Kiggavik Project

Final Environmental Impact Statement

Tier 3 Technical Appendix 2S:
Waste Management Plan

September 2014

History of Revisions

Revision Number	Date	Details of Revisions
01	December 2011	First Issue with Draft Environmental Impact Statement
02	September 2014	Issued for Final Environmental Impact Statement

A management plan is a living document which is continually reviewed and revised throughout the life of the Project to ensure it meets health, safety, and environmental performance standards. This process of adaptive management and continual improvement (Tier 2, Volume 2, Section 17) is consistent with the Inuit Qaujimajatuqangit (IQ) principles of Qanuqtuurunnarniq *being resourceful and flexible to solve problems* and Pilimmaksarniq *maintaining and improving skills through experience and practice.*

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Abbreviations

CCME ..... Canadian Council of Ministers of the Environment

CEPA ..... Canadian Environmental Protection Act

CWS ..... Canada Wide Standards

DFO ..... Department of Fisheries and Oceans

D of SD ..... Department of Sustainable Development

EC ..... Environment Canada

IMO ..... International Maritime Organization

NPRI ..... National Pollutant Release Inventory

PCCD ..... Polychlorinated dibenzo-p-dioxins

PPE ..... Personal Protective Equipment

TMF ..... Tailings Management Facility

1 Introduction

The AREVA Resources Canada Inc. (AREVA) Waste Management Plan (Plan) applies to the Kiggavik Project (Project) located approximately 80 km west of Baker Lake. The Plan will be in effect during the construction, operation, and decommissioning of the mine. In addition, the Plan will be made available to operational remote areas, the Project, AREVA's Baker Lake office and AREVA's corporate office.

1.1 Purpose and Scope

The development of the waste management program is based largely on proven methods used at AREVA's McClean Lake Operation located in Northern Saskatchewan as well as at recent mining operations in Nunavut and NWT. The Plan describes the Project's planned waste facilities and waste management throughout construction, operation and decommissioning. Waste generated by the project includes domestic, industrial and chemically/radiologically contaminated wastes, sewage, and incinerator ash. The Plan also covers waste oil suitable for incineration however the management of all other hazardous wastes can be found in the Technical Appendix 2U (Hazardous Materials Management Plan). In the context of the Plan, waste does not include process waste streams such as effluent, mill tailings, or mine rock. The management of the landfarm can be found in Technical Appendix 10B - Spill Contingency and Landfarm Management Plan where spills, such as diesel fuel, and the associated cleanup and remediation are discussed.

The Landfill Management Plan is incorporated into the Waste Management Plan which encompasses all waste elements onsite including incinerator operation, sewage handling, and waste oil collection. These components were combined following guidance from Section 4.1 of the NIRB Guidelines. Further specific operational details will become available upon completion of detailed engineering. An updated Waste Management Plan will be presented at the licensing stage.The Plan will be reviewed on an annual basis and updated as required to keep the information current and consistent with regulatory and procedural changes. Any changes and/or amendments to the Plan will be submitted to the appropriate regulatory agencies for approval.

1.2 Acts, Regulations and Standards

Federal and territorial acts, regulations, standards and guidance documents have been reviewed for the preparation of this document. These include:

- *Canadian Environmental Protection Act* (CEPA, 1999)

- Northwest Territories Environment and Natural Resources Used Oil and Waste Fuel Management Regulations (NWT, 2003)
- Nunavut Environmental Guideline for Industrial Waste Discharges (D of SD, 2002)
- CCME Canada-Wide Standards (CWS) for Dioxins and Furans (CCME, 2000a)
- CCME CWS for Mercury Emissions (CCME, 2000b)
- Environment Canada Technical Document for Batch Waste Incineration (EC, 2010)

1.2.1 Canada-Wide Standards

The CWS for Dioxins and Furans and the CWS for Mercury Emissions outlines emission limits and reporting requirements in efforts to reduce national emissions. The standards encourage facilities to use pollution prevention, waste segregation and diversions to achieve these limits.

1.2.1.1 Canada-Wide Standards for Dioxins and Furans

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, are toxic, persistent, bioaccumulative, and result predominantly from human activity. Due to their extraordinary environmental persistence and capacity to accumulate in biological tissues, dioxins and furans are slated for virtual elimination under the *Canadian Environmental Protection Act (CEPA*, 1999) and the CWS for Dioxins and Furans (CCME, 2000a).

1.2.1.2 Canada-Wide Standards for Mercury

Mercury is a natural and persistent bioaccumulative element which can be transported many miles in the atmosphere, mercury can have impacts many years and many miles removed from its original source. A common thread through all mercury impacts is that deposition to waterbodies from anthropogenic emissions poses a threat to human and ecosystem health, and that reduced deposition will contribute, in time, to reduced impacts (CCME, 2000b).

1.2.2 Technical Document for Batch Waste Incineration

The EC Technical Document for Batch Waste Incineration (EC, 2010) provides guidance in order to meet the CWS for Dioxins and Furans and the CWS for Mercury. This guidance includes proper system selection, operation, maintenance and record keeping.

1.2.3 Used Oil and Waste Fuel Management Regulations

The NWT Used Oil and Waste Fuel Management Regulations (NWT, 2003) apply to the storage, handling and disposal of used oil and waste fuel and includes sampling, records and reporting requirements.

According to the regulations, used oil is any oil, including lubrication oil, hydraulic fluid, metal working fluid and insulating fluid, that is unsuitable for its intended purpose due to the presence of impurities or the loss of original properties, but does not include waste oil derived from animal or vegetable fat, a petroleum product spilled on land or water or waste from a petroleum refining operation (NWT, 2003).

Waste fuel means a flammable or combustible petroleum hydrocarbon, with or without additives, that is unsuitable for its intended purpose due to the presence of contaminants or the loss of original properties, and includes gasoline, diesel fuel, aviation fuel, kerosene, naphtha and fuel oil, but does not include paint, solvent or propane (NWT, 2003).

1.3 Expected Wastes and Facilities

As shown in Tier 2, Volume 2 - Project Description and Assessment Basis, Table 1.3-1 provides a summary of waste materials expected to be generated at the site. These quantities have been estimated based on the Project Description and by bench-marking against the AREVA McClean Lake site.

The proposed locations of waste facilities incorporate proposed site features that provide additional barriers to potential contaminant migration into the surrounding environment. Waste facilities planned for the project include two industrial landfills, a contaminated landfill, and an incinerator. The industrial landfills will be located on top of Type 1 / 2 mine rock stockpiles which provides the advantage of minimizing spring freshet and storm water runoff interactions. The contaminated landfill will be located on the perimeter of a Tailings Management Facility (TMF) to ensure any leachate or runoff will drain directly to the TMF. It is planned that the incinerator building will be located near the accommodation complex and will house a double chamber, controlled air incinerator.

The landfills will be designed to retain sufficient waste volumes for the entire life of the mine. As areas of the industrial landfill reach capacity, they will be progressively decommissioned by the addition of a compacted till cover. Upon final decommissioning, industrial landfills will receive an additional compacted till cover, grading to redirect runoff, and subsequent revegetation. Final decommissioning of the contaminated landfill involves deposition of all waste into a TMF. Information on landfill decommissioning is discussed in the Preliminary Decommissioning Plan (Technical Appendix 2R).

Table 1.3-1 Predicted Waste Material Quantities

Material Category	Units	Predicted Annual Quantity		Retained on-site or Shipped
		Construction	Operations	
Domestic waste	m^3	7,000	1,900	Retained
Industrial Waste	m^3	4,000	3,000	Retained
Contaminated Waste	m^3	0	3,000	Retained
Hydrocarbon Contaminated Material	m^3	600	200	Retained
Used oil	m^3	100	50	Retained
Used antifreeze	m^3	25	150	Shipped
Waste fuels	m^3	10	5	Retained
Used cooking oil	drums	40	20	Retained
Waste grease	drums	50	50	Shipped
Used oil and fuel filters	drums	50	50	Shipped
Oil contaminated sorbal etc.	drums	6	6	Shipped
Spent aerosol containers	drums	2	5	Shipped
Batteries	cases	3	5	Shipped
Paints and Related Materials	drums	10	5	Shipped
Empty drums returned	drums	100	50	Shipped
Paper and Cardboard	m^3	50	30	Incinerated
Co-mingle Recycled	m^3	50	100	Shipped
Nitrobenzene overpacks	drums	4	2	Shipped
Misc. (resin, acetone,)	drums	0	10	Retained
Fluorescent lightbulbs	drums	2	5	Shipped

1.4 Relationship to Other Management Plans

The construction, operation, and maintenance of waste management facilities can affect site water quality, wildlife interactions, and air quality. Therefore, this plan must be viewed in concert with the following Tier 3 documents of the EIS:

- Preliminary Decommissioning Plan – Technical Appendix 2R
- Environmental Management Plan – Technical Appendix 2T

- Hazardous Materials Management Plan – Technical Appendix 2U
- Air Quality Monitoring Plan – Technical Appendix 4C
- Spill Contingency and Landfarm Management Plan – Technical Appendix 10B

1.5 Mitigation and Monitoring

As outlined in Tier 3, Technical Appendix 2T, AREVA's Environmental Protection Framework provides an integrated approach to facility design, mitigation, and environmental assessment, and outlines how the outcomes of these processes are integrated into facility construction, operation and decommissioning. Furthermore, the Environmental Protection Framework outlines how the results of monitoring and follow-up programs are incorporated into evaluation processes which facilitate the identification of continual improvement initiatives and adaptive management requirements, when necessary.

As part of the environmental assessment process, mitigation measures are incorporated into the Project to avoid and minimize potential adverse environmental effects. Mitigation measures consist of industry best technologies and practices and incorporate the learning based experiences of other development projects. Mitigation measures can generally be classified as mitigation by design, and mitigation by management, as outlined below.

1.5.1 Mitigation by Design

Many facility design features have been adopted to mitigate potential environmental and health effects and ensure worker safety. The main waste management mitigation measures by design outlined in this plan include:

- To ensure the containment of waste and contaminants, waste facilities will be designed to meet the appropriate regulation, have sufficient capacity for the length of the Project and incorporate natural barriers. This includes such measures as the collection of contact water from the landfill sites.
- To reduce the impact to wildlife, facilities will be designed to minimize the potential for animals to use the facility as a shelter or source of food. Design features such as bird spikes will be considered.

1.5.2 Mitigation by Management

Many facility design features have been adopted to mitigate potential environmental and health effects and ensure worker safety. The main water management mitigation measures by design outlined in this plan include:

- Different types of waste will be segregated in order to reduce the volume of waste and ensure proper disposal. This will include coloured garbage bins for contaminated, domestic and industrial wastes. AREVA personnel and contractors at site will be trained in waste management.
- Waste will be compacted and a soil cover will be maintained over exposed waste to minimize trash mobilized by wind.
- To avoid attracting wildlife, domestic waste will be contained in solid, enclosed containers prior to being incinerated.
- To continually improve waste management strategies and demonstrate compliance with regulatory requirements, annual reports will be submitted to the appropriate regulatory authorities.

1.5.3 Monitoring

Results from the monitoring of facilities and operations will be evaluated against predicted performance, a process it identify design and management improvement opportunities, and adaptive management needs. The main monitoring activities outlined in this plan include:

- Routine monitoring will be performed on various waste streams and waste facilities to confirm compliance with regulatory requirements,
- Inspections will be performed to confirm adequate segregation of waste, record any wildlife interactions, and ensure facilities are maintained in an orderly condition.

2 Management Plan

2.1 Waste Segregation

Wastes have been organized into designated categories. Each waste category has its own waste collection container and waste management facility, which is designed specifically for that particular waste product. The three R's of waste management; reduce, reuse, and recycle; will be encouraged within the waste management program to minimize the quantity of waste placed in the landfill or incinerated. This waste management strategy for the Project is aligned with the current practices at AREVA's McClean Lake Operation which conforms to ISO 14001 Environmental Management Standards. The primary objective of segregating waste into recyclable, domestic, industrial, or contaminated components has proven effective for controlling interactions with the environment.

Waste must be sorted at the source by the waste generator before it can be disposed of in, or transported to, specific designated areas for proper disposal. Waste collection areas will consist of multiple bins for different types of waste, each bin will be clearly marked or color coded for domestic, industrial or contaminated materials. A similar system to the AREVA McClean Lake Operation will be followed which currently includes using recycling bins for recyclables, blue dumpsters for non-recyclable domestic waste, orange dumpsters for industrial waste and yellow dumpsters for contaminated waste. Garbage bags may also be color coded to identify contaminated materials. Proper waste segregation helps in limiting the dioxin, furan and mercury emissions from the incinerator.

A full set of operating procedures specifying how waste is collected and disposed of will be developed prior to start up. Training on waste management procedures will be provided to AREVA personnel and onsite contractors during site orientation. Refresher training will also be provided as required when there are regulatory or operational changes to procedures.

In order to ensure the appropriate designation for waste, source criteria will be used to aid identification and sorting as follows.

2.1.1 Domestic Waste

Domestic waste is defined as general waste materials originating from the accommodation complex and offices. Throughout construction and operation domestic wastes will be sorted into recyclables and non-recyclables and collected either in dumpsters or recycling containers distributed around the site.

Recyclable materials may include drinking containers (glass, metal and plastic), computer components, electronics, printer and ink cartridges, re-chargeable batteries, alkaline batteries and fluorescent light bulbs. Recyclables will be sorted and transported off-site to the appropriate recycling facility.

Non-recyclable domestic wastes, such as ffood wastes, clean wood, organic matter, paper and cardboard will be incinerated. The composting of food waste represents a concern due to the likelihood of attracting wildlife, therefore, all food wastes will be placed in sealed plastic bags and inside sealed containers until they can be transported to the incinerator building for immediate incineration. Incinerating food waste will discourage wildlife interactions in conformance with the *Nunavut Wildlife Act* (GN, 2005).

During marine transportation a similar recycling program will be in place as well as onboard incineration for domestic waste.

2.1.2 Industrial Waste

Industrial waste consists of bulk waste materials that are non-combustible and non-contaminated originating from construction and operations. Industrial waste will be reused or recycled wherever possible. The remaining waste will be land filled in designated areas of the Kiggavik and Andrew Lake Type 1 / 2 waste rock piles. Examples of industrial waste include piping and fittings, treated wood, drywall and tires.

2.1.3 Chemically/Radiologically Contaminated Waste

Chemically or radiologically contaminated waste materials originate from the mining, milling, and water treatment areas and may include used disposable coveralls, PPE and used sample containers. Contaminated materials will be collected in designated receptacles that will be available throughout the site and deposited in the contaminated landfill located at the perimeter of the TMF.

2.1.4 Sewage

Throughout operations, the preferred disposal method for solid sewage is to dispose of it on site in a dedicated sewage disposal area; the composted material would later be used in selected areas as a soil amendment for site re-vegetation. However, as sewage sludge may have the potential of attracting wildlife, AREVA may consider burying the sewage sludge under mine rock or incinerating the sewage sludge and burying the ashes as is the practice at several mines. Treated sewage effluent will be combined with the water treatment plant discharge (after monitoring) and discharged to Judge Sissons Lake. Sewage effluent will meet the DFO regulations, Nunavut Public Health

Regulations and any requirements stipulated by the Nunavut Water Board and the CCME Municipal Effluent Guidelines.

Sewage at the Baker Lake dock and storage facility will be contained in a portable unit (port-a-potty) or an above-ground sewage tank and hauled as needed to the Baker Lake community sewage lagoon.

During the construction and latter part of the decommissioning phase, all sewage solids will be incinerated.

2.1.5 Used Oil and Waste Fuels

Used oil and waste fuels will be collected and stored in approved containment facilities. Used oil will be sampled to ensure it meets the requirements of the Northwest Territories Used Oil and Waste Fuel Management Regulations (NWT, 2003) and is not radiologically contaminated prior to being incinerated. Used oil that does not meet these requirements will be removed from site by a licensed carrier and delivered to a licensed receiver for recycling. During the construction phase, prior to the installation of the dual chamber incinerator equipped with a waste oil burner, all oil and waste fuels will be shipped off-site to a licensed facility.

2.1.6 Incinerator Ash

The incinerator will be operated in compliance with all applicable federal, territorial and local regulations. Ash resulting from the incineration of solid waste will be tested as required by the Environmental Guidelines for Industrial Waste Discharges (D of SD, 2002) and disposed of in the industrial landfills.

At AREVA's McClean Lake Operation in Saskatchewan, only domestic waste is burned in the incinerator. This material is generated at the camp and consists predominately of household waste such as leftover food, packaged papers, cardboard, etc. This is clean waste and is not contaminated. The resulting ash is transferred to designated 'industrial' dumpsters, as indicated by the color of the dumpster. Once full, these dumpsters are transported to the industrial landfill and documented as required.

For the Kiggavik Project, the function and operation of the incinerator would be similar. No contaminated waste would be disposed of into the industrial landfill. In the unexpected event the incinerator ash indicates contamination; it would be disposed of accordingly into the contaminated landfill.

During construction, incinerated ash will be collected in drums and shipped offsite to a licensed facility or stored onsite until the industrial landfill is in operation.

2.1.7 Hazardous Substances and Waste Dangerous Goods

Hazardous Substances and waste dangerous goods will be collected in designated drums, tanks and other approved containers and shipped offsite for disposal at a licensed facility throughout construction and operation. Additional information on handling and disposal of hazardous substances and waste dangerous goods can be found in Tier 3, Technical Appendix 2U - Hazardous Materials Management Plan.

It is not expected that the incinerated ash would be contaminated as all the waste that is burned in the incinerator is from the camp which does not contain any contaminated materials or used oils which must be sampled prior to incineration (Section 2.1.5). Furthermore, all contaminated waste from the mill site will be segregated and clearly identified by yellow garbage bags. These materials will not be incinerated.

2.2 Incinerator Performance and Operation

The Project will select and operate an appropriate incinerator following the EC Technical Document for Batch Waste Incineration (EC, 2010).

2.2.1 Incinerator Technologies, Facilities and Equipment

It is proposed to use a dual chamber, controlled air incinerator. The incinerator will be designed to achieve the Canada-Wide Standard for Dioxins and Furans immediately upon installation. As PCDD/F are destroyed at temperatures in excess of 600ºC the incinerator will be equipped with a large secondary chamber able to provide a residence time of at least one second at a temperature higher than 1000ºC to ensure complete combustion and minimize PCDD/F emissions. The incinerator stack will have appropriate sampling ports to allow stack sampling. Stack sampling will be conducted periodically to confirm conformance with the CWS for Dioxins and Furans and the CWS for Mercury Emissions.

To reduce the potential of attracting wildlife and ensure the incinerator burns at a consistent and optimal temperature throughout the year the incinerator will be located in a purpose built, heated building.

The incinerator will also be equipped with a used oil burner in the secondary chamber to reduce the quantity of fuel needed to operate the incinerator. Used petroleum products such as heavy lubricants and engine oil will be incinerated in the used oil furnace. The waste oils are pumped to the waste oil

system's integral waste oil metering tank, which meters the feed rate automatically based on the system's temperature control loop. The waste oil burner will burn the oils in the secondary chamber, and will significantly reduce the quantity of virgin fuels needed. Use of the waste oil burner will be in compliance with the NWT Used oil and Waste Fuel Regulations (NWT, 2003). Waste oils will be sampled to ensure they are within the allowable impurity limits and have an acceptable flashpoint. It is required that waste oil/waste fuel in excess of impurity limits or with a flash point less than 37.7 degrees Celsius are not burned and not blended with other waste oil/waste fuels. Until the waste oil burner is installed, waste oil will be stored and shipped off site for recycling.

Prior to commissioning of the new incinerator, the current incinerator located at the Kiggavik exploration camp will continue to be used to dispose of non-recyclable domestic waste. The existing incinerator is a Westland CY 1000, a single chamber cyclonator model, designed specifically for the mining, petroleum, and lumber industries. It is designed to incinerate the various waste types generated at the Kiggavik site, and is built for heavy industrial use.

The exploration camp incinerator is quite small and does not have the capacity to process the volume of waste expected to be generated by the population on site during the Project construction stage, nor the capability of incinerating sewage sludge or waste oil; therefore, it is anticipated that a new, larger incinerator will be installed and commissioned early in the construction period. The specific type of incinerator has not yet been selected; further detail will be provided during the licensing phase prior to construction.

Sewage sludge can be mixed with other domestic waste in multiple hearth incinerators; therefore, a proposed dual chamber incinerator could potentially be used for disposal of sewage solids, if that option is determined to be the most desirable. However, it is expected that the sewage solids will be stored until they can be placed in a purpose-built disposal area for composting, or else buried, rather than incinerated. If the incineration option is preferred, AREVA will confirm that all required equipment is installed, and that further controls and training are implemented as necessary to ensure that emissions meet Environment Canada's Technical Document for Batch Waste Incineration Guidelines.

In order to monitor the incineration process and ensure the unit is burning efficiently, the incinerator will be equipped with monitoring equipment, which may include temperature probes, differential pressure meters, and auxiliary fuel flow. The monitoring equipment will be capable of maintaining a continuous log of the data recorded. This data will be retained for the duration of the Project and available for inspection as necessary.

All marine incinerators will meet IMO MEPC.76 (40) standards. They will be capable of handling solid waste, including domestic waste, oil waste, and in most cases sewage. Modern marine incinerators operate at very high combustion temperatures in the range of 850º - 1200º C. Automatic combustion controls and rapid cooling of exhaust gasses maintain emissions within stringent limits of IMO

MEPC.76 (40). Waste generated by tugs will be minimal and will consist of residual ash from incineration amounting to less than 10% of the total waste onboard. This residual ash will be sealed in heavy duty fabric containers loaded into a designated waste shipping container which when filled or at the end of the season will be shipped south as backhaul and disposed of at an approved receiving facility at a southern port.

2.2.2 Incinerator Operation

A full set of operating procedures specifying how to operate the incinerator will be developed prior to start up. Incinerator operation will be conducted in accordance with the Technical Document for Batch Waste Incineration which includes but is not limited to:

- Separating waste according to its heating value.
- Mix waste from each category to achieve the manufacturer's specified input calorific value.
- Remain present to supervise the beginning of the burn cycle to ensure unit is working optimally.
- Ensure charging door remains closed until after the burn is complete and the unit has cooled down.
- Remove ash from previous burn cycle before reloading the incinerator.
- Transport waste immediately prior to incineration as accumulation would attract wildlife.
- Incineration to take place several times daily.

2.3 Landfill Management

The proposed industrial and contaminated landfills for the Kiggavik Project will be located to incorporate proposed site features that provide an additional barrier to potential contaminant migration into the surrounding environment. The subsections below outline management strategies to minimize environmental interactions. A contingency plan will outline measures to be implemented in the event that landfill monitoring indicates an exceedance of action levels. This Plan will be revised at the time of licensing prior to operations.

2.3.1 Industrial Landfills

The industrial landfills will be located on top of Type 1/2 waste rock stockpiles which provide the advantage of minimizing spring freshet and storm water runoff interactions. Industrial waste will be deposited in a pit or trench such that waste is not accumulated at grade and to minimize windblown material. The industrial landfill will be covered with soil periodically to further limit exposure to wind. To avoid attracting wildlife, only odourless and non-putrescible materials will be deposited in

industrial landfills. The industrial landfills will be inspected regularly to ensure adequate waste segregation and monitor and record any wildlife presence.

Contact water at the Project site will be intercepted, contained, analysed, and treated, when required. Contact water is defined as any water that may have been physically or chemically affected by site activities. Runoff from the industrial landfills will be directed to the mine rock sedimentation ponds.

In order to minimize the amount of contact water, diversion channels and snow fences will be installed around the Site. Snow may also be cleared and removed from the industrial landfills prior to the spring melt. Drainage channels will be located around mine rock piles to collect runoff water for passive treatment in unlined sedimentation ponds to reduce potential suspended sediment loads prior to release. All water released into the environment will meet discharge quality criteria.

Industrial landfill leachate generation will be minimized by compaction of waste as it is placed and construction of a compacted till cover on areas that have reached capacity. Groundwater monitoring wells will be installed down gradient of the permanent Type 2 mine rock stockpiles and monitored for water quality parameters. Nearby water bodies will be monitored for water and sediment quality as outlined in the Environmental Management Plan (Technical Appendix 2T, Section 4.2.2).

2.3.2 Contaminated Landfill

The contaminated landfill will be located on the perimeter of a Tailings Management Facility (TMF) to ensure any leachate or runoff will drain directly to the TMF. Chemically/radiologically contaminated waste will be deposited at the bottom of a pit or trench located at the crest of a TMF, which will provide protection from wind. Periodically the contaminated landfill will be capped with glacial till to prevent infiltration of precipitation, minimize windblown material and provide shielding from interred radioactive materials. The contaminated landfill will not be lined, however, its location ensures rainwater, snow, and spring freshet will drain directly into the TMF. All contact water and leachate from the contaminated landfill will report to the TMF where it will be subsequently treated at the Kiggavik water treatment plant.

2.4 Wildlife Management

Other mines have incorporated wildlife-specific waste management actions into mitigation plans (e.g. Jericho, Snap Lake, Diavik). This has included employing a wildlife interaction expert to conduct regular audits on Project facilities, inspecting waste sites or containers to evaluate the effectiveness of waste management plans, or monitoring for and clearing of litter on Project-related roads. Details of mitigation measures for wildlife are found in Technical Appendix 6D – Wildlife Mitigation and Monitoring Plan.

3 Training

AREVA personnel and contractors working at the Project site will be trained in waste management. This training will be included in the site orientation given to AREVA personnel and contractors upon their arrival at site. The orientation will include the types of wastes produced at site, the appropriate waste disposal bins and dumpsters i.e. blue bins for non-recyclable domestic waste, and locations of these disposal bins. Signage will also be placed in and around the Project site for clear identification of waste disposal facilities. Additional training will be given to AREVA personnel and contractors, as required, following regulatory or procedural changes, identification of misdirected waste, or indication of wildlife presence at waste facilities.

As listed in the EC Technical Document for Batch Waste Incineration, incinerator operators will be trained by the incinerator supplier or manufacturer. The training course will include the following elements:

- System safety including identification of hazards that the operator should recognize;
- Waste characterization and how waste composition can affect operation;
- Loading limitations, including materials that should NOT be charged to the incinerator, and the allowable quantities of different types of wastes that can be charged;
- Start-up procedures for the incinerator and the normal operation cycle;
- Operation and adjustment of the incinerator to maximize performance;
- Clean out procedures at the end of the cycle;
- Troubleshooting procedures;
- Maintenance schedule; and,
- Record keeping and reporting.

Supervisors will also be involved in the training session so that continuity can be maintained with multiple operators.

4 Monitoring

Monitoring of the Project's waste management program will be conducted primarily by the Environment and Radiation departments. Monitoring will include inspections of waste collection areas and waste facilities, preparation and shipment of waste oil and ash samples, incinerator emissions testing, air quality monitoring and contact water sampling.

4.1 Inspections

The Environment department will conduct regular inspections of the waste collection areas in and around the accommodation complex and mill site and of the waste facilities. Radiation technicians will scan the contents of the industrial landfills and dumpsters in the vicinity of the mill to confirm that contaminated and uncontaminated wastes are disposed of appropriately. During inspections of the waste disposal areas and facilities technicians will be looking for:

- Proper segregation of waste at the source
- Quantity of waste being disposed of in each facility,
- Windblown debris,
- Evidence of wildlife near the landfills and incinerator.

4.2 Waste Oil Sampling

A sample of one month's feedstock of waste oil will be tested at least once a year. The Environment Technician will collect a grab sample from the waste oil tank, ensuring that it is a representative sample, which will be tested for flash point and the existence/amount of impurities. Table 4.2-1 shows the maximum levels of contaminants in waste oil that can be incinerated as per the Used Oil and Waste Fuel Management Regulations (NWT, 2003). Waste oil that contains an impurity listed in Table 4.2-1 in excess of the maximum level or has a flashpoint lower than 37.7 degrees Celsius will not be incinerated or blended with other waste oils, except for the purpose of shipment to a licensed disposal facility.

Table 4.2-1 Used Oil Impurity Limits

Impurity	Maximum level Allowed in Used Oil
Cadmium	2 ppm
Chromium	10 ppm
Lead	100 ppm
Total organic halogens (as chlorine)	1000 ppm
Polychlorinated biphenyls	2 ppm

Waste oil which comes from potentially radiologically contaminated areas will be scanned by the Radiation Group. Waste oil which is radiologically contaminated will be properly packaged and shipped to a licensed waste disposal facility as per the Hazardous Materials Management Plan.

The following will be recorded for the incineration of used oil as required by the Used Oil and Waste Fuel Management Regulations (NWT, 2003):

- Volume of used oil generated
- Volume of used oil incinerated/consumed
- Name and address of person in charge, management or control of the used oil
- Location of production of used oil
- A summary of maintenance performed on incinerator or processing equipment
- Volume and nature of the products produced from the used oil
- The destination of used oil products shipped from the facility

4.3 Incinerator Emissions Testing

To confirm conformance with the CWS for Dioxins and Furans and the CWS for Mercury Emissions, periodic stack testing will be conducted and the results reported to regulatory agencies in the annual report. The Guideline maximums for dioxins, furans and mercury are summarized in Table 4.3-1. Details pertaining to the collection of samples will be informed by manufacturer's instructions upon final selection of an incinerator design. Sampling protocols, including who will conduct the sampling, when sampling will occur, how samples will be collected, analytical and statistical analysis methods will be included in the revised Air Quality Monitoring Plan, submitted at the licensing stage. Incinerator monitoring data will be retained and available for inspection for the duration of the Project. Typically, monitoring data is provided to regulatory agencies annually.

Table 4.3-1 CWS Maximum Emissions

Activity	Emission	Maximum Concentration
Municipal Waste Incineration	Dioxins and furans	80 pg I-TEQ/m³
Sewage Sludge Incineration	Dioxins and furans	80 pg I-TEQ/m³
Municipal Waste Incineration	Mercury	20 µg/Rm³
Sewage Sludge Incineration	Mercury	70 µg/Rm³
NOTE: Stack concentrations are corrected to 11% oxygen content for reporting purposes (CCME, 2000)		

4.4 Incinerator Ash Sampling

In accordance with the Environmental Guideline for Industrial Waste Discharge, incinerator ash will be sampled monthly and analyzed using a leachate testing method. The parameters that the ash will be tested for are summarized in Table 4.4-1. Incinerator ash which meets the guidelines will be disposed in industrial landfills while ash that does not meet the guidelines will be disposed of in the contaminated landfill and the cause of the exceedance will be investigated.

Table 4.4-1 Standards for Solid Waste Residuals Suitable for Landfill

Parameter	Concentration (mg/L)
Arsenic	2.5
Barium	100
Cadmium	0.5
Carbon Tetrachloride	0.5
Chromium	0.5
Cyanide (free)	20
DDT	3
Endrin	0.02
Heptachlor + Heptachlor epoxide	0.3
Lead	5
Lindane	0.4
Mercury	0.1

Table 4.4-1 Standards for Solid Waste Residuals Suitable for Landfill

Parameter	Concentration (mg/L)
Methoxychlor	10
Methyl ethyl ketone	200
Metolachlor	5
PCBs	50*
Selenium	1
Silver	5
Tetrachloroethylene	3
Toxaphene	0.5
Trihalomethanes	10
2, 4, 5-TP (Silvex)	1
Zinc	500
NOTE: *based on concentration by mass (D of SD, 2002)	

4.5 Air Quality Monitoring

An assessment of the projected emissions from site operations was completed. An air monitoring program will be established to ensure emissions are equivalent to or lower than those predicted. This will include monitoring of particulates ($PM_{2.5}$ and PM_{10}) that may result from incinerator operation. Air monitoring is detailed in the Air Quality Monitoring Plan (Technical Appendix 4C).

4.6 Contact Water Sampling

Contact water contained in the sedimentation ponds around the Kiggavik and Andrew Lake Type 2 mine rock stockpiles will be sampled as necessary to confirm it meets discharge quality criteria.

The contact water from the mine rock stockpile sedimentation ponds at Kiggavik will be diverted and stored in the purpose-built water storage facility to reduce freshwater needed in the mill process. Any excess contact water which cannot be stored in the purpose-built water storage facility that meets discharge criteria will be discharged to the environment. Further detail regarding sampling and discharge of contact water will be available at the licensing stage.

5 Reporting

5.1 Reporting

To demonstrate compliance with regulatory guidelines, an annual report will be submitted to the appropriate regulatory agencies. As outlined in the EC Technical Document for Batch Waste Incineration, the annual report will include at minimum:

- Quantity of waste disposed of in the industrial landfills, contaminated landfill or incinerated.
- Results of stack emissions testing, waste oil and ash sampling.
- Description of any changes in operation which may affect waste management.
- A list of staff who have been trained to operate the incinerator, the type of training, dates of training, and dates of refresher courses.
- Preventative maintenance conducted on equipment.
- Records of operation of the incinerator.
- Auxiliary fuel usage.
- Amount of incinerator ash generated and disposal site.

The National Pollutant Release Inventory (NPRI) is a legislated, publically available inventory of pollutant releases, disposals and transfers for recycling (EC, 2007). The NPRI outlines substances to be tracked and the associated reporting requirements. Table 5.1-1 summarizes substances to be tracked and the reporting requirements of the Project.

Table 5.1-1 NPRI Reportable Substances

Criteria Air Contaminant	Required to Report When:
Hexachlorobenzene	Always
Dioxins and Furans	
Nitrogen oxides (expressed as nitrogen dioxide)	Emissions are 20 tonnes or more per annum
Sulphur dioxide	
Carbon monoxide	
Total particulate matter	
Volatile organic compounds	Emissions are 10 tonnes or more per annum
Particulate matter with a diameter less than or equal to 10 micrometres (PM_{10})	Emissions are 0.5 tonnes or more per annum
Particulate matter with a diameter less than or equal to 2.5 micrometres ($PM_{2.5}$)	Emissions are 0.3 tonnes or more per annum

6 Closure

During closure of the Project site, waste facilities will be decommissioned. This will include dismantling the incinerator and demolishing the incinerator building. Materials will be recycled where possible, demobilized from site, or disposed of in a TMF. A compacted till cover, approximately 1 meter in depth, will be constructed over the industrial landfill. The surface of Type 1 / 2 mine rock stockpiles will be regraded to stable slopes and re-vegetated. Sewage solids from the sewage management area may be composted and used in reclamation of the mine rock stockpiles. Chemically/radiologically contaminated waste located in the contaminated landfill will be disposed of in a TMF.

For further details on decommissioning activities, refer to Tier 3, Technical Appendix 2R - Preliminary Decommissioning Plan.

7 References

AREVA Resources Canada (2014). Kiggavik Project EIS. Technical Appendix 2R – Preliminary Decommissioning Plan, September 2014.

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