Appendix 14.6

Report on the Geophysical Investigation **REPORT ON THE**

GEOPHYSICAL INVESTIGATION

FOR THE

MARINE OUTFALL PIPELINE, ARKLOW WASTE WATER TREATMENT PLANT

For

BYRNE LOOBY ARUP





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THE FINDINGS OF THIS REPORT ARE THE RESULT OF A GEOPHYSICAL SURVEY USING NON-INVASIVE SURVEY TECHNIQUES CARRIED OUT AT THE GROUND SURFACE. INTERPRETATIONS CONTAINED IN THIS REPORT ARE DERIVED FROM A KNOWLEDGE OF THE GROUND CONDITIONS, THE GEOPHYSICAL RESPONSES OF GROUND MATERIALS AND THE EXPERIENCE OF THE AUTHOR. APEX GEOSERVICES LTD. HAS PREPARED THIS REPORT IN LINE WITH BEST CURRENT PRACTICE AND WITH ALL REASONABLE SKILL, CARE AND DILIGENCE IN CONSIDERATION OF THE LIMITS IMPOSED BY THE SURVEY TECHNIQUES USED AND THE RESOURCES DEVOTED TO IT BY AGREEMENT WITH THE CLIENT. THE INTERPRETATIVE BASIS OF THE CONCLUSIONS CONTAINED IN THIS REPORT SHOULD BE TAKEN INTO ACCOUNT IN ANY FUTURE USE OF THIS REPORT.

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1. EXECUTIVE SUMMARY

APEX Geoservices Limited was requested by Byrne Looby Arup on behalf of Irish Water to carry out a geophysical investigation as part of a ground investigation for a proposed outfall pipeline for the Arklow Waste Water Treatment Plant.

The marine area under investigation is located offshore Arklow, Co. Wicklow and covers approximately 75Ha. Data was acquired from the shoreline to c. 1.5Km offshore.

The marine investigation consisted of underwater multichannel analysis of surface waves (UMASW), sub bottom profiler single channel seismic reflection and seismic refraction surveys.

The objectives of the investigation were to map the type and thickness of the sediment layers, determine sediment stiffness, map the depth to bedrock, map variation in bedrock and rock quality and determine engineering parameters.

The results of the investigation are presented in a series of maps, figures and tables and are presented in **Appendix A: Drawings** and **Appendix B: Tabular Data with Engineering Parameters**.

The area under investigation is generally characterised by unconsolidated sediments over glacial till of variable thickness overlying undulating bedrock.

Three sediment layers were defined by the geophysical datasets with layers 1 and 2 consisting of very soft / very loose to firm / medium dense non consolidated sediments overlying firm – very stiff / medium dense – very dense sediment of layer 3. Layer 3 is interpreted as a glacial till unit.

These sediment layers have thickness ranges of < 0.5m to c. 5.5m, c. 1 - 3.5m and c. 1.5m - > 10m respectively.

The depth to the base of sediment / top of bedrock varies across the survey area from c. 7.0m - > 12.5m. The sediment thickness / depth to bedrock undulates from west to east with both ridges and channels present in the top of rock. These features are in general alignment with the regional fault pattern shown on the GSI database.

Recommendations are given for confirmatory boreholes across the site. Proposed borehole locations are given in Irish National Grid (ING) coordinates.

The findings of the geophysical investigation should be reviewed following intrusive investigations.



2. INTRODUCTION

APEX Geoservices Limited was requested by Byrne Looby Arup on behalf of Irish Water to carry out a geophysical investigation as part of a ground investigation for a proposed outfall pipeline for the Arklow Waste Water Treatment Plant (WwTP). The investigation consisted of sub bottom profiler single channel seismic reflection, underwater multichannel analysis of surface waves (UMASW) and seismic refraction surveys.

The investigation involved the acquisition of data over an area covering the client area of interest of c. 10.6 Ha and an additional fringe to the south, east and north to give a total coverage of c. 75 Ha.

During the initial period of data acquisition the client area of interest was altered due to the presence of a power cable in the southern part of the area.

2.1 Survey Objectives

The objectives of the investigation were to:

- Map type and thickness of sediments
- Establish sediment stiffness
- Map the depth to bedrock across the survey area
- Map variation in bedrock type and rock quality
- Determine engineering parameters

2.2 Site Background

The survey area is located to the north of the north pier in Arklow port. The area of interest has a shoreline frontage of c. 250m immediately east of a derelict factory near the pier. The client supplied location of the proposed diffuser head lies c. 900m offshore.

The location of the geophysical investigation area is shown in Figs. 2.1 and 2.2. Figure 2.2 shows the survey profile layout referenced to local chainages used for the project. The survey layout referenced to chainage and Irish National Grid (ING) is shown in more detail in **Appendix A: Drawings**.





Fig 2.1: Location map showing generalised survey area outlined in red.



Fig 2.2: Location map showing acquired survey profiles in red, blue and magenta with chainage.



2.2.1 Geology

The GSI terrestrial bedrock geology map (Fig. 2.3) shows the area around the town of Arklow and close to the port is underlain by two formations of Ordovician lithologies of the Paleozoic. The town centre, including areas along the north and south banks of the Avoca River are dominated by the Kilmacrea Formation which consists of dark grey slate, shale, minor pale sandstone and some tuffaceous horizons. Close to the mouth of the river and on the north and south banks the bedrock map shows the Maulin Formation is present. This is described as blue – grey slate, phyllite with siltsone laminae and schist.

The contact between the Kilmacrea and Maulin Formations is unconformable and is shown on the map as a northeast – southwest faulted contact. This fault is shown as continuing offshore to the north. A north- south oriented fault is shown to lie east of the mouth of the river and numerous northeast – southwest oriented faults are shown in the country to the south of Arklow.

The GSI marine bedrock geology map (Fig. 2.4) shows the survey area is underlain by Lower Paleozoic metasedimentary lithologies.



Fig. 2.3: The GSI bedrock map for the Arklow area with faults shown by purple lines.





Fig. 2.4: The GSI Marine geology map (survey area highlighted in red). Bedrock type 104, described as metasedimentary rocks, underlies the area.

2.2.2 Quaternary

The GSI Quaternary map for the Arklow area (Fig. 2.5) describes 'urban sediment' across the town with alluvium further west to the north and south of the river. To the north Irish Sea Till derived from Lower Palaeozoic sandstone and shales is described with southerly and southwesterly oriented meltwater channels also shown.



Fig 2.5: The GSI Quaternary map for the Arklow area.



2.2.3 Direct Investigation Data

No direct investigation data was supplied by the client for this investigation.

2.3 Survey Rationale

A number of geophysical surveying techniques were utilised to generate an integrated geological ground model for the marine area under investigation and to achieve the objectives of the survey. These methods included sub bottom profiling, Underwater Multi-Channel Analysis of Surface Waves (UMASW) and seismic refraction profiling.

Sub Bottom Profiling utilises the single channel seismic reflection method to continuously profile the sub seabed structure to assess the nature and morphology of the sediment layering and to determine the structure of the top of the bedrock lithology.

The **UMASW** method is used to estimate shear-wave (S-wave) velocities in the sediment material. These velocities are derived from analysis of Scholte wave dispersion curves. The UMASW data is acquired as a series of 1D soundings to allow for determination of lateral variation in the stiffness of sediment material and derivation of engineering parameters of the sedimentary units including dynamic moduli (Gmax). The data may also give an indication of depth to top of weathered rock.

Seismic Refraction Profiling in the marine environment measures the velocity of refracted seismic Pwaves through rock material and allows an assessment of the quality of the bedrock material to be made. Lateral variation in the bedrock velocity will indicate changes in the competency of the bedrock. In the marine environment the sediment velocities are generally not determined as they are masked by water velocity.



3. RESULTS

The marine geophysical investigation was carried out over a number of work sessions between the 06th and the 16th March 2017 and involved the acquisition of sub bottom profiler data, Underwater Multi-Channel Analysis of Surface Wave (UMASW) and seismic refraction.

The results of the investigation are displayed in **Appendix A: Drawings**. Data is displayed referenced to local chainage and Irish National Grid (ING).

In the sub bottom profiler investigation a total of fifty eight datasets were acquired along sixteen inlines, which were generally acquired with a southwest to northeast orientation, and eighteen crosslines generally acquired with a northwest to southeast orientation. The inlines were generally acquired to within c. 120 - 170m of the shore due to shallow water conditions, the turning circle of the survey vessel and the length of the source and hydrophone receiver array. It was practical to sail crosslines to within c. 50m of the shoreline.

A total of fifty five seismic refraction spreads and 1D UMASW soundings were acquired across the area under investigation. These were generally positioned on four of the sub bottom profiler inlines and on four of the crosslines. These were located to give good spatial coverage and to tie in with the expected positions of the diffuser head and future client specified borehole locations. While the spacing of the spreads was generally regular there is some variation in the gaps or areas of overlap between adjacent spreads. This was due to slight movement of anchor blocks and the hydrophone cable while deploying from the deck of the survey vessels in fast tidal conditions. In one part of the survey area four tightly spaced overlapping spreads were recorded over two work sessions as a quality control and data repeatability check. Spreads were acquired to within c. 30m of the shoreline. Acquisition closer to the shoreline was not possible due to shallow water, strong currents and a rocky bottom associated with the sea defences.

No UMASW or seismic refraction data was acquired across an exclusion zone, centred on the cable route close to the north pier wall.

3.1 Sub Bottom Profiler

In the sub bottom profiler investigation the sixteen inlines had a nominal line spacing of c. 25m while the eighteen crosslines were generally acquired with a line spacing of 100m. The data acquisition rate along each profile was generally 0.5 seconds, equating to data points every c. 1.15m. Other acquisition rates were trialled during pre production parameterisation testing. Data acquisition was to 100mS, which resulted in a maximum depth of c. 88m below the seabed. The vessel speed during acquisition was generally 2 - 3 knots. The profiles extended to c. 1.5km from the shoreline to give additional background information beyond the area of the proposed diffuser head.

The overall sub bottom profiler data quality was good with some reduction in primary data imaging in shallow water close to the shoreline where a strong seabed multiple was present in the data. A multiple occurs when the seismic signal reverberates or bounces between the seabed and the surface.



In shallow water it has the effect of masking real reflections from beneath the seabed. This effect was minimised by acquiring multiple datasets during high and low tide. On one of the northwest – southeast oriented shoreline sideswipe data from the sea defences obscured the likely top of rock boundary imaging.

The data results show a number of defined layers within the sediment units and the likely top of rock. Up to six distinctive layers were interpreted within the uppermost 30ms of the data where a high reflectivity contrast across a layer boundary indicates a change in the material properties. The two shallowest layers, layers 1 and 2, were interpreted as non consolidated sediments with some internal layering visible in the data. Layer 3 was interpreted as likely glacial till. The deepest layer interpreted across the survey area represents the base of till / likely top of rock. The sub bottom profiler single channel seismic reflection data does not yield intra bedrock imaging.

Examples of four sub bottom profiler sections and the interpreted layer boundaries are shown in **Appendix A: Drawing No.s AGL15077_03 – 06.**



3.2 UMASW

Each marine spread was c. 67.85m in length with 24 hydrophones and a hydrophone spacing of 2.95m. Each spread resulted in the acquisition of a 1D UMASW sounding situated at the centre of the refraction spread. The overall data quality was good.

The spread and 1D sounding locations are shown in Appendix A: Drawing No. AGL15077_01.

The shear wave (S-wave) velocities ranged from 94m/s - 582m/s over a depth range of 0 - 15m. Values > 428m/s were generally recorded at the top of rock. Data for the sediment layers has been generally interpreted on the following basis:

Layer	S-Wave Seismic Velocity (m/s)	Interpretation	Stiffness/Rock Quality
1	94 - 125	unconsolidated sediments	Very Soft /Very Loose
2	125 - 175	unconsolidated sediments	Soft /Loose
3	175 - 250	unconsolidated sediments / Till	Firm / Medium Dense
4	250 - 300	Sediments / Till	Dense
5	250 - 350	Sediments / Till	Stiff
6	350 - 428	Sediments / Till	Very Stiff / Very Dense

The following table shows shear wave velocity (m/s) and related material type for cohesive and granular sediments / soils. The table also shows typical velocities for weathered – fresh bedrock. The data for offshore Arklow showed top of completely – highly weathered bedrock velocities in the range274 – 582m/s. No values are returned beneath top of weathered rock.

The results of the UMASW investigation are shown in more detail in **Appendix B: Tabular Data with Engineering Parameters.**





Fig.3.1. Shear-wave velocity and corresponding sediment cohesion.

3.3 Seismic Refraction Profiling

The locations of the P-wave (Vp) seismic refraction spreads are shown in **Appendix A: Drawing No. AGL15077_01**. The overall data quality was good.

The results of the seismic refraction survey were used to determine bedrock information. The bedrock velocities vary across the site from 2283 – 6587m/s with the majority of velocities ranging 2738 - 5729 The interpolated bedrock velocity model is displayed in **Appendix A Drawing No.s AGL16077_03 -06**. The data is displayed to 2m below the top of rock. The Vp velocity data for bedrock has generally been interpreted on the following basis using a calculated RQD based on a laboratory bedrock velocity of 6,000m/s (see **Appendix B**):



Layer	P-Wave Seismic Velocity (m/s)	Interpretation	Rock Quality	Excavatibility
1	2283 - 4242	Metasediment Bedrock	Very Poor - Fair	Break / Blast
2	4243 - 5692	Metasediment Bedrock	Fair - Good	Break / Blast
3	>5692	Metasediment Bedrock	Excellent	Break / Blast

Weathered rock, as indicated by reduced Vp values and by shear wave velocities, may be present at the top of the bedrock layer.

The results of the seismic refraction investigation are shown in more detail in **Appendix B: Tabular Data with Engineering Parameters.**



4. DISCUSSION

The area under investigation offshore Arklow is generally characterised by unconsolidated sediments over glacial till of variable thickness overlying undulating bedrock.

4.1 Sedimentary Layers

Three sediment layers were defined by the geophysical datsets with layers 1 and 2 consisting of nonsolidated sediments with low shear wave velocities. These two layers have shear wave velocities in the range 94 - 250m/s and are interpreted as very soft / very loose to firm / medium dense.

Layer 1 is present from the coastline to c. 1km offshore and ranges in thickness from < 0.5m to c. 5.5m. The sub bottom profiler indicates some lamination at the base of this layer at the contact with the underlying layer 2.

Layer 2 is present across the surveyed area and thickens to the east. It is c. 1 - 3.5m thick within 1km of the shore but increases to > 6.5m thick to the east, where layer 1 is not present.

Layer 3, with shear wave velocities in the range 175 - 428m/s, is the deepest sediment layer and is interpreted as glacial till. This is a firm – very stiff / medium dense – very dense layer ranging in thickness from c. 1.5m - > 10m. The data indicates this unit is thinnest in the west and east with a thicker zone, oriented northwest – southeast, present across the central part of the site. Channel features cut into the top of this unit are interpreted from the sub bottom profiler data and are seen in **Appendix A: Drawing No. AGL16077_03 – 06.**

Thickness plots for the three individual sediment units are displayed in **Appendix A: Drawing No. AGL16077_02** and the combined thickness of the units is displayed in **Appendix A: Drawing No. AGL16077_01.**

4.2 Bedrock

The depth to the top of bedrock (see **Appendix A: Drawing No. AGL16077_01**) varies across the survey area from c. 7.0m - > 12.5m. The sediment thickness / depth to bedrock map shows the top of rock is undulating from west to east with both shallow and deep rock present on the southern boundary of the client zone of interest. The data indicates a series of southeast – northwest oriented ridges and channels in the top of rock.

The channels in the top of rock are coincident with thicker sediment infill but may also relate to the regional faulting. The GSI database shows northeast - southwest and northwest – southeast faults in area (see Figs. 2.4 and 2.5 above).

The seismic velocities for the bedrock range from 2283 – 6585m/s and indicate bedrock quality ranges from very poor – excellent. Bedrock velocities are also shown in map view in **Appendix A: Drawing No. AGL16077_02** and correlate well with the bedrock channels and ridges and localised variation in sediment shear wave velocity.



Elevation maps for seabed and bedrock, referenced to Lowest Astronomical Tide (LAT), are displayed in **Appendix A: Drawing No. AGL16077_01.** These maps were generated using interpolation between the acquired data points and show interpolated bedrock elevation varies from c. -13m in the west to -22m in the east.

NOTE: Elevation maps were produced following a time to depth conversion of the sub bottom profiler data. No Bathymetric survey was undertaken across the full extent of the sub bottom profiler investigation.

Variation in bedrock should be investigated further by borehole drilling.



5. **RECOMMDATIONS**

A number of boreholes are recommended across the site to investigate variations in the overburden and confirm bedrock depth and type.

Proposed Borehole	ING Easting	IING Northing	Target Depth
PBH1	325399	173302	15m
PBH2	325742	173430	10m
РВНЗ	326424	173489	10m
PBH4	325786	173234	10m
PBH5	325939	173309	15m
PBH6	326127	173314	10m
PBH7	326284	173352	10m
PBH8	326026	173177	15m

The findings of the geophysical investigation should be reviewed upon completion of intrusive ground investigations.



6. **REFERENCES**

Bell F.G., 1993; 'Engineering Geology', Blackwell Scientific Press.

Bellefleur, G., Duchesne, M.J., Hunter, J., Long, B. F. and Lavoie, D., 2006; 'Comparison of single- and multichannel high-resolution seismic data for shallow stratigraphy mapping in St. Lawrence River estuary, Quebec', Geological Survey of Canada.

Deere, D. U., Hendron, A. J., Patton, F.D., and Cording, E.J. 1967; 'Design of surface and near surface construction in rock. Failure and breakage of rocks', proceedings 8th U.S. symposium rock mechanics, New York: Soc. Min Engrs, Am. Inst. Min Metall. Petroleum Engrs.

Duchesne, M. J. and Bellefleur, G., 2007; 'Processing of single-channel, high resolution seismic data collected in the St. Lawrence Estuary, Quebec', Geological Survey of Canada.

GSI., 2014; 'Bedrock Geology of Ireland, Scale 1:1,000,000', Department of Communications Energy and Natural Resources.

Hagedoorn, J.G., 1959; 'The plus - minus method of interpreting seismic refraction sections', Geophysical Prospecting, 7, 158 -182.

Kaufmann, R.D., Xia, J., Benson, R.C., Yuhr, L.B., Casto, D.W. and Park, C.B., 2005; 'Evaluation of MASW data acquired with a hydrophone streamer in a shallow marine environment', Journal of Environmental & Engineering Geophysics, 10(2): pp.87-98.

KGS, 2000; 'Surfseis Users Manual', Kansas Geological Survey.

Klein, G.2003; 'Acquisition and Inversion of Dispersive Waves in Shallow Marine Environments', Dissertation for Doctorate Degree, Christian-Albrechts University, Kiel.

Mari, J. L., Glangeud, F. And Coppens, F., 1999; 'Signal Processing for geologists and geophysicists', Editions Technip.

McGrath, T., 2016; 'Multichannel Analysis of Surface Waves (MASW) for Offshore Geotechnical Investigations', MEngSc. Thesis, University College Dublin.

Palmer, D., 1980; 'The Generalized Reciprocal Method of seismic refraction interpretation', SEG.



Park, C.B., Miller, R.D., and Xia, J., 1998; 'Ground roll as a tool to image near-surface anomaly', SEG Expanded Extracts, 68th Annual Meeting, New Orleans, Louisiana, 874-877.

Park, C.B., Miller, R.D., and Xia, J., 1999; 'Multi-channel analysis of surface waves (MASW)', Geophysics, May-June issue.

Press, F., 1966; 'Seismic velocities. Handbook of Physical Constants', Clark, S. G. (Ed.). 195 – 218 Geological Society of America.

Redpath, B.B., 1973; 'Seismic refraction exploration for engineering site investigations', NTIS, U.S. Dept. of Commerce

Reynolds, J.M., 1997. 'An Introduction to Applied and Environmental Geophysics', Wiley.

Sandmeier, K.J., 1998; 'ReflexW User Manual'.

SeisImager, 2009; 'SeisImager / 2D Manual version 3.3', OYO Corporation.

Sheriff, R. E., and Geldart, L. P., 1982; 'Exploration Seismology, Volume 1, Cambridge University Press.

Soske, J.L., 1959; 'The blind zone problem in engineering geophysics', Geophysics, 24, pp 359-365.

Van Heerden, W. L., 1987;

'General Relations Between Static and Dynamic Moduli of Rocks'. International Journal Rock Mechanics Mineral Sciences and Geomechanics, V24, No.6, pp381-385.

Xia, J., Chen, C., Tian, G., Miller, R.D. and Ivanov, J., 2005. 'Resolution of High-frequency Rayleigh-wave Data', Journal of Environmental & Engineering Geophysics, 10(2): pp.99-110.

Yilmaz, O., 1987; 'Seismic Data Processing', Society of Exploration Geophysicists.

Young, R. A., 2004; 'Seismic Reflection Processing', European Association of Geoscientists and Engineers.



7. APPENDIX A: DRAWINGS

The information derived from the geophysical investigation is presented in the following drawings:

AGL15077_01

Fig.1	Geophysical Investigation Location Map	Scale 1:5000 @ A1
Fig.2	Seabed Elevation Map in Lowest Astronomical Tide (LAT)	Scale 1:5000 @ A1
Fig.3	Total Sediment Thickness Map	Scale 1:5000 @ A1
Fig.4	Bedrock Elevation Map (LAT)	Scale 1:5000 @ A1
AGL1506	50_02	
Fig.1	Geophysical Investigation Location Map	Scale 1:5000 @ A1
Fig.2	Thickness of Nonconsolidated Sediment – Layer 1	Scale 1:5000 @ A1
Fig.3	Thickness of Nonconsolidated Sediment – Layer 2	Scale 1:5000 @ A1
Fig.4	Thickness of Overburden / Till – Layer 3	Scale 1:5000 @ A1
AGL1506	50_03	
Fig.1	Bedrock Vp Velocity Map	Scale 1:5000 @ A1
Fig.2	Line 33 Cross Section – Sub Bottom Profiler & Structural Interp.	Scale 1:5000 @ A1
Fig.3	Line 33 Cross Section – Sediment Vs Velocity	Scale 1:5000 @ A1
Fig.4	Line 33 Cross Section – Bedrock Vp Velocity	Scale 1:5000 @ A1
Fig.5	Line 33 Cross Section - Interpretation	Scale 1:5000 @ A1
AGL1506	50_04	
Fig.1	Bedrock Vp Velocity Map	Scale 1:5000 @ A1
Fig.2	Line 03B Cross Section – Sub Bottom Profiler & Structural Interp.	Scale 1:5000 @ A1
Fig.3	Line 03B Cross Section – Sediment Vs Velocity	Scale 1:5000 @ A1
Fig.4	Line 03B Cross Section – Bedrock Vp Velocity	Scale 1:5000 @ A1
Fig.5	Line 03B Cross Section - Interpretation	Scale 1:5000 @ A1
AGL1506	50_05	
Fig.1	Bedrock Vp Velocity Map	Scale 1:5000 @ A1
Fig.2	Line 07 Cross Section – Sub Bottom Profiler & Structural Interp.	Scale 1:5000 @ A1
Fig.3	Line 07 Cross Section – Sediment Vs Velocity	Scale 1:5000 @ A1
Fig.4	Line 07 Cross Section – Bedrock Vp Velocity	Scale 1:5000 @ A1
Fig.5	Line 07 Cross Section - Interpretation	Scale 1:5000 @ A1
AGL1506	50_06	
Fig.1	Bedrock Vp Velocity Map	Scale 1:5000 @ A1
Fig.2	Line 36B Cross Section – Sub Bottom Profiler & Structural Interp.	Scale 1:5000 @ A1
Fig.3	Line 36B Cross Section – Sediment Vs Velocity	Scale 1:5000 @ A1
Fig.4	Line 36B Cross Section – Bedrock Vp Velocity	Scale 1:5000 @ A1
Fig.5	Line 36B Cross Section - Interpretation	Scale 1:5000 @ A1



FIGURE 2: Seabed Elevation Map in Lowest Astronomical Tide (LAT)



FIGURE 3: Total Sediment Thickness Map





FIGURE 4: Bedrock Elevation Map (LAT)



LEGEND: Client Site Boundary 0 100 i Centre line chainage L01 Sparker Profile S01 Seismic Refraction Profile	PROJECT: MARINE OUTFALL PIPELINE, ARKLOW WWTP GEOPHYSICAL INVESTIGATION	DATE: NOTES: The Informati Report AGL1 the Marine Of APEX Geose	05/05/2017 Ion displayed here is 6077 Report on the (utfall Pipeline, Arklov rvices Ltd. 05th May	to be used in co Geophysical inve v WwTP for Byrr 2017.	onjunction with estigation at ne Looby Arup.	ape	X
M01 MASW 1D Profile ING Coordinate/Lat Long Coordinate	CLIENT: BYRNE LOOBY ARUP	DRAWN:	MN DATE:	CHECKED: DRAWN:	TL CHECKED:	6 Konockmullen Business Park Gorev	Regus House, Herald Way Pegasus Business Park
PDH Proposed Diffuser Head PBH1 Proposed Borehole	DRAWING NUMBER: AGL16077_01					Co. Wexford Ireland T +353 (0)402 21842	Castle Donington Derby DE74 2TZ UK
Seabed Exclusion Zone Interpreted Fault	SCALE: 1:5000 @ A1			 		F +353 (0)402 21843 E info@apexgeoservices.ie www.apexgeoservices.ie	T +44 (0)844 8700 692 E info@apexgeoservices.co.uk www.apexgeoservices.co.uk



FIGURE 2: Thickness of Noncosolidated Sediment - Layer 1



FIGURE 3: Thickness of Noncosolidated Sediment- Layer 2 Scale 1:5000





FIGURE 4: Thickness of Sediment / Till - Layer 3



END: Client Site Boundary Centre line chainage Client Site Boundary Centre line chainage Sparker Profile Sol Seismic Refraction Profile	PROJECT: MARINE OUTFALL PIPELINE, ARKLOW WWTP GEOPHYSICAL INVESTIGATION	DATE: NOTES: The Information Report AGL160 the Marine Outf APEX Geoservi	05/05/2017 n displayed here is 77 Report on the all Pipeline, Arklov ces Ltd. 05th May	to be used in co Geophysical inve v WwTP for Byrn 2017.	njunction with stigation at e Looby Arup.	ape	X Vices
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Seabed Exclusion Zone Interpreted Fault	SCALE: 1:5000 @ A1					F +353 (0)402 21842 E info@apexgeoservices.ie www.apexgeoservices.ie	T +44 (0)844 8700 692 E info@apexgeoservices.co.uk www.apexgeoservices.co.uk





FIGURE 2: Line 33 Cross Section - Sub Bottom Profiler & Structural Interpretation, Scale 1:5000







FIGURE 4: Line 33 Cross Section - Bedrock Vp Velocity, Scale 1:5000



<u>535 M35 S38 / M38</u>

S39 / M39

<u>\$27 / M27</u><u>\$29 / M29</u>

<u>S25 / M25_S26 / M26</u>

<u>\$28 / M28 \$30 / M30</u>



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and I would			Unconsolidated Overburden			<u> </u>			T +353 (0)402 21842	T ±44 (0)844 8700 602
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the second and the second second			Metasediment Bedrock	1:5000 @ A1					www.apexgeoservices.ie	www.apexgeoservices.co.uk
	Interpreted Fault	139393								





FIGURE 2: Line 03B Cross Section - Sub Bottom Profiler & Structural Interpretation, Scale 1:5000







FIGURE 4: Line 03B Cross Section - Bedrock Vp Velocity, Scale 1:5000







	Client Site Boundary	Internal Overburden Layer Boundary Top of Bedrock Change in Layer Stiffness V.soft - Soft/V. Loose - Loose Nonconsolidated Overburden Firm - Stiff/Medium Dense - Dense Nonconsolidated Overburden	MARINE OUTFALL PIPELINE, ARKLOW WWTP GEOPHYSICAL INVESTIGATION	NOTES: The Information Report AGL160 the Marine Outf APEX Geoservi	displayed here is 77 Report on the f all Pipeline, Arklov ces Ltd. 05th May	to be used in co Geophysical inves w WwTP for Byrna 2017.	njunction with stigation at e Looby Arup.	ape	X Vices
	M01 MASW 1D Profile ING Coordinate/	Stiff/Dense Nonconsolidated Overburden V.soft - Soft/V. Loose - Loose Overburden/Till	CLIENT: BYRNE LOOBY ARUP	DRAWN:	/N DATE:	CHECKED:	TL CHECKED:	C Kennedersullen Duringen Dark	Denne Henre Henrid West
PDI PDI	Lat Long Coordinate	Firm /Medium dense Overburden/Till Stiff /Dense Overburden/Till	DRAWING NUMBER:	01	05/05/2017	MN	TL	Gorey Co. Wexford	Regus House, Heraid Way Pegasus Business Park Castle Donington
PBH	BH1 Proposed Borehole	Very Stiff / Very Dense Overburden/Till	AGL16077_04					Ireland T +353 (0)402 21842	Derby DE74 2TZ UK
The second secon	Seabed Exclusion Zone	Overburden/Till Metasediment Bedrock	SCALE: 1:5000 @ A1					F +353 (0)402 21843 E info@apexgeoservices.ie www.apexgeoservices.ie	T +44 (0)844 8700 692 E info@apexgeoservices.co.uk www.apexgeoservices.co.uk





FIGURE 2: Line 07 Cross Section - Sub Bottom Profiler & Structural Interpretation, Scale 1:5000



FIGURE 3: Line 07 Cross Section - Overburden Vs Velocity, Scale 1:5000



FIGURE 4: Line 07 Cross Section - Bedrock Vp Velocity, Scale 1:5000

L07 W

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\$37 / M37 ______\$06 / M06 ______\$07 / M07 ____ ______S08/_M08______S09__M09____S11/_M11



Е

	LEGEND:	Seabed Internal Overburden Layer Boundary	bed rnal Overburden Layer Boundary MARINE OUTFALL PIPELINE, ARKLOW WwTP							
Constant of the second se	Client Site Boundary 0 100 Image Image L01 Sparker Profile S01 Seismic Refraction Profile	Top of Bedrock Change in Layer Stiffness + + V.soft - Soft/V. Loose - Loose Nonconsolidated Overburden + + + + + + + + Firm - Stiff/Medium Dense - Dense Nonconsolidated Overburden	GEOPHYSICAL INVESTIGATION	NOTES: The Informa Report AGL1 the Marine C APEX Geose	tion displayed here is 6077 Report on the utfall Pipeline, Arklo rvices Ltd. 05th May	s to be used in co Geophysical inve w WwTP for Byrn ⁄ 2017.	njunction with stigation at e Looby Arup.	ape	X	
and the st	MO1 MASW 1D Profile	Stiff/Dense Nonconsolidated Overburden	CLIENT:	DRAWN:	MN	CHECKED:	TL	80000		
and the second	📓 ING Coordinate/	V.soft - Soft/V. Loose - Loose Overburden/Till	BYRNE LOOBY ARUP	REVISION:	DATE:	DRAWN:	CHECKED:	6 Konockmullen Business Park	Regus House, Herald Way	
	E 242000 Lat Long Coordinate	Firm /Medium dense Overburden/Till		01	05/05/2017	MN	TL	Gorey Co. Weyford	Pegasus Business Park	
for Sig	Proposed Diffuser Head		DRAWING NUMBER:					Ireland	Derby DE74 2TZ	
and my shart	PBH1 Proposed Borehole	Very Stiff / Very Dense Overburden/ Iill	AGL16077_05]				T +353 (0)402 21842	UK	
the second se	Seabed Exclusion Zone	Overburden/Till	SCALE:]				F +353 (0)402 21843 E info@apexgeoservices.ie	T +44 (0)844 8700 692 E info@apexgeoservices.co.uk	
Strate and Alt	Interpreted Fault	Metasediment Bedrock						www.apexgeoservices.ie	www.apexgeoservices.co.uk	





FIGURE 2: Line 36B Cross Section - Sub Bottom Profiler & Structural Interpretation, Scale 1:5000







FIGURE 4: Line 36B Cross Section - Bedrock Vp Velocity, Scale 1:5000

Seabed Exclusion Zone

Interpreted Fault

Overburden/Till

Metasediment Bedrock



1:5000 @ A1

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8. APPENDIX B: TABULAR DATA WITH ENGINEERING PARAMETERS

The information derived from the geophysical investigation at the locations of the 1D MASW soundings is presented along chainage in the attached tables. The locations of the 1D soundings in relation to the sub bottom profiler Sparker data and the seismic refraction spreads is shown in **Appendix A**: Drawings. The data is presented from north to south and east to west along sub bottom profiler survey lines L33, L03B, L07, L36B, L16, L09, L20 and L22.

The information presented in the tables is based on the following calculations and assumed parameters;

For the overburden / sediment layers dynamic moduli, Gmax, was calculated based on an assumed density of 1.6Kg/m³ for loose – medium dense / soft – firm sediments, 1.8Kg/m³ for medium dense / firm sediments and 2.0Kg/m³ for dense – very dense / stiff – very stiff sediments. Gmax (Mpa) was calculated using the formula;

Gmax (Mpa) = $(Vs^{2*}\rho) / 100$

Vs = Shear Wave Velocity (m/s)

 $\rho = \text{Density} (\text{kg/m}^3)$

Where

• The SPT value calculations for overburden / sediments are based on Imai et al * (1976) for both granular and cohesive sediments. The SPT values were calculated using the formula;

SPT = 0.0011 * Vs² - 0.1665* Vs + 7.1017 (Granular) SPT = 0.2061 * Vs - 23.076 (cohesive)

- The depth below seabed values displayed in the tables for the overburden / sediment layers and the bedrock layer are based on a time to depth stretch of the time domain layering from the sub bottom profiler data using a conversion velocity of 1900m/s. The conversion velocity was chosen following analysis of the finalised velocity regimes from the seismic refraction and 1D MSASW datasets in conjuction with the time domain layer boundary picks from the sub bottom profiler data.
- For the bedrock data the relative R.Q.D. values displayed in the tables were calculated based on an assumed laboratory velocity (V lab) of 6,000m/s. Typical published Vp values for sandstones range 1,400m/s to 4,500m/s and for shales range 2,000m/s to 4,100m/s limestone (Press, 1966 & Reynolds, 1997).
- Bedrock R.Q.D calculations are based on Deere et al. ** (1967).
- Estimated stiffness and bedrock quality are based on Imai et al 1976.



	M25										M26								
	Chainage (m)	109									Chainage (m)	155							
	Easting ING	325458.6		LAT	N 52 47	822777					Easting ING	325503.3		LAT	N 52 47.	827814			
	Northing ino	173304.1		LONG	W 00 8.	444304					Northing ING	173374.0		LONG	W 00 8.	+04418			
Sediment	Unconsolidated Overburden Unconsolidated Overburden	Depth Below Seabed (m) 1.98	۹ 1.976 4	(s/w) sn 180.023 181.638	C S S (Wpa)	Stiff ness Cohesive Built Buil	Citituess Grandar MEDIUM DENSE MEDIUM DENSE	1 the second sec	12 N 13 N		Unconsolidated Overburden Unconsolidated Overburden	Depth Below Seabed (m) (m)	۹ 1.593 4	(s/w) sn 161.348 183.8	(wba) 42	Soft Total Stiff ness contesive Laboration State	LOOSE MEDIUM DENSE	N 10 N 10 N 10 N 10 N 10 N 10 N 10 N 10	8 N 13 N
	Unconsolidated Overburden Overburden	4.00	6 9.7	196.945 260.235	70 135	FIRM	DENSE	17 N 30 N	16 N 38 N		Unconsolidated Overburden Overburden	4.00	6 9.8	207.969 269.68	78 145	FIRM	DENSE DENSE	19 N 32 N	20 N 42 N
		9.70		377.403								9.80		375.193					
Bedrock	METASEDIMENT	Depth Below Seabed (m)		(s/w) d	** 00y	Ajijen FAIR					BE METASEDIMENT	Depth Below 86 88 88 89 80		(s/w) dn 5174	** ODU 74	Ajijeno FAIR			
			-							_									
	IVIZ/ Chainage (m)	244									IVI29 Chainage (m)	297							
	Easting ING	325589.1		LAT	N 52 47	837667					Easting ING	325641.4		LAT	N 52 47.	844553			
	Northing ING	173395.1		LONG	W 06 8.	327629		_		\square	Northing ING	173409.3		LONG	W 06 8.2	280870			
Sediment	Bick Unconsolidated Overburden	Depth Below Seabed (m)	P 1.779	(\$/ w) \$ <u>N</u> 174.676	60 (Mpa)	an isau co hesi	Granular Provide to MEDIUM DENSE	N 25T* Cohesive	SPT* Granular		adc Unconsolidated Overburden	Depth Below Seabed	<mark>۴</mark> 1.837	(s/w) sn 148.935	Gmax (Mpa)	stiffness Cohesive	Stiffness Granular	SPT* Cohesive Z	SPT* Granular N
	Unconsolidated Overburden	1.78	4.2	170.643	47	SOFT to FIRM	LOOSE to MEDIUM DENSE	12 N	10 n		Unconsolidated Overburden	1.84	4.2	172.687	48	SOFT to FIRM	LOOSE to MEDIUM DENSE	12 N	11 N
	Overburden Overburden	5.80	7.7	295.083	174	STIFF	DENSE to VERY DENSE	23 N 37 N	>50 N		Overburden Overburden	5.80	7.5	292.015	171	STIFF	DENSE to VERY DENSE	37 N	>50 N
		7.70		326.185								7.50		320.532					
Bedrock	a A METASEDIMENT	Depth Below Seabed (m)		(s/w) dA	** ODJ 28	Kali ku					و ک METASEDIMENT	Depth Below 5'2 2'20		(s/w) dn	*• aga 35	Auality			
										_		1							
	M28 Chainage (m)	387									M30 Chainage (m)	444							
	Easting ING	325728.2		LAT	N 52 47	854141					Easting ING	325784		LAT	N 52 47.	858804			
	Northing ING	173429.3		LONG	W 06 8.	203220					Northing ING	173439.4		LONG	W 06 8.3	153365			
Sediment	Unconsolidated Overburden	Depth Below 000 5eabed (m)	P 1.835	(s/w) sn 142.804	(Wba) 33	Stiffness Cohesive	Stiffness Granular 35001 35001 3002	SPT* Cohesive	2 SPT* Granular		ad Unconsolidated Overburden	000 000 Seabed (m)	P 2.8	(\$/w) \$A	39 39	Stiffness Cohesive	COOSE MEDIUM DENSE	SPT* Cohesive	2 SPT* Granular
	Unconsolidated Overburden	3.80	4.8	243.276	107	FIRM to STIFF	LOOSE to MEDIUM DENSE	27 N	31 N		Overburden	4.00	6	227.937	94	FIRM	MEDIUM DENSE	23 N	26 N
	Overburden	4.80	8	266.827	142	STIFF	DENSE	31 N	40 N			6.00		274.203					
					_													_	
Bedrock	e METASEDIMENT	Depth Below 8008 008		(s/w) dA 2952	*•000 24	Atition of the second s					METASEDIMENT	Depth Below 009 Seabed (m)		(s/w) dA 2738	**00g 21	Attemb VERY POOR			
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	M31 Chainage (m) Easting ING Northing ING	538 325875.1 173465.7		LAT LONG	N 52 47 W 06 8.	871711 071718					M32 Chainage (m) Easting ING Northing ING	600 325934.7 173480.9		LAT LONG	N 52 47. W 06 8.0	879081 018398			
Sediment	Unconsolidated Overburden Unconsolidated Overburden Overburden	(m) pages 0.00 2.50 4.50 7.32	2 2.5 4.5 7.32	(s/w) 169.962 198.183 229.931 301.055	(edw) xew5 46 71 95	SOFT to FIRM FIRM FIRM	AND	11 N 17 N 24 N	10 N 17 N 26 N		Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Overburden	Depty Below (m) Seabed (m) 3.00 9.00 9.00	و 1.833 3 6 9	(s/w) s/ 141.621 146.765 148.776 260.294 333.276	(edw) xewg 32 34 35 136	SOFT SOFT SOFT SOFT STIFF	LOOSE LOOSE LOOSE LOOSE DENSE	0 N 7 N 8 N 14 Cohesive	N N N N N N N N N N N N N N N N N N N
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	Q	th Below oed (m)		(m/s)		lity					ų	tth Below bed (m)		(s/w)	**	uity			



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	M33									M34								
	Chainage (m)	687	,		_					Chainage (m)	737							
	Easting ING	326019.4		LAT	N 52 47	.888294				Easting ING	326069.8		LAT	N 52 47	892090			
	Northing ING	173500.2		LONG	W 06 7.	942691				Northing ING	173508.6		LONG	W 06 7.	897713			
Sediment	Туре	Depth Below Seabed (m)	To	Vs (m/ s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular	Туре	Depth Below Seabed (m)	To	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated Overburden	0.00	3	3 155.722	39	SOFT	LOOSE	9 N	7 N	Unconsolidated Overburden	0.00	3	157.241	40	SOFT	LOOSE	9 N	8 N
	Unconsolidated Overburden	3.00	5.003	3 149.451	36	SOFT	LOOSE	7 N	6 N	Unconsolidated Overburden	3.00	4.5	145.983	34	SOFT	LOOSE	7 N	6 N
	Overburden	5.00	7.5	5 230.682	96	FIRM	MEDIUM DENSE	24 N	27 N	Overburden	4.50	8.7	244.436	108	FIRM to STIFF	MEDIUM DENSE to DENSE	27 N	32 N
		7.50		314.147							8.70		334.509					
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		1.50		5455	04	0000				METHOLD MEN	0.70		3313	04	0000			
	M25		r		_			r –		M38					1		1	
	M35	024								M38	860							
	M35 Chainage (m)	824								M38 Chainage (m)	869							
	M35 Chainage (m) Easting ING	824 326154.2		LAT	N 52 47	.902200				M38 Chainage (m) Easting ING	869 326198.2		LAT	N 52 47	906533			
	M35 Chainage (m) Easting ING Northing ING	824 326154.2 173529.6		LAT LONG	N 52 47 W 06 7.	.902200 822126				M38 Chainage (m) Easting ING Northing ING	869 326198.2 173538.7		LAT LONG	N 52 47 W 06 7.	906533 782826			
Sediment	M35 Chainage (m) Easting ING Northing ING	824 326154.2 173529.6 pageas so the second s	To	LAT LONG (s/w) sn	N 52 47 W 06 7	902200 822126 Cohestine Scotestine	Stiffness Granul ar	SPT* Cohesive	SPT* Granular	M38 Chainage (m) Easting ING Northing ING	Debtt Below Seabed (m) (m)	To	LAT (\$/w) \$A	N 52 47 W 06 7.	9065333 782826 Copes copes	Stiffness Ganular	SPT* Cohesive	SPT* Granular
Sediment	M35 Chainage (m) Easting ING Northing ING	824 326154.2 173529.6 Deaptreed (m) 0.00	6	(s/w) so 163.993	N 52 47 W 06 7 (edw) xewy 43	.902200 822126 9455 900 855 855 855 855 855 855 855 855 855 8	suffrees Granular 1005E	01 SPT* Cohesive	ده SPT* Granular Z	M38 Chainage (m) Easting ING Northing ING	869 326198.2 173538.7 Deage of over a sease of the sease	3 2	LAT LONG (\$/w) \$X	N 52 47 W 06 7. (EdW) xews 38	906533 782826 909599 782826 5000 5000 5000 5000 5000 5000	fiffness Granular 10008	∞ SPT* Cohesive Z	∠ Z
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden	824 326154.2 173529.6 pages so tri (m) 0.00 3.00	P	(s / w) s 163.993 188.513	N 52 47 W 06 7.	902200 822126 90 50 50 50 50 50 50 50 50 50 50 50 50 50	te coose Loose MEDIUM DENSE	N 12 N 12 N	Z Z Z	M38 Chainage (m) Easting NG Northing ING Usconsolidated Overharden Usconsolidated Overharden	869 326198.2 173538.7 ppeqees work and a second sec	9 3 4	LAT LONG (*/w) \$ 154.364 187.088	N 52 47 W 06 7. (edw) xews 38 63	906533 782826 89 90 90 90 90 90 90 90 90 90 90 90 90 90	LOOSE MEDIUM DENSE	8 SPT* Cohesive	2 SPT* Granular V V 14 N
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsuldated Overhunden Unconsuldated Overhunden Unconsuldated Overhunden	824 326154.2 173529.6 page so more so	P 3 4 7.565	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 7. (edw) Xe wy 43 64 86	902200 822126 822126 9459 9459 950 950 950 950 950 950 950 950 950 9	LOOSE MEDIUM DENSE MEDIUM DENSE	10 N 15 N 21 N	9 N 14 N 23 N	M33 Change (m) Earting ING Northing ING Korthing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Overhunden	869 326198.2 173538.7 Page 95 S wolad 4.00 0.00 3.00 4.00	<mark>۹</mark> 3 4 7.388	LAT LONG (\$\u00edue \$\u00e	N 52 47 W 06 7. (edv) xews 38 63 98	906533 782826 Soft FiltM FiltM	toose MEDIUM DENSE MEDIUM DENSE	8 SPT* Cohesive	7 N 14 N 28 N 28 N
Sediment	M35 Chainage (m) Easting IMG Northing ING Unconsolidated Overharden Unconsolidated Overharden Overharden Overharden	824 326154.2 173529.6 page so so age so age	2 3 4 7.565 10	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 7. (edw) Xe Wy 43 64 86 183	902200 822126 Soft Firm STIFF	LOOSE MEDIUM DENSE MEDIUM DENSE DENSE TO VERV DENSE	10 N 15 N 21 N 39 N	9 N 14 N 23 N >50 N	M38 Chainage (m) Easting NG Northing ING Usconsidiated Overlander Usconsidiated Overlander Overlander	869 326198.2 173538.7 Pages x wojag tidag 0.00 3.00 3.00 7.39	و 3 4 7.388 10	LAT LONG \$ \$ \$ 154.364 187.088 233.517 324.878	N 52 47 W 06 7. (redw) xews 38 63 98 211	906533 782826 7829 7829 7829 7829 7829 7829 7829 7829	LOOSE MEDIUM DENSE VERY DENSE	8 N 15 N 25 N 43 N	7 N 14 N 28 N >50 N
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Overhunden	824 326154.2 173529.6 Pages s moles s moles field () 0.00 3.00 4.00 7.57 10.00	P 3 4 7.565 10	(%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 7 (redw) Xe wy 43 64 86 183	.902200 822126 SOFT FIRM FIRM STIFF	A CODE A CODE MEDIUM DENSE MEDIUM DENSE DENSE to VERY DENSE	10 N 15 N 2014	9 N 14 N 23 N 250 N	M38 Change (m) Easting ING Northing ING Unconsolidated Overburder Unconsolidated Overburder Unconsolidated Overburder Overburder Overburder	869 326198.2 173538.7 Pageess words tidag 0.00 3.00 4.00 7.39 10.00	<mark>۹ 3</mark> 4 7.388 10	\$ LAT LONG \$ 154.364 187.088 233.517 324.878 389.116	N 52 47 W 06 7. (redu) xews 38 63 98 211	906533 782826 SOFT FIRM FIRM FIRM STIFF TO VERY STIFF	A THE AND A THE	8 N 15 N 25 N 43 N	7 N 14 N 28 N >50 N
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Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden	824 326154.2 173529.6 page 35 molecular page 35 molecular 0.00 3.00 4.00 7.57 10.00	2 3 4 7.565 10	(5) (5) (5) (5) (5) (5) (5) (5) (5) (5)	N 52 47 W 06 7 W 06 7 W W W W W W W W W W W W W W W W W W W	902200 822126 822126 500 500 500 500 500 500 500 500 500 50	LOOSE MEDUM DENSE DENSE to VERY DENSE	10 N 21 N 39 N	9 N N N N N N N N N N N N N N N N N N N	M38 Chaings (m) Easting ING Avorbing ING Avorbing ING Unconsolidated Overburder Unconsolidated Overburder Overburder Overburder	869 326198.2 173538.7 173538.7 173538.7 173538.7 0.00 3.00 4.00 7.39 10.00	<mark>۹</mark> 3 4 7.388 10	LAT LONG (%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 7. (redw) Xewy 38 63 98 211	905533 782826 782826 7839400 789400 789400 780400 780400 780400 780400 780400 78040000000000	LOOSE MEDIUM DENSE VERY DENSE	8 N 15 N 25 N 43 N	7 N 14 N 28 N >50 N
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overhandem Unconsolidated Overhandem Overhandem Overhandem	824 326154.2 173529.6 Pages s moges s moges s moges s moges s moges s moges s 10.00 3.00 4.00 7.57 10.00	2 3 4 7.565	LAT LONG 5 (E) (S) 8 163.993 188.513 5 218.441 2 302.339 375.816	N 52 47 W 06 7. (red) W 43 64 86 183	902200 822126 SOFT FIRM FIRM STIFF	LOOSE MEDUUM DENSE MEDUUM DENSE MEDUUM DENSE DENSE to VERY DENSE	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9 N N N N N N N N N N N N N N N N N N N	M38 Chainage (m) Easting ING Northing ING Usconsolidated Overharden Usconsolidated Overharden Overharden Overharden	869 326198.2 173538.7 Pages 5 Molecular 1000 3.00 4.00 7.39 10.00	<mark>۹</mark> 3 4 7.388 10	LAT LONG 154.364 187.088 233.517 324.878 389.116	N 52 47 W 06 7. (edw) xews 38 63 98 211	906533 782826 782826 782826 782826 78282 SOFT FIRM FIRM FIRM FIRM STIFF to VERY STIFF	LOOSE MEDIUM DENSE VERY DENSE	8 N 15 N 25 N 43 N	7 N 14 N 28 N 30 N 00 N 00 N 00 N 00 N 00 N 00 N 0
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overburden Overburden	824 326154.2 173529.6 pages x moga 4tg ag 0.00 3.00 4.00 7.57 10.00	2 3 4 7.565 10	LAT LONG 163.993 188.513 218.441 375.816	N 52 47 W 06 7. (edv) ¥eug 43 64 86 183	902200 902200 822126 822126 8007 8007 8007 8007 8007 8007 8007 800	LOOSE MEDIUM DENSE DENSE to VERY DENSE	10 N 2514 Cohesive	23 N >50 N	M38 Chainage (m) Easting ING Arothing ING Working ING Unconsolidated Overburder Unconsolidated Overburder Overburder Overburder	869 326198.2 173538.7 Pages X X 0.00 3.00 4.00 7.39 10.00	و 3 4 7.388 10	LAT LONG (%) 154.364 187.088 233.517 324.878 389.116	N 52 47 W 06 7. (edw) xews 38 63 98 211	905533 782826 Soft Film Stiff to VERY STIFF	LOOSE MEDIUM ENSE VERV DENSE	8 N 15 N 255 N 43 N	28 N 250 N
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolitated Overharden Unconsolitated Overharden Unconsolitated Overharden Overharden Overharden	824 326154.2 173529.6 Page 35 0.00 0.00 4.00 7.57 10.00	2 3 4 7.565 10	LAT LONG 3 163.993 163.993 163.993 3 163.993 3 163.993 3 163.993 3 163.993 3 163.993 3 163.993 3 163.993 3 163.993 3 163.993 3 163.993 1 188.513 2 18.441 18.441	N 52 47 W 06 7 W 06 7 W 06 7 W 06 7	SOFT FIRM FIRM STIFF	LOOSE MEDIUM DENSE MEDIUM DENSE DENSE to VERY DENSE	10 N 2214	9 N 14 N 23 N >50 N	M38 Chainage (m) Easting ING Northing ING Unconsolidated Over burden Unconsolidated Over burden Over burden	869 326198.2 173538.7 pages as wo age to the first second	<mark>۹</mark> 3 4 7.388 10	LAT LONG (\$) 154.364 187.088 233.517 324.878 389.116	N 52 47 W 06 7. (e c d w) 38 63 98 211	Soft Fire Street	LOOSE MEDIUM DENSE VERY DENSE	8 N 15 N 25 N 43 N	28 bL1+ Granular 14 N 28 N 14 N 28 N 28 N
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overburden	824 326154.2 173529.6 pages x no s no 400 3.00 4.00 7.57 10.00	2 3 4 7.565 10	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	N 52 47 W 06 7	S02200 822126 S0FT FIRM FIRM STIFF	LOOSE MEDIUM DENSE DENSE to VERY DENSE	200 2544 COrpesive	23 N 250 N	M38 Chainage (m) Easting ING Northing ING Unconsolidated Overburder Unconsolidated Overburder Overburder Overburder	869 326198.2 173538.7 Pages X No198 4 10.00 3.00 4.00 7.39 10.00	9 3 4 7.388 10	LAT LONG 154.364 187.088 233.517 324.878 389.116	N 52 47 W 06 7. W 06 7. 38 63 98 211	STIFF to VERY STIFF	LOOSE MEDIUM BINSE VERV DENSE	8 N 15 N 25 N 43 N	Leppues9 +L45 7 N 14 N 28 N >50 N
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Overhunden	824 326154.2 173529.6 page 35 wool all 1,157 10.00	2 3 4 7.565 10	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	N 52 477 W 06 7.	SOFT FIRM STIFF	LOOSE LOOSE MEDIUM DENSE MEDIUM DENSE DENSE to VENT DENSE	N 01 2014 Cohesive	9 N 14 N 23 N >50 N	M33 Chanage (m) Easting (MG Easting (MG Easting (MG Northing (MG Use consolidated Over hurdler Use consolidated Over hurdler Over burdler Easting (MG	869 326198.2 173538.7 pages 5 Molad ti dag 0.00 3.00 4.00 7.39 10.00	2 3 4 7.388 10	(5) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	N 52 47 W 06 7. W 06 7. 38 63 98 211	906533 787826 SOFT FIRM FIRM STIFF to VERY STIFF	LOOSE LOOSE MEDIUM DENSE WEDING DENSE	8 N 8 2514 Cohesive	280 N
Sediment	M35 Chainage (m) Easting ING Northing ING Unconsolidated Overback Unconsolidated Overback Unconsolidated Overback Overback	824 326154.2 173529.6 (u) 0.000 3.000 3.000 (u) 94085 10.000 (u) 94085 10.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000	2 3 4 7.565 10	(s) (u) (A	N 52 47 W 06 7. (edw) ye wy 43 64 86 183	902200 822126 Settless Copeeve FireM FireM FireM FireM	A Construction of the cons	2014 COhesive	אר פישטרוקי שר פישטרוקי אר פישטרוקי שר פישטרוקי שר פישטרוקי אר פישטרוקי איים אר פישטרוקי אר פישטרוקי אר פישטרוק א	M38 Chainage (m) Easting ING Northing ING Unconsidiated Overlander Unconsidiated Overlander Overlander Overlander	8699 326198.2 173538.7 Padress, molecular (u) 0.00 3.00 7.39 10.00	<mark>۹ 3</mark> 4 7.388 10	LAT LONG \$5, 154.364 187.088 389.116 (\$235.517 389.116	N 52 47 W 06 7. (edv) xewy 38 63 98 211	905513 782826 782826 782826 782826 78282 78295 78285 78295 7855 78295 78295 78295 78295 78295 78295 7855 7855 7855 7855 7855 7855 7855 78	A Standard A Standard A Standard A Standard A Standard A Muldam A Standard A Muldam A Standard A Muldam A Standard A Muldam A Standard A Standa	25 N 15 N 25 N 43 N	Las 7 N 14 N 28 N >50 N
Sediment	M35 Chainage (m) Easting ING Northing ING Uncansidated Overhurden Uncansidated Overhurden Overburden Overburden	824 326154.2 177529.6 (u) 0.00 7.57 10.00 (u) Pageges (u) 0.00 7.57 10.00 0 0.00 0.00 0.00 0.00 0.00 0.00	2 3 4 7.565 10	LAT LONG 3 163.993 1 188.513 2 75.816 3 375.816 	N 52 47 W 06 7. (redw) Yeug 43 64 86 64 86 9. 183 - 	902200 822126 822126 5007 FIRM STIFF FIRM STIFF FIRM	LOOSE MEDIUM DENSE DENSE to VERY DENSE	214 Cohesive	9 N 14 N 23 N >50 N	M38 Chainage (m) Easting ING Avorbing ING Avorbing ING Unconsolidated Overburder Unconsolidated	869 326198.2 173538.7 173538.7 0000 0.000 3.00 4.00 7.39 10.00 10.00 10.00	<u>2</u> 3 4 7.388 10	LAT LONG 154.364 233.517 324.878 389.116	(edv) xews 38 63 98 2111	905533 782826 782826 SOFT FIRM STIFF to VERY STIFF PDOR	LOOSE MEDIUM ENSE VERV DENSE	8 N N 25 N 43 N 43 N 43 N 45 N 43 N 45 N 45 N 4	7 N 14 N 28 N >50 N



	M36	1	1		1					M01				r i				
	Chainage (m)	131								Chainage (m)	195							
	Easting ING	325481		LAT	N 52 47	.770959 426689			_	Easting ING	325543		LAT	N 52 47 W 06 8	778454			
Sediment	Unconsolidated Overburden	Depth Below Seabed (m)	P 3.7	(s/ш) 189.711	Gmax (Mpa)	anisauco cohesive Firem	Stiffness Granular MEDIUM DENSE	N 16 N 16 N	15 N	action of the second se	Depth Below Seabed (m)	PL 4	(s/w) sn 222.384	Gmax (Mpa)	Stiffness Cohesive	Kittess Granutar	22 SPT* Cohesive	SPT+ Granular 54 N
	Unconsolidated Overburden	3.70	6.5	211.683	81	FIRM	MEDIUM DENSE	20 N	21 N	Unconsolidated Overburden	4.00	6.7	191.748	66	FIRM	MEDIUM DENSE	16 N	15 N
	Overburden	6.50 8.80	8.8	311.232	107	FIRM to STIFF	MEDIUM DENSE to DENSE	27 N	31 N	Overburden	6.70 8.80	8.8	311.914 400.929	195	STIFF	VERY DENSE	41 N	>50 N
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Bedrock	ed AL	De pth Below 888 088		(s/w) dA 5518	**00 85	GOOD				METASEDIMENT	Depth Below 888 088		(s/w) d _A 3504	*•00a 34	Anality Duality			
						-												
	M02									M03								
	Chainage (m)	280			N 52 47	704602				Chainage (m)	337			N 53 47	702757			
	Northing ING	173297.6	6	LONG	W 06 8.	296504				Northing ING	173316		LONG	W 06 8.	247866			
Sediment	Type	Depth Below Seaber (m)	70	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular	Type	Depth Below Seaber (m)	То	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated Overburden Unconsolidated Overburden	2.57	2.574	232.049	20	VERY SOFT FIRM	VERY LOOSE MEDIUM DENSE	0 N 24 N	2 N 27 N	Unconsolidated Overburden Unconsolidated Overburden	0.00 3.70	3.7	191.132 199.519	66 72	FIRM	MEDIUM DENSE MEDIUM DENSE	16 N 18 N	15 N 17 N
	Unconsolidated Overburden	4.10	63	322.216	208	STIFF to VERY STIFF	VERY DENSE	43 N	>50 N	Overburden	5.10	6.5	319.52	204	STIFF	VERY DENSE	42 N	>50 N
	Overburden	6.30	0.3	434.109	300	VERT STIFF	VERT DENSE	>50 N	>50 N		0.50		351.331					
Bedrock	8 E METASEDIMENT	Depth Below Seabed (m)		(s/w) d _A 3861	**00 41	A the poor				A A A A A A A A A A A A A A A A A A A	Depth Below Seabed (m)		(s/ш) d _A 4218	**00a 49	Anality NOOd			
	M04									M05								
	M04 Chainage (m) Easting ING	417	F	LAT	N 52 47	.803892				M05 Chainage (m) Easting ING	477 325816.8		LAT	N 52 47	811594			
	M04 Chainage (m) Easting ING Northing ING	417 325758.5 173336.8	F	LAT LONG	N 52 47 W 06 8.	.803892 178418				M05 Chainage (m) Easting ING Northing ING	477 325816.8 173352.6		LAT LONG	N 52 47 W 06 8.	811594 126206			
Sediment	M04 Chainage (m) Easting ING Northing ING Urconsolidated Overburden Urconsolidated Overburden	417 325758.5 173336.8 (m) pedge ge ge ge ge ge ge ge ge ge ge ge ge g	9	LAT LONG (5)(L) 5) 165.354 224.806	N 52 47 W 06 8.	803892 178418 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Juppreso Statution LOOSE to MEDIUM DENSE MEDIUM DENSE	BPT* Cohesive	25 N	M05 Chainage (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden	477 325816.8 173352.6 Debt H Below (u) peqee 0.00 1.75	<mark>۹</mark> 1.75 2.7	LAT LONG (s/m) s/ 165.157 195.307	N 52 47 W 06 8. (edw) xewy 44	811594 126206 90000 90000 90000 9000 90000 9000000	JEPPRES SSAULIHATS LOOSE to MEDIUM DENSE MEDIUM DENSE	10 N 17 N 17 N	91 6 SPT* Granular X
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden	417 325758.5 173336.8 (E) 99 99 99 0.00 2.50 4.00 6.90	2.5 4 6.5	LAT LONG ()))))))))))))))))))	N 52 47 W 06 8. (ed. W) ×ew 91 107	803892 178418 999900 SOFT to FIRM FIRM FIRM to STIFF	and the second s	23 N 27 N	25 N 32 N	MOS Chainage (m) Easting ING Northing ING Unconsolidated Overharden Unconsolidated Overharden Overbarden	477 325816.8 173352.6 (E) page as 0.00 1.75 2.70 4.70	2 1.75 2.7 4.7 8.6	LAT LONG \$ 165.157 195.307 222.461 279.791	N 52 47 W 06 8. (edw) Xewy 44 69 89 157	811594 126206 everytest SOFT to FIRM FIRM FIRM STIFF	at provide the second s	0 10 N 17 N 22 N 34 N	9 N 16 N 24 N 46 N
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolitated Overhurden Unconsolitated Overhurden Overhurden	417 325758.5 173336.8 (E) b 4titage 0.00 2.50 4.00 6.90	2.5 4 6.5	LAT LONG SE S 165.354 224.806 244.346 361.288	N 52 47 W 06 8.	803892 176418 SOFT to FIRM FIRM FIRM FIRM	te Teleso Sources LOOSE to MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE to DENSE	23 N 27 N	Legnues 9 N 25 N 32 N	MOS Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Overburden	477 325816.8 173352.6 (E) 9 0.000 1.75 2.70 4.70 8.60	9 1.75 2.7 4.7 8.6	LAT LONG 165.157 195.307 222.461 279.791 377.376	N 52 47 W 06 8. (edw) xeuug 44 69 89 157	811594 126206 Sofe to FIRM FIRM FIRM STIFF	te te te te te te te te te te te te te t	20 N 20 N 20 N 20 N 20 N 20 N 20 N 20 N	9 N 16 N 24 N 46 N
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolitated Overhurden Unconsolitated Overhurden Overhurden	417 325758.5 173336.8 0.00 2.50 4.00 6.90	2.5 4 6.5	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	(edw) xewy 44 91 107	803892 176418 Soft to FIRM FIRM FIRM to STIFF	NE NE NE NE NE NE NE NE NE NE NE NE NE N	and the second s	Later 1	MOS Chainage (m) Easting ING Northing ING Unconsolitated Overborder Unconsolitated Overborder Overborder Overborder	477 325816.8 173352.6 (E) 173352.6 0.00 1.75 2.70 4.70 8.60	٩ 1.75 2.7 4.7 8.6	LAT LONG 3 165.157 195.307 222.461 279.791 377.376	(edu) xeug 44 69 157	811594 126206 Sofer to FIRM FIRM FIRM STIFF	NE DESCRIPTION DENSE MEDIUM DENSE MEDIUM DENSE DENSE	10 N 224 Cohesive	9 N 16 N 24 N 46 N
Sediment	MO4 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Overburden	417 325758.5 173336.8 (m) (m) (m) (m) (m) (m) (m) (m) (m) (m)	2.5 4 6.5	LAT LONG SE S 165.354 224.800 244.346 361.288	(red W 06 8. (red W) xewy 91 107	ADDRESS CONTRACTOR CON	Announce of the second	anii N 23 N 27 N	9 N 25 N 32 N	MOS Chainage (m) Easting ING Northing ING Unconsolitated Overhorder Unconsolitated Overhorder Overhorder Overhorder	477 325816.8 173352.6 (E) (P) (E) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F) (F)(F) (F)(F)(F)(F)(F)(F)(F)(F)	2 1.75 2.7 4.7 8.6	LAT LONG 165.157 195.307 2222.461 279.791 377.376	(edw) xews 44 69 157	811594 126206 source of the second se	earling and action of the second sec	an 10 N 10 N 12 N 34 N	24 N 46 N 46 N
Sediment	M04 Chainage (m) Easting ING Northing ING Uncarabilisted Over hurden Uncarabilisted Over hurden Overburden	417 325758.5 173336.8 (E) 98 414340 0.00 2.50 4.00 6.90	2.5 4 6.5	LAT LONG \$ 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	(edw) xewy 44 91 107	803892 178418 Source of the state Source of the state FIRM to STIFF	any and a second	23 N 27 N	25 N 32 N	MOS Chainage (m) Easting ING Resting ING Northing ING Unconsolitated Deer fundem Unconsolitated Deer fundem Over fundem Over fundem	477 325816.8 173352.6 0.00 1.75 2.70 4.70 8.60	2 1.75 2.7 4.7 8.6	LAT LONG \$ 165.157 195.307 222.461 222.461 279.791 377.376	(edw) xewy 44 69 89 157	811594 126206 Soft to FIRM FIRM STIFF	annone of the second se	10 N 17 N 22 N 34 N	9 N 16 N 24 N 46 N
Sediment	M04 Chainage (m) Easting ING Northing ING Urconsolidated Overhurden Urconsolidated Overhurden Overhurden	417 325758.5 173336.8 (E) pp 4133 c 0.00 2.50 4.00 6.90	2.5 4 6.5	(5) (5) (5) (5) (5) (5) (5) (5) (5) (5)	(edw) xewy 44 91 107	803892 77418 Soft to Firm Firm Firm Firm	NET THE STATE OF T	27 N	9 N 25 N 32 N	MOS Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden	477 325816.8 173352.6 0.00 1.75 2.70 4.70 8.60	2 1.75 2.7 4.7 8.6	(%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 8. (edw) Xeeug 44 69 89 157	811594 26206 Soft to FIRM FIRM FIRM STIFF	N THE STATE OF STATE	10 N 17 N 10 N 10 N 10 N 10 N 10 N 10 N	24 N 46 N
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overburden Overburden	417 325758.5 173336.8 (E) pages 0.00 2.50 4.00 6.90 6.90	2.5 4 6.5	LAT LONG 105.3552 224.806 244.346 361.288	N 52 477 W 06 8. U 06 8. U 07 U 07 U 07 U 07 U 07 U 07 U 07 U 07	603892 278418 SOFT to FIRM FIRM FIRM FIRM to STIFF FIRM FORM to STIFF FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM	Terrerories and the second sec	anisadoo 110 110 110 110 110 110 110 110 110 1	Jan 2000 100 100 100 100 100 100 100 100 10	MOS Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Overhunden	477 325816.8 173352.6 173352.6 0.00 1.735 2.70 4.70 8.60 0 0.00 1.75 2.70 4.70 8.60	2 1.75 2.7 4.7 8.6	LAT LONG 165.157 195.307 222.461 279.791 377.376 3332	N 52 47 W 06 8. 44 69 157 57 89 157	811594 22206 SOFT to FIRM FIRM STIFF Variation SOFT to FIRM FIRM STIFF	AT A STATE OF A STATE	0 N 101 2 N 101 34 N	9 N 16 N 24 N 46 N
Sediment	MO4 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Overhunden	417 325756.5 173336.8 (L) pages 0.00 2.50 0.00 6.90 6.90	2 2 2 2 4 6 5 5	LAT LONG 244.806 244.344 361.282 5487	N 52 477 W 06 8. (edu) xew 44 91 107	Solator 2012 2012 2012 2012 2012 2012 2012 201	A CONTRACT OF A	a 111 N 23 N 27 N	10000000000000000000000000000000000000	MOS Chainage (m) Easting ING Northing ING Unconsolitated Overhourden Unconsolitated Overhourden Overhourden Overhourden	4777 325816.8 (iii) 173352.6 (iii) 2,70 4,70 8,60 (iii) 2,70 4,70 8,60 8,60 8,60	<u>2</u> 1.75 2.7 8.6	LAT LONG 165.157 195.307 377.376 33332	N 52 47 W 06 8. 44 69 157 	A11594 222206 Cooperative Stream Stre	MEDIUM DENSE DENSE	anisation (10 km) (10	Comparison C
Sediment	M04 Chainage (m) Easting ING Northing ING Urconsolidated Overburden Urconsolidated Overburden Urconsolidated Overburden Urconsolidated Overburden Exercised	417 3255825 173368 (L) 2550 250 400 690 400 690 690 690 690	р 255 4 6.5	LAT LONG (5) (224.806 224.806 361.288 361.288 5487	N 52 477 W 06 8. (redw) 244 91 107	A03802 278418 278418 5 SOFT to FIRM FIRM FIRM FIRM FORM SOFT to STIFF GOOD	Ta prove o Second Second 945594400 111N 23N 27N	25N 32N 25N 32N	MOS Chainage (m) Easting ING Northing ING Unconsolitated Over hunders Unconsolitated O	4777 325816.8 173352.6 0.00 1.75 2.70 8.60 8.60 8.60	<u>2</u> 1.75 2.7 4.7 8.6	LAT LONG 165.157 195.307 377.376 33332	N 52 47 W 06 8. (cd w) X 24 S 24 S 24 S 24 S 24 S 25 S 25 S 25 S 25 S 25 S 25 S 25 S 25	A11594 26206 Soft to FIRM FIRM FIRM STIFF POOR	I I I I I I I I I I I I I I I I I I I	ania 10 Phase Phas	16 N 46 N 46 N	
Sediment	M04 Chainage (m) Easting ING Worthing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden METASEDIMENT M24 Chainage (m) Easting ING	4117 3255825 173368 (L) 250 250 400 690 690 690 690 690 690 690 690 690 6	255 4 6.55	LAT LONG (5) (24.346 361.288 361.288 5487 5487	N 52 477 W 06 8. (redw) Xew 91 107 	803892 178418 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Ta and the second secon	Land Contest or Contes	9 N 225 N 32 N	MOS Chainge (m) Easting ING Northing ING Unconsolidated Overhauden Unconsolidated Overhauden Overhauden Overhauden WETASEDIMENT M22 Chainge (m) Easting ING	4777 325816.8 173352.6 0.00 1.75 2.70 8.60 	<u>2</u> 1.75 2.7 4.7 8.6	(%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 8. (cd w) X 24 (cd A11594 26206 SOFT to FIRM FIRM FIRM FIRM FIRM FOR POOR	Ta particular of the second se	anisano 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Jan 2005 LL 45 9 N 16 N 46 N 46 N 46 N 46 N 46 N 46 N 46	
Sediment	M04 Chainage (m) Easting ING Northing ING Urconsolidated Overhurden Urconsolidated Overhurden Urconsolidated Overhurden Overhurden K124 Chainage (m) Easting ING Northing ING	4177 3257585 257585 000 2.50 4.00 6.90 572 325596 6.90		LAT LONG 165.354 224.806 244.346 361.288 5487	N 52 47 W 06 8. (edu) xeuy 44 91 107 107 107 84 N 52 47 W 06 8.	803892 778418 SOFT to FIRM FIRM FIRM FIRM to STIFF SOFT to STIFF SOFT to STIFF SOFT to STIFF SOFT to STIFF SOFT to STIFF SOFT to STIFF SOFT to STIFF	A THE CONTRACT OF THE CONTRACT	Lange of the second sec	19 19 14 14 19 14 14 14 14 14 14 14 14 14 14 14 14 14	M05 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Overhunden Kasebonen	4777 325816.8 173352.6 0.000 1.75 2.70 4.70 8.60 8.60 8.60	<u>9</u> 1.75 2.7 8.6	(%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 8. (red w) xew 9 44 69 157 89 157	811594 22206 SOFT to FIRM FIRM FIRM STIFF POOR 220389 826969	NEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE	N 01 2214 CONESTAE	24 N 24 N 24 N 24 N 24 N 24 N 24 N 24 N
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden M24 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden	4177 325785.5 173336.8 (()) 2.50 4.00 6.90 572 325500.6 5.70 7 325500.6 5.70 7 325500.6 5.70 7 325500.6 5.70 7 325500.5 5.70 5.70 5.70 5.70 5.70 5.70 5.7	β 2.2 4 6.5 	LAT LONG 1455 354 361 224.800 361 284 361 284	N 52 47 W 06 8. (edw) xee 91 107 107 84 84 84 84 84	603892 278413 778413 578413 5007 5007 5007 5007 5007 5007 5007 500		anytechnologies and a second s	C 554+ Ganuter N 252 N 1252	MOS Chainage (m) Easting ING Northing ING Unconsolidated Overburden Geweinschlafted Overburden Geweinschlafted Overburden Geweinschlafted Overburden Methoden Methoden Methoden Methoden Geweinschlafted Overburden Geweinschlafted Geweinschlaft	4777 325816.8 173352.6 0.00 0.00 1.75 2.70 8.60 6.637 325973.6 1 73384.6 8.60 6.637 325973.6 1 73384.6 8.60 6.637 325973.6 1 73384.6 8.60 0.00 0.00	<u>2</u> <u>1.75</u> <u>2.7</u> <u>4.7</u> <u>8.6</u>	LAT LONG \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	N 52 47 W 068. (rdby) xmug 44 69 89 157	A11594 226206 SOFT To FIRM STIFF POOR 236389 POOR 236389 266969 SOFT		GPT* Cohesive A 2 2 1 01 A 2 2 2 1 0 A 2 2 2 1 A 2 2 2 1 A 2 2 2 2 A 2 2 2 2 2 A 2 2 2 2	8 8 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
Sediment	M04 Chainage (m) Easting ING Reating ING Verthing ING Uncernalidated Over hurden Uncernalidated Over hurden M24 Chainage (m) Easting ING Verthang ING Verthang ING Verthang ING Verthang ING Verthang ING Verthang ING Verthang ING Verthang ING	4117 325758.5 173336.8 (e) pages 2.50 6.90 6.90 6.90 6.90 6.90 6.90 6.90 6.9		LAT LONG 165.354 224.304 361.288 361.288 361.288 44.344 361.288 5487 LAT LONG 197 032 141.565654	N 52 47 W 06 8. (edu) xeu 91 107 107 84 84 84 84 84 84	803892 178418 5000 5007 to FIRM FIRM 0 STIFF FIRM 0 STIFF 60000 60000 819662 50671 FIRM	Ta Target on State of	anisado 2011 11 N 23 N 27 N 27 N 27 N 27 N 27 N 27 N 27		MOS Chainage (m) Easting ING Easting ING Northing ING Unconsolidated Overharden Unconsolidated Overharden Unconsolidated Overharden Unconsolidated Easting ING MCTASEDIMENT	4777 1255816.8.8 1773552.6 (ii) pageness 2.2707 0.0 1775 1.2 1775541.6 17755541.6 1775541.6 1775541.6 1775541.6 1775541.6 1775	2 1.25 2.7 4.7 6.6 2.4 4.7 4.7 4.7 4.7 4.7 4.7 4.7 4.7 4.7 4	LAT LONG 165.157 195.307 195.307 195.307 195.307 195.307 279.791 377.376 33322 33322 44 160.302 180.733 180.732 190.732 190.73	N 52 47 W 068. (redu) Xveug 44 69 89 157 157 157 157 157 157 157 157 157 157	S11594 26206 Vitter SOFT to FIRM FIRM FIRM FIRM FIRM FIRM STIFF POOR POOR S26389 886969 S0657 FIRM S26389 S0657 FIRM	I I I I I I I I I I I I I I I I I I I	Sp1* Cohesive N × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1 ×	January 10 10 10 10 10 10 10 10 10 10 10 10 10
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden M17ASEDIMENT M24 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden	4177 325756.5 173336.8 0.000 4.000 6.900 572 325906.6 173370.1 325907.6 572 325907.6 173370.1 173370.1	2 <u>2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 </u>	LAT LONG 165,352 224,800 244,3428 361,228 5487 LAT LONG	N 52 47 W 06 8. (redw) year 91 107 44 91 107 84 84 84 84 84 84 84 84 84 84 84 84 84	803892 178418 SOFT to FIRM FIRM to STIFF GOOD GOOD SI9682 SOFT FIRM STIFF SOFT FIRM STIFF	LOOSE IN MIDIUM DENSE MEDIUM DENSE TO DENSE MEDIUM DENSE TO DENSE LOOSE MEDIUM DENSE LOOSE MEDIUM DENSE DENSE	Able Cohestve	January 1480 N 125 N 255	M05 Chainage (m) Easting ING Easting ING Unconsolidated Overhurden Unconsolidated Overhurden METASEDIMENT M22 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden	4777 325816.8.8 173352.6 0.000 0.000 1.75 2.70 8.6000 8.60000 8.60000 8.60000 8.6000000 8.60000000000	<u>2</u> <u>1.75</u> <u>2.7</u> <u>4.7</u> <u>8.6</u> <u></u>	LAT LONG 165.157.376 222.4610 3377.376 2279.791 377.376 279.791 377.376 160.302 160.302 160.302	N 52 47 W 06 8. (redu) Yeu 44 69 157 	811594 22206 SOFT to FIRM FIRM FIRM FIRM STIFF SOFT to FIRM FIRM STIFF SOFT STIFF	LOOSE MIDIUM DENSE MEDIUM DENSE DENSE LOOSE MIDIUM DENSE DENSE LOOSE MEDIUM DENSE DENSE VERY DENSE VERY DENSE	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	January 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Easting ING M24 Chainage (m) Easting ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Overhunden Easting ING	4177 325756.5 173336.8 0.000 0.000 0.000 2.500 4.000 6.90 572 225900.6 572 2000.0 575 2000.0 575 200000000000000000	<u>р</u> 23 65 65 65 65 65 65 65 65 65 65 65 65 65	LAT LONG 165.355 224.806 244.346 361.2885 361.288 361.	N 52 47 W 06 8. 91 107 91 107 84 84 N 52 47 W 06 8. 84	Coperation Superation S	A CONTRACT OF A	anisotop 27 N	January 25 N 32 N 32 N 32 N 32 N 32 N 32 N 32 N 32	MOS Chainage (m) Easting ING Northing ING Uteranalitisted Overhoutden Uteranalitisted Overhoutden Overhoutden Overhoutden Overhoutden Uteranalitisted Overhoutden	477 3125816.8 1733256 (i) program (ii) program (iii) progr	<u>2</u> <u>1.75</u> <u>2.77</u> <u>8.6</u> <u>2.4</u> <u>3.44</u> <u>9</u>	LAT LONG 165.157.376 195.307 222.4616 195.307 377.376 377.376 195.307 377.376 195.307 373.376 195.307 373.376 195.307	N 52 47 W 06 8. (redu) xew 9 157 	A11594 A11594 A1159 A1159 A1159 A1159 A1159 A1159 A115	Connect Connec	and 25 T = 2 = 2 = 2 = 2 = 2 = 2 = 2 = 2 = 2 =	
Sediment	M04 Chainage (m) Easting ING Northing ING Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Coverburden M24 Chainage (m) Easting ING Northing ING Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden Utreanolidated Overburden	4117 325758.5 173336.8 0.000 2.50 4.00 6.90 2.50 6.90 572 225909.6 6.90 572 225909.6 6.90 572 225909.6 6.90 572 225909.6 0.000 2.00 9.200	<u>р</u> 2 <u>2 5</u> 4 6 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	LAT LONG 165,355 224,306 244,346 361,288 361,288 4,365 10,965 5487 LAT LONG	N 52 47 W 06 8. 91 91 107 91 107 91 107 91 107 84 84 84 84 84 84 84	803892 278418 278418 3007 to 5100 5007 to 5100 FILM FILM FILM FILM FILM FILM FILM FILM	A DEVISE DENSE	anisauto transference anisauto	Japaneo 5, Leg 9N 25N 32N 32N 17N 38N	MOS Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden METASEDIMENT M22 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Unconsolit	4775 125816.8 173352.6 (u) paragraphic for the form of the fore	2 1.75 1.75 2.7 4.7 8.6 8.6 8.6 4.4 4.5 4.4 4.5 4.4 9 9	LAT LONG 165.157 222.461 377.376 377.376 3372.376 100NG	N 52 47 W 06 8. (rdw) xyuu 9 44 65 89 157 157 31 31 N 52 47 W 06 7. (rdw) xyuu 9 41 65 203	A11594 226206 SOFT to FIRM. FIRM. FIRM. FIRM. STIFF STIFF STIFF STIFF STIFF	A MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE LOOSE MEDIUM DENSE DENSE VERV DENSE	a 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	January 1.16 N 24 N 46 N 15 N 15 N 15 N 250 N
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden M24 Chainage (m) Easting ING Northing ING Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden	4117 325758.5 173336.8 (e) pages 2.50 6.90 6.90 6.90 6.90 6.90 6.90 6.90 6.9		LAT LONG 3 224 3 3 5 5 5 4 8 5 4 5 4 8 5 4 8 5 4 8 5 4 8 5 4 8 7 6 2 6 2 4 5 3 6 1.28 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	N 52 47 W 06 8. (rdu) weed 91 107 	803892 278418 5007 to FIRM FIRM to STIFF FIRM to STIFF 60000 60000 819682 60000	An and a second	anitation 23 N 22 N 22 N 22 N 22 N 22 N 22 N 22	Lange 1	MOS Chainage (m) Easting ING Resting ING Northing ING Unconsolidated Deerhardeen Unconsolidated Deerhardeen Overhardeen Overhardeen METASEDIMENT M22 Chainage (m) Easting ING Northing ING Unconsolidated Deerbardeen Unconsolidated Deerbardeen Unconsolidated Deerbardeen Unconsolidated Deerbardeen Unconsolidated Deerbardeen Overhardeen	4777 325816.8.6 173352.6 (ii) 173352.6 (iii) 227072.6 8.60 173384.1 173352.7 173384.1 173352.7 173384.1 173384.1 173352.7 173384.1 173384.1 173352.7 173384.1 173572.6 173384.1 173352.7 173384.1 173572.6 173572.6 1	2 1.75 2.7 4.7 8.6 	LAT LONG 165.157 222.461 155.307 222.4751 222.4751 222.4751 222.4751 222.4751 222.4751 222.4751 222.4751 222.4751 3377.376 222.451 3377.376 222.451 3372.4777 200.312 189.733 318.641 374.4777	N 52 47 W 06 8. (adv) xyuu 44 69 157 157 157 157 10 0 31 157 10 0 31 157 10 0 89 31 157 10 0 89 31 157 10 10 10 10 10 10 10 10 10 10 10 10 10	811594 26206 7000 7000 7000 7000 7000 7000 700	A STATE OF S	anspage 20 and 2	241 (294) (2
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden M24 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidat	417 325758.5 173336.8 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	р <u>2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 </u>	LAT LONG 3 165.35.4 361.288 361.288 361.288 5487 LAT LONG LAT LONG 261.722 354.566	N 52 47 W 06 8. (rdu) xeug 44 91 107 8 84 84 84 84 84 84 84 84	803892 178418 SOFT to FIRM FIRM 0 STIFF GOOD GOOD 819682 03337 SOFT FIRM STIFF	A THE REPORT OF	avisado 12 N N 227	Las S N 17 N 38 N 3 17 N 38 N 3 17 N 38 N 3 17 N 3 18 17 N 3 18 17 N 3	M05 Chainge (m) Easting ING Resting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden METASEDIMENT M22 Chainge (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Unconsolidated Overhunden Unconsolidated Unconsolida	4777 325816.8.8 (ii) 3352.6 (iii) 3470 2.770 8.600 1.75 2.770 8.600 8.600 8.600 8.600 8.600 1.73 2.7572.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 173384.1 7235972.6 7240 7240 7240 7240 7240 7240 7240 7240	9 1.75 2.7 4.7 8.6 	LAT LDNG 165.157 377.376 33332 33332 LAT LDNG 160.302 160.302 160.302	N 52 47 W 06 8. (redw) yee 44 69 89 157	811594 26206 SOFT to FIRM FIRM FIRM FIRM STIFF 826389 86969 SOFT FIRM FIRM STIFF STIFF	A THE OUT OF THE OUT O	antsauco +LdS 10 N N N 12 2 N 34 N 32 N 34 N 34 N 34 N 34 N 34 N	Los 9 N 116 N 224 N 46 N 46 N 115 N 338 N 250 N 115 N 338 N 250 N
Sediment	MO4 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Coverhunden MIETASEDIMENT MIETASEDIMENT MIETASEDIMENT	4177 325785.5 173336.8 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	2 <u>2</u> <u>2</u> <u>4</u> <u>4</u> <u>6</u> <u>5</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u> <u>7</u>	LAT LONG \$ \$ \$ 155.3554 224.506 361.288 361.288 548.7 548.7 548.7 548.7 548.7 107.05 201.722 354.568	N 52 47 4 W 06 8 107 44 91 107 44 91 107 84 84 84 84 84 84 84 84	Source of the second seco	A PROVIDE O STORY AND A PROVIDE O STORY AND	23 N 27 N 23 N 27 N 23 N 27 N 23 N 20 N 20 N 20 N 20 N 20 N 20 N 20	40000000000000000000000000000000000000	MOS Chainage (m) Easting ING Northing ING Unconsolitated Overhourden Unconsolitated Overhourden Overhourden Overhourden Overhourden Overhourden Overhourden Unconsolitated Unconsolitated Uncons	477 3125816.8 4 173325416.8 4 173325416.9 4 1733254 1733254 (ii) property data of the second	2 24 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 86 277 277 86 277 277 86 277 277 277 277 277 277 277 27	LAT LONG S S S S S S S S S S S S S S S S S S S	N 52 47 W 06 8. 44 69 89 157 157 31 31 N 52 47 W 06 7. (rdg) xeury 31 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7 S7	A11594 A22026 A2026 A2026 A2026 A2026 A2027	Contract of the second	anisation 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Ltds 9 N 16 N 16 N 16 N 16 N 16 N 16 N 16 N
Sediment	M04 Chainage (m) Easting ING Northing ING Unconsolidated Over hurden Unconsolidated Over hurden Unconsolidated Over hurden M124 Chainage (m) Easting ING Northing ING Unconsolidated Over hurden Unconsolidated	4117 325758.5 173336.8 (iii) pageses 2.50 4.00 6.90 7 572 325909.6 0.00 0.00 0.00 0.00 0.00 0.00 0.00		LAT LONG 3 3 3 5 155 3 5 4 2 2 4 3 6 1225 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	N 52 47 4 W 06 8 1000 100 100 100 100 100 100 100 100 10	803892 178418 Soft to FIRM FIRM to STIFF FIRM to STIFF 60000 60000 819662 60000 819662 50FT FIRM to STIFF 6000 6000	A STATE OF CONTRACT OF CONTRAC	8044 CONSTRUCT OF	Lange and the second se	M05 Chainage (m) Easting ING Resting ING Northing ING Unconsolidated Deerhardeen Unconsolidated Deerhardeen Overbardeen Overbardeen Overbardeen Extra Sector (m) Easting ING Unconsolidated Deerbardeen Unconsolid	4777 325816.8.6 1773352.6 (u) paterparticular and a second (u) a sec	2 1.75 2.7 4.7 6.6 0 0 0 0 0 0 0 0 0 0 0 0 0	(s) (s) (s) (s) (s) (s) (s) (s)	N 52 47 47 W 06 8 44 44 69 89 157 157 31 157 31 157 44 69 80 31 157 44 69 80 80 80 80 80 80 80 80 80 80 80 80 80	Statistics S	A THE OWNER OF THE OWNER OWN	N N	241 (Gaundige 9 k) 4 (Gaundig



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	M23										M20								
	Chainage (m)	682									Chainage (m)	195							
	Easting ING	326018		LAT	N 52 47	.831808					Easting ING	326080.5		LAT	N 52 47	839474			
	Northing ING	173395.4		LONG	W 06 7.	.946379					Northing ING	173411.2		LONG	W 06 7.	890420			
Sediment	Type	Depth Below Seabed (m)	To	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular		Type	Depth Below Seabed (m)	To	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated Overburden	0.00	2.5	211.459	80	FIRM	MEDIUM DENSE	20 N	21 N		Unconsolidated Overburden	0.00	2.6	140.599	32	SOFT	LOOSE	5 N	5 N
	Unconsolidated Overburden	2.50	3.9	190.524	65	FIRM	MEDIUM DENSE	16 N	15 N		Unconsolidated Overburden	2.60	4.6	154.014	38	SOFT	LOOSE	8 N	7 N
	Overburden	3.90	6.3	226.819	93	FIRM	MEDIUM DENSE	23 N	25 N		Overburden	4.60	9.4	240.618	104	FIRM to STIFF	MEDIUM DENSE to DENSE	26 N	30 N
	Overburden	6.30	9.9	301.32	182	STIFF	DENSE to VERY DENSE	39 N	>50 N		Overburden	9.40		309.003					
		9.90		421.773															
		1																	
		1																	
Bedrock	Type	Depth Below Seabed (m)		Vp (m/s)	RQD**	Quality					Type	Depth Below Seabed (m)		Vp (m/s)	RQD**	Quality			
	METACEDIMENT	1 0 00		E027	1 70	EAID		1	1		MACTASCOMMENT	0.40		4050	46	0000			

						-				_									
	M21										M18								
	Chainage (m)	836									Chainage (m)	900							
	Easting ING	326168.3		LAT	N 52 47	.844915					Easting ING	326224.2		LAT	N 52 47	.850984			
	Northing ING	173423.6		LONG	W 06 7	812114					Northing ING	173436.3		LONG	W 06 7.	762038			
Sediment	Type	Depth Below Seabed (m)	To	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiff ness Granular	SPT* Cohesive	SPT* Granular		Type	Depth Below Seabed (m)	То	Vs (m/s)	Gmax (Mpa)	Stiff ness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated Overburden	0.00	2.4	151.647	37	SOFT	LOOSE	8 N	7 N		Unconsolidated Overburden	0.00	1.8	235.708	100	FIRM	MEDIUM DENSE	25 N	28 N
	Unconsolidated Overburden	2.40	3.5	242.131	106	FIRM to STIFF	MEDIUM DENSE to DENSE	26 N	31 N		Unconsolidated Overburden	1.80	2.2	244.871	108	FIRM to STIFF	MEDIUM DENSE to DENSE	27 N	32 N
	Overburden	3.50	10	269.553	145	STIFF	DENSE	32 N	42 N		Overburden	2.20	8	223.946	90	FIRM	MEDIUM DENSE	23 N	24 N
		10.00		419.054							Overburden	8.00	9.7	330.5	218	STIFF to VERY STIFF	VERY DENSE	45 N	>50 N
												9.70		359.283					
Bedrock	Type	Depth Below Seabed (m)		Vp (m/s)	RQD**	Quality					Type	Depth Below Seabed (m)		Vp (m/s)	RQD**	Quality			
	A APT A PPOINT APAIT	10.00		4 1/1 1		E AID					A APTA PPPSIA APAIT	0.70		1100		FAID			

										_
	M19									
	Chainage (m)	992								
	Easting ING	326319.1		LAT	N 52 47	864096				
	Northing ING	173463.1		LONG	W 06 7.	577053				
Sediment	Type	Depth Below Seabed (m)	To	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular	
	Unconsolidated Overburden	0.00	0.7	291.097	169	STIFF	DENSE to VERY DENSE	36 N	>50 N	
	Unconsolidated Overburden	0.70	1.5	292.816	171	STIFF	DENSE to VERY DENSE	37 N	>50 N	
	Overburden	1.50	3	309.779	192	STIFF	VERY DENSE	40 N	>50 N	
	Overburden	3.00	9	367.457	270	STIFF to VERY STIFF	VERY DENSE	>50 N	>50 N	
		9.00		422.328						
Bedrock	Type	Depth Below Seabed (m)		Vp (m/s)	RQD**	Quality				
	METASEDIMENT	9.00		4808	64	FAIR				



Image: Problem Problem		M37									M06								
Image: Problem Control		Chainage (m)	117			N 53 47	717000				Chainage (m)	178		LAT	N 53 47	722626			
		Northing ING	173171		LONG	W 06 8.4	403127				Northing ING	173183		LAT	W 06 8.	350401			
	Sediment	Unconsolidated Overburden Unconsolidated Overburden	Depth Below Seabed (m) 2.14	<mark>۹</mark> 2.137 4.3	(%) 5) 170.078 203.16	(edw) xewg 46 74	SOFT to FIRM FIRM	Loose - Medium dense Medium dense	8 N N N N N N N N N N N N N N N N N N N	N 01 SPT* Granular	ad Unconsolidated Overburden Unconsolidated Overburden	Depth Below Seabed (m) 1.92	۲ 1.924 4.329	(s/w) sn 189.032 190.52	6 bage (Wpa)	Stiftuess Copiesion Maii Maii	Still use of the second	N 21 SPT* Cohesive	N 16 N 191
		Unconsolidated Overburden Overburden	4.30	10.3	308.566	85 190	STIFF	VERY DENSE	21 N 40 N	>50 N	Unconsolidated Overburden Overburden	4.33	7.335	313.651	94 197	STIFF	VERY DENSE	24 N 41 N	26 N >50N
			10.30		397.307							10.30		429.699	369	VERY DENSE		>50 N	>50 N
	Bedrock	METASEDIMENT	Depth Below 10.30		(s/w) dn 3700	** dD**	A jiend				METASEDIMENT	Depth Below 5eabed (m)		(s/w) dA 5723	** doa 91	אז סמחס EXCELLENT			
Image: state in the state																			
Image Description Descrint Description D		M07	246								M08								
Image in the second		Chainage (m) Easting ING	24b 325636		LAT	N 52 47	730784		L		Easting ING	320 325709		LAT	N 52 47	735693			
Norm Norm <th< td=""><td></td><td>Northing ING</td><td>173198</td><td></td><td>LONG</td><td>W 06 8.3</td><td>290493</td><td></td><td></td><td></td><td>Northing ING</td><td>173209</td><td></td><td>LONG</td><td>W 06 8.</td><td>225344</td><td></td><td></td><td></td></th<>		Northing ING	173198		LONG	W 06 8.3	290493				Northing ING	173209		LONG	W 06 8.	225344			
			peq									peq							
	Sediment	Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Overburden Overburden	0.00 (m) 2.05 4.30 7.60	2.048 4.3 7.6 9	(%) 5 175.284 201.547 220.613 335.173	(edw) xewp 55 73 88 225	SOFT to FIRM FIRM FIRM STIFF to VERY STIFF	LOOSE - MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE VERY DENSE	22 N 46 N	23 N 250 N	Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Overburden	(m) 0.00 1.92 4.00 5.50	2 1.917 4 5.5 7.2	(s/w) 165.029 173.557 199.414 272.453	(edw) xewp 44 48 72 148	SOFT to FIRM SOFT to FIRM FIRM STIFF	LOOSE - MEDIUM DENSE LOOSE - MEDIUM DENSE MEDIUM DENSE DENSE	N 10 N 13 N 13 N 14 N 14 N 14 N 14 N 14 N 14	9 N 9 N 11 N 17 N 43 N
Norm Norm <th< td=""><td></td><td></td><td>9.00</td><td></td><td>400.177</td><td></td><td></td><td></td><td></td><td></td><td></td><td>7.20</td><td></td><td>327.211</td><td>214</td><td></td><td></td><td>>50 N</td><td>.50 N</td></th<>			9.00		400.177							7.20		327.211	214			>50 N	.50 N
And A																			
Image: sector Image: s																			
Anome Normal Normal </td <td><u> </u></td> <td></td>	<u> </u>																		
MO2 No	Bedrock	e de de la companya d	Depth Below 00'6 Seabed (m)		(s/w) d _A 3745	* 4 QD * *	Ayina book				METASEDIMENT	Depth Below Seabed (m)		(s/w) dn	* * 00 2	Ayjen0 FAIR			
M09 No	1																		
Image (m) 100 1		M09									M11								
Normal prof. 17220 ODD VP 1 1257 Prof. Pro. Prof. Prof.		Chainage (m)	392		LAT	N 52 47	744054				Chainage (m)	448		LAT	N E2 47	756607			
Image: section of the sectio		Northing ING	173228		LONG	W 06 8.	162677				Northing ING	173251		LONG	W 06 8.	115030			
Momentary Constraints Constrain		84	epth Below sabed (m)		t (m/s)	(edM) xem	iffness Cohesive	iffness Granular	oT* Cohesive	rt* Granular	8.	epth Below sabed (m)		(s/w) :	(edM) xem	iffness Cohesive	iffness Granular	rt* Cohesive	or* Granular
Use-motified Gurdent 1.54 1.53 1.54 1.54 1.54 1.55<	Seament	 Unconsolidated Overburden 	0.00	F 1.537	> 170.261	46	S LOOSE to MEDIUM DENSE	LOOSE - MEDIUM DENSE	5 10 N	50 10 N	Unconsolidated Overburden	0.00	₽ 1.63	> 111.632	20	VERY SOFT	VERY LOOSE	-1 N	2 N
Description ATD S.2 28.66 ATD DESS		Unconsolidated Overburden	1.54	3.9	167.677	45 97	LOOSE to MEDIUM DENSE MEDIUM DENSE	LOOSE - MEDIUM DENSE MEDIUM DENSE	10 N 27 N	10 N 22 N	Unconsolidated Overburden	1.63	3.2	161.424	42	SOFT	LOOSE	10 N 30 N	8 N 38 N
Section State Section		Overburden	4.70	5.7	288.69	167	DENSE	DENSE	50 N	>50 N	Overburden	4.00	6	307.513	189	STIFF	VERY DENSE	40 N	>50 N
Image: Second second			5.70		294.658							6.00		345.874				>50 N	>50 N
Image: Section of the sectio																			
Image: section of the sectin of the section of the section																			
Bedrock Bedrock <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>																			
M10 N N N N N N N12 N <td>Bedrock</td> <td>METASEDIMENT</td> <td>Depth Below Seabed (m)</td> <td></td> <td>(s/w) dA 2535</td> <td>**00a 18</td> <td>VERY POOR</td> <td></td> <td></td> <td></td> <td>METASEDIMENT</td> <td>Depth Below 009 Seabed (m)</td> <td></td> <td>(s/w) dn</td> <td>**aba</td> <td>VERY POOR</td> <td></td> <td></td> <td></td>	Bedrock	METASEDIMENT	Depth Below Seabed (m)		(s/w) dA 2535	**00a 18	VERY POOR				METASEDIMENT	Depth Below 009 Seabed (m)		(s/w) dn	**aba	VERY POOR			
M10 Image model I	L																		
Bareling Not Data		M10 Chainage (m)	624								M12	600							\square
Northing MG 1732 V MO V 06 x 0.173 MOM MOS 3.0137 MOM Mode MOS 3.0137 Mode M		Easting ING	325914		LAT	N 52 47.	761388				Easting ING	325980		LAT	N 52 47	772319			
Sediment Normalization		Northing ING	173262		LONG	W 06 8.	041878			_]	Northing ING	173284		LONG	W 06 7.	982697			\vdash
Operation Description Description <thdescription< th=""> <thdescription< th=""> <</thdescription<></thdescription<>	Sediment	Unconsolidated Overburden Unconsolidated Overburden	Depth Below 0.00 1.48 2.20	P 1.481 2.2	(\$/w) \$X 134.276 154.026	29 28 (Wba)	Soft Content of Conten	VERY LOOSE - LOOSE LOOSE	<pre>>> SPT* Cohesive >> Z</pre>	A P SPT* Granular	Unconsolidated Overburden Unconsolidated Overburden	Depth Below 000 1.96	2 1.955 3	(s/w) sn 187.034 203.392	(edw) xewp 63	Ritturess Cohesive Mail Mail	Stitutes or and a statement of the state	N N N N N N N N N N N N N N N N N N N	14 N 18 N 18 N
And Constraints And Constr		Unconsolidated Overburden Overburden	2.20 3.20 8.90	3.2 8.9	194.163 230.16 352.606	68 95	FIRM	MEDIUM DENSE MEDIUM DENSE	16 N 24 N	16 N 27 N	Overburden Overburden	3.00 7.45 9.80	7.452 9.8	225.871 331.18 386.88	92 219	FIRM STIFF to VERY STIFF	MEDIUM DENSE VERY DENSE	23 N 45 N	25 N >50 N
Bedrock G V </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>																			
Bedrock VE by a state VE by a state<			~ (~ (
	Bedrock	METASEDIMENT	Depth Belo 06'8 06'8		(\$/w) d/ 3778	** apa	AjjenD				METASEDIMENT	Depth Belo 08'6 Seabed (m)		(s/w) 3232	** a ða 29	AjjenO			



	M13					<u> </u>		L	L	M14							1	
	Chainage (m)	326000	-	LAT	N 52 47	780899				Chainage (m)	326117		LAT	N 52 47	788723			
	Northing ING	173302		LONG	W 06 7	911161				Northing ING	173318		LONG	W 06 7.	860118			
Sediment	1ype	Depth Below Seabed (m)	2	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiff ness Granular	SPT* Cohesive	SPT* Granular	Type	Depth Below Seabed (m)	T0	Vs (m/s)	Gmax (Mpa)	Stiff ness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated Overburden	1.89	3.4	175.892	56	SOFT to FIRM	LOOSE - MEDIUM DENSE	13 N	11 N	Unconsolidated Overburden	1.23	2.774	259.909	135	STIFF	DENSE	30 N	38 N
	Overburden	3.40	7.204	249.453	112	FIRM to STIFF	MEDIUM DENSE - DENSE	28 N	34 N	Overburden	2.77	4.701	252.542	128	FIRM to STIFF	MEDIUM DENSE - DENSE	28 N	35 N
	Overburden	10.90	10.895	393.974	201	STIFF	VERY DENSE	42 N	>50 N	Overburden	9.00	9	336.608	227	FIRM to STIFF	MEDIUM DENSE - DENSE	27 N	32 N
Bedrock	METASEDIMENT	Depth Below 06:01 06:01		(%/w) d/ 3757	** GD 39	Atijien D POOR				METASEDIMENT	Depth Below 006 Seabed (m)		(\$/w) dA 3747	** dD 39	Anality DOOR			
	M15							L		M16								
	Chainage (m)	822			N 50 -	707215				Chainage (m)	878			N. 50 -	000550			
	Easting ING Northing ING	326196		LAT	N 52 47 W 06 7	./9/315 789470		-	-	Easting ING Northing ING	326250 173349	-	LAT	N 52 47 W 06 7	.803563 741163			
Sediment	Unconsolidated Overburden	Depth Below Seabed (m)	P 1.5	(\$/w) \$A 94.2167	(edw) Xews	VERY SOFT	VERY LOOSE	o SPT* Cohesive	z SPT* Granular	edA1 Unconsolidated Overburden	Depth Below Seabed (m)	2	(s/w) sn 115.407	(Wpa) 21	COPresso COPresso VERY SOFT	Crandian Stiffness Crandian Research	0 SPT * Cohesive	N 2 SPT * Granular
	Unconsolidated Overburden Overburden	1.50	3.7	165.299	44	SOFT to FIRM FIRM	LOOSE - MEDIUM DENSE MEDIUM DENSE	10 N 18 N	9 N 18 N	Unconsolidated Overburden Overburden	1.60	4.9 7.058	126.08	25 93	VERY SOFT to SOFT FIRM	VERY LOOSE - LOOSE MEDIUM DENSE	2 N 23 N	3 N 26 N
	Overburden	8.00	9.8	319.396	204	STIFF	VERY DENSE	42 N	>50 N	Overburden	7.06	10	268.333	144	STIFF	DENSE	32 N	41 N
		9.80	19.258	373.793							10.00	15.193	324.254	210				
-																		
Bedrock	METASEDIMENT	Depth Below 86 Seabed (m)		(s/w) dA 3869	**00 42	Asile n D POOR				e A METASEDIMENT	Depth Below 0001 Seabed (m)		(s/w) d	** 0 08	Atjijen D POOR			
	M17									M40								
	M17 Chainage (m) Fasting ING	947		LAT	N 52 47	809076				M40 Chainage (m)	1020		LAT	N 52 47	817764			
	M17 Chainage (m) Easting ING Northing ING	947 326318 173361	5 2	LAT LONG	N 52 47 W 06 7	809076 680433				M40 Chainage (m) Easting ING Northing ING	1020 326390 173379		LAT LONG	N 52 47 W 06 7.	817764 616007			
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Overbander Unconsolidated Overbander Unconsolidated Overbander	947 326318 173361 173361 173361 0 0 0 0 0 0 0 0 0 0	2 1.6 4 7.295 9 15.703	(5) 5) 5) 5) 5) 5) 5) 5) 5) 5) 5) 5) 5) 5	N 52 47 W 06 7. (ed W) Xemuy 33 48 75 186	809076 660013 Softa Softa Softa Firm Softa Firm Firm Stiff	terror of the second se	0 8 PT* Cohesive	5 N 10 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Overhunden Overhunden	1020 326390 173379 0.00 1.57 2.80 6.00 8.90	و 1.573 2.88 5.998 8.99 12.912	(5) 198.274 197.69 212.061 329.259 441.431	N 52 47 W 06 7. (redw) xeeus 71 70 81 217	S17764 610007 GROUT GROUT GROUT FIRMA FIRMA FIRMA FIRMA STIFF to VERY STIFF	MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE VERY DENSE	avisando 17 N 17 N 20 N 44 N >50 N	rstanuts 17 N 21 N >50 N >50 N
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Overburden Overburden	947 326318 173361 0 eq tpage 9 eq tpage 0.00 1.60 4.00 7.30 9.00	2 1.6 4 7.295 9 15.703	(%) 143.529 173.911 204.053 305.259 416.522	N 52 47 W 06 7 (ret W) 33 48 75 186	809076 660433 98 98 98 98 98 98 98 98 98 98 98 98 98	AN THE STATE OF STATE	6 N 12 N 39 N	5 N N 27 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden	1020 326390 173379 0 et u b b c c c c c c c c c c	2 1.573 2.8 5.998 8.99 12.912	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 7. (fed w) xeeu 71 70 81 217	817764 66007 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	JE MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE VERY DENSE	average of the second s	J17 N 17 N 21 N ≥50 N
Sediment	M17 M17 Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden	947 3263184 177361 177361 0.00 7.30 9.00 9.00 9.00	2 1.6. 4.95 9.95 9.95 15.703	LAT LONG 143.529 143.529 305.259 416.522	N 52 47 W 06 7. (ed w) X reug 333 48 75 186	2090776 2090776 2090776 2090776 20977 2077	LOOSE LOOSE to MEDUM REVER VERV DENSE	0 N 12 N 13 N 13 N 13 N 13 N 13 N 13 N 13	January 2014	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden Overhurden	1020 326390 90 173379 (u) pastase 2.8896 ed (u) 8.90 (u) 8.90 (u) 8.90	2 1.573 2.8 5.988 8.9 12.912	(%) 50 198.274 198.274 197.59 212.061 329.259 441.431 (%) 04 4514	N 52 47 W 06 7. 70 81 217 **000 57	Alter of the second sec	MEDIUM DENSE MEDIUM DENSE VERY DENSE	an tsau co 17 N 20 N 44 N >50 N	21 N 21 N 21 N 21 N 21 N 250 N 250 N
Sediment	M17 M137 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Overburden Overburden Overburden Me TASEDIMENT	944# 944# 326318 (u) 173361 173361 173361 (u) 9.00 9.00 9.00 9.00 9.00	2 1.6.6 4 7.29592 15.703	LAT LONG 173-512 305-259 416-522 204-0535 305-259 416-522	N 52 47 W 06 7. (edw) xeeu 333 48 75 186 	200076 600133 600133 50017 50000000000	Tooss Marcine Person Very Dense	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jenness +Las 5 N 10 N 27 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Overhunden Overhunden Overhunden	10200 326390 0 4040 0 4040 1773379 (u) 0 4040 2 4040 0 4040 1773379 1.577 2.880 6.000 8.839 8.839 8.900	<u>e</u> 1.573 2.8 5.998 8.9 12.912	LAT LONG 198.274 197.69 212.061 212.061 212.2051 212.2051 212.2051 441.431	N 52 47 W 06 7. 71 70 81 217 217 57 57	817764 610007 610007 FIRM FIRM FIRM STIFF to VERY STIFF FAIR FAIR	MEDIUM DENSE MEDIUM DENSE VERY DENSE	an 1990 17 N 20 N 44 N >50 N	21 N 250 N 2
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Overharden Disconsolidated Overharden Disconsolidated Overharden Overharden Overharden	9419 9419 9419 9419 9419 9419 9419 9419	2 1.6. 4 4 7.299 9 9 15.703	LAT LONG 204 053 416.522 416.522 4517	N 52 47 W 06 7. (edw) xrewy 333 48 75 186 	AB90056 B090153 SOFT STRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM	The second secon	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Jenness +Las 5 N 10 N 27 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden Overhurden Overhurden Overhurden	1020 326390 90 1773379 (u) pages 0.00 1.2.80 6.00 8.990 8.990 8.990 8.990	<u>2</u> 1573 2.8 5.988 8.9 12.912	(s) (s) (s) (s) (s) (s) (s) (s)	N 52 47 W 06 7. 71 70 81 217 217 57	817764 61007 Cross FIRM FIRM FIRM STIFF to VERY STIFF Cross FAIR	TE POPULA UN DENSE MEDIUM DENSE MEDIUM DENSE VENY DENSE VENY DENSE	av (59400) 17 N 17 N 20 N >50 N	January 17 N 17 N 17 N 25 O N 25 O N
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Overburden Overburden Overburden MeTASEDIMENT M41	947 326118 173361 0.00 0.00 0.00 0.00 0.00 0.00 0.00 9.00 9.00 9.00	P 1.66 4 7.295 9 15.703 15.703	LAT LONG 1435229 204.053 305.259 416.522 416.522	N 52 477 W 06 7. (redw) xrew 33 48 75 75 757 57	A09076 66013 98 99 99 90 50 50FT SOFT to FIRM FRM STIFF FAIR FAIR	N TO THE TRANSPORT	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	27 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden Overhurden MetriAssoluteNT	10202 226390 1773379 1773379 1773379 1773279 1	2 1.573 2.8 5.998 8.9 12.912	LAT LDNG 198.274 197.69 329.259 441.431	N 52 47 W 06 7. 71 70 81 217 57	A17764 640007 640007 6700 6700 6700 6700 6	MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE VERY DENSE	an 15000 17 N 17 N 17 N 17 N 17 N 17 N 17 N 17 N	17 N 17 N 21 N >50 N
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Overburden Overburden WethASEDIMENT M41 Chainage (m) Easting ING	947 32618 173361 173361 160 0.00 0.00 1.60 9.0	2 1.6. 4. 7.295 9 15.703	LAT LONG 143.529 143.529 416.522 416.522 416.522	N 52 47 W 06 7. 33 48 75 186 186 57 57	200076 300076 500433 50077 5077	LOOSE MADUM DENSE VERV DENSE	anisano (Contestine) 12 N 12 N 13 N 13 N 13 N 13 N 13 N 13 N	27 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsolitated Overhunden Unconsolitated Overhunden Overhunden Overhunden Overhunden Mittasseliment	10200 1026390 173379 265390 205491 2055491 2055551 2055551 2055551 2055551 20555551 205555555555	2 1.573 2.83 8.99 12.912	LAT LDNG 198.274 197.69 329.259 441.431	N 52 47 W 06 7. (dw) X1 70 81 217 70 81 217 57	817764 817764 51007 91007 9100 910 91	A BARRAN AND AND A BARRAN AND AND A BARRAN AND AND AND AND AND AND AND AND AND A	9(1) 17 N 17 N 17 N 44 N >50 N	17 N 17 N 17 N 250 N 250 N
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Diverbanden Unconsolidated Diverbanden Unconsolidated Diverbanden Diverbanden Chainage (m) Easting ING Northing ING	947 326318 173361 173361 0,000 7,30 9,0000 9,000 9,0000 9,0000 9,00000000	P 16.6 4 9 9 9 9 15.703	LAT LONG 143.529 143.529 416.522 416.522 416.522	N 52 47 W 06 7. (edw) xeeus 33 48 75 186 57 57	800076 660013 9 9 9 9 9 9 9 9 9 9 9 9 9	toose Loose to Microw Dense WEDVUM DENse VENY DENse	anisando - 19900 - 19900 - 19900 - 19900 - 1990 - 1990 - 1990 - 1990 - 1990 - 1	5 N 10 N 27 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsidiated Overhurden Unconsidiated Overhurden Overhurden Overhurden	10200 1773379 0.000 1773379 0.000 1.57 6.000 8.990 8.990 8.990 8.990 8.990	2 1573 2.8 5.988 8.9 12.912	(2) 198.274 198.274 212.061 212.061 441.431	N 52 47 W 06 7. 71 70 81 217 57	S17764 610007 610007 FIRM FIRM FIRM FIRM FIRM STIFF to VERY STIFF COMMISSION FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM	A STATE OF A STATE OF	av 1524 17 N 17 N 44 N >50 N	17 N 250 N 250 N
Sediment	M17 M17 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Overburden Overburden Overburden METASEDIMENT M41 Chainage (m) Easting ING Northing ING SG	9477 326518 1773561 1773561 1773561 1773561 0.000 0.000 0.000 9.00 9.00 9.00 9.00	2 1.1.1 4.1.2 9.9 9.9 15.703 15.703 1.5.7	LAT LONG 1413 529 1413 529 1413 529 305 259 416 522 416 r>54 54 54 54 54 54 54 54 54 54 54 54	N 52 47 W 06 7. (ret w) xeeus 33 48 57 57 57 57 57 (ret w) xeeus 57 57	200076 200076 200076 200076 200076 200076 200076 20077 2077 2	SIGNER CONTRACT OF	strate Contestive	5 N 10 N 277 N 10 N 20 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Overhunden Overhunden Overhunden Overhunden Overhunden	10200 1225390 (u) pages 1773379 (u) pages 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0	2 1.573 2.8 3.909 8.9 11.912 11.912	(2) (N 52 47 / W 06 7. (red w) xmug 71 217 70 81 217 57 57	817764 610007 610007 FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM	APPRIL	9 (544) 17 N 17 N 17 N 20 N 44 N 50 N	January 17 N 17 N 250 N 250 N
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Overbanden Unconsolidated Overbanden Overbanden Overbanden MetTASEDIMENT MetTASEDIMENT MetTASEDIMENT	9421 326118 226118 173361 173361 (u) 1200 2660 2600 2600 2600 2600 2600 2600	р 1.6.6 7.299 15.709 15.709 15.709 15.709 2.08666 2.0866 2.0866 2.0866 2.0866 2.0866 2.0866 2.0866 2.0	LAT LONG 143.522 4145.522 416.522 416.522 416.522 4517 4517 4517 4517	N 52 47 W 06 7. (fdw) yewy 33 48 75 186	800076 60013 SOPT to FIRM FIRM FIRM FIRM FIRM FIRM FIRM SUPT to FIRM FIRM SUPT to FIRM FIRM SUPT to FIRM SUPT to FIRM SUPT SUPT to FIRM SUPT SUPT to FIRM SUPT	The second secon	N 9 5 5 5 7 2 0 6 5 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	10 N 27 N 50 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden	10200 1225390 00 000 protein Balance (u) protein Balance 0.000 1.57 2.880 8.900 8.900 8.900	<u>e</u> 1.573 2.8 5.998 8.8 9 12.912	LAT LONG 198.274 212.0615 329.259 441.431 197.59 212.025 441.431 (5/m) 45.14	(red w) xremus 771 70 81 2177 57	817764 610007 610007 FIRM FIRM FIRM STIFF to VERY STIFF STIFF to VERY STIFF	A STATUS	91994-00 1/7 N 1/7 N 2/0 N	17 N 17 N 250 N 250 N
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Overburden Overburden Overburden M41 Chainage (m) Easting ING Northing ING	9427 325318 1773361 1773367 177357 177357 177357 177577 177577 177577 177577 177577 177577 177577 177577 17	<u>р</u> <u>1.6.</u> <u>4.6</u> <u>4.95</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u>9.9</u> <u></u>	LAT LONG 143 529 143 529 416 522 416 417 417 417 417 417 417 417 417 417	N 52 47 W 06 7. (edu) xeeu 33 48 75 186 57 186 57 57 186 57 57 186 75 200 8 57 200 8 57 200 8 57 200 8 57 200 8 57 200 8 57 200 8 57 200 8 57 200 8 57 200 8 57 200 8 57 200 7 57 57 57 57 57 57 57 57 57 57 57 57 5	2090076 209007 209007 209007 209007 209007 209007 209007 209007 209007 209007 20900 2	LOOSE LOOSE LOOSE to MEDUM DENSE VERY DENSE VERY DENSE	8 6 k P Sp1* Cohesive	10 N 27 N 50 N 550	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden MetTASEDIMENT	10200 3226390 200 1773379 (U) page 50 0.000 1.57 2.880 8.90 8.90 8.90	<u>2</u> 1.573 2.8 5.996 8.9 12.912	(%) 199229 19720 19729 441.431 229.259 441.431 4514	N 52 47 / 1 W 06 7. (rddw) xreuu 7/1 7/ 7/1 7	17764 151706 15007 15007 15007 1500 1	MEDIUM DENSE MEDIUM DENSE VERY DENSE	00000000000000000000000000000000000000	2000 Control C
Sediment	M137 M137 M137 Easting ING Easting ING Unconsolidated Develoanden Unconsolidated Develoanden Overburden Overburden M41 Chainage (m) Easting ING MCTASEDIMENT M41 Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden	9423 326518 1773361 1773361 1773361 1773361 1773361 1773361 100 1600 1600 1600 1600 1600 1600 1600 1600 1000	2 1 1 1 1 1 1 1 1 1 1 1 1 1	LAT LONG 143 529 143 529 143 529 416 522 416 522 416 522 416 522 416 522 416 522 417 911 200 053 416 522 416 522 417 911 200 05 417 91 200 05 410 200 05 410 410 05 410 05 410 05 410 05 410 05 410 05 410 410 05 410 05 410 05 410 05 410 05 410 05 410 05 410 05 410 410 05 410 05 410 05 410 05 410 05 410 05 410 05 410 05 410 410 05 410 05 410 05 410 05 410 05 410 05 410 410 05 410 05 410 410 05 410 410 05 410 410 05 410 410 05 410 410 410 410 410 410 410 410 410 410	N 52 47 W 06 7 1000 348 48 75 186 348 348 348 348 348 348 348 348 348 348	2000776 2000776 2000776 2000776 20077 2	VERV DENSE VERV DENSE VERV DENSE	0 12 12 12 12 12 12 12 12 12 12 12 12 12	200 N 200 N	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Overhunden Overhunden Overhunden	10200 326390 (b) 0000 (b) 0000 (c) 00000 (c) 0000	2 1.571 3.8 5.902 12.912	LAT LONG 198.274 197.59 212.061 212.061 2320.259 441.431	N 52 47 W 06 7. (retay) young 71 70 57 57	817764 510007 610007 FIRM FIRM FIRM STIFF to VERY STIFF FAIR FAIR	APPOUND U SOSSAULUM DENSE MEDIUM DENSE VERV DENSE	901594000 LLAS 17 N 17 N 20 N 20 N 20 N	17 N 21 N >50 N
Sediment Bedrock Sediment Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolidated Deer burden Unconsolidated Over burden Unconsolidated Over burden METASEDIMENT METASEDIMENT	9423 226318 173361 173361 (u) 100 100 100 100 100 100 100 10	<u>р</u> <u>1.6.</u> <u>7.299</u> <u>15.703</u> <u>15.703</u> <u>2.0866</u> <u>4.55</u> <u>7.8</u>	LAT LONG 3 173.911 173.911 105.253 105.255 105	N 52 47 W 06 7. (reful) xewug 33 48 75 75 186	20076 20076 20076 20076 20076 20076 20076 20076 20076 20076 2007	Terrore of search and	N 10 10 10 10 10 10 10 10 10 10 10 10 10	Interview 2	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden	10200 1225390 00 000 1173379 1773379 (u) 0000 0000 0000 0000 1.57 2.88 0.0000 0000 0000 8.390 8.390 0.0000 0000 0000 8.390 0.0000 0000 0000 1.57	<u>p</u> 1.573 2.8 5.988 8.9 12.912	(Carried Control of Co	N 52 47 W 06 7. 70 81 217 57	817764 610007 610007 510007 51000 FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA FIRMA	A STATUS	8 (1994) 17 N 20 N >50 N	2000 2011 217 N 210 N 2000 N 2
Sediment	M17 M17 Easting ING Easting ING Loconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Overburden Overburden M11 Chainage (m) Easting ING M41 Easting ING Unconsolidated Overhurden Unconsolidated Overhurden Overburden Ov	9427 325318 1773561 1773561 1773561 (u) page 4 4.00 7.30 9.00 1100 326666 0.00 1.50 0.00 1.50 0.00 1.50 0.00 1.50 0.00 1.53 0.00 1.73 0.00 1.73 0.00 1.73 0.00 1.73 0.00 1.73	<u>و</u> <u>1.6.1</u> 4.95 9.95 9.95 9.95 9.95 9.95 9.95 9.95	LAT LONG 305,259 416,522 416,5	N 52 47 W 06 7. (refu) xee 33 33 33 33 33 33 33 33 33 33 33 33 3	2090776 2090776 2090778 2090778 2090778 2090778 209077 209077 209077 20907	AT THE COSE OF	Cohesive A 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Japanese Santa S	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden METASEDIMENT	10200 1225390 000 1773379 (u) protest 0.000 1.57 2.880 0.000 1.57 2.880 0.000 8.990	2 1.573 2.8 5.988 8.9 12.912	LAT LONG 198.274 198.274 441.431	N 52 47 W 06 7. 70 70 81 217 57	E17764 E17764 E17764 E1707 E1007 E1007 E1007 FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM	MEDIUM DENSE MEDIUM DENSE VERY DENSE	8 (1920) 17 N 20 N 	JIT NN 21N 350 N 350 N
Sediment	M17 M137 M137 Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhunden Overhunden Met ASED IMENT M41 Chainage (m) Easting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden Overhund	9427 326518 1773361 1773361 (u) pages 0.00 7.30 9.00 160 7.30 9.00 1100 326466 177397 None (table pages 9.00 1100 1266 177397 None (table pages 9.00 100 100 100 100 100 100 100	р 1.6.6 4.65 9.9 9.9 9.9 15.703 1.5.703	LAT LONG 204 052 300 259 300 259 416 522 416 910 417 br>417 910 410 410 410 410 410 410 410 410 410 4	N 52 47 0 0 7. N 52 47 0 7. N 52 7. N 52 47 0 7. N 52 7.	2000776 3000776 500433 500433 500473 50077 5077	VERV DENSE VERV DENSE VERV DENSE VERV DENSE DENSE TO VERV DENSE	N N N N N N N N N N N N N N N N N N N	10 N N 10 N 10 N 10 N 10 N 10 N 10 N 10	M40 Chainage (m) Easting ING Urconsolidated Overhunden Urconsolidated Overhunden Overhunden Overhunden Overhunden Overhunden	10200 326390 (u) 1173379 (u) postes dial 2.57 6.000 8.990 (u) 2.57 6.000 8.990 8.900 8.900	2 1.571 2.8 5.992 12.912 12.912 12.912 12.912 12.912 12.912 12.912 12.912 12.912 12.912 1.571	(%) (%) (%) (%) (%) (%) (%) (%)	N 52 477 W 06 7. (adw) xwug 71. 217 81 217 81 217 57 57	817764 817764 510007 FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM FIRM	A REDIUM DENSE MEDIUM DENSE VERV DENSE	\$ 17 N 20 N >50 N	17.NN 250 N 250 N
Sediment	M17 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Coerthorden Coerthorden METASEDIMENT METASEDIMENT MAI Chainage (m) Easting ING Morting ING	9423 226318 173361 (u) 1736	р 15. 15. 15. 15. 15. 15. 15. 15.	LAT LONG 1415.522 173.911 173.911 105.259 416.522 4	N 52 47 W 06 7. (etal) xeeus 33 48 75 186 xeeus 57 X 06 7. (etal) xeeus 33 48 48 48 48 57 186 X 06 7. (etal) xeeus 33 48 48 48 48 48 48 48 48 48 48	20076 20076 20076 20076 20076 20076 20076 20076 20076 20076 20076 2007	Terrore o sesual to the second	N 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	In the second sec	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Unconsolidated Unconsolidated Overhurden Unconsolidated Overhurden Un	Detable Ballow 102:00 Potable Ballow (u) 125:390 000 1773379 (u) 1773379 0.0000 0.0000 0.00	2 1.573 5.988 8.9 12.912	(C) (C) (C) (C) (C) (C) (C) (C)	N 52 47 W 06 7. (red w) xews 71 70 81 217 70 81 217 57 57	S17764 S17764 GEORGE CONTRACTOR OF CONTRACTO	ABDUM DENSE MEDIUM DENSE MEDIUM DENSE VENT DENSE	average 32 1/2 N 1	17 N 17 N 21 N 360 N 360 N
Sediment	M17 Chainage (n) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Overburden Overburden M41 Chainage (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated	9421942 3255118 1773361 1773361 1773361 (u) pages 9.00 1.60 0.00 7.30 9.00 1.60 0.00 7.30 9.00 1.100 1.60 0.00 7.30 9.00 1.100 1.60 0.00 7.30 9.00 1.60 0.00 7.30 1.60 0.00 7.30 1.60 0.00 7.80 1.60 0.00 7.80 1.60 0.00 7.80 1.60 0.00 7.80 1.60 0.00 7.80 1.60 0.00 7.80 1.60 0.00 7.80 1.60 0.00 7.80 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.60 0.00 1.00 1.00 1.00 0.00 1.	<u>р</u> 1.6.1 4.7 2.086 4.5 2.086 4.5 7.8 - - - - - - - - - - - - -	LAT LONG 3143.529 143.529 143.529 416.522 416.522 416.522 416.522 416.522 416.522 416.522 416.522 416.522 416.522 416.522 416.522 416.522 4517 4517 4517 4517 4517 4517 4517 4517	N 52 47 W 06 7. N 52 47 W 06 7. (refer w) 33 48 57 186 	200076 200076 200076 200076 SOFT	AND DEVISE VERV DENSE VERV DENSE VERV DENSE VERV DENSE VERV DENSE	avisaugo 1445 G N N12 N N N N N N N N N N N N N N N N N	2010 2010 2010 2010 2010 2010 2010 2010	M40 Chainage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Overhurden Overhurden METASEDIMENT	10200 3226390 (u) participation (u) participatio	<u>e</u> 1.573 2.8 5.998 8.8 9 12.912	6 5 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	N 52 47 47 W 06 7. 70 70 71 70 70 8 1 217 57	17761 1007 1007 1007 1007 1007 1007 100 1	MEDIUM DENSE MEDIUM DENSE VERY DENSE	00000000000000000000000000000000000000	17 N 21 N 350 N 350 N



	M50									1	M49									
	Chainage (m)	34								-	Chainage (m)	126								-
	Easting ING	325384.5		LAT	N 52 47	852608)	Easting ING	325395.5		LAT	N 52 47	803274				_
	Northing ING	173417.6		LONG	W 06 8.	509031				1	Northing ING	173326.3		LONG	W 06 8.	501371				_
Sediment	Type	Depth Below Seabed (m)	2	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular		Type	Depth Below Seabed (m)	То	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular	
	Unconsolidated Overburden	0.00	1.89	187.068	63	FIRM	MEDIUM DENSE	15 N	14 N	_	Unconsolidated Overburden	0.00	2.518	155.757	39	SOFT	LOOSE	9 N	7	N
	Unconsolidated Overburden	1.89	3.5	190.335	65	FIRM	MEDIUM DENSE	16 N	15 N	_	Unconsolidated Overburden	2.52	3.4	201.244	73	FIRM	MEDIUM DENSE	18 N	N 18	3 N
	Unconsolidated Overburden	3.50	7.206	217.021	85	FIRM	MEDIUM DENSE	21 N	22 N	_	Unconsolidated Overburden	3.40	7.1	198.095	71	FIRM	MEDIUM DENSE	17 N	N 1	7 N
	Overburden	7.21	12	311.902	195	STIFF	VERY DENSE	41 N	>50 N	_	Overburden	7.10	12	281.567	159	STIFF	DENSE	34 N	N 43	7 N
		12.00		400.328						_		12.00		355.3/1					_	
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	be	epth Below tabed (m)		(s/m) c	** 00	uality					a	spth Below sabed (m)		(s/m) c	** 00	uality				
Bedrock	Υ ^τ	Se De		5	ž	ð					£	Se De		5	RC	ð				
	METASEDIMENT	12.00		5788	93	EXCELLENT					METASEDIMENT	12.00		5411	81	GOOD		_	_	
	M48										M47				· · · ·			1		
	M48 Chainage (m)	193									M47	264							_	_
	M48 Chainage (m) Fasting ING	182		LAT	N 52 47	773073				-	M47 Chainage (m)	264		LAT	N 52.47	728836				
	M48 Chainage (m) Easting ING	182 325403.1		LAT	N 52 47	773073				-	M47 Chainage (m) Easting ING Northing ING	264 325415.3			N 52 47	728836				
	M48 Chainage (m) Easting ING Northing ING	182 325403.1 173270.5		LAT LONG	N 52 47 W 06 8.	.773073 495857					M47 Chainage (m) Easting ING Northing ING	264 325415.3 173188.7		LAT LONG	N 52 47 W 06 8.	.728836 486881				
Sediment	M48 Chalange (m) Easting ING Northing ING	182 325403.1 173270.5 peapees (m)	To	LAT LONG (\$/w) \$A	N 52 47 W 06 8.	.773073 495857 9 49595 9 49595 9 49595 9 49595 9 40 40 40 40 40 40 40 40 40 40 40 40 40	Stiffness Granular	SPT* Cohesive	SPT* Granular		M47 Casting ING Northing ING	264 325415.3 173188.7 pease (m)	To	5/m) sA	N 52 47 W 06 8.	728836 486881	Stiffness Granular	SPT* Cohesive	SPT* Granular	
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Sediment	M48 Chainage (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden	182 325403.1 173270.5 99 99 99 99 99 99 99 99 99 99 99 99 99	2.216 3.5	(\$/@) 174.619 181.743	N 52 47 W 06 8. (edw) xewy 49 59	773073 495857 93495857 5057 to FIRM FIRM	out the second s	14 N 14 N	E II SPT* Granular		M47 Dahange (m) Zasting ING Northing ING Unconsolidated Overhunden Unconsolidated Overhunden	264 325415.3 173188.7 People sease (ii) 0.00 2.45	2.446 3.5	LAT LONG (S)(E) SN 184.106 202.921	N 52 47 W 06 8. (edw) xewy 61 74	728836 486881 stitluess Firm Firm Firm	MEDIUM DENSE MEDIUM DENSE	V 14 Cohesive	11 KPT* Granular	3 N
Sediment	M48 Chainage (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden	182 325403.1 173270.5 Page 5 8 8 173270.5 0.00 2.22 3.50	2.216 3.5 7	(%) E S 174.619 181.743 208.505	N 52 47 W 06 8. (edw) xewy 49 59 78	773073 495857 495857 5057 to FIRM FIRM FIRM	Antiparticiparti	14 N 19 N 19 N	Land Channel ar 11 N 13 N 12 N 20 N		MA7 Dainage (m) Easting, ING Sating, ING Unconsolidated Overhunten Unconsolidated Overhunten Unconsolidated Overhunten Unconsolidated Overhunten Unconsolidated Overhunten Unconsolidated Overhunten	264 325415.3 173188.7 Peqees x x00 0.00 2.45 3.50	2.446 3.5 7	LAT LONG (%)) % 184.106 202.921 191.768	(edw) (edw) 61 74 66	728836 486881 a exercise Firem Firem Firem Firem	AT THE ACTION OF ACTION OF ACTION OF ACTION OF	v 91 v 91 v 91 v 91 v 91 v 91 v 91 v 91	1 × ×	3 N N
Sediment	M48 Cohange (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden	182 325403.1 173270.5 b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b a b b a b b b a b b b b b b b b b b	2.216 3.5 7 12.775	(%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 8. (edw) Xewy 49 59 78 145	773073 495857 Soff to FIRM FIRM FIRM STIFF	A CONSTRUCTION OF A CONSTRUCTI	12 N 12 N 12 N 32 N	Land Channel ar Alam 11 N 13 N 20 N 42 N		MA7 Debinage (m) Easting ING Sorthing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden	264 325415.3 173188.7 Pegees C 0.00 2.45 3.50 7.000	₽ 2.446 3.5 7 11	LAT LONG (s) w ss 184.106 202.921 191.768 272.449	(edw) (edw)	728836 486881 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE	14 N 16 N 33 N	11 A 11 A 12 A 13 A 14 A 14 A 15 A 14 A 14 A 14 A 14 A 14 A 14 A 14 A 14	3 N N N N N N N N N N N N N N N N N N N
Sediment	M48 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Unconsolitated Overburden Unconsolitated Overburden Overburden	182 325403.1 173270.5 99 99 99 99 99 99 99 99 99 99 99 99 99	2.216 3.5 7 12.775	LAT LONG \$ 174.619 181.743 208.505 269.528 307.824	(edw) xewy 49 59 78 145	773073 495857 Soft to FIRM FIRM FIRM STIFF	AT THE REPORT OF	12 N 14 N 19 N 32 N	L1 N 13 N 20 N 42 N		MA7 Doininge (m) Easting, ING Northing ING Unconsolitated Overhurden Unconsolitated Overhurden Unconsolitated Overhurden Overhurden Overhurden	264 325415.3 173188.7 99 50 50 50 50 50 50 50 50 7.00 11.00	2.446 3.5 7 11	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	(edw) 61 74 66 148	728836 486881 99 90 90 90 90 90 90 90 90 90 90 90 90	MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE	14 N 18 N 19 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3 N N N N N N N N N N N N N N N N N N N
Sediment	M48 Cohange (m) Easting ING Northing ING Unconsidiated Overburden Unconsidiated Overburden Unconsidiated Overburden Overburden	182 325403.1 173270.5 9 9 9 9 9 9 9 9 9 9	2.216 3.5 7 12.775	LAT LONG \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$	(edw) xewy 49 59 78 145	773073 495857 Soft to FIRM FIRM FIRM STIFF	ar Ter by Search and the search and	N 12 N 12 N 12 N 12 N 12 N 12 N 12 N 12	Lag Standar 11 N 13 N 20 N 42 N		M47 Debinage (m) Easting ING Sorthing ING Uncompliated Overhurden Uncompliated Overhurden Uncompliated Overhurden Overburden	264 325415.3 173188.7 Pages 8 0.00 2.45 3.50 7.00 11.00	2.446 3.5 7 11	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	(ed.w) (e	728836 446681 945990 95900 97900 97900 97900 9700000000	at menun pense Menun pense Menun pense Menun pense Orika	▲ 14 Notestine	1 × × × × × × × × × × × × × × × × × × ×	
Sediment	M48 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Unconsolitated Overburden Unconsolitated Overburden	182 325403.1 173270.5 Swool a a c c c c c c c c c c c c c c c c c c	2.216 3.5 7 12.775	(%) (%) (%) (%) (%) (%) (%) (%)	(edw) xewy 49 59 78 145	773073 495857 495857 5057 to FIRM FIRM FIRM FIRM STIFF	Source of the second se	12 N 14 N 19 N 32 N	Land Standar Land Stand Standar Land Standar Land Standar Land Standar Land Stand		MA7 Doininge (m) Easting, ING Northing ING Unconsolitated Overharden Unconsolitated Overharden Unconsolitated Overharden Unconsolitated Overharden Overharden	264 325415.3 173188.7 99999999999999999999999999999999999	و 2.446 3.5 7 11	LAT LONG (%) 184.106 202.921 191.768 2772.449 302.392	(edw) (edw)	728836 486881 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Agreen of the second of the se	▲ 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		3 N N 5 N N
Sediment	M48 Cohange (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Overburden	182 325403.1 173270.5 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2.216 3.5 7 12.775	LAT LONG (SE) 30 174.619 181.743 208.505 269.528 307.824	(red w) xrews 49 59 78 145	773073 495857 SOFT to FIRM FIRM FIRM STIFF	A COST OF A COST	12 N 14 N 19 N 32 N	11 N 13 N 20 N 42 N		M47 Debinage (m) Easting ING Sorthing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Overhunden	264 325415.3 173188.7 Page 5 S No O O O O O O O O O O	9 2.446 3.5 7 11	LAT LONG 184.106 202.921 191.768 272.449 302.392	(red W) xrews 61 74 66 148	728836 486881 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE	√ 81 √ 81 √ 81 √ 81 √ 81	11 × ×	
Sediment	M48 Chainage (m) Easting ING Northing ING Unconsolitated Overburden Unconsolitated Overburden Unconsolitated Overburden Unconsolitated Overburden	182 325403.1 173270.5 Pages s Moge ft Go (E) 0.00 2.22 3.50 7.00 12.78	2.216 3.5 7 12.775	(%) 174.619 181.743 208.505 269.528 307.824	N 52 47 W 06 8. (edw) xewy 49 59 78 145	773073 773073 495857 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	AND A CONTRACT OF A CONTRACT O	12 N 14 N 19 N 32 N	11 N 13 N 20 N 42 N		MA7 Dohinge (m) Easting (MG Northing ING Unconsolitated Combustee Unconsolitated Unconsolitate Unconsolitat	264 325415.3 173188.7 Peress More 0.00 2.45 3.50 7.00 11.00	2.446 3.5 7 11	LAT LONG 184.106 202.921 191.768 272.449 302.392	(edw) xewy 61 74 66 148	7228836 486681 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	Agreen oo sessiyya MEDIUM DENSE MEDIUM DENSE OENSE OENSE	14 N N N N N N N N N N N N N N N N N N N	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
Sediment	M48 Cohange (m) Easting ING Northing ING Unconsolidated Overburden Unconsolidated Overburden Unconsolidated Overburden Overburden	182 325403.1 173270.5 99 90 90 0.00 2.22 3.50 7.00 12.78	2.216 3.5 7 12.775	(%) LONG (%) 174.619 181.743 208.505 269.528 307.824	(edu) xewy 49 78 145	773073 995857 995857 30507 to FIRM FIRM FIRM STIFF	A CONTRACT OF CONT	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Land Canternant Spate Granular 11 N 13 N 20 N 42 N		M47 Debinage (m) Easting ING Sorthing ING Uncompliated Deerburden Uncompliated Deerburden Uncompliated Overburden Uncompliated Overburden Overburden	264 325415.3 173188.7 0.00 2.45 3.50 7.00 11.00	<mark>و</mark> 2.446 3.5 7 11	(%) (%) (%) (%) (%) (%) (%) (%)	(edw) (edw) xewy 61 148	7288336 486881 86881 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE	14 N N N N N N N N N N N N N N N N N N N		
Sediment	M48 Chainage (m) Easting ING Northing ING Unconsolidated Overhardes Unconsolidated Overhardes Unconsolidated Overhardes Unconsolidated Overhardes Overhardes	182 325403.1 173270.5 999999999999999999999999999999999999	2 2.216 3.5 7 12.775	LAT LONG (%)) % 174.619 181.743 208.505 269.528 307.824	(edw) xewug 49 59 78 145	273073 995857 995857 Soff to FIRM FIRM FIRM FIRM	MEDUM DENSE MEDUM DENSE MEDUM DENSE DENSE DENSE	12 N 14 N 19 N 12 N 12 N 12 N 12 N 12 N 12 N 12	U 20 N 42 N 42 N 42 N 42 N 42 N 42 N 42 N		MA7 Dobinage (m) Easting ING Northing ING Unconsolitated Overhandees Unconsolitated Overhandees Unconsolitated Overhandees Unconsolitated Overhandees Unconsolitated Overhandees Unconsolitated Overhandees	264 325415.3 173188.7 0.00 2.45 3.50 7.00 11.00	2.446 3.5 7 11	LAT LONG \$ 184.106 202.921 191.768 272.449 302.392	N 52 47 W 06 8.	728836 486881 9 486881 9 5 5 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5 7 5	MEDIUM DEINSE MEDIUM DEINSE MEDIUM DEINSE DEINSE DEINSE	14 N 18 N 18 N 19 N		
Sediment	M48 Cohanage (m) Easting ING Northing ING Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden Unconsolidated Overhurden	182 325403.1 173270.5 Pagess woga the C 0.00 2.22 3.50 7.00 12.78 12.78	2.216 3.5 7 12.775	LAT LONG (%) 174.619 181.743 208.505 269.528 307.824	N 52 477 W 06 8. (red w) ¥ 49 59 78 145 ***********************************	773073 773073 999557 99957 997577 997577 997577 997577 99	LOOSE O MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE	12 N 14 N 19 N 32 N	June 20 No. 10 N		M47 Debinage (m) Easting ING Sorthing ING Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Unconsolidated Overhunden Overhunden	2644 325415.3 173188.7 pages work with the constraints of the constrai	و 2,446 3.5 7 11	(%) (%) (%) (%) (%) (%) (%) (%) (%) (%)	N 52 47 W 06 8. 61 74 66 148	728836 486881 FIRM FIRM FIRM FIRM STIFF	MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE DENSE	16 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
Sediment	M48 Colanage (m) Easting ING Northing ING Unconsultated Overharden Unconsultated Overharden Unconsultated Overharden Overharden	182 325403.1.1 173270.5 0.000 2.221 3.50 7.00 12.78	<mark>۹ 2.216</mark> 3.5 7 12.775	LAT LONG 174.619 181.743.208.505 269.528 307.824	N 52 47 W 06 8.	77 3073 495857 experience experie	AT A STATE OF A STATE	antice 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Line Construction of the second secon		M47 Dehinge (m) Easting (MG Soorthing (NG Uncansuldated Overhunden Uncansuldated Overhunden Uncansuldated Overhunden Overbunde	2644 325415.3 173188.7 Pages s worded (tub) 0.000 2.45 3.50 7.00 111.00	2.446 3.5 7 11	(x) 184.106 202.9211 191.768 272.449 302.392 5989 5989	N 52 47 W 06 8. 61 74 66 148	728836 188581 188681 18878 FIRM	MEDIUM DENSE MEDIUM DENSE DENSE	14 N 16 N 19	11 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	



	MSS									I	454							1	1
	Chainage (m)	104								-	chainage (m)	195							
	Easting ING	325616.4		LAT	N 52 47.	803951				E	asting ING	325638.8		LAT	N 52 4	.756035			
	Northing ING	173333.3		LONG	W 06 8.3	04842				0	Iorthing ING	173244.9		LONG	W 06 8	286892			
Sediment	Type	Depth Below Seabed (m)	То	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular		lype	Depth Below Seabed (m)	то	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated Overburden	0.00	2.283	203.331	74	FIRM	MEDIUM DENSE	18 N	18 N		Unconsolidated Overburden	0.00	2.612	212.027	81	FIRM	MEDIUM DENSE	20 N	21 N
	Unconsolidated Overburden	2.28	5.137	179.767	58	SOFT to FIRM	LOOSE to MEDIUM DENSE	13 N	12 N	_	Unconsolidated Overburden	2.61	5.877	190.602	65	FIRM	MEDIUM DENSE	16 N	15 N
	Overburden	9.70	9.7	381.482	220	STIFF to VERT STIFF	VENT DEINSE	45 N	>50 N		Overburben	3.60	6.599	335.300	225	STIFF to VERT STIFF	VERT DENSE	40 N	>50 N
												0.00							
										-									
Bedrock	adA	Depth Below Seabed (m)		/b (m/s)	3QD **	Quality					Ape	Depth Below Seabed (m)		/p (m/s)	300**	Quality			
	METASEDIMENT	9.70		2836	22	VERY POOR				P	METASEDIMENT	8.60		2337	15	VERY POOR			
																		I	
	M52								1	ŀ	M51				1			l I	1
	Chainage (m)	111								-	Chainage (m)	201		_		1	1	1	
	Easting ING	325617.1		LAT	N 52 47.	800231				E	asting ING	325641.9		LAT	N 52 4	.752988			
	Northing ING	173326.4		LONG	W 06 8.3	04325				1	Iorthing ING	173239.4		LONG	W 06 8	284257			
		1 Below Seabed		(s/i	(Mpa)	ess Cohesive	ess Granular	Cohesive	Granular			1 Below Seabed		(s)	(Mpa)	ess Cohesive	ess Granular	Cohesive	Granular
Sodimont	ype	n) eptt	•	s,	(emi	tiffn	tiff	ŧ.	*L		ype	eptt)	•	s,	œ	fi	ti ti	ŧ.	ŧ.
Seament	Unconsolidated Overburden	0.00	2.092	203.521	75	FIRM	MEDIUM DENSE	50 18 N	9 18 N		Unconsolidated Overburden	0.00	2.676	209.849	79	FIRM	MEDIUM DENSE	20 N	20 N
	Unconsolidated Overburden	2.09	4.707	175.287	55	SOFT to FIRM	LOOSE to MEDIUM DENSE	13 N	11 N		Unconsolidated Overburden	2.68	6.021	197.993	71	FIRM	MEDIUM DENSE	17 N	17 N
	Unconsolidated Overburden	4.71	9.601	302.982	184	STIFF	DENSE to VERY DENSE	39 N	>50 N		Unconsolidated Overburden	6.02	8.6	318.887	203	STIFF	VERY DENSE	42 N	>50 N
	Overburden	9.60	12.061	389.853	304	VERY STIFF	VERY DENSE	>50 N	>50 N	-	Overburden	8.60	15.429	409.946	336	VERY STIFF	VERY DENSE	>50 N	>50 N
		12.00	17.108	492.303						-		15.43	21.902	531.794	•				
										-									
									_										
Bedrock	ad AL METASEDIMENT	Depth Below Seabed (m)		(s/w) dA	* 008 22	VERY POOR						Depth Below Seabed (m)		(s/ш) dA 2337	* 00 15	A IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII			
												0.00							
	M42 Chainage (m) Easting ING Northing ING	68 326242. 173290.	4 2 7	LAT LONG	N 52 4 W 06	17.772240 7.749476					M43 Chainage (m) Easting ING Northing ING	3263	775 27.8 18.7	LAT	r N NG W	52 47.786121 / 06 7.672697			
Sediment	Unconsolidated Overharde Unconsolidated Overharde Unconsolidated Overharde Overharde	Pag easy Notation (1000) Notation (100	P 11.2	5 5 5 5 5 5 5 5 5 5 5 5 5 5	(edu) x reug 57 34 74 44 91 110 48 232 37	SOFT SOFT to FIRM FIRM to STIFF STIFF to VERY STIFF	LOOSE LOOSE to MEDIUM DE MEDIUM DENSE to DE F VERY DENSE	6 NSE 11 NSE 27 47	N N N N N N N N N N N N N N N N N N N	1 1 N N	Unconsolidated Overbu Unconsolidated Overbu Overbu Overbu	rden 0.0 rden 1.3 rden 2.6 rden 6.0 rden 9.1		(5/w) sn 1.3 16 2.6 18 6 16 9.2 22 3 3	4.528 8.409 7.513 2.721 31.37	43 SOFT 64 FIRM 45 SOFT to FIRM 89 FIRM	LOOSE MEDIUM DENSE MEDIUM DENSE MEDIUM DENSE	10 N 11 N 22 N 22 N	24 N N N N N N N N N N N N N N N N N N N
Bedrock	BEAL METASEDIMENT	(m) Depth Below 11.25		(s/w) d 4428	** 00 X	Atjien D FAIR					ad A METASEDIMENT	Depth Below 5.6 Seabed (m)		(s/m)d/ 4	904	67 FAIR			



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	IVI53										1146								
	Chainage (m)	229									Chainage (m)	297							
	Easting ING	326050.8		LAT	N 52 47	.794384					Easting ING	326071.1		LAT	N 52 47	.758804			
	Northing ING	173326.8		LONG	W 06 7.	918763					Northing ING	173261.3		LONG	W 06 7.	902196			
Sediment	Type	Depth Below Seabed (m)	To	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular		Type	Depth Below Seabed (m)	To	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated Overburden	0.00	2.483	230.996	96	FIRM	MEDIUM DENSE to DENSE	24 N	27 N		Unconsolidated Overburden	0.00	1.926	202.436	74	FIRM	MEDIUM DENSE	18 N	18 N
	Unconsolidated Overburden	2.48	5.586	213.612	82	FIRM	LOOSE to MEDIUM DENSE	20 N	21 N		Unconsolidated Overburden	1.93	4.333	184.268	61	FIRM	MEDIUM DENSE	14 N	13 N
	Overburden	5.59	9.8	324.908	211	STIFF to VERY STIFF	VERY DENSE	43 N	>50 N		Overburden	4.33	7.342	264.451	140	STIFF	DENSE	31 N	39 N
		9.80		410.522							Overburden	7.34	11.6	344.054	237	STIFF to VERY STIFF	VERY DENSE	47 N	>50 N
												11.60		405.798					
				L															1
		_										_							
Bedrock	łype	Depth Below Seabed (m)		(s/m) d/	3QD **	Quality					łype	Depth Below Seabed (m)		/b (m/s)	** d0 **	Quality			
	METASEDIMENT	9.80		3863	41	POOR					METASEDIMENT	11.60		4070	46	POOR			
										_									
	M45										M44								
	Chainage (m)	222									Chainage (m)	317							
	Easting ING	326259.3		LAT	N 52 47	826243					Easting ING	326278		LAT	N 52 47	775738			
	Northing ING	173391.3		LONG	W 06 7.	731920					Northing ING	173298.1		LONG	W 06 7.	717435			
Sediment	Type	Depth Below Seabed (m)	4	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular		Type	Depth Below Seabed (m)	2	Vs (m/s)	Gmax (Mpa)	Stiffness Cohesive	Stiffness Granular	SPT* Cohesive	SPT* Granular
	Unconsolidated OverBurden	0.00	2.508	110.450	20	VERT SUFT	VERT LOUSE	0 N	2 N	-	Unconsolidated Overburden	0.00	1.813	122.099	24	VERT SOFT to SOFT	VERT LOOSE to LOOSE	2 N	5 N
	Unconsolidated Overburden	5.64	0.043	253 651	120	FIRM to STIFE	MEDILIM DENSE to DENSE	20 N	35 N	F	Overburden	4.08	6.913	215 386	20	FIRM	MEDILIM DENSE to DENSE	21 N	22 N
	Overburden	9.40	3.4	348 387	123	There is a strike	MEDICINI DE NOE 10 DENSE	2.5 N	33 14		Overburden	6.91	10.6	254 221	129	FIRM to STIFF	MEDIUM DENSE to DENSE	29 N	35 N
	overburben	5.40		540.307	-						overburden	10.60	10.0	327 68			COLORIDE NOL TO DENSE	2.2 14	33.4
				-	1							10.00		527.00					
				-	1					F									
				l –	1					F									
				<u> </u>	I					F									
																			-
-				 	I					F									
Bedrock	Type	Depth Below Seabed (m)		Vp (m/s)	RQD**	Quality					Type	Depth Below Seabed (m)		Vp (m/s)	RQD **	Quality			
	METASEDIMENT	9.40		4084	46	POOR					METASEDIMENT	10.60		3942	43	POOR			
		_		I –								_						_	



9. APPENDIX C: DETAILED METHODOLOGY

A combination of a number of geophysical techniques was used to provide the integrated interpretation and reduce ambiguities, which may otherwise exist.

9.1 Multichannel Analysis of Surface Waves (MASW)

MASW profiling was carried out to provide information on overburden material stiffness or density.

9.1.1 Principles

The Multi-channel Analysis of Surface Waves (MASW) (Park et al., 1998, 1999) utilises surface waves (Rayleigh waves in the terrestrial environment) to determine the elastic properties of the shallow subsurface (<15m). Surface waves carry up to two/thirds of the seismic energy but are usually considered as noise in conventional body wave reflection and refraction seismic surveys.

In the terrestrial environment the type of Surface wave which is measured is generally the Rayleigh wave, which travels along the earth – air boundary. In the marine environment at the interface between water and solid material the surface wave behaviour is different and it is the Scholte wave which is measured. While similar to the Rayleigh wave it propagates with a velocity in the range of 88% - 99% of the Rayleigh wave. This range of variation depends on the frequency content of the wave and the water column thickness (Kaufmann et al., 2005).

The penetration depth of surface waves changes with wavelength, i.e. longer wavelengths penetrate deeper. When the elastic properties of near surface materials vary with depth, surface waves then become dispersive, i.e. propagation velocity changes with frequency. The propagation (or phase) velocity is determined by the average elastic property of the medium within the penetration depth. Therefore the dispersive nature of surface waves may be used to investigate changes in elastic properties of the shallow subsurface.

The MASW method employs the multi-channel recording and processing techniques (Sheriff and Geldart, 1982) that have similarities to those used in a seismic reflection survey and which allow better waveform analysis and noise elimination. To produce a shear wave velocity (Vs) profile and a stiffness profile of the subsurface using Surface waves the following basic procedure is followed:

(i)A point source (eg. An airgun) is used to generate vertical ground motions,

(ii)The ground motions are measured using low frequency hydrophones, which are disposed along a straight line directed toward the source,

(iii) The ground motions are recorded using either a conventional seismograph, oscilloscope or spectrum analyzer,

(iv)A dispersion curve is produced from a spectral analysis of the data showing the variation of surface wave velocity with wavelength,



(v)The dispersion curve is inverted using a modeling and least squares minimization process to produce a subsurface profile of the variation of Surface wave and shear wave velocity with depth.

9.1.2 Data Collection

The recording equipment consisted of a Geode 24 channel digital seismograph, 24 no. hydrophones, an airgun source with radio trigger and a 24 take-out cable with 2.95m hydrophone spacing. The hydrophone cable remains stationary on the seabed during data acquisition and the airgun discharges slightly off the seabed. Once data acquisition is complete on one spread the cable is lifted from the seabed and recovered to the deck of the survey vessel.

9.1.3 Data Processing

MASW processing was carried out using the SURFSEIS processing package developed by Kansas Geological Survey (KGS, 2000). SURFSEIS is designed to generate a shear wave (Vs) veolocity profile.

SURFSEIS data processing involves three steps:

- (i) Preparation of the acquired multichannel record. This involves converting data file into the processing format.
- (ii) Production of a dispersion curve from a spectral analysis of the data showing the variation of Scholte wave phase velocity with wavelength. Confidence in the dispersion curve can be estimated through a measure of signal to noise ratio (S/N), which is obtained from a coherency analysis. Noise includes both body waves and higher mode surface waves. To obtain an accurate dispersion curve the spectral content and phase velocity characteristics are examined through an overtone analysis of the data.
- (iii) Inversion of the dispersion curve is then carried out to produce a subsurface profile of the variation of shear wave velocity with depth.
- (iv) Following application of a Scholte wave to Rayleigh wave conversion ratio the shear wave velocities were then used to calculate shear modulus values using the formula:

 $G = V_s^2 * \rho / 1000000$

Where	G	=	Shear Modulus (MPa)
	Vs	=	Shear Wave Velocity (m/s)
	ρ	=	Density (kg/m ³)

9.1.4 Relocation

All profiles were surveyed to Irish National Grid using a GEO7X VRS system.



9.2 Sub Bottom Profiler

The sub bottom profiler survey utilised the single channel seismic reflection method to provide information on the stratigraphy of the sedimentary units and to determine the morphology of the bedrock.

9.2.1 Principles

The seismic surveying methodology consists of using a source to generate seismic waves and measuring the time required for the energy to travel from the source to a series of data receivers (geophones or hydrophones). The time taken by the energy to travel to the receivers (travel times) and the velocity of the waves can be used to reconstruct the pathways of the seismic waves and determine structural information of the sub surface lithological boundaries.

The single channel seismic reflection sparker method utilises a single hydrophone group and an electrical source to generate a real time continuous profile of the sub surface. The real time section allows for the imaging, identification and interpretation of sediment layering and the top of bedrock profile. The sparker source uses the discharge of a capacitor to create a spark between electrodes located within the water column. The sparker source and the hydrophone cable are both towed behind, or slightly offset from, the acquisition vessel. The source and receiver are both towed in the water column rather than on the seabed and there is a lateral offset between source and receiver.

9.2.2 Data Collection

The recording equipment used a Geo Marine Survey Systems Geo-Source 200 Light Weight Sparker system. The source equipment consisted of a Geo-Spark pulsed power supply (generally set to 300 Joules), a high voltage cable connecting to the 200 tip sparker unit. Prior to commencement of acquisition of production data acquisition parameterisation and energy level testing was undertaken. The receiver equipment consisted of a Geo-Sense mini streamer with an 8 element hydrophone array with an active length of 2.8m. The survey was conducted using a Mini-Trace II acquisition system under laptop control. Data was acquired in SEG-Y standard format for later office based processing and analysis.

9.2.3 Data Processing

The processing of the sub bottom profiler data was carried out using proprietary processing software (ReflexW V.6.05)

The following processing was applied to the data:

- \checkmark SEG-Y data importation and conversion to internal format
- ✓ Spatial relocation (data merge with surveyed navigation positions)
- ✓ Surface related multiple suppression
- ✓ Time cut
- ✓ Spherical divergence compensation
- Bandpass Butterworth filter



- ✓ Seabed Mute application
- ✓ Display optimisation
- ✓ Interpretation of sediment and bedrock layers using automated negative phase tracker
- ✓ Stretch of picked data to depth domain based on conversion velocity of 1900m/s
- ✓ Application of spatially varying time specific tidal correction computed from high resolution UKCS model (CS20-15HC) to reduce the data to Lowest Astronomical Tide (LAT)

The interpreted layer boundaries were stretched to the depth domain based on a conversion velocity of 1900m/s. The conversion velocity was chosen following analysis of the finalised velocity regimes from the seismic refraction and 1D MSASW datasets in conjunction with the time domain layer boundary picks from the sub bottom profiler data.

9.2.4 Relocation

The sub bottom profiler data was acquired using a combination of a system integrated with the ships on board dGPS navigation system and a GEO7X VRS system. The data was saved in Irish National Grid coordinates.

9.3 Seismic refraction profiling

9.3.1 Principles

This method measures the velocity of refracted seismic waves through the overburden and rock material and allows an assessment of the thickness and quality of the materials present to be made. Stiffer and stronger materials usually have higher seismic velocities while soft, loose or fractured materials have lower velocities. In the marine environment the sediment velocities can be masked by water velocity.

Seismic profiling measures the p-wave velocity (Vp) of refracted seismic waves through the overburden and rock material and in the marine environment allows an assessment of the bedrock quality to be made. Readings are taken using hydrophones connected via multi-core cable to a seismograph.

9.3.2 Data Collection

A Geode high resolution 24 channel digital seismograph, 24 hydrophones and an airgun source with radio trigger were used to provide first break information, with a 24 take-out cable with a nominal spacing of 2.95m. The source equipment was deployed from a dedicated source vessel and the recording equipment was operated from a larger command boat.

Readings are taken using geophones connected via multi-core cable to a seismograph. The depth of resolution of bedrock boundaries is determined by the length of the seismic spread, typically the depth of resolution is about one third the length of the profile.(eg. 69m profile ~23m depth.



9.3.3 Data Processing

First break picking in digital format was carried out using the FIRSTPIX software program to construct p-wave (Vp) traveltime plots for each spread. Velocity phases were selected from these plots using the GREMIX software program and were used to calculate the thickness of individual velocity units. Material types were assigned to bedrock lithologies.

Approximate errors for Vp velocities are estimated to be +/- 10%. Possible errors due to the "hidden layer" and "velocity inversion" effects may also occur (Soske, 1959).

9.3.4 Relocation

All profiles were surveyed to Irish National Grid using a GEO7X VRS system.



10. APPENDIX D: MARINE MAMMAL OBSERVER REPORT

Marine mammal observer report

Arklow Waste Water Treatment Plant



Project Name:

Arklow Waste Water Treatment Plant - Marine Outfall Geophysical Investigation

Client:

Byrne Looby Arup

Date: March 2017

Marine mammal observer:

Anthony Irwin, Elly, Clogher, Belmullet, Co. Mayo Ireland

Marine Geophysical Investigation:

Apex Geoservices Ltd. 6 Knockmullen Business Park, Gorey, Co. Wexford Ireland

Summary

As part of the ground investigation works for a proposed marine outfall pipeline for the Arklow Waste Water Treatment Plant Apex Geoservices Ltd undertook a geophysical investigation over a number of sessions between the 6th and 16th of March 2017. The investigation consisted of single channel seismic reflection sub bottom profiler, seismic refraction profiling and multichannel analysis of surface waves (MASW) surveying.

Location

The area under investigation was situated offshore Arklow, immediately north of the mouth of the Avoca River, and extended from the coastline to c. 1.5km offshore. Data acquisition was conducted along a series of southwest – northeast oriented profiles at c. 25m spacing and on northwest – southeast oriented profiles at c. 100m spacing. The generalised survey location is shown in Figure 1.



Figure 1. LOCATION MAP SHOWING GENERALISED SURVEY AREA OUTLINED IN RED.

Methods

The survey was conducted aboard the vessel *Dulra na Mara*, a 12.5 meter twin engine multipurpose research vessel and Fionn *mac cumhaill an 11m twin engine, cabin RIB*.

Equipment

The equipment for the single channel seismic reflection sub bottom profiler investigation was a marine Sparker system. The equipment consisted of a pulsed power supply, a high voltage cable, a 200 tip Sparker unit with frequency content 250Hz – 3.5KHz and an eight element single channel hydrophone receiver.

The equipment for the seismic refraction and MASW surveys consisted of a 12-cu. in. Mini G Gun energy source under control of a MG-SCU Source Controller. In response to a trigger source the Source Controller produces a high voltage pulse of 15ms duration for firing the Air Gun solenoid. The amplitude of the pulse is adjustable between 125 and 100V. The receiver for the survey was a 24 channel Bay Cable hydrophone.

A Marine Mammal Observer (MMO) was aboard the survey vessel for the whole duration of the survey work. In accordance with the code of practise for marine survey (NPWS 2007), the MMO conducted a 30-minute survey before starting survey operations.

The marine mammal observer conducted a continuous survey before survey operations (Table 1). Binoculars (Steiner pro navigator 7x50) and a hand-held compass were used to survey the area surrounding the vessel, assist with the species identification and direction of travel of animals recorded.

Environmental conditions were recorded at the start of each observation period, and at the start of survey operations. Sea state ranged between 2 and 4 during the survey work, with only small to medium waves present during the survey (Table 1).

Results

A total of 10.5 hours of visual survey effort was conducted (Table 1). All visual effort was conducted in suitable weather conditions sea state <4 (Fig. 2). One marine mammal sighting was recorded.

One marine mammal sighting of a single Harbour porpoise (*Phocoena phocoena*) was recorded on March 8 2017 (Fig. 2). The sighting was recorded during survey operation with the vessel on line and conducting a sparker survey.

Figure 2. DATA FORM FOR COASTAL/MARINE WORKS - MARINE MAMMAL SIGHTING RECORDS

Operation/Activity (plea	se tick)			F	Pile			
		Dredging	Drilling	Dr	riving	Blastir	ng	Other Sparker
								Survey
Date 08/03/2017	Time 10):28	Time 10:2	28		Sight	ing	Record no.
						001	5	
How did this sighting of	occur? (p	lease tick)						
Other (places or								
Details:Spotted While of	on line du	ring sparker						
survey								
Platform type & name			Observer	's na	me			
12.5 motor survey vesse	l Duira N	a mara	Anthony i	nwin				
Observer's position		a 111a1a		VVIII		Water	dep	th
52°48'.027N						8.2 Me	eters	
UU6 U7.605VV								
Spacios recorded			Cortainty of	idont	lification			
Harbour Porpoise				nito	lincation			
			Dem					<u> </u>
Total number of animal	S		No. of adults	5 I (No. of juv N	/eniles	No. 0	of calves
					•		Ū	
Maximum numbor			Minimum nu	umbor	r			
01			01					
Decerintian					Dhataa			
(include features such as	s overall :	size; shape o	f head: positio	n.	Photog	rapn o	r via	eo taken
shape and size of dorsal	fin; colo	ur and patterr	ning; height,	,		NO		
direction, shape of blow)					Directio	on of tr	avel	of animals
					(draw a	i on to p rrow)	platte	orm/vessel
					(unun u		←	
						- (}	
						Ľ	1	
Bobavieur					Directi	on of t-	0.40	of animala
Denaviour					(compa	ss point	avei ts or	degrees)
								ς ,
I ravelling north to South					Appro	x 180°		
Activity of platform/ves	sel (Operation/ac	tivity under w	av	Closes	t distan	icer	of animals
	(when animals	s first seen)	,	from pl	atform	ves	sel (metres)
Sparker survey in progre	SS	Var			(Record	l even il	fnot	operating)
		100				513		
	I							

Table 1. DATA FORM FOR COASTAL/MARINE WORKS - RECORD OF OPERATION/ACTIVITY

Platform name: Dulra Na mara Platform type: 12.5M Survey vessel Client: Irish Water Contractor: APEX GEO Services MMO: Anthony Irwin

Complete this form every time the sound-producing operation or activity (e.g., drilling, pile driving, blasting) occurs including overnight, whether for testing, full operation or any other purpose.

		Sound-producing			Pre-St	tart Monitorir	ng effort for n	Action necessary					
		oper	ation or act	tivity		-			_				
Type of	Date	Time when	Time when	Time when	Who carried	Start time of	End time of	Reason for	Were	Were marine	If Yes, give	If marine	
operation or		ramp-	equipment	equipment	out the	monitoring	monitoring	non-detection	hydro-	mammals	time when	mammals were	
activity		up/soft-	reached	stopped or	monitoring	for marine	for marine	of marine	phones	present in	marine	present, what	
		start began	full power	shut down	for marine	mammals	mammals	mammals?	used?	the 30/60	mammals	action was taken?	
		[if any]			mammals?	[Pre-start-up]				mins before	were last	(
Dredging, Drilling,			(0.47/1/70)		(1,1,					start-up?	seen	(e.g., delay ramp-	
Pile driving,	(dd/mm/yyyy)	(GMT/UTC)	(GMT/UTC)	(GMT/UTC)	(Job Title)	(GMT/UTC)	(GMT/UTC)	(e.g. sea state,	(Yes/No)	(Yes/No)	(GMT/UTC)	full start-up)	
other								poor light for					
								rain, etc.)					
Sparker	06/03/17	16:20	16:35	18:50	Anthony	15:50	16:20	None present	no	no	n/a	n/a	
Survey					Irwin								
Sparker	07/03/17	09:30	09:15	12:10	Anthony	09:00	09:30	None present	no	no	n/a	n/a	
Survey					Irwin								
Sparker	08/03/17	09:30	09:45	18:00	Anthony	09:00	09:30	None present	no	no	n/a	n/a	
Survey					Irwin								
Sparker	09/03/17	11:30	11:50	19;00	Anthony	11:00	11:30	None present	no	no	n/a	n/a	
Survey					Irwin								
MASW	10/03/17	11:15	11:30	17:00	Anthony	10:45	11:15	None present	no	no	n/a	n/a	
				17.07	irwin							,	
MASW	11/03/17	09:35	09:50	17:27	Anthony	08:05	09:35	None present	no	no	n/a	n/a	
N44 0)4/	40/00/47	00.00		40.55	Irwin	00.00	00.00	NI			- /-		
MASW	12/03/17	09:00	09:30	16:55	Antnony	08:30	09:00	None present	no	no	n/a	n/a	
	12/02/17	00:00	00:15	17:20		08.20	00.00	Nono procent			n/o	n/o	
IVIASVV	13/03/17	09.00	09.15	17.20	Irwin	00.30	09.00	home present	no	no	n/a	11/a	
MASW	14/03/17	09.00	09.15	18.10	Anthony	08:30	09.00	None present	no	no	n/a	n/a	
	17,00,11	00.00	00.10	10.10	irwin	00.00	00.00			110	17/4	174	

MASW	15/03/17	09:10	09:25	17:20	Anthony	08:30	09:00	None present	no	no	n/a	n/a
					Irwin							
MASW	16/03/17	09:15	09:25	16:40	Anthony	08:30	09:00	None present	no	no	n/a	n/a
					Irwin			-				
MASW	17/03/17	DEMOB	DEMOB	DEMOB	Anthony	DEMOB	DEMOB	None present	no	no	n/a	n/a
					irwin			-				

Table 2. DATA FORM FOR COASTAL/MARINE WORKS – RECORD OF MONITORING EFFORT

Location Arklow Co Wicklow Platform name: Dulra na mara Platform 12.5 m Surver Vessel type: 5m platform Client: Irish Water MMO(s): Anthony Irwin

Please record the following information every day (as many lines per day as you wish), even if no marine mammals are seen.

Type of operation or activity Dredging, Drilling, Pile driving, Blasting, other	Date (dd/mm/yyyy)	Marine Mammal Observer (name/initials)		Time you stopped monitoring for marine mammals (GMT/UTC)	Duration of monitoring watch (minutes)	Duration of the sound-producing operation/activity while you were monitoring for marine mammals (minutes)	Start Lat/Long position (if static/moving)	End Lat/Long position (if moving)	Wind direction & Beaufort wind force (e.g., SW 2)	Sea State (WMO) (0 to 9)	Swell height Choose from: 0 = no Swell L = 0-1 m M = 1-2 m H = 2+ m	Visibility Choose from: P = < 1 km M = 1-5 km G = 5-10 km H = >10 km
Sparker Survey	06/03/17	Anthony Irwin	15:50	16:20	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W.	n/a	W/F4	1	No Swell	10km
Sparker Survey	07/03/17	Anthony Irwin	09:00	09:30	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	W/F4/5/6	3	1/2M	5/10km
Sparker Survey	08/03/17	Anthony Irwin	09:00	09:30	30	<1	Daily pre start watch position 52°47'.884N 006*07'.145W	n/a	SW/F3	1	0.5M	5-1010km
Sparker Survey	09/03/17	Anthony Irwin	11:00	11:30	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	S/F4/5	3	1M	5-10km
MASW	10/03/17	Anthony Irwin	10:45	11;15	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	SSW/4/6	4	1.5M	1-5km

MASW	11/03/17	Anthony Irwin	08:05	09:35	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	W/F1/3	1	0.5M	1.5km
MASW	12/03/17	Anthony Irwin	08:30	09:00	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	WNW/F4/5	3	0.5	>10km
MASW	13/03/17	Anthony Irwin	08:30	09:00	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	Wsw/F1	2	0.5	>10km
MASW	14/03/17	Anthony Irwin	08:30	09:00	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	W/SWF3	2	0.5	>10km
MASW	15/03/17	Anthony Irwin	08:30	09:00	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	S/SWF2	2	0.5	>10km
MASW	16/03/17	Anthony Irwin	08:30	09:00	30	<1	Daily pre start watch position 52°47'.884N 006°07'.145W	n/a	SWF3	2	0.5	>10km