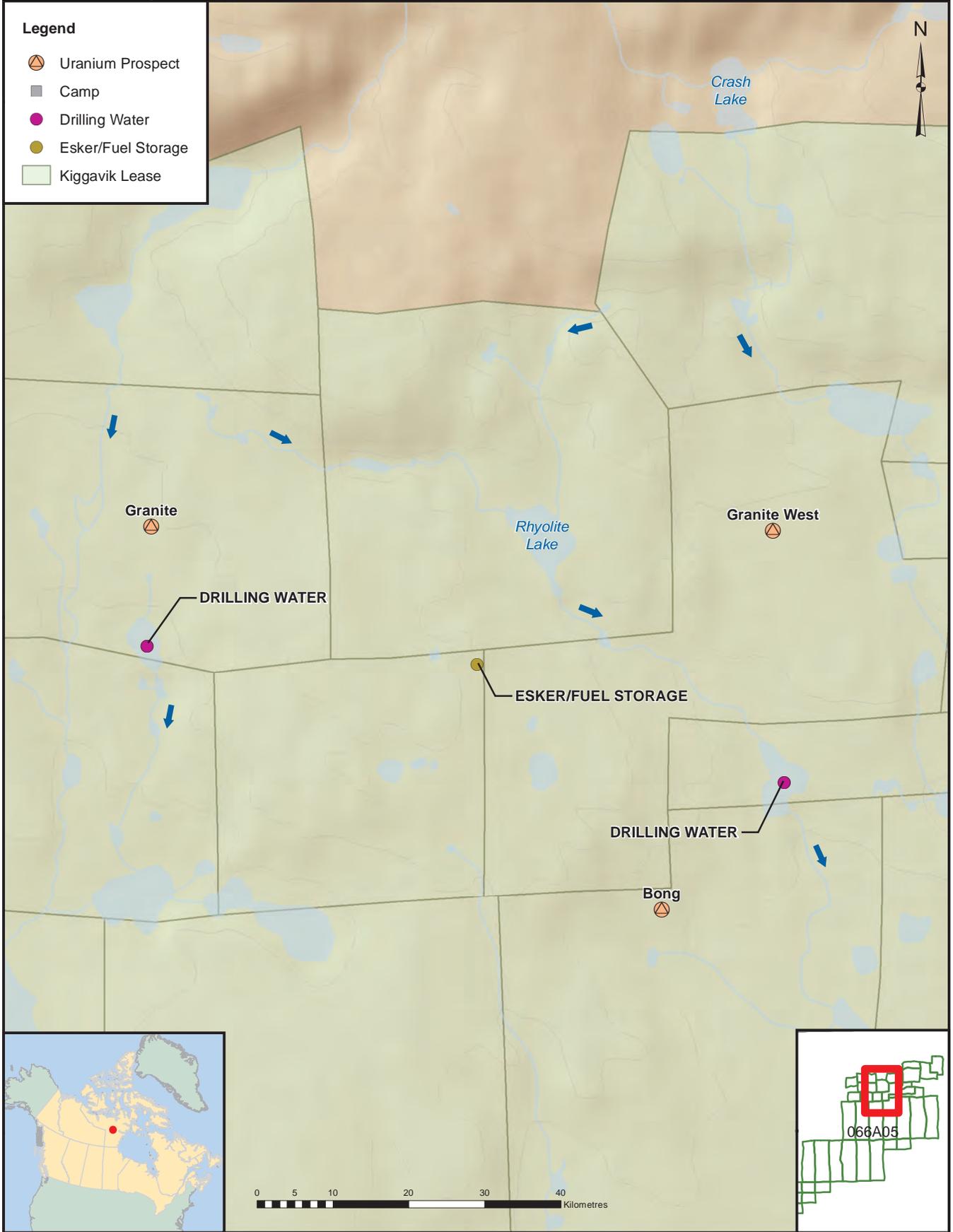
Available at:

<https://www.gov.nu.ca/environment/documents/nt-nu-spill-report-form-pdf>

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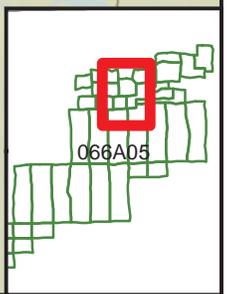
Appendix C Site Maps

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Legend

- Uranium Prospect
- Camp
- Drilling Water
- Esker/Fuel Storage
- Kiggavik Lease



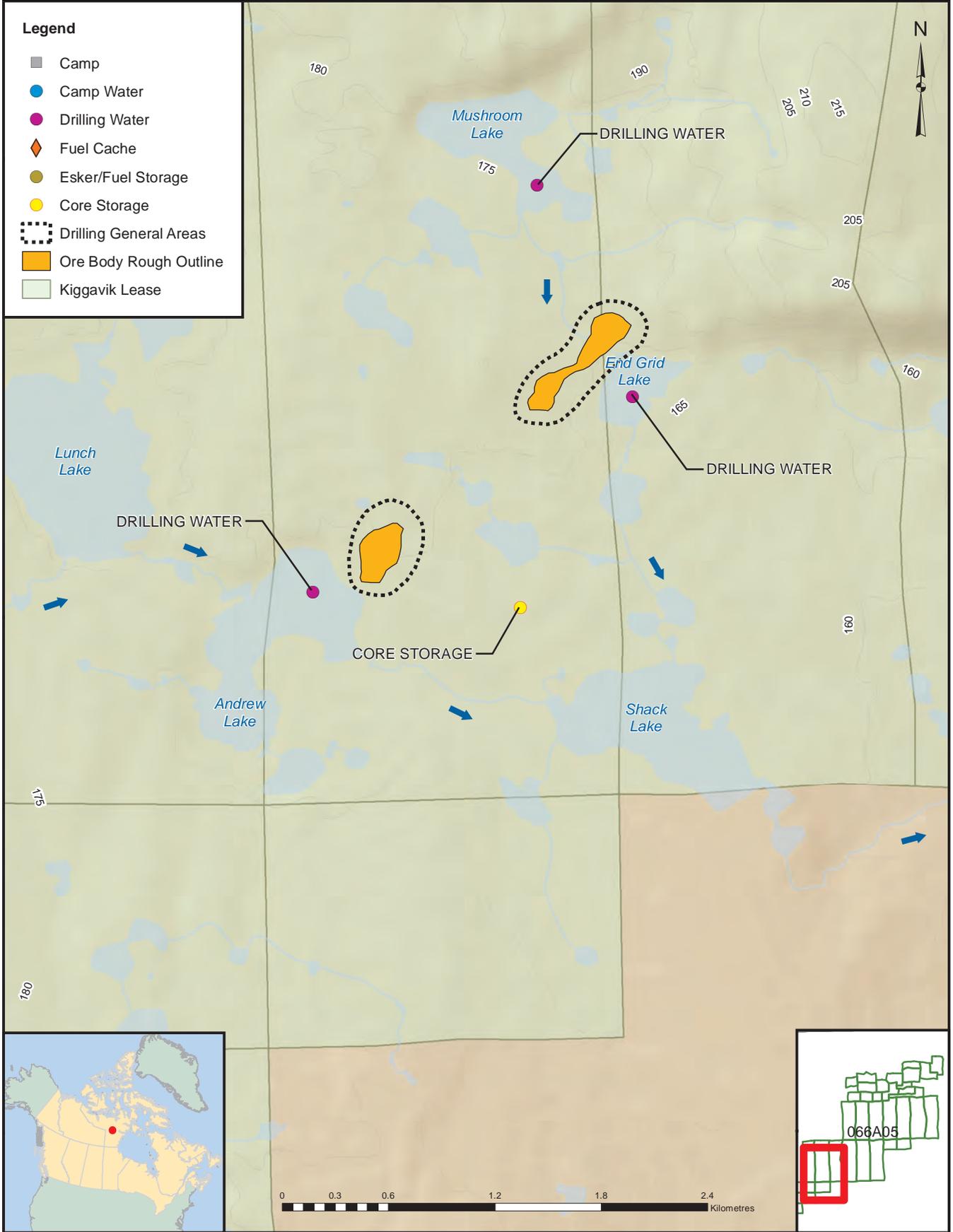
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 Date: 11/28/2018 Scale: Scalebar
 File: 1892-806

**BONG AND GRANITE MAIN AREA COMPONENTS
 SPILL CONTINGENCY PLAN**

KIGGAVIK PROJECT



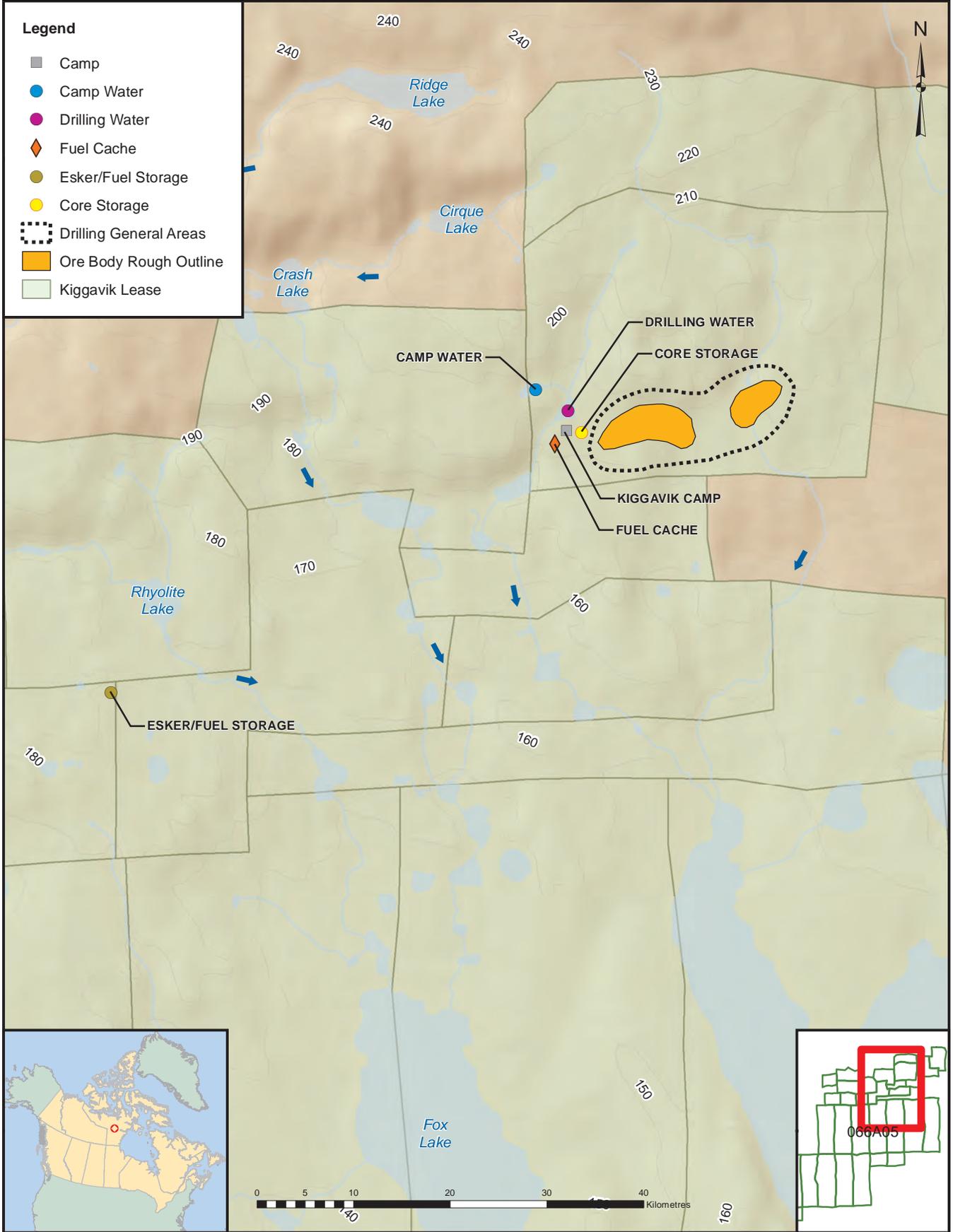


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**SISSONS MAIN AREA COMPONENTS
 SPILL CONTINGENCY PLAN**

KIGGAVIK PROJECT





Legend

- Camp
- Camp Water
- Drilling Water
- ◆ Fuel Cache
- Esker/Fuel Storage
- Core Storage
- ⋯ Drilling General Areas
- Ore Body Rough Outline
- Kiggavik Lease

Projection: NAD 1983 UTM Zone 14N
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KIGGAVIK PROJECT

**KIGGAVIK MAIN AREA COMPONENTS
 SPILL CONTINGENCY PLAN**





Orano Canada Inc.
Uranium Exploration Plan
Exploration Department
Kiggavik Project

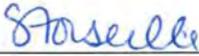
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Approval for Use

Editor:		
Stephanie Forseille	Coordinator, Exploration SHEQ (Safety, Health, Environment and Quality)	
Name	Title	Signature

Approver:		
Patrick Ledru	Vice President, Exploration	
Name	Title	Signature

History of Revisions

Version	Revision	Date	Details of Revision
1	0	March 2007	Original submission
2	0	October 2007	Updated to reflect opportunities for improvement
3	0	January 2009	Updated to reflect opportunities for improvement
3	1	May 2011	Updated to reflect personnel titles and grammatical changes.
3	2	May 2012	Updated to reflect personnel changes
3	3	May 2013	Updated to reflect personnel changes and grammatical errors
3	4	May 2014	Updated surface land administration
4	0	January 2015	Improved formatting and new template; updated site information and drilling operations
5	0	January 2017	Updated to reflect transition to Care and Maintenance phase
6	0	January 2019	Updated to reflect Corporate name change and title changes

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Acronyms and Abbreviations

Term	Definition
Orano	Orano Canada Inc.
CNSC	Canadian Nuclear Safety Commission
IATA	International Air Transport Association
IOL	Inuit Owned Land
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
KIA	Kivalliq Inuit Association
NWB	Nunavut Water Board
SHEQ	Safety Health Environment and Quality
TDG	Transportation of Dangerous Goods

1 Introduction

The Kiggavik Project is currently in a care and maintenance phase. The Uranium Exploration Plan (Plan) will be kept in this state, but is considered not applicable during the care and maintenance phase. This Plan will be updated prior to a change in project phase to reflect the most recent information.

The Orano Canada Inc. (Orano) Uranium Exploration Plan applies to the Kiggavik Project located approximately 80 km west of Baker Lake. The Plan is designed to meet the requirements of the Water Use Licence issued by the Nunavut Water Board (NWB), the Saskatchewan Environment Mineral Exploration Guidelines (Best Management Practices), and the Canadian Nuclear Safety Commission (CNSC) Regulations; however CNSC does not regulate exploration activities.

1.1 Revision to Plan

During the active exploration phase, the Plan is reviewed regularly and updated as required to keep the information current and consistent with regulatory and procedural changes. A History of Revisions can be found at the beginning of this Plan.

1.2 Responsibilities

The Manager – New Projects is responsible for the implementation of this Plan with the assistance of the following personnel:

- Project Geologist
- Coordinator, SHEQ Exploration
- Or designates

The Vice President, Exploration is ultimately responsible for any activity being carried out by Kiggavik Project personnel.

2 Site Information

The Kiggavik site is located in the Kivalliq Region of Nunavut and supports the exploration of the Kiggavik mineral leases and the St. Tropez mineral leases.

Exploration of the Kiggavik Project is a joint venture between Orano and Japan-Canada Uranium Company Limited (JCU), with Orano being the operator. The 37 Kiggavik mineral leases cover 45,639 acres. The surface rights for 31 mineral leases on Inuit Owned Land (IOL) are administered by the Kivalliq Inuit Association (KIA) while six mineral leases remain on Crown land. The Crown land covers 3,794 acres of the Jane and Contact prospects on the south-west portion of the Project with surface rights administered by Crown-Indigenous Relations and Northern Affairs Canada (INACCIRNAC).

The St. Tropez area, wholly owned and operated by Orano, is composed of 5 mineral leases covering 16,549.21 ha. The surface rights are administered by the KIA. The St. Tropez area is wholly owned and operated by Orano out of the Kiggavik site.

There is an existing temporary exploration camp at the Kiggavik site which can accommodate approximately 60 people. The Kiggavik camp is located at the following coordinates:

- UTM 14W 564530 E 7146879 N
 - Latitude: 64° 26' 29" N
 - Longitude: 97° 39' 34" W

3 Site Operations

3.1 Training

Orano provides necessary training to all its employees and contractors to ensure worker safety and protection of the environment during exploration activities. The training programs provided are designed to meet the requirements of the Nunavut Mine Health and Safety Act and Regulations, and the *ISO14001:2015 and OHSAS18001:2007* international standards. Although exploration activities are not regulated by the CNSC, the training programs are designed to meet the requirements of the *Uranium Mines and Mills Regulations*.

All Kiggavik personnel receive appropriate radiation protection training prior to beginning work. This includes instruction on the origins of ionizing radiation, types of radiation, health risks, principles of radiation safety and regulatory compliance. Training also includes the safe handling, management and disposition of radioactive materials such as radioactive core, drill muds and cuttings. Visitors at the Kiggavik site for more than 72 hours, or who will be left without an escort will receive radiation protection training. Visitors who have not received training must be escorted on site at all times. If contractors for the project have their own training program they must submit evidence of the training program.

Personnel supervising the shipment of radioactive materials must possess a valid Transportation of Dangerous Goods (TDG) certificate in accordance with Transport Canada *Transportation of Dangerous Goods Regulations* and the International Air Transport Association (IATA) *Dangerous Goods Regulations*.

Kiggavik personnel who handle fuel, lubricants and/or radioactive material require spill response training. If the contractors have their own training program they must submit evidence of the training program. Training for Orano employees is provided in accordance with the Spill Contingency Plan. If the contractors do not have an acceptable training program in place, Orano will supply the training material and/or provide the spill response training as required.

3.2 Drilling Operations

Drilling operations are conducted in accordance with land authorizations from the NWB, CIRNAC, and the KIA. As required by the current water use licence issued by the NWB, all drill sites are located at a minimum of 31 m beyond the ordinary high water mark of any nearby water bodies, unless an exemption to this requirement has been granted. During drilling activities, drill mud solids or cuttings in non-mineralized zones are deposited on the ground, in a natural low-lying depression. This natural depression must also be located at a minimum of 31 m beyond the ordinary high water mark of any nearby water bodies where direct flow into the water body is not possible. Refilling of bore-hole depressions and restoration of the natural low-lying depression will be carried out as per the Abandonment and Restoration Plan.

When mineralized core is intersected, all drill mud and cuttings are collected in appropriate containers and categorized as radioactive through appropriate radiation measurements. Drill mud or cuttings with uranium content greater than 0.05% will be collected and stored at the radioactive storage compound with an appropriate containment system in place. Down hole disposal of cuttings is often not practical at Kiggavik. Any drill hole that encounters mineralization with uranium content greater than 1.0% over a length of > 1.0 m and with a metre-per-cent concentration of > 5.0 is sealed by grouting over the entire length of the mineralization zone and not less than 10 m above or below each mineralization zone. The casing must be cut as close to the ground level as possible upon completion. A radiological survey is conducted before and after drilling to verify that radiation levels are not greater than 1 microsievert per hour ($\mu\text{Sv/h}$) above background at one metre above ground. GPS locations of all drill holes are recorded and submitted with the annual report.

3.3 Core Logging and Storage

Permanent and long-term storage areas of radioactive material, including core and drill cuttings, are located at least 31 m from the main camp and at least 100 m from the high water mark of all water bodies. Logging of core is primarily conducted in core logging tents located a few hundred metres away from the camp facilities. Geotechnical logging of core may also be conducted at the drill sites. Permanent on-site core storage areas are appropriately labelled with radiation warning signs. Gamma radiation levels at 1 metre from the surface of a storage area should be reduced to 1 $\mu\text{Sv/h}$ and in no instances exceed 2.5 $\mu\text{Sv/h}$. If long-term off-site storage is required, Orano intends to transport the material to be stored at an operating uranium mining facility.

3.4 Radioisotopes

Nuclear materials and radiation devices are used for exploration and instrument calibration. The possession, use, storage, and disposal of nuclear materials and radiation devices are carried out in accordance with Canadian Nuclear Safety Commission (CNSC) *Nuclear Substances and Radiation Devices Regulations* and *EXP-752-02 Safe Handling and Use of Exploration Sources*.

3.5 Spills

All spills of radioactive material are to be appropriately reported and responded to in accordance with the Spill Contingency Plan that was submitted to and approved by regulators during land use applications. The uncontrolled or accidental release of any radioactive materials, including drill mud solids and cuttings, is considered a spill. In the event of a spill, radioactive materials are collected and necessary site remediation undertaken to meet the site abandonment criteria of less than 1 $\mu\text{Sv/h}$ above background at a height of 1 metre. Material collected during the clean-up is stored in appropriate containers and stored in the on-site long-term radioactive storage area for future handling.

3.6 Shipping of Radioactive Materials

Shipping and receiving radioactive material is carried out in accordance with the CNSC Packaging and Transport of Nuclear Substances Regulations, the Transport Canada Transportation of Dangerous Goods Regulations, and the IATA Dangerous Goods Regulations. All personnel responsible for the shipment of radioactive materials must possess a valid TDG certificates and provide supervision of support personnel providing assistance during the preparation and shipment of radioactive material.

3.7 Site Abandonment and Restoration

Site abandonment and restoration is carried out in accordance with the Abandonment and Restoration Plan. Gamma radiation surveys are conducted at each site prior to drilling and prior to final abandonment. Contaminated soil or cuttings are collected in appropriate containers and stored in the long-term core storage area for future handling, which may include transfer to an operating mine site. All drill sites are cleaned to ensure that the gamma dose rate at a height of 1 metre is less than 1 $\mu\text{Sv/h}$ above ambient background. Materials and equipment leaving the drill site are monitored for contamination in accordance with procedure, *EXP-740, Routine Radiological Monitoring Schedule*. Materials or equipment that cannot be decontaminated to meet unrestricted release criteria are either stored in the long-term core storage area or shipped to a licensed facility such as the McClean Lake Operation in accordance with the CNSC *Packaging and Transport of Nuclear Substances Regulations* and the Transport Canada *Transportation of Dangerous Goods Regulations*.

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Orano Canada Inc.
Waste Management Plan
Exploration Department
Kiggavik Project

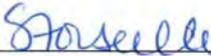
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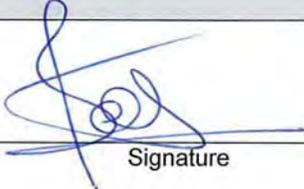
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Editor:		
Stephanie Forseille Name	Coordinator, Exploration SHEQ (Safety, Health, Environment and Quality) Title	 Signature

Approver:		
Patrick Ledru Name	Vice President, Exploration Title	 Signature

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Acronyms and Abbreviations

Term	Definition
Orano	Orano Resources Canada Inc.
SHEQ	Safety Health Environment and Quality

1 Introduction

The Kiggavik Project is currently in a care and maintenance phase. The Waste Management Plan (Plan) will be kept in this state, but is considered not applicable during the care and maintenance phase. Any waste produced during the current phase will be limited to daily domestic waste and will be hauled to Baker Lake daily. This Plan will be updated prior to a change in project phase to reflect the most recent information.

The Orano Canada Inc. (Orano) Waste Management Plan applies to the Kiggavik Project (Project) located approximately 80 km west of Baker Lake, Nunavut. Orano is committed to ensuring that all wastes generated by the Kiggavik Project are collected, stored, transported, and disposed of in a safe, efficient and compliant manner.

1.1 Purpose and Scope

The Waste Management Plan is fulfilled by using proven strategies and applying modern technologies to ensure materials are used efficiently and disposed of in an environmentally conscious manner. General strategies include the following:

- The implementation of a waste manifesting system to enable waste identification and tracking.
- The most environmentally suitable materials, equipment, and products are used where practical.
- Procurement procedures consider product substitution for materials that are hazardous to handle, generate hazardous wastes, or create an environmental liability.
- All site personnel attend an orientation, which addresses waste management and handling of hazardous goods, prior to being exposed to the worksite. The site orientation for short-term visitors includes a waste management component.
- Proper sorting, disposal, storage and handling of all waste streams.

1.2 Revision to Plan

During the active exploration phase the Plan is reviewed regularly and updated as required to keep the information current and consistent with regulatory and procedural changes. A History of Revisions can be found at the beginning of this Plan.

1.3 Responsibilities

The Manager – New Projects is responsible to ensure this Plan is implemented with the assistance of the following personnel:

- Project Geologist

- Facility and Logistics Coordinator, Kiggavik
- Coordinator, SHEQ Exploration
- Or designates

The Vice President, Exploration is ultimately responsible for any activity being carried out by Kiggavik Project personnel.

2 Waste Reduction, Reuse and Recycling

2.1 Waste Reduction

Efforts to, wherever practical, reduce waste at source, for example:

- refillable pump bottles instead of aerosol cans;
- reduction of paper consumption by promoting the use of electronic mail, voice messaging, electronic transmittals, etc.;
- reduction of disposable cups and containers by encouraging use/re-use of refillable mugs for beverages; and
- storage of bulk liquids in large containers and dispensing the liquids into smaller, refillable bottles and containers, instead of several smaller containers.
- Means of reducing the volume of waste generated continue to be developed as the project progresses.

2.2 Waste Reuse

Waste is reused to the furthest practical extent. Examples of waste reuse include but are not limited to the following:

- Reuse of packaging from shipping of materials and equipment
- 45 gallon drums for waste materials
- Sea containers for backhauling of wastes or equipment

2.3 Waste Recycling

Waste is recycled where practical. Materials that may offer recycling opportunities in the future are investigated on an on-going basis during operations to reduce waste. For example, Orano may store materials such as tires, fluorescent lamp ballasts, batteries, used oils, and other chemicals on-site for future shipment off-site for recycling.

3 Waste Sources

The most common sources and types of wastes that are generated are presented in Table 3.1.

Table 3.1 Sources of Waste Generation

Source of Waste	Types of Waste
Chemical handling and storage operations	waste petroleum products, used chemicals
Sewage	biological sludge
Equipment maintenance	used batteries, engine oil, oil filters, tires, scrap metals, <i>etc.</i>
Building maintenance	used transformers, fluorescent lighting ballasts/tubes, glycol, construction scraps (wood, piping <i>etc.</i>)
Domestic waste from: - camp and drill sites - offices - kitchen facilities	domestic garbage, food wastes, paper, cardboard
Inert waste from camp and drill sites	cement, sand, used industrial materials, metals, pipe, glass, insulation <i>etc.</i>
Biological waste from first aid facility	biological waste, blood, gauze pads <i>etc.</i>
Drilling	clean or contaminated (mineralized) drill cuttings

4 Identification, Treatment and Disposal Plan

Table 4.1 presents treatment strategies and disposal plans for wastes during the exploration program.

Table 4.1 Treatment Strategies and Disposal

Waste Type	Treatment Strategy	Disposal Plan
Petroleum based		
Used oil	Dispose or recycle off-site	Collect in bunged drums. Store in lined/bermed storage area. Ship off-site
Used hydraulic fluid	Dispose or recycle off-site	Collect in bunged drums. Store in lined/bermed area. Ship off-site
Oil filters	Recycle/recover	Collect in ring lidded drums. Store in lined/bermed storage area. Store for shipment off-site.
Contaminated soils	Excavate	Store for shipment off-site or land farming (upon approval)
Waste batteries	Recycle off-site	Drain (if required) and neutralize acid. Store for shipment off-site
Aerosol cans	Reduce/recycle	Puncture, drain, and collect in ringed drums for shipment off-site.
Paint	Dispose off-site	Collect and store cans in drums for shipment off-site
Chemicals		
Glycol	Dispose or recycle off-site	Collect in bunged drums. Store for shipment off-site
Solvents	Reduce/dispose off-site	Use non-toxic solvents where possible. Store in drums for shipment off-site
Domestic wastes		
Food	Incinerate	Collect and store in designated containers. Incinerate daily.
Paper/cardboard	Reuse/incinerate	Reuse where possible or incinerate
Plastics	reuse/dispose off-site	Reuse where possible
General camp wastes	Incinerate	Sort to retrieve non-burnable. Incinerate.
Inert Bulk Wastes		
Buildings/bulk debris	Reuse off-site/dispose off-site	Store for future shipment off-site
Wood	Incinerate, dispose	Sort wood, incinerate non-treated wood, ship treated wood off-site to approved disposal facility
Incinerator ash	Dispose off-site	Collect in drums for shipment off-site
Scrap metal	Dispose off-site	Store for shipment off-site
Organic Wastes		

Waste Type	Treatment Strategy	Disposal Plan
Sewage sludge	Incinerate	Bag and incinerate solid waste from pacto toilets; liquid waste is directed with greywater
Biological wastes	Incinerate/dispose off-site	Store in special waste receptacles. Incinerate/ship off-site
Clean drill cuttings		Disposed in a low lying area in the receiving environment; Potentially used for reclaiming sink holes
Contaminated drilling cuttings		Collected at the drill site in totes and stored in the radioactive storage compound for future handling, or shipped to an existing mining operation if the current exploration project does not proceed to development

5 Waste Management

5.1 Sorting

Waste must be sorted at the source before it can be disposed or transported to specific designated areas to ensure proper disposal. Measures that are implemented for sorting include, but are not be limited to, the following:

- Containers are available for the collection of burnable, non-burnable, and recyclable wastes, such as scrap metal, timber, unsalvageable equipment, etc. The contents of the containers are sorted and stored for future handling, which consists of incineration, off-site disposal, or recycling.
- Stored wastes are kept in a neat and tidy fashion and are transported off-site during the winter haul season in accordance with the Winter Road Plan.
- The waste manifest tracking will be updated upon removal of waste items from site.

5.2 Waste Storage

5.2.1 Containers

Containers used for storage of waste are selected based on physical and regulatory requirements prevention of wildlife attraction (i.e., steel or heavy duty plastic containers with positive clamping lids) and transport requirements (helicopter, truck, forklift, etc.). All containers are properly labelled to identify only those wastes for which the containers are being used to collect.

5.2.2 Waste Storage-Areas

All waste(s) collected in drums that are susceptible to damage which may lead to a leak or spill are stored in lined/bermed areas (arctic berms) for future handling and removal from site. The lined/bermed areas (arctic berms) have been identified as the location in which used or generated hazardous materials are to be stored prior to off-site shipment.

5.2.3 Incinerator

An incinerator is used on a daily basis for the incineration of non-hazardous, combustible waste materials, which includes paper, food waste, sewage and non-treated wood. Incinerator ash is collected regularly (frequency depending on ash loading) in sealed, wildlife resistant containers and transported off-site for disposal. Refer to *EXP-775, Operation of the Kiggavik Waste Incinerator* for proper handling instructions and operation of the incinerator. Proper waste segregation and incinerator operation ensures maximum combustion.

5.3 Food Waste Handling

Food wastes are collected from the camp, drills and other facilities as required, and immediately placed in plastic bags. The bagged waste is then transported directly to the incinerator which is located within 50 m of the kitchen. Typically, food wastes are incinerated daily to avoid potential wildlife attraction. Food wastes are not stored outside the incinerator area.

To prevent wildlife attraction, food, beverages and their containers are not disposed of outdoors. Designated snack and break areas for personnel are provided to prevent food and wastes from being generated uncontrollably around the site.

5.4 Non-Food Waste Handling

5.4.1 Sewage

When pecto-toilets are used, the sewage removed from the washrooms is collected in bags and immediately incinerated. Liquid sewage from the urinals is currently mixed with the camp grey water for discharge into a designated low-lying area, which is at minimum 30 m south of camp. The grey water from the kitchen and washroom facilities is diverted to the grey water collection sump area. The grey water sump consists of a barrel that was punctured with drainage holes and buried to allow drainage and filtration of the water.

5.4.2 Chemicals

Chemicals are collected in appropriate containers, and stored in a lined/bermed area for future shipment off site for disposal or recycling at an approved facility.

5.4.3 Waste Oil

Waste oil is collected in bunged drums and stored in the lined/bermed area for future shipment off-site for handling at an approved facility.

5.4.4 Domestic Wastes

Non-toxic, non-food solid wastes is sorted into recyclable, reusable, combustible, and non-combustible categories. Combustible items are burned in the incinerator, while non-combustible items are stored until they are shipped off-site for recycling. Aerosol cans are punctured and drained prior to being shipped off-site. Toxic materials are to be stored in sealed, steel or plastic drums in a lined/bermed area and shipped off-site for proper disposal.

5.4.5 Inert Bulk Wastes

Inert bulk wastes that cannot be readily recycled or reused, such as chemically treated wood, general debris, incinerator ash, tires, etc. are stored and appropriately labelled prior to shipment off-site to an approved facility.

5.4.6 Hazardous Wastes

Other hazardous, non-combustible waste and contaminated materials not identified above are temporarily stored in appropriate containers and shipped off-site for disposal or recycling.

During normal operations, hazardous materials are stored in other various locations associated with their intended use to minimize site transport and handling requirements. These materials and locations are as follows:

- oils and greases are stored in drums, pails, and bottles in the maintenance shop or drill laydown area
- batteries of all types are stored in a storage area;
- ethylene glycol is stored in drums in the lined/bermed area

5.4.7 Drill Cuttings

When drilling in non-mineralized zones, drill mud solids or cuttings are deposited in designated low-lying areas. When mineralized core, greater than 0.05% uranium, is intercepted, all drill mud and cuttings are disposed of down hole where possible or collected in appropriate containers and stored in the radioactive storage area. This is in accordance with *EXP-740-05, Management and Disposition of Radioactive Drill Cuttings* and the Abandonment and Restoration Plan.

6 References

Orano Canada Inc. 2015. *Abandonment and Restoration Plan*. January 2015

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Canadian Council of Ministers of the Environment (CCME). 2001. *Canada-Wide Standards for Dioxins and Furans Emissions from Waste Incinerators and Coastal Pulp and Paper Boilers*. 2001.

Environment Canada. 2010. *Technical Document for Batch Waste Incineration*. January 2010.

EXP-740-05, Management and Disposition of Radioactive Drill Cuttings

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Government of Nunavut Department of Environment. 2010. *Environmental Guideline for the General Management of Hazardous Waste*. October 2010.

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Orano Canada Inc.

Wildlife Mitigation and Monitoring Plan

Exploration Department

Kiggavik Project

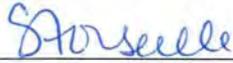
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Editor:		
Stephanie Forseille	Coordinator, Exploration SHEQ (Safety, Health, Environment and Quality)	
Name	Title	Signature

Approver:		
Patrick Ledru	Vice President, Exploration	
Name	Title	Signature

History of Revisions

Version	Revision	Date	Details of Revision
1	0	March 2007	Original submission
2	0	January 2008	Updated to reflect changes in field activities/capabilities and areas of continual improvement
2	1	May 2008	Updated to reflect program changes initiated by new consulting biologist and to integrate comments received by Nunavut and NWT biologists
3	0	January 2009	Updated to reflect opportunities for improvement
4	0	January 2010	Updated to reflect opportunities for improvement
5	0	April 2011	Updated to reflect lessons learned throughout the 2010 field season. These changes include an appendix which outlines the appropriate responses to a variety of scenarios to ensure appropriate mitigative actions are carried out in a timely and effective manner.
5	1	May 2012	Updated to reflect change in personnel titles
5	2	May 2013	Updated to reflect changes in personnel
5	3	May 2014	Updated to include deterrence measures for safety intervention and wildlife monitor responsibilities
5	4	January 2015	Minor edits for improved clarity and updated to new template
6	0	January 2017	Updated to reflect transition to Care and Maintenance phase
7	0	January 2019	Updated to reflect corporate name change and title changes

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Acronyms and Abbreviations

Term	Definition
AANDC	Aboriginal Affairs and Northern Development Canada (currently Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), but previous comments/licenses from AANDC are referenced)
Orano	Orano Canada Inc.
BQCMB	Beverly and Qamanirjuaq Caribou Management Board
EC	Environment Canada
EIS	Environmental Impact Statement
GN	Government of Nunavut
GNWT	Government of Northwest Territories
GN-DoE	Government of Nunavut, Department of Environment
HTO	Hunters and Trappers Organization
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
KIA	Kivalliq Inuit Association
SHEQ	Safety Health Environment and Quality

1 Introduction

The Kiggavik Project is currently in a care and maintenance phase. The Wildlife Mitigation and Monitoring Plan (Plan) will be kept in this state, but is considered not applicable, except for the noted applicable sections, during the care and maintenance phase. Animal sightings will be reported in the annual report. This Plan will be updated prior to a change in project phase to reflect the most recent information.

Applicable sections during care and maintenance include:

- 3.2 Raptor and Migratory Bird Protection Measures
- 3.3 Caribou Protection Measures
- 3.4 Flight Specific Mitigation

Wildlife monitoring will be performed by Orano personnel during site visits.

The Wildlife Mitigation and Monitoring Plan described herein has been developed by Orano Canada Inc. (Orano) for the Kiggavik Project (Project) located approximately 80 km west of Baker Lake, Nunavut. The Plan is implemented during the field season to monitor and reduce potential impacts on wildlife with particular emphasis on caribou. The Plan serves as a work instructional and internal best management practice and encompasses activities in Nunavut, including continued exploration and environmental studies for the environmental assessment process.

Orano personnel, contractors, subcontractors, helicopter contractors, and Wildlife Monitors have the responsibility to be familiar with and to follow this Plan. Implementation and enforcement is the responsibility of the Coordinator, SHEQ Exploration or designate with support from the Wildlife Monitors. Kiggavik Project worksites and activities include the following:

- Camp Activities (including the fuel cache)
- Drilling Operations
- Airborne Geophysics
- Ground Geophysics and Exploration Activities
- Environmental Baseline Work and
- Environmental Monitoring

During the active exploration phase, the Plan is reviewed and updated regularly, and was developed in consultation with a biologist knowledgeable in barren ground caribou. The Plan is reviewed to reflect lessons learned through Orano's experience and the experience of other projects and to incorporate feedback and recommendations from regulators and community members.

The current Plan has evolved with lessons learned during the previous field seasons, community input, and regulatory commitments. Orano is working closely with the Government of Nunavut Department of

Environment (GN-DoE) to investigate options for collecting meaningful caribou population data using low invasive methodologies.

2 Monitoring Plan

2.1 Wildlife Monitoring

Orano will employ an Independent Wildlife Monitor(s) to:

- Verify that this Plan is carried out
- Independently report Kiggavik related wildlife and any concerns to external agencies
- Provide safety assistance regarding wildlife issues

The Wildlife Monitor must become familiar with their scope of work by discussing this Plan with the Coordinator, SHEQ Exploration or designate. The Wildlife Monitor will be responsible for observations surrounding the Kiggavik camp and must report wildlife sightings to the Coordinator, SHEQ Exploration or designate. They may report to the local Conservation Officer and Hunters and Trappers Organization (HTO) at any time. Provided weather conditions are adequate, the camp observations should be conducted from the five height-of-land (HOL) locations surrounding camp. If collared caribou are identified as approaching the site activities, or caribou herds have been visually observed in the area, an aerial reconnaissance survey greater than 610 m (2,000 feet) may be conducted with the Wildlife Monitor to determine proximity to site activities. The Wildlife Monitor will be responsible for advising on the number and proximity of caribou to determine when to cease activity. Regular communication with the Coordinator, SHEQ Exploration and Project Geologist is beneficial for adequate reporting and mitigation measures.

If requested, the Wildlife Monitor will be allowed to carry the firearm provided by Orano during regular monitoring of the HOL locations and during wildlife deterrence for safety intervention. The firearm may be obtained following discussion with the Facility and Logistics Coordinator, Kiggavik and will be returned to the locked gun cabinet once work is complete. [HSER-906 Firearms and Weapons](#) guides the storage and use of firearms.

2.2 Baseline Data to Support Environmental Assessment

Wildlife survey data collected to support development of the Environmental Impact Statement (EIS) may be used to support site monitoring and help inform appropriate mitigation actions as required. The environmental consultants communicate regularly with the Coordinator, SHEQ Exploration or designate to ensure important wildlife observations are recorded and communicated to appropriate personnel at site.

2.3 Aerial Observations

Wildlife observations during daily transportation of field staff and contractors will be recorded to provide information about the presence of caribou and any other wildlife in the area. Refer to section 3.4 Flight Specific Mitigation for the required altitudes of the above mentioned flights.

2.4 Wildlife Logs

Orano has provided Wildlife Sightings Forms for all site personnel and visitors to complete following the observation of any wildlife. Instructions regarding this form are provided during orientation. The Wildlife Monitor will communicate information obtained in the field to the Coordinator, SHEQ Exploration or designate. All wildlife information will be transcribed to an electronic file which is included in the monthly wildlife reports.

2.5 Caribou Radio-Collaring Data

The study area will be monitored for approaching caribou with the use of satellite collar information provided by caribou biologists with the Government of Northwest Territories. In the future, the Government of Nunavut may provide collar data as well.

3 Mitigation and Protection Measures

Mitigation and protection measures are heavily based on compliance with permit/licence terms and conditions. Additional Orano commitments were adopted from recommendations from the Government of Nunavut Department of Environment (GN-DoE), Environment Canada (EC), Beverly and Qamanirjuaq Caribou Management Board (BQCMB) and Orano-led commitments. Orano will implement the following mitigation and protection measures for caribou, and other wildlife that are seasonal or annual residents of the Project area.

3.1 General Protection Measures

Wildlife will have the “right-of-way” and will not be blocked or deterred from moving through the Project area. The camp layout and drilling area will be limited in size to reduce the Project footprint and the use of “good housekeeping” practices to reduce attractants limits the number of wildlife around work areas. Refer to the Noise Abatement Plan for measures taken to control noise.

Non-hazardous combustible garbage will be burned in an incinerator (see Waste Management Plan). Non-combustible waste and hazardous materials are stored in enclosed buildings and/or sea containers for future shipment to an approved facility. Wildlife safety will be discussed during orientation, and all predator interactions will be reported to the Baker Lake Conservation Officer. Orano educates and enforces “no feeding or harassment of wildlife” and the appropriate response to animal encounters, specifically carnivores and muskoxen will be communicated. An Orano representative will contact the Baker Lake Conservation Officer for appropriate protocols and actions if a need for deterrents or other wildlife management techniques are identified.

Hunting and trapping by Orano employees and contractors is prohibited on the Kiggavik lease. Orano employees and contractors must obtain a Sport Fishing Licence, and provide a copy to the Coordinator, SHEQ Exploration or designate before commencing on a fishing trip leaving from site.

The use of firearms is strictly controlled. The Project Geologist or designate must approve any firearm coming on site. The only allowable use of firearms is for dangerous animal deterrence measures (e.g., firearms, bear bangers, bear spray, cracker shells and rubber bullets), and for safety kills to protect human life should a situation arise when other measures have failed. The Wildlife Monitor is permitted to carry a firearm. Refer to *GSP Section 9.03 Firearms and Offensive Weapons* regarding storage and use of firearms.

If there is a disturbance to caribou or if an incident occurs between a grizzly bear, wolverine, wolf, or fox and the field staff a Supervisor’s Investigation Report will be completed. An incident is defined as a disturbance to caribou, damage to camp facilities caused by wildlife, continued persistence of a carnivore(s) within the camp or work site, and/or interactions between humans and wildlife that lead to harm to either. In the case of a wildlife incident, notify the Baker Lake Conservation Officer.

Materials, chemicals, and equipment will be removed from the drill sites and camp area at completion of the project as described in the Abandonment and Restoration Plan. The intent is to reclaim the area as close as possible to the natural state. Chemicals are stored in double-walled containers or in secondary containment. Diesel fuel, gasoline, and aviation fuel is contained within arctic berms or double-walled storage tanks (see Spill Contingency Plan). In the event of a spill, the Spill Contingency Plan will be implemented immediately. Used chemicals are stored for transportation off site for proper handling.

3.1.1 Safety Intervention

3.1.1.1 Field Personnel

In the event that there is potential for a human to wildlife conflict, safety intervention may be necessary. As recommended by the Conservation Officer, field personnel should use bear bangers as a deterrent first before requesting helicopter assistance or rubber bullets. The Wildlife Monitor is available for added deterrent support with firearms loaded with bear bangers and rubber bullets. Any such occurrence must be reported to the Coordinator, SHEQ Exploration immediately who will then report to the local Conservation Officer.

3.1.2 Camp Personnel

Similar to the standard practice for field personnel, in the event there is potential for a human to wildlife conflict, the first priority for deterrence is the use of bear bangers. Where the helicopter is already in the air, the animal will likely be deterred without requiring the bear bangers. The camp also has two firearms available to the Wildlife Monitor. The 12 gauge shotgun has bear bangers, rubber bullets, and lethal shot; the rifle has lethal shot. Both are available when safety is at risk. Any such occurrence must be reported to the Coordinator, SHEQ Exploration immediately who will then report to the local Conservation Officer.

3.2 Raptor and Migratory Bird Protection Measures

To mitigate potential impacts to raptors and other migratory birds, Orano will avoid disturbing known raptor nests from April 15 to September 1 by maintaining a 1.5 km buffer when in transit by aircraft and will avoid approaching known nests closely while on foot. Limited disturbance (e.g. raptor nest monitoring) within the aircraft buffer may occur infrequently prior to September to obtain necessary baseline data for the environmental assessment.

If a nest site is established on a man-made structure and eggs are present, the nest will be avoided as much as possible and monitored for nest success.

Prior to drilling in an area, a gamma survey is conducted. During this survey the area is surveyed for active bird nests during the breeding period of May 30 to July 31. All nests will be recorded and efforts to create appropriate buffers (dependent on species tolerance and protection level) around migratory birds and species at risk will be made. Nests will be monitored for hatch or termination.

3.3 Caribou Protection Measures

Caribou will have the “right-of-way”, and will not be blocked or deterred from moving through the Project area. Activities that may interfere with migration will cease during migration. The calving grounds for the Beverly and Qamanirjuaq herds are approximately 70 km and 200 km from the exploration areas, respectively. Orano does not conduct any activity within the designated Caribou Protection Areas or within the larger known Caribou Calving Grounds. The distance between the Kiggavik camp and the nearest known caribou water crossings is 25 km. Figure 3.1 shows the caribou crossings and calving areas in relation to the Kiggavik Project Site. Orano follows the DIAND Caribou Protection Measures (AANDC, 2010) as well as additional caribou protection and mitigation commitments. Refer to 3.4 Flight Specific Mitigation for altitudes over concentrations of fifty caribou or more within close proximity to one another.

No camp construction, caching of fuel, or blasting will occur within 10 km of a designated and/or recognized caribou crossing during periods of migration between May 15 and September 1. No diamond drilling activity will occur within 5 kilometres of any designated and/or recognized caribou crossing during periods of migration between May 15 and September 1. Operation of ground, air or water-based mobile equipment within 10 km of a caribou crossing is anticipated to happen infrequently and will only occur in the absence of caribou concentrations. Snowmobile and ATV use will be suspended if cows and calves are within two km of activities. Ground-based monitoring and/or aerial reconnaissance flights will be used to monitor caribou presence as required and appropriate prior to and during operations of mobile equipment (AANDC, 2010).

If a collared caribou is identified as approaching site activities, the Coordinator, SHEQ Exploration or designate may determine what the collar represents by communicating with the Government of Nunavut (GN) or Government of Northwest Territories (GNWT), with environmental consultants, and exploration companies within the area. If required, verification may occur through an aerial reconnaissance survey with the Wildlife Monitor.

In the event that caribou cows calve outside the designated Caribou Protection Areas, Orano will suspend operations within 10km¹ of any area occupied by cows and calves between May 15 and July 15 (AANDC, 2010). Water circulation in the drills will continue to ensure the rods do not freeze in the hole. Monitoring activities and visuals from the drill area will be used to identify when caribou are within 10 km of drilling activities. Through high altitude aerial reconnaissance or ground based monitoring, the Wildlife Monitor will determine when caribou cows and calves are outside the 10 km buffer and report the information to the Coordinator, SHEQ Exploration or designate. Activities can resume when the caribou are outside the 10 km buffer following confirmation by the Coordinator, SHEQ Exploration or designate. If a concentration of caribou remains within 10 km of drilling operations for more than two days, the Coordinator, SHEQ

¹ The 10 km calving period buffer originated from comments by the BQCMB and GNDOE (BQCMB, 2007, GN, 2007, GN 2008)

Exploration or designate will contact the Conservation Officer in Baker Lake to determine the next appropriate course of action.

To avoid injuries to caribou and humans during June and July, drilling activities will be suspended if concentrations of caribou (fifty or more) approach within two km² of drilling operations (NIRB, 2007a and GN-DoE, 2008). Water circulation within the drill will continue to keep the rods from freezing in the hole. Monitoring activities and visuals from the drill area will be used to identify when caribou are within two km of drilling activities. Through ground based monitoring, the Independent Wildlife Monitor will determine when caribou are outside the two km buffer, and report the information to the Coordinator, SHEQ Exploration or designate. Activities can resume when caribou are outside the two km buffer following confirmation by the Coordinator, SHEQ Exploration or designate. If a concentration of caribou remains within two km of drilling operations for more than two days the Coordinator, SHEQ Exploration will contact the Conservation Officer in Baker Lake and the consulting biologist to determine the next appropriate course of action. Orano will forward any direction from GN-DoE or KIA regarding caribou monitoring to NIRB (NIRB 2007).

² With respect to the recommendation for suspending activities when caribou are within 10 km of exploration activities (GN-DoE 2007, GN-DoE 2008), Orano offers the following information and approach. Studies of woodland caribou have demonstrated avoidance of up to 1 km for well sites and 250 m for roads and seismic lines (Dyer et al. 2001). Data from the Ekati Diamond Mine suggests that the instantaneous negative response (alert, stop feeding) of barren-ground caribou to stressors (e.g., truck traffic) increases within 1 km of the source (BHPB 2004). Behaviour data also demonstrated that the amount of time spent feeding by females with calves was reduced when animals were within 5 km of Ekati mine footprint (BHPB 2004). The size and level of activity of the Kiggavik-Sissons project is much less than an operating diamond mine or road. Regardless, the BQCMB and GN-DoE comments have been considered and operations continue to abide by the more stringent 10 km buffer.

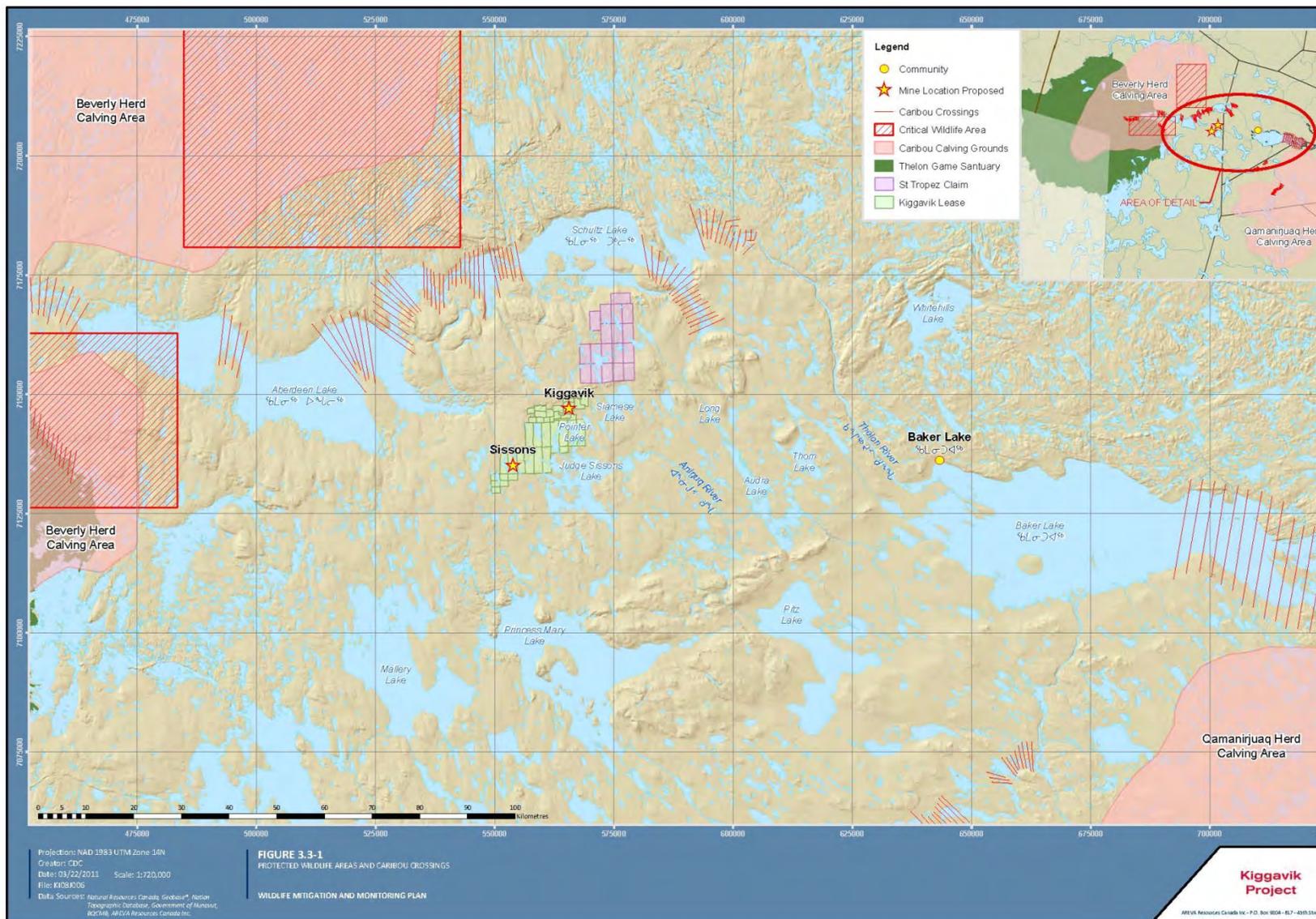


Figure 3.1 Beverly and Qamanirjuaq Calving Areas and Caribou Crossings in Relation to Kiggavik Project Site

3.4 Flight Specific Mitigation

Orano will make efforts to avoid wildlife during flights and to avoid low-level flying to minimize impact of helicopter and airplane noise and presence. Although required flight altitudes are outlined below, some low-level flights are occasionally required for geological/environmental surveys, slinging operations, and during periods of poor weather. Geological or environmental surveys that will be flown below desired altitude must be pre-approved by the Coordinator, SHEQ Exploration or designate. Unless otherwise approved by the Coordinator, SHEQ Exploration or designate, personnel must adhere to the minimum flight altitudes listed below. If flying at lower altitudes is required, the Coordinator, SHEQ Exploration must be notified and reasons documented. Any special requirements including the necessity for high level reconnaissance surveys will be determined by the Coordinator, SHEQ Exploration or designate.

Aircraft abide by strict altitude restrictions, and helicopter contractors must provide Orano the capability of tracking all flight altitudes to ensure compliance with this Plan. Aircraft pilots are instructed not to fly over the Beverly calving grounds 70 km northwest of the Project area (as shown in Figure 3.1). For long-range transportation flights (>25 km), aircrafts are required to fly at a minimum of 610 m (2000 feet) above ground level. For shorter transportation flights (between 4-25 km), which are typically used for movement of staff and equipment between camp and work sites, the normal practice is to fly all aircraft at a minimum of 300 m (1000 feet) above ground level. Protection measures specific to low-level airborne surveys are given in the following section. Unless caribou are present, there are no altitude restrictions for flights less than 4 km. In the presence of fifty or more caribou, best practice is to avoid the caribou by a minimum distance of 610 m above or around the herd. Taking-off or landing of aircraft does not occur if 50 or more caribou are within 1 km of the landing area, except where safety is at risk (NIRB, 2007). From April 15 to September 1, Orano will not fly within 1.5 km of nesting raptors when in air transit and will avoid disturbance in poor weather. A summary of altitude restrictions is provided in Table 3.1 below.

Table 3.1 Flying Altitudes and Related Activities

Activity	Flying Altitude (above ground) ³
Regular Long Distance Flights >25 km	> 610 m
Short Distance Flights between 4 and 25 km	> 300 m
Aerial Reconnaissance Surveys	> 300 m
Airborne Geophysical Surveys	≥ 120 m (as required by the survey protocol)

³ Normally the altitude above ground is estimated using the aircraft altimeter set to 29.92" of mercury and correcting for the ground elevation along the track. This causes uncertainties due to estimating the ground elevation and the difference between the barometric pressure at the time of the flight and standard pressure of 29.92".

Activity	Flying Altitude (above ground) ³
Flights in the vicinity of > 50 caribou	> 610 m (horizontal separation if vertical is not possible)

3.5 Mitigation Specific to Geophysical Surveys

3.5.1 Survey Rationale

Aerial

Airborne geophysical techniques are used extensively in exploration to identify physical variations in the underlying geology which can be then used as a means of defining areas of interest. Different methods are employed such as Electromagnetics (EM), Gravity Gradiometry, Magnetics and Radiometrics which may be conducted in different years if required. Flying altitudes and line spacing's are the main factors that govern the resolution of the survey. To map the targets both a tight line spacing (~150 m) and a low altitude of (~50-200 m) following the topography is required.

Airborne geophysical surveys can gain access to remote areas quickly and reduce exploration time. In addition, where environmental issues may limit the amount of exploration possible with ground activities, airborne surveys offers a solution to these issues. If flying over concentrations of caribou is avoided, then this technique is a non-invasive passive technology and an environmentally friendly alternative that will help focus future ground-based activities while limiting or reducing impacts to the environment.

Ground Geophysical Surveys

Ground geophysical surveys are generally the second step in geophysical exploration. Mainly used to refine the areas of interest that result from the airborne surveys, they employ the same kind of techniques such as DC Resistivity, EM, Gravity, Magnetics, and Radiometrics. They are used to better understand the underlying geology with more detail and to help geologists to define their drill targets.

Ground geophysical surveys have a lower production rate compared to airborne surveys because they are generally performed by people on the ground but the accuracy is generally better. Techniques have almost no effects on the environment (walking on the ground) and instruments can be removed from the field if caribou are too close to the survey area.

3.5.2 Survey Specifications

Airborne Geophysical Survey Specifications

The chosen method is to mount survey instrumentation in a suitable aircraft. Instrumentation includes among others the data acquisition system (which records full tensor gravity gradiometry, triaxial magnetic gradiometry etc. if any), digital video, and a complete digital terrain model from an inertially referenced laser (Lidar) altimeter system or a radar system. Specific requirements to complete a survey could be as follows:

- Nominal Flying Height: 120 - 200 m
- Flying Mode: Modified Drape
- Line Spacing: 150 m
- Tie Line Spacing: 750 m
- Ground Cover Restriction: Results are much more precise without snow cover
- Survey time: Dependant on weather conditions and the presence of caribou within the survey area)

Ground Geophysical Survey Specifications

The chosen method is to deploy in the field the adequate technique to realize, if any, a mapping of the apparent resistivity or gravity, to locate anomalous radioactivity, to define magnetic structures and to characterize targets at depth.

An example of requirements to complete a mapping survey includes the following:

- Line Spacing: 150 m
- Number of lines: 20
- Length of lines: 2000 m
- Surface covered: 6 km²
- Ground Cover Restriction: Results are much more precise without snow cover and frozen ground
- Survey time: Dependent on surface cover, contractor's crew size, quantity of equipment used, weather conditions and the presence of caribou within the survey areas

3.5.3 Protection Measures

There are caribou protection measures in place for airborne and ground geophysical surveys. The intent of these protection measures is to ensure surveys are only conducted when caribou disturbance can be minimized. The preferred window for conducting geophysical surveys is in June after the northern migration, and efforts will be made to avoid the migration and post calving periods from July 15 to July 31. The Coordinator, SHEQ Exploration or designate is notified of the requested survey area and duration to confirm compliance with the Plan. A reconnaissance flight is flown at an altitude of 300 m over the initial line of the proposed area to determine the presence of caribou. If the ceiling is lower than the 300 m but at an altitude that permits safe flying, the reconnaissance flight will be flown at the maximum altitude possible.

Airborne Geophysical Surveys

- If a concentration of caribou (fifty or more individuals in close proximity to one another) are within the survey area the aircraft will relocate to another part of the survey block and repeat the reconnaissance flight or the survey will be postponed until the caribou are at a distance of two km from the survey area.

- If caribou calves are present in the survey area between May 15 and July 15, the survey will be postponed until either the calves are gone or the survey can be conducted outside of this time period.
- If concentrations of caribou are not observed within the survey route, then the survey proceeds at the approved altitude
- A continuous watch is kept for caribou during the survey. If concentrations of caribou are observed in the survey area during the course of the work, the survey is aborted and another part of the block is selected.
- The contractor must notify the Coordinator, SHEQ Exploration or designate of such caribou encounters and provide information pertaining to the location, time, and number of caribou.

Ground Geophysical Surveys

Ground geophysical surveys that exclude the use of wire abide by the protection measures outlined for regular operations (see section 3.3 Caribou Protection Measures). Where ground geophysical surveys include the use of wire, the following protection measures will be in place:

- Reconnaissance flights are flown daily during the survey to confirm the absence of caribou herds in proximity to the survey area.
- If caribou herds (fifty or more) or caribou cows with calves are absent (between May 15 and July 15) within 10 km of the study area, or are not expected to be within the study area during the survey, the survey can proceed. If caribou are within 10 km, the geophysical survey will be temporarily postponed until caribou are out of the area.
- For concentrations of caribou the Coordinator, SHEQ Exploration or designate and Wildlife Monitor will determine an adequate distance at which the geophysical wire is to be retrieved. The time required to retrieve wire and the speed in which the caribou are migrating will be considered. This distance will be determined prior to conducting each new survey.
- If fifty or more caribou (in close proximity to one another) approach the survey area, within the minimum distance determined above, the geophysical wire would be retrieved to ensure they are protected.

4 Reporting

All wildlife activities will be recorded and reported monthly during the field season. With the assistance of the independent Wildlife Monitor, reports will be submitted by the Coordinator, SHEQ Exploration or designate on site to the Manager, Nunavut Affairs, the Manager-New Projects, Baker Lake Hunters and Trappers Organization (HTO) the Baker Lake Conservation Officer, the GN Department of Environment (GN-DoE), Regional Biologist, Kivalliq Inuit Association (KIA) and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC). The monthly reports will be used to help construct a year-end overview to be included in the Kiggavik Project Annual Report.

5 References

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- NIRB, 2009. Screening Decision on Extension Request from AANDC and KIA - Additional Terms and Conditions for NIRB File No. 06AN085 (January 9, 2009)

Appendix A Events and Responses

Event	Contractors	Wildlife Monitor	Coordinator, SHEQ Exploration or Designate
General Mitigation			
A disturbance to caribou	<ul style="list-style-type: none"> Notify the Coordinator, SHEQ Exploration Assist with the completion of the Supervisor's Investigation Report where necessary 	<ul style="list-style-type: none"> May be required to assist in emergency situations such as using firearm for safety kills or notifying camp when danger (wildlife) is out of the area Assist with the completion of the Supervisor's Investigation Report where necessary 	<ul style="list-style-type: none"> Complete a Supervisor's Investigation Report Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions Note in monthly wildlife report
An incident occurs between grizzly bear, wolverine, wolf, fox and field staff	<ul style="list-style-type: none"> Notify the Coordinator, SHEQ Exploration Assist with the completion of the Supervisor's Investigation Report where necessary 	<ul style="list-style-type: none"> May be required to assist in emergency situations such as using firearm for safety kills or notifying camp when danger (wildlife) is out of the area Assist with the completion of the Supervisor's Investigation Report where necessary 	<ul style="list-style-type: none"> Complete a Supervisor's Investigation Report Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions Notify the Baker Lake Conservation Officer Note in monthly wildlife report
If a need for deterrents or other wildlife management techniques are identified	<ul style="list-style-type: none"> No action required 	<ul style="list-style-type: none"> No action required 	<ul style="list-style-type: none"> Contact Baker Lake Conservation Officer
Caribou Mitigation			
Collared Caribou are identified as approaching site activities	<ul style="list-style-type: none"> No action required 	<ul style="list-style-type: none"> Assist Coordinator, SHEQ Exploration with identifying what the collar represents and aerial reconnaissance surveys where necessary 	<ul style="list-style-type: none"> Determine what the collar represents by contacting the GN and/or GNWT or exploration companies in the area Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions Note in monthly wildlife report
If caribou with newborn calves approach drilling rig between May 15 and July 15	<ul style="list-style-type: none"> Notify the Coordinator, SHEQ Exploration and Wildlife Monitor If caribou and calves are observed within 10 km of drilling rig, shut down 	<ul style="list-style-type: none"> Station at a vantage point for observing proximity of herd and presence of calves Notify the Coordinator, SHEQ Exploration of 	<ul style="list-style-type: none"> Advise Contractor to shut down drilling activity if Wildlife Monitor determines calves are present within 10 km Following verification from Wildlife Monitor, advise

Event	Contractors	Wildlife Monitor	Coordinator, SHEQ Exploration or Designate
	drilling activity (continue water circulation)	observations <ul style="list-style-type: none"> If drilling activity is suspended, continue monitoring and notify Coordinator, SHEQ Exploration of caribou proximity to drill rig 	Contractor to commence drilling when caribou are outside the 10 km range <ul style="list-style-type: none"> If caribou remain within 10 km for >2 days, notify the Baker Lake Conservation Officer for further action Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions Note in monthly wildlife report
> 50 caribou approach drilling rig during June or July	<ul style="list-style-type: none"> Notify the Coordinator, SHEQ Exploration and Wildlife Monitor If >50 caribou are observed within 2 km of drilling rig, shut down drilling activity (continue water circulation) 	<ul style="list-style-type: none"> Station at a vantage point for observing proximity of herd and presence of calves. Notify the Coordinator, SHEQ Exploration of observations If drilling activity is suspended, continue monitoring and notify Coordinator, SHEQ Exploration of caribou proximity to drill rig 	<ul style="list-style-type: none"> Advise Contractor to shut down drilling activity if Wildlife Monitor determines >50 caribou are present within 2 km Following verification from Wildlife Monitor, advise Contractor to commence drilling when caribou are outside the 2 km range If >50 caribou remain within 2 km for >2 days, notify the Baker Lake Conservation Officer for further action Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions Note in monthly wildlife report
Flight Mitigation			
>50 caribou are within 1 km of landing area	<ul style="list-style-type: none"> Pilot will not land or take off within 1 km of >50 caribou except for flight safety Flights must be 610 m above ground when flying over >50 caribou (horizontal separation of 610 m is acceptable if 610 m altitude is not possible) If possible, choose an alternate landing area > 1 km from the herd Notify the Coordinator, SHEQ Exploration and Wildlife Monitor 	<ul style="list-style-type: none"> If landing area is within sight, monitor proximity of herd Notify the Coordinator, SHEQ Exploration of observations 	<ul style="list-style-type: none"> Notify pilots when >50 caribou are within 1 km of their landing area as advised by the Wildlife Monitor Notify pilots when the caribou have moved outside the 1 km range of the landing area as advised by the Wildlife Monitor Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions Note in monthly wildlife report

Event	Contractors	Wildlife Monitor	Coordinator, SHEQ Exploration or Designate
Aerial Geophysical Surveys			
During flight, 50 or more caribou are within the aerial survey route	<ul style="list-style-type: none"> • Notify the Coordinator, SHEQ Exploration • The aircraft will relocate to another part of the block and repeat the reconnaissance flight or will be postponed until the animals are a distance of 2 km from the survey area 	<ul style="list-style-type: none"> • No Action Required 	<ul style="list-style-type: none"> • Notify Project Geologist or designate, Wildlife Monitor and Manager of Nunavut Affairs of mitigating actions • Note in monthly wildlife report.
If calves are present between May 15 and July 15	<ul style="list-style-type: none"> • Notify the Coordinator, SHEQ Exploration • The survey will be postponed until either the calves are gone or the survey can be conducted outside of this time period. 	<ul style="list-style-type: none"> • No Action Required 	<ul style="list-style-type: none"> • Notify Project Geologist or designate, Wildlife Monitor and Manager of Nunavut Affairs of mitigating actions
Ground Geophysical Surveys (include the use of wire)			
Caribou cows and calves are present within 10 km between May 15 and July 15	<ul style="list-style-type: none"> • Notify the Coordinator, SHEQ Exploration and Wildlife Monitor • Retrieve wire following verification from Coordinator, SHEQ Exploration 	<ul style="list-style-type: none"> • Station at a vantage point for observing proximity of herd and presence of calves • Notify the Coordinator, SHEQ Exploration of observations 	<ul style="list-style-type: none"> • The Coordinator, SHEQ Exploration in consultation with the Wildlife Monitor will notify the Contractor to retrieve the wire • Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions • Note in monthly wildlife report
> 50 caribou are within close proximity of the ground survey area during June/July	<ul style="list-style-type: none"> • Notify the Coordinator, SHEQ Exploration and Wildlife Monitor • Retrieve wire following verification from Coordinator, SHEQ Exploration 	<ul style="list-style-type: none"> • Station at a vantage point for observing proximity of herd and presence of calves • Notify the Coordinator, SHEQ Exploration of observations 	<ul style="list-style-type: none"> • The Coordinator, SHEQ Exploration in consultation with the Wildlife Monitor will notify the contractor to retrieve the wire • Notify Project Geologist or designate and Manager of Nunavut Affairs of mitigating actions • Note in monthly wildlife report