IGSL Limited

DBFL Consulting Engineers

Ballyhale Flood Relief Scheme

Factual Ground Investigation Report

Project No. 23434

August 2021

Report

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FLOOD RELIEF SCHEME
BALLYHALE

COUNTY KILKENNY

D.B.F.L.
CONS. ENGINEERS

CONTENTS

APPENDICES

FOREWORD
The following conditions and notes on the geotechnical site investigation procedures should be read in conjunction with this report.

Standards
The ground investigation works for this project have been carried out by IGSL in accordance with Eurocode 7 - Part 2: Ground Investigation & Testing (EN 1997-2:2007). This has been used together with complementary documents such as BS 5930 (1999), BS 1377 (Parts 1 to 9) and Engineers Ireland Specification & Related Documents for Ground Investigation in Ireland (2006). A new National Annex for use in the Republic of Ireland is currently in circulation for comment and will be adopted in the near future. In the mean time, the following Irish (IS) and European Standards or Norms are referenced:

- IS EN 1997-2 Eurocode 7: 2007 – Geotechnical Design – Part 2: Ground Investigation & Testing
- IS EN ISO 22475-1:2006 Geotechnical Investigation and Sampling – Sampling Methods & Groundwater Measurements
- IS EN ISO 14688-1:2002 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 1: Identification and Description
- IS EN ISO 14688-2:2004 Geotechnical Investigation and Testing – Identification and Classification of Soil, Part 2: Classification Principles
- IS EN ISO 14689-1:2004 Geotechnical Investigation and Testing - Identification & Classification of Rock, Part 1: Identification & Description

Reporting
Recommendations made and opinions expressed in this report are based on the strata observed in the exploratory holes, together with the results of in-situ and laboratory tests. No responsibility can be held by IGSL Ltd for ground conditions between exploratory hole locations.

The engineering logs provide ground profiles and configuration of strata relevant to the investigation depths achieved and caution should be taken when extrapolating between exploratory points. No liability is accepted for ground conditions extraneous to the investigation points.

This report has been prepared for DBFL Consulting Engineers and the information should not be used without prior written permission. The recommendations developed in this report specifically relate to the proposed development. IGSL Ltd accepts no responsibility or liability for this document being used other than for the purposes for which it was intended.

In-Situ Testing
Standard penetration tests were conducted strictly in accordance with Section 4.6 of IS EN 1997-2:2007. The SPT equipment (hammer energy test) has been calibrated in accordance with EN ISO 22476-3:2005 and the Energy Ratio (E_r). A calibration certificate is available upon request. The E_r is defined as the ratio of the actual energy E_{meas} (measured energy during calibration) delivered to the drive weight assembly into the drive rod below the anvil, to the theoretical energy (E_{theor}) as calculated from the drive weight assembly. The measured number of blows (N) reported on the engineering logs are uncorrected. In sands, the energy losses due to rod length and the effect of the overburden pressure should be taken into account (see IS EN ISO 22476-3:2005).

Groundwater

The depth of entry of any influx of groundwater is recorded during the course of boring operations. However, the normal rate of boring does not usually permit the recording of an equilibrium level for any one water strike. Where possible drilling is suspended for a period of twenty minutes to monitor the subsequent rise in water level. Groundwater conditions observed in the borings or pits are those appertaining to the period of investigation. It should be noted however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions, tidal variations etc.

Engineering Logging

Soil and rock identification has been based on the examination of the samples recovered and conforms with IS EN ISO 14688-1:2002 and IS EN ISO 14689-1:2004. Rock weathering classification conforms to IS EN ISO 14689-1:2003 while discontinuities (bedding planes, joints, cleavages, faults etc) are classified in accordance with 4.3.3 of IS EN ISO 14689-1:2003. Rock mechanical indices (TCR, SCR, RQD) are defined in accordance with IS EN ISO 22475-1:2006.

Retention of Samples

Samples shall be retained for a period of 60 days following approval of the final factual report, as detailed in the Scope of Works.

REPORT ON A SITE INVESTIGATION
FOR A FLOOD RELIEF SCHEME
AT BALLYHALE
COUNTY KILKENNY
FOR
KILKENNY COUNTY COUNCIL
AND
DBFL
CONSULTING ENGINEERS

Report No. 23434 August 2021

I Introduction

A Flood Relief Scheme is to be undertaken on a site located at Ballyhale in County Kilkenny.

An investigation of sub soil conditions in the area of the proposed development has been carried out by IGSL for consultants DBFL, on behalf of Kilkenny Co. Co.

The works have been completed in accordance with HSE and Government COVID-19 guidelines and recommendations, ensuring safety of site personnel and the general public.

Close liaison was maintained throughout with the client and consulting engineer and an appointed archaeologist was in attendance during the course of the investigation.

The scheduled site investigation included the following elements:

- Trial Pit Excavations (10 nr.)
- Geotechnical Laboratory Testing
- Environmental Laboratory Testing

This factual report includes all data from field and laboratory operations and incorporates an environmental assessment of the site area.

II Fieldwork

The development is located in Ballyhale in County Kilkenny in the vicinity of the Ballyhale River.

The exploratory locations are noted on the drawing enclosed in Appendix III. This drawing was provided by DBFL. Locations were marked out by IGSL and accurately surveyed to National Grid. Ground levels were also established.

All trial pitting works were supervised by an experienced geotechnical engineer who carefully recorded stratification, recovered samples as required and prepared detailed records with supporting photographs.

Each location was scanned electronically (CAT) to ensure that existing services were not damaged.

Trial Pits

Pits were excavated using a 5 tonne tracked excavator under engineering supervision. Detailed trial pit logs are enclosed in Appendix I. Trial Pits are referenced TP01 to TP10.

A high degree of consistency was noted in the general stratification. Topsoil (with a little FILL in places) generally overlies firm to stiff very gravelly CLAY.

In some locations a thin SAND/GRAVEL layer is noted between the upper topsoil and the gravelly CLAY.

Trial pits were terminated at relatively shallow depths (between 1.00 and 2.00 metres) in eight of the ten locations. At TP03 and TP08 excavations continued to refusal at approximately 2.80 metres.

Ground water was noted in three of the trial pits with a copious flow recorded in TP06 at 1.40 metres. Seepage only was noted in TP02 and TP09.

Samples were recovered at intervals in all trial pits and were returned to IGSL for examination and laboratory analysis.

All excavations were carefully backfilled with excavated material.

The findings are summarised in the following table.

Trial Pit Summary

Ref No.	Topsoil	Fill	Gravel	Gravelly Clay	Rock
01	0 – 0.20	0.20 -0.40		0.40 – 1.50	1.50
02	0 – 0.20		0.20 – 1.10	1.10 – 1.30	1.30
03	0 – 0.20			0.20 – 1.00	1.00
04	0 – 0.25			0.25 – 2.80	2.80
05	0 – 0.25			0.25 – 0.80	0.80 – 1.00
06	0 - 0.20		0.20 – 1.00	1.00 – 1.40	1.40
07	0 – 0.20			0.20 – 1.00	1.00
08	0 – 0.20		0.20 – 0.70	0.70 – 1.80	1.80
09	0 – 0.20			0.20 – 2.70	2.70
10	0 – 0.10	0.10 - 0.30	0.30 – 0.70	0.70 – 1.90	1.90

III. Laboratory Testing

A programme of laboratory testing was scheduled following completion of site operations. Geotechnical testing was carried out by IGSL in it's INAB-Accredited laboratory. Environmental and chemical testing was carried out in the UK by EUROFINS Ltd. The test programme included the following elements:

- Liquid and Plastic Limits / Moisture Content
- PSD Grading by wet sieve and hydrometer.
- Sulphate, Chloride and pH
- RILTA Suite Environmental

All test results are presented in Appendix II and are discussed briefly in the following paragraphs.

Classification

Tests on the cohesive gravelly SILT/ CLAY confirm that the material ranges from silt to clay dominant, falling partly into Class CI/CL of the standard classification and partly into the non-plastic fraction. Results are indicative of sensitive soil of low plasticity. Moisture contents of 8 to 24% were recorded.

Grading

Four samples of the overburden soils were tested using wet sieve and hydrometer analysis. The grading curves reflect some variation from gravelly silty CLAY to more granular clay-bound sandy GRAVEL. A sample from the gravel stratum in TP02 is clean and well graded in the sand to coarse gravel range.

Sulphate, Chloride and pH

Three samples have been analysed to determine sulphate, chloride and pH values.
A Sulphate concentration (SO4 2:1 extract) of < 0.010 g/l was established with pH values of 7.5 to 8.8. A Water Soluble Chloride content of <0.010 g/l was also established.

A sulphate design class of DS-1 (ACEC Classification for Concrete) is indicated for sulphate concentrations lower than 0.5 g/l. No special precautions are therefore deemed necessary for protection of below ground concrete.

Environmental RILTA Suite

Three samples of soil from the trial pits were submitted for detailed environmental analysis to RILTA Suite (WAC) parameters. Specialist environmental consultants have examined and assessed the test data.

They confirm that all samples are classified as INERT in accordance with the Landfill Waste Acceptance Criteria (WAC). Material excavated during construction may be disposed of within the site or off site to a suitably licensed landfill facility.

No traces of Asbestos were determined during routine testing.

IGSL/JC
AUGUST 2021

Appendix I

Trial Pit Records

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP01**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,246.78 E 635,344.67 N
		DATE STARTED	06/07/2021
		DATE COMPLETED	06/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	55.70
		EXCAVATION METHOD	5T tracked excavator
ENGINEER	DFBL		

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	55.50						
MADE GROUND firm brown sandy gravelly CLAY with plastic and glass bottles. Gravels are sub angular to sub rounded and fine to coarse.		0.40	55.30						
Firm to stiff grey sandy gravelly CLAY with medium cobble content and low boulder content. Gravels cobbles and boulders are angular to sub angular and fine to coarse.		0.70	55.00		AA155654	B	0.50-0.50		
1.0 Firm to stiff multicoloured green purple and yellow slightly sandy silty gravelly CLAY. Gravels are angular to sub rounded and fine to coarse. Pit terminated - refusal on weathered yellow and red sandstone bedrock.					AA155655	B	1.30-1.30		
End of Trial Pit at 1.50m		1.50	54.20						
2.0									
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 23434A.GPJ IGSL.GDT 8/7/21

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP02**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,251.93 E 635,429.25 N
		DATE STARTED	06/07/2021
		DATE COMPLETED	06/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	53.95
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
TOPSOIL		0.20	53.75						
Firm grey sandy gravelly CLAY. Gravels are angular to sub angular and fine to coarse.		0.40	53.55						
Medium dense purpleish grey mottled brown very gravelly SAND with medium cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse.					AA155656	B	0.50-0.50		
Firm greenish grey mottled yellow slightly sandy very gravelly CLAY. Gravels are sub angular to sub rounded and fine to coarse. Pit terminated - refusal on weathered yellow and red sandstone bedrock.		1.10	52.85		AA155657	B	1.10-1.30		
End of Trial Pit at 1.30m		1.30	52.65						

Groundwater Conditions
Seepage 1.3m

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 23434A.GPJ IGSL.GDT 8/7/21

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP03**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,223.81 E 635,464.77 N
		DATE STARTED	06/07/2021
		DATE COMPLETED	06/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	53.86
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	53.66						
Firm brown slightly sandy gravelly CLAY with medium cobble content. Gravels and cobbles are angular to sub rounded and fine to coarse.		0.40	53.46						
Yellowish brown firm sandy gravelly CLAY with medium cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse. Pit terminated - refusal on weathered yellow and red sandstone bedrock.		1.00	52.86		AA155658	B	0.70-0.70		
End of Trial Pit at 1.00m									

1.0
2.0
3.0
4.0

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 23434A.GPJ IGSL.GDT 8/7/21

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP04**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,168.07 E 635,412.34 N
		DATE STARTED	06/07/2021
		DATE COMPLETED	06/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	59.26
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
TOPSOIL		0.25	59.01						
Firm light brown sandy silty gravelly CLAY. Gravels are angular to sub rounded and fine to coarse.		0.40	58.86						
Firm to stiff light brown sandy silty gravelly CLAY with medium cobble content and medium boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse.					AA155659	B	0.60-0.60		
Medium dense brownish grey clayey very gravelly SAND with medium cobble content and medium boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse. Pit terminated - refusal on moderately weathered yellow and red sandstone bedrock.		1.30	57.96		AA155660	B	1.50-1.50		
					AA155661	B	2.50-2.50		
End of Trial Pit at 2.80m		2.80	56.46						

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP05**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,079.52 E 635,384.74 N
		DATE STARTED	06/07/2021
		DATE COMPLETED	06/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	60.33
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.25	60.08						
Firm brown sandy gravelly CLAY with medium cobble content. Gravels are angular to sub rounded and fine to coarse.		0.50	59.83		AA155662	B	0.50-0.50		
Firm to stiff yellowish brown sandy very gravelly CLAY with medium cobble content and medium boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse.		0.80	59.53						
1.0 Weathered rockhead recovered as angular cobbles and boulders of green and red sandstones and dark brown clay. Pit terminated at 1.1 m.		1.10	59.23						
End of Trial Pit at 1.10m									
2.0									
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 23434A.GPJ IGSL.GDT 8/7/21

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP06**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,238.45 E 635,281.70 N
		DATE STARTED	07/07/2021
		DATE COMPLETED	07/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	56.36
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	56.16						
Medium dense light grey clayey very sandy GRAVEL with high cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse.		0.50	55.86						
Medium dense greyish brown very gravelly SAND with high cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse.		1.00	55.36		AA155663	B	0.60-0.60		
1.0 Firm to stiff purplish grey slightly sandy very gravelly CLAY with medium cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse. Pit terminated at 1.4 m to wet to continue excavating or sample.		1.40	54.96						
End of Trial Pit at 1.40m									
2.0									
3.0									
4.0									

Groundwater Conditions
Fast flow at 1.4m

Stability
Stable

General Remarks
CAT scanned location for services

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP07**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,270.40 E 635,274.19 N
		DATE STARTED	07/07/2021
		DATE COMPLETED	07/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	56.34
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	56.14						
Firm greyish brown sandy gravelly CLAY. Gravels are sub angular to sub rounded and fine to coarse.		0.45	55.89						
Stiff yellowish brown slightly sandy gravelly CLAY with high cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse. Pit terminated - refusal on weathered yellow and red sandstone bedrock.					AA155664	B	0.50-0.70		
1.0 End of Trial Pit at 1.00m		1.00	55.34						
2.0									
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 23434A.GPJ IGSL.GDT 8/7/21

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP08**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,298.98 E 635,227.83 N
		DATE STARTED	07/07/2021
		DATE COMPLETED	07/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	56.70
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	56.50						
Firm greyish brown sandy CLAY.		0.40	56.30						
Medium dense purpleish grey clayey gravelly SAND with medium cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse.		0.70	56.00		AA155665	B	0.50-0.50		
1.0 Firm to stiff pale green mottled yellow slightly sandy slightly gravelly silty CLAY with low cobble content and low boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse. Pit terminated - refusal on weathered yellow and red sandstone bedrock.					AA155666	B	1.00-1.20		
End of Trial Pit at 1.80m		1.80	54.90						
2.0									
3.0									
4.0									

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 23434A.GPJ IGSL.GDT 8/7/21

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP09**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,155.37 E 635,840.35 N
		DATE STARTED	07/07/2021
		DATE COMPLETED	07/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	50.41
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
0.0 TOPSOIL		0.20	50.21						
Firm greyish brown slightly sandy gravelly CLAY. Gravels are angular to sub rounded and fine to coarse.		0.35	50.06						
Stiff brown sandy very gravelly CLAY with medium cobble content and medium boulder content. Gravels cobbles and boulders are sub angular to sub rounded and fine to coarse.		0.70	49.71		AA155667	B	0.50-0.70		
1.0 Firm brown mottled dark brown sandy gravelly CLAY with medium cobble content. Gravels and cobbles are angular to sub rounded and fine to coarse.					AA155668	B	1.20-1.20		
Firm to stiff yellowish brown sandy gravelly CLAY with medium cobble content and medium boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse. Pit terminated refusal on large boulders.		1.80	48.61						
2.0					AA155669	B	2.20-2.40		
End of Trial Pit at 2.70m		2.70	47.71						
3.0									
4.0									

Groundwater Conditions
Seepage at 2m

Stability
Stable

General Remarks
CAT scanned location for services

IGSL TP LOG 23434A.GPJ IGSL.GDT 8/7/21

TRIAL PIT RECORD

REPORT NUMBER 23434

CONTRACT	Ballyhale flood relief scheme	**TRIAL PIT NO.**	**TP10**
		SHEET	Sheet 1 of 1
LOGGED BY	S.Hannon	**CO-ORDINATES**	654,172.40 E 635,792.57 N
		DATE STARTED	07/07/2021
		DATE COMPLETED	07/07/2021
CLIENT	Kikenny county council	**GROUND LEVEL (m)**	50.32
ENGINEER	DFBL	**EXCAVATION METHOD**	5T tracked excavator

Geotechnical Description	Legend	Depth (m)	Elevation	Water Strike	Samples: Sample Ref	Samples: Type	Samples: Depth	Vane Test (KPa)	Hand Penetrometer (KPa)
TOPSOIL		0.10	50.22						
MADE GROUND comprising stiff to very stiff light brown sandy gravelly CLAY with high cobble content. Gravels and cobbles are angular to sub rounded and fine to coarse. Very difficult to excavate.		0.30	50.02						
Firm brown sandy gravelly CLAY. Gravels are angular to sub rounded and fine to coarse.		0.50	49.82		AA155670	B	0.50-0.70		
Medium dense purpleish grey gravelly SAND with medium cobble content. Gravels and cobbles are angular to sub rounded and fine to coarse.		0.70	49.62						
Firm to stiff yellowish brown slightly sandy gravelly CLAY with medium cobble content and medium boulder content. Gravels cobbles and boulders are angular to sub rounded and fine to coarse. Pit terminated - refusal on weathered yellow and red sandstone bedrock or possible very large boulders.					AA155671	B	1.30-1.50		
End of Trial Pit at 1.90m		1.90	48.42						

Groundwater Conditions
Dry

Stability
Stable

General Remarks
CAT scanned location for services

Ballyhale FRS – 23434

Trial pit photos.

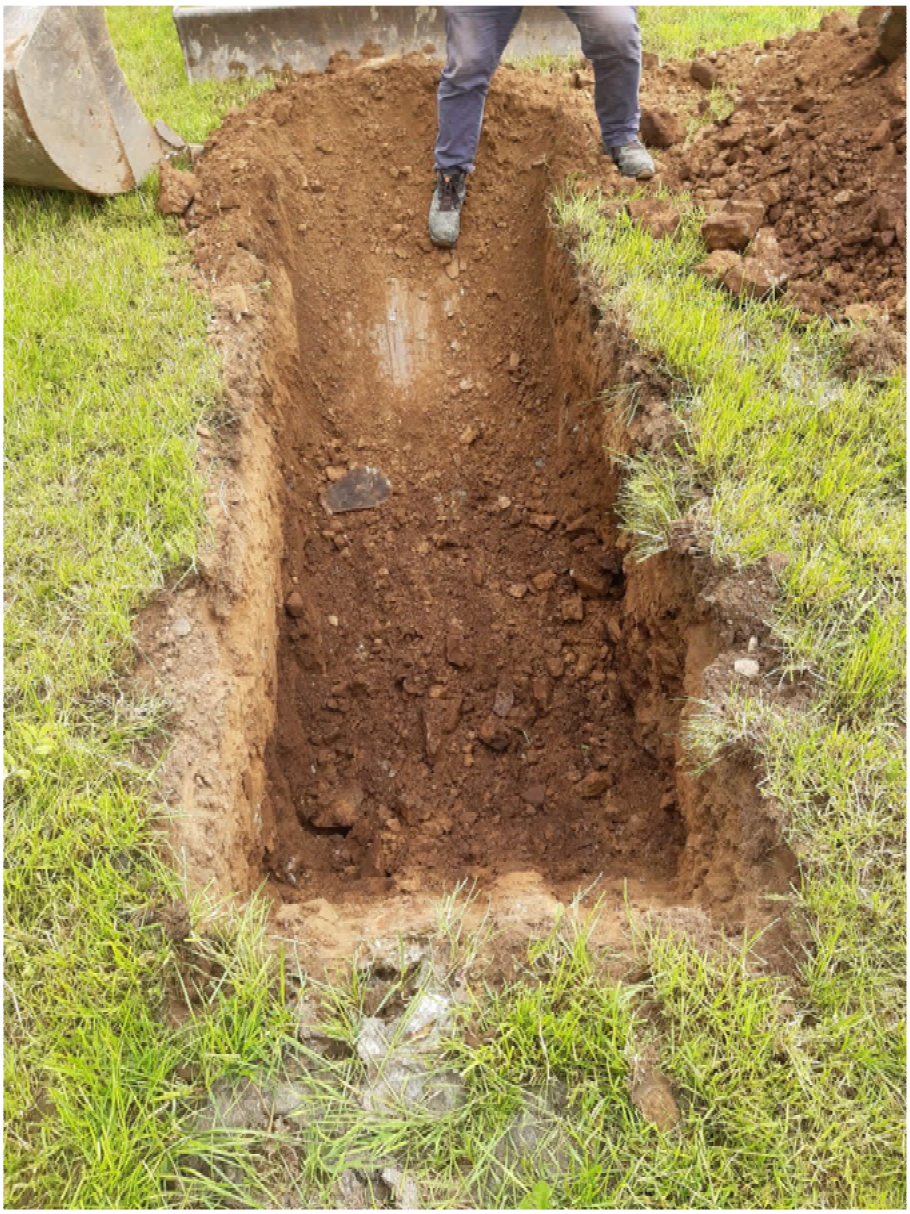
TP01

TP02

TP03

TP04

TP05



TP06

TP07

TP08

TP09

TP10

Appendix II Laboratory Results

IGSL Ltd
Materials Laboratory
Unit J5, M7 Business Park
Newhall, Naas
Co. Kildare
045 846176

Test Report

Determination of Moisture Content, Liquid & Plastic Limits

Tested in accordance with BS1377:Part 2:1990, clauses 3.2, 4.3, 4.4 & 5.3**

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

Report No. **R125586** Contract No. 23434 Contract Name: Ballyhale FRS

Customer DBFL

Samples Received: 13/08/21 Date Tested: 13/08/21

BH/TP*	Sample No.	Depth* (m)	Lab. Ref	Sample Type*	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	% <425µm	Preparation	Liquid Limit Clause	Classification (BS5930)	Description
TP01	AA155655	1.3	A21/3803	B	20	36	17	19	84	WS	4.4		Brown sandy gravelly CLAY
TP03	AA155658	0.7	A21/3805	B	8.7	32	NP	NP	21	WS	4.4		Brown sandy gravelly SILT
TP06	AA155663	0.6	A21/3807	B	8.2	31	NP	NP	21	WS	4.4		Brown sandy gravelly SILT
TP08	AA155666	1.0	A21/3809	B	21	33	16	17	95	WS	4.4	C L	Brown sandy gravelly CLAY
TP09	AA155669	2.2	A21/3810	B	17	34	18	16	44	WS	4.4	C L	Brown slightly sandy, gravelly, CLAY with some cobbles
TP10	AA155671	1.3	A21/3808	B	24	44	19	25	72	WS	4.4	C I	Brown sandy gravelly CLAY

Preparation: WS - Wet sieved
AR - As received
NP - Non plastic

Liquid Limit Clause: 4.3 Cone Penetrometer definitive method
4.4 Cone Penetrometer one point method

Sample Type: B - Bulk Disturbed
U - Undisturbed

Remarks:
Results relate only to the specimen tested,in as received condition unless otherwise noted.
NOTE: **These clauses have been superceded by EN 17892-1 and EN17892-12.
Opinions and interpretations are outside the scope of accreditation. * denotes Customer supplied information.

IGSL Ltd Materials Laboratory

Persons authorized to approve reports
H Byrne (Laboratory Manager)

Approved by	Date	Page
H Byrne	20/08/21	1 of 1

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

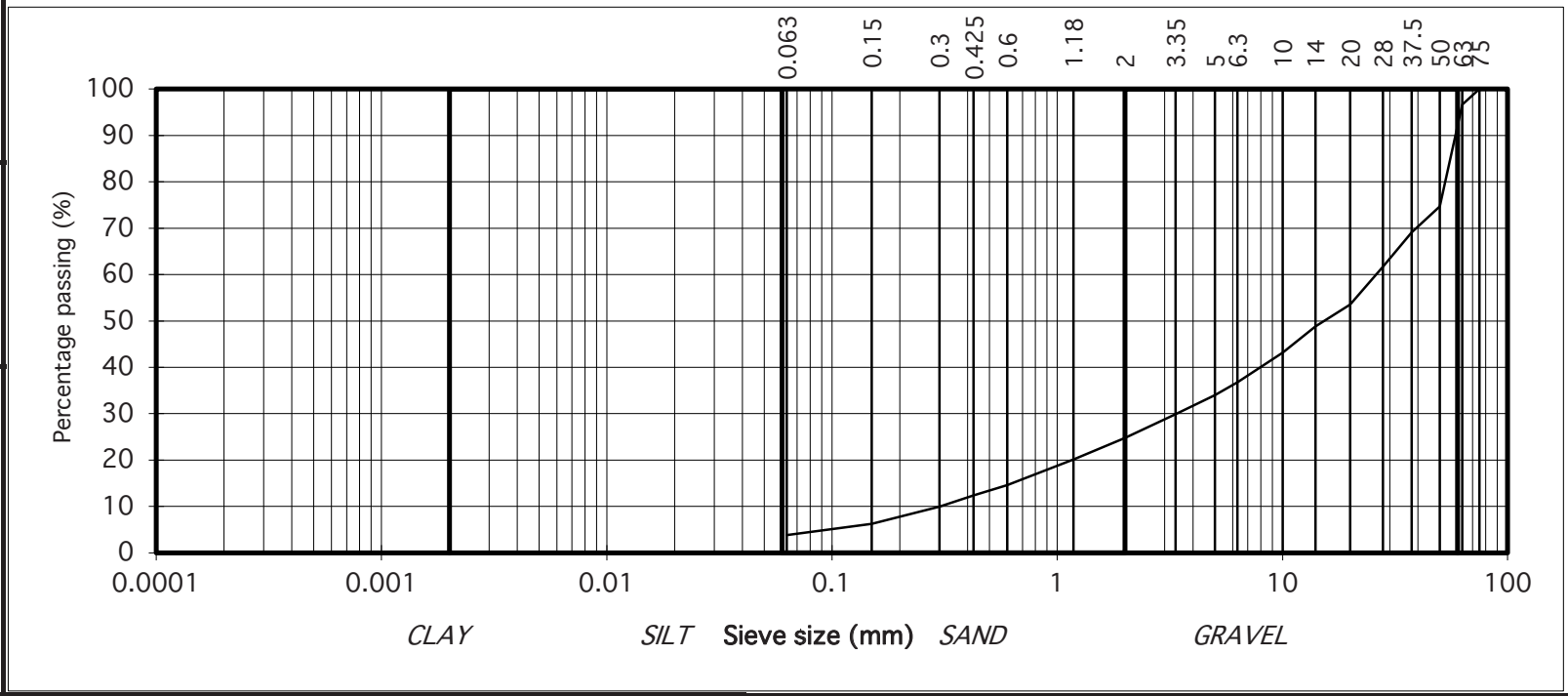
ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	97	
50	75	GRAVEL
37.5	69	
28	62	
20	54	
14	49	
10	43	
6.3	37	
5	34	
3.35	30	
2	25	
1.18	20	SAND
0.6	15	
0.425	12	
0.3	10	
0.15	6	
0.063	4	SILT/CLAY

Contract No.	23434	Report No.	R125585
Contract Name:	Ballyhale FRS		
BH/TP* :	TP02		
Sample No.*	AA155656	Lab. Sample No.	A21/3804
Sample Type:	B		
Depth* (m)	0.50	Customer:	DBFL
Date Received	13/08/2021	Date Testing started	13/08/2021
Description:	Brown slightly clayey, very sandy, GRAVEL with occasional cobbles		

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

Remarks: Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20/08/21	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	99	
20	95	
14	94	
10	89	
6.3	80	
5	74	
3.35	66	
2	54	
1.18	45	SAND
0.6	36	
0.425	31	
0.3	26	
0.15	19	
0.063	14	SILT/CLAY

Contract No.	23434	Report No.	R125582
Contract Name:	Ballyhale FRS		
BH/TP* :	TP04		
Sample No.*	AA155660	Lab. Sample No.	A21/3806
Sample Type:	B		
Depth* (m)	1.50	Customer:	DBFL
Date Received	13/08/2021	Date Testing started	13/08/2021
Description:	Brown clayey/silty, very sandy, GRAVEL		

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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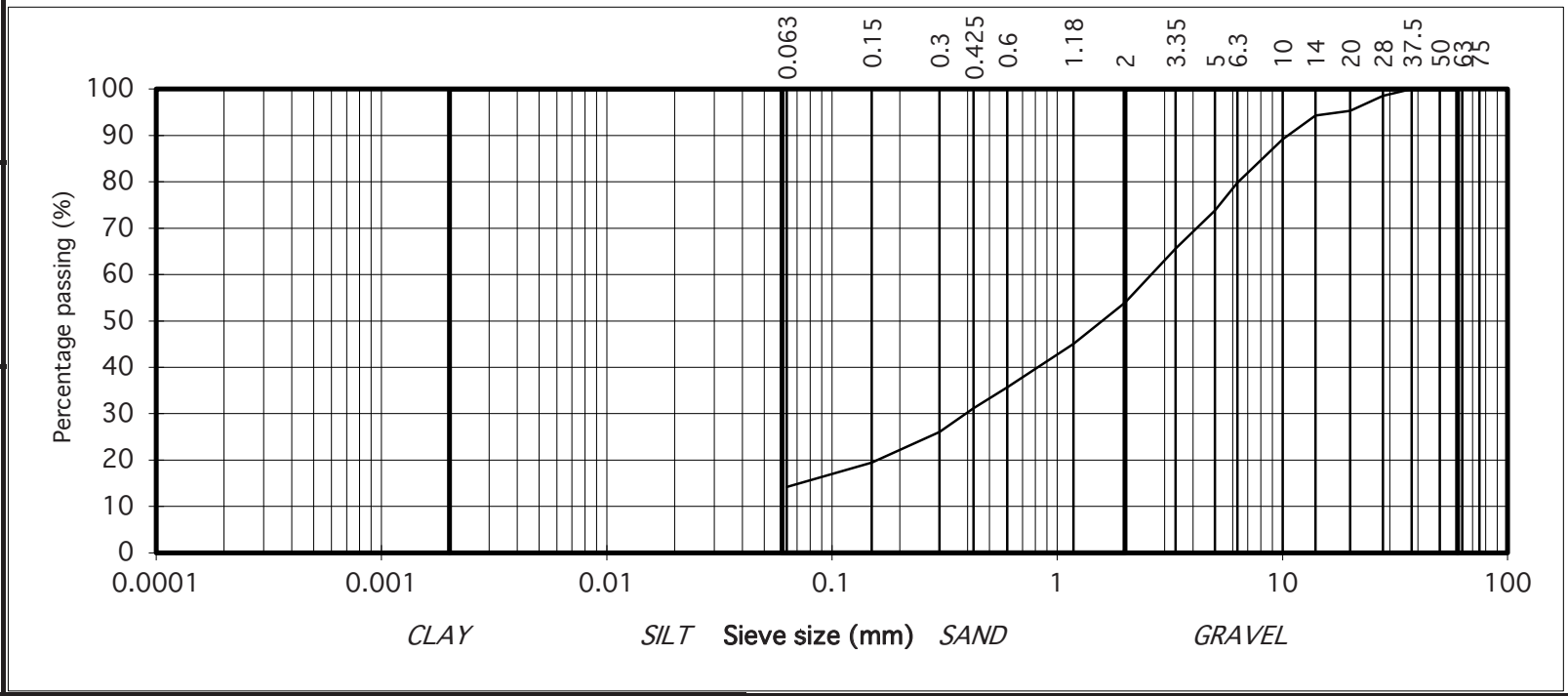
Remarks

Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .



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Approved by:	Date:	Page no:
H Byrne	20/08/21	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	100	
50	100	GRAVEL
37.5	100	
28	100	
20	97	
14	96	
10	94	
6.3	92	
5	89	
3.35	86	
2	81	
1.18	78	SAND
0.6	75	
0.425	73	
0.3	72	
0.15	68	
0.063	61	SILT/CLAY

Contract No. 23434 Report No. R125583
Contract Name: Ballyhale FRS
BH/TP* : TP07
Sample No.* AA155664 Lab. Sample No. A21/3808
Sample Type: B
Depth* (m) 0.50 Customer: DBFL
Date Received 13/08/2021 Date Testing started 13/08/2021
Description: Brown slightly sandy, slightly gravelly, SILT/CLAY

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2016 .

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.
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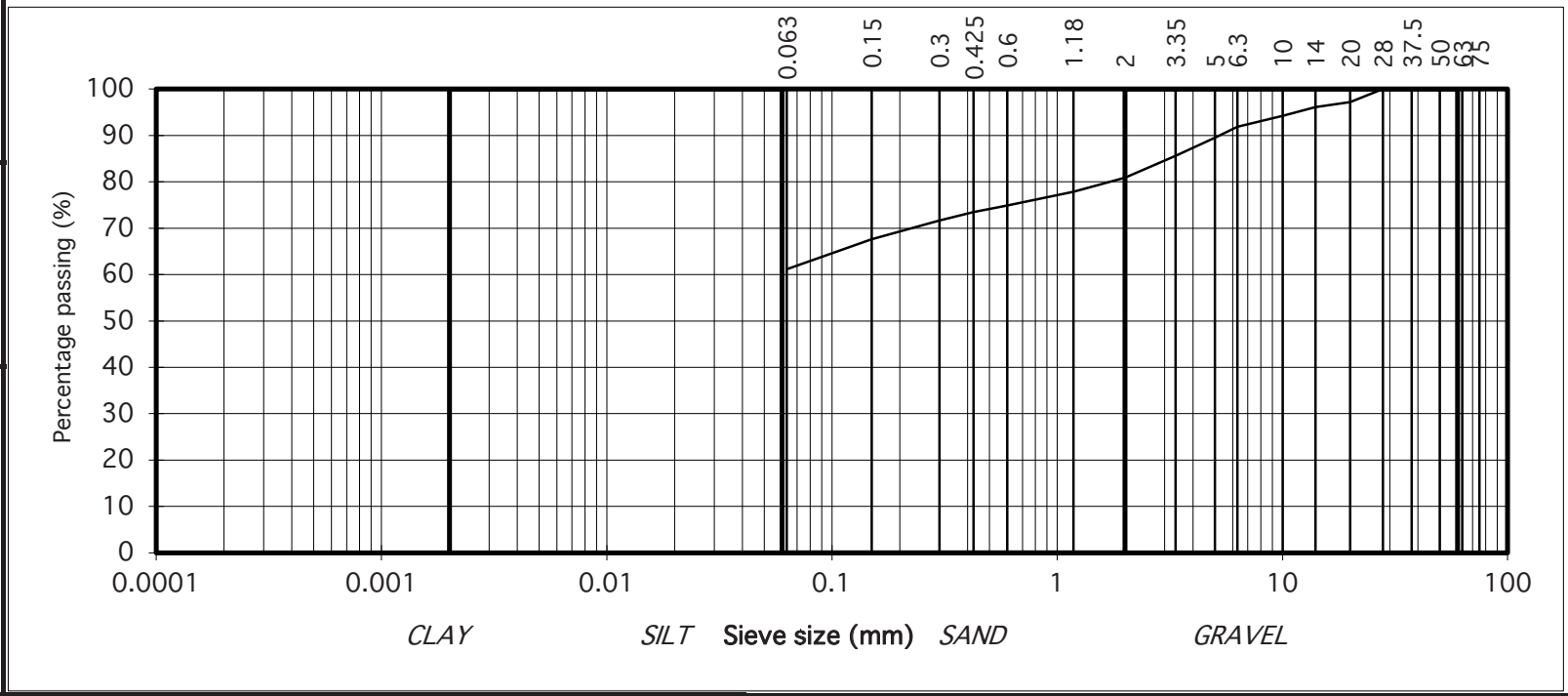

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Approved by:	Date:	Page no:
H Byrne	20/08/21	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

TEST REPORT
Determination of Particle Size Distribution
Tested in accordance with: BS1377:Part2:1990 , clause 9.2 & 9.5**
(note: Sedimentation stage not accredited)

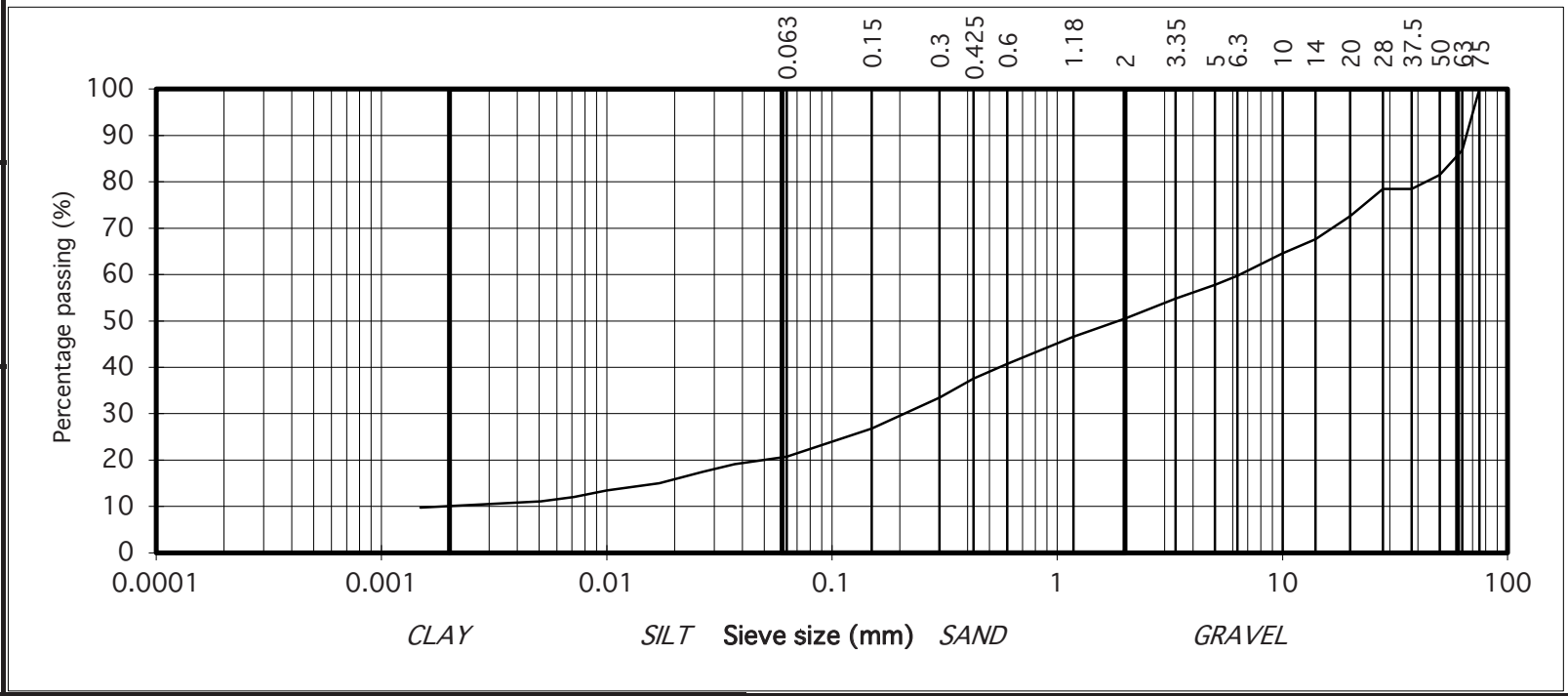
ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO. 133T

particle size	% passing	
75	100	COBBLES
63	87	
50	81	GRAVEL
37.5	78	
28	78	
20	73	
14	68	
10	65	
6.3	60	
5	58	
3.35	55	
2	51	
1.18	47	SAND
0.6	41	
0.425	38	
0.3	33	
0.15	27	
0.063	21	SILT/CLAY
0.037	19	
0.027	17	
0.017	15	
0.010	13	
0.007	12	
0.005	11	
0.001	10	

Contract No.	23434	Report No.	R125584	
Contract Name:	Ballyhale FRS			
BH/TP* :	TP09			
Sample No.*	AA155669	Lab. Sample No.		A21/3810
Sample Type:	B			
Depth* (m)	2.20	Customer:	DBFL	
Date Received	13/08/2021	Date Testing started		13/08/2021
Description:	Brown slightly sandy, gravelly, CLAY with some cobbles			

Results relate only to the specimen tested in as received condition unless otherwise noted. * denotes Customer supplied information. Opinions and interpretations are outside the scope of accreditation.

Remarks Note: **Clause 9.2 and Clause 9.5 of BS1377:Part 2:1990 have been superseded by ISO17892-4:2 Sample size did not meet the requirements of BS1377



IGSL Ltd Materials Laboratory

Approved by:	Date:	Page no:
H Byrne	20/08/21	1 of 1

Persons authorised to approve report: J Barrett (Quality Manager) H Byrne (Laboratory Manager)

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

2183

Final Report

Report No.:	21-28502-1
Initial Date of Issue:	25-Aug-2021
Client	IGSL
Client Address:	M7 Business Park Naas County Kildare Ireland
Contact(s):	Darren Keogh
Project	23434 Ballyhale FRS (DBFL)

Quotation No.:		**Date Received:**	17-Aug-2021
Order No.:		**Date Instructed:**	17-Aug-2021
No. of Samples:	6		
Turnaround (Wkdays):	7	**Results Due:**	25-Aug-2021
Date Approved:	25-Aug-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Leachate

Project: 23434 Ballyhale FRS (DBFL)

Client: IGSL				**Chemtest Job No.:**		21-28502	21-28502	21-28502
Quotation No.:				**Chemtest Sample ID.:**		1262174	1262176	1262178
Order No.:				Client Sample Ref.:		AA155654	AA155659	AA155667
				Sample Location:		TP01	TP04	TP09
				Sample Type:		SOIL	SOIL	SOIL
				Top Depth (m):		0.50	0.60	0.50
Determinand	**Accred.**	**SOP**	**Type**	**Units**	**LOD**			
pH	U	1010	10:1		N/A	8.2	8.1	8.2
Ammonium	U	1220	10:1	mg/l	0.050	< 0.050	0.058	< 0.050
Ammonium	N	1220	10:1	mg/kg	0.10	0.46	0.62	0.35
Boron (Dissolved)	U	1455	10:1	mg/kg	0.01	0.14	< 0.01	< 0.01
Benzo[j]fluoranthene	N	1800	10:1	µg/l	0.010	< 0.010	< 0.010	< 0.010

Results - Soil

Project: 23434 Ballyhale FRS (DBFL)

Client: IGSL				**Chemtest Job No.:**	21-28502	21-28502	21-28502	21-28502	21-28502	21-28502
Quotation No.:				**Chemtest Sample ID.:**	1262174	1262175	1262176	1262177	1262178	1262179
Order No.:				Client Sample Ref.:	AA155654	AA155658	AA155659	AA155663	AA155667	AA155668
				Sample Location:	TP01	TP03	TP04	TP06	TP09	TP09
				Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Top Depth (m):	0.50	0.70	0.60	0.60	0.50	1.20
				Asbestos Lab:	COVENTRY		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
ACM Type	U	2192		N/A	-		-		-	
Asbestos Identification	U	2192		N/A	No Asbestos Detected		No Asbestos Detected		No Asbestos Detected	
Moisture	N	2030	%	0.020	12	8.3	10	7.3	6.5	11
pH (2.5:1)	N	2010		4.0		[A] 8.0		[A] 7.5		[A] 8.8
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	[A] < 0.40		[A] < 0.40		[A] < 0.40	
Magnesium (Water Soluble)	N	2120	g/l	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010
Total Sulphur	U	2175	%	0.010		[A] < 0.010		[A] 0.018		[A] 0.011
Sulphur (Elemental)	U	2180	mg/kg	1.0	[A] 2.7		[A] 1.8		[A] 1.7	
Chloride (Water Soluble)	U	2220	g/l	0.010		[A] < 0.010		[A] < 0.010		[A] < 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010		< 0.010		< 0.010		< 0.010
Cyanide (Total)	U	2300	mg/kg	0.50	[A] < 0.50		[A] < 0.50		[A] < 0.50	
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 0.91		[A] < 0.50		[A] < 0.50	
Ammonium (Water Soluble)	U	2220	g/l	0.01		< 0.01		< 0.01		< 0.01
Sulphate (Acid Soluble)	U	2430	%	0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] < 0.010	[A] 0.010	[A] < 0.010
Arsenic	U	2450	mg/kg	1.0	2.1		21		8.4	
Barium	U	2450	mg/kg	10	48		56		24	
Cadmium	U	2450	mg/kg	0.10	< 0.10		0.76		0.26	
Chromium	U	2450	mg/kg	1.0	8.1		16		11	
Molybdenum	U	2450	mg/kg	2.0	< 2.0		< 2.0		< 2.0	
Antimony	N	2450	mg/kg	2.0	< 2.0		< 2.0		< 2.0	
Copper	U	2450	mg/kg	0.50	8.9		34		14	
Mercury	U	2450	mg/kg	0.10	< 0.10		< 0.10		< 0.10	
Nickel	U	2450	mg/kg	0.50	8.5		40		27	
Lead	U	2450	mg/kg	0.50	11		19		7.8	
Selenium	U	2450	mg/kg	0.20	< 0.20		0.68		0.29	
Zinc	U	2450	mg/kg	0.50	26		49		31	
Chromium (Trivalent)	N	2490	mg/kg	1.0	8.1		16		11	
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50		< 0.50		< 0.50	
Mineral Oil (TPH Calculation)	N	2670	mg/kg	10	< 10		< 10		< 10	
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	

Results - Soil

Project: 23434 Ballyhale FRS (DBFL)

Client: IGSL			**Chemtest Job No.:**		21-28502	21-28502	21-28502	21-28502	21-28502	21-28502
Quotation No.:			**Chemtest Sample ID.:**		1262174	1262175	1262176	1262177	1262178	1262179
Order No.:			Client Sample Ref.:		AA155654	AA155658	AA155659	AA155663	AA155667	AA155668
			Sample Location:		TP01	TP03	TP04	TP06	TP09	TP09
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.50	0.70	0.60	0.60	0.50	1.20
			Asbestos Lab:		COVENTRY		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**						
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0		[A] < 5.0		[A] < 5.0	
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[A] < 5.0		[A] < 5.0		[A] < 5.0	
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[A] < 10		[A] < 10		[A] < 10	
Benzene	U	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Toluene	U	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Ethylbenzene	U	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
m & p-Xylene	U	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
o-Xylene	U	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Methyl Tert-Butyl Ether	U	2760	µg/kg	1.0	[A] < 1.0		[A] < 1.0		[A] < 1.0	
Naphthalene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Acenaphthylene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Acenaphthene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Fluorene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Phenanthrene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Anthracene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Fluoranthene	N	2800	mg/kg	0.010	[A] 0.072		[A] < 0.010		[A] < 0.010	
Pyrene	N	2800	mg/kg	0.010	[A] 0.080		[A] < 0.010		[A] < 0.010	
Benzo[a]anthracene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Chrysene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Benzo[b]fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Benzo[k]fluoranthene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Benzo[a]pyrene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Indeno(1,2,3-c,d)Pyrene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Benzo[g,h,i]perylene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Coronene	N	2800	mg/kg	0.010	[A] < 0.010		[A] < 0.010		[A] < 0.010	
Total Of 17 PAH's	N	2800	mg/kg	0.20	[A] < 0.20		[A] < 0.20		[A] < 0.20	
PCB 28	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	
PCB 52	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	
PCB 90+101	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	
PCB 118	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	

Results - Soil

Project: 23434 Ballyhale FRS (DBFL)

Client: IGSL					**Chemtest Job No.:**	21-28502	21-28502	21-28502	21-28502	21-28502
Quotation No.:					**Chemtest Sample ID.:**	1262174	1262175	1262176	1262177	1262178	1262179
Order No.:					Client Sample Ref.:	AA155654	AA155658	AA155659	AA155663	AA155667	AA155668
					Sample Location:	TP01	TP03	TP04	TP06	TP09	TP09
					Sample Type:	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
					Top Depth (m):	0.50	0.70	0.60	0.60	0.50	1.20
					Asbestos Lab:	COVENTRY		COVENTRY		COVENTRY	
Determinand	**Accred.**	**SOP**	**Units**	**LOD**							
PCB 153	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	
PCB 138	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	
PCB 180	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	
Total PCBs (7 congeners)	N	2815	mg/kg	0.0010	[A] < 0.0010		[A] < 0.0010		[A] < 0.0010	
Total Phenols	U	2920	mg/kg	0.10	< 0.10		< 0.10		< 0.10	

Results - Single Stage WAC

Project: 23434 Ballyhale FRS (DBFL)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	21-28502						
Chemtest Sample ID:	1262174						
Sample Ref:	AA155654				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP01						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 1.1	3	5	6
Loss On Ignition	2610	U	%	5.8	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.0	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	< 0.0020	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	0.0008	0.0083	0.5	2	25
Barium	1455	U	< 0.005	< 0.0005	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	0.0020	0.020	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0006	0.0064	0.5	10	30
Nickel	1455	U	0.0007	0.0072	0.4	10	40
Lead	1455	U	0.0005	0.0051	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0005	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.16	1.6	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	22	210	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	6.3	63	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	12

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 23434 Ballyhale FRS (DBFL)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	21-28502						
Chemtest Sample ID:	1262176						
Sample Ref:	AA155659				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP04						
Top Depth(m):	0.60						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.42	3	5	6
Loss On Ignition	2610	U	%	4.5	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.1	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.010	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	< 0.0002	< 0.0002	0.5	2	25
Barium	1455	U	< 0.005	< 0.0005	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0005	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0004	0.0036	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0005	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.089	< 1.0	10	150	500
Sulphate	1220	U	2.3	23	1000	20000	50000
Total Dissolved Solids	1020	N	16	160	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	2.7	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	10

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Results - Single Stage WAC

Project: 23434 Ballyhale FRS (DBFL)

					Landfill Waste Acceptance Criteria Limits		
Chemtest Job No:	21-28502						
Chemtest Sample ID:	1262178						
Sample Ref:	AA155667				**Inert Waste Landfill**	**Stable, Non-reactive hazardous waste in non-hazardous Landfill**	**Hazardous Waste Landfill**
Sample ID:							
Sample Location:	TP09						
Top Depth(m):	0.50						
Bottom Depth(m):							
Sampling Date:							
Determinand	**SOP**	**Accred.**	**Units**				
Total Organic Carbon	2625	U	%	[A] 0.50	3	5	6
Loss On Ignition	2610	U	%	1.7	--	--	10
Total BTEX	2760	U	mg/kg	[A] < 0.010	6	--	--
Total PCBs (7 congeners)	2815	N	mg/kg	[A] < 0.0010	1	--	--
TPH Total WAC	2670	U	mg/kg	[A] < 10	500	--	--
Total Of 17 PAH's	2800	N	mg/kg	[A] < 0.20	100	--	--
pH	2010	U		8.4	--	>6	--
Acid Neutralisation Capacity	2015	N	mol/kg	0.0060	--	To evaluate	To evaluate
Eluate Analysis			**10:1 Eluate mg/l**	**10:1 Eluate mg/kg**	**Limit values for compliance leaching test using BS EN 12457 at L/S 10 l/kg**		
Arsenic	1455	U	< 0.0002	< 0.0002	0.5	2	25
Barium	1455	U	< 0.005	< 0.0005	20	100	300
Cadmium	1455	U	< 0.00011	< 0.00011	0.04	1	5
Chromium	1455	U	< 0.0005	< 0.0005	0.5	10	70
Copper	1455	U	< 0.0005	< 0.0005	2	50	100
Mercury	1455	U	< 0.00005	< 0.00005	0.01	0.2	2
Molybdenum	1455	U	0.0014	0.014	0.5	10	30
Nickel	1455	U	< 0.0005	< 0.0005	0.4	10	40
Lead	1455	U	< 0.0005	< 0.0005	0.5	10	50
Antimony	1455	U	< 0.0005	< 0.0005	0.06	0.7	5
Selenium	1455	U	< 0.0005	< 0.0005	0.1	0.5	7
Zinc	1455	U	< 0.003	< 0.003	4	50	200
Chloride	1220	U	< 1.0	< 10	800	15000	25000
Fluoride	1220	U	0.25	2.5	10	150	500
Sulphate	1220	U	< 1.0	< 10	1000	20000	50000
Total Dissolved Solids	1020	N	25	250	4000	60000	100000
Phenol Index	1920	U	< 0.030	< 0.30	1	-	-
Dissolved Organic Carbon	1610	U	3.5	< 50	500	800	1000

Solid Information	
Dry mass of test portion/kg	0.090
Moisture (%)	6.5

Waste Acceptance Criteria

Landfill WAC analysis (specifically leaching test results) must not be used for hazardous waste classification purposes. This analysis is only applicable for hazardous waste landfill acceptance and does not give any indication as to whether a waste may be hazardous or non-hazardous.

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request.The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
1262174	AA155654		TP01		A	Amber Glass 250ml
1262174	AA155654		TP01		A	Plastic Tub 500g
1262175	AA155658		TP03		A	Amber Glass 250ml
1262175	AA155658		TP03		A	Plastic Tub 500g
1262176	AA155659		TP04		A	Amber Glass 250ml
1262176	AA155659		TP04		A	Plastic Tub 500g
1262177	AA155663		TP06		A	Amber Glass 250ml
1262177	AA155663		TP06		A	Plastic Tub 500g
1262178	AA155667		TP09		A	Amber Glass 250ml
1262178	AA155667		TP09		A	Plastic Tub 500g
1262179	AA155668		TP09		A	Amber Glass 250ml
1262179	AA155668		TP09		A	Plastic Tub 500g

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
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.
1455	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
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters 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	Pentane extraction / GCMS detection
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
2015	Acid Neutralisation Capacity	Acid Reserve	Titration
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
2175	Total Sulphur in Soils	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2180	Sulphur (Elemental) in Soils by HPLC	Sulphur	Dichloromethane extraction / HPLC with UV detection
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurememrnt by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N–dimethyl-p-phenylenediamine.
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.

Test Methods

SOP	Title	Parameters included	Method summary
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.
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
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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"
SOP	Standard operating procedure
LOD	Limit of detection

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

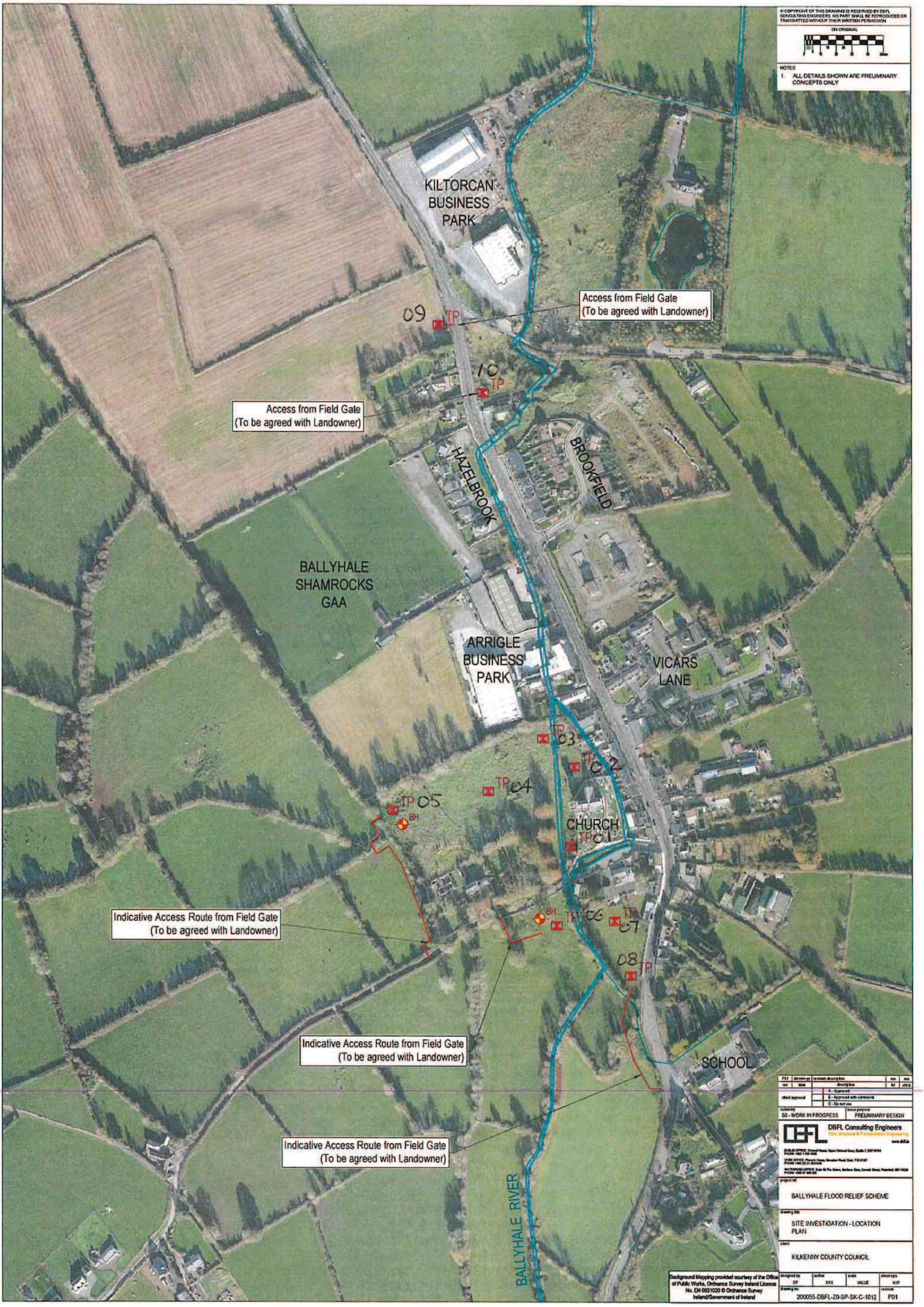
A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 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

Appendix III　Site Plan



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ON ORIGINAL
NOTES
1. ALL DETAILS SHOWN ARE PRELIMINARY CONCEPTS ONLY
KILTORCAN BUSINESS PARK
Access from Field Gate (To be agreed with Landowner)
09 TP
10 TP
Access from Field Gate (To be agreed with Landowner)
HAZELBROOK
BROOKFIELD
BALLYHALE SHAMROCKS GAA
ARRIGLE BUSINESS PARK
VICARS LANE
TP 03
TP 02
TP 04
TP 05
BH
CHURCH
TP 01
BH
TP 06
TP 07
08 TP
Indicative Access Route from Field Gate (To be agreed with Landowner)
Indicative Access Route from Field Gate (To be agreed with Landowner)
SCHOOL
Indicative Access Route from Field Gate (To be agreed with Landowner)
BALLYHALE RIVER
Background Mapping provided courtesy of the Office of Public Works, Ordnance Survey Ireland Licence No. EN 0021020 © Ordnance Survey Ireland/Government of Ireland
P01 dd-mm-yy revision description xxx xxx
rev date description by chk'd
client approval
A - Approved
B - Approved with comments
C - Do not use
suitability
S0 - WORK IN PROGRESS
issue purpose
PRELIMINARY DESIGN
DBFL Consulting Engineers
www.dbfl.ie
project ref
BALLYHALE FLOOD RELIEF SCHEME
drawing title
SITE INVESTIGATION - LOCATION PLAN
client
KILKENNY COUNTY COUNCIL
designed by DF
author XXX
scale VALUE
sheet size A1P
drawing no. 200055-DBFL-Z0-SP-SK-C-1012
revision P01