Operation & Maintenance Plan for Chesterfield Inlet Municipal Water Licence:
Sewage Disposal Facilities
2022

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1.0 Site Description

Date this plan was prepared: December 7, 2022

1.1 Location of the Sewage Disposal Facility (SDF)

Municipality: Chesterfield Inlet
Latitude: 63° 20’ 41” N
Longitude: 90° 45‟ 01” W
Proximity to Town: 2.2 km West

Figure 1 Chesterfield Inlet Sewage Disposal Facility

1.2 SDF Site Summary

Year of commissioning the SDF: 1993
Design life of the SDF: 2029

Site History:

The sewage treatment facility is located approximately 2.2 km west of the community. The facility was upgraded in 2010 and is comprised of two truck discharge areas, two sewage detention cells, and a wetlands area with a series of four small ponds and two flow diversion berms. The wetlands encompass an area that is approximately 10.4 hectares. Effluent flows 800 to 1000 metres through the wetlands from the sewage detention cells to the marine environment of Finger Bay on Hudson Bay. The truck discharge adjacent to pond 1 is primarily used due to the orientation of the second discharge area with respect to prevailing winds.

The Hamlet of Chesterfield Inlet provides trucked sewage collection service from houses and other buildings by vacuum truck.

2.0 Staff

Role: Senior Administrative Officer **Name:** John Ivey
Phone: 867-898-9951 **Email:** SAO@chesterfield-inlet.ca

Responsibilities: The SAO manages the municipal staff to ensure that:

- proper operation of the SDF is carried out
- sampling and inspections are completed
- annual reporting to the Nunavut Water Board (NWB) is prepared by the Government of Nunavut Department of Community and Government Services (GN-CGS)

Role: Foreman **Name:** Don Tanuyak
Phone: 867-898-9939 **Email:** chester_foreman@qiniq.com

Responsibilities: The foreman is responsible for:

- daily operations and maintenance of the SDF
- the sampling program at the monitoring stations
- maintaining signage at the SDF and monitoring stations
- annual decanting of the lagoon effluent into the adjacent wetland treatment area

Role:	Sewage Truck Drivers	**Name:**	Various
Phone:	N/A	**Email:**	N/A

Responsibilities: The sewage vacuum truck drivers collect sewage from holding tanks within the municipality. Sewage is transported to the lagoon where it is deposited.

3.0 Health and Safety

All personnel working within the SDF must follow the *Nunavut Safety Act* and be made aware of potential health hazards associated with working around sewage and wastewater. This is imperative so individuals make a conscious effort to perform all necessary safety procedures to protect themselves, their co-workers and family members at home. Safety precautions include:

- Ensure all equipment is kept as clean as possible;
- Assume anything touched by sewage is contaminated;
- Protective clothing such as coveralls, gloves, boots, and safety glasses are to be provided to personnel and always worn when working around sewage;
- Workers must always wear protective gloves
- Work clothing is not worn home
- Workers must wash their hands with soap and water on a regular basis, especially before delivering drinking water, eating and before going home;
- Workers are prohibited from eating or drinking in and around the sewage vacuum trunks; and
- Workers must keep their vaccinations up to date.

4.0 Security and Control

Access Control of to the facility:

- Perimeter fencing around the lagoon
- Signage
- 450 m restricted land use development setback surrounding the SDF

5.0 Wastewater Conveyance

Wastewater transportation: Trucked
Annual volume of sewage collected: 16,127.798 m^3
Number of days per week sewage is collected: 5

Operations:

1. Sewage is collected Monday through Friday from holding tanks in residences and other buildings in the community. Sewage is collected using sewage vacuum trucks.

2. The vacuum trucks pump out sewage from the building holding tanks and transport it to the detention cell.

3. Sewage is deposited into the lagoon from the vacuum trucks using one of three offload chutes and concrete splash pads, located on the east side of the offload truck pad. The sewage truck backs up to one of the offload chutes and the release valve of the truck is opened. Bollards with railings have been placed in front of each offload chute for safety precautions.

4. The volume of sewage discharged into the lagoon is estimated from the municipal water delivery records

Influent Volume:

Table 1 Wastewater generation estimates

Year	Estimated Wastewater Volume (m^3)	Difference (%)
2015	15,023	-
2016	15,295	1.8%
2017	15,406	0.7%
2018	15,598	1.2%
2019	14,759	-5.4%
2020	16,064	8.8%
2021	16,128	0.4%
Average	**15,468**	**1.3%**

6.0 SDF Design

Lagoon Capacity:	23,000 m^3
Wetland Treatment Area:	10.4 hectare
Effluent Path Length:	800-1000 m
Discharge Method:	Passive Discharge
Final Receiving Body:	Finger Bay
Type of Receiving Environment:	Marine

An overview of the wastewater treatment process:

Sewage is discharged into the detention cells year-round. In the winter, the sewage freezes in the detention cells and will be discharged only when the effluent reaches the rip rap height in the detention cell berms. The detention cells provide primary treatment of sewage as effluent is held in the impervious cells for a period of time.

I. Effluent is automatically released from each of the detention cells when the volume of effluent reaches a certain height.
II. The top of the detention cell berms are at 17.8 m (above sea level) elevation; the berms are impervious except for an installed rip rap area at elevation 17.5 m. Once effluent reaches 17.5 m, it flows through the rip rap area and into the first pond of the tundra wetland.

Effluent then flows into the tundra wetland where it receives further treatment. Two diversion berms are situated immediately south of Finger Bay to channel flow from the tundra wetland for a defined outlet and compliance point. A third diversion berm is situated within the solid waste disposal facility to divert leachate into the tundra wetland and allow additional treatment.

Once effluent is released to the tundra wetland, the effluent flows in a west and northwest direction, receiving treatment from native vegetation, soil bacteria, and the chain of small ponds and boggy areas. The tundra wetland discharge passes between flow diversion berms and reaches the marine environment of Finger Bay.

Figure 2 Effluent flow through the wetland treatment area

7.0 Maintenance

Overview of Maintenance Activities:

1. Annual inspections will be undertaken by Crown Indigenous Relations and Affairs Canada (CIRNAC) accompanied by a licensee and/or a licensee representative from GN-CGS. The inspection report and recommendations will be reviewed by a GN-CGS municipal engineer and submitted in the Annual Report submitted to the Nunavut Water Board (NWB).

2. Regular visual inspections by municipal staff of the:

- Offload chutes
- Lagoon berms
- Lagoon fence
- Signage

   Any issues identified by municipal staff must be reported to the regional municipal engineer. Follow-up actions will be undertaken by the municipality with support from the GN-CGS.

3. Inspection of the lagoon berms by a qualified engineer as outlined in the municipal water licence.

Sludge Management:

Sewage sludge is generated by the settling of wastewater solids during primary treatment. Sludge produced in Chesterfield Inlet would be considered “lagoon sludge" and will be contained within the detention cells. The amount of sludge accumulation in the detention cell needs to be monitored to ensure the accumulation does not exceed a certain percent volume of the cell. The quality of the effluent will determine when a sludge management program is initiated. Sludge is typically monitored annually to determine its volume and physical and chemical characteristics. The monitoring indicates when the performance of the detention cells starts to degrade. Sludge may need to be removed from the detention cells and disposed of if too much begins to accumulate and/or it becomes contaminated. Sludge contains a great deal of high-value organic matter and nutrients and is used in a lot of places around the world as fertilizer for crops. However, sludge contamination can result from mixing of domestic wastes with industrial and household hazardous wastes (e.g. cleaning chemicals, prescriptions,

solvents, etc, dumped down the drain), which are then concentrated into the sludge during primary treatment.

Sludge must be sampled and tested to ensure the disposal method selected is appropriate, safe and environmentally responsible. The sludge may be of a quality suitable for land disposal. If the sludge is not suitable for land disposal, it may be disposed of at the MSW disposal facility if it meets the facility's requirements. The sludge may require additional treatment before disposal.

The sewage sludge has not been sampled in Chesterfield Inlet. Before an appropriate sludge management plan can be developed, the sludge should be sampled to obtain its chemical and physical characteristics. Additionally, the volume of sludge in the detention cell should be measured. The annual quantities of sewage sludge removed from the detention cells also needs to be measured and reported to the NWB in the Hamlet's Annual Report. Once the chemical composition of the sludge is understood, a sludge management plan can be developed to explore the best options for removal and disposal.

8.0 Monitoring

Regulatory Inspection: The annual CIRNAC inspection will take place accompanied by the licensee and/or with a licensee representative from GN-CGS. The inspection report will be reviewed by a GN-CGS municipal engineer and submitted with the annual report.

Table 2 Licence requirements related to O&M of the SDF

Requirements	**Reported**
Monthly and annual quantities of wastewater disposal	Annual report submitted to NWB
Notice of commencement of monitoring program and observed flow	Notice given to the CIRNAC inspector
A summary of modifications and/or major maintenance work carried out on the SDF	Proposal submitted to NWB 60 days prior
A list of spills and unauthorized discharges.	Annual report submitted to NWB
A summary of any studies requested for the SDF and future planned studies planned	Annual report submitted to NWB
Monitoring Program Station CHE-4 shall not exceed the effluent quality limits: • 80 mg/L BOD_5 • 100 mg/L TSS • 1 x 10^4 CFU/dl Fecal Coliform • No visible sheen of Oil and grease • 6-9 pH	Annual report submitted to NWB
The Licensee shall carry out inspections at Monitoring Program Stations CHE-3, CHE-3a and CHE-4 weekly from May to August inclusive, to determine presence of Effluent or Water flow.	Annual report submitted to NWB
A freeboard of 1.0 m in the lagoon must be maintained	Annual report submitted to NWB

Table 3 Monitoring Program Station description and locations

Station	Description	Latitude	Longitude
CHE-3	Effluent from Sewage Holding Cell 1	63° 34’ 45” N	90° 75’ 14” W
CHE-3a	Effluent from Sewage Holding Cell 2	63° 34’ 38” N	90° 75’ 16” W
CHE-4	Final Discharge Point for Effluent from the wetland treatment area prior to Finger Bay	63° 34’ 97” N	90° 76’ 01” W

9.0 Modifications and Upgrades

Modifications or upgrades needed for the SDF: N/A

Planned modifications or upgrades: N/A

10.0 Previous Reports

- Schematic Design Report – Tundra Wetland Sewage Treatment System Design – Chesterfield Inlet, NU, Nunami Jacques Whitford Ltd, 2009

Appendix A: As-Built Drawings

GOVERNMENT OF NUNAVUT
DEPARTMENT OF COMMUNITY AND GOVERNMENT SERVICES
CHESTERFIELD INLET SEWAGE SYSTEM IMPROVEMENTS
IGLULIGAARJUK, NUNAVUT

Record Drawing

October 2011

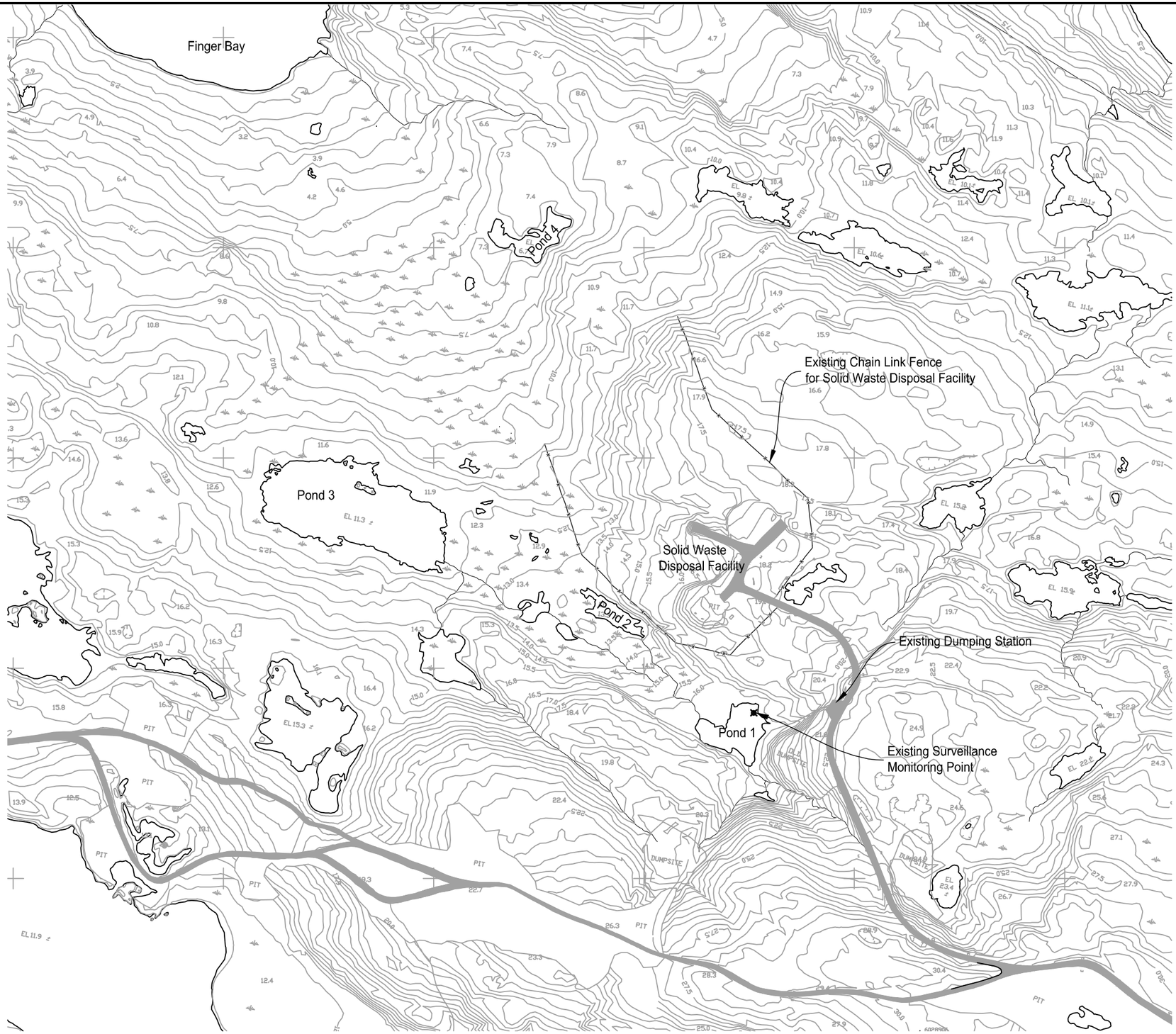
Location Map

Drawing List

NUNAMI
JACQUES WHITFORD LIMITED

Stantec
4444 Centerville Road, Suite 140
White Bear Lake, MN 55127
651-255-5050
651-255-5060 (fax)

10/27/2011 U:\123510080 Chesterfield Inlet\dwg\record drawings\1042903-C000.dwg



Plot Date: 27 October 2011 By Wagner, Richard

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Site Plan Existing Conditions

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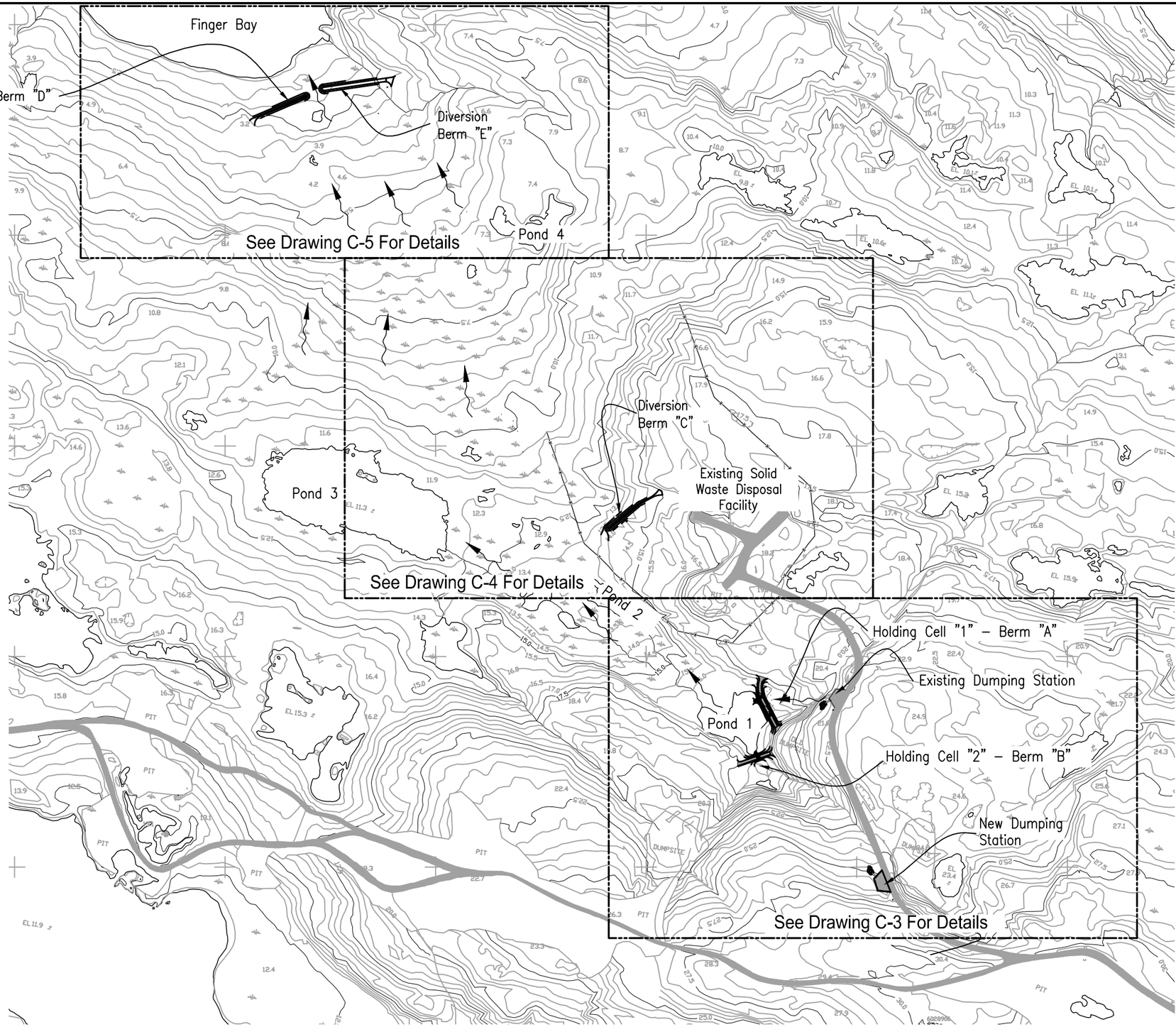
DENOTES WASTEWATER FLOW DIRECTION



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Site Plan
Sewage System Improvements

C-2

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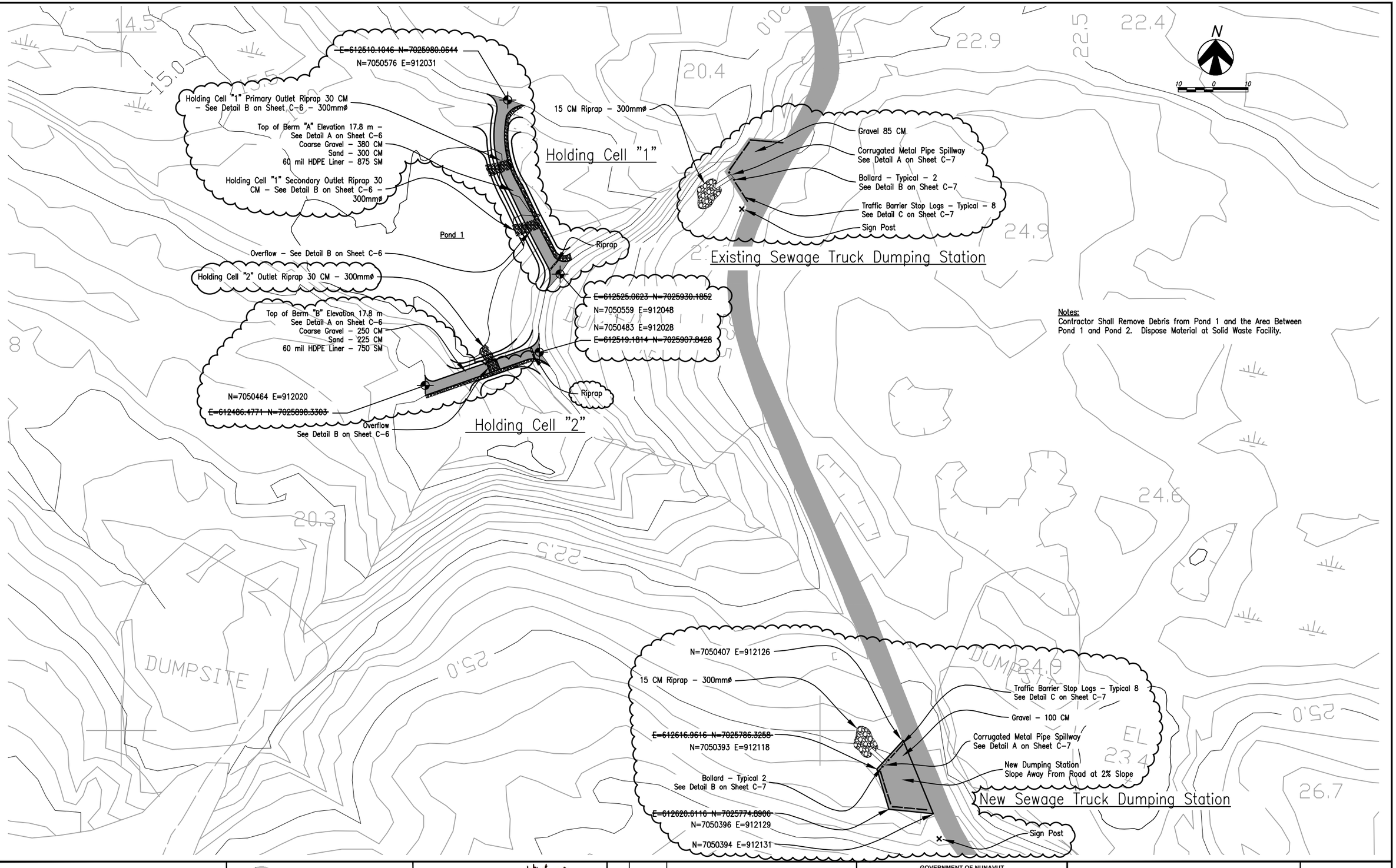

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Truck Dumping Station & Holding Cells "1" & "2" Plan

C-3

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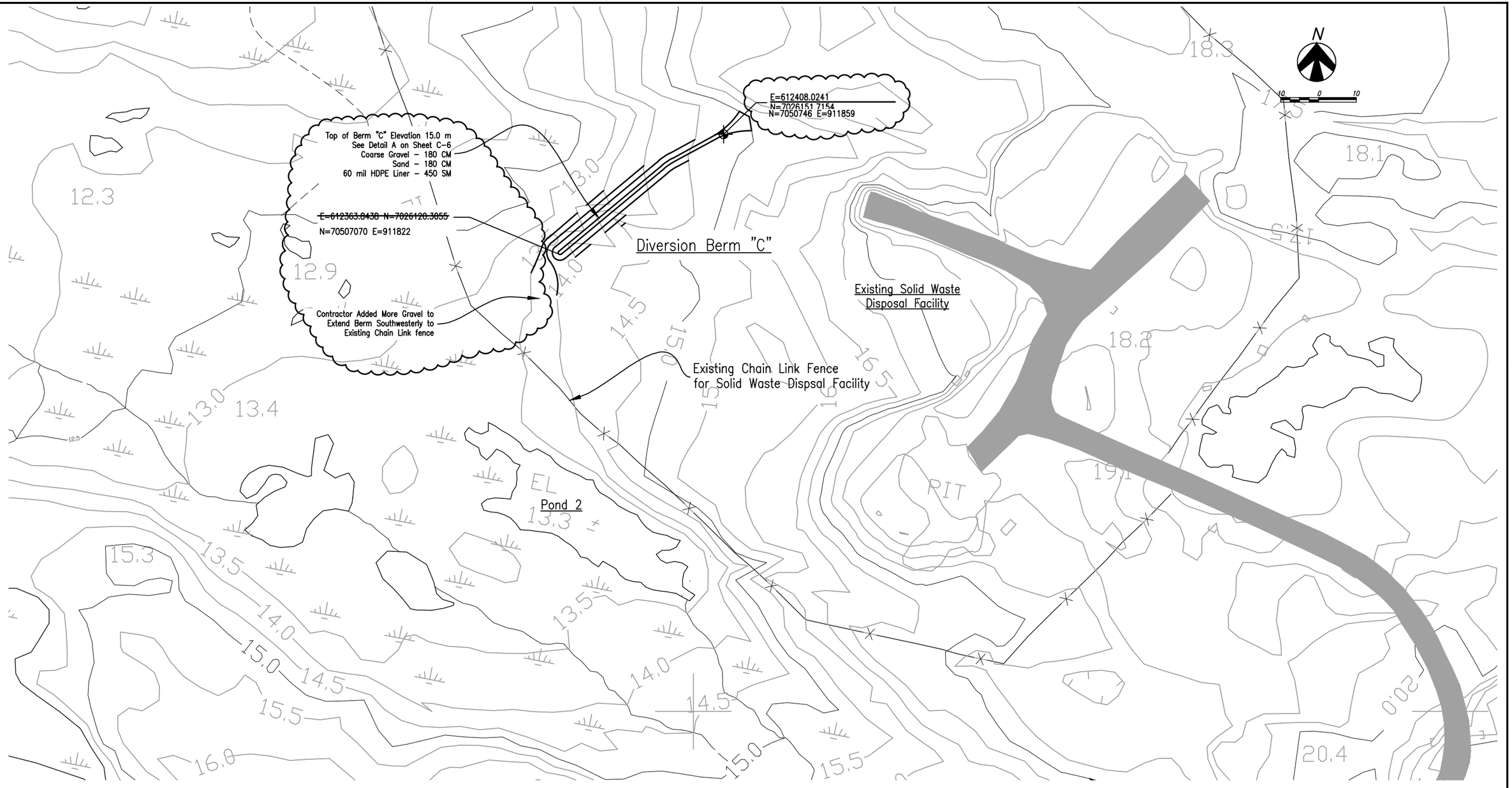

Notes:
Contractor Shall Remove Any Large Debris from Pond 2 and the Area Between Pond 1 and Pond 2. Dispose Material at Solid Waste Facility.

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Diversion Berm "C" Plan

C-4

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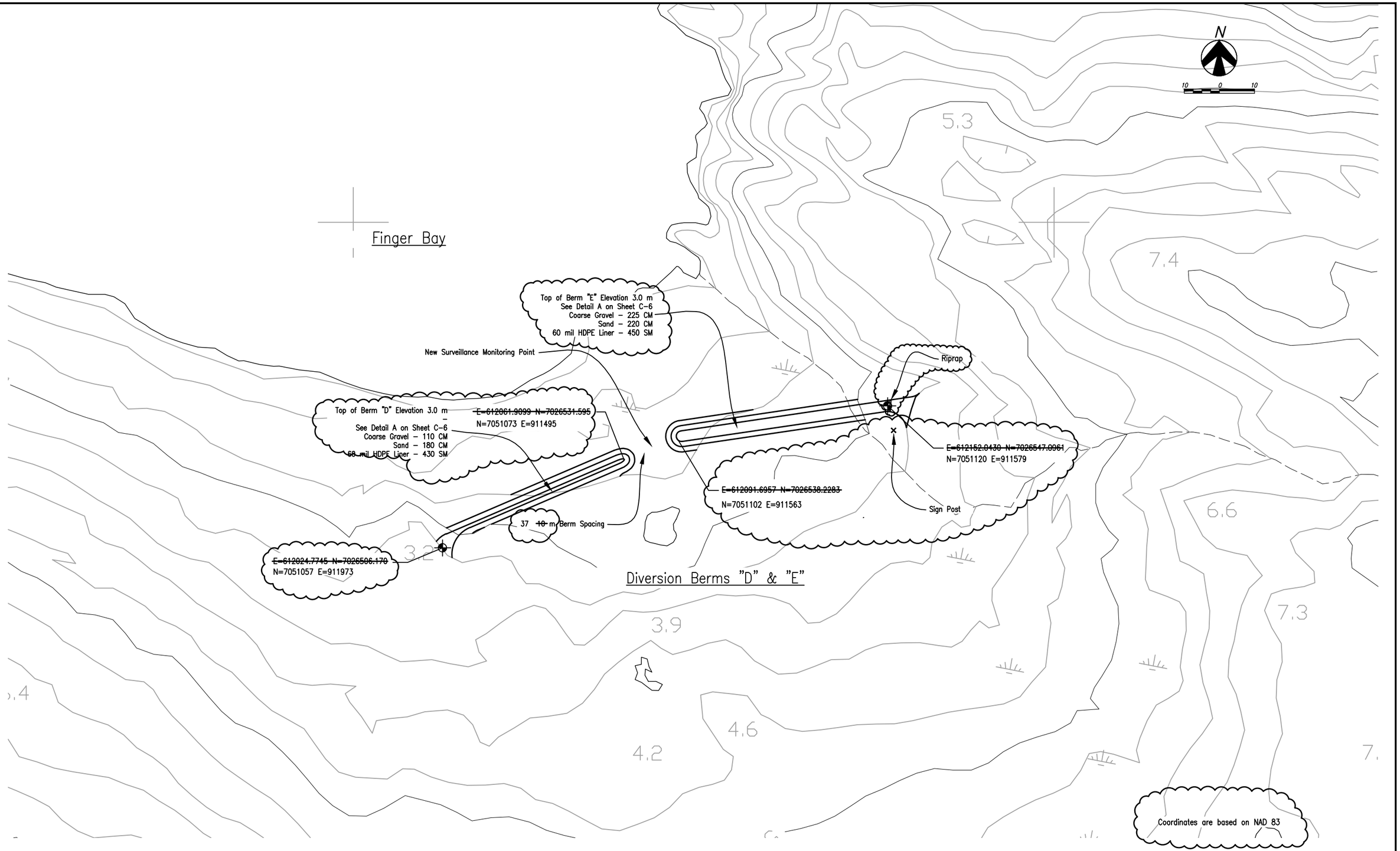

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Diversion Berms "D" & "E" Plan

C-5

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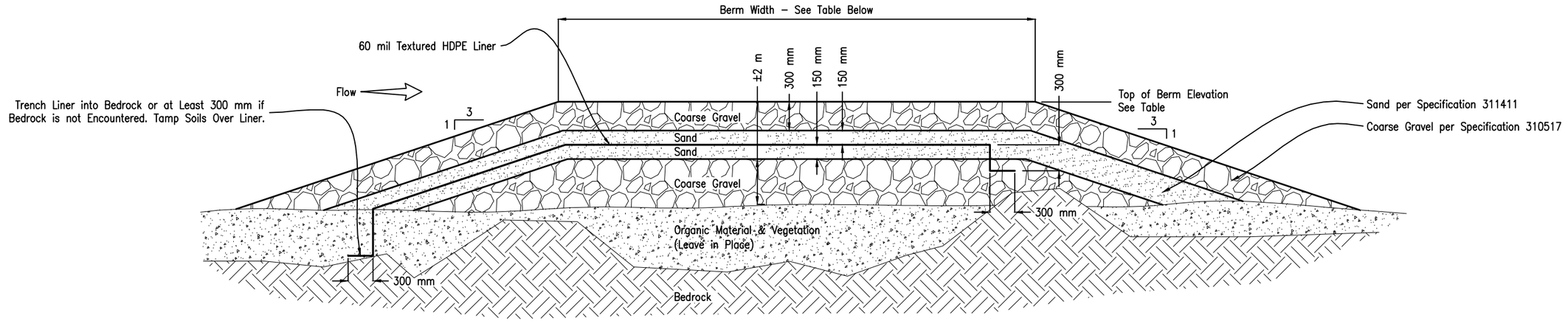
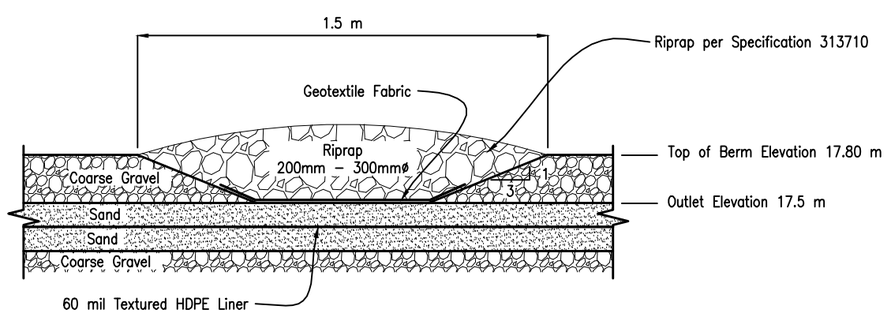


Detail A – Typical Berm Cross Section

Scale: None



Detail B – Typical Holding Cell Berm Outlet

Scale: None

	BERM				
	"A"	"B"	"C"	"D"	"E"
TOP OF BERM ELEVATION (msl)	17.8	17.8	15.0	3.0	3.0
TOP OF BERM WIDTH (in Meters)	3	3	1	1	3

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Berm Details

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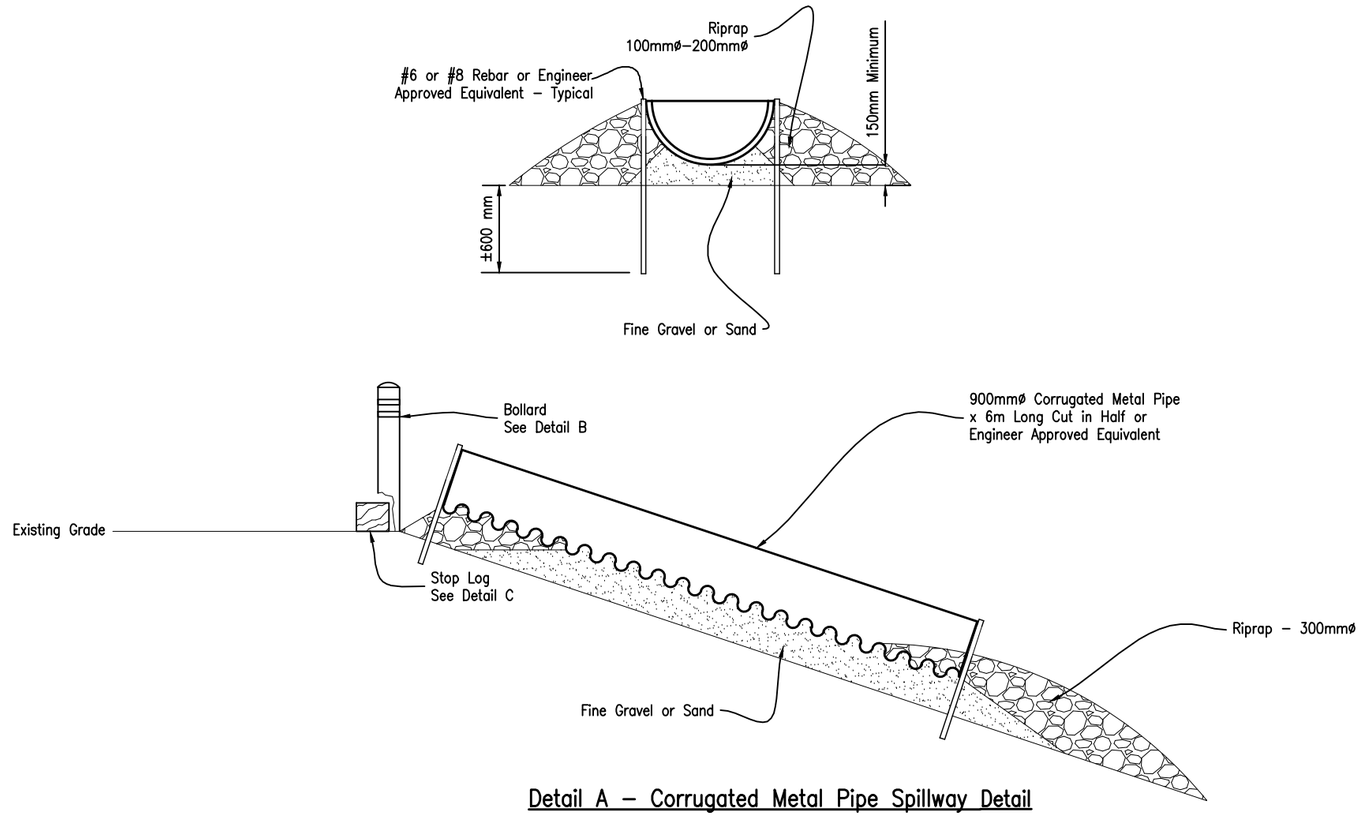
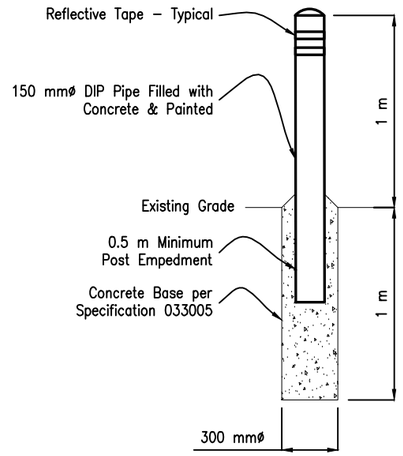
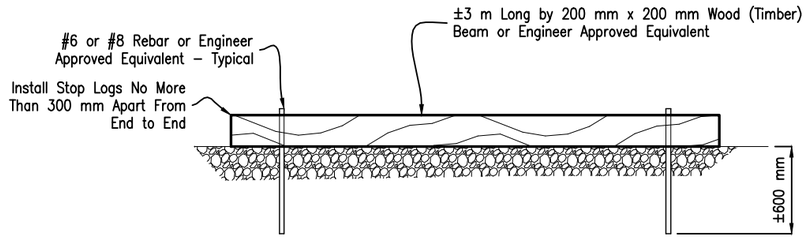


Detail A – Corrugated Metal Pipe Spillway Detail



Detail B – Bollard



Detail C – Traffic Barrier Stop Log

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Spillway, Bollard & Traffic Barrier Details

C-7

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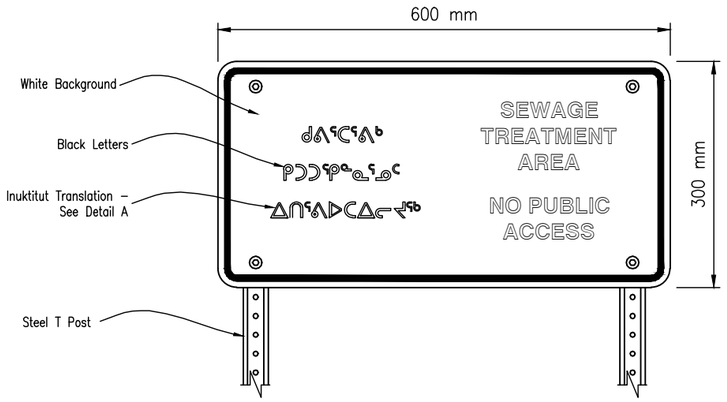

Warning Sign
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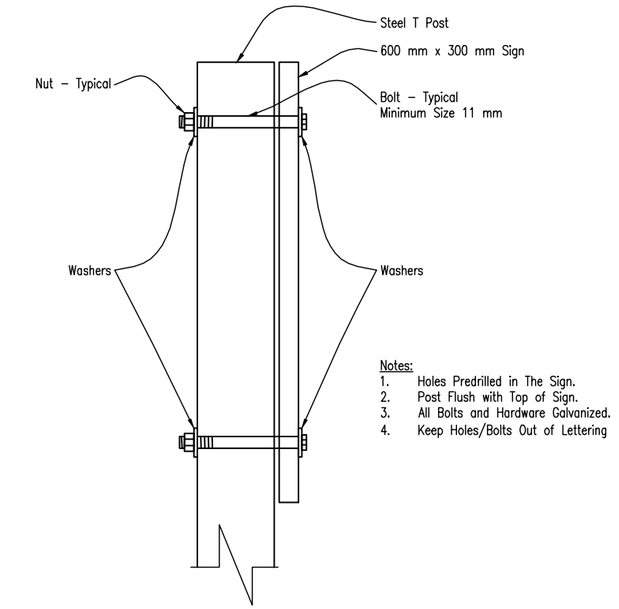
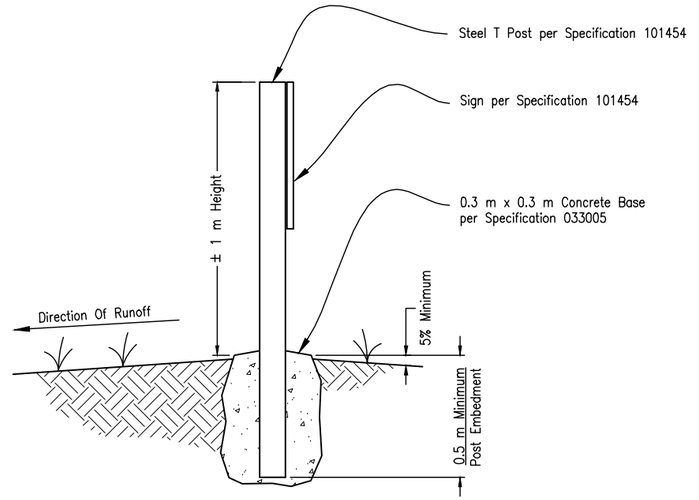


Notes:
1. Holes Predrilled in The Sign.
2. Post Flush with Top of Sign.
3. All Bolts and Hardware Galvanized.
4. Keep Holes/Bolts Out of Lettering

Standard Sign Detail
Scale: None

Detail A – Inuktitut Translation for Warning Sign
Scale: None



Sign Installation Detail
Scale: None

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Sign Details

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