HAYES HIGGINS PARTNERSHIP
CHARTERED ENGINEERS • PROJECT MANAGERS

Civil Engineering Services Report

For

Residential Housing Development at Blackglen Road

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Revision	Status	Author	Reviewed By	Approved By	Issue Dates
P	Planning	PN	LM	DH	August 2024

1. Introduction

Hayes Higgins Partnership has been commissioned to prepare a Civil Engineering Services Report for the proposed residential housing development at Blackglen Road.

This report was compiled after reviewing the available information on drainage and water supply, reviewing the OPW flood maps and other available information from public bodies. It contains information on the design of the surface water and foul drainage systems to be constructed for the proposed development.

The design of both the surface water and foul drainage systems has been carried out in accordance with the following:

- The Greater Dublin Regional Code of Practice for Drainage Works
- Technical Guidance Document H of the Building Regulations
- The Greater Dublin Strategic Drainage Study (GDSDS)
- DOE Recommendations for Site Development Works for Housing Areas
- BS 8301:1985, Code of practice for Building Drainage
- BS EN 752 External building drainage
- OPW The Planning System and Flood Risk Management
- Uisce Éireann Code of Practice and Standard Details (Water & Wastewater)
- South Dublin County Council Sustainable Drainage Explanatory Design & Evaluation Guide 2022
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas
- The SuDS Manual (C753)
- DMURS – Design Manual for Urban Roads and Streets

The proposed surface water drainage system is a combination of SuDs mechanisms including permeable surfaces, rain gardens / landscaped areas, green roofing and gravity feed drainage systems discharging to attenuation system. The permeable roadway and parking spaces will be used as a stone storage attenuation area also. Surface water run-off will be dealt with on the site and a connection to the public system is provided via hydrobrake. The surface water system is designed to take the runoff generated by a 1 in 100 year storm event (+30%).

The foul drainage system for the proposed development is a gravity feed system within the site, two separate connections to the existing foul line on Blackglen Road will be provided.

There will be a full separation of the foul and surface systems within the site.

2. Proposed Site

The site in question is located at Blackglen Road, Sandyford, County Dublin. The existing site is a greenfield site. The proposed site measures approximately 2.8ha. The site is bound by Blackglen Road to the South, a forestry area to the North and East. There is a large building located to the West of the site. The topography of the site shows that the site slopes off in a south-easterly direction. Proposed on the site are 129 apartments with associated facilities and 138 parking spaces.

The site will be accessed from a new entrance in the south located on Blackglen Road, refer to Appendix A for Sightlines drawing and Swept Path Analysis drawing. A swept path analysis has been undertaken as part of this planning submission and has demonstrated that the proposed site entrance and internal layout can appropriately accommodate the manoeuvring and circulation of fire truck vehicles. The road layout has been reviewed by the Road Audit Safety team and all recommendations have been accepted, see attached Appendix I.

3. Surface Water Drainage

Local Authorities require that all developments include a sustainable urban drainage system, SuDS. A combination of SuDS mechanisms will be utilised on this site. Having undertaken a detailed review of the current site (including site investigations), the surrounding areas and the proposed development a detailed surface drainage strategy has been developed in accordance with all current SuDS guidelines. All possible SuDs mechanisms have been explored, refer to the justification matrix for SuDs in Appendix G. The site investigation confirmed the site not suitable for infiltration and as such the permeable surfacing will be used as an attenuation system. The surface water generated on site will be attenuated via the porous surface and a modular system, both will be connected to the public system via a hydrobrake.

SuDS measures to be utilised on this site include;

- Permeable surfacing – will be used within the parking areas and roadways. This will allow some limited natural infiltration and also attenuation storage. These areas have been suitably sized to stone surface water from the surrounding areas
- Rain gardens / planting – will allow limited natural infiltration. This has not been taken into account in the surface water calculations but will contribute positively to the overall surface water strategy for the site.
- Green Roofs – a green roof will be utilized on three-unit apartment blocks. Green factor of 0.6 was used for these roof areas within the design thus reducing overall hard standing area pertaining to the roofs. Apartment units 19, 20, 43-46 and 75 contain the green roof.
- Modular attenuation system – will be used to compliment the above measures and ensure the outflow from site is restricted to greenfield run off rates.

To alleviate any possible risk of flood the on-site surface water system is designed for a 1 in 100-year storm (+30%). A 30% increase in runoff due to global warming is included. Site specific MET Eireann Rainfall data has been used in the surface water drainage and attenuation design. There will be a complete separation of the foul and surface water drainage systems within the site, both in respect of installation and use. The surface water drains are designed in accordance with BS EN 752, Code of Practice for Drainage Outside Buildings.

Refer to Appendix A for the Storm Water Layout and Appendix C for the surface water calculations.

4. Foul Water Drainage

The foul drainage system has been designed in accordance with Uisce Éireann Code of Practice and Standard Details for Wastewater, BS 8301:1985, Code of Practice for Building Drainage and the current Building Regulations and Irish Water Code of Practice.

The foul drainage system for the development is a gravity feed system falling to an existing foul line on Blackglen road. The main foul sewers in the proposed development are to consist of 150mm diameter uPVC pipe and 225mm diameter uPVC pipes with required fall designed throughout to minimise the risk of blockages and to aid maintenance. The development will not result in a significant increase in foul discharge from the site on the public system. A roughness coefficient (ks) of 0.6mm is applied to the design of all pipes. Given the gradient and layout of the site two connections to the exiting line will be provided.

A Pre-Connection Enquiry form was submitted to Uisce Éireann on 4th April 2024 nominating the proposed post-development wastewater demand. A Confirmation of Feasibility letter reflecting same for the development was received from Uisce Éireann on 6th of June (Uisce Éireann Ref Number: CDS23003485), refer to letter contained in Appendix F. Uisce Éireann have confirmed the development is feasible without upgrade by Uisce Éireann. Details of the proposed foul sewer system for this site are shown in Hayes Higgins Partnership drawing within Appendix A. Calculations are provided within Appendix D.

5. Water Supply System

There is an existing 200mm diameter water main on Blackglen Road south of the site. Given the site layout two connections from this line will be provided to serve the site. On site looped 100mm diameter HDPE watermain to suit the layout will be installed.

In accordance with requirements air valves and scour valves will be provided around the site as necessary. Hydrants will be provided as directed by the Fire Safety Certificate and Technical Guidance Document B of the Building Regulations 2006. Water saving devices including aerated taps and low water usage appliances will be used in the proposed development in accordance with best practice. The water supply

system has been designed and will be installed in accordance with Uisce Éireann Code of Practice and Standard Details for Water.

The proposed watermain layout and details are shown on Hayes Higgins Partnership drawing within Appendix A.

A Pre-Connection Enquiry form was submitted to Uisce Éireann on 4th April 2024 nominating the proposed post-development water demand. A Confirmation of Feasibility letter reflecting same for the development was received from Uisce Éireann on 6th of June (Uisce Éireann Ref Number: CDS23003485), refer to letter contained in Appendix F. Uisce Éireann have confirmed the development is feasible without upgrade by Irish Water.

6. Flood Risk Assessment

A stage 1 desktop flood risk assessment was undertaken to identify possible sources of flooding, and the risk posed to the development, and separately the risk posed to surrounding areas because of the development. The site is situated far enough away from the sea not to be subjected to coastal or fluvial flooding. Site is sloping from the north to south and from the west to east.

External Sources

The OPW flood mapping website, www.floodmaps.ie has been reviewed.

From the information contained in this report it is evident that the site has not been subjected to flooding during previously reported flooding events. As such it is reasonable to assume there is no risk to the proposed development resulting from flooding off-site.

Internal sources

It is intended that all surface water run off generated by the 1in100 year storm will be dealt with via the attenuation tank. An allowance has been made for a 30% increase in runoff due to global warming, as per the "Greater Dublin Strategic Drainage Study" recommendations.

Due to all these factors the risk of flooding is minimal.

7. Services Design Summary

The proposed Surface water drainage system has been set up to ensure that adequate self-cleansing velocities are obtained, in accordance with the Building Regulations, and to comply fully with the Greater Dublin Regional Code of Practice for Drainage Works. The SuDS design for the site is in compliance with current guidelines. Similarly, the proposed Foul drainage system has been set up to ensure that adequate

self-cleansing velocities are obtained for partial flows under design loading, in accordance with the Building Regulations and Uisce Éireann Code of Practice and Standard Details for Water & Wastewater.

Appendix A – Proposed Layout Drawings

DRAWING / DOCUMENT REGISTER AND ISSUE SHEET

Sheet No. 1

Project No.	23D059
Project Name	125 APARTMENTS AT BLACKGLEN ROAD
Day	12
Month	08
Year	24

Drg No.	Drawing / Document Name	Format	R.C. Sched. Sheets	Drawing Revisions
01	Proposed Site Layout	A1		P
02	Proposed Drainage Layout	A1		P
03	Proposed Watermain Layout	A1		P
04A	Irish Water Foul & Surface Drainage Details - Sheet 1	A1		P
04B	Irish Water Foul & Surface Drainage Details - Sheet 2	A1		P
04C	Irish Water Foul & Surface Drainage Details - Sheet 3	A1		P
04D	Irish Water Foul & Surface Drainage Details - Sheet 4	A1		P
05A	Irish Water Watermain Details - Sheet 1	A1		P
05B	Irish Water Watermain Details - Sheet 2	A1		P
05C	Irish Water Watermain Details - Sheet 3	A1		P
05D	Irish Water Watermain Details - Sheet 4	A1		P
06	Proposed Road Details	A1		P
07	Proposed Sight Line Layout	A1		P
08	Proposed Swept Path Analysis	A1		P
100	Typical Structural Floor Plan and Details (Apartments)	A1		
101	Typical Floor Plan and Details (Housing)	A1		
102	Typical Retaining Wall Sections Block B & C	A1		
103	Typical Retaining Wall Sections Block B & C	A1		

Distribution		Initials	Name	No. of copies
Client			DLRCC	1
Architect			JFOC Architects	1
Project Manager				
Quantity Surveyor				
Main Contractor	Head Office			
	Site			
Mech. / Elec. Engineer				
Structural Engineer				
Planning Authority				
Irish Water				
Fire Authority				
Construction Manager				
Tank Copy				

ISSUED FOR	P
DOCUMENT TYPE	EM
R.C SCHEDULE	

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Symbols Key

Issued For						Document Type			
Preliminary	A	Planning	P	Measurement	M	Prints	PR	Email	EM
Information	I	Tender	T	Construction	C	Disks	CD	Upload Share Drive	UP

NOTES

GENERAL

1.) THESE DRAWINGS TO BE READ IN CONJUNCTION WITH ALL RELEVANT HAYES HIGGINS ENGINEERING DRAWINGS AND SPECIFICATIONS.

2.) DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.

LEGEND

PROPOSED BOUNDARY

+135.00 PROPOSED LEVELS

REV	DATE	DESCRIPTION	DWG BY	APPR. BY
P	12.08.24	ISSUED FOR PLANNING	PN	LM

ISSUED: PLANNING

CLIENT: DÚN LAOGHAIRE COUNTY COUNCIL

PROJECT NAME: RESIDENTIAL HOUSING DEVELOPMENT AT BLACKGLEN ROAD

DRAWING NAME: PROPOSED SITE LAYOUT

PROJECT No.: 23D059

DRAWING No.: 01

REVISION: P

SCALE: 1:500

DRAWN DATE: 25.03.24

CAD DRAWN BY: F.S.

CHECKED BY: L.M.

APPROVED BY: D.H.

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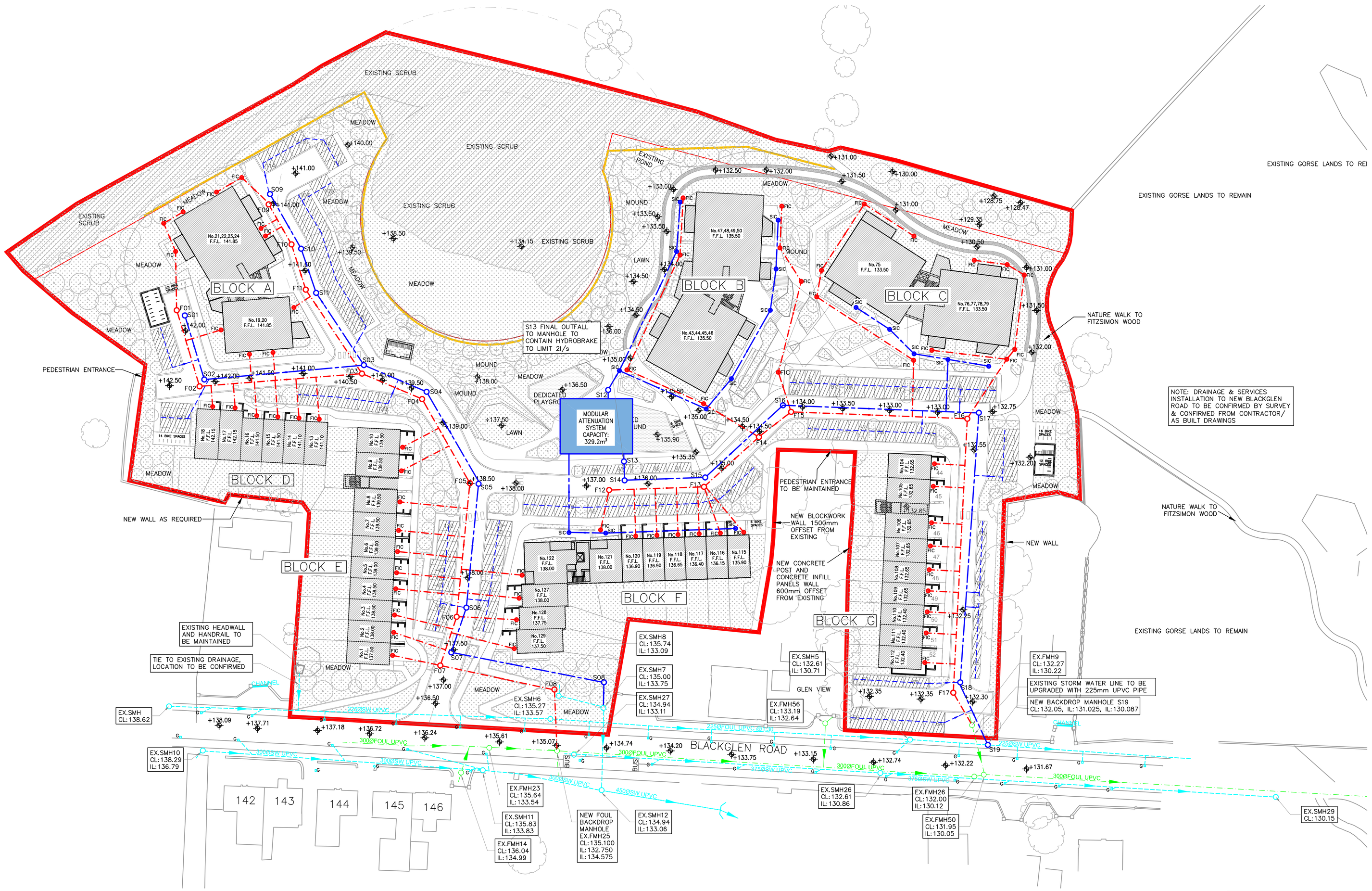
A1



NOTES

GENERAL

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DRAINAGE

3. ALL DRAINAGE WORKS ARE TO BE DESIGNED TO DÚN LAOGHAIRE COUNTY COUNCIL TAKING IN CHARGE STANDARDS. PLEASE CONSULT WITH WCC WATER SERVICES DEPARTMENT.
4. ALL WASTEWATER INFRASTRUCTURE TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH IRISH WATERS REQUIREMENTS & THEIR STANDARD DETAILS JULY 2020 (REVISION 2); IW-CDS-5030-01.
5. ALL DRAINAGE WORK TO BE CARRIED OUT IN ACCORDANCE WITH "DÚN LAOGHAIRE COUNTY DEVELOPMENT PLAN 2022-2028".
6. ALL DRAINAGE CONNECTIONS FROM BUILDINGS TO CONFORM TO THE BUILDING REGULATIONS 2010, PART H.
7. THE SURFACE/STORM WATER DRAINAGE TO CONSIST OF A SUSTAINABLE URBAN DRAINAGE (SUDS) TREATMENT MANAGEMENT TRAIN APPROACH, REFER TO THE CIRIA SUDS MANUAL & WWW.IRISHSUDS.COM. THE CONTRACTORS DESIGN TEAM TO FORWARD THE SUDS TREATMENT STRATEGY FOR APPROVAL TO DÚN LAOGHAIRE COUNTY COUNCIL WATER SERVICES DEPARTMENT.
8. CLASS E BEDDING TO ALL PIPES WITH COVER GREATER THAN 1.2m UNDER ROAD & 0.9m UNDER OTHER AREAS.
9. LADDERS ARE REQUIRED IN MANHOLES WHERE DEPTH FROM COVER LEVEL EXCEEDS 2.5m.
10. ALL ABANDONED PIPE RUNS AND MANHOLES TO BE BROKEN OUT AND BACKFILLED WITH 15/20N LEAN MIX CONCRETE.
11. ROAD GULLIES TO BE PROVIDED ALONG THE CARRIAGEWAY AT APPROPRIATE INTERVALS TO BE DESIGNED BY THE CONTRACTORS DESIGN TEAM.
12. ALL ROAD GULLIES AND MANHOLES COVERS TO EN 124 D400 IN ROADS AND B125 IN ALL OTHER PAVED AREAS, FOOTWAYS AND LANDSCAPED AREAS.
13. ALL PROPOSED SEWERS SHALL BE CLEANED, CCTV SURVEYED AND TESTED IN ACCORDANCE WITH DÚN LAOGHAIRE COUNTY COUNCIL'S "REQUIREMENTS FOR THE CONNECTION TO PUBLIC SEWERS". DLCC SHALL BE GIVEN THE OPPORTUNITY TO WITNESS THE TESTING.
14. THE CONTRACTOR ON COMPLETION SHALL PROVIDE AS CONSTRUCTED DRAWINGS OF INSTALLED DRAINAGE GIVING DETAILS OF TESTING RESULTS AND RE-TESTING IF NECESSARY.
15. CONTRACTOR TO REFER TO SERVICE/UTILITY PROVIDER FOR FURTHER SPECIFICATIONS & DETAILS ON COVER & SEPARATION DISTANCES TO SERVICES.
16. ALL UNITS TO HAVE FOUL INSPECTION CHAMBER AND CONNECTION TO MAIN FOUL LINE AND SURFACE WATER SYSTEM.
17. ALLOW FOR 30 No. ROAD GULLIES AND CONNECTION TO SURFACE LINE.

FOUL SEWER DRAINAGE TABLE

MANHOLE	COVER LEVEL	INVERT LEVEL	MH – MH	PIPE DIA.	MIN. PIPE GRAD.	MATERIAL
F01	141.986	139.480	F01–F02	150mm	1:60	uPVC
F02	142.148	139.198	F02–F03(BC)	150mm	1:60	uPVC
F03(BC)	140.295	138.545	–	–	–	–
F03(BC)	140.295	136.515	F03(BC)–F04	225mm	1:100	uPVC
F04	139.319	136.371	F04–F05	225mm	1:100	uPVC
F05	138.451	136.151	F05–F06	225mm	1:100	uPVC
F06	137.697	135.841	F06–F07(BC)	225mm	1:100	uPVC
F07(BC)	137.155	135.730	–	–	–	–
F07(BC)	137.155	134.776	F07(BC)–F08	225mm	1:200	uPVC
F08	136.000	134.642	F08–EX.FMH25(BC)	225mm	1:200	uPVC
EX.FMH25(BC)	135.100	134.575	–	–	–	–
F09	140.970	139.070	F09–F10	150mm	1:60	uPVC
F10	141.331	138.906	F10–F11	150mm	1:60	uPVC
F11	141.405	138.736	F11–F03(BC)	150mm	1:60	uPVC
F03(BC)	140.295	138.686	–	–	–	–

FOUL SEWER DRAINAGE TABLE

MANHOLE	COVER LEVEL	INVERT LEVEL	MH – MH	PIPE DIA.	MIN. PIPE GRAD.	MATERIAL
F12	136.610	133.642	F12–13	150mm	1:60	uPVC
F13	135.279	133.282	F13–F14(BC)	150mm	1:150	uPVC
F14(BC)	134.522	133.172	–	–	–	–
F14(BC)	134.480	130.913	F14(BC)–F15	150mm	1:150	uPVC
F15	134.087	130.855	F15–F16	150mm	1:150	uPVC
F16	132.716	130.582	F16–F17	225mm	1:200	uPVC
F17	132.191	130.259	F17–EX.FMH9	225mm	1:200	uPVC
EX.FMH9	132.270	130.220	–	–	–	–

STORM WATER DRAINAGE TABLE

MANHOLE	COVER LEVEL	INVERT LEVEL	MH – MH	PIPE DIA.	MIN. PIPE GRAD.	MATERIAL
S01	141.975	139.697	S01–S02	225mm	1:200	uPVC
S02	142.151	139.532	S02–S03(BC)	225mm	1:200	uPVC
S03(BC)	140.536	139.511	–	–	–	–
S03(BC)	140.536	136.611	S03(BC)–S04	225mm	1:200	uPVC
S04	139.320	136.535	S04–S05	225mm	1:200	uPVC
S05	138.404	136.414	S05–S06	225mm	1:200	uPVC
S06	137.784	136.271	S06–S07(BC)	225mm	1:200	uPVC
S07(BC)	137.440	136.221	–	–	–	–
S07(BC)	137.440	134.048	S07(BC)–S08	225mm	1:200	uPVC
S08	136.000	133.958	S08–EX.SMH7	225mm	1:200	uPVC
EX.SMH7	135.000	133.750	–	–	–	–
S09	140.993	139.499	S09–S10	225mm	1:200	uPVC
S10	141.403	139.368	S10–S11	225mm	1:200	uPVC
S11	141.352	139.172	S11–S03(BC)	225mm	1:200	uPVC
S03(BC)	140.536	139.111	–	–	–	–

STORM WATER DRAINAGE TABLE

MANHOLE	COVER LEVEL	INVERT LEVEL	MH – MH	PIPE DIA.	MIN. PIPE GRAD.	MATERIAL
S12	136.020	133.295	S12–ATT	225mm	1:200	uPVC
ATT	136.500	133.288	–	–	–	–
ATT	136.500	133.088	ATT–S13	225mm	1:200	uPVC
S13	136.650	133.081	S13–S14	225mm	1:200	uPVC
S14	136.362	133.065	S14–S15	225mm	1:200	uPVC
S15	135.242	132.974	S15–S16(BC)	225mm	1:200	uPVC
S16(BC)	134.152	132.850	–	–	–	–
S16(BC)	134.152	131.122	S16(BC)–S17	225mm	1:200	uPVC
S17	132.647	131.093	S17–S18	225mm	1:200	uPVC
S18	132.293	131.077	S18–S19(BC)	225mm	1:200	uPVC
S19(BC)	132.050	131.025	–	–	–	–

DRAINAGE LEGEND

- EXISTING SURFACE WATER SEWER
- EXISTING FOUL SEWER
- PROPOSED SURFACE WATER SEWER (UPVC)
- PROPOSED FOUL SEWER (UPVC)
- PERFORATED 225mm PIPE (UPVC)
- EX.SMH — EXISTING SURFACE WATER MANHOLE
- EX.FMH — EXISTING FOUL WATER MANHOLE
- S02 — PROPOSED SURFACE WATER MANHOLE
- F02 — PROPOSED FOUL MANHOLE
- EXISTING HEADWELL
- GY — PROPOSED SURFACE WATER GULLY
- SIC — PROPOSED SURFACE INSPECTION CHAMBER
- FIC — PROPOSED FOUL INSPECTION CHAMBER
- +135.00 — PROPOSED LEVELS

REV	DATE	DESCRIPTION	DWG BY	APPR. BY
P	12.08.24	ISSUED FOR PLANNING	PN	LM

ISSUED: PLANNING

CLIENT: DÚN LAOGHAIRE COUNTY COUNCIL

PROJECT NAME: RESIDENTIAL HOUSING DEVELOPMENT AT BLACKGLEN ROAD

DRAWING NAME: PROPOSED DRAINAGE LAYOUT

PROJECT No.: 23D059

DRAWING No.: 02

REVISION: P

SCALE: 1:500

DRAWN DATE: 27.03.24

CAD DRAWN BY	CHECKED BY	APPROVED BY
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LEGEND

- PROPOSED 100mm ø HDPE WATERMAIN
- EXISTING WATERMAIN
- SV — NEW SLUICE VALVE
- H — NEW HYDRANT
- BM — BULK METER
- TB — THRUST BLOCK
- Sc.V. — SCOUR VALVE IN ACCORDANCE WITH SECTION 3.16.4 OF I.W CODE OF PRACTICE
- AV — ONLINE AIR VALVE IN ACCORDANCE WITH SECTION 3.16.6 OF I.W CODE OF PRACTICE

NOTES

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WATERMAIN

1. ALL WATERMAINS AND SUPPLY SHOULD BE CONSTRUCTED TO IRISH WATER REQUIREMENTS AND IN ACCORDANCE WITH IRISH WATER CONNECTIONS & DEVELOPER SERVICES WATER INFRASTRUCTURE STANDARD DETAILS IW-CDS-5020-03 JULY 2020.
2. THE CONTRACTOR SHOULD CONFIRM THE LOCATIONS OF ALL EXISTING WATERMAIN INFRASTRUCTURE ON SITE AND REPORT TO THE ENGINEER.
3. WATERMAIN PIPES SHOULD HAVE A MINIMUM NOMINAL PRESSURE CLASSIFICATION OF 10 BAR. MOPVC PRESSURE PIPES SHALL CONFORM TO UK WATER INDUSTRY SPECIFICATION NO 4-31-08 OR EQUIVALENT. MANUFACTURERS SHALL OPERATE A QUALITY SYSTEM IN COMPLIANCE WITH BS 5750 PART 2 (EN29002).
4. WATERMAIN PIPES SHOULD HAVE A MINIMUM COVER OF 900mm. PROPOSED WATERMAIN IN THE FOOTPATH TO BE 750mm FROM KERB (ACCORDING TO IRISH WATER STANDARD DETAILS: STD-W-11)
5. AN APPROVED MARKER TAPE CONTAINING A TRACER WIRE SHOULD BE AFFIXED TO THE TOP SURFACE OF ALL WATERMAINS
6. CONCRETE THRUST BLOCKS SHOULD BE PROVIDED ON WATERMAINS AT DEAD ENDS, TEES, BENDS OF CURVATURE GREATER THAN 22 ½° AND AT BOTH SIDES OF A SLUICE VALVE CHAMBER. ANCHOR BLOCKS SHOULD ENCASE THE PIPE IN CONCRETE (CLASS E, CLAUSE 1502, SPECIFICATION FOR ROADWORKS) TO A MINIMUM THICKNESS OF 150mm ALL ROUND AND SHOULD BE A MINIMUM LENGTH OF 750mm
7. SLUICE VALVES SHOULD COMPLY WITH THE REQUIREMENTS OF BS 5163. THE DEPTH OF THE SLUICE VALVE SPINDLE CAP BELOW FINISHED GROUND LEVEL SHOULD NOT EXCEED 300mm
8. HYDRANTS SHOULD BE OF THE MALE THREAD SCREW DOWN TYPE IN COMPLIANCE WITH THE REQUIREMENTS OF BS 750. HYDRANT OUTLETS SHOULD COMPLY WITH THE CHIEF FIRE OFFICERS REQUIREMENTS. THE DEPTH OF THE HYDRANT OUTLET BELOW FINISHED GROUND LEVEL SHOULD NOT EXCEED 200mm
9. SCOUR VALVES TO BE LOCATED AT LOW POINTS AND AIR VALVES AT HIGH POINTS ALONG THE VERTICAL PROFILE OF THE WATERMAIN. CONTRACTOR TO AGREE SPECIFICATION FOR VALVES WITH WICKLOW COUNTY COUNCIL.
10. CONTRACTOR TO ALLOW FOR ROAD OPENING UP LICENCE FOR WORKS IN PUBLIC ROAD, WHERE NECESSARY.
11. WATERMAIN CONNECTION TO BE MADE FROM EACH HOUSE DIRECTLY WITH WATER METER.

EXISTING SCRUB
MEADOW
EXISTING POND
MOUND
LAWN
DEDICATED PLAYGROUND
BLOCK A
BLOCK B
BLOCK C
BLOCK D
BLOCK E
BLOCK F
BLOCK G
No.21,22,23,24 F.F.L. 141.85
No.19,20 F.F.L. 141.85
No.47,48,49,50 F.F.L. 135.50
No.43,44,45,46 F.F.L. 135.50
No.75 F.F.L. 133.50
No.76,77,78,79 F.F.L. 133.50
No.18 F.F.L. 142.15
No.17 F.F.L. 142.15
No.16 F.F.L. 141.50
No.15 F.F.L. 141.50
No.14 F.F.L. 141.10
No.13 F.F.L. 141.10
No.10 F.F.L. 139.50
No.9 F.F.L. 139.50
No.8 F.F.L. 139.50
No.7 F.F.L. 139.50
No.6 F.F.L. 139.00
No.5 F.F.L. 139.00
No.4 F.F.L. 138.50
No.3 F.F.L. 138.50
No.2 F.F.L. 138.00
No.1 F.F.L. 137.50
No.122 F.F.L. 138.00
No.121 F.F.L. 138.00
No.120 F.F.L. 136.90
No.119 F.F.L. 136.90
No.118 F.F.L. 136.65
No.117 F.F.L. 136.40
No.116 F.F.L. 136.15
No.115 F.F.L. 135.90
No.127 F.F.L. 138.00
No.128 F.F.L. 137.75
No.129 F.F.L. 137.50
No.104 F.F.L. 132.65
No.105 F.F.L. 132.65
No.106 F.F.L. 132.65
No.107 F.F.L. 132.65
No.108 F.F.L. 132.65
No.110 F.F.L. 132.40
No.111 F.F.L. 132.40
No.112 F.F.L. 132.40
14 BNC SPACES
8 BNC SPACES
16 BNC SPACES
12 BNC SPACES
PEDESTRIAN ENTRANCE
PEDESTRIAN ENTRANCE TO BE MAINTAINED
NEW WALL AS REQUIRED
NEW BLOCKWORK WALL 1500mm OFFSET FROM EXISTING
NEW CONCRETE POST AND CONCRETE INFILL PANELS WALL 600mm OFFSET FROM EXISTING
NEW WALL
EXISTING GORSE LANDS TO REMAIN
NATURE WALK TO FITZSIMON WOOD
GLEN VIEW
EXISTING WATERMAIN
BLACKGLEN ROAD
BUS
142 143 144 145 146

REV	DATE	DESCRIPTION	DWG BY	APPR. BY
P	12.08.24	ISSUED FOR PLANNING	PN	LM

ISSUED: PLANNING

CLIENT: DÚN LAOGHAIRE COUNTY COUNCIL

PROJECT NAME: RESIDENTIAL HOUSING DEVELOPMENT AT BLACKGLEN ROAD

DRAWING NAME: PROPOSED WATERMAIN LAYOUT

PROJECT No.: 23D059

DRAWING No.	REVISION
03	P
SCALE: 1:500	DRAWN DATE: 25.03.24

CAD DRAWN BY	CHECKED BY	APPROVED BY
F.S.	L.M.	D.H.

HAYES HIGGINS PARTNERSHIP
The Glass House, 11 Coke Lane
Smithfield, Dublin 7. Tel: 01 6612321
E-mail: admin@hayeshiggins.ie
Gas House Lane, Kilkenny. Tel: (056) 7764710
Email: info@hhp.ie

A1

NOTES

GENERAL

1.) THESE DRAWINGS TO BE READ IN CONJUNCTION WITH ALL RELEVANT HAYES HIGGINS ENGINEERING DRAWINGS AND SPECIFICATIONS.

2.) DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.

LEGEND

+135.00	PROPOSED LEVELS
	SITE BOUNDARY
	BLISTER TACTILE PAVING IN ACCORDANCE WITH THE GUIDANCE ON THE USE OF TACTILE PAVING SURFACES DOCUMENT
STOP	(RUS 027) STOP SIGN
R.T.J.	ROAD TRANSVERSE JOINT

REV	DATE	DESCRIPTION	DWG BY	APPR. BY
P	12.08.24	ISSUED FOR PLANNING	PN	LM

ISSUED
PLANNING

CLIENT
DÚN LAOGHAIRE COUNTY COUNCIL

PROJECT NAME
RESIDENTIAL HOUSING DEVELOPMENT AT BLACKGLEN ROAD

DRAWING NAME
PROPOSED SIGHT LINE LAYOUT

PROJECT No.
23D059

DRAWING No.	REVISION
07	P

SCALE	DRAWN DATE
1:500	25.03.24

CAD DRAWN BY	CHECKED BY	APPROVED BY
F.S.	L.M.	D.H.

HAYES HIGGINS PARTNERSHIP
The Glass House, 11 Coke Lane
Smithfield, Dublin 7. Tel: 01 6612321
E-mail: admin@hayeshiggins.ie
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Email: info@hhp.ie

A1

NOTES

GENERAL

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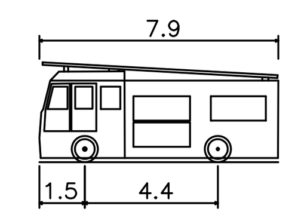
2.) DO NOT SCALE. USE FIGURED DIMENSIONS ONLY.



Pumping Appliance	
Overall Length	7.900m
Overall Width	2.500m
Overall Body Height	3.300m
Min Body Ground Clearance	0.140m
Track Width	2.500m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	7.750m

REV	DATE	DESCRIPTION	DWG BY	APPR. BY
P	12.08.24	ISSUED FOR PLANNING	PN	LM

ISSUED: PLANNING

CLIENT: DÚN LAOGHAIRE COUNTY COUNCIL

PROJECT NAME: 125 APARTMENTS AT BLACKGLEN ROAD

DRAWING NAME: PROPOSED SWEPT PATH ANALYSIS

PROJECT No.: 23D059

DRAWING No.: 08 | REVISION: P

SCALE: 1:500 | DRAWN DATE: 25.03.24

CAD DRAWN BY: F.S. | CHECKED BY: L.M. | APPROVED BY: D.H.

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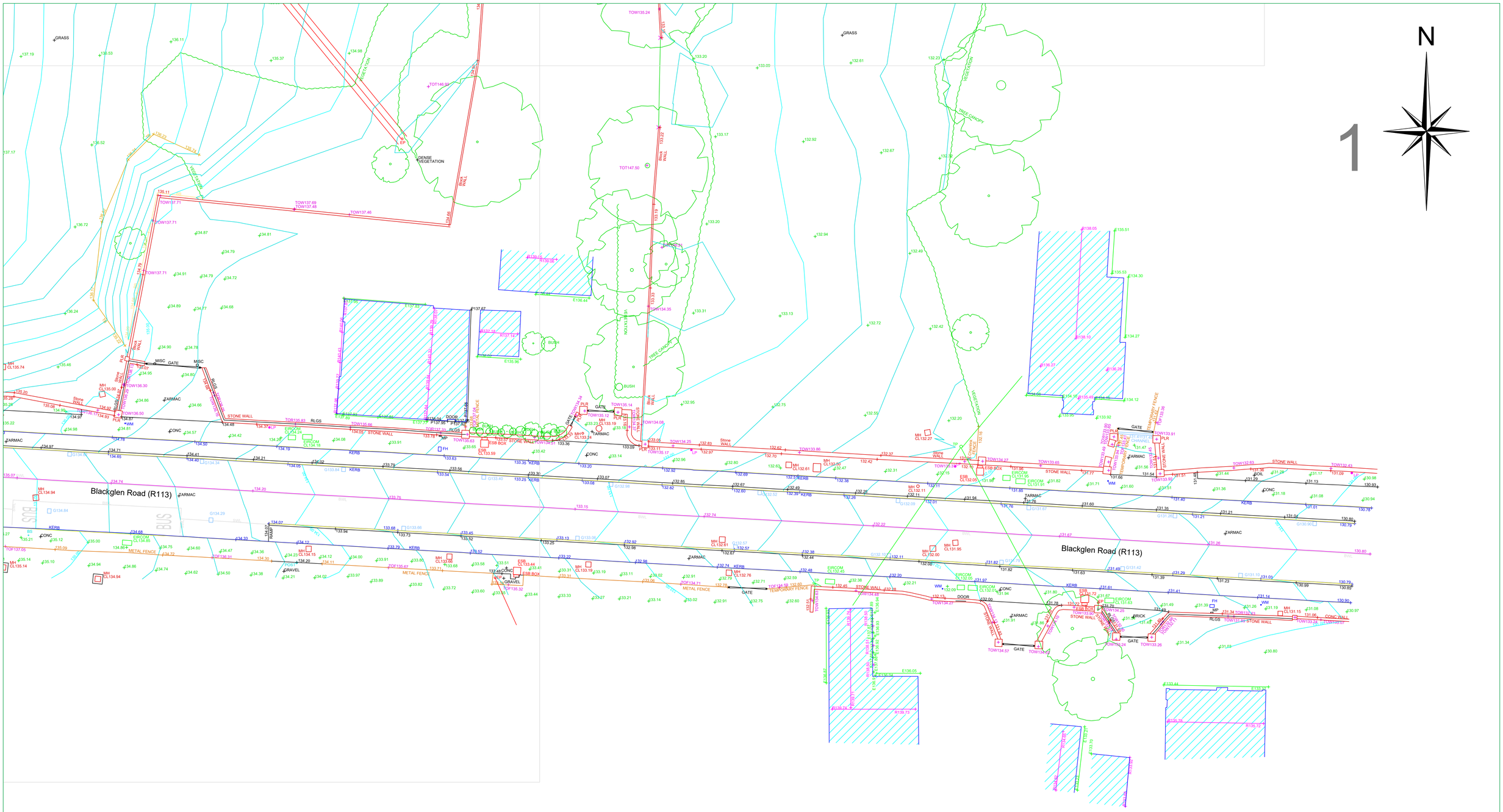
A1

Appendix B – Site Survey



APEX SURVEYS

www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

RURAL/NATURAL FEATURES :

- BUSH
- SAPLING
- TREE
- HEDGE
- TROUGH
- CATTLE GRID

LINEWORK:

EMBANKEMENT TOP	101.50
DRAIN	101.50
BREAKLINE	101.50
BUILDING	101.50
KERB BOTTOM	101.50
WALL	101.50
PATH/CHANGE SURFACE	101.50
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

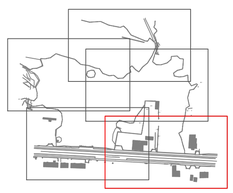
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

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Dunboyne, Co. Meath, Ireland
www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

CLIENT:

Hayes Higgins Partnership

PROJECT:

Blackglen Road, Dun Laoghaoire Co. Dublin

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE :	1/200 A1	DATE :	23/05/2024
DRG No:	6337	DESCRIPTION :	3D Topographical
		SURVEYED BY :	R.D. & S.E.
SHEET:	1 of 5	PROCESSED BY :	F.S.
		CHECKED BY :	A.B.

RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH TR
CATTLE GRID GRID

LINEWORK:

EMBANKEMENT TOP 101.50
DRAIN 101.50
BREAKLINE 101.50
BUILDING 101.50
KERB BOTTOM 101.50
WALL 101.50
PATH/CHANGE SURFACE 101.50
O/HEAD ELECTRICITY OE
O/HEAD TELECOM OT

STREET FURNITURE :

BOLLARDS BD
BORE HOLE BH
BUS STOP BS
CRASH BARRIER CB
ELECTRICITY POLE EP
EARTHING ROD ER
GATE
GROUND LIGHT LT
ILLUMINATED BOLLARD BOL
LAMP POST LP
MARKER POST MKR
POST POST
POST BOX POST BOX
ROADSIGN RS RS
SIGN POST SIGN
TELEPHONE BOX TB
TELEPHONE POLE TP
TRAFFIC LIGHT TL
TRIAL PIT TPIT

SERVICES :

AIR VALVE AV
ARMSTRONG JUNCTION AJ
CABLE TV IC CATV
COVER LEVEL CL
EIRCOM COVER EIRCOM
EIRCOM JUNCTION BOX EIRCOM BOX
ELECTRICAL CABLE PIT ECP
ESAT COVER ESAT
ESB COVER ESB
ESB JUNCTION BOX ESB BOX
FIRE HYDRANT FH
GAS VALVE GV
GULLY G
INSPECTION COVER IC
MANHOLE MH
SEPTIC TANK SEPTIC
SLUICE VALVE SV
STOPCOCK ST

SERVICES :

SERVICE BOX (UNKNOWN) BOX
TRAFFIC COVER TLIC
VENT VENT
WATER METER WM
UNABLE TO LIFT UTO

LEVELS :

BED LEVEL BED101.50
EAVE LEVEL E101.50
FLOOR LEVEL FL101.50
INVERT LEVEL IL101.50
ROAD LEVEL 101.50
RIDGE LEVEL R101.50
SOFFIT LEVEL SL101.50
SPOT LEVEL 101.50
TOP OF FENCE LEVEL TOF101.50
TOP OF WALL LEVEL TOW101.50
WATER LEVEL WL101.50
SURVEY CONTROL STATION

SHEET LAYOUT :

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PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

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Dunboyne, Co. Meath, Ireland
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info@apexsurveys.ie
00353 1 691 0156

CLIENT:
Hayes Higgins Partnership

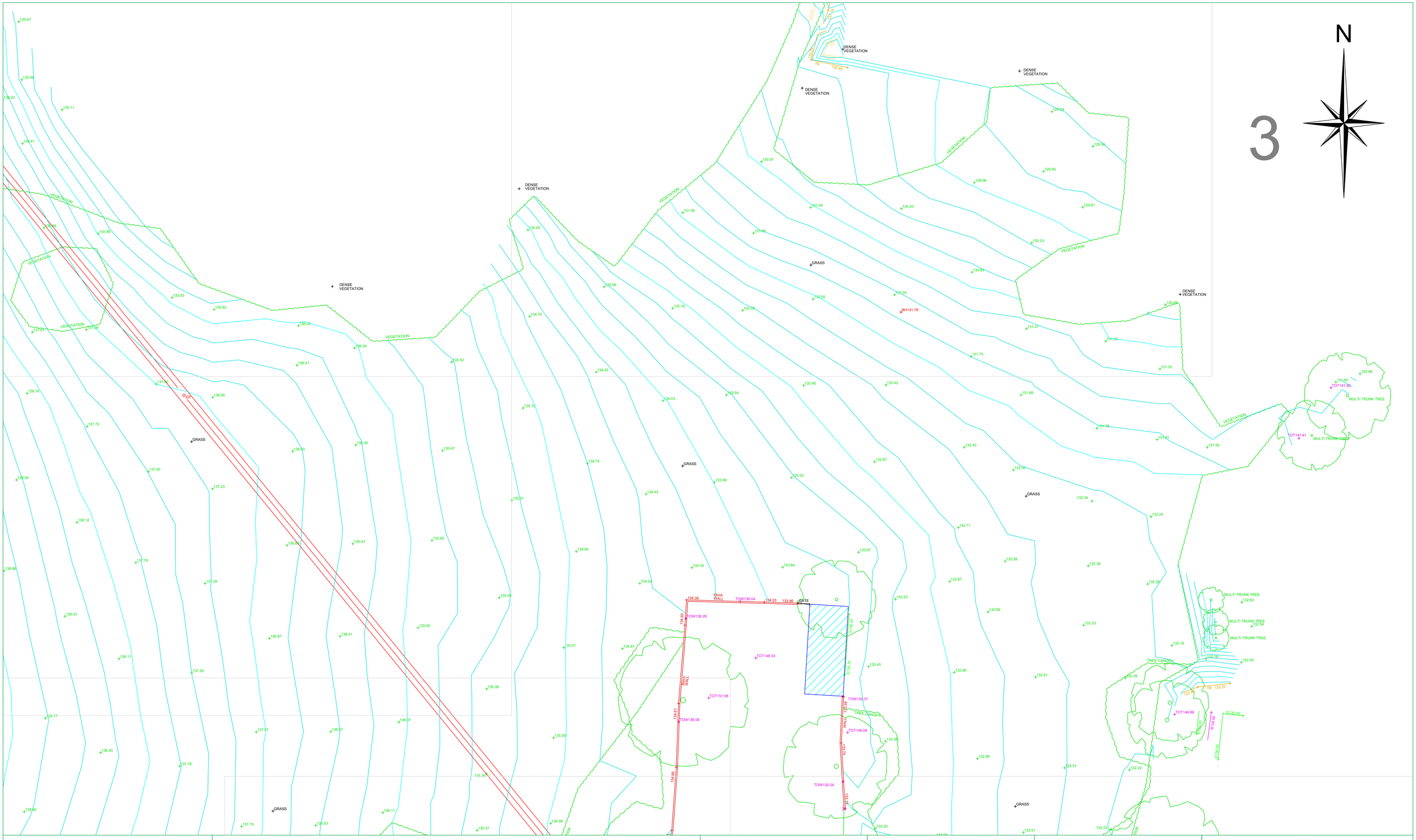
PROJECT:
Blackglen Road, Dun Laoghaoire Co. Dublin

GRID SYSTEM: Irish Transverse Mercator
DATUM: Malin Head (OSGM15)
NOTES: Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE : 1/200 A1
DATE : 23/05/2024
DRG No: 6337
DESCRIPTION : 3D Topographical
SURVEYED BY : R.D. & S.E.
PROCESSED BY : F.S.
SHEET: 2 of 5
CHECKED BY : A.B.



APEX SURVEYS

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00353 1 691 0156

RURAL/NATURAL FEATURES :

BUSH
SAPLING
TREE
HEDGE
TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP
DRAIN
BREAKLINE
BUILDING
KERB BOTTOM
WALL
PATH/CHANGE SURFACE
O/HEAD ELECTRICITY
O/HEAD TELECOM

STREET FURNITURE :

BOLLARDS	BD *
BORE HOLE	BH +
BUS STOP	BS *
CRASH BARRIER	CB
ELECTRICITY POLE	EP *
EARTHING ROD	ER +
GATE	
GROUND LIGHT	LT *
ILLUMINATED BOLLARD	BOL
LAMP POST	LP *
MARKER POST	MKR +
POST	POST *
POST BOX	POST BOX +
ROADSIGN	RS * RS +
SIGN POST	SIGN +
TELEPHONE BOX	TB
TELEPHONE POLE	TP *
TRAFFIC LIGHT	TL *
TRIAL PIT	TPIT +

SERVICES :

AIR VALVE	AV +
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH *
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV *
STOPCOCK	ST *

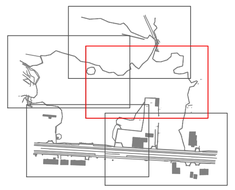
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT *
WATER METER	WM +
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



PLAN PRODUCED BY:

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CONTACT INFORMATION:

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00353 1 691 0156

CLIENT:

Hayes Higgins Partnership

PROJECT:

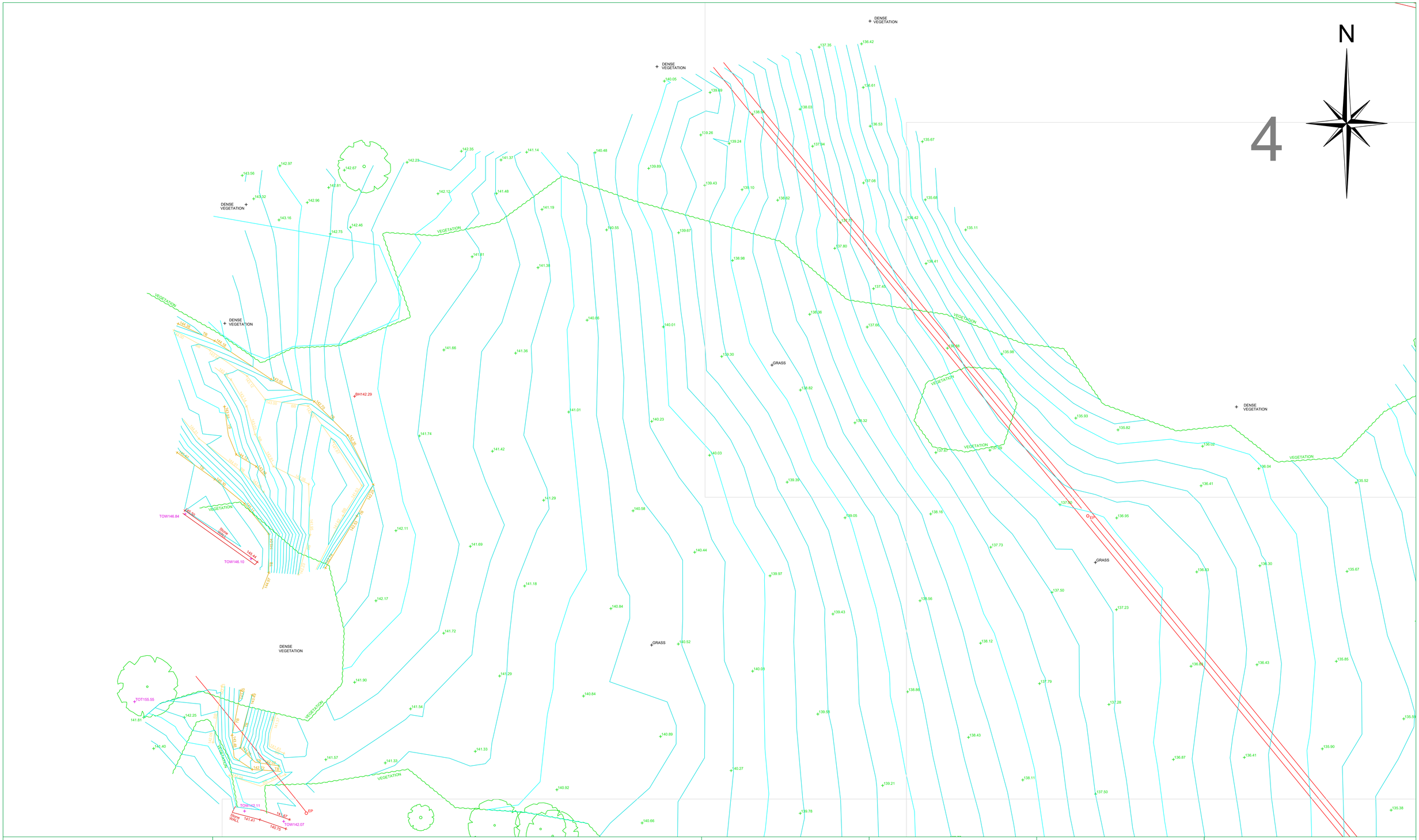
Blackglen Road, Dun Laoghaoire Co. Dublin

GRID SYSTEM: Irish Transverse Mercator
DATUM: Malin Head (OSGM15)
NOTES: Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE : 1/200 A1
DATE : 23/05/2024
DRG No: 6337
SURVEYED BY : R.D. & S.E.
SHEET: 3 of 5
PROCESSED BY : F.S.
CHECKED BY : A.B.



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RURAL/NATURAL FEATURES :

BUSH
SAPLING
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CATTLE GRID

LINEWORK:

EMBANKEMENT TOP
DRAIN
BREAKLINE
BUILDING
KERB BOTTOM
WALL
PATH/CHANGE SURFACE
O/HEAD ELECTRICITY
O/HEAD TELECOM

STREET FURNITURE :

BOLLARDS
BORE HOLE
BUS STOP
CRASH BARRIER
ELECTRICITY POLE
EARTHING ROD
GATE
GROUND LIGHT
ILLUMINATED BOLLARD
LAMP POST
MARKER POST
POST
POST BOX
ROADSIGN
SIGN POST
TELEPHONE BOX
TELEPHONE POLE
TRAFFIC LIGHT
TRIAL PIT

SERVICES :

AIR VALVE
ARMSTRONG JUNCTION
CABLE TV IC
COVER LEVEL
EIRCOM COVER
EIRCOM JUNCTION BOX
ELECTRICAL CABLE PIT
ESAT COVER
ESB COVER
ESB JUNCTION BOX
FIRE HYDRANT
GAS VALVE
GULLY
INSPECTION COVER
MANHOLE
SEPTIC TANK
SLUICE VALVE
STOPCOCK

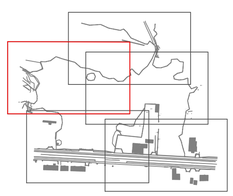
SERVICES :

SERVICE BOX (UNKNOWN)
TRAFFIC COVER
VENT
WATER METER
UNABLE TO LIFT

LEVELS :

BED LEVEL
EAVE LEVEL
FLOOR LEVEL
INVERT LEVEL
ROAD LEVEL
RIDGE LEVEL
SOFFIT LEVEL
SPOT LEVEL
TOP OF FENCE LEVEL
TOP OF WALL LEVEL
WATER LEVEL
SURVEY CONTROL STATION

SHEET LAYOUT :



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00353 1 691 0156

CLIENT:

Hayes Higgins Partnership

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

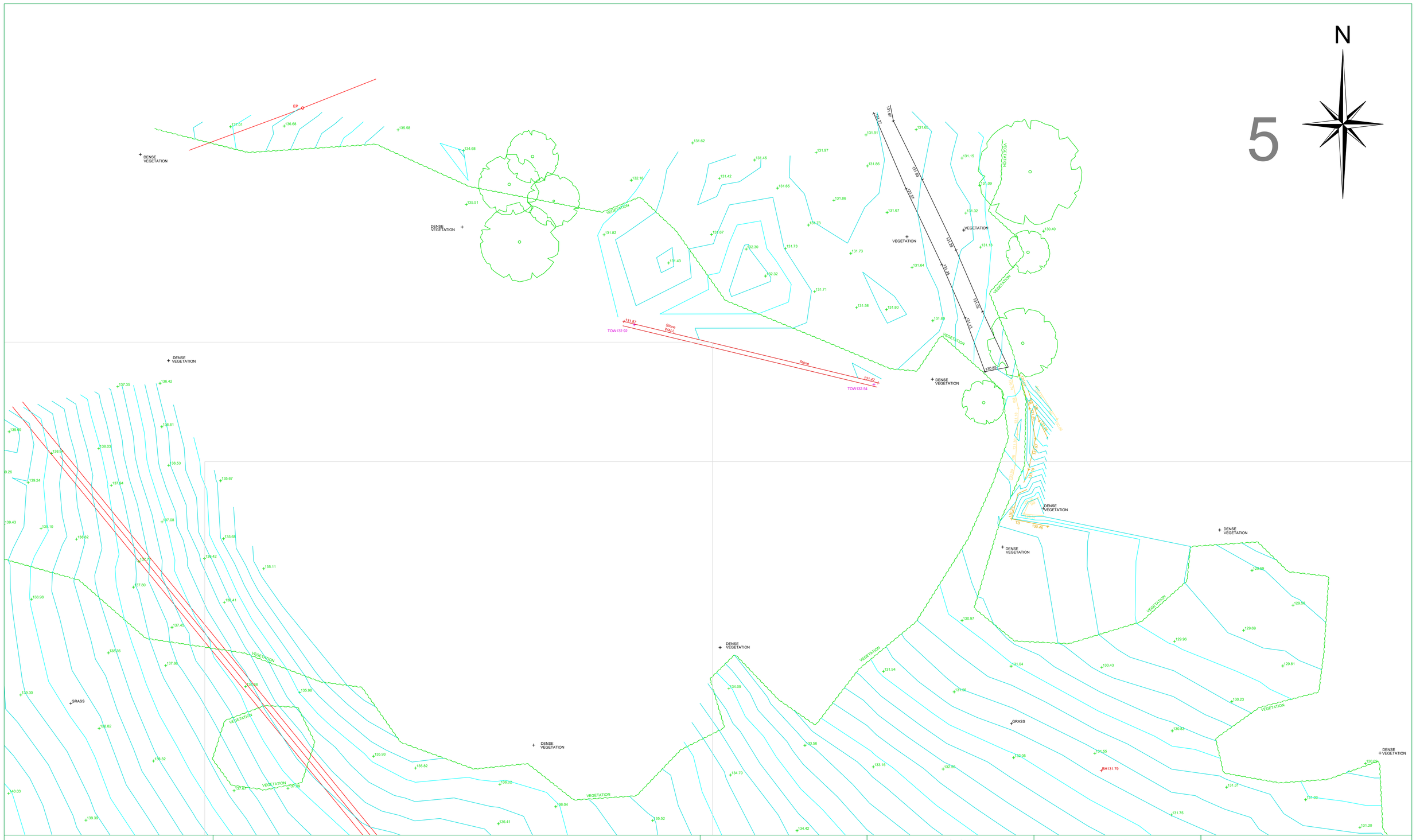
REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

PROJECT:

Blackglen Road, Dun Laoghaoire Co. Dublin

SCALE :	1/200 A1	DATE :	23/05/2024
DRG No:	6337	DESCRIPTION :	3D Topographical
		SURVEYED BY :	R.D. & S.E.
SHEET:	4 of 5	PROCESSED BY :	F.S.
		CHECKED BY :	A.B.



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BUSH
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TREE
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TROUGH
CATTLE GRID

LINEWORK:

EMBANKEMENT TOP
DRAIN
BREAKLINE
BUILDING
KERB BOTTOM
WALL
PATH/CHANGE SURFACE
O/HEAD ELECTRICITY
O/HEAD TELECOM

STREET FURNITURE :

BOLLARDS	BD
BORE HOLE	BH
BUS STOP	BS
CRASH BARRIER	CB
ELECTRICITY POLE	EP
EARTHING ROD	ER
GATE	
GROUND LIGHT	LT
ILLUMINATED BOLLARD	BOL
LAMP POST	LP
MARKER POST	MKR
POST	POST
POST BOX	POST BOX
ROADSIGN	RS
SIGN POST	SIGN
TELEPHONE BOX	TB
TELEPHONE POLE	TP
TRAFFIC LIGHT	TL
TRIAL PIT	TPIT

SERVICES :

AIR VALVE	AV
ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
EIRCOM JUNCTION BOX	EIRCOM BOX
ELECTRICAL CABLE PIT	ECP
ESAT COVER	ESAT
ESB COVER	ESB
ESB JUNCTION BOX	ESB BOX
FIRE HYDRANT	FH
GAS VALVE	GV
GULLY	G
INSPECTION COVER	IC
MANHOLE	MH
SEPTIC TANK	SEPTIC
SLUICE VALVE	SV
STOPCOCK	ST

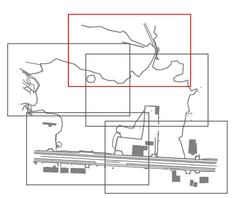
SERVICES :

SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
UNABLE TO LIFT	UTO

LEVELS :

BED LEVEL	+ BED101.50
EAVE LEVEL	+ E101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
RIDGE LEVEL	+ R101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF FENCE LEVEL	+ TOF101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

SHEET LAYOUT :



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CONTACT INFORMATION:

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CLIENT:

Hayes Higgins Partnership

PROJECT:

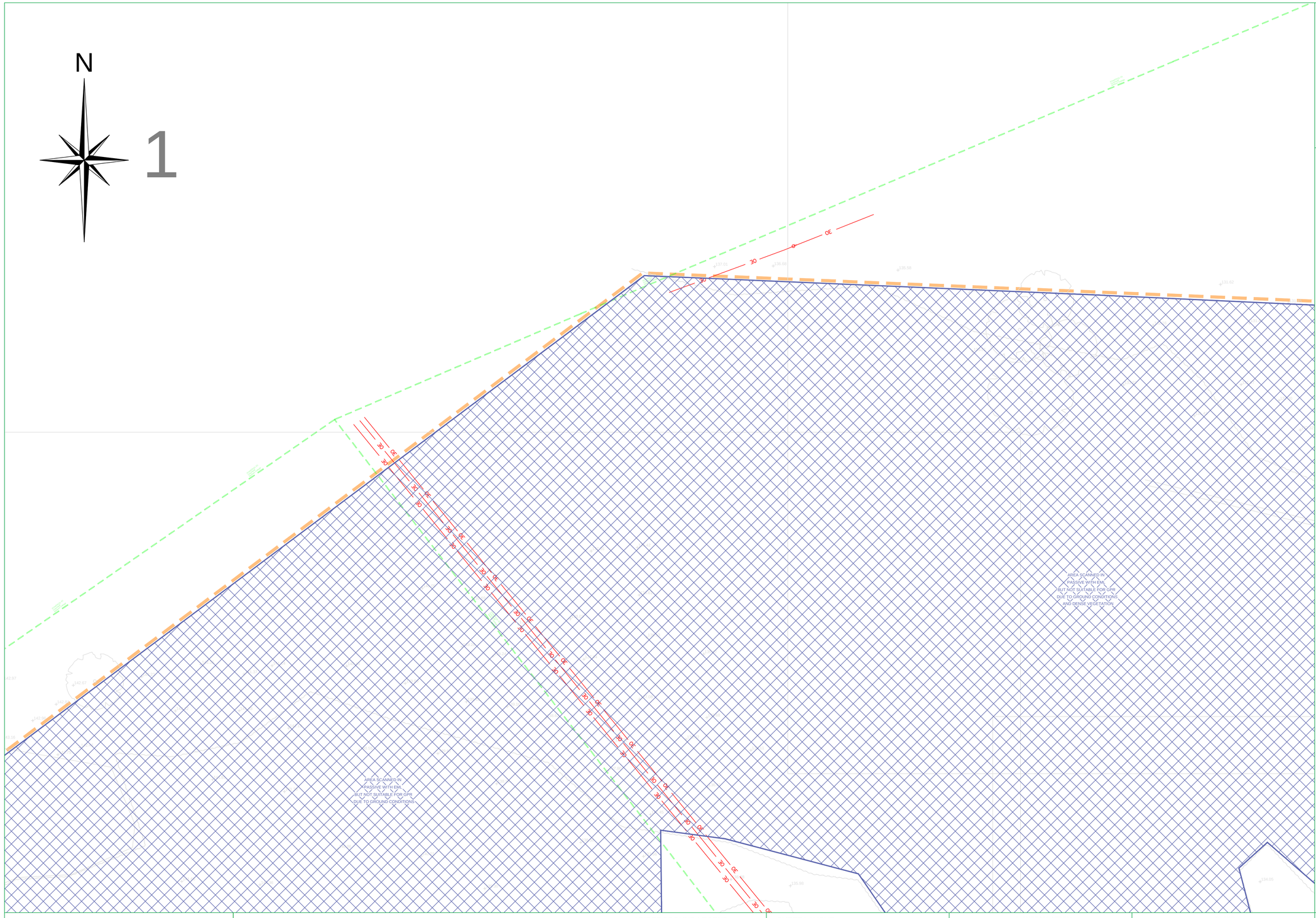
Blackglen Road, Dun Laoghaoire Co. Dublin

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE :	1/200 A1	DATE :	23/05/2024
DRG No:	6337	DESCRIPTION :	3D Topographical
		SURVEYED BY :	R.D. & S.E.
SHEET:	5 of 5	PROCESSED BY :	F.S.
		CHECKED BY :	A.B.



PAS 128: 2014 (Quality of Survey Level Outputs):

DESKTOP UTILITY RECORDS SEARCH	
QL-D	Drafted from utility records
SITE RECONNAISSANCE	
QL-C	Location Demonstrated by visual reference to street furniture or evidence of previous streetworks, ie - reinstatement scars
DETECTION	
QL-B4	A segment of utility suspected to exist but has not been detected by a geophysical technique
QL-B3	Horizontal location only of the utility detected by one of the geophysical techniques used
QL-B2	Horizontal and vertical location of the utility detected by one of the geophysical techniques used
QL-B1	Horizontal and vertical location of the utility detected by multiple geophysical techniques
VERIFICATION	
QL-A	Horizontal and vertical location of the top and/or bottom of the utility

Apex Surveys Ltd. Disclaimer - Utility Survey

The interpretative nature and the non-intrusive, indirect and non-destructive survey methods must be taken into account when considering the results of the surveys. Therefore Apex Surveys, while using appropriate practice to execute, interpret and present the data, gives no guarantees that all underground utilities and underground structures will be located and mapped. Furthermore, Apex Surveys cannot guarantee the accuracy of the utility depths annotated on the survey drawings.
Apex Survey shall not be liable for any omissions or inaccuracies in the survey which arise due to the limitations of the service. No liability shall attach to Apex Surveys, in any circumstances, howsoever arising, in respect of any consequential loss or damages suffered by the Client.

The following is a non-exhaustive list of the limitations of utility surveys:

The Survey aims to map existing utilities subsurface utilities and provide information with respect to pipe size, material type and drainage connectivity. However utility surveying is limited by the following guidelines and it may not be possible to accurately survey, define and locate all services and sub-surface features.

- Depth of Utility: The depth and size of a utility affect the signal response and the degree with which a utility can be located.
  Due to attenuation of the radar signal with depth, resolution is restricted, hence making identification of utilities more difficult with increasing depth.
- Size of Utility: The smaller the diameter of a utility the more difficult it is to locate. This difficulty increases with depth.
- Ground Conditions: The depth penetration and quality of the data depends on the ground conditions of the site. GPR Surveying works best within high resistivity material. Clay overburden can impair GPR Surveying. Poor data may be a result of areas with high conductivity.
- Utility Congestion: Where different utilities converge together into a service corridor or cross paths it becomes difficult to isolate a specific utility and to map its route. The reflected signal will display a single response to multiple utilities. Therefore multiple utilities may appear to be a single utility. Where similar services run on close proximity, separation may be impossible.
- Signal Jumping: Signal from surrounding services may 'jump' to a highly conductive line masking its true identity.
- Shadowing: (of deeper utilities by shallower objects) Shallow utilities will mask the existence of deeper utilities where they are in close proximity. Also, high reflective materials close to the surface i.e rebar may hide deeper anomalies.
- Surface Obstructions: The GPR system relies on a relatively flat and even surface on which to perform radar passes. If ground obstructions such as vehicles, organic material (long grass, scrub) or undulating ground surface are present then the acquired data will be of lower resolution and in some cases not viable.
- Loss of signal: It is not always possible to trace the entire length of each underground service.
- Connections between manholes: Connections between manhole chambers are assumed to be straight.
- Non-metallic objects: Nonmetallic objects are amongst the most difficult to trace therefore successful tracing of non-metallic pipes/ utilities may be limited.
- Fiber Optic Cables: Fiber optic cables may not be possible to locate except where laid with a built in tracer wire or similar conductor system.
- Defective / flooded manholes or pipework: It may not be possible to establish connections between flooded or defective manholes or pipework.
- Acute bends in pipework: It may not be possible to trace a pipe past an acute bend.

Accuracy estimates:

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00353 1 691 0156

STREET FURNITURE :

BOLLARDS	BD •
BUS STOP	BS •
CRASH BARRIER	CB
GATE	
ELECTRICITY POLE	EP •
TELEPHONE POLE	TP •
EARTHING ROD	ER +
LAMP POST	LP •
MARKER POST	MKR •
SIGN POST	SIGN
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TELEPHONE BOX	TB
POST	POST •
POST BOX	POST BOX
ROADSIGN	RS-RS
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TRIAL PIT	TPIT +

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EIRCOM JUNCTION BOX	EIRCOM BOX
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MANHOLE	MH
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SLUICE VALVE	SV •

STOPCOCK	ST •
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TRAFFIC COVER	TLIC
VENT	VENT •
WATER METER	WM +

LEVELS :

BED LEVEL	+ BED101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

BOTTOM OF CHAMBER	BOC	DOWNPIPE	DP	START OF RUN	SOR
CAST-IRON	C/I	EARTHENWARE	E/W	UNABLE TO OPEN	UTO
CONCRETE	CONC	NO FURTHER TRACE	NFT	UNABLE TO TRACE	UTT
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UNDERGROUND LEGEND :

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ELECTRIC CABLE	POWER
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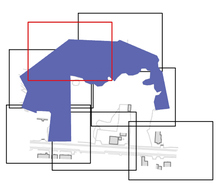
SHEET LAYOUT :



PLAN PRODUCED BY:

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GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

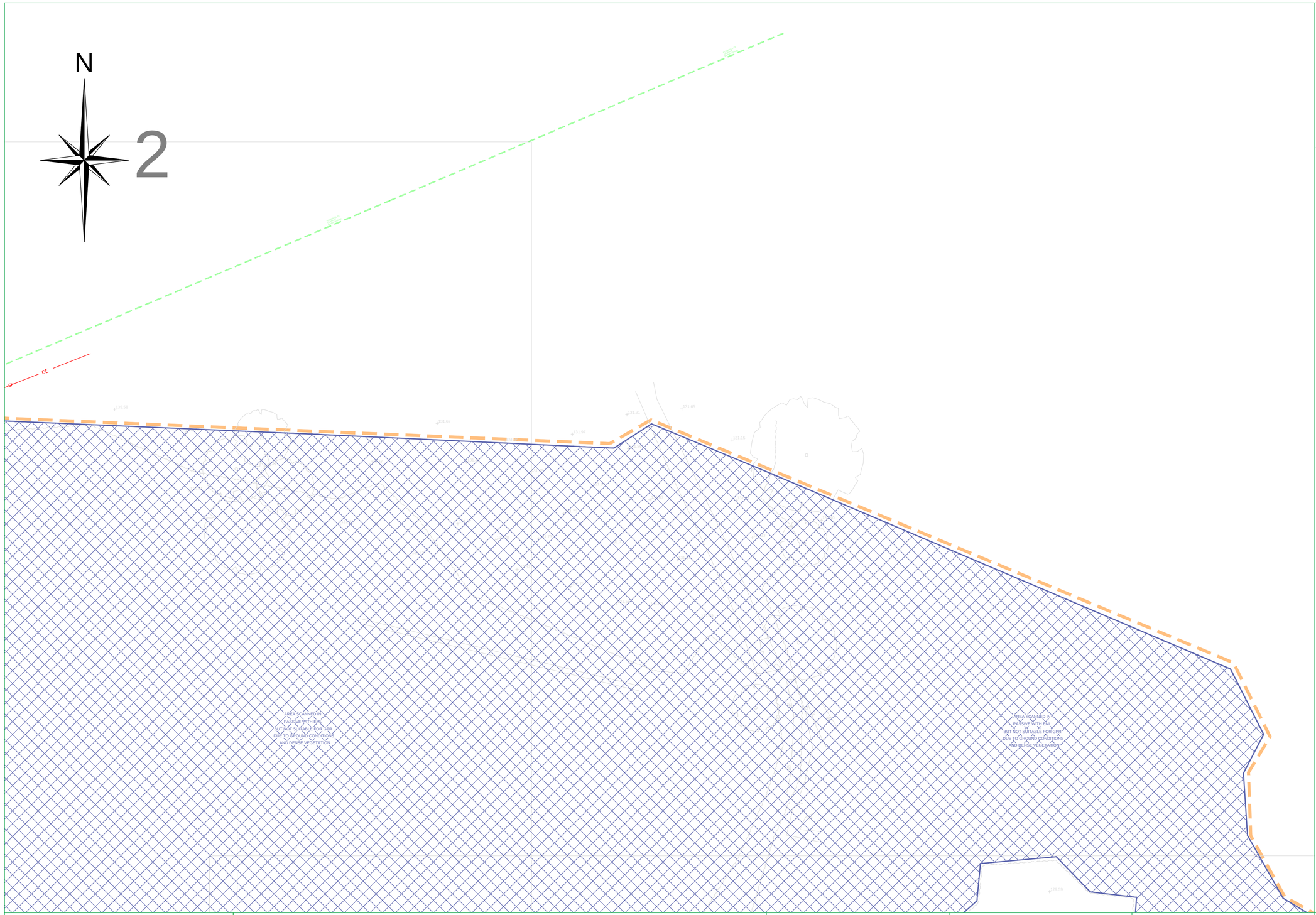
REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

PROJECT:

Blackglen Road,
Dun Laoghaire

SCALE :	1/200 A1
DATE :	07/06/2024
DRG No:	6337
DESCRIPTION :	2D Utilities
SURVEYED BY :	K.K. & M.R.
SHEET:	1 of 7
PROCESSED BY :	A.B.
CHECKED BY :	A.B.



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VERIFICATION	
QL-A	Horizontal and vertical location of the top and/or bottom of the utility

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GATE	
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TELEPHONE POLE	TP ●
EARTHING ROD	ER +
LAMP POST	LP ▪
MARKER POST	MKR ▫
SIGN POST	SIGN
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LEVELS :

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SPOT LEVEL	+101.50
TOP OF WALL LEVEL	+ TOW101.50
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SURVEY CONTROL STATION	

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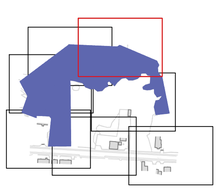

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REVISIONS:

No.	Date	Description
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SCALE : 1/200 A1

DATE : 07/06/2024

DRG No: 6337

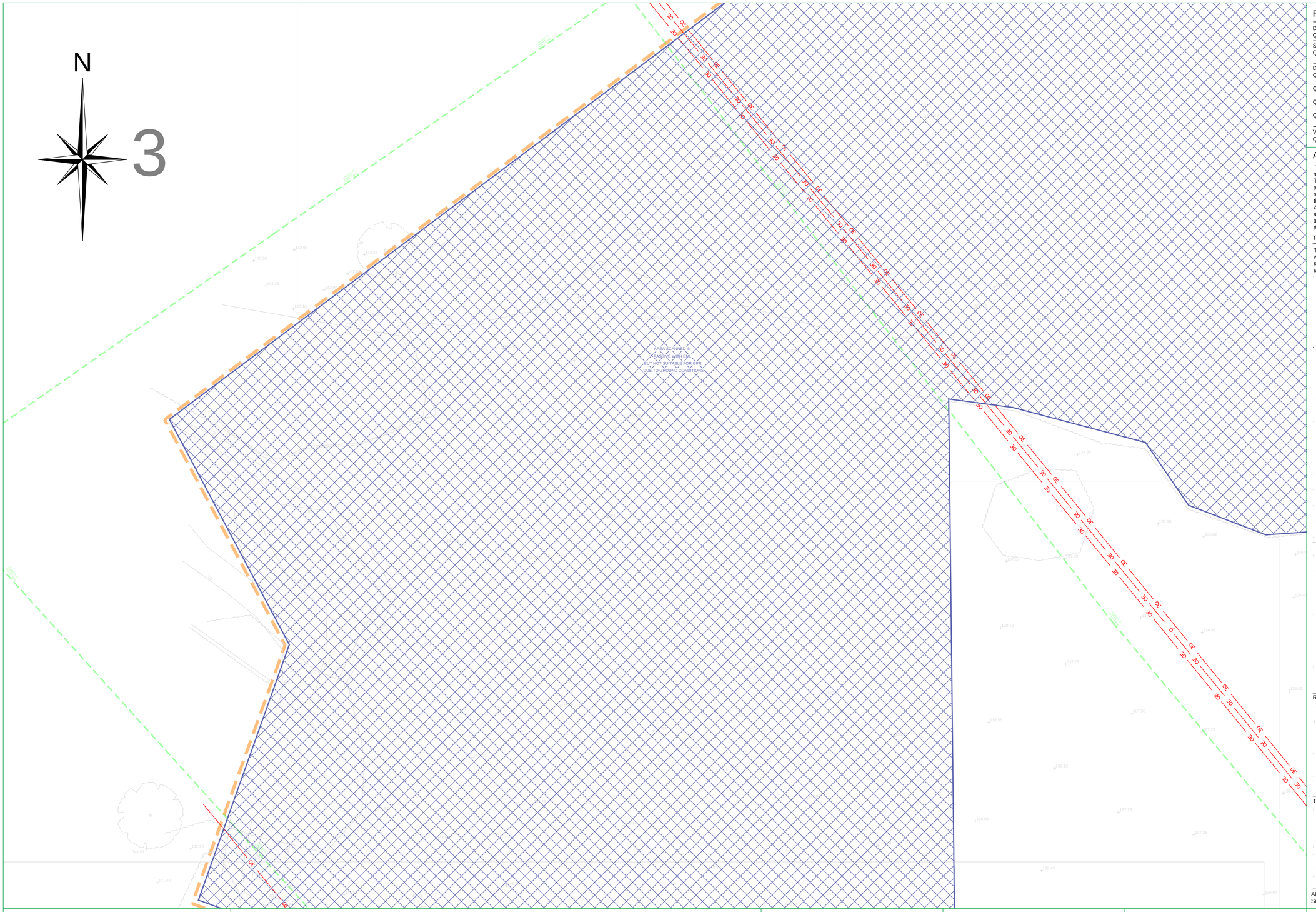
DESCRIPTION : 2D Utilities

SURVEYED BY : K.K. & M.R.

PROCESSED BY : A.B.

SHEET: 2 of 7

CHECKED BY : A.B.



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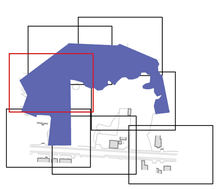

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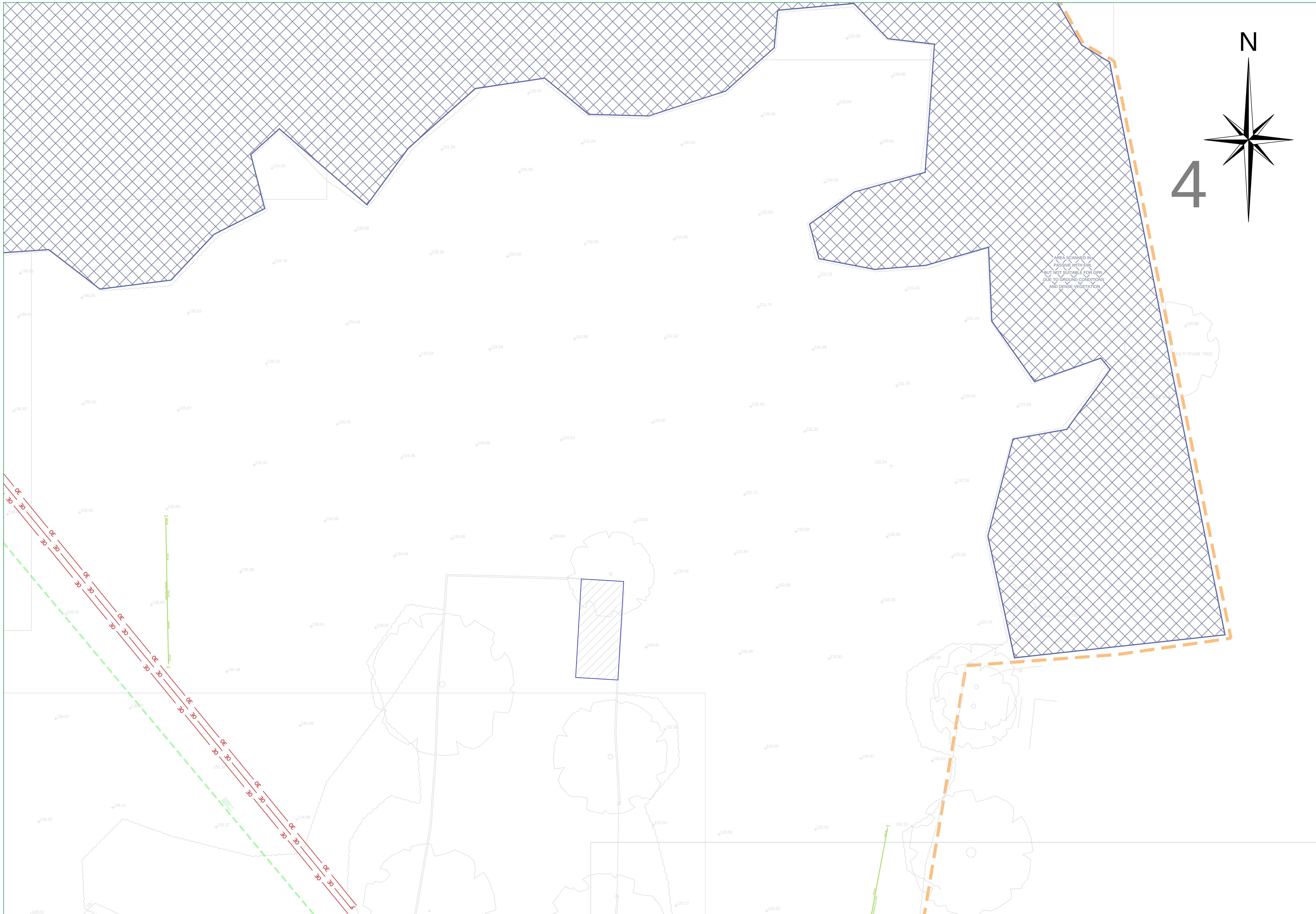

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- Ground Conditions: The depth penetration and quality of the data depends on the ground conditions of the site. GPR Surveying works best within high resistivity material. Clay overburden can impair GPR Surveying. Poor data may be a result of areas with high conductivity.
- Utility Congestion: Where different utilities converge together into a service corridor or cross paths it becomes difficult to isolate a specific utility and to map its route. The reflected signal will display a single response to multiple utilities. Therefore multiple utilities may appear to be a single utility. Where similar services run on close proximity, separation may be impossible.
- Signal Jumping: Signal from surrounding services may 'jump' to a highly conductive line masking its true identity.
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00353 1 691 0156

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BOLLARDS	BD
BUS STOP	BS
CRASH BARRIER	CB
GATE	
ELECTRICITY POLE	EP
TELEPHONE POLE	TP
EARTHING ROD	ER
LAMP POST	LP
MARKER POST	MKR
SIGN POST	SIGN
TRAFFIC LIGHT	TL
TELEPHONE BOX	TB
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POST BOX	POST BOX
ROADSIGN	RS · RS
BORE HOLE	BH
TRIAL PIT	TPIT
BOTTOM OF CHAMBER	BOC
CAST-IRON	C/I
CONCRETE	CONC
DIAMETER	DIA

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ARMSTRONG JUNCTION	AJ
CABLE TV IC	CATV
COVER LEVEL	CL
EIRCOM COVER	EIRCOM
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DOWNPIPE	DP
EARTHENWARE	E/W
NO FURTHER TRACE	NFT
OFFSITE	O/S

STOPCOCK	ST
SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM

LEVELS :

BED LEVEL	BED101.50
FLOOR LEVEL	FL101.50
INVERT LEVEL	IL101.50
ROAD LEVEL	101.50
SOFFIT LEVEL	SL101.50
SPOT LEVEL	101.50
TOP OF WALL LEVEL	TOW101.50
WATER LEVEL	WL101.50
SURVEY CONTROL STATION	
START OF RUN	SOR
UNABLE TO OPEN	UTO
UNABLE TO TRACE	UTT

UNDERGROUND LEGEND :

WATER MAIN	WATER
GAS MAIN	GAS
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FOUL SEWER	FOUL
COMBINED SEWER	COMB
ELECTRIC CABLE	POWER
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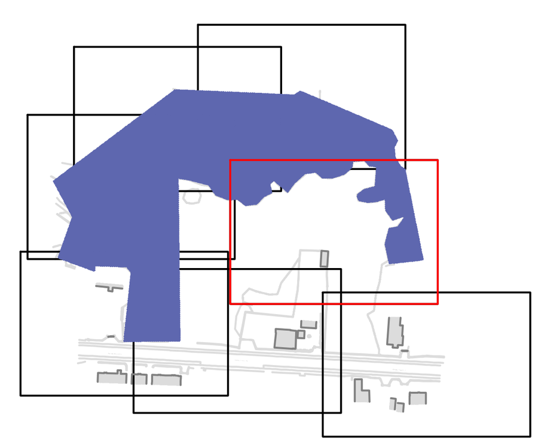
SHEET LAYOUT :



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Hayes Higgins

PROJECT:

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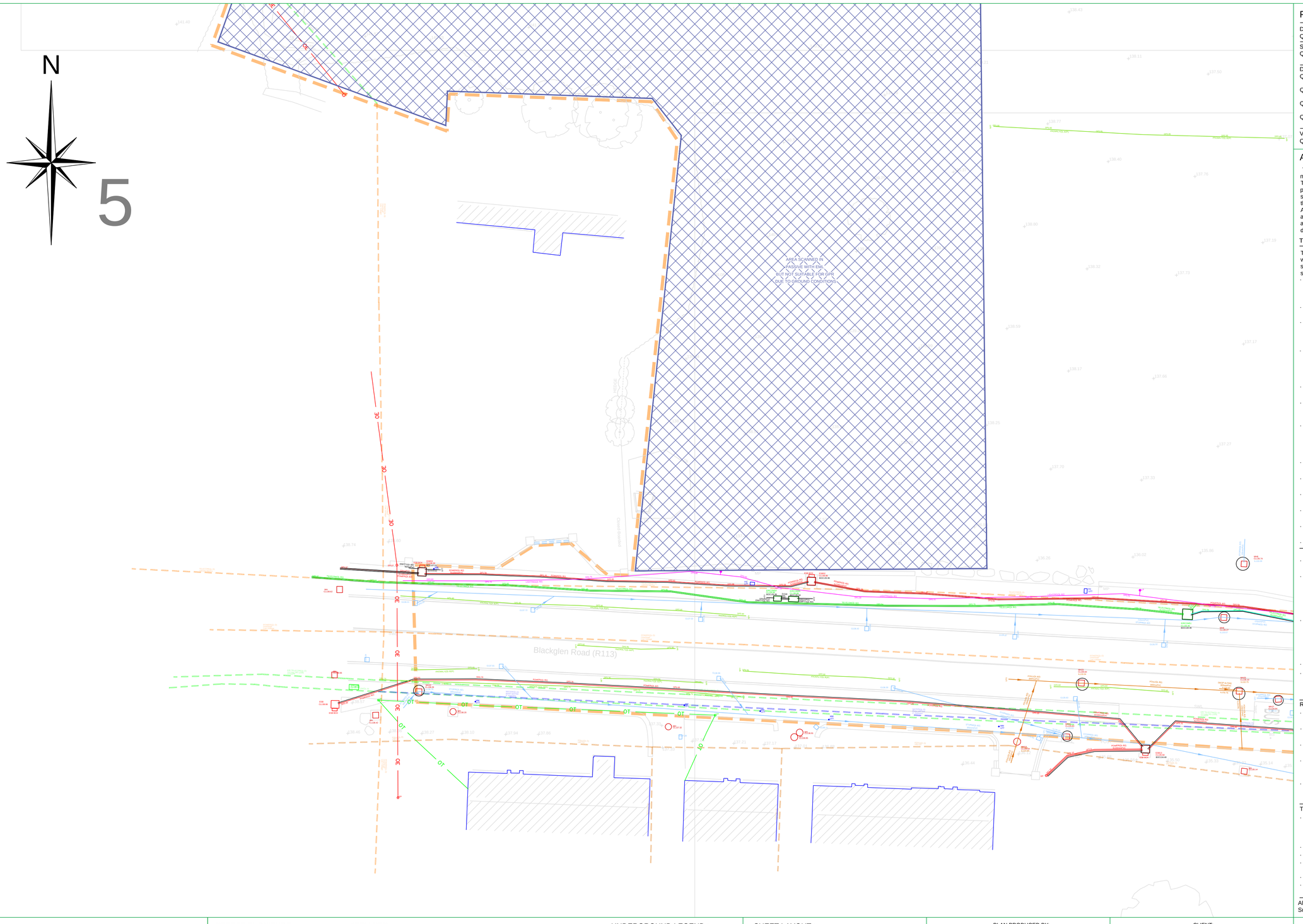
GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE :	1/200 A1	DATE :	07/06/2024
DRG No:	6337	DESCRIPTION :	2D Utilities
		SURVEYED BY :	K.K. & M.R.
SHEET:	4 of 7	PROCESSED BY :	A.B.
		CHECKED BY :	A.B.



PAS 128: 2014 (Quality of Survey Level Outputs):

DESKTOP UTILITY RECORDS SEARCH	
QL-D	Drafted from utility records
SITE RECONNAISSANCE	
QL-C	Location Demonstrated by visual reference to street furniture or evidence of previous streetworks, ie - reinstatement scars
DETECTION	
QL-B4	A segment of utility suspected to exist but has not been detected by a geophysical technique
QL-B3	Horizontal location only of the utility detected by one of the geophysical techniques used
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VERIFICATION	
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ROAD LEVEL	+ 101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

BOTTOM OF CHAMBER	BOC	DP	START OF RUN	SOR
CAST-IRON	C/I	DOWNPIPE	UNABLE TO OPEN	UTO
CONCRETE	CONC	EARTHENWARE	UNABLE TO TRACE	UTT
DIAMETER	DIA	NO FURTHER TRACE		
		OFFSITE		

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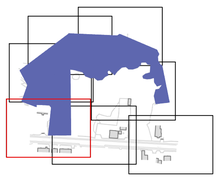
SHEET LAYOUT :



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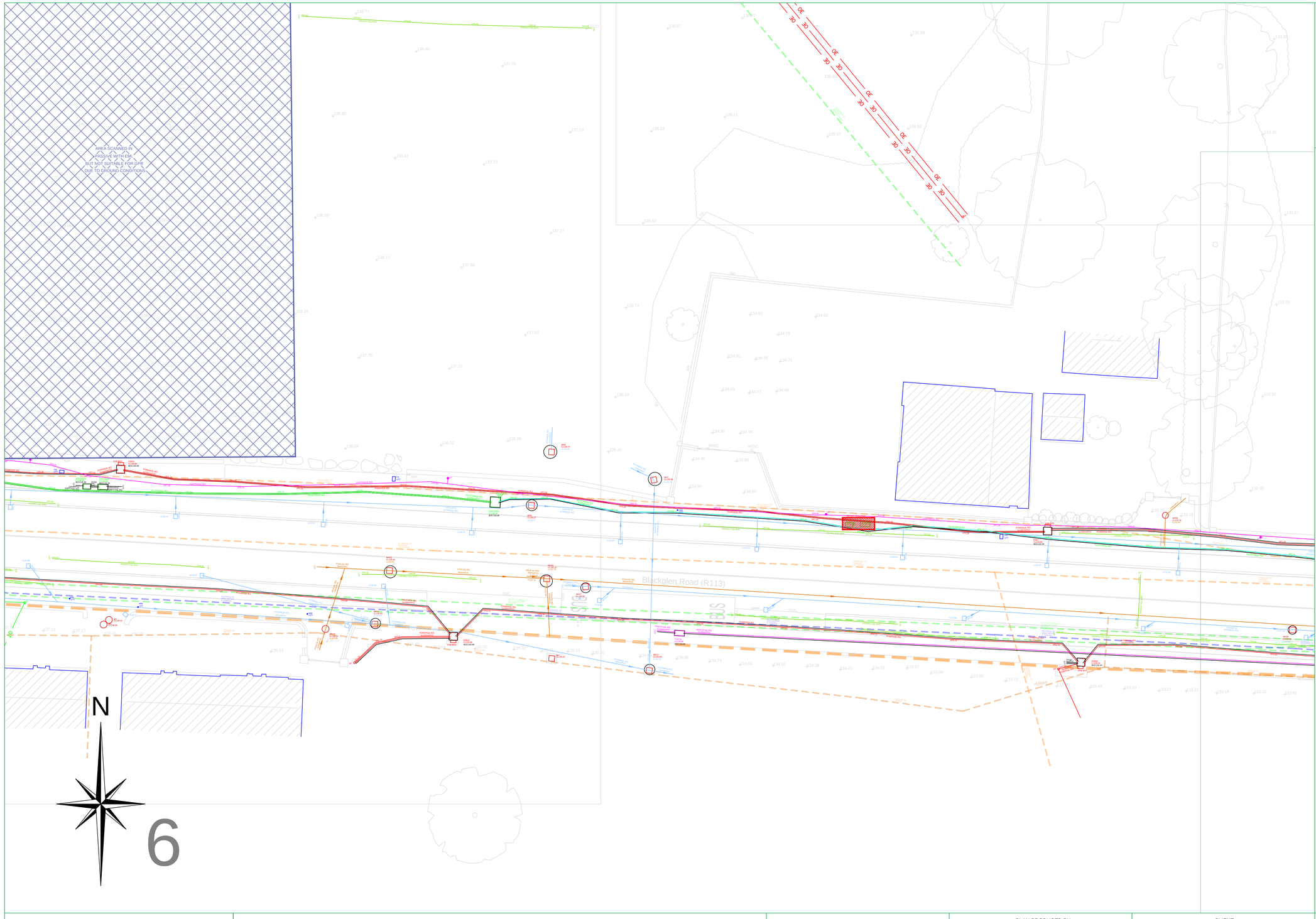

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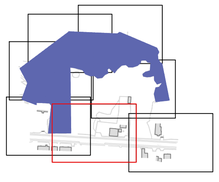
O/HEAD TELECOM	OT

SHEET LAYOUT :



PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

Apex Surveys
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Dunboyne, Co. Meath, Ireland
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info@apexsurveys.ie
00353 1 691 0156

CLIENT:

Hayes Higgins

PROJECT:

Blackglen Road,
Dun Laoghaire

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE : 1/200 A1

DATE : 07/06/2024

DRG No: 6337

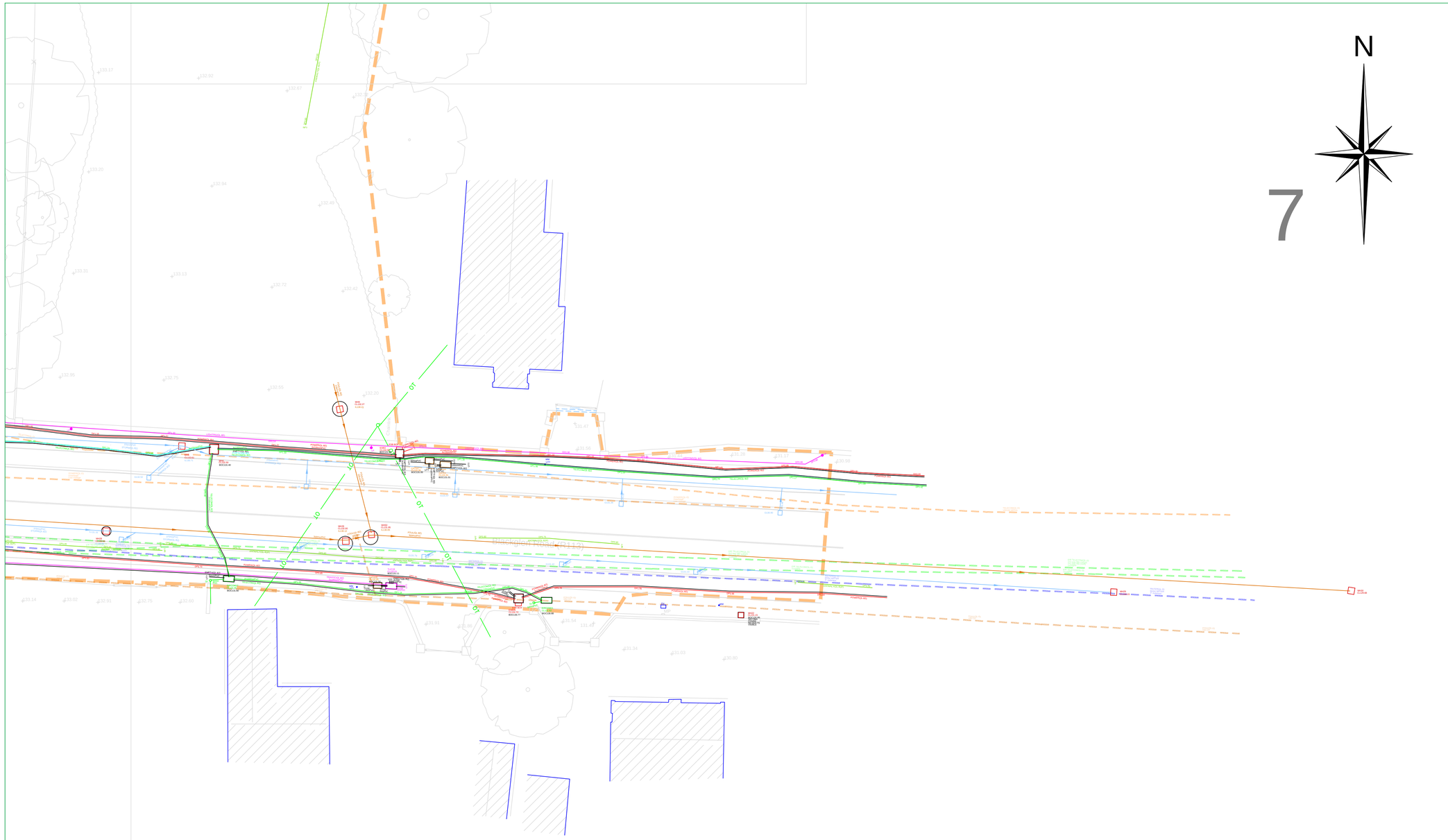
DESCRIPTION : 2D Utilities

SURVEYED BY : K.K. & M.R.

SHEET: 6 of 7

PROCESSED BY : A.B.

CHECKED BY : A.B.



PAS 128: 2014 (Quality of Survey Level Outputs):

DESKTOP UTILITY RECORDS SEARCH	
QL-D	Drafted from utility records
SITE RECONNAISSANCE	
QL-C	Location Demonstrated by visual reference to street furniture or evidence of previous streetworks, ie - reinstatement scars
DETECTION	
QL-B4	A segment of utility suspected to exist but has not been detected by a geophysical technique
QL-B3	Horizontal location only of the utility detected by one of the geophysical techniques used
QL-B2	Horizontal and vertical location of the utility detected by one of the geophysical techniques used
QL-B1	Horizontal and vertical location of the utility detected by multiple geophysical techniques
VERIFICATION	
QL-A	Horizontal and vertical location of the top and/or bottom of the utility

Apex Surveys Ltd. Disclaimer - Utility Survey

The interpretative nature and the non-intrusive, indirect and non-destructive survey methods must be taken into account when considering the results of the surveys. Therefore Apex Surveys, while using appropriate practice to execute, interpret and present the data, gives no guarantees that all underground utilities and underground structures will be located and mapped. Furthermore, Apex Surveys cannot guarantee the accuracy of the utility depths annotated on the survey drawings.
Apex Survey shall not be liable for any omissions or inaccuracies in the survey which arise due to the limitations of the service. No liability shall attach to Apex Surveys, in any circumstances, howsoever arising, in respect of any consequential loss or damages suffered by the Client.

The following is a non-exhaustive list of the limitations of utility surveys:

The Survey aims to map existing utilities subsurface utilities and provide information with respect to pipe size, material type and drainage connectivity. However utility surveying is limited by the following guidelines and it may not be possible to accurately survey, define and locate all services and sub-surface features.

- Depth of Utility: The depth and size of a utility affect the signal response and the degree with which a utility can be located.
  Due to attenuation of the radar signal with depth, resolution is restricted, hence making identification of utilities more difficult with increasing depth.
- Size of Utility: The smaller the diameter of a utility the more difficult it is to locate. This difficulty increases with depth.
- Ground Conditions: The depth penetration and quality of the data depends on the ground conditions of the site. GPR Surveying works best within high resistivity material. Clay overburden can impair GPR Surveying. Poor data may be a result of areas with high conductivity.
- Utility Congestion: Where different utilities converge together into a service corridor or cross paths it becomes difficult to isolate a specific utility and to map its route. The reflected signal will display a single response to multiple utilities. Therefore multiple utilities may appear to be a single utility. Where similar services run on close proximity, separation may be impossible.
- Signal Jumping: Signal from surrounding services may 'jump' to a highly conductive line masking its true identity.
- Shadowing: (of deeper utilities by shallower objects) Shallow utilities will mask the existence of deeper utilities where they are in close proximity. Also, high reflective materials close to the surface i.e rebar may hide deeper anomalies.
- Surface Obstructions: The GPR system relies on a relatively flat and even surface on which to perform radar passes. If ground obstructions such as vehicles, organic material (long grass, scrub) or undulating ground surface are present then the acquired data will be of lower resolution and in some cases not viable.
- Loss of signal: It is not always possible to trace the entire length of each underground service.
- Connections between manholes: Connections between manhole chambers are assumed to be straight.
- Non-metallic objects: Nonmetallic objects are amongst the most difficult to trace therefore successful tracing of non-metallic pipes/ utilities may be limited.
- Fiber Optic Cables: Fiber optic cables may not be possible to locate except where laid with a built in tracer wire or similar conductor system.
- Defective / flooded manholes or pipework: It may not be possible to establish connections between flooded or defective manholes or pipework.
- Acute bends in pipework: It may not be possible to trace a pipe past an acute bend.

Accuracy estimates:

- Locational accuracy is determined by referring to the manufacturers guidelines for the detector used.
- In ideal conditions the spatial accuracies for the underground utilities may be +/- 5% for Radiodetection and +/- 10% of depth for the GPR to 2.5m deep. However variations within the subsurface, depth below the ground, close proximity of other services and local magnetic, atmospheric or ground conditions, bends, lateral service connections and any of the other limitations listed in this disclaimer may alter this estimated accuracy.
- Plan accuracies of + or - 150mm may be achieved but this figure will depend on the depth of service below ground level. However variations within the subsurface subsurface, depth below the ground, close proximity of other services and local magnetic, atmospheric or ground conditions, bends, lateral service connections and any of the other limitations listed in this disclaimer may alter this estimated accuracy.
- DP represents distance from the surface level to the top of the service/ target
- Where technically possible, depth indications will be given. These along with plan positions should be used for guidance only and wherever critical accuracy is required these should be confirmed by the client by undertaking trial excavations or similar.

Record Drawing Information

- Services which have been untraceable are shown from records where possible or available. These lines are annotated as "Taken From Records" or "From Records".
- Existing record information showing underground services is often incomplete and with unknown accuracies therefore it should be regarded as indicative only.
- Where Apex Surveys issue a utility drawing, this should be read in conjunction with all available public or private utility records.
- Apex Surveys endeavor to add relevant Public Utility record information onto the final drawing. However, we would recommend that direct contact is made with the asset owner or statutory undertaker.
- We shall not be held responsible for the accuracy, or otherwise, of the location of a service, as issued by the utility provider and therefore shown as "Taken for Records" on the drawing.

The following have been excluded from the survey:

- Location of individual service feeds to properties or buildings as access would be required into each property to apply direct connections to inlet points and this would significantly increase the scope of works, survey cost and also cause possible disruption to occupants.
- Pot ended or disconnected cables or terminated short lengths of pipe.
- Internal building services.
- Small diameter cables less than 20mm diameter or pipes less than 40mm diameter.
- Above ground services unless specifically requested.
- Lifting manholes which require longer than 10 minutes effort using standard heavy duty apparatus.

All works carried out be Apex Surveys conforms to the guidelines set out by The Survey Association (TSA) and PAS:128 Standard for utility mapping

APEX SURVEYS

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00353 1 691 0156

STREET FURNITURE :

BOLLARDS	BD •	BOC	BOTTOM OF CHAMBER
BUS STOP	BS •	C/I	CAST-IRON
CRASH BARRIER	CB	CONC	CONCRETE
GATE		DIA	DIAMETER
ELECTRICITY POLE	EP •		
TELEPHONE POLE	TP •		
EARTHING ROD	ER +		
LAMP POST	LP •		
MARKER POST	MKR +		
SIGN POST	SIGN		
TRAFFIC LIGHT	TL •		
TELEPHONE BOX	TB		
POST	POST •		
POST BOX	POST BOX		
ROADSIGN	RS • RS		
BORE HOLE	BH +		
TRIAL PIT	TPIT +		

SERVICES :

AIR VALVE	AV	DP	DOWNPIPE
ARMSTRONG JUNCTION	AJ	E/W	EARTHENWARE
CABLE TV IC	CATV	NFT	NO FURTHER TRACE
COVER LEVEL	CL	O/S	OFFSITE
EIRCOM COVER	EIRCOM		
EIRCOM JUNCTION BOX	EIRCOM BOX		
ELECTRICAL CABLE PIT	ECP		
ESAT COVER	ESAT		
ESB COVER	ESB		
ESB JUNCTION BOX	ESB BOX		
FIRE HYDRANT	FH		
GAS VALVE	GV		
GULLY	G		
INSPECTION COVER	IC		
MANHOLE	MH		
SEPTIC TANK	SEPTIC		
SLUICE VALVE	SV •		

STOPCOCK	ST •	SOR	START OF RUN
SERVICE BOX (UNKNOWN)	BOX	UTO	UNABLE TO OPEN
TRAFFIC COVER	TLIC	UTT	UNABLE TO TRACE
VENT	VENT •		
WATER METER	WM +		

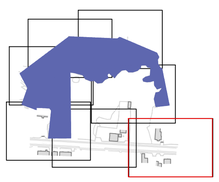
LEVELS :

BED LEVEL	+ BED101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

UNDERGROUND LEGEND :

WATER MAIN	WATER
GAS MAIN	GAS
STORM DRAIN	STORM
FOUL SEWER	FOUL
COMBINED SEWER	COMB
ELECTRIC CABLE	POWER
ELECTRIC LIGHTING	LIGHTING
EIRCOM	EIRCOM
FIBRE OPTIC CABLE	F.OPTIC
BROADBAND	BROADBAND
CABLE TV	TV
TRAFFIC AND SIGNAL CABLE	TRAFFIC
CCTV	CCTV
IRRIGATION PIPE	IRRIGATION
EMPTY DUCT	EMPTY
GPR ANOMALY	ANOMALY
UNKNOWN CABLE	CABLE
O/HEAD ELECTRICITY	OE
O/HEAD TELECOM	OT

SHEET LAYOUT :



PLAN PRODUCED BY:

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CLIENT:

Hayes Higgins

PROJECT:

Blackglen Road,
Dun Laoghaire

GRID SYSTEM:	Irish Transverse Mercator
DATUM:	Malin Head (OSGM15)
NOTES:	Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

SCALE : 1/200 A1

DATE : 07/06/2024

DRG No: 6337

DESCRIPTION : 2D Utilities

SURVEYED BY : K.K. & M.R.

SHEET: 7 of 7

PROCESSED BY : A.B.

CHECKED BY : A.B.

Appendix C – Surface Water Calculations (Attenuation, MET Eireann rainfall)

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 317880, Northing: 225413,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.6,	3.9,	4.6,	5.6,	6.3,	6.9,	8.8,	11.0,	12.5,	14.6,	16.5,	18.0,	20.3,	22.2,	23.7,	N/A ,
10 mins	3.7,	5.4,	6.4,	7.8,	8.8,	9.6,	12.2,	15.3,	17.4,	20.3,	23.0,	25.1,	28.3,	30.9,	33.0,	N/A ,
15 mins	4.3,	6.3,	7.5,	9.2,	10.4,	11.3,	14.4,	18.0,	20.4,	23.9,	27.0,	29.5,	33.3,	36.3,	38.8,	N/A ,
30 mins	5.7,	8.3,	9.7,	11.9,	13.4,	14.5,	18.4,	22.9,	25.9,	30.2,	34.0,	37.0,	41.7,	45.4,	48.5,	N/A ,
1 hours	7.5,	10.8,	12.6,	15.3,	17.2,	18.7,	23.5,	29.1,	32.8,	38.1,	42.8,	46.5,	52.3,	56.8,	60.5,	N/A ,
2 hours	9.8,	14.0,	16.3,	19.8,	22.1,	24.0,	30.0,	36.9,	41.5,	48.1,	53.9,	58.4,	65.5,	71.0,	75.5,	N/A ,
3 hours	11.5,	16.3,	19.0,	22.9,	25.6,	27.7,	34.6,	42.5,	47.7,	55.1,	61.7,	66.8,	74.7,	80.9,	86.0,	N/A ,
4 hours	12.9,	18.2,	21.1,	25.5,	28.5,	30.8,	38.3,	46.9,	52.6,	60.7,	67.8,	73.4,	82.0,	88.7,	94.3,	N/A ,
6 hours	15.1,	21.3,	24.6,	29.6,	33.0,	35.6,	44.2,	54.0,	60.4,	69.5,	77.6,	83.9,	93.6,	101.1,	107.3,	N/A ,
9 hours	17.7,	24.8,	28.6,	34.4,	38.2,	41.2,	51.0,	62.1,	69.4,	79.7,	88.8,	95.9,	106.7,	115.2,	122.2,	N/A ,
12 hours	19.8,	27.7,	31.9,	38.2,	42.5,	45.8,	56.5,	68.6,	76.6,	87.8,	97.7,	105.4,	117.2,	126.4,	133.9,	N/A ,
18 hours	23.2,	32.3,	37.1,	44.4,	49.2,	53.0,	65.2,	78.9,	88.0,	100.6,	111.8,	120.4,	133.7,	144.0,	152.5,	N/A ,
24 hours	26.0,	36.1,	41.4,	49.3,	54.6,	58.8,	72.2,	87.2,	97.0,	110.8,	123.0,	132.4,	146.8,	158.0,	167.2,	199.3,
2 days	32.6,	44.1,	50.1,	58.9,	64.8,	69.3,	83.8,	99.8,	110.2,	124.6,	137.3,	147.0,	161.8,	173.1,	182.4,	214.7,
3 days	37.9,	50.6,	57.1,	66.7,	73.0,	77.8,	93.3,	110.3,	121.2,	136.2,	149.4,	159.4,	174.7,	186.3,	195.9,	228.8,
4 days	42.6,	56.3,	63.3,	73.5,	80.2,	85.3,	101.6,	119.4,	130.8,	146.4,	160.0,	170.4,	186.1,	198.1,	207.9,	241.5,
6 days	50.9,	66.2,	74.0,	85.3,	92.7,	98.3,	116.0,	135.2,	147.4,	164.1,	178.6,	189.5,	206.1,	218.7,	228.9,	263.9,
8 days	58.2,	75.0,	83.5,	95.7,	103.6,	109.7,	128.7,	149.0,	162.0,	179.6,	194.8,	206.3,	223.6,	236.7,	247.3,	283.6,
10 days	64.9,	83.0,	92.1,	105.2,	113.6,	120.0,	140.1,	161.6,	175.1,	193.6,	209.4,	221.4,	239.3,	252.9,	264.0,	301.4,
12 days	71.3,	90.5,	100.2,	114.0,	122.9,	129.6,	150.7,	173.2,	187.3,	206.5,	222.9,	235.3,	253.9,	267.9,	279.3,	317.9,
16 days	83.0,	104.4,	115.0,	130.1,	139.9,	147.2,	170.1,	194.3,	209.5,	230.0,	247.6,	260.7,	280.4,	295.3,	307.3,	347.8,
20 days	93.9,	117.2,	128.7,	145.0,	155.5,	163.4,	187.8,	213.6,	229.7,	251.4,	269.9,	283.8,	304.4,	320.0,	332.6,	374.8,
25 days	106.7,	132.2,	144.7,	162.3,	173.6,	182.1,	208.3,	235.9,	253.0,	276.0,	295.6,	310.2,	332.0,	348.3,	361.5,	405.8,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

STORMTECH Stormwater Management System Design Tool

ver: Aug15

PROJECT REF:	23D059
LOCATION:	Residential Housing Development at Blackglen Road
DATE:	09.08.2024
CREATED BY:	

SYSTEM PARAMETERS

Required Total Storage	**313.1**	m^3
Stormtech chamber model	**MC4500**	
Filtration Permeable Geo or Impermeable Geo	Filter geo	
Number of Isolator Rows (IR)	1	

SITE PARAMETERS

Stone Porosity	40%		
Excavation Batter Angle (degrees)	60	°	*Minimum Requirement*
Stone Above Chambers	0.3	m	*0.30*
Stone Below Chambers	0.23	m	*0.23*
In-between Row Spacing	0.30	m	*0.23*
Additional Storage outside Excavation. E.g manholes, Header Pipe	0	m^3	

HEADER PIPE

Is Header pipe required within excavation	No	
Orientation of Header Pipe	Parrallel to IR	
Diameter of Header Pipe	0.225	m
Length of Header Pipe	0	m

CHAMBER SYSTEM DIMENSIONS

	Calculated	Adopted	
Number of Rows		6	ea
Number of units per Row		9	ea
System Installed Storage Depth (effective storage depth)	2.055		m
Tank overall installed Width at base	17.34	17.34	m
Tank overall installed Length at Base	13.23	13.23	m
Total Effective System Storage	**329.2**	**329.2**	m^3

STORMTECH SYSTEM DETAIL

StormTech Chamber Model	MC4500	
Unit Width	2.54	m
Unit Length	1.23	m
Unit Height	1.525	m
Min Cover Over System	0.3	m
Max Cover Over Chamber	2.1	m
Chamber Internal Storage Vol.	3.01	m^3
Header Pipe Internal Storage Vol in Excavation	0.0	m^3

STONE AND EXCAVATION DETAIL

Volume of Dig for System	552	m^3
Width at base	17.34	m
Width at top	19.71	m
Length at base	13.23	m
Length at top	15.60	m
Depth Of System	2.06	m
Area of Dig at Base of System	229	m^2
Area of Dig at Top of System	308	m^2
Void Ratio	60%	
Stone Requirement - m3	374	m^3
Stone Requirement - tonne	614	tonne

23D059 - Surface Water Attenutation Calculation 1-100 + 30%

Green Area - WEST

Time (mins)	1 *Storm Frequency & Duration*	2 *Rainfall (mm)*	3 *Rainfall Intensity (mm/hr)*	4 *Potential Run-off From Developed Site (l/s)*	5 *Allowable Run-off From Developed Site (l/s)*	6 *Storage Requirement (m3)*	
5	M100-5 min	23.40	280.80	431.90	2.0	129.0	
10	M100-10 min	32.63	195.78	301.13	2.0	179.5	
15	M100-15 min	38.35	153.40	235.95	2.0	210.6	
30	M100-30 min	48.10	96.20	147.97	2.0	262.7	
60	M100-60 min	60.45	60.45	92.98	2.0	327.5	
120	M100-2 hr	75.92	37.96	58.39	2.0	406.0	
180	M100-3 hr	86.84	28.95	44.52	2.0	459.2	
240	M100 - 4hr	95.42	23.86	36.69	2.0	499.6	
360	**M100-6 hr**	**109.07**	**18.18**	**27.96**	**2.0**	**560.7**	**Worst case scenario**
540	M100-9 hr	124.67	13.85	21.31	2.0	625.5	
720	M100-12 hr	137.02	11.42	17.56	2.0	672.3	
1080	M100-18 hr	156.52	8.70	13.37	2.0	737.1	
1440	M100-24 hr	172.12	7.17	11.03	2.0	780.3	
2880	M100-2day	191.10	3.98	6.12	2.0	712.6	

Run-off 2 l/s
Area 5537 m^2

Allowable Run-off 2 l/s

	Area	Factor	Total	
Paving	3844	1	3844	m^2
Roof	1693	1	1693	m^2
Total Area			**5537**	**m^2**

23D059 - Surface Water Attenutation Calculation 1-100 + 30%

Time (mins)	1 *Storm Frequency & Duration*	2 *Rainfall (mm)*	3 *Rainfall Intensity (mm/hr)*	4 *Potential Run-off From Developed Site (l/s)*	5 *Allowable Run-off From Developed Site (l/s)*	6 *Storage Requirement (m3)*	
5	M100-5 min	23.40	280.80	254.83	2.0	75.8	
10	M100-10 min	32.63	195.78	177.67	2.0	105.4	
15	M100-15 min	38.35	153.40	139.21	2.0	123.5	
30	M100-30 min	48.10	96.20	87.30	2.0	153.5	
60	M100-60 min	60.45	60.45	54.86	2.0	190.3	
120	M100-2 hr	75.92	37.96	34.45	2.0	233.6	
180	M100-3 hr	86.84	28.95	26.27	2.0	262.1	
240	M100 - 4hr	95.42	23.86	21.65	2.0	282.9	
360	**M100-6 hr**	**109.07**	**18.18**	**16.50**	**2.0**	**313.1**	**Worst case scenario**
540	M100-9 hr	124.67	13.85	12.57	2.0	342.5	
720	M100-12 hr	137.02	11.42	10.36	2.0	361.2	
1080	M100-18 hr	156.52	8.70	7.89	2.0	381.8	
1440	M100-24 hr	172.12	7.17	6.51	2.0	389.5	
2880	M100-2day	191.10	3.98	3.61	2.0	278.7	

Run-off 2 l/s
Area 3267 m^2

Allowable Run-off 2 l/s

	Area	Factor	Total	
Paving	2009	1	2009	m^2
Roof	1258	1	1258	m^2
Total Area			**3267**	**m^2**

23D059 - Surface Water Attenutation Calculation 1-100 + 30%

Blue Area - EAST

Time (mins)	1 *Storm Frequency & Duration*	2 *Rainfall (mm)*	3 *Rainfall Intensity (mm/hr)*	4 *Potential Run-off From Developed Site (l/s)*	5 *Allowable Run-off From Developed Site (l/s)*	6 *Storage Requirement (m3)*	
5	M100-5 min	23.40	280.80	432.85	2.0	129.3	
10	M100-10 min	32.63	195.78	301.79	2.0	179.9	
15	M100-15 min	38.35	153.40	236.46	2.0	211.0	
30	M100-30 min	48.10	96.20	148.29	2.0	263.3	
60	M100-60 min	60.45	60.45	93.18	2.0	328.3	
120	M100-2 hr	75.92	37.96	58.51	2.0	406.9	
180	M100-3 hr	86.84	28.95	44.62	2.0	460.3	
240	M100 - 4hr	95.42	23.86	36.77	2.0	500.7	
360	**M100-6 hr**	**109.07**	**18.18**	**28.02**	**2.0**	**562.1**	**Worst case scenario**
540	M100-9 hr	124.67	13.85	21.35	2.0	627.0	
720	M100-12 hr	137.02	11.42	17.60	2.0	674.0	
1080	M100-18 hr	156.52	8.70	13.40	2.0	739.0	
1440	M100-24 hr	172.12	7.17	11.05	2.0	782.3	
2880	M100-2day	191.10	3.98	6.14	2.0	714.9	

Run-off 2 l/s
Area 5549 m^2

Allowable Run-off 2 l/s

	Area	Factor	Total	
Paving	3296	1	3296	m^2
Roof	2253	1	2253	m^2
Total Area			**5549**	**m^2**

Appendix D – Foul Water Calculations

According to section 3.7.2.

Consumption: 150l/person/day
Occupancy ratio: 2.7 persons/dwelling

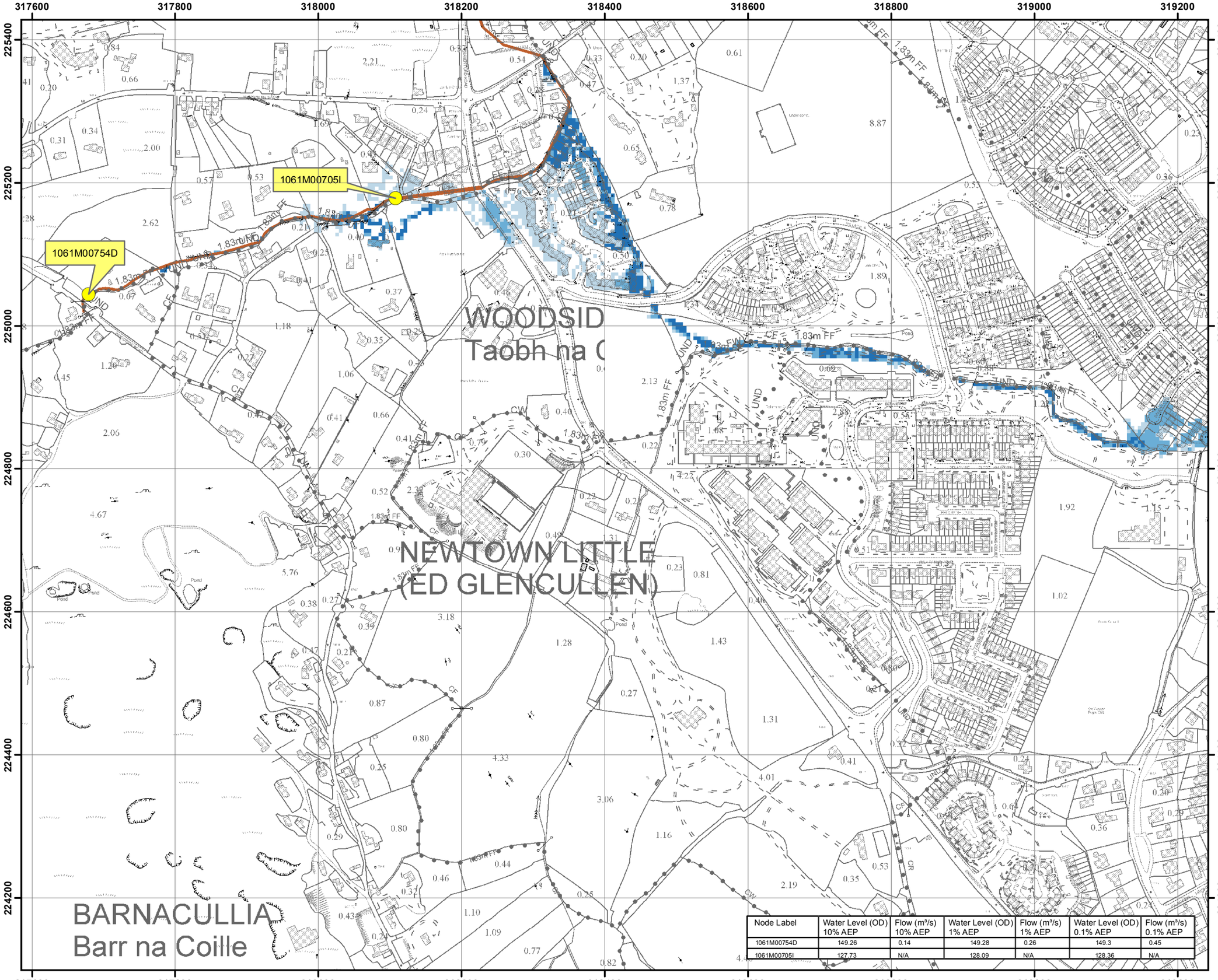
Average flow per dwelling = 405 l/dwelling/day
Average flow per dwelling = 0.004688 l/s

Considering 129 dwellings:

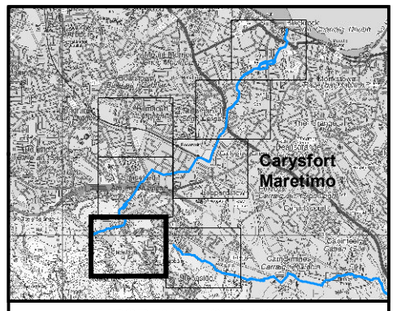
*Average flow for 129 dwellings = 0.6047 l/s

*Peak flow for 129 dwellings = 5 x 0.6047 l/s = 3.023 l/s

Appendix E – Flood Map Report



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
1061M00754D	149.26	0.14	149.28	0.26	149.3	0.45
1061M00705I	127.73	N/A	128.09	N/A	128.36	N/A



IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Embankment
- Wall
- Defended Area
- 1% AEP — Standard of Protection of Flood Defence (Walls / Embankments)
- 1% AEP
- Node Point
- Node ID — Node Label

FINAL

REV:	NOTE:	DATE:

EASTERN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

The Office of Public Works
Jonathan Swift Street
Trim
Co Meath

Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

Map: Carysfort Maretimo Fluvial Flood Extents

Map Type:	EXTENT		
Source:	FLUVIAL		
Map Area:	HPW		
Scenario:	CURRENT		
Drawn By :	C.C.	**Date :**	27 October 2017
Checked By :	A.S.	**Date :**	27 October 2017
Approved By :	S.P.	**Date :**	27 October 2017

Drawing No. : E09CAR_EXFCD_F2_02

Map Series : Page 2 of 7

Drawing Scale : 1:5,000 @ A3

Appendix F – Irish Water Confirmation of Feasibility

CONFIRMATION OF FEASIBILITY

Uisce Éireann
Bosca OP 448
Oifig Sheachadta na
Cathrach Theas
Cathair Chorcaí

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

Síle Hayes

Hayes Higgins
The Glass House
11 Coke Lane
Smithfield
Dublin 7

6 June 2024

Our Ref: CDS24003075 Pre-Connection Enquiry
129 Apartments at Blackglen Road, Sandyford, Dun Laoghaire, Dublin

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 129 unit(s) at 129 Apartments at Blackglen Road, Sandyford, Dun Laoghaire, Dublin, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Uisce Éireann

- The 200mm main on Blackglen Road constructed under the LA Road Upgrade Project has to be connected to Uisce Éireann network prior the connection.

- **Wastewater Connection** - Feasible Subject to upgrades

- In order to accommodate the proposed connection, wastewater network upgrade works are required downstream of the site. Uisce Éireann currently has a project on our current investment plan which will provide the necessary network upgrade and capacity. Estimated completion date for the project is Q3 2028 (subject to change).

- Additionally, the 300mm gravity sewer on Blackglen Road constructed under the LA Road Upgrade Project, has to be connected to the proposed downstream infrastructure.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,

Dermot Phelan
Connections Delivery Manager

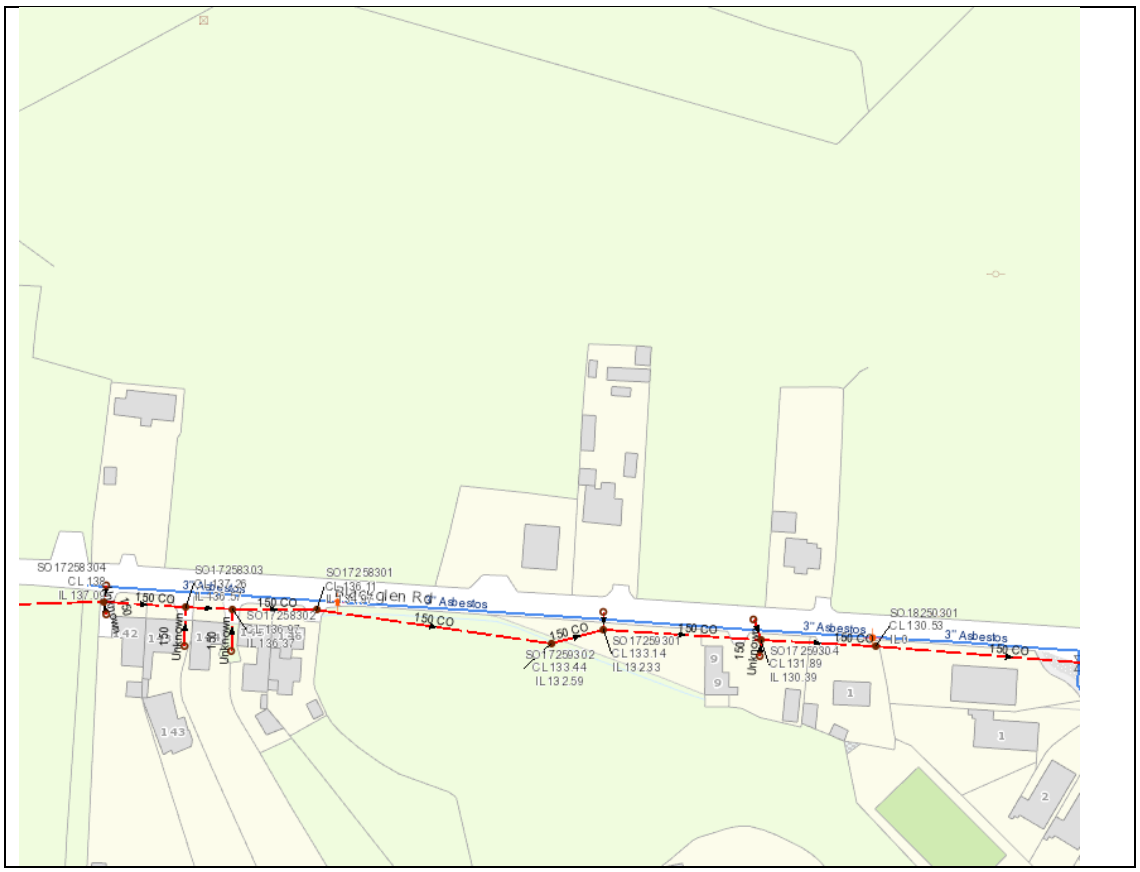
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie



Reproduced from the Ordnance Survey of Ireland by Permission of the Government. License No. 3-3-34

Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

Appendix G – SuDs Matrix Document

SUDS/Green Infrastructure feasibility checklist – 23D059 – 20th March 2024

SuDS Measures	Measures to be used on this site	Rationale for selecting/not selecting measure
Source Control		
Swales	N	There is limited space within the site for same.
Tree Pits	Y	Tree pits maybe included in landscape design. Not included in the SuDs calculations given the poor infiltration rate on site, but they will contribute.
Rainwater Butts	N	To be reviewed with the architect and client.
Rainwater harvesting	N	To be reviewed with the architect and client to see if it is a viable option.
Soakaways	N	Not viable due to impermeable ground conditions.
Infiltration trenches	N	Not viable due to impermeable ground conditions.
Permeable pavement	Y	Permeable surfacing will be provided to provide storage.
Green Roofs	N	Not viable due to nature of development .
Filter strips	N	Filter strips maybe included in landscape design. Not included in the SuDs calculations, due to the impermeable ground conditions, but they will contribute.
Bio-retention systems/Raingardens	Y	Raingardens maybe included in landscape design. Not included in the SuDs calculations, due to the impermeable ground conditions.
Blue Roofs	N	Not cost effective over the lifespan due to maintenance.
Filter Drain	N	Not currently proposed.
Site Control		
Detention Basins	N	No available room on site for large bodies of water and poses a potential drowning hazard.
Retentions basins	N	No available room on site for large bodies of water and poses a potential drowning hazard.
Regional Control		
Ponds	N	No available room on site for large bodies of water and poses a potential drowning hazard
Wetlands	N	No available room on site for large bodies of water and poses a potential drowning hazard.
Other		
Petrol/Oil interceptor	Y	Included in overall drainage design.
Attenuation tank – only as a last resort where other measures are not feasible	Y	Two locations on site. Provided on site. Site storage for 1/100 yr storm + 20% climate change with hydro brake connection to outfall.

Appendix H – Site Investigation

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Ground Investigations Ireland

Blackglen Road, Sandyford

Kavanagh Mansfield

Ground Investigation Report

March 2024

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
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DOCUMENT CONTROL SHEET

Project Title	Blackglen Road, Sandyford.
Engineer	Kavanagh Mansfield
Client	Dun Laoghaire Rathdown County Council
Project No	12844-05-23
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	J. Conneally	S. Kealy	S. Kealy	Dublin	11 March 2024

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

GROUND INVESTIGATIONS IRELAND
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CONTENTS

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APPENDICES

1.0 Preamble

On the instructions of Kavanagh Mansfield Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between December 2023 and January 2024 at the site of the proposed housing development in Sandford, Co. Dublin.

2.0 Overview

2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently greenfield however. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 16 No. Trial Pits to a maximum depth of 3.80m BGL
- Carry out 2 No. Soakaways to determine a soil infiltration value to BRE digest 365
- Carry out 8 No. TRL Probes to determine CBR
- Carry out 3 No. Rotary Core Boreholes to a maximum depth of 7m BGL
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a JCB 3CX excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by a Geotechnical Engineer/Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Soakaway Testing

The soakaway testing was carried out in selected trial pits at the locations shown in the exploratory hole location plan in Appendix 1. These pits were carefully excavated and filled with water to assess the infiltration characteristics of the proposed site. The pits were allowed to drain and the drop in water level was recorded over time as required by BRE Digest 365. The pits were logged prior to completing the soakaway test and were backfilled with arising's upon completion. The soakaway test results are provided in Appendix 3 of this Report.

3.4. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 4 of this Report.

3.5. Surveying

The exploratory hole locations have been recorded using a KQ GEO Technologies KQ-M8 System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.6. TRL Dynamic Cone Penetrometer

The TRL DCP tests were carried out at locations specified by the Consulting Engineer to determine a CBR design value for the design of external pavements. The testing was carried out below the Topsoil or existing pavement at the depths detailed on the test report. The test consists of dropping a 10kg weight on an anvil to drive a small diameter cone and recording the blows for a given penetration. The results of the DCP testing are included in Appendix 5 of this Report.

3.7. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical and environmental testing to assist in the classification of soils and to provide information for the proposed design.
Environmental & Chemical testing as required by the specification, including the Rilta Suite pH and sulphate testing was carried out by Element Materials Technology Laboratory in the UK. The Rilta suite testing includes both Solid Waste and Leachate Waste Acceptance Criteria.
Rock strength testing including Point Load (Is_{50}) and Unconfined Compressive Strength (UCS) testing was carried out in CMTL Ireland Ltd.'s Laboratory in Portlaoise, Co. Laois.
The results of the laboratory testing are included in Appendix 6 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and generally comprised;

- Topsoil/Surfacing
- Made Ground
- Cohesive Deposits
- Weathered Bedrock
- Bedrock

TOPSOIL: Topsoil was encountered in all the exploratory holes, except Trial pits 01 & 02, which are located near the boundary of the site, and was present to a maximum depth of 0.2m BGL.

MADE GROUND: Made Ground deposits were encountered in Trial pits 01 & 02 from ground level and were present to depths of between 1.3m and 2.5m BGL. These deposits were described generally as *brown mottled black slightly sandy gravelly CLAY with fragments of plastic, timber, red brick concrete and construction waste.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown slightly sandy slightly gravelly CLAY with low cobble and boulder contents*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was firm to stiff or stiff between 0.2m BGL and the top of bedrock in the majority of the exploratory holes. These deposits had some, occasional or frequent cobble and boulder content, where noted on the exploratory hole logs.

WEATHERED BEDROCK: In the majority of exploratory holes weathered rock was encountered which was digable with the large excavator to a depth of up to 1.0m below the top of the stratum. The trial pits were terminated upon encountering the more competent bedrock, in which further excavation became more difficult. This material was recovered typically as light brown sandy GRAVEL of granite with low sub-angular cobble content. Some clay and sand were also present with the rock mass either from weathering or as infilling to fractures which were opened upon excavation.

BEDROCK: The rotary core boreholes recovered strong to very strong white to cream mottled grey and pink crystalline coarse-grained GRANITE. This is typical of the type 3 muscovite porphyritic unit of the Northern pluton of the Leinster Granite.
The depth to rock varies from 1.6m BGL in BH02 to a maximum of 2.6m BGL in BH03. However TP07 reached a depth of 3.8m bGL without intersecting bedrock. The total core recovery is good, typically 100% with only one run in BH03 dropping to 67%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH01 BH02

and BH03 to allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 7 of this Report.

4.3. Laboratory Testing

4.3.1. Environmental Laboratory Testing

A number of samples were analysed for a suite of parameters which allows for the assessment of the sampled material in terms of total pollutant content for classification of materials as *hazardous* or *non-hazardous*. The suite also allows for the assessment of the sampled material in terms of suitability for placement at licenced landfills (inert, stable non-reactive, hazardous etc.). The parameter list for the suite includes analysis of the solid samples for arsenic, barium, cadmium, chromium, copper, cyanide, lead, nickel, mercury, zinc, speciated aliphatic and aromatic petroleum hydrocarbons, pH, sulphate, sulphide, moisture content, soil organic matter and an asbestos screen.

The suite also includes those parameters specified in the EU Council Decision establishing criteria for the acceptance of waste at Landfills (Council Decision 2003/33/EC), which for the solid samples are total organic carbon (TOC), speciated aliphatic and aromatic petroleum hydrocarbons, BTEX, phenol, polychlorinated biphenyls (PCB) and PAH.

As part of the suite a leachate is generated from the solid sample which is analysed for antimony, arsenic, barium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, chloride, fluoride, soluble sulphate, sulphide, phenols, dissolved organic carbon (DOC) and total dissolved solids (TDS).

While the laboratory report provides a comparison with the waste acceptance criteria limits it does not provide a waste classification of the material sampled nor does it comment on any potentially hazardous properties of the materials tested. The possibility for contamination, not revealed by the testing undertaken should be borne in mind particularly where Made Ground deposits are present or the previous site use or location indicate a risk of environmental variation. The waste classification report is included under the cover of a separate report by Ground Investigations Ireland. A waste classification report is recommended to be carried out to provide an interpretation of the laboratory data should any material be required to be disposed of off site.

4.3.2. Rock Laboratory Testing

The rock testing carried out on samples recovered from the boreholes reported Unconfined Compressive Strength (UCS) values ranging between 28.7 and 49.5 MPa while the point load testing gave Is50 values ranging between 1.09 to 1.44 MPa. The Is_{50} results correlate to the UCS values using a factor of approximately 20, giving values 21.8 MPa and 28.8MPa. These results correlate to the strength descriptions ranging between of Weak to Medium Strong and confirming the variability of this stratum and the descriptions on the logs. The average of the UCS testing and associated correlated values from the point loading suggest the rock is typically on the border of weak to medium strong.

The results from the completed laboratory testing are included in Appendix 6 of this report.

5.0 Recommendations & Conclusions

5.1. General

The recommendations given and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

An allowable bearing capacity of 1000 kN/m^2 is recommended for conventional strip or pad foundations on the medium strong bedrock deposits between a depth of 1.60m to 2.80m BGL. Where the medium strong bedrock deposits are deeper, such as at the location of TP07, lean mix trench fill to a depth of 3.80m BGL is recommended to achieve the recommended allowable bearing capacity.

The possibility for variation in the depth of the made ground in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

The pH and sulphate testing completed on samples recovered from the exploratory holes indicates the pH results are near neutral and the sulphate results are low, when compared to the guideline values from BRE Special Digest 1:2005. No special precautions are required for concrete foundations to prevent sulphate attack. The samples tested were below the limits of DS1 in the BRE Special Digest 1:2005.

5.3. External Pavements

The proposed pavements are recommended to be designed in accordance with the CBR test results included in the Appendices of this Report. The low CBR test results indicate that a capping layer or a sufficient depth of crushed stone fill may be required. Plate bearing tests are recommended at the time of construction to verify the design assumptions for the proposed pavement make up and to verify adequate compaction has been achieved.
The use of a geogrid and separation membrane may improve the performance of the proposed pavement and enable a more economical pavement design to be achieved, a specialist supplier is recommended to advise of the required strength, depth and type of geotextile for the proposed design.

5.4. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Excavations in the Made Ground, Peat or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

Excavations in the upper cohesive and weathered rock deposits are expected to be excavatable with conventional excavation equipment, with zones of more intact bedrock below this depth requiring rock breaking techniques. Based on the fracture spacing, the rock strength testing and Pettifer & Fookes (1994) Revised Excavatability Graph, Leinster Granite, ranges from hard digging to hard ripping, however the zones recovered as non-intact should be easy to hard digging. The 3CX excavator was generally able to excavate to depths of 0.9m to 1.9m below the top of the weathered rock and became difficult to excavate within the confines of the trial pit on encountering the more competent rock.
Any waste material to be removed off site should be disposed of to a suitably licenced landfill.
The environmental testing completed during the ground investigation is reported under the cover of a separate GII Waste Classification/Subsoil Assessment Report.

5.5. Soakaway Design

At the locations of SA01 and SA02 the water level dropped too slowly to allow calculation of ‘f’ the soil infiltration rate. These locations are therefore not recommended as suitable for soakaway design and construction.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan

Legend

Exploratory holes blackglen_1

- TP05
- TP06
- BH
- CBR
- SA
- TP

Client:

KAVANAGH MANSFIELD & PARTNERS
CONSULTING STRUCTURAL AND CIVIL ENGINEERS

Project Code:
12844-05-23

Project Title:
Blackglen road, Sandyford

Drawing Title:
Figure 1 Site Location

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental
Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

0 10 20 30 40 50 60 70 80 90 m

Drawn By:	Date:
JC	04/03/2024

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Blackglen Road Sandyford			**Trial Pit Number** TP01
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.50m x 0.70m x 2.10m (L x W x D)	**Ground Level (mOD)** 138.99	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717762.2 E 725380.7 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.50	B1				(1.30)	MADE GROUND: dark brown slightly gravelly Clay with low subangular cobble and boulder content and high plastic, timber, concrete fragment content. Gravels are fine to coarse angular to subrounded.		
1.40	B2			137.69	1.30	WEATHERED ROCK recovered as brownish grey slightly clayey sandy fine to coarse angular to subangular Gravel of Granite.		
1.80	B3				(0.70)			
				136.99	2.00	Obstruction: Bedrock.		
				136.89	(0.10) 2.10	Complete at 2.10m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 2.10m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP01

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Site Blackglen Road Sandyford			**Trial Pit Number** TP02
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 2.70m (L x W x D)	**Ground Level (mOD)** 137.27	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717806.8 E 725374.8 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.80)	MADE GROUND: brown mottled black slightly sandy gravelly Clay with medium subangular cobble and high plastic, timber, red brick and C&D waste content. Gravels are fine to coarse angular to subangular.		
0.50	B1			136.47	0.80	POSSIBLE MADE GROUND: brown slightly sandy gravelly Clay. Gravels are fine to coarse angular to subangular. Note odour at 1.00m BGL.		
1.00 1.00-2.00	B2 B3				(1.70)			
				134.77	2.50 (0.10)	WEATHERED ROCK recovered as brown sandy fine to coarse angular to subangular Gravel of Granite with medium subangular to subrounded cobble and low subrounded boulder content.		
2.70	B4			134.67 134.57	2.60 (0.10) 2.70	Obstruction: Bedrock.		
						Complete at 2.70m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 2.70m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP05

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Site Blackglen Road Sandyford			**Trial Pit Number** TP03
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 2.70m (L x W x D)	**Ground Level (mOD)** 138.41	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717796.6 E 725398.9 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with rootlets.		
				138.21	0.20	Firm to stiff brown mottled black slightly gravelly CLAY. Gravels are fine to coarse angular to subangular.		
					(0.60)			
0.60	B1			137.61	0.80	Firm to stiff brown slightly sandy slightly gravelly CLAY with low subangular cobble content. Gravels are fine to coarse angular to subangular.		
1.30	B2				(1.40)			
				136.21	2.20	Medium dense to dense greyish brown slightly gravelly SAND with low subangular to subrounded cobble content. Gravels are fine to coarse angular to subrounded.		
2.40	B3				(0.30)			
				135.91	2.50	WEATHERED ROCK recovered as light brown sandy fine to coarse angular to subangular Gravel of Granite.		
					(0.10)			
				135.81	2.60	Obstruction: Bedrock.		▽1
			Slow(1) at 2.70m.		(0.10)			
				135.71	2.70	Complete at 2.70m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 2.70m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP03

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Site Blackglen Road Sandyford			**Trial Pit Number** TP04
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.70m x 0.70m x 2.80m (L x W x D)	**Ground Level (mOD)** 136.80	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717819.2 E 725386.1 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown slightly gravelly TOPSOIL with rootlets. Gravels are fine to coarse angular to subangular.		
				136.60	0.20			
					(0.50)	Firm to stiff brown slightly sandy gravelly CLAY. Gravels are fine to coarse angular to subangular.		
0.50	B1							
				136.10	0.70			
1.00	B2				(1.20)	Firm to stiff dark brown slightly sandy gravelly CLAY with medium subangular boulder content. Gravels are fine to coarse angular to subangular.		
				134.90	1.90			
2.30	B3				(0.80)	Medium dense to dense greyish brown gravelly SAND. Gravels are fine to coarse angular to subangular.		
				134.10	2.70			
					(0.10)	Obstruction: Bedrock.		
				134.00	2.80	Complete at 2.80m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 2.80m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP04

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Site Blackglen Road Sandyford			**Trial Pit Number** TP05
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 1.80m (L x W x D)	**Ground Level (mOD)** 134.99	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717849.7 E 725401.9 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with rootlets.		
				134.79	0.20	Firm to stiff brown slightly sandy gravelly CLAY. Gravels are fine to coarse subangular to subrounded with low subangular cobble content.		
					(0.60)			
0.70	B1			134.19	0.80	Firm brown sandy very gravelly CLAY. Gravels are fine to coarse angular to subangular with medium angular to subangular cobble content.		
1.10	B2				(0.60)			
				133.59	1.40	WEATHERED ROCK recovered as brown sandy fine to coarse angular to subangular Gravel of Granite with medium subangular to subrounded cobble and low subrounded boulder content.		
					(0.30)			
				133.29	1.70	Obstruction: Bedrock.		
				133.19	(0.10) 1.80			
1.80	B3					Complete at 1.80m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 1.80m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP05

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Site Blackglen Road Sandyford			**Trial Pit Number** TP06
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.70m x 0.70m x 1.25m (L x W x D)	**Ground Level (mOD)** 141.79	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717717.6 E 725421.1 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15)	Dark brown TOPSOIL with tree roots and rootlets.		
				141.64	0.15	Firm to stiff brown slightly sandy gravelly CLAY with low subangular cobble content. Gravels are fine to coarse angular to subangular.		
					(1.00)			
				140.64	1.15	WEATHERED ROCK recovered as greyish light brown sandy fine to coarse angular to subangular Gravel of Granite.		
				140.59	1.20			
				140.54	1.25	Obstruction: Bedrock.		
						Complete at 1.25m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 1.25m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP06

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Site Blackglen Road Sandyford			**Trial Pit Number** TP07
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.30m x 0.70m x 3.80m (L x W x D)	**Ground Level (mOD)** 141.42	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717739.6 E 725436.6 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Dark brown TOPSOIL rootlets.		
				141.22	0.20	Firm to stiff brown slightly sandy gravelly CLAY with low subangular cobble content. Gravels are fine to coarse angular to subangular.		
0.50	B1							
1.00	B2				(2.00)			
2.00	B3		Slow(1) at 2.00m.					▽1
				139.22	2.20	Stiff dark brown slightly sandy gravelly CLAY with low subangular cobble content. Gravels are fine to coarse angular to subangular (damp).		
					(1.60)			
3.50	B4							
				137.62	3.80	Complete at 3.80m		

Plan

Remarks

Groundwater encountered at 2.00m BGL with slow inflow.
Trial pit sidewalls spalling below 2.50m BGL.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP07

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Site Blackglen Road Sandyford			**Trial Pit Number** TP08
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 2.70m (L x W x D)	**Ground Level (mOD)** 140.74	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717756.9 E 725435.1 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with rootlets.		
				140.54	0.20	Firm to stiff brown slightly sandy gravelly CLAY with low subangular cobble content. Gravels are fine to coarse angular to subangular.		
0.60	B1				(0.80)			
				139.74	1.00	Stiff dark brown slightly sandy gravelly CLAY with medium subangular cobble content. Gravels are fine to coarse angular to subangular.		
1.20	B2				(0.60)			
				139.14	1.60	Stiff brown slightly sandy very gravelly CLAY with high Weathered Rock content. Gravels are fine to coarse angular to subangular.		
2.00	B3				(0.80)			
				138.34	2.40	WEATHERED ROCK recovered as light brown sandy fine to coarse angular to subangular Gravel of Granite with low subangular cobble content.		
				138.14	(0.20) 2.60			
2.70	B4		Slow(1) at 2.70m.	138.04	(0.10) 2.70	Obstruction: Bedrock. Complete at 2.70m		▽1

Plan

Remarks

Groundwater encountered at 2.00m BGL with slow inflow.
Trial pit sidewalls spalling below 2.50m BGL.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP08

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Site Blackglen Road Sandyford			**Trial Pit Number** TP09
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.10m x 0.70m x 0.50m (L x W x D)	**Ground Level (mOD)** 141.98	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717719.1 E 725454.9 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				141.88	(0.10) 0.10	Brown TOPSOIL with tree roots and rootlets.		
					(0.30)	WEATHERED ROCK recovered as greyish light brown sandy fine to coarse angular to subangular Gravel of Granite with medium angular to subangular cobble content.		
				141.58	0.40			
				141.48	(0.10) 0.50	Obstruction: Bedrock.		
						Complete at 0.50m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 0.50m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP09

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Site Blackglen Road Sandyford			**Trial Pit Number** TP10
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 2.10m (L x W x D)	**Ground Level (mOD)** 141.84	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717731.1 E 725470.3 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				141.69	(0.15) 0.15	Brown TOPSOIL with tree roots and rootlets.		
0.60	B1				(0.95)	Firm to stiff light brown slightly sandy gravelly CLAY with low subangular cobble content. Gravels are fine to coarse subangular to subrounded.		
				140.74	1.10	WEATHERED ROCK recovered as greyish light brown sandy fine to coarse angular to subangular Gravel of Granite with medium subangular cobble content.		
1.80	B2				(0.90)			
				139.84	2.00	Obstruction: Bedrock.		
				139.74	(0.10) 2.10	Complete at 2.10m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 2.10m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP10

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Site Blackglen Road Sandyford			**Trial Pit Number** TP11
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.50m x 0.70m x 0.80m (L x W x D)	**Ground Level (mOD)** 136.44	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717825.1 E 725440.3 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with tree roots and rootlets.		
				136.24	0.20			
0.30	B1				(0.45)	Firm to stiff brown slightly sandy slightly gravelly CLAY with low subangular to subrounded cobble content. Gravels are fine to coarse subangular to subrounded.		
				135.79	0.65			
				135.74	0.70	WEATHERED ROCK recovered as light brown slightly clayey sandy fine to coarse angular to subangular Gravel of Granite with medium subangular cobble and low subangular boulder content.		
				135.64	(0.10) 0.80	Obstruction: Bedrock.		
0.80	B2					Complete at 0.80m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 0.80m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP11

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Site Blackglen Road Sandyford			**Trial Pit Number** TP12
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.40m x 0.70m x 1.00m (L x W x D)	**Ground Level (mOD)** 133.91	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717845.4 E 725467.4 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with tree roots and rootlets.		
				133.71	0.20			
					(0.20)	Firm brown slightly sandy gravelly CLAY with low subangular cobble content. Gravels are fine to coarse subangular to subrounded.		
				133.51	0.40			
					(0.40)	Firm to stiff brown sandy gravelly CLAY with low subangular cobble content. Gravels are fine to coarse subangular to subrounded.		
0.70	B1			133.11	0.80			
					(0.10)	WEATHERED ROCK recovered as light brown slightly clayey sandy fine to coarse angular to subangular Gravel of Granite with medium subangular cobble and low subangular boulder content.		
				133.01	0.90			
					(0.10)	Obstruction: Bedrock.		
				132.91	1.00	Complete at 1.00m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 1.00m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP12

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Site Blackglen Road Sandyford			**Trial Pit Number** TP13
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.40m x 0.70m x 2.30m (L x W x D)	**Ground Level (mOD)** 130.85	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717873.4 E 725474.8 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with tree roots and rootlets.		
				130.65	0.20	Firm to stiff brown slightly sandy gravelly CLAY with low subangular cobble content. Gravels fine to coarse subangular to subrounded.		
					(0.90)			
0.80	B1							
				129.75	1.10	WEATHERED ROCK recovered as light brown slightly clayey sandy fine to coarse angular to subangular Gravel of Granite with low subangular cobbles.		
1.50	B2				(0.90)			
				128.85	2.00	WEATHERED ROCK recovered as light brown slightly clayey sandy fine to coarse angular to subangular Gravel of Granite with medium subangular cobble and low subangular boulder content (wet).		▽1
2.20	B3		Slow(1) at 2.10m.		(0.20)			
				128.65	2.20	Obstruction: Bedrock.		
				128.55	(0.10) 2.30	Complete at 2.30m		

Plan

Remarks

Groundwater encountered with slow inflow at 2.10m BGL.
Trial pit stable.
Trial pit terminated at 2.30m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP13

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Site Blackglen Road Sandyford			**Trial Pit Number** TP14
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 0.90m (L x W x D)	**Ground Level (mOD)** 133.35	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717886.8 E 725417.1 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with rootlets.		
				133.15	0.20	Firm to stiff orangish brown slightly gravelly CLAY. Gravels are fine to coarse subangular to subrounded.		
					(0.40)			
0.50	B1			132.75	0.60			
					(0.20)	Firm to stiff dark brown slightly gravelly CLAY. Gravels are fine to coarse subangular to subrounded.		
				132.55	0.80			
				132.50	0.85	WEATHERED ROCK recovered as light brown to yellow sandy fine to medium subangular to subrounded Gravel of Granite with low subangular cobble and boulder content.		
				132.45	0.90	Obstruction: Bedrock.		
						Complete at 0.90m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 0.90m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP14

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Site Blackglen Road Sandyford			**Trial Pit Number** TP15
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.60m x 0.70m x 0.90m (L x W x D)	**Ground Level (mOD)** 131.74	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717903.1 E 725448 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				131.64	(0.10) 0.10	Brown TOPSOIL with rootlets.		
0.50	B1				(0.50)	Firm to stiff brown slightly sandy slightly gravelly CLAY. Gravels are fine to coarse subangular to subrounded with low subrounded cobble content.		
				131.14 131.09 131.04	0.60 0.65 0.70	WEATHERED ROCK recovered as light brown to yellow sandy fine to coarse angular to subangular Gravel of Granite.		
						Obstruction: Bedrock.		
						Complete at 0.90m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 0.70m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP15

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Site Blackglen Road Sandyford			**Trial Pit Number** TP16
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.00m x 0.70m x 1.90m (L x W x D)	**Ground Level (mOD)** 132.95	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717888.8 E 725362.2 N	**Dates** 27/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				132.85	(0.10) 0.10	Brown TOPSOIL with rootlets.		
0.50-1.00	B1					MADE GROUND: Dark brown mottled grey and black slightly sandy gravelly Clay with medium cobble and boulder content and fragments of timber and cloth. Gravels are fine to coarse angular to subangular.		
					(1.40)			
1.70	B2			131.45	1.50	WEATHERED ROCK recovered as light brown to yellow sandy fine to medium subangular to subrounded Gravel of Granite with medium cobble content.		
					(0.30)			
				131.15	1.80	Obstruction: Bedrock.		
			Slow(1) at 1.90m.	131.05	(0.10) 1.90			▽1
						Complete at 1.90m		

Plan

Remarks

Groundwater encountered with slow inflow at 1.90m BGL.
Trial pit stable.
Trial pit terminated at 1.90m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.TP16

Trial Pit Photographs – Blackglen Road Sandyford

TP01

TP01

Trial Pit Photographs – Blackglen Road Sandyford

TP01

TP02

Trial Pit Photographs – Blackglen Road Sandyford

TP02

TP02

Trial Pit Photographs – Blackglen Road Sandyford

TP03

TP03

Trial Pit Photographs – Blackglen Road Sandyford

TP03

TP04

Trial Pit Photographs – Blackglen Road Sandyford

TP04

TP04

Trial Pit Photographs – Blackglen Road Sandyford

TP05

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Trial Pit Photographs – Blackglen Road Sandyford

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Trial Pit Photographs – Blackglen Road Sandyford

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Trial Pit Photographs – Blackglen Road Sandyford

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Trial Pit Photographs – Blackglen Road Sandyford

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Trial Pit Photographs – Blackglen Road Sandyford

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Trial Pit Photographs – Blackglen Road Sandyford

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TP09

Trial Pit Photographs – Blackglen Road Sandyford

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TP10

Trial Pit Photographs – Blackglen Road Sandyford

TP10

TP10

Trial Pit Photographs – Blackglen Road Sandyford

TP11

TP11

Trial Pit Photographs – Blackglen Road Sandyford

TP11

TP12

Trial Pit Photographs – Blackglen Road Sandyford

TP12

TP12

Trial Pit Photographs – Blackglen Road Sandyford

TP13

TP13

Trial Pit Photographs – Blackglen Road Sandyford

TP13

TP14

Trial Pit Photographs – Blackglen Road Sandyford

TP14

TP14

Trial Pit Photographs – Blackglen Road Sandyford

TP15

TP15

Trial Pit Photographs – Blackglen Road Sandyford

TP15

TP16

Trial Pit Photographs – Blackglen Road Sandyford

TP16

TP16

APPENDIX 3 – Soakaway test Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

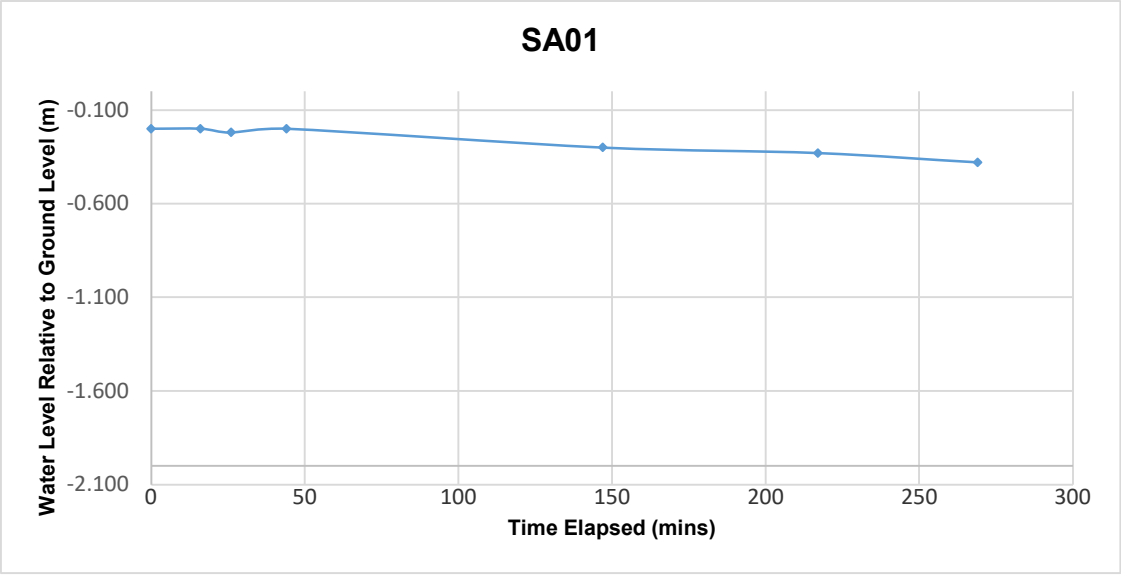
SA01

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.10m x 0.60m x 1.00m (L x W x D)

Date	Time	Water level (m bgl)
29/11/2023	0	-0.200
29/11/2023	16	-0.200
29/11/2023	26	-0.220
29/11/2023	44	-0.200
29/11/2023	147	-0.300
29/11/2023	217	-0.330
29/11/2023	269	-0.380

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.20	1.000	0.800	0.4	0.8



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
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Web: www.gii.ie

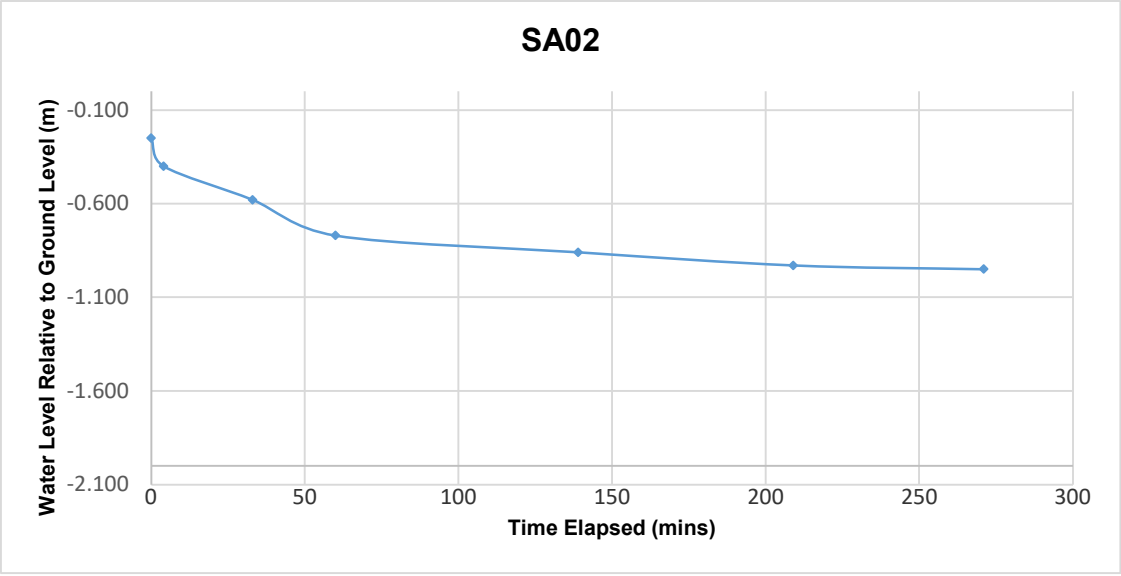
SA02

Soakaway Test to BRE Digest 365
Trial Pit Dimensions: 2.20m x 0.60m x 2.10m (L x W x D)

Date	Time	Water level (m bgl)
29/11/2023	0	-0.250
29/11/2023	4	-0.400
29/11/2023	33	-0.580
29/11/2023	60	-0.770
29/11/2023	139	-0.860
29/11/2023	209	-0.930
29/11/2023	271	-0.950

***Soakaway failed - Pit backfilled**

Start depth	Depth of Pit	Diff	75% full	25%full
0.25	2.100	1.850	0.7125	1.6375



Ground Investigations Ireland Ltd
www.gii.ie

Site Blackglen Road Sandyford			**Trial Pit Number** SA01A
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.20m x 0.60m x 0.50m (L x W x D)	**Ground Level (mOD)** 135.69	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717831.8 E 725453.1 N	**Dates** 28/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				135.59	(0.10) 0.10	Brown TOPSOIL with tree roots and rootlets.		
					(0.20)	Firm brown slightly sandy slightly gravelly CLAY. Gravels are fine to coarse angular to subangular.		
				135.39	0.30			
				135.29	(0.10) 0.40	WEATHERED ROCK recovered as light brown sandy Gravel of Granite. Gravels are fine to coarse angular to subangular.		
				135.19	(0.10) 0.50	Obstruction: Bedrock		
						Abandoned at 0.50m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 0.50m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.SA01A

Ground Investigations Ireland Ltd
www.gii.ie

Site Blackglen Road Sandyford			**Trial Pit Number** SA01B
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.10m x 0.60m x 1.00m (L x W x D)	**Ground Level (mOD)**	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location	**Dates** 28/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	Brown TOPSOIL with rootlets.		
					(0.45) 0.60	Firm brown slightly sandy slightly gravelly CLAY. Gravels are fine to coarse angular to subangular.		
					(0.30) 0.90	WEATHERED ROCK recovered as light brown sandy Gravel of Granite with medium angular to subangular cobble content. Gravels are fine to coarse angular to subangular.		
					(0.10) 1.00	Obstruction: Bedrock		
						Complete at 1.00m		

Plan

Remarks

No groundwater encountered.
Trial pit stable.
Trial pit terminated at 1.0m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.SA01B

Ground Investigations Ireland Ltd
www.gii.ie

Site Blackglen Road Sandyford			**Trial Pit Number** SA02
Machine : 3CX **Method :** Trial Pit	**Dimensions** 2.20m x 0.60m x 2.10m (L x W x D)	**Ground Level (mOD)** 129.97	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717908.3 E 725466.1 N	**Dates** 28/11/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20)	Brown TOPSOIL with rootlets.		
				129.77	0.20	Firm brown slightly sandy slightly gravelly CLAY with low subangular cobble content. Gravels are fine to coarse subangular to subrounded.		
					(0.90)			
				128.87	1.10	WEATHERED ROCK recovered as light brown sandy Gravel of Granite with low subangular cobble content. Gravels are fine to coarse angular to subangular.		
					(0.90)			
			Moderate(1) at 2.00m.	127.97	2.00			▽1
				127.87	(0.10) 2.10	Obstruction: Bedrock.		
						Complete at 2.10m		

Plan

Remarks

Groundwater encountered at 2.00m BGL with moderate inflow.
Trial pit sidewalls spalling.
Trial pit terminated at 2.10m BGL due to encountering competent bedrock.
Trial pit backfilled upon completion.

Scale (approx)	Logged By	Figure No.
1:25	AM	12844-05-23.SA02

Trial Pit Photographs – Blackglen Road Sandyford

SA01A

SA01B

Trial Pit Photographs – Blackglen Road Sandyford

SA01B

SA01B

Trial Pit Photographs – Blackglen Road Sandyford

SA02

SA02

Trial Pit Photographs – Blackglen Road Sandyford

SA02

APPENDIX 4 - Rotary Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Blackglen Road Sandyford				**Borehole Number** BH01
Machine : Beretta T-41 **Flush :** Water **Core Dia :** 96 mm **Method :** Rotary Cored	**Casing Diameter** 100mm cased to 5.50m	**Ground Level (mOD)** 142.40	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717721.9 E 725460.3 N	**Dates** 11/12/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00						142.30	0.10	Brown TOPSOIL with grass and roots			
						142.20	0.20	Soft brown slightly sandy CLAY			
	30						(2.30)	Weathered rock recovered as slightly clayey slightly sandy gravelly COBBLES AND BOULDERS of granite			
2.50						139.90	2.50	Medium strong white to cream mottled grey and pink crystalline coarse grained GRANITE slightly weathered 2.50m BGL to 4.00m BGL: Sequence consists of one fracture set. F1: dipping 0-30 degrees, very close to closely spaced, undulating to planar rough with some surface staining.			
	100	100	79	9							
4.00							(3.00)				
	100	95	38	13				4.00m BGL to 5.50m BGL: Sequence consists of two fracture sets. F1: dipping 0-30 degrees, very close to medium spaced, undulating to planar rough with some surface staining. F2: dipping 40-70 degrees, close to medium spaced, undulating to planar rough with some surface staining.			
5.50						136.90	5.50	Complete at 5.50m			

Remarks
Rotary coring drilling carried out to 5.50m BGL
Standpipe installed in borehole upon completion; Slotted from 5.50m BGL to 1.00m BGL; Plain from 1.00m BGL to Ground Level with a raised cover

Scale (approx)	Logged By
1:50	JI

Figure No. 12844-05-23.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Site Blackglen Road Sandyford			**Borehole Number** BH02
Machine : Beretta T-41 **Flush :** Water **Core Dia :** 96 mm **Method :** Rotary Cored	**Casing Diameter** 100mm cased to 5.50m	**Ground Level (mOD)** 135.29	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717839.8 E 725454 N	**Dates** 11/12/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00	74		34				(1.60)	Weathered rock recovered as slightly clayey slightly sandy gravelly COBBLES AND BOULDERS of granite		
1.60						133.69	1.60			
2.50	100		95	4			(3.90)	Medium strong white to cream mottled grey and pink crystalline coarse grained GRANITE slightly weathered 1.60m BGL to 5.50m BGL: Sequence consists of two fracture sets. F1: dipping 0-30 degrees, medium to widely spaced, undulating to planar rough with slight surface staining. F2: dipping 70-90 degrees, medium to widely spaced, undulating to planar rough with slight surface staining.		
4.00	100		100							
5.50						129.79	5.50	Complete at 5.50m		

Remarks
Rotary coring drilling carried out to 5.50m BGL
Borehole backfilled upon completion

Scale (approx)	Logged By
1:50	JI

Figure No. 12844-05-23.BH02

Ground Investigations Ireland Ltd
www.gii.ie

Site Blackglen Road Sandyford			**Borehole Number** BH03
Machine : Beretta T-41 **Flush :** Water **Core Dia :** 96 mm **Method :** Rotary Cored	**Casing Diameter** 100mm cased to 7.00m	**Ground Level (mOD)** 131.58	**Client** Dun Laoghaire Rathdown County Council	**Job Number** 12844-05-23
	Location 717883.6 E 725460.1 N	**Dates** 12/12/2023	**Engineer** Kavanagh Mansfield & Partners Consulting	**Sheet** 1/1

Depth (m)	TCR (%)	SCR (%)	RQD (%)	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00						131.48	0.10	Brown TOPSOIL with grass and roots]			
						131.33	(0.15) 0.25	Soft brown slightly sandy CLAY			
	32							Weathered rock recovered as sandy GRAVEL of granite			
							(2.35)				
2.50						128.98	2.60	Strong to very strong white to cream mottled grey and pink crystalline coarse grained GRANITE slightly weathered 2.50m BGL to 4.00m BGL: Sequence consists of one fracture set. F1 dipping 0-20 degrees, close to widely spaced, undulating to planar rough, with some surface staining. 1 fracture at 2.80m BGL dipping 40-50 degrees, undulating to planar rough with some surface staining			
	100	92	79	3			(1.40)				
4.00				NI		127.58	4.00	Weathered rock recovered as sandy GRAVEL of granite 4.00m BGL to 4.50m BGL: Not intact			
							(0.50)				
4.50	67	51	43			127.08	4.50	Medium strong white to cream mottled grey and pink crystalline coarse grained GRANITE slightly weathered 4.50m BGL to 7.00m BGL: Sequence consists of two fracture sets. F1 dipping 0-30 degrees, close to medium spaced, undulating to planar rough with slight surface staining. F2 dipping 40-60 degrees, close to medium spaced, undulating to planar rough with slight surface staining			
5.50				4			(2.50)				
	100	100	82								
7.00						124.58	7.00	Complete at 7.00m			

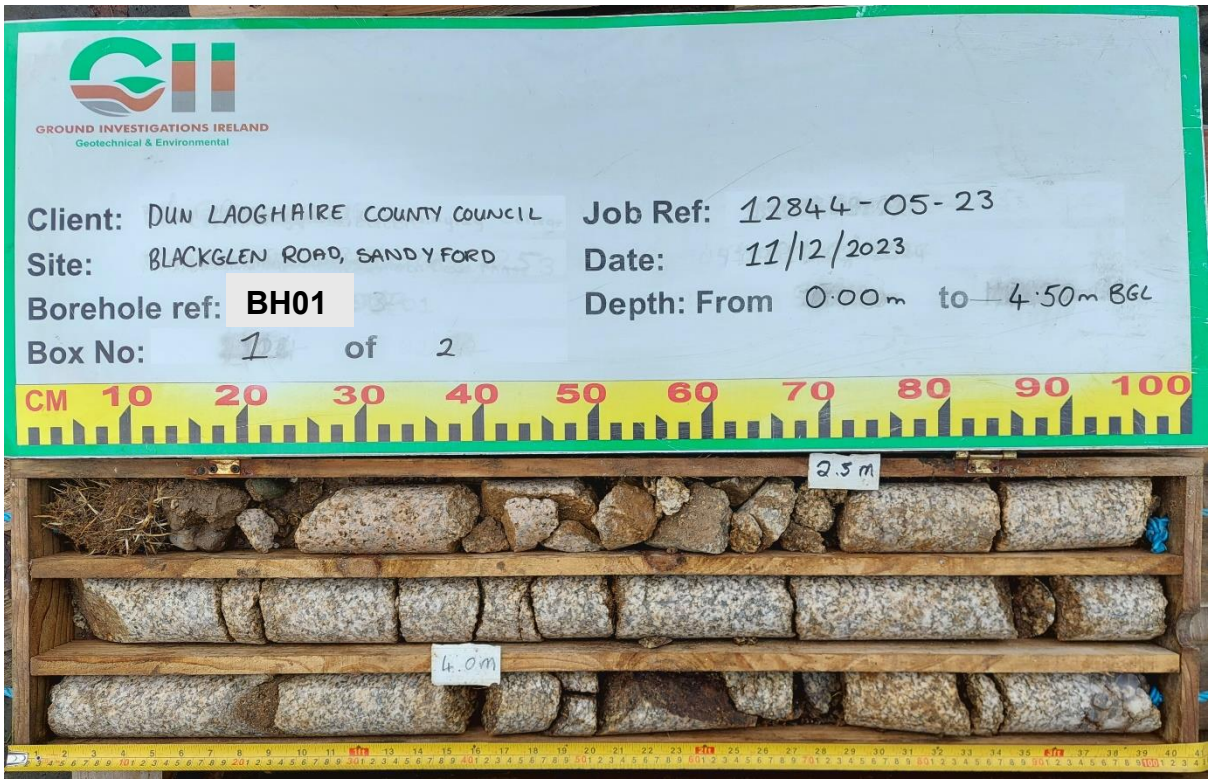
Remarks
Rotary coring drilling carried out to 7.00m BGL
Standpipe installed in borehole upon completion; Slotted from 7.00m BGL to 1.00m BGL; Plain from 1.00m BGL to Ground Level with a raised cover

Scale (approx)	Logged By
1:50	JI

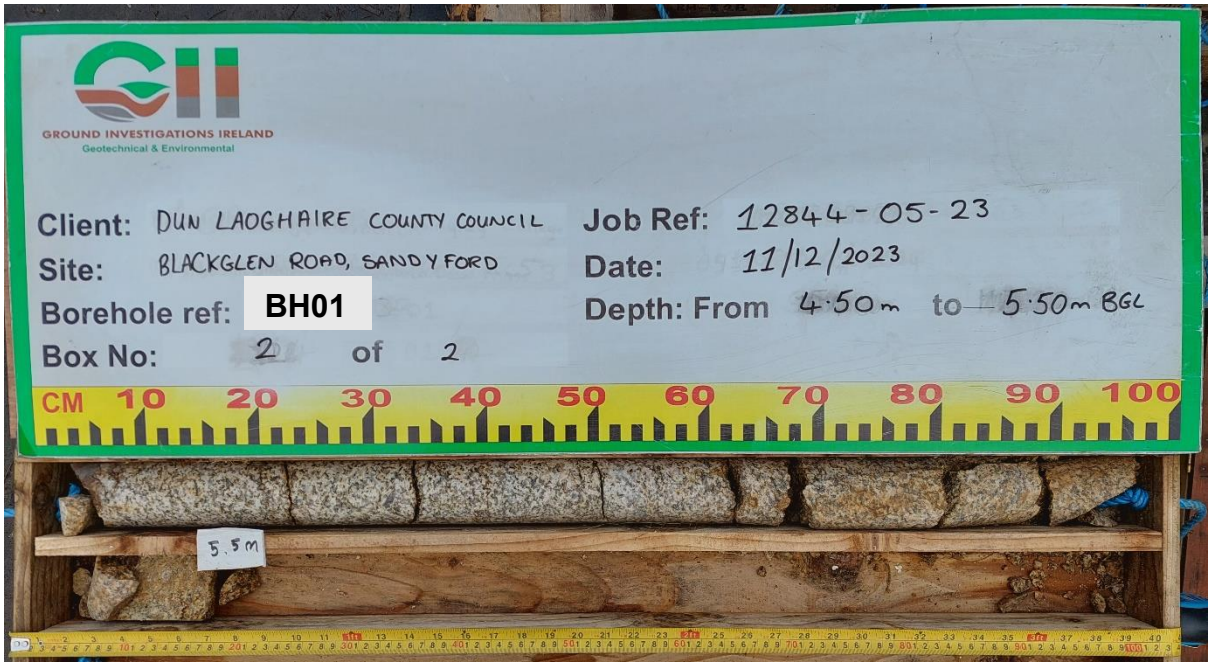
Figure No. 12844-05-23.BH03

Blackglen Road, Sandyford Rotary Core Photographs

BH01

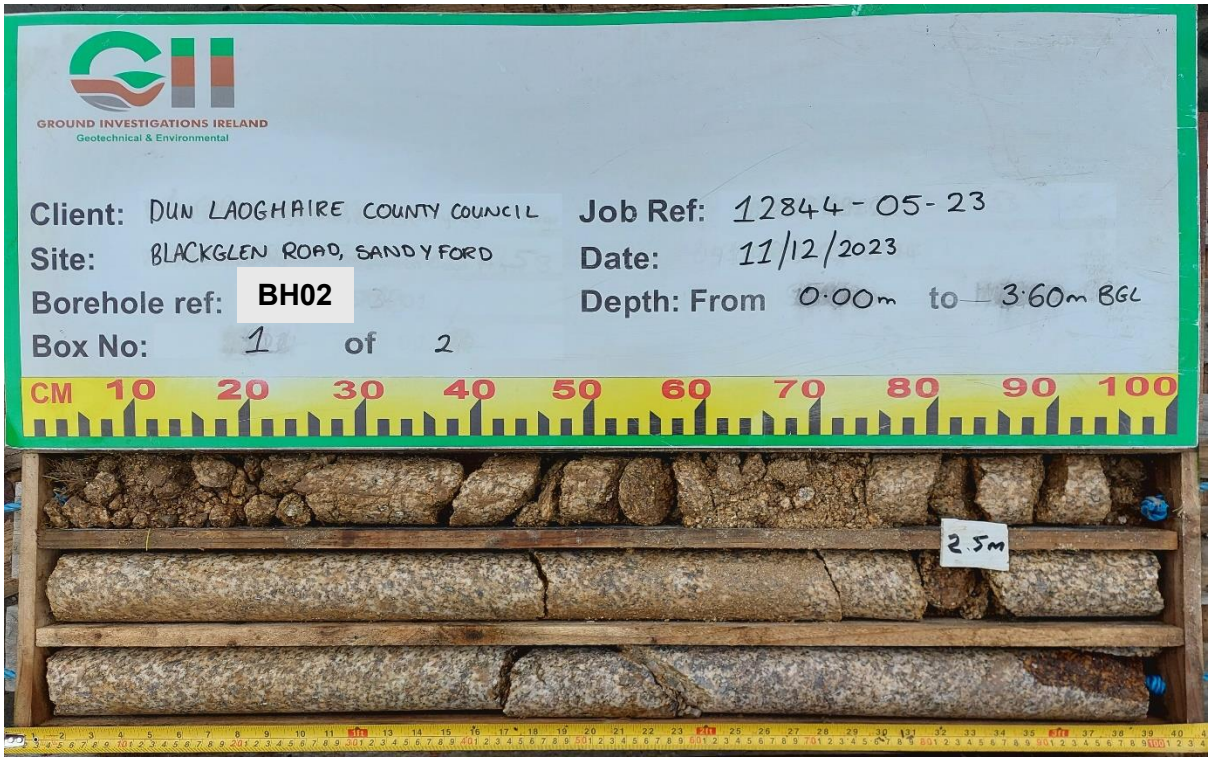


BH01

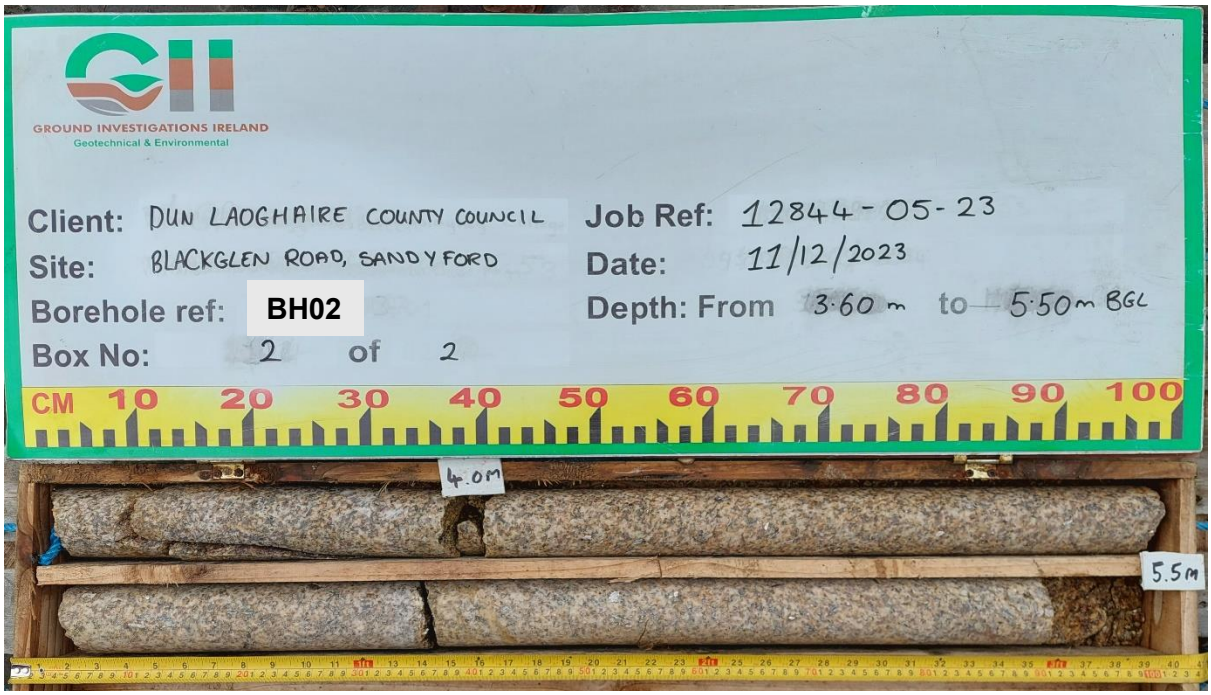


Blackglen Road, Sandyford Rotary Core Photographs

BH02



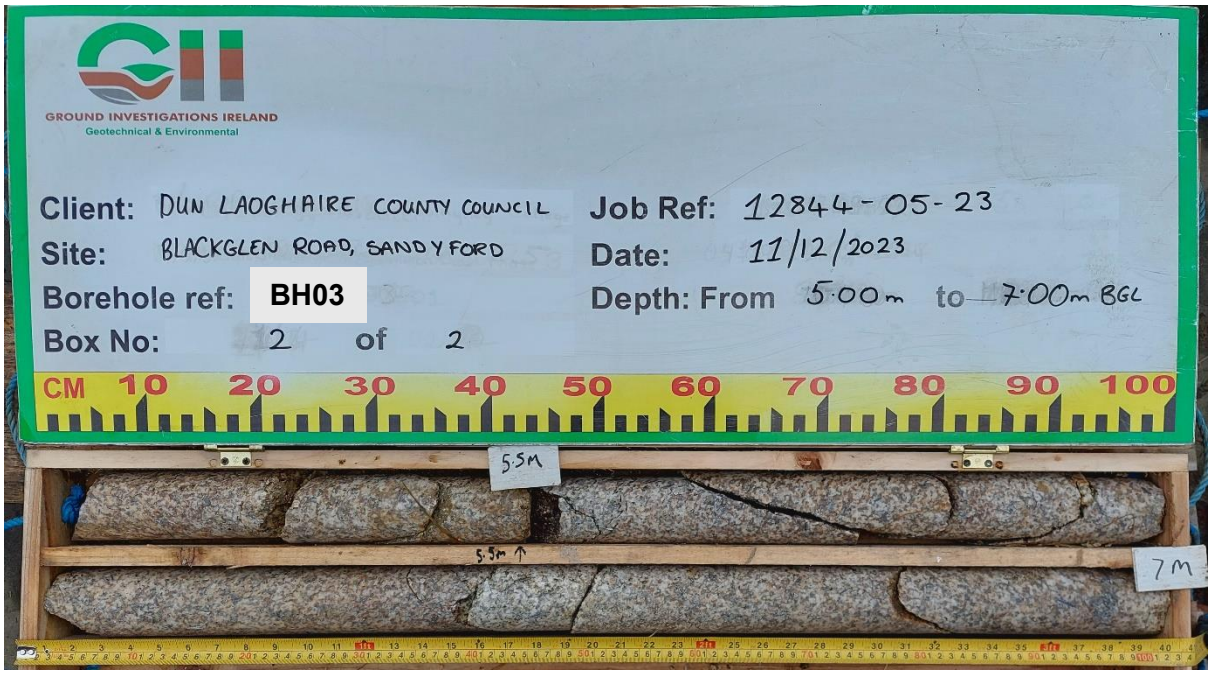
BH02



Blackglen Road, Sandyford Rotary Core Photographs

BH03

BH03



APPENDIX 5 – TRL Dynamic Cone Penetrometer Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

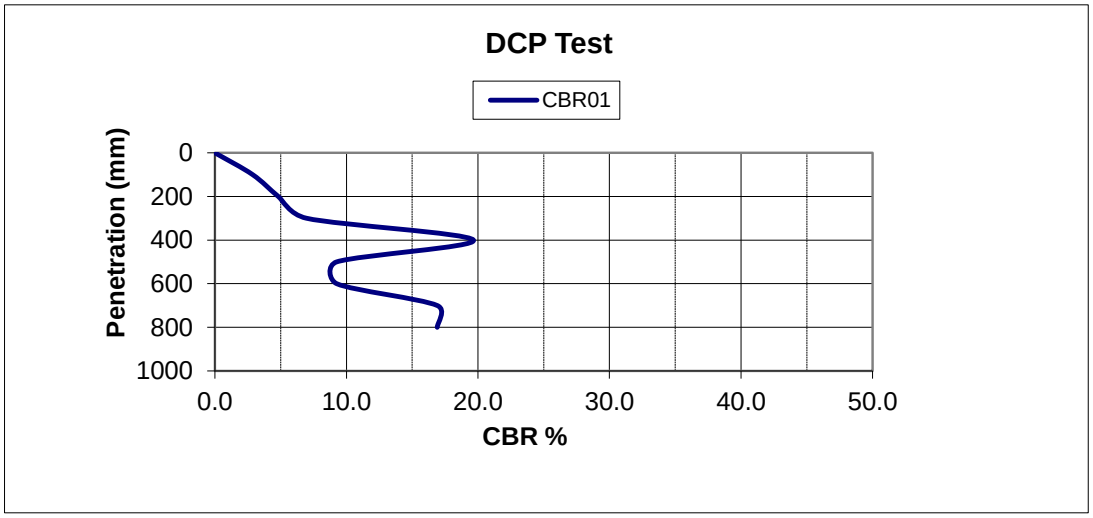
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR01
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	2	50.0	2.9
200	3	33.3	4.8
300	4	25.0	7.0
400	9	11.1	19.7
500	5	20.0	9.3
600	5	20.0	9.3
700	8	12.5	16.9
800	8	12.5	16.9
900	-		
1000	-		
1100	-		
1200	-		
1300	-		
1400	-		
1500	-		

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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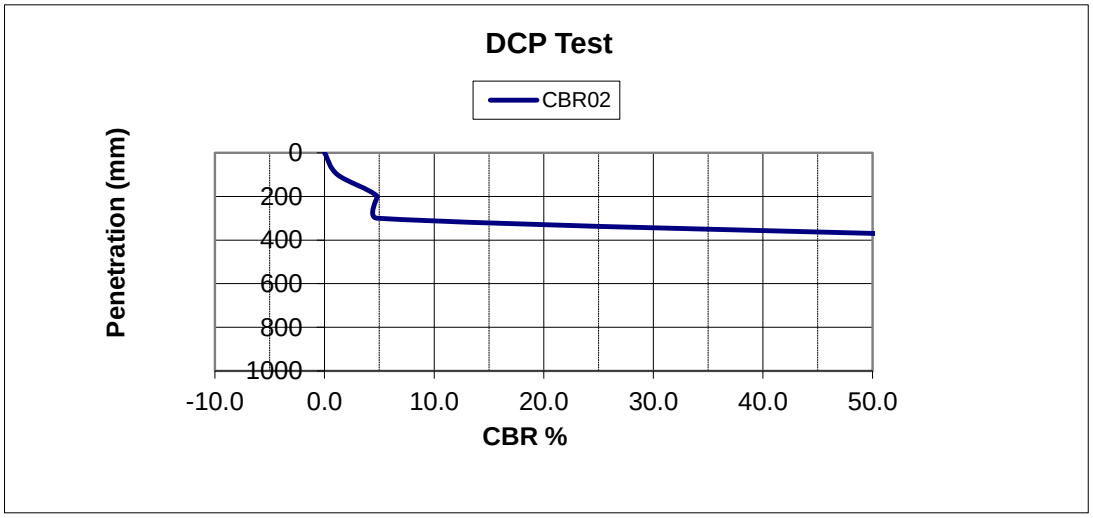
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR02
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	3	33.3	4.8
300	3	33.3	4.8
400	25	4.0	72.7

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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Tel: 01 601 5175 / 5176
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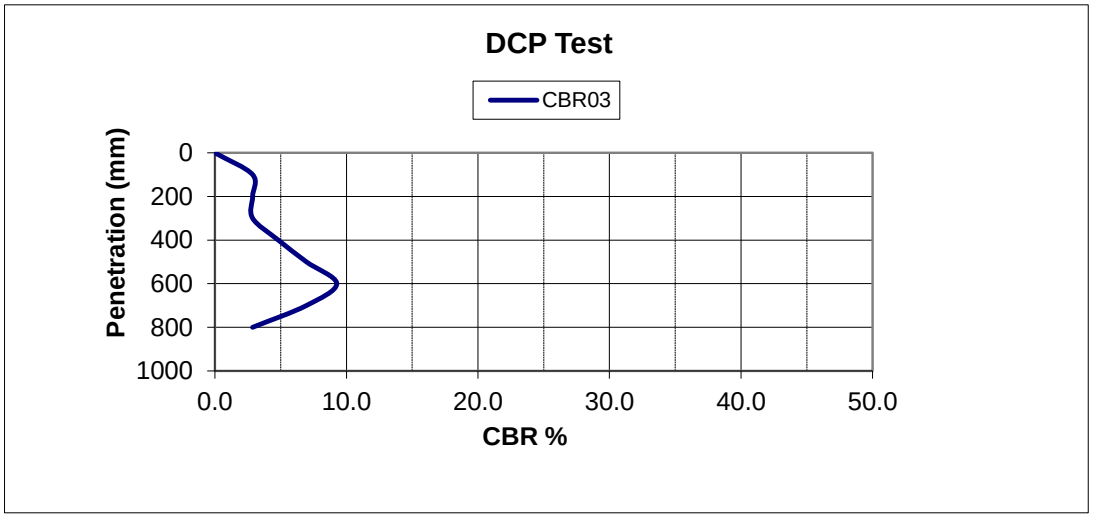
Web: www.gii.ie

Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR03
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	2	50.0	2.9
200	2	50.0	2.9
300	2	50.0	2.9
400	3	33.3	4.8
500	4	25.0	7.0
600	5	20.0	9.3
700	4	25.0	7.0
800	2	50.0	2.9

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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Tel: 01 601 5175 / 5176
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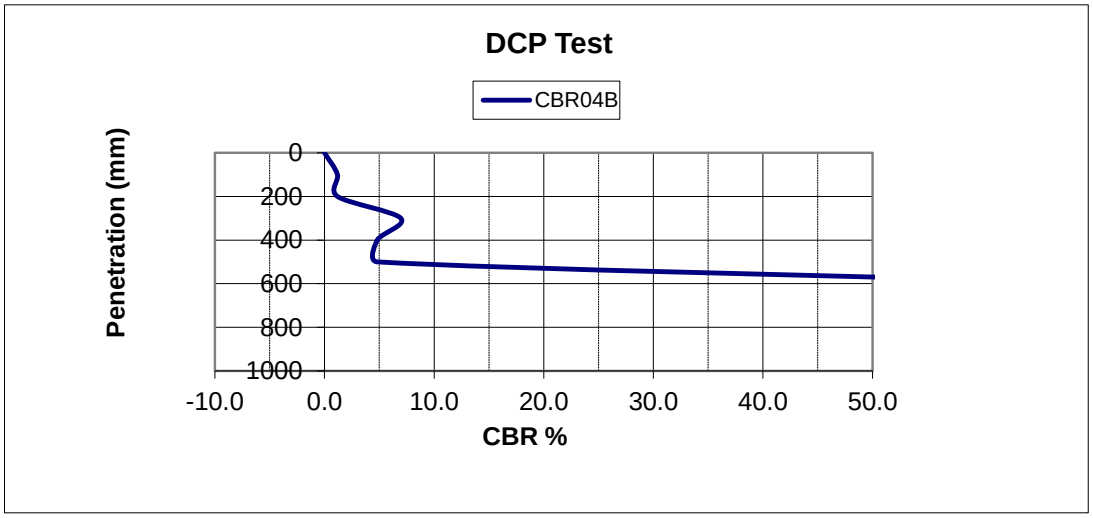
Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR04B
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	1	100.0	1.2
200	1	100.0	1.2
300	4	25.0	7.0
400	3	33.3	4.8
500	3	33.3	4.8
600	25	4.0	72.7

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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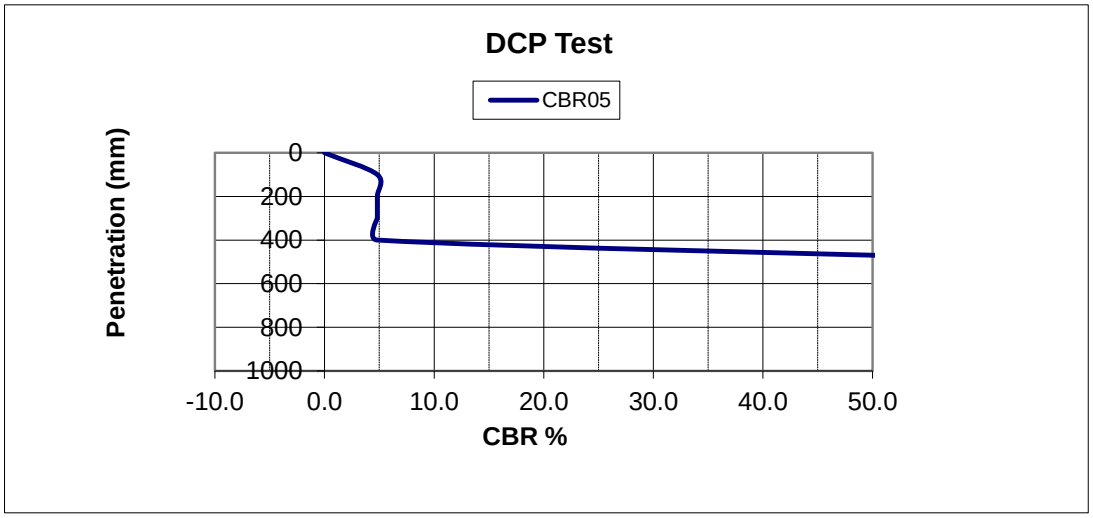
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR05
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	3	33.3	4.8
200	3	33.3	4.8
300	3	33.3	4.8
400	3	33.3	4.8
500	25	4.0	72.7

Reference **Kleyn and Van Heerden (60^{o} Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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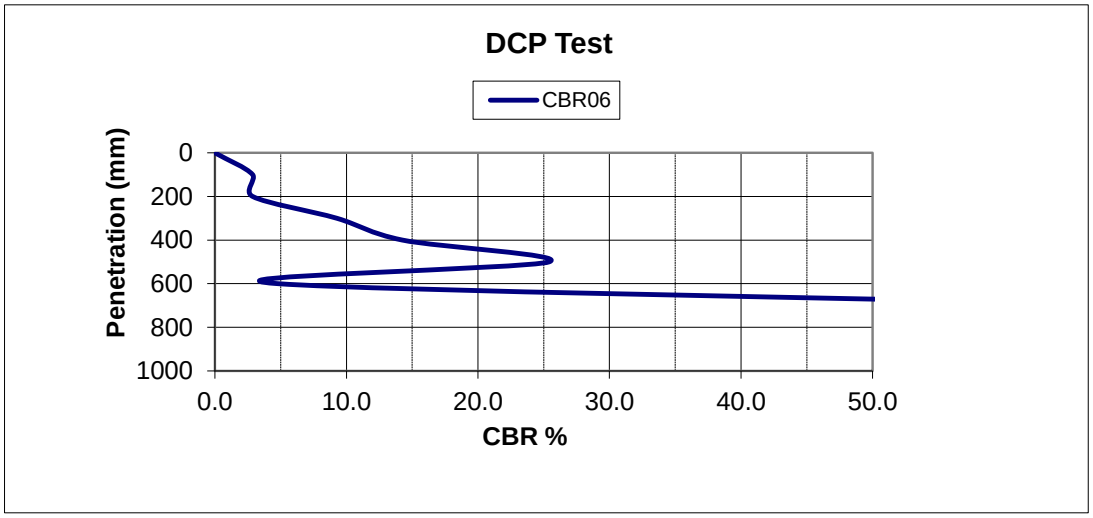
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR06
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	2	50.0	2.9
200	2	50.0	2.9
300	5	20.0	9.3
400	7	14.3	14.2
500	11	9.1	25.4
600	3	33.3	4.8
700	25	4.0	72.7

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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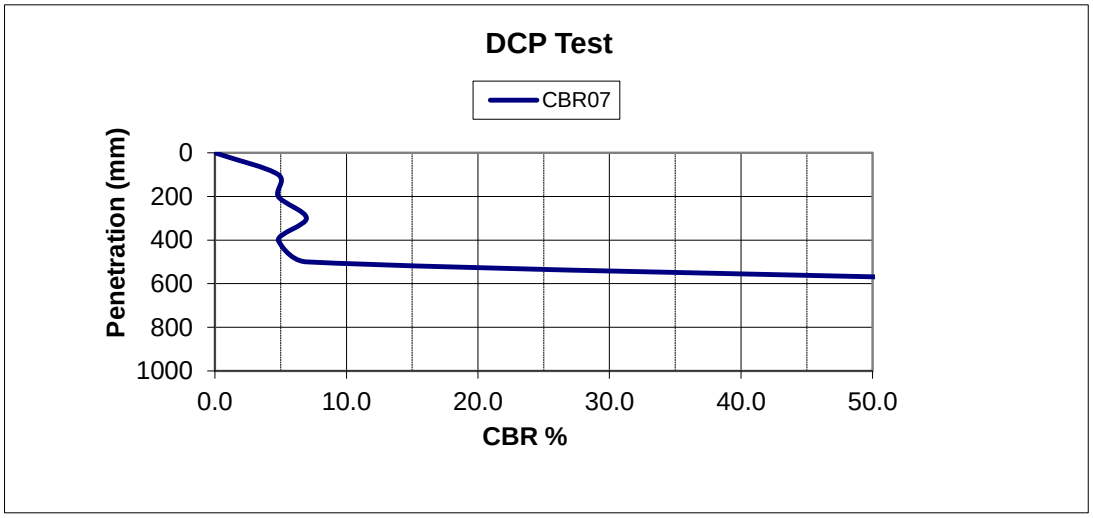
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR07
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	3	33.3	4.8
200	3	33.3	4.8
300	4	25.0	7.0
400	3	33.3	4.8
500	4	25.0	7.0
600	25	4.0	72.7

Reference **Kleyn and Van Heerden (60^{o} Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

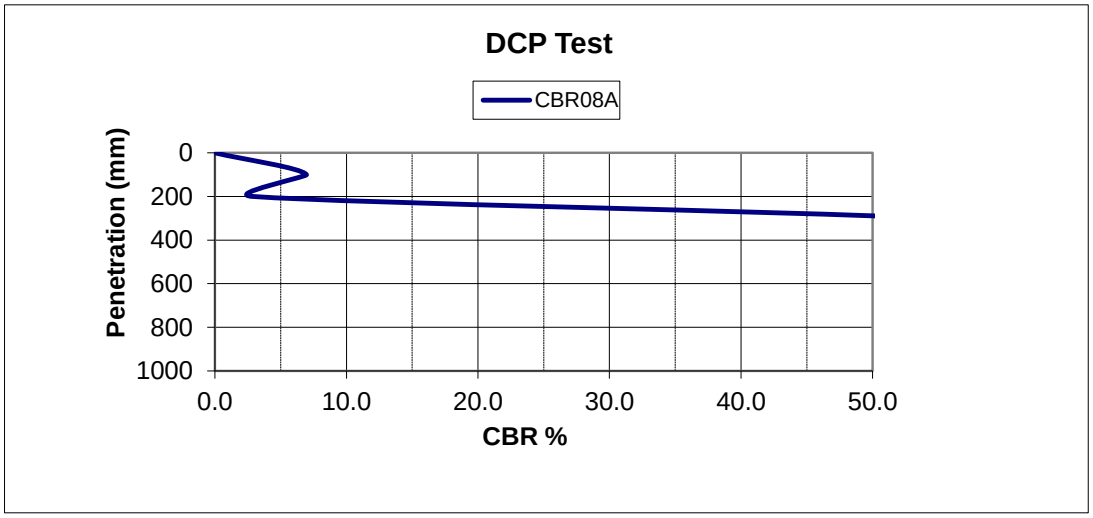
Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR08A
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	4	25.0	7.0
200	2	50.0	2.9
300	20	5.0	54.6
400	25	4.0	72.7

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



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Tel: 01 601 5175 / 5176
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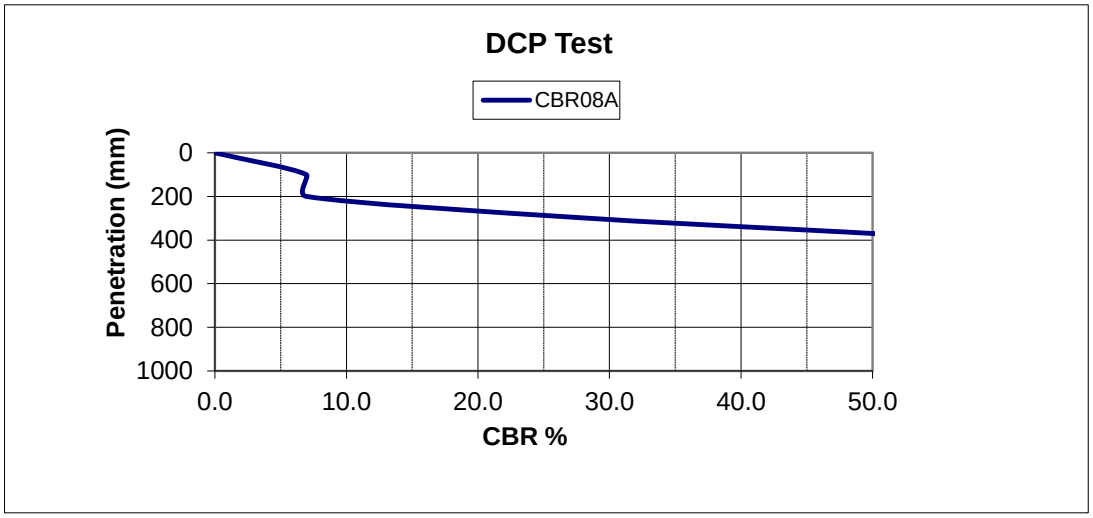
Job Name	Blackglen Road Sandyford	**Test Type**	Dynamic Cone Penetration Test
Job No.	12844-05-23	**Test Reference**	CBR08A
Client	DLRCC	**By**	A Molloy
		Date	28/11/2023
Initial Depth	0.20m BGL		

Depth (mm bgl)	No. of Blows per 100mm	Penetration per Blow (mm)	CBR (%)
0	-	-	0.0
100	4	25.0	7.0
200	4	25.0	7.0
300	12	8.3	28.4
400	21	4.8	58.1
500	25	4.0	72.7

Reference **Kleyn and Van Heerden (60° Cone)**
Formula Log10 (CBR) = 2.632 - 1.28 Log10 (mm/blow)



APPENDIX 6 – Laboratory Testing Records

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland
D22 K5P8

Attention :	Annmarie Molloy
Date :	15th December, 2023
Your reference :	12844-05-23
Our reference :	Test Report 23/20422 Batch 1
Location :	Blackglen Road Sandyford
Date samples received :	4th December, 2023
Status :	Final Report
Issue :	202312151313

Three samples were received for analysis on 4th December, 2023 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 14.77 kg of CO2

Scope 1&2&3 emissions - 34.904 kg of CO2

Authorised By:

Phil Sommerton BSc
Senior Project Manager

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 12844-05-23
Location: Blackglen Road Sandyford
Contact: Annmarie Molloy
EMT Job No: 23/20422

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12									
Sample ID	TP-01	TP-13	TP-16									
Depth	0.50	1.50	0.50-1.00									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	29/11/2023	29/11/2023	29/11/2023									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/12/2023	04/12/2023	04/12/2023									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Antimony	2	<1	1								<1	mg/kg	TM30/PM15
Arsenic #	77.7	63.9	75.8								<0.5	mg/kg	TM30/PM15
Barium #	72	16	53								<1	mg/kg	TM30/PM15
Cadmium #	0.8	<0.1	0.6								<0.1	mg/kg	TM30/PM15
Chromium #	41.2	33.1	32.5								<0.5	mg/kg	TM30/PM15
Copper #	27	6	13								<1	mg/kg	TM30/PM15
Lead #	50	<5	30								<5	mg/kg	TM30/PM15
Mercury #	0.1	<0.1	<0.1								<0.1	mg/kg	TM30/PM15
Molybdenum #	3.4	2.8	2.3								<0.1	mg/kg	TM30/PM15
Nickel #	29.0	6.6	13.0								<0.7	mg/kg	TM30/PM15
Selenium #	2	<1	<1								<1	mg/kg	TM30/PM15
Zinc #	123	18	69								<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03								<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05								<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.28	<0.03	<0.03								<0.03	mg/kg	TM4/PM8
Anthracene #	0.09	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Fluoranthene #	1.46	<0.03	0.07								<0.03	mg/kg	TM4/PM8
Pyrene #	1.16	<0.03	0.06								<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.84	<0.06	0.07								<0.06	mg/kg	TM4/PM8
Chrysene #	0.75	<0.02	0.05								<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	1.68	<0.07	<0.07								<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.87	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	0.74	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.13	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.48	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Coronene	0.09	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
PAH 6 Total #	5.23	<0.22	<0.22								<0.22	mg/kg	TM4/PM8
PAH 17 Total	8.57	<0.64	<0.64								<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	1.21	<0.05	<0.05								<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.47	<0.02	<0.02								<0.02	mg/kg	TM4/PM8
Benzo(j)fluoranthene	<1	<1	<1								<1	mg/kg	TM4/PM8
PAH Surrogate % Recovery	104	101	101								<0	%	TM4/PM8
Mineral Oil (C10-C40) (EH_CU_1D_AL)	<30	<30	<30								<30	mg/kg	TM5/PM8/PM16

Client Name: Ground Investigations Ireland
Reference: 12844-05-23
Location: Blackglen Road Sandyford
Contact: Annmarie Molloy
EMT Job No: 23/20422

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12									
Sample ID	TP-01	TP-13	TP-16									
Depth	0.50	1.50	0.50-1.00									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	29/11/2023	29/11/2023	29/11/2023									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/12/2023	04/12/2023	04/12/2023									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
TPH CWG													
Aliphatics													
>C5-C6 (HS_1D_AL)#	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C6-C8 (HS_1D_AL)#	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C8-C10 (HS_1D_AL)	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C10-C12 (EH_CU_1D_AL)#	<0.2	<0.2	<0.2								<0.2	mg/kg	TM5/PM8/PM16
>C12-C16 (EH_CU_1D_AL)#	8	<4	<4								<4	mg/kg	TM5/PM8/PM16
>C16-C21 (EH_CU_1D_AL)#	<7	<7	<7								<7	mg/kg	TM5/PM8/PM16
>C21-C35 (EH_CU_1D_AL)#	<7	<7	<7								<7	mg/kg	TM5/PM8/PM16
>C35-C40 (EH_CU_1D_AL)	<7	<7	<7								<7	mg/kg	TM5/PM8/PM16
Total aliphatics C5-40 (EH_CU+HS_1D_AL)	<26	<26	<26								<26	mg/kg	TM5/TM36/PM8/PM12/PM16
>C6-C10 (HS_1D_AL)	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C10-C25 (EH_CU_1D_AL)	<10	<10	<10								<10	mg/kg	TM5/PM8/PM16
>C25-C35 (EH_CU_1D_AL)	<10	<10	<10								<10	mg/kg	TM5/PM8/PM16
Aromatics													
>C5-EC7 (HS_1D_AR)#	<0.1+	<0.1+	<0.1								<0.1	mg/kg	TM36/PM12
>EC7-EC8 (HS_1D_AR)#	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC8-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC10-EC12 (EH_CU_1D_AR)#	<0.2	<0.2	<0.2								<0.2	mg/kg	TM5/PM8/PM16
>EC12-EC16 (EH_CU_1D_AR)#	8	<4	<4								<4	mg/kg	TM5/PM8/PM16
>EC16-EC21 (EH_CU_1D_AR)#	36	<7	<7								<7	mg/kg	TM5/PM8/PM16
>EC21-EC35 (EH_CU_1D_AR)#	182	<7	69								<7	mg/kg	TM5/PM8/PM16
>EC35-EC40 (EH_CU_1D_AR)	13	<7	<7								<7	mg/kg	TM5/PM8/PM16
Total aromatics C5-40 (EH_CU+HS_1D_AR)	239	<26	69								<26	mg/kg	TM5/TM36/PM8/PM12/PM16
Total aliphatics and aromatics(C5-40) (EH_CU+HS_1D_Total)	239	<52	69								<52	mg/kg	TM5/TM36/PM8/PM12/PM16
>EC6-EC10 (HS_1D_AR)#	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC10-EC25 (EH_CU_1D_AR)	69	<10	<10								<10	mg/kg	TM5/PM8/PM16
>EC25-EC35 (EH_CU_1D_AR)	112	<10	52								<10	mg/kg	TM5/PM8/PM16
MTBE#	<5	<5	<5								<5	ug/kg	TM36/PM12
Benzene#	<5	<5	<5								<5	ug/kg	TM36/PM12
Toluene#	103	<5	56								<5	ug/kg	TM36/PM12
Ethylbenzene#	14	<5	<5								<5	ug/kg	TM36/PM12
m/p-Xylene#	<5	<5	<5								<5	ug/kg	TM36/PM12
o-Xylene#	<5	<5	<5								<5	ug/kg	TM36/PM12
PCB 28#	<5	<5	<5								<5	ug/kg	TM17/PM8
PCB 52#	<5	<5	<5								<5	ug/kg	TM17/PM8
PCB 101#	<5	<5	<5								<5	ug/kg	TM17/PM8
PCB 118#	<5	<5	<5								<5	ug/kg	TM17/PM8
PCB 138#	<5	<5	<5								<5	ug/kg	TM17/PM8
PCB 153#	<5	<5	<5								<5	ug/kg	TM17/PM8
PCB 180#	<5	<5	<5								<5	ug/kg	TM17/PM8
Total 7 PCBs#	<35	<35	<35								<35	ug/kg	TM17/PM8

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 12844-05-23
Location: Blackglen Road Sandyford
Contact: Annmarie Molloy
EMT Job No: 23/20422

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12									
Sample ID	TP-01	TP-13	TP-16									
Depth	0.50	1.50	0.50-1.00									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	29/11/2023	29/11/2023	29/11/2023									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/12/2023	04/12/2023	04/12/2023									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Natural Moisture Content	29.3	7.6	23.8								<0.1	%	PM4/PM0
Moisture Content (% Wet Weight)	22.6	7.1	19.2								<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3								<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0418	0.0031	0.0230								<0.0015	g/l	TM38/PM20
Chromium III	41.2	33.1	32.5								<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	3.28	0.03	2.16								<0.02	%	TM21/PM24
pH #	7.39	8.05	7.87								<0.01	pH units	TM73/PM11
Asbestos Type*	NAD	NAD	NAD									None	Subcontracted

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 12844-05-23
Location: Blackglen Road Sandyford
Contact: Annmarie Molloy
EMT Job No: 23/20422

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12								LOD/LOR	Units	Method No.
Sample ID	TP-01	TP-13	TP-16										
Depth	0.50	1.50	0.50-1.00										
COC No / misc													
Containers	V J T	V J T	V J T										
Sample Date	29/11/2023	29/11/2023	29/11/2023										
Sample Type	Soil	Soil	Soil										
Batch Number	1	1	1										
Date of Receipt	04/12/2023	04/12/2023	04/12/2023										
Dissolved Antimony #	0.004	<0.002	0.003								<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	0.04	<0.02	0.03								<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	0.0287	0.0115	0.0152								<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	0.287	0.115	0.152								<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.016	0.004	0.006								<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.16	0.04	0.06								<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005								<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005								<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015								<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015								<0.015	mg/kg	TM30/PM17
Dissolved Copper #	0.010	<0.007	<0.007								<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	0.10	<0.07	<0.07								<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005								<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05								<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.013	<0.002	0.004								<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.13	<0.02	0.04								<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	0.005	<0.002	<0.002								<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	0.05	<0.02	<0.02								<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003								<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03								<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	0.007	0.006	0.003								<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	0.07	0.06	0.03								<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	<0.00001								<0.00001	mg/l	TM61/PM0
Mercury Dissolved by CVAF #	<0.0001	<0.0001	<0.0001								<0.0001	mg/kg	TM61/PM0
Phenol	<0.01	<0.01	<0.01								<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1								<0.1	mg/kg	TM26/PM0
Fluoride	0.3	<0.3	0.4								<0.3	mg/l	TM173/PM0
Fluoride	3	<3	4								<3	mg/kg	TM173/PM0
Sulphate as SO4 #	<0.5	0.7	2.3								<0.5	mg/l	TM38/PM0
Sulphate as SO4 #	<5	7	23								<5	mg/kg	TM38/PM0
Mass of raw test portion	0.1168	0.0994	0.1063									kg	NONE/PM17
Chloride #	4.0	<0.3	1.3								<0.3	mg/l	TM38/PM0
Chloride #	40	<3	13								<3	mg/kg	TM38/PM0
Mass of dried test portion	0.09	0.09	0.09									kg	NONE/PM17
Dissolved Organic Carbon	29	<2	6								<2	mg/l	TM60/PM0
Dissolved Organic Carbon	290	<20	60								<20	mg/kg	TM60/PM0
pH	8.24	8.01	8.16								<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Element Materials Technology

Client Name: Ground Investigations Ireland
Reference: 12844-05-23
Location: Blackglen Road Sandyford
Contact: Annmarie Molloy
EMT Job No: 23/20422

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1-4	5-8	9-12									
Sample ID	TP-01	TP-13	TP-16									
Depth	0.50	1.50	0.50-1.00									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	29/11/2023	29/11/2023	29/11/2023									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/12/2023	04/12/2023	04/12/2023									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Total Dissolved Solids #	125	<35	74								<35	mg/l	TM20/PM0
Total Dissolved Solids #	1250	<350	740								<350	mg/kg	TM20/PM0

All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 12844-05-23
Location: Blackglen Road Sandyford
Contact: Annmarie Molloy
EMT Job No: 23/20422

Report : **EN12457_2**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1-4	5-8	9-12								Inert	Stable Non-reactive	Hazardous	LOD LOR	Units	Method No.
Sample ID	TP-01	TP-13	TP-16													
Depth	0.50	1.50	0.50-1.00													
COC No / misc																
Containers	V J T	V J T	V J T													
Sample Date	29/11/2023	29/11/2023	29/11/2023													
Sample Type	Soil	Soil	Soil													
Batch Number	1	1	1													
Date of Receipt	04/12/2023	04/12/2023	04/12/2023													
Solid Waste Analysis																
Total Organic Carbon #	3.28	0.03	2.16								3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	0.117	<0.025	0.056								6	-	-	<0.025	mg/kg	TM36/PM12
Sum of 7 PCBs #	<0.035	<0.035	<0.035								1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<30	<30	<30								500	-	-	<30	mg/kg	TM5/PM8/PM16
PAH Sum of 6 #	5.23	<0.22	<0.22								-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	8.57	<0.64	<0.64								100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic #	0.287	0.115	0.152								0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	0.16	0.04	0.06								20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005	<0.005								0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015	<0.015								0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	0.10	<0.07	<0.07								2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	<0.0001	<0.0001								0.01	0.2	2	<0.0001	mg/kg	TM61/PM0
Molybdenum #	0.13	<0.02	0.04								0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	0.05	<0.02	<0.02								0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05	<0.05								0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	0.04	<0.02	0.03								0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03	<0.03								0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	0.07	0.06	0.03								4	50	200	<0.03	mg/kg	TM30/PM17
Total Dissolved Solids #	1250	<350	740								4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	290	<20	60								500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.1168	0.0994	0.1063								-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	76.7	90.6	84.9								-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.873	0.891	0.884								-	-	-		l	NONE/PM17
Moisture Content 105C (% Dry Weight)	30.3	10.4	17.8								-	-	-	<0.1	%	PM4/PM0
pH #	7.39	8.05	7.87								-	-	-	<0.01	pH units	TM73/PM11
Phenol	<0.1	<0.1	<0.1								1	-	-	<0.1	mg/kg	TM26/PM0
Fluoride	3	<3	4								10	150	500	<3	mg/kg	TM173/PM0
Sulphate as SO4 #	<5	7	23								1000	20000	50000	<5	mg/kg	TM38/PM0
Chloride #	40	<3	13								800	15000	25000	<3	mg/kg	TM38/PM0

Client Name: Ground Investigations Ireland

Reference: 12844-05-23

Location: Blackglen Road Sandyford

Contact: Annmarie Molloy

Matrix : Solid

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	EPH Interpretation
23/20422	1	TP-01	0.50	1-4	PAH's & Naturally occurring compounds
23/20422	1	TP-13	1.50	5-8	No interpretation possible
23/20422	1	TP-16	0.50-1.00	9-12	Possible PAH's & Naturally occurring compounds

Client Name: Ground Investigations Ireland
Reference: 12844-05-23
Location: Blackglen Road Sandyford
Contact: Annmarie Molloy

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/20422						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/20422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified 8015B v2:1996 method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) within the range C8-C40 by GCFID. For waters the solvent extracts dissolved phase plus a sheen if present.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	please refer to TM5 and TM36 for method details	PM8/PM12/PM16	please refer to PM8/PM16 and PM12 for method details			AR	Yes
TM17	Modified US EPA method 8270D v5:2014. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3:1990/USEPA 160.1/3 (TDS/TS: 1971) Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Preparation of Soil and Marine Sediment Samples for Total Organic Carbon.	Yes		AD	Yes

EMT Job No: 23/20422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B v2:1996. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID. MTBE by GCFID co-elutes with 3-methylpentane if present and therefore can give a false positive. Positive MTBE results will be re-run using GC-MS to double check, when requested.	PM12	Modified US EPA method 5021A v2:2014. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	TC/TOC analysis of Waters by High Temperature Combustion followed by NDIR detection. Based on the following modified standard methods: USEPA 9060A (2002), APHA SMEWW 5310B:1999 22nd Edition, ASTM D 7573, and USEPA 415.1.	PM0	No preparation is required.			AR	Yes

EMT Job No: 23/20422

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM61	Determination of Mercury by Cold Vapour Atomic Fluorescence - WATERS: Modified USEPA Method 245.7, Rev 2, Feb 2005. SOILS: Modified USEPA Method 7471B, Rev.2, Feb 2007	PM0	No preparation is required.	Yes		AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.			AR	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 9214 - 340.2 (EPA 1998)	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AD	Yes
NONE	No Method Code	PM17	Modified method BS EN12457-2:2002 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.			AR	
Subcontracted	See attached subcontractor report for accreditation status and provider.					AR	

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CMTL
CONSTRUCTION MATERIALS TESTING LABORATORIES
A PHENNA GROUP COMPANY

Laboratory Test Report
Uniaxial Compressive Strength

Project:	Blackglen Road, Sandyford	**Job Number**	12844-05-23
Client:	Ground Investigations Ireland	**Lab Ref No**	ST 27304
	Catherinestown House, Hazelhatch Road	**Date Received**	23/01/2024
	Newcastle. Co. Dublin	**Date Tested**	29/01/2024
Originator:	Stephen Kealy	**Date Reported**	26/01/2024

Sample Reference	Moisture Content	Density (Mg/m^3)	Uniaxial Compressive Strength (N/mm^2)
BH01 4.50-4.70	2.5	2608	28.7
BH02 4.70-5.00	1.1	2611	49.5
BH03 6.50-6.75	1.0	2593	31.7

Remarks: Cores BH01 4.50-4.70, BH02 4.70-5.00, BH03 6.50-6.75 Visible Cracks

JRWard

Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

CMTL Ireland Limited
Unit D, Zone 5, Clonminam Business Park
Portlaoise, Co. Laois R32 W30Y
Tel: 057 8664885

Laboratory Test Report
Point Load Strength Index

Project :	Blackglen Road, Sandyford	**Job Number**	12844-05-23
Client :	Ground Investigations Ireland	**Lab Ref No**	ST 27303
	Catherinestown House, Hazelhatch Road	**Date Received**	23/01/2024
	Newcastle, Co. Dublin	**Date Tested**	26/01/2024
Originator :	Stephen Kealy	**Date Reported**	26/01/2024

Point Load Strength Index

Sample No:-	Depth (m)	Description	Type	Orientation	W (mm)	D (mm)	P (kN)	A	De (mm)	I_s	F	$I_{s(50)}$MN/m²
BH01	3.50-3.70	1,2	D	⊥	63.0	65.0	5.40	4095	65.0	1.278	1.13	1.44
BH02	2.10-2.40	1,2	D	⊥	63.0	64.0	4.00	4032	64.0	0.977	1.12	1.09
BH03	4.50-4.85	1,2	D	⊥	63.0	64.0	7.00	4032	64.0	1.709	1.12	1.91

Description 1 : Brown / Grey Marble
Description 2 : Cracks

$I_{s(50)}$MN/m² for	Description 1,2	
Min	1.09	
Mean	1.48	
Max	1.91	

Test
A = axial
D = diametrical

Relationship to planes of weakness
IL = irregular lump
II = parallel
⊥ = perpendicular

	Mean Value $I_{s(50)}$MN/m²	U.C.S. MN/m²
Extremely Weak	<0.05	0.6-1.0
Very Weak	0.05-0.20	1.0-5.0
Weak	0.20-0.50	5.0-25.0
Medium Strong	0.50-2.00	25-50
Strong	2.00-4.50	50-100
Very Strong	4.50-9.00	100-250
Extremely Strong	9.00 +	>250

JRWard

Approved Signature
James Ward, Operations Manager
CMTL Ireland Limited

APPENDIX 7 – Groundwater Monitoring Records

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Catherinestown House,
Hazelhatch Road,
Newcastle,
Co. Dublin.
D22 YD52

Tel: 01 601 5175 / 5176
Email: info@gii.ie
Web: www.gii.ie

GROUNDWATER MONITORING

Blackglen Road Sandyford

BOREHOLE	DATE	TIME	GROUNDWATER (m BGL)	Comments
BH01	12/01/2024	09:27:00	2.03	
BH03	12/01/2024	09:32:00	1.61	

Appendix I – Road Safety Audit Report

Contact us
+353 1 5242060
info@ors.ie
www.ors.ie

2024

Stage 1 Road Safety Audit Proposed Residential Development, Blackglen Road, Sandyford, Co. Dublin.

ENGINEERING A SUSTAINABLE FUTURE

Stage 1 Road Safety Audit
Proposed Residential Development, Blackglen Road, Sandyford, Co. Dublin.

Document Control Sheet

Client:	Hayes Higgins
Document No:	240995-ORS-XX-XX-RP-TR-13g-001

Revision	Status	Author:	Reviewed by:	Approved By:	Issue Date
P01	S2	AP	MG	MG	01/07/2024

Table of Contents

1 Introduction

This report documents the findings of a Stage 1 Road Safety Audit (RSA) carried out with respect to a Proposed Residential Development at Blackglen Road, Sandyford, Co. Dublin.

The audit team conducted the site visit on Monday the 17th of June 2024. The audit was carried out in the offices of ORS on Thursday the 27th of June 2024.

The audit team comprised of the following people:

Audit Team Leader:
Adam Price BEng (Hons), CEng, MIEI

Audit Team Member:
Mark Gallagher AEng, MIEI

During the site visit the weather was dry and overcast. The road surface was dry, and the traffic levels were noted to be low across the audit period.

Previous Road Safety Audits were not available for review. The audit team reviewed the following documents and drawings provided by the Design Team:

(1) BGR-JF-ZZ-DR-A-0005
(2) BGR-JF-ZZ-DR-A-1010
(3) 23ME022-ME-1000(C)
(4) 23D059_02_Rev A_Proposed Drainage Layout.

Documents/Information not supplied:
- Departures from Standards.
- Traffic counts and speed survey.

The terms of reference / procedure for the Audit were as per the relevant sections of the **Transport Infrastructure Ireland Road Safety Audit Standard GE-STY-01024**. The audit examined only those issues within the design relating to the road safety implications of the scheme and has therefore not examined or verified the compliance of the designs to any other criteria. The Road Safety Audit should not be treated as a design check.

The problems identified and described in this report are considered by the Audit Team to require action to improve the safety of the development and minimise accident occurrence. All comments, references and recommendations in this safety audit are in respect of the review of information supplied by the Design Team.

2 Description of the Proposed Development

The proposed scheme put forward by the Design Team on behalf of Dun Laoghaire Rathdown County Council is for the development of 127 dwellings is a mix of Social, Cost Rental and Affordable units at Blackglen road, Dun Laoghaire, Co. Dublin.

The mix is: 24 Affordable houses, 01 High support unit, 102 Social and Cost Rental units - made up of houses and apartments. and associated siteworks

The speed limit in the vicinity of the access point is 50km/h. Please refer to the proposed layout at **Figure 2.1** below for further details.

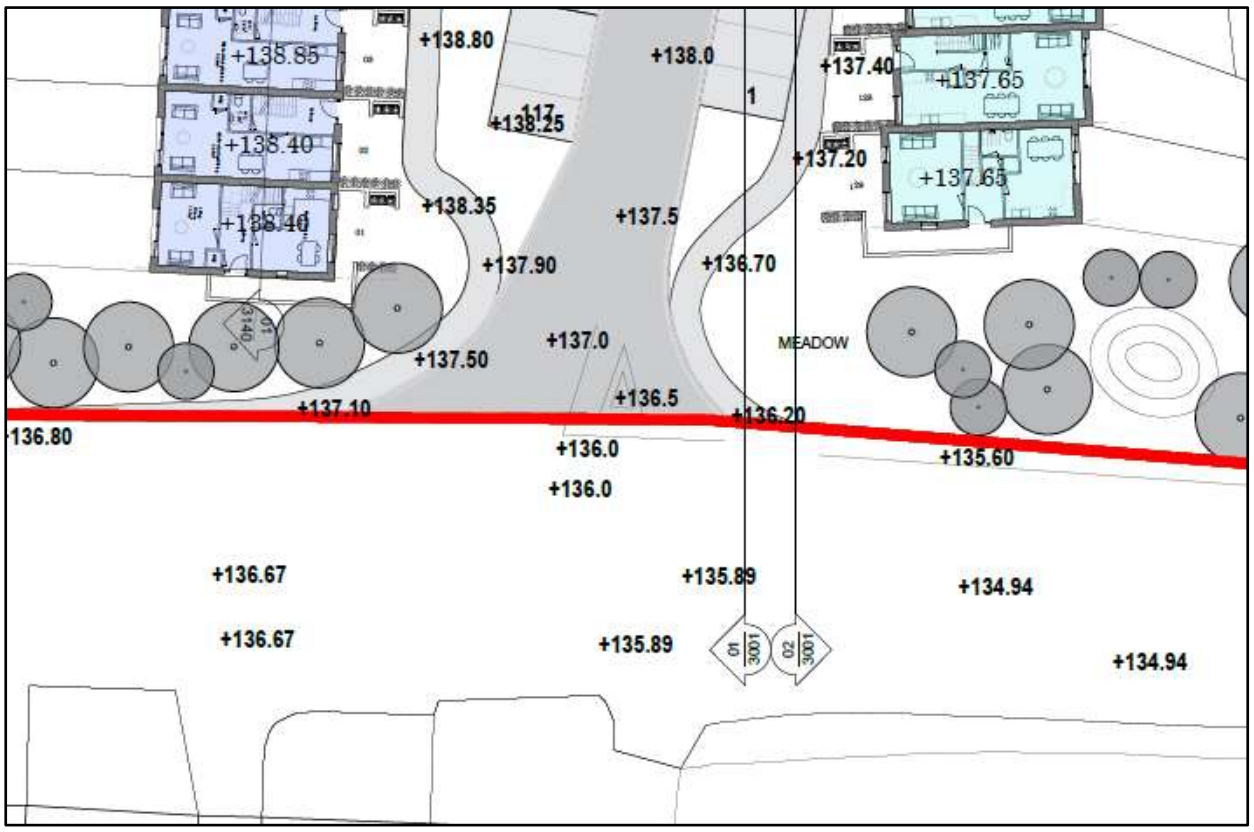
Figure 2.1: Site Layout (Source: JFOC Architects)

3 Problems Raised from the Road Safety Audit

The following are problems and recommendations to address the safety issues associated with the proposal. The recommendations are proposed to the designer of the scheme to reduce any safety risks associated with it.

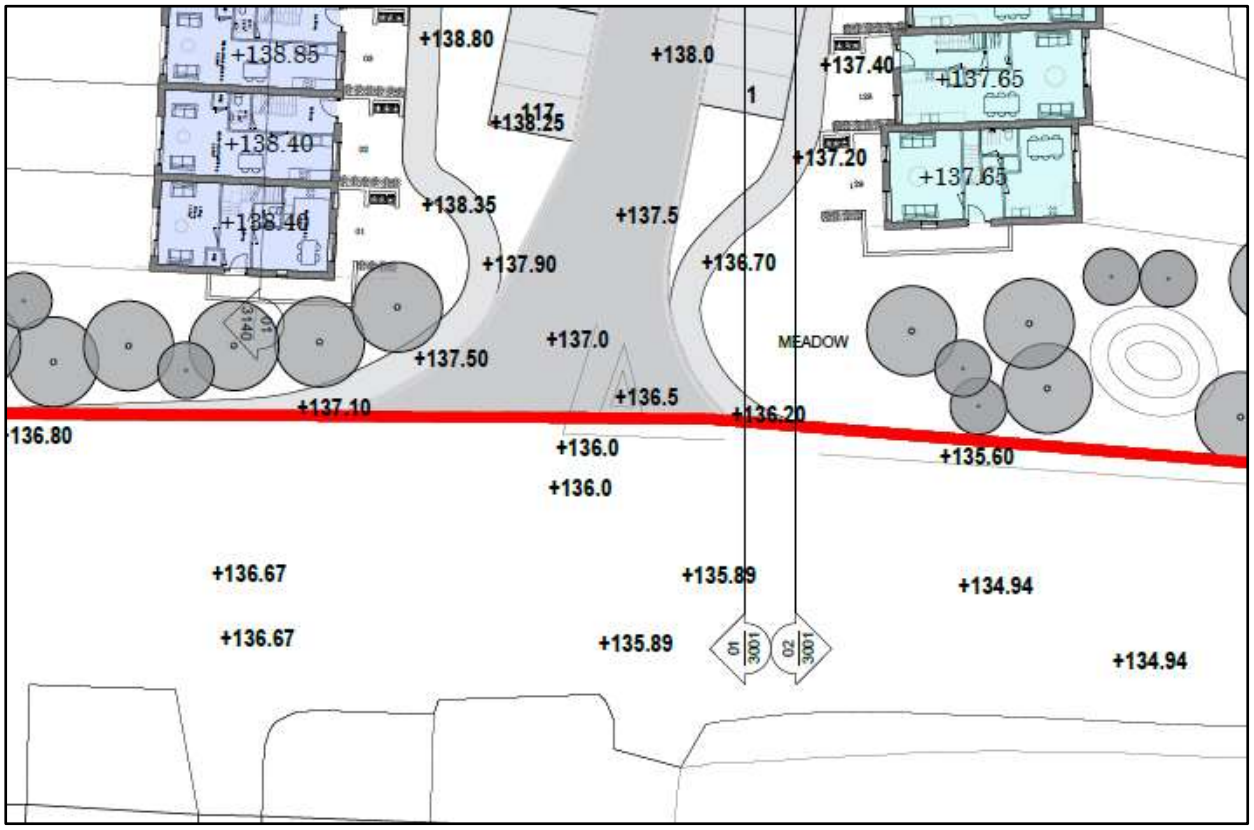
3.1 Potential Problems Identified

Problem No.1: Sightlines
Location: Main Access Point
The audit team note from the drawings provided that sightline distances are not marked clearly on the drawings. Inadequate sightlines for vehicles exiting the development and/or for vehicles and vulnerable users travelling along Blackglen Road may lead to unsafe exit manoeuvres by vehicles departing the development which could cause vehicular collisions, leading to Injury.



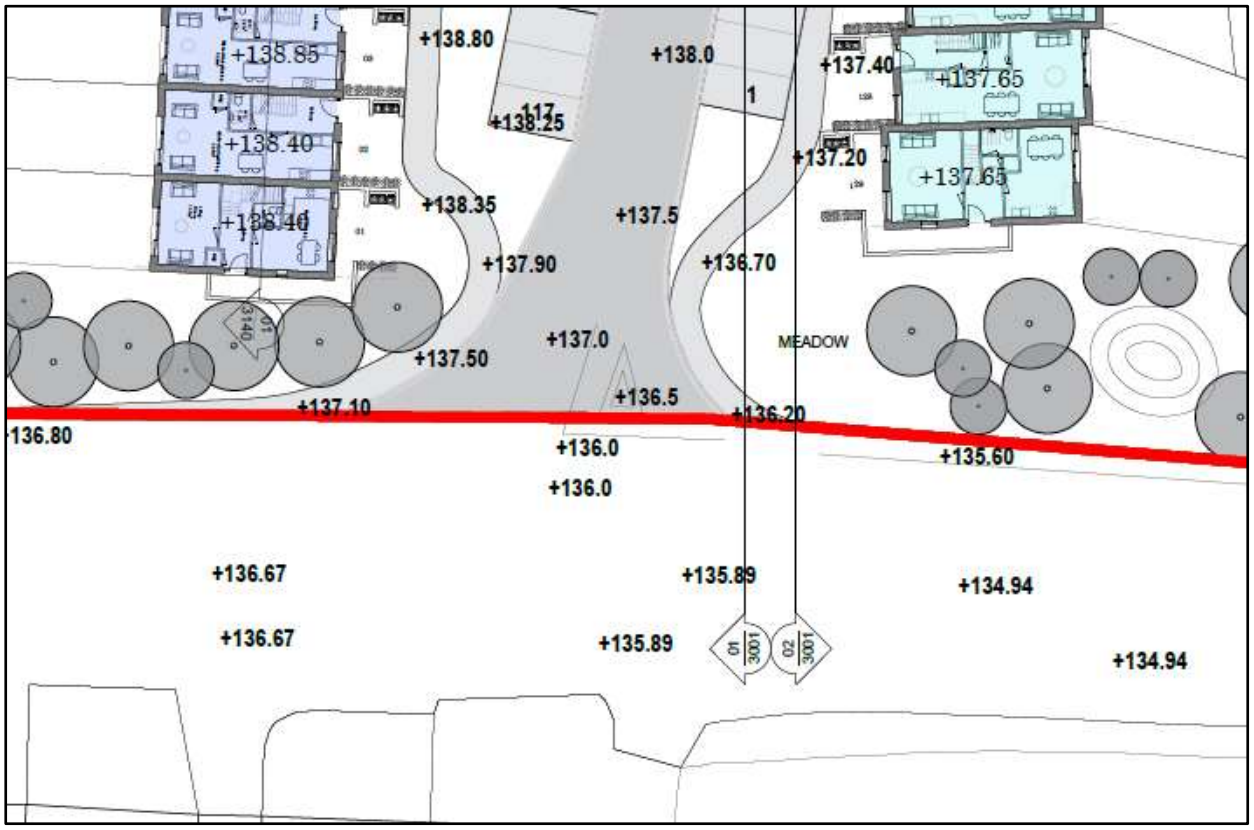
Recommendation:
The design team should ensure that the visibility and sightlines for vehicles exiting the development are provided and appropriate to ensure that drivers can see vehicles and vulnerable users approaching along Blackglen Road from either direction. Additionally, the design team should ensure that sightlines are detailed to the nearside road edge and that the sightline envelope is clear of all obstructions such as street furniture and boundary walls.

Problem No.2: Tie-in to Existing Infrastructure
Location: Main Access Point
The audit team note from the site visit and drawings and the site visit that the proposed drawings do not detail the existing arrangements on site and how the development will safely tie into the new carriageway arrangements along Blackglen Road. Lack of an appropriate tie-in to the existing arrangements on Blackglen Road could lead to safety hazards for all users.



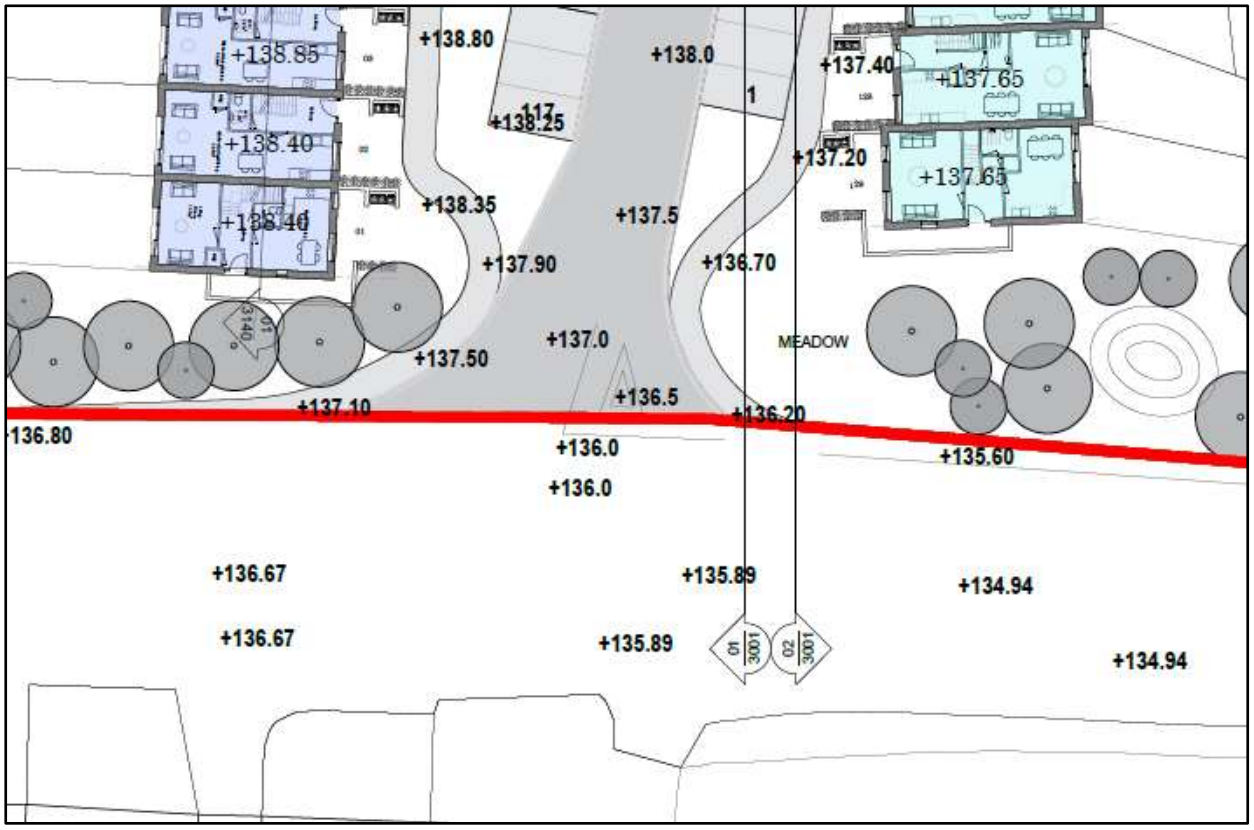
Recommendation:
The design team should ensure that the existing arrangements on Blackglen Road are clearly detailed on the proposed plans and to ensure the at the proposed development ties in appropriately with these arrangements.

Problem No.3: Excessive Radii at Main Access
Location: Main Access Point
The audit team note from the drawing provided that the main access radii is excessive and will result in increased speeds of vehicles entering the development which could increase the likelihood of potential conflicts with vulnerable users crossing the main access and vehicles exiting the development.



Recommendation:
The design team should ensure that the kerb radii at the main access point is reduced in accordance with appropriate design standards to mitigate the safety risk identified.

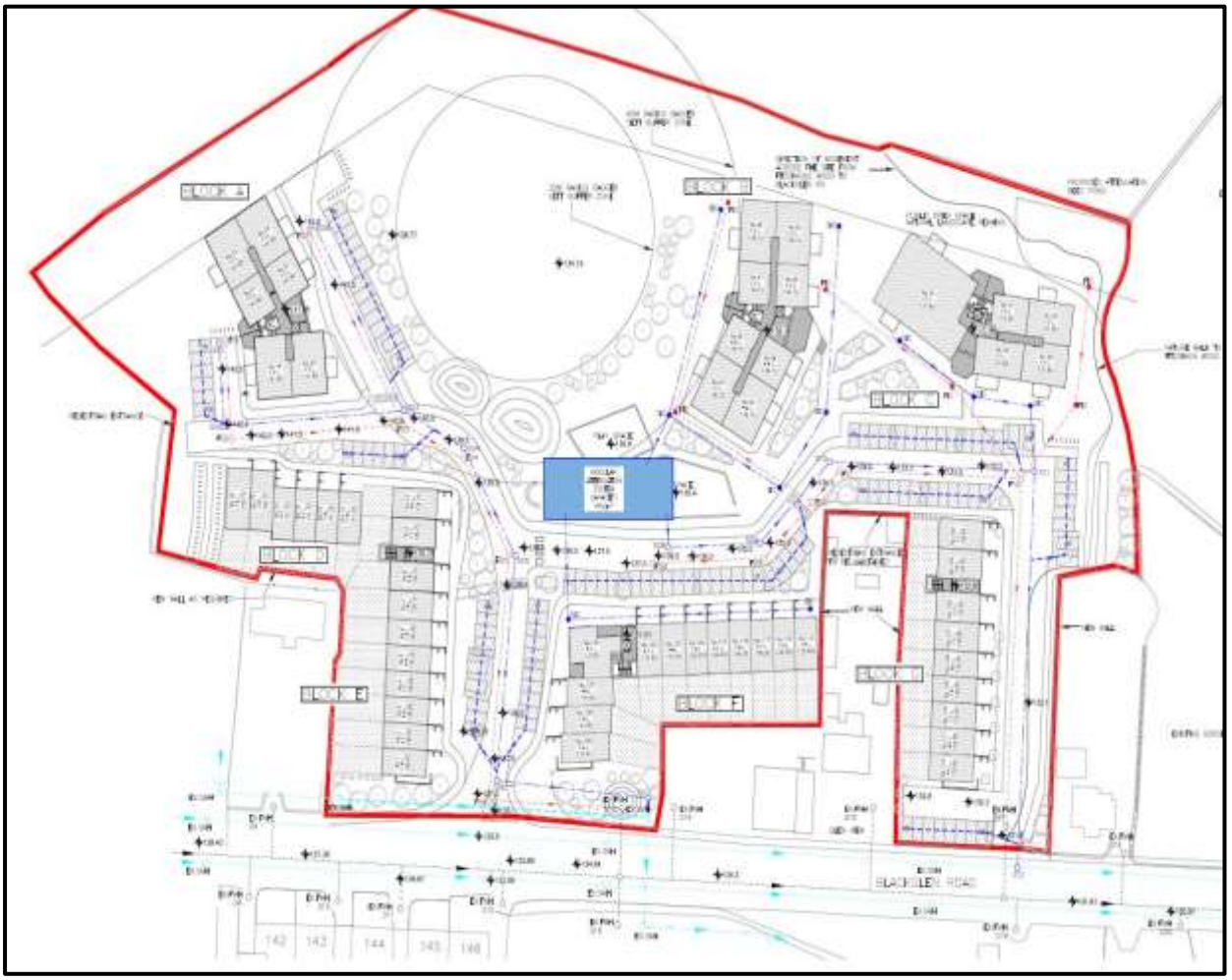
Problem No.4: Pedestrian Permeability
Location: Across Main Access along Blackglen Road
The audit team note from the drawings provided that there are no details relating to a proposed pedestrian crossing point at the main access point onto Blackglen Road. This could lead to users crossing in undesignated locations which could result in trip and falls. The lack of a dedicated crossing point could restrict passage for mobility impaired users in particular.



Recommendation:
The design team should ensure that a dedicate crossing point is provided for along pedestrian desire lines at the main access to the development.

Problem No.5: Speed Control Measures and Road Widths
Location: Main Access Road

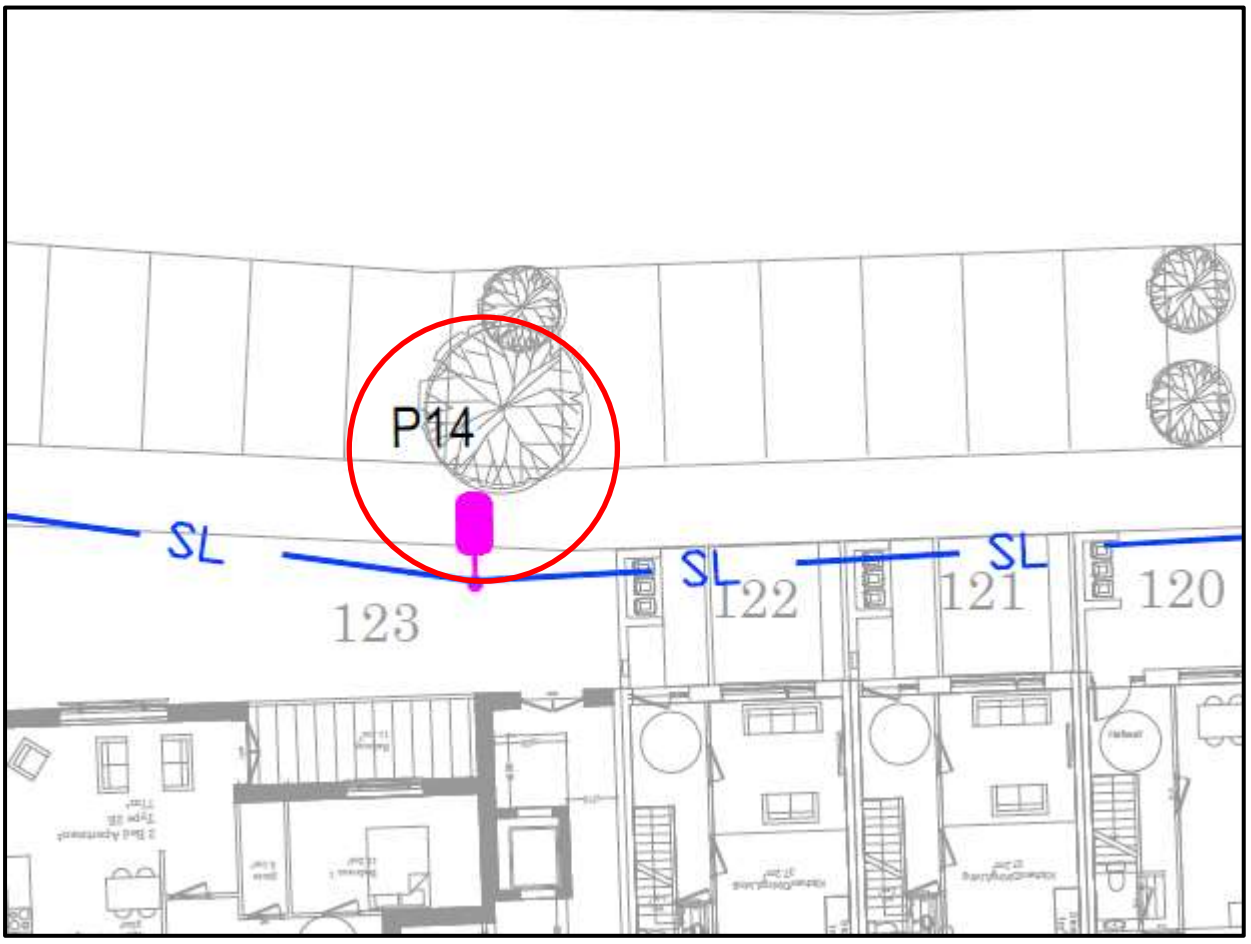
The audit team noted from the drawings provided, that there are no speed control measures proposed throughout the scheme. The audit team are concerned that the layout as its currently presented particularly with the excessive road widths could encourage higher speeds which could put vulnerable users within the development at risk. Should a collision occur there is a high risk of injury to the vulnerable user.



Recommendations:

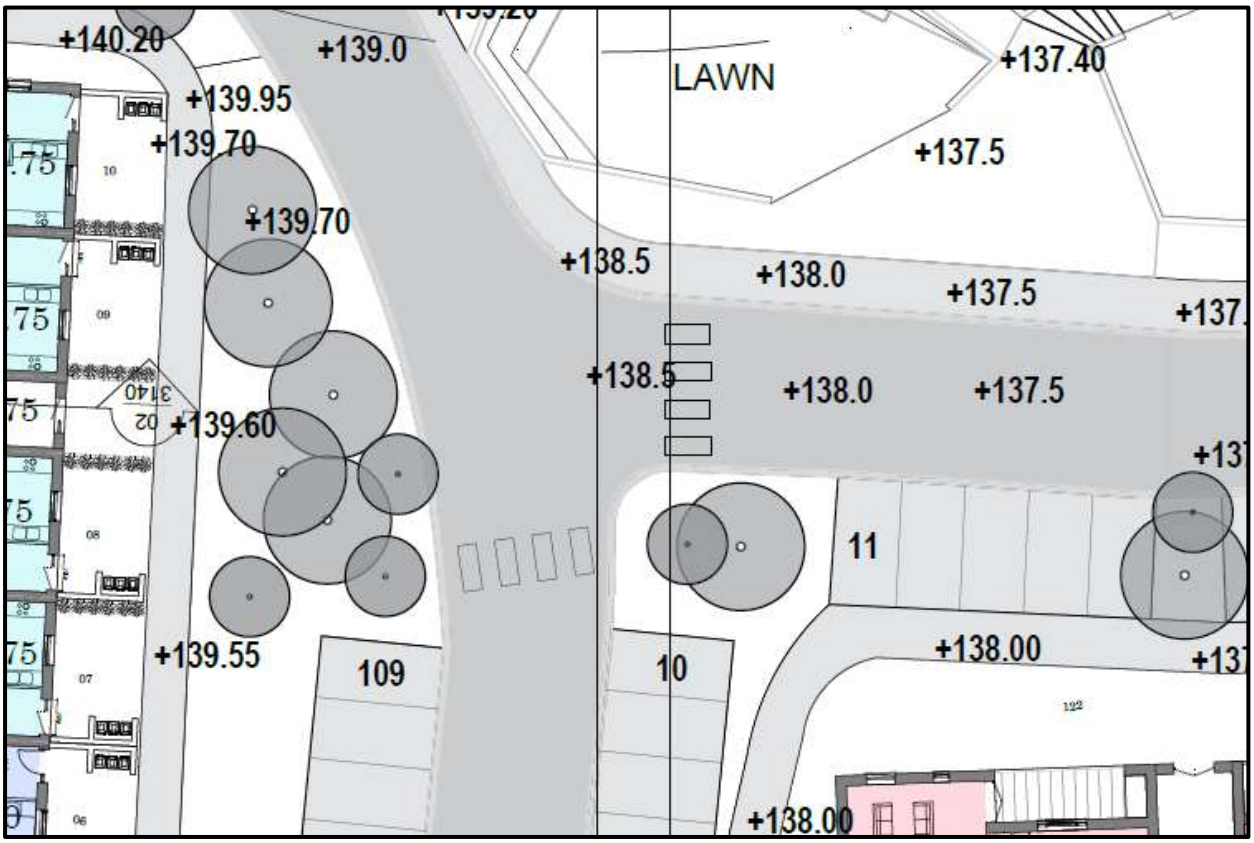
The design team should ensure that appropriate speed control measures are incorporated within the development to reduced vehicular speeds. The design team should also ensure that the road width is reduced to mitigate the risk of speeding further.

Problem No.6: Positioning of Lighting Columns in Landscaped Areas
Location: Multiple Locations Throughout Scheme
The audit team note from the drawings provided that there are public lighting columns which appear to be positioned within areas where trees are proposed. This could result in the proposed trees or landscaping restricting the light from the public lighting which could result in reduced lighting levels across the site. This could result in a potential safety hazard for both vulnerable users and vehicles in low light conditions.



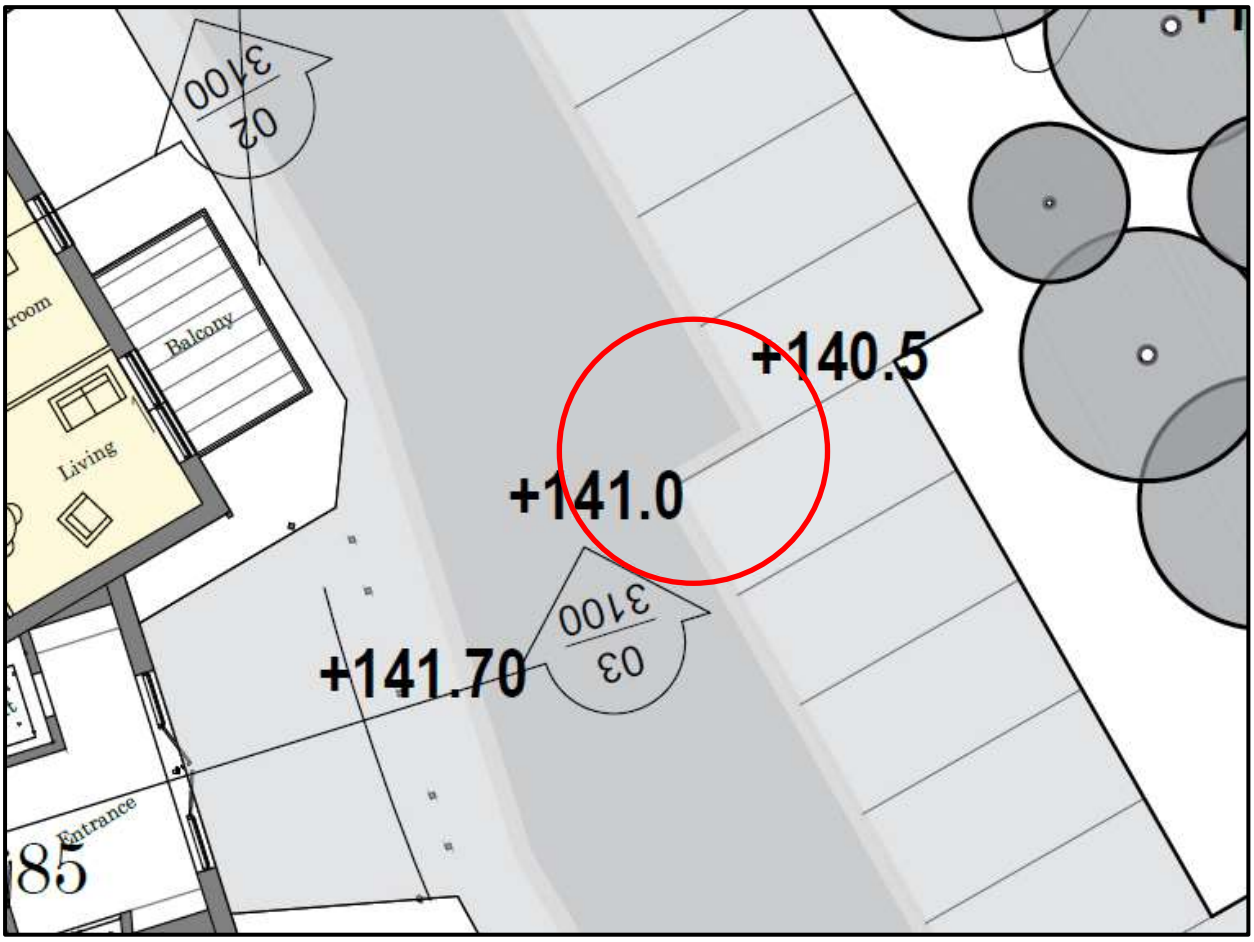
Recommendation:
The design team should ensure that public lighting is not restricted by proposed trees or landscaping. The design team should position lighting columns away from landscaping areas to mitigate the risk.

Problem No.7: Crossing Points with No Footpaths
Location: Junction Identified
The audit team note from the drawings provided that there are proposed crossing points indicated on the drawings at the location identified. However, there does not appear to be footpaths provided at either side of the crossing. The lack of footpaths at these locations could lead to a high potential for trip and falls among vulnerable users and a severe lack of accessibility for mobility impaired users.



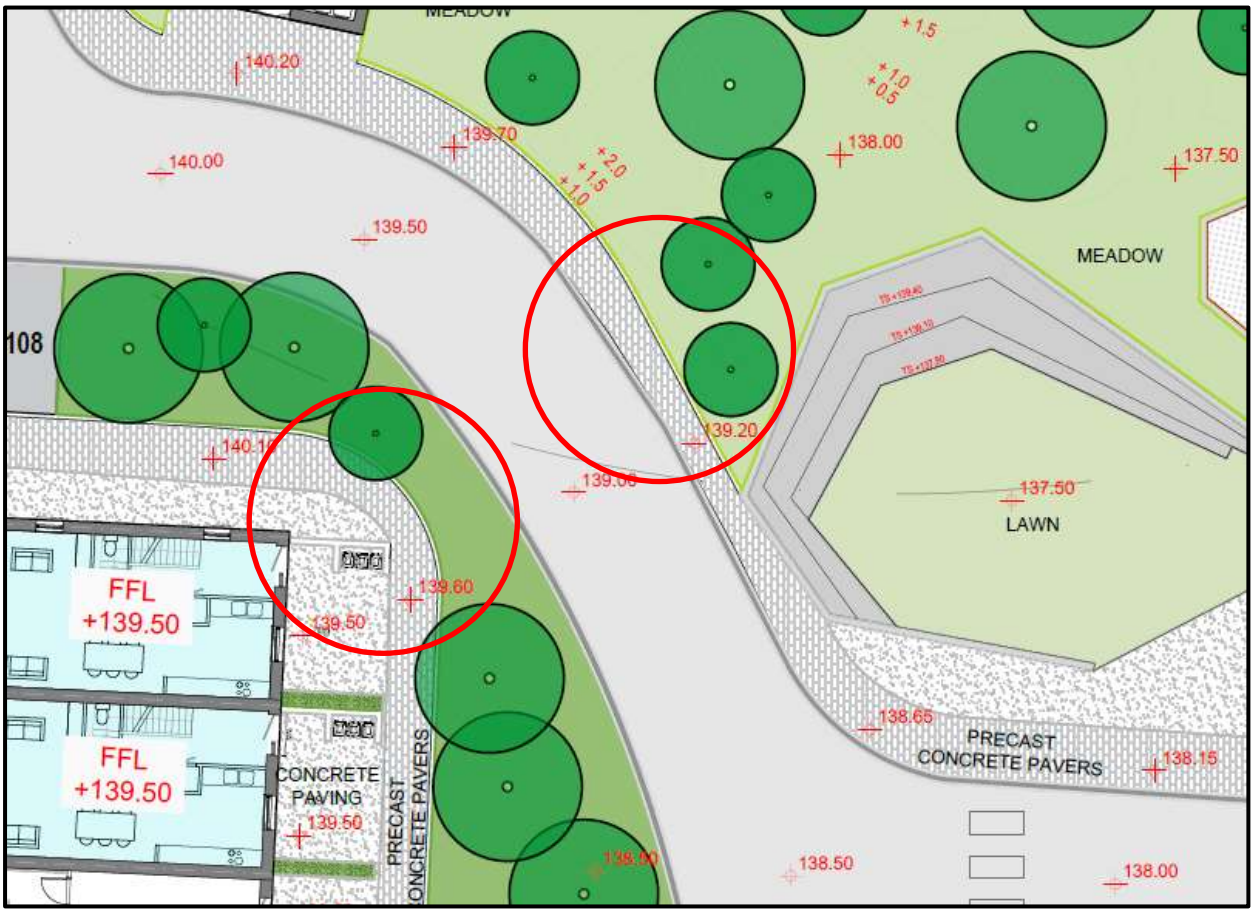
Recommendation:
The design team should ensure that appropriate footpath provisions including dropped kerbs and tactile paving are provided for at all crossing points.

Problem No.8: Carriageway Geometry
Location: Location Identified
The audit team note from the drawings provided that the carriageway sticks out at the location identified to allow for parking in the area. This section of carriageway could result in potential vehicle conflicts due to the fact that a parked car and the proposed kerbing will extend out in the carriageway essentially reducing the carriageway width abruptly.



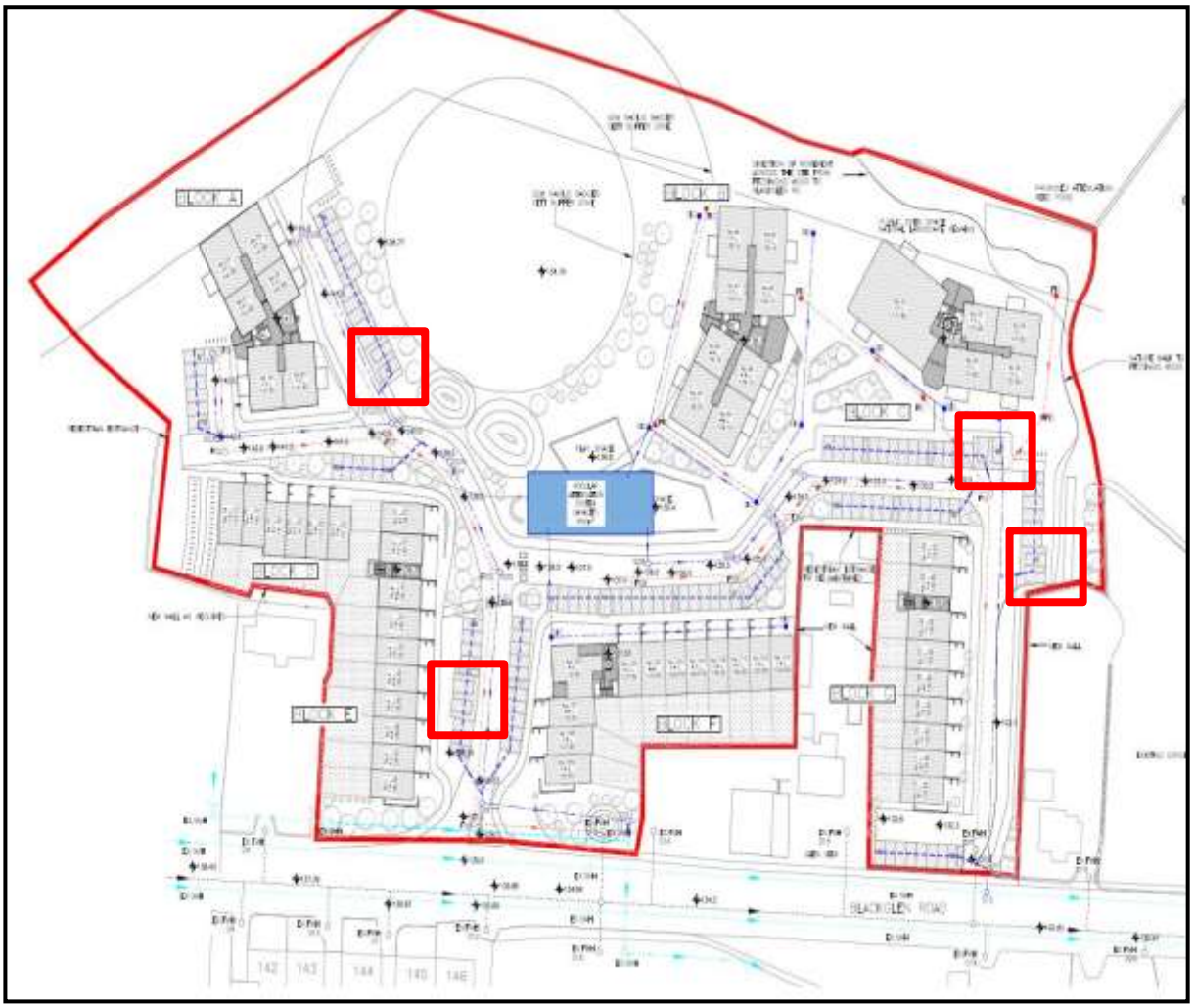
Recommendation:
The design team should redesign the carriageway in this area to ensure that there are no abrupt changes to carriageway widths and that the edgeline of the carriageway is uniform.

Problem No.9: Footpath Widths
Location: Throughout Scheme
The audit team note from the drawings provided that the footpath appears to narrow down to inappropriate widths in several locations. This could increase the likelihood of potential conflicts among users and could also result in vulnerable users stepping into the roadway to avoid other footpath users. This could increase the likelihood of potential conflicts with vehicles on the main access road.



Recommendation:
The design team should redesign the carriageway in this area to ensure that there are no abrupt changes to carriageway widths and that the edgeline of the carriageway is uniform.

Problem No.10: Accessibility of Disabled Parking Spaces
Location: Disabled Parking Spaces Identified
The audit team note from the drawings provided, that there are disabled parking spaces provided within development. It is not clear from the drawings provided if appropriate dropped kerbing is provided for these spaces at the locations identified below. The audit team are concerned that users of the spaces may not have access to the footpath and may use the closest road to access the footpath resulting in potential collisions between vehicles and vulnerable road users.



Recommendation:
The design team should provide adequate provision for users of the spaces to access the footpath safely.

3.2 General Problems Identified

Problem No.11: Lack of Dimensions
Location: Proposed Scheme
The audit team note from the drawings provided, that there is a lack of dimensions on the drawings. Roadway widths, corner radii, footpath widths are not detailed on the drawings. Inadequate infrastructure geometry may create an increased risk of potential conflicts for both vulnerable road users and motorists.

Recommendation:
The design team should ensure that adequate roadway widths, corner radii, footpath widths are detailed on the drawings.

Problem No.12: Signage and Road Markings
Location: Throughout Scheme
The audit team note that there is a lack of signage and/or road markings on the drawings provided. Signage and road markings aid in informing motorists of any hazards, locations to stop and/ or yield and the presence of pedestrians/crossings etc.

Recommendation:
The design team should ensure that signage and road markings are provided in line with DMURS and the applicable Traffic Signs Manual.

Problem No.13: Drainage
Location: Throughout Scheme
The audit team note from the drawings provided that there is no provision for drainage channels/ gully positions for the proposed stormwater network on the main access road. Inadequate gully positioning may lead to issues of ponding in areas of the development which poses a risk of slips, trips or falls to vulnerable road users.

Recommendation:
The design team should ensure that details and locations of all drainage gullies etc are provided for across the site and positioned strategically to avoid the risk of ponding across the site and in particular at any proposed pedestrian crossing points of at any proposed ramps within the scheme.

Problem No.14: Vehicle Swept Path Analysis
Location: Proposed Scheme
The audit team has observed that no vehicle swept path analysis has been conducted based on the provided drawings. To ensure the road layout is optimally designed for emergency and service vehicles, it is crucial to undertake a thorough swept path analysis using appropriate design vehicles. This analysis will confirm that the road configuration allows for safe turning movements without encroaching on pedestrian areas or mounting kerbs, thereby minimising potential conflicts between vehicles and pedestrians. Additionally, the swept path analysis should encompass all relevant vehicle turning movements, ensuring that vehicles can manoeuvre smoothly within the property.

Recommendation:
The design team should analyse vehicle swept paths on the scheme with industry standard software to assess vehicle wheel paths during turning movements to confirm the suitability of the road and internal driveway layout for intended vehicle purposes.

4 Audit Team Statement

We certify that we have examined the drawings listed in Appendix A and examined the site by means of a site visit. This examination has been carried out with the sole purpose of identifying any features of the design that could be removed or modified to improve the safety of the scheme. The issues that we have identified have been noted in the report, together with suggestions for improvement, which we recommend should be studied for implementation.

Audit Team Leader: Adam Price: BEng (Hons), CEng, MIEI
ORS
Signed: 

Date: 28th June 2024

Audit Team Member: Mark Gallagher, MIEI
ORS
Signed: 

Date: 28th June 2024

Appendix A – Inspected Documents

The audit team reviewed the following drawings and documents provided by the Design Team:

(1) BGR-JF-ZZ-DR-A-0005
(2) BGR-JF-ZZ-DR-A-1010
(3) 23ME022-ME-1000(C)
(4) 23D059_02_Rev A_Proposed Drainage Layout.

Appendix B – Designer Response Form

Job: 240995 – Proposed Residential Development, Blackglen Road, Sandyford, Co. Dublin

Stage of Audit: Stage 1

Date Audit Completed: 27/06/2024.

Problem Reference in Safety Audit Report	To Be Completed by the Designer			To be Completed Audit Team Leader
	Problem Accepted (Yes/No)	Recommendation Accepted (Yes/No)	Alternative Option (Describe) (Only complete if recommendation not accepted)	Alternative Option Accepted by Auditors (Yes/No)
P1				
P2				
P3				
P4				
P5				
P6				
P7				
P8				
P9				
P10				
P11				
P12				
P13				
P14				

Signed:…… Designer Date:……

Signed:……..……..……Audit Team Leader Date:……

Signed:…… Employer Date:……

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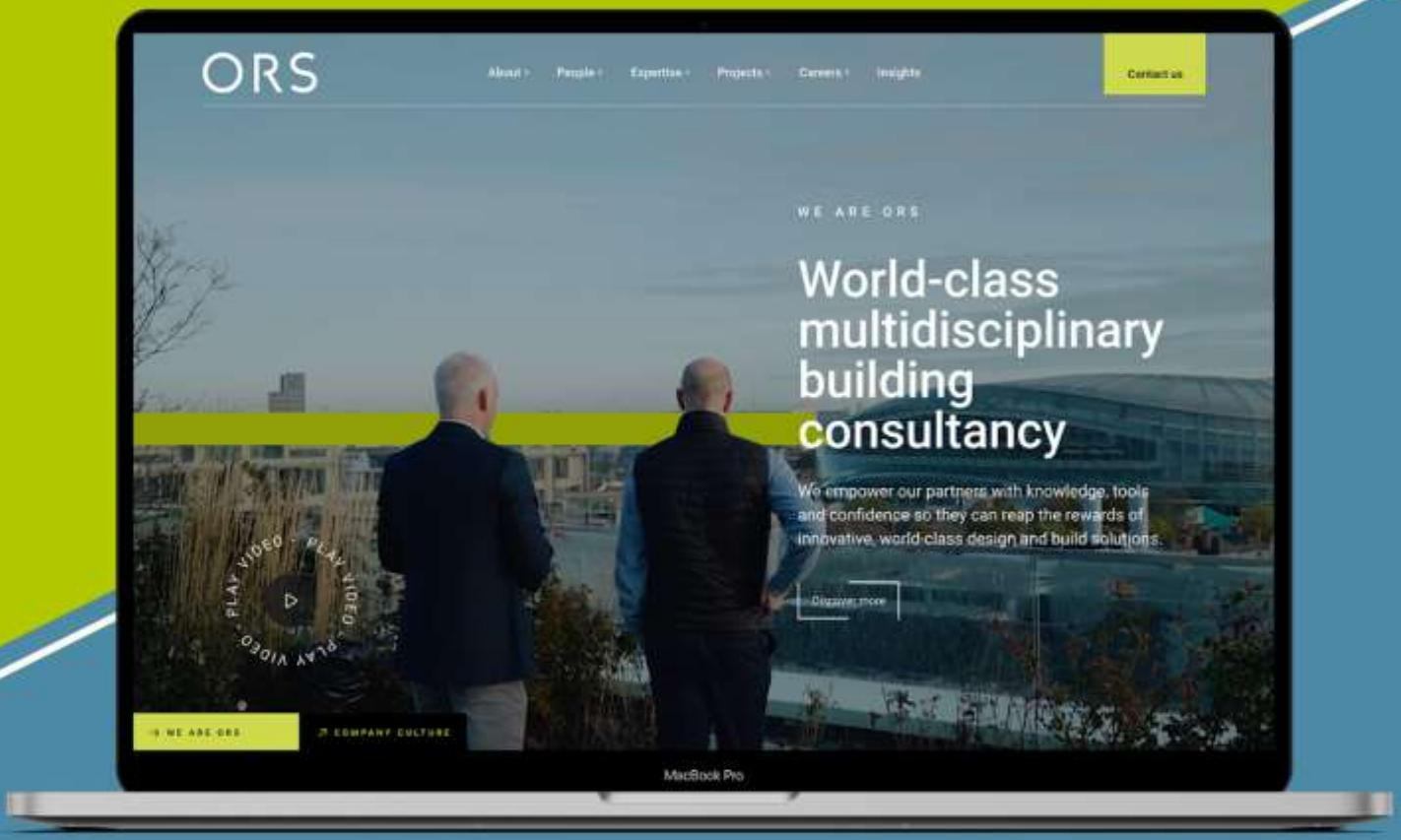

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