Project

Tallaght Stadium North Stand Development

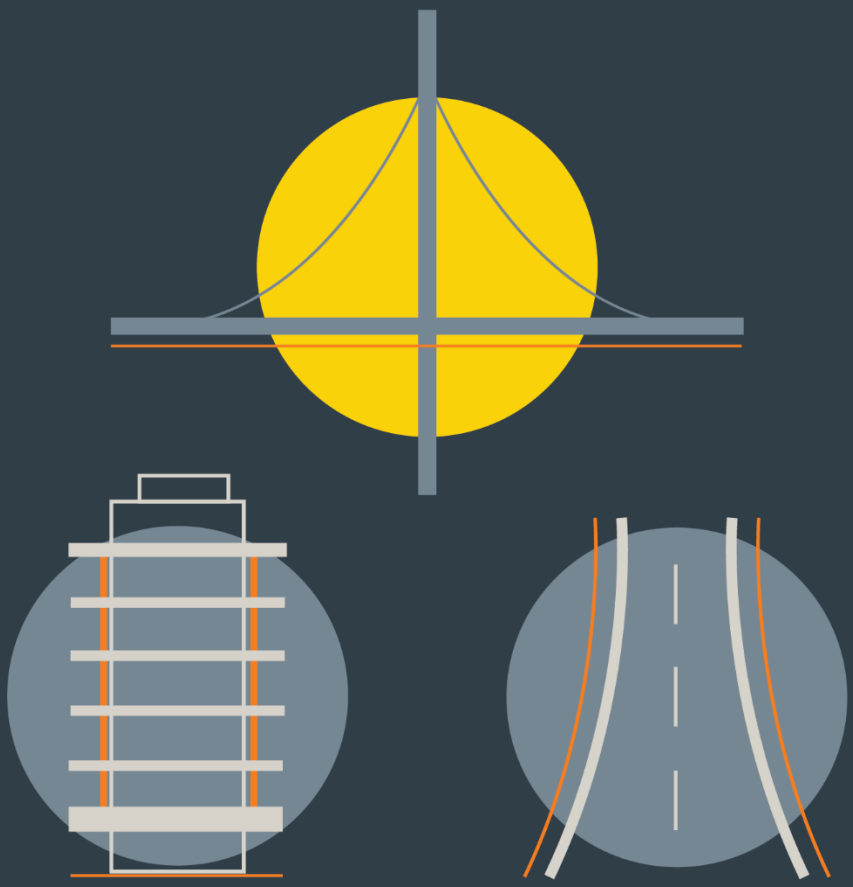
Report Title

Infrastructure Design Report

Client

South Dublin County Council

INFRASTRUCTURE



DBFL CONSULTING ENGINEERS

Job Title: **Tallaght Stadium North Stand Development**

Job Number: **190179**

Report Title: **Infrastructure Design Report**

Report Reference: **190179-DBFL-ZZ-RP-C-001**

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Draft	22/05/2020	Planning	GS	NOH	NOH
Final Draft	22/06/2020	Planning	GS	NOH	NOH
P1	25/06/2020	Planning	GS	NOH	KJS

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1.0 INTRODUCTION

1.1 Background

DBFL were commissioned by South Dublin County Council (SDCC) to undertake an Infrastructure Design Report to accompany the Part VIII Planning application for the North Stand development at Tallaght Stadium, Dublin 24. (Figure 1.1 below).

Tallaght Stadium, based in Tallaght, South Dublin, is owned and operated by South Dublin County Council (SDCC). The stadium has a current capacity of approximately 8,131 spectators and local soccer team Shamrock Rovers use this as their home venue for matches throughout their football season. The project aim is to increase capacity by 2,416 spectators by building a new North Stand.

1.2 Objective

This report addresses the development's main infrastructure elements including site access, management of surface water runoff, foul drainage strategy and water supply.

1.3 Existing Site Characteristics

Tallaght stadium is located at the Juncture of Whitestown Way and the N81 dual carriageway in Tallaght town centre. The N81 is a National Secondary road and is also the main road through Tallaght that leads directly onto the M50 Motorway.

The subject site is bound by the N81 dual carriageway to the North, Whitestown Way to the West and Sean Walsh Park Depot and Memorial Park to the South. The eastern boundary is formed by Old Bawn Community School and Central Tallaght Football Field. The surrounding area is predominantly a mix of existing residential and commercial development including key commercial areas such as The Square, Tallaght Shopping Centre (located north of the subject site) and Tallaght Business Park (located southwest of the subject site).

Within the stadium on the North side of the site there is a small green area which runs from pitch side to the external boundary wall. Beyond the boundary wall is another larger green public realm area which extends from the external boundary wall to an existing fenceline which acts as the boundary treatment along the N81 dual carriageway. Within this public realm area there are designated and demarcated pedestrian and cycling facilitates. SDCC own these lands in addition to Tallaght Stadium. Turnstiles are located on either corner of the North boundary wall to facilitate pedestrian access to matches and other events held in the stadium. .

To the west of the subject site lies a mixed-use development comprising; Woodies retail store; Lidl supermarket; Bank of Ireland; The Maldron Hotel and residential apartments. To the south-east of the subject site lies the established Old Bawn residential area, while to the northwest is the established Springfield residential area.

The overall subject site comprises circa 0.399 ha which include 0.17ha for the new stand itself. Currently there are two main stands on the East and West side respectively. The west side stand houses the dressing rooms and the club's superstore while the east site stand is primarily used to house supporters. With the development of the North Stand this will allow for an additional capacity of approximately 2416 spectators. There are no works proposed to the south side of the stadium at this time.

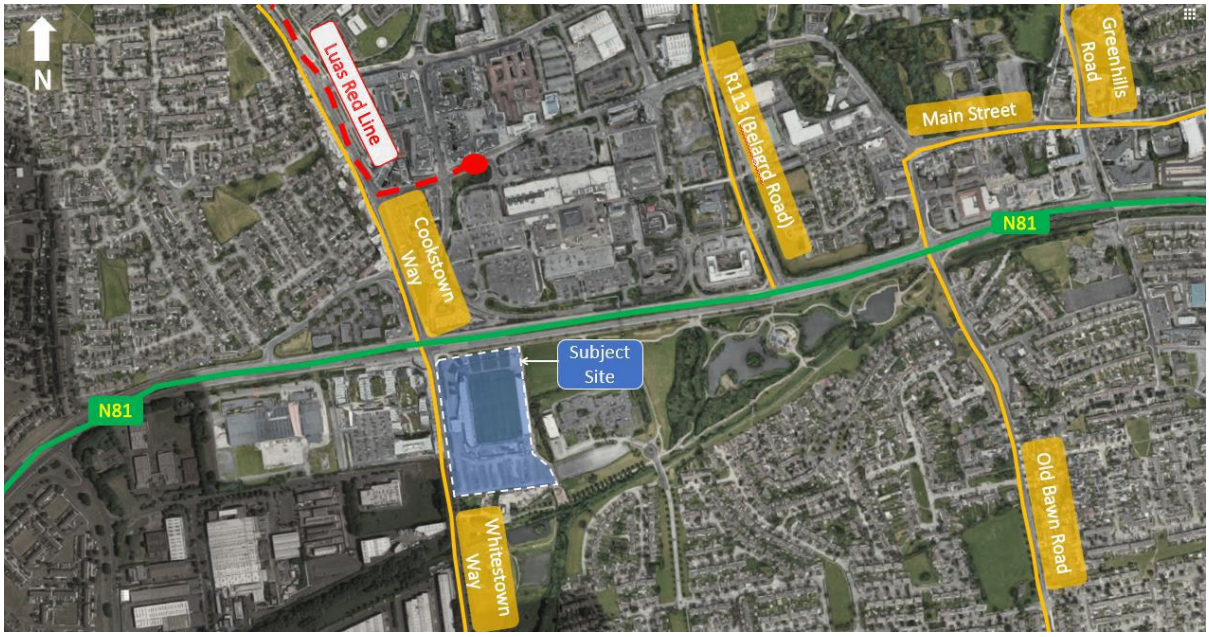


Figure 1.1 Site Location (Google Maps)

Figure 1.2: Indicative Site Boundary and Surrounding Land (Source Google Maps)

1.4 Topography

In order to facilitate the design of the North Stan a new topographical and Ground Penetrating Radar (GPR) survey has been undertaken by APEX Surveys and reference should be made to Appendix A for these Topographic Survey Plans.

The site is generally flat, and falls from its north and eastern boundaries to its southern and western boundaries at gradients ranging across the site from 1:100 and 1:70.

The existing topographic survey information is also shown in the background of the Proposed Layout Plans. Reference should be made to Appendix B DBFL Drawing Series. 1000.

1.5 Traffic and Transportation Assessment

As the new North Stand development at Tallaght Stadium will result in an increase in capacity in the Stadium of circa 2,416 persons, a full Traffic and Transportation Assessment (TTA) has been undertaken and prepared as part of this application. Reference should be made to this separate document for the TTA.

1.6 Ground Conditions

Ground Investigations Ireland carried out a detailed intrusive ground investigation at the site in October 2016 for a proposed development on the South side of the stadium (refer to Appendix E for the full ground site investigation report from GII).

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results in the detailed report. 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 are generally comprised of;

- Topsoil/Surfacing
- Made Ground
- Cohesive Deposits

2.0 EXISTING SERVICES AND UTILITIES

2.1 General

DBFL have liaised with SDCC on an ongoing basis to develop an agreed foul and Surface water drainage strategy and associated design for the proposed development. At an early stage of the design process the impact of existing services within the subject area was considered and subsequently a comprehensive non-intrusive site investigation was undertaken.

In March 2020 a topographical and Ground Penetrating Radar (GPR) survey was commissioned for the site undertaken by Apex Surveys in May 2020. The GPR survey has confirmed the documented service locations as noted on the Irish Water and SDCC drawings.

Reference should be made to the Utility Mapping Report located within Appendix A for details of the existing utilities and services that have been detected.

2.2 Surface Water Drainage

There appears to be two connections to the external surface water network from the stadium site, one to the Whitestown stream to the south and a second to the west of the site, connecting to a 300mm diameter surface water line which runs south along Whitestown Way.

A 225mm diameter SDCC surface water sewer runs along the northern boundary of the Tallaght Stadium Site, and currently, there does not appear to be a connection from the site to this line. These have been confirmed from the GPR Survey.

In line with the GDSDS, the surface water discharge within the Tallaght Stadium site has been limited to a maximum of 2 l/s/ha to the external storm network. Each network(s) has been hydraulically modelled and tested against the rainfall intensities for 1 in 1 Year and 1 in 30 Year return period for the prevention of flooding in addition for the area being designed and engineered to manage a volume of water equivalent to a 1 in 100-year 6 hour duration storm. It is proposed to discharge storm water to the existing 225mm Stormwater sewer running along the north of the site. Preliminary discussions have taken place with SDCC drainage department who have not advised of any capacity issue,

There is a large area of public realm space that is proposed to accommodate the attenuation of surface water for the new North Stand. The viability of attenuation features such as swales into the landscaping has been investigated and discussed with SDCC drainage. It has been considered that open above ground sustainable drainage systems would not be suitable in this location and that the use of attenuation tanks / cellular storage underneath is sufficient to facilitate for excessive rainfall flows. Rainwater harvesting also has been considered.

2.3 Foul Drainage

An existing 750mm diameter concrete sewer line conveys north to south along Whitestown Way. The proposed topographical and GPR surveys assisted DBFL in identifying the location of any existing connecting spurs from the Stadium site to this line, and also the existing private foul network across the site.

The wastewater for the proposed New North Stand development has been designed in accordance with Irish water technical standard for Wastewater Gravity Sewers.

A pre-connection enquiry (PCE) form has been prepared and submitted to Irish Water in June 2020. The PCE is currently going through the various stages of that process and in due course will confirm the viability of using this public network to discharge the foul sewerage from this proposed development.

2.4 Water Supply

An existing 150mm diameter water main runs along the internal Western boundary wall of the stadium site parallel to Whitestown Way. This watermain terminates at a hydrant located just beyond the turnstiles on the North side of the stadium. Non-intrusive investigations via Topographical and GPR surveys were undertaken on the 15th May 2020 which also confirmed this.

2.5 CCTV Survey

Following on from the GPR survey DBFL and SDCC believe it will be necessary to undertake a CCTV survey of the foul drainage lines to assess their condition.

2.6 Utilities

Existing utility company records were collected and reviewed in order to determine the existing utilities within the site area and the immediate environs. These records along with a review of the results of the GPR survey were undertaken and the following were determined:

- There are 2no. existing Eircom underground running along west and north boundary walls of the stadium. Records indicate that these service ducts convey underneath the footpath outside the Stadium and link with each other at the footpath located on west boundary.
- Gas Networks Ireland (GNI) were contacted as part of the desktop study and indicated there are gas mains located to the north of the site
- ESB records indicate there are MV/LV buried power lines running along southern boundary of the site. It is not anticiapated that these will interfere with the proposed scheme
- Virgin Media were contacted as part of this desktop study. Service records indicate there is a main line running underneath Whitestown Way road.

Please refer to Appendix A for the GPR and Topographical survey findings

3.0 Proposed Surface Water Drainage

3.1 Surface Water Management Strategy

The surface water management strategy has been designed to comply with the Greater Dublin Strategic Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines and the requirements of South Dublin County Council. The guidelines require the following main 4 main criteria to be provided by the development's surface water design;

- **Criterion 1**: River Water Quality Protection – satisfied by providing interception storage, treatment of run-off within the SUDS features e.g. within the on-line linear swale detention basin at upper level and the lower level detention basin and petrol interceptor on the main surface water discharge from the development.
- **Criterion 2**: River Regime Protection – satisfied by attenuating run-off with flow control devices prior to discharge to the outfall.
- **Criterion 3**: Level of Service (flooding) for the site – satisfied by the Site being outside the 1000 year coastal and fluvial flood levels following proposed mitigation measures. (Refer to Flood Risk assessment document). Pluvial flood risk addressed by development designed to accommodate a 100 year storm as per GDSDS. Planned flood routing for storms greater than 100 year level considered in design and development run-off contained within site. All roadways fall towards open space areas and in particular to the district park in the north east corner of the site.
- **Criterion 4**: River flood protection – attenuation provided within the SUDS features e.g. on-line attenuation basins.

3.2 Flood Risk

A separate Site-Specific Flood Risk Assessment has been prepared as part of this planning application and reference should to this document within the Part VIII application.

This flood risk assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping (www.floods.ie) and the Eastern CFRAM Study and has been carried out in accordance with the OPW's Guidelines for Planning Authorities – The Planning System and Flood Risk Management (November 2009).

3.3 Pluvial Flooding Provision

The surface water pipes, attenuation storage and site levels has been designed to accommodate a 100-year storm event and includes climate change provision. Finished floor levels of North Stand has been designed to be in excess of the 500mm freeboard as required in the GDSDS.

3.4 Sustainable Drainage Systems (SuDS)

SuDs features has been integrated into the surface water drainage network for the development, with the objective being to control the quantity of surface water runoff, manage the quality of runoff to prevent pollution, and to create and sustain better places for people and for nature. The four main categories of benefits that can be achieved by SuDs are water quantity, quality, amenity and biodiversity.

The use of SuDs features is a requirement of the GDSDS (Greater Dublin Strategic drainage Study) and the features proposed for the development include the following:

- Stormtech Underground Cellular Storage System

3.5 Surface Water Attenuation

Surface water run-off from the overall building will be attenuated using a vortex flow control device (Hydrobrake or equivalent) at the northern end boundary.

The Qbar rate is estimated at 0.0150m3/sec or 1.50 l/s for the site. As a result the stormwater discharge rate will be set to a maximum discharge of 2l/s in line with GDSDS.

Qbar is calculated using “The Institute of Hydrology” Qbar equation as follows:

- **Qbar (rural) = 0.00108 x AREA$^{0.89}$ x SAAR$^{1.17}$ x Soil$^{2.17}$**

Where:

Qbar (rural) is the mean catchment annual flow from a rural catchment in m3/s;

AREA is the area of the catchment in km^2

SAAR is the standard average annual rainfall

SOIL is the soil index, with 5 soil types used and SPR values (standard percentage runoff) applied to each soil type.

For small catchment, flow rates are linearly interpolated for areas smaller than 50hectares.

- AREA = 2764 m^2;
- SAAR = 830mm
- The SPR values for the 5 soil types are as follows:

Soil 1 = 0.1; Soil 2 = 0.3; Soil 3 = 0.37; Soil 4 = 0.47; Soil 5 = 0.53;

A SPR value of 0.47 (Soil Type 4) is applied for the subject site. This is based on site specific site investigations (by **Ground Investigation Ireland Ltd** and has been included as a standalone report in Appendix F of this report), which indicated that the soil throughout the site are predominantly clay with generally no permeability. Please refer to Figure 3.1 and Figure 3.2 below

3.6 Ground Investigation

A preliminary site investigation was undertaken on the subject site in 2017 which recorded a thin layer of topsoil overlaying a mantle of gravelly sandy clay which is generally in a firm to still condition becoming stiff to very stiff in places. While no allowance can be taken with volumetric calculations, it would still be considered that some infiltration will naturally occur for lower flow events. The site investigation report is attached in Appendix E of this Report/

Table 3.1 Drainage Classification (GII, 2017)

Drainage Group	3 - Commonly waterlogged within 60cm
Depth to impermeable layer	1 - >80cm
Permeability group (above 'impermeable' layers or to 80cm)	2 - Medium
Slope	1 – 0 -2°

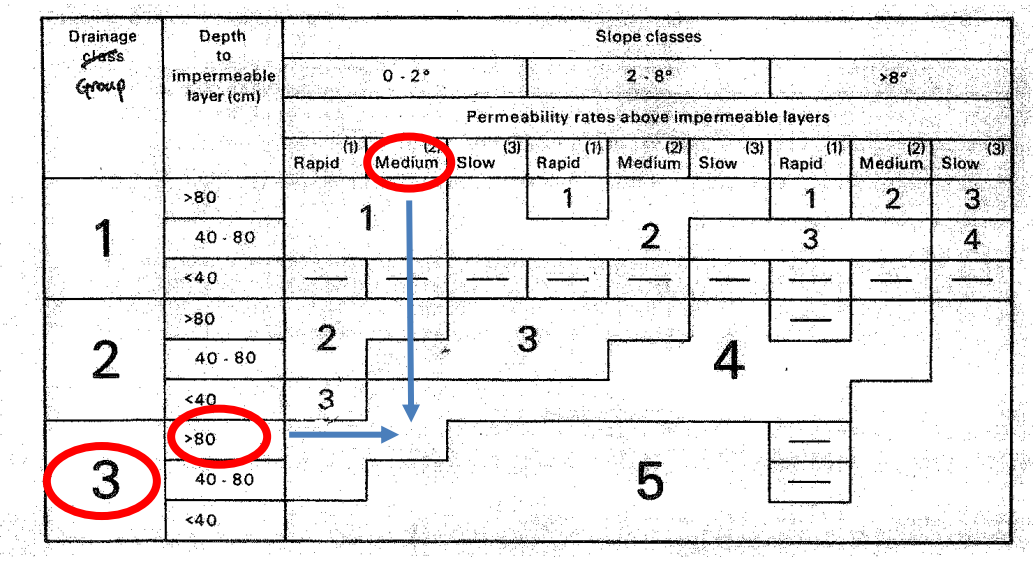


Figure 3.2 Soil Classification (GII, 2017)

3.7 Surface Attenuation Volume Storage

Simulation carried on using "Microdrainage" software have shown that the water volumes can be managed through storing exceptional events discharge using StormTech Underground Cellular Storage tank system. An attenuated volume of 100m3 shall be provided for the site. Please refer to appendix G for simulation results and proposed drawings located in Appendix B.

3.8 Interception Storage

To prevent pollutants or sediments discharging into water courses the GDSDS requires “interception storage” to be incorporated into the development. The volume of interception required is based on 5mm of rainfall depth from 80% of the runoff from impermeable areas as defined in GDSDS. The interception volume attributable to each Suds feature consists of the volume of water that can infiltrate to the ground, what will evaporate into the atmosphere and what can transpire through plants and vegetation. Additionally, there will be some loses of water due to absorption and wetting of stone and soil media. The total interception storage required is circa 7.2m3.

- Impermeable area = 0.27ha
  = 2764m2
- Interception Storage = 2764 x 0.005 x 0.8
  = 11.06 m3

3.9 Treatment Volume

The GDSDS requires that a “treatment volume” (Vt) be provided to prevent any pollutants or sediments entering river systems. Treatment storage is calculated as 80% runoff from impermeable areas for the first 15mm of rainfall.

- Impermeable area = 0.27ha
  = 2764m^2
- Treatment Storage = 2764 x 0.015 x 0.8
  = 33.17 m^3

3.10 Climate Change

Surface water calculations for the site made use of rainfall values for Tallaght, provided by Met Eireann. Rainfall intensities were increased by a factor of 10% to take account of climate change, as required by the GDSDS for attenuation storage design.

Rainfall Data is located in Appendix C of this report.

3.11 Design Standard & Basis

The proposed surface water drainage network has been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the Department of the Environment’s Building Regulations “Technical Guidance Document Part H Drainage and Waste Water Disposal” and BS EN 752: 2008 Drain and Sewer Systems Outside Buildings. Surface water network has been sized using the Microdrainage Windes drainage modelling software using the following parameters indicated in Table 3.1

Table 3.2 Storm Sewer Design Parameters

Return period for pipe work	5 years
Return Period for Attenuation Design	30 year below ground 100 year above ground
Time of entry	4 minutes
Discharge Limit	2 l/s/ha @ 100 years for subject site
Pipe Friction (Ks)	0.6 mm
Minimum Velocity	1.0 m/s
Standard Average Annual Rainfall	830mm (Met Eireann 1km2 grid)
M5-60	19.2mm (Met Eireann)
Ratio r (M5-60/M5-2D)	0.26 (Met Eireann)
Climate Change Allowance	10%
Factor of Safety for infiltration	2.0
Runoff from Roads and Footpaths	100%

Surface water sewers have been designed in accordance with IS EN 752 and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS). Standard drainage details are in accordance with the Greater Dublin Regional Code of Practice for Drainage Works. The minimum pipe diameter for public surface water sewers is 225mm. A breakdown of Impermeable Areas is provided in Table 3.1 below

Table 3.1 : Breakdown of Impermeable Areas

	Runoff Coefficient	Gross Area (ha)	Total Imp Area (ha)
Roof	1.00	0.152	0.152
Footpath	1.00	0.124	0.124
Total		**0.276**	**0.276**

3.12 Storm Drainage Proposal

Due to the constraints of the existing environment such as the close proximity to the N81 dual carriageway and heavy pedestrianised area its is proposed to keep the attenuation and majority of storm sewers underground within SDCC owned lands. As such it is proposed to Stormtech Underground Cellular Storage to provide 105m3 and to convey stormwater to the existing public network.

A flow control manhole located within SDCC lands will restrict flows to the public sewer network in line with GDSDS requirements.

Reference should be made to Appendix B DBFL drawings for further details of these proposals.

4.0 Proposed Foul Drainage

Foul sewers have been designed in accordance with all relevant codes of practice and specifications. Primarily these involve the Irish Water Code of Practice for Wastewater Design, Building Regulations and the principles and methods set out in the IS EN752 (2008), BS8301: 1985, IS EN12056: Part 2 (2000) and the recommendations of the 'Greater Dublin Strategic Drainage Study', (GDSDS). Since this is a commercial development average occupancy was taken as 5persons per square meter. it was assumed that the peak flow discharge for this development would be spread over a 3hour event which is the average time for sporting activities.

The following criteria have been applied:

Demand	150 l/person/day (Irish Water Code of Practice)
Discharge units	As specified below
Pipe Friction (Ks)	1.5 mm
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	3.0 m/s (1:20 maximum pipe gradient)
Frequency Factor	1.0 for public use

The general foul sewer strategy for the development will be to discharge by gravity to the existing foul sewer located underneath Whitestown Road, on the West Side of the stadium.

Estimated foul loading generated by the development are included in **Table 2** below:

Table 4.1: Foul Loading Demand for business development

Infrastructure extension – North Stand (m^2)	1800
Volume (m^3/day)	21.6
Average daily demand (assuming 24hrs for residential and non-residential) (l/s)	0.25
Peak Flow Discharge (over 3hr sporting event) (l/s)	2
Design Flow (l/s)	2

4.1 Waste Water Discharge Calculation

(as outlined in Irish Water's Pre-Connection Enquiry Application Form)

Average Occupancy for Commercial Unit	5 PE/m2
Area	1'700 m2
Post Development Average Discharge	0.25 l/sec
Post Development Peak Discharge	1.50 l/sec
Commercial Dry Weather Flow Volume	21'600 l/Day
Average 21'600 l/Day	

4.2 Biochemical Oxygen Demand – BOD

(as outlined in EPA Waste Water Treatment Manual)

Average Occupancy for Commercial Unit	5 PE/m2
Area	1'700 m2
BOD Loading (60g per person per day)	540'000 g

4.3 Foul Sewer proposal

It is proposed to connect to convey foul sewage from the new north stand to an existing 750mm diameter foul sewer located on Whitestone Way. A 150mm foul sewer with appropriate self cleansing velocities and minimum clearances within other utilities has been designed in accordance with IW Irish Water Code of Practice for Wastewater Design.

Reference should be made to Appendix B DBFL drawings for further details of these proposals.

5.0 Proposed Water Supply

5.1 Water Demand

It is proposed to supply the development via the existing 150mm diameter watermain running on the West side of the Stadium. The connection to the public water main will include a metered connection with sluice valve arrangement in accordance with the requirements of Irish Water.

Similar to the foul design, water demand will be based on an average 3 hour sporting event and demand rates were taken from Irish Water Code of Practice for water infrastructre.

The following criteria have been applied:

Demand	45 l/person/day (Irish Water Code of Practice for commerical)
Demand per 3hr Sporting event:	6 l/person
Occupancy	2416 Persons
Minimum Velocity	0.75 m/s (self-cleansing velocity)
Maximum Velocity	3.0 m/s (1:20 maximum pipe gradient)
Frequency Factor	*1.0 for public use*

Table 5.1 Water Loading Demand for business development

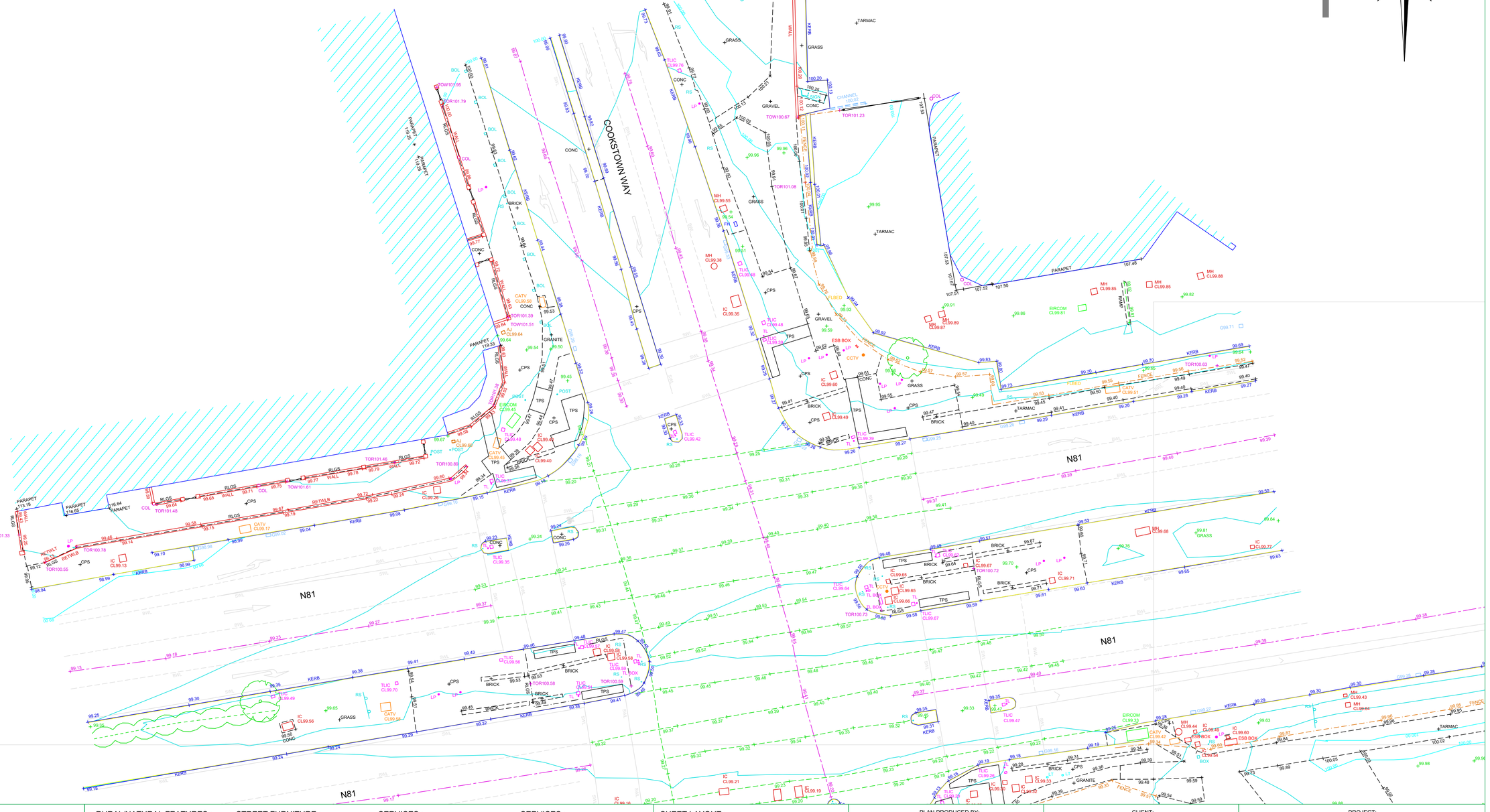
Total Occupancy	2416
Volume (m^3/day)	13.6
Average daily demand (assuming 24hrs non-residential) l/s	0.16
Peak Flow L/S (Peak demand over 3hr sporting event)	1.57

5.2 Hydrants

The development will be designed in accordance with the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety". Under this guidance document sports stadium, pavilions and the like fall under the classification of Assembly and recreation facilities. Hydrants shall also comply with the requirements of BS 750:2012 and shall be installed in accordance with Irish Water's Code of Practice and Standard Details. They shall

The estimated water daily water demand generated by the development is included in **Table 5.1** below.

Appendix A – Topographical and GPR 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
TB	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:

Apex Surveys
Unit 78 Dunboyne Business Park
Dunboyne, Co. Meath, Ireland
www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

CLIENT:

D.B.F.L.

PROJECT:

Tallaght Stadium

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 : 19/05/2020

DRG No: 4311

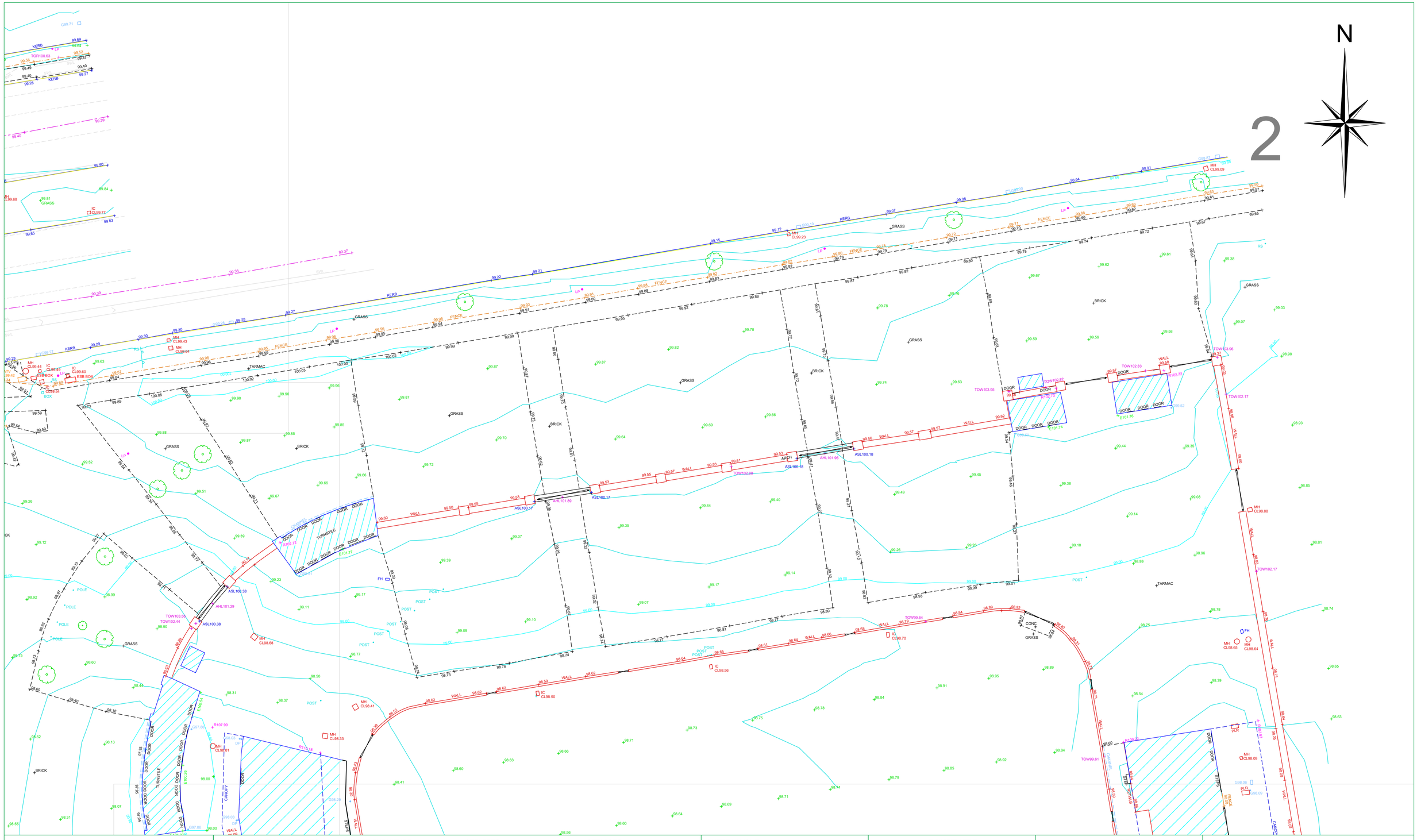
SHEET: 1 of 6

DESCRIPTION : 2D Topographical

SURVEYED BY : A.H., J. P.

PROCESSED BY : CristinaButur

CHECKED BY : Alan Brady



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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 :

PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

Apex Surveys
Unit 78 Dunboyne Business Park
Dunboyne, Co. Meath, Ireland
www.apexsurveys.ie
info@apexsurveys.ie
00353 1 691 0156

CLIENT:

D.B.F.L.

PROJECT:

Tallaght Stadium

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

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

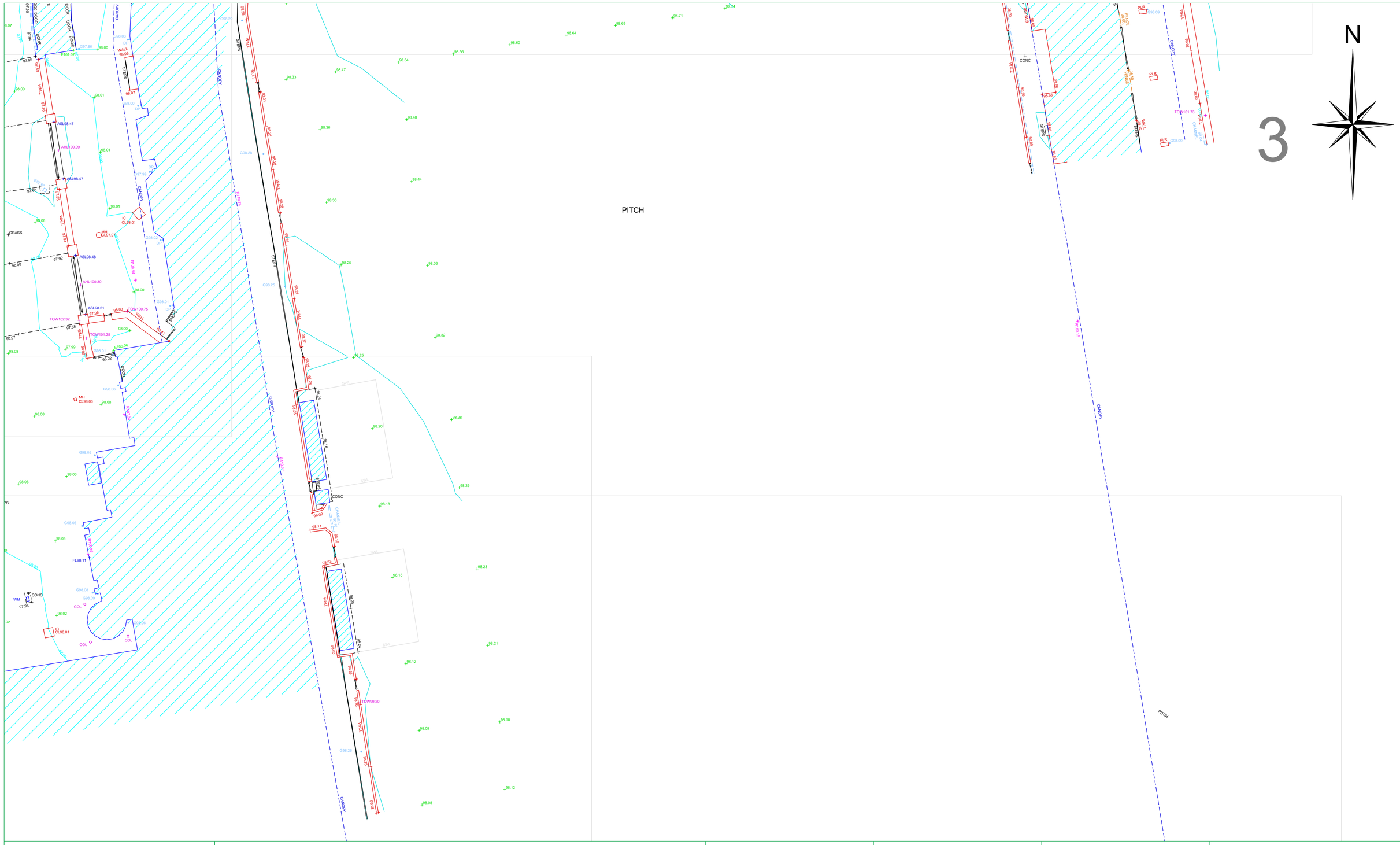
SCALE : 1/200 A1

DATE : 19/05/2020

DRG No: 4311

SHEET: 2 of 6

DESCRIPTION : 2D Topographical
SURVEYED BY : A.H., J. P.
PROCESSED BY : CristinaButur
CHECKED BY : Alan Brady



APEX SURVEYS

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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 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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CLIENT:

D.B.F.L.

PROJECT:

Tallaght Stadium

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 : 19/05/2020

DRG No: 4311

SHEET: 3 of 6

DESCRIPTION :	2D Topographical
SURVEYED BY :	A.H., J. P.
PROCESSED BY :	CristinaButur
CHECKED BY :	Alan Brady

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00353 1 691 0156

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
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:

CONTACT INFORMATION:
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00353 1 691 0156

CLIENT:
D.B.F.L.

PROJECT:
Tallaght Stadium

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 : 19/05/2020
DRG No: 4311
DESCRIPTION : 2D Topographical
SURVEYED BY : A.H., J. P.
SHEET: 4 of 6
PROCESSED BY : CristinaButur
CHECKED BY : Alan Brady

RURAL/NATURAL FEATURES :

Feature	Symbol
BUSH	
SAPLING	
TREE	
HEDGE	
TROUGH	TR
CATTLE GRID	GRID

LINEWORK:

Linework	Symbol
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 :

Item	Code
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 :

Item	Code
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

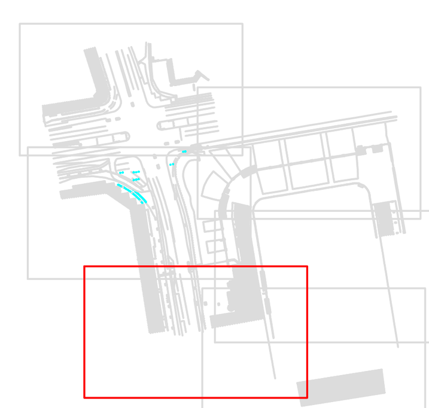
SERVICES :

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

LEVELS :

Level	Code
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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CLIENT:

D.B.F.L.

PROJECT:

Tallaght Stadium

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

REVISIONS:

No.	Date	Description
001	N/A	Original Drawing

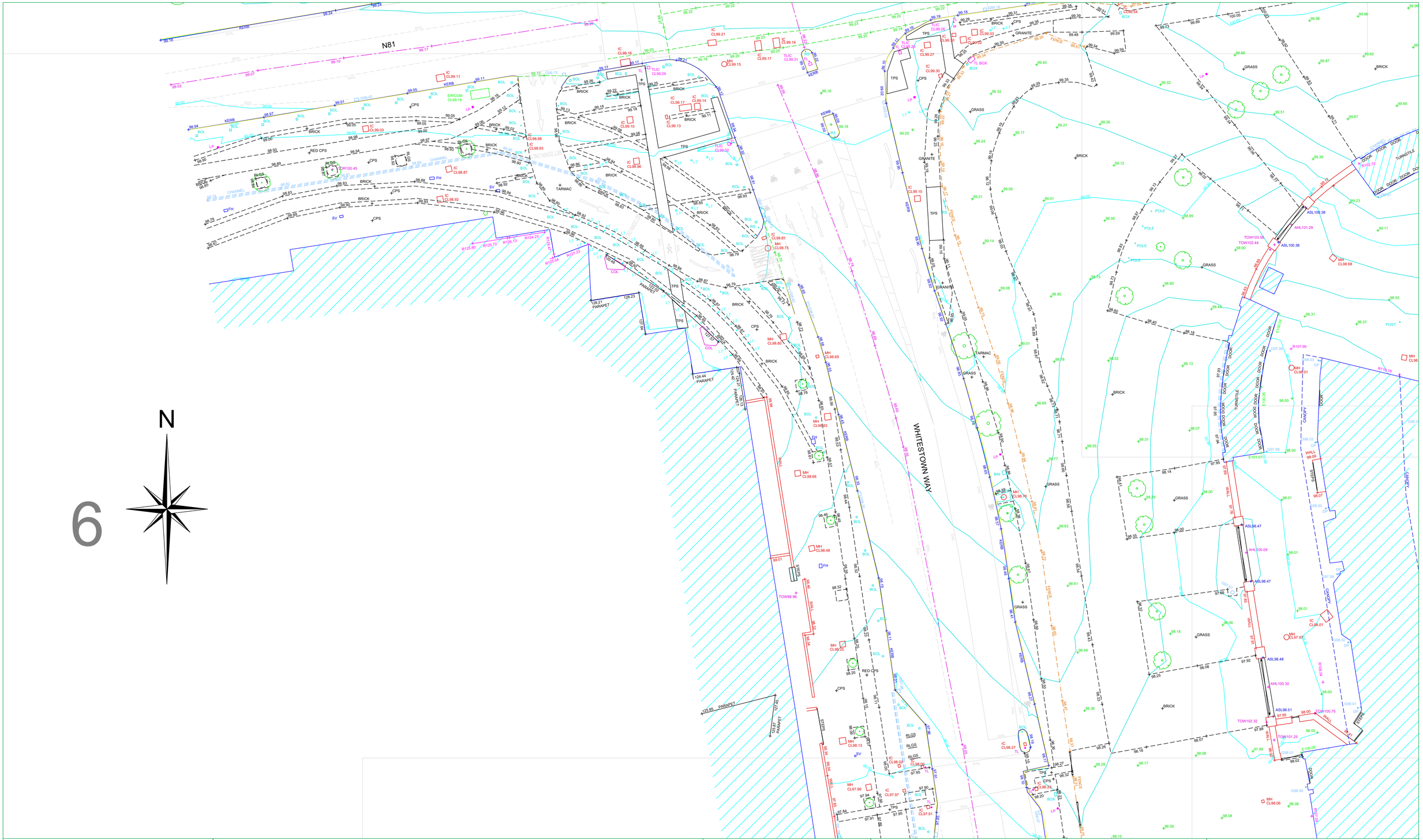
SCALE : 1/200 A1

DATE : 19/05/2020

DRG No: 4311

SHEET: 5 of 6

DESCRIPTION : 2D Topographical
SURVEYED BY : A.H., J. P.
PROCESSED BY : CristinaButur
CHECKED BY : Alan Brady



APEX SURVEYS

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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 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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00353 1 691 0156

CLIENT:

D.B.F.L.

PROJECT:

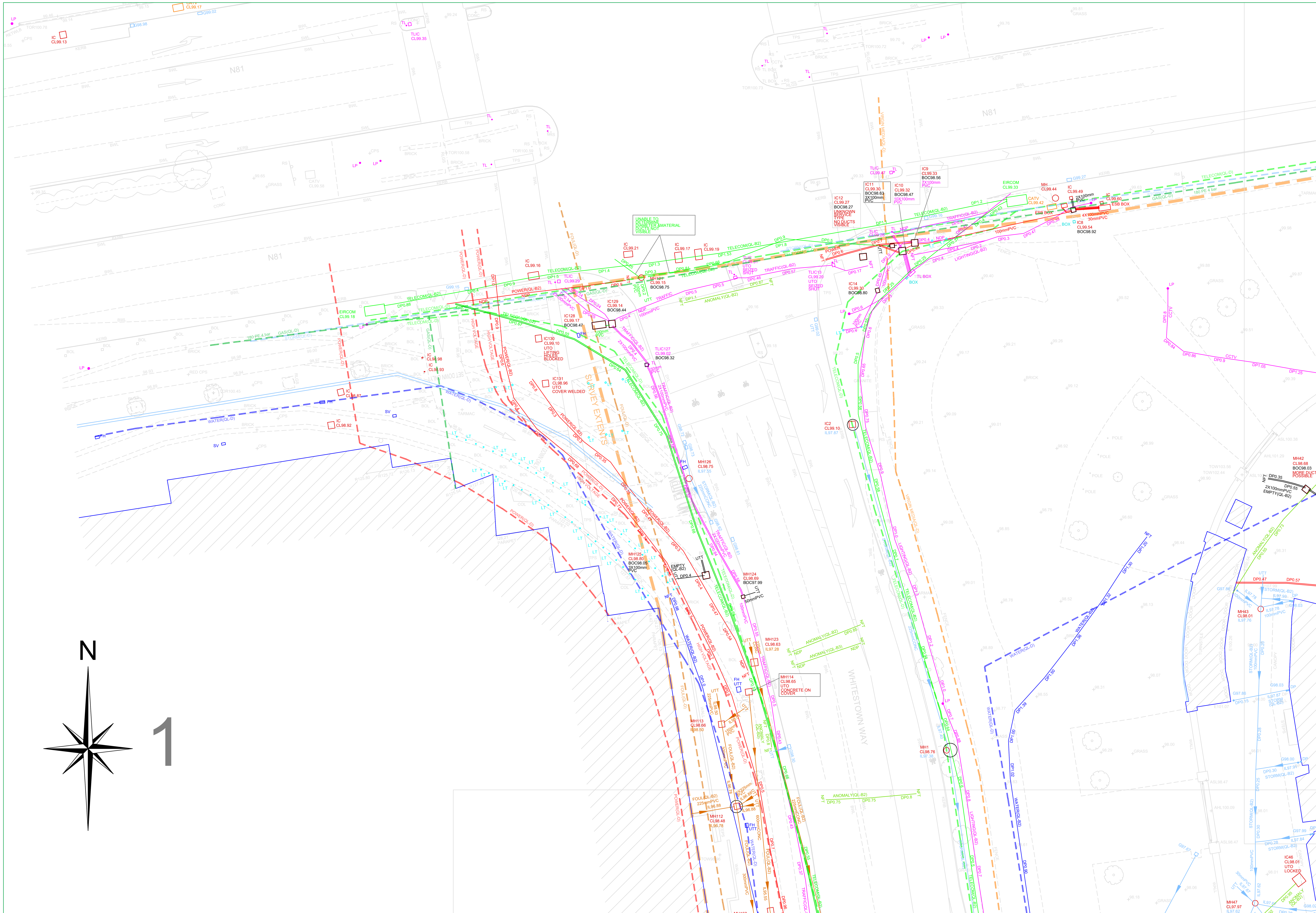
Tallaght Stadium

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 : 19/05/2020
DRG No: 4311
SHEET: 6 of 6
DESCRIPTION : 2D Topographical
SURVEYED BY : A.H., J. P.
PROCESSED BY : CristinaButur
CHECKED BY : Alan Brady



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
www.apexsurveys.ie
info@apexsurveys.ie
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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
TRAFFIC LIGHT	TL
TELEPHONE BOX	TB
POST	POST
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

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
SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC
VENT	VENT
WATER METER	WM
DOWNPIPE	DP
EARTHENWARE	E/W
NO FURTHER TRACE	NFT
OFFSITE	O/S
START OF RUN	SOR
UNABLE TO OPEN	UTO
UNABLE TO TRACE	UTT

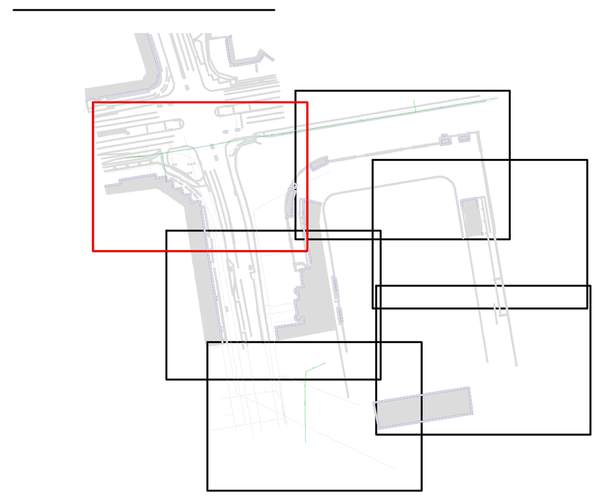
LEVELS :

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:

APEX SURVEYS

CONTACT INFORMATION:

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00353 1 691 0156

CLIENT:

D.B.F.L.

PROJECT:

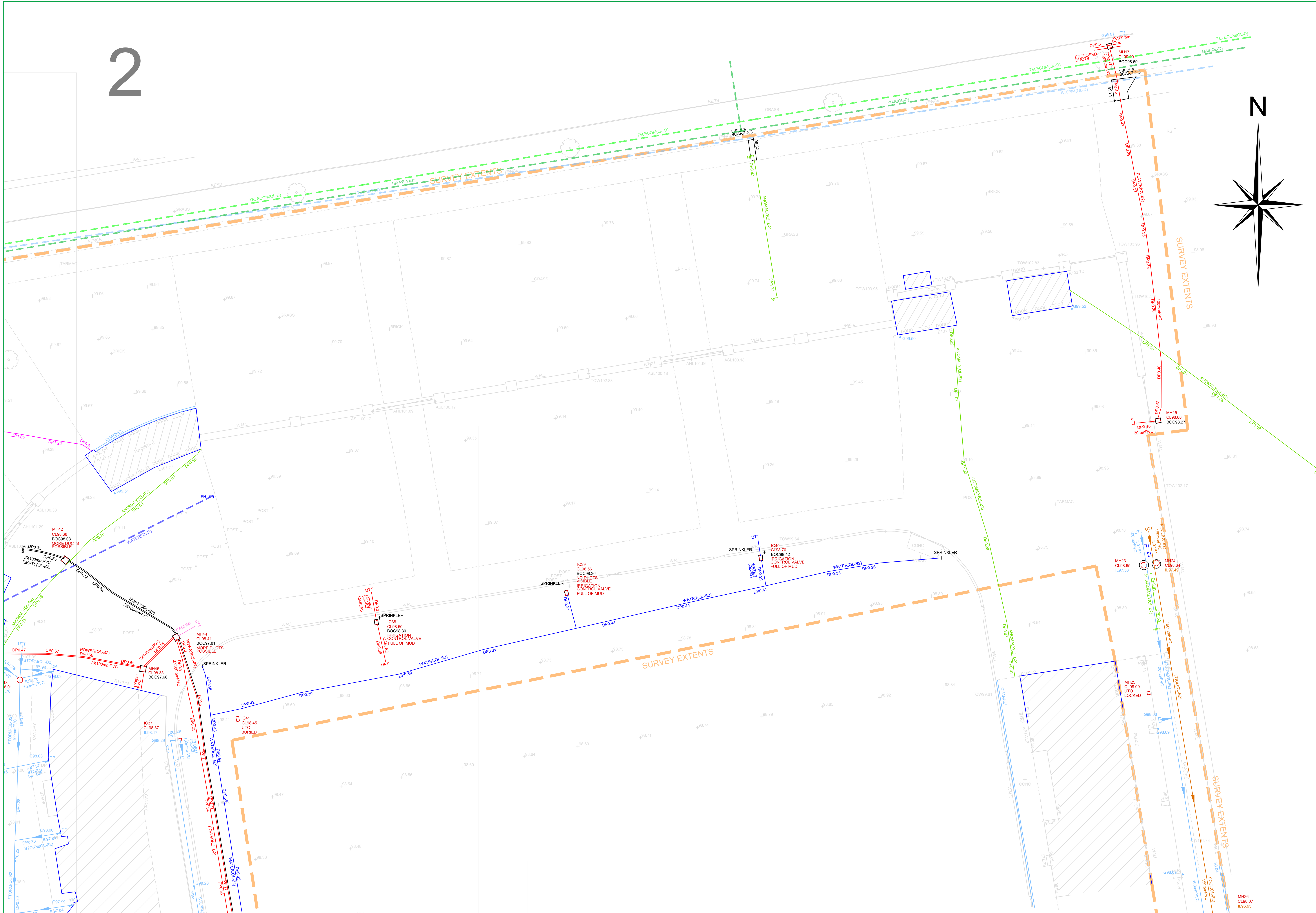
Tallaght Stadium

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

REVISIONS:

No.	Date	Description
001	04/06/20	Original Drawing
002	08/06/20	Additional Information Added-Gas Records

SCALE :	1/200 A1	DATE :	04/06/2020
DRG No:	4311	DESCRIPTION :	3D Utilities
		SURVEYED BY :	M.G., S.B.
SHEET:	1 of 6	PROCESSED BY :	Cristina Butur
		CHECKED BY :	Alan Brady



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

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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
TRAFFIC LIGHT	TL
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COVER LEVEL	CL
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OFFSITE	O/S
STOPCOCK	ST
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LEVELS :

BED LEVEL	+BED101.50
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INVERT LEVEL	+IL101.50
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SPOT LEVEL	+101.50
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SURVEY CONTROL STATION	
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ELECTRIC CABLE	POWER
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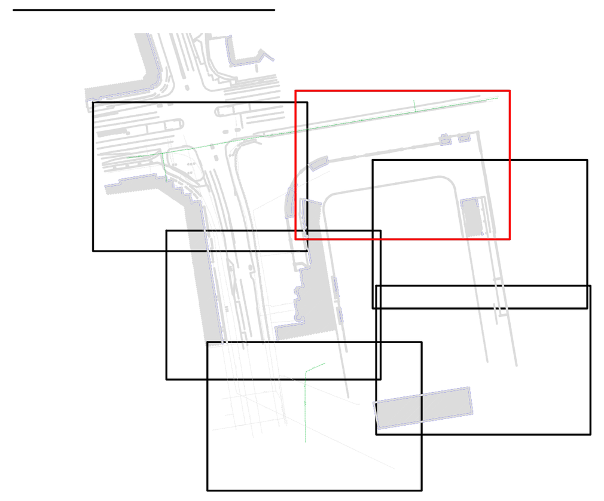
SHEET LAYOUT :



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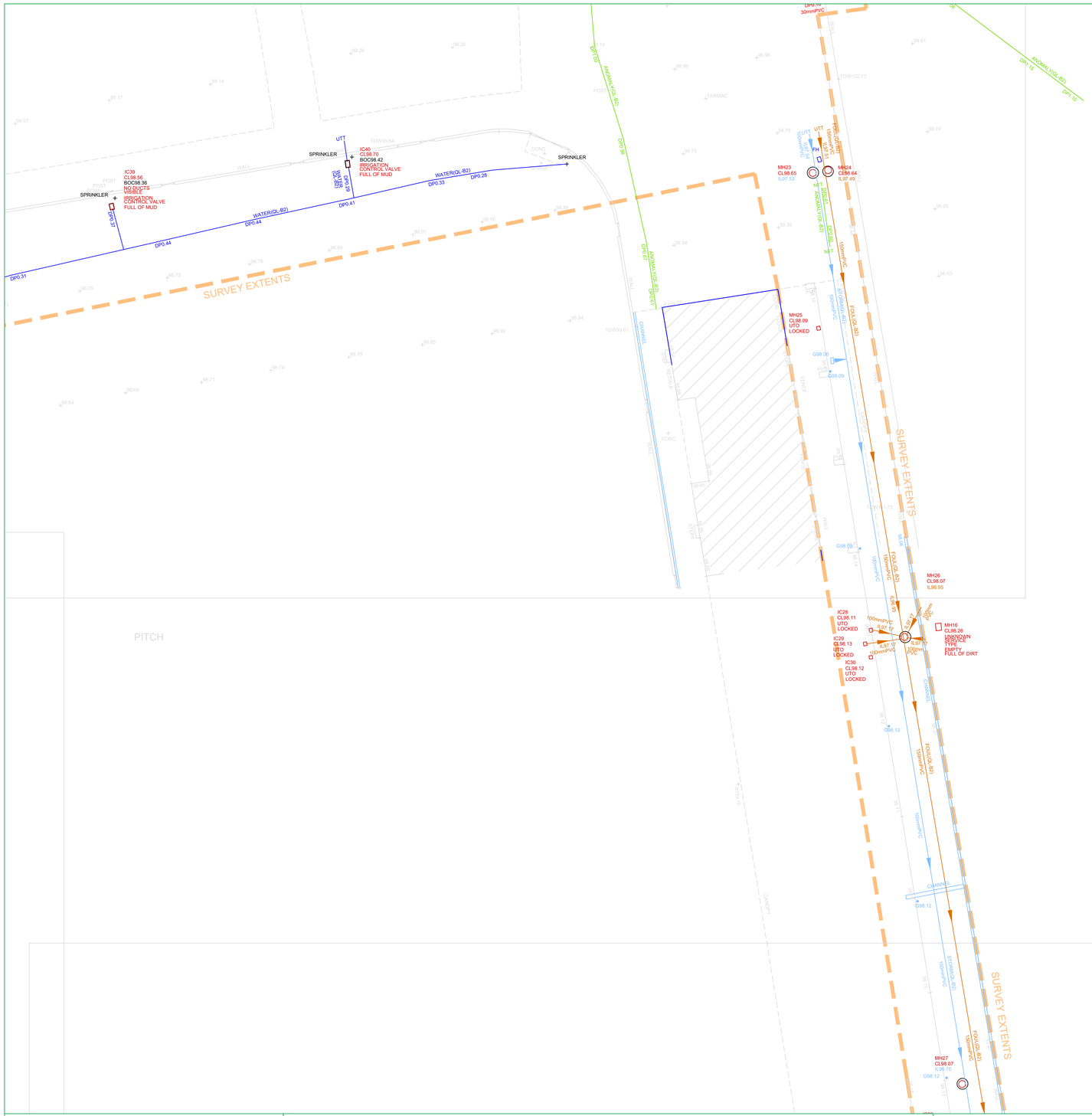
GRID SYSTEM: Irish Transverse Mercator
DATUM: Malin Head (OSGM15)
NOTES: Drawing Contains Scale Factor

REVISIONS:

No.	Date	Description
001	04/06/20	Original Drawing
002	08/06/20	Additional Information Added-Gas Records

SCALE :	1/200 A1	DATE :	04/06/2020
DRG No:	4311	DESCRIPTION :	3D Utilities
		SURVEYED BY :	M.G., S.B.
SHEET:	2 of 6	PROCESSED BY :	Cristina Butur
		CHECKED BY :	Alan Brady



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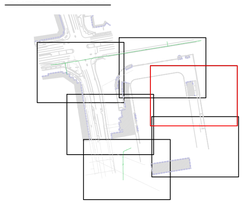

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SCALE : 1/200 A1

DRG No: 4311

SHEET: 3 of 6

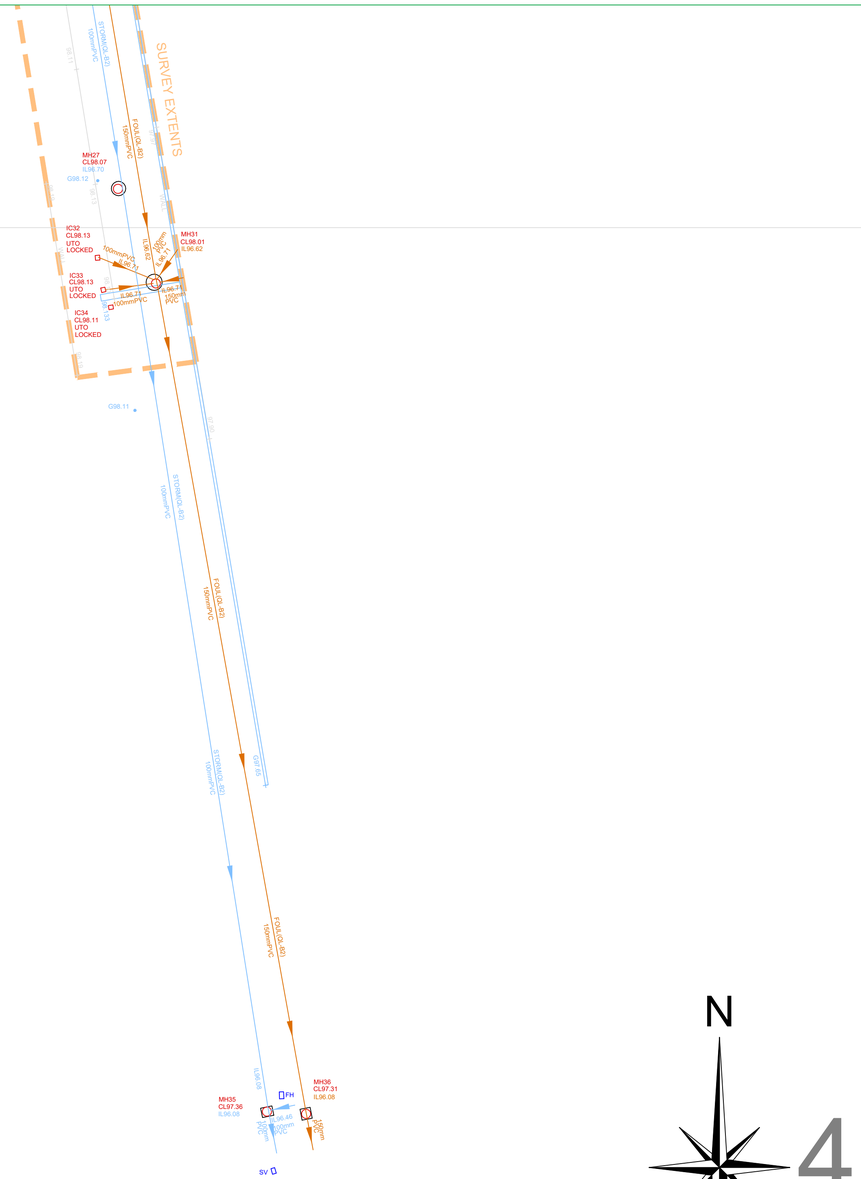
DATE : 04/06/2020

DESCRIPTION : 3D Utilities

SURVEYED BY : M.G., S.B.

PROCESSED BY : Cristina Butur

CHECKED BY : Alan Brady



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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	TRIT +		

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 •	SERVICE BOX (UNKNOWN)	BOX
TRAFFIC COVER	TLIC	VENT	VENT •
WATER METER	WM +		

LEVELS :

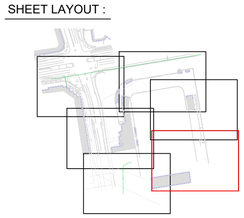
BED LEVEL	+ BED101.50
FLOOR LEVEL	+ FL101.50
INVERT LEVEL	+ IL101.50
ROAD LEVEL	+ 101.50
SOFFIT LEVEL	+ SL101.50
SPOT LEVEL	+ 101.50
TOP OF WALL LEVEL	+ TOW101.50
WATER LEVEL	+ WL101.50
SURVEY CONTROL STATION	

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

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

SHEET LAYOUT :



PLAN PRODUCED BY:

APEX SURVEYS

CONTACT INFORMATION:

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

CLIENT:

D.B.F.L.

PROJECT:

Tallaght Stadium

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

REVISIONS:

No.	Date	Description
001	04/06/20	Original Drawing
002	08/06/20	Additional Information Added-Gas Records

SCALE : 1/200 A1

DATE : 04/06/2020

DRG No: 4311

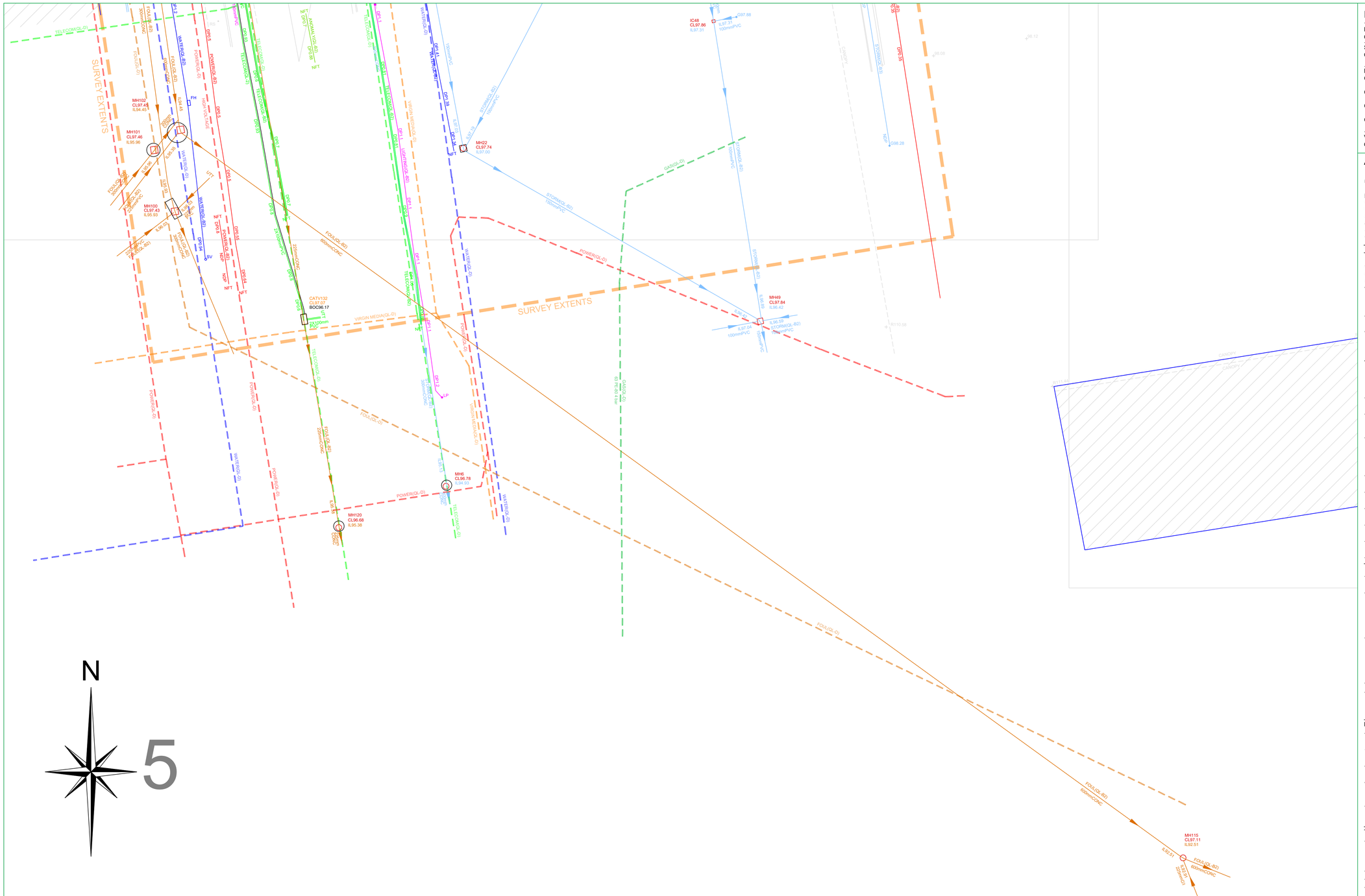
DESCRIPTION : 3D Utilities

SURVEYED BY : M.G., S.B.

SHEET: 4 of 6

PROCESSED BY : Cristina Butur

CHECKED BY : Alan Brady



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

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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.
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- 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.
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- 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.
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- 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.

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- 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.
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00353 1 691 0156

STREET FURNITURE :

BOLLARDS	BD •	BOTTOM OF CHAMBER	BOC
BUS STOP	BS •	CAST-IRON	C/I
CRASH BARRIER	CB	CONCRETE	CONC
GATE		DIAMETER	DIA
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 +		

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COVER LEVEL	CL	OFFSITE	O/S
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STOPCOCK	ST •	START OF RUN	SOR
SERVICE BOX (UNKNOWN)	BOX	UNABLE TO OPEN	UTO
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VENT	VENT •		
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LEVELS :

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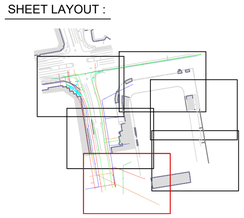
SHEET LAYOUT :



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Tallaght Stadium

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

REVISIONS:

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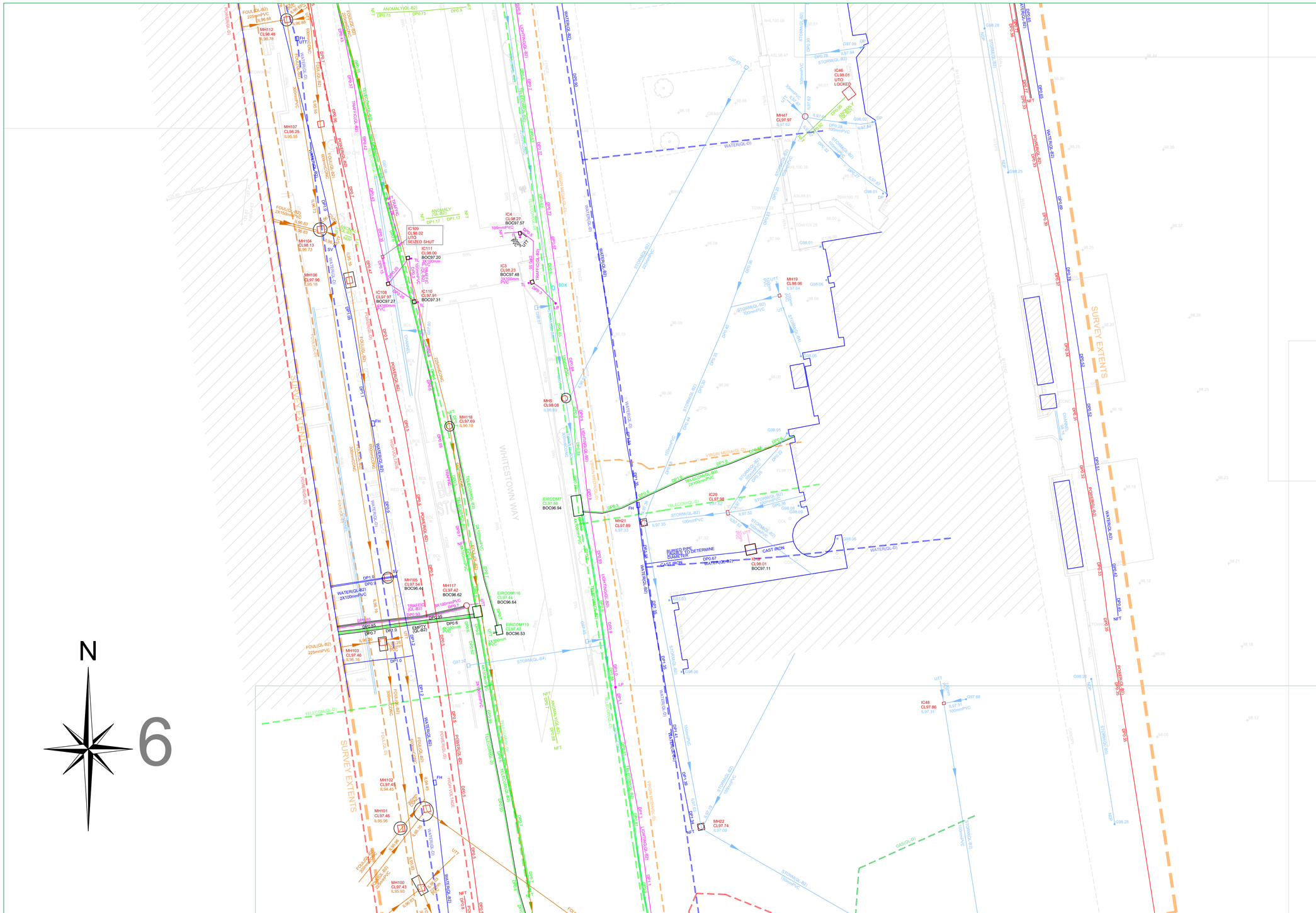
SCALE : 1/200 A1

DATE : 04/06/2020

DRG No: 4311

SHEET: 5 of 6

DESCRIPTION : 3D Utilities
SURVEYED BY : M.G., S.B.
PROCESSED BY : Cristina Butur
CHECKED BY : Alan Brady



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GPR ANOMALY	ANOMALY
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O/HEAD ELECTRICITY	OE
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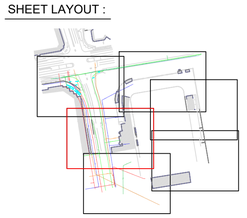
SHEET LAYOUT :



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REVISIONS:

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SCALE : 1/200 A1

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DRG No: 4311

DESCRIPTION : 3D Utilities

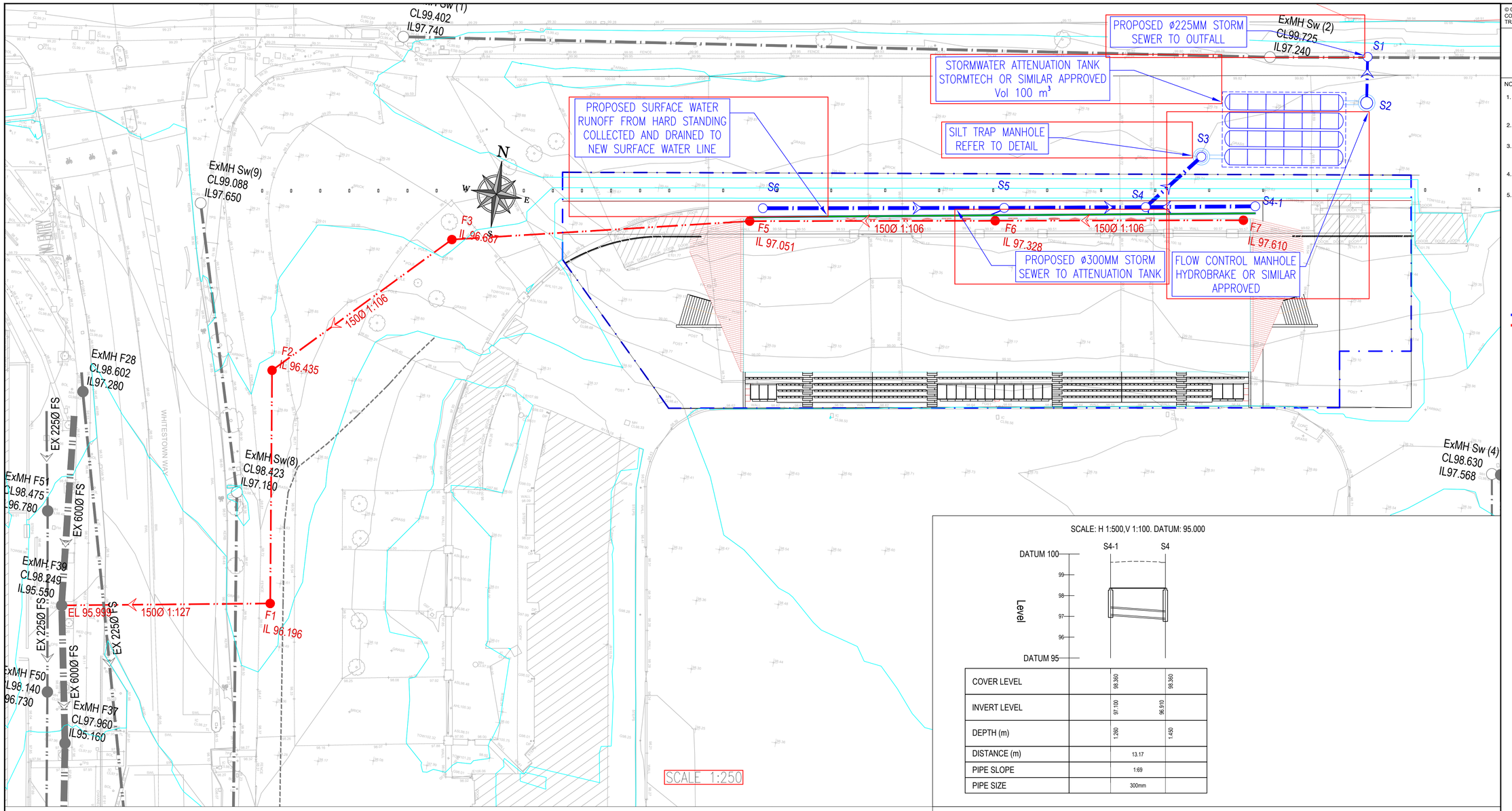
SURVEYED BY : M.G., S.B.

SHEET: 6 of 6

PROCESSED BY : Cristina Butur

CHECKED BY : Alan Brady

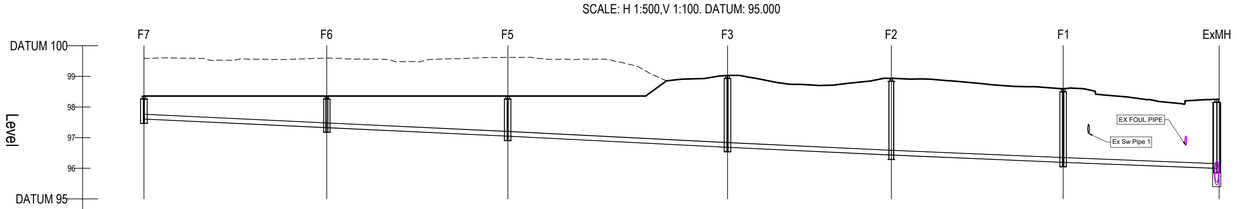
Appendix B – DBFL Drawings



SCALE: H 1:500,V 1:100. DATUM: 95.000

COVER LEVEL		98.360	98.350
INVERT LEVEL		97.100	96.910
DEPTH (m)		1.260	1.450
DISTANCE (m)		13.17	
PIPE SLOPE		1:69	
PIPE SIZE		300mm	

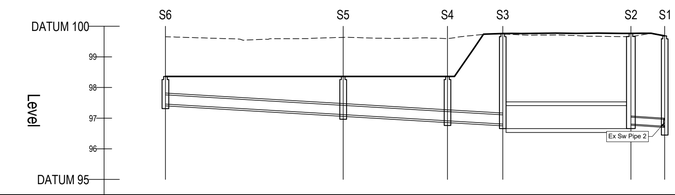
SCALE: H 1:500,V 1:100. DATUM: 95.000



COVER LEVEL	98.360	98.360	98.360	99.032	98.939	98.593	98.249
INVERT LEVEL	97.610	97.328 97.328	97.051 97.051	96.687 96.687	96.435 96.435	96.195 96.195	95.999
DEPTH (m)	0.750	1.032	1.309	2.346	2.503	2.397	2.251
DISTANCE (m)	29.86	29.52	35.89	26.74	28.04	25.10	
PIPE SLOPE	1:106	1:106	1:99	1:106	1:117	1:127	
PIPE SIZE	150mm	150mm	150mm	150mm	150mm	150mm	

FOUL LONGSECTION

SCALE: H 1:500,V 1:100. DATUM: 95.000



COVER LEVEL	98.360	98.350	98.350	99.763	99.766	99.687	
INVERT LEVEL	97.460	97.116 97.116	96.914 96.914	96.868	96.868 96.735		
DEPTH (m)	0.900	1.244	1.450	2.895	2.898	3.091	
DISTANCE (m)	29.01	17.03	9.02		5.51		
PIPE SLOPE	1:84	1:84	1:85		1:76		
PIPE SIZE	300mm	300mm	300mm		225mm		

STORMWATER LONGSECTION

ON ORIGINAL

0 5 10 15 20 25 30 40 50mm

NOTES:

1. ALL DRAWINGS TO BE CHECKED BY CONTRACTOR ON SITE AND ENGINEER INFORMED OF DISCREPANCIES BEFORE WORK COMMENCES
2. ALL LEVELS ARE IN METRES AND ARE RELATED TO ORDNANCE DATUM
3. CONTRACTOR SHALL SATISFY HIMSELF AS TO THE ACCURACY OF PAVEMENT LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORKS ON SITE
4. ALL LINE MARKINGS & SIGNAGE TO COMPLY WITH THE D.O.T. TRAFFIC SIGNS MANUAL
5. ALTERATIONS TO THE PUBLIC FOOTPATHS & ROADS ADJACENT TO THE MAIN DEVELOPMENT ARE SUBJECT TO AGREEMENT WITH DUBLIN CITY COUNCIL

PROPOSED STORM SEWER

PROPOSED FOUL SEWER

REV.	DATE	DESCRIPTION	BY	CHKD.

PLANNING

DESIGNED	GIS	PREPARED	GIS
DATE	29/06/20	CHECKED	NOH

DUBLIN OFFICE Ormond House, Upper Ormond Quay, Dublin 7, Ireland. PHONE +353 1 400 4000 FAX +353 1 400 4050

WATERFORD OFFICE Unit 2, The Chandlery, 1-2 O' Connell Street, Waterford, Ireland. PHONE +353 51 309 500 FAX +353 51 844 913

DBFL Consulting Engineers EMAIL info@dbfl.ie SITE www.dbfl.ie

PROJECT

190179 - TALLAGHT STADIUM - NORTH STAND DEVELOPMENT

DRG. TITLE

PROPOSED DRAINAGE AND FOUL NETWORK

CLIENT

SOUTH DUBLIN CITY COUNCIL

SCALE	AS NOTED @A1	FILE REF.	190179-DBFL-CS-XX-DR-C-1001

DRG. NO. 190179-1001 .

Appendix C - Rainfall Data

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 308506, Northing: 227125,

	Interval					Years								
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.7,	3.9,	4.6,	5.7,	6.4,	7.0,	9.0,	11.2,	12.8,	14.9,	16.9,	18.5,	20.9,	22.8,	24.4,	N/A ,
10 mins	3.7,	5.5,	6.4,	7.9,	9.0,	9.8,	12.5,	15.7,	17.8,	20.8,	23.6,	25.7,	29.1,	31.8,	34.0,	N/A ,
15 mins	4.4,	6.4,	7.6,	9.3,	10.6,	11.5,	14.7,	18.4,	20.9,	24.5,	27.7,	30.3,	34.3,	37.4,	40.0,	N/A ,
30 mins	5.8,	8.4,	9.9,	12.1,	13.7,	14.9,	18.9,	23.6,	26.7,	31.2,	35.2,	38.4,	43.3,	47.2,	50.4,	N/A ,
1 hours	7.6,	11.0,	12.9,	15.7,	17.7,	19.2,	24.3,	30.2,	34.1,	39.7,	44.7,	48.6,	54.7,	59.5,	63.5,	N/A ,
2 hours	10.0,	14.4,	16.8,	20.4,	22.9,	24.8,	31.2,	38.6,	43.5,	50.5,	56.7,	61.6,	69.2,	75.1,	80.0,	N/A ,
3 hours	11.7,	16.8,	19.6,	23.8,	26.6,	28.8,	36.2,	44.6,	50.2,	58.1,	65.2,	70.8,	79.3,	86.0,	91.6,	N/A ,
4 hours	13.2,	18.8,	21.9,	26.5,	29.6,	32.1,	40.2,	49.4,	55.6,	64.3,	72.0,	78.1,	87.4,	94.7,	100.8,	N/A ,
6 hours	15.5,	22.0,	25.5,	30.8,	34.5,	37.3,	46.5,	57.1,	64.1,	74.0,	82.8,	89.7,	100.3,	108.6,	115.4,	N/A ,
9 hours	18.2,	25.7,	29.8,	35.9,	40.1,	43.3,	53.9,	66.0,	74.0,	85.2,	95.3,	103.1,	115.1,	124.4,	132.2,	N/A ,
12 hours	20.4,	28.8,	33.3,	40.0,	44.6,	48.2,	59.9,	73.1,	81.9,	94.2,	105.2,	113.7,	126.9,	137.1,	145.5,	N/A ,
18 hours	23.9,	33.6,	38.8,	46.6,	51.9,	56.0,	69.4,	84.5,	94.5,	108.5,	121.0,	130.7,	145.6,	157.1,	166.7,	N/A ,
24 hours	26.9,	37.6,	43.4,	52.0,	57.8,	62.3,	77.0,	93.7,	104.6,	120.0,	133.6,	144.2,	160.5,	173.1,	183.5,	220.1,
2 days	34.0,	46.3,	52.8,	62.3,	68.7,	73.6,	89.3,	106.9,	118.2,	134.1,	148.0,	158.7,	175.0,	187.5,	197.9,	233.7,
3 days	39.8,	53.4,	60.4,	70.6,	77.4,	82.6,	99.3,	117.6,	129.5,	145.8,	160.1,	171.0,	187.6,	200.3,	210.8,	246.8,
4 days	44.9,	59.5,	67.0,	77.8,	85.0,	90.5,	108.0,	127.0,	139.3,	156.1,	170.7,	181.9,	198.8,	211.7,	222.3,	258.6,
6 days	53.9,	70.1,	78.4,	90.4,	98.2,	104.1,	122.9,	143.3,	156.2,	173.9,	189.2,	200.8,	218.4,	231.7,	242.6,	279.6,
8 days	61.8,	79.5,	88.5,	101.3,	109.7,	116.0,	135.9,	157.3,	170.9,	189.4,	205.3,	217.3,	235.4,	249.1,	260.2,	298.1,
10 days	69.1,	88.1,	97.6,	111.2,	120.1,	126.8,	147.7,	170.0,	184.1,	203.3,	219.7,	232.1,	250.7,	264.7,	276.1,	314.8,
12 days	75.9,	96.1,	106.1,	120.5,	129.7,	136.7,	158.5,	181.7,	196.3,	216.1,	233.0,	245.7,	264.8,	279.1,	290.8,	330.2,
16 days	88.6,	110.8,	121.8,	137.4,	147.4,	154.9,	178.3,	203.0,	218.5,	239.3,	257.1,	270.4,	290.3,	305.2,	317.3,	358.0,
20 days	100.4,	124.4,	136.2,	152.8,	163.5,	171.5,	196.3,	222.3,	238.6,	260.3,	278.8,	292.7,	313.3,	328.7,	341.2,	383.1,
25 days	114.2,	140.2,	152.9,	170.8,	182.2,	190.7,	217.1,	244.5,	261.6,	284.4,	303.7,	318.1,	339.5,	355.6,	368.5,	411.7,

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

Appendix D – Stormwater Simulation Results

Storage Structures for Storm

Tank or Pond Manhole: S5, DS/PN: S1.004

Invert Level (m) 96.808

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	133.3	0.750	133.3

Areas for Storm

PN	C. Area (ha)	PIMP (%)	Imp. Area (ha)	X (m)	Y (m)
S1.000	0.193	100	0.193	708379.444	727228.714
				708380.433	727221.976
				708396.196	727206.090
				708455.724	727216.166
				708449.666	727243.426
				708379.011	727232.238
S2.000	0.082	100	0.082	708455.786	727216.227
				708484.097	727220.802
				708479.955	727245.219
				708480.759	727248.433
				708449.790	727243.426

Summary Wizard of 15 minute 5 year Summer I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.270
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	5, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	17	97.659	-0.101	0.000	0.74		42.9	OK
S1.001	S2	21	97.564	-0.100	0.000	0.78		42.3	OK
S2.000	S3	20	97.584	-0.176	0.000	0.36		18.9	OK
S1.002	S3	26	97.452	-0.154	0.000	0.48		59.5	OK
S1.003	S4	36	97.203	-0.155	0.000	0.47		59.1	OK
S1.004	S5	42	96.978	-0.130	0.000	0.11		2.9	OK
S1.005	S6	42	96.977	-0.112	0.000	0.04		1.6	OK

Summary Wizard of 60 minute 30 year Summer I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.270
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	5, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	15	97.663	-0.097	0.000	0.79		45.4	OK
S1.001	S2	19	97.573	-0.091	0.000	0.83		44.9	OK
S2.000	S3	18	97.587	-0.173	0.000	0.37		19.3	OK
S1.002	S3	23	97.459	-0.148	0.000	0.51		63.5	OK
S1.003	S4	26	97.257	-0.101	0.000	0.51		63.7	OK
S1.004	S5	24	97.256	0.148	0.000	0.12		3.4	SURCHARGED
S1.005	S6	24	97.262	0.173	0.000	0.04		1.8	SURCHARGED

Summary Wizard of 360 minute 100 year Summer I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.270
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	5, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	12	97.702	-0.058	0.000	0.35		20.3	OK
S1.001	S2	6	97.700	0.037	0.000	0.37		20.3	SURCHARGED
S2.000	S3	4	97.699	-0.061	0.000	0.16		8.6	OK
S1.002	S3	4	97.698	0.091	0.000	0.23		28.9	SURCHARGED
S1.003	S4	4	97.697	0.339	0.000	0.23		28.3	SURCHARGED
S1.004	S5	4	97.696	0.588	0.000	0.08		2.2	SURCHARGED
S1.005	S6	4	97.702	0.613	0.000	0.04		1.8	SURCHARGED

Summary Wizard of 15 minute 5 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.270
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	5, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	16	97.659	-0.101	0.000	0.75		43.2	OK
S1.001	S2	20	97.565	-0.098	0.000	0.78		42.7	OK
S2.000	S3	19	97.584	-0.176	0.000	0.36		18.9	OK
S1.002	S3	25	97.454	-0.153	0.000	0.48		60.2	OK
S1.003	S4	35	97.204	-0.154	0.000	0.48		59.9	OK
S1.004	S5	41	96.999	-0.109	0.000	0.11		3.1	OK
S1.005	S6	41	96.998	-0.091	0.000	0.04		1.7	OK

Summary Wizard of 60 minute 30 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.270
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	5, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	21	97.633	-0.127	0.000	0.63		36.1	OK
S1.001	S2	24	97.542	-0.121	0.000	0.66		36.0	OK
S2.000	S3	24	97.571	-0.189	0.000	0.29		15.3	OK
S1.002	S3	28	97.440	-0.166	0.000	0.41		51.2	OK
S1.003	S4	20	97.315	-0.044	0.000	0.41		51.2	OK
S1.004	S5	20	97.314	0.206	0.000	0.11		3.0	SURCHARGED
S1.005	S6	20	97.319	0.230	0.000	0.04		1.8	SURCHARGED

Summary Wizard of 360 minute 100 year Winter I+10% for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.270
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.200	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360
Return Period(s) (years)	5, 30, 100
Climate Change (%)	10, 10, 10

PN	US/MH Name	Storm Rank	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	4	97.825	0.065	0.000	0.25		14.7	SURCHARGED
S1.001	S2	1	97.823	0.160	0.000	0.27		14.7	SURCHARGED
S2.000	S3	1	97.822	0.062	0.000	0.12		6.2	SURCHARGED
S1.002	S3	1	97.821	0.215	0.000	0.17		20.9	SURCHARGED
S1.003	S4	1	97.820	0.462	0.000	0.17		20.8	SURCHARGED
S1.004	S5	1	97.819	0.712	0.000	0.08		2.1	SURCHARGED
S1.005	S6	1	97.826	0.737	0.000	0.04		1.8	SURCHARGED

Appendix E Ground Investigation Report (2016)

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Hazelhatch Road,
Newcastle, Co Dublin.
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Email: info@gii.ie | Web: gii.ie

Ground Investigations Ireland

Tallaght Stadium, Tallaght, Dublin 24

Ground Investigation Report

DOCUMENT CONTROL SHEET

Project Title	Tallaght Stadium
Engineer	Muir Associates Limited Consulting Engineers
Client	South Dublin County Council
Project No	6386-11-16
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	N. Sheehan	F. McNamara	F. McNamara	Dublin	19 January 2017

GROUND INVESTIGATIONS IRELAND

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CONTENTS

APPENDICES

1.0 Preamble

On the instructions of Muir Associates Limited Consulting Engineers, a site investigation was carried out by Ground Investigations Ireland Ltd., between 8th and 21st December 2016 at the southern end of Tallaght Stadium, Tallaght, Dublin 24.

2.0 Overview

2.1. Background

It is proposed to construct a new stand at the southern end of the existing Tallaght Stadium on Kiltipper Road, Tallaght. Extra trial pits were excavated further south behind the existing car park in the South Dublin County Council Parks Department land.

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 6 No. Trial Pits to a maximum depth of 3.20m BGL
- Carry out 1 No. Foundation Inspection Pit to determine existing foundation details
- Carry out 3 No. Cable Percussion Boreholes to a maximum depth of 8.20m BGL
- Installation of 2 No. Groundwater monitoring wells
- 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 backhoe loader 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 an 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. Foundation Pits

The foundation inspection pit was excavated at the location shown in the exploratory hole location plan in Appendix 1. The exposed foundation was logged and sketched prior to backfilling and reinstatement. The logs and sketches are provided in Appendix 4 of this Report.

3.4. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.
The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.
Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the ‘N’ value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 3 of this Report.

3.5. Groundwater Monitoring Installations

Groundwater Monitoring Installations were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.6. 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 testing, including Murphy Waste Acceptance Criteria (WAC) and sulphate testing was carried out by Jones Environmental Laboratory in the UK. Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD) tests were carried out in NMTL's Geotechnical Laboratory in Carlow. The results of the laboratory testing is included in Appendix 5 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 are generally comprised;

- Topsoil/Surfacing
- Made Ground
- Cohesive Deposits

TOPSOIL: Topsoil was encountered in TP03, TP04 and TP05 and was present to a maximum depth of 0.20m BGL. In TP01 and TP02 Tarmacadam surfacing was present typically to a depth of 0.10m BGL and in TP06 Concrete was present to a depth of 0.15m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil/Surfacing and Tarmacadam/Concrete and were present to a relatively consistent depth of between 1.60m and 2.00m BGL. These deposits were described generally as *light brown sandy slightly gravelly CLAY with plastic fragments, wire, straw and timber.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *stiff grey brown sandy gravelly CLAY with occasional cobbles and boulders* overlying a *very stiff black sandy gravelly CLAY with sub angular limestone cobbles and boulders.* The strength of the cohesive deposits typically increased with depth and was stiff to very stiff below 3.50m BGL in all the cable percussion boreholes. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

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. Seepage was noted in TP01 only but suspect the concrete foundation near the outer perimeter wall is not allowing the surface water to run off. 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 time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH01 and BH03 to allow the equilibrium groundwater level to be determined.

4.3. Laboratory Testing

The geotechnical testing carried out on soil samples recovered generally confirm the descriptions on the logs with the primary constituent of the cohesive deposits found to be a CLAY of low to intermediate plasticity. The Particle Size Distribution tests confirm that generally the cohesive deposits are well-graded with percentages of sands and gravels ranging between 10% and 47% generally with fines contents of 23 to 52%.

The sulphate testing carried out indicate that the water soluble sulphate results are low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

The results of the Murphy Waste Acceptance Criterial Test Suite are presented with the individual parameter limits for “Inert” “Non Hazardous” and “Hazardous” as outlined within European Council Directive 1999 131/EC Article 16 Annex II, “Criteria and procedures for the acceptance of waste at landfills”. The intended disposal site should be consulted to ensure compliance with their specific requirements.

The results indicate that the results are below the inert limits, all spoil disposed of off-site should be sent to a suitably licenced facility. 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 results from the completed laboratory testing is included in Appendix 5 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 125 kN/m^2 is recommended for conventional strip or pad foundations on the stiff cohesive deposits at a depth of 2.00m BGL below the made ground and an allowable bearing capacity of 250 kN/m^2 is recommended if the foundations are placed below 3.50m BGL on the very stiff cohesive deposits.

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 sulphate testing completed on samples recovered from the trial pits indicates 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.

5.3. Excavations

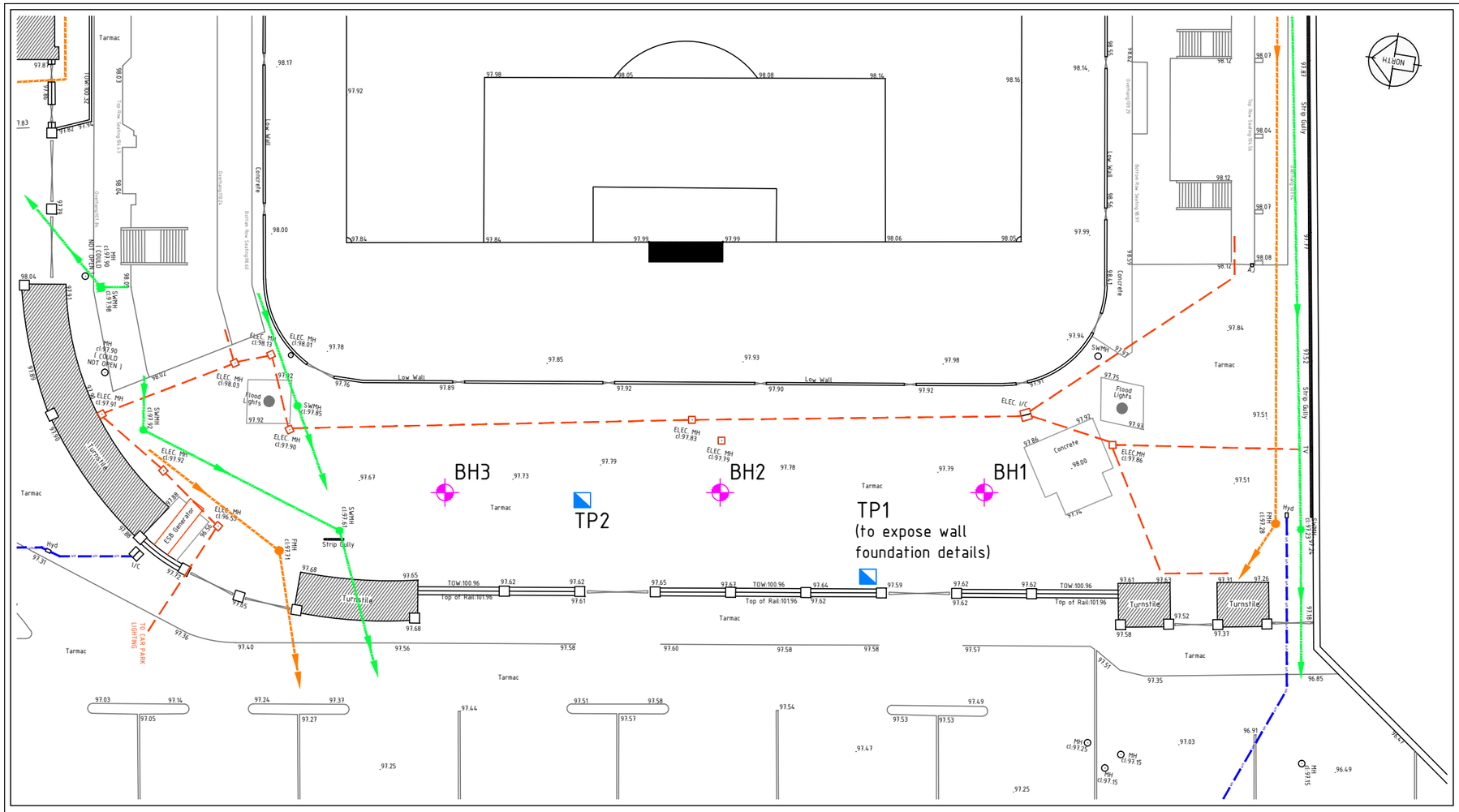
Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry. Excavations in the Made Ground or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

The groundwater and stability noted on the trial pit logs should be consulted when determining the most appropriate construction methods for excavations. Generally, where significant excavations are required in water bearing granular deposits a cut-off wall may be more cost effective than extensive dewatering. An assessment by a specialist dewatering contractor is recommended to determine the most cost effective approach to the proposed excavation.

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

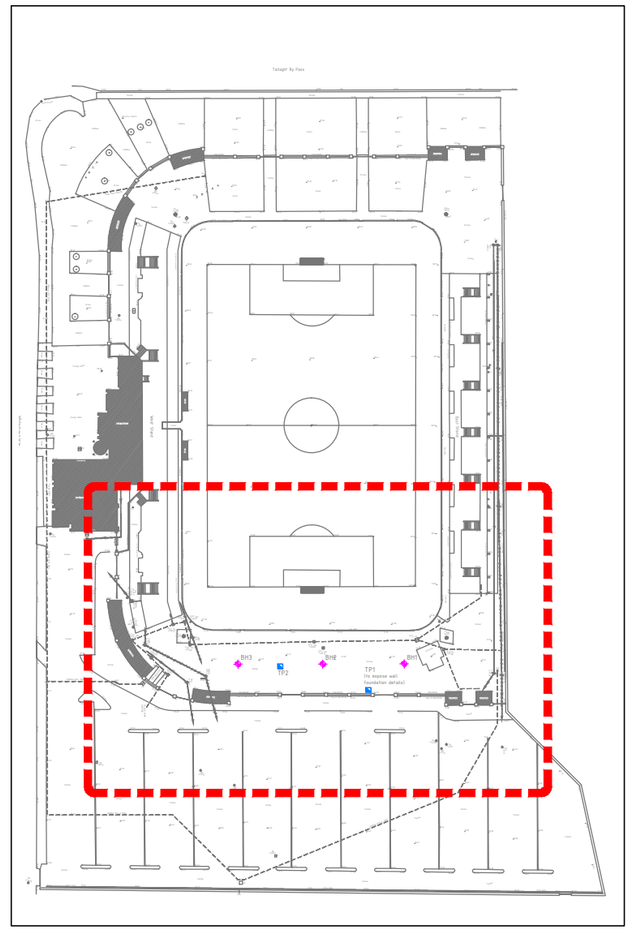
settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



STADIUM PART PLAN - SITE INVESTIGATION AREA

Scale 1:125 (1:250 @ A3)



STADIUM PART KEY PLAN

Scale N.T.S

LEGEND

SWMH cl:98.01 ..... DENOTED SURFACE WATER MANHOLE/PIPE

FMH cl:98.00 ..... DENOTED FOUL WATER MANHOLE/PIPE

ELEC. MH cl:97.83 ..... DENOTED ELECTRICAL INSPECTION CHAMBER/DUCT

WM WM ..... DENOTED WATERMAIN

BH# ..... DENOTES PROPOSED BOREHOLE LOCATION

TP# ..... DENOTES PROPOSED TRIAL PIT LOCATION

NOTES:

1. This drawing is to be read in conjunction with all relevant documents and schedules;
2. Do not scale this drawing, use figured dimensions only;
3. All levels are in metres.

REVISION	DATE	DESCRIPTION	REV BY	CHK BY
A	07.10.2016	ISSUED FOR TENDER	DOS	RA

Consulting Engineers
Project Managers

Marketing Network House,
Argyle Square, Morehampton Road,
Dublin 4, Ireland
Telephone: +353-1-6762788
Email: info@muir.ie www.muir.ie

MUIR ASSOCIATES LIMITED

PROJECT	THIRD STAND, TALLAGHT STADIUM			
TITLE	SITE PLAN			
ISSUE	TENDER			
Sheet A1	Director TAW	Proj. Eng. RA	Drawn by DOS	DRG.NO D1796(B)-GI-02 / REV A
	Scale AS SHOWN	Checked RA	Date AUG'16	


TP06
TP05
TP04
TP03

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Site Tallaght Stadium, Tallaght, Dublin 24			**Trial Pit Number** TP01
Machine : JCB-3CX **Method :** Trial Pit	**Dimensions** 3.00m x 0.50m x 1.10m L x W x D	**Ground Level (mOD)**	**Client** South Dublin County Council	**Job Number** 6386-11-16
	Location	**Dates** 08/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.30)	Grey clause 804 FILL material		
0.35	GW		Water strike(1) at 0.35m.		0.40			▽1
0.60	B				(0.45)	FILL of dark grey brown sandy gravelly clay with plastic fragments, metal bars, timber and carpet material		
					0.85			
					(0.25)	Firm to stiff brown sandy gravelly CLAY		
					1.10	Complete at 1.10m		

Plan

Remarks

Trial pit excavated to observe foundation
Trial pit stable
Groundwater observed at 0.35mBGL
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	N. Sheehan	6386-11-16

Ground Investigations Ireland Ltd
www.gii.ie

Site Tallaght Stadium, Tallaght, Dublin 24			**Trial Pit Number** TP02
Machine : JCB-3CX **Method :** Trial Pit	**Dimensions** 2.30m x 0.50m x 3.20m L x W x D	**Ground Level (mOD)**	**Client** South Dublin County Council	**Job Number** 6386-11-16
	Location	**Dates** 08/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TARMACADAM		
					(0.15) 0.25	Grey clause 804 FILL material		
0.80	B				(1.35)	FILL of brown sandy gravelly clay with sub angular cobbles, plastic fragments, wire, straw and timber		
1.60	B				1.60	Stiff light brown sandy slightly gravelly CLAY with occasional sub angular limestone cobbles and boulders		
					(1.60)			
					3.20	Complete at 3.20m		

Plan

Remarks

Trial pit stable
No groundwater observed
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	N. Sheehan	6386-11-16

Ground Investigations Ireland Ltd
www.gii.ie

Site Tallaght Stadium, Tallaght, Dublin 24			**Trial Pit Number** TP03
Machine : JCB-3CX **Method :** Trial Pit	**Dimensions** 3.00m x 0.50m x 3.00m L x W x D	**Ground Level (mOD)**	**Client** South Dublin County Council	**Job Number** 6386-11-16
	Location	**Dates** 08/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.20) 0.20	TOPSOIL		
					(0.90) 1.10	Firm dark brown sandy gravelly clay with rounded cobbles (possible FILL - MADE GROUND)		
					(0.90) 2.00	Stiff grey brown sandy gravelly CLAY		
					(1.00) 3.00	Stiff to very stiff black sandy gravelly CLAY with sub angular cobbles and boulders		
						Complete at 3.00m		

Plan

Remarks

Trial pit stable
No groundwater observed
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	N. Sheehan	6386-11-16

Ground Investigations Ireland Ltd
www.gii.ie

Site Tallaght Stadium, Tallaght, Dublin 24			**Trial Pit Number** TP04
Machine : JCB-3CX **Method :** Trial Pit	**Dimensions** 2.80m x 0.50m x 3.00m L x W x D	**Ground Level (mOD)**	**Client** South Dublin County Council	**Job Number** 6386-11-16
	Location	**Dates** 08/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.10) 0.10	TOPSOIL		
					(0.30)	Firm dark brown sandy gravelly clay with rounded cobbles (possible FILL - MADE GROUND)		
					0.40	Firm to stiff light brown sandy slightly gravelly CLAY with occasional sub angular cobbles		
					(1.40)			
					1.80	Stiff grey brown sandy gravelly CLAY		
					(0.70)			
					2.50	Stiff to very stiff black sandy gravelly CLAY with sub angular cobbles and boulders		
					(0.50)			
					3.00	Complete at 3.00m		

Plan

Remarks

Trial pit stable
No groundwater observed
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	N. Sheehan	6386-11-16

Ground Investigations Ireland Ltd
www.gii.ie

Site Tallaght Stadium, Tallaght, Dublin 24			**Trial Pit Number** TP05
Machine : JCB-3CX **Method :** Trial Pit	**Dimensions** 2.50m x 0.50m x 3.10m L x W x D	**Ground Level (mOD)**	**Client** South Dublin County Council	**Job Number** 6386-11-16
	Location	**Dates** 08/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	TOPSOIL		
						Firm dark brown sandy gravelly clay with rounded cobbles (possible FILL - MADE GROUND)		
					(0.65) 0.80			
						Firm to stiff light brown sandy slightly gravelly CLAY with occasional sub angular cobbles		
1.00	B				(0.90) 1.70			
						Stiff grey brown sandy gravelly CLAY		
1.80	B				(0.80) 2.50			
						Stiff to very stiff black sandy gravelly CLAY with sub angular cobbles and boulders		
2.60	B				(0.60) 3.10			
						Complete at 3.10m		

Plan

Remarks

Trial pit stable
No groundwater observed
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	N. Sheehan	6386-11-16

Ground Investigations Ireland Ltd
www.gii.ie

Site Tallaght Stadium, Tallaght, Dublin 24			**Trial Pit Number** TP06
Machine : JCB-3CX **Method :** Trial Pit	**Dimensions** 2.10m x 0.50m x 3.00m L x W x D	**Ground Level (mOD)**	**Client** South Dublin County Council	**Job Number** 6386-11-16
	Location	**Dates** 09/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.15) 0.15	CONCRETE with reinforced steel mesh at base		
					(0.15) 0.30	Grey clause 804 material		
					(0.20) 0.50	FILL of dark brown sandy gravelly CLAY with plastic fragments and timber		
0.60	B				(2.00)	Stiff grey brown sandy gravelly CLAY with sub angular cobbles and large boulders		
1.90	B							
2.30	B							
					2.50			
					(0.50)	Stiff to very stiff black sandy gravelly CLAY with sub angular cobbles and boulders		
					3.00	Complete at 3.00m		

Plan

Remarks

Trial pit stable
No groundwater observed
Trial pit backfilled on completion

Scale (approx)	Logged By	Figure No.
1:25	N. Sheehan	6386-11-16

APPENDIX 3 – Cable Percussion Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site	Borehole Number
Tallaght Stadium, Tallaght, Dublin 24	BH01

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion			South Dublin County Council	6386-11-16
	Location	**Dates** 19/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.10 (0.20) 0.30	TARMACADAM Grey clause 804 FILL material		
0.50-0.95 0.50	SPT(C) N=22 D			3,4/5,5,6,6			FILL of light brown sandy gravelly clay		
1.00-1.45 1.00	SPT(C) N=19 D			3,5/4,5,5,5		(1.70)			
2.00-2.45 2.00	SPT(C) N=15 D			2,3/3,4,4,4		2.00	Stiff grey brown sandy gravelly CLAY with occasional cobbles and boulders		
2.50-2.95	SPT(C) N=13			1,2/3,3,4,3					
3.00-3.10 3.00	SPT(C) 25*/50 50/50 D			25/50		(1.70)			
						3.70	Very stiff black sandy gravelly CLAY with sub angular cobbles and boulders		
4.00-4.45 4.00	SPT(C) N=33 D			5,6/7,7,9,10					
4.50	D			Water strike(1) at 4.50m, rose to 4.40m in 20 mins.					▼1 ▽1
4.50-4.95 5.00-5.40 5.00	SPT(C) N=44 SPT(C) 55/250 D			8,9/9,10,12,13 6,9/10,19,16,10					
						(4.30)			
6.00-6.45 6.00	SPT(C) N=41 D			5,11/9,10,10,12					
				Water strike(2) at 6.50m, rose to 6.40m in 20 mins.					▼2 ▽2
7.00-7.45 7.00	SPT(C) N=40 D			7,9/10,9,10,11					
8.00-8.20 8.00	SPT(C) 50/50 D			9,15/50		8.00	Complete at 8.00m		

Remarks
Groundwater encountered at 4.50m BGL rose to 4.40m BGL after 20 mins. Encountered at 6.50m BGL rose to 6.40m BGL after 20 mins.
50mm diameter standpipe installed with slotted pipe from 2.00 to 5.00m BGL. Plain pipe installed from ground level to 2.00m BGL with pea gravel surround, bentonite seal and flush cover.

Scale (approx)	Logged By
1:50	N Sheehan

Figure No. 6386-11-16

Ground Investigations Ireland Ltd
www.gii.ie

Site	Borehole Number
Tallaght Stadium, Tallaght, Dublin 24	BH02

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion			South Dublin County Council	6386-11-16
	Location	**Dates** 15/12/2016-16/12/2016	**Engineer** Muir Associates Ltd Consulting Engineers	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.10 (0.20) 0.30	TARMACADAM Grey clause 804 FILL material		
0.50-0.95 0.50	SPT(C) N=22 D			3,4/5,5,6,6			FILL of light brown sandy gravelly clay		
1.00-1.45 1.00	SPT(C) N=19 D			3,5/4,5,5,5		(1.70)			
2.00-2.45 2.00	SPT(C) N=15 D			2,3/3,4,4,4		2.00	Stiff grey brown sandy gravelly CLAY with occasional cobbles and boulders		
3.00-3.45 3.00	SPT(C) N=27 D			4,5/6,7,7,7		(1.30)			
4.00-4.45 4.00	SPT(C) N=32 D			5,6/7,7,9,9		3.30	Very stiff black sandy gravelly CLAY with sub angular cobbles and boulders		
5.00-5.45 5.00	SPT(C) N=39 D			6,7/9,9,10,11		(4.90)			
6.00-6.45 6.00	SPT(C) N=38 D			5,7/9,9,10,10					
7.00-7.45 7.00	SPT(C) N=36 D			6,7/9,8,9,10					
8.00-8.45 8.00	SPT(C) N=37 D			4,8/9,9,9,10		8.20	Complete at 8.20m		

Remarks
No groundwater encountered

Scale (approx)	Logged By
1:50	N Sheehan

Figure No.
6386-11-16

Ground Investigations Ireland Ltd
www.gii.ie

Site	Borehole Number
Tallaght Stadium, Tallaght, Dublin 24	BH03

Boring Method	Casing Diameter	Ground Level (mOD)	Client	Job Number
Cable Percussion			South Dublin County Council	6386-11-16
	Location	**Dates**	**Engineer**	**Sheet**
		20/12/2016-21/12/2016	Muir Associates Ltd Consulting Engineers	1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
						0.10 (0.20) 0.30	TARMACADAM Grey clause 804 FILL material		
0.50-0.95 0.50	SPT(C) N=19 D			3,4/4,5,5,5			FILL of light brown sandy gravelly clay		
1.00-1.45 1.00	SPT(C) N=16 D			2,3/3,4,5,4		(1.70)			
2.00-2.45 2.00	SPT(C) N=15 D			2,4/3,4,4,4		2.00	Stiff grey brown sandy gravelly CLAY with occasional cobbles and boulders		
3.00-3.45 3.00	SPT(C) N=15 D			3,3/4,3,4,4		(1.50)			
3.50-3.95	SPT(C) N=28			5,6/6,7,7,8		3.50	Very stiff black sandy gravelly CLAY with sub angular cobbles and boulders		
4.00-4.35 4.00	SPT(C) 50/200 D			6,8/9,19,22					▼1
4.50	D			Water strike(1) at 4.30m, rose to 4.10m in 20 mins.					▽1
5.00-5.40 5.00	SPT(C) 51/250 D			9,16/18,19,14		(4.50)			
6.00-6.45 6.00	SPT(C) N=47 D			9,11/11,12,12,12					
7.00-7.45 7.00	SPT(C) N=44 D			6,9/11,10,11,12					
8.00-8.40 8.00	SPT(C) 50/250 D			8,9/10,24,16		8.00	Complete at 8.00m		

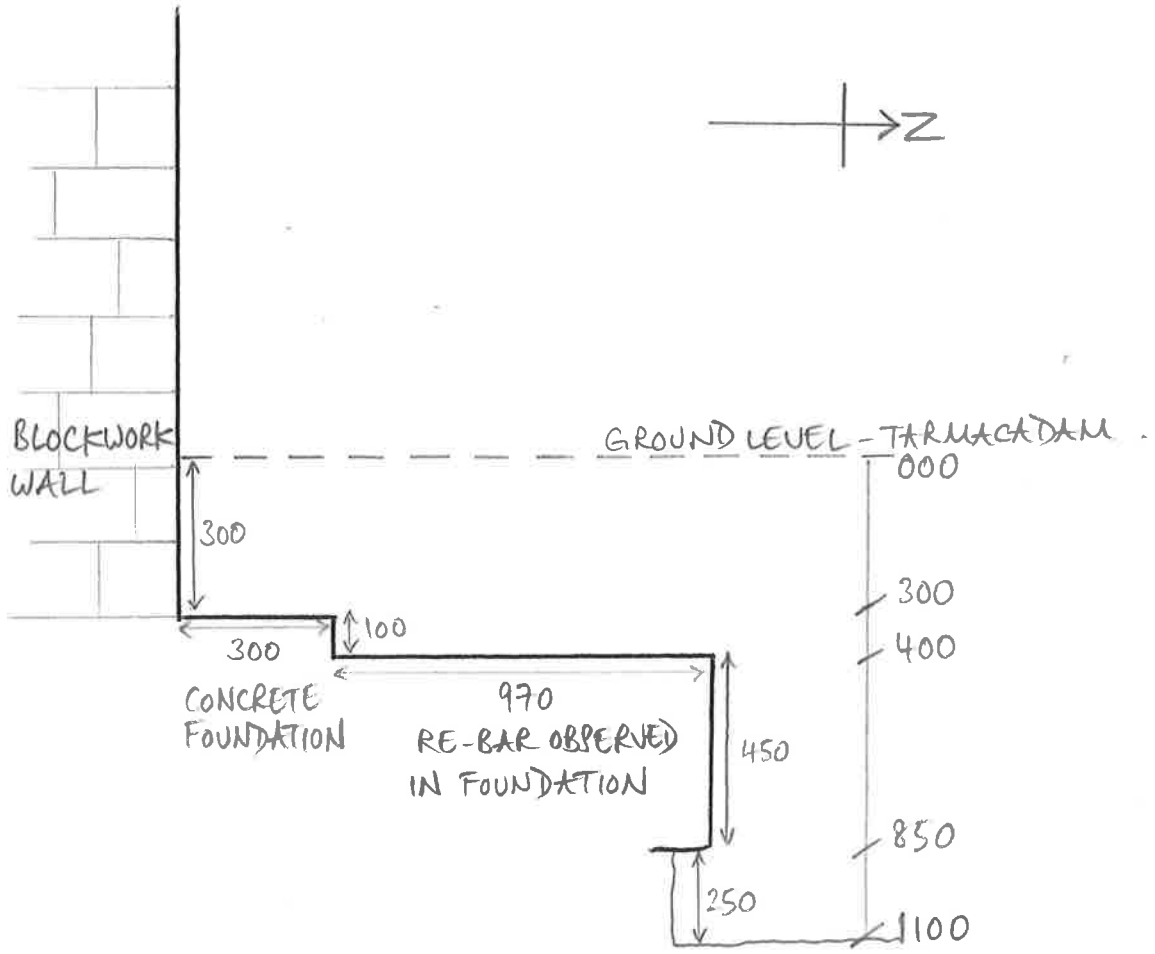
Remarks
Groundwater encountered at 4.30m BGL rose to 4.10m BGL after 20 mins.
50mm diameter standpipe installed with slotted pipe from 2.00 to 5.00m BGL. Plain pipe installed from ground level to 2.00m BGL with pea gravel surround, bentonite seal and flush cover.
Chiselling from 4.30m to 4.50m for 1 hour.

Scale (approx)	Logged By
1:50	

Figure No.
6386-11-16

APPENDIX 4 – Foundation Sketch

Foundation Sketch



0 - 100 TARMACADAM.

100 - 400 GREY clause 804 MATERIAL.

400 - 850 FILL OF DARK GREY BROWN SANDY GRAVELLY CLAY WITH PLASTIC FRAGMENTS, METAL BARS, TIMBER, CARPET MATERIAL

850 - 1100 FIRM TO STIFF BROWN SANDY GRAVELLY CLAY.

Project:	**Tallaght Stadium**	**TP 01**	
Client:	**Muir Associates**		
Contractor	Ground Investigations Ireland Ltd	Date	08.12.16

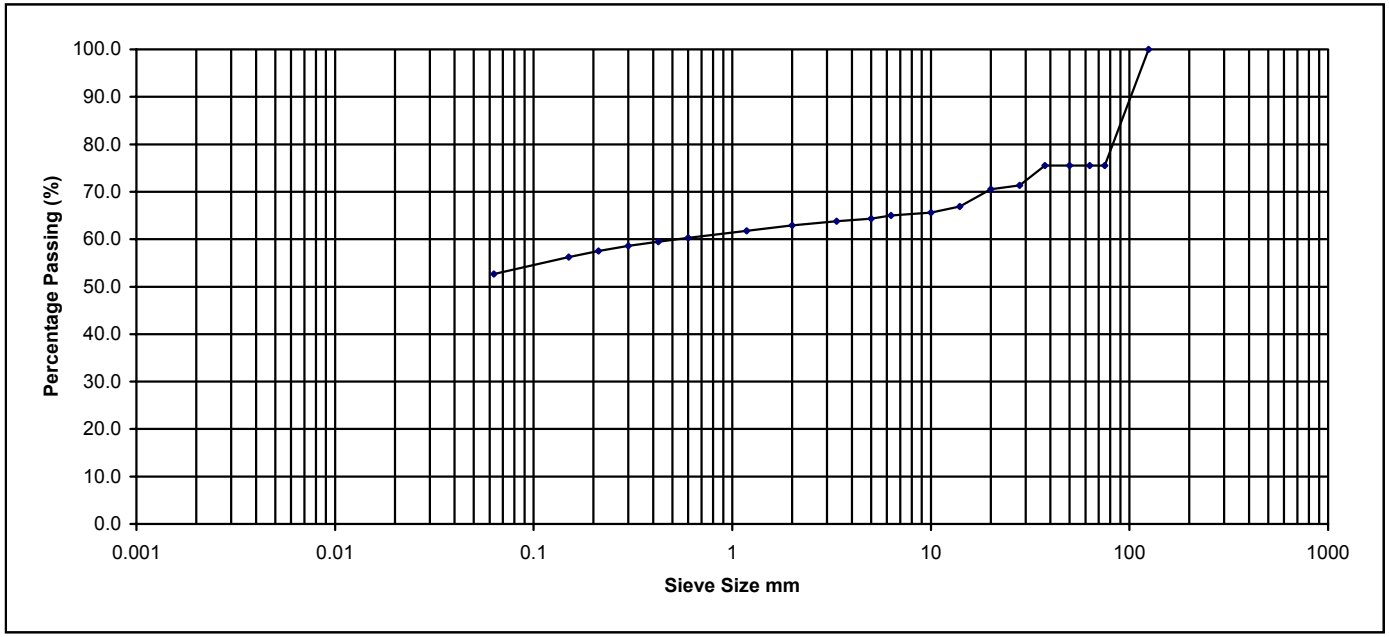
APPENDIX 5 – Laboratory Testing

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	75.5
63.000	75.5
50.000	75.5
37.500	75.5
28.000	71.3
20.000	70.5
14.000	66.9
10.000	65.6
6.300	65.0
5.000	64.3
3.350	63.8
2.000	62.9
1.180	61.7
0.600	60.3
0.425	59.5
0.300	58.6
0.212	57.5
0.150	56.3
0.063	52.6



Percentage Particle Size

Clay	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	Cobbles	Boulder
	Silt			Sand			Gravel				
52.6				10.2			12.7			24.5	0.0

Sample Description: Grey brown slightly sandy slightly gravelly silty CLAY with many cobbles.

Project: Tallaght Stadium

Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	10/01/2017

Project No.	NMTL 1985
BH/TP No.	BH1
Sample No.	B
Depth	2.0m

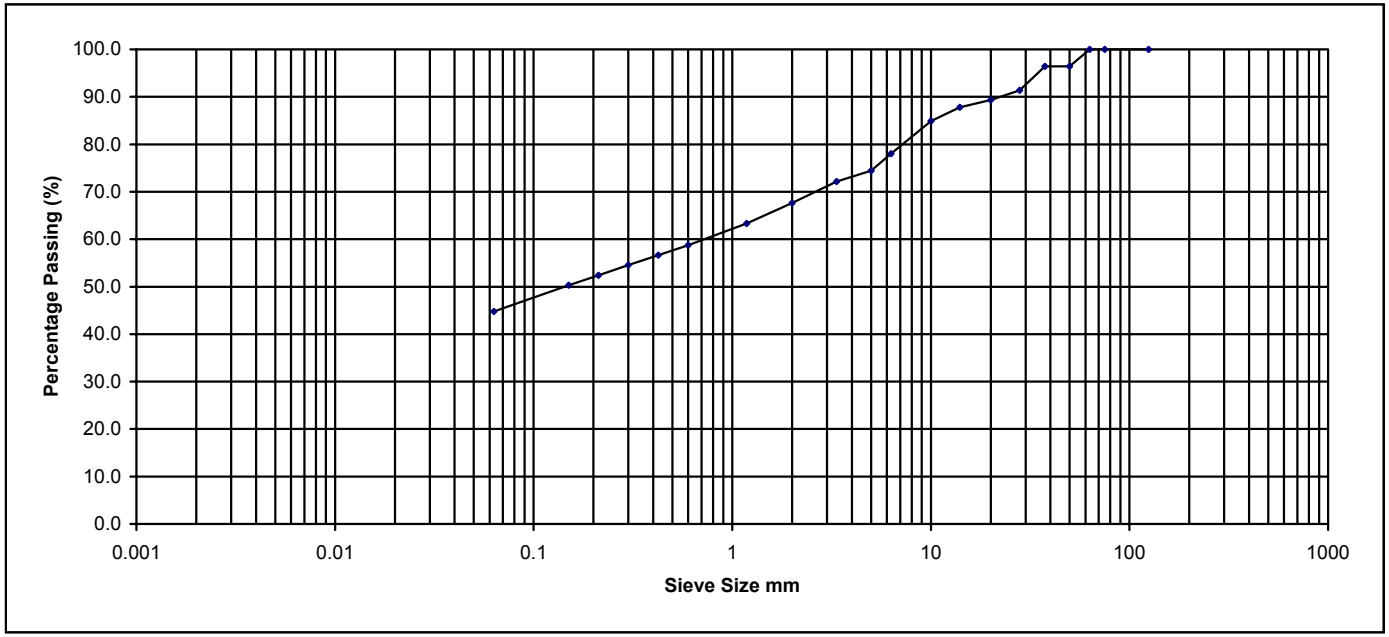
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	96.5
37.500	96.5
28.000	91.4
20.000	89.4
14.000	87.8
10.000	84.9
6.300	78.0
5.000	74.4
3.350	72.1
2.000	67.6
1.180	63.3
0.600	58.7
0.425	56.7
0.300	54.5
0.212	52.4
0.150	50.3
0.063	44.8



Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
44.8				22.9			32.4			0.0	0.0

Sample Description: Brown slightly sandy slightly gravelly silty CLAY.

Project: Tallaght Stadium

Operator	Checked	Approved	Date sample tested
Tzr	Nc	Bc	10/01/2017

Project No.	NMTL 1985
BH/TP No.	BH2
Sample No.	B
Depth	3.0m

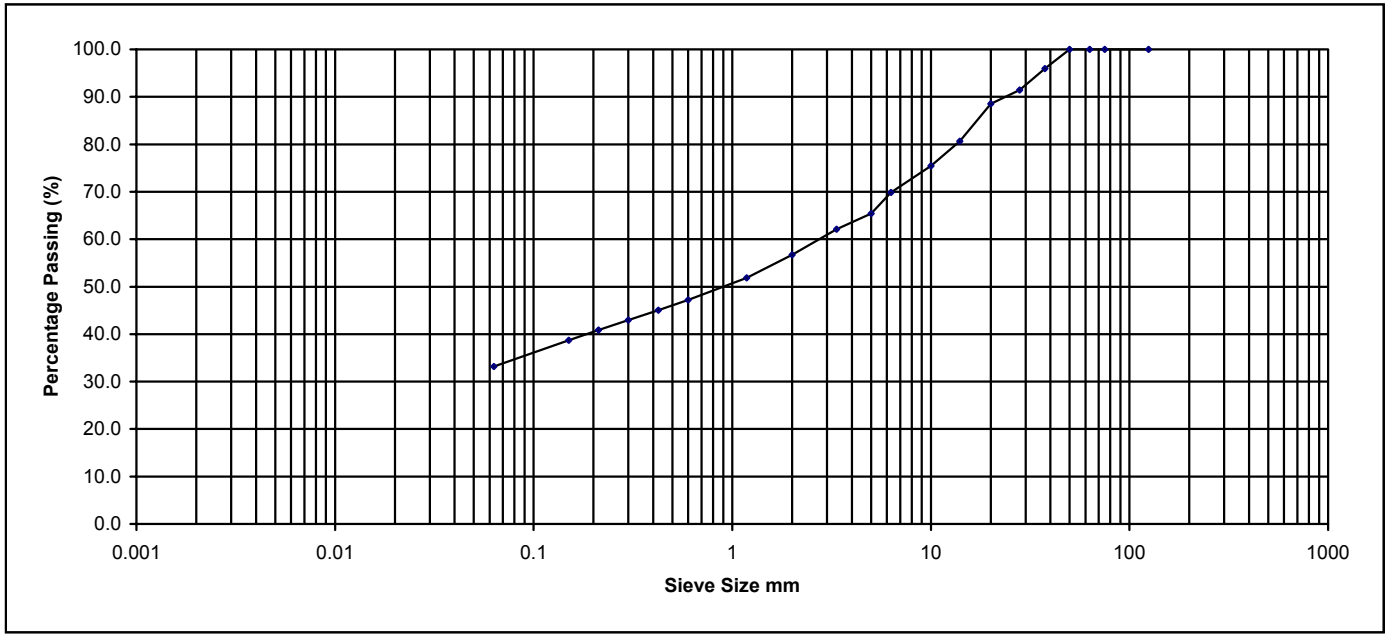
NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	96.0
28.000	91.4
20.000	88.5
14.000	80.7
10.000	75.5
6.300	69.9
5.000	65.4
3.350	62.1
2.000	56.7
1.180	51.9
0.600	47.2
0.425	45.1
0.300	42.9
0.212	40.8
0.150	38.7
0.063	33.2



Percentage Particle Size

Clay	Fine Medium Coarse	Fine Medium Coarse	Fine Medium Coarse	Cobbles	Boulder
	Silt	Sand	Gravel		
	33.2	23.6	43.3	0.0	0.0

Sample Description: Dark grey slightly sandy gravelly clayey SILT

Project: Tallaght Stadium

Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	10/01/2017

Project No.	NMTL 1985
BH/TP No.	BH2
Sample No.	B
Depth	4.0m

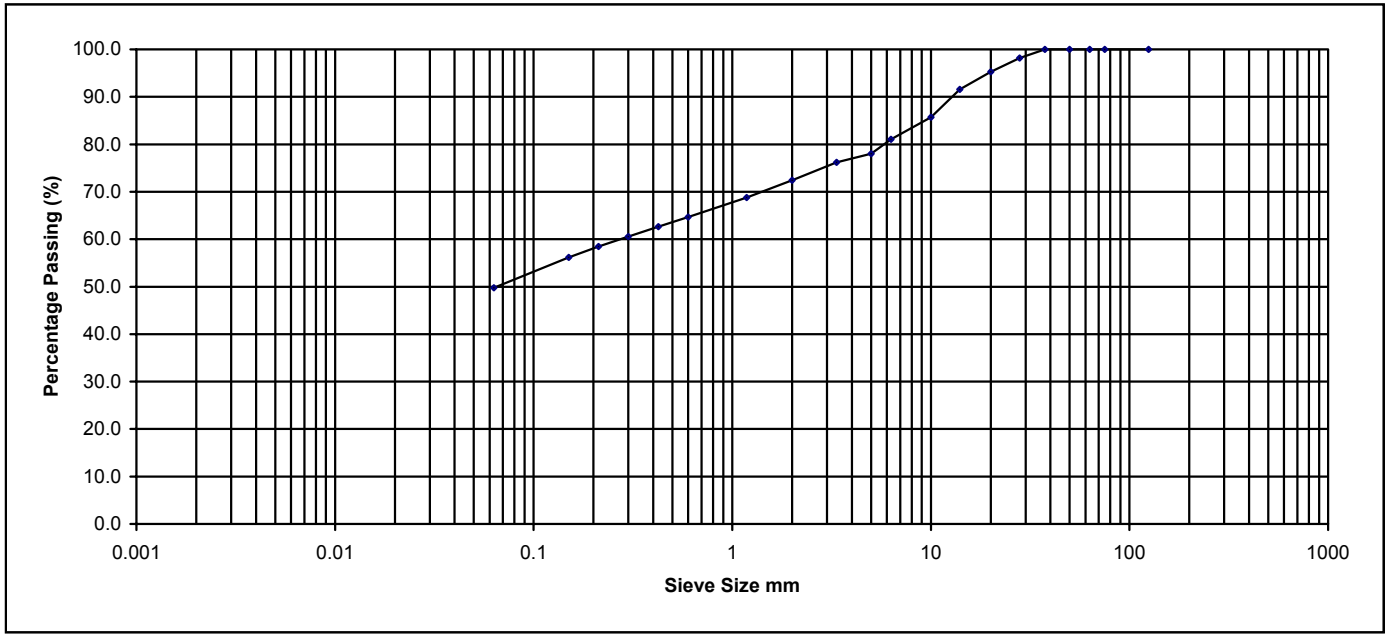
NM TL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	100.0
50.000	100.0
37.500	100.0
28.000	98.2
20.000	95.3
14.000	91.6
10.000	85.7
6.300	81.0
5.000	78.0
3.350	76.2
2.000	72.4
1.180	68.8
0.600	64.7
0.425	62.7
0.300	60.6
0.212	58.4
0.150	56.2
0.063	49.7



Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
49.7				22.7			27.6			0.0	0.0

Sample Description: Brown slightly sandy slightly gravelly silty CLAY

Project: Tallaght Stadium

Operator	Checked	Approved	Date sample tested
Tzr	Nc	Bc	10/01/2017

Project No.	NMTL 1985
BH/TP No.	BH3
Sample No.	B
Depth	3.0m

NMTL Ltd

NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	94.9
50.000	90.1
37.500	84.5
28.000	76.7
20.000	72.1
14.000	69.5
10.000	64.0
6.300	59.3
5.000	55.0
3.350	52.6
2.000	47.5
1.180	43.0
0.600	38.0
0.425	35.7
0.300	33.5
0.212	31.2
0.150	28.9
0.063	23.6

Percentage Particle Size

Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel	Cobbles	Boulder
	23.6			23.9			47.4			5.1	0.0

Sample Description: Dark grey slightly sandy gravelly clayey SILT with some cobbles.

Project: Tallaght Stadium

Operator	Checked	Approved	Date sample tested
Tzr	Nc	Bc	10/01/2017

Project No.	NMTL 1985
BH/TP No.	BH3
Sample No.	B
Depth	7.0m

NM TL Ltd

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

			Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Shear Strength	
BH/TP	Depth	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Cu	Mode of
No	m	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	Failure
BH1	1.00	16.5		72.7	39	20	19						
BH1	2.00	25.7		59.5	44	23	21						
BH1	5.00	10.1		64.5	26	14	12						
BH2	0.50	15.1		65.4	36	18	18						
BH2	3.00	13.2		56.7	29	16	13						
BH2	4.00	9.8		45.1	23	14	9						
BH3	1.00	13.6		63.7	32	17	15						
BH3	3.00	13.1		62.7	31	17	14						
BH3	7.00	9.4		35.7	23	14	9						

NMTL	Notes :	Job ref No.	NMTL 1985		Table
	1. All BS tests carried out using preferred (definitive) method unless otherwise stated.	Location	Tallaght Stadium		

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
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Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Neil Sheehan
Date :	10th January, 2017
Your reference :	6386-11-16
Our reference :	Test Report 16/18920 Batch 1
Location :	Tallaght Stadium
Date samples received :	21st December, 2016
Status :	Final report
Issue :	1

Three samples were received for analysis on 21st December, 2016 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.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: Ground Investigations Ireland
Reference: 6386-11-16
Location: Tallaght Stadium
Contact: Neil Sheehan
JE Job No.: 16/18920

Report : Solid

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

J E Sample No.	1-3	4-6											
Sample ID	TP01	TP02											
Depth	0.60	0.40											
COC No / misc													
Containers	V J T	V J T											
Sample Date	08/12/2016	08/12/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	21/12/2016	21/12/2016											

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
PAH MS													
Naphthalene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.14	<0.03									<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.31	<0.03									<0.03	mg/kg	TM4/PM8
Pyrene #	0.30	<0.03									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.14	<0.06									<0.06	mg/kg	TM4/PM8
Chrysene #	0.14	<0.02									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.22	<0.07									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.10	<0.04									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	0.05	<0.04									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.08	<0.04									<0.04	mg/kg	TM4/PM8
Coronene	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
PAH 6 Total #	0.76	<0.22									<0.22	mg/kg	TM4/PM8
PAH 17 Total	1.48	<0.64									<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.16	<0.05									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.06	<0.02									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	104	105									<0	%	TM4/PM8
Mineral Oil >C8-C10	<5	<5									<5	mg/kg	TM5/PM16
Mineral Oil >C10-C12	<10	<10									<10	mg/kg	TM5/PM16
Mineral Oil >C12-C16	<10	<10									<10	mg/kg	TM5/PM16
Mineral Oil >C16-C21	<10	<10									<10	mg/kg	TM5/PM16
Mineral Oil >C21-C40	<10	<10									<10	mg/kg	TM5/PM16
Mineral Oil >C8-C40	<45	<45									<45	mg/kg	TM5/PM16
MTBE #	<5	<5									<5	ug/kg	TM31/PM12
Benzene #	<5	<5									<5	ug/kg	TM31/PM12
Toluene #	<5	<5									<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	<5									<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	<5									<5	ug/kg	TM31/PM12
o-Xylene #	<5	<5									<5	ug/kg	TM31/PM12
PCB 28 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5									<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5									<5	ug/kg	TM17/PM8

Client Name: Ground Investigations Ireland
Reference: 6386-11-16
Location: Tallaght Stadium
Contact: Neil Sheehan
JE Job No.: 16/18920

Report : Solid

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

J E Sample No.	1-3	4-6									LOD/LOR	Units	Method No.
Sample ID	TP01	TP02											
Depth	0.60	0.40											
COC No / misc													
Containers	V J T	V J T											
Sample Date	08/12/2016	08/12/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	21/12/2016	21/12/2016											
Total 7 PCBs #	<35	<35									<35	ug/kg	TM17/PM8
Natural Moisture Content	28.5	9.9									<0.1	%	PM4/PM0
% Dry Matter 105°C	75.2	88.2									<0.1	%	NONE/PM4
Sulphate as SO4 (2:1 Ext) #	0.0521	0.0640									<0.0015	g/l	TM38/PM20
Total Organic Carbon #	1.77	0.58									<0.02	%	TM21/PM24
Mass of raw test portion	0.12	0.1016										kg	NONE/PM17
Mass of dried test portion	0.09	0.09										kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 6386-11-16
Location: Tallaght Stadium
Contact: Neil Sheehan
JE Job No.: 16/18920

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	7												
Sample ID	TP01												
Depth	0.35												
COC No / misc													
Containers	P												
Sample Date	08/12/2016												
Sample Type	Liquid												
Batch Number	1												
Date of Receipt	21/12/2016												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Sulphate	141.8										<0.5	mg/l	TM38/PM0

Client Name: Ground Investigations Ireland
Reference: 6386-11-16
Location: Tallaght Stadium
Contact: Neil Sheehan
JE Job No.: 16/18920

Report : CEN 10:1 1 Batch

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

J E Sample No.	1-3	4-6									LOD/LOR	Units	Method No.
Sample ID	TP01	TP02											
Depth	0.60	0.40											
COC No / misc													
Containers	V J T	V J T											
Sample Date	08/12/2016	08/12/2016											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	21/12/2016	21/12/2016											
Dissolved Antimony #	<0.002	<0.002									<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	<0.02	<0.02									<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	<0.0025	<0.0025									<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	<0.025	<0.025									<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.034	0.012									<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.34	0.12									<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005									<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005									<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015									<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015									<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007									<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07									<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005									<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05									<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.011	0.010									<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.11	0.10									<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	0.004	<0.002									<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	0.04	<0.02									<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003									<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03									<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	<0.003	<0.003									<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	<0.03									<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	0.00002									<0.00001	mg/l	TM61/PM38
Mercury Dissolved by CVAF #	<0.0001	0.0002									<0.0001	mg/kg	TM61/PM38
Phenol	<0.01	<0.01									<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1									<0.1	mg/kg	TM26/PM0
Fluoride	0.3	0.4									<0.3	mg/l	TM27/PM0
Fluoride	<3	4									<3	mg/kg	TM27/PM0
Sulphate #	17.17	16.94									<0.05	mg/l	TM38/PM0
Sulphate #	171.6	169.4									<0.5	mg/kg	TM38/PM0
Chloride #	0.8	0.3									<0.3	mg/l	TM38/PM0
Chloride #	8	3									<3	mg/kg	TM38/PM0
Mass of raw test portion	0.12	0.1016										kg	NONE/PM17
Leachant Volume	0.87	0.888										l	NONE/PM17
Eluate Volume	0.71	0.78										l	NONE/PM17
Dissolved Organic Carbon	7	2									<2	mg/l	TM60/PM0
Dissolved Organic Carbon	70	20									<20	mg/kg	TM60/PM0
Total Dissolved Solids #	109	100									<35	mg/l	TM20/PM0
Total Dissolved Solids #	1090	1000									<350	mg/kg	TM20/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Ground Investigations Ireland
Reference: 6386-11-16
Location: Tallaght Stadium
Contact: Neil Sheehan
JE Job No.: 16/18920

Report : EN12457_2

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

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-3	4-6														
Sample ID	TP01	TP02														
Depth	0.60	0.40														
COC No / misc																
Containers	V J T	V J T														
Sample Date	08/12/2016	08/12/2016														
Sample Type	Soil	Soil														
Batch Number	1	1														
Date of Receipt	21/12/2016	21/12/2016														
Solid Waste Analysis																
Total Organic Carbon #	1.77	0.58									3	5	6	<0.02	%	TM21/PM24
Sum of BTEX	<0.025	<0.025									6	-	-	<0.025	mg/kg	TM31/PM12
Sum of 7 PCBs #	<0.035	<0.035									1	-	-	<0.035	mg/kg	TM17/PM8
Mineral Oil	<45	<45									500	-	-	<45	mg/kg	TM5/PM16
PAH Sum of 6 #	0.76	<0.22									-	-	-	<0.22	mg/kg	TM4/PM8
PAH Sum of 17	1.48	<0.64									100	-	-	<0.64	mg/kg	TM4/PM8
CEN 10:1 Leachate																
Arsenic #	<0.025	<0.025									0.5	2	25	<0.025	mg/kg	TM30/PM17
Barium #	0.34	0.12									20	100	300	<0.03	mg/kg	TM30/PM17
Cadmium #	<0.005	<0.005									0.04	1	5	<0.005	mg/kg	TM30/PM17
Chromium #	<0.015	<0.015									0.5	10	70	<0.015	mg/kg	TM30/PM17
Copper #	<0.07	<0.07									2	50	100	<0.07	mg/kg	TM30/PM17
Mercury #	<0.0001	0.0002									0.01	0.2	2	<0.0001	mg/kg	TM61/PM38
Molybdenum #	0.11	0.10									0.5	10	30	<0.02	mg/kg	TM30/PM17
Nickel #	0.04	<0.02									0.4	10	40	<0.02	mg/kg	TM30/PM17
Lead #	<0.05	<0.05									0.5	10	50	<0.05	mg/kg	TM30/PM17
Antimony #	<0.02	<0.02									0.06	0.7	5	<0.02	mg/kg	TM30/PM17
Selenium #	<0.03	<0.03									0.1	0.5	7	<0.03	mg/kg	TM30/PM17
Zinc #	<0.03	<0.03									4	50	200	<0.03	mg/kg	TM30/PM17
Fluoride	<3	4									10	150	500	<3	mg/kg	TM27/PM0
Total Dissolved Solids #	1090	1000									4000	60000	100000	<350	mg/kg	TM20/PM0
Dissolved Organic Carbon	70	20									500	800	1000	<20	mg/kg	TM60/PM0
Mass of raw test portion	0.12	0.1016									-	-	-		kg	NONE/PM17
Dry Matter Content Ratio	75.2	88.2									-	-	-	<0.1	%	NONE/PM4
Leachant Volume	0.87	0.888									-	-	-		l	NONE/PM17
Eluate Volume	0.71	0.78									-	-	-		l	NONE/PM17
Phenol	<0.1	<0.1									1	-	-	<0.1	mg/kg	TM26/PM0
Sulphate #	171.6	169.4									1000	20000	50000	<0.5	mg/kg	TM38/PM0
Chloride #	8	3									800	15000	25000	<3	mg/kg	TM38/PM0

Client Name: Ground Investigations Ireland

Reference: 6386-11-16

Location: Tallaght Stadium

Contact: Neil Sheehan

Matrix : Solid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
16/18920	1	TP01	0.60	1-3	GRO	Sample holding time exceeded
16/18920	1	TP01	0.60	1-3	GRO	Solid Samples were received at a temperature above 9°C.
16/18920	1	TP02	0.40	4-6	GRO	Sample holding time exceeded
16/18920	1	TP02	0.40	4-6	GRO	Solid Samples were received at a temperature above 9°C.

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.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

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SOILS

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.

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. 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.

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.

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.

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.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

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 UKAS requirement 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.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) 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.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental 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

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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 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 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 8270 method for the solvent extraction and determination of 16 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 USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM17	Modified US EPA method 8270. 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 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. 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.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM27	Modified US EPA method 9056.Determination of water soluble anions using Dionex (Ion-Chromatography).	PM0	No preparation is required.			AR	Yes

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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
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7 and 6010B	PM17	Modified method EN12457-2 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
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen and hydrazine. Samples are extracted using an orbital shaker.	Yes		AD	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes		AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2 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	PM17	Modified method EN12457-2 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.			AR	

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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
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 and BS1377.			AR	

Appendix - Methods used for WAC (2003/33/EC)

Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometic methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amouns of acid or base needed to cover the pH range

Notes:

*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS

**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180

***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.

APPENDIX 6 – Trial Pit Photographs

Tallaght Stadium – Trial Pit Photos

TP01

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TP02

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