



June 19, 2018

Miller Environmental Corporation  
PO Box 279  
St Jean Baptiste, MB  
R0G 2B0

Attention: Ms. Yolo Ortiz  
Operations Manager

*Miller Environmental Corporation - Central Hazardous Waste Management Facility  
Permit No.: 58 HW S2 RRRR  
Design of Expansion for RC1, Revised*

Dear Ms. Ortiz:

Dillon Consulting Limited (Dillon) was retained by Miller Environmental Corporation (Miller) to prepare a design of the expansion of the repository cell (RC1) located at the Central Hazardous Waste Management Facility located 70 kilometers south of Winnipeg in the R.M. of Montcalm in Manitoba under Licence No. 58 HW S2 RRRR.

Background information in this letter is referenced from the Notice of Alteration submitted by Miller in July 2014 for the construction of a repository cell (RC1) – Dangerous Goods Handling & Transportation Act (DGHTA). The Notice of Alteration included design, construction and operation considerations, as well as details on Miller's Environmental Monitoring Program. It is anticipated that the operation and management of the expansion of RC1 will be conducted in a similar fashion to that currently undertaken in RC1, which has been previously documented.

In addition, Dillon subcontracted TREK Geotechnical Inc. (TREK) to conduct a geotechnical investigation to provide recommendations, assist in conducting slope stability requirements, and heave analysis to confirm internal and external slopes and maximum excavation depth for the design of the RC1 expansion.

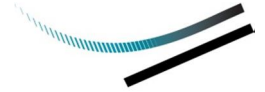
#### 1. Design Development – Expansion of RC1

The proposed expansion to RC1 will be located west of the current RC1 and will be built in two areas: RC1-1 and future RC1-2. The combined surface area of the RC1 expansion is around 29,000 m<sup>2</sup>. A site plan showing the current RC1 and proposed RC1 expansion is shown on Drawing 1.

RC1-1 Phase 1 will be the first cell to be constructed to base elevation 234.3 m and will have an estimated below ground capacity of 19,500 m<sup>3</sup>. The overall capacity for RC1 Expansion is estimated to be around 77,680 m<sup>3</sup>. The capacities have been

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Dillon Consulting  
Limited



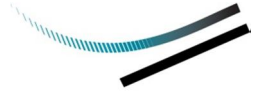
estimated from the proposed cell base grades to existing ground elevations (cut volume).

A base heave analysis was carried out by TREK to confirm the maximum excavation depth considering a long term factor of safety of 1.3 to minimize the risk of having a hydraulic fracture of the clay due to groundwater seepage. Based on this analysis it is recommended to maintain a 3:1 excavation slope.

The maximum depth of excavation recommended for short term and base heave stability is 4.7 m below current ground surface and for long term stability is 3.4 m below ground surface. To meet the short term and long term stability requirements, it is recommended that RC1-1 expansion be completed in the following stages:

- Stage 1: Excavating RC1-1 to a minimum elevation of 235.6 m to meet short term and long term stability.
- Stage 2: Excavate RC1-1 Phase 1 to a minimum elevation of 234.3 m. Monitoring of the hydraulic pressure and seepage should be conducted during and following the cell excavation. To meet slope stability requirements the leachate collection system are designed to be placed at 50 mm above the base elevation surrounded by one metre clearstone drainage layer wrapped in geotextile. Based on the waste material currently disposed at the facility, approximately 1.3 m of waste should be placed on top of the cell base within RC1-1 Phase 1 to minimize the risk of clay fracturing.
- Stage 3: The above ground perimeter berm should be constructed using the on-site clay soil. The clay fill should be unfrozen, free from organic matter, debris and deleterious materials. The berm should be constructed in uniform lifts compacted to 95% Standard Proctor Maximum Dry Density (SPMDD) in lifts of 150 mm. The above ground berms should be built in a phased approach with construction being completed following the inclusion of an additional 1 m height of waste material for 3 m width at the base of the term berm.

The current approved liner system requires a recompacted clay liner to a minimum thickness of 1 meter for the side slopes and 1 meter for the base of the active area with a hydraulic conductivity of  $1 \times 10^{-7}$  cm/second or less (as per Licence No. 58 HW S2 RRRR, Condition 42). Two soil samples from the native clay material were analyzed for hydraulic conductivity by the flexible wall method (ASTM D5084) as part of TREK's geotechnical investigation. Hydraulic conductivity results indicated values of  $2.52 \times 10^{-8}$  cm/s (TH17-08 at 1.5-2.1m) and  $1.41 \times 10^{-8}$  cm/s (TH17-01 at 4.6 - 5.2m), meeting the provincial cell liner hydraulic conductivity requirements.



Based on the laboratory analysis and existing information at the site, the in-situ high plasticity silty clay appears to be appropriate for liner material. Therefore, during construction the following recommendations should be followed:

- If there are areas where the in-situ material is not high plasticity silty clay, this material should be removed and replaced with high plasticity clay fill, moisture conditioned and compacted to 95% SPMDD. The liner should be continuous along the base of the new cell.
- The hydraulic conductivity of in-situ samples of the high plasticity silty clay liner material should be confirmed during construction.
- The upper portion of the liner should be scarified to 300 mm depth, moisture conditioned and compacted to 95% SPMDD.

Alternatively a base liner configuration is proposed to be used for the RC1 expansion, which incorporates a synthetic liner above the compacted clay liner system.

The alternative liner option will feature a 60 mil high density polyethylene (HDPE) liner overlying the in-situ clay meeting the hydraulic conductivity requirement. This offers a low permeability solution to minimize leachate migration from the repository cell. With its low permeability, the HDPE liner will greatly improve the effectiveness of the leachate management system. The lower the permeability value, the more resistant the liner is to infiltration and the better it performs as a barrier against leachate migration. Design details are shown on Drawing 1.

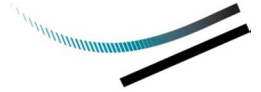
The selection of which alternate base liner configuration (60 mil HDPE liner or recompacted clay liner), will be addressed at the time of construction. Both options are provided to allow flexibility for cell design while meeting the provincial landfill requirements.

Prior to placing the 60 mil HDPE liner, the on-site clay liner quality shall be tested by collecting Shelby tube samples to confirm the hydraulic conductivity from at least one randomly selected location for each 4,000 m<sup>2</sup>.

The final capping process will be conducted in accordance with the Licence No. 58 HW S2 RRRR to mitigate erosion and runoff. The leachate collection system, discussed below, will continue to be in operation to collect and monitor leachate levels.

## 2. Leachate Management

A perimeter 200 mm diameter perforated HDPE leachate collection pipe will be located along the north, east and south boundaries of the proposed RC1 expansion to



convey leachate towards a proposed manhole sump located east of the RC1 expansion as show on Drawing 2.

The leachate collection pipes will be placed at approximately 50 mm above the cells base grades surrounded by one metre clearstone drainage layer wrapped in geotextile as shown on Drawing 1. Interim leachate management for the RC1 expansion will be consistent with the leachate management for the current RC1.

Leachate from the proposed RC1 expansion will be monitored as part of the current monitoring program. Depending on the leachate generation rates, it might be required to collect and apply it to the top of the processed material. Depending on the leachate characteristics additional treatment may be required.

### 3. Operations & Monitoring

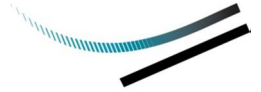
Operation of the Repository Cell will be conducted in accordance with Conditions 49 to 53 in Licence No. 58 HW S2 RRRR.

Regular site inspections will be conducted by the Site Operator to verify that nuisance factors associated with housekeeping procedures are under control. A check list of housekeeping items that need to be implemented on a regular basis will be maintained. All site inspection records will be maintained and retained by the Site Operator including the date wastes were deposited in the cell, volumes received, results of laboratory analysis of the wastes and annual inspection of the leachate collection system.

Long-term monitoring would include regular testing of the groundwater monitoring wells for water quality parameters as described in the Environment Act Licence. Should the results of the program indicate that continued long-term operation of the repository cell is resulting in impact to the groundwater quality at the site, then applicable contingency measures will be evaluated and, if necessary, implemented. Additional discussion on the annual groundwater monitoring program is discussed in Section 4.

### 4. Groundwater Monitoring

Groundwater Monitoring for the Hazardous Waste Management Facility is conducted as per Clause 83 of the Licence No. 58 HW S2 RRRR, dated November 3, 2014 (Client File Number 3440.20). As per Clause 83, the groundwater monitoring program should be completed annually. In addition to the annual reporting requirements for the Licence and in context of liability management and groundwater monitoring best practices, Dillon advanced four new shallow monitoring wells to augment the existing



network in 2017. Monitoring wells OW-1 through OW-7 and the newly installed OW-8 though OW-11 are sampled annually for benzene, toluene, ethylbenzene and xylenes (BTEX), inorganic metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc) and routine analysis (pH, calcium, magnesium, sodium, potassium, chloride, nitrate, sulphate, total organic carbon, and total dissolved solids).

## 5. Potential Environmental Effects Assessment and Mitigation Measures

Environmental effects associated with the construction and operation of the RC1 expansion is described below. Mitigation measures are identified for environmental effects determined to be adverse.

### 5.1 Air

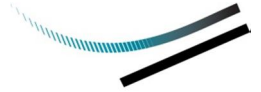
Odours can originate from the waste at the working face or leachate generation. Material with very strong odours will be immediately covered with soil cover. If required, odour suppressing agents would be used.

Odours can originate from cracks or fissures in the soil cover long after landfilling has taken place. Regular inspections would identify cracks or fissures to be repaired by filling with cover soil.

Dust is an inherent part of waste management operations, when precipitation is not present to wet down travelled surfaces. The main cause of dust is from vehicles using on-site access roads and from equipment movement around the cell working area. The main access road to the new cell will have a gravel surface and the vehicles will be restricted to a maximum speed of 20 km/h to avoid producing excess amounts of airborne dust. To avoid excessive dust generation, on-site roads will be routinely monitored and maintained as part of the normal site operations.

Currently, Miller completes the ambient air monitoring at two locations (A1 and A2) on a monthly basis from May to October for VOC's and an alternating monthly basis for particulate matter, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc as per Condition 81 in the Licence. Results of the annual monitoring program are reported to Manitoba Sustainable Development (MSD) on an annual basis.

Miller takes proactive measures to reduce dust and emissions on-site. The proposed mitigation measures along with the monitoring program documented above provide adequate protection and environmental effects to the air for the proposed modifications to the licence.



## 5.2 Water

Groundwater and surface water can be impacted by migrating leachate which will be reduced by the construction of a lined cell, meeting the permeability requirements by MSD. Leachate produced will be contained in the repository cells and will be dissipated through evaporation.

As part of the site operations, any leachate seeps identified in the cells will be repaired by excavating to a depth where leachate can be re-introduced. The excavation would then be filled with coarse, granular material, and covered with soil or a geotextile. The top surface would be dressed with cover soil.

A groundwater program is completed at the facility for 11 groundwater monitoring wells for parameters discussed in Section 4. Results of the annual monitoring program are reported to MSD on an annual basis as per Condition 83. In addition, prior to any discharge of water into the retention pond on-site, surface water monitoring of the discharge material is conducted as per Clause 85 of the Licence. The proposed mitigation measures along with the monitoring program documented above provide adequate protection and environmental effects to water for the proposed modifications to the licence.

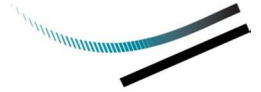
## 5.3 Land

The landscape would be altered by the expansion. Leachate and windblown soil dust can impact the surrounding lands if not contained and side slopes can erode if they are not seeded and monitored after construction activities are completed.

All vehicles entering the site will be required to be covered by a tarp or have their loads appropriately tied down to minimize off-site dust dispersion.

All disturbed areas will be seeded upon construction completion to minimize soil erosion.

A soil monitoring program is completed at the facility for three soil locations, which are completed every three years for analysis of arsenic, cadmium, chromium, copper, lead, nickel, zinc, mercury, BTEX, PHC F1-F4 and PAHs. Results of the soil monitoring program are reported to MSD every three years.



6. Closure

Based on the design of the project and the implementation of the mitigation measures identified above, no significant negative environmental impacts are anticipated. If you have any questions or concerns, please feel free to contact me at (204) 453-2353 x 4023 or by email to vkrahn@dillon.ca.

Yours sincerely,

DILLON CONSULTING LIMITED

Cristina Olarte, P. Eng., EP  
Associate

Vanessa Krahn, M.Sc., P. Eng.  
Project Manager

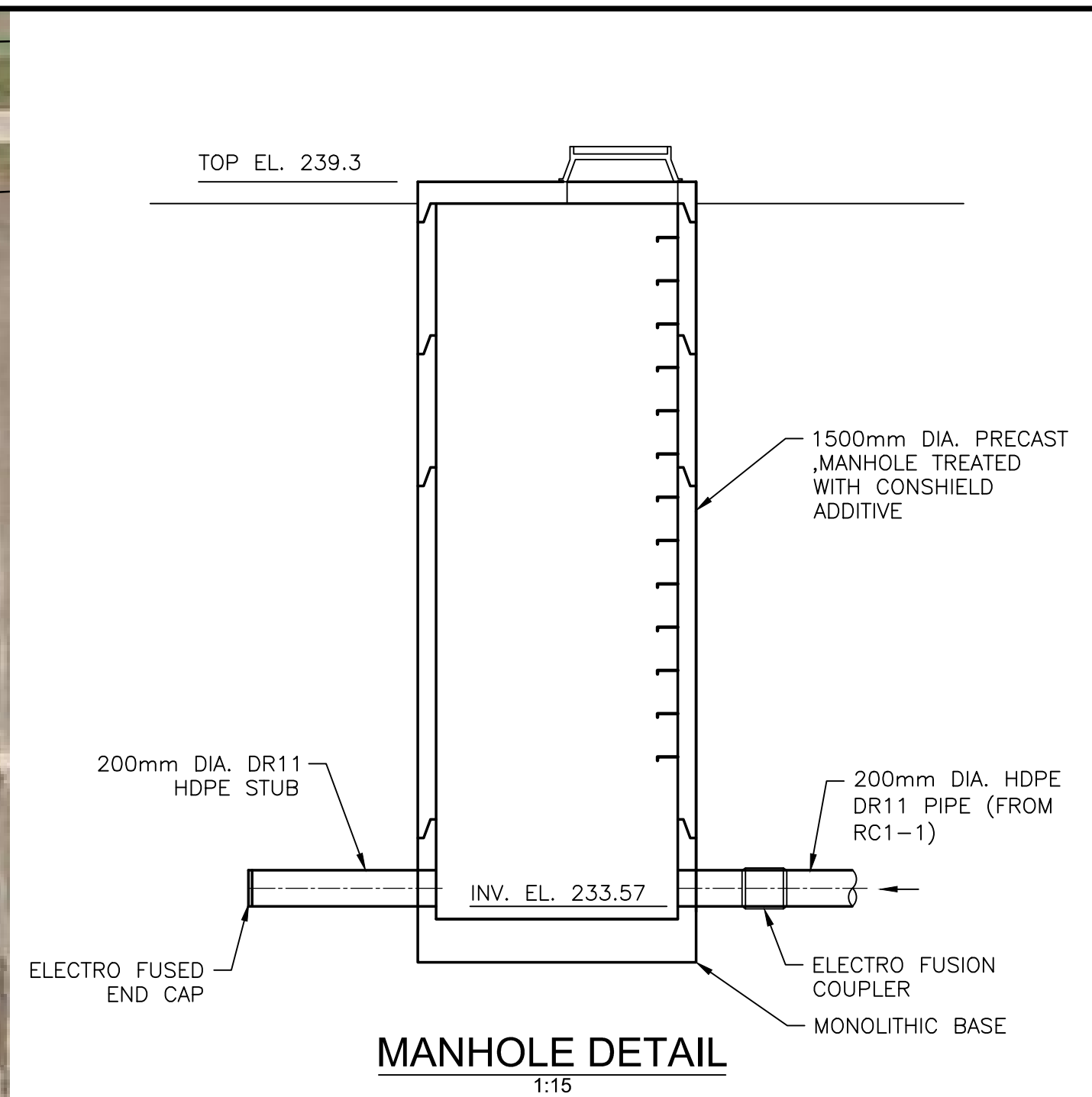
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Attachments: Drawings

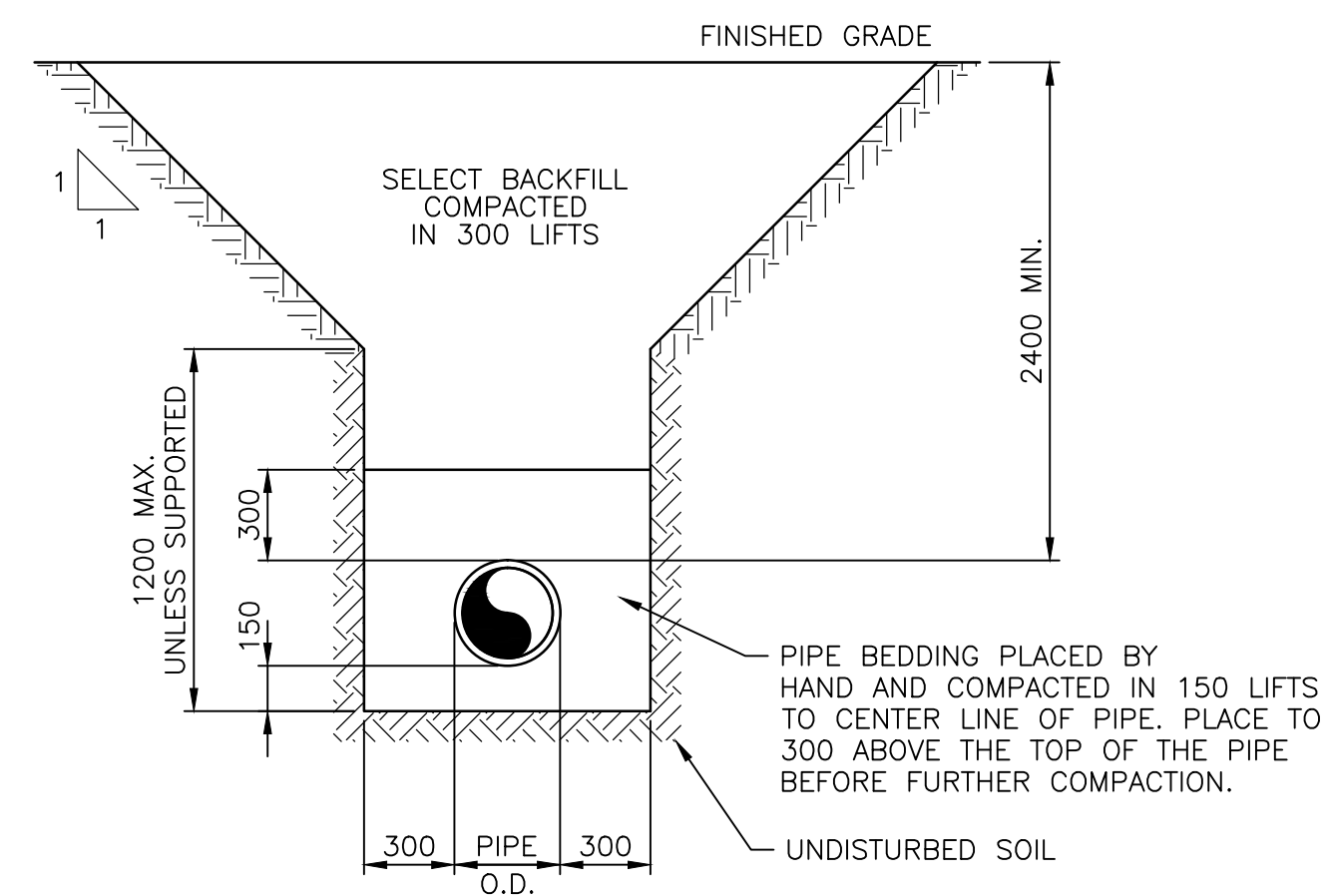
Our file: 17-5581



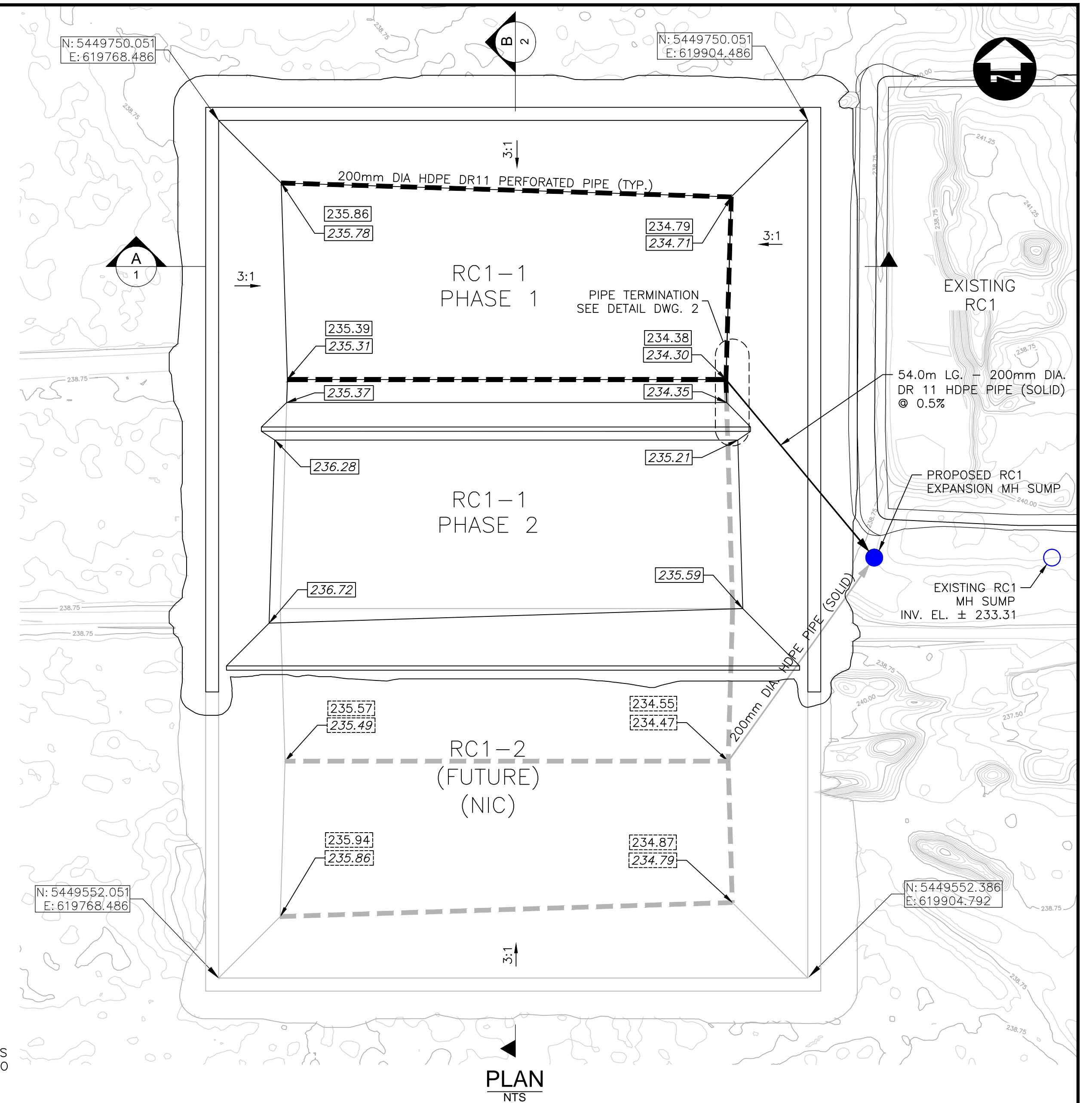
**SITE PLAN**  
NTS



**MANHOLE DETAIL**  
1:15



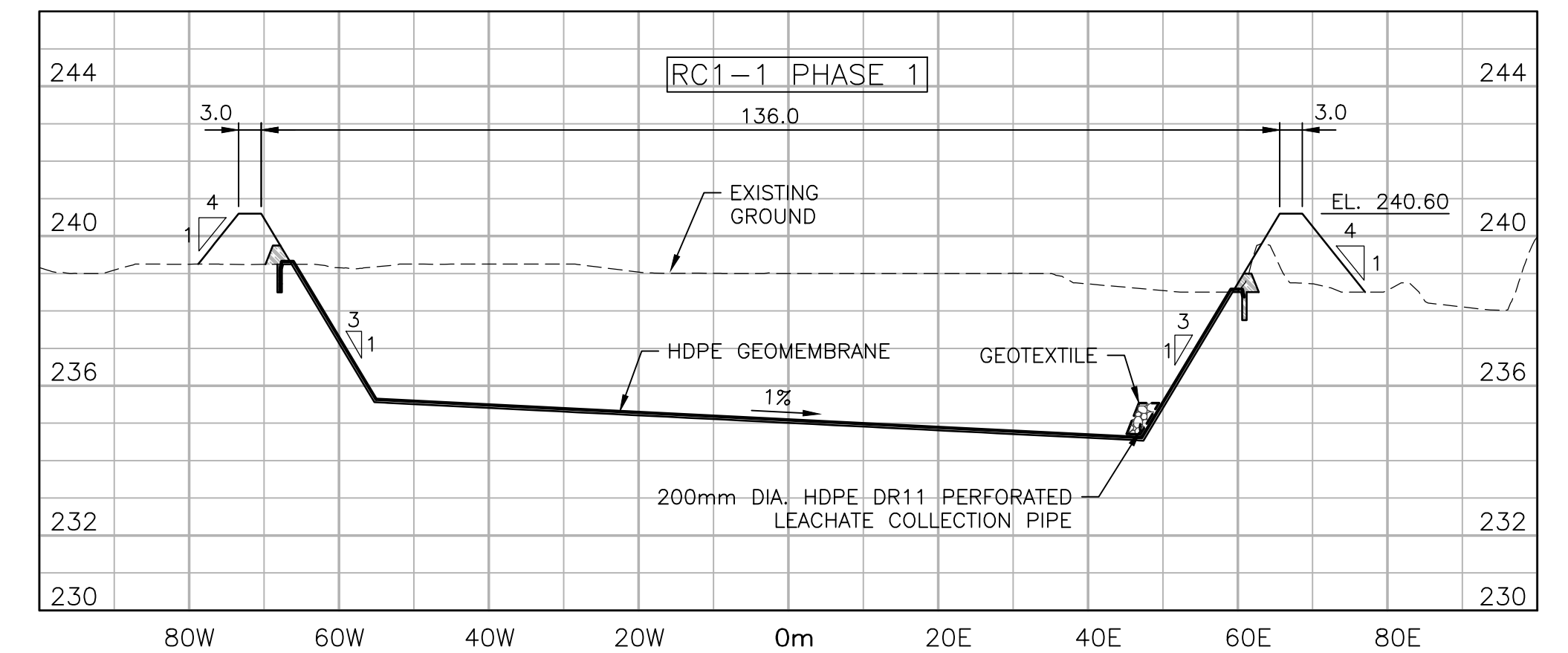
**PIPE TRENCH DETAIL**  
1:15



**PLAN**  
NTS

**CONSTRUCTION NOTES:**

- EXISTING GROUND ELEVATION DATA AS PER TOPOGRAPHIC SURVEY DATED AUGUST 2017.
- MONITOR THE HYDRAULIC PRESSURE IN THE CLAY/TILL PRIOR, DURING AND FOLLOWING CELL EXCAVATION.
- CONTRACTOR TO CONFIRM EXISTENCE AND LOCATION OF ALL ON-SITE UTILITIES IN THE AREA OF WORK PRIOR TO COMMENCEMENT OF CONSTRUCTION.
- EXCESS EXCAVATED SOIL TO BE STOCKPILED IN THE LOCATIONS SPECIFIED BY THE OWNER.
- EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED PRIOR TO CONSTRUCTION OF THE PROPOSED WORKS AND MAINTAINED TO THE SATISFACTION OF THE OWNER.
- NO EQUIPMENT REFUELING AND SERVICING SHALL OCCUR WITHIN 30m OF WATERCOURSES.
- THE CONTRACTOR UNDER SUPERVISION OF THE OWNER SHALL DEWATER THE WORKING AREA DURING THE COURSE OF THE WORK.
- IF THERE ARE AREAS WHERE THE IN-SITU SOIL MATERIAL AT THE LINER ELEVATION IS NOT HIGH PLASTICITY SILTY CLAY, THIS MATERIAL SHOULD BE REMOVED AND REPLACED WITH HIGH PLASTICITY CLAY FILL, MOISTURE CONDITIONED AND COMPACTED TO 95% STANDARD PROCTOR MAXIMUM DRY DENSITY (SPMDD).
- THE HYDRAULIC CONDUCTIVITY OF IN-SITU OR RE-MOULDED SAMPLES OF HIGH PLASTICITY SILTY CLAY LINER MATERIAL SHOULD BE CONFIRMED DURING CONSTRUCTION.



**SECTION**  
NTS

DATUM: UTM NAD83 ZONE 14N  
ON SITE BENCHMARK (BM.): N49.188763 W97.348697  
IN CONCRETE PAD NORTH SIDE OF BUILDING ELEVATION 240.740

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Do not modify drawing, re-use it, or use it for purposes other than those intended at the time of its preparation without prior written permission from Dillon Consulting Limited.



**LEGEND**

- [233.00] LEACHATE COLLECTION SYSTEM PIPE INV. ELEV.
- [233.00] BASE ELEV.
- [233.00] LEACHATE COLLECTION SYSTEM PIPE INV. ELEV. (FUTURE)
- [233.00] BASE ELEV. (FUTURE)

NOTE: ELEVATIONS SHOWN IN LEGEND ARE FOR STYLE REFERENCE ONLY AND DO NOT REPRESENT ACTUAL ELEVATIONS.



| No. | ISSUED FOR                   | DATE    | BY |
|-----|------------------------------|---------|----|
| 2   | GEOTEXTILE REMOVED FROM BASE | 6/15/18 | CO |
| 1   | ISSUED FOR CONSTRUCTION      | 5/17/18 | CO |

| DESIGN | REVIEWED BY   |
|--------|---------------|
| CO     | CO            |
| DRAWN  | CHECKED BY    |
| SKB    | CS            |
| DATE   | JUNE 15, 2018 |
| SCALE  | AS NOTED      |

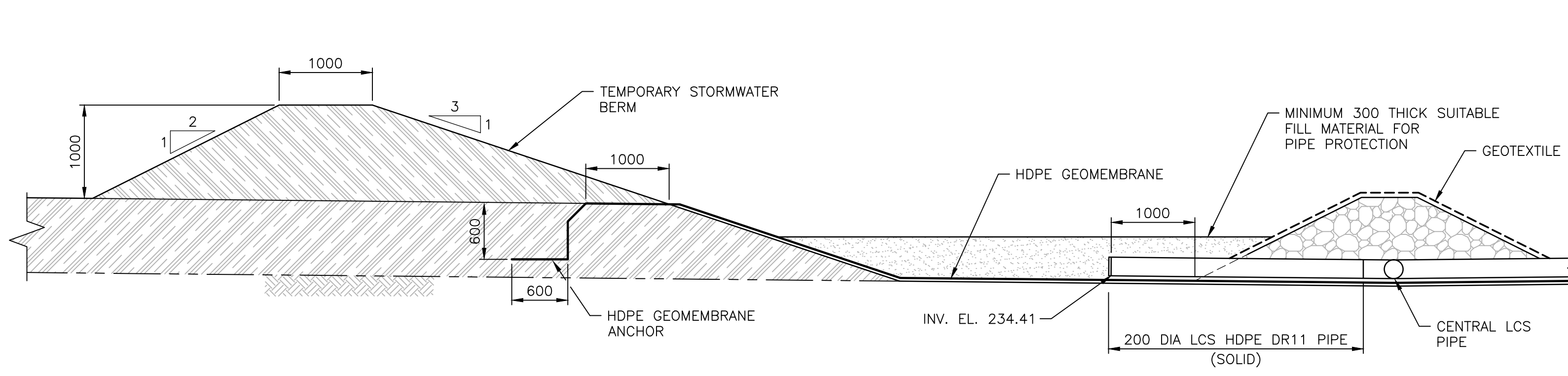
**MILLER ENVIRONMENTAL CORPORATION**

PROJECT NO. 17-5581

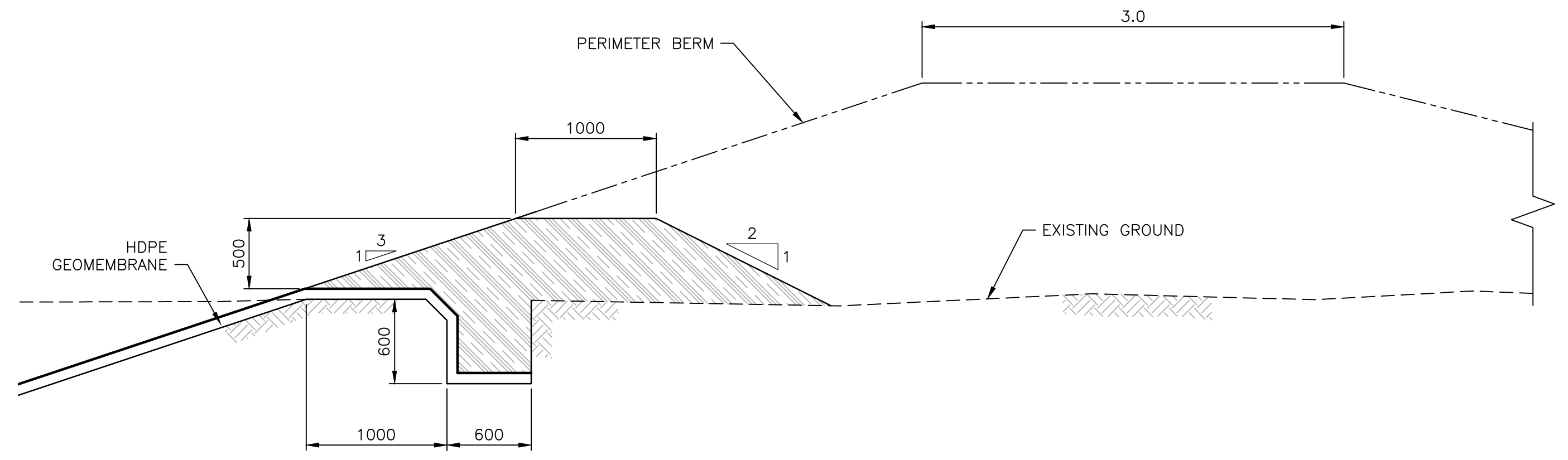
**PROPOSED RC1 EXPANSION**

SHEET NO. 1

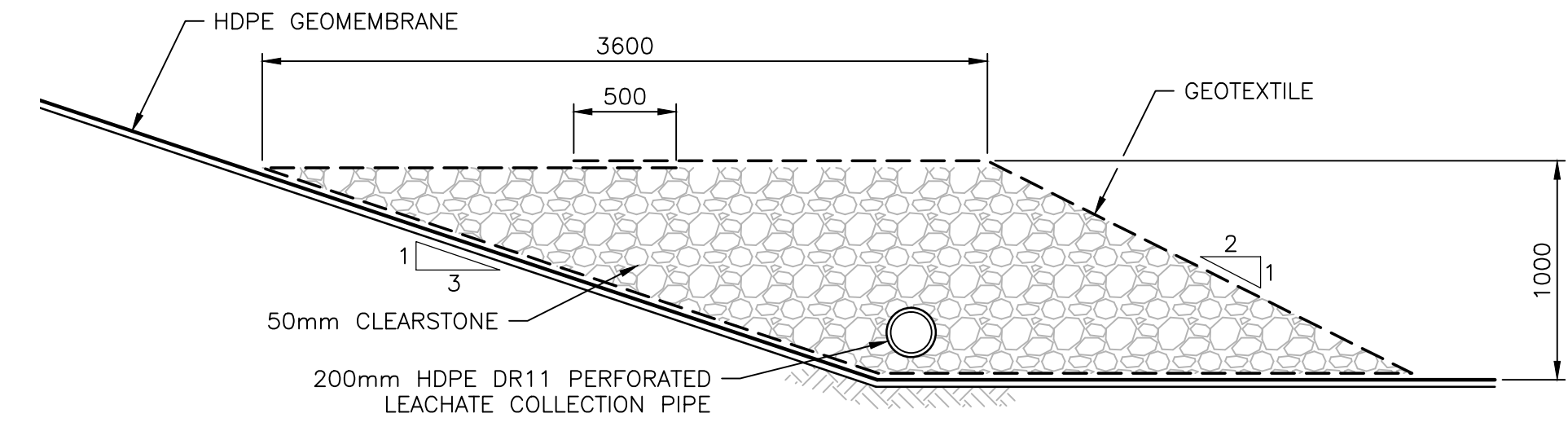




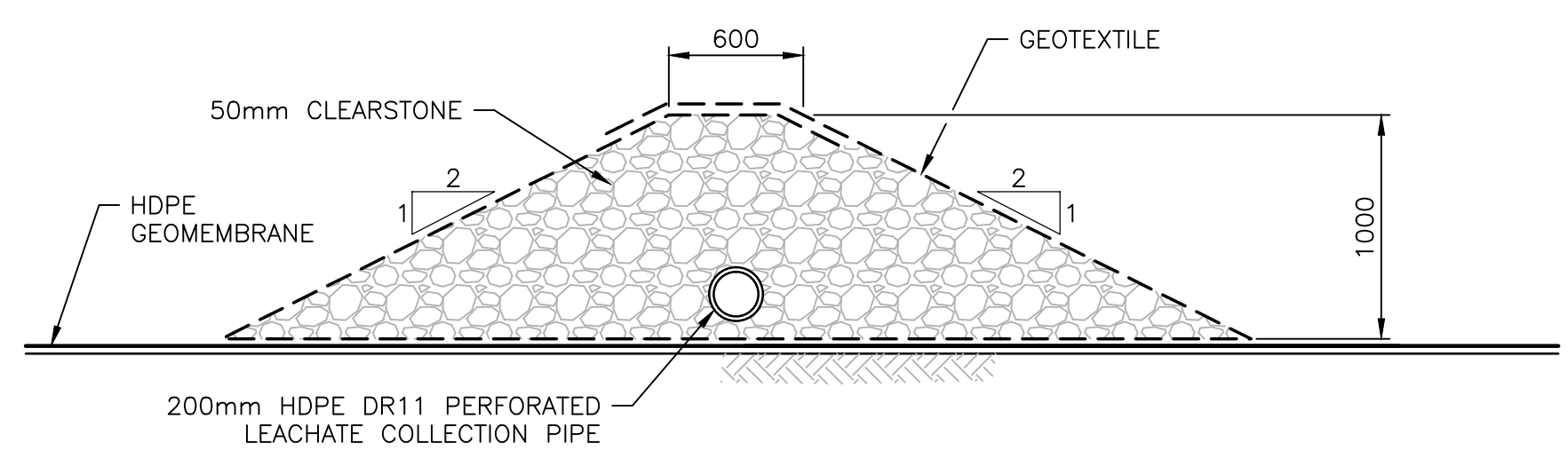
**LEACHATE COLLECTION PIPE TERMINATION**  
NTS



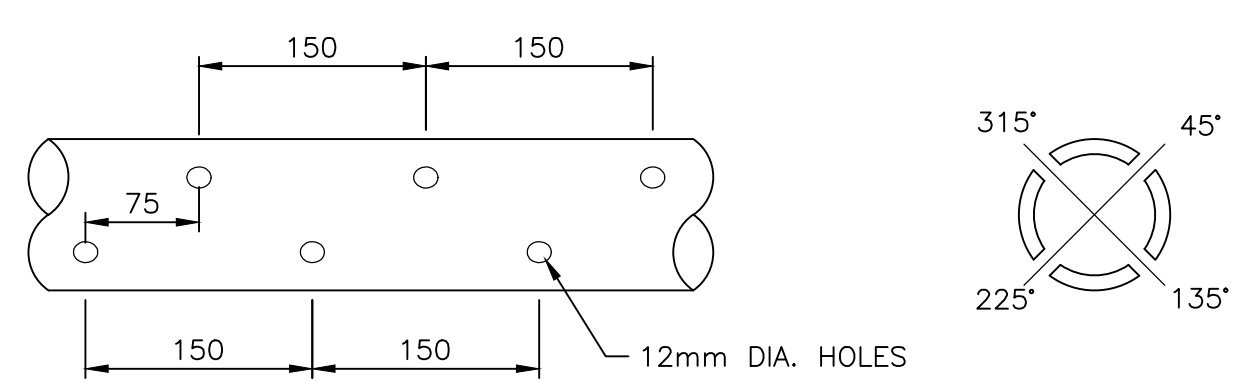
**LINER ANCHOR DETAIL**  
NTS



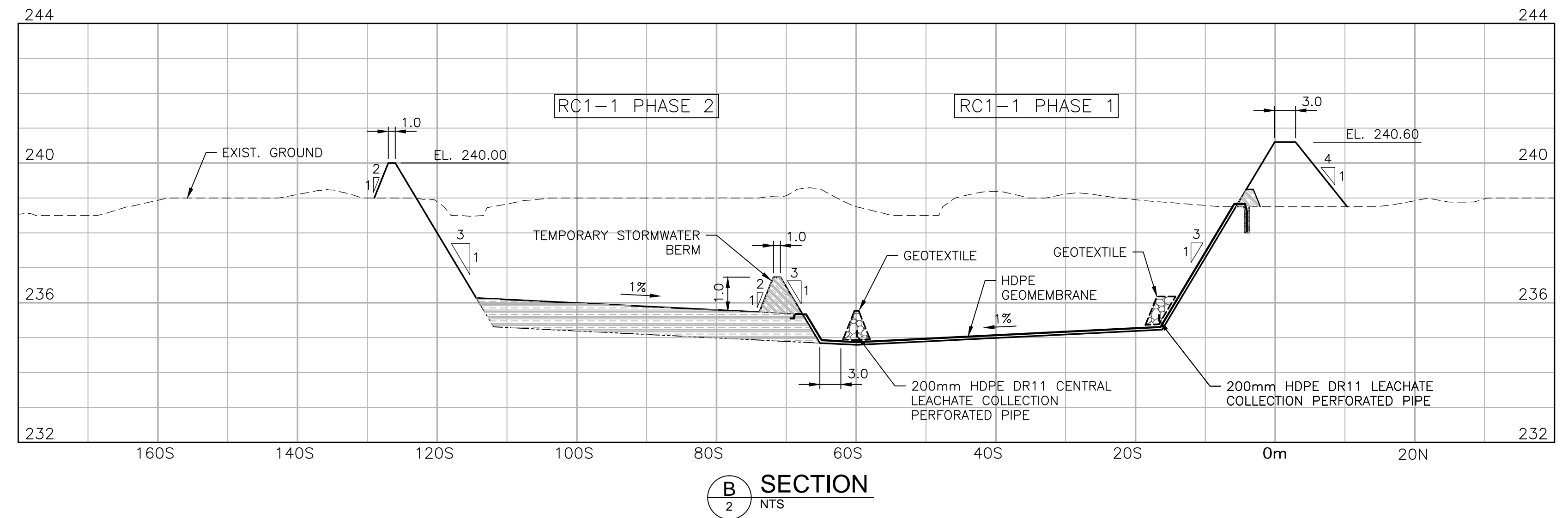
**LEACHATE COLLECTION PIPE DETAIL AT SIDE SLOPE TOE**  
NTS



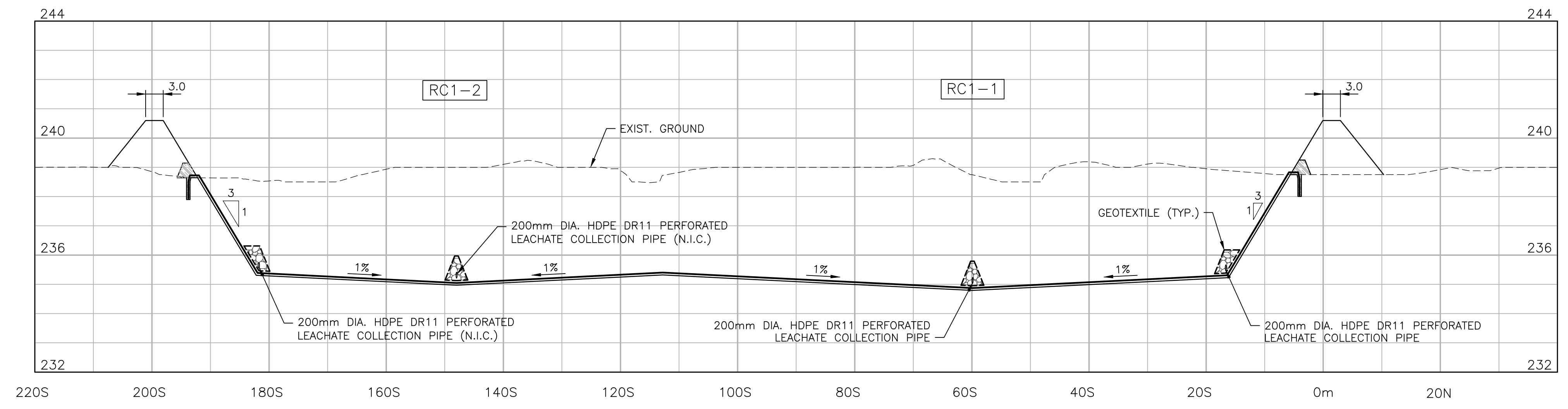
**CENTRAL LEACHATE COLLECTION PIPE DETAIL**  
NTS



**200mm DIA. HDPE DR11 PIPE PERFORATION DETAIL**  
NTS



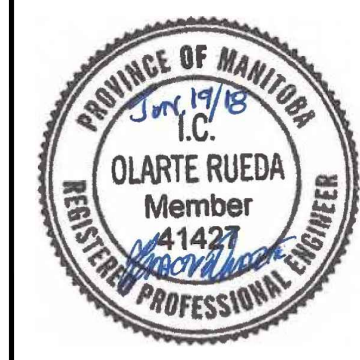
**SECTION B**  
NTS



**SECTION B**  
NTS

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| No. | ISSUED FOR                   | DATE    | BY |
|-----|------------------------------|---------|----|
| 2   | GEOTEXTILE REMOVED FROM BASE | 6/15/18 | CO |
| 1   | ISSUED FOR CONSTRUCTION      | 5/17/18 | CO |

|   |               |             |    |
|---|---------------|-------------|----|
| DESIGN  | CO            | REVIEWED BY | CO |
| DRAWN   | SKB           | CHECKED BY  | CS |
| DATE  | JUNE 15, 2018 |             |    |
| SCALE   | AS NOTED      |             |    |
| <b>MILLER ENVIRONMENTAL CORPORATION</b>         |               |             |    |
| <b>PROPOSED RC1 EXPANSION PLAN AND SECTIONS</b> |               |             |    |
| PROJECT NO.                                     | 17-5581       |             |    |
| SHEET NO.                                       | <b>2</b>      |             |    |