Waste Management Plan: (Attachment 2)

Liard River Basin Groundwater Monitoring Project

March 21, 2023

Contents

Revision History Table

Date	Section	Revisions
March 2023	2.4, Bullet 5. Toilet Waste	Operations will be 24-hours and will require portable toilet use by field crew.
March 2023	3, Table 1: Waste Management Plan	All solid and liquid effluence, including grey water from handwashing will be removed from site and disposed of at an appropriate facility by the portable toilet rental company.
March 2023	4 Infrastructure Required for Waste Management	A vac trucks will be used by portable toilet rental company to remove all solids and liquid and dispose of in an appropriate waste facility off site.

1 Introduction

The G^{360} Institute for Groundwater Research at the University of Guelph and the Department of Environment and Natural Resources (ENR) with the Government of the Northwest Territories (GNWT) has developed this Waste Management Plan for the proposed research project, 'Groundwater Monitoring and Aquifer Characterization in the Liard River Basin', commencing in May 2023. The study site will be located approximately 30 km radially from the hamlet of Fort Liard, between latitude's 60°00'00"N and 60°40'00"N and longitudes 122°40'00"W and 124°20'00"W. A complete project description is outlined in Attachment 1, Project Description.

1.1 Company Contacts

The research project will be a collaboration between the G^{360} Institute for Groundwater Research at the University of Guelph and the Department of Environment and Natural Resources in the Government of the Northwest Territories.

G^{360} Institute for Groundwater Research: Company Contacts

Beth L. Parker, Ph.D., L.E.L.
Professor, School of Engineering
NSERC Industrial Research Chair
Director, G^{360} Institute for Groundwater Research
bparker@uoguelph.ca | 519-824-4120 x 53642

Jennifer Hurley
Chief Operations Officer, G^{360} Institute for Groundwater Research
jen.hurley@g360group.org | 519-824-4120 x 56486

Government of Northwest Territories: Company Contact

Isabelle de Grandpre, M.Sc
Hydrogeologist, Water Resources Division
Environment and Natural Resources, Government of the Northwest Territories
Isabelle_de-Grandpre@gov.nt.ca| 867-767-9234 x 53123

1.2 Effective Date of the Waste Management Plan

This waste management plan will be effective from the initial onset of the project (proposed September 2018) to the completion of the project in 2023.

1.3 Waste Management Goals

The goal of this Waste Management Plan will be to document a strategy for disposal of all generated waste that has minimal impact to the natural environment and, therefore, does not negatively impact land, water, air, wildlife, fish and vegetation. The central principles of the proposed Waste Management Plan, which will meet the goals for successful waste management include:

1. A waste reduction and recover approach will be taken on the project, this involves making all possible attempts to reduce waste and dispose of any generated waste in appropriate facilities.

2. All recyclable materials will be disposed of at the temporary satellite processing center in Fort Liard, if possible, or transported to appropriate recycling centers in Fort Nelson, B.C. Every effort will be to coordinate with the mobile recycling depot (Tri R Recycling) in Fort Liard.

3. Non-hazardous and domestic waste will be disposed of in the Fort Liard Landfill Facility

4. Borehole drilling fluid will be analyzed for total dissolved solids (TDS) in the field. If TDS is <4000 mg/L (considered the fresh-saline boundary), it will be considered 'freshwater' and disposed of on the ground, a minimum of 100 m away from the borehole and 100 m away from any natural freshwater source. If TDS is >4000 mg/L, the drilling fluid will be collected in tanks and removed off-site for disposal at an appropriate waste water facility. This approach will include a plan to allow solids to settle, reducing the turbidity of the fluid to be disposed.

5. Drill cuttings and rock waste will be contained at the borehole drilling area and disposed in an appropriate low-lying gully at least 100 m from a freshwater receptor and without disruption to any natural waterways.

6. Every effort will be made to minimize disturbance to flora and fauna and preserve the natural landscape, which will include removal of all waste material, not disposing of drilling fluid into natural waterways or areas of drainage, and adherence to the limit of the abstraction water license.

2 Identification of Waste Types

The following types of waste are expected to be generated as a result of this project:

1. **Drill Cuttings and Rock Waste** . Geological material obtained from borehole drilling and brought to surface is not expected to be contaminated. Part of this material, including rock core and some cuttings, will be removed from site for laboratory analysis, the remaining drill cuttings and rock chips will be disposed in low-lying holes at least 100 m away from a water source or taken off-site and disposed.

2. **Excess Borehole Drilling Wastewater**. Fresh water will be used as a lubricant for drilling.

Returns of excess drilling fluid will be tested for total dissolved solids (TDS) to ensure the returning fluid does not exceed 4000 mg/L. If the TDS of the drilling fluids is in excess of 4000 mg/L the saline fluid will be stored in tanks and disposed off-site in an approved facility.

3. **Domestic Non-hazardous Waste.** Field operations are expected to generate some inert, household and domestic waste, such as rags, food containers and other standard domestic waste. This will be picked up and taken to the Fort Liard Landfill.

4. **Recycling Waste.** Plastic sample bottles, household jugs, glass containers, and cardboard will be removed from site and disposed in an appropriate recycling facility.

5. **Toilet Waste.** Field operations and drilling on-site will 24-hour days, with no on-site camp. Portable toilets will be brought to each of the three drilling sites. All solid and liquid effluence, including grey water from handwashing will be removed from site.

3 Management of Waste Types

Table 1, below, summarizes the management strategy for each waste type.

Table 1: Waste Management Plan

Waste Type	Approximate Amount	Description	Management Plan
Drill cuttings	Expected ~1.25 m^3 per site Borehole 1 ~ 0.86 m^3 Borehole 2 ~ 0.39 m^3	Geological material from the boreholes that will not be used for analysis	Disposed in either in a low-lying gully without disruption to natural water sources, or removed from site and disposed in an approved facility
Excess Drill Water	Expected to use no more than 44 m^3 in a 24 hour period.	Water that comes from the borehole, used as a lubricant for drilling	The water will be tested. If the TDS exceed 4000 mg/L, the water will be collected in tanks, and disposed in an approved facility.
Domestic waste	1-3 domestic garbage bags per day of fieldwork	Inert domestic waste, rags, household consumables	To be disposed at Fort Liard Landfill
Recycling Waste	~ 1 standard black bag per day during sampling fieldwork only	Plastic sample bottles, glass containers, jugs.	To be disposed in the mobile satellite recycling facility in Fort Liard, or transported to a Fort Nelson recycling facility
Toilet Waste	~ 6 portable toilets each with holding tanks of 50 gal are expected to be pumped out twice (~600 gal total) over 2 months.	Solid and liquid effluence from portable toilets, including grey water from handwashing.	To be removed from site by the portable toilet rental company and disposed of at an appropriate waste facility near Fort Nelson.

4 Infrastructure Required for Waste Management

Domestic and recycling waste generated on-site will be removed using trucks and a trailer. A vac truck will be used by the portable toilet rental company to remove all solids and liquid and dispose of in an appropriate waste facility off site.

If excess drilling fluid is tested and exceeds a TDS of 4000 mg/L, the fluid will be stored and removed from site in intermediate bulk container (ICB) tanks that will be brought to site using trucks and trailers. These tanks would be stored on site for the duration of the field operations, then removed to an appropriate disposal facility.