N25 Little Island Pedestrian and Cyclist Bridge
Environmental Impact Assessment Report

Appendix 17.3

Historic Ground Investigation

Our Ref: JMS/Rp/P19248 + attachments (*.pdf)

29th June, 2020

Messrs. Cork County Council,
County Hall,
Carrigrohane Road,
Cork,
Ireland.

Re: Dunkettle Advance ITS Works Ground Investigation– Factual Report.

Introduction

In December 2019, Priority Geotechnical (PGL) were requested by Cork County Council acting on behalf of Transport Infrastructure Ireland (TII) to undertake a site investigation as part of the Dunkettle Advance ITS Works Ground Investigation project. Atkins were acting as consulting engineers for the project.

The site is located along the following roads:

- M8 – Between junction 18 and Dunkettle Interchange
- N8 – Near Dunkettle Roundabout
- R639 – Near Dunkettle Roundabout
- N25 – Between junction 2 and Dunkettle Interchange
- N40 – Between Jack Lynch Tunnel and interchange with N28
- N28 – At R610 exit

The topography of the site is varied. The majority of exploratory holes are situated on grass verges of roadways, which vary between flat and steeply sloping surfaces. All areas of the site are currently in use as active roadways of regional, national and

motorway grade. The portion of the site on the N25 was formerly the site of a small stream, which still exists nearby but has since changed course.

A portion of the N40 section is composed of reclaimed land, nearest the Jack Lynch Tunnel, and on the other end adjacent to the Douglas river. This was mostly mud flats before the reclamation efforts. The rest of the site was used for agricultural purposes before the construction of the roads.

The proposed development at the site includes: Installation of VMS to facilitate the flow of traffic at the Dunkettle Interchange. These VMS will consist of screens displaying traffic information for drivers approaching the interchange. The screens will be installed on large gantries overhanging the roadways, which require new foundations to be built and potential reuse of existing foundations at some locations. The ground investigation that is the subject of this specification is the main intrusive geotechnical investigation of the site.

Scope of works

The original scope of works, which was specified by Arup, comprised of;

- Drilling of 25nr. cable percussive boreholes with rotary core follow-on, to an expected maximum depth of 30m;
- Excavation of 4nr. foundation inspection pits to approximately 3m to gather information on existing foundations;
- Excavation of 42nr. slit trenches to typically 1.2m depth;
- All associated sampling and
- Factual reporting.

The scope was altered during the period of works. Quantities and details of works carried out are outlined, herein. This factual report presents the fieldworks records and data obtained with regard to the ground investigation for the Dunkettle Advance ITS Works Ground Investigation project and should be read in conjunction with the exploratory and photographic records and laboratory test data accompanying this factual report (attached).

Site Works

This investigation was carried out in accordance with Eurocode 7- Geotechnical Design Part 2, ground investigation and testing (BS EN 1997-2: 2007) and the relevant British Standards (BS 5930 (2015) Code of Practice for Site Investigation and BS 1377, Method of Tests for Soil for Civil Engineering Purposes, *in situ* Tests Parts 1 to 9).

The fieldworks were undertaken between the 12th of December 2019 and the 20th of May, 2020 under the supervision of PGL's, Engineering Geologist. Details of the plant and equipment used are detailed on the relevant exploratory records, attached herein.

Cable Percussion Boreholes

A total of eighteen (18) cable percussion boreholes were advanced to depths of between 0.5m below existing ground level (bgl) and 6.2m bgl using PGL's Dando 2000 light cable percussion rig and 200mm diameter casing. Boreholes terminated after chiselling without progress. The records are attached, herein.

Location	Depth (m bgl)	Date (dd/mm/yyyy)
BH901	1.4	20/12/2019
BH902	4.7	17/01/2020
BH905	0.8	09/01/2020
BH906	1.3	09/01/2020
BH908	0.8	09/01/2020
BH911	2.3	07/01/2020
BH915	0.5	20/01/2020
BH916	5.1	10/01/2020
BH917	2.6	13/01/2020
BH918	5.6	16/01/2020
BH919	4.2	15/01/2020
BH920	3.8	20/01/2020
BH921	6.2	14/01/2020
BH923	3.4	22/01/2020
BH925	3.5	21/01/2020
BH926	2.3	27/01/2020
BH927	4.8	24/01/2020
BHDA34	2.1	18/05/2020

Location	Chiselling		Duration (hh:mm)	Tool
	Depth Top (m bgl)	Depth Base (m bgl)		
BH901	0.8	0.95	03:00	Chisel.
BH901	1.4	1.45	01:00	Chisel.
BH902	1.2	1.36	00:30	Chisel.
BH902	2.4	2.57	00:30	Chisel.
BH902	4.7	4.7	01:00	Chisel.
BH905	0.8	0.8	01:00	Chisel.
BH906	1.3	1.3	01:00	Chisel.
BH908	0.8	0.8	01:00	Chisel.
BH911	1.5	1.65	00:30	Chisel.
BH911	2.0	2.17	00:30	Chisel.
BH911	2.3	2.3	01:00	Chisel.
BH915	0.5	0.5	01:00	Chisel.
BH916	4.3	4.47	00:30	Chisel.
BH916	5.0	5.1	01:00	Chisel.
BH916	5.1	5.1	01:00	Chisel.
BH917	1.4	1.57	00:30	Chisel.
BH917	1.8	1.97	00:30	Chisel.
BH917	2.3	2.48	00:30	Chisel.
BH917	2.6	2.6	01:00	Chisel.
BH918	2.6	2.76	00:30	Chisel.
BH918	5.6	5.6	01:00	Chisel.
BH919	3.3	3.45	00:30	Chisel.
BH919	4.2	4.2	01:00	Chisel.
BH920	1.2	1.38	00:30	Chisel.
BH920	3.8	3.8	01:00	Chisel.
BH921	3.4	3.57	00:30	Chisel.
BH921	5.7	5.88	00:30	Chisel.
BH921	6.2	6.2	01:00	Chisel.
BH923	2.6	2.79	00:30	Chisel.
BH923	3.4	3.4	01:00	Chisel.
BH925	1.2	1.37	00:30	Chisel.
BH925	3.5	3.5	01:00	Chisel.
BH926	1.2	1.37	00:30	Chisel.
BH926	2.3	2.3	01:00	Chisel.
BH927	1.8	1.97	00:30	Chisel.
BH927	3.8	3.96	00:30	Chisel.
BH927	4.8	4.8	01:00	Chisel.
BHDA34	1.3	1.46	00:30	Chisel.

Location	Chiselling		Duration (hh:mm)	Tool
BHDA34	1.7	1.85	00:30	Chisel.
BHDA34	2.1	2.1	02:00	Chisel.

Rotary Boreholes

Nineteen (19) rotary boreholes were drilled to depths between 5.5m bgl and 27.0m bgl using PGL's Soilmec PSM rotary rig. Open hole boring and T6H methods were utilised during the investigation. The exploratory records are attached, herein.

Location	Depth (m bgl)	Date (dd/mm/yyyy)
RC901	12.3	30/01/2020
RC902	13.7	31/01/2020
RC905	5.5	16/01/2020
RC906	6.0	16/01/2020
RC908	6.2	16/01/2020
RC911	24.0	04/02/2020
RC915	22.5	24/01/2020
RC916	22.5	22/01/2020
RC917	27.0	17/01/2020
RC918	16.8	20/01/2020
RC919	27.0	21/01/2020
RC920	25.5	14/02/2020
RC921	25.5	03/02/2020
RC923	19.8	23/01/2020
RC925	25.5	29/01/2020
RC926	24.0	28/01/2020
RC927	25.5	27/01/2020
RCDA34(01)	25.5	19/05/2020
RCDA34(02)	25.5	20/05/2020

Slit trenches

A total of forty four (44) number slit trenches were excavated to depths of between 0.6m bgl and 1.7m bgl using tracked excavators. The slit trench exploratory records are attached, herein.

Location	Depth (m bgl)	Date (dd/mm/yyyy)
ST901	1.6	17/12/2019
ST902	0.6	12/12/2019
ST905	1.15	09/01/2020
ST906	1.0	19/12/2019

Location	Depth (m bgl)	Date (dd/mm/yyyy)
ST907	0.9	19/12/2019
ST908A	1.0	19/12/2019
ST908-E	1.0	19/12/2019
ST908-V	1.3	19/12/2019
ST909	1.15	09/01/2020
ST910	1.05	19/12/2019
ST913	1.5	07/01/2020
ST914	1.5	06/01/2020
ST914A	1.4	23/01/2020
ST915	1.3	06/01/2020
ST916	1.4	06/01/2020
ST917	1.4	07/01/2020
ST918	0.6	19/12/2019
ST918A	1.4	23/01/2020
ST919	1.4	07/01/2020
ST920	1.2	08/01/2020
ST921	1.3	08/01/2020
ST921A	1.3	21/01/2020
ST922	1.3	08/01/2020
ST923	1.4	14/01/2020
ST924	1.6	10/01/2020
ST925	1.5	09/01/2020
ST926	1.3	14/01/2020
ST927	1.5	14/01/2020
ST928	1.3	13/01/2020
ST929	1.5	13/01/2020
ST930	1.5	13/01/2020
ST931	1.6	21/01/2020
ST932	1.5	21/01/2020
ST933	1.6	21/01/2020
ST938	1.5	07/01/2020
ST940	1.3	22/01/2020
ST941	0.7	22/01/2020
ST942	1.5	22/01/2020
ST950	1.3	18/05/2020
ST951	1.7	18/05/2020
ST952	1.3	18/05/2020
ST953	1.6	18/05/2020
STDA34(01)	1.3	18/05/2020
STDA34(02)	1.2	18/05/2020

Foundation pits

Four (4) number foundation pits were excavated to depths of between 0.9m bgl and 2.4m bgl using a 3t tracked excavator. The foundation pit exploratory records are attached, herein.

Location	Depth (m bgl)	Date (dd/mm/yyyy)
FIP901	0.9	17/12/2019
FIP902	1.5	22/01/2020
FIP903	2.4	08/01/2020
FIP904	1.5	14/01/2020

Survey and Drawings

A manhole survey was undertaken by PGL to identify the existing structure and services present. The findings are presented in this factual report. Upon completion of the fieldworks, the 'as built' exploration locations were surveyed using Trimble 5700/5800 GPS equipment to the Ordinance Survey Irish Trans Mercator system of co-ordinates (ITM) and elevations to Malin Head datum. The exploratory locations are summarised below and shown on the Exploratory Location layout and Plan (P19248-SI-A, P19248-SI-01 to P19248-SI-13) attached.

Location	Easting	Northing	Ground Level (mOD)	Final Depth (m bgl)	Date Start (dd/mm/yyyy)
BH901	571998.9	572677.1	2.88	1.4	20/12/2019
BH902	572568.4	573067.3	3.29	4.7	17/01/2020
BH905	573739.2	573883.2	56.61	0.8	09/01/2020
BH906	573832.9	573583.4	51.44	1.3	09/01/2020
BH908	573831.2	573328.4	44.1	0.8	09/01/2020
BH911	575227.7	572800.0	3.85	2.3	07/01/2020
BH915	575736.3	572857.2	3.46	0.5	20/01/2020
BH916	571582.7	569358.7	14.1	5.1	10/01/2020
BH917	571457.0	569975.3	6.65	2.6	13/01/2020
BH918	571818.9	570100.5	3.88	5.6	16/01/2020
BH919	571799.2	570061.7	3.78	4.2	15/01/2020
BH920	572471.7	570459.6	8.83	3.8	20/01/2020
BH921	572624.8	570212	13.34	6.2	14/01/2020
BH923	573072.9	570750.3	4.65	3.4	22/01/2020
BH925	573013.4	571294.1	4.6	3.5	21/01/2020
BH926	572958.4	571332.8	4.82	2.3	27/01/2020
BH927	572914.7	571453.3	5.34	4.8	24/01/2020
BHDA34	576123.4	573014.6	5.55	2.1	18/05/2020
FIP901	572558.7	573079.9	1.32	0.9	17/12/2019

Location	Easting	Northing	Ground Level (mOD)	Final Depth (m bgl)	Date Start (dd/mm/yyyy)
FIP902	571586.7	569369.9	15.46	1.5	22/01/2020
FIP903	571780.1	570096	4.86	2.4	08/01/2020
FIP904	571792.2	570061.8	4.86	1.5	14/01/2020
RC901	571998.9	572677.1	2.88	12.3	30/01/2020
RC902	572568.4	573067.3	3.29	13.7	31/01/2020
RC905	573739.2	573883.2	56.61	5.5	16/01/2020
RC906	573832.9	573583.4	51.44	6	16/01/2020
RC908	573831.2	573328.4	44.1	6.2	16/01/2020
RC911	575207	572798.1	3.85	24	04/02/2020
RC915	575736.3	572857.2	3.46	22.5	24/01/2020
RC916	571582.7	569358.7	14.1	22.5	22/01/2020
RC917	571457	569975.3	6.65	27	17/01/2020
RC918	571818.9	570100.5	3.88	16.8	20/01/2020
RC919	571799.2	570061.7	3.78	27	21/01/2020
RC920	572471.7	570459.6	8.83	25.5	14/02/2020
RC921	572624.8	570212	13.34	25.5	03/02/2020
RC923	573072.9	570750.3	4.65	19.8	23/01/2020
RC925	573013.4	571294.1	4.6	25.5	29/01/2020
RC926	572958.4	571332.8	4.82	24	28/01/2020
RC927	572914.7	571453.3	5.34	25.5	27/01/2020
RCDA34(01)	576130.1	572999.5	5.11	25.5	19/05/2020
RCDA34(02)	576118.8	573019.3	5.3	25.5	20/05/2020
ST901	571994.8	572672.2	2.88	1.6	17/12/2019
ST902	572567.3	573066.1	3.18	0.6	12/12/2019
ST905	573726.4	573853.9	56.4	1.15	09/01/2020
ST906	573737.8	573880.7	56.55	1	19/12/2019
ST907	573794.3	573713.3	54.09	0.9	19/12/2019
ST908A	573832.3	573577.7	51.38	1	19/12/2019
ST908-E	573831.7	573580.3	51.4	1	19/12/2019
ST908-V	573831.7	573580.3	51.4	1.3	19/12/2019
ST909	573819.1	573333.6	43.54	1.15	09/01/2020
ST910	573829.4	573330.8	44.08	1.05	19/12/2019
ST913	575227.8	572797	3.62	1.5	07/01/2020
ST914	575226.1	572784.1	3.99	1.5	06/01/2020
ST914A	575199.3	572782.8	4.01	1.4	23/01/2020
ST915	575460.7	572801.9	4.12	1.3	06/01/2020
ST916	575616.5	572828.4	4.08	1.4	06/01/2020
ST917	575725.4	572874	3.45	1.4	07/01/2020
ST918	575730.8	572863.7	3.6	0.6	19/12/2019
ST918A	575760.2	572873.8	3.5	1.4	23/01/2020

Location	Easting	Northing	Ground Level (mOD)	Final Depth (m bgl)	Date Start (dd/mm/yyyy)
ST919	571581.4	569379.4	14.21	1.4	07/01/2020
ST920	571205.4	569870.2	4.21	1.2	08/01/2020
ST921	571460.9	569972.3	6.8	1.3	08/01/2020
ST921A	571488.9	569988.5	6.91	1.3	21/01/2020
ST922	571819	570100.3	3.99	1.3	08/01/2020
ST923	571798.6	570066.3	3.61	1.4	14/01/2020
ST924	572455.9	570460.2	8.99	1.6	10/01/2020
ST925	572473.7	570452.6	9.43	1.5	09/01/2020
ST926	572514.7	570256.9	12.6	1.3	14/01/2020
ST927	572615.5	570294.4	14.8	1.5	14/01/2020
ST928	572638.4	570294.2	13.65	1.3	13/01/2020
ST929	572622.8	570208.7	13.29	1.5	13/01/2020
ST930	572609.8	570132.2	11.43	1.5	13/01/2020
ST931	572968.8	570511.2	5.82	1.6	21/01/2020
ST932	573077	570751.7	4.13	1.5	21/01/2020
ST933	573086.6	570740.9	4.53	1.6	21/01/2020
ST938	573008.9	571292.3	4.61	1.5	07/01/2020
ST940	572962.2	571334.4	4.64	1.3	22/01/2020
ST941	572971.5	571339.5	4.59	0.7	22/01/2020
ST942	572919.4	571454.4	5.34	1.5	22/01/2020
ST950	573712.7	572386.1	7.39	1.3	18/05/2020
ST951	573993	572389.7	4.1	1.7	18/05/2020
ST952	574324.2	572533.2	3.54	1.3	18/05/2020
ST953	574613.5	572688.3	5.44	1.6	18/05/2020
STDA34(01)	576125.7	573003.1	5.16	1.3	18/05/2020
STDA34(02)	576121.5	573013.2	5.66	1.2	18/05/2020

Sampling

A total of one hundred and forty six (146) bulk disturbed samples (B), twenty five (25) small disturbed samples (D), two (02) undisturbed samples (U), twenty seven (27) push in window samples (WS) and rotary core were recovered from the exploratory holes in accordance with Geotechnical Investigation and Sampling– Sampling Methods and Groundwater Measurements (EN ISO 22475-1:2006).

Thirty three (33) environmental samples (ENV) were taken at 0.4m bgl to 1.2m bgl at exploratory locations. These were placed immediately in air-tight containers, which were filled to the top of the sample container. The sample suite consisted of: 2No. small

disturbed samples (D) not less than 1.0kg, 2No. 250g amber glass sample containers and 2No. 60g amber glass sample containers.

The preparation for and methods of taking environmental samples, together with their size, preservation and handling was in accordance with British Standard BS 5930: 1981- Code of Practice for Site investigation, the contract documents and the Association of Geotechnical and Geoenvironmental Specialists (AGS) guide to environmental sampling, September 2010.

In-Situ Testing

Standard Penetration Test

Standard Penetration Tests, N values, were typically carried out in the boreholes using the 60º solid cone in place of the standard split barrel sampler. The Standard Penetration Test was carried out in accordance with Geotechnical Investigation and Testing, Part 3 Standard penetration test, BS EN ISO 22476-3:2005+A1:2011. Fifty seven (57) SPT's were carried out in cable percussion boreholes and two hundred and eleven (211) in rotary holes. The data is presented on the exploratory logs accompanying this factual report.

Laboratory Testing

Laboratory testing was scheduled by Atkins and carried out by PGL in accordance with BS1377 (1990), Methods of test for soils for civil engineering purposes and the ISRM suggested methods for rock characterisation, testing and monitoring. Specialist environmental testing was carried out by Chemtest UK Ltd. on behalf of PGL. Test results are summarised below and accompany this factual report.

Please note that all samples shall be retained for a period no longer than 28 days from the date of this report. Thereafter all remaining samples shall be appropriately disposed of unless a written instruction to the contrary is received by PGL prior to the date of this reporting and within the 28 day period outlined above. Laboratory testing will result in a reduction of sample quantity and in some cased the use of the full sample mass. Samples already tested may not be suitable or available for further testing.

SUMMARY OF LABORATORY TESTSING

Soil		
Type	**Nr.**	**Remarks**
Natural Moisture Content	145	4% to 110%
Atterberg Limits	80	Liquid Limit, LL 21% to 177% Plastic Limit, PL 13% to 116% incl. non plastic soils Plasticity Index, PI 6 to 61 incl. non plastic soils
Particle Size Distribution	45	28Nr. hydrometer analysis on fine soils
pH	46	7.2 to 10.2
Sulphate (water soluble as $SO_{4)}$	46	<0.010g/l to 0.78g/l
Dry Density/ Moisture Content Relationship	01	RC919 4.5m. **Maximum dry density**: 2.18Mg/m^3 **Optimum moisture content**: 9.9%
One dimensional consolidation test	09	RC911 4.5m, RC911 7.5m, RC917 7.5m, RC925 6.0m, RC926 6.0m, RCDA34(01) 6.0m, RCDA34(01) 12.0m, RCDA34(02) 7.5m and RCDA34(02) 12.0m.
Moisture Condition Value (MCV)	01	BH921 1.5m. **MCV**: 2.4
Unconsolidated Undrained Triaxial	11	BH920 2.0m, BH927 3.0m, RC911 3.0m, RC915 3.0m, RC915 4.5m, RC915 6.0m, RC917 9.0m, RC926 4.5m, RCDA34(01) 9.0m, RCDA34(02) 6.0m and RCDA34(02) 10.5m.
Environmental Suite D	14	See attached results
Environmental Suite E	24	See attached results

Rock		
Point Loads	12	0.1MPa to 3.8MPa

Published Geology

Solid

The Geological Survey of Ireland, 1:100,000 mapping (Sheet 25) was reviewed to determine the geology of the sites. The geology of Cork City is defined by five major units along a syncline. Front north to south, furthest north lies the Gyleen Formation (GY) described as Upper Devonian red Sandstone with Mudstone and Siltstones towards the top of the unit. The Old Head Sandstone Formation (OH) lies immediately south and is characterised by Upper Devonian flaser bedded Sandstone and Minor Mudstone. This is followed by the Cuskinny Member KNcu), defined by Dinantian flaser bedded Sandstone and Mudstone. Next is the Ballysteen Formation (BA), defined by dark muddy Limestone and Shale. This is followed by Waulsortian Limestones (WA) described as massive unbedded Lime-mudstone. The relatively minor Cork Red Marble Formation (CK) occurs next and is described as red brecciated calcilutite Limestone. The central section of the Cork City Syncline is defined by the Little Island Formation (LI) comprised of Massive and crinoidal fine Limestone. Waulsortion Limestones (WA) occur again directly south followed by the geological sequence of the Cuskinny Member, Gyleen Formation and Old Head Sandstone which are repeated on the southern section of the syncline.

Superficial Deposits

Teagasc subsoil mapping indicates the area is underlain by Made Ground deposits. Quaternary deposits mainly consisting of peats and silts are anticipated followed by river deposits of Sands and Gravels and Glacial deposits of Gravels. The national aquifer vulnerability mapping indicated a low to extreme vulnerability rating across the study area.

Ground and Groundwater Conditions

The full details of the ground conditions encountered are provided for on the exploratory records accompanying this report. The records provide descriptions, in accordance with BS 5930 (2015) and Eurocode 7, Geotechnical Investigation and Testing, Identification and classification of soils, Part 1, Identification and description (EN ISO 14688-1: 2002),– Identification and Classification of Soil, Part 2: Classification Principles (EN ISO 14688-2:2004) and Identification and Classification of Rock, Part 1: Identification & Description (EN ISO 14689-1:2004) of the materials encountered, in situ testing and

details of the samples taken, together with any observations made during the ground investigation.

Groundwater was encountered at depths 0.2m bgl to 16.5m bgl during the period of works. Groundwater observations may be subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc. Under the scope of works no sandpipe wells were installed. The groundwater regime should be assessed from standpipe well installations, where available.

SUMMARY OF GROUNDWATER

Location	Depth Strike (m bgl)	Remarks
BH901	-	None encountered.
BH902	-	None encountered.
BH905	-	None encountered.
BH906	-	None encountered.
BH908	-	None encountered.
BH911	-	None encountered.
BH915	-	None encountered.
BH916	-	None encountered.
BH917	-	None encountered.
BH918	2.60	See shift data.
BH919	3.30	See shift data.
BH920	-	None encountered.
BH921	-	None encountered.
BH923	-	None encountered.
BH925	-	None encountered.
BH927	3.80	See shift data.
BHDA34	-	None encountered.
FIP901	0.80	Standing water. Assumed tidal.
FIP902	-	None encountered.
FIP903	-	None encountered.
FIP904	-	None encountered.
RC901	6.00	See shift data.
RC902	5.00	-
RC905	-	None encountered.
RC906	-	None encountered.
RC908	-	None encountered.
RC911	13.50	-

Location	Depth Strike (m bgl)	Remarks
RC915	-	None encountered.
RC916	10.50	See shift data.
RC917	-	None encountered.
RC918	6.00	See shift data.
RC919	4.50	Ground water volume increased below 15.0m.
RC919	15.00	-
RC920	12.00	-
RC921	16.50	Groundwater volume increased below 21.0m.
RC923	6.00	Groundwater volume increased below 13.0m.
RC925	7.50	-
RC926	6.00	-
RC927	12.00	Groundwater flow increased below 21.0m.
RCDA34(01)	-	None encountered.
RCDA34(02)	-	None encountered.
ST901	-	None encountered.
ST902	-	None encountered.
ST905	-	None encountered.
ST906	0.20	Groundwater encountered running on rock surface.
ST907	-	None encountered.
ST908A	-	None encountered.
ST908-E	-	None encountered.
ST908-V	-	None encountered.
ST909	-	None encountered.
ST910	-	None encountered.
ST913	-	None encountered.
ST914	-	None encountered.
ST914A	-	None encountered.
ST915	-	None encountered.
ST916	-	None encountered.
ST917	-	None encountered.
ST918	-	None encountered.
ST918A	-	None encountered.
ST919	-	None encountered.
ST920	-	None encountered.
ST921	-	None encountered.
ST921A	-	None encountered.
ST922	-	None encountered.
ST923	-	None encountered.

Location	Depth Strike (m bgl)	Remarks
ST924	-	None encountered.
ST925	-	None encountered.
ST926	-	None encountered.
ST927	-	None encountered.
ST928	-	None encountered.
ST929	-	None encountered.
ST930	-	None encountered.
ST931	-	None encountered.
ST932	-	None encountered.
ST933	-	None encountered.
ST938	-	None encountered.
ST940	-	None encountered.
ST941	-	None encountered.
ST942	-	None encountered.
ST951	-	None encountered.
ST952	-	None encountered.
ST953	-	None encountered.
STDA34(01)	-	None encountered.
STDA34(02)	-	None encountered.

Exploratory holes were backfilled upon instruction from the engineer. Backfill details are shown graphically on the exploratory logs accompanying this factual report.


ARISINGS Backfill


BENTONITE Backfill

Should you have any queries in relation to the data collected, please do not hesitate to contact our office.

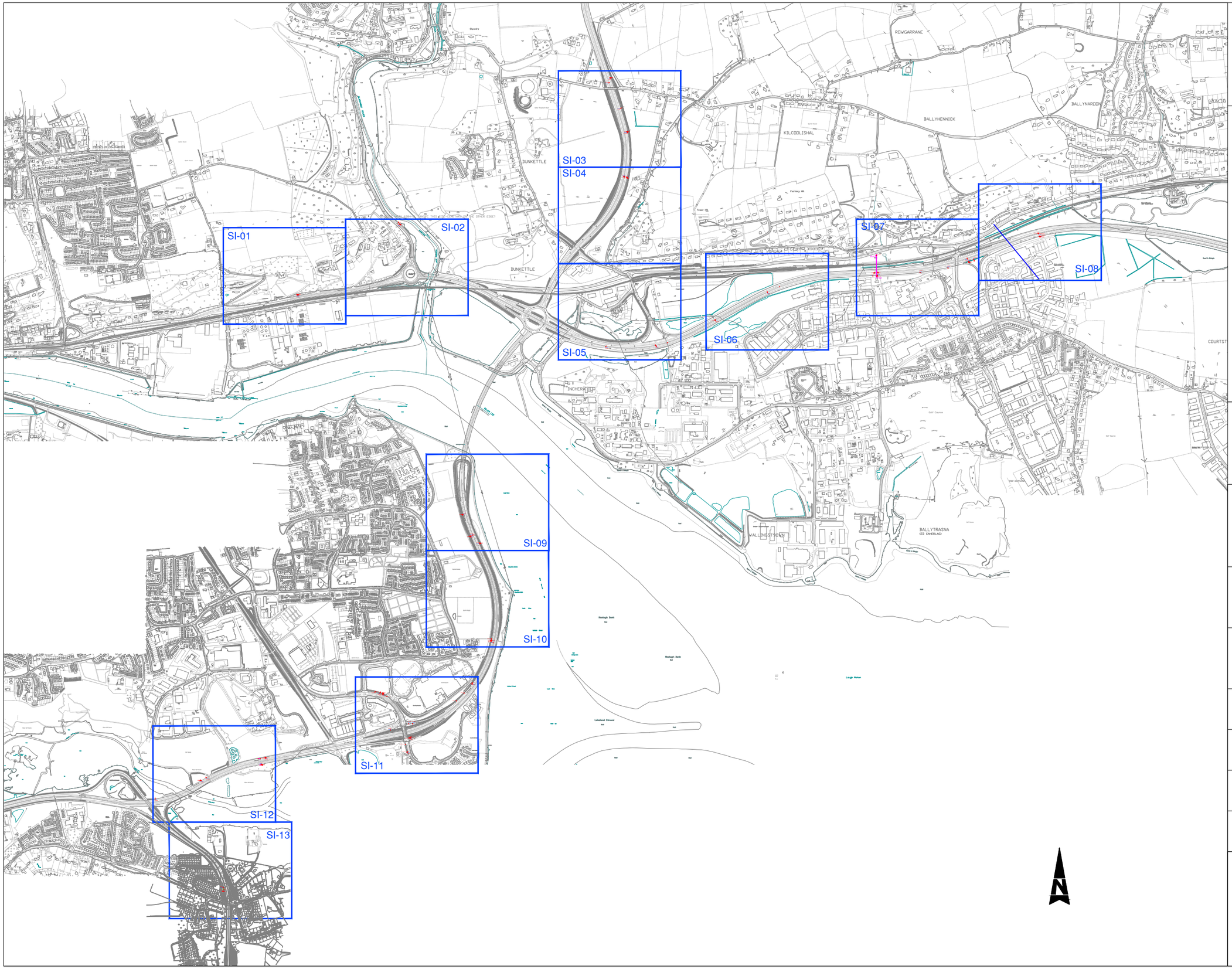
Yours sincerely,
For **Priority Geotechnical,**

James McSweeney BSc
Engineering Geologist

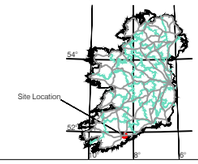
No responsibility can be held by PGL for ground conditions between exploratory locations. The exploratory logs provide for ground profiles and configuration of strata relevant to the investigation depths achieved during the fieldworks. Caution shall be taken when extrapolating between such exploratory locations. No liability is accepted for ground conditions extraneous to the exploratory locations.

No account has been taken of potential subsidence or ground movement due to mineral extraction, mining works or karstification below or in proximity to the site, unless specifically addressed.

This report has been prepared for Employer and their Representative as outline, herein. The information should not be used without their prior written permission. PGL accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.



Priority Geotechnical Site



JOB NAME:

N40 / Dunkettle Interchange Upgrade Scheme

Sheet Title:

EXPLORATORY LOCATION LAYOUT

JOB NUMBER:

P19248

DRAWING NUMBER:

P19248-SI-A

DRAWN BY:

Gary Curtin

DATE:

06/01/2020

SCALE:	APPROVED:
1:20,000 ON A3	GH

REVISION:

D01

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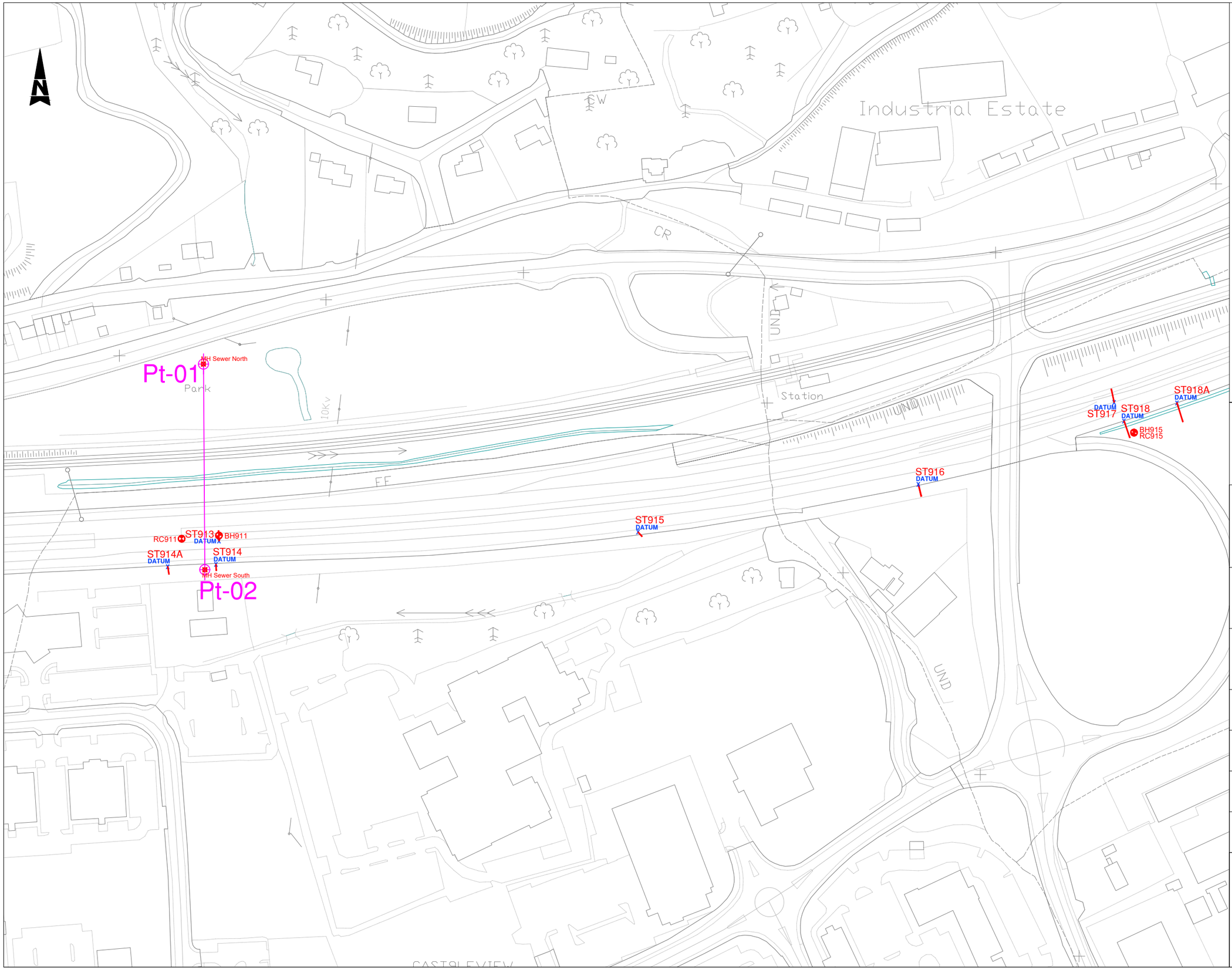

KEY:

- TP00 Denotes Trial Pit location
- CPT00 Denotes Dynamic Probe location
- BH00 Denotes Borehole location
- RC00 Denotes Rotary Core location
- FP00 Denotes Foundation Pit location

JOB NAME:

N40 / Dunkettle Interchange Upgrade Scheme

Sheet Title:

EXPLORATION LOCATION PLAN

JOB NUMBER:

P19248

DRAWING NUMBER:

P19248-SI-07

DRAWN BY:

Gary Curtin

DATE:

06/01/2020

SCALE:	APPROVED:
1:2000 ON A3	GH

REVISION:

D01

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KEY TO SYMBOLS ON EXPLORATORY HOLE RECORDS

All linear dimensions are in metres or millimetres

DESCRIPTIONS

**	Drillers Description
Friable	Easily crumbled

SAMPLES

U( )	Undisturbed 102mm diameter sample, ( ) denotes number of blows to drive sampler
U( )F, U( )P	F- not recovered, P-partially recovered
U38	Undisturbed 38mm diameter sample
P(F), (P)	Piston sample - disturbed
B	Bulk sample - disturbed
D	Jar Sample - disturbed
W	Water Sample
CBR	California Bearing Ratio mould sample
ES	Chemical Sample for Contamination Analysis
SPTLS	Standard Penetration Test S lump sample from split sampler

CORE RECOVERY AND ROCK QUALITY

TCR	Total Core Recovery (% of Core Run)
SCR	Solid Core Recovery (length of core having at least one full diameter as % of core run)
RQD	Rock Quality Designation (length of solid core greater than 100mm as % of core run)

Where there is insufficient space for the TCR, SCR and RQD, the results may be found in the remarks column

If	Fracture Spacing in mm (Minimum/Average/Maximum) NI - non intact, NR - no recovery
AZCL	Assumed Zone of Core Loss
NI	Non intact

GROUNDWATER

▽	Groundwater strike
▼	Groundwater level after standing period
Date/Water	Date of shift (day/month)/Depth to water at end of previous shift shown above the date and depth to water at beginning of shift given below the date

INSITU TESTING

S	Standard Penetration Test - split barrel sampler
C	Standard Penetration Test - solid 60^o cone
SW	Self Weight Penetration
Ivp, HVp (R)	In Situ Vane Test, Hand Vane Test (R) demonstrates remoulded strength
K(F), (C), (R), (P)	Permeability Test
HP	Hand Penetrometer Test

MEASURED PROPERTIES

N	Standard Penetration Test - blows required to drive 300mm after seating drive
x/y	Denotes x blows for y mm within the Standard Penetration Test
x*/y	Denotes x blows for y mm within the seating drive
c_u	Undrained Shear Strength (kN/m^2)
CBR	California Bearing Ratio

ROTARY DRILLING SIZES

Index Letter	Nominal Diameter (mm)	
	Borehole	Core
N	75	54
H	99	76
P	120	92
S	146	113

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Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:**	575228E - 572800N	**Hole Type** CP
Location:	Cork		**Level:**	3.85m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Date:**	07/01/2020 - 07/01/2020	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description
		Depth (m bgl)	Type	Results				
					0.30	3.55		(TOPSOIL)
		0.50 - 1.00	B					Brown, slightly sandy gravelly SILT with rootlets. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.
		1.20	SPT (C)	N=62 (8,10/13,15,18,16)	1.30	2.55		
		1.50 - 2.00	B					Stiff, brown, slightly sandy gravelly SILT with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular to sub-angular. Cobbles are angular to sub-angular.
		2.00	SPT (C)	N=82 (13,15/16,16,25,25)				
		2.30	SPT (C)	50 (25 for 75mm/50 for 100mm)	2.30	1.55		End of Borehole at 2.300m

Groundwater:

Struck (m bgl)	Rose to	After (mins)	Sealed	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
2.30	200	200

Equipment: Dando 2000

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
1.50	1.65	00:30	Chisel
2.00	2.17	00:30	Chisel
2.30	2.30	01:00	Chisel

Remarks:

Borehole terminated at 2.30m bgl due to obstruction.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	07/01/2020 08:00	0.00	Start of shift
Dry	07/01/2020 18:00	2.30	End of borehole.

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Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:**	575207E - 572798N	**Hole Type** Rotary open hole
Location:	Cork		**Level:**	3.85m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Dates:**	04/02/2020	04/02/2020

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Cable tool borehole depth. Refer to BH911 for detailed overburden description.
							2.30	1.55		
							2.70	1.15		Open hole boring. Driller described: (MADE GROUND) Clause 804 or similar with cobble content.
		3.00 - 3.50	WS							Open hole boring. Driller described: Soft, Silt.
		N=5 (1,1/1,1,2,1) (C)								
		4.50 - 5.50	WS							
		N=4 (1,0/1,1,1,1) (C)								
		6.00 - 7.00	WS							
		N=3 (1,0/0,1,1,1) (C)								
		7.50 - 8.50	WS							
		N=26 (4,4/6,6,7,7) (C)					8.40	-4.55		Open hole boring. Driller described: Medium dense to dense, clayey sandy Gravel with low cobble content.

Groundwater:

Struck (m bgl)	Rose to	After (min)	Sealed	Comment
13.50				

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
24.00	131	131

Equipment:	Soilmec PSM.
Method:	Compressed air mist.

Remarks:

Borehole terminated at 24.00m bgl due to water flow.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	04/02/2020 08:00	0.00	Start of shift.
	04/02/2020 18:00	24.00	End of borehole.

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Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575207E - 572798N	**Hole Type** Rotary open hole
Location:	Cork		**Level:** 3.85m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Dates:** 04/02/2020	04/02/2020

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
		N=29 (4,4/6,7,8,8) (C)								Open hole boring. Driller described: Medium dense to dense, clayey sandy Gravel with low cobble content.
		10.50 - 12.00 N=35 (5,6/6,8,10,11) (C)	B							
		N=41 (4,6/8,10,10,13) (C)								
	▼	13.50 - 15.00 N=30 (5,7/7,7,7,9) (C)	B							
							14.50	-10.65		Open hole boring. Driller described: Dense, sandy Gravel.
		N=50 (6,8/10,10,11,19) (C)								
		N=35 (5,7/7,7,8,13) (C)								
							18.00	-14.15		

10 11 12 13 14 15 16 17 18

Groundwater:

Struck (m bgl)	Rose to	After (min)	Sealed	Comment
13.50				

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
24.00	131	131

Equipment: Soilmec PSM.

Method: Compressed air mist.

Remarks:

Borehole terminated at 24.00m bgl due to water flow.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	04/02/2020 08:00	0.00	Start of shift.
	04/02/2020 18:00	24.00	End of borehole.

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Drilled By:	Borehole No.
GW	**RC911**
Logged By:	Sheet 3 of 3
N/A	

Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:**	575207E - 572798N	**Hole Type** Rotary open hole
Location:	Cork		**Level:**	3.85m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Dates:**	04/02/2020	04/02/2020

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / FI (/m)	Level (mOD)	Legend	Stratum Description
		N=29 (5,4/5,8,8,8) (C)								Open hole boring. Driller described: Stiff, slightly sandy gravelly Clay with boulder content.
		50 (25 for 85mm/50 for 0mm) (C)								
		N=60 (13,10/10,14,16,20) (C)								
		50 (5,6/50 for 30mm) (C)								
		50 (25 for 75mm/50 for 0mm) (C)					24.00	-20.15		End of Borehole at 24.000m

19 20 21 22 23 24 25 26 27

Groundwater:

Struck (m bgl)	Rose to	After (min)	Sealed	Comment
13.50				

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
24.00	131	131

Equipment:	Soilmec PSM.
Method:	Compressed air mist.

Remarks:
Borehole terminated at 24.00m bgl due to water flow.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	04/02/2020 08:00	0.00	Start of shift.
	04/02/2020 18:00	24.00	End of borehole.

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Drilled By:	Borehole No.
JC	**BH915**
Logged By:	Sheet 1 of 1
OD	

Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:**	575736E - 572857N	**Hole Type** CP
Location:	Cork		**Level:**	3.46m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Date:**	20/01/2020 - 20/01/2020	

Well Backfill	Water Strike (m bgl)	Sample and In Situ Testing			Depth (m bgl)	Level (mOD)	Legend	Stratum Description
		Depth (m bgl)	Type	Results				
		0.20 - 0.50	B		0.20	3.26		(TOPSOIL)
		0.50	SPT (C)	50 (25 for 0mm/50 for 0mm)	0.50	2.96		Brown, slightly sandy slightly gravelly SILT with low cobble content. Sand is fine to coarse. Gravel is fine to coarse and angular to rounded. Cobbles are 63mm to 100mm dia and angular to sub-angular.
								End of Borehole at 0.500m

1 2 3 4 5 6 7 8 9

Groundwater:

Struck (m bgl)	Rose to	After (mins)	Sealed	Comment
				None encountered.

Hole Information:

Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
0.50	200	200

Equipment: Dando 2000.

Chiselling Details:

Top (m)	Base (m)	Duration (hh:mm)	Tool
0.50	0.50	01:00	Chisel.

Remarks:

Borehole terminated at 0.50m bgl due to refusal.

Shift Data:

GW (m bgl)	Shift	Depth (m bgl)	Remarks
	20/01/2020 08:00	0.00	Start of shift.
Dry	20/01/2020 18:00	0.50	End of borehole.

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Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:**	575736E - 572857N	**Hole Type** Rotary open hole
Location:	Cork		**Level:**	3.46m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Dates:**	24/01/2020	24/01/2020

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
										Cable tool depth. Refer to BH915 for detailed overburden description.
							0.60	2.86		
										Open hole boring. Driller described: Stiff, Clay with boulder content.
		50 (25 for 60mm/50 for 70mm) (C)					1.90	1.56		
										Open hole boring. Driller described: Slightly sandy slightly gravelly CLAY.
		3.00 - 4.00	WS							
		N=7 (2,2/2,1,2,2) (C)					4.00	-0.54		
		4.50 - 5.50	WS							Open hole boring. Driller described: Firm, Silt.
							4.90	-1.44		
		N=16 (2,3/3,4,5,4) (C)								Open hole boring. Driller described: Soft, slightly sandy slightly gravelly SILT.
		6.00 - 7.00	WS							
		N=5 (1,1/1,2,1,1) (C)								
		7.50 - 8.50	WS							
		N=3 (1,0/0,1,1,1) (C)								
		N=4 (1,0/1,1,1,1) (C)								

Groundwater:

Struck (m bgl)	Rose to	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
22.50	131	131

Equipment:	Soilmech PSM
Method:	Compressed air

Remarks:

Borehole terminated at 22.50m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	24/01/2020 08:00	0.00	Start of shift.
	24/01/2020 18:00	22.50	End of borehole.

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Drilled By:	Borehole No.
GW	**RC915**
Logged By:	Sheet 2 of 3
HG	

Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:**	575736E - 572857N	**Hole Type** Rotary open hole
Location:	Cork		**Level:**	3.46m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Dates:**	24/01/2020	24/01/2020

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
		N=2 (1,2/1,0,0,1) (C)								Open hole boring. Driller described: Soft, slightly sandy slightly gravelly SILT.
		N=3 (1,0/0,1,1,1) (C)								
		N=9 (1,0/0,1,3,5) (C)					14.00	-10.54		
		N=25 (4,4/5,7,6,7) (C)								Open hole boring. Driller described: Medium dense to dense, clayey sandy GRAVEL.
		0 (39 for 75mm/0 for 0mm) (C)								

10 11 12 13 14 15 16 17 18

Groundwater:

Struck (m bgl)	Rose to	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
22.50	131	131

Equipment:	Soilmech PSM
Method:	Compressed air

Remarks:
Borehole terminated at 22.50m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	24/01/2020 08:00	0.00	Start of shift.
	24/01/2020 18:00	22.50	End of borehole.

pgl priority geotechnical	**Priority Geotechnical Ltd.** **Tel: 021 4631600** **Fax: 021 4638690** **www.prioritygeotechnical.ie**	**Drilled By:** GW **Logged By:** HG	Borehole No. **RC915** Sheet 3 of 3

Project Name:	Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:**	575736E - 572857N	**Hole Type** Rotary open hole
Location:	Cork		**Level:**	3.46m OD	**Scale** 1:50
Client:	Transport Infrastructure Ireland (TII)		**Dates:**	24/01/2020	24/01/2020

Well	Water Strike (m)	Depth (m)	Type /Fs (min, max, avg)	Coring (%) TCR	SCR	RQD	Depth (m) / Fl (/m)	Level (mOD)	Legend	Stratum Description
		53 (10,10/53 for 150mm) (C)								Open hole boring. Driller described: Medium dense to dense, clayey sandy GRAVEL.
		N=49 (6,7/8,14,14,13) (C)								
		50 (25 for 85mm/50 for 0mm) (C)								
		50 (16,19/50 for 75mm) (C)					22.50	-19.04		End of Borehole at 22.500m

19 20 21 22 23 24 25 26 27

Groundwater:

Struck (m bgl)	Rose to	After (min)	Sealed	Comment
				None encountered.

Hole Information:

Hole Depth (m bgl)	Hole Dia (mm)	Casing Dia (mm)
22.50	131	131

Equipment: Soilmech PSM

Method: Compressed air

Remarks:

Borehole terminated at 22.50m bgl, required depth.

Shift Data:

Groundwater (m bgl)	Shift	Hole Depth (m bgl)	Remarks
Dry	24/01/2020 08:00	0.00	Start of shift.
	24/01/2020 18:00	22.50	End of borehole.

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Trial Pit No
ST913
Sheet 1 of 1

Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575228E - 572797N **Level:** 3.62m OD	**Date** 07/01/2020
Location: Cork		**Dimensions (m):** 6.50 × 0.80	**Scale** 1:25
Client: Transport Infrastructure Ireland (TII)		**Depth:** 1.50m BGL	**Logged** DMC

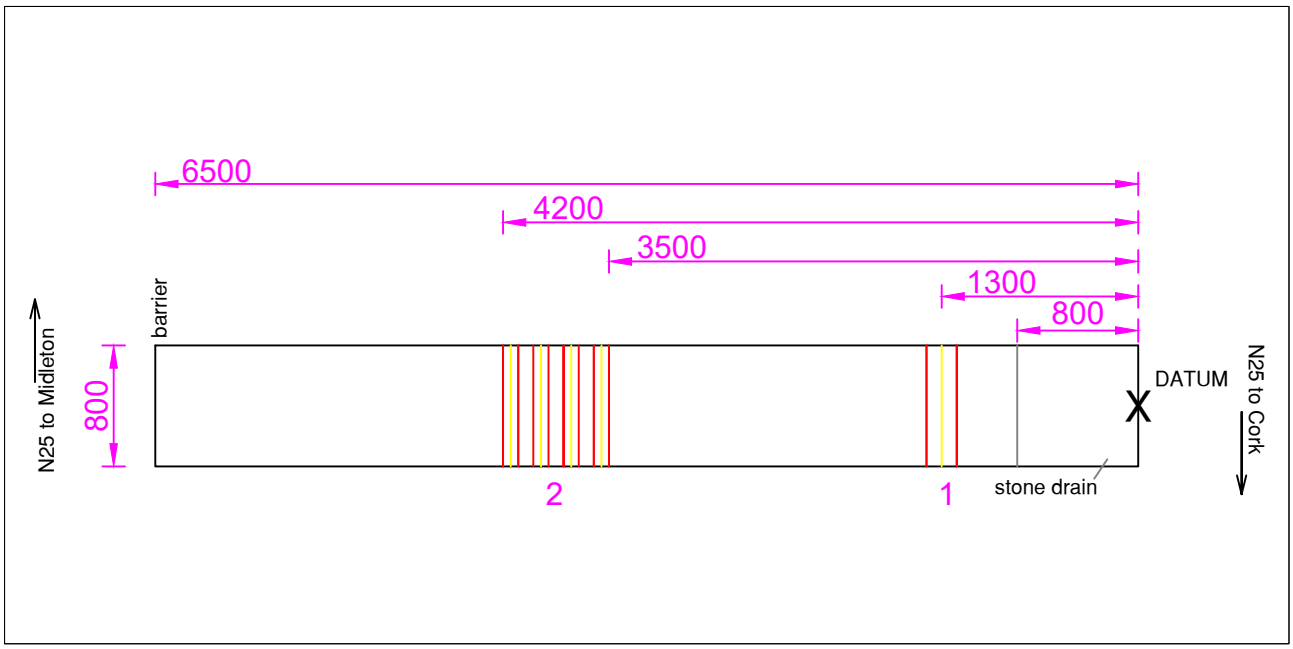
Water Strike & Backfill	Samples & In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.30	3.32		(TOPSOIL)
	0.50 0.50 - 1.50	ENV B					Soft, brown, slightly sandy gravelly SILT with medium cobble content and low boulder content. Cobbles are 63mm to 200mm dia, sub-angular. Boulders are 200mm to 800mm dia, sub-angular.
				1.50	2.12		End of Pit at 1.500m

1
2
3
4
5

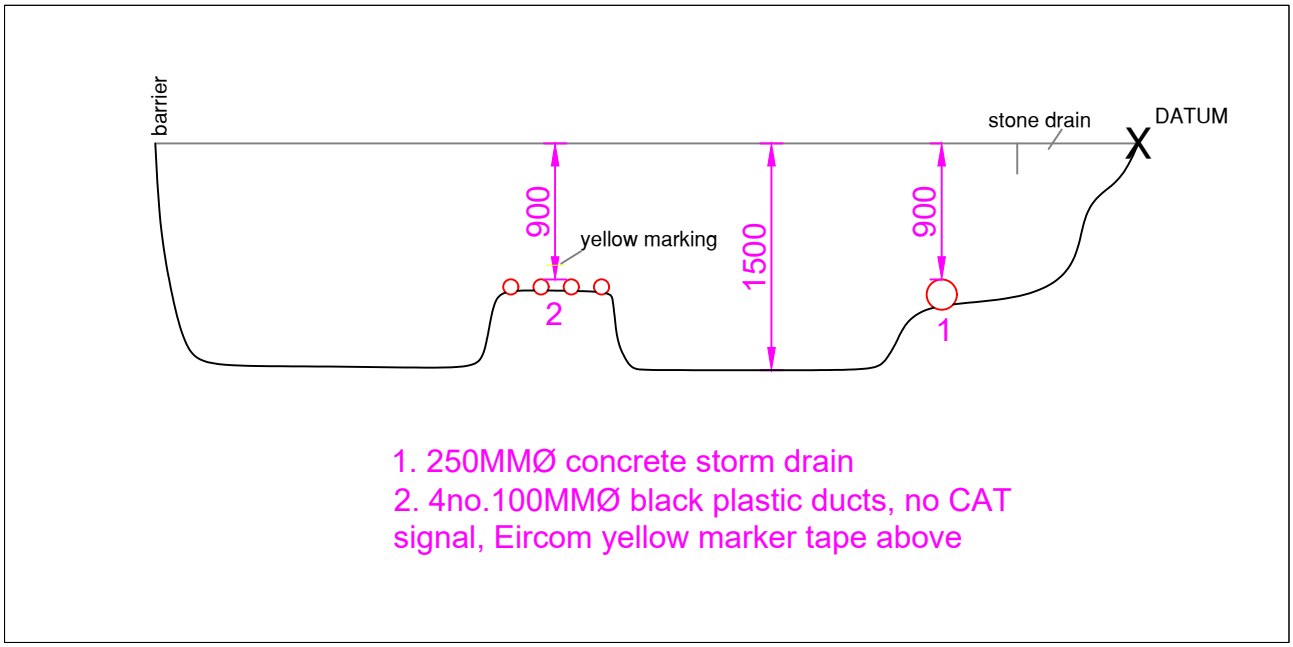
Stability: Moderate.
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

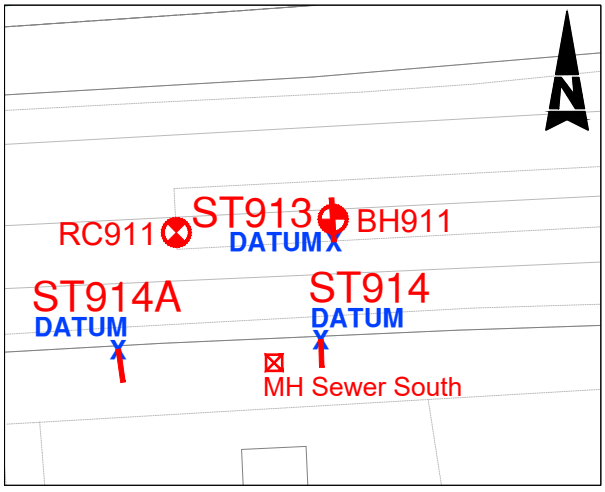
Remarks: Slit trench terminated at 1.50m bgl. Refer to DWG P19248 ST913 for cross sectional detail. Drainage stone surrounding the storm drain.



SLIT TRENCH PLAN, 1:50 ON A4



SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575227.8
NORTHING: 575797.0
LEVEL: 3.618mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 6.50m
WIDTH: 0.80m
DEPTH: 1.50m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:	DATE:
G.C.	10/01/2020
LOGGED BY:	DATE:
D.McC.	07/01/2020

SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST913

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST913

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Photographic Record

Number:	**ST913**	**Project** Dunkettle Advance ITS Works **Project No** P19248 **Engineer** Atkins	

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Trial Pit No
ST914
Sheet 1 of 1

Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575226E - 572784N **Level:** 3.99m OD	**Date** 06/01/2020
Location: Cork		**Dimensions (m):** 4.60 × 0.70	**Scale** 1:25
Client: Transport Infrastructure Ireland (TII)		**Depth:** 1.50m BGL	**Logged** DMC

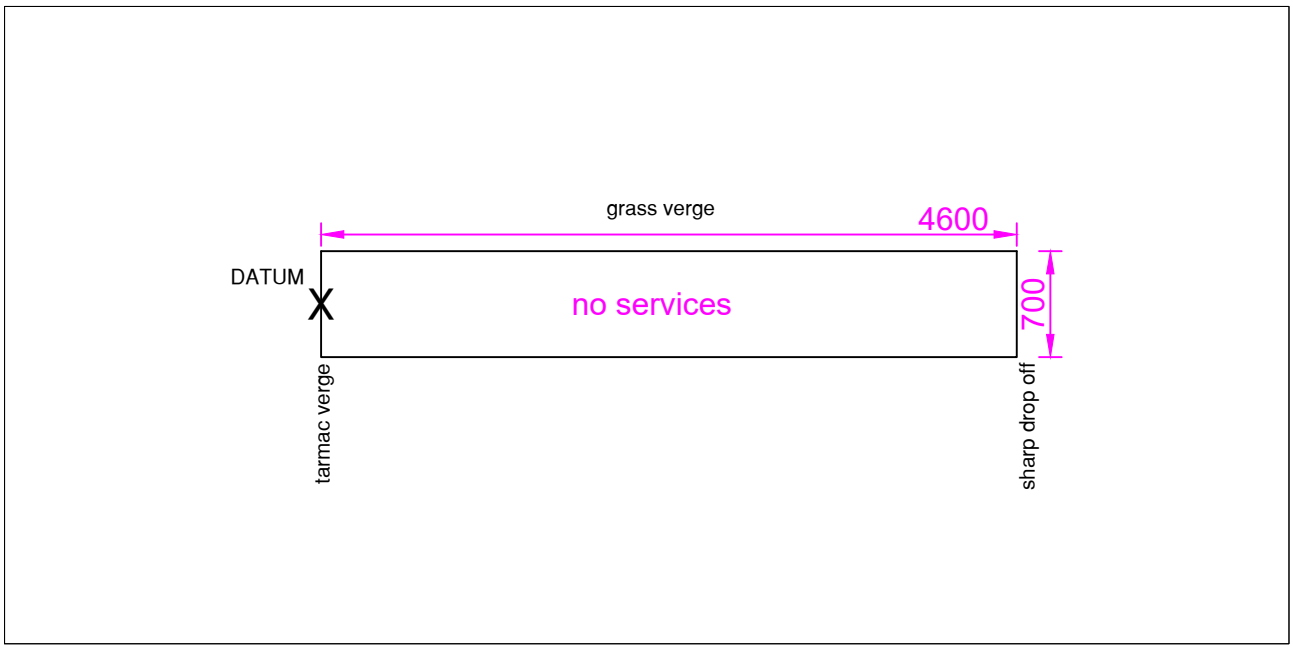
Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.30	3.69		(TOPSOIL)
	0.60 0.60 - 1.40	ENV B					Soft to firm, brown, slightly sandy gravelly SILT with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular. Cobbles are 63mm to 200mm dia, sub-angular to sub-rounded.
				1.50	2.49		End of Pit at 1.500m

1
2
3
4
5

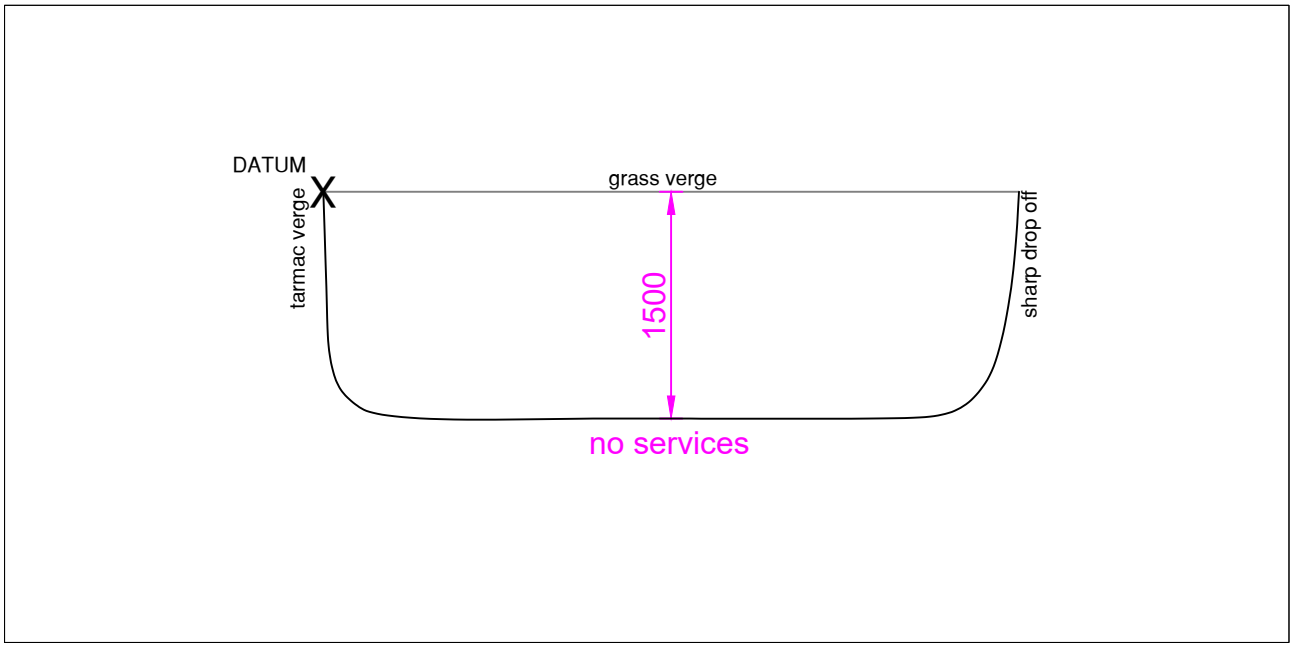
Stability: Good
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

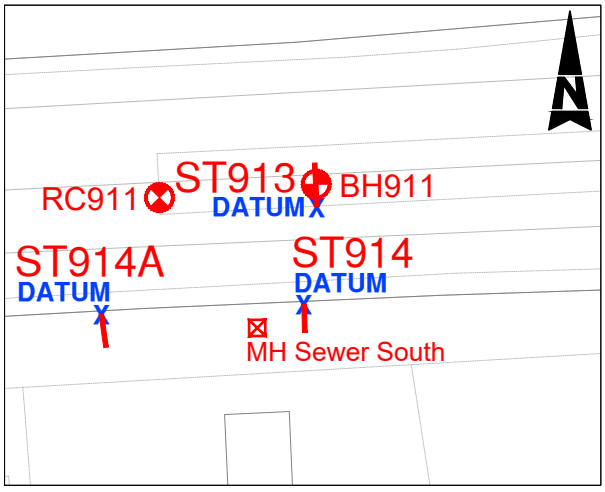
Remarks: Slit trench terminated at 1.50m bgl. Refer to DWG P19248 ST914 for cross sectional detail.



SLIT TRENCH PLAN, 1:50 ON A4



SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575226.1
NORTHING: 572784.1
LEVEL: 3.986mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 4.60m
WIDTH: 0.70m
DEPTH: 1.50m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:		DATE:
G.C.		09/01/2020
LOGGED BY:		DATE:
D.McC.		06/01/2020
SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST914

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST914

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Photographic Record

Number:	**ST914**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

Photographic Record

Number:	**ST914**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

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Trial Pit No
ST914A
Sheet 1 of 1

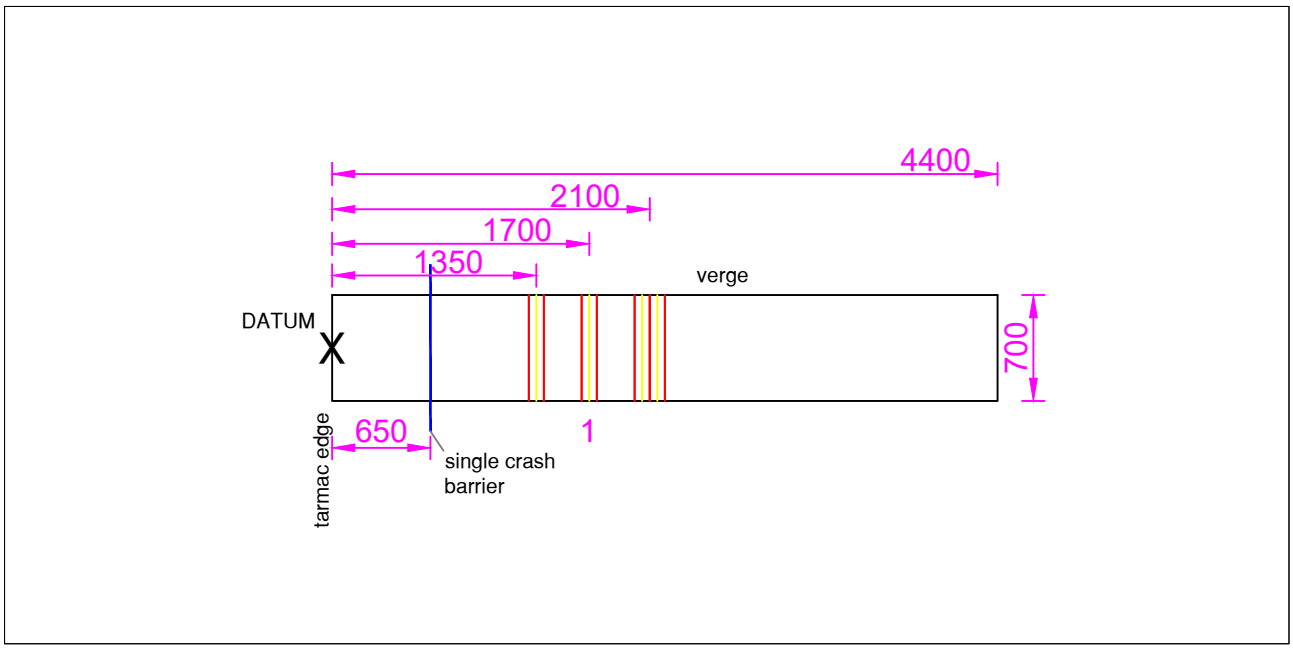
Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575199E - 572783N **Level:** 4.01m OD	**Date** 23/01/2020
Location: Cork		**Dimensions (m):** 4.40 x 0.70 **Depth:** 1.40m BGL	**Scale** 1:25
Client: Transport Infrastructure Ireland (TII)			**Logged** DMC

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.20	3.81		(TOPSOIL)
	0.50 0.50 - 1.20 0.50 - 1.20	ENV B D					Firm, brown, slightly sandy gravelly CLAY with high cobble content.
				1.40	2.61		End of Pit at 1.400m

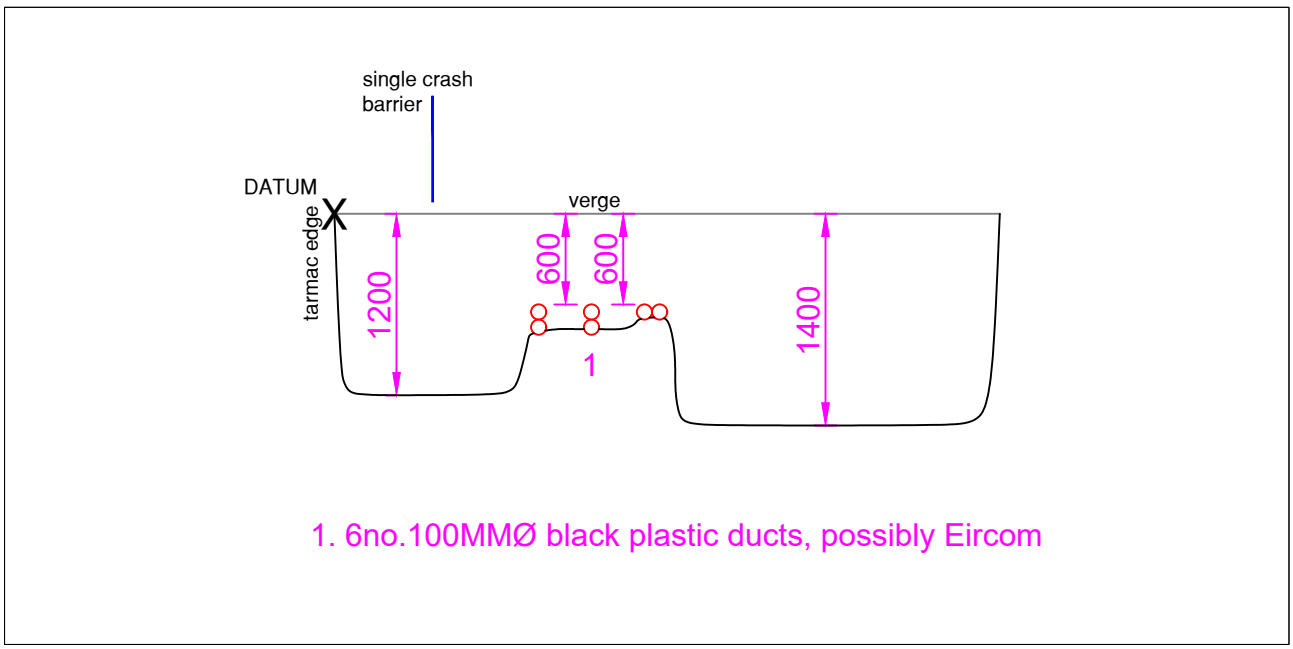
Stability: Good.
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Slit trench terminated at 1.40m bgl. Refer to drawing P19248 ST914A for cross section detail.

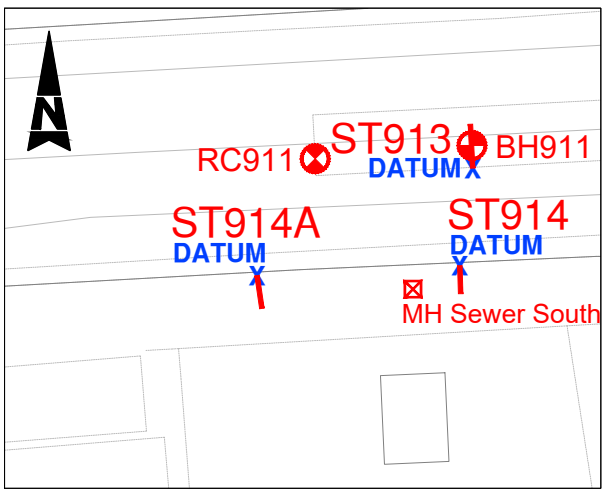


SLIT TRENCH PLAN, 1:50 ON A4



1. 6no.100MMØ black plastic ducts, possibly Eircom

SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575199.3
NORTHING: 572782.8
LEVEL: 4.006mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 4.40m
WIDTH: 0.70m
DEPTH: 1.40m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:		DATE:
G.C.		24/01/2020
LOGGED BY:		DATE:
D.McC.		23/01/2020
SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST914A

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST914A

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Photographic Record

No photos

No photos

Number:	**ST914A**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

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Trial Pit No
ST915
Sheet 1 of 1

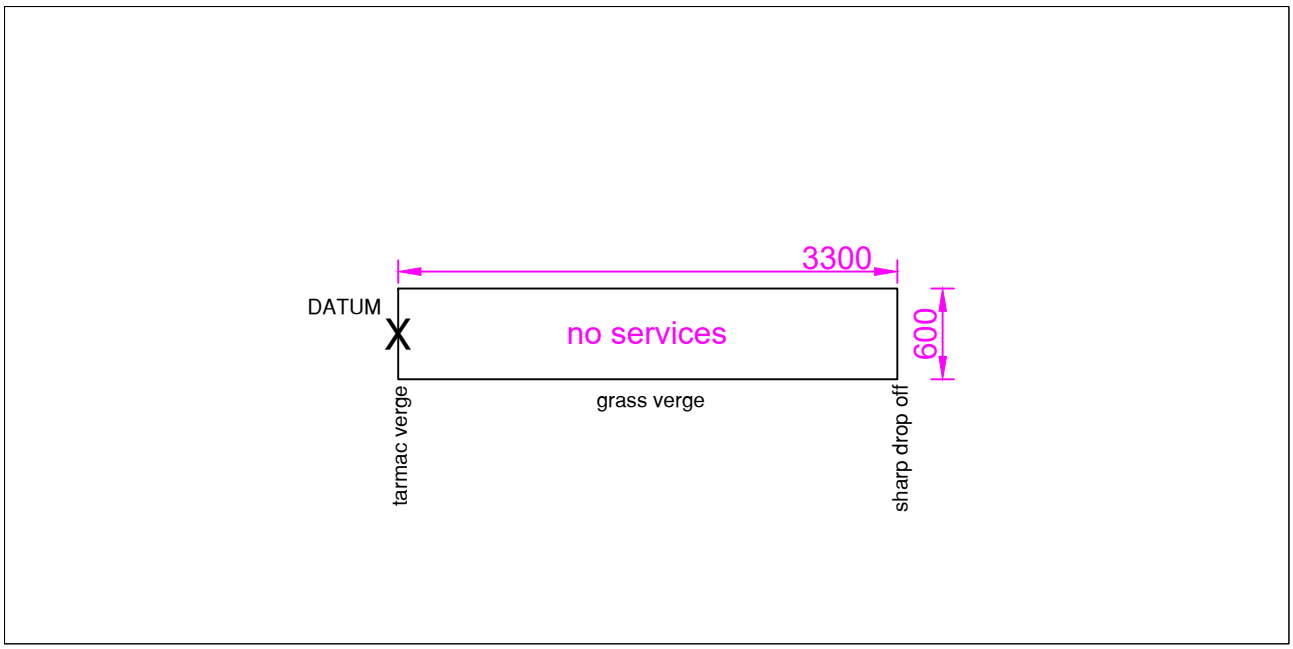
Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575461E - 572802N **Level:** 4.12m OD	**Date** 06/01/2020
Location: Cork		**Dimensions (m):** 3.30 x 0.60 **Depth:** 1.30m BGL	**Scale** 1:25
Client: Transport Infrastructure Ireland (TII)			**Logged** DMC

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
							(TOPSOIL)
	0.60 0.60 - 1.20	ENV B		0.30	3.82		Soft to firm, brown, slightly sandy gravelly CLAY with high cobble content. Sand is fine to coarse. Gravel is fine to coarse, angular. Cobbles are 63mm to 150mm dia, sub-angular to angular.
				1.30	2.82		End of Pit at 1.300m

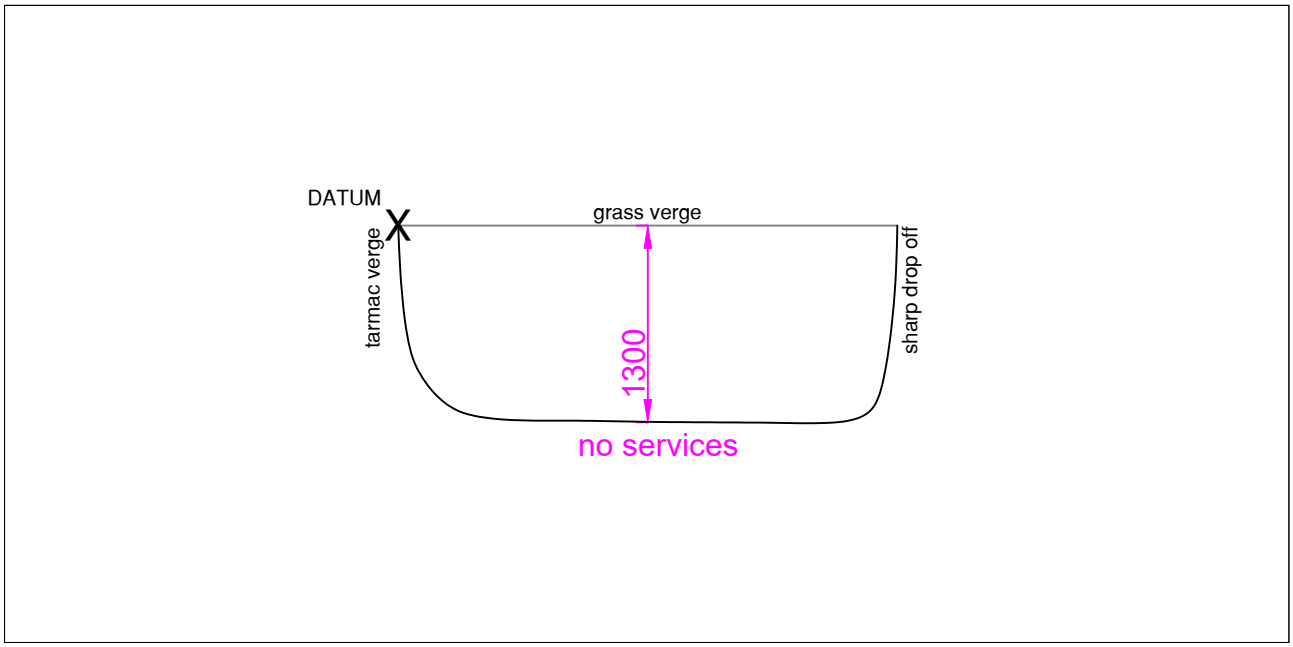
Stability: Good
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

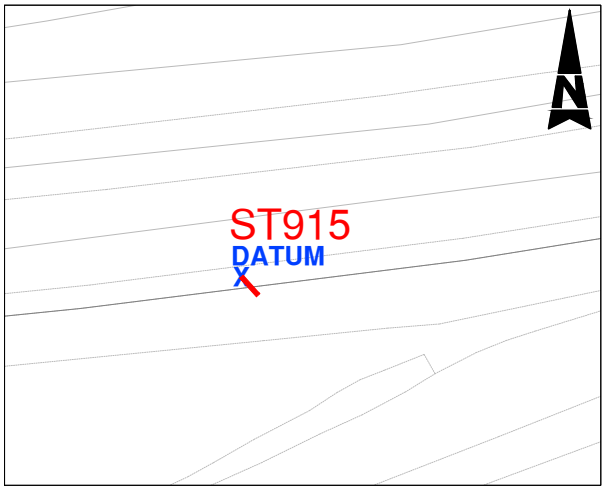
Remarks: Slit trench terminated at 1.30m bgl. Refer to DWG P19248 ST915 for cross sectional detail.



SLIT TRENCH PLAN, 1:50 ON A4



SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575460.7
NORTHING: 572801.9
LEVEL: 4.122mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 3.30m
WIDTH: 0.60m
DEPTH: 1.30m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:		DATE:
G.C.		09/01/2020
LOGGED BY:		DATE:
D.McC.		06/01/2020
SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST915

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST915

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Photographic Record

Number:	**ST915**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

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Trial Pit No
ST916
Sheet 1 of 1

Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575616E - 572828N **Level:** 4.08m OD	**Date** 06/01/2020
Location: Cork		**Dimensions (m):** 6.90 × 0.60	**Scale** 1:25
Client: Transport Infrastructure Ireland (TII)		**Depth:** 1.40m BGL	**Logged** DMC

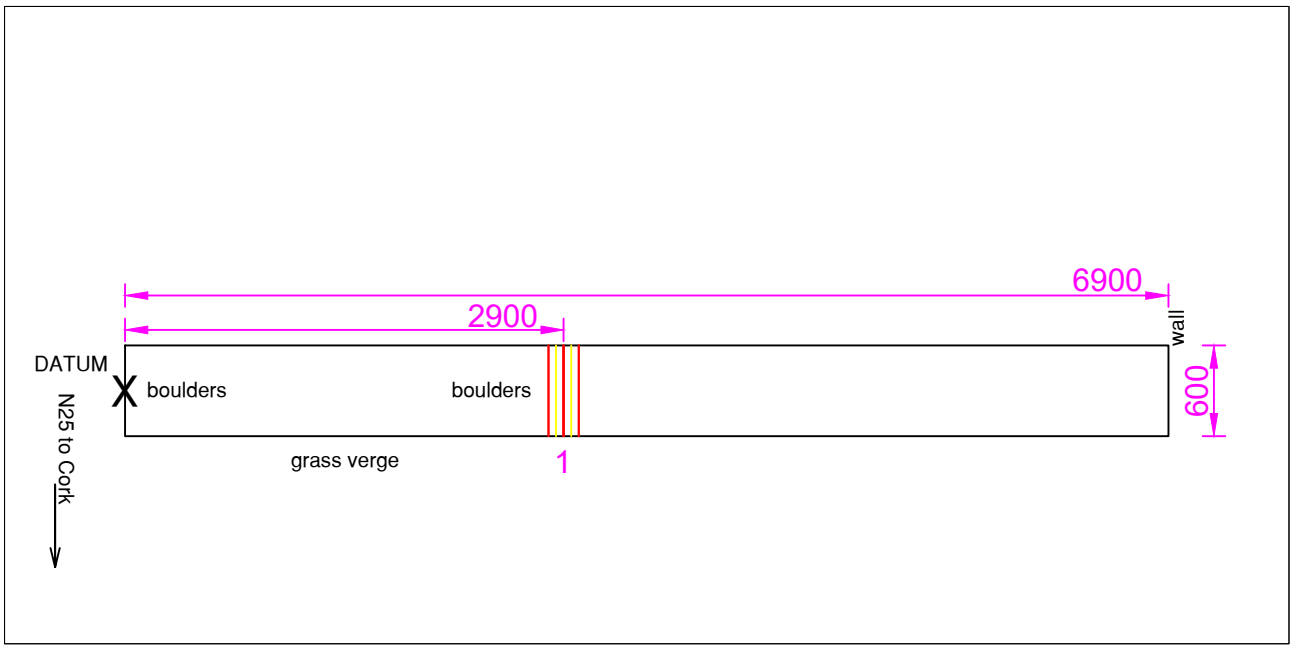
Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.40	3.68		(TOPSOIL) with roots.
	0.50 - 1.40 0.60	B ENV					Soft to firm, grey, gravelly SILT with medium cobble content. Gravel is fine to coarse, angular. Cobbles are 63mm to 200mm dia, sub-angular.
				1.40	2.68		End of Pit at 1.400m

1
2
3
4
5

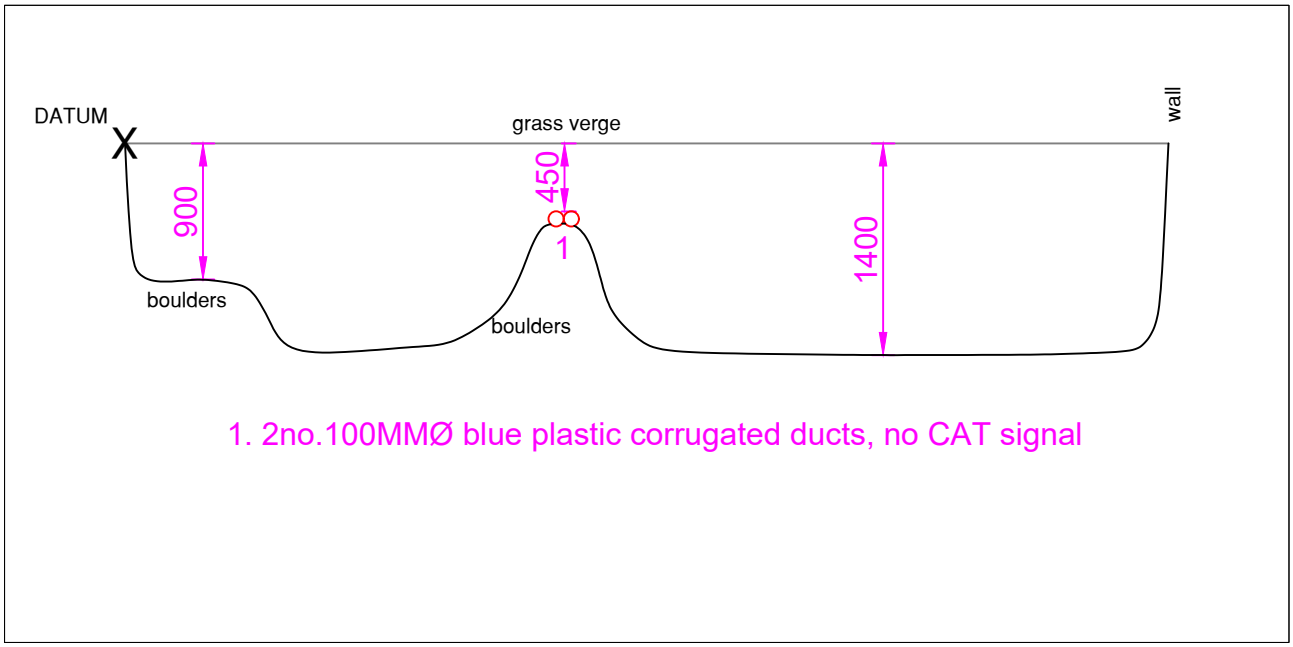
Stability: Good.
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

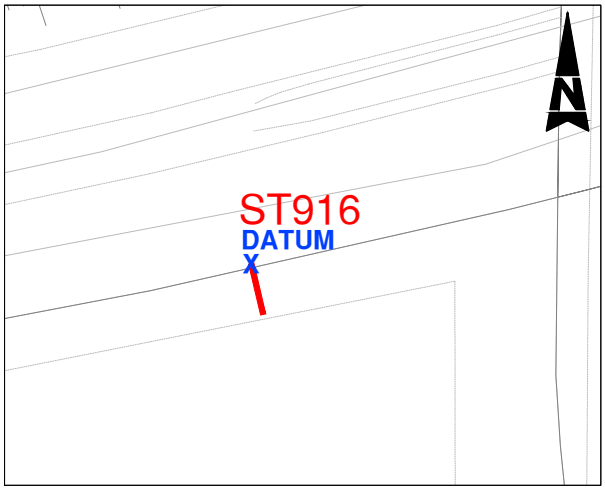
Remarks: Slit trench terminated at 1.40m bgl. Refer to DWG P19248 ST916 for cross sectional detail.



SLIT TRENCH PLAN, 1:50 ON A4



SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575616.5
NORTHING: 572828.4
LEVEL: 4.076mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 6.90m
WIDTH: 0.60m
DEPTH: 1.40m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:		DATE:
G.C.		10/01/2020
LOGGED BY:		DATE:
D.McC.		06/01/2020
SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST916

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST916

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Photographic Record

Number:	**ST916**	**Project** Dunkettle Advance ITS Works **Project No** P19248 **Engineer** Atkins	

Photographic Record

Number:	**ST916**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

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Trial Pit No
ST917
Sheet 1 of 1

Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575725E - 572874N **Level:** 3.45m OD	**Date** 07/01/2020
Location: Cork		**Dimensions (m):** 7.40 × 0.60	**Scale** 1:25
Client: Transport Infrastructure Ireland (TII)		**Depth:** 1.40m BGL	**Logged** DMC

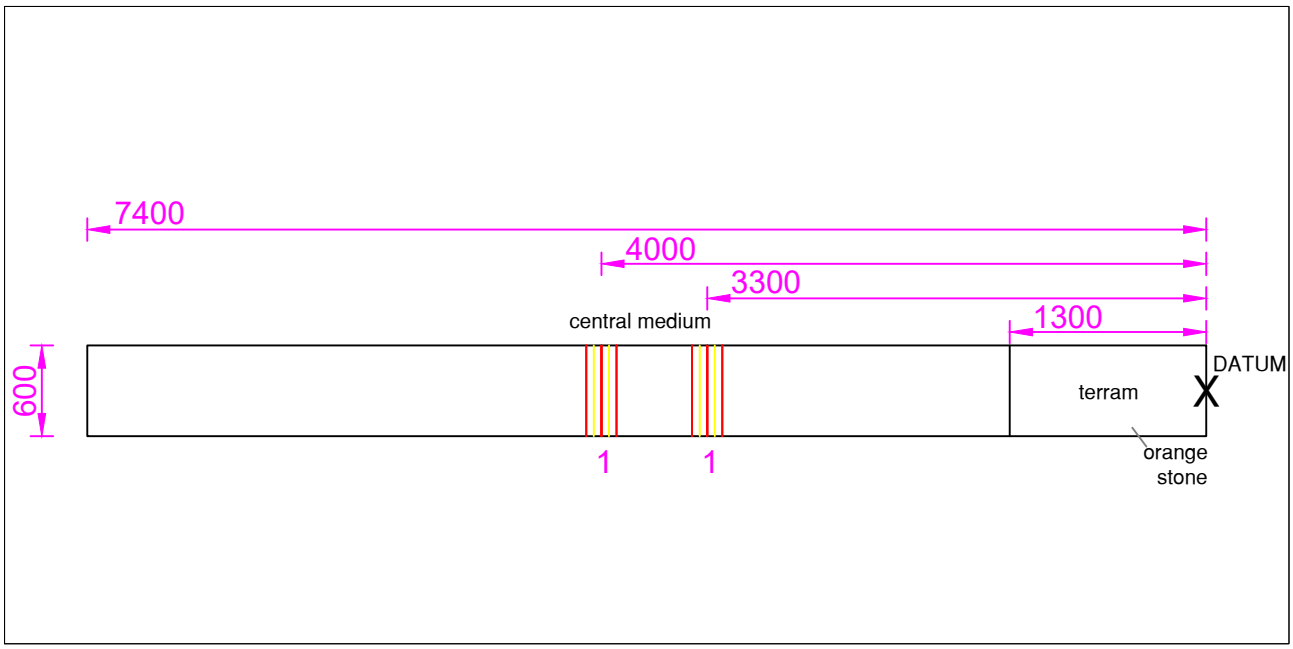
Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.20	3.25		(TOPSOIL) with roots.
							Soft to firm, brown, gravelly SILT with boulder content. Gravel is fine to coarse, angular. Boulders are 200mm to 1000mm.
				1.40	2.05		End of Pit at 1.400m

1
2
3
4
5

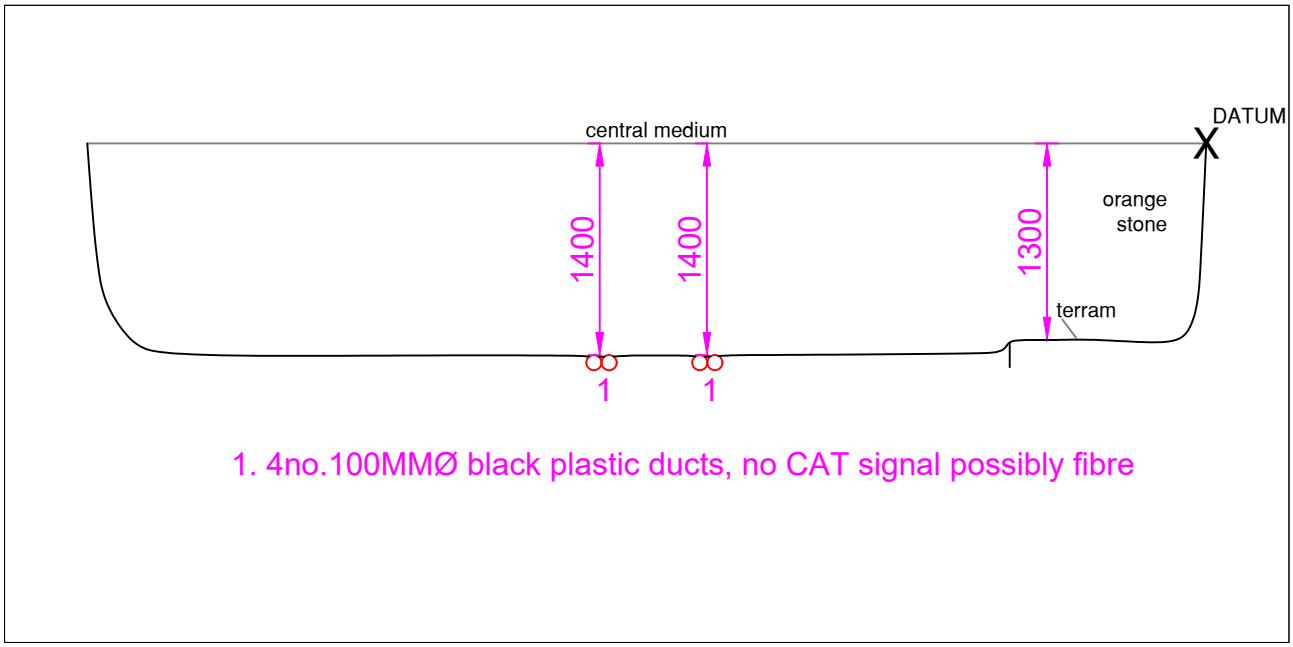
Stability: Moderate
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

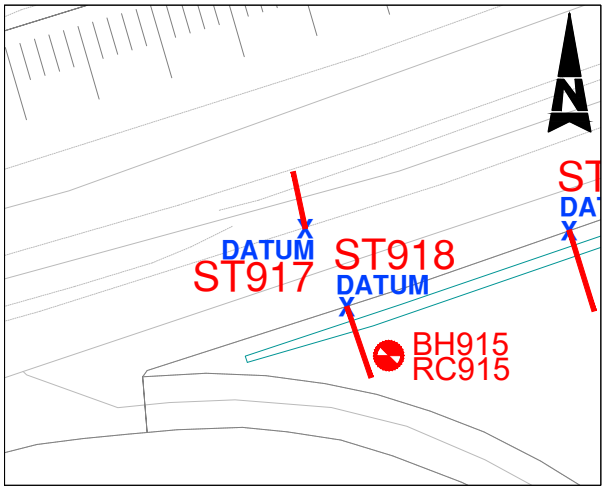
Remarks: Slit trench terminated at 1.40m bgl. Refer to DWG P19248 for cross sectional detail.



SLIT TRENCH PLAN, 1:50 ON A4



SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575725.3
NORTHING: 572874.0
LEVEL: 3.448mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 7.40m
WIDTH: 0.60m
DEPTH: 1.40m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:		DATE:
G.C.		10/01/2020
LOGGED BY:		DATE:
D.McC.		07/01/2020
SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST917

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST917

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Photographic Record

Number:	**ST917**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

Photographic Record

Number:	**ST917**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

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Trial Pit No
ST918
Sheet 1 of 1

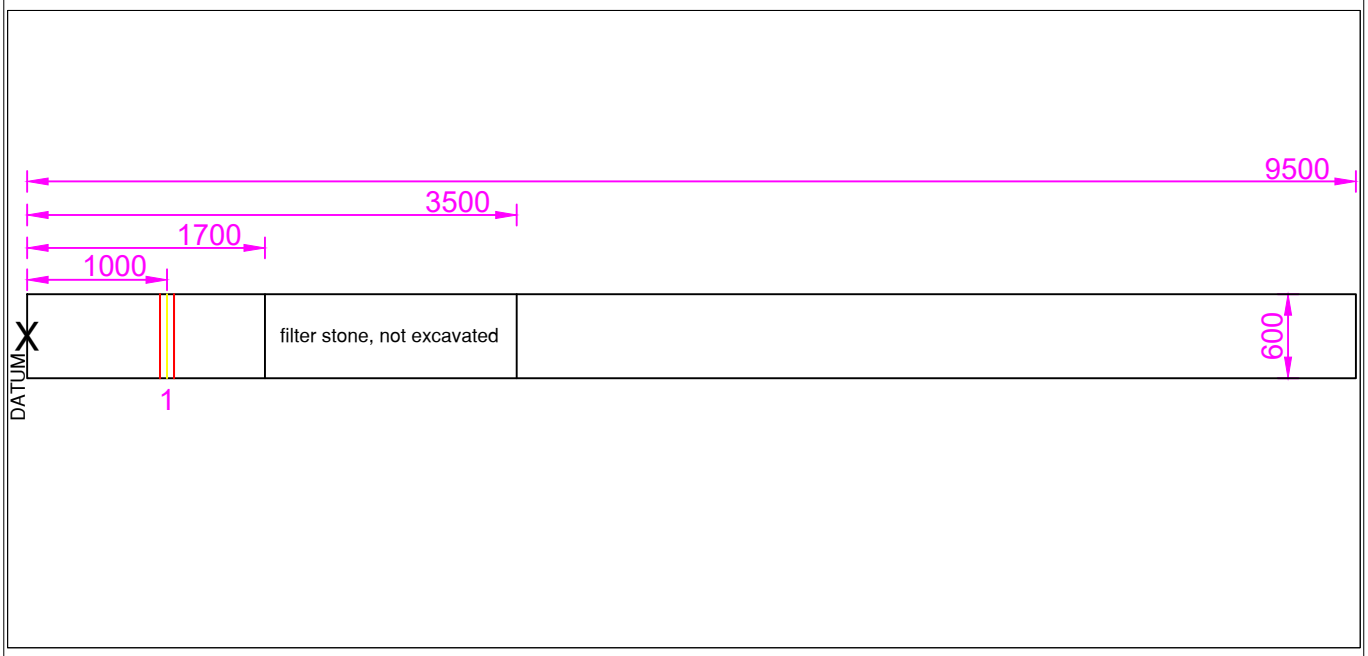
Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575731E - 572864N **Level:** 3.60m OD	**Date** 19/12/2019
Location: Cork		**Dimensions (m):** 9.50 / 0.60	**Scale** 1:25
Client: Transport Infrastructure Ireland (TII)		**Depth:** 0.60m BGL	**Logged** DMC

Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
							(TOPSOIL)
				0.45	3.14		(MADE GROUND) Clause 804 or similar.
				0.60	3.00		End of Pit at 0.600m

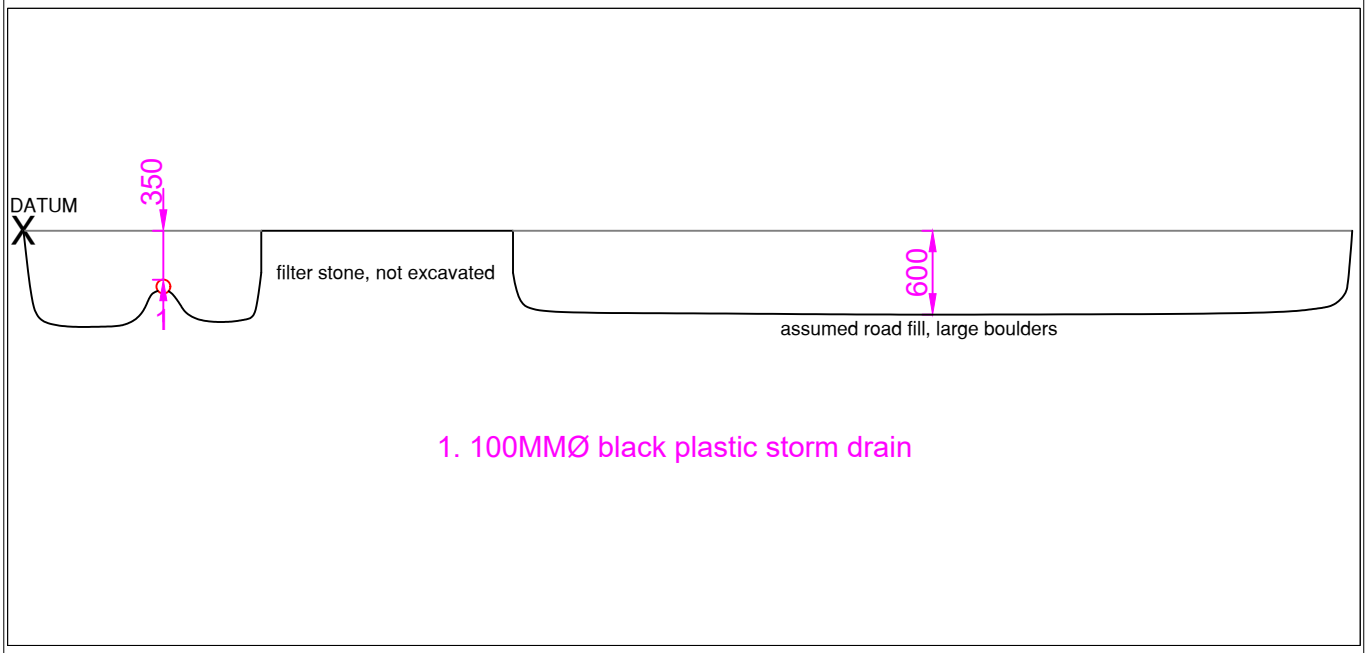
Stability: Good.
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

Remarks: Slit trench terminated at 0.60m bgl. Refer to drawing P19248 ST918 for cross section detail. Drainage stone between the road edge and the drainage pipe.

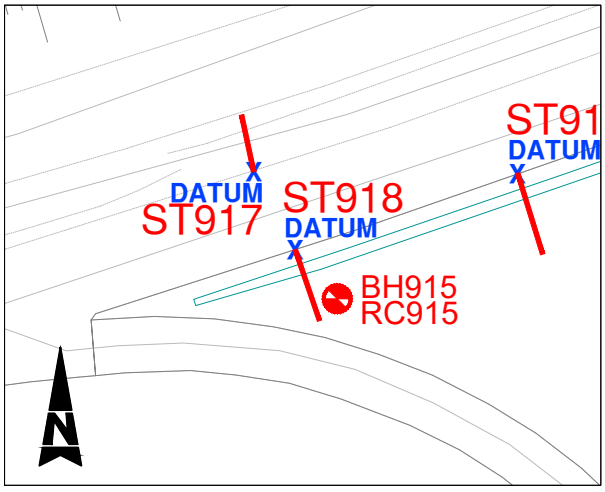


SLIT TRENCH PLAN, 1:50 ON A4



1. 100MMØ black plastic storm drain

SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575730.8
NORTHING: 572863.7
LEVEL: 3.595mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 9.50m
WIDTH: 0.60m
DEPTH: 0.60m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:	DATE:
G.C.	07/01/2020
LOGGED BY:	DATE:
D.McC.	19/12/2019

SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST918

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST918

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Photographic Record

Number:	**ST918**	**Project** Dunkettle Advance ITS Works **Project No** P19248 **Engineer** Atkins	

Photographic Record

Number:	**ST918**	**Project** Dunkettle Advance ITS Works **Project No** P19248 **Engineer** Atkins	

Photographic Record

Number:	**ST918**	**Project**	Dunkettle Advance ITS Works	
		Project No	P19248	
		Engineer	Atkins	

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Trial Pit No
ST918A
Sheet 1 of 1

Project Name: Dunkettle Advance ITS Works	**Project No.** P19248	**Co-ords:** 575760E - 572874N **Level:** 3.50m OD	**Date** 23/01/2020
Location: Cork		**Dimensions (m):** 8.70 × 0.70 **Depth:** 1.40m BGL	**Scale** 1:25 **Logged** DMC
Client: Transport Infrastructure Ireland (TII)			

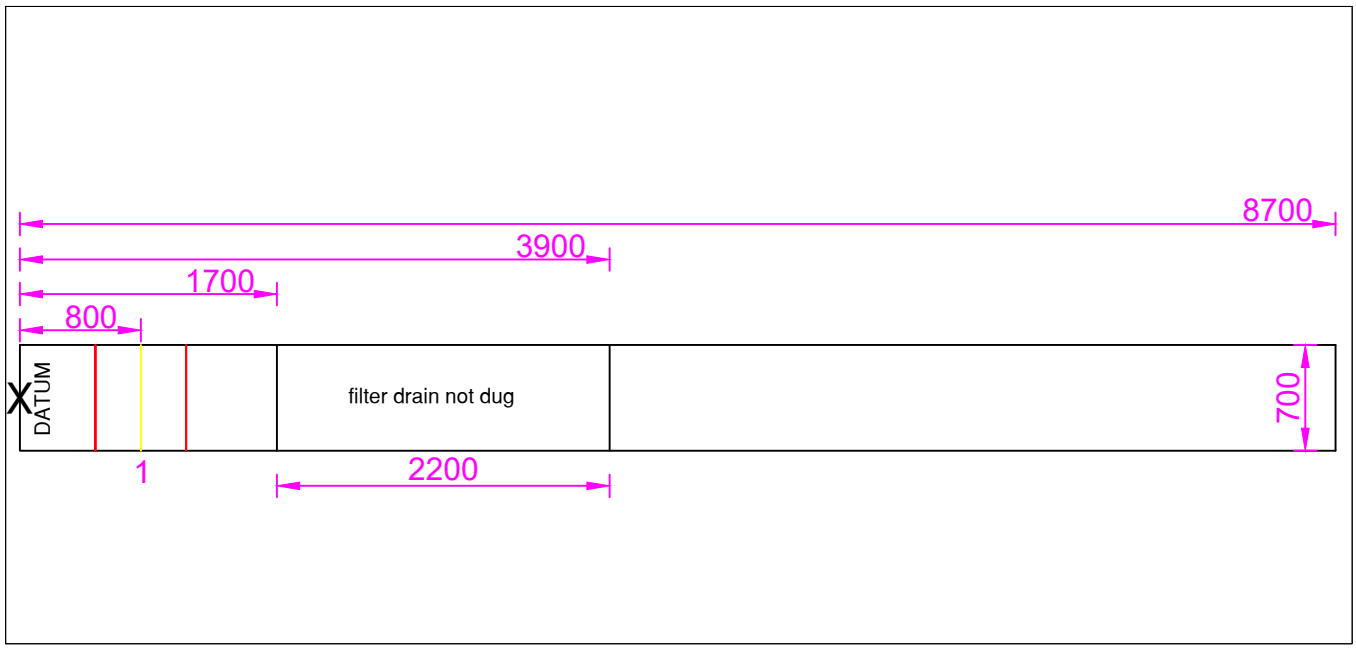
Water Strike & Backfill	Samples & In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m OD)	Legend	Stratum Description
				0.10	3.40		(TOPSOIL)
	0.20 - 0.60 0.20 - 0.60	B D					(MADE GROUND) Firm, brown, slightly sandy gravelly SILT.
	0.50	ENV					
	0.60 - 1.20	B		0.60	2.90		(MADE GROUND) Compacted crushed stone. (1-2inch with fines). Very difficult to excavate.
				1.40	2.10		End of Pit at 1.400m

1
2
3
4
5

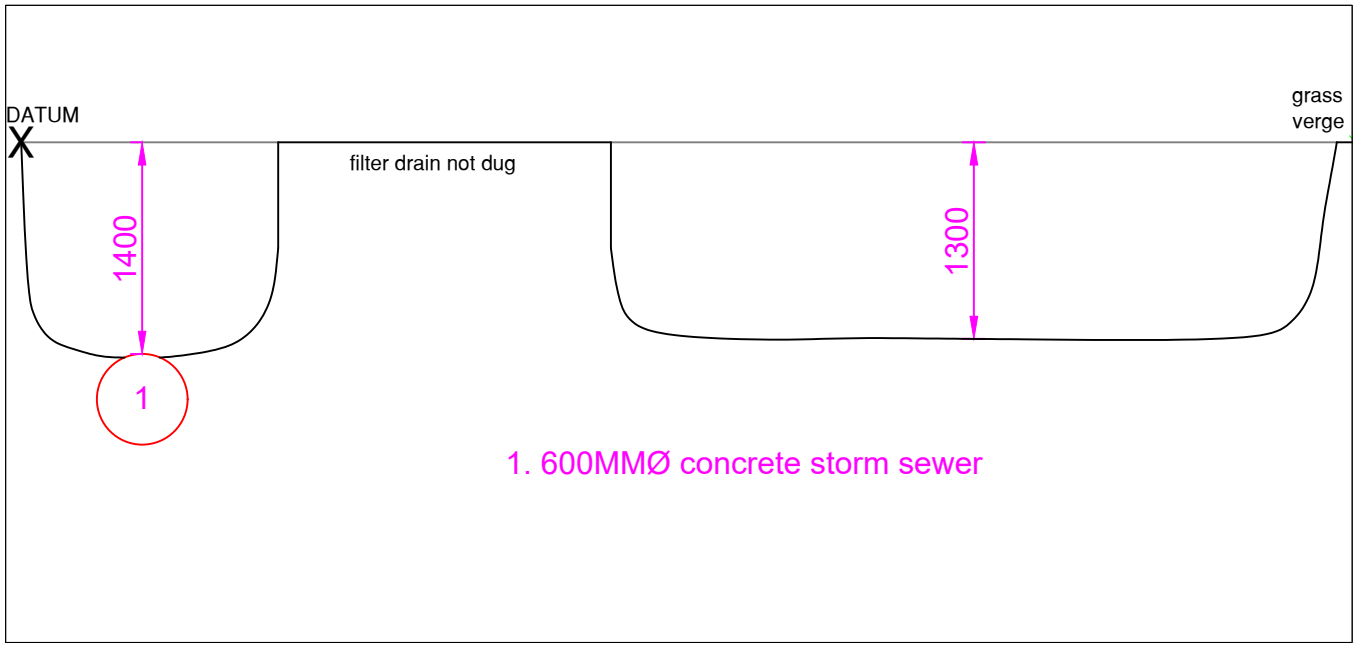
Stability: Moderate.
Plant: 3t tracked excavator
Backfill: Arisings.

Groundwater: None encountered.

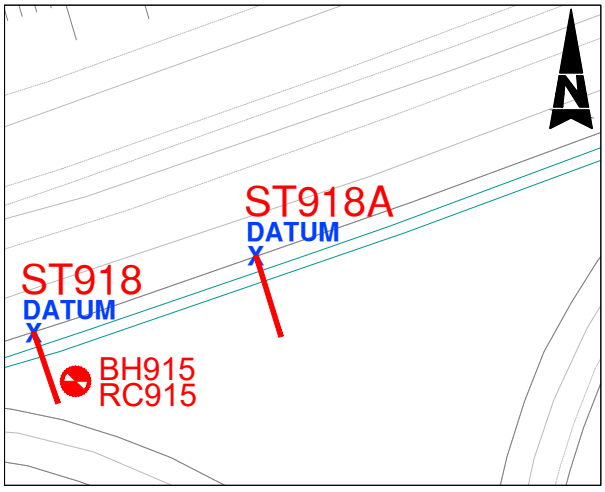
Remarks: Slit trench terminated at 1.40m bgl. Refer to drawing P19248 ST918A for cross section detail. Road edge to filter drain is drainage stone. The remainder of the trench is in grass verge.



SLIT TRENCH PLAN, 1:50 ON A4



SLIT TRENCH SECTION, 1:50 ON A4



SLIT TRENCH LOCATION PLAN, 1:1000 ON A4

DATUM COORDINATES:
EASTING: 575760.2
NORTHING: 572873.8
LEVEL: 3.503mAOD

KEY:
DATUM: X

SLIT TRENCH DIMENSIONS:
LENGTH: 9.50m
WIDTH: 0.60m
DEPTH: 0.60m

STRATA SHOWN ON DETAILED LOG

DRAWN BY:	DATE:
G.C.	27/01/2020
LOGGED BY:	DATE:
D.McC.	19/12/2019

SCALE:	APPROVED:	REVISION:
AS ST9ATED	GH	D01

SLIT TRENCH NUMBER:
ST918A

JOB NAME:
N40 / Dunkettle Interchange Upgrade Scheme

JOB NUMBER:
P19248

DRAWING NUMBER:
P19248-ST918A

pgl priority geotechnical

KEY TO SYMBOLS - LABORATORY TEST RESULT

U	Undisturbed Sample	
P	Piston Sample	
TWS	Thin Wall Sample	
B	Bulk Sample - Disturbed	
D	Jar Sample - Disturbed	
W	Water Sample	
pH	Acidity/Alkalinity Index	
SO_3	% - Total Sulphate Content (acid soluble)	
SO_3	g/ltr - Water Soluble Sulphate (Water or 2:1 Aqueous Soil Extract)	
+	Calcareous Reaction	
Cl	Chloride Content	
PI	Plasticity Index	
<425	% of material in sample passing 425 micron sieve	
LL	Liquid Limit	
PL	Plastic Limit	
MC	Water Content	
NP	Non Plastic	
Yb	Bulk Density	
Yd	Dry Density	
Ps	Particle Density	
U/D	Undrained/Drained Triaxial	
U/C	Unconsolidated/Consolidated Triaxial	
T/M	Single Stage/Multistage Triaxial	
100/38	Sample Diameter (mm)	
REM	Remoulded Triaxial Test Specimen	
TST	Triaxial Suction Test	
V	Vane Test	
DSB	Drained Shear Box	
RSB	Residual Shear Box	
RS	Ring Shear	
σ_3	Cell Pressure	
σ_1-σ_3	Deviator Stress	
c	Cohesion	
c_	Effective Cohesion Intercept	
ϕ	Angle of Shearing Resistance - Degrees	
ϕ_	Effective Angle of Shearing Resistance	
εf	Strain at Failure	
*	Failed under 1st Load	
**	Failed under 2nd Load	
#	Untestable	
##	Excessive Strain	
p_o	Effective Overburden Pressure	
m_v	Coefficient of Volume Decrease	
c_v	Coefficient of Consolidation	
Opt	Optimum	
Nat	Natural	
Std	Standard Compaction - 2.5kg Rammer	(¶ CBR)
Hvy	Heavy Compaction - 4.5kg Rammer	(§ CBR)
Vib	Vibratory Compaction	
CBR	California Bearing Ratio	
Sat m.c.	Saturation Moisture Content	
MCV	Moisture Condition Value	

pgl priority geotechnical	**Natural Moisture Content/Atterberg Limits Summary** **BS 1377 : Part 2 : 1990 : Clause 3**	**Job Ref**
Location	**Dunkettle Advance ITS Works**	**P19248**

Hole ID	Sample Ref	Depth (m)	Sample Type	Sample Description	MC	LL	PL	PI	% Pass 425
BH902	1	0.8	B	Gravelly CLAY	11				
BH902	2	1.5	B	Clayey sandy GRAVEL with low cobble content	9				
BH902	3	2.5	B	Clayey sandy GRAVEL	13	24	17	7	48.7
BH902	4	3.5	B	Clayey sandy GRAVEL with medium cobble content	16	28	18	10	52.3
BH905	1	0.5	B	Slightly sandy gravelly SILT	15	44	27	17	50.3
BH906	1	0.5	B	Slightly sandy gravelly SILT	13	31	20	11	52.6
BH908	1	0.5	B	Slightly sandy gravelly SILT	25	46	28	18	57.5
BH911	1	0.5	B	Slightly sandy gravelly SILT	19	46	30	16	64.3
BH911	2	1.5	B	Slightly sandy gravelly SILT	16	39	26	13	52.9
BH915	1	0.2	B	Slightly sandy slightly gravelly SILT	16	38	26	12	41.8
BH916	3	2.5	B	Slightly sandy gravelly CLAY	17	29	19	10	63.8
BH916	4	3.5	B	Slightly sandy gravelly CLAY	17	30	19	11	56.6
BH916	5	4.5	B	Slightly sandy gravelly CLAY	17	33	21	12	-5.9
BH917	1	0.5	B	Slightly sandy gravelly CLAY	15	33	22	11	47.5
BH917	2	1.5	B	Slightly sandy gravelly CLAY	13	32	17	15	45.6
BH918	1	0.5	B	Slightly sandy gravelly CLAY	14	33	23	10	37.4
BH918	2	1.5	B	Slightly sandy gravelly CLAY	11	27	18	9	37.6
BH918	3	2.6	B	Slightly sandy GRAVEL	8				
BH918	4	3.5	B	Slightly sandy GRAVEL	10				
BH918	5	4.5	B	Sandy GRAVEL	8				

pgl priority geotechnical	**Natural Moisture Content/Atterberg Limits Summary** **BS 1377 : Part 2 : 1990 : Clause 3**	**Job Ref**
Location	**Dunkettle Advance ITS Works**	**P19248**

Hole ID	Sample Ref	Depth (m)	Sample Type	Sample Description	MC	LL	PL	PI	% Pass 425
BH925	3	2.5	B	Clayey very sandy GRAVEL	13	23	15	8	56.9
BH926	1	0.5	B	Slightly sandy gravelly SILT	11	28	17	11	40.8
BH926	2	1.5	B	Very silty very sandy GRAVEL with medium cobble content	13				
BH927	1	0.5	B	Slightly sandy slightly gravelly CLAY	19	36	22	14	51.6
BH927	2	1.6	B	Slightly sandy slightly gravelly CLAY	22				
BH927	3	2.5	B	Slightly sandy slightly gravelly CLAY	22				
BH927	4	3	U	Slightly sandy slightly gravelly CLAY	22				
BH927	5	3.45	D	Slightly sandy slightly gravelly CLAY	4				
BH927	6	4	B	COBBLES	7				
FIP902	1	0.5	B	Slightly sandy gravelly CLAY	15	31	18	13	44
RC901	2	3	B	Silty sandy GRAVEL	13				
RC902	3	0.5	B	Gravelly CLAY	10				
RC902	1	4.8	B	Slightly sandy silty GRAVEL	14				
RC902	2	6	B	Silty very sandy GRAVEL	17				
RC902	4	9	B	Silty sandy GRAVEL	20				
RC902	5	10.5	B	Silty sandy GRAVEL	18				
RC911	1	3	WS	SILT	32	47	31	16	99.7
RC911	2	4.5	WS	SILT	29	44	27	17	100
RC911	3	6	WS	SILT	33	49	33	16	100
RC911	4	7.5	WS	SILT	33	46	30	16	100

pgl priority geotechnical	**Natural Moisture Content/Atterberg Limits Summary** **BS 1377 : Part 2 : 1990 : Clause 3**	**Job Ref**
Location	**Dunkettle Advance ITS Works**	**P19248**

Hole ID	Sample Ref	Depth (m)	Sample Type	Sample Description	MC	LL	PL	PI	% Pass 425
RC911	5	10.5	B	Clayey sandy GRAVEL	17				
RC911	6	13.5	B	Clayey sandy GRAVEL	15				
RC915	1	3	WS	Slightly sandy slightly gravelly CLAY	20	35	23	12	71.1
RC915	2	4.5	WS	SILT	80	102	61	41	80.3
RC915	3	6	WS	Slightly sandy slightly gravelly SILT	110	177	116	61	92.4
RC915	4	7.5	WS	Slightly sandy slightly gravelly SILT	68				
RC917	1	7.5	WS	Slightly sandy slightly gravelly SILT	42	52	31	21	97.8
RC917	2	9	WS	Slightly sandy gravelly SILT	34	42	29	13	91.2
RC917	3	12	WS	Slightly sandy slightly gravelly SILT		30	21	9	77.5
RC917	4	12	D	Slightly sandy slightly gravelly SILT	18				
RC917	5	13.5	D	Slightly sandy slightly gravelly CLAY	13	22	16	6	71.1
RC918	1	7.5	WS	Clayey very sandy GRAVEL	16	28	19	9	38.8
RC919	1	4.2	B	Slightly sandy slightly gravelly CLAY	13	27	15	12	51.8
RC919	2	4.5	B	Slightly sandy slightly gravelly CLAY	15				
RC919	3	6	B	Clayey very sandy GRAVEL	13				
RC919	4	7.5	B	Clayey very sandy GRAVEL	14				
RC919	5	13.5	B	SAND	25				
RC919	6	18	B	SAND	24				
RC920	1	6	B	Gravelly CLAY	15	24	13	11	32.4
RC920	2	7.5	B	Gravelly SILT	9	23	NP	NP	28.4

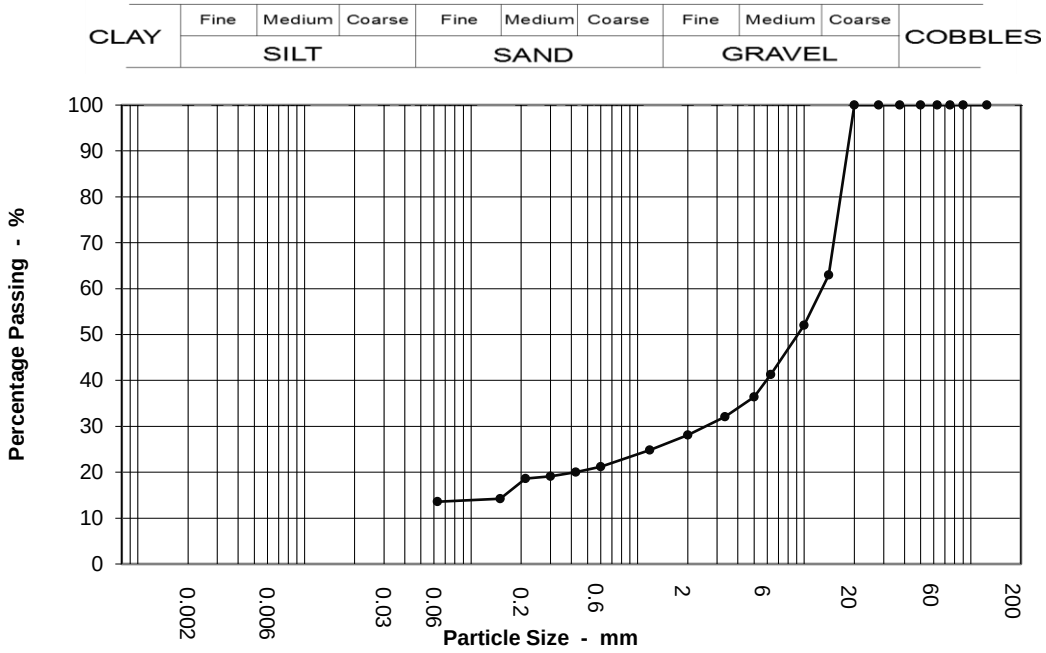
pgl priority geotechnical	**Natural Moisture Content/Atterberg Limits Summary** **BS 1377 : Part 2 : 1990 : Clause 3**	**Job Ref**
Location	**Dunkettle Advance ITS Works**	**P19248**

Hole ID	Sample Ref	Depth (m)	Sample Type	Sample Description	MC	LL	PL	PI	% Pass 425
ST908-E	1	0.5	B	Very clayey very sandy GRAVEL with low cobble content	17	25	18	7	47.9
ST913	1	0.5	B	Slightly sandy gravelly SILT	24	42	27	15	61.8
ST914A	1	0.5	B	Slightly sandy gravelly CLAY	17	35	23	12	53.8
ST914A	2	0.5	D	Slightly sandy gravelly CLAY	14				
ST915	1	0.6	B	Clayey very sandy GRAVEL	14	34	22	12	43.4
ST918A	1	0.2	B	Sandy gravelly SILT	9				
ST918A	2	0.2	D	Sandy gravelly SILT	8				
ST918A	3	0.6	B	GRAVEL	5	21	15	6	21.3
ST920		0.5	B	GRAVEL	17				
ST921	1	0.5	B	Gravelly CLAY	16	37	23	14	54.7
ST922	2	0.5	D	Gravelly CLAY	13	32	21	11	47.1
ST923	1	0.5	B	Gravelly CLAY	39	31	21	10	61
ST923	2	0.5	D	Gravelly CLAY	39	25	18	7	65.8
ST925	1	0.5	B	Gravelly CLAY	13	27	16	11	72.6
ST925	2	0.5	D	Gravelly CLAY	13	27	16	11	72.6
ST926	1	0.5	B	Slightly sandy gravelly CLAY	11	30	19	11	63.8
ST926	2	0.5	D	Slightly sandy gravelly CLAY	11	30	19	11	63.8
ST930	2	0.5	D	Very clayey very sandy GRAVEL	17	30	20	10	53
ST931	2	0.5	D	Slightly sandy gravelly CLAY	14	29	18	11	63.9
ST932	1	0.8	B	Slightly gravelly sandy CLAY	15	25	18	7	65.8

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P19248**
		Borehole / Pit No	RC911
Location	**Dunkettle Advance ITS Works**	Sample No	5
		Depth	10.50 m
Soil Description	Clayey sandy GRAVEL	Sample type	B



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100		
90	100		
75	100		
63	100		
50	100		
37.5	100		
28	100		
20	100		
14	63		
10	52		
6.3	41		
5	36		
3.35	32		
2	28		
1.18	25		
0.6	21		
0.425	20		
0.3	19		
0.212	19		
0.15	14		
0.063	14		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.3
Sedimentation	N/A

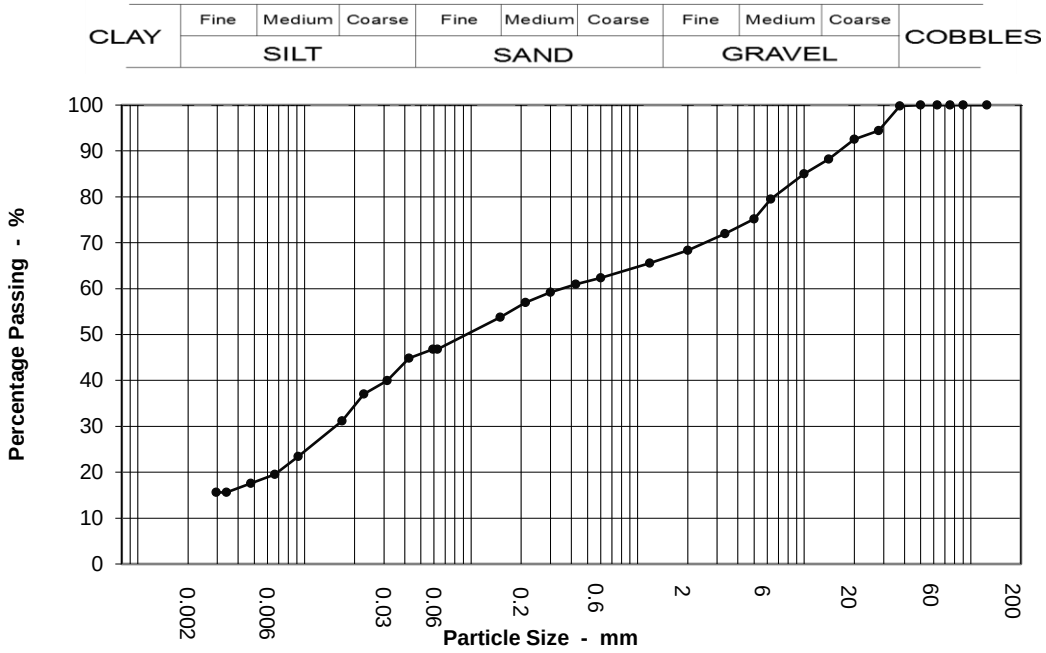
Sample Proportions	
Cobbles	0.0
Gravel	72.0
Sand	15.0
Silt & Clay	14.0

Grading Analysis	
D100	20.00
D60	12.80
D10	
Uniformity Coefficient	

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P19248**
		Borehole / Pit No	RC915
Location	**Dunkettle Advance ITS Works**	Sample No	1
		Depth	3.00 m
Soil Description	Slightly sandy slightly gravelly CLAY	Sample type	WS



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.059	47
90	100	0.042	45
75	100	0.031	40
63	100	0.023	37
50	100	0.017	31
37.5	100	0.009	23
28	94	0.007	20
20	93	0.005	18
14	88	0.003	16
10	85	0.003	16
6.3	80	0.001	10
5	75		
3.35	72		
2	68		
1.18	66		
0.6	62		
0.425	61		
0.3	59		
0.212	57		
0.15	54		
0.063	47		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.5
Sedimentation	Clause 9.5

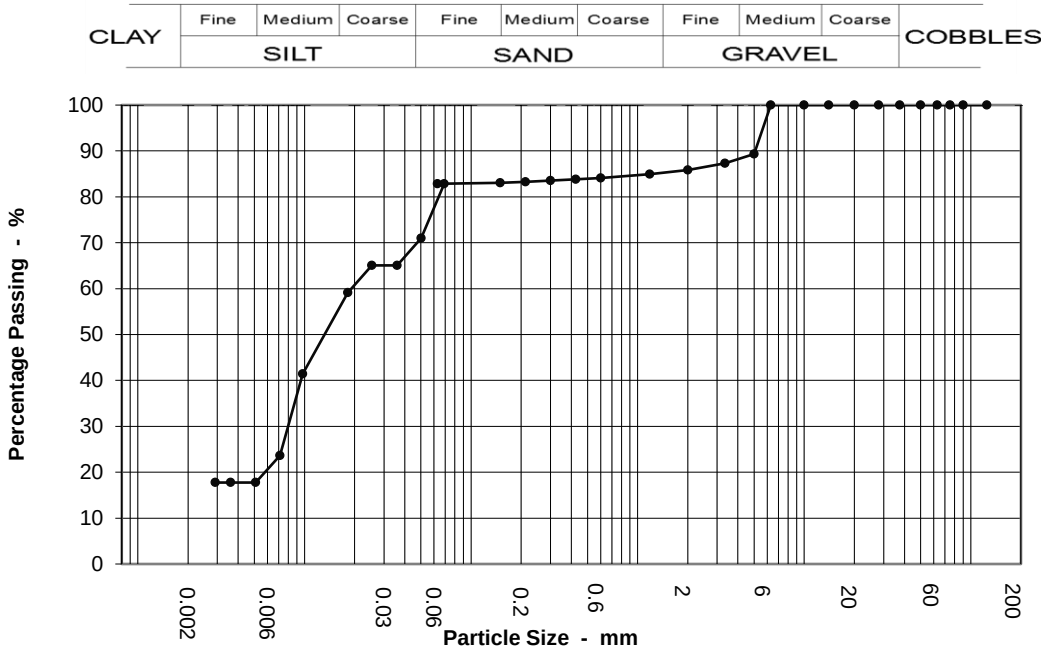
Sample Proportions	
Cobbles	0.0
Gravel	32.0
Sand	22.0
Silt	33.0
Clay	14.0

Grading Analysis	
D100	50.00
D60	0.35
D10	0.00
Uniformity Coefficient	390.00

PARTICLE SIZE DISTRIBUTION

BS 1377 : Part 2 : 1990 : Clause 9

		Job Ref	**P19248**
		Borehole / Pit No	RC915
Location	**Dunkettle Advance ITS Works**	Sample No	3
		Depth	6.00 m
Soil Description	Slightly sandy slightly gravelly SILT	Sample type	WS



Sieving		Sedimentation	
Particle Size mm	% Passing	Particle Size mm	% Passing
125	100	0.069	83
90	100	0.050	71
75	100	0.036	65
63	100	0.025	65
50	100	0.018	59
37.5	100	0.010	41
28	100	0.007	24
20	100	0.005	18
14	100	0.004	18
10	100	0.003	18
6.3	100	0.002	18
5	89		
3.35	87		
2	86		
1.18	85		
0.6	84		
0.425	84		
0.3	84		
0.212	83		
0.15	83		
0.063	83		

Test Method	
BS 1377 : Part 2 : 1990	
Sieving	Clause 9.5
Sedimentation	Clause 9.5

Sample Proportions	
Cobbles	0.0
Gravel	14.0
Sand	3.0
Silt	65.0
Clay	18.0

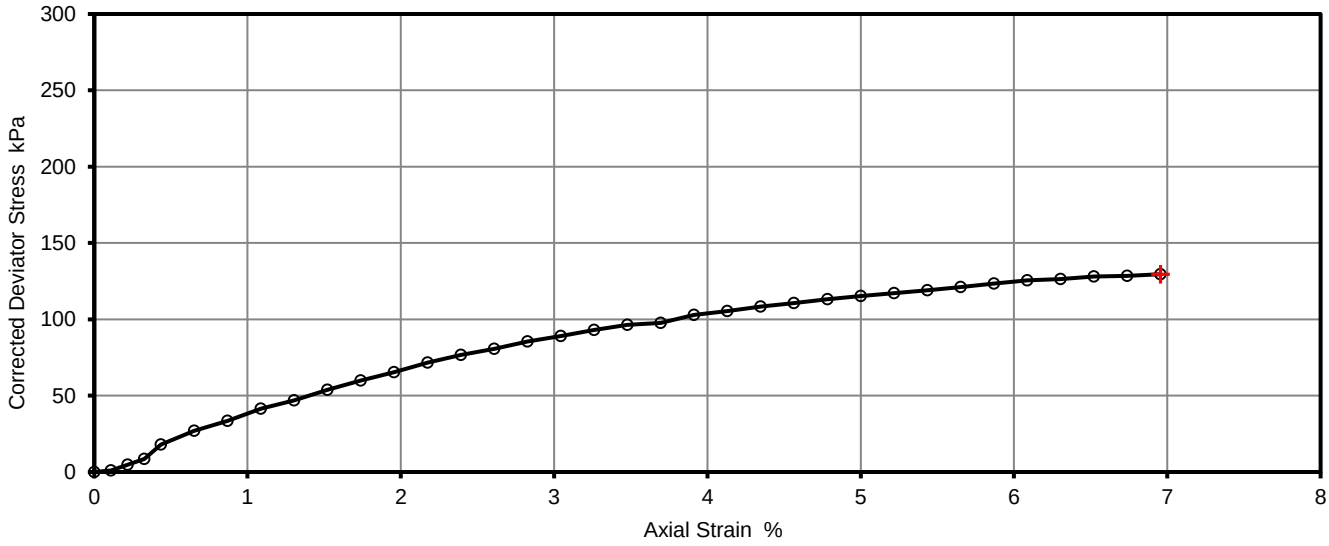
Grading Analysis	
D100	6.30
D60	0.02
D10	
Uniformity Coefficient	

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

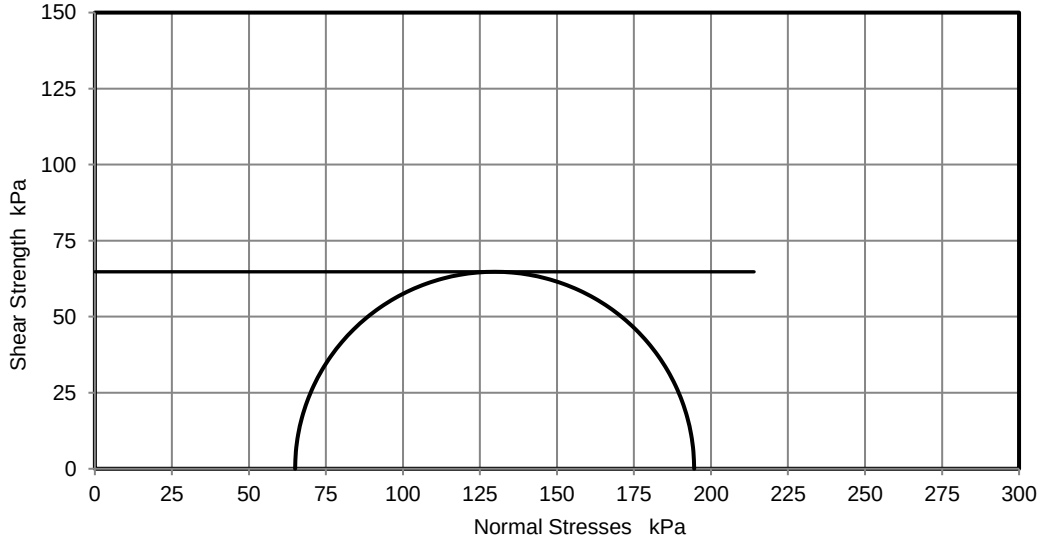
Job Ref	P19248		
Borehole/Pit No.	RC911		
Site Name	Dunkettle Advance ITS Works	Sample No.	1
Soil Description	SILT	Depth	3.00
		Sample Type	WS
		KeyLAB ID	PGL12020052510
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number		1	
Length		230.0	mm
Diameter		100.0	mm
Bulk Density		1.71	Mg/m3
Moisture Content		31.6	%
Dry Density		1.30	Mg/m3
Rate of Strain			%/min
Cell Pressure		65	kPa
At failure	Axial Strain	7.0	%
	Deviator Stress, (σ1 - σ3)f	130	kPa
	Undrained Shear Strength, cu	65	kPa ½(σ1 - σ3)f
	Mode of Failure	Plastic	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks

Approved: Cilla

Printed: 18/06/2020 17:03

Lab Sheet Reference :

Fig. No. 1

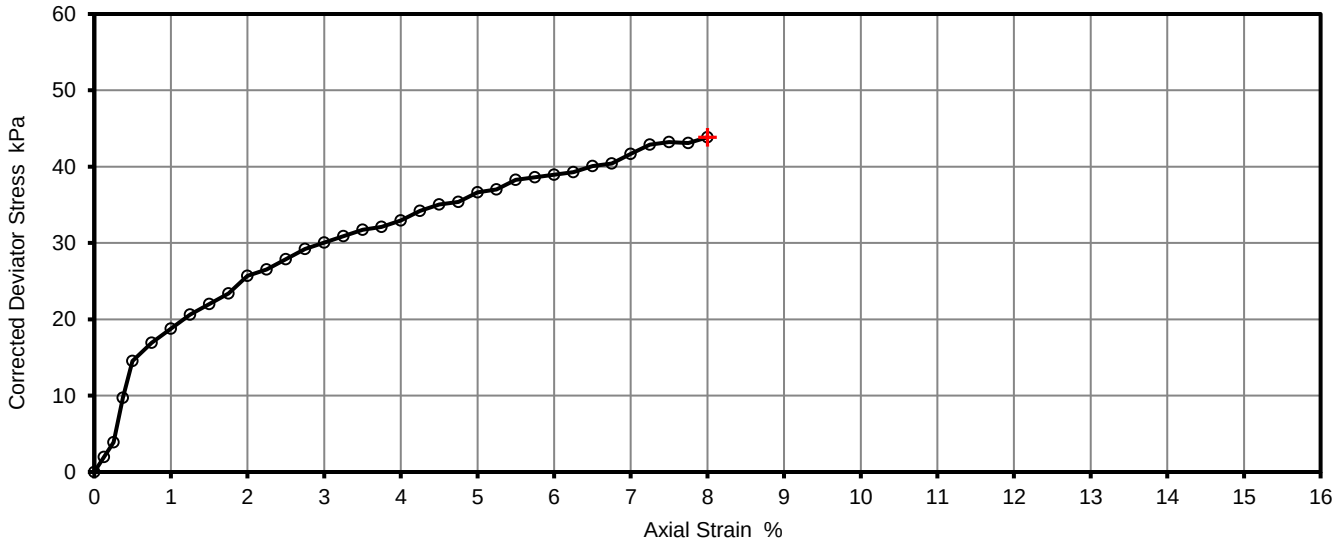
Sheet 3

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

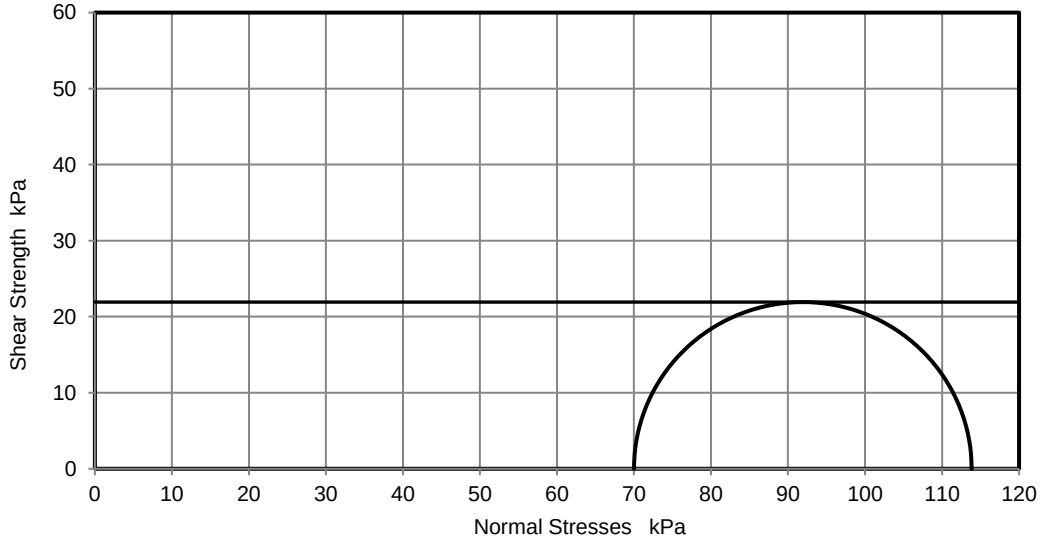
Job Ref	P19248		
Borehole/Pit No.	RC915		
Site Name	Dunkettle Advance ITS Works	Sample No.	1
Soil Description	Slightly sandy slightly gravelly CLAY	Depth	3.00
		Sample Type	WS
		KeyLAB ID	PGL12020012862
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number		1	
Length		200.0	mm
Diameter		100.0	mm
Bulk Density		2.22	Mg/m3
Moisture Content		21.4	%
Dry Density		1.83	Mg/m3
Rate of Strain			%/min
Cell Pressure		70	kPa
At failure	Axial Strain	8.0	%
	Deviator Stress, (σ1 - σ3)f	44	kPa
	Undrained Shear Strength, cu	22	kPa ½(σ1 - σ3)f
	Mode of Failure	Plastic	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

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Remarks

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Lab Sheet Reference :

Fig. No. 1

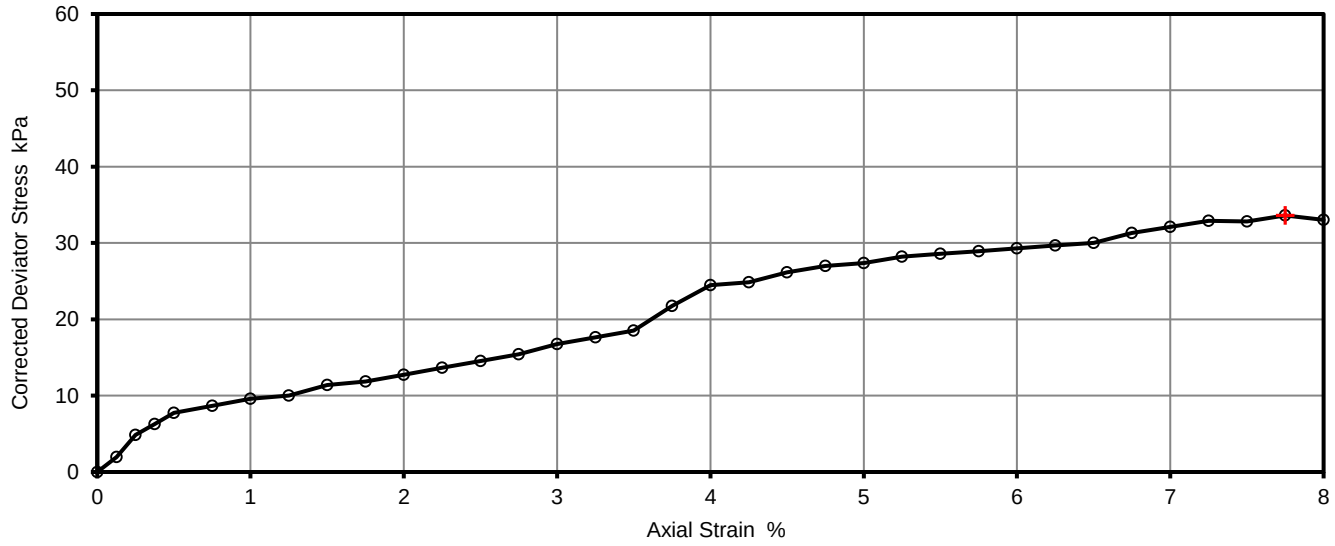
Sheet 4

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

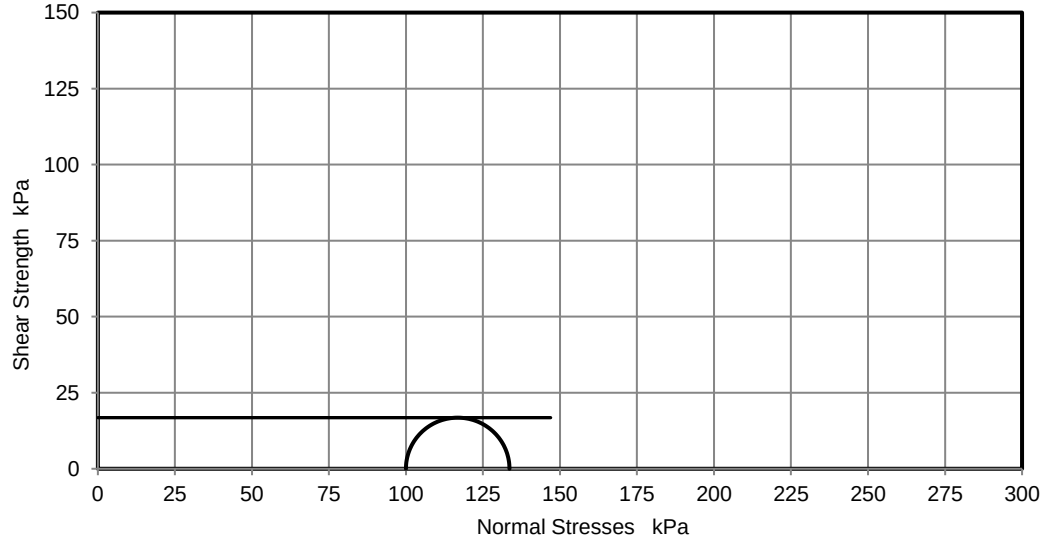
Job Ref	P19248		
Borehole/Pit No.	RC915		
Site Name	Dunkettle Advance ITS Works	Sample No.	2
Soil Description	SILT	Depth	4.50
		Sample Type	WS
		KeyLAB ID	PGL12020012863
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number		1	
Length		200.0	mm
Diameter		100.0	mm
Bulk Density		1.34	Mg/m3
Moisture Content		156.5	%
Dry Density		0.52	Mg/m3
Rate of Strain			%/min
Cell Pressure		100	kPa
At failure	Axial Strain	7.8	%
	Deviator Stress, (σ1 - σ3)f	34	kPa
	Undrained Shear Strength, cu	17	kPa ½(σ1 - σ3)f
	Mode of Failure	Plastic	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
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Remarks

Approved: Cilla

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Lab Sheet Reference :

Fig. No. 1

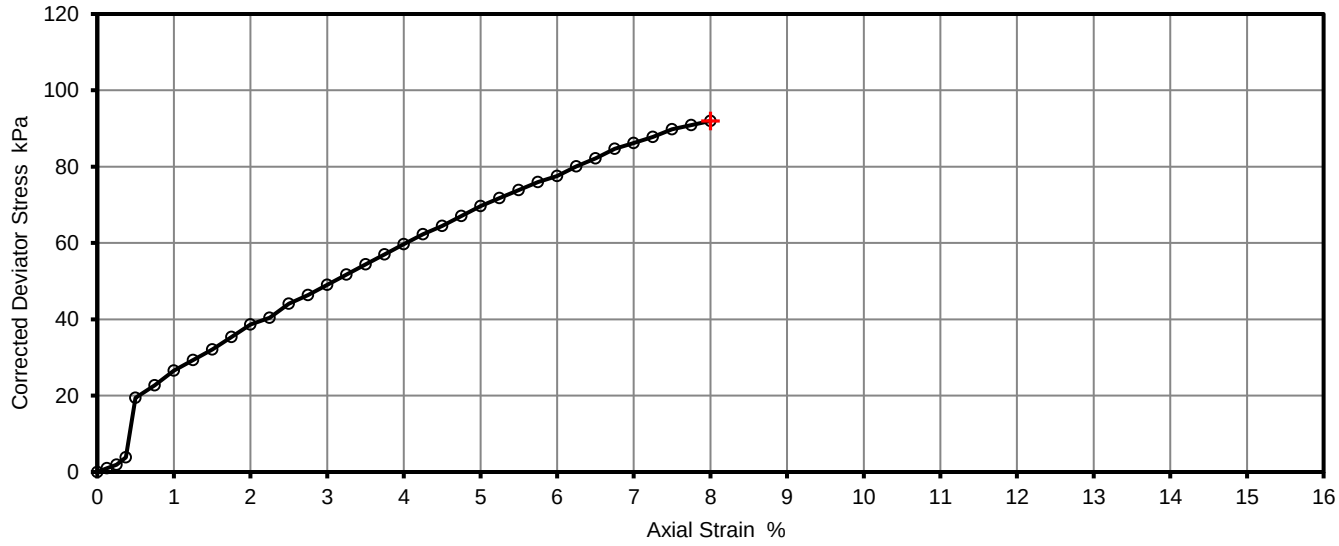
Sheet 5

Unconsolidated Undrained Triaxial Compression Test without measurement of pore pressure - single specimen

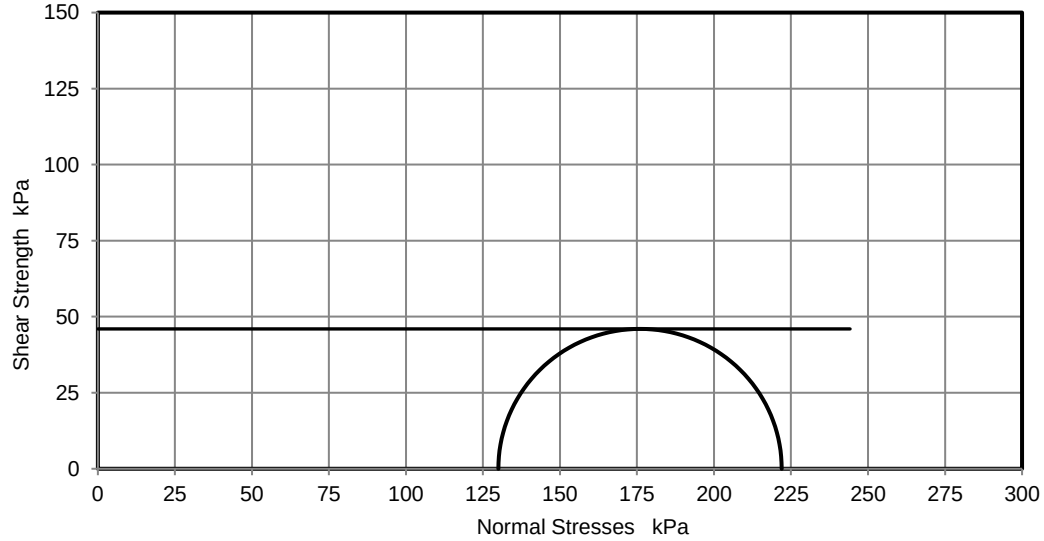
Job Ref	P19248		
Borehole/Pit No.	RC915		
Site Name	Dunkettle Advance ITS Works	Sample No.	3
Soil Description	Slightly sandy slightly gravelly SILT	Depth	6.00
		Sample Type	WS
		KeyLAB ID	PGL12020012864
Test Method	BS1377 : Part 7 : 1990, clause 8, single specimen		

Test Number		1	
Length		200.0	mm
Diameter		100.0	mm
Bulk Density		1.34	Mg/m3
Moisture Content		105.8	%
Dry Density		0.65	Mg/m3
Rate of Strain			%/min
Cell Pressure		130	kPa
At failure	Axial Strain	8.0	%
	Deviator Stress, (σ1 - σ3)f	92	kPa
	Undrained Shear Strength, cu	46	kPa ½(σ1 - σ3)f
	Mode of Failure	Plastic	

Deviator Stress v Axial Strain



Mohr Circles



Deviator stress corrected for area change and membrane effects

Mohr circles and their interpretation is not covered by BS1377.
This is provided for information only.

Remarks

Approved: Cilla

Printed: 18/06/2020 17:03

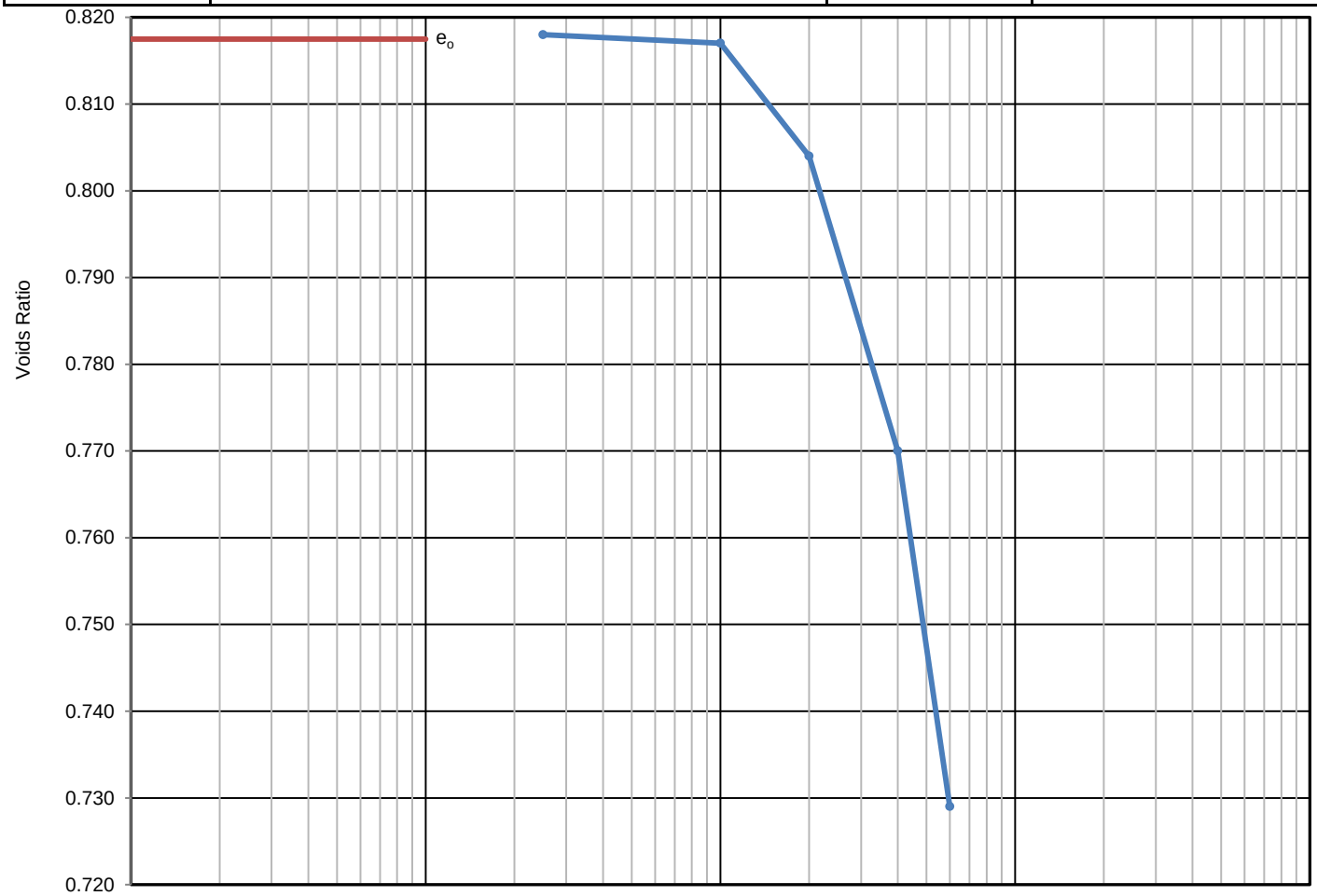
Lab Sheet Reference :

Fig. No. 1

Sheet 6

ONE DIMENSIONAL CONSOLIDATION TEST
BS1377:Part 5:1990, clause 3

Job Ref	P19248		
Borehole/Pit No.	RC911		
Site Name	Dunkettle Advance ITS Works	Sample No.	2
		Depth	4.5
		Sample Type	WS
Sample Description	SILT	KeyLAB ID	PGL12020052511
Test Method	BS1377:Part 5:1990, clause 3		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t90, root) m2/yr
0.0	0.817	-	-
25	0.818	-0.01	
100	0.817	0.004	760
200	0.804	0.074	4.6
400	0.770	0.094	180
600	0.729	0.12	1400

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	20.00	19.03	mm
Moisture Content	32.5	27.4	%
Bulk density	1.93	1.95	Mg/m3
Dry density	1.46	1.53	Mg/m3
Voids Ratio	0.817	0.729	
Saturation	105	99	%
Average temperature for test	18.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

Final values should be used with caution
Cv plotted at mid point of load increments
Cv corrected to 20oC

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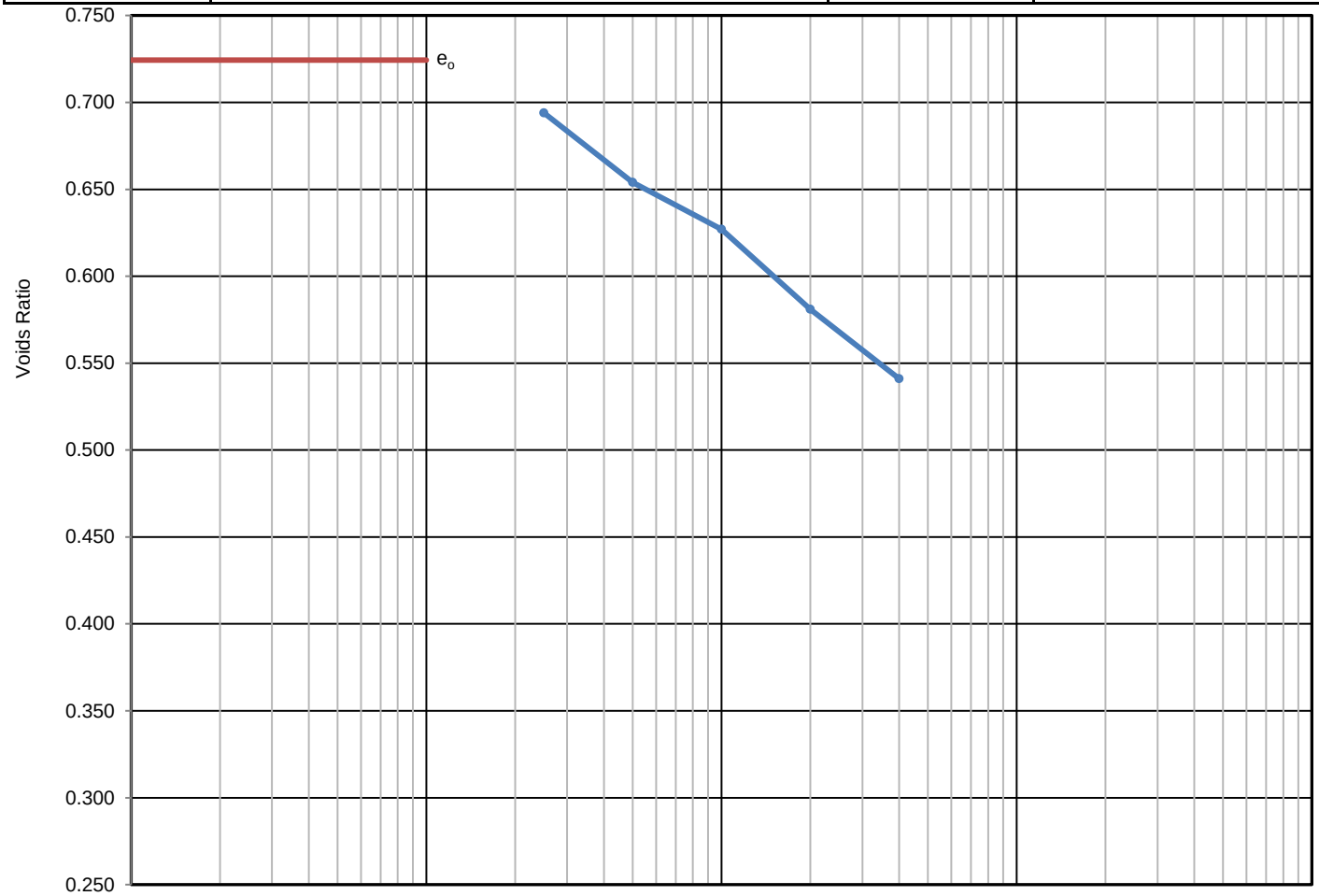
Fig. No 1

ONE DIMENSIONAL CONSOLIDATION TEST
BS1377:Part 5:1990, clause 3

Job Ref	P19248		
Borehole/Pit No.	RC911		
Site Name	Dunkettle Advance ITS Works	Sample No.	4
		Depth	7.5
		Sample Type	WS
Sample Description	SILT	KeyLAB ID	PGL12020052513
Test Method	BS1377:Part 5:1990, clause 3		



Applied Pressure kPa	Voids ratio	Mv m2/MN	Cv (t90, root) m2/yr
0.0	0.724	-	-
25	0.694	0.7	26
50	0.654	0.94	1800
100	0.627	0.33	4.5
200	0.581	0.29	9200
400	0.541	0.13	840

Preparation

Particle density assumed 2.65 Mg/m3

Specimen details	Initial	Final	
Diameter	75.00	-	mm
Height	20.00	17.88	mm
Moisture Content	29.0	26.3	%
Bulk density	1.98	2.17	Mg/m3
Dry density	1.54	1.72	Mg/m3
Voids Ratio	0.724	0.541	
Saturation	106	129	%
Average temperature for test	18.0		oC
Swelling Pressure			kPa
Settlement on saturation			%

Remarks

Final values should be used with caution
Cv plotted at mid point of load increments
Cv corrected to 20oC

Printed : 19/06/2020 12:13

Fig. No 1

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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	20-13420-1
Initial Date of Issue:	03-Jun-2020
Client	Priority Geotechnical Ltd
Client Address:	Unit 12 Owenacurra Business Park Midleton County Cork Ireland
Contact(s):	Colette Kelly
Project	P19248 N40

Quotation No.:		**Date Received:**	28-May-2020
Order No.:	12463	**Date Instructed:**	28-May-2020
No. of Samples:	4		
Turnaround (Wkdays):	7	**Results Due:**	05-Jun-2020
Date Approved:	03-Jun-2020		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: P19248 N40

Client: Priority Geotechnical Ltd		**Chemtest Job No.:**			20-13420	20-13420	20-13420	20-13420
Quotation No.:		**Chemtest Sample ID.:**			1009719	1009720	1009721	1009722
			Sample Location:		RC911	RC911	RC925	RC926
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		3.0	7.5	6.0	3.0
			Date Sampled:		26-May-2020	26-May-2020	26-May-2020	26-May-2020
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
Moisture	N	2030	%	0.020	16	18	29	11
pH	U	2010		4.0	8.2	8.0	9.2	9.2
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.056	1.0	0.78	0.093

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

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Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Chemtest
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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

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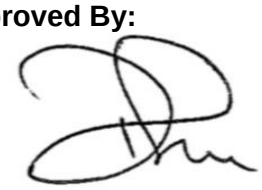
Final Report

Report No.:	20-04608-1
Initial Date of Issue:	19-Feb-2020
Client	Priority Geotechnical Ltd
Client Address:	Unit 12 Owenacurra Business Park Midleton County Cork Ireland
Contact(s):	Colette Kelly
Project	P19248 N40

Quotation No.:		**Date Received:**	12-Feb-2020
Order No.:	12463	**Date Instructed:**	13-Feb-2020
No. of Samples:	3		
Turnaround (Wkdays):	7	**Results Due:**	21-Feb-2020
Date Approved:	18-Feb-2020		

Approved By:



Details: Darrell Hall, Director

Chemtest
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Results - Soil

Project: P19248 N40

Client: Priority Geotechnical Ltd		**Chemtest Job No.:**			20-04608	20-04608	20-04608
Quotation No.:		**Chemtest Sample ID.:**			968952	968953	968954
		Sample Location:			RC915	RC915	RC919
		Sample Type:			SOIL	SOIL	SOIL
		Top Depth (m):			3.00	6.00	4.20
		Date Sampled:			10-Feb-2020	10-Feb-2020	10-Feb-2020
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Moisture	N	2030	%	0.020	16	57	10
pH	U	2010		4.0	8.3	7.2	8.5
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.096	0.69	0.031

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES

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Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

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Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

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Final Report

Report No.:	20-02703-1
Initial Date of Issue:	06-Feb-2020
Client	Priority Geotechnical Ltd
Client Address:	Unit 12 Owenacurra Business Park Midleton County Cork Ireland
Contact(s):	Colette Kelly
Project	P19248 N40
Quotation No.:	Q20-19314
Date Received:	29-Jan-2020
Order No.:	12463
Date Instructed:	29-Jan-2020
No. of Samples:	4
Turnaround (Wkdays):	7
Results Due:	06-Feb-2020
Date Approved:	06-Feb-2020
Approved By:	
Details:	Darrell Hall, Director

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Results - Leachate

Project: P19248 N40

Client: Priority Geotechnical Ltd				**Chemtest Job No.:**		20-02703	20-02703	20-02703	20-02703
Quotation No.: Q20-19314				**Chemtest Sample ID.:**		960305	960306	960307	960308
				Sample Location:		ST914A	ST918A	ST940	ST942
				Sample Type:		SOIL	SOIL	SOIL	SOIL
				Top Depth (m):		0.50	0.50	0.60	0.60
				Date Sampled:		23-Jan-2020	23-Jan-2020	22-Jan-2020	22-Jan-2020
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**				
Total Dissolved Solids	N	1020	10:1	mg/l	1.0	40	35	91	59
Chloride	U	1220	10:1	mg/l	1.0	1.9	< 1.0	1.6	3.4
Fluoride	U	1220	10:1	mg/l	0.050	0.16	0.19	0.13	0.20
Sulphate	U	1220	10:1	mg/l	1.0	< 1.0	< 1.0	48	< 1.0
Arsenic (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0	1.2
Barium (Dissolved)	U	1450	10:1	µg/l	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Cadmium (Dissolved)	U	1450	10:1	µg/l	0.080	< 0.080	< 0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper (Dissolved)	U	1450	10:1	µg/l	1.0	1.4	1.6	< 1.0	1.7
Mercury (Dissolved)	U	1450	10:1	µg/l	0.50	< 0.50	< 0.50	< 0.50	< 0.50
Molybdenum (Dissolved)	U	1450	10:1	µg/l	1.0	2.9	1.1	1.6	2.4
Nickel (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Lead (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Antimony (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	1.1	1.1	< 1.0
Zinc (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dissolved Organic Carbon	U	1610	10:1	mg/l	2.0	6.4	6.1	5.6	6.5
Total Phenols	U	1920	10:1	mg/l	0.030	< 0.030	< 0.030	< 0.030	< 0.030

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Results - Soil

Project: P19248 N40

Client: Priority Geotechnical Ltd				**Chemtest Job No.:**	20-02703	20-02703	20-02703	20-02703
Quotation No.: Q20-19314				**Chemtest Sample ID.:**	960305	960306	960307	960308
				Sample Location:	ST914A	ST918A	ST940	ST942
				Sample Type:	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	0.50	0.60	0.60
				Date Sampled:	23-Jan-2020	23-Jan-2020	22-Jan-2020	22-Jan-2020
				Asbestos Lab:	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
ACM Type	U	2192		N/A	-	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-	-
Moisture	N	2030	%	0.020	12	5.9	13	8.5
pH	U	2010		4.0	7.9	8.6	7.9	8.5
pH (2.5:1)	N	2010		4.0	8.0	8.6	8.0	
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.037	< 0.010	0.37	
Total Sulphur	U	2175	%	0.010	0.043	0.032	0.17	
Chloride (Water Soluble)	U	2220	g/l	0.010	0.010	< 0.010	< 0.010	
Nitrate (Water Soluble)	N	2220	g/l	0.010	< 0.010	< 0.010	< 0.010	
Sulphate (Acid Soluble)	U	2430	%	0.010	0.016	< 0.010	0.12	
Arsenic	U	2450	mg/kg	1.0	5.8	9.1	7.0	14
Barium	U	2450	mg/kg	10	23	21	20	17
Cadmium	U	2450	mg/kg	0.10	0.15	0.29	0.23	0.44
Mercury Low Level	U	2450	mg/kg	0.05	0.11	< 0.05	0.06	< 0.05
Molybdenum	U	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	14	9.2	11	10
Nickel	U	2450	mg/kg	0.50	21	19	22	26
Lead	U	2450	mg/kg	0.50	17	12	18	13
Selenium	U	2450	mg/kg	0.20	0.28	< 0.20	< 0.20	< 0.20
Zinc	U	2450	mg/kg	0.50	42	37	47	54
Chromium (Trivalent)	N	2490	mg/kg	1.0	15	10	14	13
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50
LOI	U	2610	%	0.10	3.1	1.3	2.5	1.6
Total Organic Carbon	U	2625	%	0.20	0.93	< 0.20	0.80	0.24
Mineral Oil	N	2670	mg/kg	10	< 10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0

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Results - Soil

Project: P19248 N40

Client: Priority Geotechnical Ltd					**Chemtest Job No.:**	20-02703	20-02703	20-02703	20-02703
Quotation No.: Q20-19314					**Chemtest Sample ID.:**	960305	960306	960307	960308
					Sample Location:	ST914A	ST918A	ST940	ST942
					Sample Type:	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	0.50	0.60	0.60
					Date Sampled:	23-Jan-2020	23-Jan-2020	22-Jan-2020	22-Jan-2020
					Asbestos Lab:	LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**					
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0	< 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0	< 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10	< 10	
Benzene	N	2760	µg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	
Toluene	N	2760	µg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	
Ethylbenzene	N	2760	µg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	
m & p-Xylene	N	2760	µg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	
o-Xylene	N	2760	µg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	
Methyl Tert-Butyl Ether	N	2760	µg/kg	0.20	< 0.20	< 0.20	< 0.20	< 0.20	
Naphthalene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Acenaphthylene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Acenaphthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Fluorene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Phenanthrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Fluoranthene	N	2800	mg/kg	0.010	0.10	< 0.010	< 0.010	< 0.010	
Pyrene	N	2800	mg/kg	0.010	0.11	< 0.010	< 0.010	< 0.010	
Benzo[a]anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Chrysene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Benzo[b]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Benzo[k]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Benzo[a]pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Benzo[g,h,i]perylene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Coronene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010	< 0.010	
Total Of 17 PAH's	N	2800	mg/kg	0.20	0.21	< 0.20	< 0.20	< 0.20	
PCB 28	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
PCB 52	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
PCB 90+101	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
PCB 118	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
PCB 153	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	
PCB 138	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010	

Results - Soil

Project: P19248 N40

Client: Priority Geotechnical Ltd								
Quotation No.: Q20-19314			**Chemtest Job No.:**		20-02703	20-02703	20-02703	20-02703
			Chemtest Sample ID.:		960305	960306	960307	960308
			Sample Location:		ST914A	ST918A	ST940	ST942
			Sample Type:		SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	0.50	0.60	0.60
			Date Sampled:		23-Jan-2020	23-Jan-2020	22-Jan-2020	22-Jan-2020
			Asbestos Lab:		LIVERPOOL	LIVERPOOL	LIVERPOOL	LIVERPOOL
Determinand	**Accred.**	**SOP**	**Units**	**LOD**				
PCB 180	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010	< 0.0010

Test Methods

SOP	Title	Parameters included	Method summary
1020	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Electrical Conductivity and Total Dissolved Solids (TDS) in Waters	Conductivity Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1450	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measuremernt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2610	Loss on Ignition	loss on ignition (LOI)	Determination of the proportion by mass that is lost from a soil by ignition at 550°C.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.

Test Methods

SOP	Title	Parameters included	Method summary
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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Report Information

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M	MCERTS and UKAS accredited
N	Unaccredited
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T	This analysis has been subcontracted to an unaccredited laboratory
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The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis
The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols
For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Chemtest
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Chemtest Ltd.
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

UKAS TESTING
2183

Final Report

Report No.:	20-01207-1
Initial Date of Issue:	27-Jan-2020
Client	Priority Geotechnical Ltd
Client Address:	Unit 12 Owenacurra Business Park Midleton County Cork Ireland
Contact(s):	Colette Kelly
Project	P19248 N40
Quotation No.:	
Order No.:	12463
No. of Samples:	3
Turnaround (Wkdays):	7
Date Approved:	27-Jan-2020
Approved By:	
Details:	Darrell Hall, Director

Date Received:	14-Jan-2020
Date Instructed:	16-Jan-2020
Results Due:	24-Jan-2020

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Results - Leachate

Project: P19248_N40

Client: Priority Geotechnical Ltd				**Chemtest Job No.:**		20-01207	20-01207	20-01207
Quotation No.:				**Chemtest Sample ID.:**		953804	953805	953806
				Client Sample ID.:		ST914	ST916	ST938
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.60	0.60	0.50
				Date Sampled:		06-Jan-2020	06-Jan-2020	06-Jan-2020
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
Total Dissolved Solids	N	1020	10:1	mg/l	1.0	10	72	140
Chloride	U	1220	10:1	mg/l	1.0	1.2	2.0	39
Fluoride	U	1220	10:1	mg/l	0.050	0.083	0.11	0.31
Sulphate	U	1220	10:1	mg/l	1.0	< 1.0	< 1.0	11
Arsenic (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	1.2	< 1.0
Barium (Dissolved)	U	1450	10:1	µg/l	5.0	< 5.0	< 5.0	< 5.0
Cadmium (Dissolved)	U	1450	10:1	µg/l	0.080	< 0.080	< 0.080	< 0.080
Chromium (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0
Copper (Dissolved)	U	1450	10:1	µg/l	1.0	1.5	1.9	< 1.0
Mercury (Dissolved)	U	1450	10:1	µg/l	0.50	< 0.50	< 0.50	< 0.50
Molybdenum (Dissolved)	U	1450	10:1	µg/l	1.0	1.6	< 1.0	1.4
Nickel (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0
Lead (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0
Antimony (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0
Selenium (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0
Zinc (Dissolved)	U	1450	10:1	µg/l	1.0	< 1.0	< 1.0	< 1.0
Dissolved Organic Carbon	U	1610	10:1	mg/l	2.0	5.0	5.5	< 2.0
Total Phenols	U	1920	10:1	mg/l	0.030	< 0.030	< 0.030	< 0.030

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The right chemistry to deliver results

Results - Soil

Project: P19248_N40

Client: Priority Geotechnical Ltd			**Chemtest Job No.:**		20-01207	20-01207	20-01207
Quotation No.:			**Chemtest Sample ID.:**		953804	953805	953806
			Client Sample ID.:		ST914	ST916	ST938
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.60	0.60	0.50
			Date Sampled:		06-Jan-2020	06-Jan-2020	06-Jan-2020
			Asbestos Lab:		DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
ACM Type	U	2192		N/A	-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
ACM Detection Stage	U	2192		N/A	-	-	-
Moisture	N	2030	%	0.020	9.6	10	6.0
pH	U	2010		4.0	8.4	8.4	8.8
Arsenic	U	2450	mg/kg	1.0	12	18	9.1
Barium	U	2450	mg/kg	10	36	39	21
Cadmium	U	2450	mg/kg	0.10	0.34	0.64	0.24
Mercury Low Level	U	2450	mg/kg	0.05	0.07	0.10	< 0.05
Molybdenum	U	2450	mg/kg	2.0	2.1	2.2	< 2.0
Antimony	N	2450	mg/kg	2.0	< 2.0	< 2.0	< 2.0
Copper	U	2450	mg/kg	0.50	19	19	12
Nickel	U	2450	mg/kg	0.50	28	29	29
Lead	U	2450	mg/kg	0.50	27	40	14
Selenium	U	2450	mg/kg	0.20	< 0.20	< 0.20	< 0.20
Zinc	U	2450	mg/kg	0.50	64	89	60
Chromium (Trivalent)	N	2490	mg/kg	1.0	18	19	18
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50
LOI	U	2610	%	0.10	3.2	4.2	1.8
Total Organic Carbon	U	2625	%	0.20	0.74	1.5	0.30
Mineral Oil	N	2670	mg/kg	10	< 10	< 10	< 10
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	< 1.0	< 1.0	< 1.0

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Results - Soil

Project: P19248_N40

Client: Priority Geotechnical Ltd			**Chemtest Job No.:**		20-01207	20-01207	20-01207
Quotation No.:			**Chemtest Sample ID.:**		953804	953805	953806
			Client Sample ID.:		ST914	ST916	ST938
			Sample Type:		SOIL	SOIL	SOIL
			Top Depth (m):		0.60	0.60	0.50
			Date Sampled:		06-Jan-2020	06-Jan-2020	06-Jan-2020
			Asbestos Lab:		DURHAM	DURHAM	DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**			
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	< 5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	< 10	< 10	< 10
Benzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Toluene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
m & p-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
o-Xylene	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	< 1.0	< 1.0	< 1.0
Naphthalene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Acenaphthylene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Acenaphthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Fluorene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Phenanthrene	N	2800	mg/kg	0.010	0.22	< 0.010	< 0.010
Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Fluoranthene	N	2800	mg/kg	0.010	0.29	< 0.010	< 0.010
Pyrene	N	2800	mg/kg	0.010	0.25	< 0.010	< 0.010
Benzo[a]anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Chrysene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Coronene	N	2800	mg/kg	0.010	< 0.010	< 0.010	< 0.010
Total Of 17 PAH's	N	2800	mg/kg	0.20	0.76	< 0.20	< 0.20
PCB 28	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 52	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 90+101	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 118	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 153	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
PCB 138	N	2815	mg/kg	0.0010	< 0.0010	< 0.0010	< 0.0010
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1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.
2010	pH Value of Soils	pH	pH Meter
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2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
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2815	Polychlorinated Biphenyls (PCB) ICES7Congeners in Soils by GC-MS	ICES7 PCB congeners	Acetone/Hexane extraction / GC-MS

Test Methods

SOP	Title	Parameters included	Method summary
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customerservices@chemtest.com

VOLUME 2

Report on a Site Investigation of the Bord Gais Eireann proposed Gas Pipeline route from Ballinacurra to Cork City with a branch to Marino Point.

Electricity Supply Board,
Projects & Hydrometric Division,
Civil Works Department,
Stephen Court,
18/21 St. Stephen's Green,
Dublin 2.

SEPTEMBER, 1976.

SITE INVESTIGATION ON GAS PIPELINE ROUTE FROM POWERHEAD BAY TO CORK, AGHADA AND MARINO POINT

INDEX OF VOLUMES

VOLUME No.	TITLE
1	Site Investigation on Pipeline Route from Powerhead Bay to Ballinacurra and branch to Aghada.
2	Site Investigation on pipeline route from Ballinacurra to Cork City and branch to Marino Point.
3	Maps and Drawings showing location of boreholes on pipeline route.

CONTENTS

APPENDICES

I. FOREWORD

Notes on Site Investigation Procedure

The following notes should be read in conjunction with the Report. Any modifications to the procedures outlined below are indicated in the main text.

GENERAL:

The recommendations made and opinions expressed in the Report are based on the Boring Records, an examination of samples and the results of the site and laboratory tests. No responsibility can be held for conditions which have not been revealed by the boreholes, for example, between borehole positions. Whilst the Report may express an opinion on a possible configuration of strata both between borehole positions and below the maximum depth of the investigation, this is for guidance only and no liability can be accepted for its accuracy.

BORING TECHNIQUE:

Unless otherwise stated the 'Shell and Auger' technique of soft ground boring has been employed. Whilst this technique allows the maximum data to be obtained on strata conditions, a degree of mixing of some layer soils, (e.g. thin layers of coarse and fine granular material) is inevitable. Specific attention is drawn to the factor where evidence of such a condition is available.

GROUND WATER:

The ground water conditions entered on the Boring Records are those appertaining at the time of the investigation. The normal rate of boring does not usually permit the recording of

an equilibrium water level for any one water strike. Moreover, ground water levels are subject to variations caused by seasonal effects or changes in local drainage conditions. The table on each Boring Record shows the ground water level at the quoted borehole and casing depths, usually at the start of the days work.

ROUTING SAMPLING:

Undisturbed samples of predominantly cohesive soils are obtained in a 102 mm diameter open-drive sampler, complying with the requirements of the British Standard Code of Practice C.P.2001. Large disturbed samples of granular soils, or of soils in which undisturbed sampling is not possible or appropriate, are taken from the boring tools and sealed into polythene bags. Small disturbed samples are taken at frequent intervals of depth and sealed into 0.5 kg glass jars with screw lids for subsequent visual classification. Where encountered in sufficient quantity, samples of ground water are taken.

Unless otherwise stated in the main text, disturbed soil samples may not be at their natural water content.

SITE INVESTIGATION ON GAS PIPELINE
ROUTE FROM POWERHEAD BAY TO CORK,
AGHADA AND MARINO POINT

SEPTEMBER, 1976.

II. INTRODUCTION.

Gas will be conveyed by submarine pipeline from the offshore gas field to a land terminal at Inch near Powerhead Bay 5 km to the east of the entrance to Cork Harbour. The land pipeline commences at Inch and from there it runs in a general northerly direction to Ardra Beg A.G.I. Site where there is a branch to Aghada. It carries on to near the town of Midleton, crossing the Owenacurra River at Ballinacurra. It then swings west, passing to the south of Carrigtohill, where there is another A.G.I. Site and a branch to Marino Point, after which it crosses to the north side of the main Cork-Waterford road and the Cork-Youghal railway line. It then follows a north-westerly and westerly course as far as Caherlag A.G.I. Site before turning south to cross the same road and railway line again. From there it follows a south-westerly course and crosses the River Lee at Lough Mahon, after which it takes a west to north-west direction along a disused railway and the Marina riverside walk to the E.S.B. Generating Station at Marina, and thence along public roads to Cork Gas Works.

Feasibility studies for the three main water crossings at Lough Mahon, Weir Island and Ballinacurra have been carried out separately and the investigation which is the subject of this report relates only to ground conditions along the proposed pipeline route including other crossings and Above Ground Installation (A.G.I.) Sites.

The investigation was carried out to obtain information which will be of assistance in assessing excavation and pipelaying difficulties along the pipeline route and foundation requirements for attendant Above Ground Installations (A.G.I. Sites).

To expedite the site investigation work two contractors were engaged in the first stage of the investigation to drill shell and auger boreholes at road and other crossings.

One contractor drilled on the route from Powerhead Bay to Ballinacurra including the branch line to Aghada (Volume I of the Report) while the other drilled from Ballinacurra to Cork City including the branch line to Marino Point (Volume II of the Report). For the second stage of the investigations a series of rock probe drillings was carried out by one contractor over the entire route to supplement the borehole information.

Unfortunately, Bord Gais Eireann were refused permission to enter on lands along the route to carry out trial pitting, which was an essential requirement in preparing a comprehensive report. In certain areas permission was refused to enter lands to carry out any type of investigation whatsoever, and in these cases an opinion based on visual observations only has been included in the report.

The report in three volumes, contains the information obtained and discusses in general terms the implications of ground conditions in relation to the proposed project.

III. FIELDWORK

A total of 57 shell and auger boreholes and 43 Percussion Probes were drilled in the locations shown on the strip maps in Volume 3 of this report and along the line shown on the site plan in Appendix III.

The description and depth of the various strata encountered and the depths at which samples were recovered are shown on the boring records in Appendix I. Also shown on these records are the results of in-situ penetration tests, the ground water conditions observed during the course of boring operations and details of rotary drilling operations where appropriate.

The route of the proposed pipeline which is the subject of the investigation described in this report, extends from Ballinacurra, near Midleton to Cork City with a branch line to Marino Point.

For reference purposes the route has been divided into sections and the following should, therefore, be read in conjunction with Volume 3 of this report.

Main Pipeline Route - Ballinacurra to Cork City

Ballinacurra to Carrigtohill A.G.I. Site - Strip maps 01/08 to 01/11:

The northern side of the river crossing at Ballinacurra, which was investigated as part of the river crossing feasibility study, showed a silty gravel layer of five to six metres depth overlying limestone rock and in the first borehole (SX 18) on the main pipeline to Cork City conditions were somewhat similar with a stiff gravelly sandy clay of depth 2.90 metres overlying shattered limestone rock with some clay. The borehole was drilled to a total depth of 7.10 metres and the 4.20 metres of rock coring gave a core recovery of approx. 40%. No water was met in this hole.

Borehole SX 19 revealed a very stiff grey silt becoming more sandy from a depth of 2 metres below ground level and eventually hitting a stiff boulder clay (S.P.T. 32) at 6.00 metres below ground level. Standing water level in this hole was at 5.50 metres below ground level.

The next two boreholes SX 20 and SX 21 are very similar penetrating upper layers of stiff stoney clay and then very stiff boulder clay. Depth of drilling here was 5.00 metres with no rock or water in either borehole.

Boreholes 22, 22A, 22B, 22C and 23 are in a generally marshy area south of Carrigtohill traversed by a small probably tidal stream with numerous connecting drains. The top 1.5 metres in these holes consists of a mixture of fill, peat and soft silt but thereafter a stiff gravelly clay with cobbles followed by fine sand or a mixture of sands and gravels persists to five metres. As would be expected water level is generally not more than 2 metres below ground level.

Four boreholes were drilled on the initial A.G.I. site at Carrigtohill and these showed compact clayey gravels or gravelly clay from under top soil (0.30 metres) to six metres below ground level. Standing water level was approx. 1.50 metres below ground level.

For reasons other than ground conditions Bord Gais decided to move the A.G.I. site to a new position between the above site and borehole SX 24. Because of the obvious uniformity of ground conditions at the two adjoining sites, it was decided not to drill any further boreholes.

Carrigtohill A.G.I. Site to Caherlag A.G.I. Site - Strip Maps 01/11 to 01/15:

From the A.G.I. Site at Carrigtohill up to and including road crossing SX 30 no access permission was obtainable from the owner but a visual inspection of this area indicated apparently good ground conditions except for a small marshy area and stream adjoining the Carrigtohill site.

The main road and railway crossing at SX 31 and SX 32 was investigated but due to access being refused by the owner it was not possible to drill holes in the area between the road and the railway. However, boreholes SX 31 and SX 32 were very similar and showed a stiff stoney clay to a depth of approx. 2 metres followed by a compact coarse gravel to 6 metres below ground level. Water level here varied between two and three metres below ground level although a high level stream flows alongside the main road.

From borehole SX 32 the pipeline heads north-westward towards the high level ground north of the main road from Cork to Waterford and ground conditions change, with rock (generally sandstone) appearing in almost all boreholes. The sandstone is weathered in the top layers but rock was found in boreholes SX 33, SX 34 and SX 36, between 0.60 and 2.00 metres below ground level. Access to drill borehole SX 35 was not possible. No water was struck in any of these holes.

Four boreholes were drilled on the original Caherlag A.G.I. site and two further holes on the adjoining finally selected site. All the above boreholes except borehole No. 2 on the initial site showed a stiff or very stiff silty clay with gravel and angular rock particles approx. two to three metres deep overlying a coarse grained red sandstone. Rock coring in three of these holes gave varying core recoveries averaging around 50%. Two boreholes, one on the original site and one on the final site, showed water at 3 metres below ground level. Borehole No. 2 referred to earlier had rock at 0.60 metres below ground level.

Caherlag A.G.I. Site to Inchera A.G.I. Site -
Strip maps 01/15 to 01/17:

From Caherlag A.G.I. Site the pipeline heads practically due south and downhill towards the main Cork-Waterford road and Cork-Cobh and Youghal railway line. Boreholes SX 37 and SX 38 are very similar to the boreholes on the route to Caherlag with sandstone rock in various states of decay from 0.60 metres below ground level. No water was found in these holes.

Boreholes SX 39 and SX 39A were placed alongside the main Cork Waterford road and railway line and these showed some gravel filling material in the top metre to two metres followed by soft silt or silty clay to a depth of six metres below ground level. No water was found in these holes. A borehole south of the railway line was not possible as access to the land was refused.

From the railway line crossing, the pipeline turns south-west towards Inchera. No access was permitted by the owner to the first 1100 metres of this route. From visual inspection the initial part of this line is apparently reasonably good agricultural land but a marshy low-lying area up to 300 metres long with a stream flowing through its centre is evident towards the Inchera end.

Boreholes 39B, 39C, 39D, 39E and 39F were all drilled in or around a marshy tidal area controlled by a sluice valve just short of Inchera A.G.I. Site. The surrounding ground rises steeply from the area liable to flooding and boreholes 39E and 39D were drilled on the rising ground and showed good compact clayey gravel from ground level. Borehole 39C has a soft organic silt with shells followed by a soft silty clay to a depth of 4.00 metres below ground level but 39B and 39F have a shallower depth of silt, between 1.2 and 2.0 metres, followed by a fairly compact silty gravel. Water level in all these holes is at ground level to 0.60 metres below ground level.

The Industrial Development Authority, who own the land at Inchera dug a series of trial pits on their property prior to our investigation. Some of these pits were on the A.G.I. Site and were inspected and all showed a compact silty gravel from ground level to a depth of abour four metres.

Inchera A.G.I. Site to Marina A.G.I. -
Strip maps 01/17 to 01/20:
A feasibility study of the river crossing Inchera to Mahon has been carried out and reported on separately.

The A.G.I. Site at Lough Mahon shows a soft silt or silty clay to a depth of 2.00 metres below ground level, followed by a stiff sandy boulder clay. Limestone rock was found in boreholes adjacent to the site.

From the A.G.I. Site at Lough Mahon the pipeline heads in a westerly direction towards the disused railway cutting. Near Lough Mahon A.G.I. Site limestone rock levels are approx. 1.5 metres below ground level but in borehole C_6 and C_5 rock was not met until 5 metres below ground level although rock is visible near the surface in the quarry adjacent to the disused railway. A very stiff stoney silt or gravelly clay was found in the upper parts of C_5 and C_6 and no water was struck.

Between boreholes C_4 and C_3 the pipeline runs along the top of the railway cutting and a stiff gravelly sandy silt was found in both of these holes to a depth of 5 metres. The top two metres of borehole C_4 was found to have a somewhat softer clayey silt layer. No water was struck.

At borehole C_3 the pipeline enters the cutting and continues in the cutting and the subsequent embankment to near borehole C_2. The pipe will be laid on the surface in this area. Boreholes C_8, C_9 and C_{10} were drilled on the route of a possible diversion from this line. These holes all contained a considerable depth of soft silt and water levels were generally within 0.5 metres of ground level.

Boreholes C_2 and C_1 were drilled in the road margin at Marina. Water level in these holes probably varies with the tides. Both boreholes showed good firm material at two metres below ground level, but borehole C_1 has a layer of silt with some gravel from 2.70 to 4.30 metres below ground level which varies between soft and stiff in consistency.

Four boreholes were drilled on Marina A.G.I. Site and these all showed fill to a depth of 2.50 to 3.00 metres followed by a soft grey organic silt and in some holes a loose sandy gravel before hitting a compact coarse sandy gravel at a depth of between 6 and 8 metres below ground level. Water level is generally 3 metres below ground level but probably varies with the tides. Tests on a sample of soil from borehole No. 2 gave a Ph of 7.10 and So_3 0.08%.

Marina A.G.I. Site to Cork Gas A.G.I. Site -
Strip map 01/20:

No boreholes were drilled along the main industrial estate roadway between these sites. In the boreholes drilled on Cork Gas property limestone rock was generally found at depths varying between 1.5 and 3.0 metres with the cover consisting mainly of gravel filling and some top soil. No water was found in any of these holes except borehole No. 6. Here the water was found at 4.00 metres below ground level and may be influenced by the tide.

Branch Pipeline Route -
Carrigtohill to Marino Point

Carrigtohill A.G.I. Site to Weir Island -
Strip maps 03/01 and 03/02:

Boreholes SX 24 and SX 24A show a compact coarse sand or sandy gravel to 5.00 metres below ground level with a relatively high water level in borehole SX 24A of 1.40 metres below ground level. When drilling borehole SX 24A blowing back of material occurred between 4.0 and 5.0 metres below ground level.

From borehole SX 24A the ground slopes gently downwards to a soft marshy tidal area traversed by a stream. Borehole SX 24B on the edge of this area showed similar sub-surface conditions to SX 24A with water level about one metre below ground level.

Borehole SX 25 which is located in a field approx. 2 metres below the adjoining road level shows a mixture of silty clay and peat to 2.0 metres below ground followed by a compact gravelly clay and finally gravel to 6.0 metres. No water was found in this borehole.

After crossing the roadway at SX 25 there follows almost immediately an area approx. 250 metres long which is low-lying, liable to flooding by tides and is controlled by some form of sluice. Borehole SX 25A which is in the centre of this area contained a soft grey silty clay from ground level to a depth of 6.0 metres. No water was found in this hole. Results of laboratory tests on this material can be seen in Appendix II.

The remainder of the route to Weir Island contains a compact sandy silty gravel from ground level except for a small section at borehole SX 25B which is situated at the top of an area liable to flooding. Borehole SX 25B has 1.3 metres of soft/ firm silty clay followed by a stiff gravelly silt and coarse gravel at 1.8 metres below ground level.

Weir Island (Rosslague Side) to Marino Point - Strip maps 03/02 to 03/04:

A feasibility study of the river crossing from Weir Island to Rosslague has been carried out and reported on separately. Boreholes SX 26, SX 27 and SX 28, which were drilled to a depth of 5.0 metres all show compact layers of silty gravels or boulder clays. No water was found except in SX 26 where water level was five metres below ground level.

From borehole SX 28 the pipeline descends gradually to the Cork-Cobh railway where borehole SX 29 was drilled on the western side of the crossing. It was not possible to drill a borehole on the eastern side of the railway crossing because access was not permitted by the owner. Borehole SX 29 shows broken rock and clay (probably fill) for 2.90 metres followed by a compact clayey gravel with cobbles.

The exact location of the A.G.I. Site at Marino Point was not available to enable furhter boreholes to be drilled at the time of this investigation.

IV. COMMENTS ON GROUND CONDITIONS IN RELATION TO THE PROPOSED WORKS

From information received from Bord Gais Eireann, it is understood that the invert level of the proposed pipeline will generally be approximately two metres below ground level although the depth may be increased at road, rail and stream crossings to four or five metres.

It is further understood that A.G.I. Sites represent the locations of various pressure reducing valves, structures, bases, light buildings etc., with loadings of 100 to 200Kn/m^2. Foundations would be placed at a depth of approximately one metre below ground level unless conditions dictated otherwise.

Main Pipeline Route - Ballinacurra to Cork City

Ballinacurra to Carrigtohill A.G.I. Site - Strip maps 01/08 to 01/11:

From the river crossing at Ballinacurra to the vicinity of borehole SX 18 the pipe invert will generally be in compact silty gravel and information would suggest that no water or trench support problems should be encountered.

Commencing at borehole SX 18 and continuing to borehole SX 19, SX 20, SX 21 and as far as SX 22 the pipe invert will be in a stiff grey silt or boulder clay. Ground water at the time of the investigation was well below the 2.0 metres excavation line but depending on weather conditions and the time of year it may be necessary to grade back the sides of the excavation or to use close timber sheeting in certain areas.

The area from SX 22 to SX 23 will generally have the pipe invert below ground water level and because of this and the fact that the overlying material consists of mainly peat and soft silts trench support will probably be required. Considerable pumping may also be required on this section. Also depending on tides and rainfall at the time of construction access to this area by machinery may be limited. Since this area is partly tidal it may be necessary to include for some special protective coating to the pipes. There are many land drains and open drains in this area and special precautions as regards marking and replacing these to the owners satisfaction will be necessary.

From SX 23 to the A.G.I. Site at Carrigtohill compact silty gravel is present at pipe invert and no special difficulties are envisaged.

Carrigtohill A.G.I. Site to Caherlag A.G.I. Site - Strip maps 01/11 to 01/15:

Carrigtohill A.G.I. Site:
On this site a compact silty gravel or gravelly clay is present with C.P.T. results between 19 and 28 at 1.65 metres below ground level. Excavation and foundation loadings at the levels envisaged should present no problems.

Because access was not allowed by the owner investigation was limited to a visual inspection of the ground between the A.G.I. Site at Carrigtohill and crossing SX 30. Conditions would appear to be similar to those between borehole SX 23 and the A.G.I. Site. One small section about 100 metres long probably has a small depth of silt and could be quite soft in winter conditions. A stream which may be tidal on spring tides runs through the centre of this area.

From crossing SX 30 to broehole SX 31 probe information suggests a similar compact silty gravel and no particular problems of excavation are envisaged.

The method and depth of excavation to be carried out at the road and railway crossings at SX 31 and SX 32 are not known at this time but a very stiff stoney clay at 1.50 metres depth changes to a compact gravel at 1.90 metres at SX 31 and to a gravelly clay at 2.50 metres in SX 32. Water was struck between 2 and 3 metres below ground level and could be higher in winter conditions. Trench protection and pumping may be needed in this location.

At half way between SX 32 and SX 33 rock appears in the rock probes and the pipe invert level from here to Caherlag A.G.I. could be assumed to lie mainly below the rock horizon. The rock consists generally of sandstone and good recovery was achieved in the rock coring. However, a weathered top surface is present in some of the boreholes and excavation of this material by machine would appear possible. No ground water was encountered in these holes.

Caherlag A.G.I. Site to Inchera A.G.I. Site - Strip maps 01/15 to 01/17:

Caherlag A.G.I. Site:
The two boreholes drilled on this final site and the four on the adjoining initial site show rock at varying depths of 0.60 to 3.50 metres below ground level covered with a silty sandy clay with cobbles which required chiselling from 1.50 metres below ground level. Water level was least 3.00 metres below ground level although the position of the site would indicate that this could rise considerably in winter conditions. Excavation and foundation loadings at the levels envisaged should present no problems.

From Caherlag A.G.I. Site to near borehole SX 39 the pipeline rises and then descends towards the main road and conditions are very similar to those found in SX 33 to SX 36. The rock levels are within one metre of ground level in SX 37 and SX 38 and core recovery is good. Considerably variation in rock quality at a depth of 2.0 metres could occur and again excavation by machine to these depths may prove possible over large stretches. Both on the route to Caherlag A.G.I. Site and

from there to SX 39 there are some very steep sections of ground which may impose some limitations as regards the type of machinery used.

Again at the road and railway crossing at SX 39 and SX 39A the depth and method of excavation can only be finally decided in consultation with Cork County Council and C.I.E. but with loose fill on top of a soft silt or silty clay all open excavation will require close timber sheeting. If thrust boring under the railway is contemplated then further borehole drilling on the south of the railway will be necessary to determine suitable layers for boring. No water was found in boreholes SX 39 and SX 39A at the time of drilling but in winter conditions this picture could alter considerably in this location.

From the south side of the railway crossing for 1100 metres as stated earlier access for boreholes or inspection was not granted by the owners but from a visual examination a distance of 300 to 400 metres of pipeline would be laid in marshy area subject to flooding and with a stream in its centre. Conditions are probably very similar to the next section at SX 39C but special precautions would need to be taken in replacing field drains etc., which were being laid during the time of this investigation.

The pipeline is shown crossing the marshy tidal area short of Inchera site at borehole SX 39C. In this location the high ground water levels and depth of silt together with the tidal stream will make excavation difficult. Trench supports will be required and machinery may experience difficulties in working in this area unless specially tracked for the purpose. An alternative crossing line which would probably be less difficult would be to just south of the concrete sluice chamber adjacent to borehole SX 39F. Here the depth of silt is only one metre and is followed by a compact silty gravel and ground conditions on each side are better for machinery etc.

Inchera A.G.I.Site to Marina A.G.I. Site -
Strip maps 01/17 to 01/20:

Inchera A.G.I. Site:
Site development by the I.D.A. has produced a level surface over most of this area and there is a depth of at least 4 metres of compact silty gravel with water level well below proposed foundation levels. Again excavation and foundations should present no difficulties.

Lough Mahon A.G.I.Site:
The upper layers on this site consist of a soft silt or silty clay to a depth of approx. 2.00 metres below ground level. It may be necessary to go through this layer to the stiff sandy boulder clay which is found beneath it. Part of this site has ground levels below spring tide level and because of its proximity to the sea is actually flooded by these tides. Excavations may have to be supported and pumping allowed for.

From the A.G.I. at Lough Mahon to the road crossing at borehole C_4 the pipe invert should generally be in a stiff stoney silt or gravelly sand and in quite a few positions may be in limestone rock. No water levels were recorded and no particular difficulties are envisaged apart from the fact that limestone rock where found will probably be of good quality requiring blasting.

At a depth of 2 metres below ground level between C_4 and C_3 a good pipe foundation is available but depending on the time of year precautions with excavation machinery close to the top of the disused railway embankment may have to be taken to avoid any possibility of a slip.

In the railway cutting we understand that the pipe will be laid on the cutting invert and apart from the obvious clearing of rubble, waste and undergrowth and its disposal no other difficulty is envisaged. Also the detour from the cutting on the line of boreholes C_8, C_9 and C_{10} has now been abandoned and the pipe will be laid on the adjoining embankment to the north.

Between borehole C_2 and the Marina A.G.I. Site a compact sand and sandy stoney clay was found at pipe invert level and if two metres is the maximum excavation level no particular difficulties should be encountered. Even though water levels here are probably tidal the trench should be dry at about two metres depth during all stages of the tide.

Marina A.G.I. Site to Cork Gas A.G.I. Site - Strip map 01/20:

Marina A.G.I. Site:
Fill material followed by a soft silt seems to indicate that unless large settlements can be entertained foundations would have to be piled. Bored piles have been used successfully on adjoining sites and if used should be taken to the dense gravel layer at 6-8 metres below ground level. Sulphate tests here gave a low value of SO_3 but in view of the fact that the adjacent site gave much higher values (generally Class 2 values) and that the ground water is probably tidal a sulphate resistant cement should be used.

As previously mentioned in Section III of this Report no boreholes were drilled on this route but visual inspection suggested that there was unlikely to be any difficulties. Excavation through the premises of the Cork Gas Co. will require careful attention to avoid underground pipes etc.

Cork Gas A.G.I. Site:
A tarmacadam surface on fill material on this site has shown large settlement in places and in view of the fact that the boreholes show rock at between 1.5 and 3.0 metres overlain by an assorted mixture of top soil, fill and brown clay, we consider that all foundations should preferably go to rock. No water was found in the boreholes and is unlikely to be present in the excavation but trench support may be necessary.

Branch Pipeline Route - Carrigtohill to Marino Point

Carrigtohill A.G.I. Site to Weir Island - Strip maps 03/01 and 03/02:

From borehole 24A to 24B and for a further distance of approx. 70 metres beyond borehole 24B there lies a marshy area subject to flooding and high spring tides. The ground water level is high and the presence of gravels and sands at pipe invert level probably means trench supports and considerable pumping. Special protection coating may be needed on the pipes and the movement of machinery could be difficult in this area.

From the above area to a distance of 100 metres beyond borehole SX 25 the pipe invert should generally be in a gravelly clay or clayey gravel. The initial section of this length could still require pumping and trench support. At borehole SX 25 a firm to stiff silty clay at 1.60 metres depth is followed by peat from 1.60 to 2.00 metres below ground level. This could cause problems at this road crossing particularly as the road-way level is 2 to 3 metres over field level.

The next length of pipeline will traverse an area liable to flooding where ground conditions consist of a soft grey silt and silty clay from ground level to a depth of 6 metres. Trench support may be required here and access of machinery will depend on weather conditions and the time of year.

On the remainder of the length to Weir Island sandy silty gravel is present at pipe invert level and where the gravel is loose and also in a small section at SX 25B some trench support might need to be employed.

Weir Island to Marino Point - Strip maps 03/02 to 03/04:

After the river crossing from Weir Island to Rosslague and continuing through boreholes SX 26, SX 27, SX 28 to SX 29 at Marino Point compact silty gravels or boulder clays predominate with no water present in the boreholes. No special works or precuations would appear necessary in this section of the route.

Marino Point A.G.I.:

The exact location of this site was not defined at the time of writing this report but the area near borehole SX 29 has a considerable depth of well consolidated hardcore and clay. Settlement would depend on the depth and presence of any silt under the particular site decided on.

APPENDIX II

LABORATORY TEST RESULTS

SUMMARY OF LABORATORY TEST RESULTS

Borehole No.	Sample No.	Depth (mtrs)	Nat M.C. %	C_u (Kn/m^2)	ϕ_u	B.D. (Mg/m^3)	L.L.	P.L.	Description
25A	3361	0.6 to 1.1	38.3%	-	-	-	50%	27%	Soft grey organic silty clay.
25A	3363	2.0 to 2.5	55.8%	19.8	0°	1.65	-	-	Soft grey silty clay.
25A	3365	4.0 to 4.5	52.5%	-	-	-	-	-	Soft blue/grey silty clay
25A	3367	5.5 to 6.0	76.0%	-	-	-	-	-	Soft blue/grey silty clay
25B	3184	1.0 to 1.5	35.3%	-	-	-	-	-	Soft/firm grey silty clay
39	1314	1.5 to 2.0	36.6%	27.6	2.0°	1.84	87%	35%	Soft grey organic silty clay (root fibre).
39	1316	3.0 to 3.5	53.6%	-	-	-	84%	35%	Soft grey organic silty clay.
39	1318	4.5 to 5.0	31.0%	-	-	-	48%	31%	Soft grey organic silty clay.
39A	1322	1.5 to 2.0	25.5%	-	-	-	-	-	Soft grey organic gravelly silt.
39A	1324	3.5 to 4.0	39.3%	-	-	-	-	-	Very stiff grey organic silt.
39A	1326	5.5 to 6.0	45.5%	-	-	-	-	-	Soft grey organic sandy silt.
39A	1328	7.0 to 7.5	45.1%	-	-	-	-	-	Soft grey organic sandy silt.
39F	3191	6.8 to 1.3	38.3%	-	-	-	-	-	Soft grey organic clayey silt.
2 (Marina)	0673	2.5 to 3.0	44.7%	16.2	0°	1.78	51%	30%	Soft grey organic sandy clayey silt.
3 (Marina)	0685	3.5 to 4.0	39.7%	-	-	-	52%	34%	Soft grey organic clayey silt.
3	0687	4.5 to 5.0	44.4%	10.9	0°	1.74	52%	40%	Soft grey organic clayey silt.

RESULTS OF CHEMICAL TESTS

Borehole No.	Sample No.	Depth (Mtrs)	PhValue	SO_3 Content
25A	3361	0.6 to 1.1	7.45	1.45%
25B	3184	1.0 to 1.5	7.15	0.10%
39F	3191	0.8 to 1.3	7.10	0.08%
2(Marina)	0673	2.50 to 3.00	7.10	0.08%

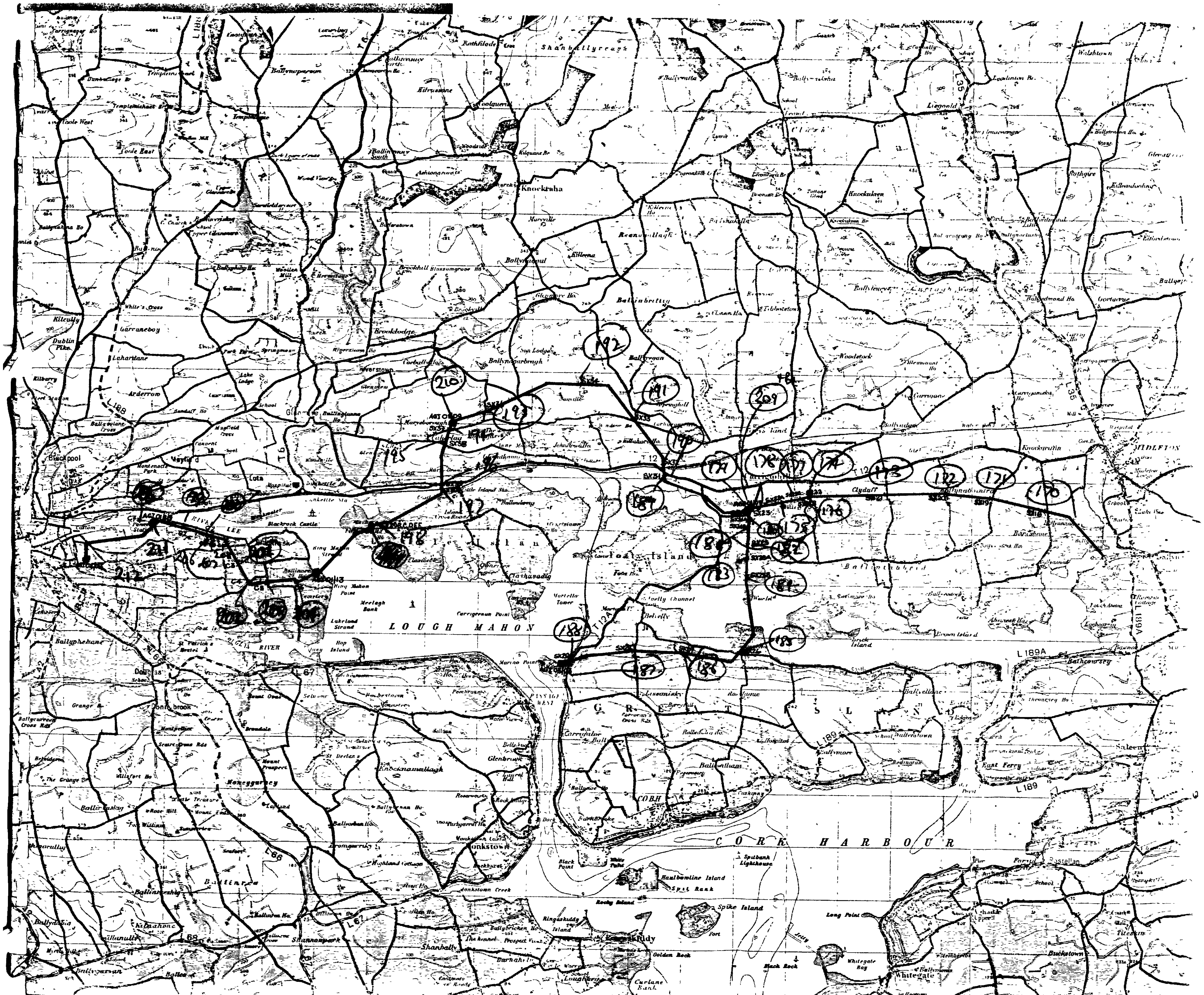
NOTE: All laboratory tests were carried out by Professor R. W. Kirwan at Trinity College, Dublin.

VOLUME III

MAPS AND DRAWINGS

Electricity Supply Board,
Civil Works Department,
Stephen Court,
18/21 St. Stephen's Green,
Dublin 2.

SEPTEMBER, 1976.


Blackpool
Knockraha
Shanballyreagh
Killeena
Ballinbrittig
Brooklodge
Garraneboy
Kilbarry
Dublin Pike
Lota
Blackrock Castle
Fota Island
LOUGH MAHON
Lakeland Strand
Hop Island
Carrigrennan Point
Martello Tower
Belvelly
Marino Point
Brown Island
Rathcoursey
East Ferry
Saleen
Knockgriffin
Woodstock
Springhill
Knocknamallagh
COBH
CORK HARBOUR
Spitbank Lighthouse
Haulbowline Island
Spike Island
Long Point
Rostellan
Buckstown
Whitegate
Whitegate Bay
Black Rock
Ringaskiddy
Shanbally
Ballinrea
T 12
L 189
L 189A
L 35
L 188
L 66
L 67
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SITE INVESTIGATIONS LTD.

DH 28

SOIL INVESTIGATION

BORING RECORD

~~DH~~

CONTRACT	Boro Gais Pipeline.	**BOREHOLE No.**	SX 39A
Report No.		**Order No.**	
Bored for	E. S. B.		
Site Address	South East Cork.		
Boring Commenced	18.6.1976.	**Boring Completed**	19.6.1976.
Type of Boring	Shell & Auger	**Diameter of Borehole**	200 mm.
Ground level	O.D.		
Water Struck (1)	Nil. (2)	(3)	
Standing Water Level	-		
Remarks	All levels are related to ground level.		

70375

Description of Strata	Depth From	Depth To	Thickness	Samples Ref No.	Samples Type	Samples Depth
Filling of clay, stones, etc.	0	0.50	0.50			
Soft grey/brown organic gravelly silty clay.	0.50	1.60	1.10	1321 1322	D U	1.50 1.50 - 1.95
Stiff grey silt.	1.60	5.00	3.40	1323 1324 1325	D U D	3.00 3.50 - 4.00 4.50
Soft grey organic sandy clayey silt.	5.00	7.00	2.00	1326 1327 1328	U D U	5.50 - 6.00 6.00 7.00 - 7.50
Final level.	7.00					

SITE INVESTIGATIONS LTD.

(17127)

SOIL INVESTIGATION

BORING RECORD

(126)

CONTRACT	Bord Gais Pipeline.	**BOREHOLE No.**	SX 39
Report No.		**Order No.**	
Bored for	E. S. B.		
Site Address	South East Cork.		
Boring Commenced	18.6.1976.	**Boring Completed**	18.6.1976.
Type of Boring	Shell& Auger	**Diameter of Borehole**	200 mm.
Ground level	O.D.		
Water Struck (1)	Nil. (2) (3)		
Standing Water Level	-		
Remarks	All levels are related to ground level.		

703474-

Description of Strata	Depth From	Depth To	Thickness	Samples Ref No.	Samples Type	Samples Depth
Brown clayey gravel.	0	1.90	1.90	1313 1314	D U	1.50 1.50 - 2.00
Soft grey organic clayey silt.	1.90	2.00	0.10			
Soft grey silty clay.	2.00	6.50	4.50	1315 1316 1317	D U D	2.00 3.00 - 3.50 4.00
Final level.	6.50			1318 1319 1320	U D D	4.50 5.00 6.50
Standard Penetration Tests.						
At 6.65 9 blows to 12"						

N25 Little Island Pedestrian and Cyclist Bridge
Environmental Impact Assessment Report