INCINERATOR MANAGEMENT PLAN

MODULE B: 2BE-HOP1222 (WINDY)

CONFORMITY TABLE

Licence	Part	Item	Topic	Report Section
2BE-HOP1222	D	3	The Licensee is authorized to dispose of all acceptable food waste, paper waste and untreated wood products in an incinerator.	Main Document and this Module

B1. Introduction

The Type B Water Licence No. 2BE-HOP1222 issued to TMAC by the Nunavut Water Board (NWB) allows the incineration of approved waste streams.

Old Windy Camp was closed for operations in 2008 and is undergoing closure and reclamation. A New Windy Camp is permitted under the current water licence, but has not yet been constructed. No domestic wastes are produced at Windy Camp and there is no incinerator operated under this Licence. Waste produced in support of the Regional Exploration surface drilling program or generated during water management and licence compliance activities executed under this licence is transported to Doris Camp and managed as part of the Doris Camp waste stream. This waste undergoes the same comprehensive sort-at-source and segregation processes as domestic wastes generated at the Doris Camp. Waste is collected and transferred to the centralized waste management area at Robert Bay for timely incineration.

The Incinerator Management Plan has been prepared and is being submitted by TMAC to address the requirement specified in Part G, Item 5 of the 2AM-DOH1323 Water Licence, and also includes the plan for incineration throughout the Hope Bay belt. The plan addresses all relevant aspects of waste stream management, and the operation, maintenance and monitoring of incinerator units used to burn permitted wastes. The plan includes the management and disposal of all residual ash waste generated by the operation of the incinerator.

B1.1 Background

B1.1.1 Overview of Windy Incineration Compliance

Domestic waste is not produced at Windy Camp and is managed as part of the Doris Camp waste stream. Incineration at Doris North, under the prior project owner, was demonstrated to comply with the relevant Canada-wide Standards for incinerator emissions, through effective waste segregation and efficient burn practices. It is the aim of TMAC to continue implementing the practices that reduce the probability of formation of pollutant compounds during waste incineration.

B2. Incinerator Management at Windy

There is no incinerator operated at Windy Camp at this time.

B3. Monitoring and Evaluation

TMAC is required to report a summary of waste disposal activities in the 2BE-HOP1222 Licence Annual Report by March 31 of each year. No wastes are currently deposited under the 2BE-HOP1222 Licence. All incinerator monitoring is reported under the 2AM-DOH1323 Licence Annual Report.

Records of materials deposited to the landfill (when constructed), including qualifying incinerator ash, will be reported annually to the NWB per the relevant requirements of the Licence.

INCINERATOR MANAGEMENT PLAN

HOPE BAY, NUNAVUT

April 2016

PLAIN LANGUAGE SUMMARY

This Plan describes the waste management processes at Hope Bay relevant to on site incineration. This Plan ensures that 1) only appropriate burnable material enters the incinerator waste stream, 2) animal attractants are promptly incinerated, 3) the incinerator is operated in a manner that reduces harmful emissions, 4) residual ash is handled and disposed of properly, and 5) that all compliance monitoring and reporting associated with incinerator operations occurs.

REVISION HISTORY

Revision #	Date	Section	Summary of Changes	Author	Approver
0	May 2009		Initial issuance of Incinerator Management Plan		HBML
1	Feb 2012		Update and revise Incinerator Management Plan	KBL Environmental	HBML
1.1	Mar 2012		General document revision	HBML	HBML
2	Sept 2015		Updated to TMAC ownership and format, added glossary, added plan implementation information, update 2AM- Licence number references and requirements, add related documents and relevant legislation tables, updated information on incinerators in use, updated ash management section, included reference to NPRI reporting, added contingencies section	TMAC	TMAC

GLOSSARY AND ACRONYMS

TERM	DEFINITION
CCME	Canadian Council of Ministers of the Environment
CWS	Canada-wide Standards
NIRB	Nunavut Impact Review Board
NPRI	National Pollutant Release Inventory
NWB	Nunavut Water Board
PCDD	Poly-chlorinated dibenzo-dioxin
PCDF	Poly-chlorinated dibenzo-furan
PVC	Poly-vinyl chloride
TDG	Transport of Dangerous Goods (Act or Regulations)
TMAC	TMAC Resources Inc.

TABLE OF CONTENTS

List of Tables

1. INTRODUCTION

This Hope Bay Incinerator Management Plan (the Plan) has been prepared by TMAC Resources Inc. (TMAC) in accordance with the water licences held by TMAC. The Plan is intended primarily for use by TMAC and its contractors to ensure that best practices for domestic waste incineration are followed, and that the conditions of water licences and project permits are met.

This Plan is structured in a manner such that one document pertaining to domestic waste incineration is approved and implemented across all TMAC Hope Bay project sites, while still addressing site- and licence-specific needs. The main document outlines TMAC's approach to domestic waste stream segregation and incinerator management as it pertains to all TMAC Hope Bay developments. Appended modules provide details for each site and the associated water licence. In the event of a new water licence, or an existing licence amendment, only the specific modules pertaining to that licence and site will need to be revised. This is intended for consistency and efficiency across operations and for compliance management.

1.1. OBJECTIVES

The main objective of this Plan is to ensure domestic waste incinerators are operated in a safe, efficient and environmentally-compliant manner. Consistent with TMAC's intent to be a responsible operator, these objectives are described as follows:

- Compliance with the Environmental Guidelines for the Burning and Incineration of Solid Waste (Government of Nunavut Environmental Protection Division)
- Compliance with the Environment Canada Technical Document for Batch Waste Incineration
- Compliance with the Canadian Council of Ministers of the Environment Canada-Wide Standards for Mercury Emissions and Dioxins and Furans
- Compliance with Project Certificate and Water Licence requirements;
- Prevention of public health risk;
- Protection of the operator;
- Protection of surface and ground water;
- Protection of land;
- Protection of local flora and fauna species; and
- Conservation of resources.

This Incinerator Management Plan has been developed to ensure that these factors are built into the TMAC operational approach at Hope Bay. It discusses the importance of waste management and reduction of specific waste streams to ensure Canada Wide Standards (CWS) for dioxins, furans and mercury are achieved.

1.2. Relevant Legislation and Guidance

Table 1 List of federal and territorial regulations governing the Hope Bay Incinerator Management Plan

Regulation/Guideline	Year	Governing Body	Relevance
Canada Wide Standards for Dioxins and Furans	2001	Environment Canada	Contains stack testing requirements triggered by waste volumes incinerated, and numeric targets for dioxins and furans.
Canada Wide Standards for Mercury Emissions	2000	Environment Canada	Contains numeric targets for mercury.
Technical Document for Batch Waste Incineration	2010	Environment Canada	Contains recommendations for batch waste incineration to achieve emissions compliance.
Environmental Guideline for the Burning and Incineration of Solid Waste	2012	Government of Nunavut – Department of Environment	Identifies pollutants of concern, outlines best management practices for burning of wastes, types of wastes that can be burned, and ash management.
Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities	2011	Government of Nunavut – Department of Environment	Provides the criteria that determines if process residuals (incl. incinerator ash) may be disposed in a municipal landfill, or is classified as a hazardous waste.

Canada-wide Standards (CWSs) are intergovernmental agreements developed under the *Canadian Council of Ministers of the Environment* (CCME). CWSs can include qualitative or quantitative standards, guidelines, objectives and criteria for protecting the environment and reducing risks to human health. Canada has identified dioxins, furans and mercury as emission products that need to be managed as they pose a potentially significant health and environmental threat. Hope Bay's Project Certificate and NWB water license for the Doris North Project states that these emissions must be in compliance with the CWSs for dioxins, furans and mercury.

The Technical Document for Batch Waste Incineration was issued by Environment Canada in January 2010 and is intended to act as a guideline for owners and operators of various incinerators. The technical document focuses on batch waste incinerators ranging in size from 50 to 3,000 kg of waste per batch. Batch waste incinerators are those that operate in a non-continuous manner (i.e. they are charged with waste prior to the initiation of the burn cycle, and the door remains closed until the ash has cooled inside the primary chamber). Batch waste incineration is the type of incineration process utilized at Hope Bay for domestic wastes.

The document recommends and describes a six-step process for batch waste incineration:

Step 1 – Understand Your Waste Stream.

Step 2 – Select the Appropriate Incinerator (or Evaluate the Existing System).

Step 3 – Properly Equip and Install the Incinerator.

Step 4 – Operate the Incinerator for Optimum Combustion.

Step 5 – Safely Handle and Dispose of Incinerator Residues.

Step 6 – Maintain Records and Report.

The batch waste incineration document addresses proper system selection, operation, maintenance and record keeping, with the goals of achieving the Canada-Wide Standards for dioxins/furans and mercury, and reducing releases of other toxic substances.

The Environmental Guideline for the Burning and Incineration of Solid Waste produced by the Government of Nunavut provides guidance for incineration and ash disposition best management practices to reduce risk to the environment.

The Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities governs deposition of process residuals into municipal landfills in Nunavut, but it is expected that the TMAC Landfill Management Plan (when developed), will contain similar criteria to determine acceptable wastes for landfilling at Hope Bay, or for determining alternate disposition of incinerator bottom ash classified as a hazardous waste if sampling determines it contains pollutants of concern.

1.3. Related TMAC Documents

The documents listed in Table 2 are expected to be referenced and utilized in conjunction with the Incinerator Management Plan.

Table 2 List of documents related to the Hope Bay Incinerator Management Plan

Document Title	Year	Relevance
Non-Hazardous Waste Management Plan (revision *in prep.* to include Landfill)	2012 (revision *in prep.*)	Describes management of non-hazardous solid waste segregated from the incinerator waste stream and disposal of incinerator ash.
Hazardous Waste Management Plan	2012 (revision *in prep.*)	Describes management of items such as batteries, aerosol containers and other materials not acceptable for incineration or landfilling.
Air Quality Management Plan	2015 (revision *in prep.*)	Describes the air quality monitoring programs associated with the Hope Bay Project, including stack testing of incinerators.
Safe Waste Incineration Standard Operating Procedure	2014	Describes safe work procedures for operation of incinerator units at Hope Bay.
Solid Waste Segregation, Handling and Disposal Standard Operating Procedure	2015	Outlines waste segregation required by all personnel working at Hope Bay and proper handling and disposal procedures.
Kitchen Food and Waste Handling Storage	2014	Describes proper handling and storage procedures of food wastes by all personnel at Hope Bay.

Incinerator Ash Sampling		Describes the procedure for collecting composite ash samples to be submitted for laboratory analysis.

The Incinerator Management Plan is supported by a set of working procedures that provide detailed instructions on such topics as waste sorting, operation of specific models of incinerators in use, and ash sampling protocols. The procedures contain the various forms and checklists required to ensure the appropriate records are maintained concerning all incinerator operations.

1.4. Plan Management

The Vice President of Operations (VPO) has the overall responsibility for implementing this management plan and will provide the on-site resources to operate, manage and maintain all incinerators located in the Hope Bay Belt in accordance with the operation manuals and regulatory requirements.

The Surface Manager is responsible for providing on-site support and resources for waste stream management and incineration of domestic waste, including monetary resources for completing maintenance and repairs.

The Site Services Supervisor is responsible for revising this management plan and will maintain waste incinerator records, conduct and record regular inspections of the incinerators, request maintenance or repairs and document completion of the request, provide feedback on operational procedures to improve performance, and will supervise the operation of the incinerators, including sampling and disposition of ash.

The Environmental Coordinator is responsible for supporting the Site Services Supervisor for revisions (where required) to this plan, coordinating ash characterization analyses to identify appropriate disposal options, conducting workplace inspections and performing regular audits of the waste management and incineration records.

1.5. Plan Implementation

In accordance with the requirements of the General Conditions (Part B) of the applicable water licences, this plan will be implemented following its submission, subject to any modifications proposed by the NWB as a result of the review and approval process.

This plan will be periodically reviewed and updated as required as the Project moves through operations and final closure and reclamation.

Additionally, the detail in the document will continue to be refined with subsequent revisions.

2. Incineration Management Issues

Waste management at Hope Bay has made substantial advances and improvements since activity in the Project area started. Dedicated facilities allow for centralized collection, sorting and proper packaging for various forms of waste products. This may include on-site incineration or preparing waste for transport to a waste transfer station for further recycling, treatment or disposal. Any waste that meets the requirements for on-site incineration is burned on site. For more information regarding hazardous or non-hazardous waste management at Hope Bay refer to the following documents:

- Hope Bay Hazardous Waste Management Plan
- Hope Bay Interim Non–Hazardous Waste Management Plan
- Hope Bay Non Hazardous Waste and Landfill Management Plan (in prep. – currently the Interim Non-Hazardous Waste Management Plan)

Under no circumstances does TMAC allow personnel or contractors to burn hazardous waste. Hazardous waste and industrial waste are kept separate and temporarily stored according to regulations until shipped off site for disposal or recycling at approved facilities. Site incinerators are only approved to burn "domestic" camp waste such as kitchen waste, food scraps, camp room and restroom garbage, cardboard, paper and sewage sludge cake.

2.1. Waste Stream Management

The first steps to ensuring that effective and compliant incineration occurs is to ensure proper waste segregation so that inappropriate wastes do not make it into the waste stream destined for the incinerator and to understand the resulting composition of the wastes to be incinerated.

2.1.1. Management Response

2.1.1.1. Waste Stream Composition and Segregation

Only appropriate domestic camp waste is permitted for incineration. All wastes are segregated at the source to ensure non-burnable waste streams do not enter the feed stock for the incinerator. All "burnable" waste is placed in specifically identified waste containers with transparent bags and in bins located throughout the camp facilities. Prior to loading the waste batches in the incinerator, the feed material is visually inspected by the incinerator operator to ensure it does not contain inappropriate waste materials. General classes of inappropriate wastes include, but are not limited to:

- Hazardous Wastes
- Mercury-containing materials/waste (fluorescent lamps, thermometers, thermostats)
- Asbestos waste
- Liquid wastes including petroleum hydrocarbons and untreated liquid sewage (sewage sludge cake may be burned)
- Metal and glass
- Wastes containing mercury, pressure or chemically treated wood
- Uncontaminated plastics, including chlorinated plastics
- Bulky materials such as machinery parts or large metal goods such as appliances
- Radioactive materials such as smoke detectors
- Potentially explosive materials such as pressurized vessels, unused or ineffective explosives
- Hazardous materials such as organic chemicals (e.g. PCBs, pesticides)
- Electronics, batteries, fluorescent light bulbs, whole tires, rubber boots, etc.

When encountered, inappropriate waste material is removed from the incinerator feed, where possible. If the inappropriate waste is too intermixed with the incinerator feed, the bag will be rejected and not incinerated. Removed inappropriate wastes and rejected batches will be stored and handled in accordance with the Hazardous Waste Management Plan. The waste feed inspections shall be recorded on the appropriate forms, and issues with proper segregation and sorting at source in the waste management stream will be addressed by identifying the source or root cause of the issue, re-enforcing or improving training of site personnel, providing additional labelled receptacles, or implementing other measures as needed.

2.1.1.2. REDUCE, REUSE AND RECYCLE

TMAC has adopted the 3R's of waste management: Reduce, Reuse and Recycle. The objective of these activities is to divert as much material from becoming a waste (hazardous or otherwise) and therefore reduce the total volume of wastes requiring handling, storage, transportation and disposal. Some of the most significant actions in this regard include:

Reduce

- Purchasing only the required amounts of materials and buying in bulk when the opportunity is available.
- Employing inventory control methods in an attempt to ensure that quantities of materials are completely utilized.
- Establishing maintenance schedules that are consistent with the equipment manufacturers' suggested replacement.
- Maintaining and protecting materials to prevent damage and breakage.
- Eliminating unnecessary plastic and bulky packaging by buying kitchen supplies in bulk (i.e. ketchup, salad dressings, syrups, etc.).
- Cutting down on plastic food packaging.
- Substituting less hazardous chemicals where possible.
- Selecting products that provide the maximum "life-of-material".

Re-Use

- If appropriate, collect and return materials to the system (i.e. equipment, operations, etc.) following maintenance or repair.
- Waste oil burners will be used to heat selected facilities.
- Oil/water separators are used onsite to reduce the amount of contaminated water requiring shipment off site.
- If appropriate, filter and/or use additives to replenish lost properties of material in order to extend its useful life.
- Testing to ensure items (i.e. batteries) are "spent" before removing from service.

Recycle

- Commercial companies are used to the maximum extent practical to recycle appropriate materials on a fee for service basis.
- Explore waste management options that allow for the recycling of a material or product instead of disposal.

2.1.1.3. PREVENTION OF WILDLIFE ATTRACTION

TMAC is required by the Water Licence and Project Certificate to incinerate food wastes to prevent attraction of wildlife. A comprehensive program exists to educate site personnel on the importance of proper food waste (or other potential attractant) management to ensure animals are not attracted to worksites. All food waste is returned daily to the main camp facilities so it is captured in the domestic waste stream. Collection and transfer of food wastes is performed so that these attractants are stored safely, moved between facilities securely and are burned in the incinerator promptly.

2.1.1.4. TARGETING PRE-CURSORS TO THE FORMATION OF DIOXINS AND FURANS

Chlorine, in almost any form, is the key component required for dioxin and furan formation. Reducing or removing the chlorinated material that enters incinerators is the first minimization strategy to reduce the formation of dioxins and furans. Removing all chlorine compounds is extremely difficult because chlorine is used in the manufacture of a large variety of products, and in many cases there are no substitutes. Poly vinyl chloride (PVC) containing products are, however, eliminated from the incinerator waste stream to the extent possible. Sewage sludge also generally contains chlorinated compounds. TMAC may incinerate adequately dried sewage sludge or alternatively store this material in biodegradable bags (in a secure location not accessible to wildlife) until it can be buried in the overburden stockpile or beneath tailings in the Tailings Impoundment Area.

The following components of the waste stream must be removed before incineration to reduce the presence of potential catalysts and to reduce the presence of materials that may form or act as precursors for the formation of dioxins and furans:

- **Metals:** The inorganic component of the waste is largely made of metal-containing materials. During combustion, it is possible for these metals to become catalysts for the formation of dioxins and furans and it is, therefore, important that metal be eliminated from the waste stream destined for incineration. The metals include foils, batteries, nails and screws, painted wood products, aerosol cans, etc.
- **Plastic:** Plastics, particularly PVC, must be eliminated from the incinerator waste stream to the extent possible. The chlorine compounds contained in PVC and plastics are an ideal building block for the formation of dioxins and furans.
- **Medical Waste:** Medical waste can potentially be the biggest source of dioxin- and furan-forming material. Medical waste contains a mix of sharps made of metal, plastics (frequently PVC) and organic material which frequently contain chlorine compounds. This is an ideal mix for forming dioxins and furans. TMAC avoids incinerating these materials to the extent possible by segregating them from the incinerator waste stream.

By following these waste separation guidelines the extent of dioxin and furan formation will be reduced.

2.1.2. MANAGEMENT RESPONSE

TMAC's current waste segregation practices greatly reduce the volume of plastics, metals, glass, and other potential catalysts for dioxin and furan formation from ending up in the incinerator waste stream.

Containers are set up throughout camp buildings to collect batteries, aerosol cans, food cans and glass containers, domestic plastic containers (toiletries, etc.), refundable cans/bottles and medical wastes. Separate labelled waste containers are available for plastic construction debris, cardboard, non-burnable wood and rags/absorbent pads. All kitchen grease is securely stored for offsite disposal and does not enter the incinerator waste stream.

2.2. Dioxin and Furan Emissions

Polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs), commonly known as dioxins and furans, respectively, are predominantly a result of human activity. These substances are toxic, persistent, and bio-accumulative. Due to their extraordinary environmental persistence and capacity to accumulate in biological tissues, dioxins and furans are slated for virtual elimination.

Dioxin and furan contamination found in soil, water, sediments, and tissues are the subject of national guidelines for dioxins and furans. The CWS Dioxin/Furan guideline for incineration is 80 pg I-TEQ/m^3, where pg = picogram, I-TEQ = international toxic equivalent, m^3 = cubic metre.

The exact mechanism of dioxin and furan formation in incinerators is poorly understood, but generally they form during the thermal breakdown of organic materials in the presence of transition metals and chlorinated compounds. Dioxin formation takes place as the flue gas cools from the initial 1000°C to about 250°C, with peak dioxin and furan formation occurring in the range of 650°C to 250°C.

Regardless of how dioxins and furans are formed, certain operating conditions increase the potential for formation of these compounds including;

a) Incomplete combustion of fuel
b) An oxidizing atmosphere
c) Presence of a chlorine source
d) Fly ash surfaces (carbon source)
e) Fly ash with degenerated graphite structures
f) Presence of catalytic metals (copper, iron, manganese, zinc, etc.)

2.2.1. Management Response

Dioxin and furan emissions from incinerators may be reduced by:

- Reducing or removing certain waste types from the incinerator waste stream as described above through appropriate waste sorting techniques;
- Placement of waste in the incinerator chamber and operating the incinerator according to manufacturer specifications to ensure optimal burning efficiency and provide adequate destruction of dioxins and furans;
- Use of Pre-Operational, Operational and Maintenance Checklists and Log Books to ensure that the unit is operated in a safe and efficient manner.

TMAC has selected and will continue to select incinerator technology that should reduce the extent to which dioxins and furans can form. This is achieved through the following mechanisms:

- Use of dual or secondary chamber incinerator technology with a clear burn process defined which eliminates spurious burn conditions and operator error.
- Operating each incinerator unit within the manufacturer specifications to achieve adequate temperatures and residence time. This should allow the materials to be combusted completely so that no precursors are available for dioxin and furan formation during cooling.

2.3. Mercury Emissions

Waste incineration has historically been responsible for a portion of the mercury emitted in Canada; however reductions in emissions have been apparent nationwide since the implementation of the CWS

and the requirement to monitor specific emissions. Improved exhaust gas controls can reduce emissions of acid gases and fine particulates in addition to new activated carbon injection systems that decrease emissions of mercury and dioxins and furans.

At the same time, action has been taken by many product manufacturers to reduce the mercury content of consumer goods which could end their life cycle in domestic solid waste (e.g., alkaline batteries) and thus have reduced the mercury available in the waste stream.

Emission limits are expressed as the concentrations of specific compounds and elements present in the exhaust gas exiting the stack of the facility. New or expanding facilities are expected to comply with the standard upon attaining normal full scale operation, while the limits for existing facilities are capable of being met using generally available technology (or waste diversion). Larger facilities are subject to annual stack testing to verify compliance with the limit. Mercury emission limits are presented in Table 3.

Table 3 Canada-Wide Standard for Mercury Emissions

Source	Mercury Standard
Municipal waste incineration	20 µg/Rm^3
Hazardous waste incineration	50 µg/Rm^3
Sewage sludge incineration	70 µg/Rm^3
Medical waste incineration	20 µg/Rm^3

µg = microgram, Rm^3 = reference cubic metre

2.3.1. Management Response

TMAC disposes of any waste stream that may contain mercury, including thermostats, thermometers, light bulbs, etc., at an off-site facility. These items are placed in labelled collection containers located throughout the camp and facility. Waste management employees screen for all possible mercury contaminated waste and ensure all relevant regulations are adhered to regarding handling, storage and transport for offsite disposal. For more information regarding the regulations and waste shipment procedures please refer to the Hope Bay Hazardous Waste Management Plan.

2.4. Incinerator Capacity and Operations

Incinerator capacity has been selected to ensure timely and effective management of the volumes of burnable domestic waste generated at Hope Bay. Incinerator details, including model, capacity, location, status and reference to operating details and manuals are provided in the site-specific modules appended to this plan.

2.4.1. Management Response

The Hope Bay site waste management facilities are closely supervised and waste management personnel are present to monitor incinerator burns and document burn conditions and other relevant information. Incinerator units may be enclosed within shelters to ensure efficiency of the burn process is optimized.

Employees are trained prior to commencement of work so that they are aware of the operational procedure and capacity of the incinerator, and health and safety risks associated with the incinerator and its operation.

2.4.1.1. BURN PROCESS OPERATIONAL OVERVIEW

Batch waste incineration is a process that occurs through charging the incinerator unit with a discrete load or quantity, and allowing a complete burn cycle to finish before the next load is burned. This process is critical to the efficiency of the burn. Standard operating procedures outline the process to prepare and properly load each incinerator in accordance with manufacturer instructions to optimize burn efficiency.

2.4.1.2. BATCH PREPARATION OF WASTE

Using categories defined by the supplier of the incinerator, the approximate waste composition of a batch is determined for each incinerator model used. Understanding the typical waste stream composition is important as it leads to key opportunities for waste management generally and specifically for incineration control on site. Periodic audits of the waste stream using incinerator logs and operational checklists will guide continuous improvement of batch preparation processes.

Daily record keeping and operator experience will assist in ensuring batches are prepared consistently and within the capacity of the specific incinerator unit. The weight of the various waste categories loaded into the incinerator determine the proper batch composition for efficient burn cycles.

An appropriate load composition would roughly be represented by:

55% Food Waste / 23% Paper or Cardboard Waste / 22% Other (Sewage Sludge Cake, other domestic)

2.4.1.3. HEALTH AND SAFETY

All incinerators at Hope Bay will be operated in accordance with the manufacturer's instructions. All operators will have appropriate training before being tasked with operating any unit or handling waste and will include the identification of any potential hazards that could be encountered while performing these tasks. Standard operating procedures outline the appropriate personal protective equipment that is required by all personnel operating the incinerator system.

2.4.1.4. TRAINING

Personnel with the responsibility of operating incinerators at Hope Bay will be required to read and comprehend this Incinerator Management Plan, the Operating and Maintenance Manual(s) relevant to the unit they will be operating, and any Standard Operating Procedures that support this Plan or provide site-specific information required for safe and effective incinerator operations.

In addition, an on-site training program will be provided to cover all aspects of incinerator management including: equipment pre-checks, operation, maintenance, monitoring, and record keeping. The training also includes identification of activity related risks, knowledge and use of job-specific PPE, as well as proper handling, storage, and disposal of all ash generated from the facility. A supervised competency evaluation is conducted for all trainees.

The training is both job-specific and equipment-specific and is provided to any site personnel assigned the responsibility to oversee, inspect, maintain, or monitor the incinerator.

2.5. ASH MANAGEMENT

Bottom ash in the incinerator can contain pollutants of concern including mercury, lead and cadmium. These residuals in the ash can be reduced to acceptable levels with proper segregation of non-burnable items from the incinerator feed stock and through maximizing efficient burn practices. The

Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste and Sewage Treatment Facilities published by the Government of Nunavut in 2011 establishes the criteria for determining whether the bottom ash from open burning or incineration is appropriate for disposal in a landfill.

2.5.1. MANAGEMENT RESPONSE

The incinerator ash sampling program established for Hope Bay will determine the proper disposition of bottom ash. Once the combustion chamber of the incinerator is cool, the incinerator operator will remove the ash from the previous burn cycle before reloading the incinerator. During ash removal, the operator will inspect and clean the combustion air holes, inspect the burner tip for damage, and will also collect ash samples for analysis.

The remaining ash is placed into metal containers to be weighed. Once weighed and documented, these contents are then transferred into a labelled drum. When full, this drum is sealed and stored to await results of the ash sampling.

A composite sample of ash is sent to an external laboratory for analysis of:

- Leachable metals
- Leachable mercury
- Leachable benzene, toluene, xylenes, and ethylbenzene
- Paint filter
- Flash point

The details of this sampling program can be found in standard operating procedures for ash sampling for the site incinerators and burn pan. Results of the sampling will determine if the ash can be disposed of as non-hazardous waste (landfilled) or must be treated as hazardous waste and managed in accordance with the site Hazardous Waste Management Plan. Ash sampling analysis records are maintained on site, and may be conveyed offsite to receivers of ash shipments if warranted. Hazardous waste shipments will follow the Transportation of Dangerous Goods (TDG) regulations as well as the Interprovincial Movements of Hazardous Waste regulations. The Waste Management Facility maintains a tracking report of all ash shipped from Hope Bay. Certificates of Disposal for waste shipped off site are provided by the off-site waste handling facility. This is provided so waste generators can demonstrate to regulatory authorities that their waste is being handled by an approved facility and that the waste was disposed according to applicable federal and territorial regulations.

2.6. FUEL STORAGE

Incinerator units are supplied by dedicated diesel fuel tanks.

2.6.1. MANAGEMENT RESPONSE

The fuel storage, secondary containment and fuel delivery lines are subject to regular inspection. There are also spill kits available nearby in the event of a spill or leaking fuel line.

3. MONITORING AND EVALUATION

3.1. INSPECTIONS

Routine inspections of the incinerator and associated facilities will be conducted by a qualified individual prior to every use of the incinerator as per stand operating procedures.

Detailed standard operating procedures for each type of incinerator unit contain the specific inspection checklists that are utilized. All raw data records from the operation of the incinerator will be retained for inspection by the appropriate authorities.

3.2. MONITORING

3.2.1. INCINERATOR STACK TESTING

A monitoring program has been implemented for the operation of site incinerators. A third-party service provider is used for monitoring emissions when the stack testing requirement is triggered. The requirement for stack testing is outlined in the CWS for dioxins and furans and the CWS for Mercury, with triggers related to operational state, volumes and types of wastes burned. The testing will be conducted when the thresholds for monitoring are met, unless otherwise approved by Environment Canada.

The following parameters are required to be monitored based on the CWSs;

- Dioxin
- Furan
- Mercury

Results of samping are reported annually to the NWB and the Nunavut Impact Review Board (NIRB), and emissions data is used for calculating and reporting non-fugitive (point source) emissions to the National Pollutant Release Inventory (NPRI).

3.3. DOCUMENTATION AND REPORTING

TMAC maintains detailed records for the operation of the incinerator. Records will be kept on file for each burn and will be available for audit by TMAC management or regulatory agency representatives. Any out-of-specification situations will be raised immediately and the incinerator should not be used until maintenance or remedial measures have been applied.

To demonstrate appropriate operation and maintenance of the incinerator, the facility will maintain records containing, at minimum, the following information:

- A list of all staff who have been trained to operate the incinerator; type of training conducted and by whom; dates of the training; dates of the refresher courses.
- All preventative maintenance activities undertaken on the equipment.
- Records of operation of the incinerator.
- Records of quantities and types of waste incinerated.
- Summarized annual auxiliary fuel usage.

- The quantity and disposal location of incinerator residual ash.
- Results of any stack emission monitoring and ash sampling information.

Monthly Waste Summary

A monthly summary tracks incinerator burns per day, the weight and type of waste prior to the burn and the amount of ash produced. Notes from daily operations are included in this summary. A chart is produced that compares the volume of waste burned to the amount of ash produced. This information is used to determine any trends apparent in the incineration process and identify opportunities where improvements could be implemented. The summary of waste burned during the calendar year is also used for calculations and reporting to the NPRI, by July 1 each following year.

4. CONTINGENCIES

A back-up unit is available in the event that an incinerator malfunctions or is taken out of service for maintenance. This redundancy ensures there is limited interruption to management of the incinerator waste stream, and reduces the possibility that stockpiling of any burnable domestic waste is required. In the event that temporary stockpiling is required, all food waste is packaged and stored securely from access by wildlife until functioning of the incinerator can resume.

5. REFERENCES

Health Canada. 2005. Dioxins and Furans

Canadian Council of Ministers of the Environment (CCME). 2006. 2006 Review Update for Dioxins and Furans Canada Wide Standards.

CCME. 2001. Canada Wide Standards for Dioxins and Furans.

CCME. 2000. Canada Wide Standards for Mercury Emissions.

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

Government of Canada. 1999. Canadian Environmental Protection Act (CEPA)

Government of Canada. 1995. Federal Toxic Substances Management Policy (TSMP)

Government of Nunavut. 2012. Environmental Guideline for the Burning and Incineration of Solid Waste

CCME. 1998. Policy for the Management of Toxic Substances

Westland Consulting. 2011. Incinerator General Operational Plan and Standard Operating Procedure

Westland Consulting. 2009. Forced Air Incineration Systems Operating and Maintenance Manual

Westland Consulting. No date. Maintenance Operating Specification and Technical Data for CY2020FA