

AECOM

99 Commerce Drive, Winnipeg, MB Canada R3P 0Y7
T 204.284.0580 F 204.475.3646 www.aecom.com

Technical Memorandum

Date: June 11th, 2010
To: Brian Beyak, P.Eng, Manitoba Hydro
From: Jamie Ellis, P.Eng, AECOM
Project Number: 0217-200-07 (3) [Hydro Ref: 243 981 0100]
Subject: **Keeyask Infrastructure Project – North Access Road Start Up Camp
Design for Wastewater Disposal
Additional Information at June 11th, 2010**

Distribution: Neil Klassen, C.E.T., AECOM
Bob Romanetz, P.Eng, AECOM

1. Introduction

Information relating to wastewater disposal from the North Access Road Start Up Camp (SUC) was previously submitted as part of the Environment Act Proposal submission for the Keeyask Infrastructure Project. Concept design information was presented in the following technical memoranda submissions:

- Original (dated July 28th, 2009)
- Revision 1 (dated October 2nd, 2009)
- Revision 2 (dated October 21st, 2009)
- Additional Information (dated October 26th, 2009)

Following a telephone discussion between Rob Boswick (MB Conservation) and Jamie Ellis (AECOM) on April 28th, 2010 this memo has been prepared to show changes made during the development of detailed design, as additional information has become available.

2. Accompanying Drawings

The following drawings relating to the septic tanks and drain field are attached;

1001 – General Plan	3002 – Drain Field - Sections
1004 – Drain Field - Detailed Site Plan	4004 – Sewer and Water Details 3
1007 – Plan/Profile – Forcemain and Drain Field	4005 – Sewer and Water Details 4
1009 - Drain Field Grading Plan	4006 – Sewer and Water Details 5
	1010 – Sewer and Water Details 6

3. Proposed Changes from Concept Design

a) Type of Field

During the concept design stage our calculations indicated that a trench type disposal field utilizing effluent chambers would create the smallest total footprint for the drain field. These calculations were based on the Manitoba Environment Act Regulations at the time. Since that time amendments to the Regulations have been issued (amendment 156/2009). These amendments affect the calculations used to determine the size of trench type disposal fields utilizing chambers by removing the "Open Area Multiplier" from the calculation for length of trench required. It is understood that this multiplier was in place to acknowledge the larger storage capacity of a chamber vs. traditional aggregate system.

Therefore, sizing calculations were re-examined and it was found that a total area field utilizing effluent chambers now created the smallest foot print, rather than a trench field. This combined with a small change to the location of the field has allowed for a reduction in earthworks quantities.

It should be noted however, that more chambers will be required. It is proposed that the chambers are laid level in the east to west direction. From discussions with Rob Boswick, it is also understood that only the two types of chamber approved for use in Manitoba would be considered acceptable (Infiltrator and ADS brands).

b) Application rate

The majority of the soil samples tested for gradation correspond to a silt loam to a loamy sand given the low percentage of clay (i.e. less than 10 percent) and the range of silt and sand percentages. As can be seen from the table in Enclosure 2, whilst some samples did contain greater than 85% sand content, these are at least 1m below the base of the field, and TH09-13 is some 75m away from the west end of the field. Results are summarized on the Soil Texture Classification Triangle contained within the Supplementary Information as shown in **Figure 1 (attached)**. As shown, application rates range from 12.72 to 29.35 litres/m²/day. Therefore, the wastewater application rate assumed in the concept design (12.72 litres/m²/day) was revised to 18 litres/m²/day. Whilst this is not a value within the Soil Texture Classification Triangle, it is considered to be more appropriate and representative of the existing soil conditions. Again, these changes allowed for a reduction in earthworks required for the drain field.

Based on the above, the following equation was used to size the field which gives a field area requirement of 5,000 m².

$$\text{Area of Field} = \frac{(\text{Daily Effluent Flow}) \times (\text{Safety Factor})}{\text{Application Rate}}$$

This area has been provided over 4 cells, each with 4 zones measuring 8.1m by 39.0m, giving a total field area of approximately 5060 m².

c) Bed level

As described in previous information, three test holes were completed in the field location.

The upper 1.5 m of soil at Test Holes 09-13, 09-14 and 09-15 generally consists of a silt with trace to some sand and variable clay content (trace clay to clayey). Below this layer the soil has variable silt and sand content (i.e. silt content ranges from about 11 to 85 percent and the sand ranges from about 7 to 88 percent) and the clay content is less than 10 percent.

The review of the information suggested that the base of the field could be located higher than previously assumed in the concept design drawings (the potential for this change was noted in Revision 2 of the Technical Memorandum).

4. Pressure system

From discussions with Manitoba Conservation, it was understood that a gravity system would not be as considered appropriate for a field of this size, as even distribution of wastewater across the whole bed area could not be guaranteed. Therefore, a calculation method provided within guidance documents from Alberta (Private Sewage Systems Standard of Practice Handbook, 1999) has been used to size the pressure distribution system, comprising headers and laterals.

An at-grade package lift station is proposed rather than submersible pumps. A pressure filter will also be installed to remove small debris (such as hair) that could clog small holes on the distribution laterals. These filters will require regular cleaning from camp maintenance staff.

As shown on the drawings, it is proposed that an arrangement of 5 automatic distributing valve assemblies (1 primary and 4 secondary, each mechanically operated) which operate with each pump cycle. As such, flow is sequentially directed to a total of 16 zones across the 4 cells.

In addition, due to the shallow nature of the system, a number of freeze protection measures are included, including box insulation and placement of stripping material (organics) over the chambers.

5. Conclusion

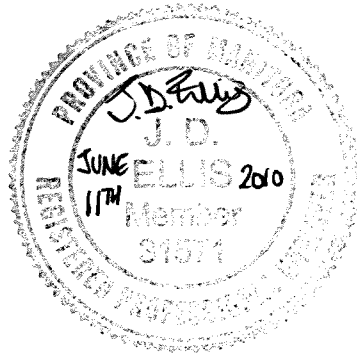
In summary, this memo provides details of improvements which have occurred between concept and detailed design. These include the use of a total area field, more chambers, a higher application rate and a pressure distribution system.

Technical Memorandum

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Respectfully submitted,



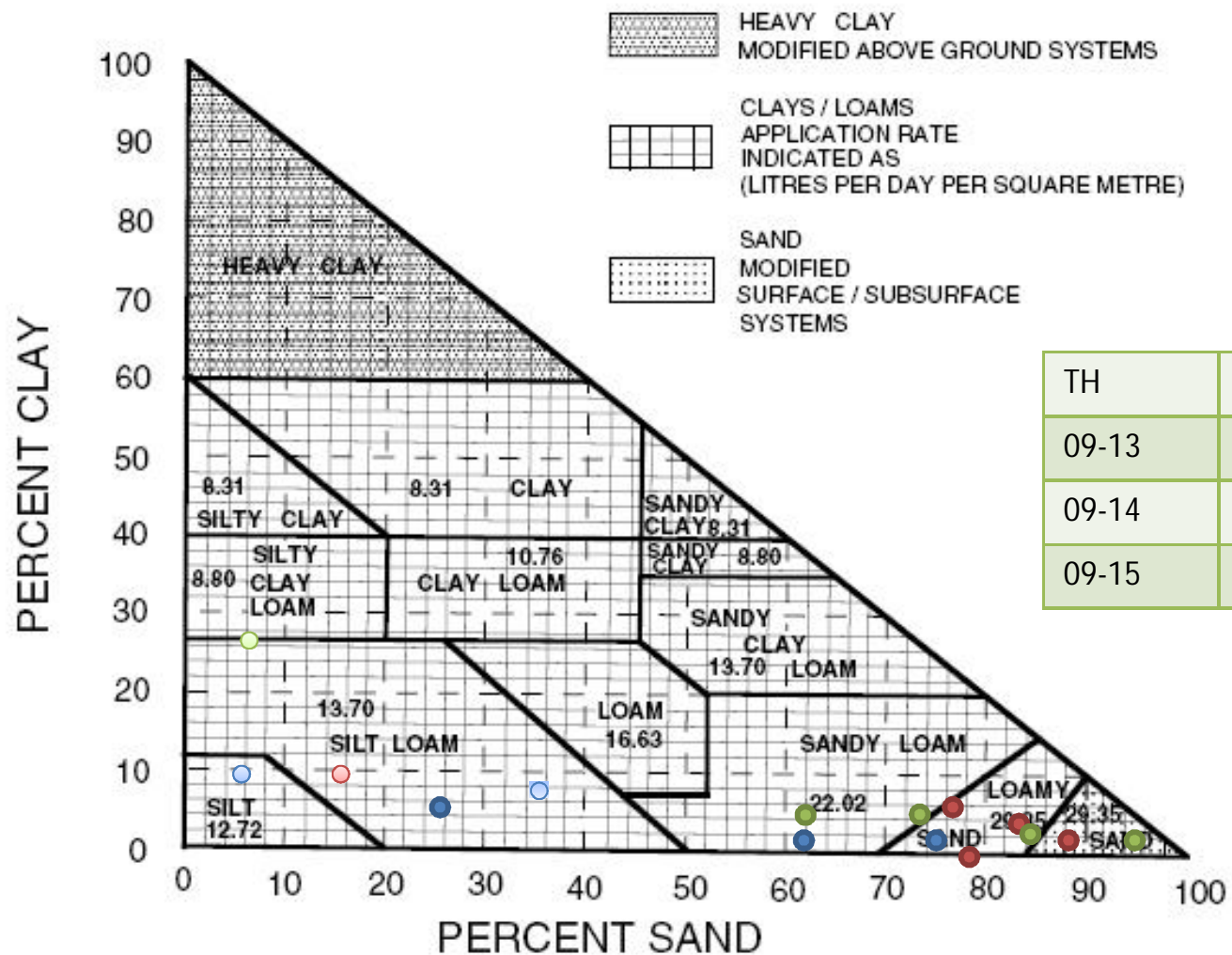
J. D. Ellis, P.Eng
Community Infrastructure
AECOM Canada Ltd.

Encs:

Figure 1 – Soil Texture Classification Triangle
Drawings

Figure 1

SOIL TEXTURE CLASSIFICATION TRIANGLE



TH	Above base	Below base
09-13		
09-14		
09-15		

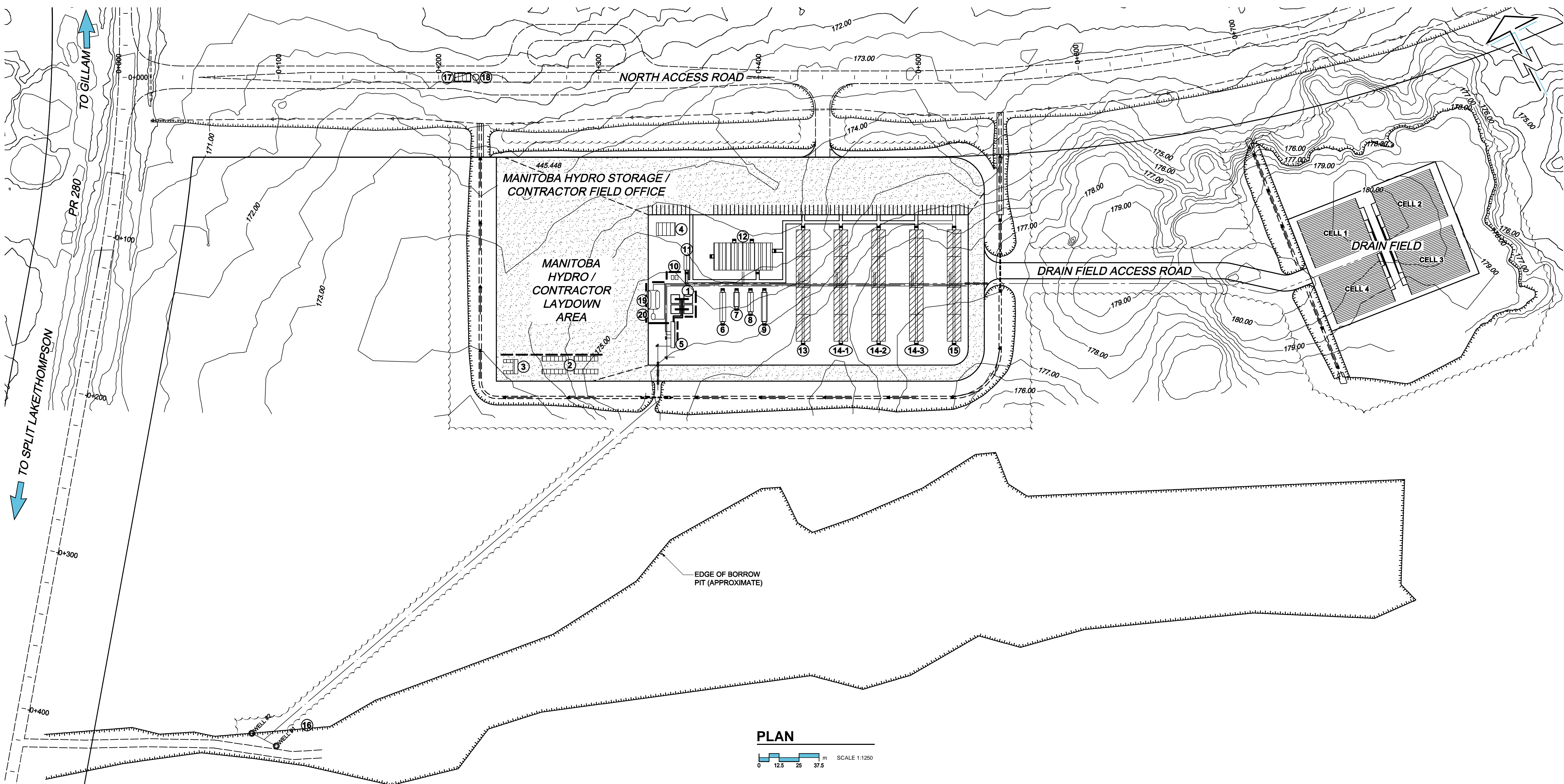
*APPLICATION RATE-LITRES PER DAY PER SQUARE METRE

D SIZE = 566 x 801
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1001 00

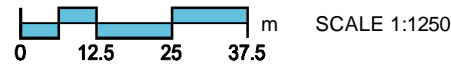
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PLAN



CAMP INVENTORY						
ITEM	DESCRIPTION	No. Req'd	Assumed Dimensions (m)	Area (Sq. M.)	Supplied by	S & W Req'd.
1	Treated Water Storage Tanks and Building	1	13.6 x 11.8	161.8	CONTRACT 2A	YES
2	Fuel Tanks	4	15.0 x 3.0	180.0	OTHER	N/A
3	Generator	1	9.0 x 9.0	81.0	OTHER	N/A
4	Potential Fire Truck Storage Garage	1	12.0 x 8.0	96.0	OTHER	NO
5	Water Treatment / Pumphouse Container	1	16.3 x 2.7	43.3	CONTRACT 2A	YES
6	Site Office	1	18.3 x 3.7	66.9	CONTRACT 13	NO
7	5 Person Office	1	9.0 x 3.7	32.9	CONTRACT 13	NO
8	General Meeting Office	1	12.2 x 3.7	44.6	CONTRACT 13	NO
9	Traning / Boardrom / Safety	1	18.3 x 3.7	66.9	CONTRACT 13	NO
10	Propane Tanks (Location to be Confirmed by Supplier)	1	-	-	OTHER	NO
11	First Aid / Security Building	1	9.0 x 3.7	32.9	CONTRACT 13	YES
12	Kitchen & Diner / Recreation Complex	1	36.6 x 17.1	624.4	CONTRACT 13	YES
13	18 Person Dormitory	1	69.7 x 8.6	597.9	CONTRACT 13	YES
14-1, 14-2, 14-3	49 Person Dormitory	3	69.7 x 8.6	597.9	CONTRACT 13	YES
15	Furure 49 Person Dormitory	1	69.7 x 8.6	597.9	CONTRACT 13	YES
16	Wells	1	-	-	N/A	N/A
17	Security Gate House and Gate	1	10.0 x 5.0	50.0	CONTRACT 13	NO
18	Security Gatehouse Pumpout Tank	1	-	-	CONTRACT 1	NO
19	Wastewater Sedimentation Tanks	2	11.1 x 2.4	25.7	CONTRACT 2B	N/A
20	Wastewater Control Tank and Pumps	1	4.0 x 2.4	8.4	CONTRACT 2B	N/A



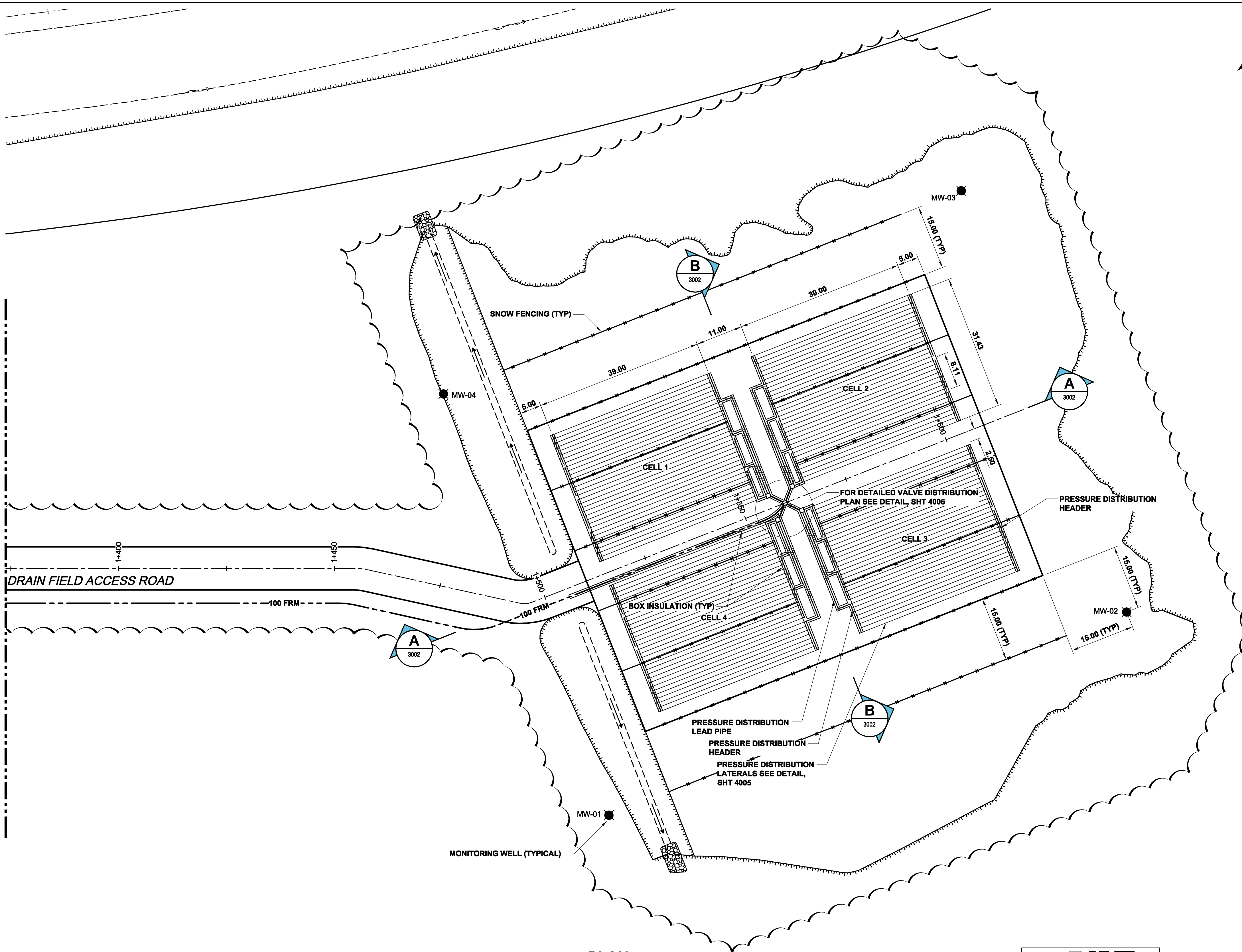
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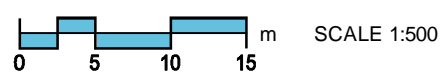
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NO.	DATE	REVISIONS	BY	CHKD.	APP.
MANITOBA HYDRO KEYEYASK GENERATING STATION NORTH ACCESS ROAD STARTUP CAMP GENERAL PLAN					
DRAWN					
CHECK					
SCALE	AS NOTED				
DATE					
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CONSULTANT PROJECT NUMBER: 60112682 (0217-200-07)

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PLAN



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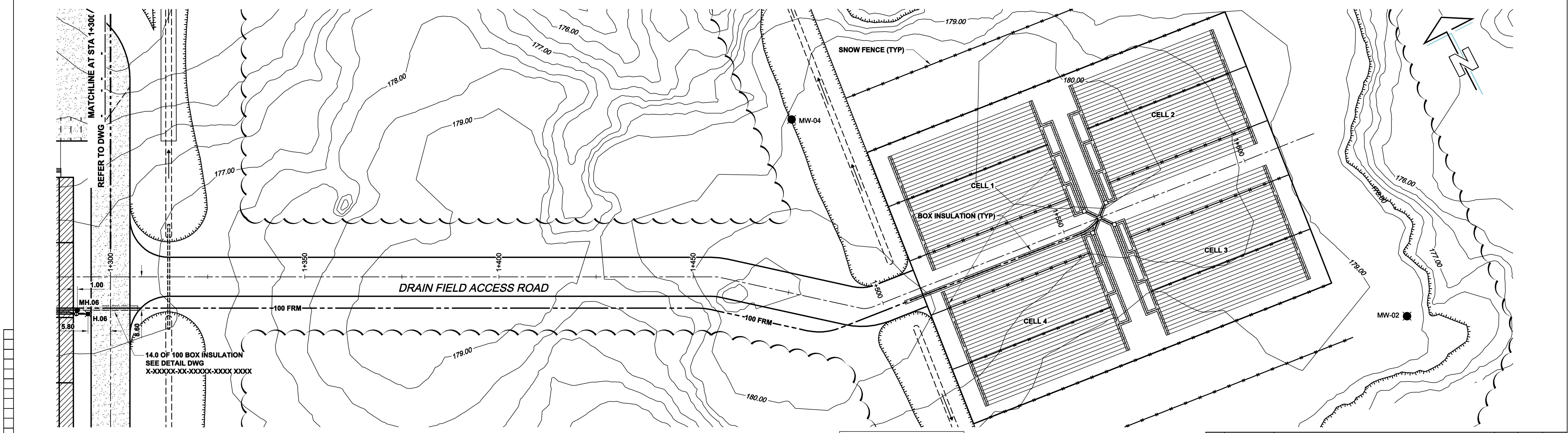
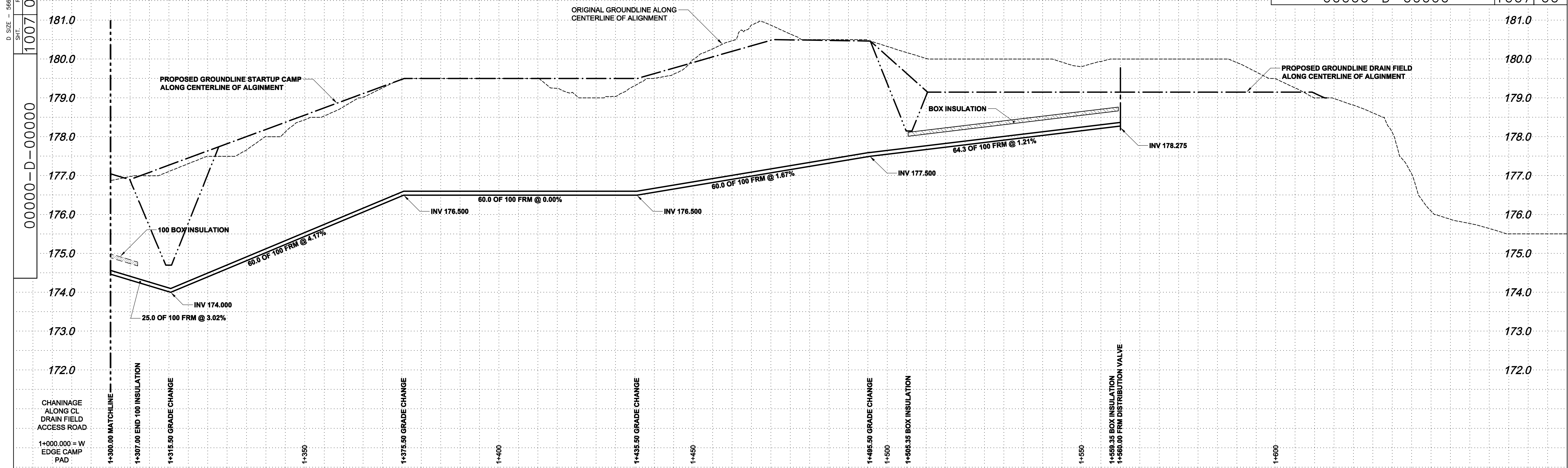
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CONSTRUCTION NOTES:

- DRAIN FIELD DESIGN IS BASED ON:
A) TOTAL AREA FIELD.
B) PRESSURE DISTRIBUTION OF WASTEWATER
C) MAXIMUM FLOW OF 60m³ PER DAY.
D) WASTEWATER APPLICATION RATE OF 18 LITRES PER SQUARE METRE PER DAY.
E) REGULAR INSPECTION AND CLEANING OF THE PRESSURE FILTERS BY CAMP MAINTENACE STAFF.
F) ADJUSTMENT OF DISTRIBUTION VALVES BY CAMP MAINTENACE STAFF TO DEAL WITH VARIATION IN CAMP POPULATION.
- THE CONTRACTOR SHALL REFER TO MANUFACTURER'S RECOMMENDATIONS AND INSTALLATION MANUAL REGRADING MAXIMUM CONSTRUCTION EQUIPMENT AXLE LOADS ON:
A) FINISHED BED DURING EXCAVATION AND PIPING / CHAMBER INSTALLATION.
B) CHAMBERS AND BACKFILLING OPERATIONS.
- THE CONTRACTOR SHALL INSTALL SNOW FENCE AT 15m INTERVALS, PERPENDICULAR TO THE PREVAILING WIND DIRECTION.
- THE CONTRACTOR SHALL BE REQUIRED TO COORDINATE COMMISSIONING TO ALLOW INSPECTION BY A MANITOBA CONSERVATION OFFICER.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMMISSIONING OF THE DRAIN FIELD. COMMISSIONING SHALL INCLUDE REPRESENTATIVE "SQUIRT TESTS" TO DEMONSTRATE THE OPERATION OF THE PRESSURE DISTRIBUTION SYSTEM OVER A REPRESENTATIVE SAMPLE OF FIELD, BEFORE PLACEMENT OF CHAMBERS AND BACKFILL.
- THE CONTRACTOR SHALL ENSURE SEPTIC TANK AND DRAIN FIELD INSTALLATION ARE CARRIED OUT BY PERSONNEL REGISTERED AS CERTIFIED INSTALLERS OF ONSITE WASTEWATER MANAGEMENT SYSTEMS IN THE PROVINCE OF MANITOBA.

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NO.	DATE	REVISIONS	BY	CHKD.	APP.

DRAWN CHECK SCALE AS NOTED DATE	MANITOBA HYDRO KEEYASK GENERATING STATION NORTH ACCESS ROAD STARTUP CAMP DRAIN FIELD - DETAILED SITE PLAN				
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KEY PLAN

PLAN / PROFILE

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0 0.5 1 1.5 V=1:50

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NOTED	A	10/05/07	ISSUED FOR INFORMATION	KMB	JDE	NK
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MANITOBA HYDRO
KEEYASK GENERATING STATION
NORTH ACCESS ROAD STARTUP CAMP

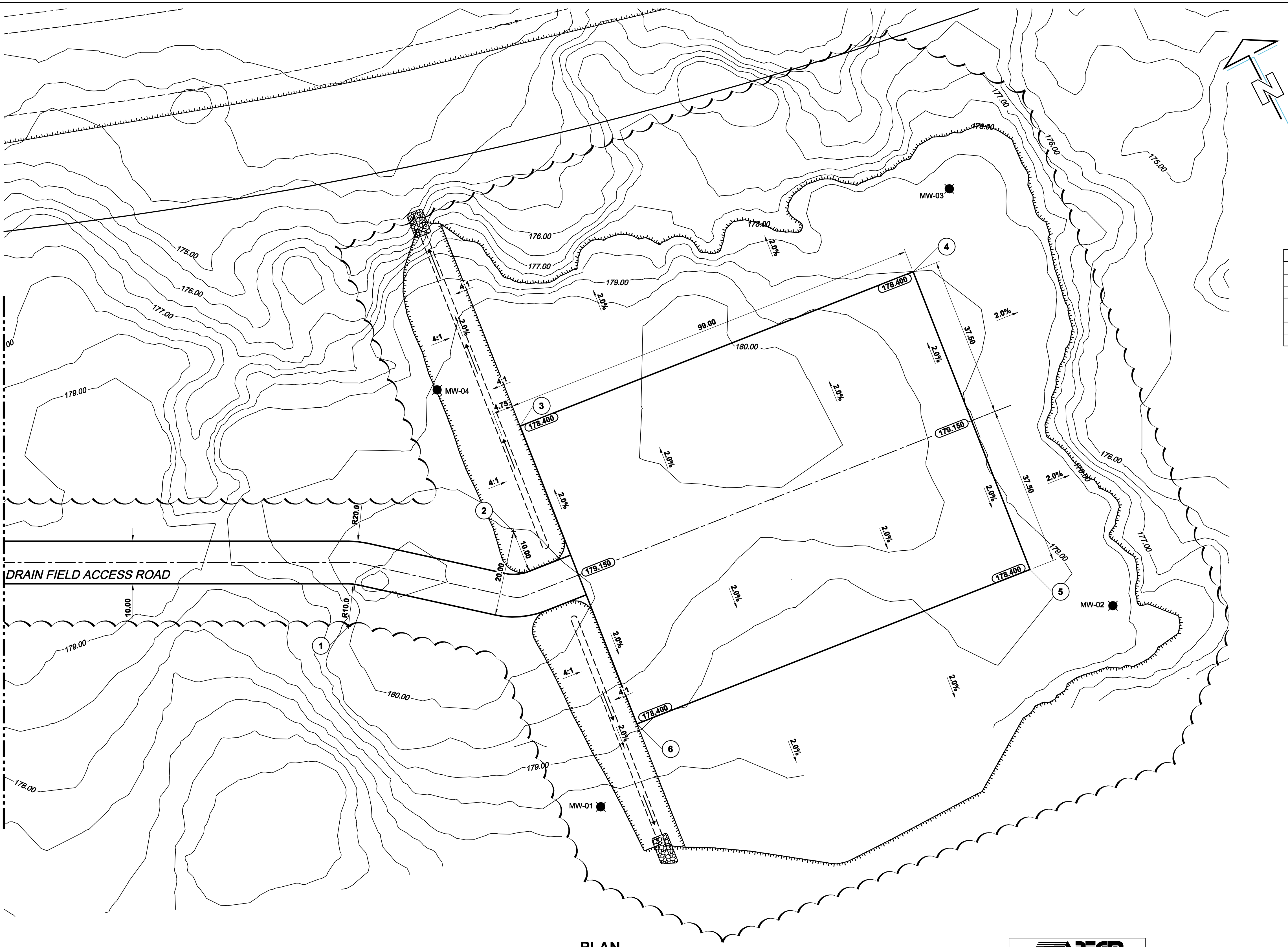
PLAN / PROFILE
FORCEMAIN AND DRAIN FIELD

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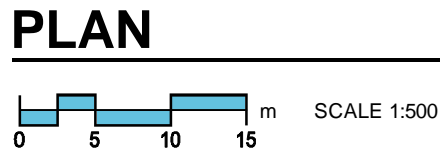
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COORDINATE LAYOUT TABLE			
POINT	DESCRIPTION	NORTHING	EASTING
1	RADIUS PT	6254843.128	343951.680
2	RADIUS PT	6254845.272	343996.246
3	FIELD CORNER PT	6254866.626	344008.868
4	FIELD CORNER PT	6254856.806	344107.380
5	FIELD CORNER PT	6254782.176	344099.941
6	FIELD CORNER PT	6254791.996	344001.429

PROPOSED MONITORING WELLS		
WELL	NORTHING	EASTING
MW-01	6254778.557	343985.015
MW-02	6254765.762	344113.379
MW-03	6254870.244	344123.794
MW-04	6254883.040	343995.430

NOTE:
1. GRADES SHOWN REFER TO TOP OF CHAMBER BACKFILL AND DO NOT INCLUDE ORGANICS LAYER.

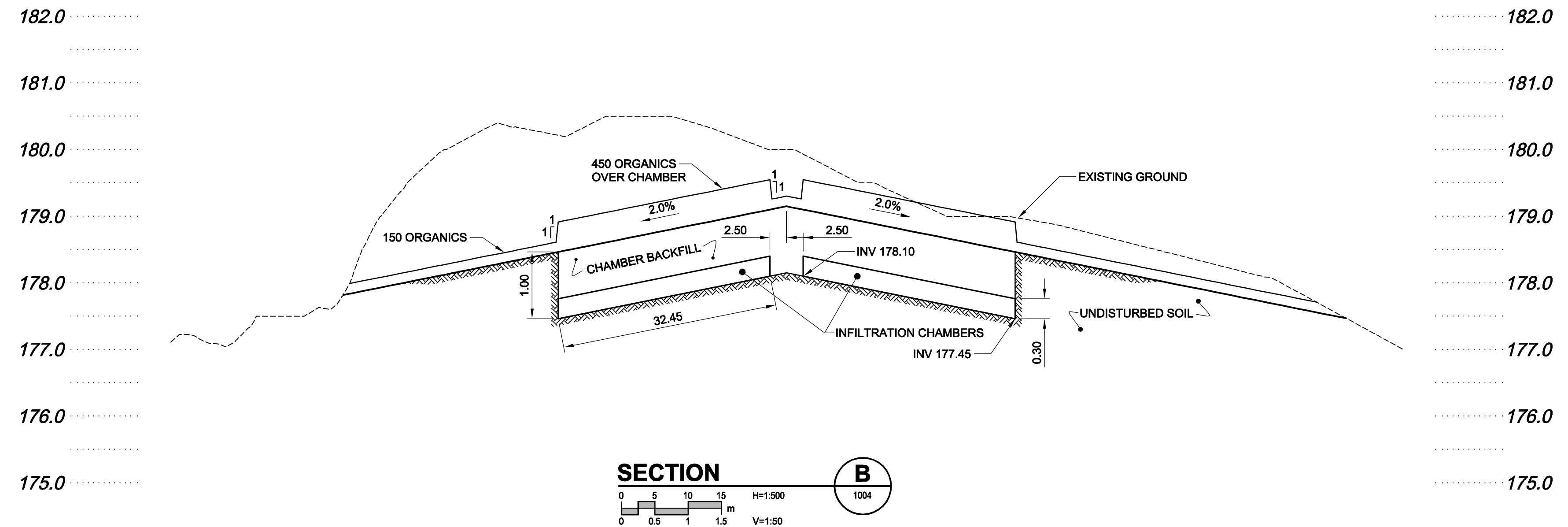
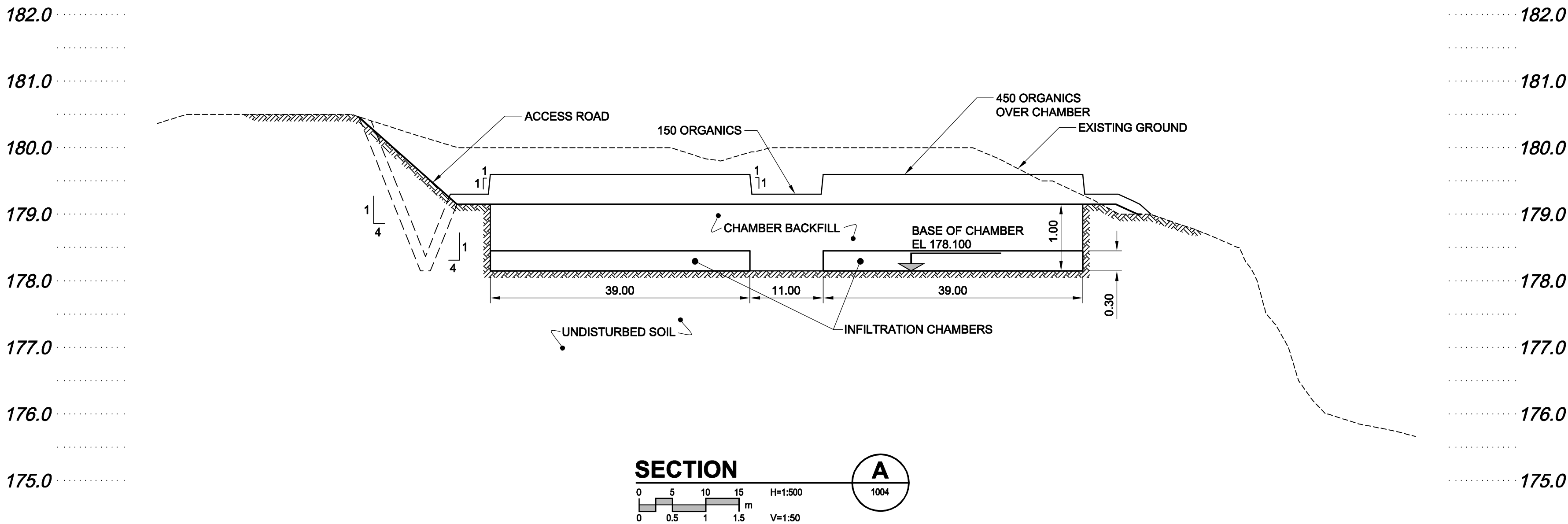


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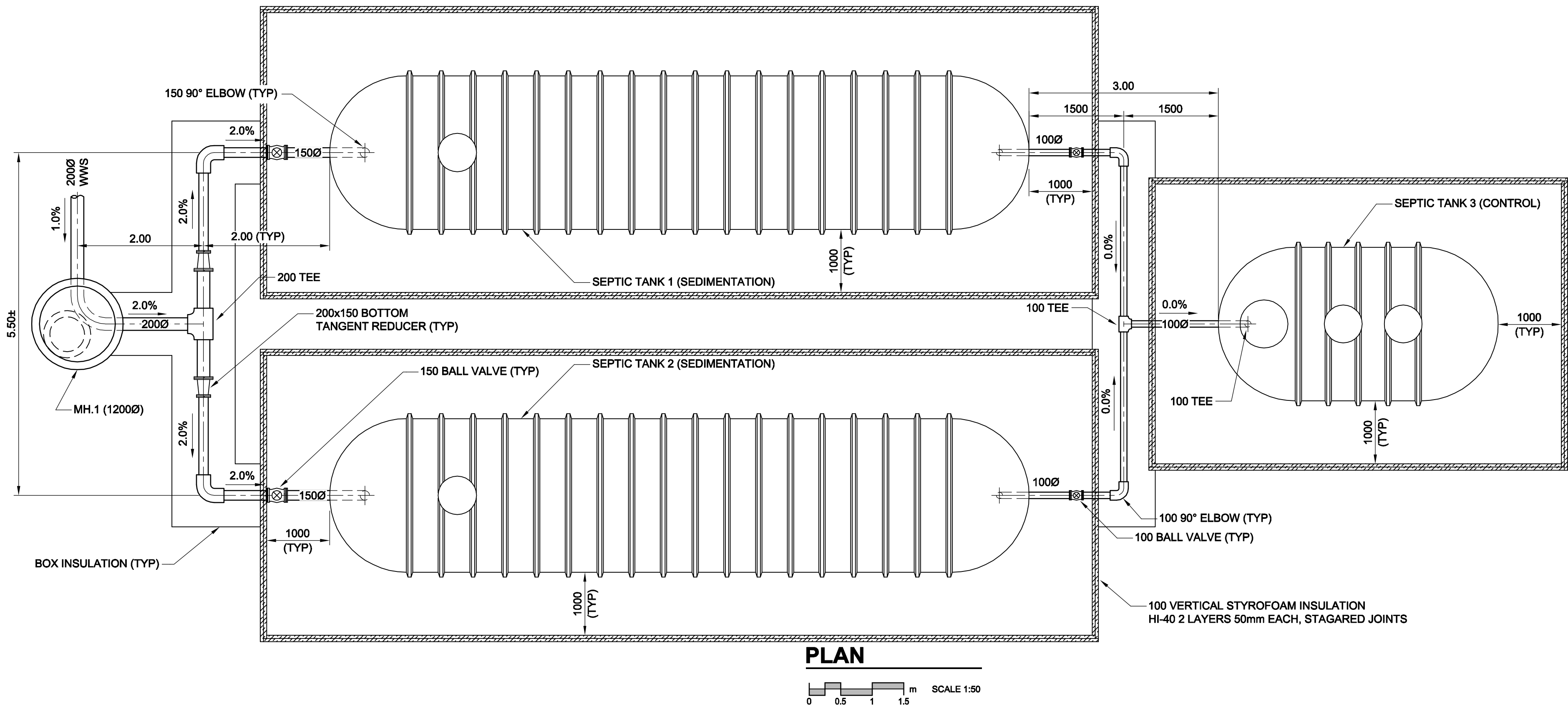
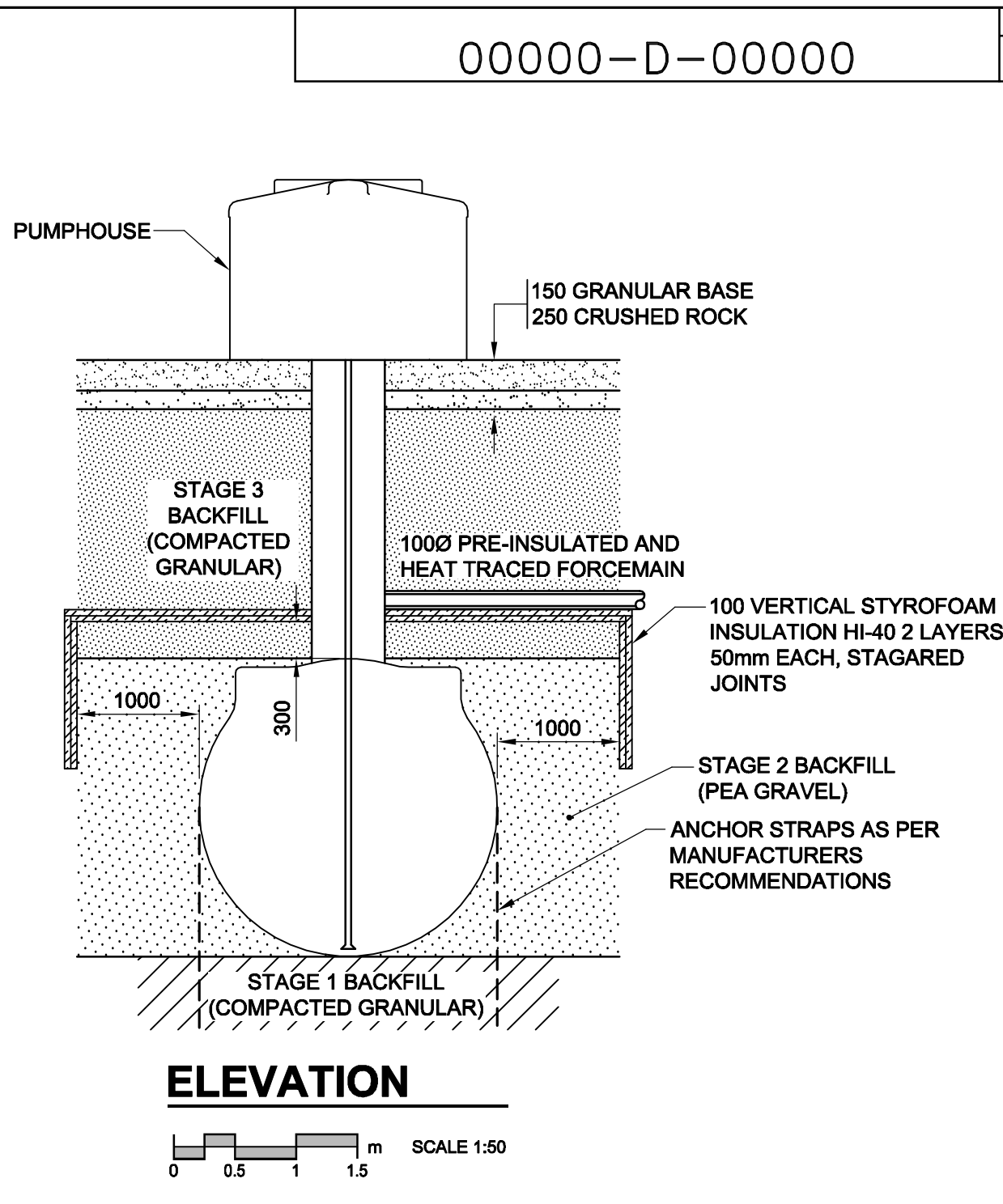
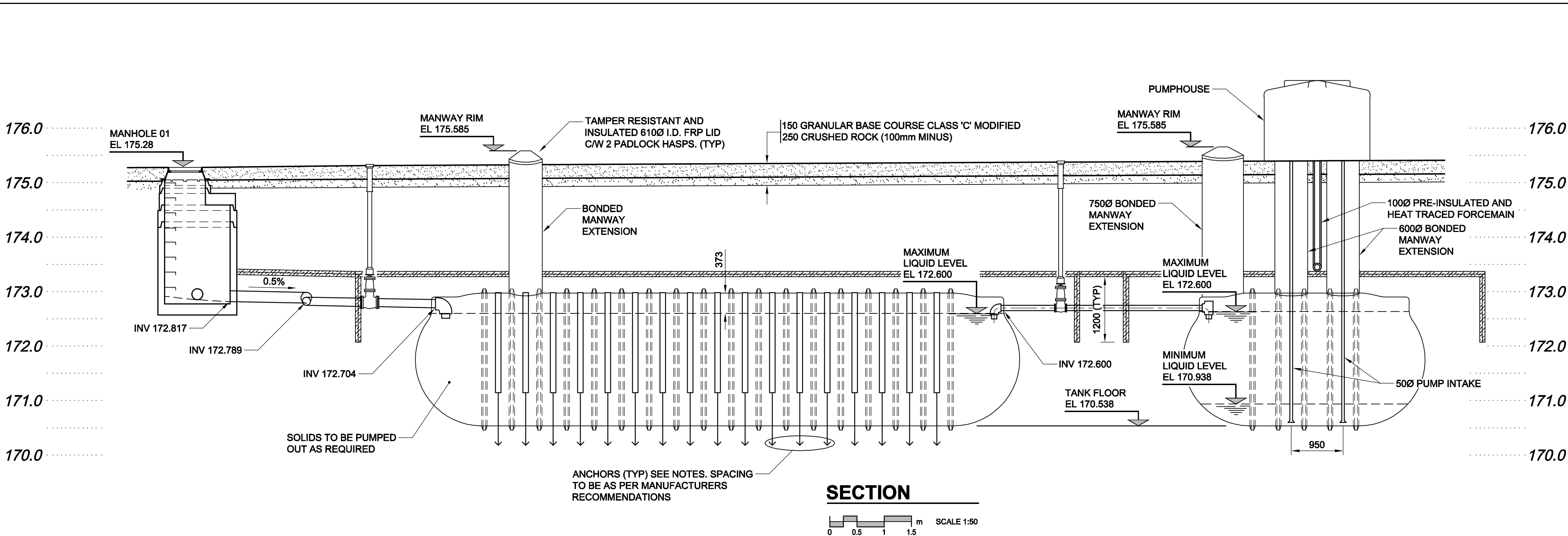


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- DRAWING NOTES:**
- EARTHWORKS**
- EXCAVATE AS REQUIRED AND REMOVE FROM SITE MATERIALS NOT REQUIRED FOR BACKFILL OR GRADING.
 - BACKFILL WITH MATERIALS INDICATED ON DRAWINGS AND SPECIFICATIONS.
 - COMPACTION (STANDARD PROCTOR DRY DENSITY %)
 - | | |
|-----------------------------|------|
| 3.1. SUBGRADE | 95% |
| 3.2. BESIDE AND TOP OF TANK | 90% |
| 3.3. BELOW TANK | 100% |
 - FILL IN 200mm LIFTS (LOOSE) AND COMPACT EACH LIFT TO REQUIRED DENSITY.
- ANCHORS**
- CONTRACTOR SHALL DESIGN, DETAIL, SUPPLY AND INSTALL ALL STAINLESS STEEL ANCHORS AND MISCELLANEOUS METAL HARDWARE OR PRECAST CONCRETE ANCHORS NECESSARY TO HOLD DOWN TANKS.
 - SUBMIT GENERAL LAYOUT SHOP DRAWINGS TO ENGINEER FOR APPROVAL PRIOR TO FABRICATION. THESE DRAWINGS SHALL INCLUDE:
 - ALL MISCELLANEOUS DETAILS.
 - SEAL OF PROFESSIONAL ENGINEER REGISTERED IN THE PROVINCE OF MANITOBA COVERING DESIGN OF LIFTING DEVICES AND NEOPRENE BEARINGS.
 - ALL PRECAST UNITS SHALL BEAR IDENTIFICATION MARK PLACED LEGIBLY ON UNIT AT TIME OF MANUFACTURE.
- PROCEDURES AND GENERAL NOTES**
- EXCAVATE TO LEVEL BASE ON UNDISTURBED SUBGRADE CAPABLE OF 120 Kpa. BEARING PRESSURE.
 - INSTALL ANCHORS AS PER MANUFACTURERS RECOMMENDATIONS.
 - PLACE STAGE 1 BACKFILL AS SPECIFIED.
 - PLACE TANK ON STAGE 1 BACKFILL AND SECURE STRAPS.
 - BACKFILL AROUND TANK (STAGE 2) UNIFORMLY IN LAYERS AS SPECIFIED AROUND ALL SIDES TO A HEIGHT OF THE TANK.
 - BACKFILL ABOVE TANK AS SHOWN (STAGE 3) USING SAME BACKFILL TECHNIQUE IN LAYERS.
 - GRANULAR BACKFILL TO BE UNIFORMLY GRADED AGGREGATE WITH MAXIMUM AGGREGATE SIZE OF 63.5mm AND 7% MAXIMUM PASSING # 200 SIEVE.
 - COMPACT TO 95% STANDARD PROCTOR DENSITY IN 150mm MAXIMUM LIFTS.

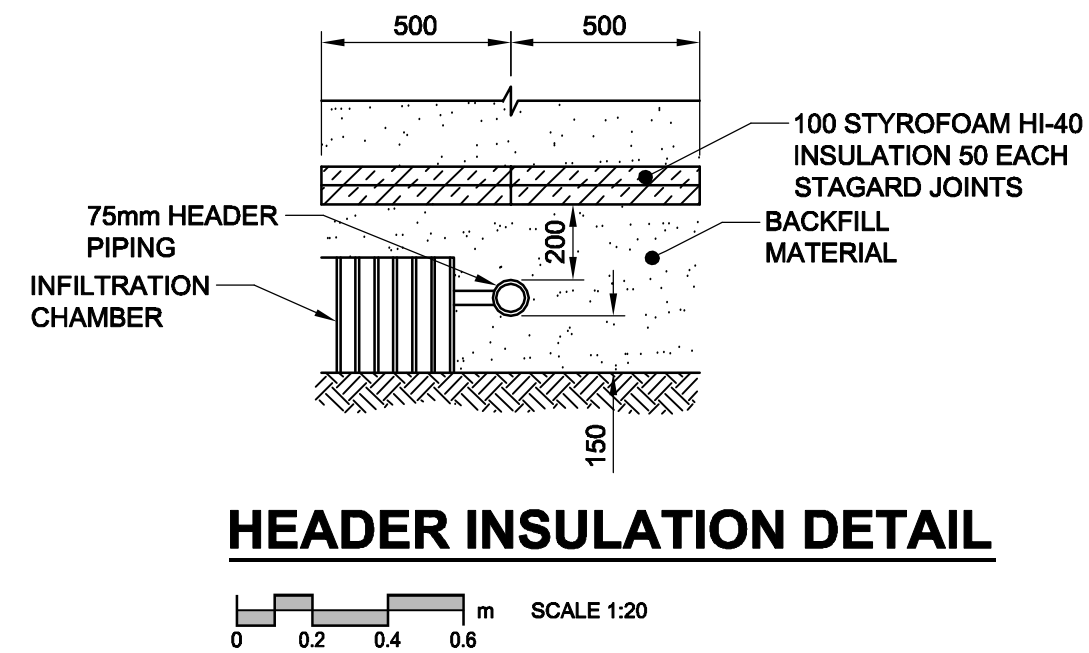
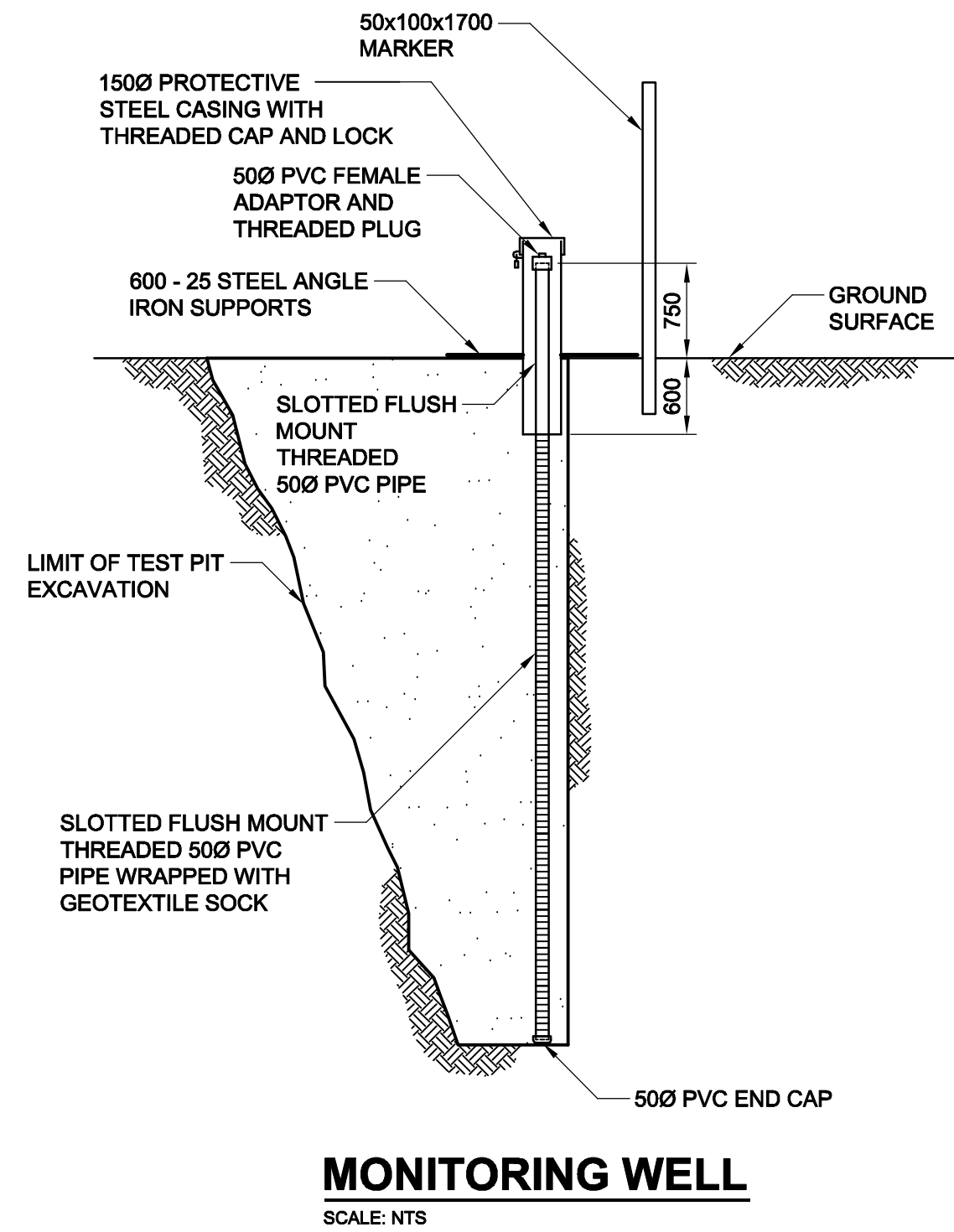
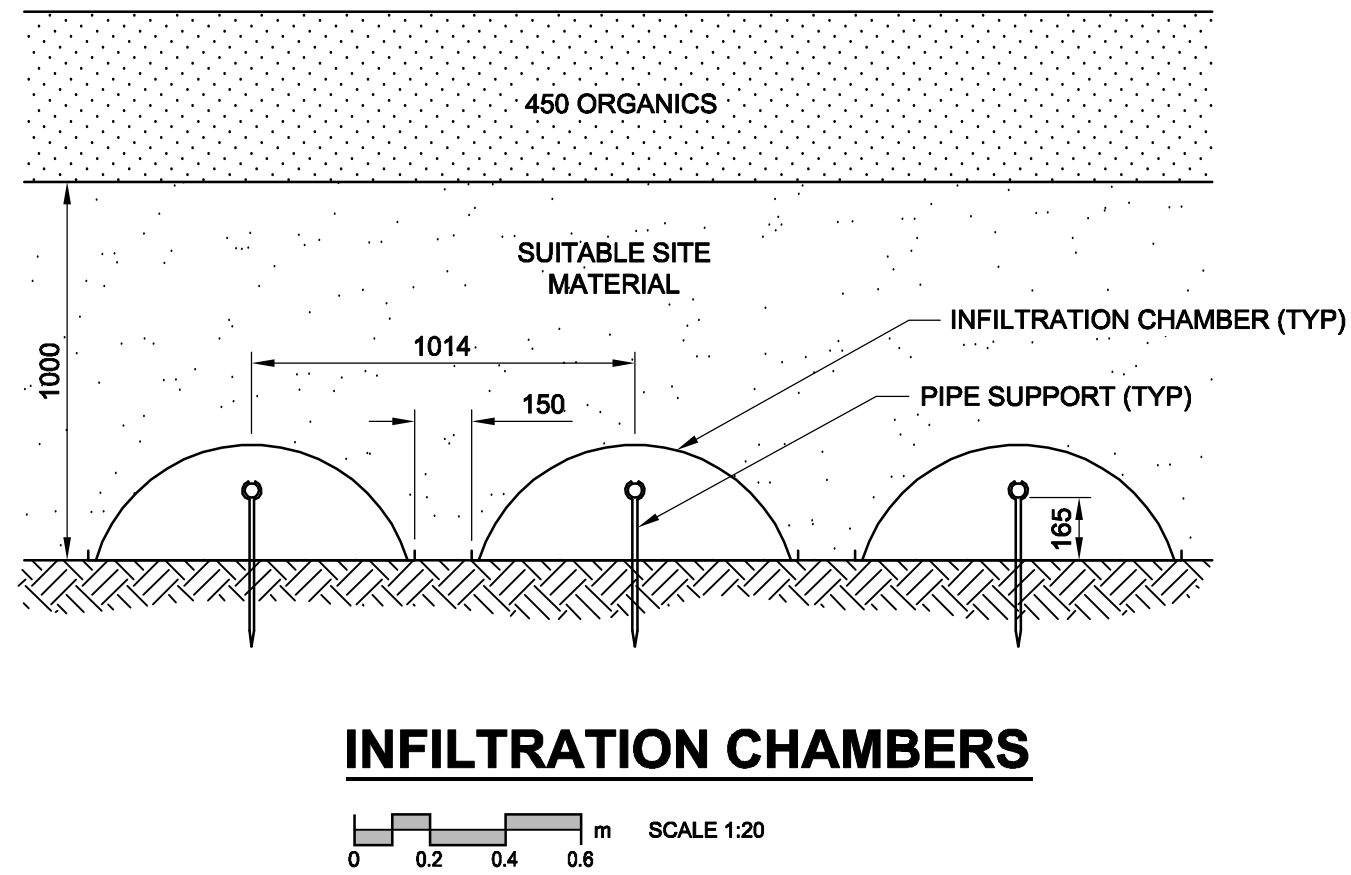
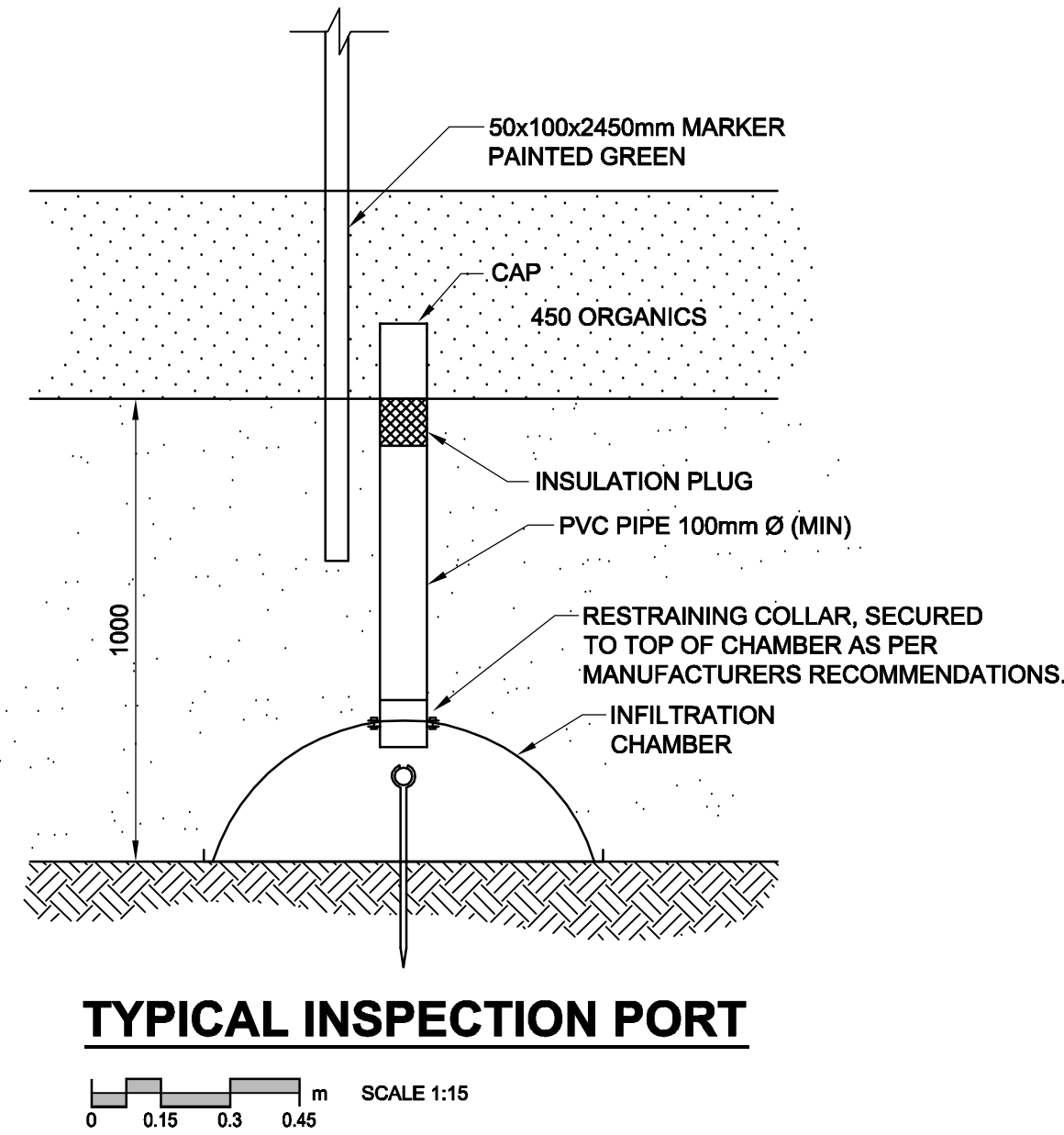
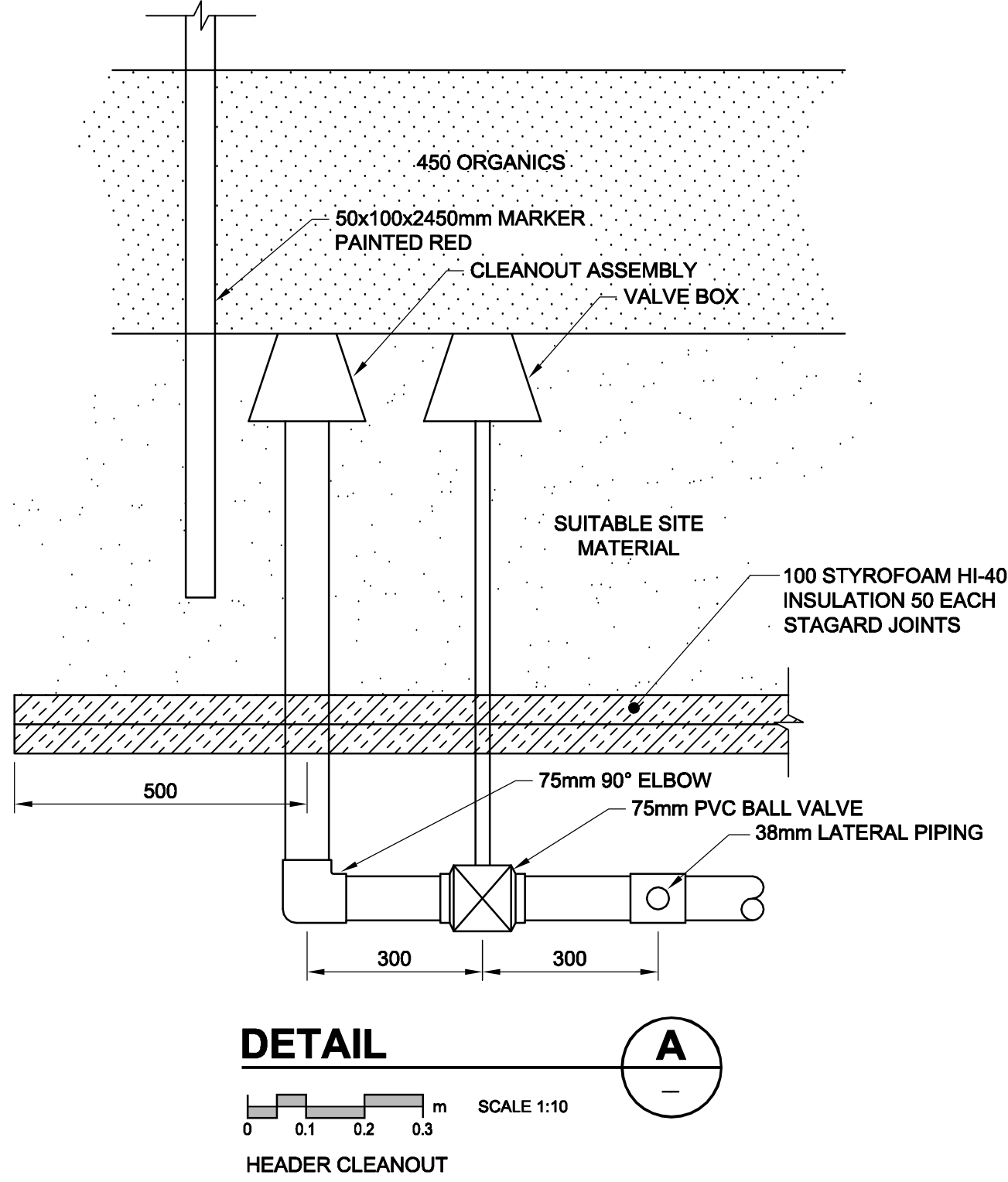
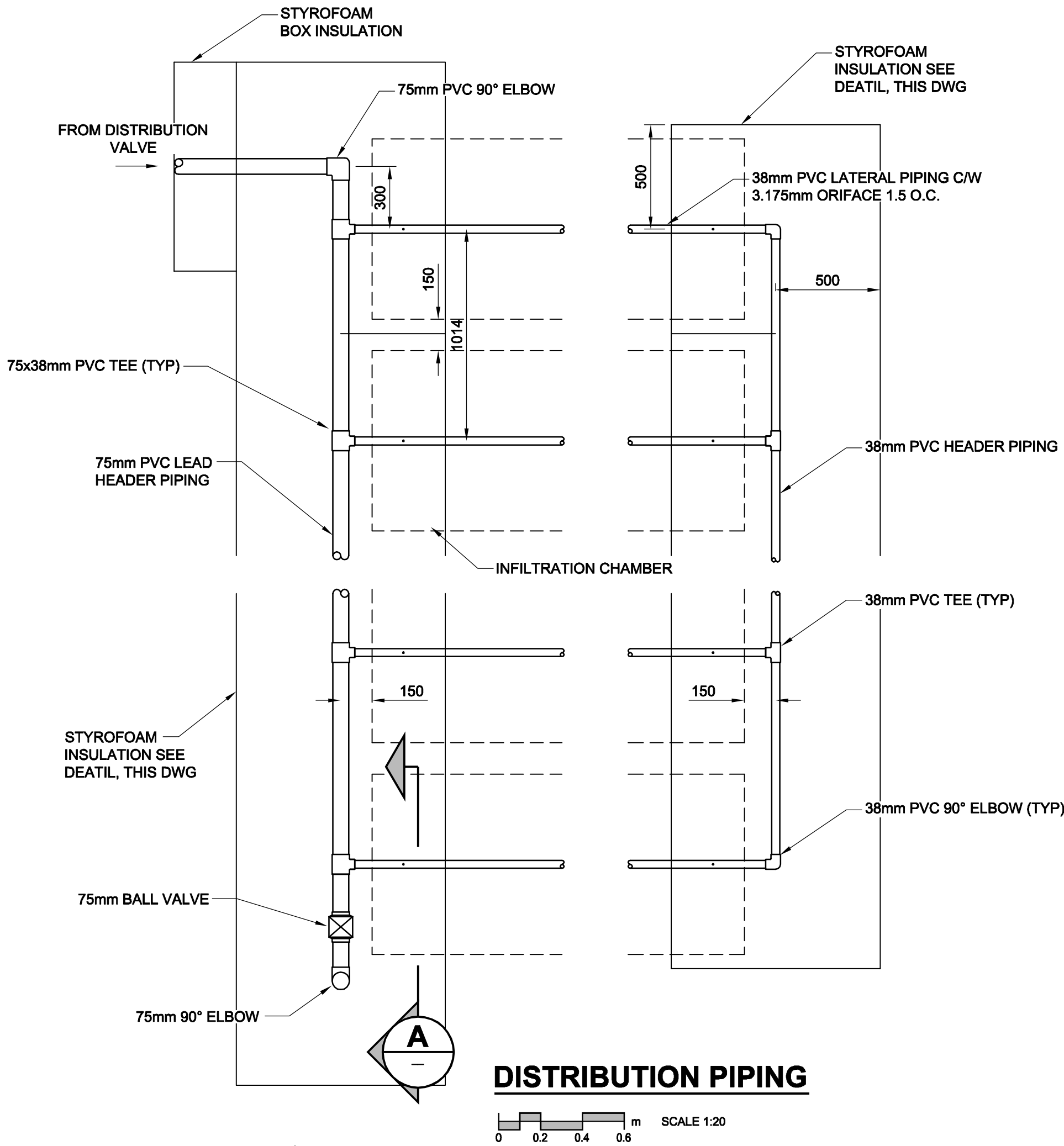
SEPTIC TANK TABLE				
TANK	NOMINAL VOLUME	OUTSIDE DIAMETER	MODEL	HORIZON / POLYWEST REFERENCE NUMBER
1	45,460 L	2591	TRICKLE	FGHON45460-8T2.14
2	45,460 L	2591	TRICKLE	FGHON45460-8T2.14
3	13,640 L	2591	PUMPOUT	FGHON13640-8P2.14



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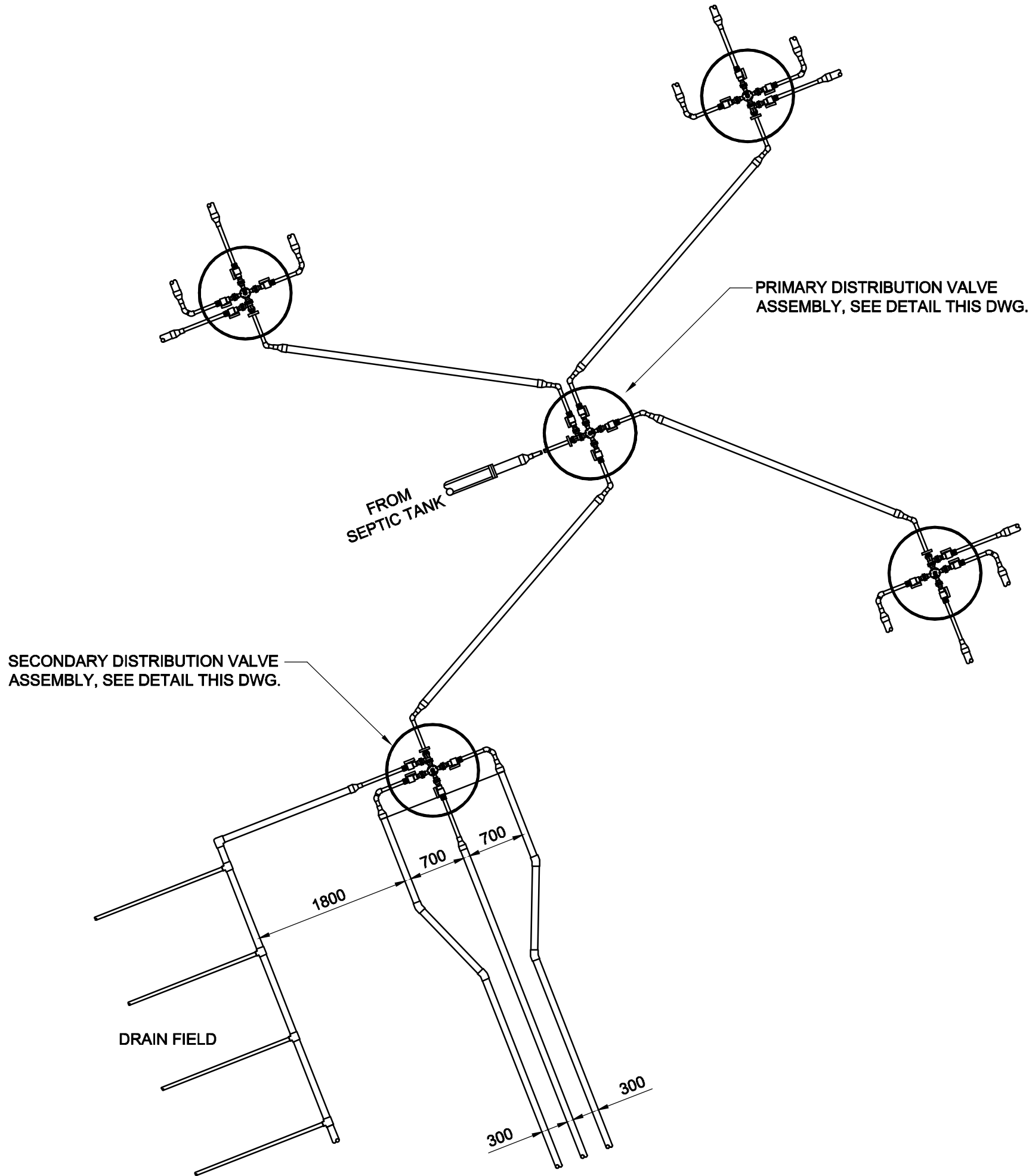
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	NO.	DATE	REVISIONS	BY	OKD.	APP.
	MANITOBA HYDRO KEEYASK GENERATING STATION NORTH ACCESS ROAD STARTUP CAMP SEWER AND WATER - DETAILS 3					
	DRAWN					
	CHECK					
	SCALE	AS NOTED				
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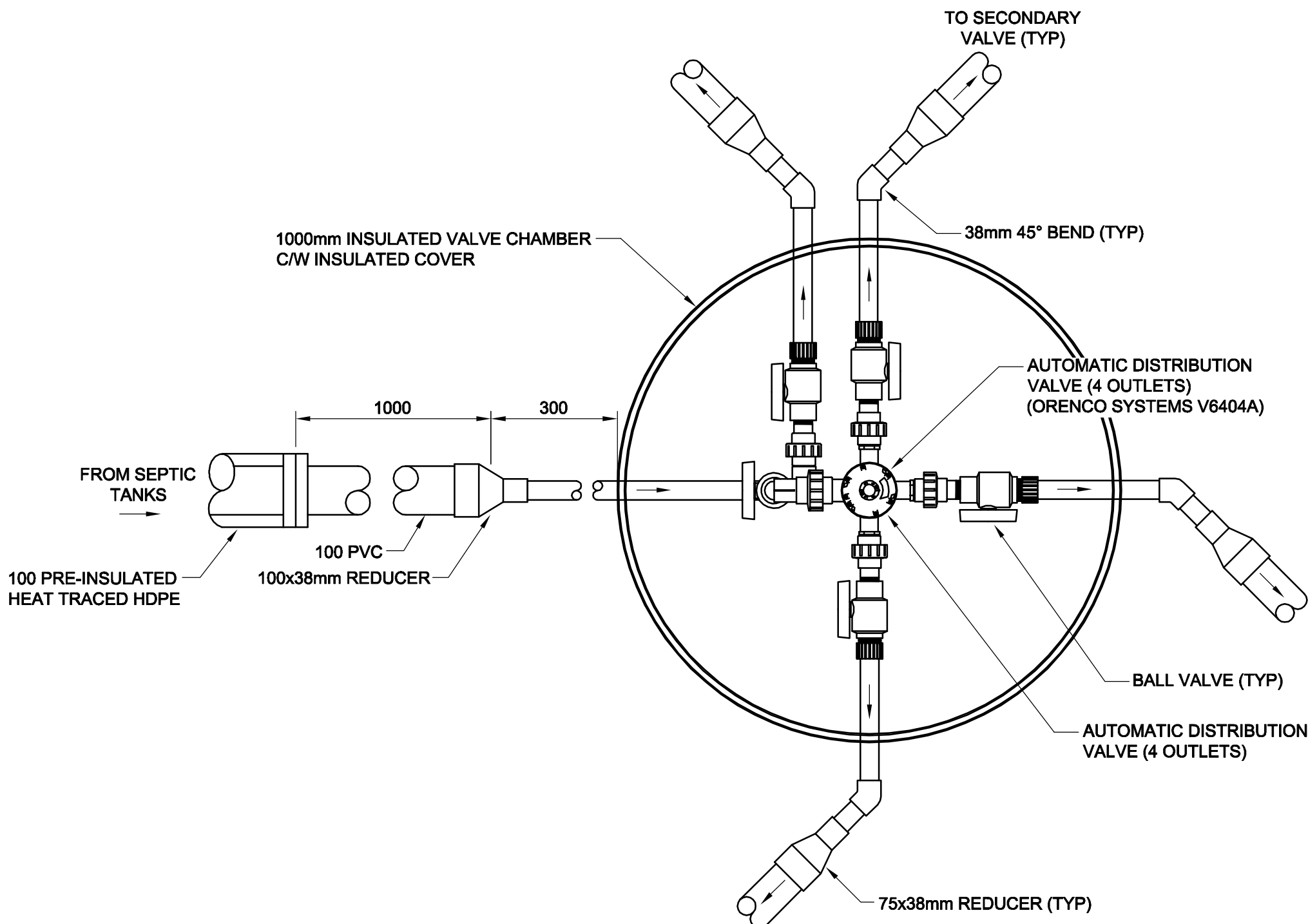
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DRAWN CHECK SCALE AS NOTED DATE	MANITOBA HYDRO					
	KEEYASK GENERATING STATION					
	NORTH ACCESS ROAD STARTUP CAMP					
	SEWER AND WATER - DETAILS 4					
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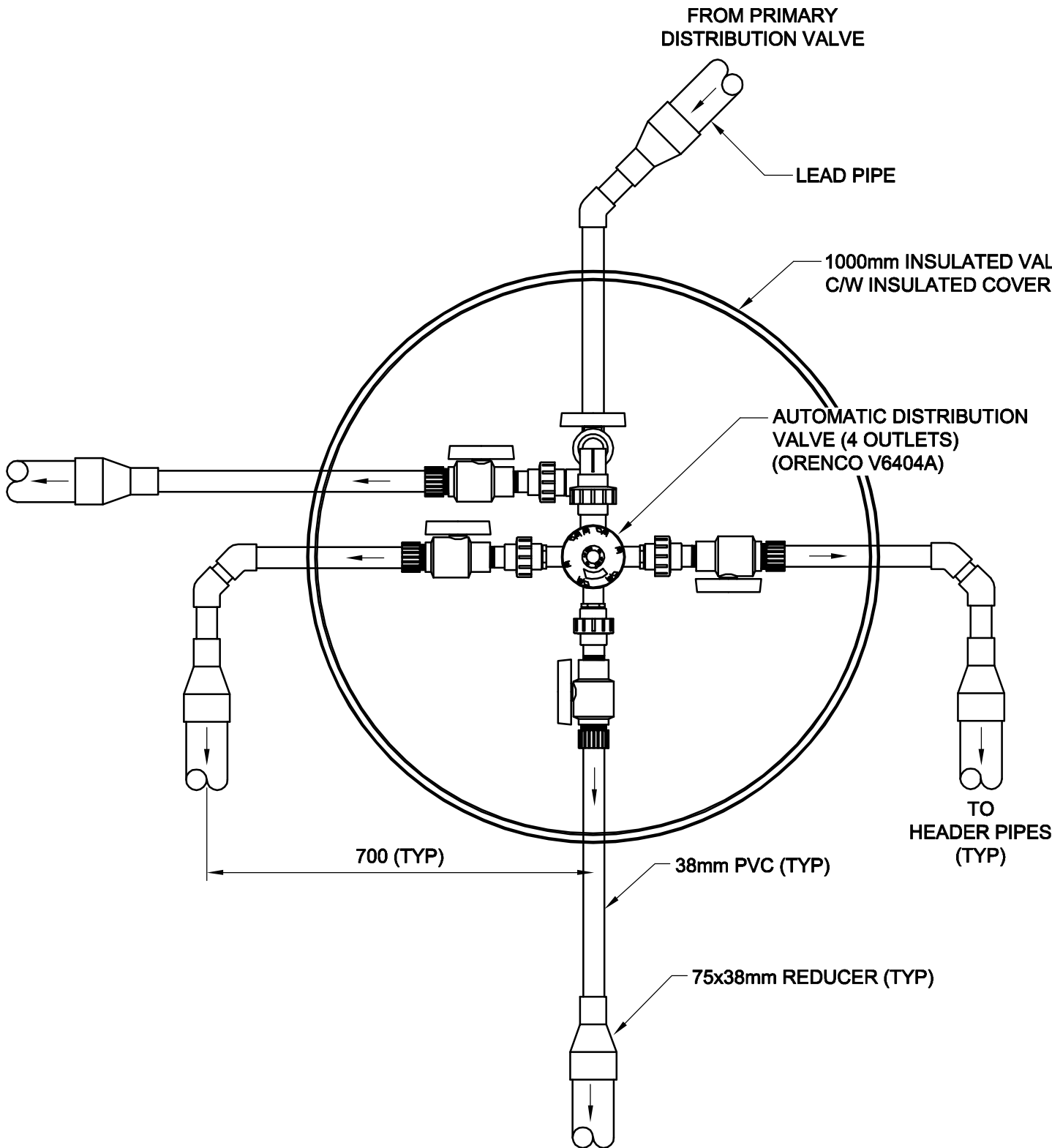
Drain Field Distribution Plan

0 0.5 1 1.5 m SCALE 1:50



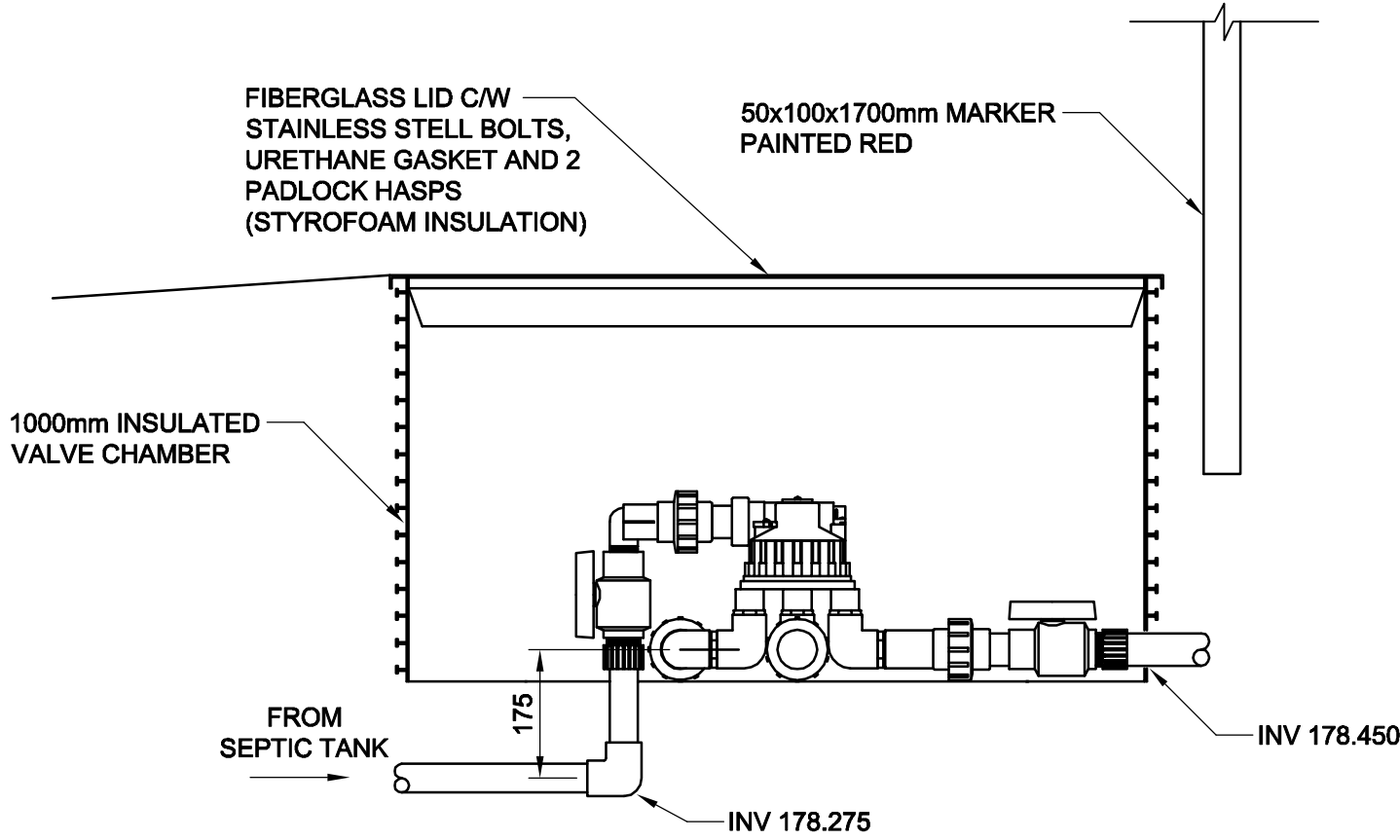
Primary Distribution Valve Assembly

0 0.1 0.2 0.3 m SCALE 1:10



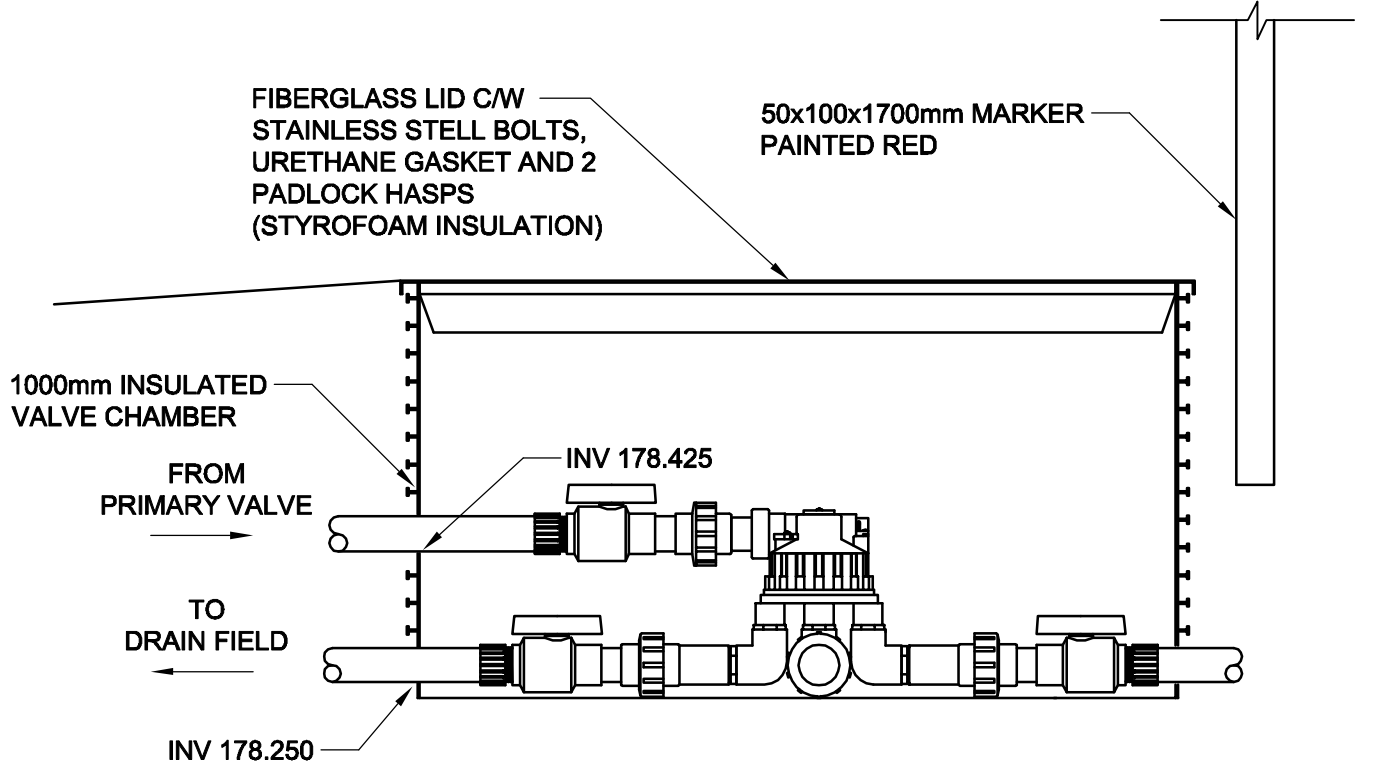
Secondary Distribution Valve Assembly

0 0.1 0.2 0.3 m SCALE 1:10



Primary Distribution Valve Section

0 0.1 0.2 0.3 m SCALE 1:10



Secondary Distribution Valve Section

0 0.1 0.2 0.3 m SCALE 1:10



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MANITOBA HYDRO					
KEEYASK GENERATING STATION					
NORTH ACCESS ROAD STARTUP CAMP					
SEWER AND WATER - DETAILS 5					
DRAWN					
CHECK					
SCALE	AS NOTED				
DATE					
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4006					00