PUBLIC SERVICES AND PROCUREMENT CANADA

Waste Fuel Reduction Plan: Isachsen High Arctic Weather Station (HAWS), Nunavut

Prepared for Public Services and Procurement Canada on behalf of Environment and Climate Change Canada (ECCC)

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FCSI #: 07525123

Final Report

Waste fuel drums being Inventoried
July 2023

Incinerator test burn
July 2024

February 2025

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Attention: Mr. Michael Brownlee
Senior Environmental Specialist

Dear Mr. Brownlee:

Nuqsana-Outcome Joint Venture (NOJV) is pleased to provide Public Services and Procurement Canada (PSPC) with the attached Waste Fuel Reduction Plan report for Environment and Climate Change Canada's (ECCC's) Isachsen High Arctic Weather Station (HAWS) in Nunavut.

Should you have any further questions or comments, please contact the undersigned at your convenience.

Yours truly,

DILLON-OUTCOME JOINT VENTURE

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Our File: NP2023-16

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Executive Summary

Nuqsana and Outcome Consultants Inc. in joint venture (Nuqsana-Outcome or NOJV) was retained by Public Services and Procurement Canada (PSPC) to complete a Fuel Reduction Plan for the decommissioning and remediation at the Isachsen High Arctic Weather Station (HAWS) on Ellef Ringnes Island in Nunavut (the Site). The purpose of this task is to provide a scope, plan, and schedule for the reduction of waste fuel currently on site at the Isachsen HAWS. Prior to developing this Plan NOJV conducted a waste fuel inventory, product testing and recommissioned two incinerators at the Site which were used for burning (flaring) waste fuel in an earlier phase of the site decommissioning. Identifying the additional equipment required for the fuel reduction plan, and specifying the setup of a dedicated area for fuel incineration are also included in this Plan.

The waste fuel inventory has found that there is approximately 76,200 litres (L) of waste fuel on site. The fuels are contained in varying quantities at four identified locations: Drums, Runway Tanks, Middle/Lower Tank Farms, and 31 Other ASTs. The fuel types are diesel (52,224L), jet fuel, A and B (13,395 L), gasoline (4,665 L), kerosene (1,055 L), oily water (5,302 L) and other (1,190 L).

In the incinerator recommissioning program conducted in the field season of 2024, the incineration chambers that were present on site were upgraded with modern control panels, blowers, pilot burners, and waste fuel pumps. The incinerators were recertified by their original manufacturer, Ketek Group Inc. and tested with the major types of waste fuel present, with the exception of gasoline. The burn rate is 113 L/per hour for all types of fuel. Gasoline must be mixed with other fuels with a higher flashpoint to be incinerated. A standard operating procedure (SOP) for the incinerators has been produced and is included as an appendix to this report.

A plan to incinerate all of the fuel in the 2025 field season has been developed. An incinerator operation area would have to be set up, with the fuel separation mixing tanks, generators for electrical power and the incineration units themselves. A location and a schematic of the operation area is contained in **Appendix E: Incinerator SOP**. Additional equipment required to complete the fuel reduction plan includes: mixing tanks, oily water and fuel separation totes, drum grabber for the loader on site, and spill kits. The fuel reduction plan would have a duration of approximately 42 work days. Following the reduction / removal of waste fuels, the required steps could be taken to properly render the registered tanks out of service.

1.0 Introduction

Nuqsana and Outcome Consultants Inc. in joint venture (Nuqsana-Outcome or NOJV) was retained by Public Services and Procurement Canada (PSPC) to complete a Fuel Reduction Plan for the decommissioning and remediation at the Isachsen High Arctic Weather Station (HAWS) on Ellef Ringnes Island in Nunavut (the Site). The purpose of this task is to provide a scope, plan, and schedule for the reduction of waste fuel currently on site at the Isachsen HAWS. Prior to developing this Plan NOJV conducted a waste fuel inventory, product testing and recommissioned two incinerators at the Site which were used for burning (flaring) waste fuel in an earlier phase of the site decommissioning. Identifying the additional equipment required for the fuel reduction plan, and specifying the setup of a dedicated area for fuel incineration are also included in this Plan.

The work was carried out as a component of the 2024-25 Scope of Work for the Isachsen HAWS provided by PSPC to NOJV in May 2024. The work was carried out for PSPC on behalf of Environment and Climate Change Canada (ECCC) under the Standing Offer Agreement #EW699-220414/011/NCS, project number R.125553.001.

1.1 Objectives of this Task

Reducing the quantity of waste fuel stored at the Isachsen HAWS is a precautionary measure being undertaken to reduce the risk and liability of site contamination from potential releases from the considerable volume (approximately 76,200 L) of waste fuel at the Site. Given the urgency of reducing the risk of contamination, this plan will be implemented ahead of the wholescale decommissioning of the Site. The waste fuel has been accumulating in the 45 years since staffed operations at Isachsen ceased. The volume of unused fuel originates from the partial decommissioning projects in the 1990s, leftover fuel from numerous other projects at Isachsen, and expeditions to the North Pole using Isachsen as a fuel cache location.

From a compliance perspective, the Site is under the federal *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulation* (amended Oct 20, 2020) and the CCME *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.* Nine of the ten large fuel storage tanks are registered in the Federal Identification Registry for Storage Tank Systems (FIRSTS). Although a formal tank compliance study has not been done, there are non-compliance issues related to inventory control, inspection and record keeping, and corrosion protection.

The total volume of waste fuel is approximately 76,200 L. There are approximately 304 drums that are either full or partially full of waste fuel which contain approximately 20,800 L of various fuel products. The three above ground storage tanks (ASTs) at the runway contribute the largest portion of the waste fuel with a total of approximately 45,800 L of diesel fuel. As well, other ASTs located in various locations

around the Site contain approximately ~9,500 L of various fuel products too. These tanks that are partially full of petroleum product are deemed to still be *in service*.

The objective of the waste fuel reduction plan is to reduce the fuel inventory to zero thereby reducing the risk of contamination from potential future tank or drum leakage. Following the elimination of the product within the tanks, steps can be taken to officially take them out of services, and update their status within FIRSTS.

Table 1-1 below summarizes the ASTs located at the Site and the estimate volume of product contained within them.

Table 1-1: AST Summary Table

Location	Tank ID	Suspected Fuel Type	Estimated Volume of Product (L)
Runway Tanks	Tank 00001914	Diesel	21,221
	Tank 00001920	Diesel	17,170
	Tank 00001923	Diesel	7,427
	Tank 30	n/a	0
Middle and Lower Tank Farm	Tank 00001915	n/a	0
	Tank 00001916	n/a	Assumed 0[1]
	Tank 00001917	n/a	0
	Tank 00001918	Diesel	965
	Tank 00001921	n/a	0
	Tank 00001922	n/a	0
Other AST's	Tank 1	n/a	0
	Tank 2	n/a	0
	Tank 3	n/a	0
	Tank 4	Diesel	25

[1] A visual inspection of the inside of the tank from above could not be performed due to the damaged ladder on the tank.

	Tank 5	n/a	0
	Tank 6	n/a	0
	Tank 7	n/a	0
	Tank 8	n/a	0
	Tank 9	n/a	0
	Tank 10	Diesel (99.9% Water)	840
	Tank 11	Diesel (99.9% Water)	160
	Tank 12	n/a	0
	Tank 13	n/a	0
	Tank 14	Diesel (33.7% water)	50
	Tank 15	Diesel	3,328
	Tank 16	n/a	0
	Tank 17	n/a	0
	Tank 18	n/a	0
	Tank 19	n/a	0
	Tank 20	Diesel	25
	Tank 21	Diesel (99.9% water)	1,130
	Tank 22	Diesel (99.9% water)	1,390
	Tank 23	Diesel (55% water)	200
	Tank 24	n/a	0
	Tank 25	n/a	0
	Tank 26	n/a	0
	Tank 27	Diesel	600
	Tank 28	n/a	0
	Tank 29	n/a	0
	Tank 31	Diesel	850
Operations Building	Two large tanks	n/a	0

Power House	Eight tanks	n/a	0

2.0 Background Information

2.1 Site Description and History of the Site

The Isachsen HAWS has a total area of approximately 450 hectares (ha) and is centered at a latitude of 78o 46' 40" N and 103o 31'40" W longitude facing Louise Bay, on the west-facing side of Ellef Ringnes Island, NU. The federal land reserve is occupied by approximately 21 permanent structures with associated infrastructure, equipment, and supplies. Other features previously identified at the Site, in addition to the 21 structures, include a 1,300-metre-long runway, former water and sewage infrastructure, fuel storage and distribution facilities, power generation equipment, two on-site waste disposal areas (WDAs), another potential WDA, fuels tanks, thousands of empty/partially empty barrels, other abandoned equipment, and debris. A Site Location figure is presented in **Appendix A.**

The supplies for constructing the initial buildings and grading of the runway at Isachsen were mobilized by air and deposited on sea ice between April 3 and 21, 1947. The station operated as one of five Joint (Canadian and American) Arctic Weather Stations for the purpose of measuring meteorological information and relaying it down to weather analysists in the South. One of the weather measurement activities consisted of filling and releasing hydrogen-filled balloons and tracking their movement. The United States left this partnership in 1972. Canada maintained a staffed operation at Isachsen under Transport Canada until 1975 and under Environment Canada until September 1978 when the staffed station was closed.

Since 1978, the weather data collection facilities at Isachsen have been automated and the facilities at the Site have been used to support numerous scientific research groups, and for hosting exercises by the Canadian Rangers. The Meteorological Services of Canada Bureau (MSCB) operates an automated weather station at Isachsen which is available at: Isachsen - Past 24-Hour Conditions - Environment Canada (weather.gc.ca). Access to Isachsen for building materials, equipment and personnel has been exclusively by air (with one exception) including documented access by large transport aircraft (Hercules) in the past. Isachsen was reached by cat train over ice by a remediation contractor in 1995. There is no record of it having been reached by sea.

Waste clean-up efforts began in 1996 with drum crushing, partial fuel incineration and burial of derelict heavy equipment in the West Gully Landfill, but very muddy conditions made the job very difficult. The two incinerators currently on-site were brought to the Site and used for that endeavour.

The Site has been the subject of numerous studies by various consultants since 1996. Of interest to waste fuel and drum and tank management are the following reports:

- Stantec. *Isachsen Storage Tank Decommissioning Strategy.* (Stantec 2014);
- DOJV. *Isachsen High Arctic Weather Station Data Gap Analysis Report.* (DOJV 2023); and
- NOJV. *2023 Environmental Site Assessment (ESA) Summary Report: Isachsen High Arctic Weather Station (HAWS), Nunavut.* (NOJV 2024).

2.2 Applicable Guidelines and Regulations

Canada. *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulation* (amended Oct 20, 2020)

CCME. *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* (2003, with updates to 2015).

Indian and Northern Affairs Canada. *Abandoned Military Site Remediation Protocol. Volume 1, 2008. Appendix B Barrel Protocol*.

Nunavut, Department of Environment. *Environmental Guideline for the Burning and Incineration of Solid Waste*. (2012)

Nunavut, Department of Environment. *Environmental Guideline for Used Oil and Waste Fuel*. (2012)

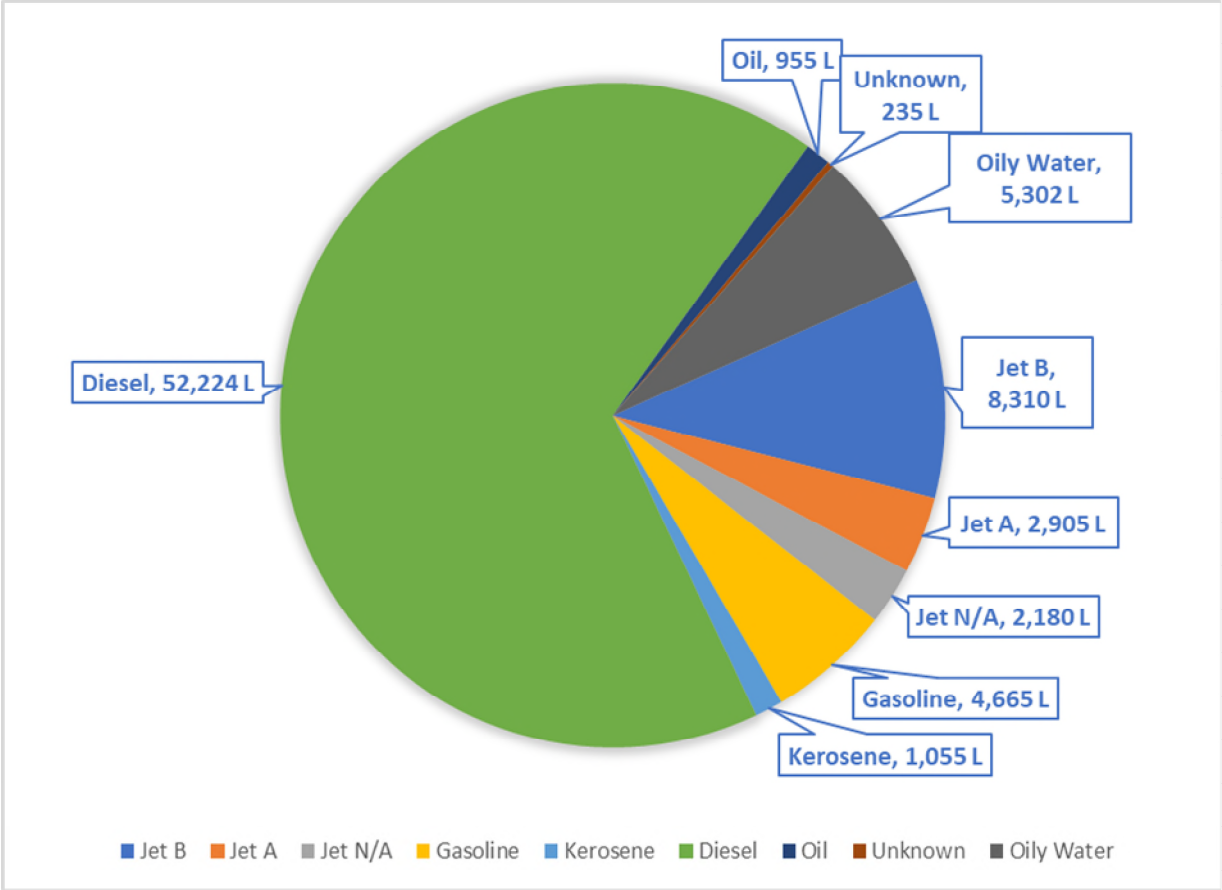
There is no specific regulation or permit required for the use of forced air incinerators for fuel in Nunavut. There is a guideline published by the Nunavut Department of Environment on Burning and Incineration of Solid Waste, which mentions that burning waste with forced air incinerators is a recommended practice. Registration of waste fuel burners is optional. The activity of fuel incineration will require an application for a Land Use Permit to be submitted to the Nunavut Planning Commission at least 100 days prior to the commencement of that activity. This activity is consistent with the land use at Isachsen, so it is not expected to require screening by the NIRB.

Significant amounts of fuel handling will be required in the incineration process and safe handling practices and spill protection measures will need to be in place, and spill clean up equipment will need to be on hand.

3.0 Waste Fuel Inventory Summary

There is approximately 76,200 L of waste fuel on site, the fuels are contained in varying quantities at four identified locations: Drums, Runway Tanks, Middle/Lower Tank Farms, and 31 Other ASTs. Figure 3-1 shows the breakdown of the types of fuels on site. See **Appendix B** for the full Fuel Inventory at the Site.

Figure 3-1: Waste Fuel Types and Volumes



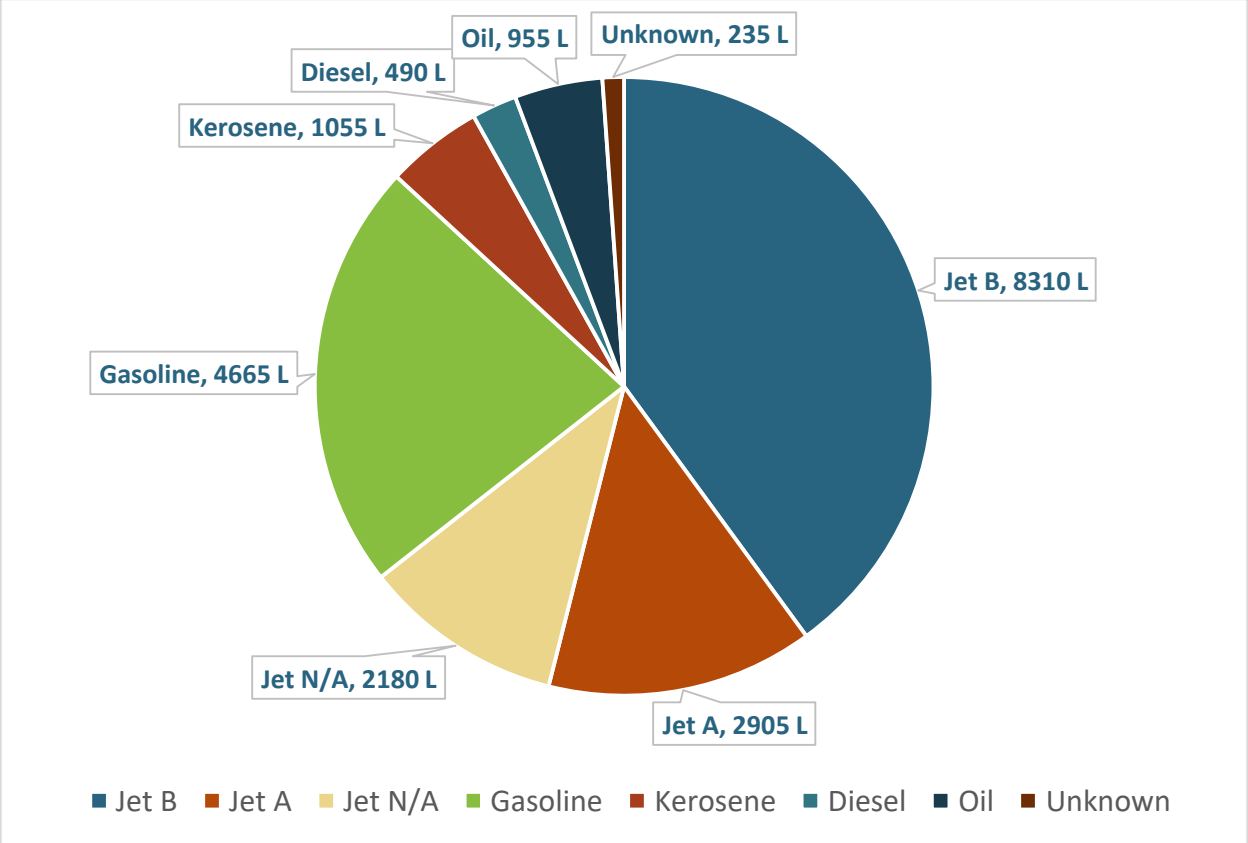
3.1 Fuel in Drums

There are 304 drums with various fuels on site accounting for currently an estimated 20,800 L of waste fuel. The various labels on drums categorized them into 7 fuel groups with 1% of the drums being unknown fuel. There are 49 drums that are open and/or had results displaying high-water content. Figure 3-2 shows the breakdown of the types of fuels contained in the drums at the Site.

Lab analysis completed by NOJV during the 2023 field program also identified that despite the drum labelling and drums being sealed, some drums contained fuel and water mixtures. Therefore, any drum which was not full but sealed has the potential to contain some water content. Using this assumption an estimate of approximately 1,655 L of oily waste water can be dissociated from the 20,800 L of waste fuel in the drums.

As well, lab analysis from 2023 indicated that four drums (Group DR23-AW1) marked *piston oil* contain lead content, above the Abandoned Military Site Remediation Protocol (AMSRP) guideline for incineration. These four drums will require removal from the Site and will be management as liquid hazardous waste.

Figure 3-2: Drum Waste Fuel Types and Volumes



Photographs of the drum fuel inventory are provided in **Appendix C.**

3.2 Fuel in Aboveground Storage Tanks (ASTs)

A site figure showing the AST locations and highlighting the ASTs with product remaining is provided in **Appendix A.**

3.2.1 Runway Tanks

There are four 57,727 L vertical storage tanks at the southwest end of the runway three of which currently contain a combined volume of approximately 45,800 L of waste diesel. Tanks 00001914, 00001920, and 00001923 (the Runway Tanks) contain 21,221 L, 17,170 L and 7,427 L of product, respectively (totalling 45,818 L), Tank 30 is separate off to the side and is empty. Testing and analysis of the product in the Runway Tanks in 2023 identified it as diesel and subsequent testing in 2024 determined the diesel has a sulfur content that is higher than current specifications.

3.2.2 Middle and Lower Tank Farms

There are six registered 57,727 L tanks located at the Middle (1) and Lower (5) Tank Farms north of the Main Station complex, along the main road. Tank 00001918 contained approximately 965 L of waste fuel and Tank 00001916 could not be assessed due to damage to its ladder. The other five tanks were confirmed to be empty via inspection from an access hatch on top of the tanks or from an open inspection hatch near the bottom of the tank (Tank 00001922).

3.2.3 Other Above Ground Storage Tanks (ASTs)

There are 31 other ASTs located around the Site. Eleven tanks were confirmed to have fuel remaining within them with a combined volume of approximately 8,600 L. Lab analysis completed by NOJV during the 2024 field program found some of the ASTs have high water content within the fuel caused by the tanks being unsealed and open to the elements. As a result, there is an estimated quantity of 3,650 L of oily waste water that can be dissociated from the 8,600 L fuel total.

Photographs of the tank inventory with waste fuel present are provided in **Appendix C.**

3.3 Fuel Testing Results

In 2023 NOJV completed fuel analysis from the Runway Tanks and collected one representative sample from each drum group as determined by the physical fuel label, drum appearance and proximity to each other. Many drums contained fuel water mixtures, and one drum sample group (DR23-AW) had lead content exceeding the AMSRP incineration protocol guidelines.

In 2024 NOJV completed a full inspection (as possible) of the other 37 ASTs on Site in accordance with Working from Heights protocols. Eleven tanks were found to contain fuel and/or fuel water mixtures. Additionally, a more comprehensive suite of diesel testing was carried out on the Runway Tanks to determine the quality of the diesel and if re-use was possible. The diesel had high sulfur content exceeding the current guidelines.

Refer to **Appendix B** for the 2023 and 2024 fuel analytical results.

4.0 Incinerator Recommissioning

4.1 Incinerator Background

In March 1996 a fuel incineration system with two incineration chambers was brought to the Site by the Nunasi Corporation under contract with PWGSC. The system was used to burn off waste fuel from drums prior to drum crushing. The incinerator was built by the Ketek Group Inc. (Ketek) from Edmonton, AB. The incineration system had a small gas-powered motor driving a single blower with a manifold to six air hoses (three for each incineration chamber). This system had a basic control panel used to ignite the incinerators and pump waste fuel into the two incineration chambers (Figure 4-1 below).

Figure 4-1: Previous Fuel Incineration System in Operation (1996).

During NOJV's 2023 work program the incinerator conditions and parts were documented. The blower/control panel had been stored in the New Garage and incineration chambers were found partially sunk in the mud south of the Runway Tanks (Figure 4-2 below). This sparked an investigation into whether these units could be recommissioned for future incineration of the remaining waste fuels on the Site.

Figure 4-2: Fuel Incinerator Condition in 2023.

In early 2024 NOJV consulted Ketek about recommissioning the incineration system. Ketek advised that the control panel and blower units were likely not operable or up to current incinerator safety standards, however, the incineration chambers could likely be reused provided that the refractory lining was still in good condition.

4.1.1 Current Conditions of the Runway Tanks Berm, Liner and Spill Prevention Measures

In 1996 a fuel containment berm was built around the Runway Tanks. The berm capacity totaled approximately 41,029 L (Figure 4-2 below).

Figure 4-3-2 Original Berm around the Runway Tanks in 1996

The current conditions of the berm have since changed with the addition of a liner placed overtop a drum berm with some exterior soil shaping. The liner is tied down using the weight of some plywood wedged underneath the tanks as well as with soil which may have been placed to protect the liner from tearing. However, there is evidence of tearing of the liner around the northwestern corner of the berm and the drums forming the berm have separated over time, leaving notable sagging of the liner in each of the corners. Photos of the current state of the Runway Tanks and berm conditions are presented in **Appendix C.**

Site visits have shown the berm to hold some pooling water. This pooling water is an accumulation of mostly snow melt as Isachsen receives minimal precipitation throughout the year. The amount of seasonal pooling noted within the berm depends on the year and the timing of the investigation. No PHC sheen or odour has been noted within the pooling water and the water tends to evaporate within the berm by mid to late summer. The minimal volume of seasonal pooling water within the berm is not expected to affect the capacity of the berm as it stands in its current state.

The berm capacity total of 41,029 L, even if rendered leakproof, is insufficient to contain the volume of one of the tanks, plus 10%; all three tanks have the same capacity of 57,727 L. However, at present the volume of product in the fullest of the three tanks is 21,221 L, thus there is approximately 93% additional containment capacity within the berm for the product within the fullest tank. If repaired, the

containment berm will adequately contain a leak caused by failure of any one tank with their current volumes of fuel.

Should more than one of the runway tanks fail, the berm would overfill and lead to leakage primarily in the southwestern direction. A figure showing the Runway Tanks Berm and adjacent topography is presented in **Appendix A.**

4.2 2024 Incinerator Recommissioning Activities

The 2024 incinerator recommissioning activities included an assessment and measurements by ATCO to assist Ketek in preparing their recommissioning plan and parts list. Ketek had on file the original shop drawings and specifications of the system deployed at the Site. Although there was still some uncertainty about the condition of the incineration chambers, the plan was made to fabricate new components for the incinerators in order to bring the system up to the current safety standards and to enable the two incineration chambers to operate independently of one another.

The additions included: individual control panels and blowers for each incinerator, new blower hoses, new fuel lines, a waste oil pump and filter and new ignitors/burners for each incineration chamber. The parts were transported to the Site in July 2024. Six pails of new refractory cement were also brought to Resolute Bay in case the incineration chambers need repair.

On site assembly of the control panels and blower stands was completed by Ketek on July 14-15, 2024. Test burns were completed on the following day.

After connecting the control panels and blowers to each incineration chamber, the incineration systems operated exactly as intended. Certificates from Ketek confirming the recommissioning of the incineration chambers is provided in **Appendix D.** Test burn results are summarized in section 4.2.1. Following successful test burns, the incinerators were disassembled. The sensitive parts (control panels, blowers, waste oil pump and hoses) were stored in the New Garage, and the incineration chambers were sealed (to prevent snow/water from entering the chambers) and left outside as movement was deemed unnecessary and could risk damage to the chambers. Outside storage of the incineration chambers will suffice given that they had been historically stored outside unsealed from 1996 until 2024 without structural damage occurring.

4.2.1 Test Burn Results

Test burns were completed with one drum of each of the major waste fuel types (Diesel, Jet A and B, and Kerosene) being run through the incinerators. Gasoline was not burned on the advice of Ketek because it is too volatile without dilution via mixing with a fuel with a higher flashpoint (i.e diesel or oil). All the fuels burned cleanly with no visible smoke at the certified rate of approximately 113 L/per hour. Each fuel type requires some fuel rate adjustment depending on the volatility (see **Appendix E Incinerator Standard Operating Procedure (SOP)** for fuel rate adjustment instructions).

The pilot burner is required for the initial ignition of fuels as well as assisting with incineration of high-water content and oily fuels. The pilot burner must be supplied with clean diesel at an intake rate of 16 L/hour until a steady state of incineration is achieved. During a test burn of high-water content fuel, the pilot flame went out which caused water to pool at the bottom of the incineration chamber. The water pooling was rectified by turning on the pilot burner for a few minutes which evaporated the watery fuel mixture out of the chamber.

Constant monitoring of the incinerators while in operation is a requirement. As well, a 3 hr cooldown of the incineration chambers is required where the blowers are running with no fuel or ignition source on.

The incinerators must be setup and operated in accordance with the layout and procedures as outlined in **Appendix E: Incinerator SOP**. It is advised that mixing tanks be used to supply the waste fuel to the incinerators for continuous operation.

5.0 Fuel Reduction Plan

5.1 Safety and Environmental Considerations

5.1.1 Setup and Location, Spill Plan and Equipment Required for Area of Incinerator Operation

5.1.1.1 Location

The proposed incinerator operation location is on the southern side of the runway, west of the Runway Tanks as shown in the figure included as part of **Appendix E: Incinerator SOP**. The setup will require a minimum area of 90 m^2 for adequate spacing of all the components of the fuel incineration system. This proposed location is ideal due to the firmer ground offered by the runway edges. The ground firmness is an important safety factor providing favorable working condition for both personal and the heavy equipment used for maneuvering drums and tanks around. Firm ground also lessens the sinking and rutting of the service vehicles and possibilities of a spill cause by unstable ground. The location also allows for efficient transfer requiring less pumping pressure from the runway tanks as it is downhill of the tanks so fuel from the runway tanks can simply flow via hoses and hydrostatic pressure, regulated by valves at the tanks and at the incineration area end point.

5.1.1.2 Spill Response Plan

A site-specific Spill Response and Mitigation Plan should be prepared by the personal undertaking the Fuel Reduction Plan. Specifying areas of concern, clean-up equipment and actions to be taken in the case of a spill. All personal working on the Fuel Reduction program must be adequately trained for the tasks they are undertaking.

5.1.1.3 Additional Equipment Required

A few clearly marked clean-up kits in locations to be determined within a Spill Response and Mitigation Plan must include, at minimum, the following items:

- Personal protective equipment appropriate for the chemicals present
- Absorbent material or other methods to contain the spills (e.g., sand, absorbent socks, etc.)
- Neutralizing material
- Shovel, scoops, pans, containers, vacuum/pumps, broom, and dustpan, as needed, and made of appropriate material
- Heavy-duty trash bags or containers for the waste
- Labels for identification of the hazardous waste

- Caution tape to isolate the spill area
- First aid supplies, where appropriate

A mounted and covered 10lb ABC fire extinguisher (or larger) is required near incineration operations to meet requirements outlined by Occupational Safety Act O. Reg. 213/91, s. 53 (1). for construction projects.

Ten additional portable rig mats are required to aid with maneuverability, surface stability and minimize sinking and rutting at the incineration area will be required during incineration activities.

Two steel UN rated mixing tanks (~1,300 L) for regulation compliant transport or storage of waste fuels will be required. One for each incinerator to allow for proper mixing of waste fuels as per the Incinerator SOP found in **Appendix E**, thereby reducing down-time and facilitate the continual mixing of waste fuels and incinerator operation.

Five 1,250 L IBC plastic totes for oily water separation of high-water content fuels. The plastic sides will allow visual identification of the thickness of the floating phase (fuel) so that it can be drawn off for incineration. When the job is complete these totes can be relocated offsite while containing waste water which cannot be incinerated in the future.

A portable spill containment berm capable of containing the capacity of the largest mixing tank (~1,300 L) or drums plus 10% the volume of the sum of all storage tanks within the secondary containment berm

Approximately 50-100 bung caps and adhesive sealers for sealing open or cracked fuel drums to prevent water entry and residual fuel escape until crushing or decommissioning can be completed.

A field-erected shelter or tent for the incinerator operators to stay dry while monitoring the incineration activities.

A submersible or adequately equipped (intrinsically safe) pump and minimum 100 m hose for fuel transfer from the Runway Tanks and other ASTs into the mixing tanks or drums.

A Rotary Drum Pump for drum fuel transfer

A drum grabber attachment for the on-site Kubota backhoe or Komatsu loader to transport full drums to the incineration area.

Two 8000-Watt generators capable of an output Voltage of 125/250 VAC, 30 Amperes, at a frequency of 60Hz in Phase 1 operation

5.1.2 Transfer of Fuels

5.1.2.1 Drums

To prevent accidents and back strain, a steel drum grabber attached to the forks of the Komatsu loader or Kubota backhoe should be used to transfer drums over long distances. Given the large number of drums, a double drum grabber is recommended.

Where machine access is not possible, drums must be propped upright and inspected for leaks prior moving the drum to a machine accessible spot. Missing bung caps need to be replaced with a new bung cap prior to movement. If drum leaks are observed the drum must immediately be oriented to a position that minimizes leaking and implement spill kits to clean the impacted area. If drums are compromised or suspected of being compromised the contents must be transferred to sturdy new containers prior to movement.

The transfer of fuel from any fuel drum should be completed using a proper drum pump. When transferring fuels into a mixing tank for incinerator operation see the Incinerator SOP in **Appendix E** for product mixing information and recommended proportions.

5.1.2.2 Runway Tanks

Fuel transfer from the large ASTs at the runways should be completed by installation of a fuel line into the main valve of Tank 00001914. Tank 00001914 (western-most tank) is the only tank with a suitable main valve for a fuel line connection. A valve on the other end of the fuel line will be used to control the flow to the incinerator mixing tanks as needed. Both valves will be shut off when fuel is not being transferred to the mixing tank.

Tank 00001914 will be drained of fuel first, then a portable intrinsically safe pump will be used to transfer fuel from Tank 00001920 and then from Tank 00001923 into Tank 00001914 in separate stages. This will allow the hose with double valves from Tank 00001914 to continue to feed the mixing tank at the incinerator area as needed and set by the operators.

5.1.2.3 Other ASTs

Fuel transfer from the other ASTs will require pumping their contents to sturdy new drums or to a fuel separation tote which can then be transported to the incinerators. A mobile tote needs to be CSA certified and securely attached to the forks of the loader.

Access to some ASTs will require personal trained in working at height and a 26 ft ladder for accessing Tank 00001916 to determine if product exists.

5.2 Recovery and Management of Emptied Drums and Tanks

Once the waste fuel was been removed from the drums, they will be sealed and consolidated at one location for future processing and crushing during the next phase of the decommissioning activities at the Site.

Following removal of the waste fuels from the ASTs, a licensed petroleum fitter will need to certify the tanks as out of service and updates will need to made to FIRSTS database. Removal of any sludge or residual fuels that cannot be removed using the pump during the Fuel Reduction program will occur during the next phase of the decommissioning activities at the Site. As well, the tanks abatement (lead paint) and actual deconstruction will also occur during the next phase of the decommissioning activities at the Site.

6.0 Schedule for Fuel Reduction Activities

6.1.1 Estimated Duration of Incineration Activities

Each incinerator has an average fuel burn rate of 113 Liters per hour. The total fuel volume to be incinerated is approximately 76,200 Liters. An operation time of at least 10 hours per day would allow for daily inspections and maintenance of the incineration system including the 3 hour cool down period. Barring any down-time for repairs that cannot be effectively mitigated on-site and unforeseen weather delays, the time needed to incinerate all the fuel at Isachsen is approximately 34 days.

The typical separation time required for water to dissociate from a fuel mixture is a half hour and batches will be decanted very day. This operation would be done concurrently with burning so would not add time to the overall duration.

Five days will likely be needed to set up the incineration area and prepare the large mixing tanks for commencement and three days for teardown thus an approximate 42-day field program will be required for total fuel reduction.

6.1.2 2025-26 Proposed Field Schedule and Activities

The proposed field schedule for 2024 Fuel Reduction Plan is:

Date	Fuel Reduction Activities
June 20th – June 23rd	Mobilization to Site; Set up of the camp
June 24th	Mobilization of Incineration Operations Personal
June 25th — June 30thth	Setup of Incineration Area
July 1st – Aug 3rd	Incineration of Waste Fuels
Aug 4th to 7th	Teardown of Incineration Area, storing the sensitive incinerator parts in the New Garage
Aug 8th	Shipping out of oily water and piston oil (hazardous liquid waste)

7.0 Summary and Conclusions

There are approximately 76,200 litres (L) of waste fuel currently on the Site. The fuels are contained in varying quantities at four identified locations: Drums, Runway Tanks, Middle/Lower Tank Farms, and 31 Other ASTs. The fuel types are diesel (52,224L), jet fuel, A and B (13,395 L), gasoline (4,665 L), kerosene (1,055 L), oily water (5,302 L) and other (1,190 L).

In the incinerator recommissioning program conducted in the field season of 2024, the incineration chambers that were present on site were upgraded with modern control panels, blowers, pilot burners, and waste fuel pumps. The incinerators were recertified by their original manufacturer, Ketek Group Inc. and tested with the major types of waste fuel present, with the exception of gasoline. The burn rate is 113 L/per hour for all types of fuel. Gasoline must be mixed with other fuels with a higher flashpoint to be incinerated. A standard operating procedure (SOP) for the incinerators has been produced and is included as an appendix to this report.

A plan to incinerate all of the fuel in the 2025 field season has been developed. An incinerator operation area would have to be set up, with the fuel separation mixing tanks, generators for electrical power and the incineration units themselves. A location and a schematic of the operation area is contained in **Appendix E: Incinerator SOP**. Additional equipment required to complete the fuel reduction plan includes: mixing tanks, oily water and fuel separation totes, drum grabber for the loader on site, and spill kits. The fuel reduction plan would have a duration of approximately 42 work days. Following the reduction / removal of waste fuels, the required steps could be taken to properly render the registered tanks out of service.

Closure

This report was prepared exclusively for the purpose, project, and site locations outlined in the report. The report is based on information provided to, or obtained by, Nuqsana-Outcome as indicated in the report, and applies solely to site conditions and the regulatory and planning frameworks existing at the time of the site investigation. Nuqsana-Outcome's report represents a reasonable review of available information within an established work scope and schedule.

This report was prepared by Nuqsana-Outcome for the sole benefit of our federal client. The material in it reflects Nuqsana-Outcome's best judgment in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Nuqsana-Outcome accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We trust that this information is satisfactory for your requirements.

Sincerely,

NUQSANA-OUTCOME JOINT VENTURE

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8.0 References

Canada. *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulation* (amended October 2020).

CCME. *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* (PN 1326)

Dillion-Outcome Joint Venture (DOJV) 2023. *Isachsen High Arctic Weather Station Data Gap Analysis Report*. December 2023

INAC. *Abandoned Military Sites Remediation Protocol, Volume 1 – Main Report.* December 2008.

Nuqsana-Outcome Joint Venture Inc. (NOJV) 2024. *2023 Environmental Site Assessment (ESA) Summary Report, Isachsen High Arctic Weather Station (HAWS), Nunavut.* March 2024