ODYSSEY

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WINNHAM FARM, DOWNEND ROAD, PORCHESTER

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY

WINNHAM FARM, DOWNEND ROAD, PORCHESTER

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY ON BEHALF OF MILLER HOMES

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Drawing No. 16-329/002

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1.0 INTRODUCTION

1.1 General

1.1.1 Odyssey has been commissioned by Miller Homes to undertake a Flood Risk Assessment (FRA), incorporating a surface water and foul water drainage strategy to be submitted in association with a planning application for proposed residential development at Winnham Farm, Downend Road, Portchester.

1.1.2 The development proposals for this 20.39 hectare (ha) site are for the demolition of existing agricultural buildings and the construction of new buildings providing up to 350 dwellings; the creation of new vehicular access with footways and cycleways; provision of landscaped communal amenity space, including children's play space; creation of public open space; together with associated highways, landscaping, drainage and utilities.

1.1.3 This report comprises of the following elements:

- Summary of relevant planning policy;
- Review of existing site conditions including the hydrology, geology and existing drainage regime of the site;
- Assessment of the existing flood risk to the site; and
- Proposed surface water and foul drainage strategy.

2.0 PLANNING POLICY

2.1 Flood and Water Management Act (2010)

2.1.1 The Flood and Water Management Act (FWMA) received royal assent on 8th April 2010. It was intended to implement Sir Michael Pitt's recommendations following the widespread summer 2007 floods. Guidance and information notes are published online by the Department for Environment, Food and Rural Affairs (Defra) to address a range of aspects concerning the act.

2.1.2 The FWMA encourages the use of Sustainable Drainage Systems (SuDS) on development sites by removing the automatic right to connect to sewers.

2.1.3 The development proposals for the site considered by this report should adhere to the FWMA through the provision of SuDS as a fundamental component of the surface water drainage scheme.

2.2 National Planning Policy Framework (2019)

2.2.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies, and how these policies should be applied. Planning Practice Guidance (PPG) is available online and provides additional guidance to the NPPF, as well as providing links to relevant current detail documents. Please refer to **Section 2.3** for further detail.

2.2.2 Paragraph 155 of the NPPF states that "*inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere*."

2.2.3 Paragraph 163 of the NPPF states *"when determining planning applications, Local Planning Authorities (LPAs) should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*

- *Within the site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location;*
- *The development is appropriately flood resistant and resilient;*
- *It incorporates Sustainable Drainage Systems, unless there is clear evidence that this would be inappropriate;*
- *Any residual risk can be safely managed; and*
- *Safe access and escape routes are included where appropriate, as part of an agreed emergency plan."*

2.2.4 In accordance with the NPPF, a site-specific FRA is required for sites within the following categories:

- In Flood Zone 1, all proposals involving:
  - sites of 1 hectare or more;

- land which has been identified by the EA as having critical drainage problems;
- land identified in a strategic flood risk assessment as being at increased flood risk in future;
- land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use;

- All proposals for development in Flood Zones 2 or 3.

2.3 Planning Practice Guidance (2019)

2.3.1 The PPG for Flood Risk and Coastal Change provides additional direction to the NPPF, with details provided in each section of the document on how to conform to the NPPF.

2.3.2 All land in England is classified as falling into one of three main flood zones, with the zones referring to the probability of river or sea flooding, ignoring the existence of defences. Table 1 of the PPG identifies and describes the Environment Agency (EA) flood zones as:

- Flood Zone 1: Low probability, land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Flood Zone 2: Medium probability, land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%);
- Flood Zone 3: High probability, land assessed as having a 1 in 100 or greater annual probability of river flooding (≥1%), or a 1 in 200 or greater annual probability of sea flooding (≥0.5%);
- Flood Zone 3b: The Functional Floodplain, land where water has to flow or be stored in times of flood (as identified by the LPAs in the Strategic Flood Risk Assessments).

2.3.3 Paragraph 080 of the PPG sets out the following drainage hierarchy that the discharge of surface water runoff should adhere to:

- Into the ground (infiltration);
- To a surface water body;
- To a surface water sewer, highway drain, or another drainage system; and,
- To a combined sewer.

2.4 Non-Statutory Technical Standards for Sustainable Drainage Systems (2015)

2.4.1 The Non-Statutory Technical Standards for Sustainable Drainage Systems was published by Defra in March 2015. The standards are to be used to manage surface water runoff in accordance with Schedule 3 of the FWMA.

2.4.2 The Technical Standards document provides guidance on runoff destination, peak flow rate, volume and control of water quality and function.

2.4.3 The LPA may set local requirements for planning permission that have the effect of more stringent requirements than those of the standards referred to above.

2.5 Fareham Borough Council Core Strategy (2011)

2.5.1 The Fareham Borough Council Core Strategy (Local Plan 1) was adopted in August 2011, and the Core Strategy identifies the borough's development needs up to 2026 and how they will be met. The Strategy sets out the spatial vision for the area and identifies a series of objectives designed to achieve the vision, overarching key policy areas which provide focus and link the objectives to the spatial strategy, and core delivery policies. The Strategy additionally identifies an implementation and monitoring framework which sets out how the spatial strategy will be delivered.

2.5.2 Policy CS15 of the Core Strategy states that *"the Borough Council will promote and secure sustainable development, where there is a minimum negative impact on the environment or opportunities for environmental enhancement."* It is stated that this will be achieved by *"avoiding unacceptable levels of flood risk and proactively managing surface water through the promotion of sustainable drainage techniques."*

2.6 Fareham Borough Council Local Plan Part 2 – Development Sites and Policies (2015)

2.6.1 The Development Sites and Policies Plan forms 'Part 2' of the Fareham Borough Local Plan. These Plans identify the borough's policies to encourage growth and investment in housing and jobs, whilst providing protection to the natural environment.

2.6.2 Policy DSP2 of the Local Plan Part 2 states that *"development proposals should not, individually, or cumulatively, have a significant adverse impact, either on neighbouring development, adjoining land, or the wider environment, by reason of noise, heat, liquids, vibration, light or air pollution (including dust, smoke, fumes or odour)."* It is further stated that *"development should provide for the satisfactory disposal or surface and waste water, and should not be detrimental to the management and protection of water resources."*

3.0 EXISTING SITE CONDITIONS

3.1 Location

3.1.1 The site is located off Downend Road in Portchester, Hampshire, approximately 1.2 kilometres (km) north-west of the town centre. The Ordnance Survey (OS) grid reference for the centre of the site is 460450E, 106300N and the nearest postcode for the site is PO16 8NF. A site location plan is shown in **Appendix A**.

3.1.2 The site is currently used for agricultural purposes, and is bounded by agricultural fields and the M27 to the north, dwellings and Portchester Crematorium and memorial garden to the east, the Fareham to Portchester railway line to the south, and Downend Road and an open-air waste and composting facility to the west.

3.2 Topography

3.2.1 A topographical survey was completed in October 2016 by Encompass Surveys, which shows the existing levels across the site. The site slopes from north to south, with the highest point at approximately 43 metres Above Ordnance Datum (m AOD) along the northern boundary of the site, and the lowest being 14m AOD in the south-east of the site. The topographical survey is shown in **Appendix C**.

3.3 Hydrology

3.3.1 The nearest EA designated main river, the River Wallington, passes approximately 1.50 kilometres (km) to the west of the site. For EA records please see **Appendix D**. It is noted that there are no ordinary watercourses on site, or in the immediate vicinity of the site.

3.4 Geology and Hydrogeology

3.4.1 British Geological Survey (BGS) online maps (accessed July 2020) indicate that the site is underlain by a range of different bedrock types; Portsdown Chalk Formation in the north of the site, Tarrant Chalk Member in the east of the site, Spetisbury Chalk Member in the centre of the site, and Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation in the south of the site.

3.4.2 The BGS maps indicate that there are superficial deposits of clay, silt, sand and gravel on site. Refer to **Appendix E** for BGS records.

3.4.3 BGS hydrogeology mapping demonstrates that the site is located on the White Chalk Subgroup aquifer, described as a *"highly productive aquifer"*.

3.4.4 EA mapping indicates that the site is not situated in any of the EA's Groundwater Source Protection Zones (SPZs).

3.4.5 Intrusive ground investigations were undertaken by Geo-Environmental Services Ltd in December 2016 and February 2017, with further testing completed in July 2020. The ground investigation report for the most recent borehole testing sets out the ground conditions encountered at different depths below ground level (bgl). The findings are summarised in **Table 3.1**.

Table 3.1 Ground Investigation Findings

Top Depth (m bgl)	Base Depth (m bgl)	Description
0	0.1 – 0.2	TOPSOIL: Brown sandy gravelly clay with roots
0.1 – 0.2	0.1 – 5.0+	HEAD DEPOSITS: Brown sandy gravelly CLAY. Soft to vert stiff, generally stiff to very stiff consistency. Variable proportions of sand and flint gravel; Brown clayey flint GRAVEL; Yellow and orange-brown fine SAND with chalk gravel
0.7 – 5.0+	5.0+	CHALK: Structureless CHALK composed of off-white very weak to weak low density gravel sized chalk clasts and silt chalk matrix with occasional flint nodules. CIRIA Grade Dm, Dc and Dc-C.

3.4.6 Soakage testing was undertaken by Geo-Environmental Services Ltd in July 2020. The resulting infiltration rates are set out in **Table 3.2**.

Table 3.2: Summary of Soil Infiltration Testing Results

Location	Infiltration Rate (m/s)		
	Test Cycle 1	Test Cycle 2	Test Cycle 3
TP01	6.9×10^{-4}	3.2×10^{-4}	3.0×10^{-4}
TP02	4.4×10^{-6}	2.3×10^{-6}	2.3×10^{-6}

3.5 Existing Drainage Regime

3.5.1 The site is currently used for agricultural purposes. As such, the majority of the site is in a greenfield state. Considering the underlying soil characteristics, it is anticipated that surface water currently infiltrates into the ground, with any excess water discharged towards Portchester Crematorium, owing to the topography of the site.

3.5.2 According to Southern Water (SW) records, there is no public surface water sewer network on site, or in the immediate vicinity of the site. The absence of a surface water network at the site further supports the view that surface water currently infiltrates into the ground.

3.5.3 SW records show the foul sewer network in the immediate vicinity of the site. The nearest Point of Connection is located approximately 60m to the south of the site along Winnham Drive. SW records are shown in **Appendix G**.

3.5.4 The developable area for this site is less than 50ha, meaning that the Institute of Hydrology (IoH) Report 124 Flood Estimation for Smaller Catchments (1994) method is suitable to estimate greenfield peak flow rates (50ha is used in the formula and the flow rate value is linearly interpolated

based on the ratio of the development area). This methodology is approved in the EA's Rainfall Runoff Management for Developments Report; the parameters used are shown in **Table 3.3**.

Table 3.3: Interim Code of Practice SuDS Parameters

Parameter	Value	Unit
SAAR	791	mm
Soil Index	0.400	-
Region	7	-
Urban	0.000	-

3.5.5 **Table 3.4** summarises the estimated current greenfield discharge rates for the site. Calculations are provided in **Appendix H**.

Table 3.4: Existing Surface Water Discharge Rates

Return Period	Existing Greenfield Discharge Rates from Site (l/s)	Existing Greenfield Discharge Rates per Hectare (l/s/ha)
Q_{BAR}	79.6	3.9
Q_{30}	180.3	8.8
Q_{100}	253.8	12.4

4.0 DEVELOPMENT PROPOSALS

4.1 General

4.1.1 The development proposals for the site are for the demolition of existing agricultural buildings and the construction of new buildings providing up to 350 dwellings; the creation of new vehicular access with footways and cycleways; provision of landscaped communal amenity space, including children's play space; creation of public open space; together with associated highways, landscaping, drainage and utilities. A landscape parameter plan can be found in **Appendix B**.

5.0 SOURCES OF FLOOD RISK

5.1 Fluvial Flooding

5.1.1 Fluvial flooding is caused by flows in rivers or streams exceeding the capacity of the river channel and spilling into the floodplain. Fluvial flooding can also occur on designated floodplain land after a period of heavy rainfall.

5.1.2 The EA's Flood Map for Planning (accessed July 2020) shows that the site is entirely located in Flood Zone 1; land assessed as *"having a less than 1 in 1,000 annual probability of river or sea flooding"* (<0.1% Annual Exceedance Probability [AEP]). For EA data, refer to **Appendix E**.

5.1.3 The flood risk vulnerability classification of dwellings is deemed as *"more vulnerable."* In accordance with the PPG, development of this nature in Flood Zone 1 is acceptable.

5.1.4 There are no records of the site being affected by fluvial flooding in the Partnership for South Hampshire (PfSH) SFRA Update. The risk of flooding from fluvial sources is considered to be low.

5.2 Surface Water Flooding

5.2.1 Surface water (pluvial) flooding is caused by rainfall levels exceeding the natural infiltration properties of the surrounding soils. Flooding can occur where there is a lack of a formalised drainage system or as a result of a poorly designed or maintained sewer system. Flooding can also occur owing to the absence of a natural method of drainage such as watercourses or ditches, or where soil infiltration rates are low. Flooding often results in ponding of water at low points or when surface water flow routes are blocked by an obstruction.

5.2.2 The EA's Risk of Flooding from Surface Water (RoFSW) mapping (accessed July 2020) shows that in its current state, the entirety of the site is at *"very low (less than 0.1% AEP)"* risk of pluvial flooding.

5.2.3 The PfSH SFRA Update states that *"within Fareham Borough there are a number of areas which have a high to very high potential for generating flow"*. However, considering the underlying soil characteristics and the "very low" flooding risk of the site in accordance with RoFSW mapping, the site is not considered to be one of these areas. The risk of flooding from pluvial sources is considered to be low.

5.3 Groundwater Flooding

5.3.1 Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land. Periods of prolonged rainfall may also be a cause of groundwater flooding, with aquifers and soils becoming saturated.

5.3.2 No groundwater was encountered on site during the ground investigation, whilst in the surrounding area of the site, groundwater was encountered at a level of 35.7m bgl. The risk of groundwater flooding is considered to be low.

5.4 Sewer Flooding

5.4.1 Sewer flooding can occur due to the failure of existing foul or surface water drainage infrastructure. If flows within the drainage system exceed the designed capacity, or if foreign matter causes blockages, overflow to the surface can occur, leading to flooding.

5.4.2 There is no historical data of the site being affected by sewer flooding. The risk of flooding from sewers is considered to be low.

6.0 SURFACE WATER DRAINAGE STRATEGY

6.1 Surface Water Drainage Strategy Requirements

6.1.1 Any surface water drainage strategy must demonstrate that the proposed development would be drained in a sustainable manner, commensurate with local and national policy. The NPPF requires that flood risk to land and property is not increased as a result of new development.

6.1.2 Drainage calculations for the proposed development have been carried out to ensure that any surface water discharged from the site would be at greenfield rates or lower.

6.2 Proposed Surface Water Drainage Strategy

6.2.1 The proposed surface water management strategy described below is outlined in Drawing 16-329/002 in **Appendix H**.

6.2.2 As set out in **Section 2.3**, the drainage hierarchy states that the first option for surface water discharge should be infiltration. The infiltration rates achieved at the site suggest that infiltration SuDS would be suitable at the site.

6.2.3 It is proposed that surface water generated by the proposed development would drain to four attenuation basins, located adjacent to the southern boundary of the site owing to the drainage catchments. On-parcel SuDS features such as permeable paving could also be utilised upstream.

6.2.4 The attenuation basins have been calculated to attenuate flows for all rainfall events up to a 1 in 100 year storm plus 40% to account for climate change. In adopting a conservative approach, the lowest infiltration rate achieved during the soakage tests has been used in the drainage calculations.

6.2.5 Urban creep would be accounted for in drainage calculations by incorporating an additional 10% of the roof area to the total impermeable area.

6.2.6 With regards to exceedance flows, it is anticipated that surface water would be conveyed to the topographical low points on site and routed away from proposed dwellings.

6.2.7 Network Rail has stipulated a distance of between 10m and 20m from any soakaway to the Network Rail boundary at the south of the site, to ensure the proposed SuDS features would not adversely affect the stability of their property.

6.2.8 The 20m buffer is for worst case areas associated with solution features. Intrusive ground investigations carried out on site at the locations of the proposed basins show the presence of sandy gravel mixed with clay. The presence of this bedrock indicates that this area is not at risk of developing solution features which could impact on nearby embankments.

6.2.9 The infiltration basins would spread the runoff evenly prior to infiltration, and as such a 15m buffer is considered acceptable. Any stability calculations and supporting geotechnical information would be provided at the detailed design stage.

6.3 Water Quality

6.3.1 Improving water quality is a key principle of a SuDS system. Steps would be taken to ensure that water quality on site and of any water leaving the site is not negatively impacted by the proposed development. **Table 6.1** details the Pollution Hazard Indices of the different land use classifications of the site, in accordance with the Construction Industry Research and Information Association (CIRIA) SuDS Manual 2015 (C753).

Table 6.1: Pollution Hazard Indices for Proposed Development

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7

6.3.2 The pollution hazard level for the proposed development would be “medium”. All surface water generated by the proposed development would be attenuated in one of the designed infiltration basins before discharging from the site. The SuDS mitigation indices have been calculated in **Table 6.2**, in accordance with the guidance contained in the CIRIA SuDS Manual. Groundwater was not encountered at the site, and on this basis the infiltration basins would have at least 1m groundwater clearance. Additional SuDS features such as permeable paving would provide an appropriate level of surface water runoff treatment, as shown in **Table 6.2**.

Table 6.2: SuDS Mitigation Indices for Proposed SuDS Features

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Soil with good contaminant attenuation potential of at least 300mm depth	0.4 + (0.5 x (0.4 + 0.4)) = 0.8	0.3 + (0.5 x (0.3 + 0.3) = 0.6	0.3 + (0.5 x (0.3 + 0.3)) = 0.6
Permeable paving	0.7	0.6	0.7

6.4 SuDS Maintenance Requirements

6.4.1 Maintenance of the drainage system and of any implemented SuDS features would be carried out in accordance with the manufacturer guidance and through an approved maintenance management plan to minimise the residual flood risk of drainage system blockage.

6.4.2 Maintenance would be the responsibility of the developer to assign, however for clarity in this FRA, **Tables 6.3** and **6.4** set out the maintenance measures which would typically be undertaken for an infiltration basin and permeable paving. **Tables 6.3** and **6.4** are based on information extracted from the CIRIA SuDS Manual.

Table 6.3: Maintenance Requirements for an Infiltration Basin (continued overleaf)

Maintenance Category	Maintenance Activity	Frequency	Responsible Body
Routine Maintenance	Remove litter and debris	Monthly	Private maintenance contractor, as identified by developer
	Cut grass – for spillways and access routes and meadow grass in and around basin – and manage other vegetation and nuisance plants	Monthly (during growing season), or as required	Private maintenance contractor, as identified by developer
	Inspect inlets, outlets and overflows for blockages and silt accumulation. Clear if required	Monthly	Private maintenance contractor, as identified by developer
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly	Private maintenance contractor, as identified by developer
	Tidy all dead growth before start of growing season	Annually	Private maintenance contractor, as identified by developer
	Reseed areas of poor vegetation growth	As required	Private maintenance contractor, as identified by developer
Occasional Maintenance	Prune and trim any trees and remove cuttings	Every 2 years, or as required	Private maintenance contractor, as identified by developer
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal where upstream source control is provided)	Private maintenance contractor, as identified by developer
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required	Private maintenance contractor, as identified by developer

	Realignment or rip-rap	As required	Private maintenance contractor, as identified by developer
	Repair/rehabilitation of inlets, outlets and overflows, and relevelling of uneven surfaces and reinstating design levels	As required	Private maintenance contractor, as identified by developer

Table 6.4: Maintenance Requirements for Permeable Paving

Maintenance Category	Maintenance Activity	Comments	Frequency	Responsible Body
Routine Maintenance	Visual inspection of paving.	Ensure joints are kept fully filled.	Monthly (depending on local environment).	Private maintenance contractor, as identified by developer
	Paving should be agitated (e.g. brushed, vacuumed, etc.).	To ensure no vegetation of any sort is allowed to grow and develop in the joints.	Six monthly or as required (Spring and Autumn seasons).	Private maintenance contractor, as identified by developer
	Paving should be inspected after any heavy precipitations.	Ensure no displacement of any organic matter into the surface of the pavement.	As required.	Private maintenance contractor, as identified by developer
	Inspection of outfall should be undertaken.	Non-infiltration systems to have outfall checked for debris and blockages.	Six monthly or as required.	Private maintenance contractor, as identified by developer
Corrective Maintenance	Removal of weeds.	To ensure weeds are killed effectively they should be actively growing so that the glyphosate will go down to the roots. Glysophate based weed killers in Roundup and Tumbleweed.	As required.	Private maintenance contractor, as identified by developer
	Laying material may require cleaning and/or replacing.	Depending on the environment the permeable pavement has received and been exposed to.	25 to 30-year period.	Private maintenance contractor, as identified by developer

7.0 FOUL WATER DRAINAGE STRATEGY

7.1 General

7.1.1 Peak design discharges for dwellings would be calculated based on Sewers for Adoption 8th Edition which sets out the expected foul water flow as follows:

Residential domestic flow = 4000 litres/dwelling/day (peak)

7.1.2 There is no SW public foul sewer network in the immediate vicinity of the site. It is proposed that foul water from the development (16.2l/s) would be conveyed via gravity to a pumping station, situated at the topographically low point on site towards the south-eastern corner.

7.1.3 The pumping station would convey the foul water via a rising main to the proposed connection point with the existing SW public foul sewer network at manhole ref. SU60068301, located on Danes Road. Refer to **Appendix G** for SW records.

7.1.4 Subject to discussions with SW, a Section 106 connection would be made in accordance with the Water Industries Act to seek approval to connect to the public sewer.

7.1.5 A Level 1 sewer capacity check was undertaken by SW in November 2016, which confirmed sufficient capacity in the existing sewer network to accommodate the foul water from the proposed development. An updated sewer capacity check should be undertaken to confirm capacity still exists in the sewer network to accommodate flows from the development.

7.1.6 SW has a duty to improve its network to cater for proposed developments. This is funded via increased infrastructure charges to developers. Should there be a requirement for offsite improvement works, SW would programme these works with due regard to Miller Homes build programme.

8.0 SUMMARY AND CONCLUSIONS

8.1 General

8.1.1 Odyssey has been commissioned by Miller Homes to undertake a Flood Risk Assessment (FRA), incorporating a surface water and foul water drainage strategy to support the proposed development at Winnham Farm, Downend Road, Portchester.

8.1.2 Based on EA flood maps, the site is shown to be located within Flood Zone 1. The site lies in an area at 'very low' risk of surface water flooding.

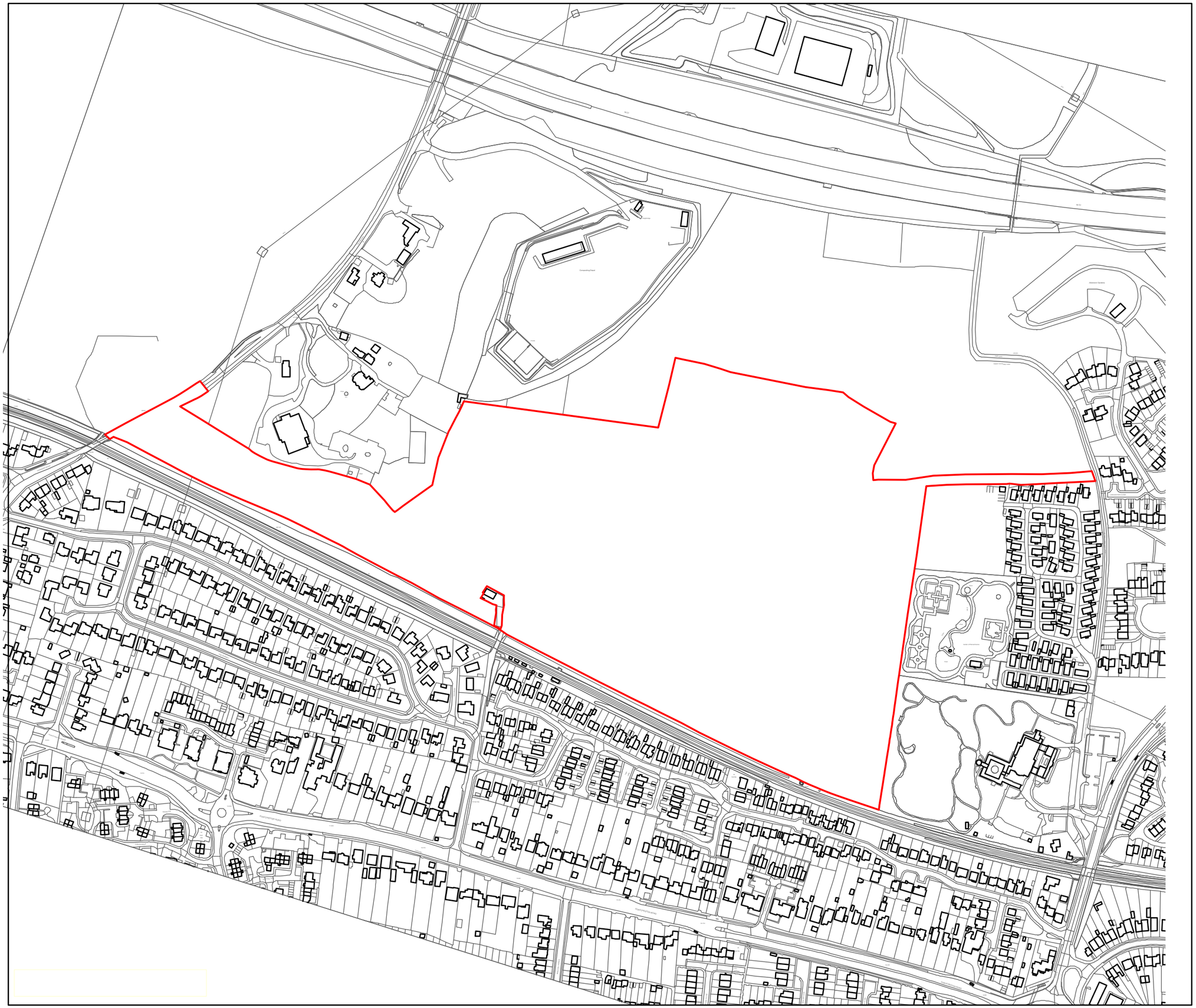
8.1.3 Intrusive ground investigation soakage testing results suggest that infiltration-based SuDS would be feasible at the site. It is proposed that surface water runoff would be attenuated on site within infiltration basins. Flows would then be discharged to the ground. The infiltration basins have been designed to accommodate flows from a 1 in 100 year storm event plus 40% to account for climate change.

8.1.4 Foul flows would drain to a pumping station on site, and be discharged to the existing SW public foul network. A previous Level 1 sewer capacity check confirmed there was sufficient capacity to accommodate the foul water from the proposed development and SW has a duty to cater for proposed development flows through its ongoing asset management improvement works.

8.1.5 This FRA demonstrates that the proposed development can be drained in a sustainable manner, commensurate with national and local policy.

APPENDIX A

Site Location Plan



Key

Notes/Revisions

Winnham Farm, Dowend Road, Portchester

Miller Homes

0m 50m 100m 150m

N

Site location plan

2495-01 /PP-002	Revision:
	Date issued: Aug 2017
1:3500 @ A3	Drawn by: SP / Checked by: IP

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APPENDIX B

Landscape Parameter Plan

Key

Red Line		20.39 ha
Informal Open Space including tree and shrub planting		6.04 ha
Formal Open space		1.08 ha
Children's Play		0.10 ha
Attenuation**		1.45 ha
Retained and enhanced historic hedgerow		
Existing trees retained		
Retained hedges		
Landscape corridor***		
Indicative cross-over points		

*(+/- 3m variance in alignment)

**(Dashed line indicates 3.5m maintenance strip)

***(Minimum 10m wide landscape corridor. Final position and alignment to a variance of +/- 20m. Final position and width to be confirmed at reserved matters stage)

Notes/Revisions

A	13/6/18	Landscape corridor increased to 10m in width along entire length

Winnham Farm, Dowend Road, Portchester

Miller Homes

N

0m 50m 100m 150m

Landscape Parameter Plan

2495-01 /PS-001	Revision: C
	Date issued: June 2018
1:4000 @A3	Drawn by: SP / Checked by: JD

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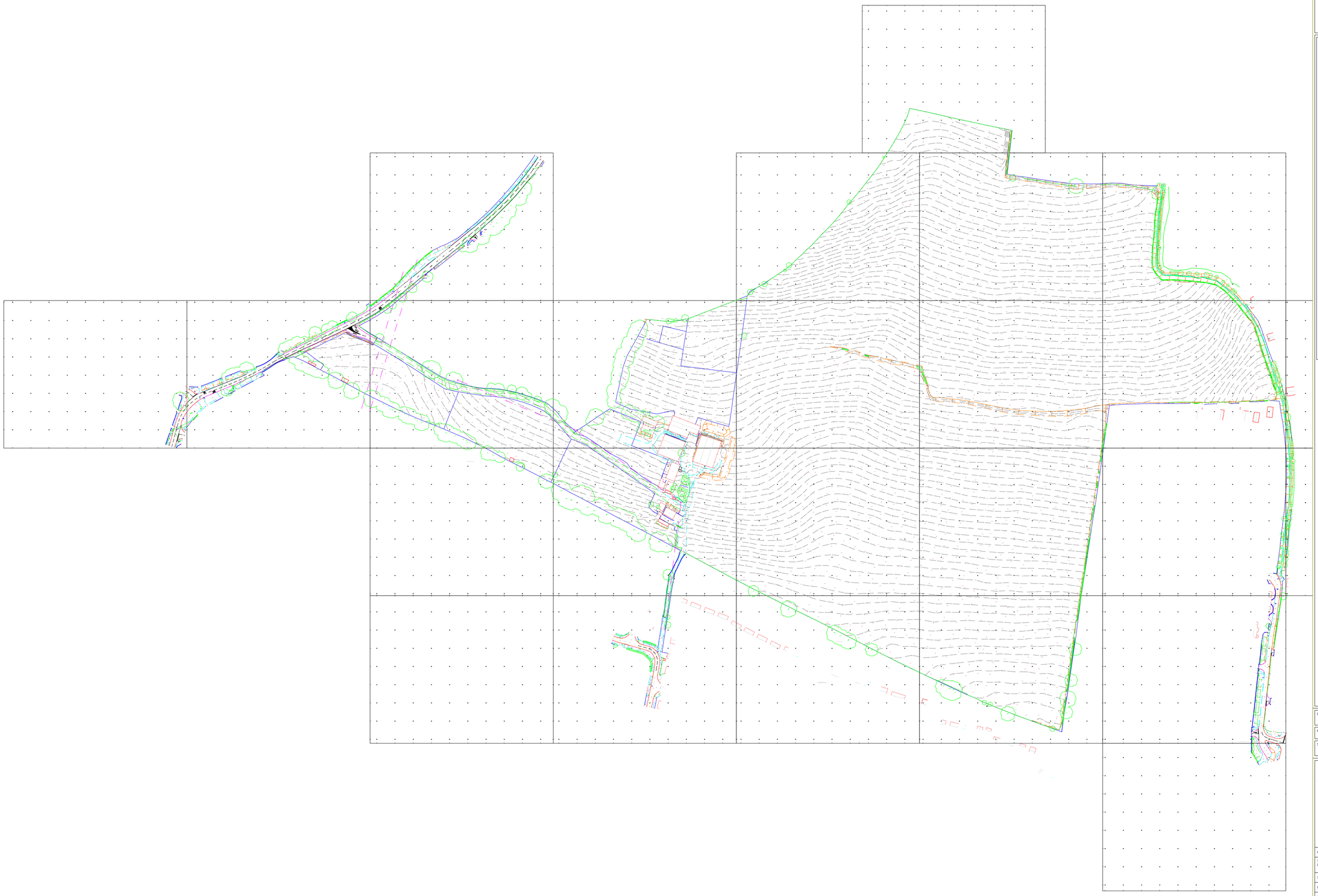
APPENDIX C

Topographical Survey



NOTES:

Drainage:
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LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOCUST	LOC
ASH	ASH	LONDON PLANE	LPN
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MPL
CEDAR	CED	OAK	OAK
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PNS
FIR	FIR	RHODODODENDRONS	RDN
FRUIT	FRT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SBI
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HBM	WALNUT	WNT
LABURNUM	LBM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Bole
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDR
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
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BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
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INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
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LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Twp
NAME PLATE	NP		

Level Datum:

Grid:

Northpoint:

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Fax: 023 80607125 Website: encompass-surveys.co.uk

Client:

Survey Location:

Survey type:	Scale:
Drawing ref:	Date:
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TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

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LARCH LAP FENCE	LLF
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PALISADE FENCE	PSF
PICKET FENCE	PKF
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FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

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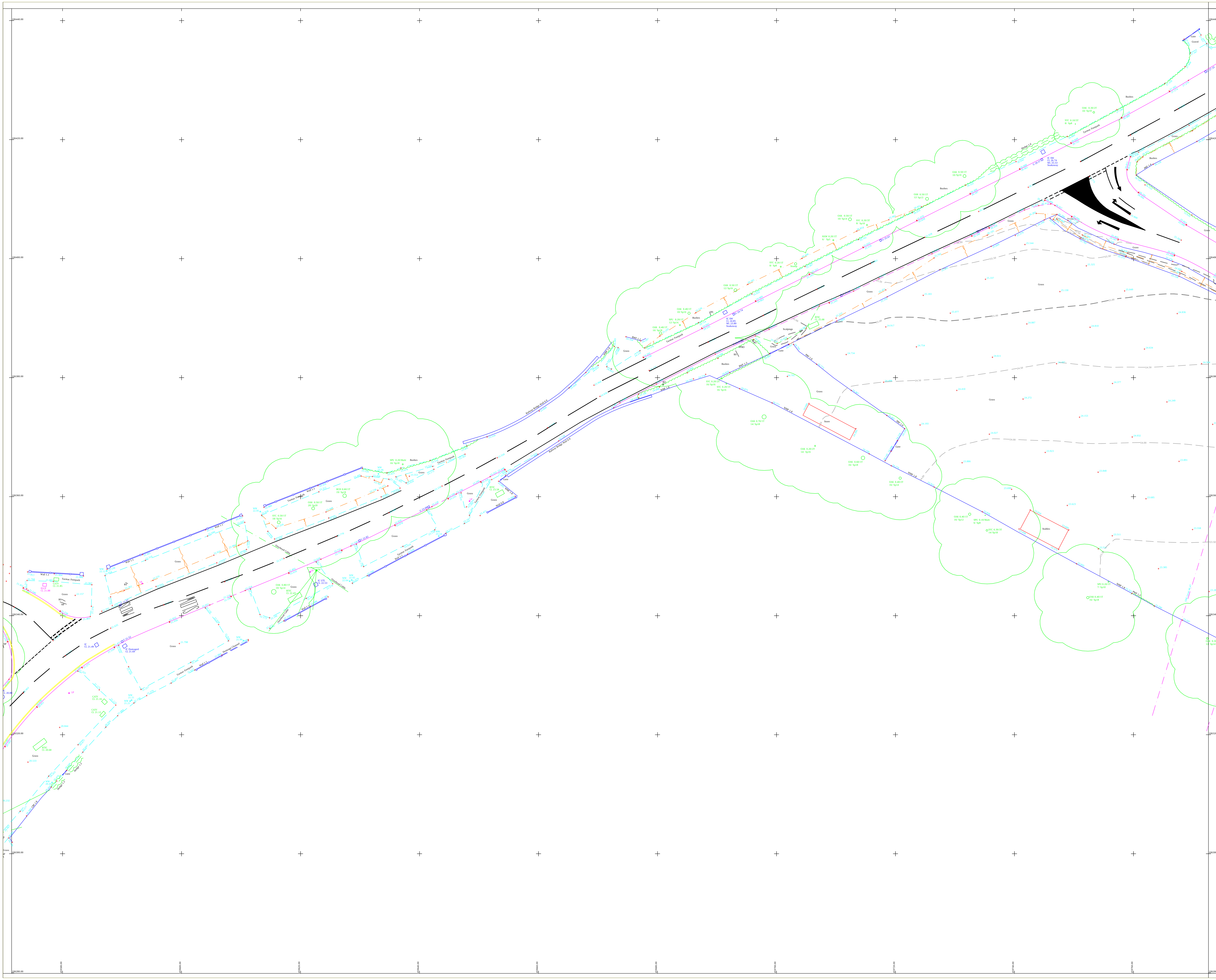

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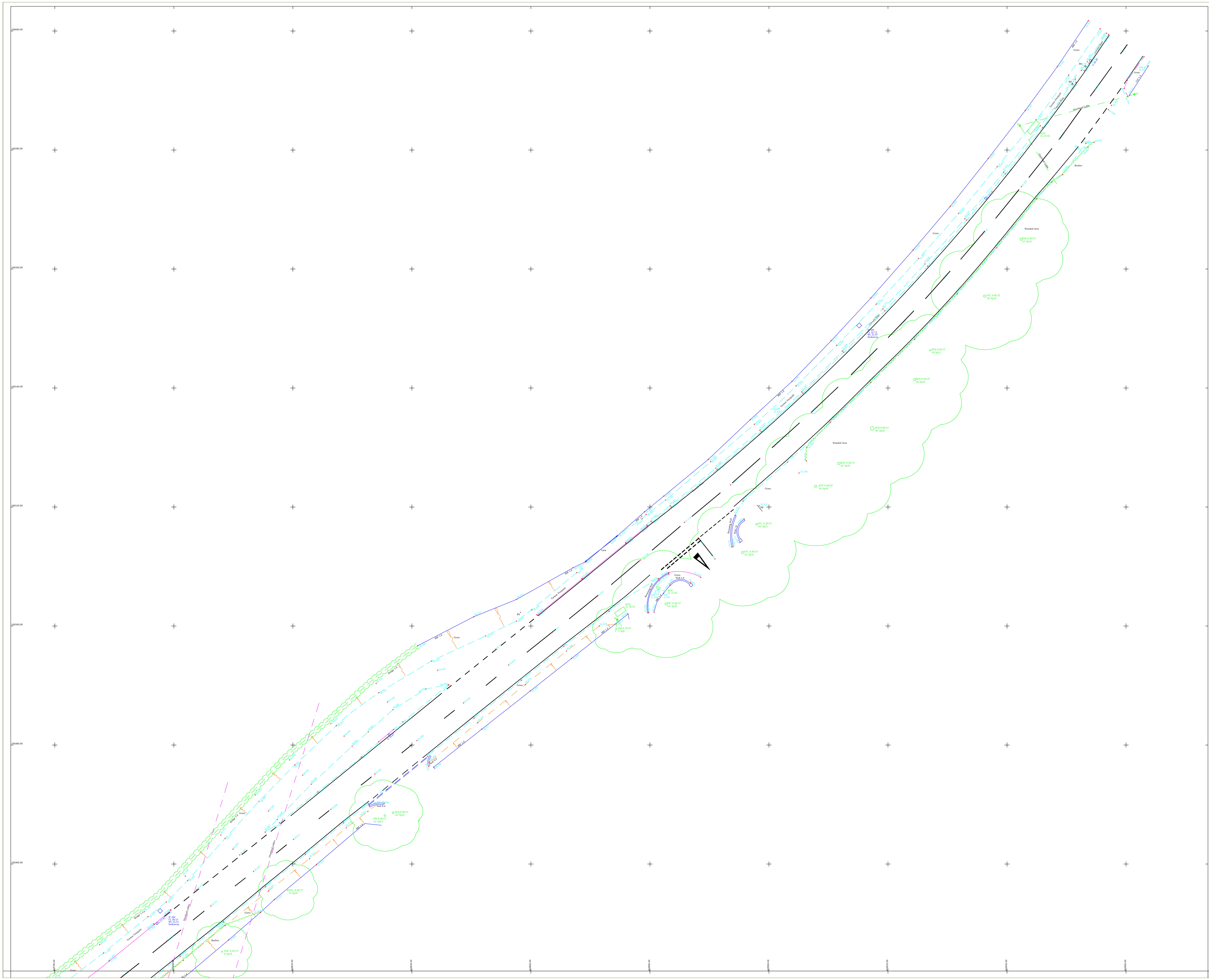

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INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
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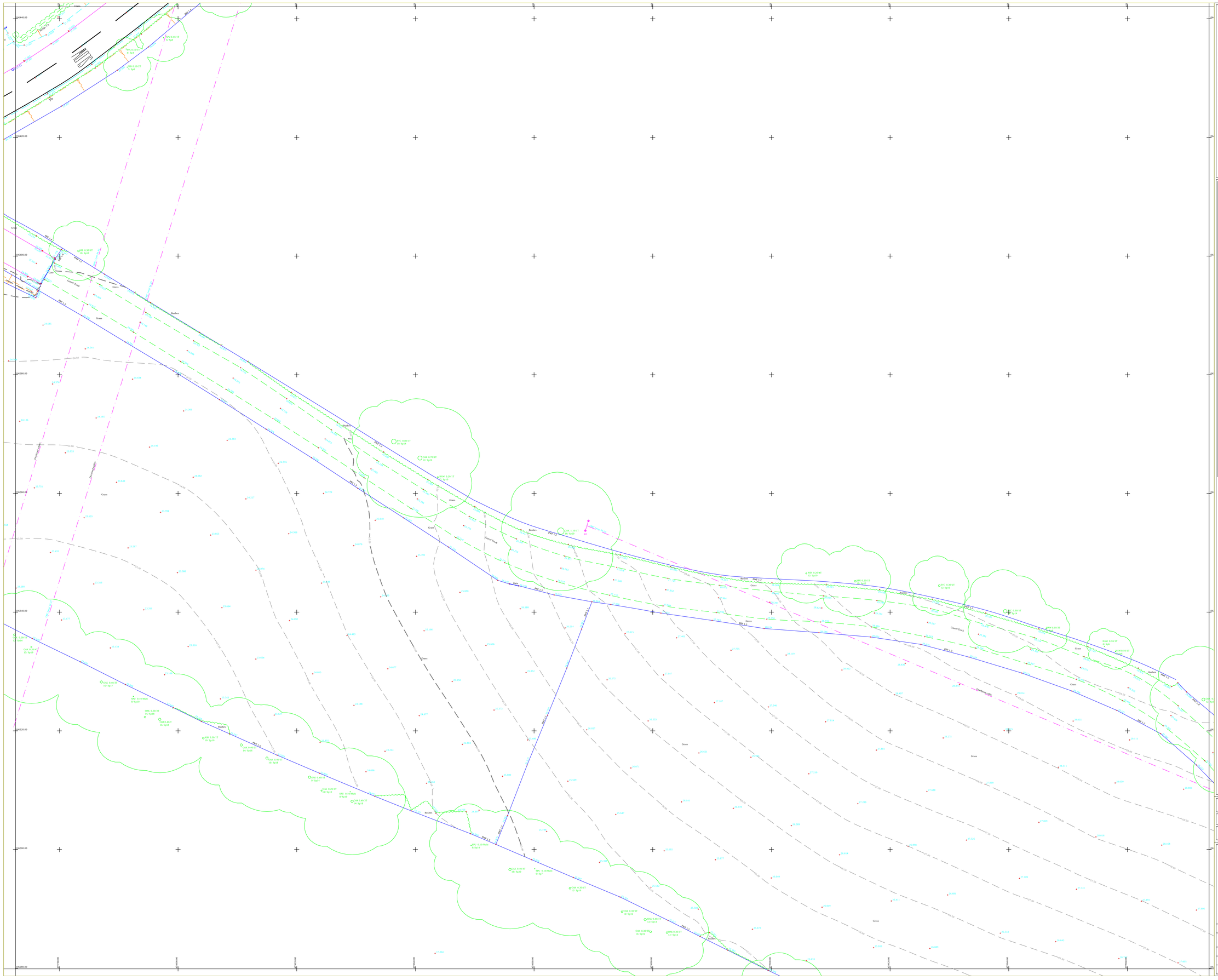

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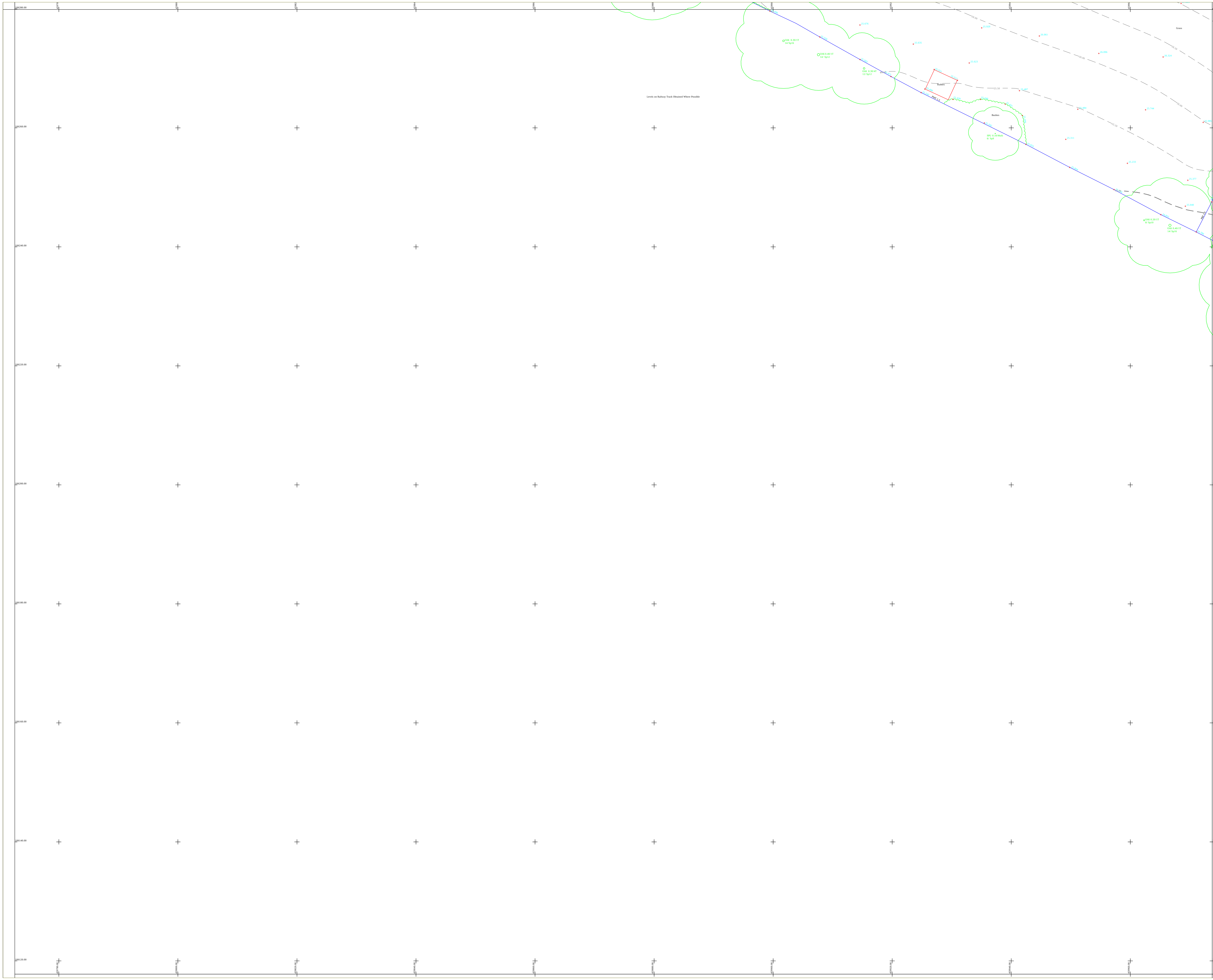

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LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOCUST	LOC
ASH	ASH	LONDON PLANE	LPN
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MPL
CEDAR	CED	OAK	OAK
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PNS
FIR	FIR	RHODODENDRONS	RDN
FRUIT	FRT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SIB
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HRM	WALNUT	WNT
LABURNUM	LRM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDL
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
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BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
ELECTRICITY CABLE PIT	ELCP	SOIL VENT PIPE	SVP
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:

Grid:

Northpoint:

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Client:	
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Survey type:	Scale:
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TREE ANNOTATIONS: Tree Species / Tree Bol Size / No of Bolls
Tree Height / Tree Canopy Spread

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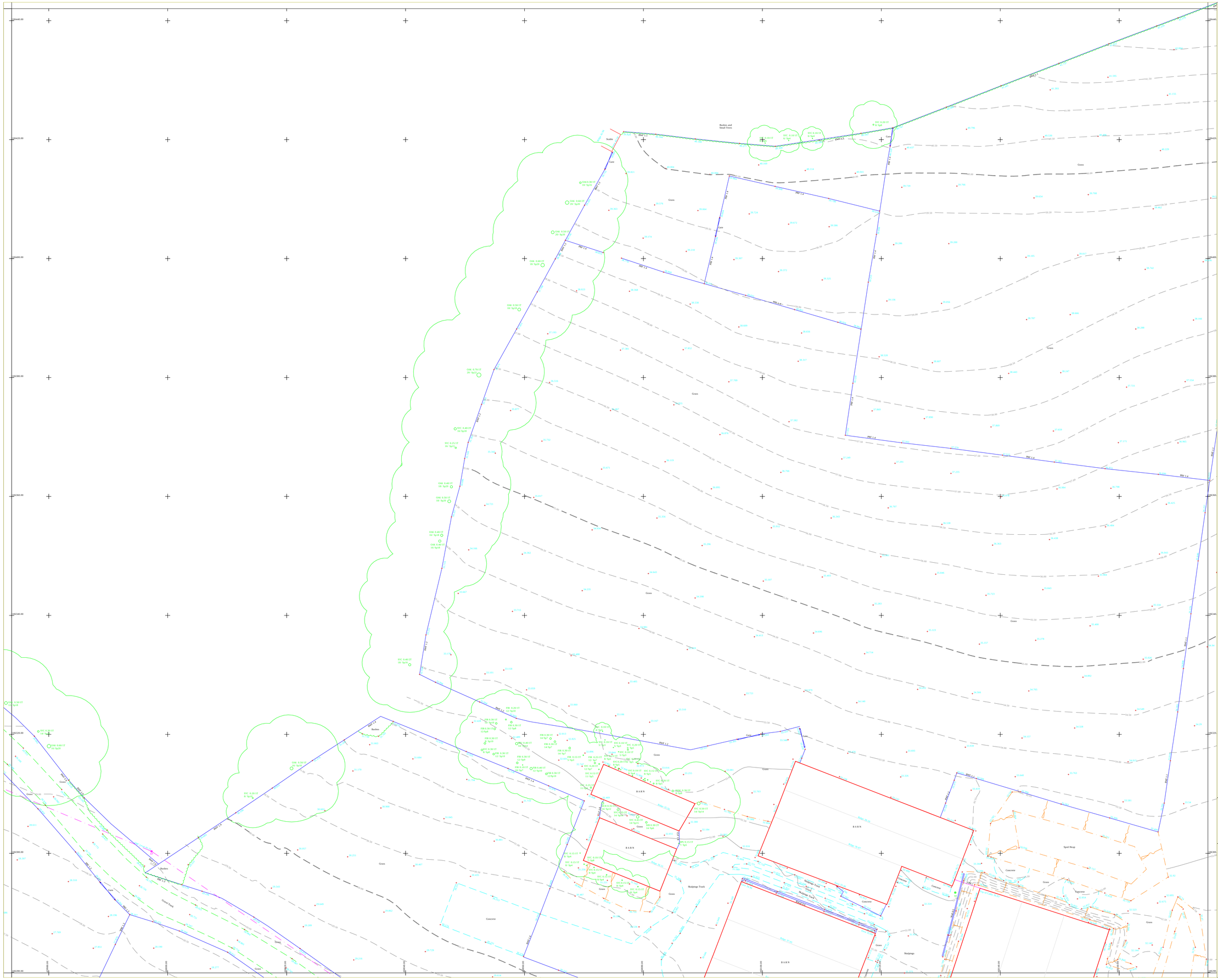

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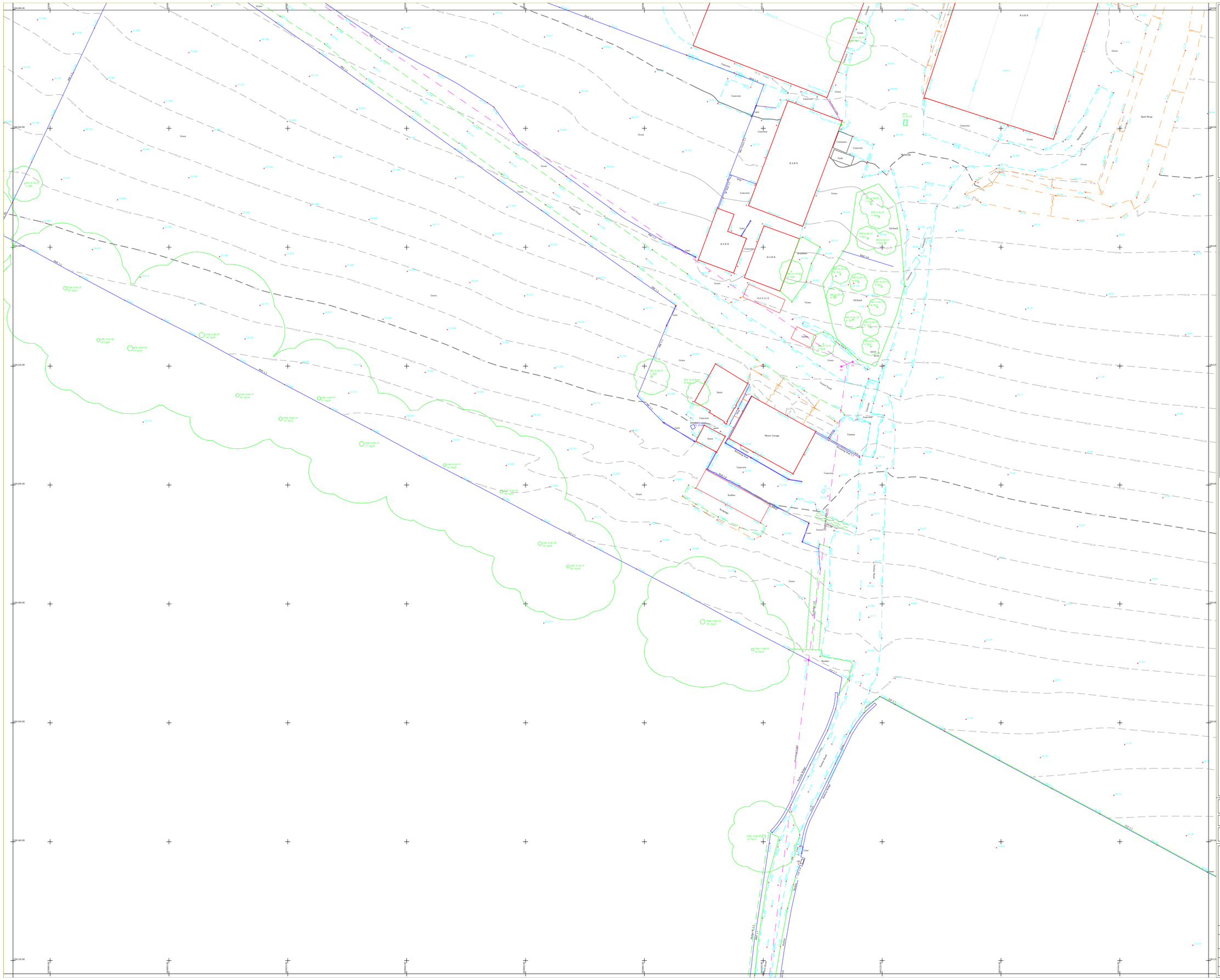

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TREE ANNOTATIONS: Tree Species / Tree Bol Size / No of Bolls
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FENCE INFORMATION

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CORRUGATED IRON FENCE	CIF	BED LEVEL	BL
CLOSE BOARD FENCE	CBF	COVER LEVEL	CL
CHAIN LINK FENCE	CLF	DAMP PROOF COURSE	DPC
CHESTNUT PALING	CPF	FLOOR LEVEL	FL
CRASH BARRIER	CBR	INVERT LEVEL	IL
HANDRAIL	HDR	OUTPUT LEVEL	OL
IRON RAILINGS	IRF	THRESHOLD LEVEL	THL
LARCH LAP FENCE	LLF	POOL WATER	PW
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PICKET FENCE	PKF	WATER LEVEL	WL
POST AND CHAIN FENCE	PCF		
POST AND RAIL FENCE	PRF		
POST AND WIRE FENCE	PWF		
STOCK WIRE FENCE	SWF		
TRELLIS FENCING	TLF		

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWBIRED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

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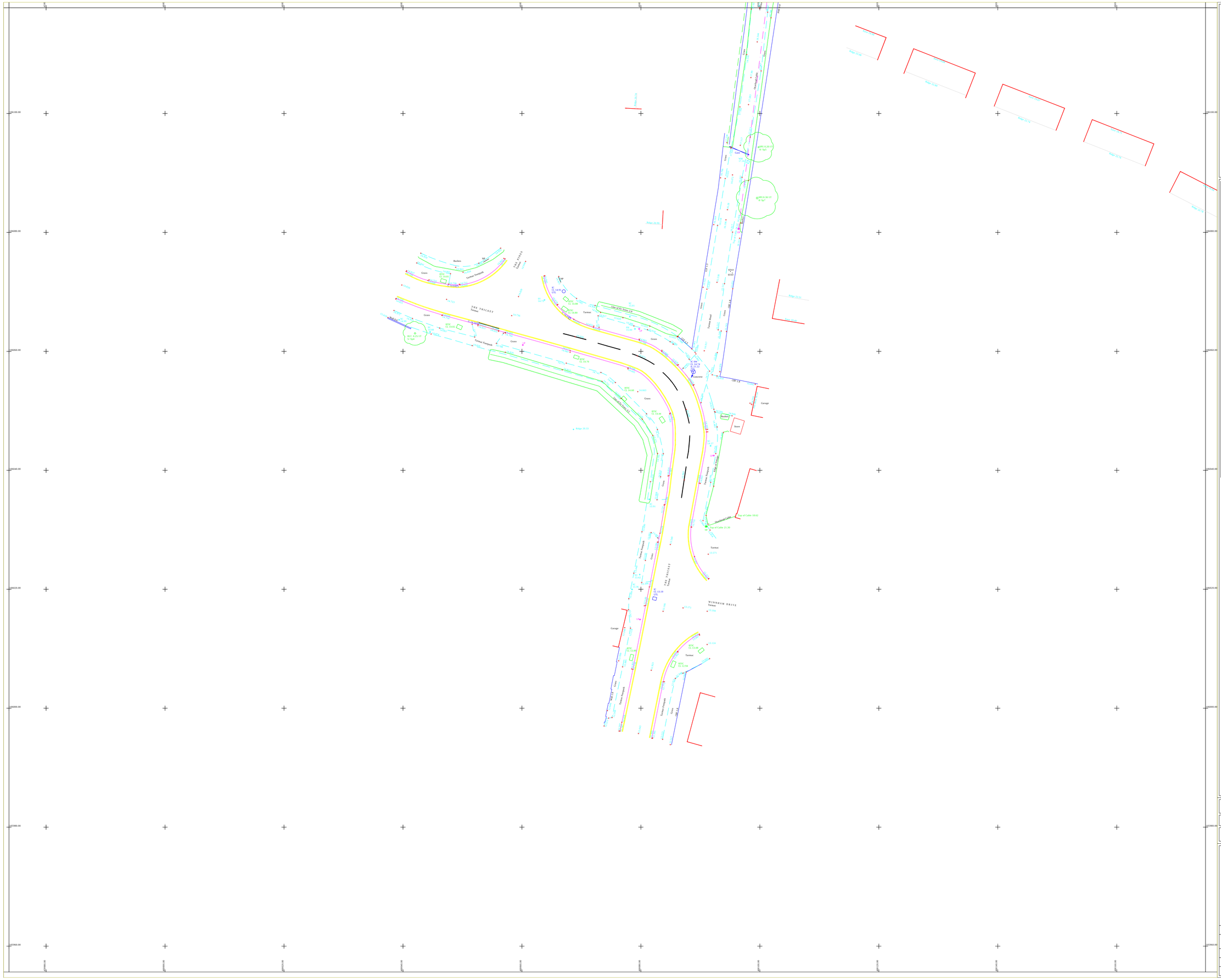

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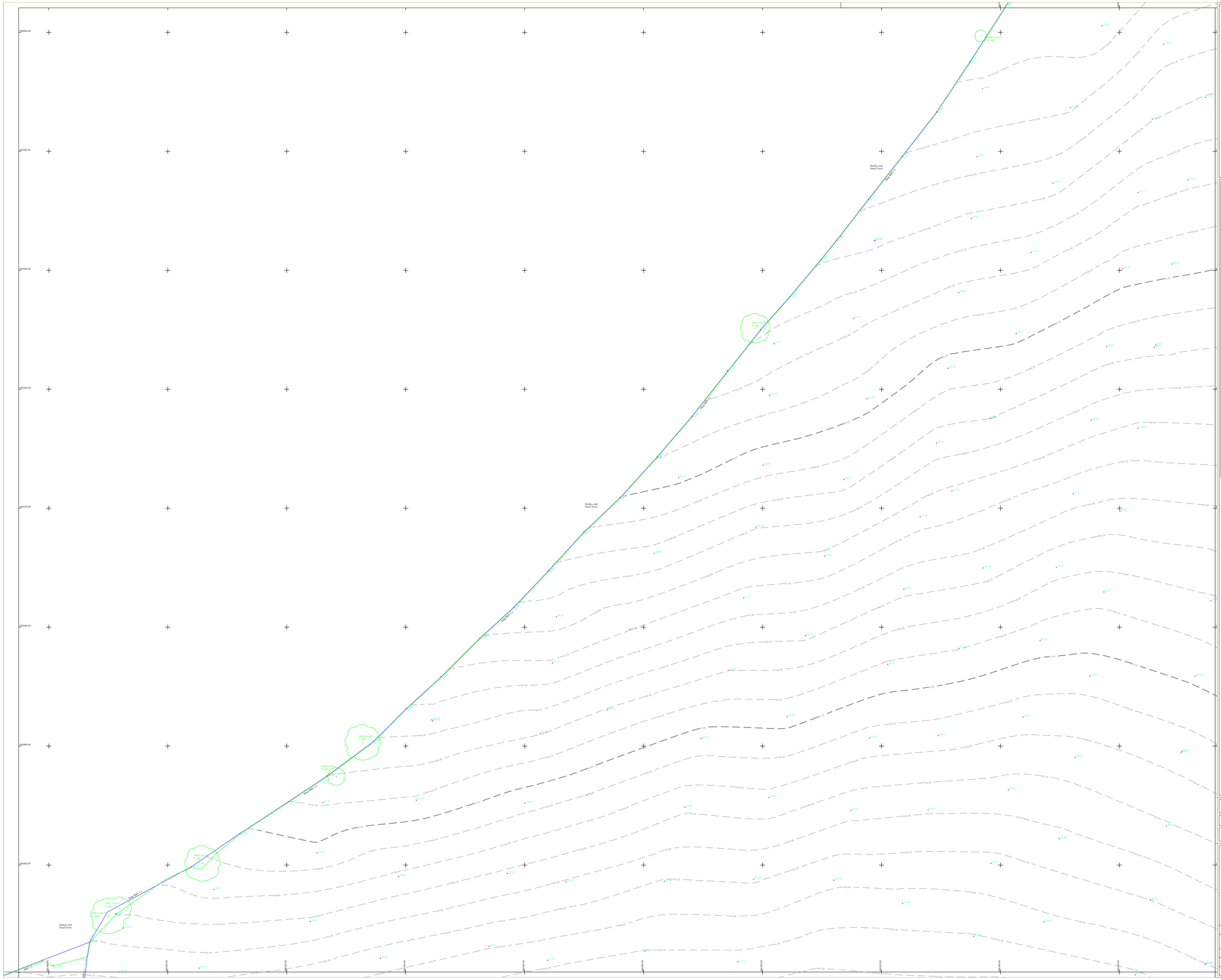

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LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Bole
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDR
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
BRITISH TELECOM BOX	BTB	POST	P
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
ELECTRICITY CABLE PIT	ELCP	SOIL VENT PIPE	SVP
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:

Grid:

Northpoint:

ENCOMPASS SURVEYS

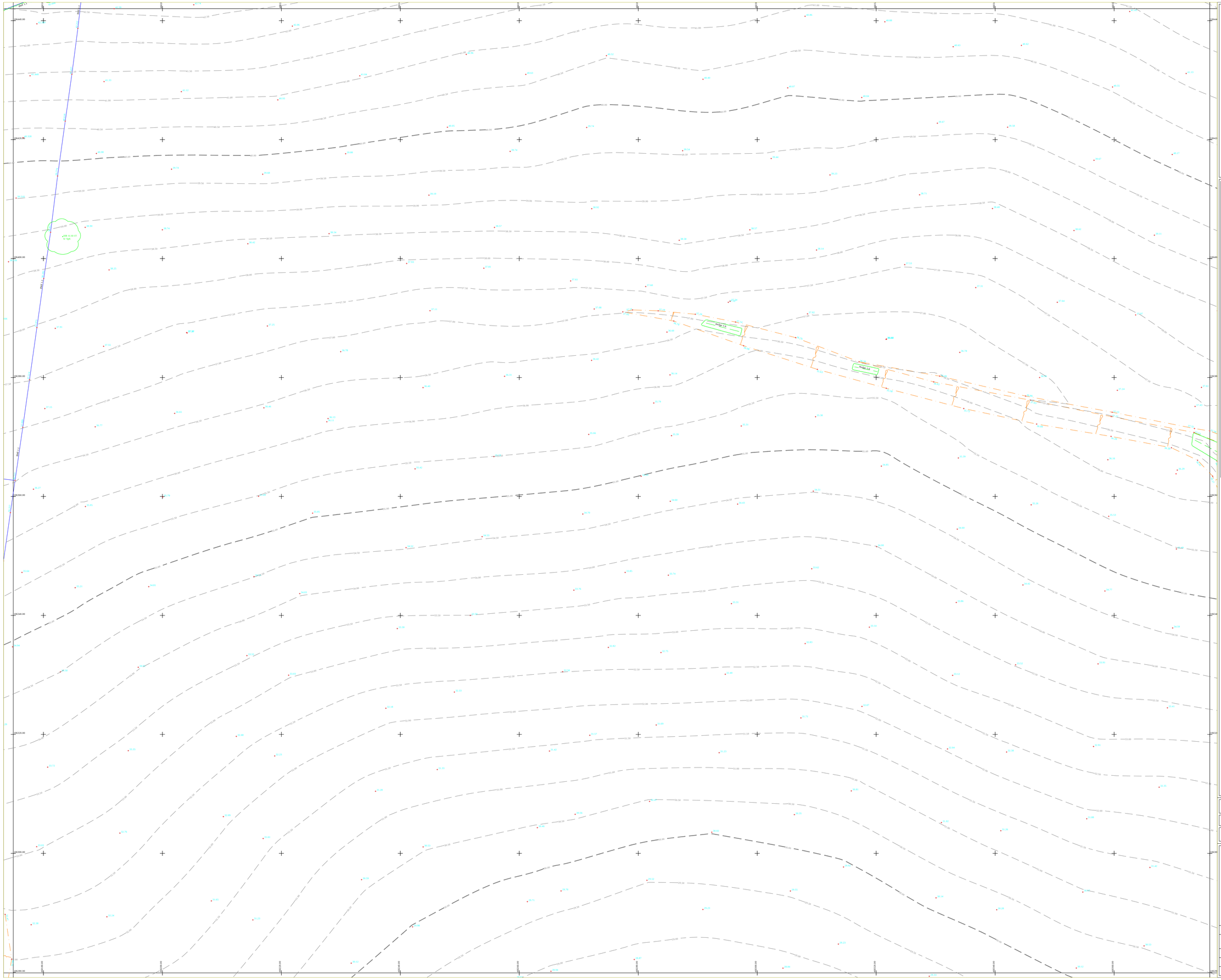
Encompass Surveys Ltd
Unit 2CA
Deer Park Farm Industrial Estate
Knowle Lane
Fair Oak, Eastleigh
Hampshire SO50 7PZ

Tel: 023 80692002 Email: info@encompass-surveys.co.uk
Fax: 023 80687125 Website: encompass-surveys.co.uk

Client:

Survey Location:

Survey type:	Scale:
Drawing ref:	Date:
Drawn/QA:	Plot No.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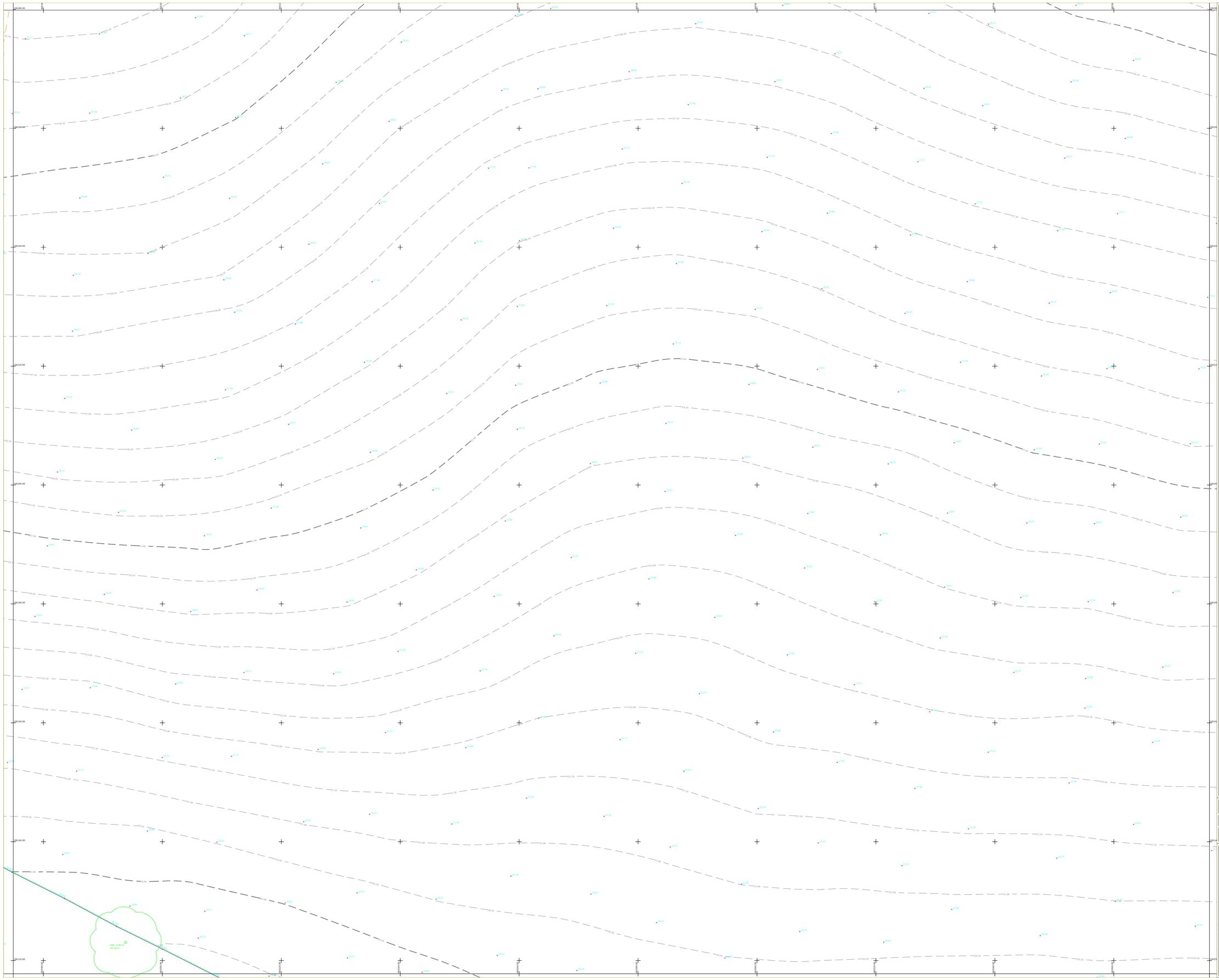

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LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOCUST	LOC
ASH	ASH	LONDON PLANE	LPN
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MPL
CEDAR	CED	OAK	OAK
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PNS
FIR	FIR	RHODODENDRONS	RDN
FRUIT	FRT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SBI
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HBM	WALNUT	WNT
LABURNUM	LBM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Bol Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDR
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTHALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWBIRED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
BRITISH TELECOM BOX	BTB	POST	P
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
ELECTRICITY CABLE PIT	ELCP	SOIL VENT PIPE	SVP
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNAL IC	TSIC
LITTER BIN	BIN	WATER METER	WM
ARRR OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:

Grid:

Northpoint:

ENCOMPASS SURVEYS

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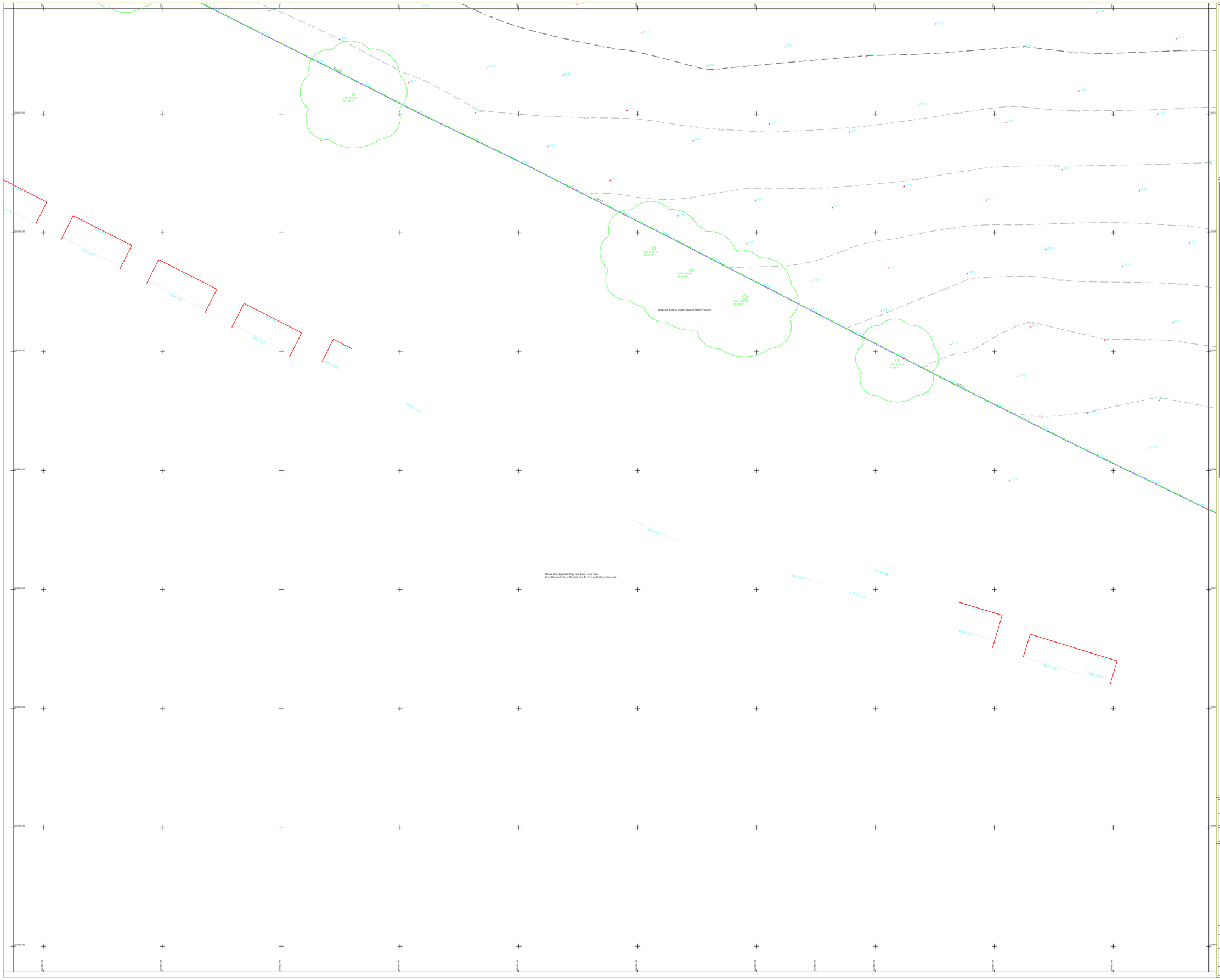
Fax: 023 80687125 Website: encompass-surveys.co.uk

Client:

Survey Location:

Survey type:	Scale:
Drawing ref:	Date:
Drawn/QA:	Plot No.



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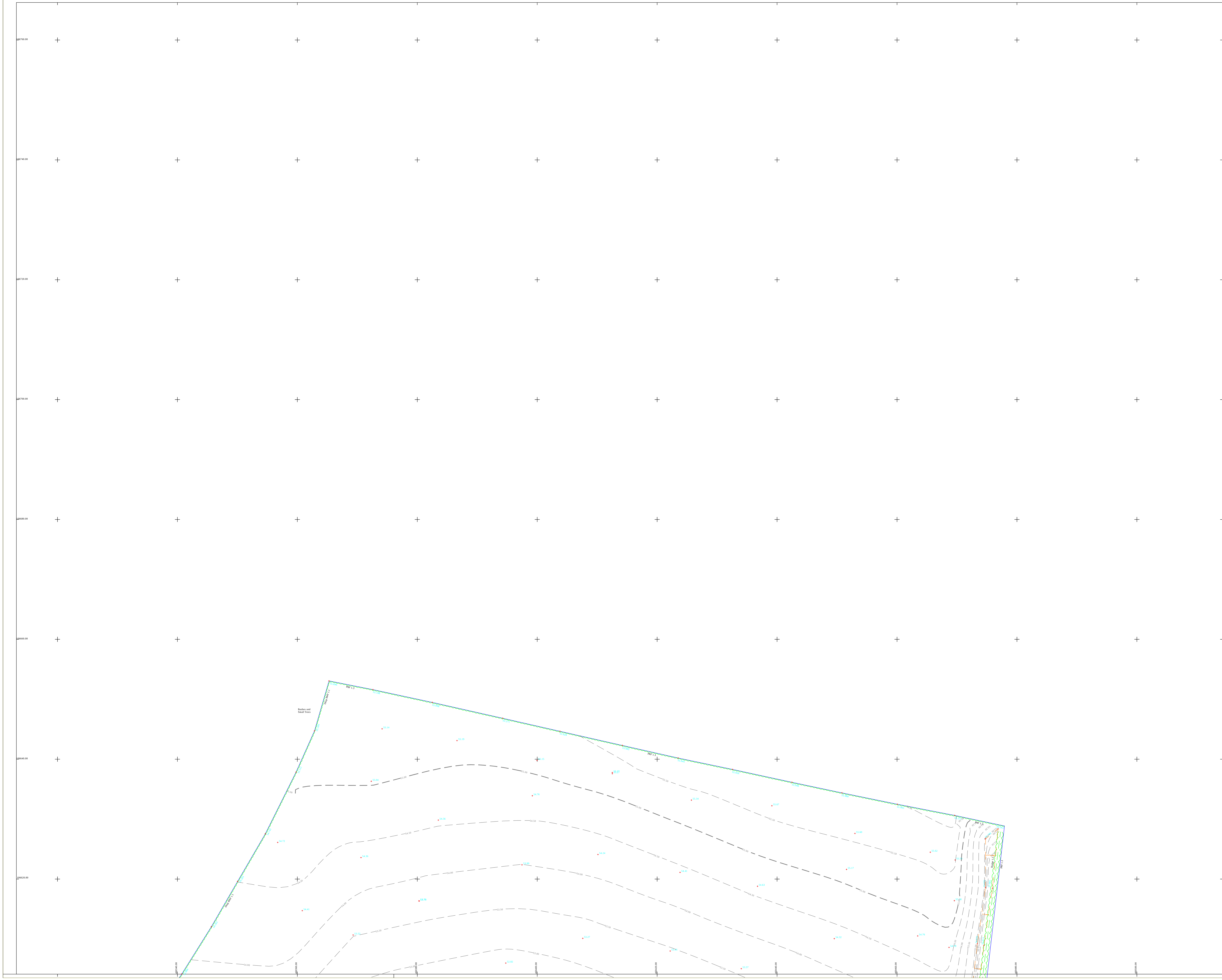
Client:

Survey Location:

Survey type:	Scale:
Drawing ref:	Date:
Drawn/QA:	Plot No.



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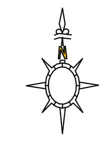

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HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HRM	WALNUT	WNT
LABURNUM	LRM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDL
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
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BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
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ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:

Grid:

Northpoint:

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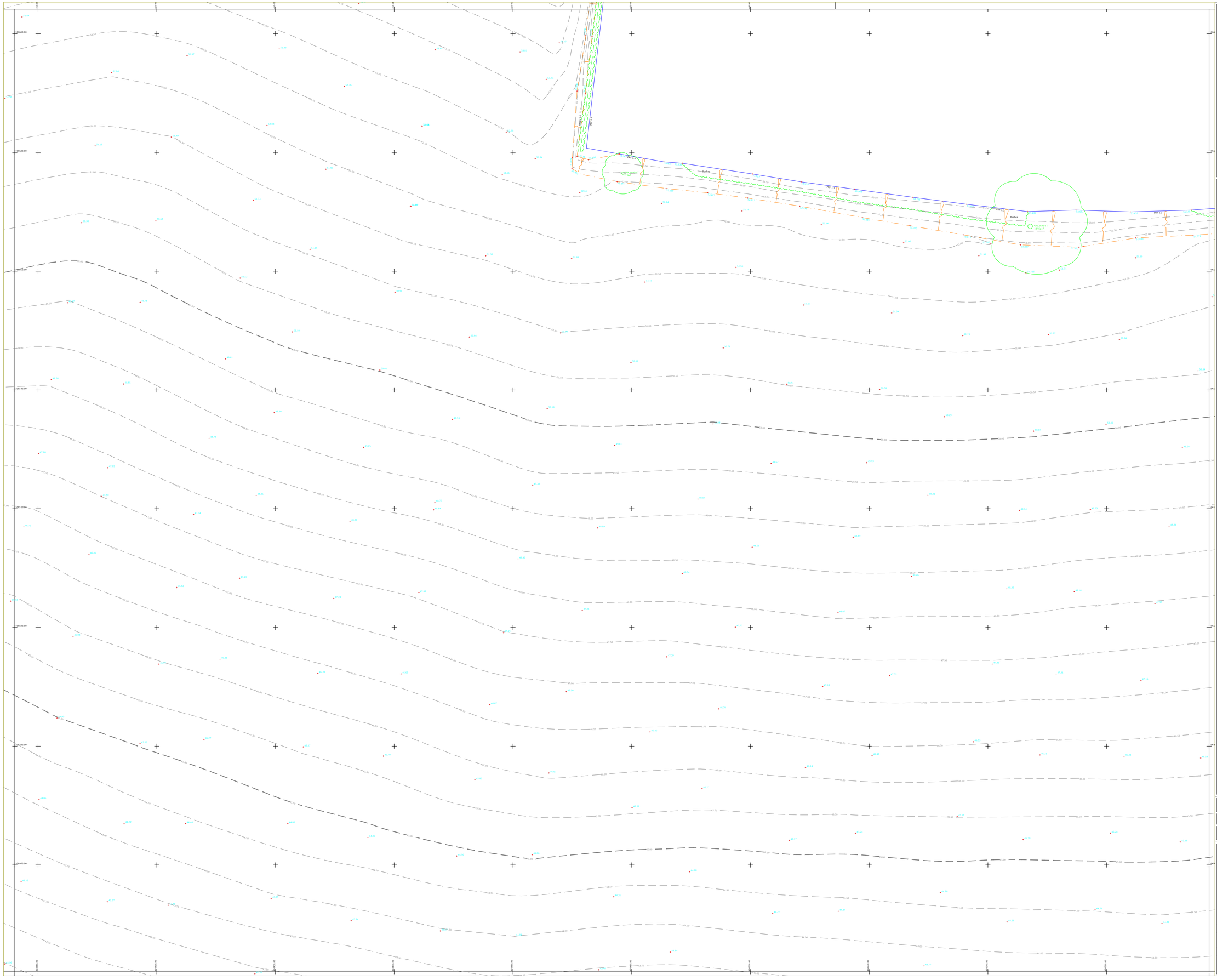

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LEGEND

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BEECH	BCH	MAPLE	MPL
CEDAR	CED	OAK	OAK
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
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PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

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COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
POOL WATER	PW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
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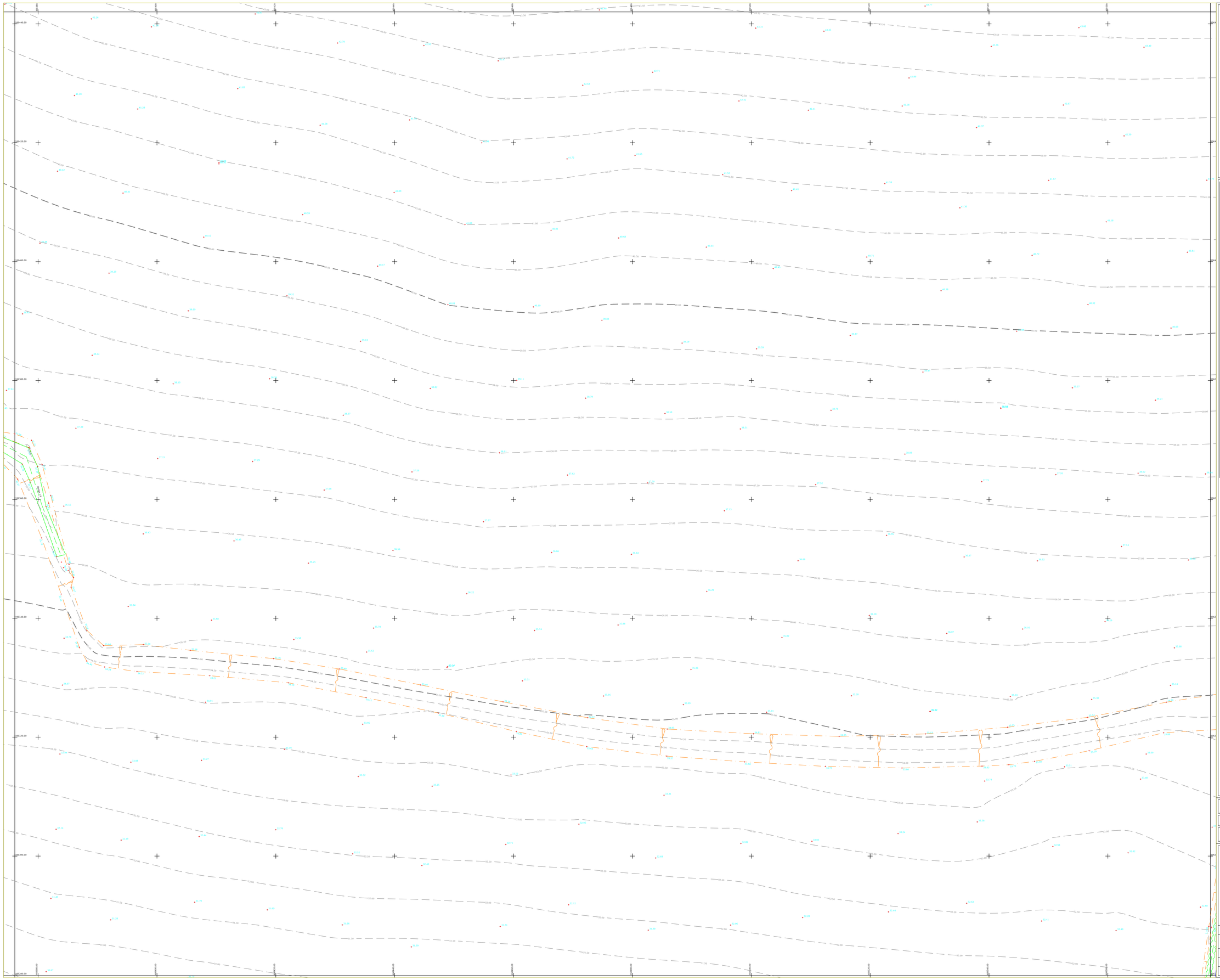

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LEVEL INFORMATION

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POOL WATER	PW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
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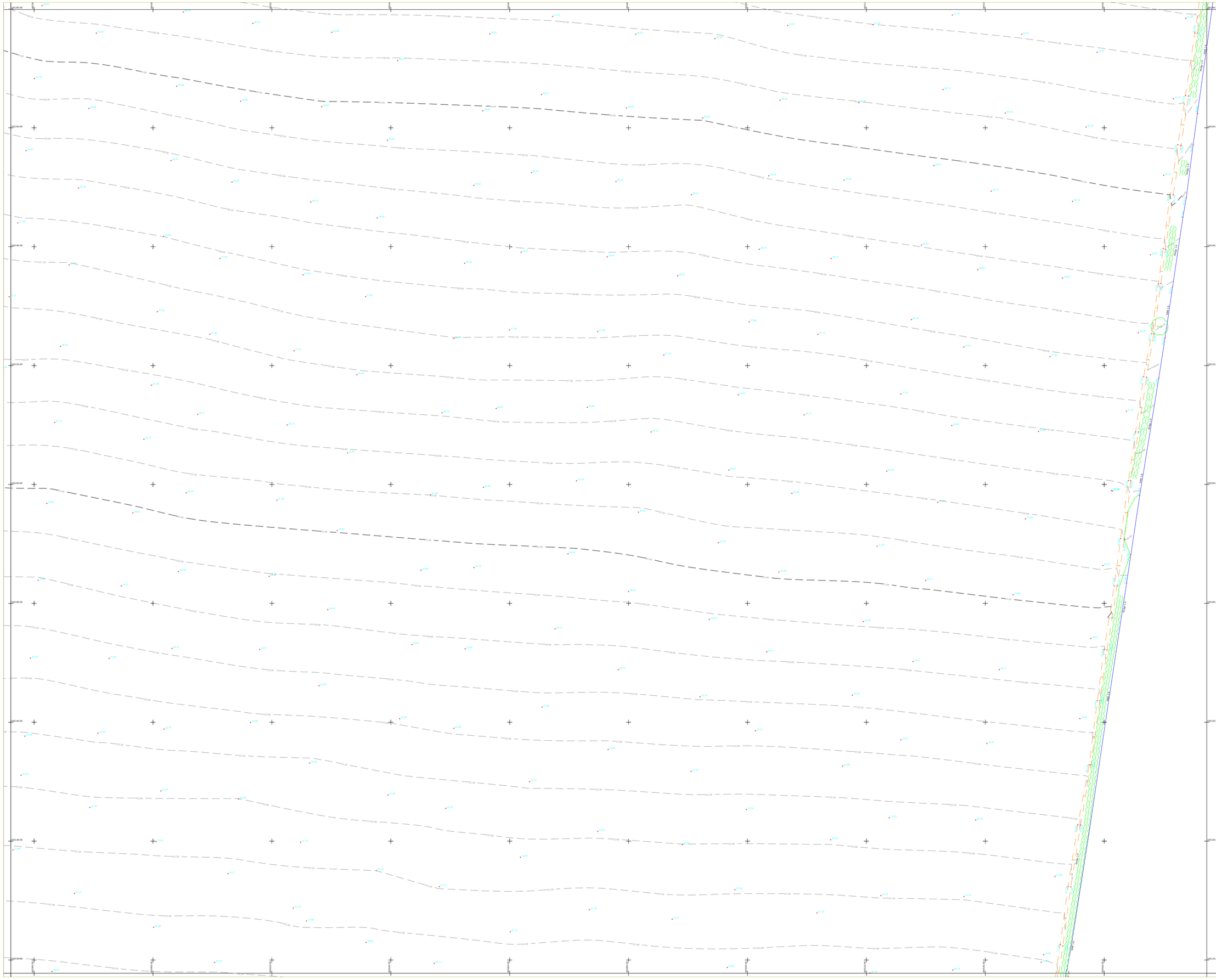
Survey Location:

Survey type:	Scale:
Drawing ref:	Date:
Drawn/QA:	Plot No.



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TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Bole
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDR
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
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PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
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POST AND WIRE FENCE	PWF
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LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWBIRED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
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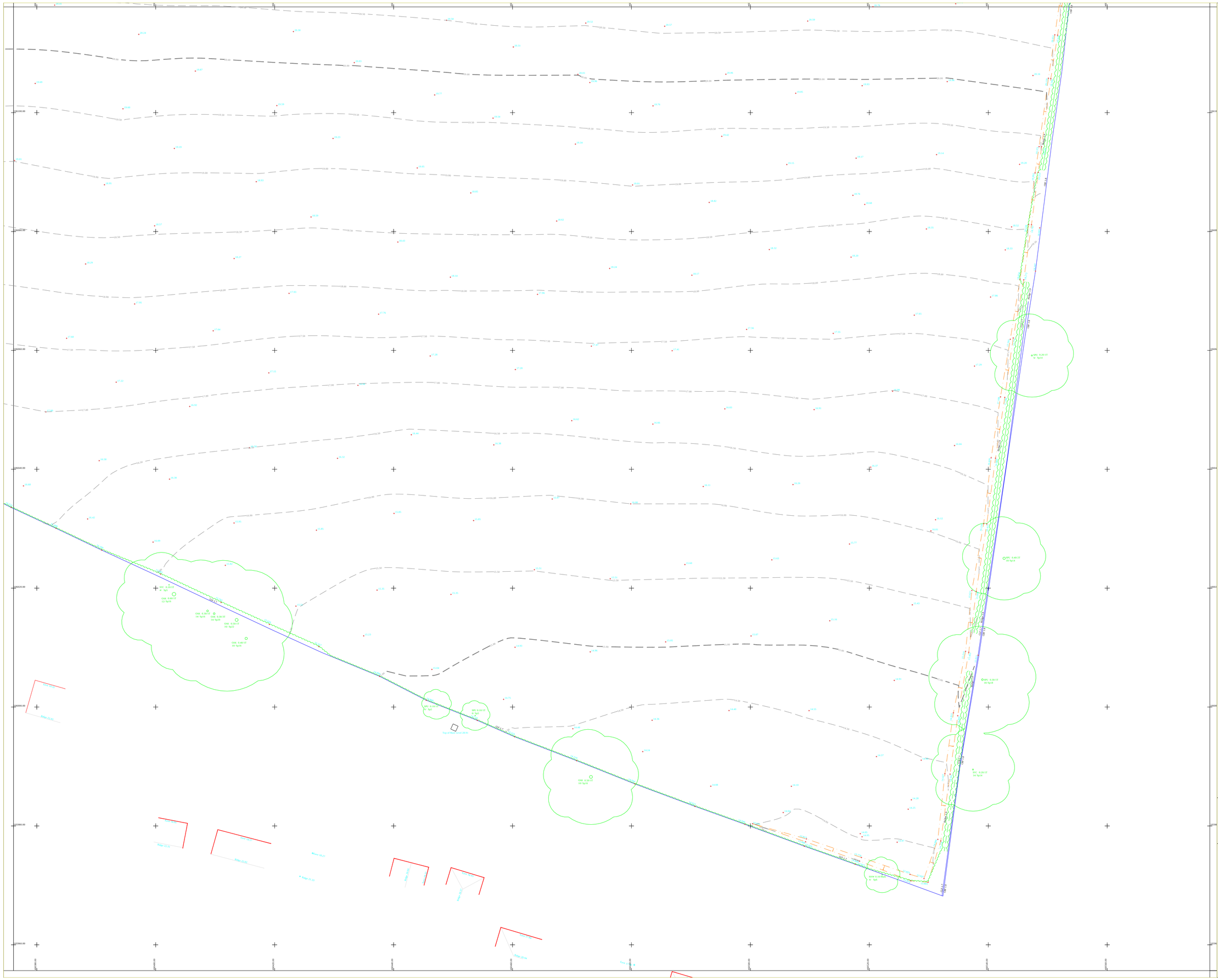

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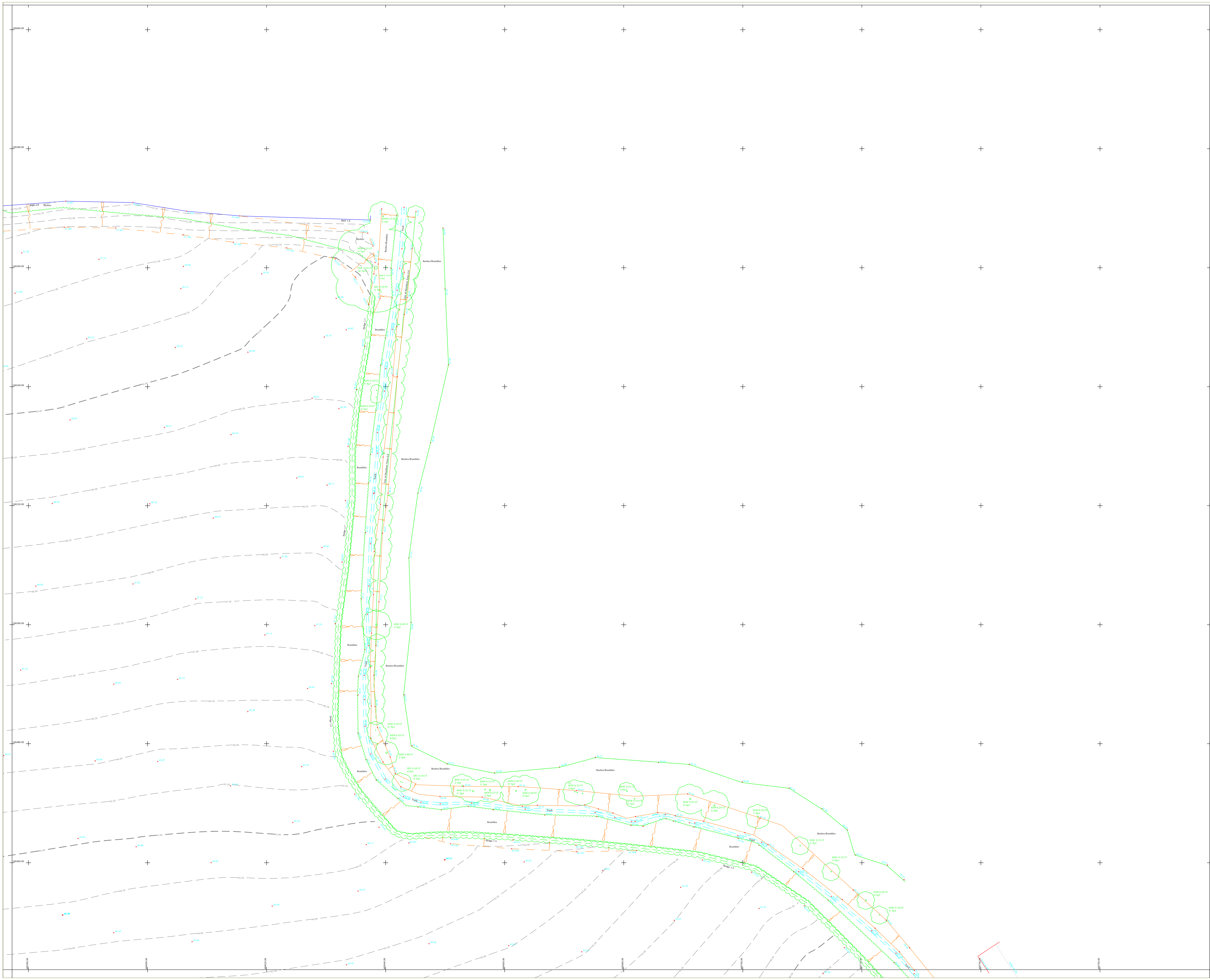

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LIME	LIM	SPECIES UNKNOWN	SPU
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TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDL
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
BRITISH TELECOM BOX	BTB	POST	P
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
ELECTRICITY CABLE PIT	ELCP	SOIL VENT PIPE	SVP
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:

Grid:

Northpoint:

ENCOMPASS SURVEYS

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Client:

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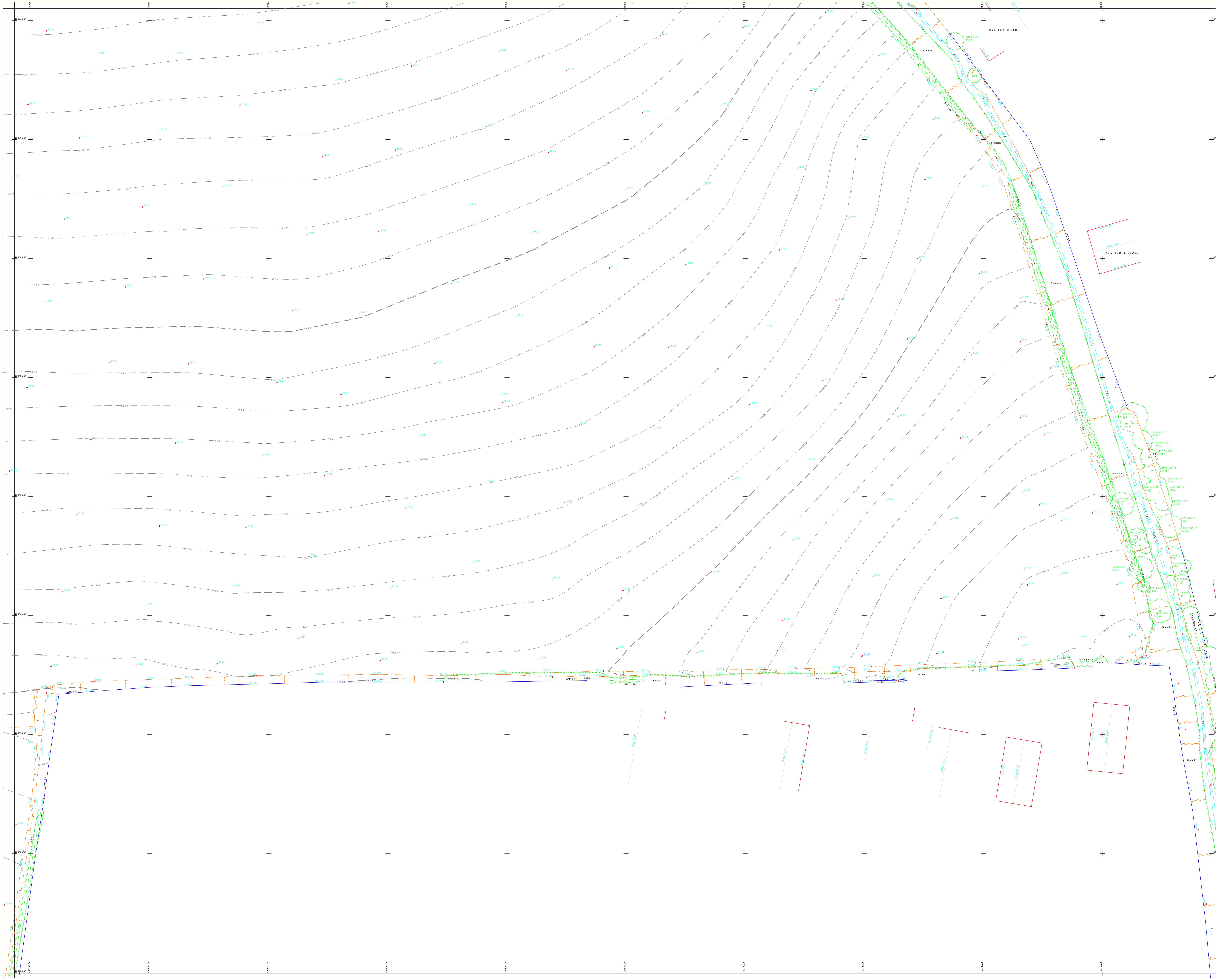
Survey type:	Scale:
Drawing ref:	Date:
Drawn/QA:	Plot No.



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LEGEND

TREE SPECIES INFORMATION

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BEECH	BCH	MAPLE	MPL
CEDAR	CED	OAK	OAK
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PNS
FIR	FIR	RHODODENDRONS	RDN
FRUIT	FRT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SIB
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HRM	WALNUT	WNT
LABURNUM	LRM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
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TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

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POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

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DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
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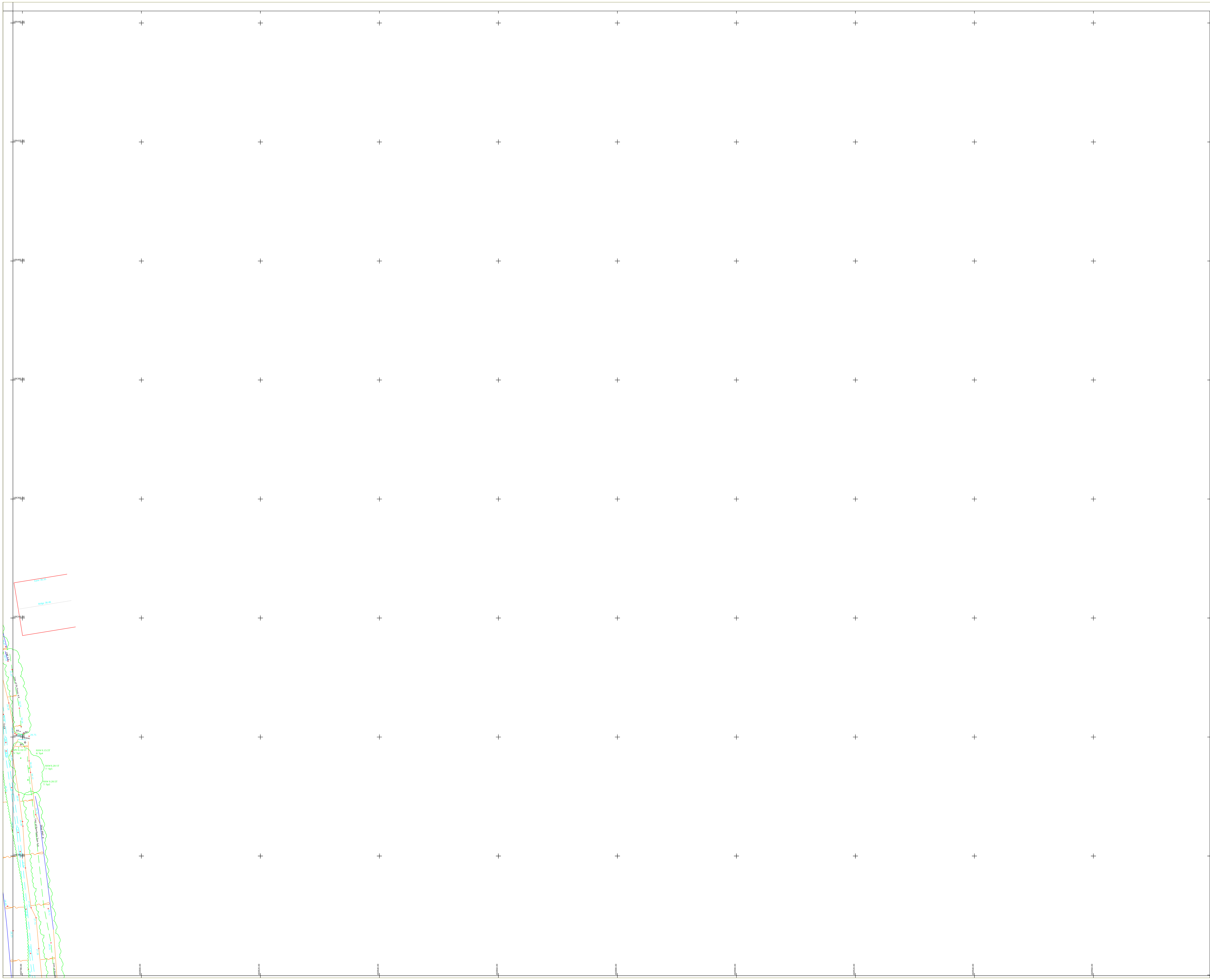

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HORNBEAM	HRM	WALNUT	WNT
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LARCH	LAR	YEW	YEW
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TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

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CRASH BARRIER	CBR
HANDRAIL	HDL
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LEVEL INFORMATION

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DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
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FLOWERBED	FB
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Survey Location:

Survey type:	Scale:
Drawing ref:	Date:
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LEGEND

TREE SPECIES INFORMATION

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BEECH	BCH	MAPLE	MPL
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LABURNUM	LRM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
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TREE ANNOTATIONS: Tree Species / Tree Boll Size / No of Bolls
Tree Height / Tree Canopy Spread

FENCE INFORMATION

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POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

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COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTFALL LEVEL	OL
THRESHOLD LEVEL	THL
POOL WATER	PW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
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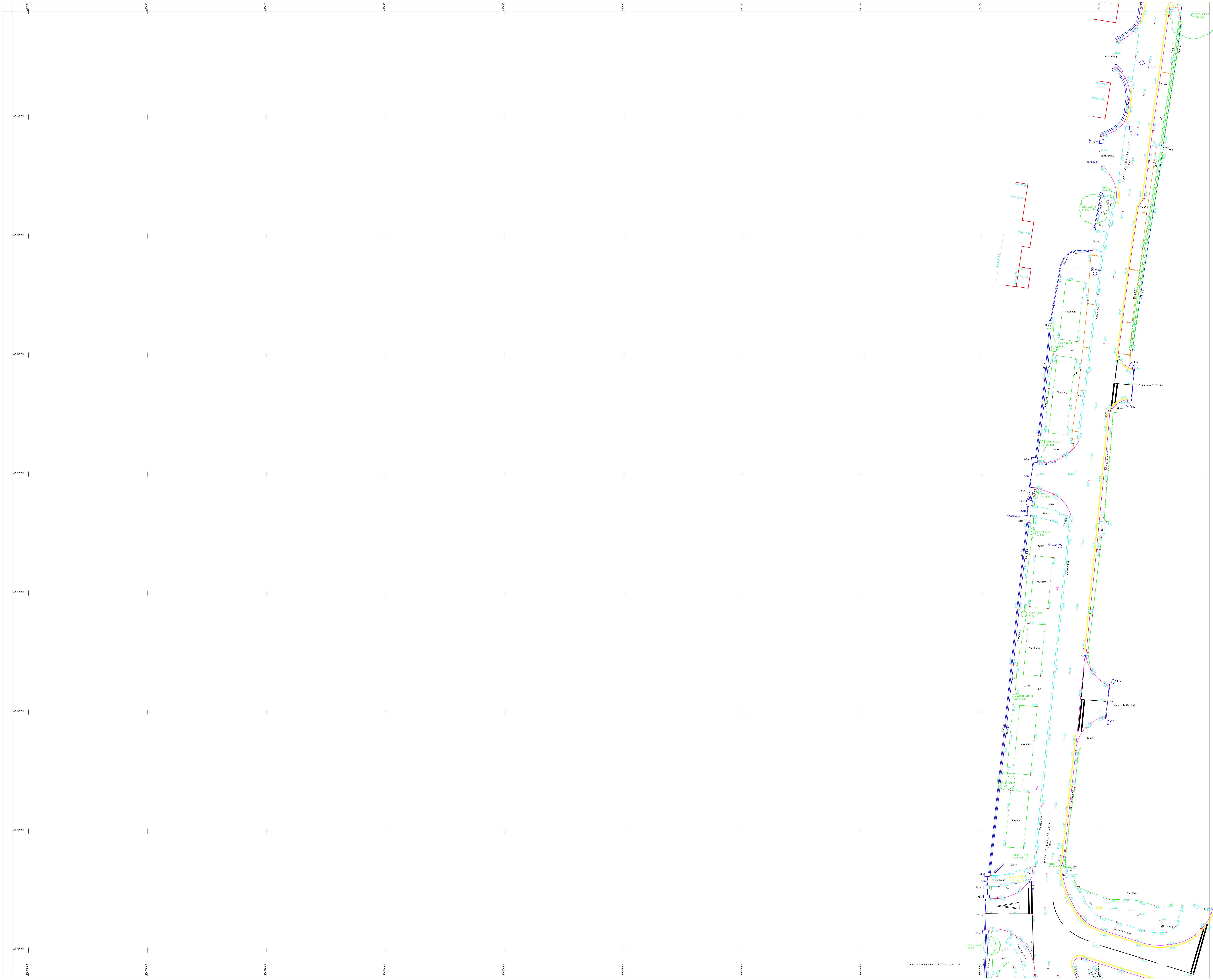

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BOLLARD	BO	NOTICE BOARD	NB
BRITISH TELECOM BOX	BTB	POST	P
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
ELECTRICITY CABLE PIT	ELCP	SOIL VENT PIPE	SVP
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNALS IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:

Grid:

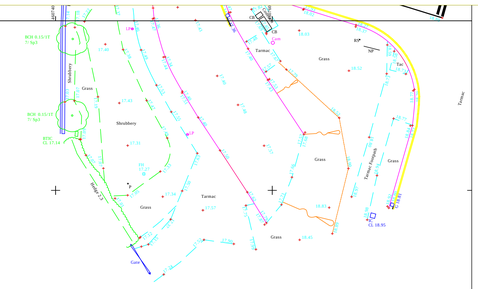
Northpoint:

ENCOMPASS SURVEYS

Encompass Surveys Ltd
Unit 2CA
Deer Park Farm Industrial Estate
Knowle Lane
Fair Oak, Eastleigh
Hampshire SO50 7PZ

Tel: 023 80692002 Email: info@encompass-surveys.co.uk
Fax: 023 80697125 Website: encompass-surveys.co.uk

Client:	
Survey Location:	
Survey type:	Scale:
Drawing ref:	Date:
Drawn/QA:	Plot No.



NOTES:

Drainage:
Inspection Covers are lifted where possible and all drainage invert information has been obtained through visual inspection only, with no entry into manholes. Therefore the complete accuracy cannot be guaranteed. Where drainage is of critical importance we suggest the services of a specialist drainage expert be used.

Trees:
Every effort has been made to identify and detail all trees on site but where trees are of critical importance we suggest the use of a specialist such as an arborist. Tree spread and heights are indicative.

GPS:
GPS detail is relative to the time and date of survey. GPS levels and grid are obtained using industry standard guidelines and can vary according to the quality of the GPS network at the time of survey. Unless stated otherwise, surveys are Scale factor 1 and Horizontal and Vertical Datums are established from a central site fix and baseline orientation station utilising GNSS correction data.

Survey notes:
Survey specification is linked to the original purpose of the survey commissioned at source and is to be used for this purpose only.
Survey is accurate within limitations of site conditions at the time of survey. In areas difficult to survey due to restricted access, lines of sight or dense vegetation, critical dimensions and positions should be verified following suitable clearance.
Survey detail obtained and shown is relative to the plotting scale.

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LEGEND

TREE SPECIES INFORMATION

ALDER	ALD	LOCUST	LOC
ASH	ASH	LONDON PLANE	LPN
ASPEN	ASP	MAGNOLIA	MAG
BEECH	BCH	MAPLE	MPL
CEDAR	CED	OAK	OAK
CHERRY	CHY	PINE	PNE
CYPRESS	CYP	POPLAR	POP
ELM	ELM	PRUNUS	PNS
FIR	FIR	RHODODODENDRONS	RDN
FRUIT	FRT	ROWAN	RWN
HAWTHORN	HAW	SILVER BIRCH	SBI
HAZEL	HAZ	SORBUS	SOR
HOLLY	HLY	SWEET CHESTNUT	SCH
HORSE CHESTNUT	HCH	SYCAMORE	SYC
HORNBEAM	HBM	WALNUT	WNT
LABURNUM	LBM	WILLOW	WLW
LARCH	LAR	YEW	YEW
LIME	LIM	SPECIES UNKNOWN	SPU
		COPPICED	COP

TREE ANNOTATIONS: Tree Species / Tree Bole Size / No of Bole
Tree Height / Tree Canopy Spread

FENCE INFORMATION

BARBED WIRE FENCE	BWF
CORRUGATED IRON FENCE	CIF
CLOSE BOARD FENCE	CBF
CHAIN LINK FENCE	CLF
CHESTNUT PALING	CPF
CRASH BARRIER	CBR
HANDRAIL	HDL
IRON RAILINGS	IRF
LARCH LAP FENCE	LLF
MISCELLANEOUS FENCE	MSF
PALISADE FENCE	PSF
PICKET FENCE	PKF
POST AND CHAIN FENCE	PCF
POST AND RAIL FENCE	PRF
POST AND WIRE FENCE	PWF
STOCK WIRE FENCE	SWF
TRELLIS FENCING	TLF

LEVEL INFORMATION

BASEMENT LEVEL	BTL
BED LEVEL	BL
COVER LEVEL	CL
DAMP PROOF COURSE	DPC
FLOOR LEVEL	FL
INVERT LEVEL	IL
OUTHALL LEVEL	OL
THRESHOLD LEVEL	THL
FOUL WATER	FW
SURFACE WATER	SW
UNABLE TO LIFT	UTL
WATER LEVEL	WL

SURFACE INFORMATION

CONCRETE	Conc
BRICK PAVERS	BP
FLOWERBED	FB
PAVING SLABS	PS
RETAINING WALL	RWall
TACTILE PAVING	Tac

FEATURE INFORMATION

BOLLARD	BO	NOTICE BOARD	NB
BRITISH TELECOM BOX	BTB	POST	P
BRITISH TELECOM IC	BTIC	RAIN WATER PIPE	RWP
BUS STOP	BS	RAISED FLOWERBED	RFB
CABLE TELEVISION BOX	CATB	ROAD SIGN	RS
CABLE TELEVISION IC	CATV	RODDING EYE	RE
EARTHING ROD	ER	SERVICE MARKER POST	SMP
ELECTRICITY CABLE PIT	ECP	SOIL VENT PIPE	SVP
ELECTRICITY CONTROL BOX	ECB	STOP COCK	SC
ELECTRICITY POLE	EP	STOP VALVE	SV
FIRE HYDRANT	FH	TELEGRAPH POLE	TP
INSPECTION COVER	IC	TELEPHONE CALL BOX	TCB
LAMP POST	LP	TRAFFIC SIGNAL	TS
LETTER BOX	LB	TRAFFIC SIGNAL IC	TSIC
LITTER BIN	BIN	WATER METER	WM
KERB OUTLET	KO	WATER TAP	Tap
NAME PLATE	NP		

Level Datum:

Grid:

Northpoint:

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Tel: 023 80692002 Email: info@encompass-surveys.co.uk
Fax: 023 80697125 Website: encompass-surveys.co.uk

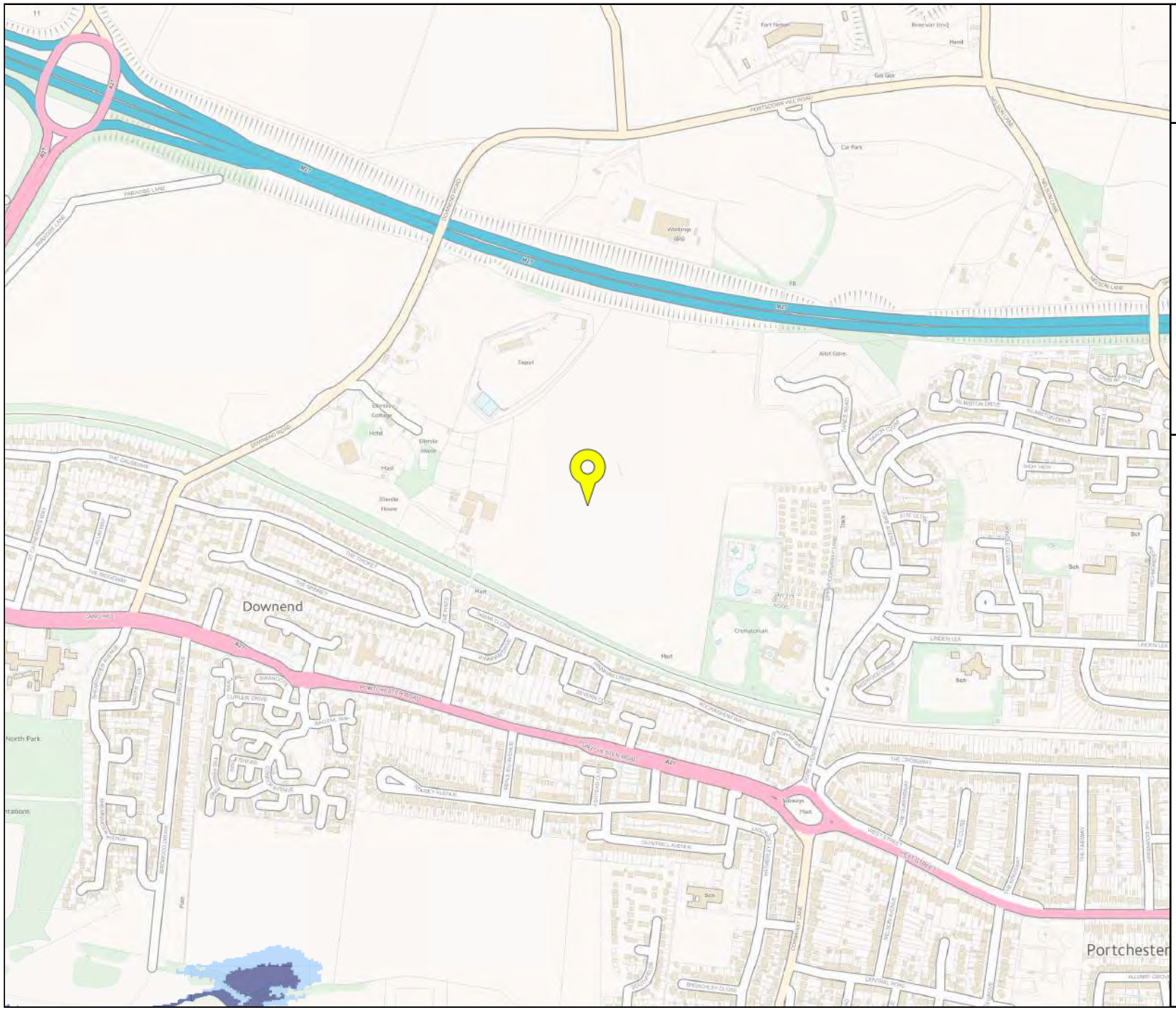
Client:

Survey Location:

Survey type:	Scale:
Drawing ref:	Date:
Drawn/QA:	Plot No.

APPENDIX D

Environment Agency Data



Environment Agency

Flood map for planning

Your reference
16-329

Location (easting/northing)
460325/106287

Scale
1:10000

Created
20 Jul 2020 16:25

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 100 200 300m

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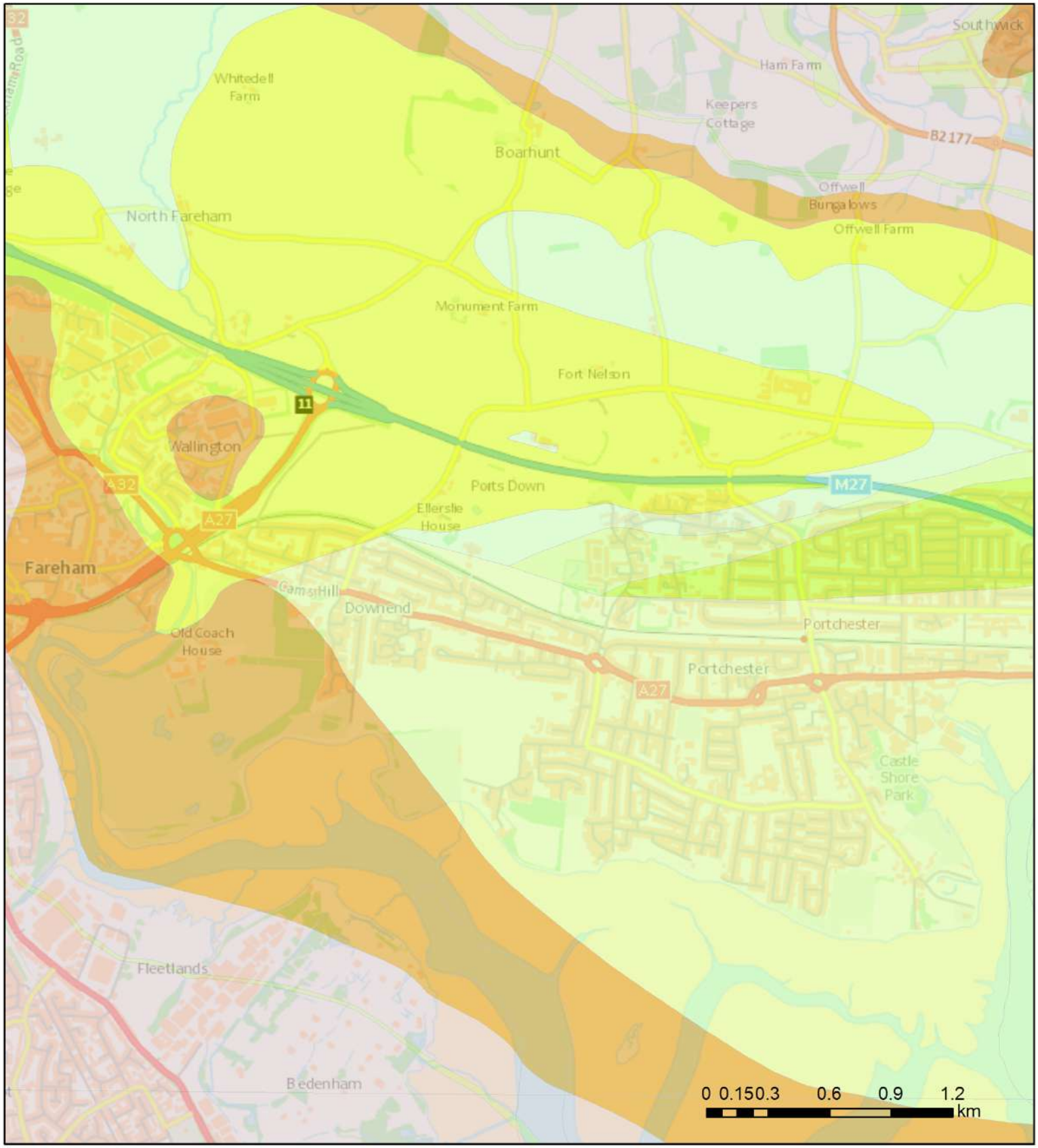
Extent of flooding from surface water

High Medium Low Very low

APPENDIX E

British Geological Survey Data

16-329 Bedrock Geology



Contains OS data © Crown Copyright and database right 2019

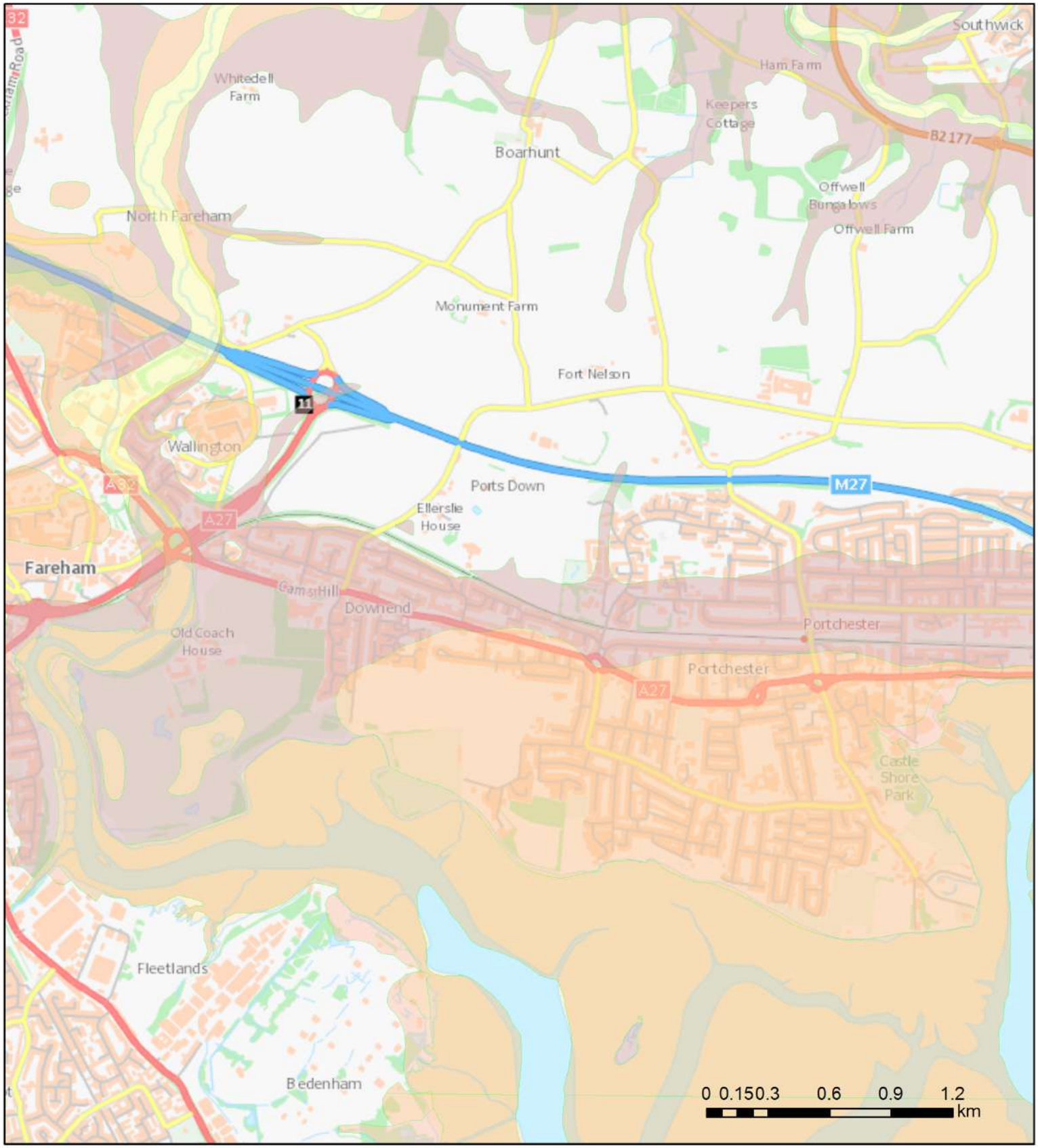
Geolndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Bedrock geology 1:50,000 scale

- LONDON CLAY FORMATION - CLAY, SILT AND SAND
- SPETISBURY CHALK MEMBER - CHALK
- LEWES NODULAR CHALK FORMATION, SEAFORD CHALK FORMATION, NEWHAVEN CHALK FORMATION, CULVER CHALK FORMATION AND PORTSDOWN CHALK FORMATION (UNDIFFERENTIATED) - CHALK
- BOGNOR SAND MEMBER - SAND
- TARRANT CHALK MEMBER - CHALK
- WITTERING FORMATION - SAND
- PORTSDOWN CHALK FORMATION - CHALK
- LAMBETH GROUP - CLAY, SILT AND SAND
- WITTERING FORMATION - SAND, SILT AND CLAY
- NEWHAVEN CHALK FORMATION - CHALK

16-329 Superficial Deps



Contains OS data © Crown Copyright and database right 2019

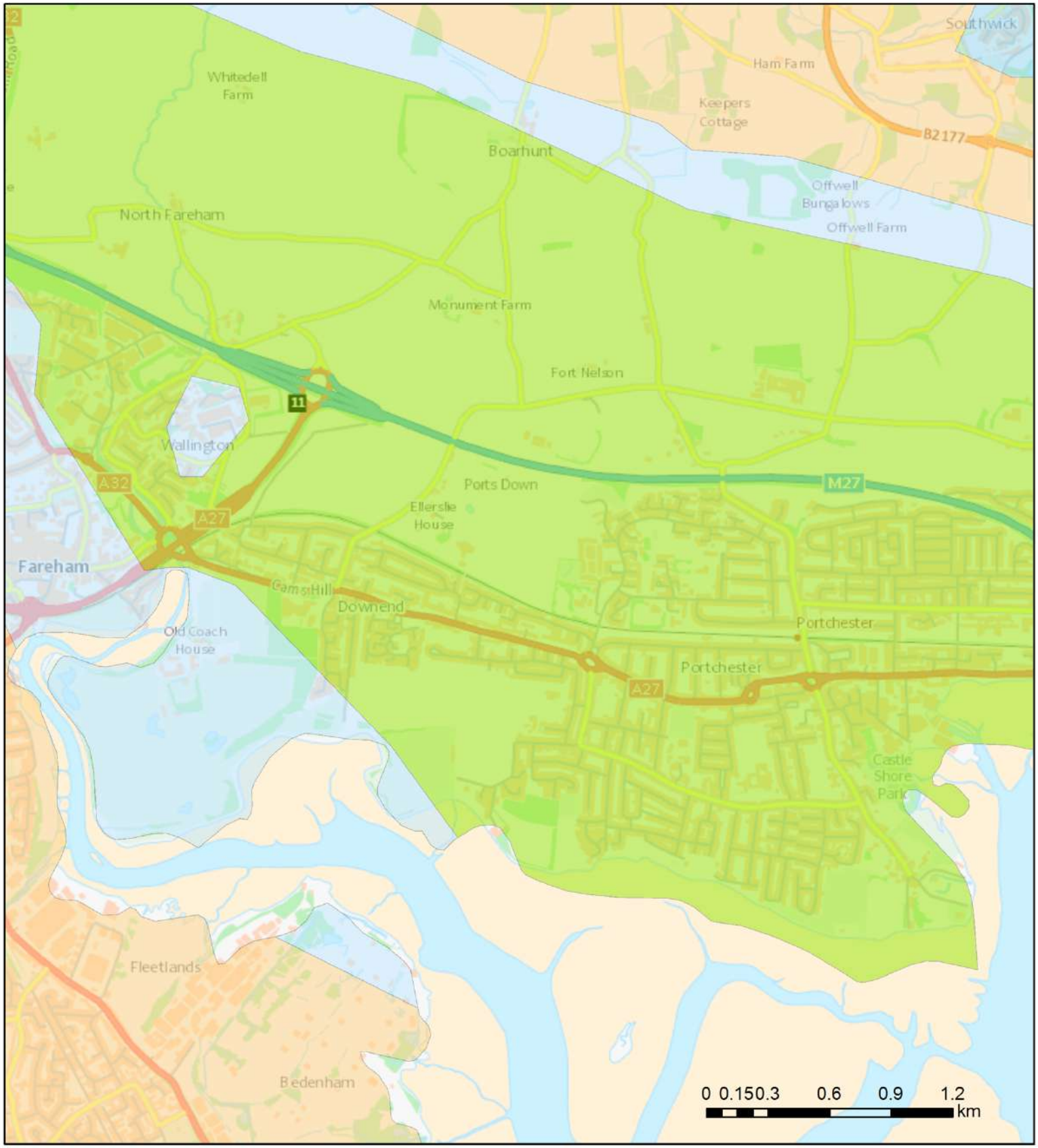
Geolndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Superficial deposits 1:50,000 scale

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- RAISED MARINE DEPOSITS - SAND AND GRAVEL
- HEAD - CLAY, SILT, SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 1 - SAND AND GRAVEL
- BEACH AND TIDAL FLAT DEPOSITS (UNDIFFERENTIATED) - CLAY, SILT, SAND AND GRAVEL

16-329 Hydrogeology



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Geolndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Hydrogeology 1:625,000 scale

Aquifers with significant intergranular flow

- **Highly productive aquifer**
- **Moderately productive aquifer**
- **Low productivity aquifer**

Aquifers in which flow is virtually all through fractures and other discontinuities

- **Highly productive aquifer**
- **Moderately productive aquifer**
- **Low productivity aquifer**
- **Rocks with essentially no groundwater**

APPENDIX F

Ground Investigation Extracts

10th July 2020

Our ref: GE18989/GR03/200710

Russell Brewer
Miller Homes
Unit 3 Faraday Office Park
Rankine Road
Basingstoke
RG24 8QB

Dear Russell,

RE: Winnham Farm, Downend Road, Portchester

Further to your instruction, please find the preliminary findings presented below for the intrusive investigation undertaken on the western portion of this site as discussed and agreed with Miller Homes and the landowner.

Background

The site comprises farmland on chalk downland which falls towards the south and which is proposed to be developed for housing. The proposed development layout includes for the positioning of stormwater attenuation basins at four locations close to the site's southern boundary, this also comprising the crest of a cutting within which a main railway line is located.

The intrusive investigation undertaken on the western area included the following:

- Attendance of a specialist surveyor to undertake a buried utilities clearance survey using radiodetection and ground penetrating radar techniques. The survey would include capture of co-ordinates and levels of exploratory holes using GPS surveying.
- Attendance of a Geo-Environmental Engineer to supervise the intrusive investigation, undertake sampling, in-situ testing and logging of recovered soils from exploratory holes.
- Trial pitting for soakage testing, investigation of ground conditions in proximity to the railway cutting and along the approximate proposed access road alignment;
- Trial pit soakage tests (to BRE DG365) in the locations of the two westernmost attenuation basins;
- Dynamic sampler boreholes and super heavy dynamic in the vicinity of the proposed attenuation basins;
- Geotechnical testing to inform road design and geotechnical assessment.

Ground Conditions

The ground conditions encountered were generally as anticipated form published mapping and previous phases of investigation on this site and comprised a mantle of Topsoil overlying Head Deposits, with the underlying Chalk proven in some exploratory holes.

The depth to and condition of the Chalk was variable, as encountered during previous phases of investigation over the wider site.

A summary of ground conditions is presented in table 1 below, but given that the conditions varied between the exploratory holes, reference should be made to the individual exploratory hole logs for further information.

Top (m bgl)	Base (m bgl)	Description
0	0.1 – 0.2	TOPSOIL: Brown sandy gravelly clay with roots
0.1 – 0.2	0.1 – 5.0+	HEAD DEPOSITS: Brown sandy gravelly CLAY. Soft to vert stiff, generally stiff to very stiff consistency. Variable proportions of sand and flint gravel; Brown clayey flint GRAVEL; Yellow and orange-brown fine SAND with chalk gravel
0.7 – 5.0+	5.0+	CHALK: Structureless CHALK composed of off-white very weak to weak low density gravel sized chalk clasts and silt chalk matrix with occasional flint nodules. CIRIA Grade Dm, Dc and Dc-C.

Table 1 Summary of ground conditions encountered in exploratory holes

Dynamic probing was undertaken adjacent to each of the dynamic sampler boreholes. Whilst the blow counts varied with depth in each location, this variation was considered likely to reflect the variation in soil composition rather than indicate the presence of loose or voided ground which might be associated with solution features in the Chalk.

Copies of the exploratory hole logs are enclosed, together with site plans.

Groundwater Conditions

Groundwater was not encountered within the exploratory holes during the course of the intrusive investigation.

Groundwater levels can vary over time such as in response to heavy rainfall, during winter months or the like. As such, perched water and/or groundwater could be present at different times.

Trial Pit Soakage Testing

Soakage testing was undertaken in trial pits TP01 and TP02 in accordance with BRE DG365. The infiltration rates derived from the testing are presented in Table 2.

Location	Infiltration rate (m/s)		
	Test cycle 1	Test cycle 2	Test cycle 3
TP01	6.9×10^{-4}	3.2×10^{-4}	3.0×10^{-4}
TP02	4.4×10^{-6}	2.3×10^{-6}	2.3×10^{-6}

Table 2 Summary of infiltration rates from soakage testing

The testing in TP02 was much slower than TP01, such that whilst test cycle 2 ran overnight to a fully drained state in TP02, test cycles 1 and 3 required extrapolation of the 75% drained (25% full time). The extrapolation utilised the full test plot from test cycle 2, the final data point for which was the pit being dry and thus using this as a reference point is considered a conservative approach. In addition, estimating the infiltration rate from the measured test range for test cycles 1 and 3, as permitted under DG365, derived better rates thus further supporting that the approach used to extrapolate provides a conservative method of estimating the infiltration rate from TP02.

It should be noted that whilst infiltration may be achievable at these locations, the implications for stability of the adjacent railway cutting are still to be determined and thus the drainage strategy may be subject to revision depending on the outcome of the stability assessment and any response from Network Rail.

Geotechnical testing

Geotechnical laboratory testing is currently underway and results will be presented in due course.

Closure

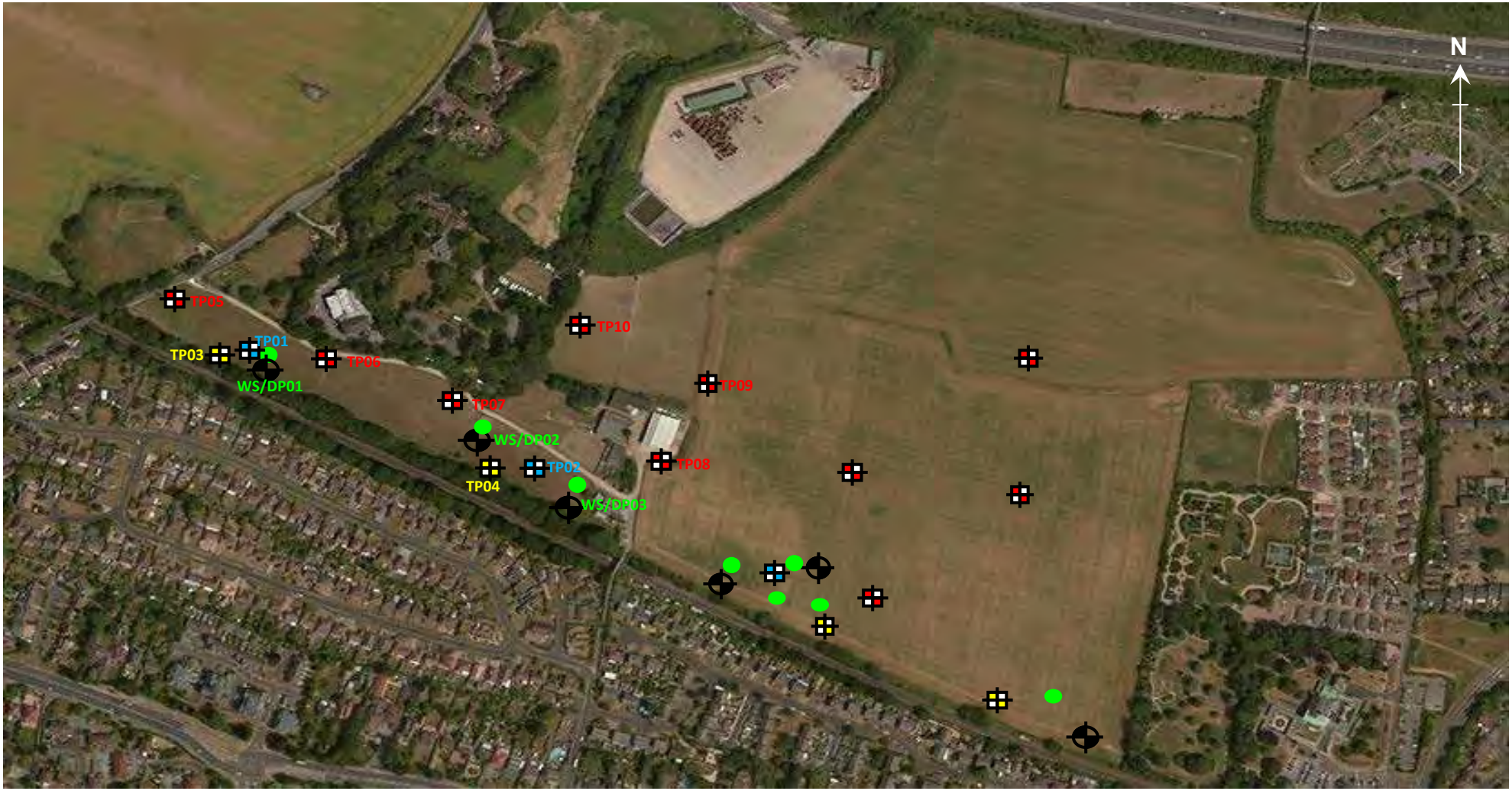
We trust we have interpreted your request correctly and provided sufficient information for your current requirements.

Should you have any queries please do not hesitate to contact us.

Yours sincerely
For and on Behalf of Geo-Environmental

GAVIN ROBERTS CGeol, BEng (Hons), MSc, FGS
Technical Director
gavin.roberts@gesl.net

Enc Figure 1 Site Location Plan
Figure 2 Exploratory Hole Location Plan
Exploratory hole logs
Soakage test results



Trial pit for soakage testing (assumed max c. 2m deep, 1-2m long, 0.6m wide)

Trial pit for geotechnical sampling (c.1-3m deep, 2m long, 0.6m wide)

Trial pit to inform geotechnical stability assessment (max c.3m deep, 2m long, 0.6m wide)

Small diameter (<100mm) borehole (max. 5m) deep)

Dynamic probe position (5m deep, <25mm diameter)

Project:	Land off Downend Road, Portchester PO16 8PX			**Title**	Exploratory Hole Location Plan
Client:	Miller Homes			**Geo-Environmental Services Ltd**	
Ref No:	GE18989	**Version:**	2	**Unit 7 Danworth Farm, Cuckfield Road**	
Drawn:	GR/WH	**Date:**	06/07/2020	**Hurstpierpoint, West Sussex BN6 9GL**	
Figure:	2	**Scale:**	Not To Scale	**+44(0)1273 832972 www.gesl.net**	Geo-Environmental

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP01 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 459821.87 - 106333.94 Level: 24.08	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 2.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.15	23.93		Turf over stiff brown slightly sandy slightly gravelly clay with abundant rootlets. Gravel is sub-angular to rounded flint
	0.50 0.50	B PP	PP=3.5kg/cm2				Very stiff brown slightly sandy gravelly CLAY with frequent rootlets. Gravel is sub-rounded to rounded flint. Single brick fragment
				0.73	23.35		Structureless CHALK composed of off-white gravelly SILT. Gravel is sub-rounded to sub-angular weak low density chalk with rare sub-angular flint. Mixed locally with orangish brown clay. CIRIA Grade Dm
	1.00	D					
				1.35	22.73		Structureless CHALK composed of off-white gravelly SILT. Gravel is sub-rounded to sub-angular weak low density chalk with rare sub-angular flint gravel and cobbles. CIRIA Grade Dm, possibly grading to Dc
	1.50	D					
	1.60	B					
	1.80	D					
	2.00	D		2.00	22.08		End of Pit at 2.00m

1 2 3 4 5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP02 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 460040.08 - 106237.63 Level: 26.02	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 2.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	25.92		Turf over stiff brown slightly sandy gravelly clay with abundant rootlets. Gravel is rounded flint
							Stiff brown very gravelly CLAY with frequent rootlets. Gravel is rounded flint
	0.50 0.50	B PP	PP=2.7kg/cm2	0.48	25.54		Stiff orangish brown slightly sandy very gravelly CLAY with occasional rootlets. Gravel is sub-rounded to rounded flint
	1.00	D					
	1.50 1.50	D PP	PP=2.9kg/cm2	1.46	24.56		Stiff to firm brownish orange sandy gravelly CLAY. Gravel is sub-rounded to rounded flint
				1.60	24.42		Firm brownish orange slightly sandy slightly gravelly CLAY with occasional black specks. Gravel is rounded flint
	2.00 2.00	D PP	PP=0.9kg/cm2	2.00	24.02		End of Pit at 2.00m

1
2
3
4
5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP03 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 459796.45 - 106335.36 Level: 23.20	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 3.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.12	23.08		Turf over stiff brown slightly sandy gravelly clay with abundant rootlets. Gravel is sub-rounded to rounded flint
				0.37	22.83		Very stiff brown slightly sandy slightly gravelly CLAY with abundant rootlets and frequent roots (10mm). Gravel is rounded flint
	0.50 0.50	D PP	PP=3.5kg/cm2				Soft orangish brown slightly gravelly sandy CLAY with frequent rootlets. Gravel is rounded flint
	1.00	B		0.90	22.30		Brown clayey GRAVEL with frequent cobbles. Clasts are sub-rounded to rounded flint
	1.70	B		1.40	21.80		Firm whitish brown slightly sandy gravelly CLAY. Gravel is rounded flint with frequent weak sub-angular to sub-rounded chalk. Rare roots (5mm)
	2.00	D					
	2.50	D		2.30	20.90		Structureless CHALK composed of off-white slightly gravelly SILT. Gravel is sub-rounded to sub-angular weak low density chalk with occasional orange staining and rare black specks. Occasional sub-rounded flint gravel. CIRIA Grade Dm
	2.80	D					
	3.00	B		3.00	20.20		End of Pit at 3.00m

1 2 3 4 5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP04 Sheet 1 of 1
Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 460011.39 - 106234.66 Level: 24.98	Date 02/07/2020
Location:	Off Downend Road, Portchester	Dimensions (m):	Scale 1:25
Client:	Miller Homes	Depth 3.00	Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.12	24.86		Turf over stiff brown slightly sandy gravelly clay with abundant rootlets. Gravel is rounded flint
				0.26	24.72		Stiff brown very gravelly CLAY with frequent rootlets and occasional cobbles. Clasts are rounded flint
	0.50	B					Stiff orangish brown very gravelly CLAY with occasional rootlets. Gravel is rounded flint
	0.75	B		0.80	24.18		
	1.00 1.00	D PP	PP=3.2kg/cm2				Very stiff brownish orange sandy gravelly CLAY with occasional rootlets and a single root (25mm diameter). Occasional black specks. Gravel is rounded flint
	1.50 1.50	D PP	PP=3.7kg/cm2				
				1.70	23.28		Stiff becoming very stiff brownish orange slightly gravelly sandy CLAY with occasional rootlets and black specks. Gravel is rounded flint
	2.00 2.00	D PP	PP=2.9kg/cm2				
	2.50 2.60	D PP	PP=3.6kg/cm2	2.50	22.48		Very stiff brownish orange sandy CLAY with rare gravel. Gravel is rounded flint
	3.00 3.00	D PP	PP=3kg/cm2	3.00	21.98		End of Pit at 3.00m

Water Strikes

Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP05 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 459728.31 - 106389.01 Level: 24.91	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 1.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.13	24.78		Turf over very stiff brown slightly sandy slightly gravelly clay with abundant rootlets. Gravel is rounded flint
	0.50 0.50	B PP	PP=4kg/cm2				Very stiff brown slightly sandy gravelly CLAY with frequent rootlets. Gravel is rounded flint
				0.80	24.11		Very stiff whitish brown slightly sandy gravelly CLAY. Gravel is rounded flint with frequent sub-angular weak chalk
	1.00	D		1.00	23.91		End of Pit at 1.00m

1
2
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5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP06 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 459872.67 - 106335.51 Level: 26.81	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 1.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.10	26.70		Turf over very stiff brown slightly sandy slightly gravelly clay with abundant rootlets. Gravel is rounded flint
	0.30	D					Very stiff brown desiccated slightly sandy slightly gravelly CLAY with frequent rootlets. Gravel is rounded flint
	0.50 0.50	B D		0.48	26.32		Structureless CHALK composed of off-white gravelly SILT of chalk. Gravel sized clasts of weak low density chalk with frequent orange staining and occasional rounded flint. CIRIA Grade Dm/Dc
	1.00	D		1.00	25.80		End of Pit at 1.00m

1
2
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Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP07 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 459956.08 - 106312.51 Level: 28.64	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 1.20	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.12	28.52		Turf over very brown very stiff gravelly clay with abundant rootlets. Gravel is sub-rounded to rounded flint
				0.42	28.22		Stiff brown slightly sandy gravelly CLAY with frequent rootlets. Gravel is rounded flint
	0.40	D					Very stiff brownish orange slightly sandy very gravelly CLAY with frequent rootlets and occasional black specks
	0.50	B					
	1.00	D					
	1.00	PP	PP=3kg/cm2				
				1.20	27.44		End of Pit at 1.20m

1
2
3
4
5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP08 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 460134.19 - 106246.55 Level: 29.37	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 1.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.20	29.17		Crop over very stiff brown slightly sandy slightly gravelly clay with frequent rootlets. Gravel is sub-rounded to sub-angular flint
	0.50	B					Firm orangish brown slightly sandy gravelly CLAY. Gravel is rounded flint
	0.75	PP	PP=1.2kg/cm2				
	1.00	D		1.00	28.37		End of Pit at 1.00m

1
2
3
4
5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP09 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 460175.35 - 106318.38 Level: 33.80	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 1.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.18	33.62		Crop over stiff brown slightly sandy gravelly CLAY with abundant rootlets. Gravel is rounded flint
	0.50 0.50	B PP	PP=0.7kg/cm2				Firm orangish brown sandy gravelly CLAY with frequent rootlets. Gravel is rounded flint with occasional cobbles
	1.00 1.00	D PP	PP=0.9kg/cm2	1.00	32.80		End of Pit at 1.00m

1
2
3
4
5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Trial Pit Log	TrialPit No TP10 Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 460064.73 - 106363.67 Level: 35.25	Date 02/07/2020
Location:	Off Downend Road, Portchester		Dimensions (m): Depth 1.00	Scale 1:25
Client:	Miller Homes			Logged WH

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
				0.13	35.12		Turf over stiff brown slightly gravelly sandy clay with abundant rootlets. Gravel is rounded flint
				0.39	34.86		Stiff brown slightly sandy gravelly CLAY with frequent rootlets. Gravel is rounded flint
	0.50	B					Firm orangish brown sandy gravelly CLAY with rare rootlets. Gravel is rounded flint with occasional cobbles
	1.00 1.00	D PP	PP=2.5kg/cm2	1.00	34.25		End of Pit at 1.00m

1
2
3
4
5

Water Strikes	
Depth Strike	Rose to (mbgl)

Remarks Dry

Stability

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Borehole Log	Borehole No. **WS01** Sheet 1 of 1
Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords: 459829E - 106320N	Hole Type WLS
Location:	Off Downend Road, Portchester	Level: 24.07	Scale 1:25
Client:	Miller Homes	Dates: 02/07/2020	Logged By TM

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	24.02		Turf topped brownish silty fine SAND. Some coarse - fine gravel flint. Frequent rootlets Brownish silty fine SAND. Frequent medium - coarse gravel flints. Rare plastic fragments.
					0.50	23.56		Stiff brownish slightly silty CLAY. Occasional coarse sand - fine gravel flint.
		0.75	PP	4.5kg/cm2	0.80	23.26		Structureless CHALK coposed of a light brown silty chalk matrix with abundant very weak fine gravel clasts of chalk. Abundant coarse gravel flint. CIRIA Grade Dc
					2.10	21.96		White CHALK with brown staining on joint faces. Rare medium gravel flint at 2.5m. Possibly CIRIA Grade Dc to C
					3.20	20.86		White CHALK with brown staining on joint faces. Rare flint at 4.5m and 5.0m. Possibly CIRIA Grade Dc to C
					5.00	19.07		End of Borehole at 5.00m

Casing		Water Strikes (mbgl)		Chiselling (mbgl)	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to

Remarks

Dry

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	Borehole Log	Borehole No. **WS02** Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords:	459986E - 106265N	Hole Type WLS
Location:	Off Downend Road, Portchester		Level:	26.63	Scale 1:25
Client:	Miller Homes		Dates:	02/07/2020	Logged By TM

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05	26.58		Turf topped light grey brown silty sandy clay with frequent rootlets 1mm dia. (Grass).	
								Brown very silty SAND with some gravel of sub-angular to sub-rounded flint with rare medium-coarse iron nodules.	
					0.40	26.23		Stiff dark brown clayey SILT	
		0.50	PP	4.0kg/cm2					1
					1.10	25.53		Stiff light orangish brown clayey SILT with coarse sand - fine gravel of chalk	
		1.20	PP	4.2kg/cm2					
					1.30	25.33		Stiff orange-brown CLAY with frequent iron staining	
		1.50	PP	4.0kg/cm2					
					1.70	24.93		Dark orangish brown clayey coarse flint GRAVEL	
					2.00	24.63		Stiff orange-brown CLAY	2
		2.10	PP	4.0kg/cm2					
					2.20	24.43		Yellow to orangish brown slightly clayey fine SAND	
					2.50	24.13		Light yellowish fine SAND with coarse gravel of very weak chalk. Weathered chalk soil.	
					2.90	23.73		Yellowish brown silty sandy gravel of CHALK	3
					3.30	23.33		Structureless CHALK composed of a light brown silty matrix and abundant gravel clasts of very weak chalk and abundant flint of gravel size. CIRIA Grade Dc	4
					4.10	22.53		White CHALK. Partial loss of structure due to sampling technique but some joint faces visible and locally stainiend orange-brown or black flecked. Possible CIRIA Grade C	
					5.00	21.63		End of Borehole at 5.00m	5

Casing		Water Strikes (mbgl)		Chiselling (mbgl)	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to

Remarks

Dry

AGS

Geo-Environmental	Unit 7, Danworth Farm Hurstpierpoint BN6 9GL www.gesl.net	# Borehole Log	Borehole No. **WS03** Sheet 1 of 1

Project Name:	Winnham Farm, Portchester	Project No. GE18989	Co-ords:	460069E - 106206N	Hole Type WLS
Location:	Off Downend Road, Portchester		Level:	23.73	Scale 1:25
Client:	Miller Homes		Dates:	02/07/2020	Logged By TM

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.05	23.68		Grass over light grey brown clayey SILT with frequent rootlets.
								Stiff rown very silty CLAY with fine to coarse sub angular flint gravel.
		0.50	D					
		1.50	D					
					1.80	21.93		Stiff orangish brown silty CLAY with occasional flint gravel. Some localised iron staining.
		2.10	PP	3.5kg/cm2				
		2.50	D					
		2.80	PP	3.5kg/cm2				
					3.30	20.43		Brown clayey flint GRAVEL
		3.50	D					
					3.60	20.13		Very stiff orangish brown silty CLAY with occasional flint gravel. Some localised iron staining.
		4.00	PP	3.5kg/cm2				
		4.50	D					
		4.50	PP	4.5kg/cm2				
		4.90	PP	3.2kg/cm2				
					5.00	18.73		End of Borehole at 5.00m

Casing		Water Strikes (mbgl)		Chiselling (mbgl)	
Diameter	Depth (m)	Depth Strike	Rose to	Depth from	Depth to

Remarks

Dry

AGS

Geo-Environmental	Soakaway Test Results (after BRE Digest 365)	Geo-EnvironmentalServices Limited Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net

Project Name :	Winnham Farm, Portchester	**Job No. :**	GE18989
Client :	Miller Homes	**Date :**	02/07/2020

Pit reference	**TP01**
Pit depth (m)	2.05
Pit width (m)	0.50
Pit length (m)	1.60
Depth to standing water (m)	

Test 1

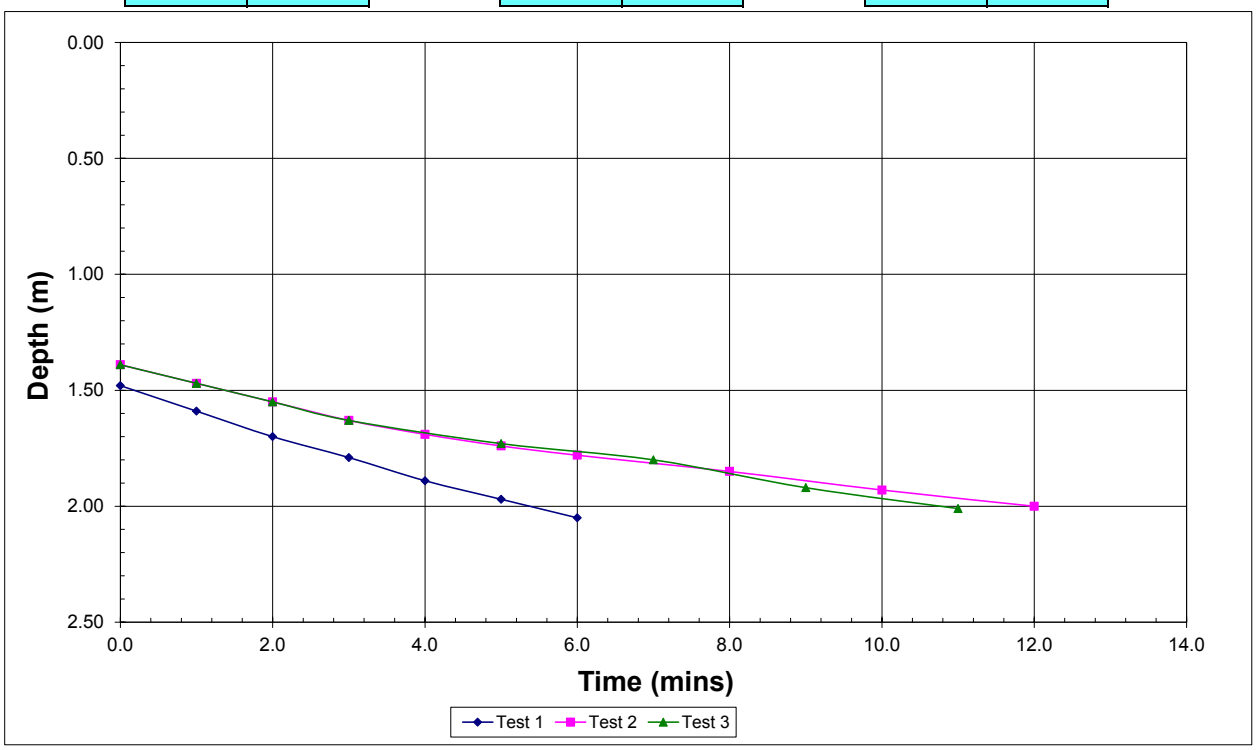
Time (min)	Depth (m)
0.0	1.48
1.0	1.59
2.0	1.70
3.0	1.79
4.0	1.89
5.0	1.97
6.0	2.05

Test 2

Time (min)	Depth (m)
0.0	1.39
1.0	1.47
2.0	1.55
3.0	1.63
4.0	1.69
5.0	1.74
6.0	1.78
8.0	1.85
10.0	1.93
12.0	2.00

Test 3

Time (min)	Depth (m)
0.0	1.39
1.0	1.47
2.0	1.55
3.0	1.63
5.0	1.73
7.0	1.80
9.0	1.92
11.0	2.01



Max. depth (m)	2.05	2.05	2.05
Effective depth (m)	0.57	0.66	0.66
75% effective depth (m)	1.62	1.56	1.56
50% effective depth (m)	1.77	1.72	1.72
25% effective depth (m)	1.91	1.89	1.89
t75 (min)	1.50	2.20	2.20
t50 (min)	2.80	4.90	4.90
t25 (min)	4.25	8.50	9.00
Vp 75-25	0.23	0.26	0.26
ap 50	1.997	2.186	2.186
tp 75-25	2.75	6.30	6.80

Soil infiltration rate (m/s)	**6.9E-04**	**3.2E-04**	**3.0E-04**
Soil infiltration rate (mm/hr)	**2.49E+03**	**1.15E+03**	**1.07E+03**

Geo-Environmental	Soakaway Test Results (after BRE Digest 365)	Geo-EnvironmentalServices Limited Unit 7 Danworth Farm, Cuckfield Road, Hurstpierpoint, West Sussex BN6 9GL +44(0)1273 832972 www.gesl.net

Project Name :	Winnham Farm, Portchester	**Job No. :**	GE18989
Client :	Miller Homes	**Date :**	02/07/2020

Pit reference	**TP02**
Pit depth (m)	2.00
Pit width (m)	0.50
Pit length (m)	1.60
Depth to standing water (m)	

Test 1

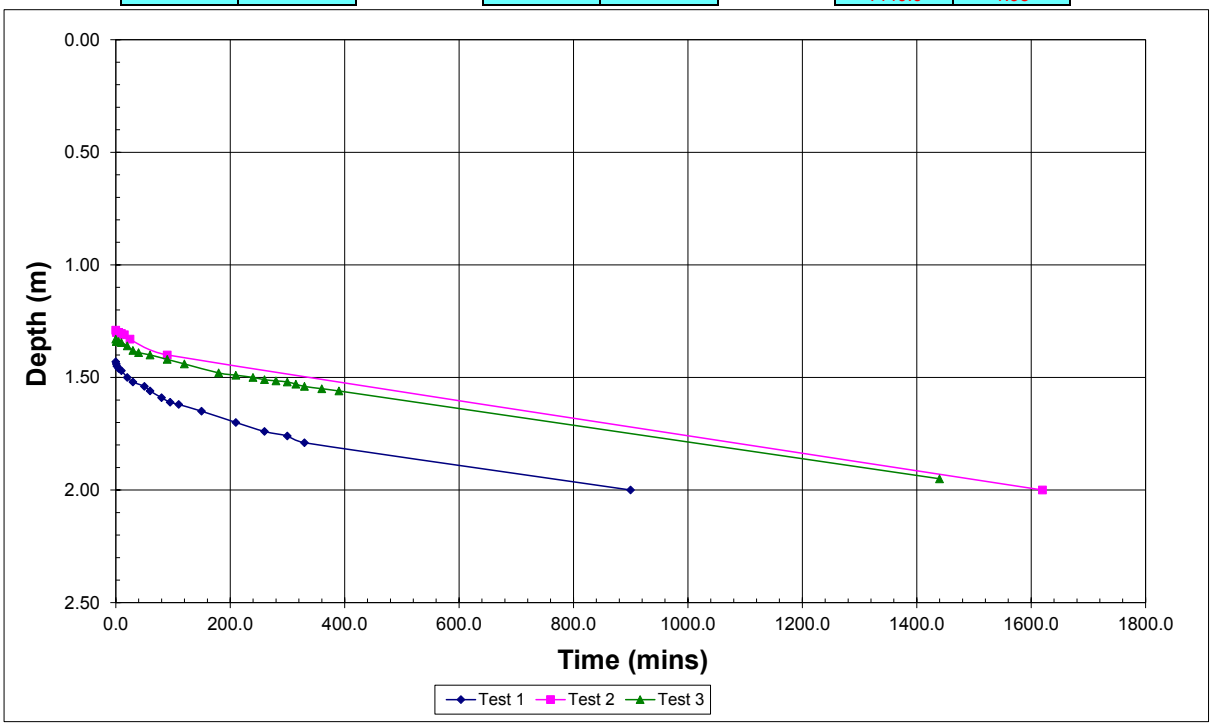
Time (min)	Depth (m)
0.0	1.43
1.0	1.44
2.0	1.45
5.0	1.46
10.0	1.47
20.0	1.50
30.0	1.52
50.0	1.54
60.0	1.56
80.0	1.59
95.0	1.61
110.0	1.62
150.0	1.65
210.0	1.70
260.0	1.74
300.0	1.76
330.0	1.79
900.0	2.00

Test 2

Time (min)	Depth (m)
0.0	1.29
1.0	1.30
2.0	1.30
5.0	1.30
10.0	1.31
15.0	1.31
25.0	1.33
90.0	1.40
1620.0	2.00

Test 3

Time (min)	Depth (m)
0.0	1.33
1.0	1.34
2.0	1.34
5.0	1.34
10.0	1.35
20.0	1.36
30.0	1.38
40.0	1.39
60.0	1.40
90.0	1.42
120.0	1.44
180.0	1.48
210.0	1.49
240.0	1.50
260.0	1.51
280.0	1.52
300.0	1.52
315.0	1.53
330.0	1.54
360.0	1.55
390.0	1.56
1440.0	1.95

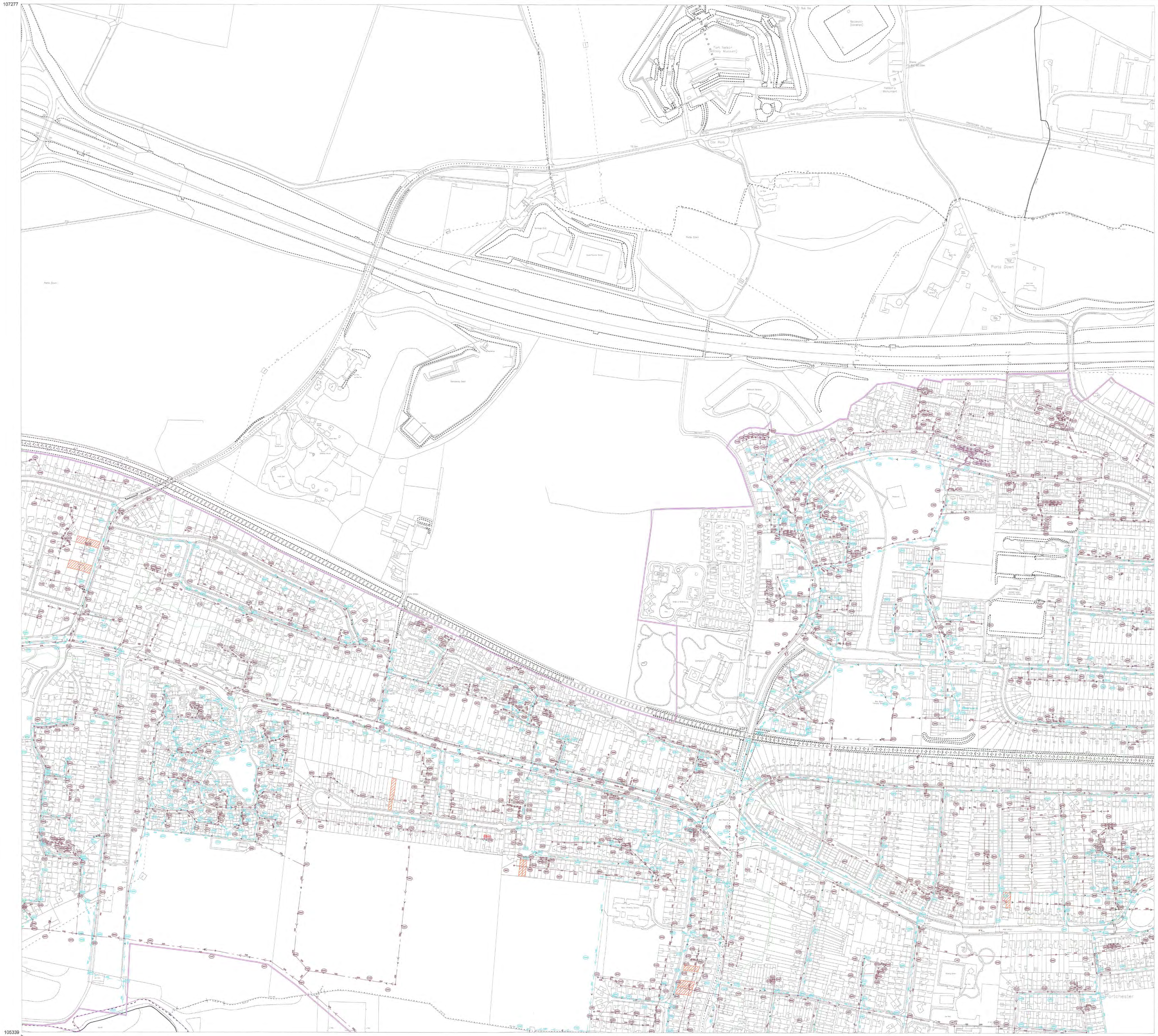


	Test 1	Test 2	Test 3
Max. depth (m)	2.00	2.00	2.00
Effective depth (m)	0.57	0.71	0.67
75% effective depth (m)	1.57	1.47	1.50
50% effective depth (m)	1.72	1.65	1.67
25% effective depth (m)	1.86	1.82	1.83
t75 (min)	66.00	260.00	340.00
t50 (min)	240.00	800.00	800.00
t25 (min)	500.00	1160.00	1220.00
Vp 75-25	0.23	0.28	0.27
ap 50	1.997	2.291	2.207
tp 75-25	434.00	900.00	880.00

Soil infiltration rate (m/s)	**4.4E-06**	**2.3E-06**	**2.3E-06**
Soil infiltration rate (mm/hr)	**1.58E+01**	**8.26E+00**	**8.28E+00**

APPENDIX G

Southern Water Records



Node	Cover	Invert	Size	Material	Shape	
0001X	21.051	18.981	150	UNK	CIRC	*
0001X	15.095	11.835	225	UNK	CIRC	*
0002X	14.967	12.627	150	UNK	CIRC	
0003X			225	UNK	CIRC	
0004X	14.979	11.809	150	UNK	CIRC	
0005X	14.743	11.253	225	UNK	CIRC	
0006X	13.198		225	UNK	CIRC	
0050X			225	UNK	CIRC	*
0050X	20.639	17.329	225	UNK	CIRC	*
0051X	20.667	18.877	150	UNK	CIRC	*
0051X	15.095		225	UNK	CIRC	*
0052X	14.743	12.573	225	UNK	CIRC	*
0052X	16.89		375	UNK	CIRC	*
0053X	13.198		225	UNK	CIRC	*
0053X			375	UNK	CIRC	*
0101X	17.926	15.036	225	UNK	CIRC	*
0101X	24.077	22.797	150	UNK	CIRC	*
0102X	15.339	14.049	150	UNK	CIRC	
0150X	17.926	16.096	225	UNK	CIRC	*
0150X	23.874	22.594	UNK	UNK	CIRC	*
0151X	24.184	22.814	150	UNK	CIRC	
0152X	25.157		150	UNK	CIRC	
0153X	27.015	25.765	150	UNK	CIRC	
0201X	33.231	30.571	150	UNK	CIRC	
0250X	29.016		150	UNK	CIRC	
0251X	29.212	28.552	150	UNK	CIRC	
0252X	32.638	30.558	375	UNK	CIRC	
0302X	6.971		150	UNK	CIRC	
0350X	6.927		750	UNK	CIRC	
0401X	7.344	5.424	225	UNK	CIRC	*
0401X	6.331	4.801	150	UNK	CIRC	*
0401X	47.221	45.991	150	UNK	CIRC	*
0402X	51.357	49.907	150	UNK	CIRC	*
0402X	6.528	4.808	225	UNK	CIRC	*
0402X			100	VC	CIRC	*
0403X			100	VC	CIRC	*
0403X	50.706	49.036	150	UNK	CIRC	*
0405X			UNK	UNK	CIRC	
040DX			UNK	UNK	CIRC	*
040DX			UNK	UNK	CIRC	*
0450X	6.389	3.869	525	UNK	CIRC	
045CX	46.502	45.282	150	UNK	CIRC	
046CX	45.075	43.805	150	UNK	CIRC	
0501X	6.318	3.858	150	UNK	CIRC	*
0501Y	6.318		150	UNK	CIRC	*
0501X			150	UNK	CIRC	*
0502X			UNK	UNK	CIRC	*
0502X	6.352	4.112	150	UNK	CIRC	*
0503X	6.606	4.636	150	UNK	CIRC	*
0503X			150	UNK	CIRC	*
0504X			UNK	UNK	CIRC	
0505X			UNK	UNK	CIRC	
0506X			UNK	UNK	CIRC	
0550X	5.85	4.46	375	UNK	CIRC	
0551X	6.284		225	UNK	CIRC	
0552X			375	UNK	CIRC	
055ZX			450	UNK	CIRC	
0601X	6.196		150	UNK	CIRC	
0602X	5.805	4.165	UNK	UNK	CIRC	
0603X			100	UNK	CIRC	
0604X	5.45	3.758	225	UNK	CIRC	
0605X	5.45	3.633	225	UNK	CIRC	
0606X	5.45	3.569	225	UNK	CIRC	
0607X			225	UNK	CIRC	
060DX			150	UNK	CIRC	
0650X	6.246	5.176	175	UNK	CIRC	
0701X	6.754	5.324	150	UNK	CIRC	*
0701X			150	UNK	CIRC	*
0702X	6.32	5.03	150	UNK	CIRC	*
0702X			150	UNK	CIRC	*
0703X			UNK	UNK	CIRC	
070ZX			150	UNK	CIRC	
0750X	6.323	5.363	150	UNK	CIRC	
0801X	7.865		150	UNK	CIRC	
0802X	8.659		150	UNK	CIRC	
0803X	10.885	8.225	300	UNK	CIRC	
080DX			150	UNK	CIRC	
0850X	7.792	6.502	225	UNK	CIRC	
0901X	12.195		300	UNK	CIRC	*
0901X	11.492	9.672	225	UNK	CIRC	*
0902X	13.879	12.169	150	UNK	CIRC	*
0902X	10.454	8.984	225	UNK	CIRC	*
0903X	10.351		UNK	UNK	CIRC	
0950X	13.838	13.348	150	UNK	CIRC	*
0950X	16.674	9.494	225	UNK	CIRC	*
0951X	10.573	9.223	150	UNK	CIRC	*
0951X	14.387	13.837	100	UNK	CIRC	*
0952X	14.271	13.481	150	UNK	CIRC	*
0952X	10.403		300	UNK	CIRC	*
0953X	10.63	9.9	300	UNK	CIRC	
0954X	11.492	10.042	225	UNK	CIRC	
1001X	15.459	13.169	150	UNK	CIRC	*
1001X	17.737		150	UNK	CIRC	*
1002X	20.388		150	UNK	CIRC	*
1002X			150	PF	CIRC	*
1003X			150	PF	CIRC	*
1003X	20.324	18.434	150	UNK	CIRC	*
1050X	16.55	15.36	300	UNK	CIRC	*
1050X	15.034	13.254	225	UNK	CIRC	*
1051X	18.481	17.101	150	UNK	CIRC	*
1051X	14.226	13.586	150	UNK	CIRC	*
1052X	20.109	18.469	150	UNK	CIRC	
1053X	19.553	18.293	150	UNK	CIRC	
1054X	21.011	19.051	150	UNK	CIRC	
1055X	16.951	16.071	150	UNK	CIRC	
1101X			UNK	UNK	CIRC	*
1101X	21.996		150	UNK	CIRC	*
1102X			UNK	UNK	CIRC	*
1102X			UNK	UNK	CIRC	*
1103X	25.094	22.664	150	UNK	CIRC	*
1103X			UNK	UNK	CIRC	*
110DX			UNK	UNK	CIRC	
1150X	22.312		150	UNK	CIRC	
1151X	22.338	21.028	150	UNK	CIRC	
1152X	23.38	21.85	150	UNK	CIRC	
1153X	23.692		150	UNK	CIRC	
1201X	28.929	27.289	150	UNK	CIRC	
1202X	31.985	29.945	150	UNK	CIRC	
1203X	33.902	31.682	150	UNK	CIRC	
1250X	31.218	30.078	150	UNK	CIRC	
1251X	33.59	31.81	375	UNK	CIRC	
1301X	6.18		150	UNK	CIRC	*
1301X	38.157		150	UNK	CIRC	*
1302X	39.43	37.89	150	UNK	CIRC	
1303X	38.67	37.32	150	UNK	CIRC	
1304X			UNK	VC	CIRC	
1305X			150	UNK	CIRC	
130ZX			225	UNK	CIRC	
1350X	36.847	35.187	225	UNK	CIRC	
135CX	40.091	38.481	225	UNK	CIRC	
1401X	5.434		150	UNK	CIRC	*
1401X	51.251	48.681	150	UNK	CIRC	*
1402X	46.673	45.203	150	UNK	CIRC	
1403X	46.065	43.715	150	UNK	CIRC	
1404X	50.727		150	UNK	CIRC	
1405X			UNK	UNK	CIRC	
1406X			UNK	UNK	CIRC	
1407X			UNK	UNK	CIRC	
1408X			UNK	UNK	CIRC	
1409X			UNK	UNK	CIRC	
140DX			UNK	UNK	CIRC	
1411X			UNK	UNK	CIRC	
1412X			UNK	UNK	CIRC	
1413X			UNK	UNK	CIRC	
1414X			UNK	UNK	CIRC	
1450X			UNK	UNK	CIRC	
1451X	46.392		150	UNK	CIRC	
1453X			UNK	UNK	CIRC	
145CX	48.456	46.626	150	UNK	CIRC	
1501X	7.972	6.382	225	UNK	CIRC	*
1501X	5.285	3.405	100	UNK	CIRC	*
1501X			150	UNK	CIRC	*
1502X	5.364	4.014	100	UNK	CIRC	*
1502X			150	UNK	CIRC	*
1503X			UNK	UNK	CIRC	
150DX			225	UNK	CIRC	
1601X	5.301	3.901	150	UNK	CIRC	*
1601X	9.04		225	UNK	CIRC	*
1602X	5.355	3.475	225	UNK	CIRC	
1603X	5.45	3.525	UNK	UNK	CIRC	
1604X			100	VC	CIRC	
1605X			100	VC	CIRC	
1606X			100	VC	CIRC	
1607X			100	VC	CIRC	
1608X			225	UNK	CIRC	
160ZX			225	UNK	CIRC	
1650X	5.281	4.651	225	UNK	CIRC	
1651X	5.318	4.558	225	UNK	CIRC	
1701X	9.761	7.811	225	UNK	CIRC	*
1701X	6.011	4.461	150	UNK	CIRC	*
1702X	6.616	5.516	150	UNK	CIRC	*
1702X	9.631	8.031	225	UNK	CIRC	*
1703X	9.906		225	UNK	CIRC	
1704X	9.621		150	UNK	CIRC	
1705X			150	UNK	CIRC	
1750X	9.545	8.425	150	UNK	CIRC	*
1750Y	7.622	5.652	150	UNK	CIRC	*
1751X	6.09	5.01	150	UNK	CIRC	*
1751X	9.524	7.994	150	UNK	CIRC	*
1801X	7.634	5.334	150	UNK	CIRC	*
1801X	10.218	8.518	225	UNK	CIRC	*
1802X	10.134		225	UNK	CIRC	*
1802X	8.371		150	UNK	CIRC	*
1803X	9.887	8.857	150	UNK	CIRC	
1804X			UNK	UNK	CIRC	
1805X			UNK	UNK	CIRC	
1806X			UNK	UNK	CIRC	
1807X			UNK	UNK	CIRC	
181DX			UNK	UNK	CIRC	

Node	Cover	Invert	Size	Material	Shape	
1850X	10.038	9.148	300	UNK	CIRC	
1851X	10.23	9.62	300	UNK	CIRC	
1852X	10.241	9.731	300	UNK	CIRC	
1853X	9.796	8.856	150	UNK	CIRC	
1854X	9.803	9.183	150	UNK	CIRC	
1901X			225	UNK	CIRC	*
1901X	11.577		300	UNK	CIRC	*
1902X	13.58	12.25	150	UNK	CIRC	*
1902X			UNK	UNK	CIRC	*
1903X	13.203	11.553	150	UNK	CIRC	*
1903X			UNK	UNK	CIRC	*
1950X			150	UNK	CIRC	*
1950X	13.509	12.579	150	UNK	CIRC	*
1951X	13.409		300	UNK	CIRC	*
1951X			150	UNK	CIRC	*
1952X	13.216	12.046	300	UNK	CIRC	*
1952X	13.584		150	UNK	CIRC	*
1953X			150	UNK	CIRC	
2001X	15.534	13.864	150	UNK	CIRC	*
2001X	17.501	15.911	150	UNK	CIRC	*
2002X	16.128	15.048	150	UNK	CIRC	
2003X			UNK	UNK	CIRC	
200DX			UNK	UNK	CIRC	
2050X	17.223	15.453	150	UNK	CIRC	*
2050X	15.589	14.189	150	UNK	CIRC	*
2051X	17.311	15.231	150	UNK	CIRC	
205ZX			225	UNK	CIRC	
2101X	22.476		UNK	UNK	CIRC	
2301X	45.322	43.552	150	UNK	CIRC	*
2301X	5.677		225	UNK	CIRC	*
2302X	5.933		225	UNK	CIRC	*
2302X	46.189	43.919	150	UNK	CIRC	*
2303X	45.578	43.918	150	UNK	CIRC	
2304X	46.154	44.044	150	UNK	CIRC	
2305X	38.266	35.156	150	UNK	CIRC	
2307X			UNK	UNK	CIRC	
2350X	5.654	5.014	150	UNK	CIRC	
235CX	45.89	44.51	UNK	UNK	CIRC	
2401Y	5.258	4.068	150	UNK	CIRC	*
2401X	5.258	3.768	150	UNK	CIRC	*
2402X	5.653	3.073	150	UNK	CIRC	*
2402X	50.012	49.282	150	UNK	CIRC	*
2403X	52.654	51.724	150	UNK	CIRC	
2404X			UNK	UNK	CIRC	
240DX			UNK	UNK	CIRC	
2450X	5.33	4.39	150	UNK	CIRC	
2500X			150	UNK	CIRC	
2501X	4.999		225	UNK	CIRC	
2502X	4.438		225	VC	CIRC	
2503X			225	VC	CIRC	
2601X			150	UNK	CIRC	
2602X	5.268		150	UNK	CIRC	
2603X			UNK	UNK	CIRC	
2604X			UNK	UNK	CIRC	
260DX			150	UNK	CIRC	
2650X	5.031	4.241	225	UNK	CIRC	
2651X	4.832	4.072	225	UNK	CIRC	
2652X	4.887	4.037	UNK	UNK	CIRC	
265DX			225	UNK	CIRC	
2701X	6.935		150	UNK	CIRC	*
2701X	9.957	8.857	150	UNK	CIRC	*
2702X	6.322		150	UNK	CIRC	*
2702X			225	UNK	CIRC	*
2703X			150	UNK	CIRC	*
2703X	10.035	8.805	225	UNK	CIRC	*
2704X	6.459	4.999	150	UNK	CIRC	*
2704X	10.087	9.027	225	UNK	CIRC	*
2705X	9.65	8.8	150	UNK	CIRC	*
2705X			150	UNK	CIRC	*
2706X	9.954	9.474	150	UNK	CIRC	*
2706X			UNK	UNK	CIRC	*
2707X			UNK	UNK	CIRC	
270DX			150	UNK	CIRC	
2750X	9.598		UNK	UNK	CIRC	*
2750X	6.835	6.455	150	UNK	CIRC	*
2751X	5.927	5.157	150	UNK	CIRC	
2752X	7.156	6.076	150	UNK	CIRC	
2801X	7.95		150	UNK	CIRC	*
2801X	10.59	8.2	225	UNK	CIRC	*
2802X	10.326	8.226	225	UNK	CIRC	*
2802X			150	UNK	CIRC	*
285CX	10.155		225	UNK	CIRC	
286CX	10.415	9.405	225	UNK	CIRC	
2901X	14.146	12.456	150	UNK	CIRC	*
2901X	11.189	8.989	300	UNK	CIRC	*
2902X	14.058	12.858	150	UNK	CIRC	
2903X	14.069	12.999	150	UNK	CIRC	
2904X	14.044	13.064	150	UNK	CIRC	
2905X	14.466	13.188	150	UNK	CIRC	
2906X	14.474	13.404	150	UNK	CIRC	
2907X			UNK	UNK	CIRC	
2950X	11.496	10.196	150	UNK	CIRC	
3001X			150	UNK	CIRC	*
3001X			UNK	PF	CIRC	*
3002X	15.813	14.503	150	UNK	CIRC	
3003X	16.083		150	UNK	CIRC	
3004X	15.972	14.032	150	UNK	CIRC	
3050X	17.575		375	UNK	CIRC	
3051X	17.308	14.278	300	UNK	CIRC	
3052X	18.212	16.512	225	UNK	CIRC	
3053X	21.229	19.539	225	UNK	CIRC	
3101X	25.527	24.107	150	UNK	CIRC	
3102X	25.571	24.661	150	UNK	CIRC	
3103X	25.595	24.255	UNK	UNK	CIRC	
3150X	24.909	23.429	225	UNK	CIRC	
3151X	25.274	23.664	225	UNK	CIRC	
3201X	32.87	31.92	150	UNK	CIRC	
3202X			UNK	UNK	CIRC	
3203X			UNK	UNK	CIRC	
3250X	35.428	33.278	150	UNK	CIRC	
3251X	33.206		225	UNK	CIRC	
325ZX			225	UNK	CIRC	
3301X	45.106	43.126	150	UNK	CIRC	
3302Y	5.284	2.894	225	UNK	CIRC	*
3302X	38.188	34.858	150	UNK	CIRC	*
3303X	44.777		150	UNK	CIRC	
3304X	40.544	37.954	150	UNK	CIRC	
3305X	41.872	40.922	150	UNK	CIRC	*
3305X			UNK	UNK	CIRC	*
3306X	39.609	38.339	150	UNK	CIRC	
3307X	45.774	43.374	150	UNK	CIRC	
3308X	43.395	40.825	150	UNK	CIRC	
3309X	38.391		150	UNK	CIRC	
330DX			100	VC	CIRC	*
330DX			225	UNK	CIRC	*
3310X			UNK	UNK	CIRC	
3311X			UNK	UNK	CIRC	
3313X			100	VC	CIRC	
3314X			100	VC	CIRC	
3315X			100	VC	CIRC	
331DX			150	UNK	CIRC	
3350X	5.279	4.549	150	UNK	CIRC	*
3350X	8.128	3.738	1050	UNK	CIRC	*
3401X	52.456	51.006	150	UNK	CIRC	*
3401X	4.458		150	UNK	CIRC	*
3402X	4.775	3.255	150	UNK	CIRC	*
3402X	51.585	49.645	150	UNK	CIRC	*
3403X			225	UNK	CIRC	*
3403X	48.615	46.37	150	VC	CIRC	*
3404X			100	UNK	CIRC	*
3404X	46.72	45.305	150	VC	CIRC	*
3405X			UNK	UNK	CIRC	
3406X			UNK	UNK	CIRC	
3407X			UNK	UNK	CIRC	
3408X			UNK	UNK	CIRC	
3409X			UNK	UNK	CIRC	
341DX			150	UNK	CIRC	
3450X	4.495	3.525	225	UNK	CIRC	
3451X	4.851	3.721	150	UNK	CIRC	
3501X	4.248		225	UNK	CIRC	*
3501X	49.145	47.725	150	VC	CIRC	*
3502X			225	UNK	CIRC	*
3502X	51.865	50.08	150	VC	CIRC	*
3503X	49.935	47.65	150	VC	CIRC	
3504X	50.98	47.35	150	VC	CIRC	*
3504X		2.83	300	UNK	CIRC	*
3505X	4.359	2.8	300	UNK	CIRC	*
3505X	50.85	47.275	150	VC	CIRC	*
3506X			UNK	UNK	CIRC	
3550X	4.524		225	UNK	CIRC	
3552X		2.51	300	UNK	CIRC	
355ZX			300	UNK	CIRC	
3601X	5.175	3.645	150	UNK	CIRC	*
3601X			225	UNK	CIRC	*
3602X	9.82	8.99	150	UNK	CIRC	
3603X			UNK	PF	CIRC	
3604X			UNK	PF	CIRC	
3605X			UNK	PF	CIRC	
3606X			UNK	UNK	CIRC	
3607X			UNK	UNK	CIRC	
360DX			225	UNK	CIRC	
361DX			UNK	UNK	CIRC	
362DX			225	UNK	CIRC	
3650Y	4.605		375	UNK	CIRC	*
3650X	4.605		300	UNK	CIRC	*
3650X	9.653	8.343	225	UNK	CIRC	*
3651X	5.063	3.643	225	UNK	CIRC	*
3651X	9.543	8.223	300	UNK	CIRC	*
365DX			300	UNK	CIRC	
365ZX			300	UNK	CIRC	
3701X	7.016		150	UNK	CIRC	
3702X	6.228	5.028	150	UNK	CIRC	
3703X			UNK	VC	CIRC	*
3703X	5.936		150	UNK	CIRC	*
3704X	6.186		150	UNK	CIRC	*
3704X			UNK	UNK	CIRC	*
3705X			UNK	UNK	CIRC	
3706X			UNK	UNK	CIRC	
3707X			UNK	UNK	CIRC	

Node	Cover	Invert	Size	Material	Shape	
3708X			UNK	UNK	CIRC	
3709X			UNK	UNK	CIRC	
3710X			150	VC	CIRC	
3713X			UNK	UNK	CIRC	
3714X			UNK	UNK	CIRC	
3750X	6.805	6.235	150	UNK	CIRC	*
3750X	9.29		300	UNK	CIRC	*
3751X	9.583		225	UNK	CIRC	*
3751X	5.858	4.618	150	UNK	CIRC	*
3752X	9.825	8.675	150	UNK	CIRC	
3753X	9.388	8.308	UNK	UNK	CIRC	
3754X	9.398	8.568	UNK	UNK	CIRC	
3755X	10.109	8.429	UNK	UNK	CIRC	
3801X	10.616	7.956	225	UNK	CIRC	
3802X	10.598		225	UNK	CIRC	
3803X	10.598		UNK	UNK	CIRC	
3804X			UNK	UNK	CIRC	
3805X	10.52		225	UNK	CIRC	
3850X	10.541	8.831	150	UNK	CIRC	
3851X	10.681		300	UNK	CIRC	
3852X	10.44	8.01	300	UNK	CIRC	
385CX	10.583	10.003	150	UNK	CIRC	
385DX			225	UNK	CIRC	
386CX	10.688	9.938	150	UNK	CIRC	
3901X	13.565	11.025	150	UNK	CIRC	*
3901X	11.46		300	UNK	CIRC	*
3902X	12.719	10.609	150	UNK	CIRC	*
3902X			100	VC	CIRC	*
3903X	13.739		150	UNK	CIRC	*
3903X			100	VC	CIRC	*
3904X	14.492	16.889	150	UNK	CIRC	
3905X	12.613		150	UNK	CIRC	
3906X	13.96	11.61	150	UNK	CIRC	
3907X			150	UNK	CIRC	
3908X	12.105	10.165	150	UNK	CIRC	
3909X			150	UNK	CIRC	
390DX			150	VC	CIRC	
3910X	13.657	11.847	150	UNK	CIRC	
3913X	13.561	11.171	UNK	PF	CIRC	
3914X			UNK	UNK	CIRC	
3915X			UNK	UNK	CIRC	
3916X			UNK	UNK	CIRC	
391DX			150	UNK	CIRC	*
391DX			150	VC	CIRC	*
392DX			150	UNK	CIRC	
394DX			150	UNK	CIRC	
3950X	13.561	11.171	150	UNK	CIRC	*
3950X	11.372	9.752	225	UNK	CIRC	*
3951X	12.662	11.592	225	UNK	CIRC	
3952X	13.738		225	UNK	CIRC	
3953X	14.495		225	UNK	CIRC	
3954X	12.579		225	UNK	CIRC	
3955X	13.681		150	UNK	CIRC	
3957X	12.108	10.488	UNK	UNK	CIRC	
3958X	11.797	10.027	300	UNK	CIRC	
3959X	13.395	11.565	150	UNK	CIRC	
395ZX			225	UNK	CIRC	
397DX			UNK	PF	CIRC	
39ADX			UNK	UNK	CIRC	
4001X	18.222	16.752	150	UNK	CIRC	*
4001X	14.242	9.372	375	UNK	CIRC	*
4002X			UNK	UNK	CIRC	
400DX			150	UNK	CIRC	
4050X	14.289	13.619	150	UNK	CIRC	*
4050X	17.905	12.955	375	UNK	CIRC	*
4051X	17.728		150	UNK	CIRC	
4052X	17.47	13.68	375	UNK	CIRC	
4053X			100	VC	CIRC	
405CX	14.116	13.426	150	UNK	CIRC	
405DX			100	VC	CIRC	
406CX	13.939	12.609	225	UNK	CIRC	
406DX			375	UNK	CIRC	
407CX	14.18	12.79	150	UNK	CIRC	
4101X	15.756	14.566	UNK	UNK	CIRC	*
4101X	25.085	23.365	150	UNK	CIRC	*
4102X	14.596	13.576	150	UNK	CIRC	*
4102X	22.015	21.155	150	UNK	CIRC	*
4103X	14.84	13.74	150	UNK	CIRC	*
4103X	22.119	20.739	150	UNK	CIRC	*
4104X	14.607	13.257	150	UNK	CIRC	
4105X	15.366		UNK	UNK	CIRC	
410DX			UNK	UNK	CIRC	
4150X	24.146	23.136	150	UNK	CIRC	
4151X	23.828	22.698	150	UNK	CIRC	
4201X	18.241	16.831	150	UNK	CIRC	*
4201X	29.868	28.508	150	UNK	CIRC	*
4202X	32.143	31.203	150	UNK	CIRC	*
4202Y	18.265		150	UNK	CIRC	*
4202X	18.265	16.625	UNK	UNK	CIRC	*
4203X	18.321	16.501	150	UNK	CIRC	*
4203X	31.752	30.892	150	UNK	CIRC	*
4204X	17.688	16.398	150	UNK	CIRC	
4205X	18.423	16.863	150	UNK	CIRC	
4206X	17.637	16.167	UNK	UNK	CIRC	
4207X			150	UNK	CIRC	
4208X			UNK	UNK	CIRC	
4250X	30.633	29.053	150	UNK	CIRC	
4301X	22.642	21.242	UNK	UNK	CIRC	*
4301X			150	UNK	CIRC	*
4301X	8.643	7.173	225	UNK	CIRC	*
4302X	44.535	42.955	150	UNK	CIRC	*
4302X	8.791	7.261	225	UNK	CIRC	*
4302X			150	UNK	CIRC	*
4303X	19.537	18.777	150	UNK	CIRC	*
4303X	37.328	33.668	150	UNK	CIRC	*
4303X			UNK	UNK	CIRC	*
4304X	36.787	33.347	150	UNK	CIRC	*
4304X	19.601	17.651	150	UNK	CIRC	*
4350X	4.94	4.1	150	UNK	CIRC	*
4350X	8.755	4.055	1050	UNK	CIRC	*
4401X	48.641	46.701	150	UNK	CIRC	*
4401X	8.772	7.012	225	UNK	CIRC	*
4401X	22.015	20.955	150	UNK	CIRC	*
4401X	4.541	3.321	150	UNK	CIRC	*
4402X	4.885	3.065	150	UNK	CIRC	*
4402X			150	UNK	CIRC	*
4403X	4.634	3.524	150	UNK	CIRC	
4404X	4.903		225	UNK	CIRC	
440DX			UNK	UNK	CIRC	
4450X	4.615	3.445	225	UNK	CIRC	*
4450X	8.721	4.481	1050	UNK	CIRC	*
4450Y	4.615	3.435	225	UNK	CIRC	*
4451X	4.911	3.311	450	UNK	CIRC	
4452X	4.877	3.277	225	UNK	CIRC	
4453X	4.39	3.48	150	UNK	CIRC	
4501X	3.421		600	UNK	CIRC	*
4501X	4.317	2.477	150	UNK	CIRC	*
4502X	4.603		225	UNK	CIRC	*
4502X	4.29		600	UNK	CIRC	*
4503X	4.262	1.942	225	UNK	CIRC	
4504X			UNK	UNK	CIRC	
4505X	4.608	2.91	300	UNK	CIRC	*
4505X			UNK	UNK	CIRC	*
4506X		2.65	300	UNK	CIRC	
4507X			UNK	UNK	CIRC	*
4507X		2.54	600	UNK	CIRC	*
4550X			300	UNK	CIRC	
4551X			300	UNK	CIRC	
4552X	4.297		375	UNK	CIRC	
4553Y		2.59	300	UNK	CIRC	*
4553X	4.547	2.757	375	UNK	CIRC	*
4554X			450	UNK	CIRC	*
4554X	4.19	2.33	300	UNK	CIRC	*
4555X	4.426	2.996	375	UNK	CIRC	
4556X	4.207	3.477	300	UNK	CIRC	
4601X	5.31	3.625	225	UNK	CIRC	*
4601X	9.557	8.797	225	UNK	CIRC	*
4601X			150	UNK	CIRC	*
4602X	5.066	3.946	150	UNK	CIRC	*
4602X	9.236	8.586	225	UNK	CIRC	*
4602X			UNK	UNK	CIRC	*
4603X			225	UNK	CIRC	*
4603X	4.955		150	UNK	CIRC	*
4603X			UNK	UNK	CIRC	*
4604X			UNK	UNK	CIRC	*
4604X	4.914	3.404	150	UNK	CIRC	*
4604X			225	UNK	CIRC	*
4605X			UNK	UNK	CIRC	*
4605X	4.357	2.727	150	UNK	CIRC	*
4606X	4.553		150	UNK	CIRC	*
4606X			UNK	UNK	CIRC	*
4607X			150	UNK	CIRC	*
4607X			UNK	UNK	CIRC	*
4608X			UNK	UNK	CIRC	*
4608X	4.346		150	UNK	CIRC	*
4609X			UNK	UNK	CIRC	*
4609X			150	UNK	CIRC	*
460DX			UNK	UNK	CIRC	*
460DX			UNK	UNK	CIRC	*
4610X			UNK	UNK	CIRC	
4611X			UNK	UNK	CIRC	
4612X			UNK	UNK	CIRC	
462DX			UNK	UNK	CIRC	
464DX			UNK	UNK	CIRC	
4650X			150	UNK	CIRC	*
4650X	9.231	7.911	300	UNK	CIRC	*
4651X	5.156	3.646	150	UNK	CIRC	*
4651X			1050	UNK	CIRC	*
4652X			375	UNK	CIRC	*
4652X	5.107		150	UNK	CIRC	*
4652X	9.291	8.181	225	UNK	CIRC	*
4653X		3.565	450	UNK	CIRC	*
4653X	4.892	3.222	150	UNK	CIRC	*
4654X		3.49	150	UNK	CIRC	*
4654X	4.224	3.584	150	UNK	CIRC	*
4655X			150	UNK	CIRC	
4656X	4.641		150	UNK	CIRC	
4657X	4.22		150	UNK	CIRC	
4658X			150	UNK	CIRC	

LINE STYLES / COLOURS

Brown: Foul; Foul Syphon Sewer; Foul Vacuum Main; Foul Rising Main

Red: Combined; Combined Syphon Sewer; Combined Rising Main; Lateral Drain

MATERIALS

AK Alkathene
BAC Bonded Asbestos Cement
BRC Brick (Common)
BRE Brick (Engineering)
CC Concrete Box Culvert
CI Cast Iron
CO Concrete (In-Situ)
CP Concrete (Pre-Cast)
CSB Concrete Segments (bolted)
CSU Concrete Segments (unbolted)
DI Ductile Iron

LEGEND - SEWERS

Manhole (SW); Manhole (F&C); Lamp hole (SW); Lamp hole (F&C); Pumping Station (SW); Pumping Station (F&C); Side entry manhole (SW); Side entry Manhole (F&C)

Washout (SW); Washout (F&C); Rodding Eye (SW); Rodding Eye (F&C); Gauging point (SW); Gauging point (F&C); Intercept chamber (SW); Intercept chamber (F&C)

Other (s); Other; Change in sewer (s); Change in sewer; Reflux valve; Flap valve; Cascade; Anode

Wastewater treatment works; Marine treatment works; Outfall headworks; Vent; Vent column; Tidal storage tank; Blank end; Head of Public Sewer

O.S. Ref.	SU6006SW	Drawn by:	kumaria
Scale:	1:2500	Date:	07/10/2016

Title: 225479_Site between M27 and Ta

The information contained on this plan is provided as a guide to the approximate position of existing public sewers. The accuracy thereof cannot be guaranteed.

THIS INFORMATION MUST BE TREATED WITH CAUTION AND THE ACTUAL POSITION OF THE PUBLIC SEWERS MUST BE ESTABLISHED ON SITE, IN ALL CASES.

Southern Water must be informed before lifting manhole covers or excavating trial holes.

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Southern Water

SEWER RECORDS

Southern Water

Odyssey
Tuscany House
White Hart Lane
Basingstoke
Hampshire
RG21 4AF

BAC.....
SRB.....
HB.....
RS.....
ACC.....

Developer Services
Southern Water
Sparrowgrove House
Sparrowgrove
Otterbourne
Hampshire
SO21 2SW

Tel: **0330 303 0119**
Email: ***developerservices@southernwater.co.uk***

Your Ref:

Our Ref:
CC/003144

Date:
16 November 2016

F.A.O: Mr. Bernard Thuku ,

Site: Land East of Downend Road, Fareham, Hampshire, PO16 8QF.

Dear Sirs,

I am now in receipt of the results of the capacity check you requested for the above development site.

FOUL WATER

Following initial investigations, there is currently adequate capacity in the local sewerage network to accommodate a foul flow from proposed development site at/downstream of manhole reference SU60068301. Please note that no surface water flows (existing or proposed) can be accommodated within the existing foul sewerage system.

Before any connection/s are made, an application form needs to be completed and approved by Southern Water Services.

Please let me know if we can be of any further assistance in this matter.

Yours faithfully,

David Akehurst
Developer Services

Please note: -
The information provided above does not grant approval for any designs/drawings submitted for the capacity analysis. The results quoted above are only valid for 12 months from the date of issue of this letter.

SOUTHERN WATER

Scale: 1:1250

Sewer Plot

Southern Water

Plotted by: Scope

Date Lateral Plot:

Reviewed By:

APPENDIX H

Proposed Drainage Strategy and Micro Drainage Calculations

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NOTES

1. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
2. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES.
3. THE SUDS DESIGN IS BASED ON THE PRELIMINARY SOAKAWAY TEST RESULTS THAT WERE OBTAINED ON SITE BY GEO-ENVIRONMENTAL IN JULY 2020.
4. THE POSITION AND DIMENSIONS OF BASINS SHOULD BE REVIEWED ONCE FURTHER SITE INVESTIGATIONS, INCLUDING GROUNDWATER MONITORING AND CHALK CLASSIFICATION, HAVE BEEN CARRIED OUT ON SITE.
5. IF THE FURTHER SITE TESTING RESULTS ARE DEEMED UNFAVORABLE, ADDITIONAL CONNECTION PIPES AND / OR PUMPING STATION MAY BE REQUIRED AT THE OUTFALL OF THE PROPOSED INFILTRATION BASINS.
6. AN EASEMENT OF 15m HAS BEEN APPLIED BETWEEN THE NETWORK RAIL BOUNDARY AND THE PROPOSED INFILTRATION BASINS.
7. ALL SUDS DEVICES HAVE BEEN SIZED TO ACCOMMODATE ALL SURFACE WATER RUNOFF UP TO A 1 IN 100 YEAR (INCLUDING 40% CLIMATE CHANGE ALLOWANCE) RETURN PERIOD STORM EVENT.
8. IN ORDER TO FULFIL THE SURFACE WATER TREATMENT REQUIREMENTS, AN ADDITIONAL SUDS SOURCE CONTROL DEVICE, SUCH AS PERMEABLE PAVING, SWALES AND FILTER STRIPS ETC, SHOULD BE INCORPORATED INTO THE DESIGN PRIOR TO SURFACE WATER RUNOFF BEING DISCHARGED INTO THE BASIN.

LEGEND

- SITE BOUNDARY
- DEVELOPABLE AREA DRAINING TO INFILTRATING BASIN 1
- DEVELOPABLE AREA TO INFILTRATING BASIN 2
- DEVELOPABLE AREA DRAINING TO BASIN 3
- DEVELOPABLE AREA DRAINING TO BASIN 4
- LIDAR DTM 1m CONTOUR
- PROPOSED INFILTRATION BASIN
- PROPOSED ADOPTABLE FOUL RISING MAIN
- PROPOSED ADOPTABLE FOUL PUMPING STATION

Rev	Amendments	Drn	Chk	App	Date
F	SUDS DESIGN UPDATED TO LATEST MASTERPLAN	NM	NA	GG	21.07.20
E	SUDS DESIGN UPDATED TO LATEST MASTERPLAN	CF	NA	GG	11.10.17
D	SUDS DESIGN UPDATED TO LATEST MASTERPLAN	CF	JH	GG	07.09.17
C	SUDS DESIGN UPDATED TO LATEST SOAKAWAY TESTS; SW PUMPING STATION ADDED.	JH	GG	GG	20.02.17
B	SUDS DESIGN UPDATED TO LATEST MASTERPLAN; FW DRAINAGE ADDED.	JH	GG	GG	23.01.17
A	SUDS DESIGN AMENDED BASED ON PRELIMINARY SOAKAWAY TEST RESULTS	JH	TG	GG	23.12.16

ODYSSEY

Tuscany House
White Hart Lane
Basingstoke
Hampshire RG21 4AF

Telephone: 01256 331144
Fax: 01256 331134
E: info@odysseyconsult.co.uk
W: www.odysseyconsult.co.uk

Job Title
WINNHAM FARM,
DOWNEND ROAD, PORTCHESTER

Drawing Title
PROPOSED DRAINAGE STRATEGY

Client
MILLER HOMES

Scale	Date	Designed
1:1000 @A1	NOV 16	JH
Drawn	**Checked**	**Approved**
JH	TG	GG
Job No	**Drawing No**	**Rev**
16-329	16-329/002	F

P:\16-329 - Land East of Downend Road, Portchester\TechAcad\Drawings\16-329-002 Proposed Drainage Strategy.dwg

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3800 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	22.501	0.401	0.5	103.0	O K
30 min Summer	22.580	0.480	0.6	128.3	O K
60 min Summer	22.669	0.569	0.6	159.6	O K
120 min Summer	22.770	0.670	0.7	197.8	O K
180 min Summer	22.833	0.733	0.8	223.7	O K
240 min Summer	22.880	0.780	0.8	243.7	O K
360 min Summer	22.948	0.848	0.9	274.1	O K
480 min Summer	22.998	0.898	0.9	297.0	O K
600 min Summer	23.036	0.936	0.9	315.4	O K
720 min Summer	23.067	0.967	1.0	330.7	O K
960 min Summer	23.089	0.989	1.0	342.0	O K
1440 min Summer	23.113	1.013	1.0	354.2	Flood Risk
2160 min Summer	23.122	1.022	1.0	359.1	Flood Risk
2880 min Summer	23.118	1.018	1.0	357.0	Flood Risk
4320 min Summer	23.125	1.025	1.0	360.7	Flood Risk
5760 min Summer	23.125	1.025	1.0	360.5	Flood Risk
7200 min Summer	23.119	1.019	1.0	357.7	Flood Risk
8640 min Summer	23.111	1.011	1.0	353.3	Flood Risk
10080 min Summer	23.100	1.000	1.0	347.9	Flood Risk
15 min Winter	22.540	0.440	0.5	115.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.458	0.0	19
30 min Summer	83.947	0.0	34
60 min Summer	52.411	0.0	64
120 min Summer	32.722	0.0	124
180 min Summer	24.841	0.0	184
240 min Summer	20.430	0.0	244
360 min Summer	15.509	0.0	364
480 min Summer	12.755	0.0	482
600 min Summer	10.960	0.0	602
720 min Summer	9.683	0.0	722
960 min Summer	7.687	0.0	962
1440 min Summer	5.551	0.0	1442
2160 min Summer	4.009	0.0	2160
2880 min Summer	3.183	0.0	2624
4320 min Summer	2.351	0.0	3328
5760 min Summer	1.897	0.0	4096
7200 min Summer	1.606	0.0	4904
8640 min Summer	1.401	0.0	5792
10080 min Summer	1.249	0.0	6560
15 min Winter	134.458	0.0	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	22.625	0.525	0.6	143.8	O K
60 min Winter	22.721	0.621	0.7	178.8	O K
120 min Winter	22.829	0.729	0.8	221.8	O K
180 min Winter	22.897	0.797	0.8	250.9	O K
240 min Winter	22.947	0.847	0.9	273.5	O K
360 min Winter	23.020	0.920	0.9	307.9	O K
480 min Winter	23.073	0.973	1.0	333.9	O K
600 min Winter	23.114	1.014	1.0	354.9	Flood Risk
720 min Winter	23.147	1.047	1.0	372.4	Flood Risk
960 min Winter	23.172	1.072	1.0	385.8	Flood Risk
1440 min Winter	23.200	1.100	1.1	401.1	Flood Risk
2160 min Winter	23.215	1.115	1.1	409.4	Flood Risk
2880 min Winter	23.215	1.115	1.1	409.2	Flood Risk
4320 min Winter	23.218	1.118	1.1	410.7	Flood Risk
5760 min Winter	23.215	1.115	1.1	409.4	Flood Risk
7200 min Winter	23.206	1.106	1.1	404.2	Flood Risk
8640 min Winter	23.193	1.093	1.1	396.9	Flood Risk
10080 min Winter	23.177	1.077	1.0	388.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	83.947	0.0	34
60 min Winter	52.411	0.0	64
120 min Winter	32.722	0.0	122
180 min Winter	24.841	0.0	182
240 min Winter	20.430	0.0	242
360 min Winter	15.509	0.0	360
480 min Winter	12.755	0.0	478
600 min Winter	10.960	0.0	596
720 min Winter	9.683	0.0	714
960 min Winter	7.687	0.0	944
1440 min Winter	5.551	0.0	1410
2160 min Winter	4.009	0.0	2080
2880 min Winter	3.183	0.0	2736
4320 min Winter	2.351	0.0	3460
5760 min Winter	1.897	0.0	4376
7200 min Winter	1.606	0.0	5328
8640 min Winter	1.401	0.0	6224
10080 min Winter	1.249	0.0	7152

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 460850 105450 SU 60850 05450
C (1km)	-0.026
D1 (1km)	0.440
D2 (1km)	0.317
D3 (1km)	0.373
E (1km)	0.301
F (1km)	2.238
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.410

Time (mins) From:	To:	Area (ha)
0	4	0.410

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Model Details

Storage is Online Cover Level (m) 23.400

Infiltration Basin Structure

Invert Level (m) 22.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00828 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00828

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	204.9	1.300	633.4

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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3278 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	23.394	0.594	1.7	321.5	O K
30 min Summer	23.485	0.685	2.0	400.5	O K
60 min Summer	23.585	0.785	2.2	497.9	O K
120 min Summer	23.694	0.894	2.5	616.8	O K
180 min Summer	23.760	0.960	2.7	697.1	O K
240 min Summer	23.808	1.008	2.9	758.9	O K
360 min Summer	23.877	1.077	3.1	852.4	O K
480 min Summer	23.926	1.126	3.2	922.6	O K
600 min Summer	23.963	1.163	3.3	978.5	O K
720 min Summer	23.993	1.193	3.4	1024.5	O K
960 min Summer	24.013	1.213	3.5	1056.8	Flood Risk
1440 min Summer	24.032	1.232	3.5	1088.3	Flood Risk
2160 min Summer	24.036	1.236	3.5	1094.7	Flood Risk
2880 min Summer	24.033	1.233	3.5	1088.9	Flood Risk
4320 min Summer	24.040	1.240	3.6	1100.2	Flood Risk
5760 min Summer	24.038	1.238	3.6	1098.0	Flood Risk
7200 min Summer	24.032	1.232	3.5	1087.3	Flood Risk
8640 min Summer	24.022	1.222	3.5	1071.6	Flood Risk
10080 min Summer	24.011	1.211	3.5	1053.3	Flood Risk
15 min Winter	23.440	0.640	1.9	360.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.458	0.0	19
30 min Summer	83.947	0.0	34
60 min Summer	52.411	0.0	64
120 min Summer	32.722	0.0	124
180 min Summer	24.841	0.0	184
240 min Summer	20.430	0.0	244
360 min Summer	15.509	0.0	364
480 min Summer	12.755	0.0	482
600 min Summer	10.960	0.0	602
720 min Summer	9.683	0.0	722
960 min Summer	7.687	0.0	962
1440 min Summer	5.551	0.0	1442
2160 min Summer	4.009	0.0	2100
2880 min Summer	3.183	0.0	2420
4320 min Summer	2.351	0.0	3156
5760 min Summer	1.897	0.0	3976
7200 min Summer	1.606	0.0	4824
8640 min Summer	1.401	0.0	5624
10080 min Summer	1.249	0.0	6456
15 min Winter	134.458	0.0	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	23.536	0.736	2.1	448.7	O K
60 min Winter	23.642	0.842	2.4	558.0	O K
120 min Winter	23.756	0.956	2.7	691.5	O K
180 min Winter	23.826	1.026	2.9	782.0	O K
240 min Winter	23.877	1.077	3.1	851.7	O K
360 min Winter	23.949	1.149	3.3	957.5	O K
480 min Winter	24.001	1.201	3.4	1037.1	Flood Risk
600 min Winter	24.040	1.240	3.6	1100.8	Flood Risk
720 min Winter	24.072	1.272	3.7	1153.6	Flood Risk
960 min Winter	24.094	1.294	3.7	1192.2	Flood Risk
1440 min Winter	24.118	1.318	3.8	1233.0	Flood Risk
2160 min Winter	24.127	1.327	3.8	1249.6	Flood Risk
2880 min Winter	24.122	1.322	3.8	1241.1	Flood Risk
4320 min Winter	24.125	1.325	3.8	1245.7	Flood Risk
5760 min Winter	24.119	1.319	3.8	1235.4	Flood Risk
7200 min Winter	24.106	1.306	3.8	1213.4	Flood Risk
8640 min Winter	24.090	1.290	3.7	1185.2	Flood Risk
10080 min Winter	24.072	1.272	3.7	1154.1	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	83.947	0.0	34
60 min Winter	52.411	0.0	64
120 min Winter	32.722	0.0	122
180 min Winter	24.841	0.0	182
240 min Winter	20.430	0.0	240
360 min Winter	15.509	0.0	358
480 min Winter	12.755	0.0	476
600 min Winter	10.960	0.0	594
720 min Winter	9.683	0.0	712
960 min Winter	7.687	0.0	944
1440 min Winter	5.551	0.0	1400
2160 min Winter	4.009	0.0	2072
2880 min Winter	3.183	0.0	2680
4320 min Winter	2.351	0.0	3332
5760 min Winter	1.897	0.0	4264
7200 min Winter	1.606	0.0	5184
8640 min Winter	1.401	0.0	6056
10080 min Winter	1.249	0.0	6960

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 460850 105450 SU 60850 05450
C (1km)	-0.026
D1 (1km)	0.440
D2 (1km)	0.317
D3 (1km)	0.373
E (1km)	0.301
F (1km)	2.238
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.280

Time (mins) From:	To:	Area (ha)
0	4	1.280

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Model Details

Storage is Online Cover Level (m) 24.300

Infiltration Basin Structure

Invert Level (m) 22.800 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00828 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00828

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	308.0	1.500	2058.0

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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 9027 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	17.956	0.506	3.1	1094.1	O K
30 min Summer	18.070	0.620	3.3	1364.3	O K
60 min Summer	18.207	0.757	3.5	1699.6	O K
120 min Summer	18.368	0.918	3.8	2113.7	O K
180 min Summer	18.475	1.025	4.0	2398.1	O K
240 min Summer	18.557	1.107	4.1	2620.7	O K
360 min Summer	18.680	1.230	4.4	2965.3	O K
480 min Summer	18.772	1.322	4.5	3232.3	O K
600 min Summer	18.847	1.397	4.7	3452.2	O K
720 min Summer	18.910	1.460	4.8	3639.8	O K
960 min Summer	18.965	1.515	4.9	3807.7	O K
1440 min Summer	19.038	1.588	5.0	4033.2	O K
2160 min Summer	19.100	1.650	5.1	4229.3	O K
2880 min Summer	19.134	1.684	5.2	4337.3	O K
4320 min Summer	19.194	1.744	5.3	4532.5	O K
5760 min Summer	19.217	1.767	5.3	4605.3	O K
7200 min Summer	19.222	1.772	5.3	4621.1	O K
8640 min Summer	19.223	1.773	5.3	4625.9	O K
10080 min Summer	19.221	1.771	5.3	4619.7	O K
15 min Winter	18.012	0.562	3.2	1225.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.458	0.0	19
30 min Summer	83.947	0.0	34
60 min Summer	52.411	0.0	64
120 min Summer	32.722	0.0	124
180 min Summer	24.841	0.0	184
240 min Summer	20.430	0.0	244
360 min Summer	15.509	0.0	364
480 min Summer	12.755	0.0	484
600 min Summer	10.960	0.0	604
720 min Summer	9.683	0.0	724
960 min Summer	7.687	0.0	964
1440 min Summer	5.551	0.0	1442
2160 min Summer	4.009	0.0	2164
2880 min Summer	3.183	0.0	2880
4320 min Summer	2.351	0.0	4320
5760 min Summer	1.897	0.0	5760
7200 min Summer	1.606	0.0	6552
8640 min Summer	1.401	0.0	7256
10080 min Summer	1.249	0.0	7968
15 min Winter	134.458	0.0	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	18.138	0.688	3.4	1528.5	O K
60 min Winter	18.287	0.837	3.7	1904.6	O K
120 min Winter	18.465	1.015	4.0	2369.3	O K
180 min Winter	18.582	1.132	4.2	2689.2	O K
240 min Winter	18.671	1.221	4.3	2939.7	O K
360 min Winter	18.805	1.355	4.6	3328.0	O K
480 min Winter	18.906	1.456	4.8	3629.5	O K
600 min Winter	18.988	1.538	4.9	3878.3	O K
720 min Winter	19.056	1.606	5.0	4091.1	O K
960 min Winter	19.117	1.667	5.1	4284.3	O K
1440 min Winter	19.199	1.749	5.3	4547.2	O K
2160 min Winter	19.271	1.821	5.4	4782.9	O K
2880 min Winter	19.312	1.862	5.5	4920.8	O K
4320 min Winter	19.388	1.938	5.6	5175.4	O K
5760 min Winter	19.423	1.973	5.7	5295.6	O K
7200 min Winter	19.436	1.986	5.7	5340.6	O K
8640 min Winter	19.436	1.986	5.7	5339.7	O K
10080 min Winter	19.428	1.978	5.7	5314.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	83.947	0.0	34
60 min Winter	52.411	0.0	64
120 min Winter	32.722	0.0	124
180 min Winter	24.841	0.0	182
240 min Winter	20.430	0.0	242
360 min Winter	15.509	0.0	362
480 min Winter	12.755	0.0	480
600 min Winter	10.960	0.0	598
720 min Winter	9.683	0.0	716
960 min Winter	7.687	0.0	954
1440 min Winter	5.551	0.0	1428
2160 min Winter	4.009	0.0	2124
2880 min Winter	3.183	0.0	2824
4320 min Winter	2.351	0.0	4192
5760 min Winter	1.897	0.0	5536
7200 min Winter	1.606	0.0	6840
8640 min Winter	1.401	0.0	8040
10080 min Winter	1.249	0.0	8368

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 460850 105450 SU 60850 05450
C (1km)	-0.026
D1 (1km)	0.440
D2 (1km)	0.317
D3 (1km)	0.373
E (1km)	0.301
F (1km)	2.238
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 4.350

Time (mins) From:	To:	Area (ha)
0	4	4.350

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Model Details

Storage is Online Cover Level (m) 19.750

Infiltration Basin Structure

Invert Level (m) 17.450 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00828 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00828

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1999.1	2.300	3708.7

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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 3821 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	13.270	0.170	2.9	401.1	O K
30 min Summer	13.311	0.211	3.0	499.4	O K
60 min Summer	13.360	0.260	3.1	620.3	O K
120 min Summer	13.418	0.318	3.2	767.5	O K
180 min Summer	13.458	0.358	3.2	866.9	O K
240 min Summer	13.488	0.388	3.3	943.5	O K
360 min Summer	13.532	0.432	3.4	1059.4	O K
480 min Summer	13.566	0.466	3.4	1146.6	O K
600 min Summer	13.592	0.492	3.5	1216.6	O K
720 min Summer	13.614	0.514	3.5	1274.6	O K
960 min Summer	13.629	0.529	3.5	1314.8	O K
1440 min Summer	13.644	0.544	3.6	1355.1	O K
2160 min Summer	13.648	0.548	3.6	1365.0	O K
2880 min Summer	13.640	0.540	3.6	1345.1	O K
4320 min Summer	13.636	0.536	3.6	1332.6	O K
5760 min Summer	13.627	0.527	3.5	1309.8	O K
7200 min Summer	13.617	0.517	3.5	1282.8	O K
8640 min Summer	13.606	0.506	3.5	1253.7	O K
10080 min Summer	13.595	0.495	3.5	1223.4	O K
15 min Winter	13.290	0.190	3.0	449.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	134.458	0.0	19
30 min Summer	83.947	0.0	34
60 min Summer	52.411	0.0	64
120 min Summer	32.722	0.0	124
180 min Summer	24.841	0.0	184
240 min Summer	20.430	0.0	244
360 min Summer	15.509	0.0	364
480 min Summer	12.755	0.0	482
600 min Summer	10.960	0.0	602
720 min Summer	9.683	0.0	722
960 min Summer	7.687	0.0	962
1440 min Summer	5.551	0.0	1442
2160 min Summer	4.009	0.0	2160
2880 min Summer	3.183	0.0	2796
4320 min Summer	2.351	0.0	3460
5760 min Summer	1.897	0.0	4256
7200 min Summer	1.606	0.0	5048
8640 min Summer	1.401	0.0	5880
10080 min Summer	1.249	0.0	6752
15 min Winter	134.458	0.0	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	13.335	0.235	3.0	559.7	O K
60 min Winter	13.390	0.290	3.1	695.5	O K
120 min Winter	13.456	0.356	3.2	861.4	O K
180 min Winter	13.499	0.399	3.3	973.8	O K
240 min Winter	13.533	0.433	3.4	1060.5	O K
360 min Winter	13.583	0.483	3.5	1192.6	O K
480 min Winter	13.621	0.521	3.5	1292.6	O K
600 min Winter	13.651	0.551	3.6	1373.1	O K
720 min Winter	13.676	0.576	3.6	1440.3	O K
960 min Winter	13.694	0.594	3.7	1489.9	O K
1440 min Winter	13.714	0.614	3.7	1544.4	O K
2160 min Winter	13.723	0.623	3.7	1570.0	O K
2880 min Winter	13.721	0.621	3.7	1562.3	O K
4320 min Winter	13.715	0.615	3.7	1547.7	O K
5760 min Winter	13.704	0.604	3.7	1517.2	O K
7200 min Winter	13.691	0.591	3.6	1480.4	O K
8640 min Winter	13.675	0.575	3.6	1437.2	O K
10080 min Winter	13.658	0.558	3.6	1391.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	83.947	0.0	34
60 min Winter	52.411	0.0	64
120 min Winter	32.722	0.0	122
180 min Winter	24.841	0.0	182
240 min Winter	20.430	0.0	240
360 min Winter	15.509	0.0	360
480 min Winter	12.755	0.0	478
600 min Winter	10.960	0.0	596
720 min Winter	9.683	0.0	714
960 min Winter	7.687	0.0	950
1440 min Winter	5.551	0.0	1412
2160 min Winter	4.009	0.0	2096
2880 min Winter	3.183	0.0	2764
4320 min Winter	2.351	0.0	3976
5760 min Winter	1.897	0.0	4496
7200 min Winter	1.606	0.0	5408
8640 min Winter	1.401	0.0	6392
10080 min Winter	1.249	0.0	7264

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 460850 105450 SU 60850 05450
C (1km)	-0.026
D1 (1km)	0.440
D2 (1km)	0.317
D3 (1km)	0.373
E (1km)	0.301
F (1km)	2.238
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.600

Time (mins) From:	To:	Area (ha)
0	4	1.600

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Model Details

Storage is Online Cover Level (m) 14.400

Infiltration Basin Structure

Invert Level (m) 13.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00828 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00828

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2300.0	1.300	3269.0

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