Chapter 8: Soils & Geology



Chapter 8

Soils and Geology

8.1 Introduction

Trinity Wharf is a brownfield site, approximately 3.6 ha, located at the southern end of Wexford Town's quay-front. The site consists of reclaimed land that extends into Wexford Harbour and was gradually reclaimed with the northern part reclaimed around 1832 (initially as a dockyard area) and then extended south-eastwards through the late 1800s and early 1900s and was occupied by a number of industrial uses. Owing to the reclaimed nature of the site, the superficial soils are dominated by relatively deep layers of 'Made Ground'. Made ground has been defined as soil which has been altered in some way by human activity (imported and placed in-situ).

The characteristics of the proposed development that will impact soils and geology are described in the following paragraphs. The proposed development will involve raising the ground level using imported material. A new sea wall will also be constructed around the coastal boundaries of the site through sheet piles and the placement of rock armour along sections of the northern and southern edges. The structural design of the buildings will typically comprise a reinforced concrete superstructure. The foundation design is proposed to consist of driven steel or concrete piles extending to competent bedrock.

A 64 berth marina and associated breakwater units, pontoon walkways and finger berth is planned on the site's northern corner. The marina will be either piled or anchored. Pontoon berths and walkways will be restrained using tubular piles driven into the seabed or an alternative restraint system.

There will also be a 180m boardwalk structure at the northern corner of the site connecting Trinity Wharf with Paul Quay. The foundations for the boardwalk structure are proposed to be driven steel tubular sections which will be installed to immediately beneath the soffit level of the boardwalk deck where an integral connection will be made.

The chapter will assess the impact of these structures as part of the proposed development on the Trinity Wharf brownfield site. Full details of the project description and likely construction methodology is detailed in Chapter 4 'Description of Development'.

This chapter considers and assesses the likely significant impacts with regard to soils and geology associated with both the construction and operational phases of the proposed development. Measures to mitigate the assessed negative impacts of the development are proposed, and residual impacts are described. The chapter initially sets out the methodology used (Section 8.2), describes the existing soils and geology environment (Section 8.3), examines the predicted impacts of the proposed development (Section 8.4), proposes mitigation measures (Section 8.5), and identifies residual impacts (Section 8.6).

8.2 Methodology

This chapter has been prepared in accordance with the following guidelines:

 Institute of Geologists of Ireland (IGI) (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements;

- National Roads Authority (NRA 2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Environmental Protection Agency (EPA 2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports;
- Waste Management Act 1996 (as amended)

A desk study of the site of the proposed development was carried out in order to establish baseline conditions. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the area. A suite of geological maps published by the Geological Survey of Ireland (GSI) were consulted as a part of the desk study. The maps included the bedrock, quaternary sediments, groundwater vulnerability and geological heritage sites, among other themes. Aerial and site-based photographs as well as historical maps and reports were also consulted as a part of the desk study. The desk study was followed by a walkover survey of the site of the proposed development by ROD Civil engineers in October 2018, with observations used in preparation of this chapter.

Previous Studies/ Reports

The following reports were consulted in the preparation of this chapter:

- Kavanagh Mansfield and Partners (2008): Report on a site investigation for a development at Trinity Wharf Wexford;
- RPS (2018): Trinity Wharf Marina Feasibility Study (project number IBE1115/D03)
- RSK (2018): Preliminary Asbestos Walkover Survey, Trinity Wharf, Wexford

Ground Investigations procured by Kavanagh Mansfield and Partners in 2008 consisted of 13 cable percussive boreholes in overburden and 9 rotary core boreholes in the bedrock. A suite of geotechnical laboratory tests for determination of the geotechnical soil parameters was carried out on the samples from the boreholes. The ground contamination testing was carried out on seven samples. The ground contamination testing was in accordance with "Murphy Suite" which determines the suitability of the soils for acceptance into licensed landfill facilities. The results of which are discussed in Section 8.3.

A Preliminary Asbestos Walkover Survey of the Trinity Wharf site was undertaken in October 2018 Sampling and testing of seven samples was undertaken and a map of general areas impacted with Asbestos Containing Materials (ACMs) was developed. The walkover survey and samples taken were confirmed by laboratory analysis as containing asbestos. The report recommended further work to be undertaken including the development of a remedial strategy and independent validation of the site prior to proceeding with the development. The Preliminary Asbestos Survey Walkover report is attached as Appendix 8.1 for reference.

8.3 Description of Receiving Environment

The proposed development is located on reclaimed land adjacent to the southern bank of the Wexford Harbour, south of the Wexford town centre. The site is flat, with generally low and sparse vegetation. The site is rectangular in shape, connected to the original bank at its southwestern side. The other three sides (north, east and south) that make the coastline are partially protected by historical concrete and masonry sea wall.

The sea bed depth at the location of the marina ranges from -2.5m OD (Ordnance Datum) to -7m OD while the depth at the location of the proposed boardwalk ranges from 0m OD to -2m OD. The site does not contain any Geological Heritage features or quarries.

Bedrock Geology

The GSI 1:100,000 bedrock map indicates that the site is underlain by the Shelmaliere Formation consisting of white and purple quartzites with slates. Cullenstown Formation (grey-green metagreywacke & slate) and Ballysteen Formation (limestones and shales) are also found in the vicinity.

The ground investigation carried out in 2008 indicate that the site is underlain by the moderately weak to strong, thin to medium bedded, slightly cherty limestone. The limestone was locally found to be interbedded with dark calcareous mudstone. This description matches well with the Ballysteen Formation features. Only one borehole (RC15) indicated the presence of interbedded sandstones and siltstones. Refer to borehole locations Plate 8.1 below.

The bedrock in the northern part of the site is typically observed at 10.2-11.5 m below ground level (bgl), overlain by the 0.5-1m of weathered bedrock returned as angular clayey gravel. The bedrock at the southern end of the site was observed at approximately 5m bgl, overlain with 1m of weathered bedrock returned as angular clayey gravel. The central part of the site exhibits a very deep zone of highly weathered bedrock. For instance, borehole RC7 shows the weathered rock, recovered as gravel and cobbles, to extend from 11m bgl down to 22m bgl, with no competent bedrock encountered in this borehole.

Soils and Subsoils

The area is entirely covered by the made ground of very heterogenous composition. Clay, rubble, stone, ash, concrete and slag were all observed as constituents. The strength and density vary accordingly and the thickness of the made ground varies from 1.5m to 4.1m.

The made ground is underlain by alluvial soil typical of riverbanks. The alluvial soils are predominantly encountered as soft to firm sandy silts and loose silty sands. The thickness of the alluvial soil ranges from 1m to 5m. These soils have undergone a degree of consolidation under the made ground layer and building loading which is why no very soft material was encountered during the ground investigation in 2008.

Firm to stiff gravelly clay (widely known as glacial till or boulder clay) underlies the alluvial soils and overlies the weathered bedrock. The thickness of the gravelly clay ranges from 2m to over 8m in BH16. (Refer to Plate 8.1).



Plate 8.1 Borehole locations investigated by IGSL in 2008

Environmental Testing

A suite of Waste Acceptance Criteria (WAC) chemical tests were undertaken on seven samples as a part of the 2008 geotechnical investigation procured by Kavanagh Mansfield and Partners and undertaken by IGSL. The WAC testing followed the Murphy Suite Criteria to determine the suitability of the soils for acceptance into licensed landfill facilities. The location of the boreholes' locations investigated by IGSL are illustrated in Plate 8.1. The samples were taken using the 'Shell and Auger' technique of soft ground boring. All boring operations sampling and / or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of text for soils for civil engineering purposes'.

Parameters forming part of the chemical testing included:

- Polychlorinated Biphenyls (PCBs)
- Polycyclic Aromatic Hydrocarbons (PAHs)
- Mineral Oil
- BTEX & Petrol Range Organics (PRO)
- Total Organic Carbon (TOC)

Leachate analysis for metals and major anions and cations was also undertaken to assess potential for movement into groundwater.

The testing found elevated levels of Polycyclic Aromatic Hydrocarbons (PAHs) and sulphates in the made ground stratum in five out of seven samples. In general, low to moderate levels of contamination have been noted. A summary of the results are presented below:

- Dissolved Mercury, Benzene, Toluene, Ethylbenzene, Total Xylene, PCB's, Total Phenols, and Dissolved Cadmium were below the respective Limit of Detection (LOD) in all boreholes.
- Elevated levels of Mineral Oil were identified at boreholes 16 and 17 (south-eastern end of the site) all other boreholes recorded values below the LOD of 1 mg/kg.
- Slightly elevated levels of Total Dissolved Solids (TDS) were identified at a depth of 2.5m below ground level at borehole 16, with all other samples categorised as Inert in terms of WAC (< 4000 mg/kg). The levels observed at borehole 16 categorise this material as Stable Non-reactive with respect to WAC guidance.
- Dissolved Antimony was either below the LOD or was within the inert criteria limits and were below 0.06 mg/kg with the exception of borehole 22. The levels observed at borehole 22 categorise this material as Stable Non-reactive with respect to WAC guidance.
- Dissolved Arsenic, Barium, Chromium, and Copper concentrations were found to be either below the LOD or within the inert criteria limits.
- Elevated levels of Total Organic Carbon (TOC) above the inert criteria were identified in five of the seven samples. Only boreholes 12 and 16 (in the deeper soil layers) fall below the Inert Landfill Threshold of 3%. For waste disposal purposes to landfill, the levels which were observed would classify the material as hazardous.
- Elevated levels of PAHs were identified in all samples analysed. Borehole 4 was found to have the highest concentrations of PAHs among the boreholes tested.

Further detail is available in the Kavanagh Mansfield and Partners Report from 2008 as appended to this EIAR as Appendix 8.2.

The Preliminary Asbestos Walkover Survey undertaken on 18th October 2018, identified fragments of asbestos cement and floor tiles and / or floor tile debris in numerous locations across the surface of the site. Seven samples were collected by RSK and asbestos was confirmed in five out of the seven samples. The preliminary findings indicate that Asbestos Containing Materials (ACMs) are broadly concentrated along the retaining wall in the northern portion of the site; along the edges of floor slabs; adjacent to and within many of the demolition stockpiles and in the gravel track along the eastern boundary. No suspect ACMs were identified within the grassed area or were visible on the surface of the stockpiles in the southern portion of the site. The Preliminary Walkover Asbestos Report is included as Appendix 8.1 of this EIAR.

The sea bed in the vicinity of the Trinity Wharf development, corresponding to the location of the boardwalk and the sea wall / revetments was sampled and tested as a part of the Trinity Wharf Marina Feasibility Study by RPS Group (November 2018). A comprehensive sampling programme was undertaken in July 2016 by Hydrographic Surveys Ltd to inform the feasibility study, whilst the sediment quality analysis was undertaken by the RPS Laboratory Services, see sampling locations in Plate 8.2 below.

The samples from the north west side of Trinity Wharf (A, B & C) were found to have values above the upper guidance threshold for OCPs and PAH levels that are substantially in excess of the lower guidance limit (there is no upper limit established at present). Station A, furthest from the Wharf, contained the least contaminated sediments on this side of the development area with stations B & C, closer to the Wharf, showing increasing levels of contaminants.

Station B had samples taken at both the surface (B1) and 1m below the surface (B2) and held the greatest amount of contaminants out of the three stations on this side of Trinity Wharf. The sample collected at depth tended to have higher levels of contaminants than the surface sample. Metals levels above the lower guidance levels were found for arsenic, copper, nickel, lead and zinc. PAH levels were also above the lower guidance level in both the surface and -1m samples, with the deeper sample recording total values approximately twice that of the surface sample. PCB, Organotin and TPH levels were satisfactory. OCP levels were all above the threshold effects level and the parameters for which limits have been set, Lindane and HCP were both above the upper guidance level.

Station C was a surface sample and contained elevations above the lower guidance level for arsenic, cadmium, nickel and zinc in the metals suite. Polycyclic Aromatic Hydrocarbon (PAH) and PolyChlorinated Biphenyl (PCB), Organotin (TBT and DBT) and total petroleum hydrocarbon (TPH) levels were acceptable. As with the other samples in the OCP suite, the results for Lindane and HCP were both above the upper guidance level for Station C, and the other parameters tested were above the Threshold Effects Level (TEL) published in the guidance.

Station D had samples taken at both the surface (D1) and 1m below the surface (D2). The samples were collected from the small accumulation of sediment immediately adjacent to the Wharf at the boundary with the navigation channel. In the metals suite, the two samples (surface and depth) recorded generally quite similar values, with the exception of copper, where the depth sample recorded a substantially higher value and both samples were above the upper guidance level. In keeping with many of the other surrounding stations, values for arsenic, nickel lead and zinc were also above the lower guidance level. PAH levels were acceptable; with the samples taken at depth recording levels almost three times lower than the surface sample. PCB levels were found to be above the lower guidance limit; however the deeper samples were four times higher than the surface sample. Organotin and TPH levels were satisfactory. OCP levels were also generally within acceptable thresholds.

Station E had samples taken at both the surface (E1) and 1m below the surface (E2). The sample collected at depth from station E was substantially more contaminated than the surface sample. In the metals suite, Station E was the only station which did not record elevated levels of arsenic or nickel. Sample E1 (surface) recorded only slight elevation of copper and all other metals levels were acceptable. Sample E2 (at depth) had slightly raised levels of cadmium and lead with all other metals at acceptable levels. In respect of PAH, the surface sample was well within the acceptable level however the sample collected at depth was over seven times higher and above the lower guidance limit. Similarly, the surface sample was totally clean of PCBs however the sample collected at depth recorded levels over 25 times higher and was again over the lower guidance level. Organotin and TPH levels were satisfactory. OCP levels were also generally within acceptable thresholds.

Generally speaking, the area returned results showing mild levels of contamination in the sediments although in a limited number of instances there were moderate levels of contamination present. Further information on the results of this sediment Analysis are found in Appendix 4.3

The exact disposal avenue for contaminated material excavated from the site will be determined in accordance with the actual level of contamination and Waste Acceptance Criteria following a comprehensive laboratory analysis of the material taking place prior to construction.



Plate 8.21: Location of sediment sampling stations at Trinity Wharf (Source: RPS Feasibility Study, 2018).

Groundwater and Hydrology

The groundwater was observed during the 2008 GI at approximately 1.5m - 2.0m below ground level, coinciding with the sea level.

Groundwater vulnerability is indicated as low on GSI's 1:100,000 map. However, the site-specific assessment was carried out, accounting for up to 4 m of predominantly high permeability made ground and further deeper layers of glaciofluvial gravels, up to 10m of moderate permeability soils such as sandy silts and up to 7m of low permeability cohesive glacial till over bedrock. Groundwater vulnerability ranges between moderate and high across the site depending on the exact thickness of the deposits present, according to the GSI Groundwater Vulnerability Classification Table 8.1 below.

Table 8.1 GSI Groundwater Vulnerability Classification Table

	Hydrogeological Conditions					
Vulnerability	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Features	
Rating	High permeability (sand/ gravel)	Moderate permeability (e.g. sandy subsoil)	Low permeability (e.g. clayey subsoil, peat)	(Sand/ gravel aquifers only)	(<30m radius)	
Extreme (E)	0-3.0m	0-3.0m	0-3.0m	0-3.0m	-	
High (H)	>3.0m	3.0-10.0m	3.0-5.0m	>3.0m	N/A	
Moderate (M)	N/A	>10.0m	5.0-10.0m	N/A	N/A	
Low (L)	N/A	N/A	>10.0m	N/A	N/A	

The main surface water body receptor in the study area is the Lower Slaney Estuary with made ground being the primary pathway for received precipitation.

8.4 Description of Potential Impacts

The made ground stratum exhibits low to moderate levels of contamination, primarily from PAHs and sulphates remaining from the historical industrial use of the site. In addition to that, the asbestos containing materials have been identified on the surface of the site. Mild to moderate levels of contamination with OCPs and PAHs were found in the samples from the sea bed undertaken as part of the Trinity Wharf Marina Feasibility Study by RPS Group (November 2018).

While the intention is for the construction works to be carried out with the least feasible disturbance of soils, some relatively minor amount of soil stripping or excavation can be expected. This primarily pertains to the construction of the foul sewage pumping station (located in the western corner of the site) and may be required for any deep service trenches or chambers identified during detailed design.

The pronounced heterogeneity of made ground and the relatively high compressibility of the alluvial soils can result in excess settlements stemming from structure loading. Any soil excavation has the potential to induce movement and settlement of surrounding ground during the construction phase.

All material excavated in the made ground stratum at the site shall be assumed to be contaminated. Appropriate testing of this material by a suitably qualified and licenced waste contractor shall take place for all aspects of ground contamination. Any contaminated material that is required to be excavated will be disposed of to a suitably licensed and permitted contractor to a licenced landfill site, which will be determined in accordance with the actual level of contamination and Waste Acceptance Criteria. Inert, non-hazardous and hazardous waste. Such contaminated material will be stored in separate bunds and will be disposed of to a suitable licensed facility. The mitigation measures for handling ACMs are presented in Section 4.4.5 in Chapter 4 of this EIAR.

8.5 Mitigation and Monitoring Measures

The mitigation measures for the impacts outlined in the section 8.4 above are outlined in this section.

Although the existing ground surface and all contaminated material is planned to be encapsulated in the thick imported granular material that will form the new surface, the removal of surface will be undertaken to ensure potential ACMs negative impacts to the environment is appropriately addressed prior to future development.

The following mitigation and control measures, in addition to the asbestos mitigation measures outlined in Section 4.4.4 in Chapter 4, will be adopted before the start of the construction works:

- Prior to the start of any construction works further asbestos surveys, intrusive
 asbestos surveys and site investigation and a Remediation Strategy will be
 developed prior to site clearance works and the subsequent construction of the
 site. The Asbestos Surveys and a Remediation Strategy will inform the site
 clearance strategy and removal of asbestos from the site. All site clearance
 works will be required to be undertaken by a suitably qualified, experienced and
 licensed asbestos contractor.
- All site clearance and excavation works will be required to follow the mitigation measures of this EIAR in this Chapter and those detailed in Chapter 4 as well as any future mitigation measures to be detailed in the Remediation Strategy (to be completed). For all site clearance works and excavation works suitably qualified,

experienced and licensed personnel will be required to undertake this specialist work in accordance with the 'measures for working with asbestos'. Any ACMs discovered in areas required for excavation, will be required to be disposed of by a licenced contractor to a licenced waste facility in accordance with waste management legislation, as appropriate.

- The 'Asbestos Survey and Remediation Strategy' will be undertaken prior to construction. All mitigation measures/ recommendations from these surveys and the remediation strategy will be required to be implemented as part of the proposed development.
- Remediation Verification Report will be produced to demonstrate that all
 mitigation measures proposed by the contractor to prevent the spread of
 asbestos or risk of fibre release and all associated remedial works implemented
 will be independently validated prior to proceeding with the redevelopment of the
 site.
- 'Measures for working with asbestos' as detailed in Chapter 4 shall be implemented by contractors as appropriate as part of the construction phase.
- The specialist contractor will ensure secure containment and transport of all contaminated materials to the appropriate licenced waste disposal facility.
- Contractors shall be required to submit and adhere to a Construction Method Statement indicating the extent of areas likely to be affected and demonstrating that this is the minimum disturbance necessary to achieve the required works. All associated hazardous waste residuals will also be stored within temporary bunded storage areas prior to removal by an appropriate EPA approved waste management contractor for off-site treatment/recycling/disposal. Any other building waste will be disposed of within on-site skips for removal by a licensed waste management contractor. The contractor will be required to submit a Construction and Demolition Waste Management Plan to the Council for approval which will address all types of materials to be disposed and the location of the licenced waste disposal facilities that will be used, as appropriate.
- Imported good-quality granular soils materials and rock armour revetment will be imported from local sources where possible. The nearest suitable licensed quarries are outlined in the Section 4.4.10 of the Chapter 4.
- To minimise any impact on the underlying subsurface strata from material spillages, all fuels, oils, solvents and paints used during construction these will be stored within specially constructed temporary bunded areas or within dedicated bunded containers. Spill kits and hydrocarbon adsorbent packs will be stored on the site compound and operators will be fully trained in the use of this equipment. Fuel for vehicles will be stored in a mobile double skinned tank.

In order limit the risk to human health and the surrounding aquatic environment by exposure to contaminated material through excavation, it is proposed to retain the majority of the made ground in place. The current ground level across the entire site will be raised for the proposed development (1.5m raise on average), using imported good quality granular material. It is also proposed that the uppermost 250mm of this material will comprise of compacted clay with a low permeability of 1 x 10-7 ms-1 (refer to Chapter 9 for details) to limit infiltration to percolating water. A minor volume of excavated material planned to be excavated pertaining to the foul sewage pump-out station and any deep service trenches or chambers will be identified during detailed design. Temporary works design and monitoring will ensure that the there are no unacceptable ground movements and settlements of the adjacent ground. This material will be required to be tested for contaminants.

All buildings will rely on driven piles for foundations. This will minimise the need for the excavation and handling of the made ground layer and soft alluvial layers beneath it, as no in-situ ground needs to be displaced or handled during the execution of this type of piles. The alternative solution of bored piles was eliminated as it would produce contaminated soil arisings. Furthermore, transferring all loads on piles will avoid the settlements in the underlying strata (particularly in made ground and soft silts). The detailed design of driven piles will include a consideration of the allowable stresses in the bedrock so as to avoid fracturing the bedrock. The encapsulation of the contaminated ground will prevent contact between the contaminated ground and the environment and end-users in the operational phase.

It is noted that the due to the stringent requirements for the rock used in the revetments, not all quarries are able to produce such stone. Quarries in strong metamorphic and volcanic rocks typically tend to produce suitable stone for revetment. Two quarries in Co. Wexford, in Ballykelly (37km) and Gorey (41km), quarry should contain suitable type of stone.

The steel driven piles were selected as the foundation option in order to avoid the handling of the contaminated pile arisings and reduce the environmental impacts related to the arisings disposal.

Sheet piles forming the sea wall on the site perimeter and the option of either bored piles or tubular steel piles and screw piles (helical anchors) for the foundation of the marina and boardwalk elements (to be decided during detailed design) are also selected as their installation requires no excavation or dredging. A sheet-piled wall will provide a new sea wall for the site, raising the site level to meet flood requirements and providing a barrier to contain contaminated material within the site.

The mildly contaminated made ground soil retained by sheet piled wall will be buried below the surface and the flow path for the potential contaminants will be largely severed by the sheet pile wall. The sheet pile wall will also provide for additional coastal protection and flood defence. The rock armour revetment and the armour underlayer will be placed directly on in-situ riverbed silt, in order to avoid the need for the handling and removal of contaminated silt.

8.6 Residual Impacts

There are no likely significant residual soil or geological impacts associated with the Trinity Wharf development.

8.7 Difficulties Encountered

No significant difficulties were experienced in the completing this assessment. While adequate information is available from previous investigations, additional and more detailed ground investigations will take place at the development site prior to detailed design stage in order to further classify ground conditions for design and also to quantify the disposal options for excavated material which may be contaminated. It is not considered that this affects this impact assessment due to the design, construction methodology and the mitigation measures provided in this EIAR.

8.8 References

Institute of Geologists of Ireland (IGI) (2013) Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements

National Roads Authority (NRA 2008) Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes

Environmental Protection Agency (EPA 2017) Draft Guidelines on the Information to be contained in Environmental Impact Assessment Reports

Government of Ireland. Waste Management Act 1996 (as amended)

Kavanagh Mansfield and Partners (2008): Report on a site investigation for a development at Trinity Wharf Wexford

RPS (2018): Trinity Wharf Marina Feasibility Study (project number IBE1115/D03)

RSK (2018): Preliminary Asbestos Walkover Survey, Trinity Wharf, Wexford.

Appendix 8.1 Preliminary Asbestos Walkover Survey





Wexford County Council

Preliminary Asbestos Walkover Survey

Trinity Wharf, Wexford

602393 (00)





RSK GENERAL NOTES

Project No.: 602393 (00) Title: Preliminary Asbestos Walkover Survey - Trinity Wharf, Wexford Client: Wexford County Council Date: October 2018 Office: **Dublin FINAL** Status: **Author** Bronagh O'Reilly **Technical reviewer** David O'Hagan Brongh O'keilly. Dollagan. Signature Signature 31st October 2018 31st October 2018 Date: Date:

RSK Ireland (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

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Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK.

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1

1 INTRODUCTION

In October 2018, RSK Ireland Limited (RSK) was instructed by Wexford County Council to complete a preliminary walkover survey at the Trinity Wharf site, Wexford town. The survey was conducted on 19th October 2018. The aim of the assessment was to identify any potential Asbestos Containing Materials (ACMs) on the surface and near surface of the site following the discovery of suspected asbestos cement debris during a recent geotechnical investigation.

This report is subject to the RSK service constraints given in Appendix A and is not intended as a specification for any removal works. RSK can provide a detailed specification for works if required.

1.1 Site Location

The site is located on a c.10-acre parcel of reclaimed land adjacent to Wexford Harbour and is situated approximately 1.3km southeast of Wexford Town centre centred at Irish Grid reference T05541 21298. The site is located within an area of mixed commercial and residential land use. A site location plan is shown on Figure 1.

1.2 Site Description

The site is derelict and is located adjacent to Wexford Harbour. The former buildings were reported demolished between 2000 and 2005, with a number of stock piles containing construction and demolition waste remaining in various locations across the site and a number of the former floor slabs still in situ in the central portion of the site.

The site is bounded to the north, east and south by Wexford Harbour within an existing sea wall and the main Wexford to Rosslare railway line bounds the site to the south west.

The site lies at an elevation of approximately 5m above Ordnance Datum (mAOD) and is predominately flat. Access to the site can be gained via a gated entrance on Trinity Street to the north west of the site.

1.3 Scope of Work

The scope of the survey and layout of this report has been designed with consideration of the Health and Safety Executive guidance document 264 Asbestos: The Survey Guide and the CIRIA guidance document "Asbestos in soil and made ground: good practice site guide".

The scope of works included:

- A preliminary walkover survey to identify any potential ACMs on the surface of the site;
- Limited representative sampling of any suspected ACMs on the surface of the site;
 and



 A factual and interpretative report with recommendations for further works (if required).

1.4 Proposed Development

It is our understanding that Wexford County Council plan to redevelop the 10-acre site to provide a high-quality business park which will include a mix of modern office space, hotel accommodation, multi-storey carparking, a landmark cultural and events multi-use building and 60 residential units. The proposed development will also include the provision of a 61-berth marina and a new boardwalk.



2 PRELIMINARY ASSESSMENT

2.1 Previous Asbestos Identification

From information provided by the councils appointed design consultants ROD, a fragment of cement suspected to contain asbestos was identified during the advancement of four trial pits in the northern portion of the site in October 2018. The TPs were undertaken as part of a geotechnical investigation by Priority Geotech. It is our understanding that all works were immediately stopped, and personnel and plant demobilised from site.

No laboratory results were provided to confirm the presence of asbestos in the cement fragment nor potential presence of asbestos in soils in any of the four TP locations completed.

No information has been provided with regards any asbestos surveys undertaken on the original buildings nor removal or disposal of asbestos during the subsequent demolition process.

2.2 Site History

A review of the historical maps of the site was undertaken to identify any potential sources of historic asbestos contamination. A review of the site history was undertaken by assessing the available historical maps on the Ordinance Survey of Ireland (OSI) map viewer http://map.geohive.ie/mapviewer.html.

The earliest available historical map of the area (1837-1842) shows the site to be undeveloped.

The development history of the site and surrounding area is detailed in Table 1 below. Map extracts are presented in Appendix B.

Table 1: Historical Map Review

Year	Site Description	Surrounding Land Uses
1837-1842	The site is partly developed reclaimed land. Docks occupy the north west potion of the site and a railway runs through a yard on the south west portion.	A railway line bounds the south western portion of the site. Trinity Street is location parallel to the southern site boundary. A barracks is located south west of the site. The surrounding area to the north west is developed docks. Wexford town centre is located c.1.3km to the north west of the subject site. The surrounding area to the south appears to be residential dwellings along the main road infrastructure with associated gardens.
1888-1913	The site has been further developed and an iron works occupy a central portion of the site. The south western portion of the subject site remains undeveloped reclaimed land.	The railway line on the southern boundary of the site is named Fishguard & Rosslare Section on the map. There are no significant changes to the surrounding land use.
1940s	The map shows the Clover Meats and Iron works. An Aerial view would indicate that the buildings	Further significant development in the surrounding area.



Year	Site Description	Surrounding Land Uses
	look like those typically constructed from AC cladding.	
1995	The map illustrates that the buildings were extended post iron works, for a car assembly plant. An Aerial view would confirm that the large building extending northeast to southwest would appear to be constructed of asbestos cement cladding. The remaining buildings appear to be corrugated metal.	The surrounding area is densely developed with mixed residential and commercial land use.
2000	No significant change onsite.	There are no significant changes to the surrounding land use.
2005	The existing buildings have been demolished and the footprint of the former buildings remains	There are no significant changes to the surrounding land use.
Present Day	The site is currently unoccupied. the former footprint of the buildings is still in situ. Stockpiles of construction and demolition waste in various locations across the site.	There are no significant changes to the surrounding land use.

2.3 Site Walkover

A preliminary walkover of the site was undertaken by an RSK P402 Qualified asbestos surveyor on 19th October 2018. The findings are summarised below and supported by the site photographs presented in Appendix D. The purpose of the walkover was to establish if any ACMs were present to the surface of the site.

The site is currently derelict however easily accessible and used by nearby residents / dog walkers. There were a number of stock piles containing construction and demolition waste remaining in various locations across the site which is extensively overgrown prohibiting access and detailed inspection.

An area of grassland occupies the western portion of the site; hardstanding area and retaining wall to the northern portion of the site and a gravel path along the shoreline on the eastern boundary. The central portion of the site is predominately covered with concrete floor slabs noted to be in varying states of disrepair.

Evidence of ground disturbance was noted in four locations in the northern portion of the site, presumed to be from the recent geotechnical investigation.

The RSK asbestos consultant walked the site noting the main areas where obvious suspected ACMs were noted. Suspected ACMs predominately comprised asbestos cement debris and floor tiles. A small number of samples were taken of suspect ACMs, these were appropriately labelled and securely double-bagged whilst on site, prior to return to the UKAS accredited laboratory for analysis. Results are presented in Appendix C.



3 WALKOVER RESULTS

3.1 Asbestos Containing Materials

Seven samples representative of suspected ACMs were taken and five were confirmed by laboratory analysis as containing asbestos. Three of the positive samples were confirmed as asbestos cement (AC) and two were confirmed as asbestos floor tiles including bitumen adhesive. A photolog of the identified ACMs is provided in Appendix C.

The AC were identified in numerous locations across the surface of the site and would be consistent with corrugated profile sheeting and rainwater goods. The asbestos floor tiles were identified in large pieces or in small badly damaged fragments across the majority of the site including stockpiles.

No other obvious suspected ACMs were noted in the grassed area in the eastern portion of the site.

The following table summarises the findings of the bulk sample analysis including a classification of the material type.

Table 2: Asbestos Containing Materials - Bulk Samples

Description		Analysis Results	Classification	Observations
S01	Beige Floor Tile	Chrysotile detected in tile and bitumen	Thermoplastic & bitumen	Within C&D waste in NW portion of the site and across the site
S04	AC Fragment	Chrysotile	Cement	AC sheeting adjacent to TP4. Similar debris noted adjacent all hard-standing areas and structures
S05	AC Fragment	Chrysotile	Cement	Small fragments noted throughout gravel area on eastern boundary
S06	Floor Tile Debris	Chrysotile detected in tile and bitumen	Thermoplastic & bitumen	Large area with floor tiles in situ, visible debris scattered throughout the area



Description		Analysis Results	Classification	Observations
S07	AC Debris (flat)	Chrysotile	Cement	Fragments noted on edge of floor slab along SW boundary



4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Asbestos Containing Materials

Fragments of AC and floor tiles and / or floor tile debris were identified in numerous locations across the surface of the site.

The preliminary findings would indicate that ACMs are broadly concentrated along the retaining wall in the northern portion of the site; along the edges of floor slabs; adjacent to and within many of the demolition stockpiles and in the gravel track along the eastern boundary.

The AC identified would be consistent with fragments and broken sections of corrugated profile sheeting and rainwater goods and likely originate from the large linear building illustrated in Map 5, which is strongly suspected to be constructed from AC cladding.

The asbestos floor tiles were identified in-situ in two main areas and distributed in large pieces or in small badly damaged fragments across much of the site.

No suspect ACMs were identified within the grassed area or to surface of the stockpiles in the southern portion of the site.

Given the presence of ACMs adjacent to and on the surface of several of the remaining stockpiles, it must be assumed that further ACMs are likely to be present within the stockpile material. The investigation of such was outside the scope of the walkover survey and visual assessment was hindered due to extensive overgrowth.

The presence of asbestos to the surface and potentially within the stockpiles of C&D waste across the site would pose a significant risk during the construction phase of the development and therefore further investigation to fully identify and quantify the extent of surface and subsurface asbestos contamination and subsequent remedial measures are required. Given the historical development of the site and widespread impact of asbestos across the surface, it is highly likely that sub surface material will also be impacted with asbestos contamination and will require further investigation.

4.2 Recommendations

Based on the findings of the preliminary walkover the following is recommended to quantify the potential risks and liabilities associated with asbestos contamination at the site:

- Make safe or secure the site so that no further access is permitted to unauthorised personnel;
- Undertake a detailed asbestos survey of the surface of the site by a suitably qualified P402 asbestos surveyor(s) experienced in undertaking surveys on contaminated land sites. The aim of the survey should be to determine the full extent, type and location of all surface and near surface ACMs and should include representative sampling as appropriate.
- Undertake an intrusive investigation to identify any potential sub-surface asbestos contamination within the demolition material stockpiled in various locations across



the site. The investigation should only be undertaken and supervised by personnel suitably qualified to work with asbestos on sites of this nature (including all plant operatives and engineers) and should include representative sampling as appropriate.

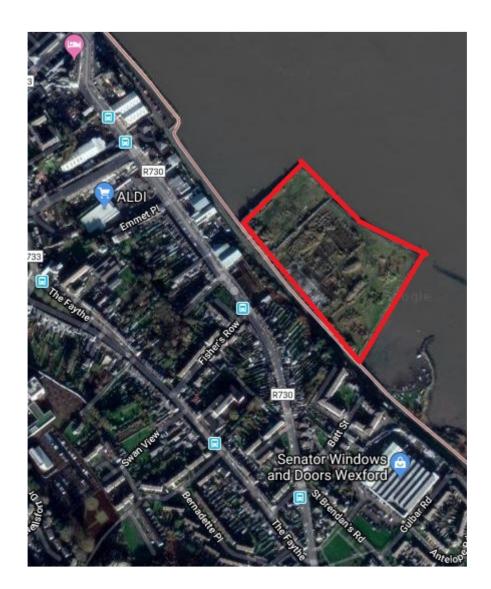
- Undertake a targeted intrusive investigation comprising trail pits and / or slit trenches to determine the extent of any possible asbestos in the fill material and below floor slabs across the site. The SI should be scoped to cause the minimal amount of disturbance to any surface ACMs identified and all suitable control measures implemented to prevent exposure to asbestos throughout the works. The investigation should only be undertaken and supervised by personnel suitably qualified to work with asbestos on site of this nature and should include representative sampling for asbestos ID screening as appropriate.
- Develop a remedial strategy for the site upon completion of the investigations to
 outline works required to mitigate the risks associated with the asbestos
 contamination identified and to prevent the potential release of asbestos fibres
 during the proposed development works. It is advised that the contractor appointed
 to undertake the remedial programme is appropriately qualified and experienced to
 work with asbestos.
- Ensure all mitigation measures proposed by the contractor to prevent the spread of asbestos or risk of fibre release and all associated remedial works implemented are independently validated prior to proceeding with the redevelopment of the site.

It is also recommended that any further works to be completed as part of the geotechnical investigation are not permitted to proceed until remedial measures are instigated. This will ensure that the spread any potential exposure to the ACMs is minimised. All remedial works must be undertaken by a suitably qualified asbestos contractor and a method statement and evidence of competences provided in advance. Field staff should also ensure that they have received the appropriate accredited training for working with asbestos in soils prior to resuming the Geotech works and all entities involved in the works should hold appropriate PI insurance for working with asbestos.



FIGURES





Job Title: Trinity Wharf, Wexford

Drawing Title: Figure 1 – Site Location Plan (Copyright googlemaps.co.uk)



SITE

Trinity Wharf Wexford

LEGEND



Site boundary



Sample Location



Areas impacted by asbestos cement debris



Main areas impacted by asbestos floor tiles



Stockpiles of C&D rubble

TITLE

SAMPLE LOCATIONS AND AREAS IMPACTED WITH ACMS



Drawn by:	Date drawn:	Scale
BOR	Oct 2018	NTS

 Report No.
 Page No.

 602393 (00)
 01 of 01



APPENDIX A SERVICE CONSTRAINTS

RSK IRELAND LIMITED SERVICE CONSTRAINTS

- 1. This report and the site investigation carried out in connection with the report (together the "Services") were compiled and carried out by RSK Ireland Limited (RSK) for Wexford County Council (the "client") in accordance with the terms of a contract between RSK and the "client", dated January 2018. The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable environmental consultant at the time the Services were performed. Further, and, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.
- Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.
- 3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.
- 4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK 's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client
- 5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.
- 6. The observations and conclusions described in this report are based solely upon the Services which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.
- 7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.
- 8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition, chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.
- 9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site.



APPENDIX B HISTORICAL MAP REVIEW





Job Title: Trinity Wharf, Wexford

Drawing Title: Map 1 – 1837-1842 (Copyright OSI)

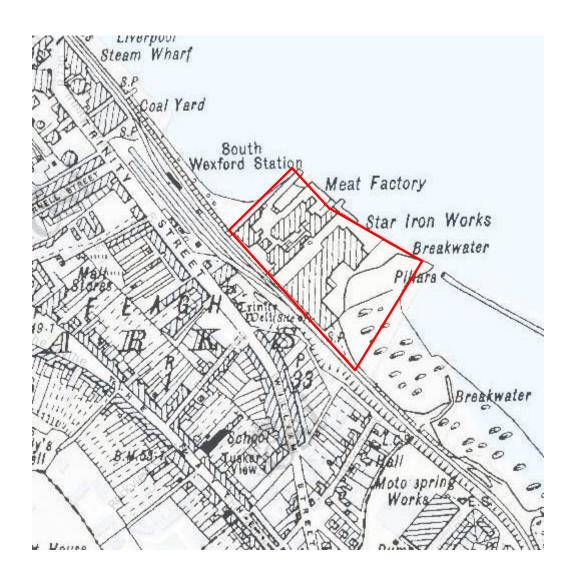




Job Title: Trinity Wharf, Wexford

Drawing Title: Map 2 – 1888-1913 (Copyright OSI)





Job Title: Trinity Wharf, Wexford

Drawing Title: Map 3 – Cassini c. 1940s (Copyright OSI)





Job Title: Trinity Wharf, Wexford

Drawing Title: Map 4 – 1995 (Copyright OSI)





Job Number: 602393 (00)

Job Title: Trinity Wharf, Wexford

Drawing Title: Map 5 – 2000 (Copyright OSI)

Date: October 2018





Job Number: 602393 (00)

Job Title: Trinity Wharf, Wexford

Drawing Title: Map 6 – 2005 (Copyright OSI)

Date: October 2018



APPENDIX C LABORATORY RESULTS



Unit B9, Inspire Business Park, 16 Carrowreagh Road, Dundonald, BT16 1QT | T: 028 90484905 | M: 07974 264204 | E: iharper@qcni.co.uk

Bulk sample analysis & asbestos identification by stereo microscopy and polarised light microscopy with dispersion staining as described in the current HSG248, Appendix 2 and in-house method SOP 01. Quality Consultants (NI) Ltd accepts responsibility only for results obtained from samples received. No responsibility is accepted for the information provided by the client or any errors that may have arisen during their sampling (such as origin or homogeneity) or transportation procedures. Opinions, interpretations and comments regarding density, appearance, material type and classification (or other) expressed herein are outside the scope of our UKAS accreditation. NADIS = No asbestos detected in sample. All samples will be retained for a minimum of six months unless the client requests alternative arrangements.

Client and Site Details						
Client Details	RSK 48 Newforge Lane, Belfast, BT9 5NW					
Site Details	Trinity Wharf					

		Job Details		
Samples Submitted By	No of samples received	Report No	Issue No	Client Order/Ref No.
RSK	07	BA9255	1.0	602393
Date Samples Received	Date of Analysis	Analysed By	Authorised By	Date Authorised
23.10.18	24.10.18	Alan Mayes	Alan Mayes	24.10.18

	Sample Details and Analysis Results										
Client Sample No.	Laboratory Sample No.	Client Sample Details	Material Type	Asbestos Type(s) Identified							
01	BA9255/01	Beige floor tile	Thermoplastic and bitumen	Chrysotile detected in tile and bitumen							
02	BA9255/02	Cement roof tile	Cement	NADIS							
03	BA9255/03	Grey floor tile	Thermoplastic	NADIS							
04	BA9255/04	AC fragment	Cement	Chrysotile							
05	BA9255/05	AC fragment	Cement	Chrysotile							
06	BA9255/06	Floor tile debris	Thermoplastic and bitumen	Chrysotile detected in tile and bitumen							
07	BA9255/07	AC debris (flat)	Cement	Chrysotile							

Authorising Signature	Position	Date Issued
A May	Senior Analyst	24.10.18



APPENDIX D SITE PHOTOLOG



PHOTOGRAPHIC LOG

Client Name:

Site Location:

Wexford County Council

Trinity Wharf, Wexford

Preliminary Asbestos Walkover

Photo No.

Date: 19/10/18

Direction Photo

taken: N/A

Description:

S01. Fragments of floor tiles within rubble



Photo No. 2 **Date:** 19/10/18

Direction Photo taken:

SW

Description:

S04.

AC debris adjacent TP-04





PHOTOGRAPHIC LOG

Client Name:

Site Location:

Wexford County Council

Trinity Wharf, Wexford

Preliminary Asbestos Walkover

Photo No. 3

Date: 22/11/17

Direction Photo

taken:

South

Description:

S05 Small scattered fragments of AC to gravel path



Photo No. 4

Date:

19/10/18

Direction Photo taken:

Description:

S06 Floor tiles in situ and damaged fragments scattered throughout area. Area also significantly contaminated with AC





Wexford County Council

PHOTOGRAPHIC LOG

Client Name:

Site Location:

Trinity Wharf, Wexford

Preliminary Asbestos Walkover

Photo No. 5

Date: 19/10/18

Direction Photo taken:

South

Description:

S07 Sporatic fragments of AC (flat profile) to edge of floor slab along SW boundary



Photo No.

Date: 19/10/18

Direction Photo taken:

N/A

Description:

Badly damaged asbestos floor tiles





PHOTOGRAPHIC LOG

Client Name:

Wexford County Council

Site Location:

Trinity Wharf, Wexford

Preliminary Asbestos Walkover

Photo No. 7 **Date:** 19/10/18

Direction Photo taken:

North

Description:

AC debris along edges of hardstanding / former floor slab



Photo No. 8 **Date:** 19/10/18

Direction Photo taken:

West

Description:

AC debris along edge of hardstanding / adjacent large stockpile on rear side of wall





PHOTOGRAPHIC LOG

Client Name:

Site Location:

Wexford County Council

Trinity Wharf, Wexford

Preliminary Asbestos Walkover

Photo No.

Date: 19/10/18

Direction Photo

taken:

East

Description:

AC debris to edge of large stockpile



Photo No. 10 **Date:** 19/10/18

Direction Photo taken:

NE

Description:

AC debris to stockpile in NW corner of the site



Appendix 8.2 Kavanagh Mansfield and Partners Site Investigation



WEXFORD HARBOUR TRINITY WHARF DEVELOPMENT

Kavanagh Mansfield & Ptns Consulting Engineers

CONTENTS

I	INTRODUCTION
П	FIELDWORK
Ш	TESTING
IV	DISCUSSION

APPENDICES

I	BOREHOLE RECORDS
II	CORE DRILLING RECORDS
III	GEOTECHNICAL LABORATORY TEST DATA
IV	ENVIRONMENTAL LABORATORY DATA
IV	SITE LOCATION PLAN / SECTIONS

FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

General.

Recommendations made, and opinions expressed in the 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 for conditions which have not been revealed by exploratory work, or which occur between exploratory hole locations. Whilst the report may suggest the likely configuration of strata, both between exploratory hole locations, or below the maximum depth of the investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

Boring Procedures.

Unless otherwise stated, the 'Shell and Auger' technique of soft ground boring has been employed. All boring operations sampling and/or logging of soils and in-situ testing complies with the recommendations of the British Standard Code of Practice BS 5930 (1981), 'Site Investigation' and BS 1377:1990, 'Methods of test for soils for civil engineering purposes'.

Whilst the technique allows the maximum data to be obtained in soft ground, some disturbance and variation of soft and layered soils is unavoidable. Attention is drawn to this condition, whenever it is suspected. Where cobbles and boulders are recorded, no conclusion should be drawn concerning the size, presence, lithological nature, or numbers per unit volume of ground.

Where peat has been encountered during siteworks, samples have been logged in accordance with the Von Post Classification (ref. Von Post, L. 1992. Sveriges Gologiska Undersoknings torvinventering och nogra av dess hittils vunna resultat (SGU peat inventory and some preliminary results) Svenska-Mosskulturforeningens Tidskrift, Jonkoping, Swedden, 36, 1-37 & Hobbs N. B. Mire morphology and the properties of some British and foreign peats. QJEG, Vol. 19, 1986).

Routine Sampling.

Undisturbed samples of soils, predominantly cohesive in nature are obtained unless otherwise stated by a 104mm diameter open-drive tube sampler. In granular soils, and where undisturbed sampling is inappropriate, disturbed samples are collected. Smaller disturbed samples are also recovered at intervals to allow a visual examination of the full strata section.

In-Situ Testing.

Standard penetration tests, utilising either the standard split spoon sampler or solid cone and automatic trip-hammer are conducted unless otherwise where required by instruction. Subsequent to a seating drive of 150mm, a summation for the number of blows for 300mm penetration is recorded on the boring records together with the blow count for each 75mm penetration. In cases where incomplete penetration is obtained, the number of blows for the recorded value of penetration are noted. In coarse granular soils, a cone end is fitted to the sampler and a similar procedure adopted.

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 condition, tidal variation or other causes.

Retention of Samples.

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded unless a period of retention of samples is agreed, it is our normal practice to discard all soil samples one month after submission of our final report.

REPORT ON A SITE INVESTIGATION FOR A DEVELOPMENT AT TRINITY WHARF WEXFORD

DEERLAND CONSTRUCTION LTD

KAVANAGH MANSFIELD AND PARTNERS CONSULTING ENGINEERS

Report No. 13184

JANUARY 2008

1 Introduction

A major commercial development is being undertaken on a site at Trinity Wharf in Wexford. The site developers, Deerland Construction Limited, have ordered a comprehensive examination of sub-soil and bedrock conditions over the site area. This investigation was directed by Kavanagh Mansfield and Partners, Consulting Engineers, and carried out by IGSL in November/December 2007.

The proposed development includes reclamation of a large area of foreshore as well as the onshore development of the site formerly occupied by a motor assembly plant.

The programme of the investigation envisaged the construction of Cable Percussion Boreholes and Rotary Core Holes to establish geotechnical criteria on which to base foundation design. A number of scheduled exploratory locations were over tidal water and were to be constructed from a Jack Up drilling platform.

Delays have been experienced in obtaining foreshore licenses and the marine operations have been deferred. On land an area of the site was classified as "an area of natural habitat" and investigation here was also postponed pending receipt of permission from the appropriate authorities.

Page 1

A programme of laboratory testing to establish geotechnical soil parameters was prepared by IGSL and laboratory testing was carried out at IGSL's Accredited laboratory immediately following site operations. A preliminary appraisal of environmental/contamination issues has also been carried out, with laboratory testing carried out by Alcontrol Geochem. Analysis was carried out to Murphy Suite requirements.

This report presents all factual data pertaining to the project and comments on the findings relative to construction of the land based segment of the development.

II Fieldwork

The site is located off Trinity Street in Wexford, comprising existing reclaimed land in Wexford harbour, formerly occupied by a major motor assembly operation. This reclaimed area is bounded on three sides by Wexford Harbour with an existing sea wall protecting the reclaimed lands. The main Wexford to Rosslare railway line forms part of the main land boundary. The site is reasonably level, ground level is taken as zero for the purposes of discussion in this report.

Demolition of the old industrial buildings has taken place, reinforced concrete ground floor slabs cover much of the site. Access to the site was secure and Deerland Construction Ltd. arranged for temporary access for drilling equipment, via a Railway Crossing, for the duration of the investigation.

A site location map and a detailed borehole and corehole layout is enclosed in Appendix V to this report. All exploratory locations were determined by Kavanagh Mansfield and Partners and marked out by site personnel for IGSL using the national grid co-ordinates provided. Access to some locations was not possible during this phase of works. Some additional boreholes were scheduled to provide in-fill data where it was indicated by the scheduled boreholes.

a.Boreholes

The exploratory holes were bored with conventional 200mm cable-tool methods using a Dando Exploratory Rig. A total of thirteen boreholes were constructed.

Detailed geotechnical records are contained in Appendix I to this report - the records give details of stratification, sampling, in-situ testing and groundwater. Note is also taken of any obstructions to normal boring requiring the use of the heavy chisel for advancement.

Page 2

The boreholes typically encounter surface deposits of made ground overlying varying loose or soft strata of sand, clay or silt. Firm to stiff brown sandy clay or silt is then typically encountered, continuing to refusal on dense highly weathered rock (weathered to a dense coarse angular gravel consistency). Borehole refusal depths range from about 4.00 metres BGL at the south eastern end of the site (close to the railway line) to in excess of 17.00 metres in the centre of the site at BH 16.

Standpipes have been installed in three borehole locations to facilitate long term water observation. Ground water has been noted at about 2.00 metres in all locations. Tidal variation can be expected. Water strikes have also been observed in the lower dense gravel / weathered rock stratum.

Sections through the boreholes have been prepared and clearly identify the pattern of stratification across the site.

b. Coreholes

A Top-Drive rotary core drill was mobilised to drill and recover rock core at eight scheduled locations. An air mist flush was employed with standard triple tube technique. Open Hole Symmetrix Drilling was used in the overburden, with standard penetration tests carried out as instructed. Diamond core drilling was used in the bedrock, rock core was recovered at all locations.

Core was recovered and placed in timber boxes and returned to IGSL for detailed geotechnical logging. These records are contained in Appendix II to this report.

The bedrock is typically weak to moderately strong grey heavily weathered limestone / mudstone. The rock is typically thinly bedded with clay staining on many joints. In the weak weathered rock, standard penetration tests have been carried out to give an indication of in situ rock strength. The rock core findings can be summarised as follows:

Overburden	Weathered Rock	Solid Rock
80		
0 - 10.20	10.20 - 11.50	11.50 - 17.00
0 - 9.80	9.80 - 10.20	10.20 - 15.20
0 - 11.50	11.50 - 22.00	
0 - 10.90	10.90 - 11.50	11.50 - 16.50
0 - 9.20	9.20 - 17.00	
0 - 10.40	10.40 - 16.00	
0 - 5.00	5.00 - 7.00	7.00 - 12.60
0 - 15.40	15.40 - 16.00	16.00 - 21.00
	0 - 10.20 0 - 9.80 0 - 11.50 0 - 10.90 0 - 9.20 0 - 10.40 0 - 5.00	$\begin{array}{ccccc} 0-10.20 & 10.20-11.50 \\ 0-9.80 & 9.80-10.20 \\ 0-11.50 & 11.50-22.00 \\ 0-10.90 & 10.90-11.50 \\ 0-9.20 & 9.20-17.00 \\ 0-10.40 & 10.40-16.00 \\ 0-5.00 & 5.00-7.00 \end{array}$

Standpipes have been installed in RC 09, RC 13 and RC 15.

Page 3

III Testing

(a) In-Situ:

Standard penetration tests were carried out at approximate 1.00 metre intervals in the geotechnical boreholes to measure relative in-situ soil strength. SPT tests have also been carried out in the rotary core holes. N values are noted in the right hand column of the records, representing the blow count required to drive the standard sampler 300mm into the soil, following initial seating blows.

Several limited penetration tests and refusals were recorded on cobbles or boulders in the overburden or on the weathered bedrock

The results of the tests are summarised as follows:

STRATUM	N VALUE RANGI	E COMMENT
Made Ground	9 to 48	Variable (Loose to Dense)
Alluvial Silt/Sand	5 to 19	Loose to medium Dense
Grey Brown Clay	14 to 46	Firm to Stiff
Gravel	8 to 40	Loose to Dense
Weathered Rock	+ 50 to Refusal	Weak Rock

Numerous limited penetration tests were recorded in the base stratum presumed to be the highly weathered thinly bedded limestone.

(b) Laboratory:

All geotechnical samples from the boreholes have been returned to the IGSL laboratory for initial visual inspection, a schedule of testing was prepared and tests as scheduled carried out.

Samples of the made ground were selected for detailed environmental analysis and sent to Alcontrol Ltd. Testing was in accordance with "Murphy Suite" which determines the suitability of the soils for acceptance into licensed landfill facilities.

Geotechnical laboratory data is presented in Appendix III and environmental results in Appendix IV.

Page 4

Geotechnical Testing

The geotechnical tests have been carried out in accordance with BS1377 Part 2: 1990 and consisted of the following:

- a. Classification (Liquid and Plastic Limits)
- b. Grading Analysis (Wet sieve/ Hydrometer)
- c. Triaxial Compression
- d. Consolidation
- e. Sulphate and pH determination

Classification:

The liquid and plastic limits for samples of the cohesive soil from each borehole have determined. Results are tabulated and plotted on the standard Classification Chart. The tests in the main indicate that the gravelly clay stratum encountered in almost all locations if of low to intermediate (occasionally high) plasticity. In some instances plots below the "A" line suggest that the soil matrix be classified as silt.

Gradings:

The particle size distribution curves for the various strata have been established by wet sieve analysis for coarse material and by wet sieve and hydrometer for the finer material. Results are presented graphically. The gravelly clay stratum has typically evenly distributed straight line grading from the clay to the gravel fraction. The coarse base gravel/weathered rock is typically graded in the sand gravel fraction while the alluvial material underlying the fill typically grades as a fine slightly gravelly (shelly) sand.

Triaxial:

The cohesive strength and behavioural characteristics of undisturbed samples has been determined by consolidated un-drained triaxial compression test, with pore water pressure measurement.

Consolidation:

The consolidation characteristics of the four samples (above) have also been established by long term analysis under a pressure range from 12.5 to 200 kN/sq.m. The results indicate the anticipated rate and extent of settlement under load.

Sulphate and pH:

Chemical analysis has been carried out on several selected samples to establish soluble sulphate concentration and acidity in soil. While sulphate concentrations generally fell into Class I, high values were noted particularly in samples from BH 4 and BH 11.

Environmental Testing:

The results of Murphy Suite testing are contained in Appendix IV. This preliminary testing regime was carried out by Alcontrol Ltd. on seven samples selected at random from the made ground deposits.

These results reflect some elevated levels, particularly for PAHs and for Sulphates. In general low to moderate levels of contamination have been noted.

Additional sampling and analysis will be scheduled following detailed assessment of the current data.

Page 6

IV: Discussion:

The proposed commercial/retail development at Wexford will involve construction over basement on the old motor assembly site located on reclaimed ground east of the main Dublin Rosslare Railway Line at Trinity Street, Wexford.

Reclamation of part of the foreshore of Wexford Harbour adjoining the above area is also proposed. Access to the development will be via a new bridge over the railway from Trinity Street.

A detailed investigation of ground conditions on the site has been carried out for Deerland Construction Ltd. This investigation was directed by Kavanagh Mansfield and Partners, Consulting Engineers for the project.

Conventional cable percussion methods were used to bore in overburden and rotary core drilling was carried out in the bedrock. Geotechnical and environmental laboratory analysis was also carried out to confirm design parameters.

The investigation has confirmed the following pattern of stratification:

MADE GROUND ALLUVIUM Gravely CLAY Dense GRAVEL Weathered ROCK

The made ground varies in thickness from 150 to 4.00 metres and overlies loose organic sand or clay (alluvial deposits). The deepest area of alluvium is noted at BH 14 where it extends to almost 5.00 metres.

Firm to stiff gravelly clay (boulder clay) is then encountered. This stratum varies in thickness but extends to a maximum depth of about 17.00 metres at BH 16.

Dense gravel/weathered mudstone or limestone is finally encountered, the horizon of the weathered rock is relatively close to the surface at the southern end close to the railway at about 3.00 metres BGL deepening to in excess of 17 metres eastwards towards the estuary.

The rock quality across the site area is extremely variable. Triple tube rotary core drilling has been employed with good quality core of Limestone/Mudstone recovered in several boreholes. Highly weathered (residual) mudstone has however been encountered in a number of locations with very low solid recovery recorded. The particular locations showing deep weathering are RC 07, RC 10 and RC 13.

Several sections through the various boreholes have been provided, clearly indicating the variations in stratification and rock profile. Further variations are possible between the borehole positions.

The development is understood to incorporate basement construction over much of the footprint with an assumed formation 3.00 metres below existing ground level. Piling techniques are to be adopted to support structural and floor loads.

The basement excavation will be mainly in made ground deposits, with alluvium present over at least part of the site where fill is shallowest. Ground water ingress has been recorded at about 2.00 metres, however with tidal variation a design water level at or close to ground level should be adopted.

PILING

High column loads are envisaged for this development. The presence of weathered shaley limestone or mudstone underlying the site suggests that this would be the preferred medium for pile formation.

Rock at the southern corner of the site is at or about 4.00 to 5.00 metres and consideration could be given to direct excavation for column bases in this area, given that 3.00 metres may be excavated for the basement.

Over the remainder of the site rock head ranges from about 10.00 to 17.00 metres BGL. The quality of the rock varies as indicated on the detailed core logs and in some locations highly weathered mudstone extends to depths in excess of 17 metres.

We would suggest that where large diameter bored piles are used a penetration of 2.00 to 3.00 metres of sound rock should be achieved. In the highly weathered rock penetration of the order of 5.00 to 6.00 metres would be expected to ensure uniformity. A 900mm diameter bored pile could support about 300 tonnes.

Where pre-cast concrete piles are proposed, these should incorporate a rock shoe and be driven to refusal in the weathered rock material. Maximum pile loading for driven concrete piles will be about 150 tonnes.

Specialist piling contractors should be consulted to provide detailed design proposals based on the data contained in this report.

Basement Excavation and Ground Water

Basement construction to a depth of 3.00 metres or so is proposed for at least part of the site area. Ground water (tidally related) is anticipated. Consideration can be given to cofferdam construction (probably in segments) using the stiff gravelly clay as a seal for either traditional steel sheet piles or secant piles. This should effectively provide a sufficient seal against ground water to permit basement construction.

Page 8

A final standing water level at or about ground level should be assumed (assuming flood or high spring tides) in design against uplift. Resistance to up-lift can be accommodated by the base slab and by utilising the bearing piles as anchors. The use of rock anchors may be also appropriate.

Disposal of Excavated Material

A preliminary assessment of environmental issues relating to the made ground and to earlier site usage has been carried out. Elevated levels of PAHs and Sulphates were noted and these may raise difficulties in disposal of excavated material to landfill.

The use of the excavated material in reclamation of part of the foreshore will be subject to Department of Marine regulations. These regulations are considerably more stringent that normal, testing to the Department's requirements involves samples being shipped to a specialist UK laboratory.

Specialist environmental experts should be consulted for advice on the issues outlined above.

Additional Works

Further borehole and corehole investigation is to be carried out in the special conservation area in the south-east of the site. During this site visit additional environmental sampling using trial pit excavation can be scheduled.

The low core recovery in some locations using traditional triple tube techniques has been noted. More sophisticated core drilling using GEOBORE "S" technology with MUD flush will ensure recovery of the weak bedrock and would be of use in assessing requirements for pile lengths.

Additional environmental laboratory analysis will be required to satisfy both landfill requirements and foreshore reclamation. Ground water sampling if required can be carried out from existing standpipes.

IGSL LTD/JC JANUARY 2008 **Appendix I – Cable Tool Borehole Records**

GEOTECHNICAL BORING RECORD

13184

REPORT NUMBER

(IGSL BOREHOLE NO. BH3 CONTRACT Trinity Wharf, Wexford Sheet 1 of 1 SHEET GROUND LEVEL (m) DATE STARTED 16/11/2007 CO-ORDINATES(_) 109,000.00 E DATE COMPLETED 17/11/2007 BOREHOLE DIAMETER (mm) 200 9.80 **BOREHOLE DEPTH (m) BORED BY** T.McCarthy **Deerland Properties** CLIENT PROCESSED BY Taras 9.80 CASING DEPTH (m) Kavanagh Mansfield ENGINEER Samples Depth (m) Ref. Number Field Test Depth (m) Description Results MADE GROUND (comprised of gravel, rubble, clay, N = 15 3737 0.50 (2, 3, 6, 4, 2, 3)N = 93738 1.50 (1, 2, 2, 3, 2, 2) 2.20 Soft brown sandy CLAY/SILT 12 blows 3739 2.50 3.00 Loose grey silty SAND 3740 3.05 3.30 Stiff brown very gravelly CLAY (Possibly claybound 3741 3.50 0-40 A N = 243742 4.50 (2, 4, 4, 8, 5, 7) N = 403743 5.50 (3, 4, 11, 14, 9, 6) 5.80 Medium dense to dense dark brown silty/clayey GRAVEL with cobbles (Possibly very gravelly clay) N = 233744 6.50 (2, 4, 4, 7, 7, 5)N = 387.50 3745 В (3, 8, 10, 12, 9, 7) N = 298.50 3746 В (4, 6, 7, 6, 7, 9)9.20 Angular cobbles and boulders N = 50/20 mm9.50 3747 (17, 8, 50) 9.80 End of Borehole at 9.80 m HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Rise To Comments From (m) To (m) Strike Depth 1.90 3.60 Moderate 2.20 9.20 2.20 0.75 Rapid 9.20 8.4 0.5 8.2 9.8 9.5 GROUNDWATER DETAILS Casing Comments Date **INSTALLATION DETAILS** Depth Depth End of boring 17-11-07 0.00 Date | Tip Depth RZ Top | RZ Base 9.80 Sample Legend
D+ Smell Disturbed (tub)
B+ Bulk Disturbed
LB- Large Bulk Disturbed
Env - Environmental Sample REMARKS

2	D)			GEC	TECHNI	CAL	BOR	ING	RECO	ORD			REPORT NUMBER	
_	$\underline{\hspace{1cm}}$										BOD	EHOLE N	O. BH4	
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Depui (iii)			Des	scription			Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standpipe Details
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2	Soft groupper h	ey slightly lorizons)	y sandy \$	SILT (with so	me fill in the	XXXX			1.40	3718	В	2.00	N = 9 (1, 2, 3, 2, 2, 2)	
з	Firm lig	ht brown	sandy (CLAY: .: L'wi	ith some grav	/el = -	<u> </u>		3.20	3719	В	3.00	N = 8 (1, 1, 2, 1, 2, 3)	
4	Firm or	angich h	rown CL	AV		7. 1. 1. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.			4.60	3720	8	4.00	N = 16 (2, 3, 4, 3, 4, 5)	
5	Fillio	angisii b	iowii oc	AY: J						3721	υ	5.00	45 blows	
						1,1,5				3722	υ	5.50	40 blows	
7	Very st cobble		very gra	velly CLAY w	vith frequent	- Parker			6.20	3723	В	6.50	N = 34 (4, 5, 6, 9, 10, 9)	
8					•	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1			1	3724	В	7.50	N = 46 (3, 8, 10, 10, 12, 14)	
9						7-7-7-89-1-1- 3-7-7-7-89-1-1-			9.20	3725	В	8.50	N = 37 (4, 6, 9, 10, 11, 7)	
			s and bo				300		9.80					
H	<u>i End of</u> ARD STF	Borehol	<u>e at 9.80</u>)RING/CI	m HISELLING			WAT	ER STI	RIKE DE	TAILS				
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IGSL

GEOTECHNICAL BORING RECORD

13184

REPORT NUMBER

	381		•	GEC	TECHNICA	AL BORI	NG	i REC	ORD			13184	
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O -	ORDINATES(_) 1,150.00 E GROUND L						n)			DATE	STARTI	ED 15/11/2007	
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in index			De	escription		Legend		Elevation Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standpipe Details
	MADE (clay)	GROU	ND (comp	orised of stone	, gravel, rubble,				3726	В	0.50	N = 18 (2, 4, 4, 3, 6, 5)	
2					×				3727	В	1.50	N = 13 (2, 3, 3, 4, 3, 3)	
,									3728	В	2.50	N = 33 (1, 4, 9, 13, 7, 4)	
			- O# T		.,			4.10	3729	В	3.50	N = 8 (2, 2, 3, 2, 1, 2)	
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	Very sti occasio	ff light l nal col	brown ve obles	ery gravelly CL	AY with	00		6.40	3733	В	6,50	N = 37 (3, 5, 6, 12, 9, 10)	
									3734	В	7.50	N = 33 (4, 4, 6, 7, 8, 12)	
8									3735	В	8.50	N = 39 (3, 6, 8, 10, 10, 11)	
	Angula	r cobbl	es and b	oulders		00		9.40	3736	8	9.50	N = 50/235 mm (5, 8, 6, 10, 19, 15	
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GEOTECHNICAL BORING RECORD

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GEOTECHNICAL BORING RECORD

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ONTRA	CT Trir	nity Whar	f, Wexford								REHOLE NO		
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6					13					i.			
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Der	nse angula	ır grey silt	y GRAVEL			Oxo Oxo		9.40	3758	B	9.50	N = 50/235 mm (2, 2, 3, 5, 17, 25)	
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Date	07 4.00	1.00			-	<u> </u>		Sar o-s-	nple Legen nal Deturbed (tab di Daturbed arge Bulk Disturbi Environmental Se	nd)		Undisturbed 100mm Diameter mole Undisturbed Piston Sample	

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NST		ION DET			III 0 I			Hole	Casing Depth	Depth to Water	Comn	nents	
П	ale	Tip Depth 4.00	RZ Top										

REMARKS

Sample Legend
D - Small Disturbed (Mb)
B - Small Disturbed
LB - Large Bluk Disturbed
Limi - Emvironmental Sample (Jer + Visi + Tub)

U - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample IGSL

GEOTECHNICAL BORING RECORD

REPORT NUMBER

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ON	TRAC	ग ।	rinity W	harf,	, Wexfo	rd								BORI SHEE	EHOLE N	IO. BH9 Sheet 1 of 1	
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/m/ made					scriptio				Legend		Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Results	Standpipe
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												9	7714	В	1.50	N = 14 (3, 3, 4, 4, 3, 3)	
	Firm	grey br	own san	idy g	jravelly	SILT			χ _ω , χ	x x		2.10	7715	В	2.50	N = 10 (1, 2, 3, 2, 2, 3)	
									× × ×	×			7716	В	3.00]
									××°×	×c			7717	В	3.50	N = 11 (2, 2, 2, 3, 3, 3)	
	Firm	to stiff	brown s	andy	gravel	y CLAY	<u> </u>	7	XOXX XXX XOXX	× × ×		4.00	7718	В	4.50	N = 14 (1, 3, 3, 4, 4, 3)	
									X X X	×c × × ×			7719	В	5.50	N = 19 (2, 4, 6, 5, 4, 4)	
								<u> </u>	× _{o×} ,×	× × ×			7720	В	6.50	N = 21 (3, 4, 4, 4, 5, 8)	
									× × ×	×с ×с			7721	8	7.50	N = 18 (2, 4, 3, 4, 6, 5)	
, -	Davis		b		OD4	MEL wi	th ook	oles and	XOX. X	× o		9.00	7722	В	8.50	N = 18 (3, 3, 4, 5, 5, 4)	
	bould	lers				14 C W	III CODE	iles al lu		X X		10.10	7723	B	9.50	N = 50/115 mm (5, 11, 19, 31)	
	ENO (פוסם וע	hole at	iU. I	V III												
1A	RD ST	RATA	BORING		IISELLI	NG							TAILS				-
om	(m)	To (m)	Tim (h)		Comme	ents		_		ater ike	Casi	ng th	Sealed At	Rise To	Time (min)	Comments	
6. 8. 9.	9	1.3 7.1 8.4 10.1	0.75 0.5 0.5 2	5					2.	00	2.0 9.0	0		1.80 3.70		Slow Moderate	
									GRO	DUND				PR 48 1			
	Date Tip Depth RZ Top RZ Base Type								ate 11-07	De	ole epth .00	ETAILS Casing Depth 9.00	Depth to Water 7.40		ments of Day		
EN	MARKS										3	Sam D Smi B Bull LB - La Env - E	ple Legen all Disturbed (tub) t Disturbed rge Bulk Disturbe nylromental San	CI) id ngle (Jar + Vial +	Tub)	I - Undsturbed 100mm Diameter ample - Undsturbed Piston Sample	

11.4	
(IGSL)	ľ

GEOTECHNICAL BORING RECORD

REPORT NUMBER

1219/

(IGSL)								13104	
CONTRACT T	rinity Wharf, Wexford						REHOLE N		
	98		N 1 22 22 4 4 4 4			SHE		Sheet 1 of 1	_
O-ORDINATES(1,030.00 E 0,990.00 N		DLEVEL (m) DLE DIAMET		200		TE STARTI		
	eerland Properties	1	OLE DEPTH ((m)	10.10		RED BY	T.McCarthy	
INGINEER K	avanagh Mansfield	CASING	DEPTH (m)		10.10	Sample	CESSED	BY F.C	_
	Description		Legend	Elevation	Depth (m) Ref.		Depth (m)	Field Test Results	Chandaina
				프	S 2	S S Z	35		ď
	UND (comprised of tarmac	over hardcore			774	5 B	0.50	N = 13 (3, 3, 4, 3, 4, 2)	
	rey/brown CLAY with some	boulders		1	774	6 B	1.50	N = 10 (1, 2, 2, 3, 2, 3)	
2					774	7 . B	2.50	N = 17 (2, 3, 3, 6, 4, 4)	
,					774	ВВ	3.00		
					774	9 B	3.50	N = 18 (3, 4, 4, 5, 4, 5)	
					775	0 B	4.50	N = 35 (2, 5, 9, 12, 8, 6)	
					775	1 B	5.50	N = 35 (3, 4, 4, 10, 13, 8)	
					NR	U U	6.00		
Medium den	se brown clayey fine to coa	rse GRAVEL	0000	6	.90	2 B	6.5 0	N = 28 (4, 7, 9, 6, 6, 7)	
			0000		775	3 B	7.50	N = 24 (3, 5, 6, 5, 7, 6)	
Dense grey boulders	brown angular GRAVEL wit	in coddies and		"	775	4 B	8.50	N = 32 (4, 5, 7, 7, 8, 10)	
10	hole at 10.10 m		00	11	0.10	4		N = 50/115 mm (6, 10, 17, 33)	
			9.5						
HARD STRATA	BORING/CHISELLING				DETAILS	Dies	Time		_
om (m) To (m) 5.8 5.9	10		Water Strike	Casing	Sealed At	То	(min)	Comments	_
5.8 7.2 7.4 9.7 10.1	0.25 0.5 2		6.90	6.90		5.80		Moderate	
				DWATER	DETAILS	no Bost	to		
NSTALLATION		Time	Date	Der		ng Depth th Wate	to Comm	nents	
Date Tip C	Depth RZ Top RZ Base	Туре							
REMARKS				9	Sample Leg	end (No)	U	- Lindisturbed 100mm Diameter	
					B - Large Bulk Dist nv - Emironments	turbed Sample (Jar + Vial	Sa (+ Tydo)	emple - Undisturbed Piston Sample	



GEOTECHNICAL BORING RECORD

REPORT NUMBER

13184 BOREHOLE NO. **BH12** CONTRACT Trinity Wharf, Wexford SHEET Sheet 1 of 2 GROUND LEVEL (m) 29/11/2007 CO-ORDINATES(_) 1,070.00 E 1,000.00 N DATE STARTED DATE COMPLETED 30/11/2007 BOREHOLE DIAMETER (mm) 200 BOREHOLE DEPTH (m) 13.90 **BORED BY** T.McCarthy CLIENT **Deerland Properties** CASING DEPTH (m) PROCESSED BY F.C 13.90 ENGINEER Kavanagh Mansfield Samples Standpipe Details Ref. Number Field Test Description Depth (m) Results MADE GROUND (comprised of concrete,rubble,hardcore) N = 32 (3, 4, 8, 11, 7, 6) 7723 В 0.50 N = 50/115 mm(19, 6, 18, 32) 2.40 Soft grey slightly sandy SILT N = 147724 В 2.50 (2, 3, 3, 4, 3, 4) 2.90 Medium dense orange/brown silty SAND with some N = 147725 В 3.50 (1, 3, 4, 4, 3, 3) N = 114.50 Firm to stiff orange/brown CLAY/SILT 7726 В 4.50 (2, 2, 3, 2, 3, 3) N = 297727 В 5.50 (3, 5, 6, 7, 7, 9)N = 377728 В 6.50 (4, 7, 8, 8, 10, 11) 7.40 Stiff black SILT/CLAY N = 247729 В 7.50 (3, 4, 6, 5, 6, 7) NR 8.00 U N = 278.50 7730 В (2, 4, 5, 7, 8, 7) N = 367731 В 9.50 (4, 6, 7, 9, 10, 10) N = 297732 В 10.50 (2, 4, 6, 6, 8, 9) HARD STRATA BORING/CHISELLING WATER STRIKE DETAILS Water Casing | Sealed Comments From (m) To (m) Comments Strike Depth To (min) Moderate 2.20 2.5 2 2.60 2.60 13.9 13.4 **GROUNDWATER DETAILS** Hole Casing Depth Depth Depth to Water Comments INSTALLATION DETAILS Date Date | Tip Depth RZ Top RZ Base REMARKS U - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample

00	asr)		GEOTI	ECHNICA	AL BORI	NG RE	CO	RD			REPORT NUMBER	1
CON	TRACT :	Trinity W	harf, Wexford		io-io				- 1	OREHOLE		
CO-	ORDINATES	(_) 1	,070.00 E ,000.00 N		ID LEVEL (n	•) 2	200	D	HEET ATE START ATE COMP		
CLIE			Properties Mansfield		OLE DEPTH DEPTH (m)			3.90 3.90	В	ORED BY	T.McCarthy	
=							=		Samp			
Deptin (m)			Description		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standpipe
	Stiff black S	ILT/CLA	Y (continued)					7733	В	11.50	N = 28	
2	Stiff brown/v	vhite CL	AY/SILT	A		1	1.80				(3, 5, 5, 7, 8, 8)	
3	Dense grey l boulders	brown ar	ngular GRAVEL with	cobbles and	00	12	2.80	7734	В	12.50	N = 23 (3, 4, 4, 6, 6, 7)	
4	End of Borel	nole at 1	3.90 m		noc	13	3.90	7735	В	13.50	N = 50/95 mm (8, 16, 32, 18)	
	25											
5												
						3						
											,	
/Bt	STRATA P	OBING/	CHISELLING		WATER	CTDIVE	L L	16				
m (i		Time (h)	Comments		Water	Casing	Se	aled	Rise	Time	Comments	-
1.3 3.4	2.1	2.5			Strike 13.10	13.10	-	At	7.30	(min)	Rapid	
					GROUND		ETA	LS				
STA Dat	E Tip De		op RZ Base	Гуре	Date	Hole Depth	4	asing Depth	Depth Wate	to Comme	ents	
					1							
MA	RKS					Sa D-S B-B	mple	Legend turbed (tub) rbed ik Disturbed		U - U Şem	indisturbed 100mm Diameter	



GEOTECHNICAL BORING RECORD

REPORT NUMBER

100	98	<u> </u>										13184	
CO	NTRA	CT T	rinity Wha	arf, Wexford						BORE SHEE	HOLE N	NO. BH14 Sheet 1 of 2	
00	ORD	INATES(70.00 E ,000.00 N	1	D LEVEL (I OLE DIAMI		mm)	200		START		
	ENT SINEE		eerland F avanagh I	Properties Mansfield	1	OLE DEPTH OLE DEPTH (A			12.30 12.30		ED BY ESSED	T.McCarthy BY Taras	
			a-anagir i	vice remoted	ORBITO			i	12.30	Samples	ESSED	DT IBIBS	_
Deptn (m)				Description		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standpipe
P	CONC	DE GROU crete, sto	JND (con ne, rubbi	nprised of re-infornced e, clay)	3		·		3759	В	0.50	N = 9 (1, 1, 2, 2, 2, 3)	
2	Loos	se grey s	ity SAND		8	****		1.40	3760	В	1.50	N = 13 (2, 2, 3, 3, 3, 4)	
	Soft	greyish t	olack s an	dy SILT		x x x x . x		2.60	3761	В	2.50	N = 12 (2, 3, 4, 3, 2, 3)	
3		54	ė.		-	X X X			3762	U	3.00	18 blows	
	*	÷.,				X X X X X X X X X X X X X X X X X X X			3763 3764	D B	3.55 4.00	N = 5	
-	Loos	se grey s	andy GR	AVEL with fragments	of shells	0 0 0 c		4.40	_ 3/64		4.00	(1, 0, 1, 1, 2, 1)	
5	Loos	se brown	clayey sa	andy GRAVEL		0.00		4.80	3765	В	5.00	N = 8 (1, 2, 1, 2, 3, 2)	
Ü	Med	ium dens	e brown	fine to medium sandy	GRAVEL	0000		6.10	3766	В	6.00	N = 11 (2, 2, 3, 3, 2, 3)	
						0000			3767	В	7.00	N = 15 (2, 3, 4, 3, 4, 4)	
	Stiff	brown gr	avelly CL	AY with occasional co	obbles	0 0 0 0		8.60	3768	В	8.00	N = 19 (3, 3, 4, 4, 5, 6)	
9									3769	В	9.00	N = 21 (2, 4, 5, 4, 5, 7)	
_	-			CHISELLING				KE DE		usa mili		·	
'On	1 (m)	To (m)	Time (h)	Comments		Water Strike		sing epth	Sealed At	Rise To	Time (min)	Comments	
9	.7 .5 .8	0.2 9.9 10.6 12.3	1.25 0.5 0.5 2			2.00	2	.00		1.80		Slow	
_		_				GROU	NDWA						
_	TALL Date	Tip De		Top RZ Base T	ype	Date 18-11-		Hole Depth 2.00	Casing Depth 2.00	Depth to Water 1.80	Comm		
	MARK					19-11-		2.00	2.00	1.80	Start o		
·=!\	m4FIF							D · Small D · Small B · Busk LB · Lar	ple Legen(II Disturbed (tub) Disturbed ge Bulk Disturbed priconmental Serv] 1 1		Undisturbed 100mm Diameter mple Undisturbed Piston Sample	

102r

REPORT NUMBER

	GSL		GEOTEC	HNICA	L BOR	IING I	RECC	ORD			13184	
co	NTRACT	, Trinity Wha	urf, Wexford						BOR	EHOLE N	O. BH14 Sheet 2 of 2	
co	-ORDINAT		70.00 E	1	LEVEL (DATI	STARTE	D 18/11/2007	
_	-		000.00 N	4	MAID 3.K	•	•	200	DATI	E COMPLI	ETED 19/11/2007	
	IENT GINEER	Deerland P Kavanagh N	•	1)LE DEPT DEPTH (1			12.30 12.30	1	ED BY CESSED !	T.McCarthy	
		Terramagn n	HEITSHOP	CASING	DEFIT (I	11)		12.30	Samples	CESSED I	BY Taras	
Depth (m)		0	escription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standpipe Details
10	Stiff brov	vn gravelly CL	AY with occasional co	obles	<u></u>			3770	В	10.00	N = 23 (3, 4, 4, 5, 5, 9)	- 1
10	10011111100	· - /									(2) 1, 1, 2, 2, 3,	. 3
-,,						Ċ					N = 26	
- 1					<u> </u>			3771	B	11.00	(4, 5, 6, 5, 7, 8)	
	Angular	cobbles and b	oulders				11.60	1				
12								3772	В	12.00	N = 50/20 mm	4
	End of B	orehole at 12.	30 m				12.30				(21, 4, 50)	
:												
13						[1]						
14				- 1								
												- 1
15				- 1	ā							
		158										
16												
-,,												
												1
18												-4
17												
19												
		TA BORING/C	Comments		Wate		sing S	AILS Sealed	Rise	Time	Comments	
	n (m) To (D 0.	(iii) (h)	Continents		Strike	De De	pth .60	At	To 7.80	(min)	Comments Moderate	-
9	.7 9. 0.5 10	9 0.5									कुर समा स्थार र समा कृति	3
	1.8 12											
10						NDWAT	ER DET Hole	AILS Casing	Donth to	Τ.		1
		N DETAILS p Depth RZ T	op IRZ Base Ty	ne	Date		Depth	Depth	Depth to Water	Comme	ents	
	-u.v [1]	- DONG TIE I	Spirite Base Ty	<u> </u>	1							2
RE	WARKS		12				Samp	le Legend	d			-
							D Small B Bulk C LB - Large	le Legen(Disturbed (tub) Isturbed Bulk Disturbed	d who the a Viet a 1	Sam	Indisturbed 100mm Diameter ple Indisturbed Piston Sample	4



GEOTECHNICAL BORING RECORD

REPORT NUMBER

NTRACT Trinity	Vharf, Wexford					·-	BORE	HOLE N	
		CROUNI	D LEVEL (SHEE		Sheet 1 of 2
-ORDINATES(_)	1,135.00 E 0,950.00 N	1	DLE DIAMI	-	mm)	200	- 1	STARTE	
IENT Deerlar	nd Properties	BOREHO	OLE DEPT	H (m)		17.30	BORE	D BY	T.McCarthy
GINEER Kavana	gh Mansfield	CASING	DEPTH (n	n)		17.30		ESSEDI	BY Taras
					<u> </u>		Samples		-
	Description		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results
	comprised of oil, ash, sla	a. rubble)	*******		+ -	-			3
						3777	В	0.50	N = 16 (2, 3, 4, 3, 5, 4)
						3778	В	1.50	N = 24 (3, 6, 9, 7, 5, 3)
Soft arm SH T			****		2.40				I F.E
Soft grey SILT			x x x			3779	В	2.50	N = 5 (1, 0, 1, 1, 1, 2)
Loose grey silty S/			××		3.00		U	3.00	N = 5 (1, 0, 1, 1, 1, 2) 30 blows N = 18 (2, 4, 4, 5, 4, 5)
Stiff to very stiff br	own very gravelly CLAY		0		3.50	3781	D	3.55	
						3782	В	4.00	N = 18
									(2, 4, 4, 5, 4, 5)
						3783	В	5.00	N = 32 (3, 4, 5, 7, 11, 9)
				l					1,0,1,0,1,1,0,
	8								
						3784	В	6.00	N = 22 (2, 3, 4, 4, 8, 6)
						÷			
				3					
				9		3785	В	7.00	N = 38 (3, 9, 10, 12, 9, 7)
				5	7.00	.			
Stiff grey CLAY/SI	LI		===		7.60				N = 28
	20. A.A	-6-6-1			0.00	3786	В	8.00	(4, 6, 7, 8, 6, 7)
Stiff brown gravell	y CLAY with occasional c	obbies			8.30	'		X0	0.00
			0				_		N = 27
						3787	В	9.00	(4, 5, 6, 6, 7, 8)
			-0						
ADD OTDATA COST	NO/CHICELLING		14/47	ED CTT	RIKE DE	TAILS			[\frac{1}{2}
ARD STRATA BORI	me Commonts		Wate	er C	asing	Sealed	Rise	Time	Comments
m (m) 10 (m) (h) Comments		Strik 2.40	e <u>D</u>	epth 2.40	At_	To 1.90	<u>(min)</u>	Moderate
4.7 4.9 0	.5		2	` '	-:]			
10.5 10.7 0	25 .5								
	2		GROU	NDWA	TER DE				
STALLATION DETA	LS		Da	te	Hole Depth	Casing Depth	Depth to Water	Comn	nents
		Туре	20-11	-07	3.00	3.00	1.70	Start	of day
2-11-07 5.00 2-11-07 17.00		mm SP mm SP							
EMARKS Seals from			Х	- 1	San D - Sn B - Bu	nple Legen	(d) ad mple (Jar + Viel +	Tr.	Undisturbed 100mm Diameter unple Undisturbed Piston Sample

IGSL

GEOTECHNICAL BORING RECORD

REPORT NUMBER

13184

h	asr)									
CO	NTRACT Trinity Wharf, Wexford	100						IOLE NO	D. BH16 Sheet 2 of 2	
co	-ORDINATES(_) 1,135.00 E		LEVEL (r	-			1	STARTE	D 20/11/2007	
CLI	0,950.00 N IENT Deerland Properties	_	OLE DIAME OLE DEPTI		•	7.30	BORE	BY	T.McCarthy	
	GINEER Kavanagh Mansfield	CASING	DEPTH (n	n)	1	7.30		SSED E	Y Taras	_
5				_	Ê		Samples		1	9
Depth (m)	Description		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standnine
10	Stiff brown gravelly CLAY with occasional co (continued)	obbles				3788	Ð	10.00	N = 35 (3, 6, 7, 9, 9, 10)	
11	***					3789	В	11,00	N = 24 (4, 4, 5, 6, 5, 8)	
12			56			3790	В	12.00	N = 25 (3, 4, 5, 5, 7, 8)	NAWAK.
13			c			3791	В	13.00	N = 33 (4, 6, 7, 7, 9, 10)	
14						3792	В	14.00	N = 29 (3, 4, 6, 6, 8, 9)	X
15						3793	В	15.00	N = 24 (4, 5, 5, 6, 6, 7)	
16	3		s			3794	В	16.00	N = 22 (3, 4, 4, 5, 7, 6)	
17			92		16.60	3795	В	17.00	N = 75/40 mm (25, 50)	
-	End of Borehole at 17.30 m			,	17.30					
18	3									
19	Ð									
H	IARD STRATA BORING/CHISELLING	901-	WATI	ER STE	IKE DET					-
1	om (m) To (m) Time Comments		Wate Strik		asing Depth	Sealed At	Rise To	Time (min)	Comments	
	1.2 1.4 0.5 4.7 4.9 0.5 5.3 5.4 0.25 10.5 10.7 0.5	_ = <u>M</u> -	16.6		6.60		12.90		Moderate	
Ľ	16.9 17.3 2	<u> </u>	GROU	INDW/	TER DE	TAILS	Don't 4-			
IN	ISTALLATION DETAILS	÷	Da	te	Hole Depth	Casing Depth	Depth to Water	Comn	nents	
2	2-11-07 5.00 1.00 5.00 50	Type mm SP mm SP						5:		1
RI	EMARKS Seals from 5.50-14.00m				Sam	ple Legen	d			



GEOTECHNICAL BORING RECORD

13184

REPORT NUMBER

(UC	gsl/								10101	
20	NTRACT Trinity Wharf, Wexford						I	HOLE NO		
_							SHEE	<u> </u>	Sheet 1 of 2	
:0	-UNDINATES(_) 1,180.00 E	GROUND L	-	-	(mm)	200		STARTE COMPLE		
	ICM I Desumio Lipheines	BOREHOLE				12.50	BORE	D BY ESSED E	T.McCarthy BY F.C	_
N	GINEER Kavanagh Mansfield	CASING DE	:PIH (m	y		12.50	Samples	E33ED 6	F.C	
Depui (m)	Description		Legend		Depth (m)	Ref. Number	Sample Type Type	(m)	Field Test Results	Standpipe
0	MADE GROUND (Comprised of iron slag)				<u> </u>	7701	8	0.50	N = 48 (3, 4, 4, 11, 14, 19)	
2						7702	В	1.50	N = 50/160 mm (9, 14, 18, 24, 8)	
3	Medium dense grey slightly slity SAND	*	****		2.80	7703	В	2.50	N = 12 (3, 5, 4, 3, 2, 3)	
4		×	× × ×			7704	В	3.50	N = 16 (2, 3, 4, 3, 4, 5)	
5	Firm brown gravelly CLAY/Si	<u></u>			4.10	7705	В	4.50	N = 15 (2, 3, 4, 4, 3, 4)	
6	Medium dense brown gravelly SAND				5.80	7706	В	5.50	N = 14 (2, 2, 3, 3, 4, 4)	
7		c	o	¥.		7707	В	6.50	N = 19 (3, 4, 4, 5, 4, 6)	
8	Stiff to very stiff brown gravelly CLAY with occobbles	casional	-0-		7.60	7708	В	7.50	N = 23 (2, 4, 4, 5, 7, 7)	
9						7709	В	8.50	N = 19 (3, 3, 4, 4, 5, 6)	
10		<u> </u>				7710	В	9.50	N = 27 (2, 5, 4, 8, 9, 6)	
			- 6	CD 61	TRIKE DE	7711	- B	10.50	N = 38 (3, 4, 6, 7, 11, 14)	<u></u>
_	IARD STRATA BORING/CHISELLING		Wate		Casing	Sealed	Rise	Time	Comments	
rc	om (m) To (m) Time Comments		Strik	е	Depth	At	То	(min)		
•	0.8 1.7 2.25 10.8 11 0.5 12.1 12.5 2		2.80 5.80	3	2.80 5.80		2.30 3.40		Slow Moderate	
					ATER DI	ETAILS Casing	Don't to	<u> </u>		
IN	ISTALLATION DETAILS		Dat	te	Depth	Depth	Depth to Water			
		/pe	23-11	-07	4.00		2.40	Start	of Day	
R	EMARKS				Sar D Sc B B US I	nple Leger nall Disturbed (tul dit Disturbed arge Bulk Disturb	TCI b) sed ample (far + Visi +	U Si Tuthi III P	Undisturbed 100mm Plameter ample Undisturbed Piston Sample	

IGSL		GEOT	ECHNICA	L BORI	NG I	RECO	ORD				REPORT NUMBER	3
CONTRACT	Trinity Wha	arf, Wexford				9			BORE	HOLE N		
CO-ORDINA	ATES(_) 1,1 0,9	80.00 E 50.00 N	- 1	D LEVEL (n OLE DIAME	•	THTI)	200		DATE	STARTI COMPL		
CLIENT ENGINEER	Deerland P Kavanagh M		- 1	OLE DEPTH DEPTH (m)			12,50 12.50		BORE	D BY ESSED	T.McCarthy BY F.C	
Depth (m)	Ε	Description		В	tion	Depth (m)	per		nples	£	Field Test	acio,
				Puegen	Elevation	Dept	Ref. Number	Sample	- ype	Depth (m)	Results	Standnine
cobbles	s (continued)	gravelly CLAY with					7712	E	,	11.50	N = 31 (2, 4, 5, 8, 9, 9)	
12 houlder	rs	jular GRAVEL with	cobbles and	999		11.80					N = 50/75 mm	
End of	Borehole at 12.	50 m				12.50					(25, 50)	
14												
15						8						
16												
17												
									ŝ			
18												
18												
21												
											93	
	ATA BORING/C	HISELLING	- aigu	WATER					75.00			
rom (m) To	(m) Time	Comments		Water Strike		sing pth	Sealed At	Ris To		Time (min)	Comments	
0.8 10.8 12.1 1	1.7 2.25 11 0.5 2.5 2											
		School State (Space Street 4		GROUN	DWAT	ER DET	ALS					
INSTALLAT	ON DETAILS	MARKAN MARKAN		Date		Hole Depth	Casing Depth	De	pth to later	Comm	ents	
0	E- D - ul or	Tech -	-		-					T		

Sample Legend
D-Smit Disturbed (tub)
B-Buth Disturbed
LB-Large Bells Disturbed
Env - Environmental Sample (jer + Vital + Tub)

U - Undisturbed 100mm Diameter Sample P - Undisturbed Platon Sample

REMARKS

Date | Tip Depth RZ Top RZ Base

GEOTECHNICAL BORING RECORD

REPORT NUMBER

100	BSL	/		420120					•••			13184	
СО	NTRACT	Trin	nity Whari	, Wexford							HOLE NO		
co	-ORDIN	ATES(_) 1,18	0.00 E	GROUND	LEVEL (m)			DATE	STARTE	Sheet 1 of 1 D 20/11/2007	
_				0.00 N		LE DIAM		-	.50	-	COMPLE		
	ENT SINEER		erland Pro anagh Ma	•	1	DEPTH (n			.50		ED BY CESSED E	T.McCarthy Taras	
Ê							Ē	(iii	<u> 1</u>	Samples			ре
Depth (m)			De	scription		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standpipe Details
0 4 5	MADE rubble		ND (comp	rised of hardcore, cla	ay,				3773	В	0.50	N = 19 (2, 3, 5, 4, 4, 6)	
2	Mediu	m dense	light bro	wn silty sandy GRAVI	EL.	‱ 2-2-2- 2-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-		1.90	3774	В	1.50	N = 13 (2, 4, 3, 3, 4, 3)	
	Firm b	rownish	reddish g	rey CLAY/SILT		***		2.50	3775	В	2.50	N = 21 (3, 4, 5, 5, 6, 5)	
4	Dense	broken	angular g	ravel,cobbles and bo	oulders			3.20	3776	В	3.50	N = 33 (3, 4, 6, 7, 10, 10)	
	End of	Boreho	le at 4.50	m	- 0	30		4.50	-	rii		N = 75/20 mm (25, 50)	
						i						:	
6				tiŝ	i		in Is						:
7				*		:						×	
8								II,		;			
9						:							
Ė													
			ORING/C	HISELLING		WATE		KE DET	AILS Sealed	Rise	Time		
<u> </u>	m (m) 1	Го (m) 4.3	(h)	Comments		Strike	e Di	epth .00	At	To 1.60	(mln)	Comments Moderate	
		7.0					=						
	YTAL C	TION D	TAUC					FER DET	AILS Casing	Depth to Water	Comm	ante	
INS	Date	TION DE		op RZ Base Tv	уре	Dat	.0	Depth	Depth	Water	COMMIT		
RE	MARKS							Samp	le Legen	d			
							-	B - Bulk I LB - Larg Env - En	Disturbed (600 Disturbed e Bufk Disturbe /rgnmental Sa) nd mple (Jar + Vtal +	U - San P - Tub)	Undisturbed 100mm Diameter noie Undisturbed Piston Sample	

ertra l						55		REPORT RUMBER	
GEOTE	CHNICA	L BORI	NG F	RECC	RD			13184	
ONTRACT Trinity Wharf, Wexford		-11 1-9				BOR SHE	EHOLE NO	D. BH21 Sheet 1 of 1	
O-ORDINATES(_)		D LEVEL (n OLE DIAME		(מער)	200		E STARTE E COMPLI		
LIENT Deerland Properties NGINEER Kavanagh Mansfield		OLE DEPTH DEPTH (m)			4.80 4.80	1	ED BY CESSED E	T.McCarthy BY F.C	
			_	=		Samples			ه ا
Description		Legend	Elevation	Depth (m)	Ref. Number	Sample Type	Depth (m)	Field Test Results	Standpipe
MADE GROUND (comprised of clay,rubble,st	one,ash)				7736	В	0.50	N = 13 (3, 3, 4, 3, 4, 2)	
Firm brown sandy gravelly CLAY				0.95	7737	8	1.50 2	N = 14 (2, 2, 3, 3, 3, 5)	
					7738	3 в	2.50	N = 15 (2, 3, 4, 3, 4, 4)	
Dense, grey, angular GRAVEL with many ang cobbles and boulders.	gular			3.20	7739	В	3.50	N = 33 (3, 5, 7, 7, 9, 10)	
End of Borehole at 4.80 m	Ē.			4.80	7740	: B	4.50	N = 50/75 mm (25, 50)	
								÷ #	
73									
		31							

ARD STRATA BORING/CHISELLING		Water	· Ca	IKE DE	TAILS Sealed	Rise	Time	Comments	
om (m) To (m) (h) Comments 1.9 2.1 0.5 4.2 4.8 2		Strike 2.30	<u> D</u>	epth 230	At	1.90	(min)	Slow	-
×		GROU	NDWAT	TER DE	TAII S				
ISTALLATION DETAILS		Date		Hole	Casing	Depth t	Comm	ents	
Date Tip Depth RZ Top RZ Base	Туре			Depth	Depth	vvaler			
EMARKS				Sam D-3m B-8m	ple Legeno il Distribed (fub) Distribed	1	ų.	Undeturbed 100mm Diameter 8am Undsturbed Peter Sample	ple



GEOTECHNICAL BORING RECORD

13184

REPORT NUMBER

BOREHOLE NO. BH22 CONTRACT Trinity Wharf, Wexford SHEET Sheet 1 of 1 GROUND LEVEL (m) 01/12/2007 DATE STARTED CO-ORDINATES(_) DATE COMPLETED 01/12/2007 BOREHOLE DIAMETER (mm) 200 **BOREHOLE DEPTH (m)** 3.90 BORED BY T.McCarthy CLIENT **Deerland Properties** PROCESSED BY F.C 3.90 CASING DEPTH (m) ENGINEER Kavanagh Mansfield Samples Depth (m) Standpipe Details Field Test Description Depth (m) Results Ref. Numi MADE GROUND (comprised of hardcore, clay, N = 20 (3, 5, 8, 6, 3, 3) 7741 0.50 N = 127742 В 1.50 (2, 3, 2, 3, 3, 4) 1.70 Medium dense brown fine to coarse gravelly SAND N = 192.50 7743 В (3, 4, 5, 5, 4, 5) 2.80 Dense grey brown angular GRAVEL with cobbles and N = 50/70 mm (9, 16, 50) 3.50 7744 В 3.90 End of Borehole at 3.90 m WATER STRIKE DETAILS HARD STRATA BORING/CHISELLING Casing Sealed Depth At Rise To Water Comments From (m) To (m) Comments Strike Slow 1.50 1.70 1.70 3.9 3.4 2 GROUNDWATER DETAILS

Date Hole Casing Depth to Depth Depth Depth Comments INSTALLATION DETAILS Date | Tip Depth RZ Top RZ Base REMARKS U - Undisturbed 100mm Diameter Sample P - Undisturbed Piston Sample

Appendix II – Rotary Coring Records

GEOTECHNICAL CORF LOG RECORD

:01	NTR	ACT	T	rinity	Wharf, Wexford				··			DRILLI- SHEET	IOLE NO	RC(02 et 1 of 2
:0	ORE	ANK	TES(_)			_ c	ROUND LEVE ORE DIAMETE	* *		34		STARTED COMPLETED		1/2007 2/2007
	ENT	ER			nd Properties agh Mansfield	-T		LUSH			90 Air/Mist	DRILLE		Miller IGSL	nnium -
Downmore Deprin (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.a.D.%	Fracture Spacing (mm) 0 250 500	Legend	Non-inlact zones (shaded)	Strata desc	atption	Depth (m)	Disco	ntinuities	Elevation	Standpipe Details	SPT (N Value)
						****	7	SYMMETRIX HOLE DRILL Observed by returns of col gravel and co. SYMMETRIX HOLE DRILL Observed by returns of bla sand.	ING: driller as acrete, bbles. OPEN ING: driller as	1,20		* ax		**************************************	
						**************************************		SYMMETRIX HOLE DRILL Observed by returns of bro	.ING: driller as	5.70					N = 50/80 mm (4, 7, 19, 21 10) N = 50/75 mm (3, 6, 22, 28
NE C		-						SYMMETRIX HOLE DRILL Observed by returns of bro gravelly (fine	,ING: driller as own	8.70			0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0; 0		*
EC	MAR ore t	KS	S.				_	INS	TALLATIO				181		
								-	OUNDWAT	ED NE	TAII C				
								 	Date	Hole	Casing	Depth to Water	Comments		
						8				Deoth	Depth	vvaler			
15	Date			DETA	NLS RZ Top RZ Base		Туре								

O	VTR/	СТ	Tr	inity '	Wharf, Wexford						DRILLH	OLE NO		RC0 Sheet	2 2 of 2
:0	ORD	INAT	ES(_)			GROUND LI	EVEL (m) IETER (mm)	= 8	34	DATE S				/2007 /2007
	ENT	R			nd Properties gh Mansfield	- 1	NCLINATIO FLUSH	N		90 Air/Mist	DRILLE			Miler IGSL	ınium
Downnole Deput (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 250 500	Non-intact zones (shaded)	Strata	description	Depth (m)	Discon	tinuities		Elevation	Standpipe Details	SPT (N Value)
11	10.00		٠				HOLE D Observe angular o size retu weathers	TRIX OPEN RILLING: d by driller as clayey gravel rns of highly d limestone bedrock), dilling, No							
12	11.50	100	0	0			driller as rock. Moderate locally m strong, ti	rilling. No Observed by very weather bly weak to oderately derey, fine slightly cherty	ed	Discontinuitie and undulos are open wit oxide stained fine gravel surfaces. In throughout.	e. Apertui h slightly ii d and clay meared	res ron and			
4	13.00	87	14	11			LIMESTO Moderate weathers	slightly cherty ONE. ety to highly ed.							
	14.50 14.80	100	0	0											
ıs		50	0	0											
16	16.00	100	41	18		L	ope.		17.00						
17	17.00						End of C (m)	Corehole at 17							
18															
19	-						e et								
₹E	MAR	KS				1		INSTALLAT	TION REM	ARKS					-
20	ore b	oxes					7.7								
								GROUNDW	ATER DE						
								Date	Hole Depth	Casing (Depth	Depth to Water	Commi	ents		



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

1	_																	
CON	ITR/	ACT	Tri	inity V	Vharf, We	xford								DRILLHO SHEET	LE NO)	RC0 Shee	5 t 1 of 2
co-	ORD	TAME	ES(_)					ROUND LE	VEL (m) ETER (mm)		84	7	DATE ST				/2007 /2007
CLI		 ER			d Propertion		-		CLINATION LUSH	N		-90 Air/M	ist	DRILLED			Miller IGSL	nnium
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	7.D.%	Fractu Spacii (mm	ire ng)	Legend	Non-intact zones (shaded)		description	Depth (m)	73.	Disco	ntinuities		Elevation	Standpipe Details	SPT (N Value)
1									HOLE DE	l by driller as Concrete an								
مسياليسيساليس							× × × × × × × × × × × × × × × × × × ×		HOLE DR Observed returns o sand.	RIX OPEN RILLING: I by driller as f grey silty RIX OPEN RILLING: I by driller as	4.20							
6							0 0		SYMME HOLE D	f silty clay. TRIX OPEN RILLING: d by driller as f brown	5.70	<u>)</u>						
13184RC.GPJ KSL.GDT 17/12/07							0 0				9.8	ᆚ	ō					
Q RE		RKS		_						INSTALLA	TION RE	MARI	KS				_	
20		boxe	S,															
PG -										GROUNDY	VATER D	ETAI	LS.					<u>-</u>
PER									·		Hole	l c	Casing	Depth to	Comm	nanta	-:-	
10M										Date	Depth		Depth	Depth to Water	Comin	116(16)		
IGSL RC NEWLOG 10M PER PG	STA Dai			DET/	AILS RZ Top	RZ Base		Тур	9									
GSL																		

ON.	TR/	СТ	Tr	inity V	Vharf, Wexford		10.00					DRILLHO	LE NO		05 eet 2	of 2
:0-	ORD	INAT	ES(_)			- 15	GROUND LE		- 8	34	DATE ST	ARTED OMPLETE		11/20	
	ENT	ER.			d Properties oh Mansfield			NCLINATION FLUSH	_		90 Air/Mist	DRILLED		MII IGS	lenniu SL	un
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)		escription	10.20 Depth (m)		tinuities	Flevation	Standpipe Details		SPT (N Value)
	10.20	100	0	0	L	宁		HOLE DR		10.20	Discontinuiti locally smoo undulose to	th and	- 1			
11	10.70	100	10	0	-	王		size return	ns of variably I limestone		locally plans are open will and slightly	r. Aperture th clay sme	25			
	11.20	100	20	0	-	三		(possible (continued Moderate)	y strong to		stained surf sub-10° with variable bre	aces. Dips	antiv			
12	11.90 12.20	100	23	0		王	100	bedded, g	ly weak, thinly rey to dark grained,		variable ore	aks unougi	iout.		1	
1	12.70		24	24	L	片		slightly ch LIMESTO Moderate	ly to highly							
13	13.20	100	40	26		王	p de la	weathered	í.					8		
14		100	0	0		臣	S. Sales									
	14.20	100	58	58		片										
15	15.20	100	58	58		户			rehole at 15.2	15.20			_			
16		57.00						(m)								
18																
19																
	MAF	RKS	1			_			INSTALLATIO	ON REI	MARKS					
_		boxes	S.													
									GROUNDWA	TER DE	TAILS Casing	Depth to	Common	le	_	
									Date	Depth.	Deoth	Depth to Water	Commen	LS .		



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

00	31				G	EUIE	CHIN		AL CON	E LOG KI	ECOR	(D				13	184
CONT	RAC	CT	Tı	rinity	Wharf, We	xford							DRILLH	OLE N	o	RC0 Shee	7 t 1 of 3
:O-OI	<u> </u>		D	eerla	nd Properti			C	ROUND LI ORE DIAM NCLINATIO	IETER (mm)		84 -90 Air/Mist	DATE S	STARTE COMPLI ED BY		27/11 28/11	/2007 /2007 Inium
Core Run Depth (m)		T.C.R.%	S.C.R.%	R.Q.D.%	Fractu Spacir (mm	ng)	Legend	Non-intact zones (shaded)	Strata	description	Depth (m)	Disc	ontinuities		Elevation	Standpipe Details	SPT (N Value)
2 2 3 3 4 4									HOLE DI Observer returns o cobbly gr SYMME HOLE DI Observer returns o SYMME HOLE DI Observer returns o sand.	TRIX OPEN RILLING: d by driffer as f concrete and ravelly fill. TRIX OPEN RILLING: d by driffer as f sandy clay TRIX OPEN RILLING: d by driffer as f black silty TRIX OPEN RILLING:	2.70	,					
7						а.			SYMME HOLE D	day	8.70				3-		
Con										INSTALLATIO	ON REN	IARKS					
										GROUNDWA	TED DE	TAUS					
										Date	Hole	Casing	Depth to Water	Comm	ente		
										Date	Depth	Depth	Water_	3011111	i Gi ILD		
_	ALL			DETA Depth	RZ Top	RZ Base		Туре	3			- 1					

(O)	TRA	СТ	Tr	inity	Wharf, Wexford	_			_			DRILLH SHEET	IOLE NO	RC0 Shee)7 et 2 of 3
:0-	ORD	INAT	ES(_)			- 1	ROUND LE	EVEL (m) ETER (mm)		84	DATE S	STARTED COMPLETED	27/1	1/2007 1/2007
	NT INEE	:R			nd Properties ogh Mansfield		- 1	NCLINATIO LUSH	N		-90 Air/Mist	DRILLE LOGGE		Miller IGSL	nnium
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)		description	Depth (m)	Dis	continuities	Elevation	Standpipe Details	SPT (N Value)
11	1.50					000000000000000000000000000000000000000		HOLE DI Observed returns of gravelly of SYMME	thy driller as f brown clay (continued transfer to the transfer tr	d) 11.3	<u>10</u>			;	
12	3,00	7	0	0				angular of size returned weathers (possible Brown gr	d by driller as dayey gravel ms of highly d limestone bedrock). ey clayey GRAVEL and S (possible						N = 50/105
14	14.50	7	0	0				highly we	eathered e bedrock)		5				mm (3, 5, 12, 1 26) N = 50/95
15		10	0	0							ļ				mm (4, 4, 10, 1 25)
16	16.00	7	o	0											N = 50/80 mm (3, 6, 15, 2
- 1	17.50		0	0				,							N = 50/85 mm (3, 4, 5, 20 25)
19	19,00	20	0	0	Ü						19				N = 50/75 mm (4, 4, 19,
	WAR ore t								INSTALLAT	TON RE	MARKS				
_					1.2										
									GROUNDW	ATER	Casing	Depth to Water			

Date Tip Depth RZ Top RZ Base

Type



REPORT NUMBER **GEOTECHNICAL CORE LOG RECORD** 13184 DRILLHOLE NO RC07 CONTRACT Trinity Wharf, Wexford Sheet 3 of 3 SHEET GROUND LEVEL (m) 27/11/2007 DATE STARTED CO-ORDINATES(_) DATE COMPLETED 28/11/2007 84 CORE DIAMETER (mm) -90 INCLINATION DRILLED BY Millennium Deerland Properties CLIENT Alr/Mist LOGGED BY **IGSL** FLUSH Kavanagh Mansfield ENGINEER Downhole Depth (m) Core Run Depth (m) SPT (N Value) Fracture Discontinuities Spacing Strata description Elevation % % % (mm) Brown grey clayey angular GRAVEL and COBBLES (possible highly weathered limestone bedrock) (continued) ່ຽີ ြင့ N = 50/7580 mm (5, 7, 30, 20) 0 30 0 0 End of Corehole at 22

INSTALLATION REMARKS REMARKS 1 Core box.

GROUNDWATER DETAILS

Casing Depth Hole Date Depth

INSTALLATION DETAILS Date Tip Depth RZ Top RZ Base Type Depth to Water Comments

	er le	1		٦							· F00		D .			REPO	ORT NU		
00	38				G	EOTE	CHN	ICA	AL COR	E LOG F	RECO	K	D				131	84	
:01	NTR/	ACT	Ti	rinity	Wharf, We	exford				<u> </u>				DRILLHO SHEET	OLE NO)	RC0	9 1 of 2	
:0	ORD		res(_)				G	SROUND LE	VEL (m)				DATE S			26/11	2007	
						<u>.</u>		_	ORE DIAMI				4 90	DATE C		TED	27/11		-
	TNE	ER			nd Propert igh Mansfie			- 1	LUSH	**			ir/Mist	LOGGE			IGSL) II OI II	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.a.D.%	Fracti Spaci (min 0 250	ing 1) 500	Legend	Non-intact zones (shaded)	_	iescription	Depth (m)	Depui (m)	Disco	ontinuities		Elevalion	Standpipe Details	SPT (N Value)	
0 1 1 1 2 2 3									HOLE DE Observed returns of fill. SYMMET HOLE DE Observed returns of Observed returns	RIX OPEN RILLING: I by driller as grey silt. RIX OPEN RILLING: I by driller as f grey silt. RILLING: I by driller as f silty sand.	2.5	70							The state of the s
RE	<u> </u> EMAF	RKS		<u> </u>			1— 6	1		INSTALLA	TION R	EM	IARKS				K///8	1	
2 (Core		S,																
										GROUNDY						_			
										Date	Hole Dept		Casing Depth	Depth to Water	Comn	nents			
_			men.	<u></u>	All C									j					
ıN	STAI Dat	_		DET/ Depth	AILS RZ Top	RZ Base		Тур											
2	7-11-	_		.50	12.50	16.50			n SP										



GEOTECHNICAL CORE LOG RECORD

REPORT NUMBER

00	38	쎗				COIL	CHIN		AL COP	E FOG 1	\EC(J N					131	184
:01	VTR/	ACT	Tr	inity '	Wharf, W	exford								DRILLI	IOLE N	0	RC0 Sheet	9 1 2 of 2
	ORD	INAT			nd Proper	ties		_ c	ROUND L ORE DIAM	METER (mm)			34 90	DATE	STARTE		26/11	/2007 /2007
	INE	ER			gh Mansfi		, ,	F	LUSH			_/	Air/Mist	LOGG	ED BY		IGSL	,
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fract Spac (mr 0 250	ing n)	Legend	Non-intact zones (shaded)	Strata	description 		Deput (III)	Disco	ntinuitles		Elevation	Standpipe Detaits	SPT (N Value)
12	11.50								HOLE D Observe	TRIX OPEN RILLING: d by driller as dayey gravel	11	.90 .50	Discontinu	ities are ro	ugh			
12	12.70	100	53 89	53 89					size returned size returned weather (possible Strong to moderate locally many to our grey to our size returned siz	ms of variably and limestone to bedrock). The very strong and coderately were dium bedde lark grey, fine cherty and	to d ak,		and unduk irregular (s Apertures frequent cl smeared s are sub-20 sub-vertica variable br	ose to local stylotile). are open w ay/fine gra urfaces. E of with al fractures	lly vith vel Dips and			
4	13.70 14.50	100	0	0				18 2 L	fossilifer LIMEST interbed grey/blay mudstor thick cal	ous ONE (locally ded with dark y calcareous ie. Frequent cite veins). o moderately						i		
5	15.30	100 83	30	62					weather	ed.						:		
17	16.50								End of C (m)	Corehole at 16		.50						
19	MAR	Ke								INSTALLA	TION P	£M	ARKS					
		e boxes.								INSTALLA	CINCIP IN	176	e st 51 06F			,		
										GROUNDW	ATER	DE	TAILS					
										Date	Hole	•	Casing Depth	Depth to Water	Comm	nents		
	Date			epth	RZ Top 12.50	RZ Base 16.50		Type										

200	33				GEOTE	CHN	IC/	AL. CORI	E LOG R	ECOF	₹D				:	13 ⁻	184
COI	CONTRACT Trinity Wharf, Wexford							-					DRILLHO	DLE NO	5	RC1	0 t 1 of 2
co-	O-ORDINATES(_)							GROUND LEVEL (m) CORE DIAMETER (mm) 84				DATE ST	DATE STARTED DATE COMPLETED			2/2007 2/2007	
-	ENT				nd Properties			INCLINATION FLUSH			-90 Air/Mist			DRILLED BY LOGGED BY		Miller	nlum
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	3.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)		lescription	Depth (m)		Disco	ntinuities		Elevation	Standpipe Details	SPT (N Value)
0 0 7 0 8 9 8	EMA!	RKS			ng in on core barrel	× × × × × × × × × × × × × × × × × × ×		SYMMET HOLE DE Observed returns of into brown observed returns of observed returns observed returns of observed returns of observed returns of obs	by driller as tar and fill. RIX OPEN RILLING: by driller as black sand. RIX OPEN RILLING: d by driller as f black silty TRIX OPEN RILLING: d by driller as f sand grading and grading at the sand grading a	7.2 ang 8.7 9.2 10.0	0						
2									GROUNDV		ETA		Denth to				
100									Date	Hole Depth	4	Casing Depth	Depth to Water	Com	ments		
IN					AILS		Tyr	ne	*5								

REPORT NUMBER

-					GEOTE	CHN	ICA	AL CORE LOG RE	COF	RD		REPO		JMBER 184	
_	VTRA		Tr	inity	Wharf, Wexford						DRILLHOLE NO	0	RC10 Sheet 2 of 2		
[CO-OKDIMATES(_)							- 1	ROUND LEVEL (m) ORE DIAMETER (mm)	84	DATE STARTE		01/12/2007			
CLIENT Deerland Properties								INCLINATION -90 FLUSH Air/Mist			DRILLED BY LOGGED BY			Millennium IGSL	
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata description	Depth (m)	Discon	tinuities	Elevation	Standpipe Details	SPT (N Value)	
_	10.00	7	0	0		0.000		Observed by driller as angular clayey gravel size returns of rock (possible bedrock). Angular red/white/brown mottled, slightly sandy coarse GRAVEL and COBBLES							
12	11.50	7	0	0				(predominantly sandstone) with local boulders, iron oxide stained, probable highly weathered rock.						N = 40/85 mm (3, 4, 10, 1 15)	
13	13.00	50	0	0		0.00						ŀ		N = 50/75 mm (4, 10, 20, 30)	
14	14.00	60	20	20		0.0			:						
15	15,00	60	0	0) O									
16	16.00	50	0	0		0.0									

End of Corehole at 17 (m)

INSTALLATION REMARKS

GROUNDWATER DETAILS

Hole Casing Depth to Comments
Depth Depth Water Comments

REMARKS
1 Core box. Rock falling in on core barrell.

Date Tip Depth RZ Top RZ Base Type

INSTALLATION DETAILS

CONTRACT Trinity Wharf, Wexford									_		- 1	DRILLHOLE NO RC13 SHEET Sheet					
CO-ORDINATES(_)							- 1	GROUND LEVEL (m) CORE DIAMETER (mm) 84					TARTED OMPLETE	25/11/2007			
	NGINEER Kavanagh Mansfield							INCLINATION -90 FLUSH Air/Mist					D BY D BY	Millennium IGSL			
Downhote Depth (m)	Core Run Depth (m)			Non-intact zones (shaded)		lescription	Depth (m)	Disc	ontinuities	Elevation	Standpipe Details	SPT (N Value)					
1								I HOLE DE	by driller as concrete &								
3						**************************************		HOLE DE	RIX OPEN RILLING: I by driller as I grey sandy	2.70							
6			:			× × ×		HOLE DI Observed returns o clay	d by driller as f brown sand	5.70 ly 7.20							
8						0 0 0 0		HOLE D									
_	MAF	RKS						1	INSTALLA	TION REM	ARKS			(//	X		
_	Core		5.														
									GROUNDW		_						
	INSTALLATION DETAILS Date Tip Depth RZ Top RZ Base Type 20 44 07 44 09 45 00 50mm SD									Hole	Casing	Depth to Water	Comment				

/	38		т.	rinity '				AL CORE LOG R		<u> </u>	DRILLH	OLE NO	<u> </u>	131 RC1	184 3
CORE DIAME								GROUND LEVEL (m) CORE DIAMETER (mm)	• •			DATE STARTED DATE COMPLE			2 of 2 /2007
	LIENT Deerland Properties						- 1	NCLINATION FLUSH		-90 Air/Mist		DRILLED BY LOGGED BY		Millennium IGSL	
Downrole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm) 0 ²⁵⁰ 500	Legend	Non-intact zones (shaded)	Strata description	Depth (m)	Disco	ontinuities		Efevation	Standpipe Details	SPT (N Value)
0								SYMMETRIX OPEN	10.40						
1	12.00	91	56	40				HOLE DRILLING: Observed by driller as angular clayey gravel size returns of highly weathered limeschole (possible bedrock). Clayey sub-angular gravel and cobble size returns of limestone	10.90			;			
3	2.00	93	21	21				returns of limestone with occasional boulder (possible highly weathered rock)	5						
4	13.40	64	0	0					28						
5	14.50 15.20	71	0	0					52						
	16.00	62	0	0				5-4-/-0	16.00						
17	10.00							End of Corehole at 16 (m)							
18				:	3										
18												ī			
)	MAR							INSTALLAT	ON REM	ARKS					
C	ore b	oxes													
								GROUNDW/	Hole	Casing	Depth to	Comme	ente		
						A		Date	Depth	Depth	Depth to Water	Commo	51115		
_	Date				RZ Top RZ Base 12.00 16.00	50	Тур								

CO	NTR	ACT	T	rinity	Wharf, Wexford							DRILLI SHEET	HOLE N	0	RC1		
co	-ORE	DINA:	res(_)			- 1		.EVEL (m) METER (mm)		84	DATE	STARTE COMPLE		30/11	t 1 of 2 1/2007	
	ENT				nd Properties		- In	NCLINATIO			-90 Air/Mist	DRILLI	ED BY		Millennium IGSL		
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata	description	Depth (m)	Disc	ontinuities		Elevation	Standpipe Details	SPT (N Value)	
1								HOLE D	TRIX OPEN RILLING: Id by driller as of gravelly fill.							ja	
3						0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		HOLE D	TRIX OPEN RILLING: d by driller as of silty sandy	2.70							
5	5.00					000		HOLE D Observe returns of gravel (f Rotary of	irilling. No	-/							
6		0	0	0		0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			 Observed by very weather 							N = 50/80 mm (4, 7, 19, 2 ⁻¹	
7	7.00	100	19	12				moderat bedded, grev & p	ely weak to ely strong, thir white slightly urple (slighly	7.00	and undul irregular. open and	ities are roose and loc Apertures a incipient wi	ally are th iron			N = 50/75 mm (3, 6, 22, 28	
8	8.00	100	0	0		gre- fine SAI Slig		fine grain SANDS Slightly t	TONE/SILTST to moderately	ONE.	7.0m-9.8n silt and fin surfaces.	ned (pervasi n) and com e gravel sm Dips are si	monly leared lb-20°				
9	8.70	100	28	8	ŀ			weather	si.		with vertic throughou	al fractures t.					
	MAR]:::::	4	1	INSTALLAT	ION REM	ARKS						
2 C	ore b	oxes,	i i														
									GROUNDW	ATER DE	TAILS						
									Date	Hole Depth	Casing Depth	Depth to Water	Comme	ents			
								3									

00	1				GEOT	ECHN	IIC	AL COR	E LOG R	ECOF	RD			REPO	131		
10	ITR/	CT	Tr	inity 1	Wharf, Wexford	- 200							IOLE N	0	RC1		
D-	ORD	INAT	ES(_)			- 1	GROUND LE	- 1	TARTE		30/11					
_			_		10			CORE DIAMETER (mm) 84 INCLINATION -90				DATE COMPLETED DRILLED BY			30/11/2007 Millennium		
	INE	ER .			nd Properties gh Mansfield		- 1	FLUSH			Air/Mist	LOGGE			IGSL	illum .	
DOWNINGS Debut (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata	description	Depth (m)	Disα	ontinuities		Elevation	Standpipe Details	SPT (N Value)	
	10.00	100	62	43				moderate bedded, grey & po green 11 fine grain SANDST	ONE/SILTST(ONE.	and unduk irregular open and i oxide stain 7.0m-9.8n silt and fin surfaces.	ities are roo use and loc Apertures a incipient will ed (pervasi a) and comi e gravel sm Dips are su	ally ire th iron ive monly eared ib-20°	931			
1	11.60	100	5 9	43			(2.90)	weathere	d. (continued)			al fractures t. <i>(continu</i> e		100			
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			45					(m)									
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5																	
5					2)				-					5			
7												ii.					
9					134												
9																	
	MAR	Ke		_					INSTALLAT	ON RE	MARKS			_			
F	_	xxes							***************************************	v v v vadal			-				
-								-	GROUNDWA	ATER DE	TAILS						
_										Links	Oneles I	Daniel to					
-									Date	Hole Depth	Casing Depth	Depth to Water	Comm	rents			
C	τ'nΑΙ	LATI	ON I	DETA	JLS				Date		Depth	Water	Comm	nents			

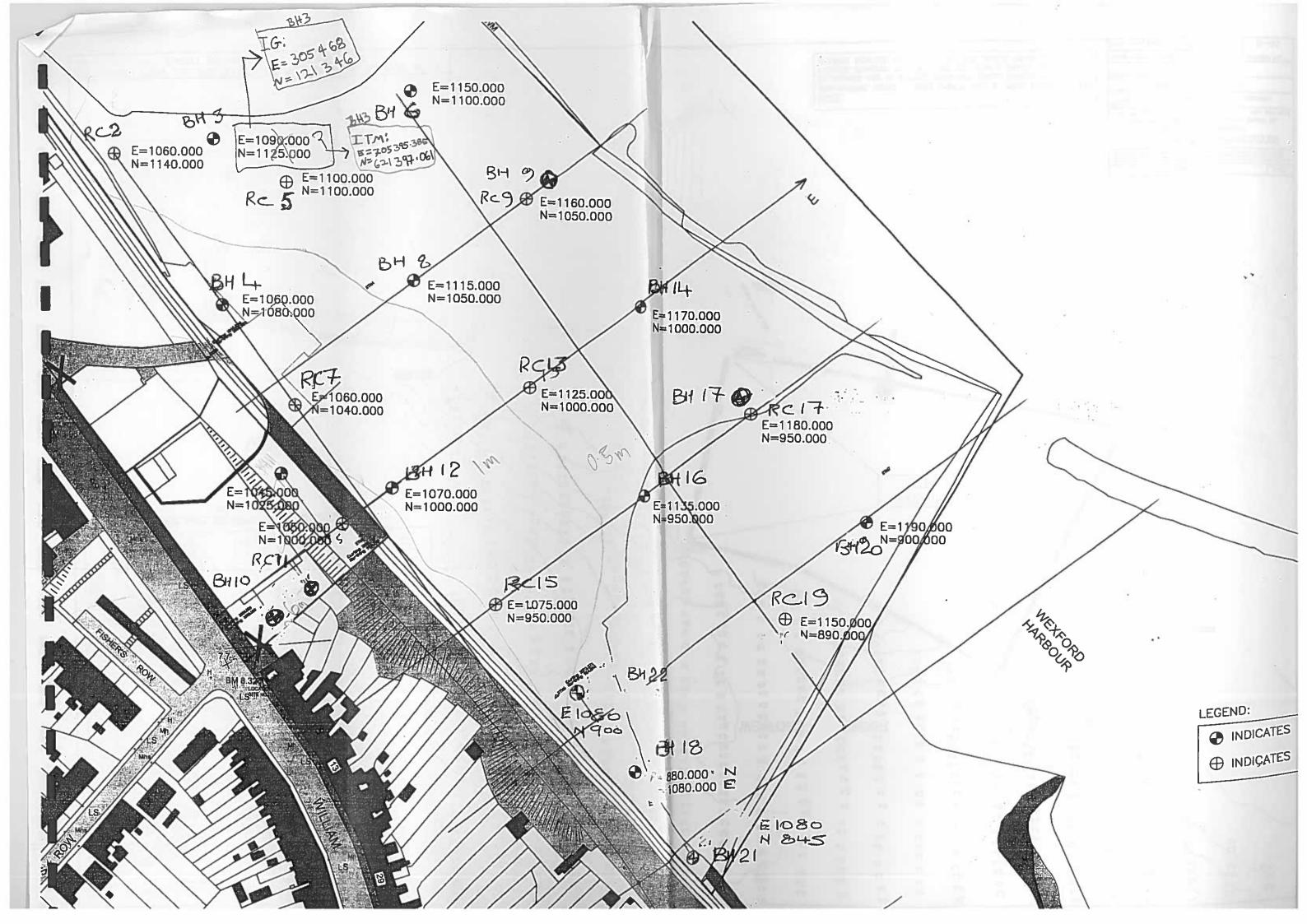
0	NTR4	ACT	Tr	inity '	Wharf, We	xford							DRILLHO SHEET	DLE NO	RC1	7 t 1 of 3
;o	ORD	TANH	res(_)			,		ROUND LE		84	4	DATE S	TARTED OMPLETED	28/11	/2007 /2007
	ENT SINE	ER			nd Propertie				NCLINATION LUSH	(3 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5 -	-9 A	ir/Mist	DRILLE		Miller IGSL	nnium
Downhole Depth (m)	Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fractu Spacir (mm	ng) 500	Legend	Non-inlard zones (shaded)		lescription	Depth (m)	Disco	ntinuities	Elevation	Standpipe Details	· SPT (N Value)
0						4			HOLE DF Observed returns of gravelly fi	by driller as cobbly II.	1.20		99			
2									HOLE DR	RIX OPEN RILLING: I by driller as I silty sandy	8.70					
`з									HOLE DE	by driller as	2.70		9			
4									HOLE DE	TRIX OPEN RILLING: I by driller as f black sitty	4.20				,	
6									HOLE DI	d by driller as f brown	5.70					
8 RI 2																
RI	EMA		_				<u> -0_</u>	<u> </u>		INSTALLAT	ION REM	ARKS				- (
2	Core	boxe	S .													
										GROUNDW	Hole	TAILS Casing	Depth to Water	Comments	15	
									- 1	Date	Depth	Depth	Water	Commission	7%	

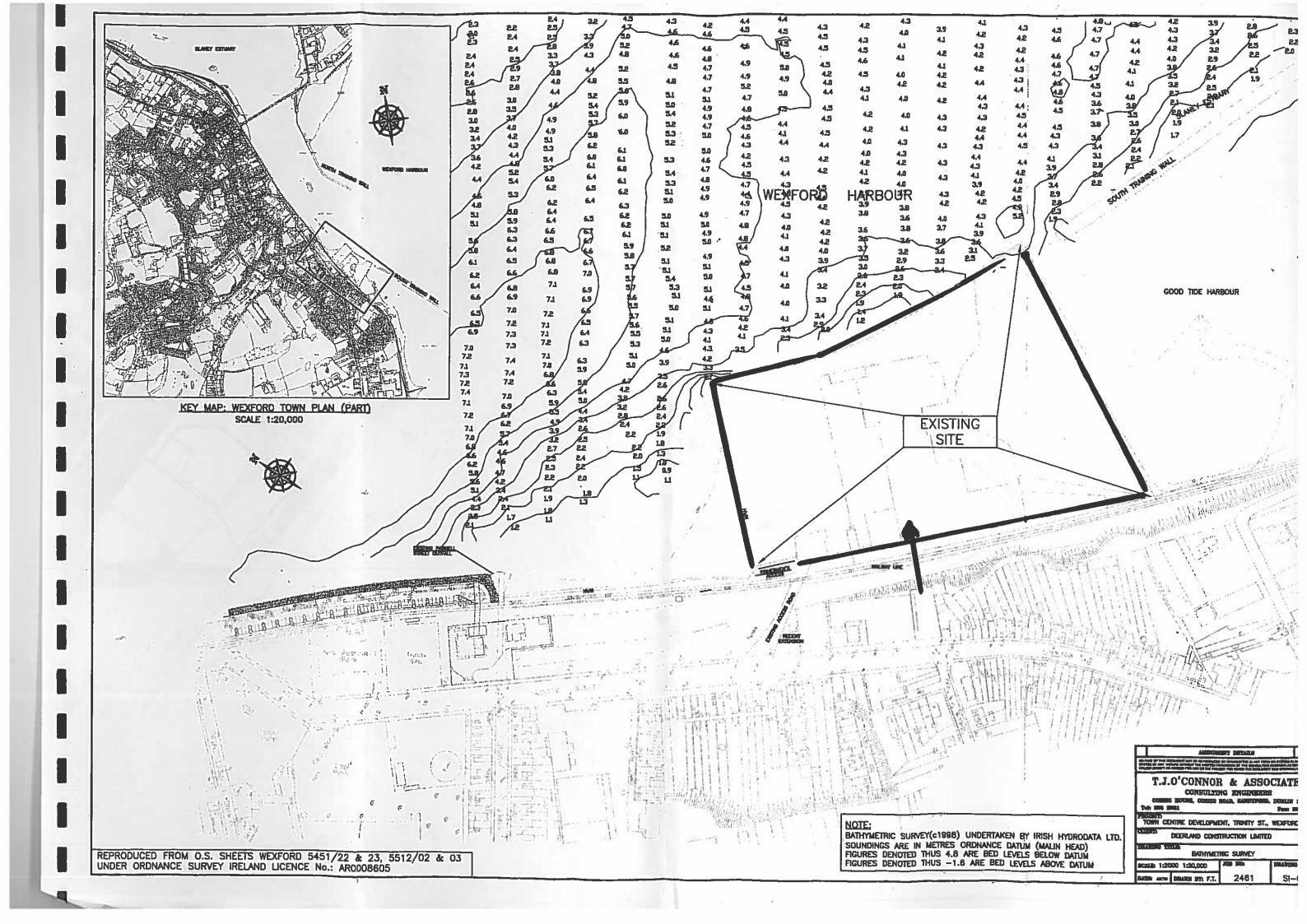
REPORT NUMBER

L				GEOTE	ECHN	ICA	L CORE	E LOG R	ECO	RI)				131	MBER 84
TRA	СТ	Tris	nity V	Wharf, Wexford									OLE NO		RC1	
-	_	_				G	ROUND LE	/EL (m)				SHEET DATE ST	TARTE	D		
ORDI	NAT	ES(_	_)							84	,				29/11	
NT		De	erlan	nd Properties				- 4		_	-				Millen	nium
INEE	R	Ka	vana	gh Mansfield	Т		LUSH		Т	T	r/Mist	LOGGE	BY		IGSL	
Core Run Depth (m)	T.C.R.%	S.C.R.%	R.Q.D.%	Fracture Spacing (mm)	Legend	Non-intact zones (shaded)	Strata d	escription	Depth (m)		Dis∞ı	ntinuities		Elevation	Standpipe Details	SPT (N Value)
7	7				0					T						
					9 9		Observed returns of	by driller as brown	,							
					9 9											
				ler di	9 0											
	10								15.4	41						
					1		SYMMET HOLE OF	RIX OPEN	10.5					1		
16.00	- 23		_		-	-	Observed	l by driller as lavev gravel		od	Discontinu	ities are rou	ıgh			
		25	19				size retur weathere (possible Moderate moderate	ns of variably d limestone bedrock). ly weak to ely strong,	4		and unduk Apertures sand and o smeared/ii Dips are s	ose to irreguare open wo clay nfilled surfa ub-10° with	ular. ith ces.			
17.50	-		-	1	-	100	grained L (heavily s	IMESTONE solution			throughou	t.				
	93	0	0			Marin Marin	weathere	d - vuggy and Moderately	to							
19.00	100	0	0		日	-	36									
19.10			29	r	五											
19.80			\vdash		上						1.71				1	
_			8 T			1 500		INSTALLAT	ION RE	EM	ARKS					200
		••												-		
							ļ		ATER I	_	TAILS Casing	Depth to Water				
								Date	INUIT			DODUI W	I C'AMO	nents		
	ORDI ENT (W) (HOD (W) (W) 19.00 17.50 19.00 19.80	16.00 100 17.50 93 19.00 19.80 EMARKS	16.00 100 25 17.50 93 0	16.00 100 25 19 17.50 93 0 0 19.00 100 29 29 19.80 MARKS	TRACT Trinity Wharf, Wexford ORDINATES(_) ENT Deerland Properties Kavanagh Mansfield (E) Had Service Spacing (mm) 250 500 100 25 19 17.50 93 0 0 19.00 100 0 0 0 19.10 100 29 29 19.80 EMARKS	TRACT Trinity Wharf, Wexford ORDINATES(_) ENT Deerland Properties Kavanagh Mansfield (w) Hadeo Spacing (mm) Self Spacing (mm) O 250 500 O	TRACT Trinity Wharf, Wexford ORDINATES(_) ENT Deerland Properties Kavanagh Mansfield Fracture Spacing (mm) Self Sinker	TRACT Trinity Wharf, Wexford ORDINATES(_) GROUND LET CORE DIAME INCLINATION FLUSH Fracture Spacing (mm) Public Spacing (mm)	ASSIL GROUND LEVEL (m) CORE DIAMETER (mm) INCLINATION FLUSH Fracture Spacing (mm) Fracture Spacing (mm) GROUND LEVEL (m) CORE DIAMETER (mm) INCLINATION FLUSH Symmetric Spacing (mm) GROUND LEVEL (m) CORE DIAMETER (mm) INCLINATION FLUSH Symmetric Spacing (mm) GROUND LEVEL (m) CORE DIAMETER (mm) INCLINATION FLUSH Symmetric Symmetric Spacing (mm) GROUND LEVEL (m) CORE DIAMETER (mm) INCLINATION FLUSH Symmetric Symmetry Symmetric S	TRACT Trinity Wharf, Wexford ORDINATES(_) Deerland Properties Kavanagh Mansfeld Fracture Spacing (mm) Deerland Properties Strata description Example Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) SYMMETRIX OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) 15.00 Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) 15.00 Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties SymMetrix OPEN HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties HOLE DRILLING: Observed by driller as returns of brown gravelly clay (continued) Deerland Properties HOLE DRILLING: Observed by	TRACT Trinity Wharf, Wexford ORDINATES(_) Deerland Properties INCLINATION 9-9 INCLINATION 9-	TITRACT Trinity Wharf, Wexford ORDINATES(_) Declared Properties Kavanagh Mansfield Fracture Spacing (mm) Spacing (mm) Public Spacing (mm) SymMetrix OPEN HOLE Drill.ING: Observed by driller as returns of brown gravely day (continued) 15.00 100 25 19 17.50 93 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	TRACT Trinity Wharf, Wexford SRILET Trinity Wharf, Wexford SRIEET ORDER SHEET OF TRILET ORDER SHEET OF TRILET ORDER SHEET OF TRILET ORDER Specing (mm) Strata description (see Strata	TRACT Trinity Wharf, Wexford SHEET ORDINATES(_) GROUND LEVEL (m) CORE DIAMETER (mm) PRILIPIDE BY INCLINATION PRILIPIDE BY INCLINATION PRILIPIDE BY Almiest Looged by Almiest Looged by Strata description Fracture GROUND LEVEL (m) CORE DIAMETER (mm) PRILIPIDE BY Almiest Looged by Almiest Looged by Strata description Fracture GROUND LEVEL (m) Almiest Looged by ORDINATION PRILIPIDE BY Discontinuities Strata description Fracture GROUND LEVEL (m) Almiest Looged by Republic BY Almiest Looged by Discontinuities SYMMETRIX OPEN HOLE DRILLING: Observed by drifter as regular clayery gravel size returns of variably weathered intensione (mossible bedreck). Modernately strong gravel size returns of variably weathered intensione (mossible bedreck). Modernately strong gravel size returns of variably weathered intensione (mossible bedreck). Modernately strong gravel size returns of variably weathered intensione (mossible bedreck). Modernately to highly weathered intensione (mossible bedreck). Modernately to h	GEOTECHNICAL CORE LOG RECORD TRACT Trinity Wharf, Wesford GROUND LEVEL (m) CORE DIAMETER (mm) SHEET DATE STARTED DATE COMPLETED DATE COMPL	GEOTECHNICAL CORE LOG RECORD TRACT Trinity Wharf, Wexford ORDINATES(_) GROUND LEVEL (m) CORE DAMFETER (mm) B4 DATE STARTED DATE STARTED 28/11 DATE COMPLETED 29/11 DRILLED BY Milled DISCONTINUITIES Fracture Spacing (mm) Spacing S

CONTRACT Trinity Wharf, Wexford CO-ORDINATES() CREDINATER (mm) CREDINATER (mm) CREDINATER (mm) CREDINATER (mm) CREDINATION PORT DIAMETER (mm) PORTILIBITY Deerland Properties Kavanagh Mansfeld Fracture Spacing (mm) PURPLE (m) CORE DIAMETER (mm) Strata description Full H GROUND LEVEL (m) CORE DIAMETER (mm) PURPLE (m) CORE DIAMETER (mm) PURPLE (m) DATE COMPLETE DATE STARTED DATE COMPLETE DRILLED BY LOGGED BY CORE DIAMETER (mm) PURPLE (m) CORE DIAMETER (mm) PURPLE (m) CORE DIAMETER (mm) PURPLE (m) DATE COMPLETE DATE STARTED DATE COMPLETE DATE STARTED DATE COMPLETE CORE DIAMETER (mm) PURPLE (m) DATE STARTED DATE STARTE	Sheet 3 of 3
CO-ORDINATES(_) GROUND LEVEL (m) CORE DIAMETER (mm) 84 DATE STARTED DATE COMPLETE: INCLINATION 90 DRILLED BY LOGGED BY Fracture Specing (mm) 0 250 500 0 100 87 87 21 21.00 End of Corehole at 21 End of Corehole at 21	
End of Corehole at 21 Test Strate description Test Spacing (mm) Tes	
20 20.10 33 0 0	Millennium IGSL
21 21.00 21.	Elevation Standpipe Details SPT (N Value)
21 21.00 End of Corehole at 21 (m) 22 23 24 25 26	
22 (m) 23 24 25 26	
24 25 26	
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REMARKS INSTALLATION REMARKS 2 Core boxes	
GROUNDWATER DETAILS	
Date Hole Casing Depth to Comments	nents
Depth Depth Water Comments	
Date Tip Depth RZ Top RZ Base Type	

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Appendix III - Geotechnical Laboratory Records

	Ciassincation	_ <u>N</u>		10	CL	M	Ü	5	ō	CL	CL	- -	CL	CL	-		ō							
	Description	Black slightly organic slightly sandy slightly gravelly SIL.T	Motted orange brown sandy gravelly CLAY	Brown slightly sandy gravelly CLAY	Mortled orange grey brown slightly sandy slightly gravelly CLAY	Orange brown silty very sandy GRAVEL with many cbbles	Orange brownslightly sandy slightly gravelly CLAY	Grey brown slightly sandy slightly gravelly CLAY with many cob	Light brown slightly sandy slightly gravelly CLAY	Brown slightly sandy gravelly CLAY	Grey brown slightly sandy slightly gravelly CLAY	Orange brown slightly sandy slightly gravelly CLAY	Grey brown slightly organic sandy gravelly CLAY	Grey brown stightly sandy slightly gravelly CLAY with some cobbles	Crew brown elightly omanic sandy drayelly CLAY	מופא מופאות מופאת מופאות מופאות מופאות מופאות מופא מופאות מופאת מופאת מופאת מופ	Grey brown slightly sandy gravelly CLAY with some cobbies				Contract No.	13184	Page	of
lests 5,3 & 5,4	Preparation Description	WS B	ws w	WS	WS	WS	WS	SW.	MS	MS	SW	ws	WS	SW	0,41	28	WS							
ation Te 3.2, 4.3, 5,	_	20	#DIV/0i	57	82	19	81	59	54	47	59	99	77	54	5 6	8	48				COCHA	מעטעט		
of Classification 1990, clauses 3.2, 4.3	Plasticity Index	17	0	21	8		24	25	21	12	14	24	12	47	= :	13	21			actic.	2000	I KINII Y WHAKI WEATOND		
Summary of Classification BS1377 Part 2:1990, clauses 3.2, 4.3,	Plastic Limit %	32		21	14	٩	23	24	22	14	14	24	15	1,	=	19	19			ND Non Blastic	<u> </u>	X X	Date	30/01/2008
Su BS137	Liquid Limit %	49		42	22	19	47	49	43	26	28	48	27	i	\$	32	40			14.42Em)	- Wer sleved (425µIII)			
	Moisture Content %	28.7		25	21.1	6.3	22.6	16.7	22.4	12.7	10.6	14.8	10.0	2 1	28.5	21.1	15.4				S - Wet siev			
	Sample		٥		۵	۵	٥	٥	٥	٥	٥	٥	3 6			۵	۵				NAT - tested as received WS		Issued By	
	Depth (m)	2 00	2 00	7.50	2.5	3.50	5.50	6.50	8.50		00.	3.5	6.7	3.00	5.50	2.50	5.50		-		ested as ru			
	Sample	371B	3721	3724	3739	3741	3732	3733	3735	3750	8	3752	37.30	2	7719	7747	7751	-			NAT - t		יני כי)
87	BH/TP No.	7 70			E E	H H	BHB	BH 6	S I S					n H	BH 8	BH 11	BH 11				Notes:			

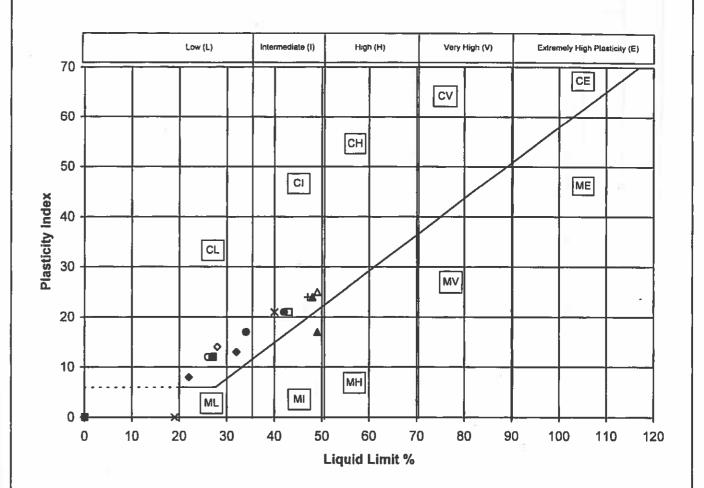
Plasticity Chart - Summary of Liquid & Plastic Limit Tests BS1377:Part 2:1990, clauses 3.2, 4 & 5 Chart in accordance with BS5930:1999, fig.18

Contract No.

13184

Contract:

TRINITY WHARF WEXFORD



Code	BH/TP	Sample	Depth (m)	MC%	LL%	PL%	PI%	%<425µm	Description
A	BH 4	3718	2.00	28.7	49	32	17	50	Black slightly organic slightly sandy slightly gravelly SILT
	BH 4	3721	5.00	0	0	0	0	#DIV/0!	Mottled orange brown sandy gravelly CLAY
•	BH 4	3724	7,50	25	42	21	21	57	Brown slightly sandy gravelly CLAY
•	BH 5	3739	2.50	21.1	22	14	8	82	Mottled orange grey brown slightly sandy slightly gravetly CLAY
X	BH 5	3741	3.50_	6.3	19	NP	0	19	Orange brown silty very sandy GRAVEL with many cibbles
+	BH 6	3732	5,50	22.6	47	23	24	81	Orange brownslightly sandy slightly gravetly CLAY
Δ	BH 6	3733	6.50	16.7	49	24	25	59	Grey brown slightly sandy slightly gravelly CLAY with many cobbles
	BH 6	3735	8.50	22.4	43	22	21	54	Light brown slightly sandy slightly gravelly CLAY
0	BH 8	3750	1.50	12.7	26	14	12	47	Brown slightly sandy gravelly CLAY
\Diamond	BH 8	3752	3,50	10.6	28	14	14	59	Grey brown slightly sandy slightly gravelly CLAY
	BH 8	3756	7.50	14.8	48	24	24	66	Orange brown stightly sandy slightly gravelly CLAY
	BH 9	7716	3.00	19.9	27	15	12	_ 77	Grey brown slightly organic sandy gravelly CLAY
•	BH 9	7719	5.50	28.5	34	17	17	54	Grey brown slightly sandy slightly gravelly CLAY with some cobbles
•	BH 11	7747	2,50	21.1	32	19	13	65	Grey brown slightly organic sandy gravelly CLAY
×	BH 11	7751	5.50	15.4	40	19	21	48	Grey brown slightly sandy gravelly CLAY with some cobbles
+			-1 = 1						
Δ									

NP denotes specimen is non-plastic.

	Issued by	Date		Page	
IGSL	4 8 8 8	30/01/2008	1907		

Classification		5	-	7	0	0	M	- C	2	+	+	O	0	O	Ç) (5	5	ock) M I	Ock)	_					
	Description	Orange brown slightly sandy CLAY	VA IO Vilavero distribution de la Company	Black slightly sandy slightly gravery of	Orange brown slightly sandy slightly gravelly CLAY	Yellow very sandy gravelly CLAY	Grey silty SAND with shell fragments	o man eliabity candy gravelly CLAY with broken rock	DIOWIS SUBJECT SERVICE STATES OF THE STATES	Grey slifty signity organic convo	Orange brown slightly sandy slightly gravery	Mottled orange black brown sandy gravelly CLAT	Orange brown slightly sandy slightly gravelly CLAY	Dark brown slightly sandy slightly gravelly CLAY	Com brown elightly sandy slightly gravelly CLAY	VAID Allowers where the second of the second	Brown signity sation signity greecity	Orange yellow sandy gravelly CLAY (weathered rock)	Yellow brown sitty very sandy GRAVEL (poss weathered rock)	Yellow brown silty very sandy GRAVEL(poss weathered rock)			Contract No.	13184	Page	of
3 & 5.4	Preparation Description	3/4/		MS	WS	SM	WS		20	MS	MS	MS	MS	SM	3	2	MS	S/M	WS	N/N				-		
3.2, 4.3, 5.3 & t	<425µm	8	25	77	96	90	81	; ;	30	76	64	80	92	2	3 5	8	92	55	52	1 8	8			/EXFORD		
Part 2:1990, clauses 3.2, 4.3, 5.3 & 5.4	Plasticity		22	15	16	18			50		17	19	22	1 6	2	16	25	13					Plastic	TRINITY WHARF WEXFORD		00
			24	19	21	20		N I	25	ď	22	26	27	17	67	14	27	24	2		d d		NP - Non Plastic	TRINITY	Date	30/01/2008
BS1377	Liquid I imit %		46	34	37	38	3 3	5	45	27	39	45	9	84	26	30	52	37	;	4	48		- Wet sieved (425μm)			
	Moisture	Content to	18.9	25.5	27.3	707	4.0	30.6	19.9	24	22	28.5	2007	32	38.6	20.5	36.3	100	2	19.7	21.2		/S - Wet siev			
		l ype	۵	٥		3 (2	۵	۵	٥	0		2	۵	٥	٥	0		<u>-</u>		۵		received WS	Contract	leened By	2000
	Depth	(E)	5.50	7.50	3	00:01	12.50	3.00	10.00	3.00	4 00	201	8.00	11.00	15.00	4 50	3	00.00	2.50	1.50	2.50	 -	NAT - tested as received			
	Sample	ġ	7727	7770	2700	//32	7734	3762	3770	3780	3782	37.02	3786	3789	3793	7705	7700	3	33/5	7737	7738		NAT -			פטר
	BH/TP No.		BH 12	5	21 HB	BH 12	BH 12	BH 14	BH 14	BH 46	2 2	8H 10	BH 16	BH 16	BH 16	BH 17	1		BH 18	BH 21	BH 21		000	NOIGS.		

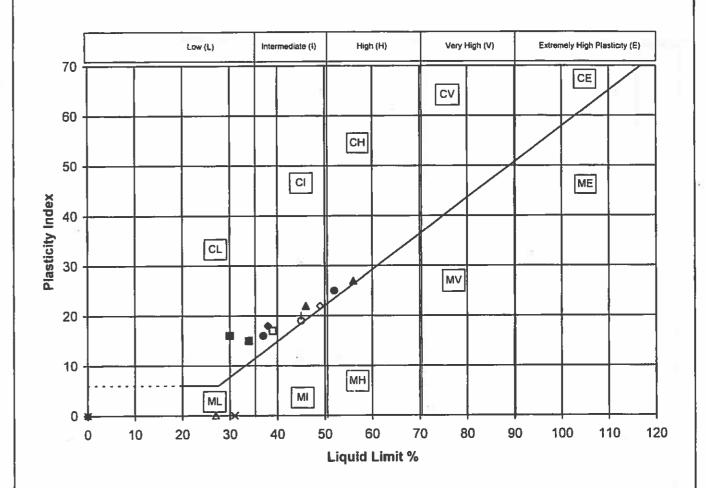
Plasticity Chart - Summary of Liquid & Plastic Limit Tests BS1377:Part 2:1990, clauses 3.2, 4 & 5 Chart in accordance with BS5930:1999, fig.18

Contract No.

13184

Contract;

TRINITY WHARF WEXFORD



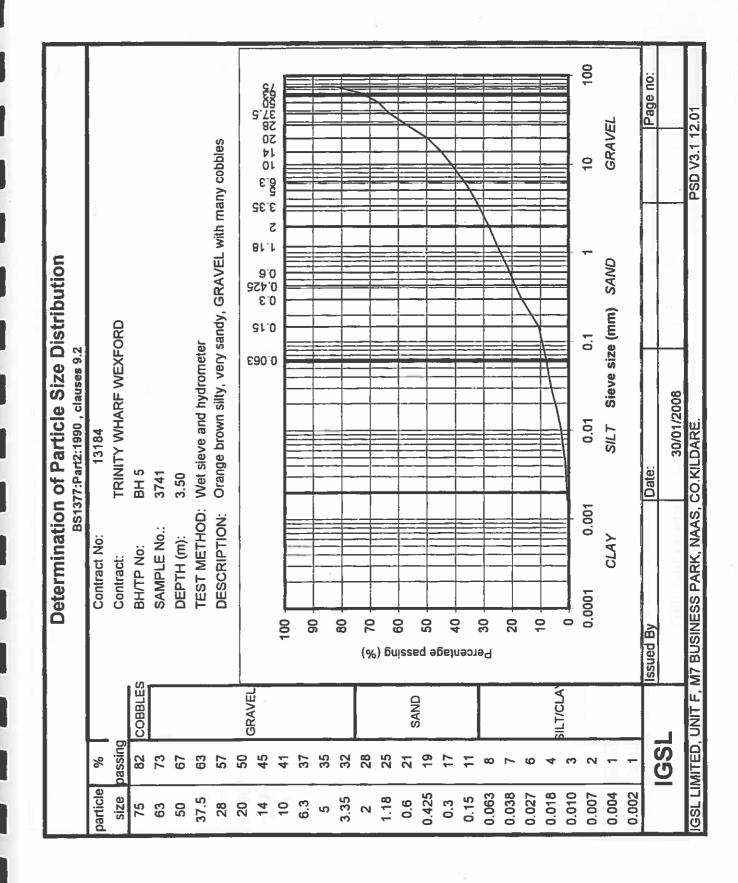
Code	вн/тр	Sample	Depth (m)	MC%	LL%	PL%	PI%	%<425µm	Description
lack	BH 12	7727	5.50	18.9	46	24	22	98	Orange brown slightly sandy CLAY
10	BH 12	7729	7.50	25.5	34	19	15	77	Black slightly sandy slightly gravelly CLAY
•	BH 12	7732	10.50	27.3	37	21	16	96	Orange brown slightly sandy slightly gravetly CLAY
•	BH 12	7734	12.50	18.4	38	20	18	50	Yellow very sandy gravelly CLAY
×	BH 14	3762	3.00	30.6	31	NP	0	81	Grey sitty SAND with shell fragments
+	BH 14	3770	10.00	19.9	45	25	20	30	Brown slightly sandy gravelly CLAY with broken rock
Δ	BH 16	3780	3.00	24	27	NP_	0	76	Grey silty slightly organic SAND
	BH 16	3782	4.00	22	39	22	17_	64	Orange brown slightly sandy slightly gravelly CLAY
0	BH 16	3786	8,00	28.5	45	26	19	80	Mottled orange black brown sandy gravelly CLAY
\Diamond	BH 16	3789	11.00	32	49	27	22	92	Orange brown slightly sandy slightly gravelly CLAY
A	BH 16	3793	15.00	38.6	56	29	27	60	Dark brown slightly sandy slightly gravelly CLAY
-	BH 17	7705	4.50	20.5	30	14	16	80	Grey brown slightly sandy slightly gravelly CLAY
•	BH 17	7709	8.50	36.3	52	27	25	92	Brown slightly sandy slightly gravelly CLAY
•			- 8						
×		1 77							
+									
Δ									

NP denotes specimen is non-plastic.

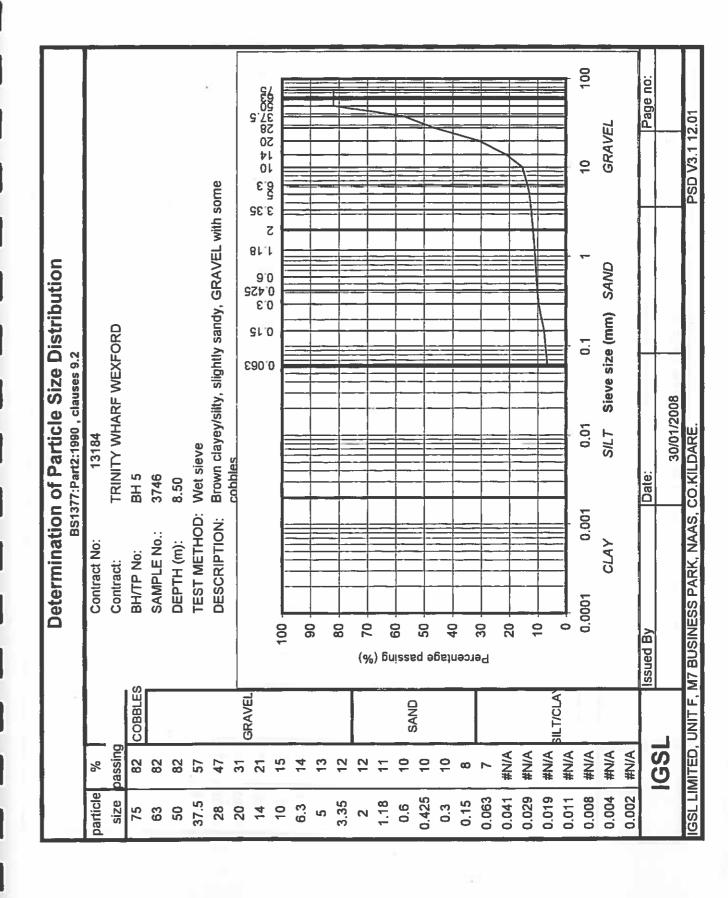
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9 Page no: 28 37.5 50 50 63 GRAVEL すし 9 01 5.3 3.35 81.1 SAND Determination of Particle Size Distribution Wet sieve and hydrometer Brown slightly sandy, gravelly, CLAY 0.425 6.0 Sieve size (mm) TRINITY WHARF WEXFORD S1.0 0.1 BS1377:Part2:1990 , clauses 9.2 690.0 30/01/2008 S, CO.KILDARE. 0.01 SILT BH 4 3724 7.50 0.001 F, M7 BUSINESS PARK, NAAS, TEST METHOD: DESCRIPTION: Contract:
BH/TP No:
SAMPLE No.: CLAY Contract No: DEPTH (m): 0.0001 9 0 30 20 22 40 09 70 9 90 8 Percentage passing (%) SAND MITED, UNIT **ISSI** 42 39 32 32 27 24 59 54 57 2 69 67 62 8 001 73 0.010 0.063 0.007 0.004 0.002 0.026 0.017 0.425 0.037 2 1.18 0.6 0.15 3.35 0.3 50 37.5 20 20 9 S



Particle % Contract No. 13184 Season Contract No. 1318				٥	etermination	Determination of Particle Size Distribution	
13184 1318					BS1:	377:Part2:1990, clauses 9.2	
Sandy, slightly gravelly, SILT/CLAY 0.063 0.070	particle	%			Contract No:	13184	
Sandy, slightly gravelly, SILT/CLAY 0.063 0.063 0.17 0.1 0.1 Sieve size (mm) SAND PST		assing			Contract:	TRINITY WHARF WEXFORD	
Sandy, slightly gravelly, SILT/CLAY 0.063 0.16 0.17 0.17 0.18 0.05 0.19 0.10 0.11 Sieve size (mm) SAND	75	100	COBBLES		BH/TP No:	BH 5	
Sandy, slightly gravelly, SILT/CLAY 0.063 0.425	63	100			SAMPLE No.:	3744	
Sandy, slightly gravelly, SILT/CLAY 0.063	50	100			DEPTH (m):	6.50	
Sandy, slightly gravelly, SILT/CLAY 0.063 0.425 0.425 0.425 0.10 0.1 0.1 Sieve size (mm) SAND	37.5	100			TEST METHOD:		
Sieve size (mm) SAND 2008 2008 2008 2008	28	100			DESCRIPTION:	Brown slightly sandy, slightly gravelly, SILT/CLAY	
0.0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	20	100	GRAVEL			32 452 9 3 3 3	5 Z 8 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
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0.1 1 1 Sieve size (mm) SAND	20	6		100			
0.1 1 Sieve size (mm) SAND		က္ဆ		06			
0.1 1 Sieve size (mm) SAND	S	න		a			
0.1 1 Sieve size (mm) SAND	3.35	92		8			
0.1 1 Sieve size (mm) SAND	2	94					
0.1 1 Sieve size (mm) SAND	1.18	93					
Sieve size (mm) SAND	9.0	91	SAND				
0.1 1 Sieve size (mm) SAND	0.425	83					
Sieve size (mm) SAND	0.3	86					
0.1 1 Sieve size (mm) SAND	0.15	79					
Sieve size (mm) SAND	0.063	73					
Sieve size (mm) SAND	0.041	#N/A		20			
0.1 1 Sieve size (mm) SAND 2008	0.029	#N/A		10			
0.1 1 Sieve size (mm) <i>SAND</i> 2008	0.019	W/V#					
Sieve size (mm) SAND	0.011	#N/A		0		700	100
Sieve size (mm) SAND 2008	0.008	#N/A		o 		0.00	
2008	0.004	#N/A			CLAY	Sieve size (mm) SAND	GRAVEL
2008	0.002	#N/A					Рапе по-
2008		0		Issued By		Date:	200
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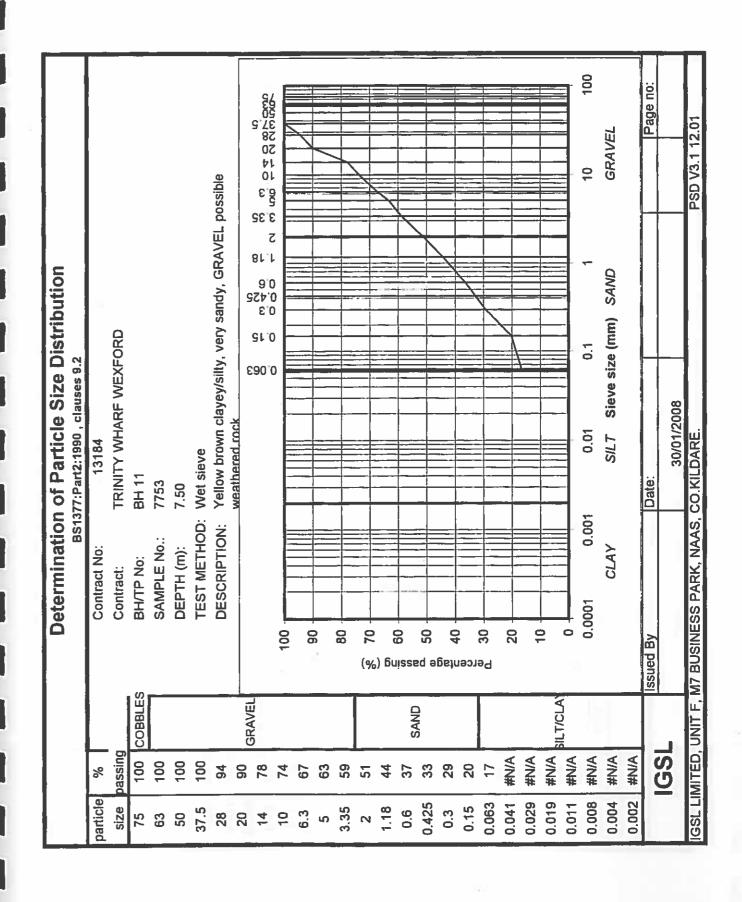
100 14 28 37.5 503 503 503 10 GRAVEL Wet sieve and hydrometer Grey brown slightly sandy, slightly gravelly, CLAY with many cobbles 5.3 3,35 81.1 SAND Determination of Particle Size Distribution BS1377:Part2:1990, clauses 9.2 0.6 0.425 0.3 Sieve size (mm) TRINITY WHARF WEXFORD S1.0 0.1 690.0 30/01/2008 , CO.KILDARE. 0.01 SILT 3733 6.50 0.001 SAMPLE No.: 3
DEPTH (m):
TEST METHOD: V
DESCRIPTION: CLAY 0,0001 30 20 9 20 70 80 06 Percentage passing (%) IGSL LIMITED, UNIT F. SAND IGSL 63 60 59 53 50 48 23 23 23 23 72 71 69 68 68 64 0.425 0.3 0.15 0.063 0.026 0.017 0.010 0.007 0.002 75 63 50 37.5 28 20 14 10 6.3 5 1.18 0.6

Second and Particle Size Distribution Determination of Particle Size Distribution Bisi377-Bart211990, clauses 9.2 Particle Size Description of Particle Size Distribution Bart211990, clauses 9.2 Particle Size Description						
## Contract No. 13184 100 COBBLES BH 8 BH 8 BH 8 100 COBBLES BH 8			_	Determination BS13	of Particle Size Distribution 377:Part2:1990 , clauses 9.2	
Contract: TRINITY WHARF WEXFORD BH 8 SAMPLE No.: 3756 DEPTH (m): 7.50 TEST METHOD: Wet sieve and hydrometer DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY 000 000 000 0000 0000 0000 0000 000	L			Contract No:	13184	
BHTP No: 3756 DEPTH (m): 7.50 TEST METHOD: Wet sieve and hydrometer DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY BOO CRAPE CLAY SILT Sieve size (mm) SAND GRAVEL Page: Page: Page: Page: Page: Page: Page: Page: Page: Page: Page: Page:		ing		Contract:	TRINITY WHARF WEXFORD	
SAMPLE No.: 3756 DEPTH (m): 7.50 TEST METHOD: Wet sieve and hydrometer DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY BOO COOC TO COOC	H		(0.	BH/TP No:	BH 8	*
DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY Solution of the series (mm) sandy of the series (mm) sandy To clay silt sieve size (mm) sandy The series of the series (mm) sandy Date: Page 1	_			SAMPLE No.:	3756	
TEST METHOD: Wet sieve and hydrometer DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY Since the size (mm) SAND Description of the size (mm) SAND Since the size (mm) SAND Description of the size (mm) SAND Since the size (mm) SAND Since the size (mm) SAND Description of the size (mm) SAND Since the size (-			DEPTH (m):	7.50	
DESCRIPTION: Orange brown slightly gravelly, CLAY 0.06 0.00 0.18 0.00 0.00 0.00 0.00 0.00 0.00	-			TEST METHOD:	Wet sieve and hydrometer	
00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0				DESCRIPTION:	Orange brown slightly sandy, slightly gravelly, CLAY	
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3y Date: 30/01/2008 PSD V3.1 12	_	_		 		81
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NESS PARK NAAS, CO KILDARE.	<u>5</u>	2 L			11 IV	
	TIMI - INC.	A TINI C	M7 BUSIN	JESS PARK NAAS		12.01

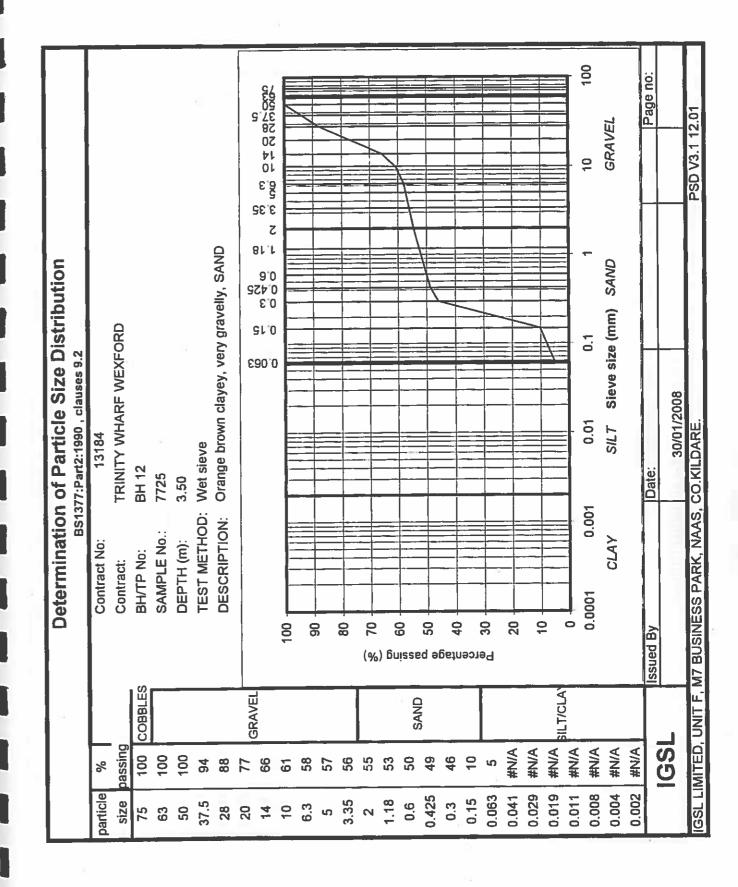
100 GRAVEL Wet sieve and hydrometer Grey brown slightly sandy, gravelly, CLAY with some cobbles 10 5.3 3,35 2 81.1 SAND Determination of Particle Size Distribution
BS1377:Part2:1990, clauses 9.2
Contract No: 13184 0 3 0 429 0 9 Sieve size (mm) TRINITY WHARF WEXFORD BH 9 7719 0.15 0.1 0.063 0.01 SILT 5.50 Contract No:
Contract: T
BH/TP No: B
SAMPLE No.: 7
DEPTH (m): 5
TEST METHOD: V
DESCRIPTION: 9 0.001 CLAY 0.0001 2 30 20 9 20 100 90 8 Percentage passing (%) GRAVEL IGSL LIMITED, UNIT IGSL 42 37 33 31 27 22 19 58 54 52 65 63 61 94 94 87 77 72 70 67 0.3 0.15 0.063 0.037 0.017 0.010 0.004 0.002 75 63 50 37.5 28 20 14 10 6.3 5 3.35 2 1.18 0.425

size passir 75 100 63 93 50 84 37.5 68 21 51 68 28 51	% passing		100	BS1377:Part2:1990, clauses 9.2	7.7	
			Contract No:	13184		
			Contract:	TRINITY WHARF WEXFORD	FORD	
		10.	BH/TP No:	BH 9		
	93		SAMPLE No.:	7723		
	84		DEPTH (m):	9.50		
	68		TEST METHOD:	Wet sieve		
_	51		DESCRIPTION:	Grey brown clayey/silty	Grey brown clayey/silty, sandy, GRAVEL with some cobbles	me cobbles
	41 GRAVE				9	
				. 3 0 (0 18 0 18 0 18 0 18	3.35 5.3 10 14 5.0 37.5 5.0 37.5
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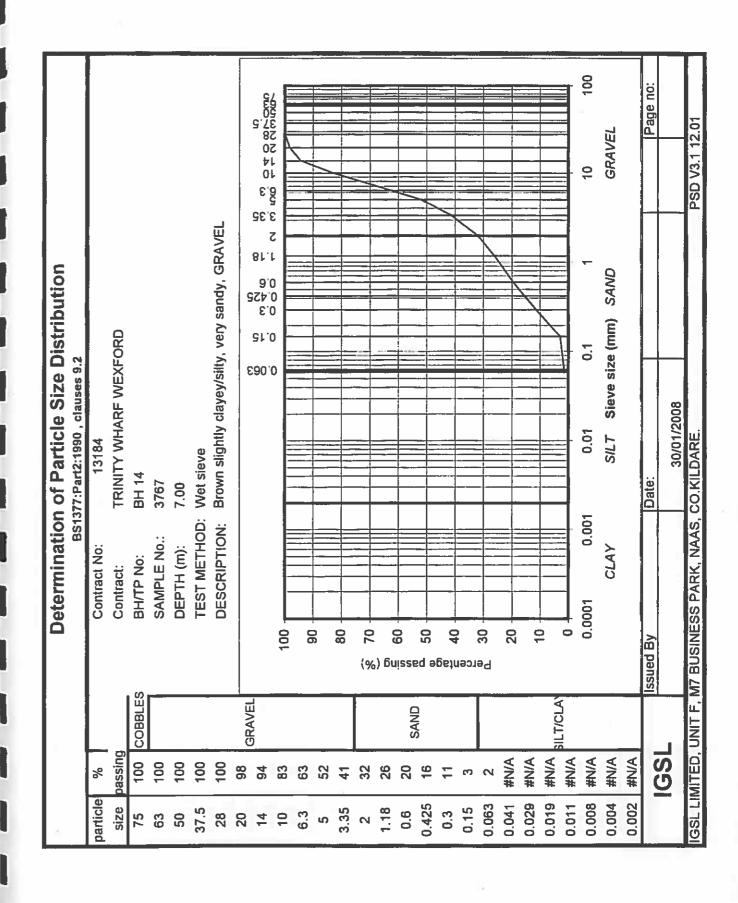
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	passing			Contract:	TRINITY WHARF WEXFORD	ORD	
75	100	COBBLES		BH/TP No:	BH 11		
63	85			SAMPLE No.:	7751		
20	85			DEPTH (m):	5.50		
37.5	73			TEST METHOD:			ochtice
28	20			DESCRIPTION:	Grey brown slightly sandy, gravelly, CLAY with some cobbies	/, gravelly, CLAY with so	IIIe coppies
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State Stat				De	termination	Determination of Particle Size Distribution	oution	
100 COBBLES Contract No. 13184 Description					BS13	77:Part2:1990 , clauses 9.2		T
100 COBBLES COntract: TRINITY WHARF WEXFORD 100 COBBLES BH/TP No. BH 11 100 COBBLES SAMPLE No. BH 11 100 DESCRIPTION: Brown clayey/silty, very sandy, GRAVEL with broken 100 TEST METHOD: Wet sieve 110 DESCRIPTION: Brown clayey/silty, very sandy, GRAVEL with broken 121 CRAVEL CRAVEL CRAVEL 100 CRAVEL CRAVEL CRAVEL 110 CRAVEL CRAVEL CRAVEL 111 CRAVEL CRAVEL CRAVEL 112 CRAVEL CRAVEL CRAVEL 112 CRAVEL CRAVEL CRAVEL 113 CRAVEL CRAVEL CRAVEL CRAVEL 111 CRAVEL CRAVEL CRAVEL CRAVEL 112 CRAVEL CRAVEL CRAVEL CRAVEL 113 CRAVEL CRAVEL CRAVEL CRAVEL CRAVEL 113 CRAVEL CRAVEL CRAVEL CRAVEL CRAVEL 113 CRAVEL CRAVEL CRAVEL CRAVEL CRAVEL 114 CRAVEL C	particle	%			Contract No:	13184		
BH/TP No. BH 11 SAMPLE No. 7754 DEPTH (m): 8.50 TEST METHOD: Wet sieve DESCRIPTION: Brown clayey/silty, very sandy, GRAVEL with broken 100 100 100 100 100 100 100 100 100 1		assing		9	Contract:	TRINITY WHARF WEXFORD		
SAMPLE No.: 7754 DEPTH (m): 8.50 TEST METHOD: Wet sieve DESCRIPTION: Brown clayev/silty, very sandy, GRAVEL with broken nockhoulder 60 0.00 0.00 0.00 0.00 0.00 0.00 0.00	75	100	COBBLES		3H/TP No:	BH 11		
DESCRIPTION: 8.50 TEST METHOD: Wet sieve DESCRIPTION: Brown dayey/silty, very sandy, GRAVEL with broken ook/houlder 80 80 80 80 80 80 80 80 80 8	63	100		3,	SAMPLE No.:	7754		
TEST METHOD: Wet sieve DESCRIPTION: Brown dayey/silty, very sandy, GRAVEL with broken nockhoulder 80 60 60 70 60 70 70 70 70 70 7	20	100		_	DEPTH (m):	8.50		
DESCRIPTION: Brown cayey/silty, very sandy, GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL with Dioxent and by Silt Sieve size (mm) SAND GRAVEL Bage Bage NAAS CO Kill DARE.	37.5	95			TEST METHOD:	Wet sieve		
100 100 100 100 100 100 100 100 100 100	28	91		_	DESCRIPTION:	Brown clayey/silty, very sandy, c	SKAVEL With Bloken	
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20 Dercentage passing (%) 70 CLAY SILT Sieve size (mm) SAND GRAVEL GRAVEL SIEVE SIZE (mm) SAND GRAVEL SIEVE SIZE (mm) SAND GRAVEL SIEVE SIZE (mm) SAND GRAVEL SIZE (mm) SAND GRA	3.35	37		- 08				
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0.0001 0.01 1 10 0.0001 0.001 0.01 1 10 CLAY SILT Sieve size (mm) SAND GRAVEL CLAY 30/01/2008 Page PSD V3.1 12.01	0.019	#N/A						
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BUSINESS PARK NAAS CO KII DARE.		0		Issued By		Date:		
DISINESS DARK NAAS CO KILDARE.		2				30/01/2008		
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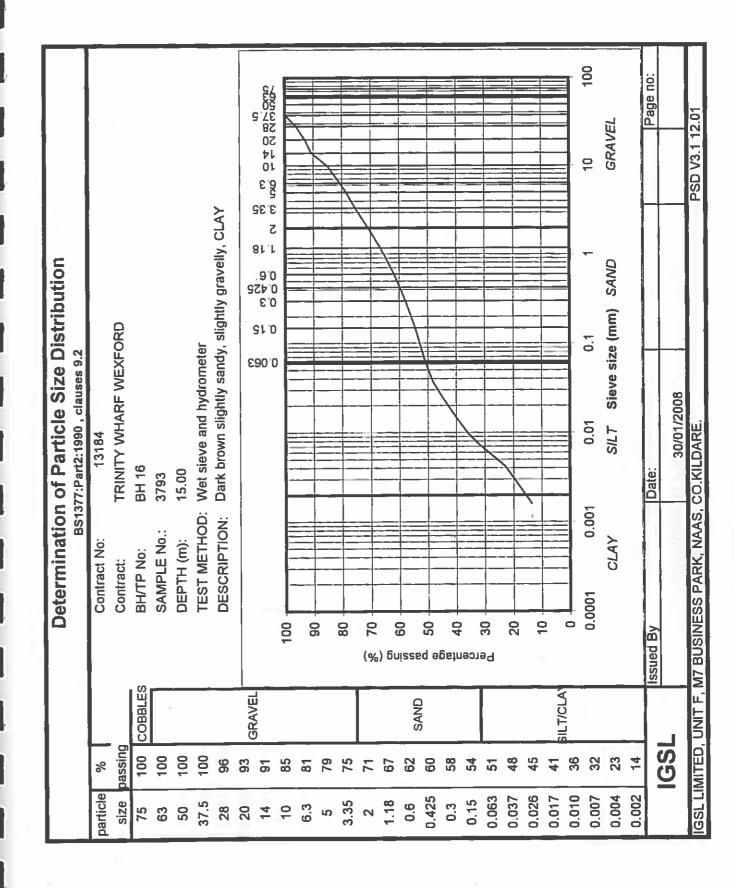
				BS1:	BS1377:Part2:1990 , clauses 9.2	auses 9.2			
narticle	%			Contract No:	13184				
	passing			Contract:	TRINITY WHARF WEXFORD	F WEXFORE	0		
		COBBLES		BH/TP No:	BH 14				
63	100			SAMPLE No.:	3760				
20	100			DEPTH (m):	1.50				
37.5	100			TEST METHOD:					
28	100			DESCRIPTION:	Grey brown sligi	ntly clayey/sii	Grey brown slightly clayey/slify, slightly glavelly, said	ווא, טאואט	
20	100	GRAVEL					5 		9
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S	66			}					
3.35	66			08					
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1.18	86) Gu	60					
9.0	97	SAND	SSE						
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0.15	27		916						
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0.041	#N/A			20					
0.029	#N/A			10					
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0.004	#N/A			CLAY	SILI	Sieve size (mm)	nm) SAMD		1
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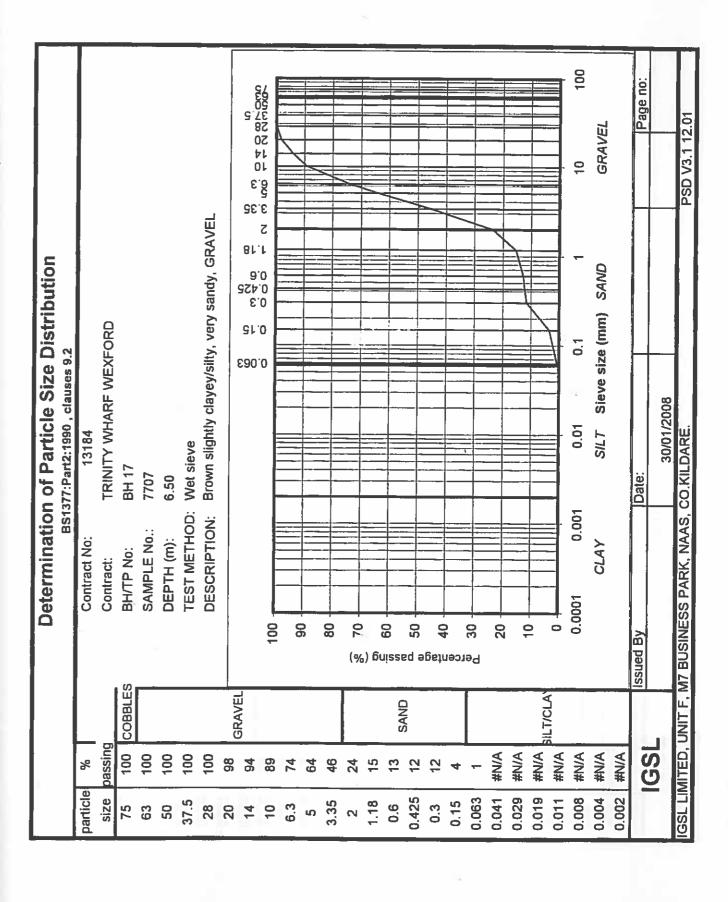
100 GRAVEL 9 5,3 BH 14
3770
10.00
5: Wet sieve and hydrometer Is Brown slightly sandy, gravelly, CLAY with broken cock/houlders 3.35 Z 81.1 SAND Determination of Particle Size Distribution BS1377:Part2:1990, clauses 9.2 0.425 0.6 6.0 Sieve size (mm) TRINITY WHARF WEXFORD G1.0 0.7 690.0 30/01/2008 3, CO.KILDARE. 0.01 SILT 0.001 M7 BUSINESS PARK, NAAS, TEST METHOD: DESCRIPTION: Contract No: Contract: BH/TP No: SAMPLE No.: DEPTH (m): CLAY 0.0001 30 20 10 20 40 70 9 8 90 80 Percentage passing (%) COBBLES GRAVEL GSL LIMITED, UNIT IGSL 37 34 31 30 29 26 25 23 23 8 5 5 5 74 60 53 44 4 48 0.004 0.010 0.007 0.063 0.017 0.425 0.3 0.037 51ze 75 63 50 37.5 28 20 14 10 6.3 5 3.35 2 1.18

				Determination BS13	Determination of Particle Size Distribution BS1377:Part2:1990, clauses 9.2	ibution	
particle	%	L		Contract No:	13184		
size	passing	. [Contract:	TRINITY WHARF WEXFORD		
75	100	COBBLES	,	BH/TP No:	BH 16		
63	100			SAMPLE No.:	3782		
20	100			DEPTH (m):	4.00		
37.5	100			TEST METHOD:	Wet sieve and hydrometer		
28	97			DESCRIPTION:	Orange brown slightly sandy, slightly gravelly, CLAY	lightly gravelly, CLAY	
20	95	GRAVE				9	
14	92				90 0	0.3 35 56 3 66 9 6 10 10 2 8 2 3 5 6 9 9 6 10 10 10 10 10 10 10 10 10 10 10 10 10	503
10	91			100			
6.3	88			Co			
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3.35	8			80			
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1.18	73) bu				
0.6	67	SAND	isss				
0.425	64		d əf	20			
0.3	9		getn	40			
0.15	49		erce.		\ \ =		
0.063	45		∍d	99			
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0.017	32	A TACLA		2			
0.010	56						7
0.007	23			0.0001 0.001	0.01	-	8
0.004	9			CLAY	S/LT Sieve size (mm) SAND	n) SAND GRAVEL	
0.002	15						
	2	-	Issued B	By	Date:	, i	Page no:
	2	۔			30/01/2008		
100	1111	TO TO CAN IN THE CONTRACT TO C	֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓֓	HOVO IN OUR NOVO COLINO		10 01 10 11 10 11	24

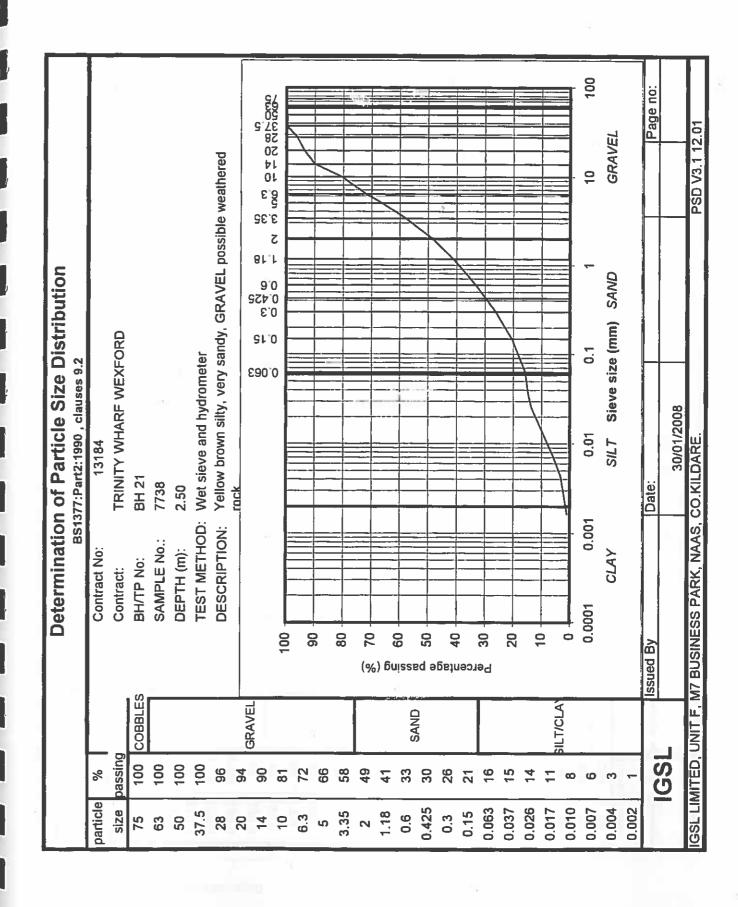
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CONTract No. 13184 Description Contract No. 13184 Description Contract No. 13184 Description Date: Dat				BS13	77:Part2:1990 , clauses 9.2	
100 COBBLES SAMPLE No.: BH 16 SAMPLE NO.: BH 17. CLAY SAMPLE NO.: BH 16 SAMPLE NO.: BH 16 SAMPLE NO.: BH 16 SAMPLE NO.: BH 17. CLAY	_	L	Con	tract No:	13184	
BH/TP No: BH 16 SAMPLE No.: 3789 DEPTH (m): 11.00 TEST METHOD: Wet sieve and hydrometer DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY 63 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	size passii	- 60	Con	itract:	TRINITY WHARF WEXFORD	
SAMPLE No.: 3789 DEPTH (m): 11.00 TEST METHOD: Wet sieve and hydrometer DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY 60 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		COBBLES		TP No:	BH 16	
DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY DESCRIPTION: Orange brown slightly sandy, slightly gravelly, CLAY Signature of the state of th			SA	MPLE No.:	3789	
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30/01/2008 PSD V3.1 1	_	5				l Page no:
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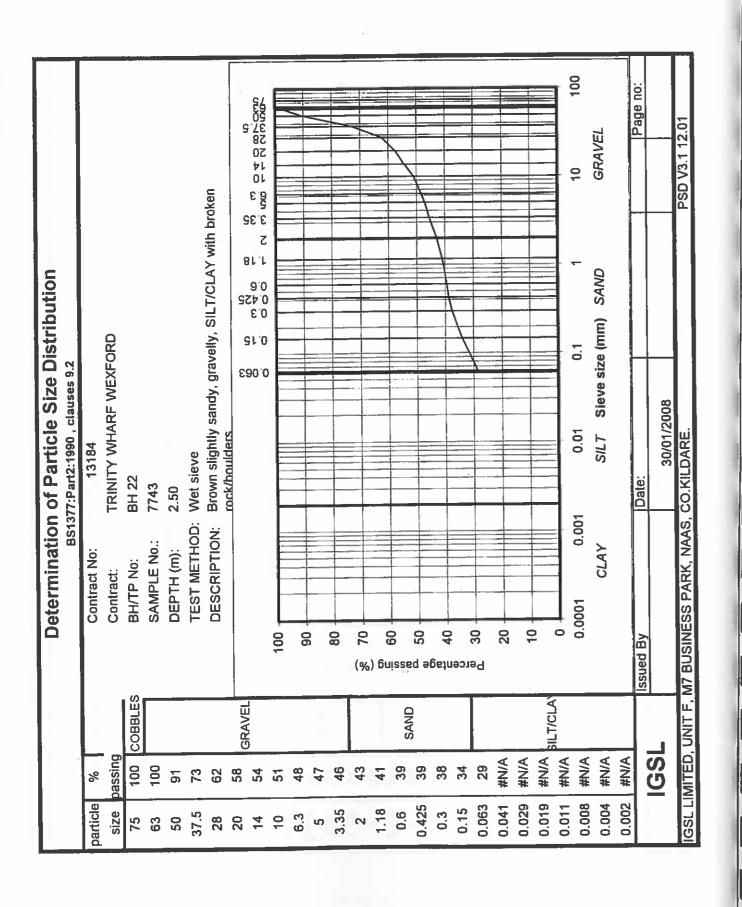


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alcitaca	%			Contract No:	13184				
	passing			Contract;	TRINITY WHARF WEXFORD	WEXFORD			
		COBBLES		BH/TP No:	BH 17		50		
63	100			SAMPLE No.:	7704				
50	100			DEPTH (m):	3.50				
37.5	100	•		TEST METHOD:	-		INAS VIIOVOTO	c	
78	100			DESCRIPTION:	Grey brown clayey/slity, slighing gravelly,	//Siky, siigind	graveny, con		
20	100	GRAVEL					18 9 152 152	98	9.7
14	100					0.0		ယ်က	1996
10	100		100				1		
6.3	100		06						
c)	100		3						
3.35	66		80						
7	66		(%)						
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0.029	#N/A		10			1			
0.019	#N/A	BII T/CI A							
0.011	#N/A		0		000	0	-	10	100
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0.004	#N/A	-		CLAY	SIFI	Sieve size (mm)	CANTO (III		ı İ
0.002	#N/A				Doto:				Page no:
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	0	_			30/01/2008	8			



				BS13	BS1377:Part2:1990, clauses 9.2	BS1377:Part2:1990 , clauses 9.2		
particle	%			Contract No:	13184			
size	passing		_	Contract:	TRINITY WHARF WEXFORD	JRD		
75	100	COBBLES		BH/TP No:	BH 17			
63	90			SAMPLE No.:	7709			
50	100		_	DEРТН (m):	8.50			
37.5	100		•	TEST METHOD:	Wet sieve and hydrometer	ارم این براسترین براهدراند. ۱۳۸۸ کیلامترین براهدراند		
78	9	·		DESCRIPTION:	Brown sligntly sandy, sligtilly gravelly,	illy gravery, cent		
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6.3	100		Co					
2	66		8					
3.35	98		08					
2	26		2 (%)					
1.18	95		G Bui					
9.0	93	SAND						
0.425	92		d əf					
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0.063	78				_			
0.037	72		50					
0.026	67		10					
0.017	29	SILT/CLA						
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0.007	41		o O	100.0	P. H		I AVE	
0.004	32			CLAY	S/L/ Sieve size (mm)	e (mm) savo	7700	
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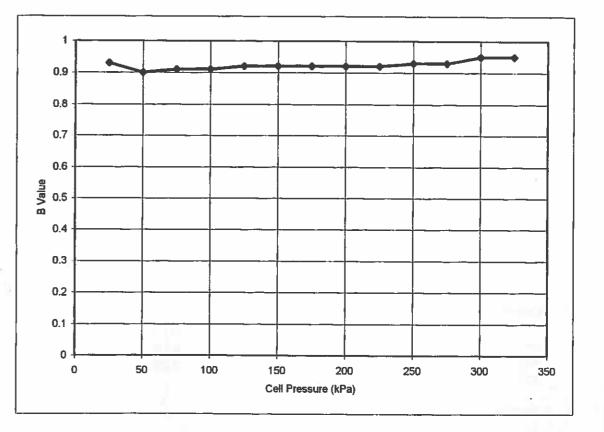


Consolidated undrained Triaxial Compression with pore pressure measurement BS1377:Part 8:1990 and K H Head *Manual of Soil Laboratory Testing* vol 3

Contract No.	13184	Contract N	lame	Wexford		
Location BH3	Sample No.	AE3740	Depth (m)	2.75	Sample Type	U
Method of Preparation	on	Undisturbe	ed		Test Type Multi-stage	
Description	Orangish br	own sandy s	slightly grav	elly CLAY	with grey sandy clay at b	ase
Initial Dimensions an	d condition					
Height (mm)	200.5	Diameter (mm)	104.7	Side drains fitted	No
		Initial		Final		
Moisture Content (%))	19		18		
Bulk Density (Mg/m ³)	•	2.02		2.03		
Dry Density (Mg/m ³)		1.70		1.73		
Saturation Stage						

Initial B Value 0.93 Final B Value 0.95 Increments of Pressure 25

Saturation by increments of Cell & Back Pressure



Number of days saturating

5



Consolidated undrained Triaxial Compression with pore pressure measurement

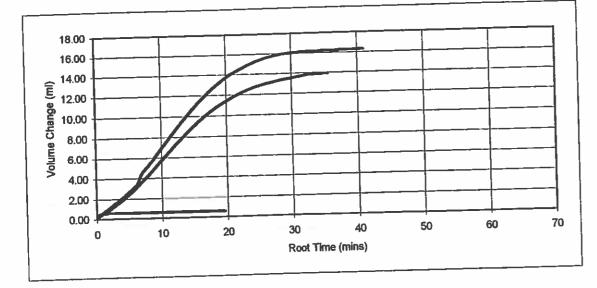
BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Contract No.	13184	Contract Name	Wexford	

Location BH3 Sample No. AE3740 Depth (m) 2.75 Sample Type U

Consolidation Stage

Olace Number	1	2	3
Stage Number Cell Pressure (kPa)	325	350	400
	300	300	300
Back Pressure (kPa)	25	50	100
Effective Pressure (kPa)	298	300	300
Final Pore Pressure (kPa)	0.60	13.89	16.29
Volume Change (ml)	100	100	100
% Pore Pressure Dissipation	100	100	



Number of days consolidating

4

Compression Stage

Failure criteria Maximun	n deviator stres	5	
I alidio oritoria	1	2	3
Stage	25	50	100
Effective Stress (kPa)	0.07	0.01	0.0233
Rate of Strain (mm/min)	299	300	300
Pore Pressure at start (kPa) Axial strain at failure (%)	5.3	9.6	16.5
Deviator Stress at failure (kPa)	71.9	115.9	179.3
Deviator Stress at failure (kPa)	306.49	312.3	330.97
Pore Pressure at failure (kPa)		153.6	247.1
Major Principal stress at failure		37.7	67.8
Minor Principal stress at failure Effective Principal Stress Rati		4.07	3.65
Number of days in compression	on 1	1	1
Total Number of days on test	12		

Page 2 of 6

	10					0002			
	2.75					009		Contract No. 13184	900
ng Vol 3	(m):		!				III	Contract	Figure
ratory Testii	Depth (m):			\$		200	:		
In accordance with BS1377:Part 8:1990 and K H Head Manual of Soils Laboratory Testing Vol 3	AE3740			#		400		φ' = 32.5	
H Head <i>Man</i> เ			182			4	rincipal odess (Kra)	_	Wexford
Part 8:1990 and K H Head Manual of Soils Laboratory Testing	Sample Number:	·				300			State
ordance with BS1377:Part 8:						500		6=3	
rdance with B	ВНЗ					28			Tack .
	HE :	- San		<u>):</u>		001	1	M7 Business	Co.Kildare
					1			M7 Bu	So. X
	C	8	200	Shear Stress (kPa)	2	0		(1)	

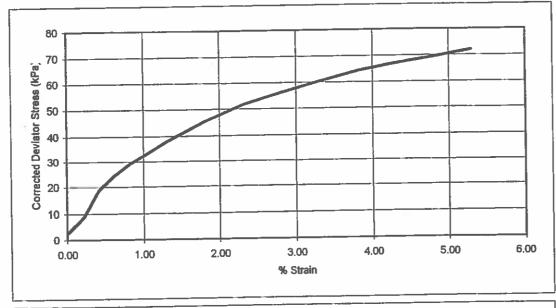


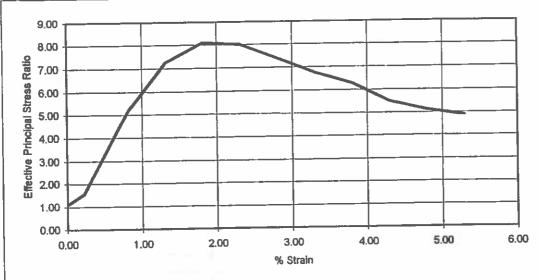
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

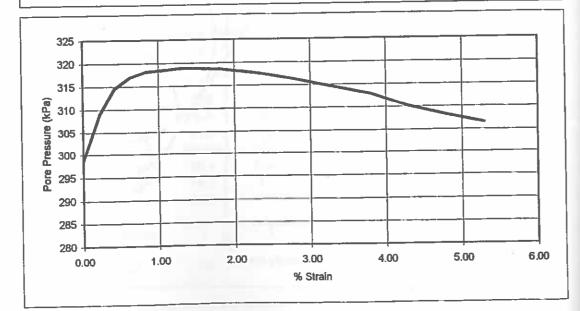
Contract No. 13184 Location

BH3 Sample No. AE3740 Depth

2.75







Page 4 of 6

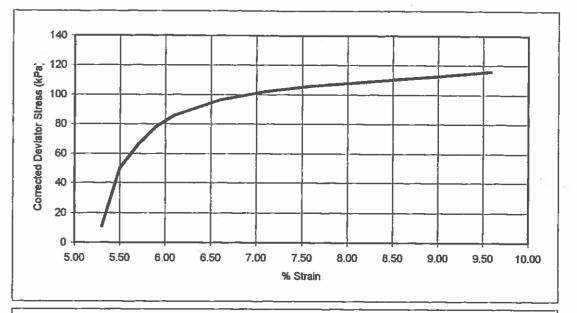


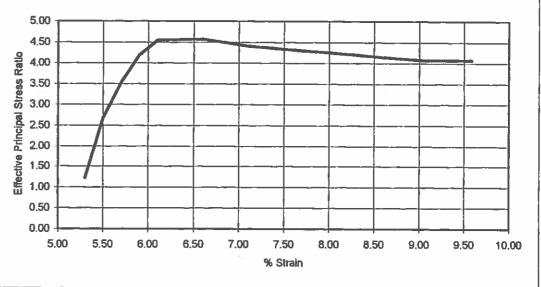
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

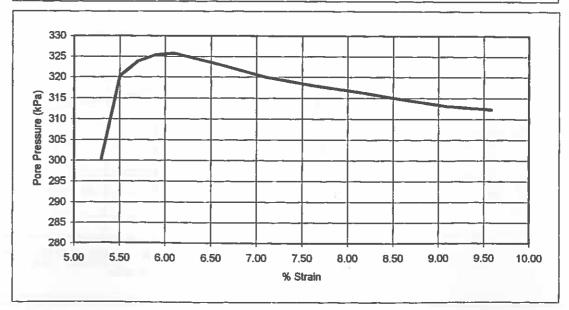
Contract No. 13184 Location

BH3 Sample No. AE3740 Depth

2.75







Page 5 of 6

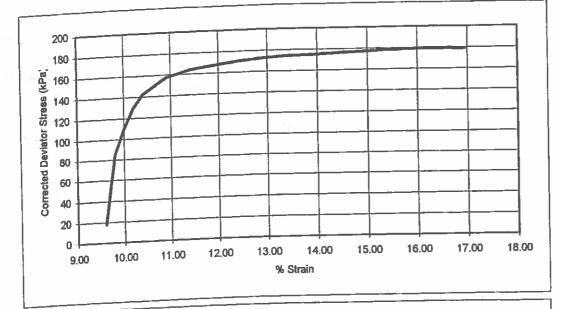


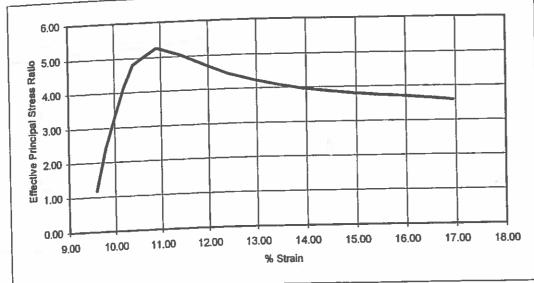
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

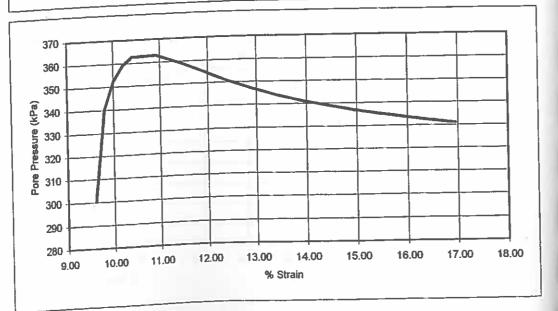
Contract No. 13184 Location

BH3 Sample No. AE3740 Depth

2.75









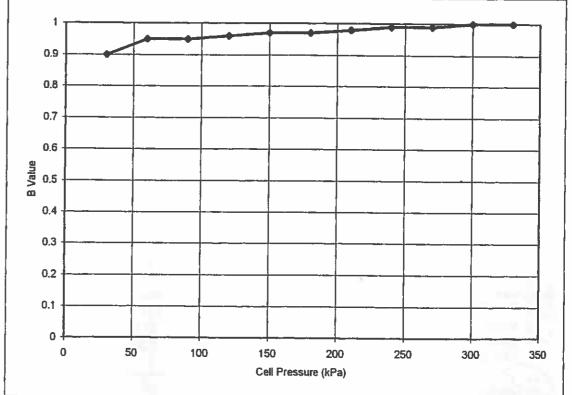


Consolidated undrained Triaxial Compression with pore pressure measurement BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Contract No.	13184	Contract Name	Wexford		
Location BH	i14 Sample	No. AE3762 Depth	(m) 3.00	Sample Type	U
Method of Preparent	aration	Undisturbed		Test Type Multi-stag	e
Description	Laminate	ed: Greyish brown CL	AY with shells	and grey silty SAND wi	th shells
Initial Dimension	s and condition	1			
Height (mm)	200.5	Diameter (mm)	104.6	Side drains fitted	No
		Initial	Final		
Moisture Conten	it (%)	54	43		
Bulk Density (Me	g/m ³)	1.58	1.65		
Dry Density (Mg	/m³)	1.03	1.15		
Saturation Stage	•				

Saturation by increments of Cell & Back Pressure

Initial B Value 0.90 Final B Value 1.00 Increments of Pressure 30



Number of days saturating

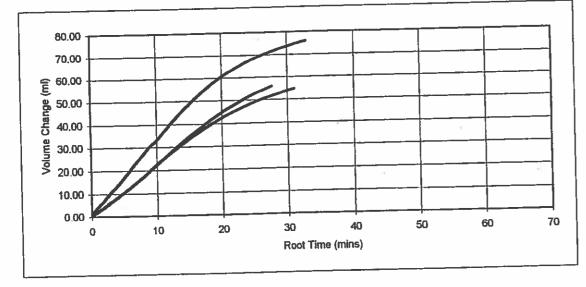
2



Consolidated undrained Triaxial Compression with pore pressure measurement

BS1377:Part 8:1990 and K H Head Manual of Soil Laboratory Testing vol 3

Contract No.	13184	Contract N	lame	Wexford		
Location B	H14 Sample No	. AE3762	Depth (m)	3.00	Sample Type	U
Consolidation :	Stage					
Stage Number Cell Pressure Back Pressure Effective Press Final Pore Pre Volume Chang % Pore Pressu	(kPa) (kPa) sure (kPa) ssure (kPa) ge (ml)	1 330 300 30 300 76.05 100	2 360 300 60 299 54.65 100	3 420 300 120 301 55.94 99		*



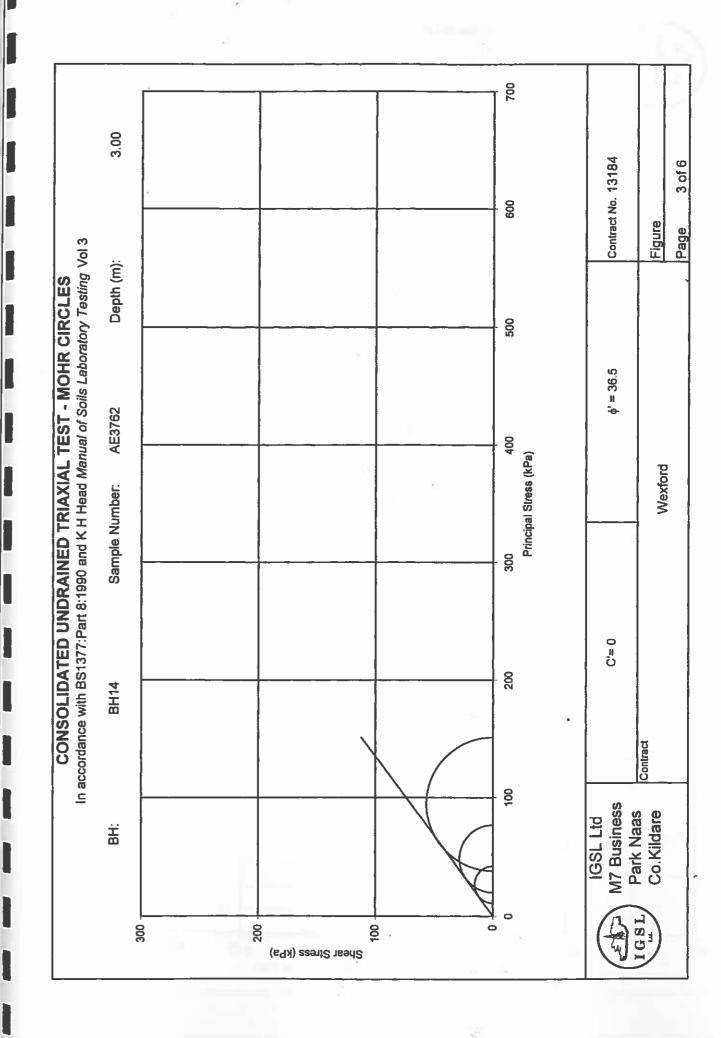
Number of days consolidating

0

Compression Stage

Failure criteria Maximum de	eviator stre	SS	
Stage	1	2	3
Effective Stress (kPa)	30	60	120
Rate of Strain (mm/min)	0.03	0.0302	0.0256
Pore Pressure at start (kPa)	300	300	301
Axial strain at failure (%)	6	12.3	20
Deviator Stress at failure (kPa)	31	56.8	113.5
Pore Pressure at failure (kPa)	319.1	340.3	382.1
	41.9	76.5	151.4
Major Principal stress at failure	10.9	19.7	37.9
Minor Principal stress at failure Effective Principal Stress Ratio	3.84	3.89	3.99
Number of days in compression	1	1	1
Total Number of days on test	11		

Page 2 of 6



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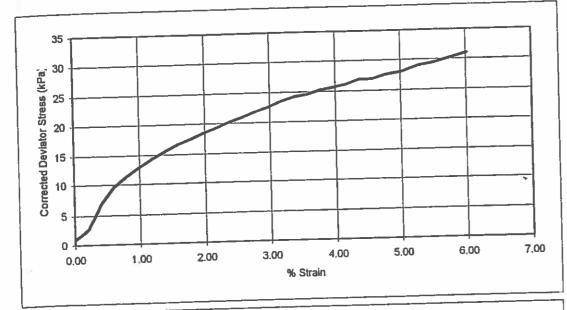
Stage 1

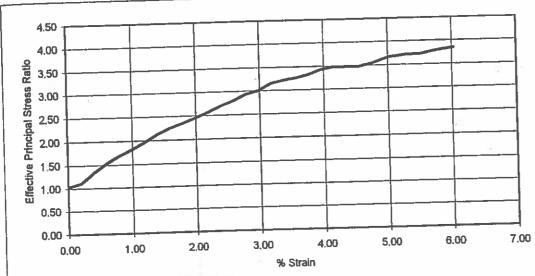
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

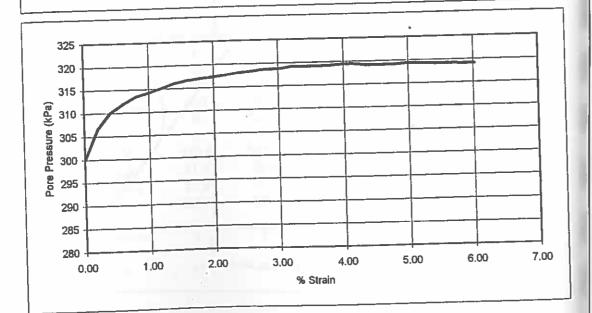
Contract No. 13184 Location

BH14 Sample No. AE3762 Depth

3.00







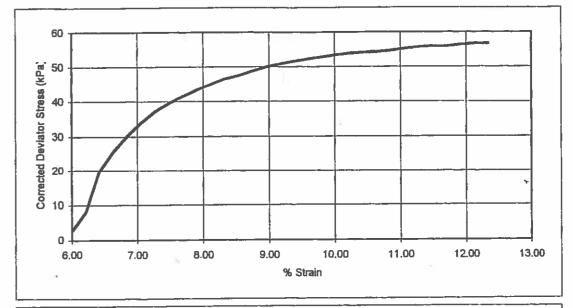
Page 4 of 6

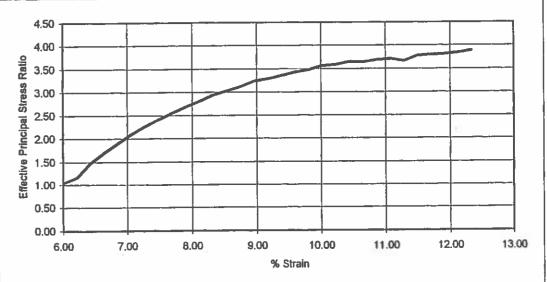
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

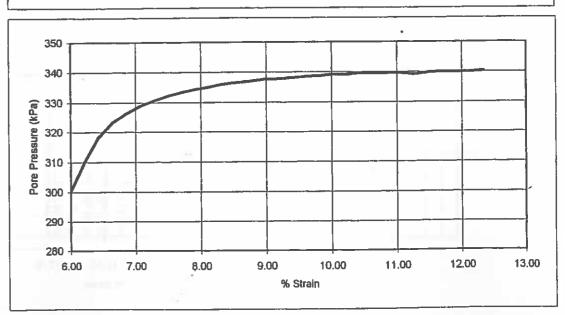


Contract No. 13184 Location BH14 Sample No. AE3762 Depth

3.00







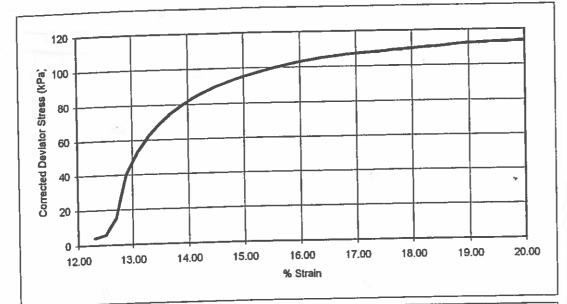
Page 5 of 6

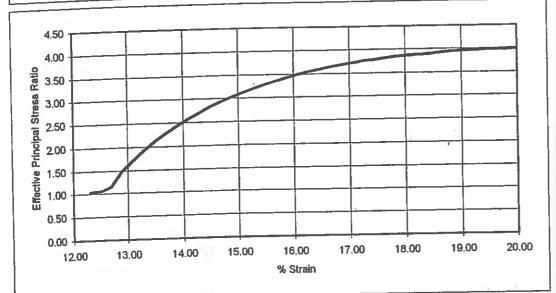


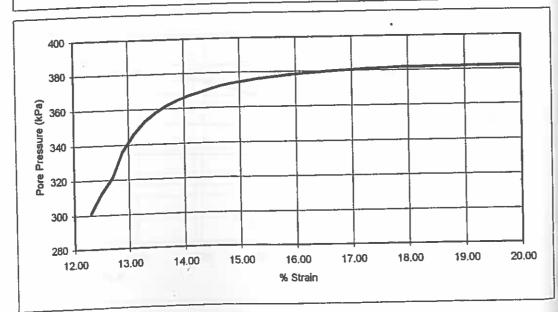
Consolidated Undrained Triaxial Compression with Pore Pressure Measurement

Contract No. 13184 Location BH14 Sample No. AE3762 Depth

3.00

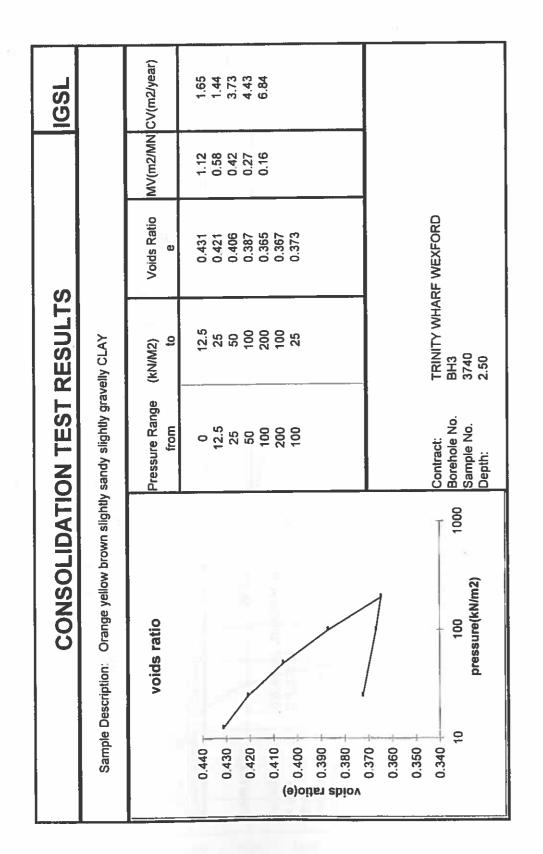




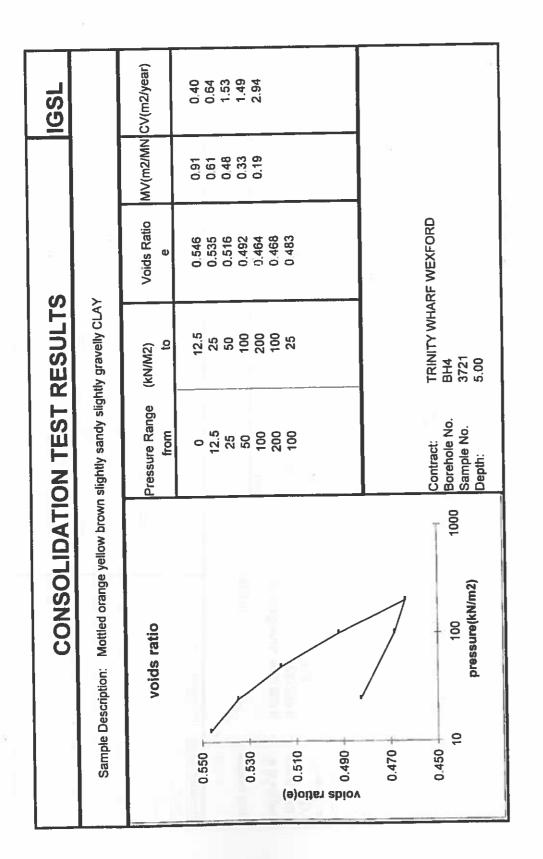


Page 6 of 6

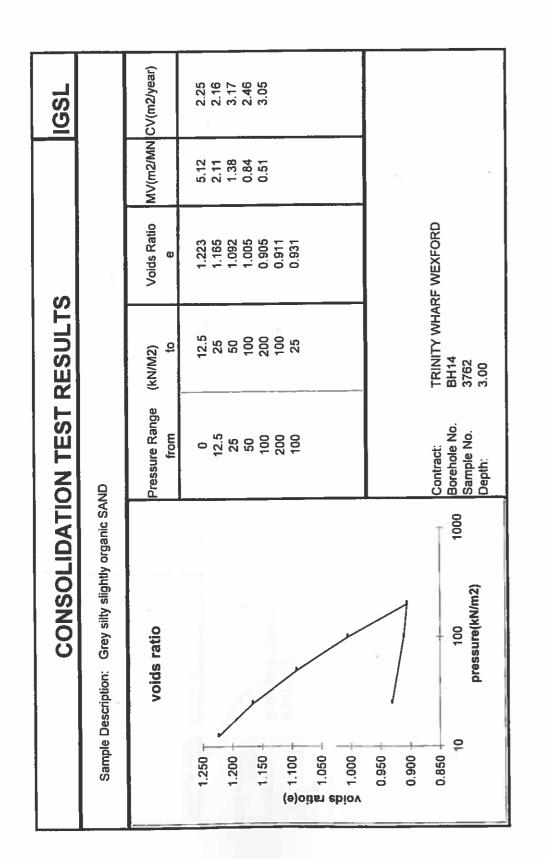
	CO	1170SN	DATIC	CONSOLIDATION TEST CALCULATIONS IGSL	-CALC	SULATIC	SNC	IGSL
initial height Wt. soil+ring final wet wt. final dry wt	19.05 287.2 283 259.3							
wt. of ring w/c initial w/c final	90.7 16.5% 14.1%	N. 20 - 20 11		Contract: 13184 Borehole No:		TRINITY WHARF WEXFORD BH3		
e final	0.3725089		11	Sample No:	3740			
בושולם וו פ	0.0701997	o.o.o.o.ss/ cnange in mr.		Denth:	2 50			
Final Height		18.012						_
Pressure range	increment	change in Ht.	change in e	e at end of stace	average e	MV (m2/MN)	HEIGHT H	HEIGHT H AV HEIGHT
from to		$\overline{}$		0.452			19.05	
<u>`</u>	12.5	0.266	0.020	0.431	0.441	1.125	18.784	18.917
	12.5	0.136	0.010	0.421	0.426	0.581	18.648	18.716
25 50	25	0.196	0.015	0.406	0.414	0.423	18.452	18.55
_	20	0.248	0.019	0.387	0.397	0.271	18.204	18.328
-	100	0.294	0.022	0.365	0.376	0.163	17.91	18.057
	-100	-0.028	-0.002	0.367	0.366	0.016	17.938	17.924
100 25	-75	-0.074	-0.006	0.373	0.370	0.055	18.012	17.975
				0.373				1
				0.373				
_				0.373				



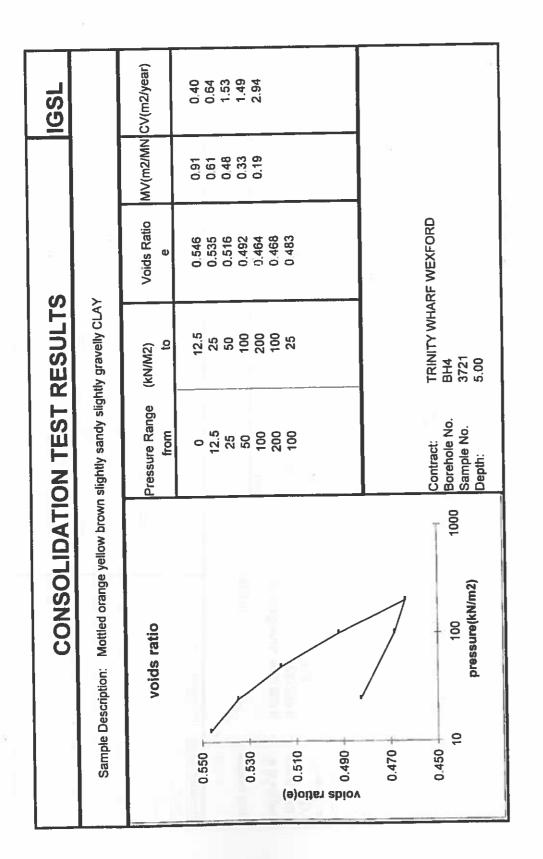
CONSOLIDATION TES 19.05 280.2 276.3 247.5 89.4 18.2% 18.2% 2.65 0.0821094 "change in Ht. 18.058 12.5 0.216 0.012 0.0564 12.5 0.224 0.018 0.554 12.5 0.224 0.018 0.546 12.5 0.224 0.024 0.028 0.024 0.026 0.026 0.0463 -75 -0.176 -0.005 0.483	8	CONSOLIDATION TEST CALCULATIONS IGSL					TRINITY WHARF WEXFORD	13184	(o: BH4	3721		5.00		stage average e [MV (m2/MN.) HEIGHT H AV HEIGHT	19.05	0.555 0.912	0.541 0.605 18.692	0.526 0.482	0.504 0.325 18.17	0.478 0.191 17.826	0.466 0.031	0.476 0.131 18.058	
24 25 27 2 28 2 28 2 2 2 2 2 2 2 2 2 2 2 2 2		ONSOLIDATION	19.05	280.2	276.3	247.5					shange in Ht.		•	ige in Ht. change in e e		0.216	0.142	0.224	0.298	0.344	-0.056	-0.176	



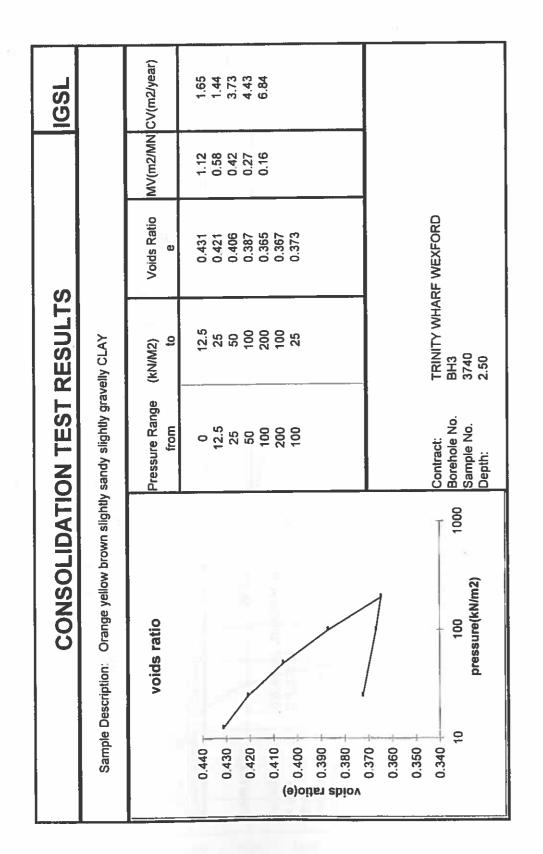
									_	_	_	_					_		_	
IGSL						7.		F ()	HEIGHLH AV. HEIGHL		18.459	17.635	17.106	16.463	15.714	15.335	15.438		i	
SNC			-	si					HEIGHI H	19.05	17.868	17.402	16.81	16.116	15.312	15.358	15.518			
ULATIC		TRINITY WHARF WEXFORD		5					MV (mZ/MN.)		5.123	2.114	1.384	0.843	0.512	0.030	0.138			!
CALC			BH14	3762		3.00	57,		average e		1.297	1.194	1.129	1.049	0.955	0.908	0.921		_	
CONSOLIDATION TEST CALCULATIONS IGSL	,	Contract:	Borehole No:	Sample No:		Depth:			e at end of stage	1.371	1.223	1.165	1.092	1.005	0.905	0.911	0.931	0.931	0.931	0.931
DATIO							•		change in e		0.147	0.058	0.074	0.086	0.100	900.0-	-0.020			
SOLIE	/5				*change in Ht.		15.518		change in Ht.		1.182	0.466	0.592	0.694	0.804	-0.046	-0.16			
CON	19.05 242.3 227.3 191.5	89.6	35.1%	2.65 0.9310108	0.1244368 *char			- 1	increment		12.5	12.5	25	50	100	-100	-75	1		
	leight il+ring st wt.	gui	<u> </u>		in e		leight		Pressure range	.	12.5	25	20	100	200	100	25	_	_	
Tal	initial height Wt. soil+ring final wet wt.	wt. of	w/c fin	S.G. e final	change in e		Final Height		Pressu	from	0	12.5	25	20	100	200	100			



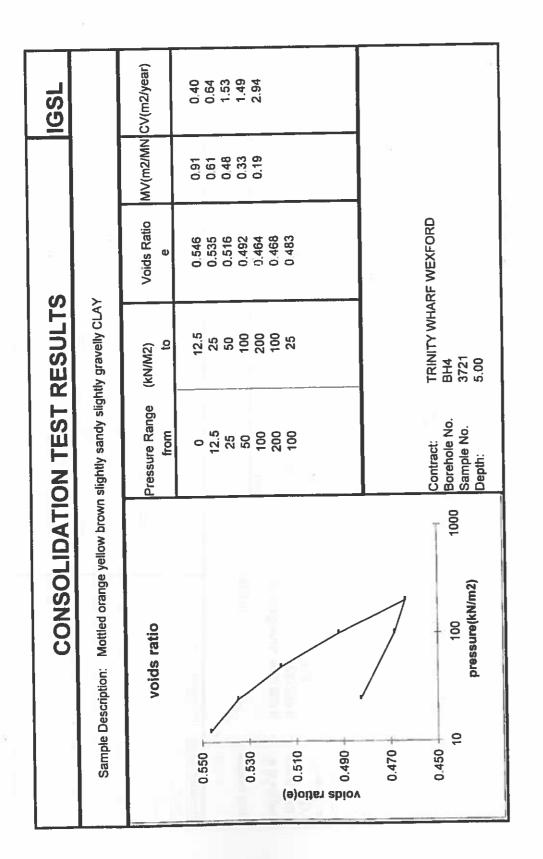
				_	_			_		1		_					_		
IGSL								HEIGHT H AV. HEIGHT		19.005	18.922	18.827	18.702	18.549	18.48	18.526			
SNC								HEIGHT H	19.05	18.96	18.884	18.77	18.634	18.464	18.496	18.556			
SULATION		TRINITY WHARF WEXFORD		~			:	MV (m2/MN.)		0.379	0.321	0.242	0.145	0.092	0.017	0.043			
-CALC		· ·	BH16	3780		3.00		average e		0.626	0.619	0.611	0.600	0.587	0.581	0.585			
CONSOLIDATION TEST CALCULATIONS IGSL		Contract: 13184	Borehole No:	Sample No:		Depth:	€.	e at end of stage	0.630	0.622	0.616	0.606	0.595	0.580	0.583	0.588	0.588	0.588	0.588
DA 710								nge in Ht. change in e		0.008	0.007	0.010	0.012	0.015	-0.003	-0.005			
170SI					0.0855697 *change in Ht.		18.556	change in Ht.		60.0	0.076	0.114	0.136	0.17	-0.032	90.0-			
COV	19.05 261.8 259.7 228.8	89.5	22.2%	0.587832	0.0855697			increment		12.5	12.5	25	50	100	-100	-75			
	eight I+ring It wt.	ng al	_		ine		eight	Pressure range	ţ	12.5	25	20	100	200	2	25			
	initial height Wt. soil+ring final wet wt. final dry wt	wt. of ring w/c initial	w/c final S.G.	e final	change in e		Final Height	Pressui	from	0	12.5	52	20	90	200	9			



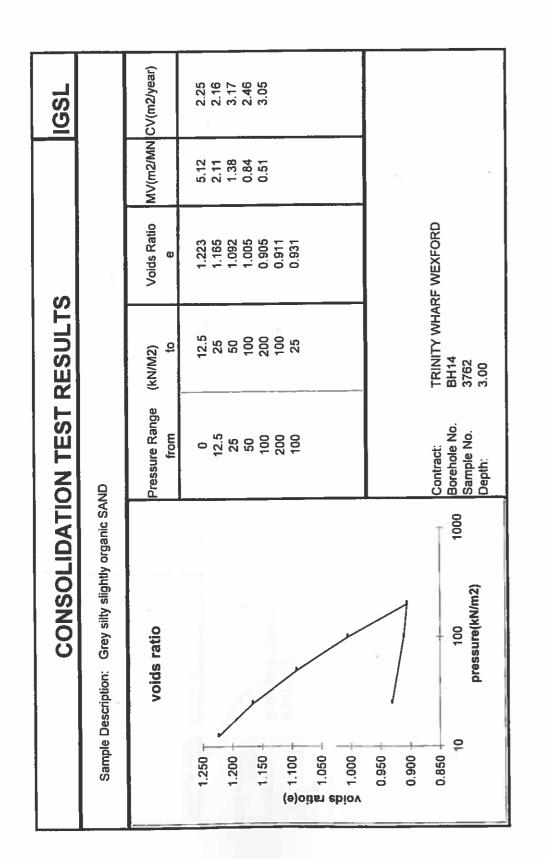
									_	_	_	_					_		_	
IGSL						7.		F ()	HEIGHLH AV. HEIGHL		18.459	17.635	17.106	16.463	15.714	15.335	15.438		i	
SNC			-	si					HEIGHI H	19.05	17.868	17.402	16.81	16.116	15.312	15.358	15.518			
ULATIC		TRINITY WHARF WEXFORD		5					MV (mZ/MN.)		5.123	2.114	1.384	0.843	0.512	0.030	0.138			!
CALC			BH14	3762		3.00	57,		average e		1.297	1.194	1.129	1.049	0.955	0.908	0.921		_	
CONSOLIDATION TEST CALCULATIONS IGSL	,	Contract:	Borehole No:	Sample No:		Depth:			e at end of stage	1.371	1.223	1.165	1.092	1.005	0.905	0.911	0.931	0.931	0.931	0.931
DATIO							•		change in e		0.147	0.058	0.074	0.086	0.100	900.0-	-0.020			
SOLIE	/5				*change in Ht.		15.518		change in Ht.		1.182	0.466	0.592	0.694	0.804	-0.046	-0.16			
CON	19.05 242.3 227.3 191.5	89.6	35.1%	2.65 0.9310108	0.1244368 *char			- 1	increment		12.5	12.5	25	50	100	-100	-75	1		
	leight il+ring st wt.	gui	<u> </u>		in e		leight		Pressure range	.	12.5	25	20	100	200	100	25	_	_	
Tal	initial height Wt. soil+ring final wet wt.	wt. of	w/c fin	S.G. e final	change in e		Final Height		Pressu	from	0	12.5	25	20	100	200	100			



CONSOLIDATION TES 19.05 280.2 276.3 247.5 89.4 18.2% 18.2% 2.65 0.0821094 "change in Ht. 18.058 12.5 0.216 0.012 0.0564 12.5 0.224 0.018 0.554 12.5 0.224 0.018 0.546 12.5 0.224 0.024 0.028 0.024 0.026 0.026 0.0463 -75 -0.176 -0.005 0.483	8	CONSOLIDATION TEST CALCULATIONS IGSL					TRINITY WHARF WEXFORD	13184	(o: BH4	3721		5.00		stage average e [MV (m2/MN.) HEIGHT H AV HEIGHT	19.05	0.555 0.912	0.541 0.605 18.692	0.526 0.482	0.504 0.325 18.17	0.478 0.191 17.826	0.466 0.031	0.476 0.131 18.058	
24 25 27 2 28 2 28 2 2 2 2 2 2 2 2 2 2 2 2 2		ONSOLIDATION	19.05	280.2	276.3	247.5					shange in Ht.		•	ige in Ht. change in e e		0.216	0.142	0.224	0.298	0.344	-0.056	-0.176	



									_	_	_	_					_		_	
IGSL						7.		F ()	HEIGHLH AV. HEIGHL		18.459	17.635	17.106	16.463	15.714	15.335	15.438		i	
SNC			-	si					HEIGHI H	19.05	17.868	17.402	16.81	16.116	15.312	15.358	15.518			
ULATIC		TRINITY WHARF WEXFORD		5					MV (mZ/MN.)		5.123	2.114	1.384	0.843	0.512	0.030	0.138			!
CALC			BH14	3762		3.00	57,		average e		1.297	1.194	1.129	1.049	0.955	0.908	0.921		_	
CONSOLIDATION TEST CALCULATIONS IGSL	,	Contract:	Borehole No:	Sample No:		Depth:			e at end of stage	1.371	1.223	1.165	1.092	1.005	0.905	0.911	0.931	0.931	0.931	0.931
DATIO							•		change in e		0.147	0.058	0.074	0.086	0.100	900.0-	-0.020			
SOLIE	/5				*change in Ht.		15.518		change in Ht.		1.182	0.466	0.592	0.694	0.804	-0.046	-0.16			
CON	19.05 242.3 227.3 191.5	89.6	35.1%	2.65 0.9310108	0.1244368 *char			- 1	increment		12.5	12.5	25	50	100	-100	-75	1		
	leight il+ring st wt.	gui	<u> </u>		in e		leight		Pressure range	.	12.5	25	20	100	200	100	25	_	_	
Tal	initial height Wt. soil+ring final wet wt.	wt. of	w/c fin	S.G. e final	change in e		Final Height		Pressu	from	0	12.5	25	20	100	200	100			



				_	_			_		1		_					_		
IGSL								HEIGHT H AV. HEIGHT		19.005	18.922	18.827	18.702	18.549	18.48	18.526			
SNC								HEIGHT H	19.05	18.96	18.884	18.77	18.634	18.464	18.496	18.556			
SULATION		TRINITY WHARF WEXFORD		~			:	MV (m2/MN.)		0.379	0.321	0.242	0.145	0.092	0.017	0.043			
-CALC		· ·	BH16	3780		3.00		average e		0.626	0.619	0.611	0.600	0.587	0.581	0.585			
CONSOLIDATION TEST CALCULATIONS IGSL		Contract: 13184	Borehole No:	Sample No:		Depth:	€.	e at end of stage	0.630	0.622	0.616	0.606	0.595	0.580	0.583	0.588	0.588	0.588	0.588
DA 710								nge in Ht. change in e		0.008	0.007	0.010	0.012	0.015	-0.003	-0.005			
170SI					0.0855697 *change in Ht.		18.556	change in Ht.		60.0	0.076	0.114	0.136	0.17	-0.032	90.0-			
COV	19.05 261.8 259.7 228.8	89.5	22.2%	0.587832	0.0855697			increment		12.5	12.5	25	50	100	-100	-75			
	eight I+ring It wt.	ng al	_		ine		eight	Pressure range	ţ	12.5	25	20	100	200	2	25			
	initial height Wt. soil+ring final wet wt. final dry wt	wt. of ring w/c initial	w/c final S.G.	e final	change in e		Final Height	Pressui	from	0	12.5	52	20	90	200	9			

CONSOLIDATION TEST RESULTS	ON TEST	RESULTS	•		IGSL	
Sample Description: Grey silty slightly organic SAND	ONY					
voids ratio	Pressure Range from	(kN/M2) to	Voids Ratio e	MV(m2/MN	MV(m2/MN CV(m2/year)	
0.630 0.630 0.630 0.630 0.590	0 12.5 25 26 50 100 100	12.5 25 50 100 200 100 25	0.622 0.616 0.606 0.595 0.580 0.583	0.38 0.24 0.15 0.09	12.37 3.24 5.02 6.21 7.89	
0.580 0.570 10 100 1000 pressure(kN/m2)	Contract: Borehole No. Sample No. Depth:	TRINITY WHARF WEXFORD BH16 3780 3.00	RF WEXFORD			

REPORT NO.		SULP	SULPHATE ANALYSIS	VALYS	SIS		: :		IGSL
CONTRACT:	TRINITY	TRINITY WHARF WEXFORD	EXFORD					CONTRACT NO	13184
ВН/ТР	DEPTH	DEPTH SAMPLE	SAMPLE	TEST	%	SULPHUR TRIOXIDE	TRIOXIDE	(so3 X 1.2)	품
Ö N	<u>\$</u>	Ö Z	TYPE	CODE	Passing	WATER SO3	TOTAL	TOTAL	VALUE
						ja J		2	
BH 4	2.00	3718	۵	S	33	ě	0.14	0.17	8.9
BH 5	2.50	3739	O	ဟ	29		0.02	0.02	8.1
ВНВ	3.50	3752	Q	ဟ	52		0.08	0.10	7.8
ВНЭ	5.50	7719	۵	Ø	45		0.07	0.08	8.4
BH 11	2.50	7747	۵	ဟ	81		0.09	0.11	7.0
BH 14	10.00	3770	Q	တ	40		0.01	0.01	8.9
BH 16	11.00	3789	0	တ	81	-	0.02	0.05	7.5
BH 18	2.50	3375	٥	S	64		0.01	, 0.01	7.6
BH 21	1.50	7737	٥	Ø	89		0.01	0.01	7.9
			•			_			
					-)			··-	
					• • •				
TEST CODE	W = WATER	/ATER	S = SOIL	A = AQUE	EOUS SOI	A = AQUEOUS SOIL EXTRACT(2:1)			

Appendix IV – Environmental Test Records



18a Rosemount Business Park, Ballycoolin, Dublin 11 Ireland

Tel: +353 (0) 1 8829893 Fax: +353 (0) 1 8829895

CERTIFICATE OF ANALYSIS

Client:

IGSL Ltd

Unit F

M7 Business Park

Naas Co Kildare Ireland

Attention:

John Clancy

Date:

14 January, 2008

Our Reference:

07-B08783/01

Your Reference: TRINITY WHARF WEXFORD

Location:

A total of 7 samples was received for analysis on Thursday, 20 December 2007 and authorised on Monday, 14 January 2008. Accredited laboratory tests are defined in the log sheet, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Signed

Lorenine Nr Nomera

Lorraine McNamara

Laboratory Technical Manager

Compiled By

Dylan Halpin

Printed at 10:12 on 15/01/2008 Alcontrol Geochem Ireland is a trading division of Alcontrol UK Limited.

Registered Office: Templeborough House, Mill Close, Rotherham, S60 1BZ. Registered in England and Wales No. 4057291

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ALcontrol Laboratories Ireland

Test Schedule

page2 \ 10

Ref Number: 07-B08783/01 Client: IGSL Ltd Date of Receipt: 20/12/2007

Sample Type: SOIL Location:

Client Contact: John Clancy
Client Ref. TRINITY WHARF WEXFORD

																		_
ICP MS		Dissolved Antimony Low CEN 10:1 Leach	×	×	×	×	×	×	×									
HPLC		Total Phenois by HPLC in CEN 10:1 Leachate	×	×	×	×	×	×	×									
GRAYIMETRIC	=	Total Dissolved Solids Gravimetric CEN 10:1	×	×	×	×	×	×	×			_	_	_				
GRAVIMETRIC		Natural Moisture Content	×	×	×	×	×	×	×		_	_					-	
GCMS		PCB 7 Congeners	×	×	×	×	×	×	×									
GCMS	^	PAH Total (6) GCMS <1.6mg/kg (Solid)	×	×	×	×	×	×	×									
GCMS		PAH Total (17) GCMS (Solid)	×	×	×	×	×	×	×									
GCMS	\	PAH EPA (16)	×	×	×	×	×	×	×									
GCMS		Coronene	×	×	X	×	×	×	×									
GC FID/CALC	^	Mineral Oil by GC	×	×	×	×	×	×	×									
ည	\	PRO & BTEX	×	×	×	×	×	×	×									
ELTRA		Total Organic Carbon	×	×	×	×	×	×	×									
CV AA		Dissolved Mercury Low Level in CEN 10:1 Leachate	×	×	×	×	×	×	×									
CEN 10:1 Leach		CEN 10:1 Leachate Test	×	×		×												
	0. 1291	P/V	Fan-Appried Rept Tub	Hon-Apprecal Please Tub	Per Alcurated Plante Tub	For Acord Place: Tub	Hon-Moore d Russic Tub	Non-Mooned Plante Tub	Per-Acorded Plante Sub-					· ·				
Detection Method	ooratory] N	Other ID	1.00	1.50	0.50	1.50	2.50	1.50	0.50									
Detecti	UKAS Accredited [Testing Laboratory] No. 1291	Sample Identity	BH4	BH9	BH12	BH16	BH16	BH17	BH22									
	UKAS Accre	ALcontrol Reference	07-B08783-S0001-A01	07-806783-S0002-A01	07-B06783-S0003-A01	07-B08783-S0004-A01	07-B08783-S0005-A01	07-B08783-S0006-A01	07-808783-S0007-A01									

Notes: NUMERIC VALUES INDICATE ADDITIONAL SCHEDULING

* SUBCONTRACTED TO OTHER LABORATORY / ** SAMPLES ANALYSED AT THE CHESTER LABORATORY

Printed at 10:12 on 15/01/2008

ALcontrol Laboratories Ireland

Test Schedule

Of \ Cogsq

Ref Number: 07-B08783/01 Client: IGSL Ltd Date of Receipt: 20/12/2007

Sample Type: SOIL Location:

Client Contact: John Clancy
Client Ref: TRINITY WHARF WEXFORD

	_																		4.1				
	KON		Sulphate in CEN 10:1 Leachate	ļ	<×	×	×	×	×	×			T	T	T								Ī
	KONE		Fluoride in CEN 10:1 Leachate	,	(×	×	×	×	×	×		1	*		+								†
	KONE		Chloride in CEN 10:1 Leachate	ļ	 ×	×	×	×	×	×		T			1			_	-	T	r	T	†
	IR.		Dissolved Organic Carbon in CEN 10:1 Leachate	×	×	×	×	×	×	×		T		+	Ť			_					t
	ICP MS		Dissolved Zinc Low CEN 10:1 Leach	×	×	×	×	×	×	×		T	T			+							 -
	J. MS		Dissolved Selenium Low CEN 10:1 Leach	×	×	×	×	×	×	×					1	1		_					l
	LCP MS		Dissolved Nickel Low CEN 10:1 Leach	×	×	×	×	×	×	×						†							
100 001	ار ا		Dissolved Molybdenum Low CEN 10:1 Leach	×	×	×	×	×	×	×				T						-			
27. 62.	2		Dissolved Lead Low CEN 10:1 Leach	×	×	×	×	×	×	×						†							-
TOD MC	ICT TI		Dissolved Copper Low CEN 10:1 Leach	×	×	×	×	×	×	×													
100 MG	מי די		Dissolved Chromium Low CEN 10:1 Leach	×	×	×	×	×	×	×													
TCD MC			Dissolved Cadmium Low CEN 10:1 Leach	×	×	×	×	×	×	×							1		_				
TCD MC	L		Dissolved Barium Low CEN 10:1 Leach	×	×	×	×	×	×	×							Ī						
TCD MS	2	>	Dissolved Arsenic Low CEN 10:1 Leach	×	×	×	×	×	×	×													
		o. 1291	P/V	Por Aborded Plane Tub	Nurselective of Places, Tub	Harr-Moure of Plaste. Tub	Hon-Moore of Deater Tub	Non-Moorer of Plasse: Tub	Non-Account Plaste Tub	Hors Moorwed Plants: Tub													
Detection Method		poratory] h	Other ID	1.00	1.50	0.50	1.50	2,50	1.50	0.50													
Detecti		UKAS Accredited [Testing Laboratory] No. 1291	Sample Identity	BH4	8H9	BH12	BH16	BH16	BH17	BHZZ													
		UKAS Accre	ALcontrol Reference	07-808783-50001-401	07-808783-50002-A01	07-B06783-S0003-A01	07-808783-S0004-A01	07-808763-50005-401	07-808783-50006-A01	07-808783-50007-A01													

Notes: NUMERIC VALUES INDICATE ADDITIONAL SCHEDULING

Printed at 10:12 on 15/01/2008

APPENDIX

APPENDIX

- Results are expressed as mg/kg dry weight (dried at 30°C) on all soil analyses except for the following: NRA Leach tests, flash point, and ammoniacal N₂ by the BRE method, VOC, PRO, Cyanide, Acid Soluble Sulphide, SVOC, DRO, PAH, PCB, TPH CWG, TPH by IR, OFGs and SEM.
- Samples will be run in duplicate upon request, but an additional charge may be incurred.
- 3. A sub sample of all samples received will be retained free of charge for one month for soils and one month for waters (sample size permitting), but may then be discarded unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage.
- 4. With respect to tumaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
- 5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
- 6. When requested, an asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD no fibres detected. If fibres are detected, then identification and quantification is carried out by ALcontrol Technichem or Alcontrol Shutlers in the UK. If a sample is suspected of containing asbestos, then drying and crushing will be suspended on that sample until the asbestos results are known. If asbestos is present, then no analysis requiring dry sample are undertaken.
- If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace is present in the volatile sample.
- 8. NDP No Determination Possible due to insufficient/unsuitable sample.
- Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
- A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.

Last updated February 2005

ALcontrol Laboratories Ireland

Test Schedule Summary

Ref Number: 07-B08783/01

Sample Type: SOIL

Client: IGSL Ltd

Location:

Date of Receipt: 20/12/2007

Client Contact: John Clancy

Client Ref: TRINITY WHARF WEXFORD

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ULE	METHOD	TEST NAME	TOTAL
	CEN 10:1 Leach	CEN 10:1 Leachate Test	7
	CV AA	Dissolved Mercury Low Level in CEN 10:1 Leachate	7
	ELTRA	Total Organic Carbon	7
	GC	PRO & BTEX	7
	GC FID/CALC	Mineral Oil by GC	7
	GCMS	Coronene	7
	GCMS	PAH EPA (16)	7
	GCMS	PAH Total (17) GCMS (Solid)	7
	GCMS	PAH Total (6) GCMS <1.6mg/kg (Solid)	7
	GCMS	PCB 7 Congeners	7
	GRAVIMETRIC	Natural Moisture Content	7
	GRAVIMETRIC	Total Dissolved Solids Gravimetric CEN 10:1	7
	HPLC	Total Phenols by HPLC in CEN 10:1 Leachate	7
	ICP MS	Dissolved Antimony Low CEN 10:1 Leach	7
	ICP MS	Dissolved Arsenic Low CEN 10:1 Leach	7
	ICP MS	Dissolved Barium Low CEN 10:1 Leach	7
	ICP MS	Dissolved Cadmium Low CEN 10:1 Leach	7
	ICP MS	Dissolved Chromium Low CEN 10:1 Leach	7
	ICP MS	Dissolved Copper Low CEN 10:1 Leach	7
	ICP MS	Dissolved Lead Low CEN 10:1 Leach	7
	ICP MS	Dissolved Molybdenum Low CEN 10:1 Leach	7
	ICP MS	Dissolved Nickel Low CEN 10:1 Leach	7
	ICP MS	Dissolved Selenium Low CEN 10:1 Leach	7
	ICP MS	Dissolved Zinc Low CEN 10:1 Leach	7
	IR	Dissolved Organic Carbon in CEN 10:1 Leachate	7
	KONE	Chloride in CEN 10:1 Leachate	7
	KONE	Fluoride in CEN 10:1 Leachate	7
	KONE	Sulphate in CEN 10:1 Leachate	7

at 10:12 on 15/01/2008

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ALcontrol Laboratories Ireland Table Of Results

Sample Type: SOIL

Ref Number: 07-B08783/01

Validated Interim

Client: IGSL Ltd
Date of Receipt: 20/12/2007
(of first sample)

Location: Client Contact:

John Clancy

Client Ref:

Anthracene Phenanthrene Fluorene TRINITY WHARF V

GONS GONS GC

<100,000 | c100,000 | c1 Acenaphthene Acenaphthylene Naphthalene Mineral Oil by GC **Total Xylene** Ethylbenzene Toluene Benzene **Petrol Range Organics Petrol Range Organics** C5-C9 **Total Organic Carbon Dissolved Mercury Low** CEN 10:1 Leachate 1.50 1.50 1.50 0.50 0.50 Other ID Sample Identity **ALcontrol Reference**

Checked By:

SUBCONTRACTED TO OTHER LABORATORY / ** SAMPLES ANALYSED AT THE CHESTER LABORATORY

Interim Validated

ALcontrol Laboratories Ireland

Table Of Results

Ref Number: 07-B08783/01 Client: IGSL Ltd

Date of Receipt: 20/12/2007 (of first sample)

Client Contact: John Clancy Location:

Sample Type: SOIL

Client Ref. TRINITY WHARF WEXFORD

Total 17 PAHs Total 16 EPA PAHs Total 6 PAHs Total 6 PAHs Dibenzo(ghi)perylene Benzo(ghi)perylene Dibenzo(ah)anthracene Benzo(a)pyrene Benzo(a)pyrene Benzo(a)anthracene Benzo(a)anthracene Benzo(a)anthracene Pyrene Pyrene Pyrene Phyrene Phyrene Phyrene Phyrene Cother ID Cother	Detection Method Method Detection Limit UKAS Accredited [Testing Laboratory] No. 1291		GCMS <1ug/kg	GCMS < 1ug/kg	GCMS < 1ug/kg	GCMS <1ug/kg	GCMS < 1ug/lq	GCMS <1ug/kg	GCMS < 1ug/kg	GCMS <1ug/kg	GCMS <1ug/kg	GCMS <1ug/kg	GCMS <1.6mg/kg	GCMS <1ug/kg	GCMS <1ug/kg	GCMS <1 ug/kg	GCMS <1ug/kg
ug/kg ug/kg <th< th=""><th></th><th>Other ID</th><th>Fluoranthene</th><th>Pyrene</th><th>Benzo(a)anthracene</th><th>Chrysene</th><th></th><th>Вепхо(а)ругеле</th><th>Indeno(123cd)pyrene</th><th>Dibenzo(ah)anthracene</th><th>Benzo(ghi)perylene</th><th>Coronene</th><th>Total 6 PAHs</th><th>Total 16 EPA PAHs</th><th>Total 17 PAHs</th><th>PCB Congener 28</th><th>PCB Congener 52</th></th<>		Other ID	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene		Вепхо(а)ругеле	Indeno(123cd)pyrene	Dibenzo(ah)anthracene	Benzo(ghi)perylene	Coronene	Total 6 PAHs	Total 16 EPA PAHs	Total 17 PAHs	PCB Congener 28	PCB Congener 52
16555 14345 14979 8698 16328 9233 9386 4932 11685 1554 54.8 128075 130200 1884 1466 1438 891 1572 860 810 340 966 127 5.5 12401 1558 2063 1759 1432 884 1618 948 850 407 1028 140 5.8 12401 15578 303 237 188 124 212 98 103 38 132 19 <16 1897 491 406 390 342 2435 202 220 69 261 26 <1.6 388 3914 1656 1426 1656 1426 765 1763 123 7.1 15129 15258 1656 1426 1666 1763 1763 1763 17.1 112129 15258 1656 1426 1426 1426 1		n	ng/kg	ng/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	mg/kg	ug/kg	ug/kg	ug/kg	ug/kg
1884 1466 1438 891 1572 860 810 340 966 127 5.5 12401 12528 2063 1759 1432 854 1618 948 850 407 1028 140 5.8 12840 12977 859 842 668 586 965 533 512 189 653 94 189 189 1789 189	Ш		92291	14345	14979	8698	16328	9233	9388	4932	11685	1554	54.8	128675	130200	<1 	~ 1
2063 1432 854 1618 948 850 407 1028 140 5.8 12840 12977 859 842 668 586 965 533 512 189 653 94 3.1 7692 7789 303 237 128 103 38 132 165 1876 1896 1897 496 390 342 2435 202 220 69 261 26 <16			1884	1466	1438	891	1572	980	810	340	996	127	5.5	12401	12528	<1	<1
859 642 668 586 965 533 512 189 653 94 3.1 7692 7789 303 237 124 212 98 103 38 132 19 <1.6			2063	1759	1432	854	1618	948	820	402	1028	140	5.8	12840	12977	12	۲×
303 237 188 124 212 98 103 38 132 19 <1.6			829	842	899	586	965	533	512	189	653	94	3.1	7692	7789	·	۲,
491 406 390 342 435 202 220 69 261 26 <1.6 3888 3914 1656 1426 1609 1450 2377 1427 1462 765 1763 123 7.1 15129 15288 1656 1426 1450 2377 1427 1462 765 1763 123 7.1 15129 15258 1656 1426 1462 765 1763 123 7.1 15129 15258 1657 1462 765 1763 123 7.1 15129 15258 1668 1469 1462 765 1763 123 7.1 15129 15258 1679 1462 1462 765 1763 162	Ц		303	237	188	124	212	86	103	38	132	19	<1.6	1876	1897	7	
1656 1426 1650 2377 1427 1462 765 1763 123 7.1 15129 15258 165 1426 1450 2377 1427 1462 765 1763 173 7.1 15129 15258 165 166 167 167 167 167 167 167 167 167 167 167 167 167 167 168 167 167 167 167 167 169 167 167 167 167 160 167 167 167 167 160 167 167 167 167 160 167 167 167 167 160 167 167 167 167 160 167 167 167 167 167 160 167 167 167 167 167 160 167 167 167 167 167 160 167 167 167 167 167 160 167 167 167 167 167 167 160 167 167 167 <t< td=""><td></td><td></td><td>491</td><td>406</td><td>390</td><td>342</td><td>435</td><td>202</td><td>220</td><td>69</td><td>261</td><td>56</td><td><1.6</td><td>3888</td><td>3914</td><td>₩</td><td>7</td></t<>			491	406	390	342	435	202	220	69	261	56	<1.6	3888	3914	₩	7
			1656	1426	1609	1450	2377	1427	1462	765	1763	123	7.1	15129	15258	7	7
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ALcontrol Laboratories Ireland

Interim Validated

Table Of Results

Ot / Teged

Ref Number: 07-B08783/01

Client: IGSL Ltd
Date of Receipt: 20/12/2007
(of first sample)

Sample Type: SOIL Location:

Client Contact: John Clancy
Client Ref: TRINITY WHARF WEXFORD

Motor Method Defection Mill Mi		Detection Method	ethod	GCMS	GCMS	GCMS	GCMS	GCMS	GCMS	GRAVIMETRIC GRAVIMETRIC	GRAVIMETRIC	HPLC	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS	ICP MS
Dissolved Cadmium Low CEN 10:1 Leach Dissolved Barium Low CEN 10:1 Leach Dissolved Barium Low CEN 10:1 Leach Dissolved Arsenic Low CEN 10:1 Leach Dissolved Arsenic Low CEN 10:1 Leach Dissolved Antimony Low CEN 10:1 Leach Dissolved A		Method Detect	ion Limit	<1ug/kg	<1ug/kg	<1ug/kg	<1ug/kg	⊢	<1ug/kg	<0.1%	<350mg/kg	<0.1mg/kg		<0.01mg/kg			<0.01mg/lg	<0.01mg/lg
Dissolved Cadmium Low	UKAS Accredit	ced [Testing Laborato	ry] No. 1291											`				
BH4 1.00 4.1 4.1 4.1 4.1 4.1 35.3 2960 40.1 0.02 0.03 2.26 6.0044 BH4 1.50 4.1 4.1 4.1 4.1 4.1 1.1 1.50 4.0 0.03 0.03 2.76 6.0044 BH12 0.50 4.1 4.1 4.1 4.1 4.1 1.2 1.5 0.03 0.03 3.77 6.0044 BH15 1.50 4.1	ALcontrol Reference	Sample Identity	Other ID	PCB Congener 101	PCB Congener 118	PCB Congener 153	PCB Congener 138	PCB Congener 180		Natural Moisture Content							Dissolved Chromium Low CEN 10:1 Leach	Dissolved Copper Low CEN 10:1 Leach
BH4 1.00 <1 <1 <1 <1 <1 35.3 2980 <0.1 0.02 0.03 2.26 <0.004				ug/kg	ug/kg	ug/kg	ug/kg	ug/kg	ng/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/ka
BH9 1.50 <1	07-B08783-S0001	BH4	1.00	<1	<1	<1	<1	<1	۲۰ ا	35.3	2980	^ 0.1	0.02	0.03	2.26	<0.004 40.004	0.47	1.38
BH12 0.50 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1 <1	07-B08783-S0002		1.50	<1	<1	1>	<1	<1	دا	21.2	2980	<0.1	0.05	0.27	5.48	<0.004	0.01	0.08
BH16 1.50	07-B08783-S0003		0.50	<1	<1	<1	<1	<1	<1	11.7	1660	<0.1	0.03	0.03	2.76	40.0°	<0.01	0.02
BH16 2.50 <1 <1 <1 <1 <1 <1	07-B08783-50004		1.50	<1	<1	<1	<1	<1 <	1	12.8	2940	<0.1	0.04	9.03	3.47	40.00	<0.01	0.06
BH17 1.50 <1 <1 <1 <1 <1 <1 0.02 0.02 0.05 3.65 <0.004 BH22 0.50 <1	07-808783-50005		2.50	<1	<1	<1	<1	<1	~ 1	71.6	2900	<0.1	0.03	0.02	3.77	*0.00	0.02	0.08
BH22 0.50 <1 <1 <1 <1 <1 <1 0.35 0.02 4.08 <0.004	07-B08783-S0006		1.50	<1	<1	<1	<1	<1	7	10.9	3540	<0.1	0.02	0.05	3.65	<0.00×	<0.01	0.05
	07-808783-50007	BH22	0.50	<1	×1	^1	<1	<1	7	22.6	2000	<0.1	0.32	0.02	4.08	<0.00	0.01	60.0
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Interim	Validate
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ALcontrol Laboratories Ireland Table Of Results

Ref Number: 07-B08783/01
Client: IGSL Ltd
Date of Receipt: 20/12/2007
(of first sample)

Sample Type: SOIL

Client Contact: John Clancy
Client Ref. TRINITY WHARF WEXFORD

	323											30					
	Sulphate in CEN 10:1 Leachate	mg/kg	414	1196	259	1089	2992	1076	569								
	Fluoride in CEN 10:1 Leachate	mg/kg	7	4	9	2	٣	3	4							15.50	
	Chloride in CEN 10:1 Leachate	mg/kg	384	731	362	71	98	399	265								
	Dissolved Organic Carbon in CEN 10:1 Leachate	mg/kg	148	41	64	53	84	25	36								
	Dissolved Zinc Low CEN 10:1 Leach	mg/kg	0.12	0.12	0.15	0.67	2.11	0.38	0.42								
	Dissolved Selenium Low CEN 10:1 Leach	mg/kg	0.04	0.05	0.03	0.03	0.02	0.03	<0.01								
	Dissolved Nickel Low CEN 10:1 Leach	mg/kg	0.04	0.02	<0.01	90.0	0.07	60.0	0.01								
	Dissolved Molybdenum Low CEN 10:1 Leach	mg/kg	0.08	0.16	0.02	0.07	0.34	0.05	- 0.09								
	Dissolved Lead Low CEN 10:1 Leach	mg/kg	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			-					
y] No. 1291	Other ID		1.00	1.50	0.50	1.50	2.50	1.50	0.50								
UKAS Accredited [Testing Laboratory] No. 1291	Sample Identity		BH4			BH16			BH22								
UKAS Accredin	ALcontrol Reference		07-B08783-S0001	07-808783-50002	07-B08783-S0003	07-B08783-S0004	07-808783-50005	07-808783-50006	07-B08783-S0007								

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Appendix V Sections and Site Plans

