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NWB file: 3BC-MGU

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Via email at: licensingadmin@nunavutwaterboard.org

Re: NWB 3BC-MGU – McGill University Arctic Research Station Project – New Type "B" Water License

On behalf of Environment Canada (EC), I have reviewed the information submitted with the above-mentioned application. The following specialist advice has been provided pursuant to the *Canadian Environmental Protection Act*, Section 36(3) of the *Fisheries Act*, the *Migratory Birds Convention Act*, and the *Species at Risk Act*.

Wayne Pollard, of the Department of McGill University, has applied for a Water Licence for water use and waste disposal associated with the research camp located at Expedition Fiord on Axel Heiberg Island, Nunavut. Research activities include: permafrost and geological mapping; climate monitoring; shallow coring; measuring rock and soil samples for weathering and ice content; and, measuring changes in landscape from melting permafrost. A second research project will study temperatures, flow rates, source and chemistry of springs; microbial diversity and composition, climate monitoring; and, ground and surface water modeling. The research camp will have a maximum capacity of 14 persons.

Based on the information presented at this time, EC has no real concerns with the issuance of this water license. Environment Canada provides the following comments and recommendations for the Boards consideration:

Camp

- The proponent shall not deposit, nor permit the deposit of any fuel, chemicals, wastes or sediment into any water body. According to the Fisheries Act, Section 36(3), the deposition of deleterious substances of any type in water frequented by fish, or in any place under any conditions where the deleterious substance, or any other deleterious substance that results from the deposit of the deleterious substance, may enter any such water, is prohibited.
- Camp sewage should be treated as outlined in the Polar Continental Shelf Project Operation Manual protocols, which calls for the use of a "latrine" area, not the incineration of sewage wastes.
- EC is developing a Technical Document for Batch Waste Incinerators. The technical aspects of the document focus on appropriate incineration equipment and best management practices required to achieve the Canada-Wide Standards for dioxins/furans and mercury.

To assist the board, a draft copy of the executive summary of the technical document is provided. The board and the proponent are encouraged to contact EC for further information regarding the technical document.

- Sumps used for the disposal of camp wastes such as gray water and sewage shall be located above the high water mark of any water body frequented by fish. Further, all sumps shall be backfilled upon closure and contoured to match the surrounding landscape.
- Sumps should be inspected regularly to ensure there is no erosion or leaching. Appropriate mitigation measures are to be taken if deleterious substances are not being adequately contained.

Fuel storage/Spill Contingency Plan

- All fuel caches shall be located above the high water mark of any waterbody and in such a manner as to prevent the contents from entering any water body frequented by fish.
- EC recommends the use of secondary containment, such as self-supporting insta-berms, for storage of all barreled fuel rather than relying on natural depressions to contain spills.
- Drip pans, or other similar preventative measures, shall be used when refueling equipment on site.
- Please note that any spill of fuel or hazardous materials, adjacent to or into a waterbody **regardless of quantity**, shall be reported immediately to the 24-hour Spill Line (867) 920-8130.

Wildlife and Species at Risk

- Section 6 (a) of the Migratory Birds Regulations states that no one shall disturb or destroy the nests or eggs of migratory birds. If active nests are encountered during project activities, the nesting area should be avoided until nesting is complete (i.e., the young have left the vicinity of the nest).
- Environment Canada recommends that food, domestic wastes, and petroleum-based chemicals (e.g., greases, gasoline, glycol-based antifreeze) be made inaccessible to wildlife at all times. Such items can attract predators of migratory birds such as foxes, ravens, gulls, and bears. Although these animals may initially be attracted to the novel food sources, they often will also eat eggs and young birds in the area. These predators can have significant negative effects on the local bird populations.
- Section 5.1 of the Migratory Birds Convention Act prohibits persons from depositing substances harmful to migratory birds in waters or areas frequented by migratory birds or in a place from which the substance may enter such waters or such an area.
- In order to reduce aircraft disturbance to migratory birds, Environment Canada recommends the following:
    - Fly at times when few birds are present (e.g., early spring, late fall, winter).
    - If flights cannot be scheduled when few birds are present, plan flight paths that minimize flights over habitat likely to have birds and maintain a minimum flight altitude of 650 m (2100 feet).
    - Minimize flights during periods when birds are particularly sensitive to disturbance such as migration, nesting, and moulting.
    - Plan flight paths to avoid known concentrations of birds (e.g., bird colonies, moulting areas) by a lateral distance of at least 1.5 km. If avoidance is not possible, maintain a minimum flight altitude of 1100 m (3500 feet) over areas where birds are known to concentrate.
    - Avoid the seaward side of seabird colonies and areas used by flocks of migrating waterfowl by 3 km.
    - Avoid excessive hovering or circling over areas likely to have birds.

- Inform pilots of these recommendations and areas known to have birds.

- The following comments are pursuant to the Species at Risk Act (SARA), which came into full effect on June 1, 2004. Section 79 (2) of SARA, states that during an assessment of effects of a project, the adverse effects of the project on listed wildlife species and its critical habitat must be identified, that measures are taken to avoid or lessen those effects, and that the effects need to be monitored. This section applies to all species listed on Schedule 1 of SARA. However, as a matter of best practice, Environment Canada suggests that species on other Schedules of SARA and under consideration for listing on SARA, including those designated as at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), be considered during an environmental assessment in a similar manner.

Terrestrial Species at Risk [1]	COSEWIC Designation	Schedule of SARA	Government Organization with Primary Management Responsibility [2]
Ivory Gull	Endangered	Schedule 1	EC
Peary Caribou	Endangered	Pending	Government of Nunavut
Porsild's Bryum	Threatened	Pending	Government of Nunavut
Red Knot (*islandica* subspecies)	Special Concern	Pending	EC
Polar Bear	Special Concern	Pending	Government of Nunavut
Wolverine (Western Population)	Special Concern	Pending	Government of Nunavut

[1] The Department of Fisheries and Oceans has responsibility for aquatic species.

[2] Environment Canada has a national role to play in the conservation and recovery of Species at Risk in Canada, as well as responsibility for management of birds described in the *Migratory Birds Convention Act* (MBCA). Day-to-day management of terrestrial species not covered in the MBCA is the responsibility of the Territorial Government. Thus, for species within their responsibility, the Territorial Government is best suited to provide detailed advice and information on potential adverse effects, mitigation measures, and monitoring.

Impacts could be disturbance and attraction to operations.

Environment Canada recommends:

- Species at Risk that could be encountered or affected by the project should be identified and any potential adverse effects of the project to the species, its habitat, and/or its residence noted. All direct, indirect, and cumulative effects should be considered. Refer to species status reports and other information on the Species at Risk registry at www.sararegistry.gc.ca for information on specific species.
- If Species at Risk are encountered or affected, the primary mitigation measure should be avoidance. The proponent should avoid contact with or disturbance to each species, its habitat and/or its residence.
- Monitoring should be undertaken by the proponent to determine the effectiveness of mitigation and/or identify where further mitigation is required. As a minimum, this monitoring should include recording the locations and dates of any observations of Species at Risk, behaviour or actions taken by the animals when project activities were encountered, and any actions taken by the proponent to avoid contact or disturbance to the species, its habitat, and/or its residence. This information should be submitted to the appropriate regulators and organizations with management responsibility for that species, as requested
- For species primarily managed by the Territorial Government, the Territorial Government should be consulted to identify other appropriate mitigation and/or monitoring measures to minimize effects to these species from the project.

- Mitigation and monitoring measures must be taken in a way that is consistent with applicable recovery strategies and action/management plans.

If there are any changes in the proposed project, EC should be notified, as further review may be necessary. Please do not hesitate to contact me with any questions or comments with regards to the foregoing at (867) 975-4631 or by email at carrie.spavor@ec.gc.ca.

Yours truly,

Original signed by

Carrie Spavor
Environmental Assessment Coordinator

c.c: Carey Ogilvie (Head, Environmental Assessment-North, EPO, Yellowknife, NT)
Ron Bujold (Environmental Assessment Technician, EPO, Yellowknife, NT)

Technical Document for Batch Waste Incinerators

Executive Summary

This section of the report summarizes the six steps that should be adopted when employing batch incineration as a means of waste disposal. The emphasis is on practices that will minimize the emissions of toxic contaminants, in particular dioxins and furans [PCDD/F]. Dioxins and furans can be generated when inadequate technology is used and/or the incinerator is not properly operated. Mercury is another toxic contaminant of concern. Mercury is not created in the incinerator; therefore limiting the amount of mercury in the waste fed to the incinerator is the best method to control mercury emissions.

STEP 1: KNOW YOUR WASTE

The first step in managing waste is to understand the quantity and composition of the waste that is generated.

CONDUCT A WASTE AUDIT

Determine how much waste is being generated in the various parts of your operation. Characterise the waste from each type of operation. Examine the waste characteristics to determine what opportunities there are for:

- reducing the amount of waste generated;
- reusing materials; and,
- recycling as much as possible before considering disposal.

CHOOSE THE MOST APPROPRIATE DISPOSAL OPTION

Where possible, find disposal alternatives other than incineration for the residual waste after the 3Rs (Reduce, Reuse and Recycle) have been implemented. Remember:

- Open burning of un-segregated waste is discouraged. Open burning does not achieve appropriate temperatures for a clean burn and may result in excessive emissions of toxic contaminants. In some jurisdictions, limited open burning of specified materials (e.g. paper products, paperboard packaging and untreated wood waste) is allowed.
- Barrel burning is discouraged for the same reasons as open burning. Testing of barrel burning emissions has shown that PCDD/F emissions are higher from barrel burning than those from some of the worst incinerators tested.
- Inert materials (e.g. rock, stone, bricks, concrete, and glass) can be landfilled. Where costs of metal recycling greatly exceed the value of the recovered materials, metals can be landfilled.

STEP 2: SELECT YOUR INCINERATOR

The characteristics of the waste residuals that require incineration should be incorporated into a call for proposals from incinerator manufacturers. As noted in § 5, there are incinerators designed for particular types of wastes. By specifying the quantity and composition of the waste that requires incineration, you will ensure that suitable incinerators will be proposed.

If it is estimated that more than 26 tonnes per year (tpy) will be incinerated, dual chamber, controlled air, incinerators are the preferred configuration. These systems will burn the range of wastes typically encountered on federal lands and at federal installations, and are capable of meeting the Canada-wide Standards (CWS) for PCDD/F emissions. These systems should have large secondary chambers capable of providing a residence time of 1 second or more at a temperature in excess of 850^{O}C.

If it is estimated that less than 26 tpy will be incinerated, "determined efforts" as defined in the Canada Wide Standard for Dioxins and Furans[1] must be made to meet the CWS for PCDD/F. Should circumstances restrict the ability to utilize a dual chamber incinerator with a large secondary chamber, an incinerator with an afterburner should be employed. It is recognized that such systems are more susceptible to upsets and less likely to be able to meet the CWS emission standards than dual chamber incinerators.

STEP 3: INSTALL AND PROPERLY EQUIP YOUR INCINERATOR

BUILDING CONSIDERATIONS

Where practical, incinerators should be installed inside a building to protect the equipment and the operators from weather conditions. In designing the installation site, care should be taken to maximise the clearances between incinerator components, including the stack, and combustible construction materials. If necessary, insulation should be used to protect combustible materials.

The building should be equipped with sufficient fresh air inlet capacity for the incinerator. Both combustion air and dilution air for the barometric damper are required. Care should be taken to introduce air in a manner that does not lead to low temperature operating problems.

EQUIPMENT CONSIDERATIONS

If it is necessary to introduce additional waste to the furnace during the burn cycle, the incinerator should be equipped with a ram charge system to limit the disruption of combustion in the primary chamber when a fresh charge is introduced into the furnace.

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[1] Available at: http://www.ccme.ca/assets/pdf/d_and_f_standard_e.pdf

Batch incinerators should NOT be equipped with heat recovery devices. Stack gases in the heat recovery systems will be in a temperature range that can lead to formation of PCDD/F in the system.

Any incinerators equipped with a heat recovery system should have an air pollution control system to treat the stack gases and remove PCDD/F from the exhaust stream.

The incinerator system should come complete with the following equipment to monitor and record performance parameters:

- A weigh scale to measure the weight of all materials charged to the incinerator;
- A computerised process control and data acquisition system to store operating data from the incinerator such as:
    - The weight of all material charged to the incinerator for a specific run;
    - Temperatures in the primary, secondary and stack during the operation;
    - Differential pressure in the primary;
    - Auxiliary burner status, energized or not energized status for the burner;
    - Operating data from any fans installed on the system including amperage the fans are drawing at any time; and,
    - Status data for all system set points and interlocks such as the charging door closed switch.
- For systems with heat recovery equipment or air pollution control systems additional operating data is required including:
    - Temperature measurements at:
        - Boiler inlet;
        - Boiler outlet;
        - Air Pollution Control (APC) quench inlet;
        - APC quench outlet;
        - Venturi scrubber or fabric filter inlet/outlet temperatures as appropriate;
    - Differential pressure measurements at:
        - Boiler outlet;
        - APC quench system;
        - Venturi scrubber system;
    - Water flow rates to quench and scrubber; and,
    - Reagent addition rate as appropriate.

Operational data should be collected and stored at a minimum every minute that the system is operating. The intent is to be able to summarize operating parameters during start-up, operation and cool-down for every cycle. Should required operating conditions not be achieved these data will allow the operators, manufacturers and the regulator to identify the contributing factors for this failure. From this information, operating procedures can be adjusted to improve performance. Provisions should be

made for the manufacturers to be able to access and review the operating data remotely for trouble shooting purposes.

STEP 4: OPERATE YOUR INCINERATOR FOR OPTIMUM COMBUSTION

OPERATION

Wastes received at the incinerator building should be segregated by their characteristics. Typically, this segregation would be on the basis of the heating value of the wastes: wet or low energy wastes (e.g. food waste) in one area; mixed wastes with average energy values in a second area; and, plastics and oily materials with high energy values in a third area. To facilitate this separation, all waste should be collected in translucent bags to improve identification of the waste in the bag. To assist with separation, wastes could be collected in different colour bags.

The operator should select waste from each category and mix it in the appropriate proportions during incinerator loading. Each bag should be weighed, its source noted, and the total weight of each category tallied before completing the loading. Ideally this information should be recorded by the computerized data acquisition equipment installed with the incinerator.

Small batch type incinerator systems have limited charging capacity. To assist the operator with the charging task, particularly for smaller incinerators, several batches could be pre-weighed and placed in their own containers prior to loading the incinerator. The same weighing and logging procedures should be used for each batch and once recorded, the batch can be charged when appropriate.

When the incinerator is charged with the appropriate mix and amount of waste, the operator should close the door, ensure all interlocks are satisfied and initiate the burn cycle. The operator should observe the burn for at least 15 minutes after ignition of the primary chamber burner to ensure the volatility of the waste charged is not creating too much gas for the secondary chamber to handle. The rate of combustion can be slowed by reducing the underfired air. The primary chamber should operate in the appropriate temperature range specified by the manufacturer during this time.

After the operator is satisfied that the burn is proceeding in a controlled manner, he can leave the incinerator area and allow the equipment to complete the burn cycle.

Under NO circumstances should an incinerator burn be interrupted by opening the charging door until after the burn is complete and the unit has cooled down, unless the incinerator is equipped with an appropriate ram feed device.

Once the burn is complete and the unit has cooled, the operator should only open the door after putting on personal protective equipment such as gloves, dust masks, face

shield or goggles.

The operator should remove the ash from the previous burn cycle before reloading the incinerator. Any unburnt materials found in the ash being removed should be recharged to the primary chamber after the operator has cleaned the air ports, and before putting a fresh charge into the incinerator.

TRAINING

Operators should be properly trained. Training should be provided by the manufacturer. The training course should include at least the following information:

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

Management staff should be involved in the training session wherever possible so continuity can be maintained with different operators.

The Do's and Don'ts of Incinerator Operation

DO:

- Use waste oil and waste fuel for other heating purposes where practical;
- Limit the amount of waste oil or waste fuel in any specific charge to the incinerator;
- Develop a waste collection and handling program that will allow the operators to mix the waste to provide a uniform heat input to your incinerator;
- Use specially designed incinerators to dispose of animal carcasses, liquid wastes, or hazardous waste materials.

DO NOT:

- Overload the incinerator.
- Incinerate raw sewage wastes. High moisture content will increase operating costs dramatically and lead to poor performance. These liquids and solids can present health hazards to workers. High moisture materials can leak from the hearth and lead to equipment damage.

- Dispose of dead animals in MSW incinerators. In addition to moisture concerns, MSW incinerators are unlikely to be able provide sufficient heat to fully combust large bones.
- Put mercury containing materials (e.g. thermometers, thermostats, dental amalgam, batteries) into the incinerator.
- Introduce metal and glass into the incinerator when alternative disposal options exist. These materials absorb energy from the furnace and increase wear and tear on incinerator components.
- Incinerate wood treated with Chromated Copper Arsenate (CCA) and/or lead paint.
- Incinerate asbestos waste.
- Introduce large quantities of plastics or high calorific wastes into incinerators designed for low calorific value wastes such as animals and food waste. Incinerators capable of disposing of low calorific value waste are not suited to burning large quantities of high calorific wastes. If introduced into the incinerator, high calorific material will release increased quantities of PCDD/F.

STEP 5: HANDLE AND DISPOSE OF INCINERATOR RESIDUES SAFELY

Ash from the primary chamber of the incinerator can contain materials deleterious to the operator's health and the environment. Operators should use personal protective equipment to minimise their risks in handling this material. The material should be carefully removed from the hearth and placed in covered metal containers suitable for transporting the ash to the disposal site. The operator should weigh the quantity of ash and keep records of these quantities.

The disposal site should be away from areas prone to flooding to minimise the potential for dispersing the ash into the aquatic environment. Ash should be carefully placed into a disposal site and covered to minimise wind erosion of the material. A slight moistening of the ash can minimise dusting prior to covering.

If the incinerator is equipped with an Air Pollution Control [APC] system, the residues from the APC will contain materials deleterious to health and the environment. Typically the concentration of these elements will be higher than found in the incinerator ash. Dry APC residues are predominantly powdered lime. The particle size of dry residues requires that it be handled in a manner that minimises the release of dust to the atmosphere. Typically this material is pneumatically transferred to bulk carriers and hauled to disposal sites. In remote areas it should be loaded into a "Super Sack" for transport and disposal. The sack can be placed directly into the disposal site where the APC residues will solidify when exposed to moisture.

When waste water is created by the APC system, the owner should discuss management

requirements for the release of APC waste water with the local regulatory agency.

If regulatory agencies require testing of incinerator ash and/or APC residuals, the samples should be collected on an appropriate frequency and sent to the appropriate laboratory for chemical analysis.

STEP 6: REPORT ON INCINERATOR OPERATION

To demonstrate appropriate operation and maintenance of the incinerator, the facility should produce annual reports providing the following information:

- All staff that have been trained for the operation of the incinerator; type of training conducted and by whom; dates of the training; dates of any refresher courses.
- All preventive maintenance undertaken on the equipment:
    - Routine maintenance activities, date completed, by whom, any problems encountered.
    - Special maintenance activities, date completed, by whom, any problems encountered.
- Records of operation of the incinerator. Records should be kept in the computer and suitable arrangements should be made to backup these data so they are not inadvertently lost. Data to be recorded in the computer should include:
    - Record of each time the incinerator was used: date, time, operator, length of cycle;
    - Record of the weight and origin of the waste in the incinerator for the cycle;
    - The one minute operating data for the incinerator for that cycle:
        - Interlock status: OPEN/CLOSED for all locations so equipped such as primary and secondary doors;
        - Temperatures: primary, secondary, stack, and across boiler or APC systems;
        - Differential pressure readings from primary, secondary, boiler and APC system;
        - Auxiliary burner status ON/OFF
    - Any problems experienced during the cycle, and steps taken to rectify problems;
- Summarized annual auxiliary fuel usage, calculated by logging and summing all auxiliary fuel deliveries;
- All shipments of incinerator residues, including the weight transported and disposed by type if necessary, and the location of the disposal site.
- Any emissions measurements, any ash sampling or any water sampling data collected during the period.

All raw data records from the operation of the incinerator should be retained for inspection by the appropriate authorities for the period designated by the authorities or at least 2 years. The owner should work with the supplier and the regulators to determine the appropriate level of summary data that should be created and forwarded to the regulatory agency. The submitted reports should be signed off by the facility senior management.