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SOW Ref: 16.F.5.d



# 2020 ANNUAL NUNAVUT WATER BOARD

## REPORT FOR BAF-3

FOR THE

### North Warning System

Contract # W8485-100224/001/NX

SOW Ref: 16.F.5.d

Document Number

NWB-B3-2020, Rev 1, 18-Mar-2021

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## ENGLISH EXECUTIVE SUMMARY FOLLOWS

பார்வையெடுப்பதற்கும் குறையாக விரைவாக விடும் பார்வையெடுப்பு முறை என்று அழைகிறோம்.



## EXECUTIVE SUMMARY

This 2020 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada (RC) for the Department of National Defence (DND) in order to meet the requirements of Part B "General Conditions", paragraph 1 of its licence 8BC-BAF1929 issued on 01-Sep-2019. This report covers 01 January to 31 December 2020.

RC is the Operation and Maintenance Contractor for the North Warning System (NWS), including BAF-3, the unattended (unmanned) North Warning System radar site located on Brevoort Island, Nunavut. The site is visited quarterly by RC staff based out of Iqaluit, Nunavut for preventive maintenance inspections and as required for other work.

No water was drawn from the water supply lake in 2020. This is below the annual maximum of 1,750 cubic meters allowed by the current licence.

Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. No effluent (berm water) samples were taken in 2020. This monitoring point was discontinued in licence 8BC-BAF1929.

Hazardous waste, including waste oil, was sent to an approved hazardous waste disposal facility outside of Nunavut as required by the licence. The hazardous waste was shipped to Qikiqtaaluk Environmental, through their subcontractor Veolia, 2630, boul. Industriel, Chambly, QC J3L 4V2.

The hazardous waste shipped from BAF-3 in 2020 consisted of 16 drums of various hazardous waste (waste oil, waste oil filters etc.) and three crates of waste batteries.

Non-hazardous domestic solid waste was flown out to the Logistics Support Site in Iqaluit and disposed of at Iqaluit's landfill. RC has documented authorization from the community for receiving the waste.

Three spills to the environment occurred at BAF-3 in 2020:

- 18-Feb-2020, NT-NU Spill #20-050: Staff arrived on-site on 18-Feb-2020 to find that there had been a spill of fuel (Jet-A1) and oil inside the Technical Services Building (TSB). The mixture had leaked through the floor and impacted two areas under the building. An initial investigation of the impacted area under the TSB was completed. Some impacted snow was collected and containerized for off site disposal. Some areas were inaccessible due to snow and ice. The area will be remediated in the summer of 2021.
- 17-Jul-2020, NT-NU Spill #20-226: On 17Jul2020, staff on site at BAF-3 noticed a spill of approximately 500 L of raw sewage. The impacted area was 15 m<sup>2</sup> in total; 9 m<sup>2</sup> of which was inside the pump house. Sewage inside the pump house was containerized and placed back into the treatment system. Sewage that reached the outdoors was containerized and placed back into the sewage treatment system. Some of the sewage may have not been visible because of snow and ice. The area will be visually inspected in 2021.
- 07-Sep-2020, NT-NU Spill #20-319: On 07-Sep-2020, the technicians noticed a 0.5 L spill of engine oil from a dozer which was parked about 2 km from the beach area. The spill impacted an area of 0.1 m<sup>2</sup> of soil. The impacted soil was containerized for off-site disposal. The dozer was taken out of service.

The Spill Contingency Plan was successfully implemented.

Reclamation of the 2015 Jet A1 spill included visual monitoring. Groundwater monitoring was paused in 2020 due to travel restriction imposed by the COVID-19 pandemic. Remediation efforts will resume once border restrictions are eased.

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## 1.0 INTRODUCTION

This 2020 Annual Report for the Nunavut Water Board (NWB) has been prepared by Raytheon Canada (RC) for the Department of National Defence (DND) in order to meet the requirements of Part B "General Conditions", paragraph 1 of its licence 8BC-BAF1929 issued 01 September 2019. This report covers 01 January to 31 December 2020.

RC is the Operations and Maintenance Contractor for the North Warning System (NWS), including BAF-3, the unattended (unmanned) North Warning System radar site located on Brevoort Island, Nunavut. The site is visited quarterly by RC staff based in Iqaluit for preventive maintenance inspections and as required for other work.

### 1.1 Report Details

Licensee: Department of National Defence, Government of Canada  
Licence: 8BC-BAF1929 – Type "B"  
Location: BAF-3 North Warning System Site, Brevoort Island, Qikiqtani Region, Nunavut  
Report Prepared by: Alaina Leslie and Reviewed by Don Beattie  
Raytheon Canada Limited, 17-Mar-2021  
Time period covered: 01 January to 31 December 2020

## 2.0 WATER USE

No water was drawn from the water supply lake in 2020. This is below the annual maximum of 1,750 cubic meters allowed by the current licence.

A total of 312.9 cubic meters was consumed from the raw water holding tanks.

## 3.0 HAZARDOUS WASTE AND WASTE OIL DISPOSAL

Hazardous waste, including waste oil, from BAF-3 were sent to an approved hazardous waste disposal facility outside of Nunavut as required by the licence. The hazardous waste was shipped to Qikiqtaaluk Environmental, through their subcontractor Veolia. See Table 3-1 for the list of items sent for disposal.

See Annex A for the shipping document including the completed movement documents for waste regulated under the Transportation of Dangerous Goods Regulations (TDGR) and NWS Manifests for non-regulated waste.

The hazardous waste shipped from BAF-3 in 2020 consisted of 16 drums of various hazardous waste (waste oil, waste oil filters etc) and three crates of waste batteries.

**Table 3-1: Hazardous Waste and Waste Oil Sent for Disposal from BAF-3 in 2020**

Description, TDG shipping name	Quantity	Movement Document or Manifest #
Waste oily rags	3 Drums	Movement Document 2539190-5
Waste solids containing flammable liquids, n.o.s (fuel, aviation, turbine engine)		
Waste paint flammable	2 Drums	Movement Document 2539190-5
Waste paint		
Waste batteries, wet, filled with acid	2 Crates	Movement Document 2539190-5

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Description, TDG shipping name	Quantity	Movement Document or Manifest #
Waste oil filters Not TDG regulated	1 Drum	NWS Manifest 41880
Waste Fuel and Water Mixture Waste Fuel, Aviation, Turbine Engine Mixture	2 Drums	Movement Document 2539190-5
Waste oil Not TDG regulated	8 Drums	NWS Manifest 41882, 41883
Waste Dry Batteries Not TDG Regulated	1 Crate	NWS Manifest 41888

#### 4.0 NON-HAZARDOUS SOLID WASTE DISPOSAL

Non-hazardous domestic solid waste was flown out to the Logistics Support Site in Iqaluit and disposed of at Iqaluit's landfill. RC has documented authorization from the community for receiving the waste. Some non-hazardous waste was incinerated on-site and the waste ash was containerized in 29 barrels and shipped south.

See Table 4-1 for the quantity of waste generated.

**Table 4-1: Non-hazardous Domestic Solid Waste Sent for Disposal from BAF-3 in 2020**

Month	Waste Generated (kg)
January	0
February	0
March	660
April	200
May	0
June	0
July	125
August	50
September	800
October	80
November	32
December	0
<b>TOTAL</b>	<b>1947</b>

#### 5.0 MONITORING PROGRAM

In 2020, a monitoring program was implemented at BAF-3 as required by the water licence, Part J. The monitoring program included the following:

1. Volume of raw water drawn from the water Supply Lake (BAF-1). The information gathered from this requirement is shown in **Section 2.0 Water Use**. The volume of water drawn was within the limit stated in the water licence.
2. Quality of sewage discharged from the final discharge point of the sewage disposal facility (BAF-2). The location of the sewage effluent outfall is shown in **Annex C: Sewage Effluent Outfall (BAF-2) Location with Coordinates**. A sump for the sewage outfall was constructed

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in 2010. The sewage outfall sump was not sampled in 2020 because the sewage sump was not pumped out. **Analysis of Discharged Sewage Effluent** has been left blank.

3. Final Discharge Point from the Landfarm Facility (BAF-3). No samples were taken in 2020.
4. Final Discharge Point of the Bulk Fuel Storage Facility (BAF-4). Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. As there are no intact berms, sampling location BAF-4 has been discontinued in licence 8BC-BAF1929. **Analysis of Berm Water** has been left blank.
5. Groundwater monitoring activities (BAF-5). Groundwater monitoring of the 19-Mar-2015 Jet A1 spill was paused in 2020 because of border restrictions imposed due to the COVID-19 pandemic. Monitoring activities will resume once travel restrictions have eased. A summary of the work completed to date is included in **Monitoring Activities**.

## 6.0 SPILLS (UNAUTHORIZED DISCHARGES)

Three spills to the environment occurred at BAF-3 in 2020. The spills consisted of 110 L of Jet-A1 fuel and oil, 500 L of sewage, and 0.5 L of engine oil. Table 6-1, below, describes the spill (unauthorized discharge) details.

The Spill Contingency Plan was successfully implemented.

Table 6-1: Unauthorized Discharges at BAF-3 in 2020

Date, NT-NU Spill #	Product	Quantity	Cause and follow-up action	On-site location
18-Feb-2020, Spill # 20-050	Jet-A1 Fuel and Oil	110 L	<p>Staff arrived on-site on 18-Feb-2020 to find that there had been a spill of fuel (Jet-A1) and oil indoors at BAF-3. Staff investigated and found that the fuel/oil mixture had leaked through the floor and impacted two areas under the building, one approximately 1.5 m<sup>2</sup> and the other approximately 2.2 m<sup>2</sup>.</p> <p>An initial investigation of the impacted area under the TSB was completed. Some impacted snow was collected and containerized. Some areas were inaccessible due to snow and ice. The area was visually inspected by RC personnel in 2020, however, some ice remained at the time of inspection. Later in the season the area was visually inspected by DND personnel and staining was found.</p> <p>The area will be remediated in the summer of 2021.</p>	Technical Services Building: PGS Area, DEG-2 (63°20'25.82"N, 64° 9'27.84"W)

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Date, NT-NU Spill #	Product	Quantity	Cause and follow-up action	On-site location
17-Jul-2020, Spill # 20-226	Sewage	500 L	On 17Jul2020, staff on site at BAF-3 noticed a spill of ~500 L of raw sewage. The impacted area was approximately 15 m <sup>2</sup> in total; 9 m <sup>2</sup> of which was inside the pump house and the rest impacted the snow outside the pump house. The distance from surface water is about 1.2 km. It was determined that the weight of the snow broke the rubber coupling split on the secondary waste storage tank B3-WW. Sewage was containerized and placed back into the treatment system. Some of the sewage may have not been visible because of snow and ice. The area will be visually inspected in 2021.	Inside and outside of sewage pump house building (63°20'25.76"N, 64° 9'28.85"W)
07-Sep-2020, Spill # 20-319	Engine Oil	0.5 L	On 06-Sep-2020, the technicians on site were using the dozer to support gravel crushing. When the technicians were done, they parked the dozer ~2km away from the beach site.  On 07-Sep-2020, technicians discovered that the parked dozer had released a small volume of oil. It was determined that the spill was of 0.5L of Engine Oil (15W40). The spill impacted an area of 0.1m <sup>2</sup> of soil. The soil was picked up with shovels and transferred into a salvage drum. The dozer has been taken out of service until the front seal is replaced.	2 km from beach, off the road (63°19'44.14"N, 64° 9'10.28"W)

## 7.0 REVISIONS TO THE SPILL CONTINGENCY PLAN

The Spill Contingency Plan was updated on 6-Jan-2021. An updated copy of the Spill Contingency Plan has been submitted to the NWB with this annual report.

## 8.0 PROGRESSIVE RECLAMATION WORK UNDERTAKEN

2020 was the sixth year of clean-up following the 19-Mar-2015 fuel spill. Because of COVID-19 sub-contractors were unable to attend the site. The area was visually inspected and monitoring will resume when border restrictions have eased. A summary of the work completed in 2020 is included in **Monitoring Activities**.

## 9.0 ACRONYMS

Table 9-1: Acronyms

Acronym	Definition
MW	Monitoring Well
NAPL	Non-Aqueous Phase Liquids
NWB	Nunavut Water Board
NWS	North Warning System

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NWSO	North Warning System Office
PHC	Petroleum Hydrocarbons
RC	Raytheon Canada Limited
RW	Recovery Well
SVE	Soil Vapor Extraction
TDGR	Transportation of Dangerous Goods Regulations
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compounds

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## ANNEX A. HAZARDOUS WASTE AND WASTE OIL DISPOSAL IN 2020

The 2020 Movement Documents for TDG Regulated waste and NWS Manifests for non-TDG Regulated waste (as described in Table 3-1) are copied in this Annex.

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**MOVEMENT DOCUMENT / MANIFEST  
DOCUMENT DE MOUVEMENT / MANIFESTE**

This Movement document/manifest conforms to all federal and provincial transport and environmental legislation. Ce document de mouvement/manifeste est conforme aux législations fédérales et provinciales sur l'environnement et le transport.

2539190-5



## SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By: <b>RRANSOM</b>	Date: <b>Jul 26, 2020, 10:48 AM</b>	Project ID:	Task ID:
			<b>TCN-41880</b>

Ship To: <b>QIKIQTAAULK ENVIRONMENTAL (QE) C/O VEOLIA 2630, BOUL. INDUSTRIEL CHAMBLEY, QC, J3L 4V2 1-866-634-6367</b>	From: <b>BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818</b>	Priority <b>0</b>
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Attention:	
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Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	SEA LIFT		1 PALLET	100 KG

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
1		100 KG	2002356	WASTE - OIL FILTERS			ASSET 351730
0							ALL ON ONE PALLET / DIMS: 48 X 48 X 45 / TOTAL WEIGHT 100 KG

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By: \_\_\_\_\_ Date: \_\_\_\_\_

Received By: \_\_\_\_\_ Date: \_\_\_\_\_



## SHIPPING MANIFEST

Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By: <b>RRANSOM</b>	Date: <b>Jul 26, 2020, 11:06 AM</b>	Project ID:	Task ID:
			<b>TCN-41882</b>

Ship To: <b>QIKIQTAAULK ENVIRONMENTAL (QE) C/O VEOLIA 2630, BOUL. INDUSTRIEL CHAMBLEY, QC, J3L 4V2 1-866-634-6367</b>	From: <b>BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818</b>	Priority <b>0</b>
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Attention:	
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Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	SEA LIFT		1 PALLET	800 KG

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
4			2002406	WASTE - OIL, 45 GAL			ASSET 354019 / 354018 / 353236 / 353235
0							ALL ON ONE PALLET / DIMS: 48 X 48 X 45 / TOTAL WEIGHT 800 KG

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By: \_\_\_\_\_ Date \_\_\_\_\_

Received By: \_\_\_\_\_ Date \_\_\_\_\_



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Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By: <b>RRANSOM</b>	Date: <b>Jul 26, 2020, 11:10 AM</b>	Project ID:	Task ID:
			<b>TCN-41883</b>

Ship To: <b>QIKIQTAAULK ENVIRONMENTAL (QE) C/O VEOLIA 2630, BOUL. INDUSTRIEL CHAMBLEY, QC, J3L 4V2 1-866-634-6367</b>	From: <b>BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818</b>	Priority <b>0</b>
--	---	----------------------

Attention:	
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Carrier:	Routing:	Waybill #:	Total Pcs.	Total Weight:
NEAS	SEA LIFT		1 PALLET	800 KG

QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
4		800 KG	2002406	WASTE - OIL, 45 GAL			ASSETS 355497 / 353227 / 353859 / 353860
0							ALL ON ONE PALLET / DIMS: 48 X 48 X 45 / TOTAL WEIGHT 800 KG

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

Received By: \_\_\_\_\_ Date: \_\_\_\_\_

Received By: \_\_\_\_\_ Date: \_\_\_\_\_



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Suite 3000, 400 Cooper Street, Ottawa, ON K2P 2H8

NON NEGOTIABLE

Filled By: <b>RRANSOM</b>	Date: <b>Jul 26, 2020, 12:13 PM</b>	Project ID:	Task ID:				
		<b>TCN-41888</b>					
Ship To: <b>QIKIQTAAULK ENVIRONMENTAL (QE) C/O VEOLIA 2630, BOUL. INDUSTRIEL CHAMBLY, QC, J3L 4V2 1-866-634-6367</b>		From: <b>BAF-3, BREVOORT ISLAND, DND Storeroom Raytheon Canada Limited, NWS LSS Iqaluit, P.O. Box 1089 Iqaluit, NU, X0A 0H0 867-979-4818</b>	Priority <b>0</b>				
Attention:		Attention:					
Carrier: <b>NEAS</b>	Routing: <b>SEA LIFT</b>	Waybill #: <b>TM10556</b>	Total Pcs. <b>1 CRATE</b>				
Total Weight: <b>150 KG</b>							
QTY Order	Type	Line Weight	Item	Description	WO or PO	B/Code or S/N	Remarks
1	150 KG	2002349	WASTE - BATTERIES, DRY, NON-RE				ASSET 355503
0							ALL ON ONE CRATE / DIMS: 36 X 39 X 28 / TOTAL WEIGHT 150 KG

NOTE: All claims related to this shipment have to be filled with Raytheon within 45 hours of receipt.

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Received By:	Date



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## ANNEX B. LOCATION OF LANDFILL WITH COORDINATES



Figure B-1 Coordinates of Landfill Location: 63° 20' 30.00"N, 64° 10' 02.00"W

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## ANNEX C. BAF-3 SEWAGE EFFLUENT OUTFALL LOCATION WITH COORDINATES



Figure C-1: Coordinates of Sewage Outfall Location (Location ID: BAF-2): 63° 20' 21.40"N, 64° 09' 26.63"W

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## **ANNEX D. ANALYSIS OF DISCHARGED SEWAGE EFFLUENT**

The sewage outfall sump was not sampled in 2020 and this annex has been left blank.

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## **ANNEX E. ANALYSIS OF BERM WATER<sup>1</sup>**

Fuel tanks within the berms were demolished in 2012 and 2013, and the berms were intentionally breached in 2012 and 2015. As there are no intact berms, no effluent (berm water) samples (Location ID: "BAF-4") were taken in 2020 and this section has been left blank.

Sampling location ID "BAF-4" was discontinued in licence 8BC-BAF1929.

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<sup>1</sup> Effluent from bermed fuel storage facilities.

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## ANNEX F. MONITORING ACTIVITIES

A Jet A1 fuel release was discovered at the North Warning System BAF-3 radar station (Site) located on Brevoort Island, Nunavut, Canada on 19-Mar-2015. The tank involved in the release was immediately isolated by closing valves. An investigation was conducted to determine the extent of the release, and plans to address the release were prepared. Over the subsequent five summer field seasons of 2015 through 2020, extensive actions were taken to recover the released fuel, define the nature and extent of the release and remediate subsurface impacts.

Overall progress made to date has achieved several goals, including:

1. Completing an extensive additional soil, soil vapor, and water investigation to define the nature and extent of petroleum hydrocarbon impacts; this included establishing and completing on-site laboratory testing and analyses;
2. Ensuring minimal migration of non-aqueous phase liquid (NAPL) using engineering controls and booms in drainages;
3. Construction and operation of soil vapor extraction (SVE) systems in two distinct areas of the release;
4. Maximizing NAPL/fuel recovery, treatment, and analysis of recovered NAPL for reuse on-Site;
5. Conducting soil treatment pilot testing, treatment evaluations, and construction of the soil treatment pile; and
6. Construction, operation, and maintenance of a water treatment system to enable extracting subsurface water to mitigate potential fuel migration of fuel and enhance recovery while maintaining compliance of discharge limits in the Site NWB Water Licence. To date, over 11,200 liters (L) of NAPL has been recovered and collection and over 2,410,678 L of petroleum hydrocarbon contaminated water has been collected and treated.

Groundwater monitoring in 2020 was paused due to the COVID-19 pandemic, other monitoring activities included:

- Visual monitoring of the water collected in cofferdams and surrounding area.

The findings of the work completed during the previous BAF-3 Summary Reports confirm the effectiveness of remediation programs implemented since the 2015. Significant gains have been made towards addressing closure pathway and molding future site activities towards monitoring operations geared towards site closure.

Monitoring and remediation of surface and sub-surface soil and water and application of remaining hydrogen peroxide stock on-site will resume once travel restrictions imposed due to the COVID 19 pandemic have eased.

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