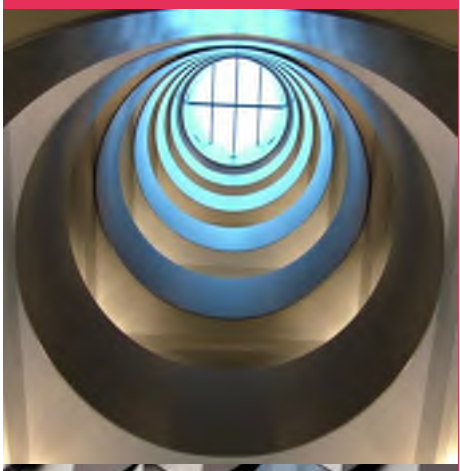

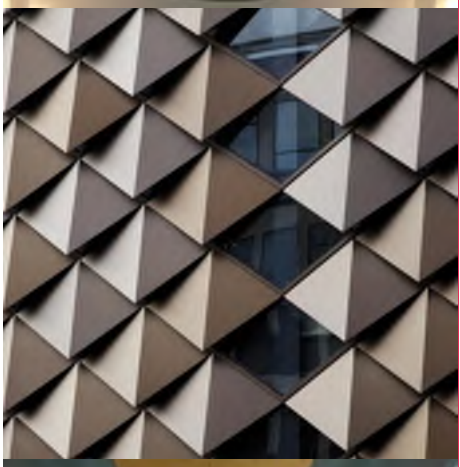

Carrow Works, Norwich

Drainage & SuDS Strategy

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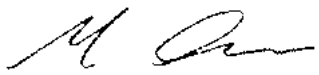
Matthew Martin BSc (Hons) EngTech Infrastructure Engineer		07/07/2022

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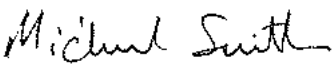
Michael Smith **MEng(Hons)** Principal Civil Engineer		07/07/2022

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Tables

1.0 Introduction

1.1 Project Overview

Curtins have prepared this Drainage Strategy on behalf of Fuel Properties Ltd in support of a hybrid planning application for the redevelopment of the Carrow Works site, Norwich. The Carrow Works site, forms part of the wider East Norwich Masterplan and aims to provide 4,000 new homes.

Proposals contained or forming part of this report represent the design intent and may be subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material derivation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.2 Site Location

The Site is located approximately 1.8km southeast of Norwich City Centre on the existing Carrow Works site. The site is bound by the River Wensum to the north, the Great Eastern Main Line to the east and the A147 so south and west. The national grid reference for the site is TG 24260 07387.

Figure 1-1 - Site Location

1.3 Site Description

The existing Carrow Works site currently houses the Grade I listed Carrow Abbey and Cottages located within the centre of the site. The areas surrounding the Abbey and Cottages parcel are existing industrial buildings previously occupied by the Colemans family and more recently Unilever UK Ltd. The hybrid planning boundary has an approximate area of 16.9 ha.

A topographical survey has been carried out by CD Surveys Ltd and is included in **Appendix A**. The survey shows that the Site generally falls from the southwest to the northeast. An existing underpass beneath the Great Eastern Railway Line between the Site and the adjacent Deal Ground site is located in the northeast corner. The lowest point on site is 1.16mAOD which is the level of one of the gullies by the underpass entrance towards the northeast of the site. The level of the underpass itself reaches a level of 0.94mAOD between Carrow Works and the Deal Ground site. The site has a topographical high point of 16.20mAOD in the south-eastern corner of the site.

The northern boundary of the site adjacent to the River Wensum varies in levels from 4.14mAOD in the west to 1.39mAOD in the east. Generally, the northern areas of the site that are occupied by the historic Colemans buildings have a level of between 3.0 – 4.0mAOD. The Carrow Abbey area's levels range from 11.5-13.5mAOD.

1.4 Project Proposal

The hybrid planning application (part full, part outline), alongside Listed Building Consent and Demolition within a Conservation Area seeks to obtain approval for the following:

- **Detailed (Full) Component:**

  "*Full application comprising the construction of the principal means of access, the primary internal road and associated public spaces and public realm, including restoration and change of use of Carrow Abbey to former use as residential (Use Class C3), alteration and extension and conversion to residential use (Use Class C3) of the Lodge, Garage and Gardener's Cottage and the Stable Cottages, development of the former Abbey Dining Room for residential use (Use Class C3), adaptation and conversion for flexible uses (Class E and/or and/or C2 and/or and/C1 and/or C3 and/or F1 and/or F2 and/or B2 and/or B8 and/or Sui Generis) for buildings 207, 92, 206, 7 (7a, 8 and 8a), 209, 35, the Chimney and Class E and/or B2 and/or B8 for the retained Workshop (Block 258), enhanced access to Carrow Abbey and Scheduled Ancient Monument and associated ancillary works*".

  The full component of the application covers a site area of 5.02 ha.

- **Outline Component:**

  "*Demolition of existing buildings and replacement with phased residential-led (Use Class C3 and/or Class E and/or F1 and/or F2 and/or C1 and/or C2 and/or B2 and/or B8 and/or Sui Generis), landscaping, open space, new and modified access, car parking and ancillary works.*"

  The outline component of the application covers a site area of 11.9 ha.

The existing Abbey grounds, Mustard Seed Driers listed building, and gateway areas are proposed to be retained, with the proposed development constructed around these retained features. Due to the industrial nature of the site, the majority of the sites is impermeable. The Abbey's Grounds make up the majority of the permeable area on site (around 2.5ha). existing Impermeable areas make up the reminder of the site area (approximately 14.4 ha). The hybrid application boundary split can be found in **Appendix B** and the proposed Landscape Masterplan in **Appendix C**.

2.0 Planning and Policy Considerations

2.1 National Planning Policy Requirements

2.1.1 National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG)

In recent years, the Government and local Councils have placed increased priority on the need for developers to take full account for the risks of their development at all stages of the planning process. The National Planning Policy Framework (NPPF) and Planning Practice Guidance (PPG) identifies how the issue of flooding is dealt with through the planning process and with the creation of a site-specific Flood Risk Assessment (FRA) for sites over 1ha in area or in Flood Zones 2 & 3.

2.1.2 DEFRA – Sustainable Drainage Systems

The Department for Environment, Food and Rural Affairs (DEFRA) national standards for sustainable drainage systems provides technical guidance on the design, construction and maintenance of Sustainable Drainage Systems (SuDS).

2.2 Local Planning Policy Requirements

2.2.1 North-Norfolk District Council Local Plan

The North Norfolk District Council Local Plan was formally adopted in Autumn 2008 and was updated in 2012 following the publication of the NPPF. The current Local Plan is due to be replaced shortly. The Local Plan sets out a vision for the area and, from this, a number of aims and objectives have been identified. Aims include:

- *To provide for sustainable development and mitigate and adapt to climate change*
- *To mitigate and adapt to impacts of coastal erosion and flooding*

Strategic and development control policies have been designed in order to achieve the objectives.

Notable policies regarding flood risk are the following:

- Policy SS 1 – Spatial Strategy for North Norfolk

  Development in these Coastal Service Villages will support local coastal communities in the face of coastal erosion and flood risk. Land may be identified in or adjacent to these settlements to provide for new development or relocation from areas at risk.
- Policy SS 2 – Development in the Countryside

  In areas designated as Countryside development will be limited to that which requires a rural location and is for one or more of the following:

- *coastal and flood protection.*
- *the preservation of Listed Buildings*

Proposals which do not accord with the above will not be permitted.

- Policy SS 4 – Environment

  All development proposals will contribute to the delivery of sustainable development, ensure protection and enhancement of natural and built environmental assets and geodiversity and be located and designed so as to reduce carbon emissions and mitigate and adapt to future climate change.

  The Council will minimise exposure of people and property to the risks of coastal erosion and flooding and will plan for a sustainable shoreline in the long-term, that balances the natural coastal processes with the environmental, social and economic needs of the area. Sustainable Drainage Systems will be encouraged, to reduce flood risk, promote groundwater recharge and improve water quality, enhance biodiversity and provide amenity benefit.)

- Policy EN 10 – Development and Flood Risk

  The sequential test will be applied rigorously across North Norfolk and most new development should be located in Flood Risk Zone 1. New development in Flood Risk Zones 2 and 3a will be restricted to the following categories:

  - *water compatible uses*
  - *minor development*
  - *changes of use (to an equal or lower risk category in the flood risk vulnerability classification) where there is no operational development (xl); and*
  - *'Less vulnerable' uses where the sequential test has been passed.*

  New development in Flood Zone 3b will be restricted to water compatible uses only.

  The Strategic Flood Risk Assessment defines zones 2, 3a and 3b in parts of North Norfolk and this will be used to inform the application of the sequential test. Where this information is not available, the Environment Agency Flood Risk Zones and a site specific Flood Risk Assessment will be used to apply the sequential test.

  A site-specific Flood Risk Assessment which takes account of future climate change must be submitted with appropriate planning applications (xli) in Flood Zones 2, 3a and 3b and for development proposals of 1 hectare or greater in Flood Zone 1.

  Land in Flood Zone 1 that is surrounded by areas of Flood Zones 2 or 3 will be treated as if it is in the higher risk zone and a Flood Risk Assessment will be required to prove that safe access / egress exists for the development or that the land will be sustainable for the duration of the flood period.

Appropriate surface water drainage arrangements for dealing with surface water run off from new development will be required. The use of Sustainable Drainage Systems will be the preference unless, following an adequate assessment, soil conditions and / or engineering feasibility dictate otherwise.

2.2.2 Norwich City Council Local Plan

The Norwich City Council Local Plan was formally adopted in December 2014. The Local Plan is comprised of three documents which together set out the strategic priorities for the greater Norwich area that allow the Council to manage development. The **Joint Core Strategy** sets out the strategy for regeneration and growth in the greater Norwich area up to 2026. The **Site Allocations Plan and Development Management Plan** provide detailed polices to guide and implement this strategy. The Development Management Plan has a number of spatial planning objectives, including Objective 1 – To minimise the contributors to climate change and address its impact. The objective states "*Where new development in such areas is desirable for reasons of sustainability (e.g. in the city centre), flood mitigation will be required and flood protection will be maintained and enhanced*."

Notable policies regarding flood risk are the following:

- Policy DM3 – Design Principles
- *Significant weight will be given to the following design principles in assessing development proposals [including]:*
    - *Energy Efficiency and Climate Change*
        - *d) promote and facilitate sustainable drainage and mitigate against flood risk from surface water runoff as required by policy DM5.*
- Policy DM5 – Planning effectively for flood resilience

<u>Flooding</u>

All development proposals will be assessed and determined having regard to the need to manage and mitigate against flood risk from all sources. Development proposals must be supported by the relevant flood risk assessments and show that (where necessary) alternative sites of lower flood risk have been assessed, adopting a sequential approach to site selection according to the requirements of national policy and standing technical advice which supports it.

The sequential site assessment as set out in the NPPF will be expected to consider reasonable alternatives for locating the development in a zone of lower flood risk on any site elsewhere in Norwich, except in the case of:

- *Proposals within the city centre regeneration areas identified on the Policies map, in which case the assessment need only take account of reasonable alternative sites within the boundary of the relevant regeneration area concerned or (where no such alternative sites exist) alternative regeneration areas elsewhere in the city centre;*
- *Any other proposal which is consistent with and forms part of a specific allocation for development within the Site allocations plan and other adopted development plan documents, in which case the requirement for the sequential test will not apply.*

In the case of proposals in areas of higher flood risk which are within the city centre but which fall outside the regeneration areas identified on the Policies map, the search area for reasonable alternative sites should take account of:

- *a) the scale and function of the proposal;*
- *b) the potential contribution of the use or uses proposed to overall regeneration of the city centre, including through the provision of new housing;*
- *c) where the proposal is for retail, leisure or other main town centre uses, the suitability of any alternative locations in relation to policy DM18 of this plan;*
- *d) any objectively identified need for the use proposed which justifies a location in the city centre in order to support the objectives and policies of the development plan.*

- *For the purposes of this policy "city centre" means the area defined on the city centre Policies map insets, including both the City Centre inset and Northern City Centre Area Action Plan inset.*

Sustainable drainage and surface water flooding

Mitigation measures to deal with surface water arising from development proposals should be incorporated to minimise the risk of flooding on the development site and where possible reduce the risk, otherwise at least minimise the risk, within the surrounding area.

Sustainable drainage measures appropriate to the scale and nature of the development shall be incorporated in all development proposals involving the erection of new buildings or the extension of existing buildings until such time as thresholds are established by nationally applicable standards for sustainable drainage. Such measures will be required except where this is not technically feasible or where it can be demonstrated that other factors preclude their use.

Within the critical drainage catchments as identified on the Policies map and in other areas where the best available evidence indicates that a serious and exceptional risk of surface water flooding exists, all development proposals involving new buildings, extensions and additional areas of hard surfacing should ensure that adequate and appropriate consideration has been given to

mitigating surface water flood risk. Developers will be required to show that the proposed development:

- *a) would not increase the vulnerability of the site, or the wider catchment, to flooding from surface water run-off from existing or predicted water flows; and*
- *b) would, wherever practicable, have a positive impact on the risk of surface water flooding in the wider area.*

Development must, as appropriate, incorporate mitigation measures to reduce surface water runoff, manage surface water flood risk to the development itself and to others, maximise the use of permeable materials to increase infiltration capacity, incorporate on-site water storage and make use of green roofs and walls wherever reasonably practicable.

The use of permeable materials, on-site rainwater storage, green roofs and walls will be required unless the developer can provide justification to demonstrate that this would not be practicable or feasible within the constraints or configuration of the site, or would compromise wider regeneration objectives.

Surface Treatment

Development proposals will be required to maximise the use of soft landscaping and permeable surfacing materials unless the developer can provide justification to demonstrate that this is not feasible.

Where permission is required, proposals involving the provision of new or replacement paved and other impermeable surfaced areas will only be permitted:

- *a) in areas of impermeable soils as identified in Appendix 1;*
- *b) in other areas where it can be demonstrated that permeable surfaces are not practicable due to poor soil infiltration capacity, high groundwater levels or risk of subsidence; and*
- *c) in areas with soils with average or good infiltration capacity, where it can be demonstrated that there is an exceptional and overriding justification for such surfaces.*

In cases where poor soil infiltration capacity or other factors preclude the use of permeable surfacing materials, development proposals should seek to manage and minimise the impact of surface water run-off by suitable measures for water storage on-site.

2.2.3 Greater Norwich Area Strategic Flood Risk Assessment (SFRA) (2017 & 2021)

The Level 1 SFRA (2017) aims to provide up to date information and guidance on all sources of flood risk throughout the Greater Norwich area, taking into account the latest flood risk information and

national planning policy. The SFRA aims to ensure all sources of flood risk are understood so they can be managed effectively throughout the planning process, taking into account the potential impacts of climate change. The SFRA provides a broad yet detailed assessment of flood risk, providing the evidence base for policies, recommendations, and guidance to help ensure the effective management of flood risk.

The Level 1 SFRA also provides guidance regarding the application of the Exception Test, aiding Norwich City Council in identifying when the Exception Test is required. It provides information on when a more detailed Level 2 SFRA will be required with regards to strategic site allocations.

The Level 2 SFRA (2021) provides a detailed assessment of all sources of flooding for sites identified by the Greater Norwich Planning Policy team as being potential allocation sites. It builds upon the Level 1 SFRA, providing site-specific assessments to provide the necessary information required to support the application of the Exception Test. All 26 sites proposed by the Greater Norwich Planning Policy team required a Level 2 assessment of flood risk.

2.2.4 Local Flood Risk Management Strategy (2015)

The aim of the Local Flood Risk Management Strategy (LFRMS) is to serve as a tool to better understand and manage flood risk within the area. For the city of Norwich, Norfolk County Council are the Lead Local Flood Authority, covering planning applications with regards to surface water drainage for the entire county of Norfolk. The aim of the document is:

"*To work with organisations, businesses and communities to manage flood risk and, where it is practicable, affordable and sustainable to do so, to reduce risk to life, property and livelihoods that may arise from local surface runoff, ordinary watercourse and groundwater flooding.*"

The document outlines the challenges and the objectives Norfolk have identified to coordinate flood risk management on a day-to-day basis. Additional information is provided regarding flood risk sources and the Risk Management Authorities who are responsible different flood risk management activities.

Norfolk conducted a Local Flood Risk Management Strategy Policy Review in 2021. Since the adoption of the 2015 LFRMS, Norfolk has experienced wide spread flooding, experienced significant growth and development, and has seen a change in the legislative landscape. As a result, the 2015 Strategy's policies were reviewed against new and emerging national strategies and policies. This resulted in 3 new policies and minor updates to the existing policies.

2.2.5 Surface Water Management Plan (2011)

The Surface Water Management Plan (SWMP) provides an assessment of surface water flood risk and outlines a long-term action plan for managing surface water. Norfolk produced five SWMPs, including a Plan for the Norwich Urban Area. Both historic and predicted flooding from different flood risk sources are assessed, including sources which have been identified as surface water, sewer and groundwater

flooding. This assessment has been used to identify 3 Critical Drainage Areas (CDA) across the Norwich Urban Area. The proposed development does not fall within a CDA.

2.2.6 Preliminary Flood Risk Assessment (2011)

The Preliminary Flood Risk Assessment (PFRA) serves as high level screening exercise to help Norfolk County Council identify areas of flood risk across the borough. Historic and predicted flood risk data has been assessed to identify areas at risk of flooding from surface water runoff, groundwater, and ordinary watercourse. The PFRA was used to inform the LFRMS by identifying areas potentially at flood risk that may require more detailed studies. Norwich ranked first on the PFRA Settlement Priority Ranking in Norfolk, with a number of people, critical infrastructure, and non-residential properties above the flood risk threshold.

3.0 Flood Risk Summary

A detailed site-specific Flood Risk Assessment (FRA) has been written for this site (081440-CUR-XX-XX-T-C-92031). The FRA outlines the existing flood risk posed to the site, as well as evaluating how the proposed development will affect these risks

4.0 Existing Drainage

4.1 Public Sewerage

Anglian Water are responsible for the public sewerage in Norwich. Anglian Water mapping for the site has been obtained, this mapping indicates the site is bisected by an existing 600mm diameter foul water sewer. The sewer is located west of the retained Carrow Abbey building and flows from north to south. Mapping indicates that sewers outfalls to the 1050mm Diameter public sewer in A147. An extract of the mapping can be found below in Figure 4-1 and the mapping can be found in **Appendix D**.

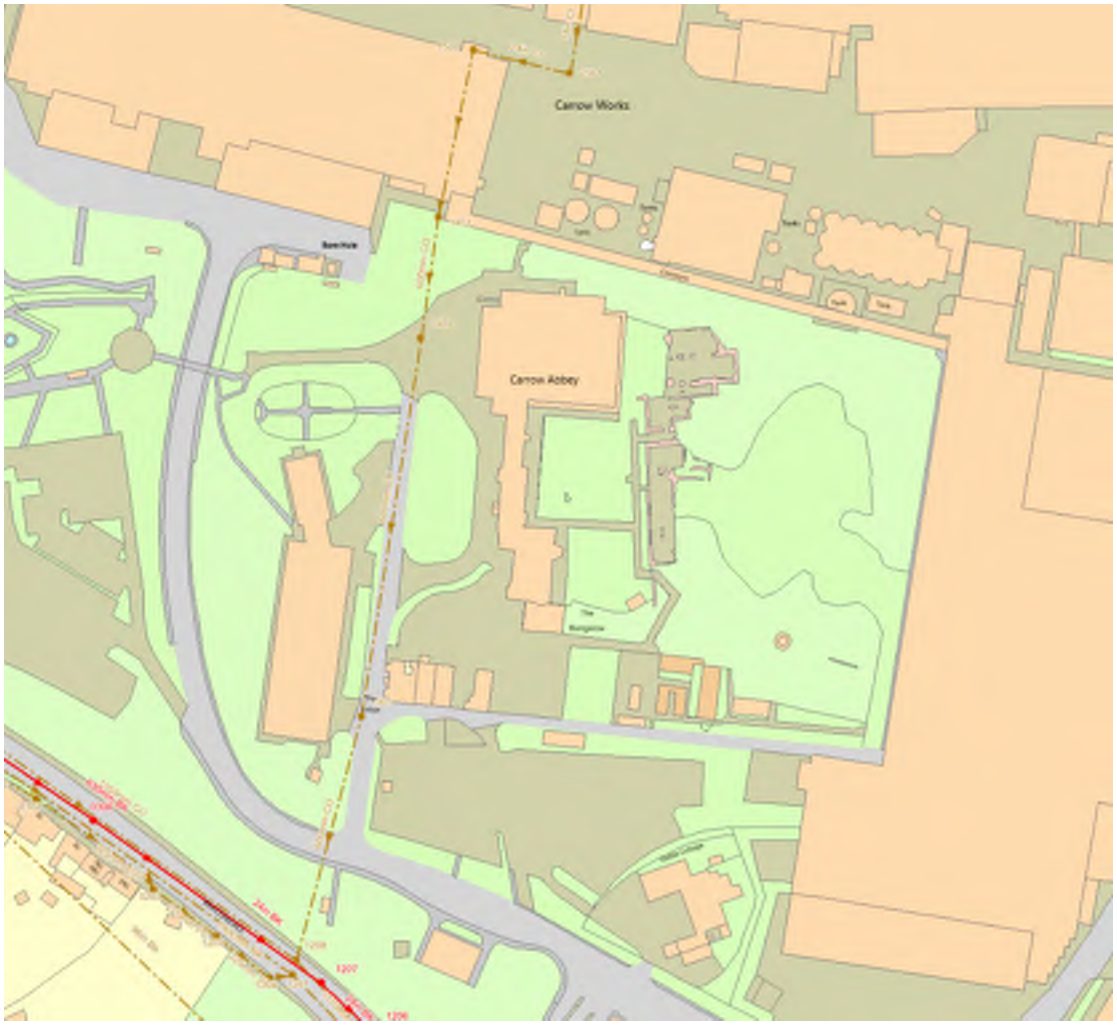


Figure 4-1 - Anglian Water Mapping Extract

A ground penetrating radar (GPR) survey of the site was carried out in November 2018 by WYG, this survey identified manholes and pipework that appears to align with the above mapping; however due to covers being unable to be lifted the route and diameter was unable to be confirmed. GPR survey can be found in **Appendix E**.

As this existing foul water sewer serves the Carrow Works site exclusively, it is anticipated to be removed as part of the development. A new foul water drainage network is proposed to be developed following development of the outline portion of the scheme.

4.2 Private Drainage

As discussed in the Section 4.1, a GPR survey was carried out in November 2018, this survey indicated that the site is served by both private surface and foul water systems.

4.2.1 Surface Water

The existing private drainage system contains two outfall methods: disposing of surface water via infiltration through soakaways and discharging surface water into the River Wensum. It can be seen that the northern area of the site discharges to the River Wensum, whereas the southern area (including the Abbey) discharges to the ground via infiltration.

The drainage system to the north has multiple outfalls to the River Wensum. It is proposed to retain and reuse three outfalls to the river in the northwest corner of the site. The retained outfalls have been identified in Figure 4-2 below.

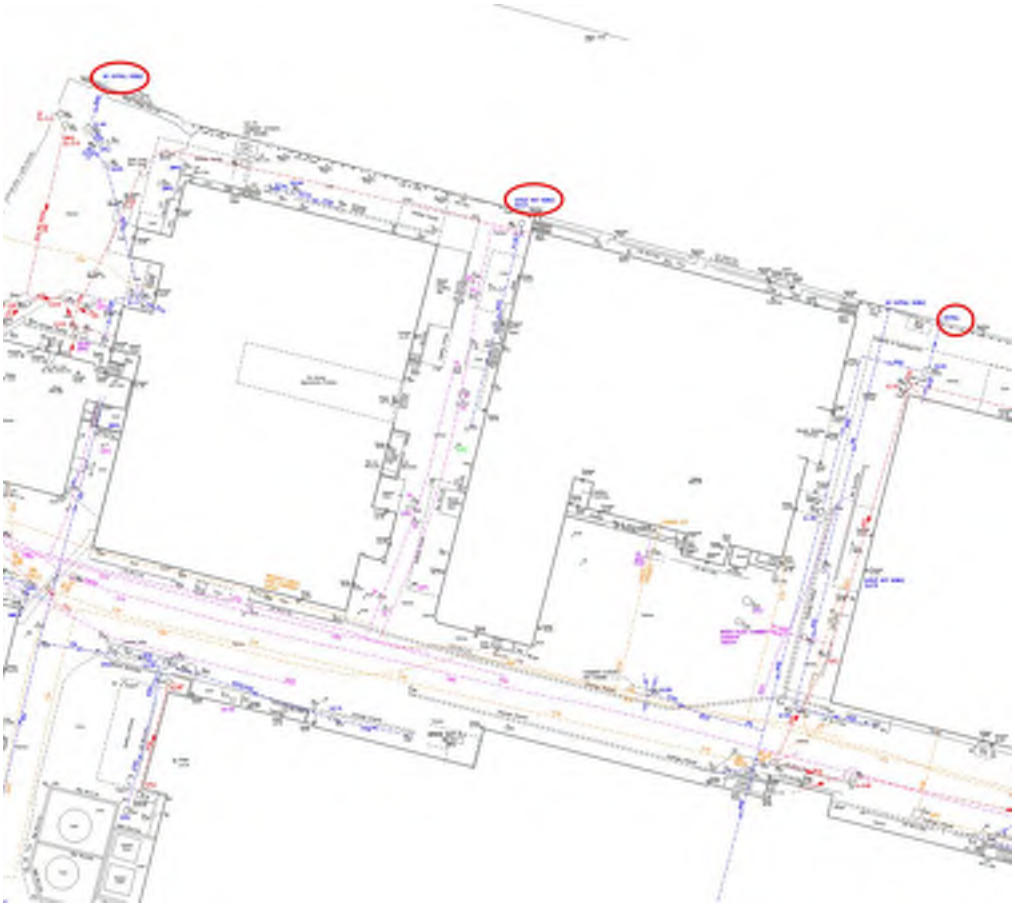


Figure 4-2 - GPR Extract Retained Outfalls

Carrow Abbey and the surrounding vegetated landscape is indicated to outfall via multiple soakaways, these soakaways have been identified in Figure 4-3. The vegetated area and highway south of the Abbey is also indicated to outfall via soakaways, see Figure 4-4. It is proposed that these existing systems are to be retained and left in situ as part of the scheme. At the time of writing no infiltration testing had been carried out, the reuse of the existing soakaways is subject to receipt of acceptable infiltration results. The proposals to maintain these soakaways is due to the sensitive nature of the Abbey Site and the Carrow Priory ruins.

Figure 4-3 - GRP Extract Carrow Abbey

Figure 4-4 - GPR Extract South of Abbey

4.2.2 Foul Water

The GPR survey did not include a definitive outfall for foul water on site, at the time of writing a CCTV survey had not been carried out therefore the existing foul water on site requires further investigation.

However, it is envisioned that the proposed development will be designed with a new below ground foul water system to serve each of the housing development. The foul water network is proposed to be developed following planning and following receipt of detailed above ground information. The exception is where existing buildings are proposed to be retained, these areas will look to reuse the existing below ground infrastructure.

An existing pump can be seen to be located in the underpass in the northeast corner of the site, it is proposed to remove the existing foul water pump and install a surface water pump to convey run off in the underpass to the proposed surface water system.

Where sewers are proposed to be abandoned or removed, works are to be carried out in accordance with building regulations Part H.

5.0 Proposed Drainage Strategy

5.1 General

The drainage strategy proposes to follow the existing site arrangement by disposing of surface water via infiltration and via outfalls to the River Wensum. Where surface water runoff is proposed to outfall to the River Wensum, it is intended to do so at a controlled 1 in 100 greenfield run-off rate (Q100) for all new build areas and for all storms (these areas are identified in Figure 5-1 below by red hatches). Where existing outfalls are proposed to be reused the existing catchment entering system is proposed to remain uncontrolled (shown in blue below); this is to avoid deep excavations adjacent to listed buildings that may affect their foundations. The River Wensum is tidal in this area and the overall site discharge is proposed to be heavily reduced.

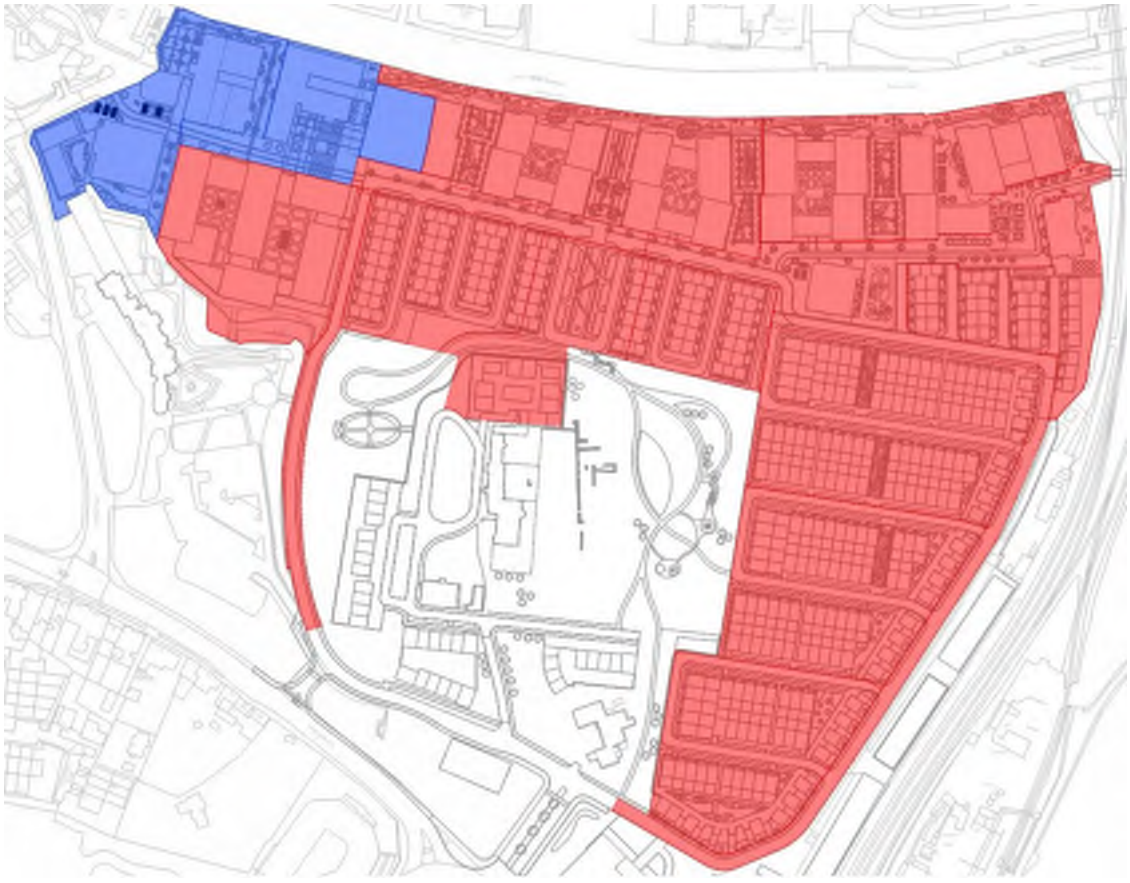


Figure 5-1 - Controlled & Uncontrolled Catchments

The hybrid planning application submitted is as such that the majority of the proposed plots are located within the outline planning areas of the site. Only with highways, the Abbey and a small area of existing commercial buildings fall within the full planning area.

To allow pipes and attenuation to be sized in the full planning network, plots have been assigned a controlled flow rate before discharging into highway system. Areas highlighted in the red in Figure 5-1

are proposed to be controlled at the Q100 rate, this approach was discussed and agreed with the LLFA during a pre planning meeting. Catchments and their classification can be found in **Appendix F**.

In line with the updated government guidance for the area, the surface water drainage has been designed to cater for up to the 1 in 100 year return period + 45% climate change. A general arrangement drawing of proposed drainage system can be found in **Appendix G**.

As discussed in Section 4.2.2, it is envisioned that the existing foul water serving the Abbey will be left in situ and foul water for the proposed development and remining retained buildings Is envision to also outfall to this existing public sewer

5.2 Surface Water

In line with the Drainage Hierarchy, surface water run off from a site should endeavour to be controlled as close to the source as possible. Discharge from site should be via one of the methods detailed in **Table 1**, in descending priority;

Table 1 - Discharge Opportunities

Sustainable Drainage Hierarchy	Site Specific Application
Store rainwater for later use	Proposed residential plots fall within the outline planning application, as plots are progressed in detail rainwater harvesting techniques are to be reviewed by M&E engineer.
Use infiltration techniques, such as porous surfaces in non-clay areas	Where existing catchments drain via infiltration it is proposed to either reuse the infiltration system or provide a new system (subject to infiltration testing results). Due to the previous site usage, the majority of the site is at an elevated contamination risk therefore not appropriate for infiltration. Infiltration has only be used in areas where existing infiltrating devices are used and contamination risk is known to be low.
Attenuate rainwater in ponds or open water features for gradual release	Spatial constrains on site limit opportunities to include ponds or open water on site.
Attenuate rainwater by storing in tanks or sealed water features for gradual release	The proposed drainage strategy proposes to attenuate surface water within below ground cellular storage.
Discharge rainwater direct to a water course	Where infiltration is not a viable outfall method due to previous commercial land use or proximity to proposed/existing listed building, it is proposed to discharge surface water to the River Wensum via a proposed outfall and an existing retained outfall.
Discharge rainwater to a surface water sewer/drain	The drainage strategy proposes to outfall runoff using infiltration and to the River Wensum.
Discharge rainwater to a combined sewer	The proposed drainage strategy proposes to outfall runoff using infiltration and to the River Wensum.

5.2.1 Proposed Site Discharge

Overview

The aggregation of the majority of the positively drained areas across the site is equal to the 1 in 100 year greenfield run-off rate. However, as described throughout this section, two catchments are proposed to freely discharge. A summary of the total site discharge is provided below. The below tables should be read in conjunction with the Catchment Plan contained in **Appendix F**.

Table 2 - Site Discharge Summary

Catchment Name	Total Area (ha)	Method of Discharge	Discharge Rate (l/s)
A,B,C,D,E,F,G,H, I, J	9.48	Controlled (Q100)	96.73
K, L, M, N, Q, R,	6.17	Infiltration	N/A
O, P, S	1.25	Uncontrolled	914.92

As per Table 1 the site proposed to outfall via two methods of discharge: infiltration and discharging directly into the River Wensum. Table 3 indicates each catchment area, the size of the catchment, planning classification of the catchment and the discharge method of the catchment. The table is an extract for the Catchment plan in **Appendix F**.

Table 3 - Catchment Classification

Catchment Name	Catchment (ha)	Discharge Method/Location	Planning Classification
A1	0.85	Proposed East Outfall	Outline
A2	0.99	Proposed East Outfall	Outline
A3	1.18	Proposed East Outfall	Outline
B	0.56	Proposed East Outfall	Outline
C1	0.63	West Outfall	Outline
C2	0.58	West Outfall	Outline

Catchment Name	Catchment (ha)	Discharge Method/Location	Planning Classification
C3	0.39	West Outfall	Outline
D	0.79	West Outfall	Outline
E	1.08	West Outfall	Outline
F	0.98	Proposed East Outfall	Outline
G	0.20	West Outfall	Full
H	0.21	West Outfall	Full
I	0.31	Proposed East Outfall	Full
J	0.73	Proposed East Outfall	Full
K	2.38	Existing Infiltration	Full
L	1.08	Existing Infiltration	Outline
M	0.53	Existing Infiltration	Outline
N	0.61	Existing Infiltration	Outline
O	0.73	Existing Outfall	Full
P	0.39	West Outfall	Full
Q	1.28	Proposed Infiltration	Outline
R	0.29	Existing Infiltration	Full
S	0.13	Existing Outfall	Outline

Table 3 indicates that an area of 6.17ha is proposed to be disposed of via infiltration utilising either existing infiltration systems or where this is not possible reinstalled systems.

This leaves a remaining 10.73 ha that outfalls to the River Wensum, of which 9.48 ha is proposed to be controlled to the Q100 rate. The Q100 rate has been calculated using MicroDrainage as 10.2 l/s/ha see Figure 5-2 below. The Q100 rate has been selected as this will provide a significant betterment when compared with the existing uncontrolled discharge from the site. This approach is seen as acceptable

as the River Wensum in this location is tidal and less susceptible to fluvial flood events. However, following consultation with the LLFA it was agreed that although the river is tidal a significant betterment would be provided.

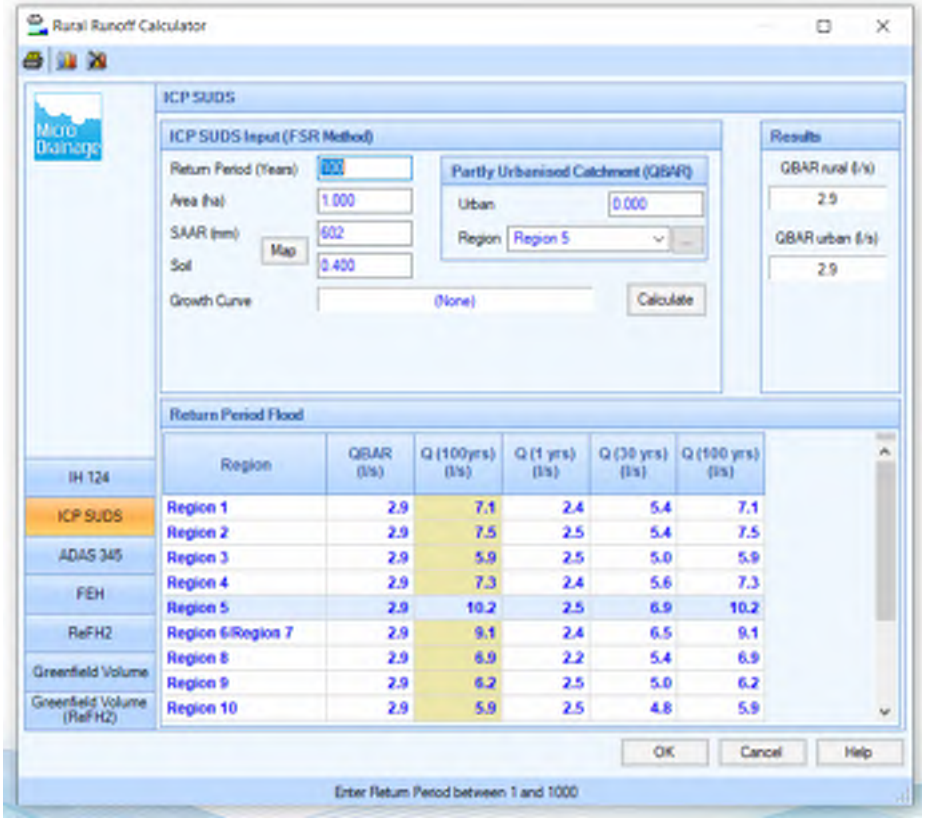


Figure 5-2 - Q100 Controlled Rate

The Q100 rate is the proposed final outfall rate from the proposed drainage system for the east outfall. The west outfall has a combined outfall rate of 378.8 l/s of which the proposed plots contribute a total controlled rate of 39.58 l/s. Plots have been assigned controlled outfall rates on a plot by plot bases, taking into account spatial constraints of the plot, location of outfall and spatial constraints of the road.

A hydraulic model has been designed for the site with the catchment areas associated with the outline planning plots assigned to a single point of outfall per catchment. A control has been modelled limiting the catchment to its assigned discharged rate, this approach allows the strategic system to be assessed and sized sufficiently whilst also provided an indication of the attenuation required for each plot.

Due to the outline status of the plots, it has been assumed that the entire plot is impermeable, therefore no allowance for landscaping has been included. This is seen as conservative.

The hydraulic modelled has been assed line with government guidance for the area, the surface water drainage has been designed to cater for up to the 1 in 100 year return period + 45% climate change. A general arrangement drawing of proposed drainage system can be found in **Appendix G** and hydraulic calculations can be found in **Appendix H**.

East Outfall

The east outfall is a proposed outfall is controlled to a discharge rate of 57.15 l/s before outfalling directly into the River Wensum. The table below outlines the plots that are proposed to outfall to the east network, the catchment area, the flow rate and attenuation required on plot. Due to the size of Catchment A three outfalls have been provided.

Table 4 - East Outfall Catchments

Catchment Name	Catchment (ha)	Controlled Discharge Rate (l/s)	Attenuation Required (m^3)
A1	0.85	15.00	472
A2	0.99	12.00	618
A3	1.18	15.00	720
B	0.56	15.00	276
F	0.98	7.33	694

West Outfall

The west outfall is proposed to reuse an existing outfall to the River Wensum and as such the final outfall rate to the River Wensum is made up of both controlled and uncontrolled rates. Catchment areas G, H and C are proposed to discharge upstream of the existing pipework and therefore the controlled rate from these areas has been prorated based on catchment area and a vortex control chamber provided. Catchment areas D & E are proposed to discharge downstream of the vortex control and will be controlled separately on each plot.

The maximum flow rate from the west outfall is 378.8 l/s, of which 39.58 l/s is controlled from the proposed drainage network. See Figure 5-3 for diagram.

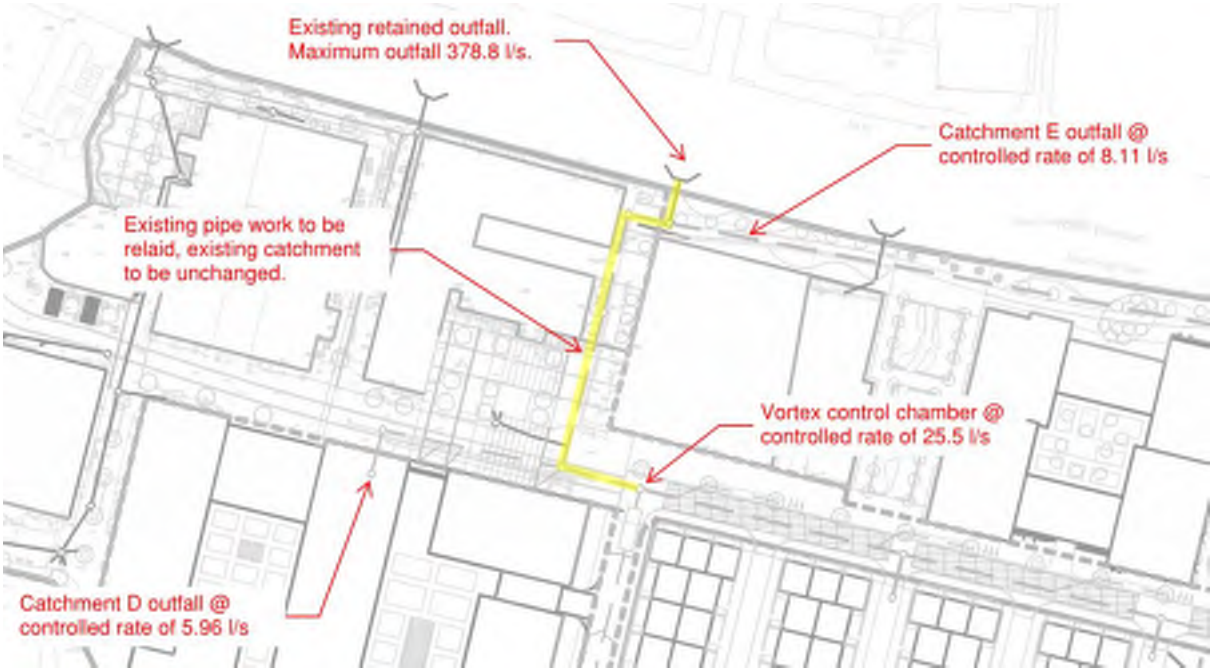


Figure 5-3 - West Outfall Diagram

Catchment C is the only plot proposed to discharge upstream of the retained network and outfall (highlighted in Figure 5-3), due to the size of Catchment C three outfalls have been provided. The table below outlines the outfall from Catchment C identifying the catchment area, the flow rate and attenuation required on plot.

Table 5 - West Outfall Catchments Upstream of Existing Network

Catchment Name	Catchment (ha)	Controlled Discharge Rate (l/s)	Attenuation Required (m^3)
C1	0.39	10.00	193
C2	0.73	11.00	319
C3	0.48	20.00	286

The remaining controlled catchment areas D and E are detailed in the table below –

Table 6 - D & E Catchments

Catchment Name	Catchment (ha)	Controlled Discharge Rate (l/s)	Attenuation Required (m^3)
D	0.79	5.96	561
E	1.08	8.11	763

As identified in Figure 5-3 the existing retained buildings are proposed to utilise the existing arrangement and outfall uncontrolled (Catchment Area O & P) as per the existing regime on site. Due to spatial constraints in this area and the historic nature of the buildings, any attenuation associated with it would be required to be below ground and deep. The construction of these features may pose a risk to be structural integrity of the building and therefore have not been included. As the River Wensum is tidal and the existing system discharges freely, the risk of instability due to the installation of attenuation has been assessed to outweigh the risk of flooding. The catchment areas associated with these buildings are identified below.

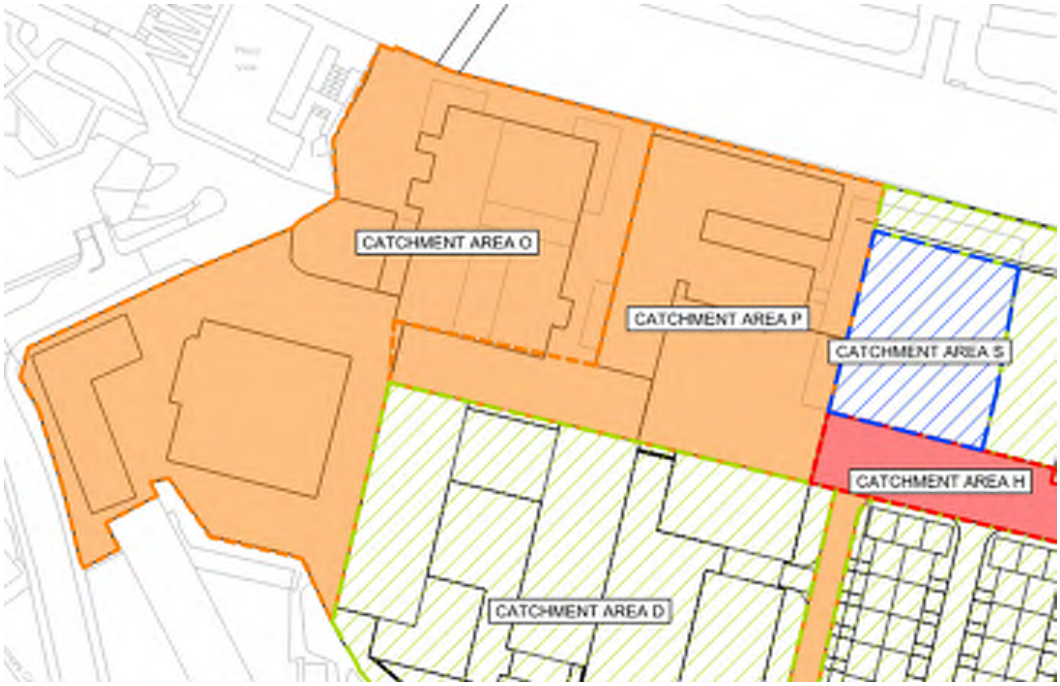


Figure 5-4 - Retained Building Catchments

5.2.2 Attenuation

As discussed in Section 5.2.1 separate attenuation is to be provided within the highways and on plot. Where attenuation is provided in the highways this is proposed to be in the form of below ground cellular storage crates.

The plots fall within the outline planning classification of the application and therefore the details of attenuation in these areas will be confirmed at a later design stage. However, it is envisioned that it will be provided via permeable paving, bioretention, blue/green roofs or below ground cellular storage.

The required attenuation has been calculated using Causeway Flow for the 100 year return period + 45% climate change, calculations can be found in **Appendix H**.

The west outfall requires a total of 2,919m^3 of storage, 797m^3 of which is proposed to be provided using below ground cellular storage and the remaining 2,122m^3 on plot as part of the outline panning extents, the form of which is to be confirmed at a later design stage.

The east outfall requires a total of 4,024m^3 of storage, 1,315m^3 of which is proposed to be provided within the detailed planning boundary using below ground cellular storage and the remaining 2,709m^3 on plot as part of the outline planning extents, the form of which is to be confirmed at a later design stage.

5.2.3 Sustainable Drainage Systems

Developments should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. As mentioned previously, the design should aim to reduce run-off rates and ensure that run-off is managed as close to its source as possible as per the drainage hierarchy (see Table 1).

The SuDS Hierarchy sets out the preferred method of discharging and managing water from a development site and aims to highlight why each item has been utilised or discounted.

Table 7 analyses the SuDS hierarchy and the appropriate techniques with specific focus on this project.

Table 7 - SuDS Opportunities

SuDS Technique	Site Specific Analysis
Rainwater Harvesting	Proposed residential plots fall within the outline planning application, as plots are progressed in detail rainwater harvesting techniques are to be reviewed by M&E engineer at a later design stage.
Living or Roofs/Areas	It is envisioned that blue/green roofs will be included within in the on plot drainage designs, as these areas fall within the outlining planning area this will be confirmed at a later design stage. The buildings within the full planning area are retained listed building and as such blue/green roofs are not proposed.

SuDS Technique	Site Specific Analysis
Basins and Ponds	Due to spatial constraints basins or ponds are not proposed within the full planning area. It is envisioned that the potential of including basins and ponds will also be limited due to spatial constraints, however as the plot designs progress the options will be reviewed.
Bio-retention and Swales	Bio-retention areas are proposed within the full planning application boundary, it is proposed that parts of the highways will runoff directly into the bio-retention areas. The bio-retention areas are to be used for treatment only and not proposed to be used as storage.
Infiltration Devices	It is proposed to reuse existing infiltration structures on site where suitable. These are shown on the Drainage General Arrangement in **Appendix G**.
Permeable Surfaces	Permeable paving is envisioned to be included within the on-plot outline drainage strategy. Porous sub-base with impermeable surfacing is proposed In the surround areas of the existing buildings to the northwest corner of the site around the listed building in the northwest corner of the site (Catchments O&P), it is proposed to outfall runoff via linear channels to a granular sub base where this will enter the below ground drainage system. This is intended to slow the flow of run-off in the uncontrolled portion of the scheme, provide some additional attenuation and reduce flood risk, without installing large attenuation tanks adjacent to the foundations of listed buildings.
Tanked Systems	Tanked systems are proposed within both the full and outline planning areas on the site. Within the full planning area tanked systems are proposed to provide a total of 2,112m^3 of storage.

5.2.1 Water Quality – Full Planning Area

The proposed drainage strategy manages pollution risk for the site based on a simple qualitative method as defined in the CIRIA SuDS Manual C753, consisting of an assessment of likely pollution hazard levels for the site and SuDS performance capacities:

Step 1. Allocate suitable pollution hazard indices for the proposed land use

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 5-5 - Extract of CIRIA SuDS Manual C753. Pollution Hazard Indices for Land Use Classification

For the development that falls within the full planning application this has been identified as *'Commercial Yards/All Other Roads'*, the existing retained buildings are classified as *'Commercial Yard'* and the highway as *'All Other Roads'*.

Step 2. Select SuDS with a total pollution mitigation index that is equal or exceeds the pollution hazard index.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices[1]		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[3]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[1,3]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 5-6: Extract of CIRIA SuDS Manual C753. Pollution Mitigation Indices

The *'Commercial Yards'* are proposed to drain via linear channels that outfall to a granular subbase before entering the wider strategic network, for the purpose of the indices matrix this can be viewed as '*Permeable Paving'*.

'All Other Roads' (Highways) are proposed to drain via roadside bioretention that outfall to a granular subbase before entering the wider strategic network.

Both permeable paving and bioretention areas provide sufficient treatment for their respective land use and pollution hazard level.

Due to spatial and arboriculture constraints the retained highways are proposed to drainage via road gulley's, it is proposed that before entering the downstream system where SuDS components are present these catchments is proposed to pass through a full retention petrol interceptor. Mitigation indices for a AquaTreat Water Treatment Separator can be found –

Table 8 - AquaTreat Water Treatment Separator Treatment Indices

TSS	Metals	Hydrocarbons
0.85	0.64	0.99

5.2.1 Water Quality – Outline Planning Area

The proposed drainage strategy manages pollution risk for the site based on a simple qualitative method as defined in the CIRIA SuDS Manual C753, consisting of an assessment of likely pollution hazard levels for the outlining planning area and SuDS performance capacities:

Step 1. Allocate suitable pollution hazard indices for the proposed land use

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 5-7 - Extract of CIRIA SuDS Manual C753. Pollution Hazard Indices for Land Use Classification

The development that falls within the outline planning application has been identified as *'Residential Roofs', 'Individual Property Driveways' or 'Commercial Yards,.*

Step 2. Select SuDS with a total pollution mitigation index that is equal or exceeds the pollution hazard index.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 5-8: Extract of CIRIA SuDS Manual C753. Pollution Mitigation Indices

The above figure provides an indication of how treatment may be provided within the outlining planning area, however the exact details of the SuDS components used within these areas will be confirmed at a later design stage.

Permeable paving, bioretention areas (blue/green roofs) and filter strips provide sufficient treatment for their respective land use and pollution hazard level. Where areas are identified at the later design stages that are not covered by these, bypass or full retention separators will be used to ensure the hazard indices are met for all areas of the development.

5.2.2 Flood Exceedance

Information taken from the Carrow Bridge TS Norwich Monitoring Station (TG2390007700) indicates that the typical high tide level for the River Wensum at this location is 0.99mAOD. The proposed eastern outfall from the site is proposed at a level of 1.00mAOD, this sits above the typical high tide level.

The western outfall from the site proposes to reuse an existing outfall. The outfall level is unknown however the next upstream invert level is 0.64mAOD, therefore it has been assumed that the pipe is laid at a grade of 1 in 100.

Both the known upstream level and assumed downstream outfall level sits below the typical high tide level, to allow for this within the design a surcharged outfall has been modelled for all return periods and durations. Calculations can be found in **Appendix H**.

Using the climate change allowances provided by the Environment Agency for the fluvial and pluvial flood risk to the site, a further assessment has been undertaken into the impact of the design rainfall event (1 in 100 year +45%CC) occurring simultaneously with the design river flooding event (1 in 100 year +11%CC). Surcharged outfall for both the west and east outfalls have been modelled to simulate river levels in the Wensum during a 1 in 100 year fluvial event occurring in the 2080s. Calculations can be found in **Appendix I**.

This model indicated that a total of 677m^3 of flooding would occur at the east outfall (MH 29), however levels indicate that should flooding occur at this manhole the exceedance flows would flow towards and enter the River Wensum.

The west outfall indicates the system would flood (511m^3) at its lowest point (MH SW36), where flood water would be located within the highway and surrounding areas.

5.3 Foul Water

As discussed in Section 4.2.2 it is envisioned that the that the existing foul water serving the Abbey building is to be retained. A new foul water network is proposed to serve the new developments across the site with existing sewerage being retained where feasible. An assessment into the foul water loading is to be undertaken following planning and during the detailed developments of the plot drainage. The existing Anglian Water sewer that bisects the site will be retained from the Abbey to its outfall in the south and abandoned or diverted to the north.

Foul water on sire proposed to be designed in accordance with Building Regulations Part H and is believed to remain private.

5.3.1 Nutrient Neutrality

Guidance has also been provided by Natural England with regards to the potential to affect water quality by treated foul effluent resulting in adverse nutrient impacts on habitat sites. The proposed development will result in a net increase in population served by the Anglian Water wastewater system. At this stage it is known that there are various options available for the mitigation of this impact, however, currently no specific mitigation measure has been opted for.

The detailed aspect of this application does not include any new buildings, therefore it is proposed that nutrient neutrality is considered and conditioned at the reserved matters application stage, where the new housing developments will be brought forward for assessment.

6.0 General Maintenance

It is assumed that all drainage within the site will be maintained as a private network. A suitable maintenance strategy will be included within handover documentation by the contractor once final details and suppliers have been chosen for the individual drainage elements. This strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

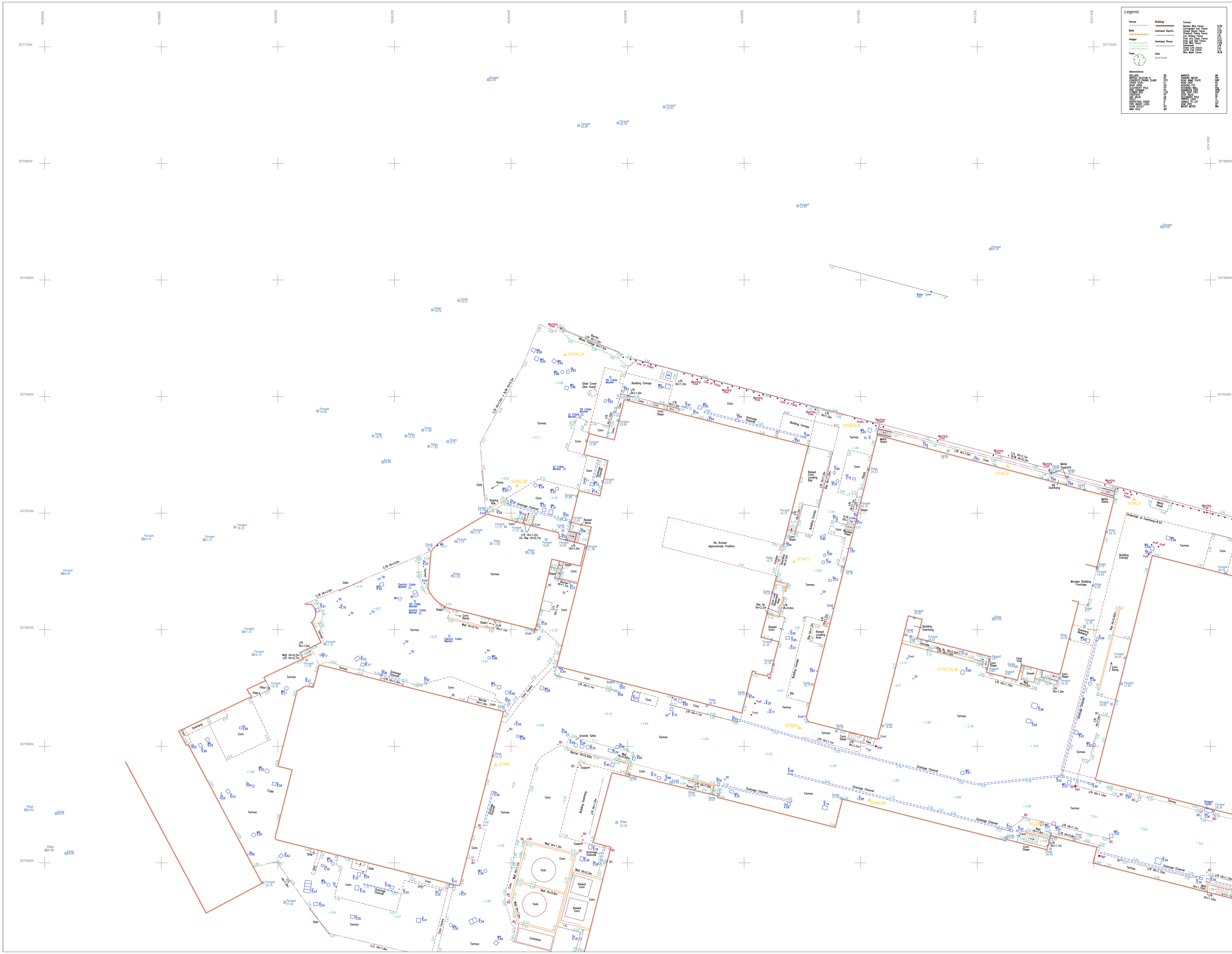
An Operation and Maintenance Manual has been written by Curtins and should be referenced for general maintenance, this can be found in **Appendix J**.

7.0 Conclusions and Recommendations

This report is intended to provide further details on the design of the drainage systems for the proposed redevelopment of the Carrow Works site and to act as additional information in support of the planning application. The conclusions to be drawn from this report are as follows:

- The southern area of the site proposes to outfall via infiltration through either existing soakaway structure, where existing structures cannot be retained existing soakaways are to be reinstalled or cleaned.
- The northern area proposes to outfall to the River Wensum at a Controlled rate of Q100.
- The northwest of the site (Catchments O&P) that are proposed refurbishments of existing listed buildings are proposed to discharge as per the existing regime.
- Where attenuation is required, it is provided via below ground cellular storage in the full planning application area.
- Further details of the drainage strategy for the outline planning areas will be provided at the reserved matters application stage. The discharge rates and attenuation volumes required have been outlined in this report.
- To combat flooding due to high tides, outfalls are proposed to be installed above the typical high tide level or a surcharged outfall has been modelled using the typical high tide level.
- Permeable paving, bioretention and Petrol interceptors are proposed to treat run off within the full planning application area before it is discharged into the River Wensum.
- It is envisioned that Foul Water will utilise the existing connections to the public sewer located on site.

Appendix A – Site wide topographical survey



Notes:

Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.

All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction.

Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Coordinate Table

Stn	Easting	Northing	Level
RC1	624190.337	307611.342	4.832
RC10	624450.249	307577.504	4.601
RC11	624485.811	307557.457	3.619
RC12	624472.992	307505.592	5.235
RC13	624431.089	307516.490	5.089
RC15	624362.846	307523.290	5.021
RC16	624338.487	307468.131	5.256
RC17	624325.864	307471.037	5.093
RC18	624309.030	307474.774	5.063
RC19	624300.886	307488.617	4.992
RC2	624243.598	307601.733	4.801
RC21	624219.933	307553.964	4.794
RC25	624173.654	307554.226	5.021
RC3	624324.448	307593.554	4.784
RC31	624131.053	307566.721	5.225
RC35	624238.767	307506.239	5.153
STN1	624408.946	307268.178	6.934
STN10	624089.489	307583.140	4.067
STN11	624204.934	307546.594	3.302
STN12	624260.866	307526.574	3.226
STN13	624345.517	307498.227	3.231
STN13A	624314.815	307526.408	3.167
STN13B	624320.373	307550.213	3.311
STN14	624393.167	307527.487	3.408
STN15	624470.483	307527.726	3.653
STN16	624478.361	307430.885	3.706
STN17	624466.896	307357.893	6.775
STN1R	624438.720	307310.810	8.710
STN2	624327.608	307198.860	7.392
STN3	624245.087	307257.967	10.932
STN3A	624212.223	307195.780	10.000
STN3Z	624260.562	307256.565	10.165
STN4	624158.281	307285.589	13.569
STN4A	624138.728	307293.833	14.147
STN4A1	624132.076	307279.935	15.588
STN4B	624163.933	307256.096	14.232
STN5	624112.684	307322.867	15.230
STN6	624104.385	307433.428	8.517
STN7	624126.108	307475.591	6.006
STN7A	624097.573	307485.526	6.178
STN7B	624147.259	307493.761	4.793
STN7C	624163.885	307506.359	4.984
STN8	624042.883	307522.770	5.308
STN8A	624077.341	307502.116	5.105
STN8A1	624075.158	307484.405	6.582
STN8B	624116.044	307502.915	4.794
STN9	624037.369	307576.782	5.554
STN9A	624046.336	307591.864	5.463
STN9B	624012.632	307600.059	6.576
STN9C	623994.743	307585.870	6.047
STN9D	623997.720	307563.436	5.835
STN9E	624031.039	307555.217	5.424
STNB1	624191.286	307243.035	13.384
STNBR1	624205.110	307263.539	11.901
STNC1	624088.529	307611.694	3.887
STNC10	624518.683	307571.198	1.476
STNC10A	624528.065	307565.700	1.167
STNC10B	624520.898	307554.534	1.643
STNC11	624470.275	307564.288	2.317
STNC11A	624473.400	307585.466	1.756
STNC12	624479.8261	307595.4946	1.5447
STNC13	624507.4054	307597.2299	1.6217
STNC14	624472.2326	307512.9358	3.6401
STNC14A	624489.3552	307517.4921	3.5595
STNC19	624450.8611	307553.4420	3.3378
STNC2	624099.6354	307635.0375	3.9449
STNC20	624340.4121	307489.8376	3.3313
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STNC22	624347.5215	307466.6815	3.7155
STNC22A	624345.2797	307455.1947	4.7870
STNC23	624297.3791	307477.6708	3.6695
STNC24	624302.0432	307498.4798	3.3561
STNC24A	624292.1747	307504.4669	3.3343
STNC2A	624049.2924	307647.1517	3.9085
STNC2B	624041.0212	307624.6973	4.4369
STNC3	624125.2265	307628.0419	1.6708
STNC30	624101.4878	307570.7955	3.8321
STNC31	624116.3712	307593.1521	3.9503
STNC4	624146.9360	307622.3406	3.5638
STNC40	624270.5552	307289.7571	10.3060
STNC41	624286.3119	307275.7697	9.4804
STNC41A	624282.8617	307286.3612	9.8426
STNC42	624280.6199	307259.8963	9.4843
STNC43	624275.7233	307253.9066	9.7601
STNC44	624265.2724	307252.9808	9.9885
STNC45	624239.1039	307269.7593	10.6611
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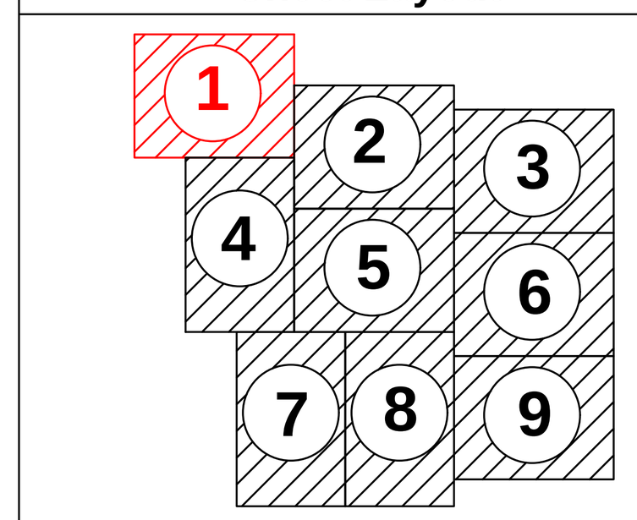
Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey Sheet 1 of 9

Job No. 1805022	Old Job No.
Drawing Number CW/1805022/1	Revision Suffix
Scale 1:200m (A0)	Date August 2018

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Notes:

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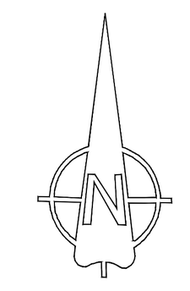
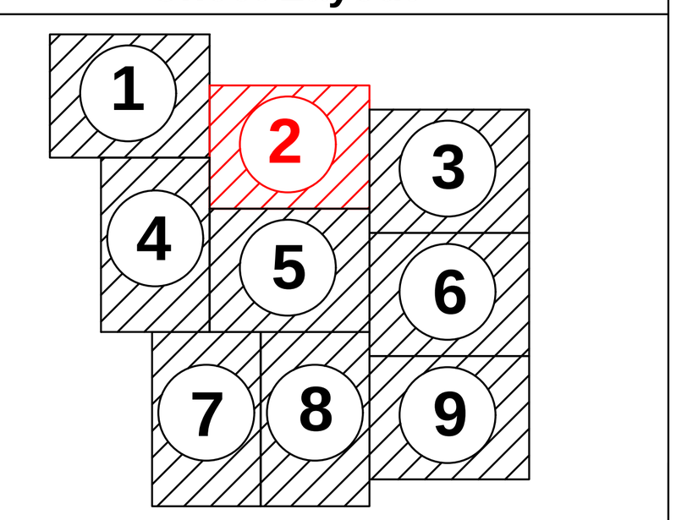
Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.



Coordinate Table

Stn	Easting	Northing	Level
STNC8	624446.199	307592.689	3.014
STNC9	624450.858	307553.439	3.337
STNE1	624368.534	307190.167	6.075
STNE10	624349.429	307450.284	6.775
STNE11	624341.315	307398.212	7.615
STNE12	624328.937	307321.187	7.614
STNE13	624320.134	307320.712	9.313
STNE14	624295.313	307323.707	10.250
STNE15	624296.494	307298.329	9.605
STNE2	624454.801	307321.008	5.854
STNE3	624452.484	307438.506	3.583
STNE4	624426.744	307440.654	4.543
STNE4A	624380.752	307448.559	4.322
STNE4B	624426.995	307427.969	4.405
STNE4R	624435.738	307438.976	5.370
STNE4R2	624433.997	307426.813	6.047
STNE5	624371.083	307450.506	4.036
STNE6	624372.228	307470.070	3.591
STNE7	624375.744	307492.229	3.389
STNE8	624416.667	307485.855	3.411
STNE9	624431.023	307516.037	3.399
STNEA1A	624347.531	307151.398	6.339
STNEA1B	624362.306	307160.385	6.030
STNEB1	624380.992	307184.408	6.065
STNEB2	624416.528	307244.897	5.919
STNER1	624343.842	307193.323	9.061
STNLB1	624381.043	307226.776	6.956
STNLB2	624295.140	307250.796	6.935
STNLP1	624312.786	307195.802	7.642
STNLP2	624281.113	307150.038	8.410
STNLP3	624242.923	307188.094	10.617
STNLP4	624256.249	307210.806	10.284
STNLPR1	624284.575	307215.994	10.711
STNM1	624177.442	307395.019	12.767
STNM2	624203.543	307469.980	11.940
STNM2A	624178.991	307459.549	12.117
STNM2B	624230.579	307471.684	12.138
STNM3	624213.473	307520.800	3.548
STNM3A	624221.464	307567.446	3.207
STNM3B	624214.992	307483.974	5.518
STNM3C	624196.541	307490.763	5.004
STNM3C1	624213.943	307474.499	8.394
STNM3D	624173.916	307496.884	6.577
STNM3E	624172.242	307487.101	7.429
STNM3F	624175.515	307470.120	10.251
STNM3G	624183.493	307459.651	11.980
STNMR1	624055.055	307557.320	5.470
STNMR2	624075.681	307495.508	5.417
STNMR4	624110.666	307384.090	11.902
STNMR5	624256.219	307223.687	10.150
STNMR6	624235.186	307227.123	10.421
STNP1	624162.409	307324.378	13.406
STNP10	624209.939	307312.024	12.488
STNP11	624248.975	307354.130	11.643
STNP12	624269.666	307377.951	12.092
STNP12A	624310.365	307384.996	10.781
STNP13	624228.107	307381.662	12.396
STNP14	624229.713	307420.328	11.929
STNP15	624260.753	307443.206	11.118
STNP15A	624242.378	307467.373	11.130
STNP16	624294.825	307462.105	11.752
STNP17	624338.627	307449.362	11.583
STNP1A	624207.797	307334.880	12.615
STNP2	624131.564	307326.766	13.867
STNP3	624140.772	307391.602	13.832
STNP4	624120.321	307421.815	14.249
STNP5	624116.849	307444.290	13.594
STNP6	624146.236	307436.427	12.609
STNP6A	624131.182	307447.582	13.409
STNP6B	624134.899	307462.372	13.223
STNP7	624172.637	307447.137	12.242
STNP8	624210.186	307379.891	12.390
STNP8A	624196.784	307351.355	11.988
STNP9	624228.720	307358.971	11.944
STNTP1	624152.598	307324.993	13.877
T1	624514.713	307591.823	5.202

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey Sheet 2 of 9

Job No. 1805022	Old Job No.
Drawing Number CW/1805022/2	Revision Suffix
Scale 1:200m (A0)	Date August 2018

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Notes:

Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.

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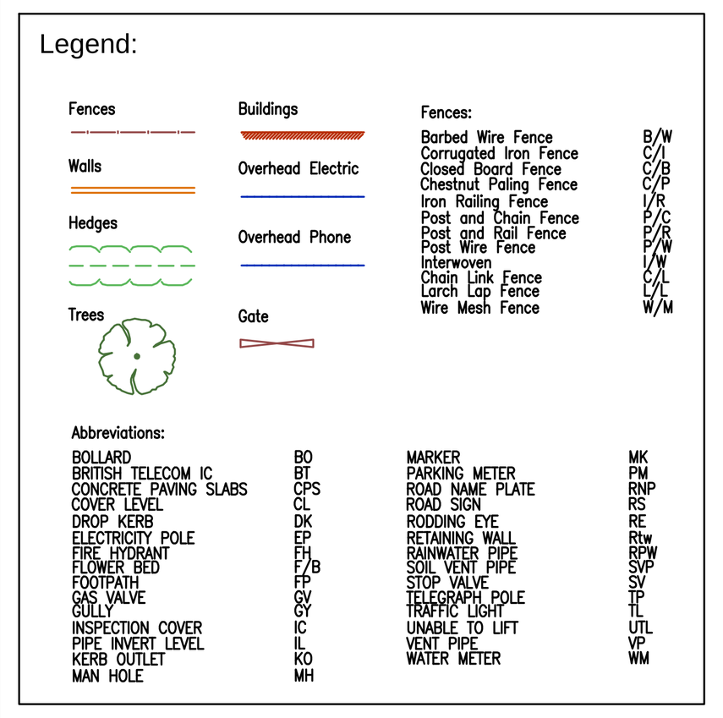
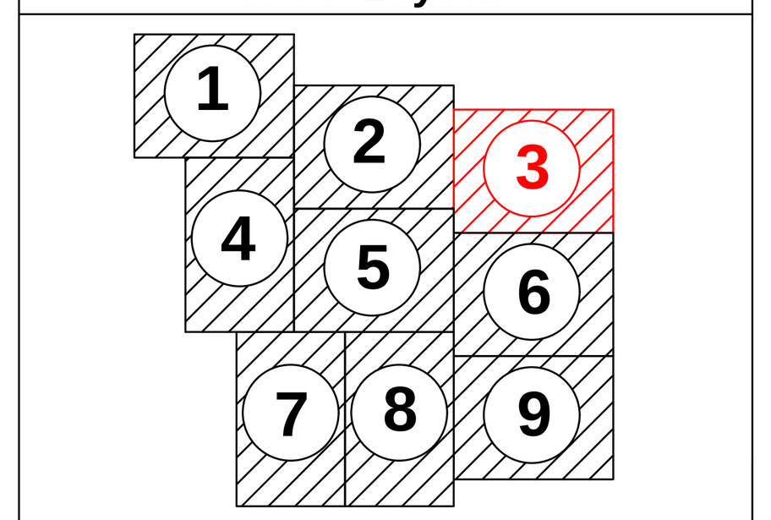
Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE



Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey
Sheet 3 of 9

Job No. 1805022	Old Job No.
Drawing Number CW/1805022/3	Revision Suffix
Scale 1:200m (A0)	Date August 2018

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INDICATIVE

Tree Schedule

Pt No	Spread	Bole	Height	Species

Legend:

Fences, Walls, Hedges, Trees, Buildings, Overhead Electric, Overhead Phone, Gate

Fences: Barbed Wire Fence BW; Corrugated Iron Fence CIF; Closed Board Fence CBF; Chestnut Paling Fence CPF; Iron Rail Fence IR; Iron and Wire Fence IWF; Post and Rail Fence PRF; Post Wire Fence PWF; Interwoven IW; Chain Link Fence CHL; Larch Lap Fence LLF; Wire Mesh Fence WM

Abbreviations:

BOLLARD	BO	MARKER	MK
BRITISH TELECOM IC.	BT	PARKING METER	PM
CONCRETE PAVING SLABS	CPS	ROAD NAME PLATE	RNP
COVER LEVEL	CL	ROAD SIGN	RS
DROP KERB	DK	RODDING EYE	RE
ELECTRICITY POLE	EP	RETAINING WALL	Rtw
FIRE HYDRANT	FH	RAINWATER PIPE	RWP
FLOWER BED	F/B	SOIL VENT PIPE	SVP
FOOTPATH	FP	STOP VALVE	SV
GAS VALVE	GV	TELEGRAPH POLE	TP
GULLY	GY	TRAFFIC LIGHT	TL
INSPECTION COVER	IC	UNABLE TO LIFT	UTL
PIPE INVERT LEVEL	IL	VENT PIPE	VP
KERB OUTLET	KO	WATER METER	WM
MAN HOLE	MH		

Sheet Layout

Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey
Sheet 4 of 9

Job No. 1805022	Old Job No.
Drawing Number CW/1805022/4	Revision Suffix
Scale 1:200m (A0)	Date August 2018

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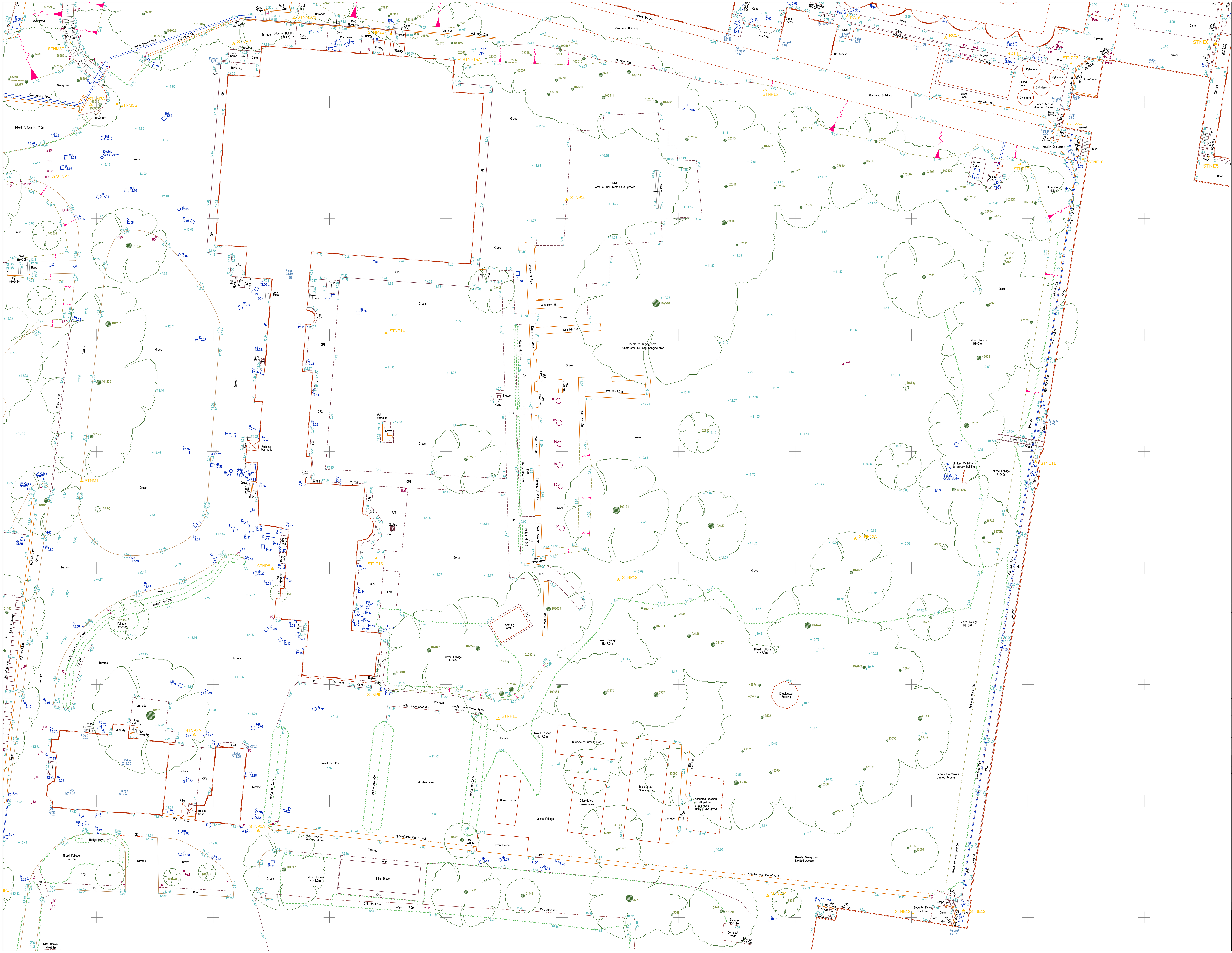

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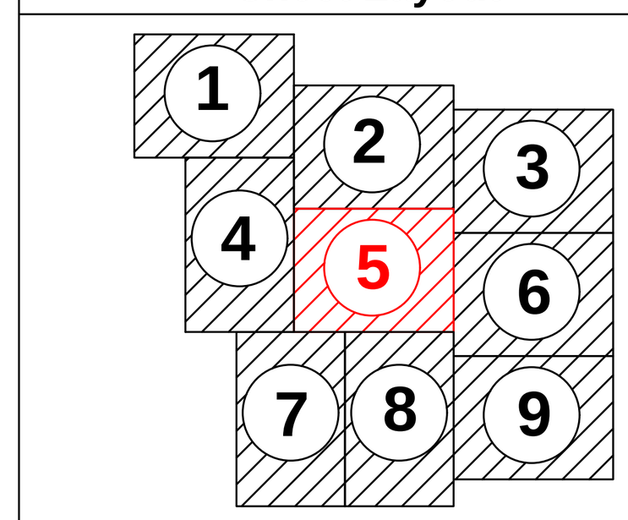
INDICATIVE

Legend:

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey Sheet 5 of 9

Job No. 1805022 | Old Job No.

Drawing Number CW/1805022/5 | Revision Suffix

Scale 1:200m (A0) | Date August 2018

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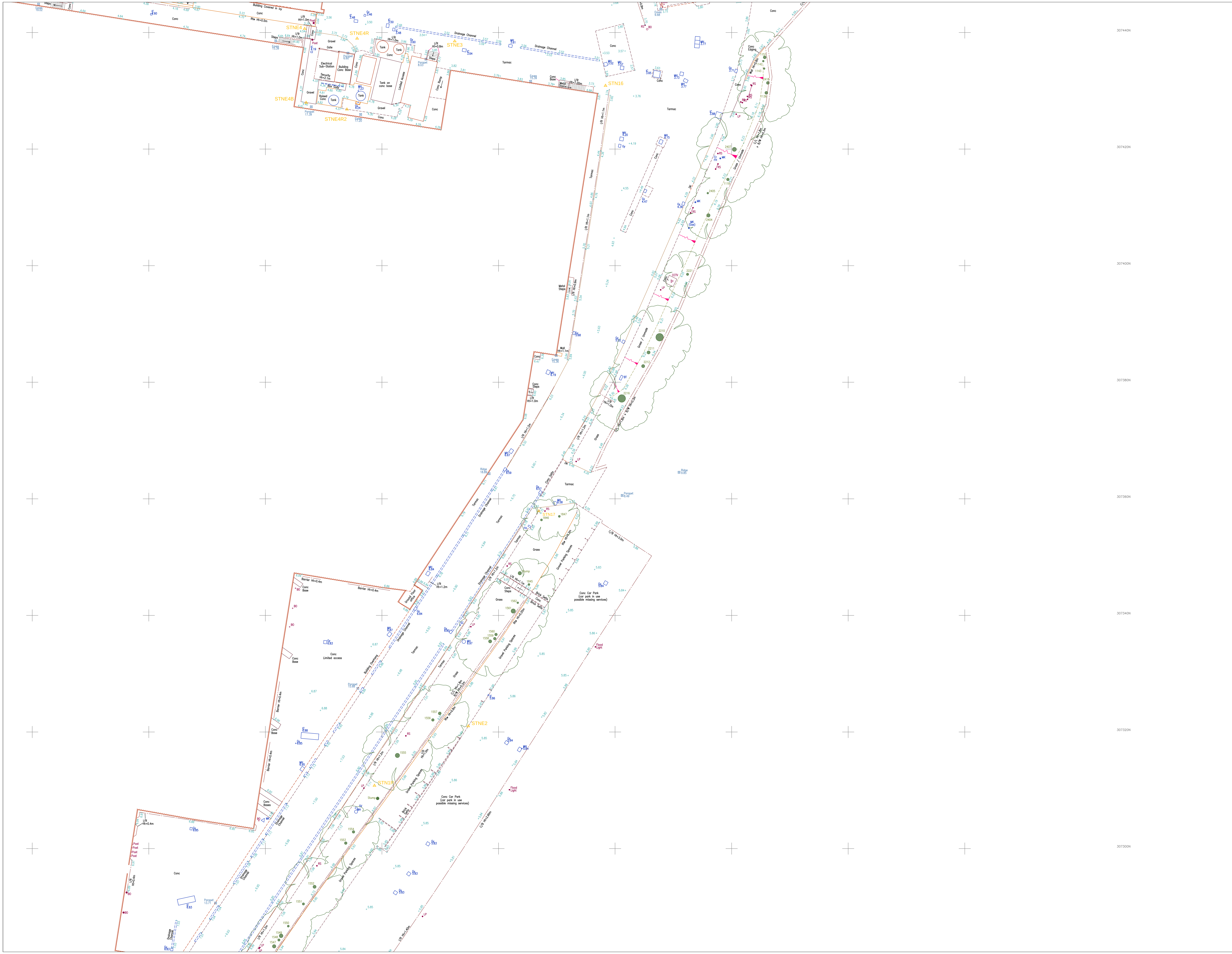

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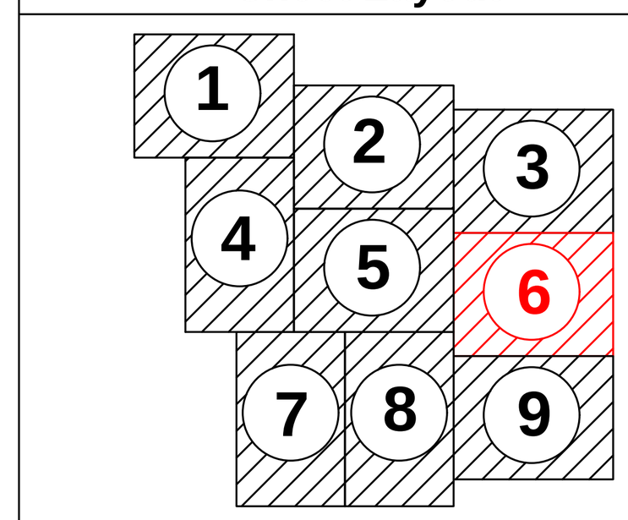
INDICATIVE

Legend:

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey
Sheet 6 of 9

Job No. 1805022	Old Job No.
Drawing Number CW/1805022/6	Revision Suffix
Scale 1:200m (A0)	Date August 2018

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INDICATIVE

Legend:

Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:

Barbed Wire Fence	B/W
Corrugated Iron Fence	C/I
Closed Board Fence	C/B
Chestnut Paling Fence	C/P
Iron Railing Fence	I/R
Post and Chain Fence	P/C
Post and Rail Fence	P/R
Post Wire Fence	P/W
Trellis	T/W
Chain Link Fence	C/L
Larch Lap Fence	L/L
Wire Mesh Fence	W/M

Abbreviations:

BOLLARD	BD	MARKER	MK
BRITISH TELECOM IC	BT	PARKING METER	PM
CONCRETE PAVING SLABS	CPS	POST NAME PLATE	PNP
COVER LEVEL	CL	ROAD SIGN	RS
DROP KERB	DK	RODDING EYE	RE
ELECTRICITY POLE	EP	RETAINING WALL	Rtw
FIRE HYDRANT	FH	RAINWATER PIPE	RPW
FLOWER BED	F/B	SOIL VENT PIPE	SVP
FOOTPATH	FP	STOP VALVE	SV
GAS VALVE	GV	TELEGRAPH POLE	TP
GRID	GD	TRAFFIC LIGHT	TL
INSPECTION COVER	IC	UNABLE TO LIFT	UTL
PIPE INVERT LEVEL	IL	VENT PIPE	VP
KERB OUTLET	KO	WATER METER	WM
MAN HOLE	MH		

Sheet Layout

Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

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Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey
Sheet 7 of 9

Job No. 1805022	Old Job No.
Drawing Number CW/1805022/7	Revision Suffix
Scale 1:200m (A0)	Date August 2018

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Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:

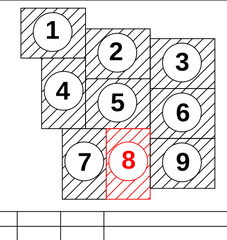
Fences
Walls
Hedges
Trees
Buildings
Overhead Electric
Overhead Phone
Gate

Fences:
Barbed Wire Fence B/W
Corrugated Iron Fence C/I
Closed Board Fence C/B
Chestnut Paling Fence C/P
Iron Railing Fence I/R
Post and Chain Fence P/CH
Post and Rail Fence P/R
Post Wire Fence P/W
Interwoven I/W
Chain Link Fence C/L
Larch Lap Fence L/L
Wire Mesh Fence W/M

Abbreviations:

BOLLARD	BO	MARKER	MK
BRITISH TELECOM IC	BT	PARKING METER	PM
CONCRETE PAVING SLABS	CPS	ROAD NAME PLATE	RNP
COVER LEVEL	CL	ROAD SIGN	RS
DROP KERB	DK	ROODING EYE	RE
ELECTRICITY POLE	EP	RETAINING WALL	RW
FIRE HYDRANT	FH	RAINWATER PIPE	RPW
FLOWER BED	F/B	SOIL VENT PIPE	SVP
FOOTPATH	FP	STOP VALVE	SV
GAS VALVE	GV	TELEGRAPH POLE	TP
KERB	K	TRAFFIC LIGHT	TL
INSPECTION COVER	IC	UNABLE TO LIFT	U/L
PIPE INVERT LEVEL	IL	VENT PIPE	VP
KERB OUTLET	KO	WATER METER	WM
MAN HOLE	MH		

Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor	PD/MB	Verified By	AL/LW	CAD Operator	TJH	Approved By	ARL	Date	23.08.18

Levelling GNSS Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey
Sheet 8 of 9

Job No. 1805022	Old Job No.
Drawing Number CW/1805022/8	Revision Suffix
Scale 1:200m (A0)	Date August 2018

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307120N
307100N
624240E
624260E
624280E
624300E
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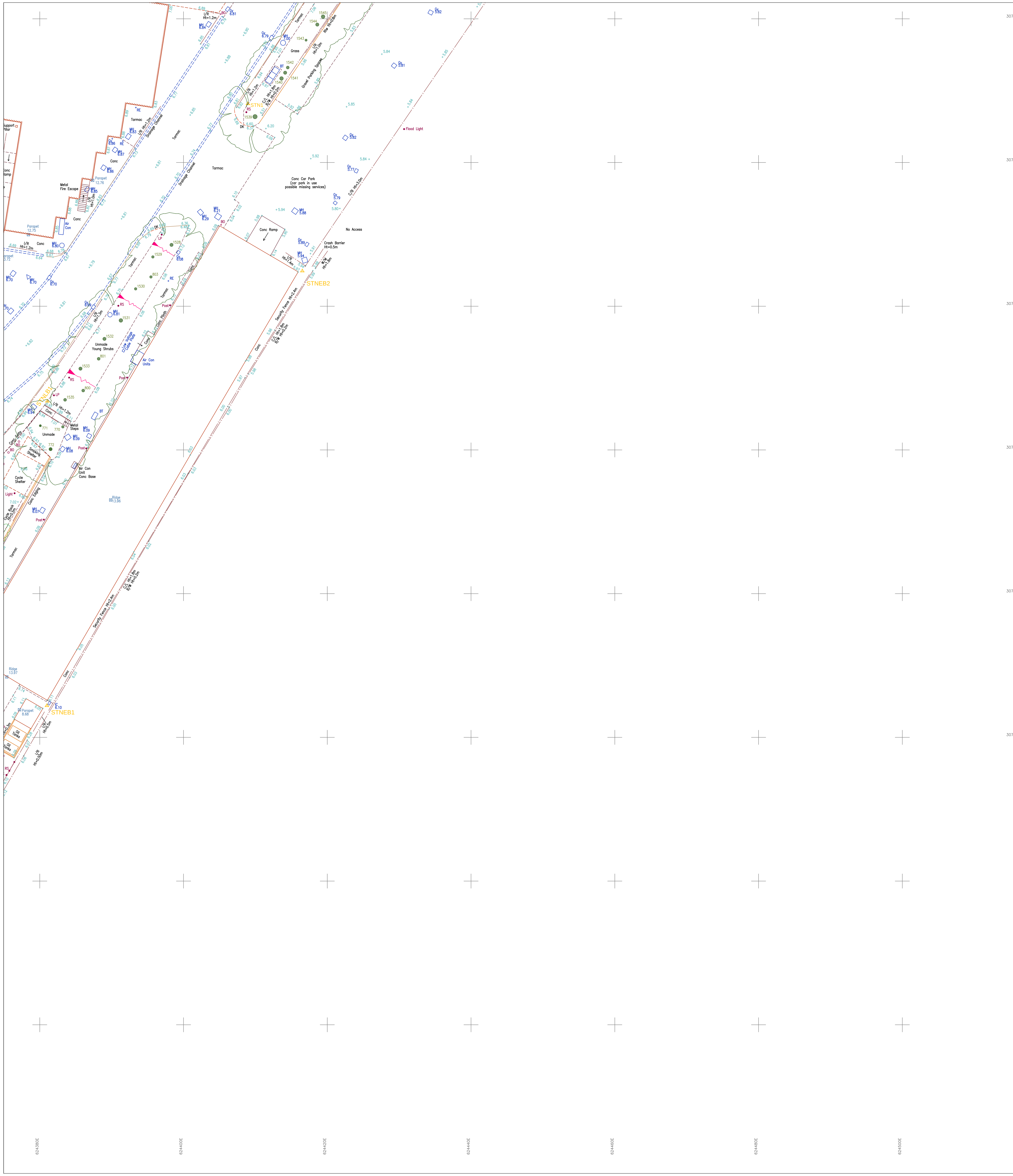


Tree Schedule

Pt No	Spread	Bole	Height	Species
142	8.0	0.35	10.0	TREE UNKOWN
166	4.0	0.25	8.0	SILVER BIRCH
167	4.0	0.30	8.0	SILVER BIRCH
168	6.0	0.30	8.0	SILVER BIRCH
385	9.0	0.40	10.0	MAPLE
539	7.0	0.50	15.0	PINE
540	6.5	0.40	15.0	PINE
542	10.0	0.50	15.0	PINE
543	7.0	0.60	16.0	PINE
544	5.0	0.30	11.0	BEECH
545	7.0	0.30	11.0	BIRCH
546	7.0	0.30	11.0	BIRCH
752	5.0	0.35	7.0	FIELD MAPLE
753	4.0	0.30	9.0	CYPRESS
770	9.0	0.35	14.0	TREE UNKOWN
771	7.0	0.30	10.0	TREE UNKOWN
772	10.0	0.45	14.0	TREE UNKOWN
800	9.0	0.40	13.0	MAPLE
801	9.0	0.40	13.0	MAPLE
803	8.0	0.35	12.0	MAPLE
848	6.0	0.45	12.0	CYPRESS
849	6.0	0.45	12.0	CYPRESS
850	4.0	0.35	10.0	CYPRESS
851	4.0	0.35	10.0	CYPRESS
852	4.0	0.30	9.0	CYPRESS
853	7.0	0.40	11.0	TREE UNKOWN
858	5.0	0.40	10.0	CYPRESS
920	9.0	0.45	13.0	TREE UNKOWN
1052	7.0	0.30	8.0	TREE UNKOWN
1053	5.0	0.40	10.0	CYPRESS
1054	8.0	0.40	10.0	TREE UNKOWN
1118	8.0	0.45	12.0	BEECH
1136	10.0	0.50	13.0	BEECH
1142	7.0	0.30	11.0	BEECH
1143	7.0	0.30	4.0	BEECH
1151	9.0	0.50	11.0	BEECH
1528	9.0	0.45	14.0	TREE UNKOWN
1529	7.0	0.35	12.0	FIELD MAPLE
1530	7.0	0.35	12.0	MAPLE
1531	10.0	0.50	15.0	MAPLE
1532	10.0	0.45	15.0	MAPLE
1533	9.0	0.45	13.0	MAPLE
1535	4.0	0.40	14.0	MAPLE
1539	10.0	0.60	14.0	BEECH
1540	10.0	0.50	14.0	BEECH
1541	10.0	0.45	14.0	BEECH
1542	9.0	0.40	14.0	BEECH
1543	7.0	0.30	12.0	BEECH
1544	7.0	0.45	13.0	BEECH
1545	8.0	0.50	13.0	BEECH
1547	9.0	0.60	14.0	BEECH
1548	9.0	0.40	14.0	BEECH
1549	9.0	0.65	14.0	BEECH
1550	8.0	0.35	14.0	BEECH
1551	6.0	0.40	12.0	BEECH
1552	10.0	0.55	14.0	BEECH
1553	9.0	0.45	13.0	BEECH
1554	9.0	0.45	13.0	BEECH
1555	12.0	0.75	16.0	FIELD MAPLE
1556	10.0	0.45	14.0	BEECH
1557	10.0	0.50	14.0	BEECH
1558	12.0	0.55	16.0	BEECH
1559	10.0	0.45	15.0	BEECH
1560	10.0	0.45	15.0	BEECH
1561	12.0	0.75	16.0	BEECH
1562	9.0	0.30	13.0	BEECH
1845	9.0	0.35	13.0	BEECH
1846	7.0	0.35	13.0	SILVER BIRCH
1847	7.0	0.35	13.0	SILVER BIRCH
2210	11.0	1.30	15.0	BEECH
2211	11.0	0.55	14.0	BEECH
2212	10.0	0.55	14.0	SYCAMORE
2216	11.0	1.30	14.0	SYCAMORE
2221	8.0	0.40	13.0	TREE UNKOWN
2404	8.0	0.60	13.0	BEECH
2405	4.0	0.30	13.0	PINE
2407	13.0	0.70	15.0	BEECH
2418	8.0	0.50	10.0	BEECH
3767	8.0	0.50	10.0	CYPRESS
3768	7.0	0.40	14.0	TREE UNKOWN
3779	14.0	1.20	17.0	TREE UNKOWN
40834	7.0	0.20	8.0	TREE UNKOWN
41103	8.0	0.40	13.0	SILVER BIRCH
41104	9.0	0.30	11.0	MAPLE
41107	9.0	0.40	15.0	PINE
41522	18.0	1.20	19.0	BEECH
41523	18.0	1.20	19.0	BEECH
41524	11.0	0.40	14.0	YEW
41541	8.0	0.30	8.0	HOLLY
41965	8.0	0.40	11.0	MAPLE
41981	10.0	0.50	12.0	WILLOW
41990	8.0	0.40	8.0	CHERRY
41991	8.0	0.20	6.0	TREE UNKOWN
41992	8.0	0.30	9.0	HORSE CHESTNUT
41993	12.0	0.20	10.0	PLANE
41994	9.0	0.30	7.0	CHERRY
41995	7.0	0.20	9.0	OAK
41996	9.0	0.20	10.0	PLANE
42137	7.0	0.20	8.0	MAPLE
42138	11.0	0.40	9.0	PLANE
42240	5.0	0.30	12.0	PINE
42360	8.0	0.30	9.0	BEECH
42370	9.0	0.30	11.0	OAK
42392	11.0	0.50	15.0	MAPLE
42393	16.0	0.80	18.0	BEECH
42501	6.0	0.20	7.0	BEECH
42502	7.0	0.30	9.0	BEECH
42529	6.0	0.60	17.0	PINE
42547	9.0	0.40	12.0	PINE
42550	9.0	0.50	12.0	YEW
42551	9.0	0.50	12.0	YEW
42552	9.0	0.50	12.0	YEW
42554	6.0	0.30	9.0	HOLLY
42555	8.0	0.20	12.0	SILVER BIRCH
42559	10.0	0.30	12.0	SYCAMORE
42560	7.0	0.30	10.0	BEECH
42561	15.0	0.70	18.0	BEECH
42562	5.0	0.40	15.0	PINE
42563	9.0	0.40	8.0	TREE UNKOWN
42564	10.0	0.60	16.0	PINE
42565	5.0	0.20	6.0	YEW
42569	10.0	0.30	15.0	SYCAMORE
42570	7.0	0.20	14.0	SYCAMORE
42571	6.0	0.50	17.0	PINE
42573	6.0	0.30	11.0	YEW
42579	9.0	0.50	16.0	BEECH
42580	6.0	0.40	10.0	YEW
42583	9.0	0.30	14.0	SYCAMORE
42585	9.0	0.30	15.0	SYCAMORE
42599	11.0	0.30	15.0	SYCAMORE
42600	11.0	0.30	15.0	SYCAMORE
42601	11.0	0.30	15.0	SYCAMORE
42602	11.0	0.30	15.0	SYCAMORE

Tree Schedule

Pt No	Spread	Bole	Height	Species
42603	6.0	0.30	9.0	YEW
42604	7.0	0.20	10.0	SYCAMORE
42613	11.0	0.40	16.0	OAK
42615	12.0	0.40	16.0	TREE UNKOWN
42616	7.0	0.60	14.0	SYCAMORE
42618	10.0	0.40	15.0	SYCAMORE
42620	8.0	0.30	15.0	SYCAMORE
42621	6.0	0.30	9.0	HOLLY
42622	6.0	0.30	9.0	HOLLY
42623	6.0	0.30	9.0	HOLLY
42657	9.0	0.30	13.0	BEECH
42658	14.0	0.60	16.0	BEECH
42659	14.0	0.60	16.0	BEECH
42743	5.0	0.30	8.0	BEECH
42744	7.0	0.30	8.0	HORSE CHESTNUT
42745	9.0	0.30	8.0	SWEET CHESTNUT
43194	12.0	0.30	14.0	MAPLE
43222	8.0	0.20	11.0	MAPLE
43223	12.0	0.40	14.0	MAPLE
43224	14.0	0.50	15.0	MAPLE
43225	7.0	0.20	9.0	MAPLE
43281	15.0	0.50	15.0	TREE UNKOWN
43282	12.0	0.30	14.0	SYCAMORE
43283	12.0	0.30	14.0	SYCAMORE
43284	12.0	0.30	14.0	SYCAMORE
43285	15.0	0.40	16.0	SYCAMORE
43286	12.0	0.30	13.0	SYCAMORE
43346	5.0	0.30	6.0	PINE
43347	4.0	0.30	7.0	PINE
43348	9.0	0.30	7.0	ASPEN
43350	8.0	0.30	8.0	PALM
43378	8.0	0.30	8.0	MAPLE
43379	9.0	0.30	8.0	MULBERRY
43383	5.0	0.30	5.0	PINE
43384	7.0	0.30	8.0	MAPLE
43385	5.0	0.30	5.0	PINE
43386	7.0	0.30	9.0	BEECH
43387	13.0	0.30	15.0	MAPLE
43388	9.0	0.30	13.0	MAPLE
43389	11.0	0.30	14.0	MAPLE
43464	5.0	0.10	4.0	CHERRY
43465	7.0	0.20	6.0	CHERRY
43489	12.0	0.60	15.0	CEDAR
82582	5.0	0.30	12.0	SYCAMORE
82583	5.0	0.30	12.0	SYCAMORE
82584	5.0	0.20	12.0	SYCAMORE
82585	5.0	0.20	12.0	SYCAMORE
82586	5.0	0.20	12.0	SYCAMORE
82587	5.0	0.20	12.0	SYCAMORE
82588	5.0	0.20	12.0	SYCAMORE
82589	5.0	0.20	12.0	SYCAMORE
82590	5.0	0.20	12.0	SYCAMORE
82591	5.0	0.20	12.0	SYCAMORE
82592	5.0	0.20	12.0	SYCAMORE
82621	8.0	0.40	12.0	SYCAMORE
82674	6.0	0.30	12.0	SYCAMORE
85904	18.0	0.60	24.0	OAK
85914	12.0	0.40	18.0	PINE
85916	8.0	0.40	16.0	SYCAMORE
85917	8.0	0.40	16.0	SYCAMORE
85918	8.0	0.30	16.0	SYCAMORE
85919	8.0	0.30	16.0	SYCAMORE
85920	8.0	0.40	16.0	SYCAMORE
85921	8.0	0.40	16.0	SYCAMORE
85922	8.0	0.40	16.0	SYCAMORE
85923	6.0	0.20	16.0	SYCAMORE
85924	6.0	0.20	16.0	SYCAMORE
85925	6.0	0.20	16.0	SYCAMORE
86123	12.0	0.40	18.0	YEW
86124	12.0	0.40	18.0	YEW
86125	8.0	0.40	16.0	YEW
86127	6.0	0.30	12.0	YEW
86128	8.0	0.40	26.0	LIME
86182	6.0	0.30	12.0	YEW
86183	14.0	0.50	26.0	SYCAMORE
86246	10.0	0.30	26.0	SYCAMORE
86247	10.0	0.30	26.0	SYCAMORE
86248	10.0	0.40	26.0	SYCAMORE
86249	4.0	0.20	7.0	LAUREL
86283	5.0	0.40	12.0	YEW
86284	8.0	0.40	12.0	YEW
86285	8.0	0.40	12.0	YEW
86286	6.0	0.40	12.0	YEW
86287	10.0	0.60	24.0	PINE
86288	10.0	0.50	15.0	PINE
86289	5.0	0.20	9.0	HOLLY
86292	10.0	0.40	26.0	SYCAMORE
86293	10.0	0.30	26.0	SYCAMORE
86294	12.0	0.40	26.0	SYCAMORE
86299	7.0	0.20	8.0	LAUREL
86300	7.0	0.20	8.0	LAUREL
86301	9.0	0.50	14.0	YEW
86319	7.0	0.50	14.0	YEW
86320	10.0	0.30	16.0	SYCAMORE
86330	12.0	0.40	9.0	YEW
86331	5.0	0.30	7.0	HAWTHORN
86351	8.0	0.30	9.0	YEW
86352	14.0	1.20	28.0	OAK
86367	8.0	0.30	16.0	BEECH
86368	8.0	0.30	16.0	BEECH
86369	8.0	0.30	16.0	BEECH
86370	8.0	0.30	16.0	BEECH
86371	8.0	0.30	16.0	BEECH
86378	14.0	0.40	18.0	BEECH
86390	9.0	0.40	16.0	ASH
86394	6.0	0.30	10.0	FRUIT
86395	9.0	0.30	12.0	YEW
86396	5.0	0.40	12.0	CYPRESS
86442	14.0	0.30	24.0	BEECH
86443	14.0	0.30	24.0	BEECH
86444	14.0	0.30	24.0	BEECH
86445	14.0	0.30	24.0	BEECH
86479	8.0	0.30	7.0	CYPRESS
86484	8.0	0.40	12.0	POPLAR
86485	12.0	0.40	12.0	SYCAMORE
86504	14.0	0.50	18.0	BEECH
86510	10.0	0.40	22.0	BEECH
86511	10.0	0.40	22.0	BEECH
86512	10.0	0.40	22.0	BEECH
86513	10.0	0.40	22.0	BEECH
86567	8.0	0.20	5.0	YEW
86568	14.0	0.60	20.0	PINE
86588	10.0	0.40	22.0	BEECH
86589	10.0	0.40	22.0	BEECH
86590	10.0	0.40	22.0	BEECH
86591	10.0	0.50	22.0	BEECH
86689	6.0	0.40	14.0	BEECH
86724	10.0	0.50	12.0	CYPRESS
86725	9.0	0.40	12.0	CYPRESS
86726	9.0	0.40	12.0	CYPRESS
100016	13.0	0.40	11.0	OAK
100155	13.0	0.80	15.0	LIME
100156	10.0	0.30	10.0	OAK

Tree Schedule

Pt No	Spread	Bole	Height	Species
100196	14.0	0.70	16.0	SYCAMORE
100197	7.0	0.30	8.0	HOLLY
100198	7.0	0.30	8.0	YEW
100199	14.0	1.00	18.0	PINE
100289	7.0	0.40	8.0	CYPRESS
100290	5.0	0.30	6.0	CYPRESS
100291	8.0	0.40	7.0	CHERRY
100292	5.0	0.30	6.0	CYPRESS
100294	8.0	0.30	7.0	TREE UNKOWN
100295	10.0	0.50	7.0	CHERRY
100296	12.0	0.60	10.0	WILLOW
100297	14.0	0.60	12.0	PLANE
100298	5.0	0.40	8.0	CYPRESS
100299	14.0	0.50	12.0	SYCAMORE
100346	8.0	0.30	4.0	CHERRY
100347	7.0	0.50	9.0	CYPRESS
100348	8.0	0.30	4.0	CHERRY
100396	8.0	0.30	5.0	CHERRY
100397	5.0	0.60	10.0	CYPRESS
100398	7.0	0.30	7.0	TREE UNKOWN
100414	16.0	0.70	16.0	BEECH
100443	17.0	0.80	17.0	OAK
100594	16.0	0.50	17.0	MAPLE
100595	7.0	0.30	14.0	SILVER BIRCH
100686	8.0	0.30	7.0	YEW
100687	20.0	1.20	18.0	BEECH
100741	18.0	1.10	18.0	BEECH
100742	8.0	0.30	7.0	YEW
100749	16.0	0.80	16.0	BEECH
100759	16.0	0.70	14.0	MAPLE
100760	8.0	0.30	7.0	YEW
100770	13.0	0.30	14.0	PLANE
100839	5.0	0.10	6.0	BEECH
100909	7.0	0.30	10.0	YEW
101001	7.0	0.30	9.0	YEW
101002	13.0	0.50	16.0	MAPLE
101051	12.0	0.70	15.0	LIME
101097	5.0	0.10	7.0	MAPLE
101163	13.0	0.50	16.0	BEECH
101171	13.0	0.40	16.0	BEECH
101233	13.0	0.90	16.0	LIME
101234	13.0	0.90	16.0	LIME
101235	20.0	0.80	18.0	OAK
101236	14.0	0.60	13.0	OAK
101451	3.0	0.10	4.0	LAUREL
101482	7.0	0.30	6.0	MAGNOLIA
101521	20.0	1.50	20.0	BEECH
101677	3.0	0.10	5.0	EUCALYPTUS
101678	3.0	0.10	5.0	EUCALYPTUS
101681	5.0	0.30	6.0	HOLLY
101717	14.0	0.70	14.0	OAK
101748	12.0	0.60	10.0	HORSE CHESTNUT
101749	6.0	0.60	10.0	CYPRESS
101851	7.0	0.30	8.0	SILVER BIRCH
101854	6.0	0.30	5.0	WHITEBEAM
101855	6.0	0.30	5.0	WHITEBEAM
101856	6.0	0.30	5.0	WHITEBEAM
101863	6.0	0.30	6.0	BEECH
101940	6.0	0.60	15.0	SPRUCE
101973	8.0	0.50	10.0	CEDAR
101988	12.0	1.00	12.0	CEDAR
102010	6.0	0.40	7.0	HOLLY
102042	14.0	0.70	15.0	BEECH
102050	6.0	0.60	13.0	CYPRESS
102069	13.0	0.80	17.0	LIME
102070	13.0	0.80	17.0	LIME
102082	8.0	0.30	14.0	SWEET CHESTNUT
102083	8.0	0.30	14.0	LIME
102084	10.0	0.70	14.0	LIME
102085	15.0	0.70	18.0	BEECH
102131	18.0	1.20	22.0	BEECH
102132	12.0	1.00	9.0	LIME
102133	5.0	0.30	8.0	HOLLY
102134	6.0	0.50	7.0	CYPRESS
102135	13.0	0.30	13.0	SYCAMORE
102136	15.0	0.60	17.0	BEECH
102137	13.0	0.70	18.0	PINE
102150	7.0	0.30	7.0	ASH
102210	12.0	0.50	12.0	TULIP
102225	18.0	0.70	17.0	MAPLE
102405	8.0	0.30	7.0	MULBERY
102505	6.0	0.30	8.0	YEW
102506	6.0	0.30	8.0	HOLLY
102507	7.0	0.30	12.0	BEECH
102508	8.0	0.50	8.0	HOLLY
102509	10.0	0.50	16.0	PINE
102510	12.0	0.50	8.0	YEW
102511	14.0	0.50	8.0	OAK
102512	12.0	0.60	15.0	PINE
102513	10.0	0.50	15.0	BEECH
102514	12.0	0.60	15.0	PINE
102538	12.0	0.50	15.0	SYCAMORE
102539	10.0	0.50	9.0	CYPRESS
102540	28.0	1.20	18.0	BEECH
102544	13.0	0.30	8.0	YEW
102545	18.0	0.80	20.0	OAK
102546	14.0	0.50	16.0	OAK
102547	6.0	0.40	15.0	CYPRESS
102549	12.0	0.40	16.0	SYCAMORE
102550	7.0	0.40	11.0	CYPRESS
102567	10.0	0.50	14.0	PINE
102568	8.0	0.30	14.0	PINE
102577	7.0	0.30	15.0	SILVER BIRCH
102578	8.0	0.30	15.0	SYCAMORE
102579	8.0	0.30	15.0	SYCAMORE
102580	8.0	0.30	15.0	SYCAMORE
102581	8.0	0.30	15.0	SYCAMORE
102604	7.0	0.40	10.0	CYPRESS
102605	8.0	0.30	12.0	ASH
102606	10.0	0.50	12.0	CYPRESS
102607	12.0	0.50	14.0	POPLAR
102608	10.0	0.40	16.0	LIME
102609	7.0	0.40	12.0	CYPRESS
102610	14.0	0.50	13.0	SYCAMORE
102611	8.0	0.30	11.0	SYCAMORE
102612	6.0	0.30	9.0	HOLLY
102613	14.0	0.50	16.0	OAK
102618	13.0	0.50	16.0	SYCAMORE
102631	13.0	0.50	14.0	SYCAMORE
102632	7.0	0.30	9.0	CYPRESS
102633	8.0	0.50	11.0	CYPRESS
102634	8.0	0.50	11.0	CYPRESS
102635	8.0	0.50	11.0	CYPRESS
102655	14.0	0.60	14.0	BEECH
102656	8.0	0.40	14.0	BEECH
102661	13.0	0.80	14.0	HORSE CHESTNUT
102665	12.0	0.60	13.0	HORSE CHESTNUT
102670	8.0	0.40	12.0	HORSE CHESTNUT
102671	8.0	0.40	9.0	HOLLY
102672	16.0	0.50	17.0	OAK
102673	14.0	0.50	8.0	CHERRY
102674	14.0	1.00	17.0	HORSE CHESTNUT

Notes:

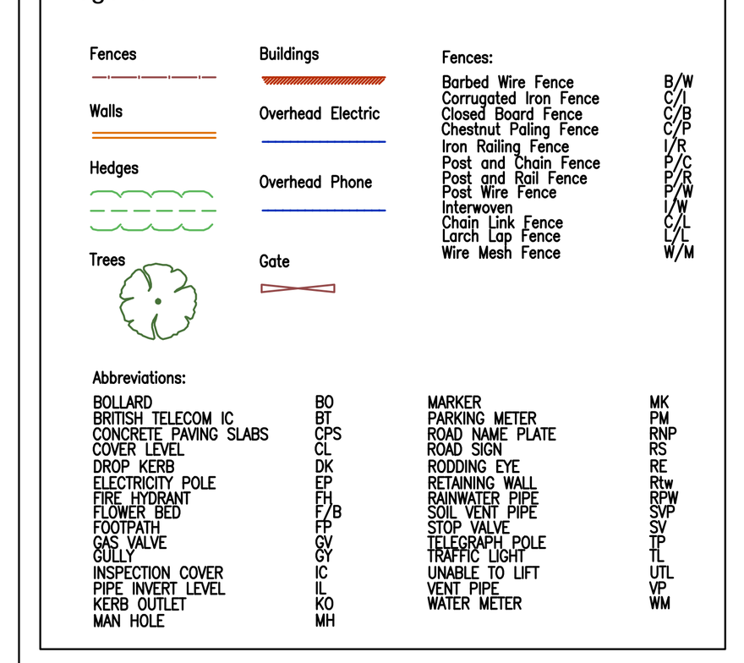
Whilst every effort has been made to correctly identify species of trees on the site, we advise that an arborologist be consulted before any final decisions are made.

All information contained in this drawing (including digital data) should be checked and verified prior to any fabrication or construction.

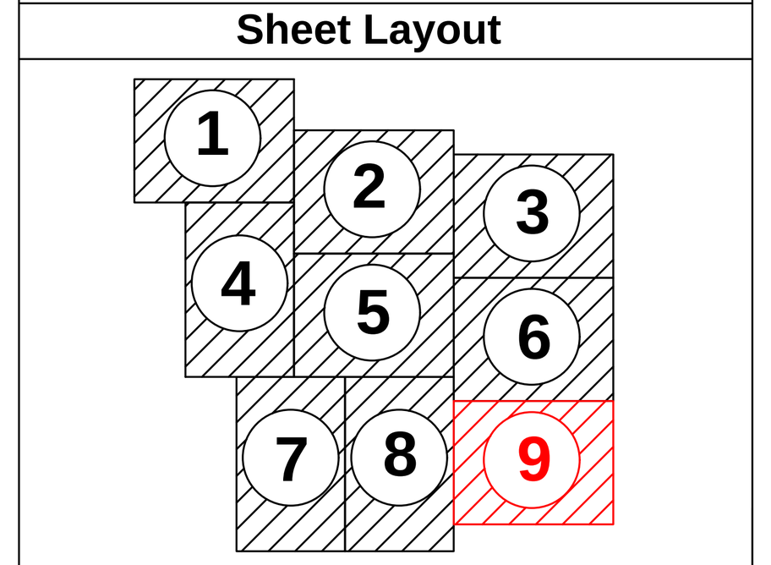
Grid coordinates are based on an OS GNSS system on a plane grid with a scale factor of 1.0000.

INDICATIVE

Legend:



Sheet Layout



Rev. Suffix	Date	Initial	Revision Details

Surveyor PDMB | Verified By ALA | CAD Operator TJH | Approved By ARL | Date 23.08.18

Levelling GNSS | Datum OSGB36

To an OS GNSS Datum

Client

Cushman & Wakefield LLP

Location

Carrow Works
Norwich, NR1 2DD

Drawing Title

Topographical Survey
Sheet 9 of 9

Job No. 1805022 | Old Job No.

Drawing Number CW/1805022/9 | Revision Suffix

Scale 1:200m (A0) | Date August 2018

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Appendix B – Planning Parameter Plan

Notes

Do not scale from this drawing.
All contractors must visit the site and be responsible for taking and checking dimensions.
All construction information should be taken from figured dimensions only.
Any discrepancies between drawings, specifications and site conditions must be brought to the attention of the supervising officer.
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This drawing is prepared for the specific project stage in the Drawing Status section below and it is not intended to be used for any other purpose. Whilst all reasonable efforts are used to ensure drawings are accurate, JTP accept no liability for any reliance placed on, or use made of, this plan by anyone for purposes other than those stated in the Drawing Status below.

Key

- Hybrid Application Boundary
- Detailed Application
- Existing Buildings To Be Retained
- Scheduled Monument

Notes

Rev	Date	Description	Drawn	Chkd

Drawing Status

Draft

Client

Fuel Properties

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Project

Carrow Works, Nowrich

Drawing Title

Parameter Plans
Hybrid Application Boundaries

Scale @A1 1 : 1000 | Job Ref. 02022

Drawing No. PP-01 | Revision.

Scale Bar

0 10 20 30 40 50 m

Sheet Code

02022-JTP-PP-01 - Hybrid Application Boundaries

Appendix C – Landscape Masterplan

notes
1. Read in conjunction with all relevant Architects, Engineers & design team drawings & specifications
2. Any discrepancies must be drawn to the attention of the lead consultant in writing
3. All dimensions are in millimeters unless otherwise noted & are subject to checking on site prior to fabrication or ordering of materials
4.

key

Orig 17.06.22 FL n/a
rev date by chk notes

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project title
CARROW WORKS, NORWICH

drawing
ILLUSTRATED LANDSCAPE MASTERPLAN

job number
2962

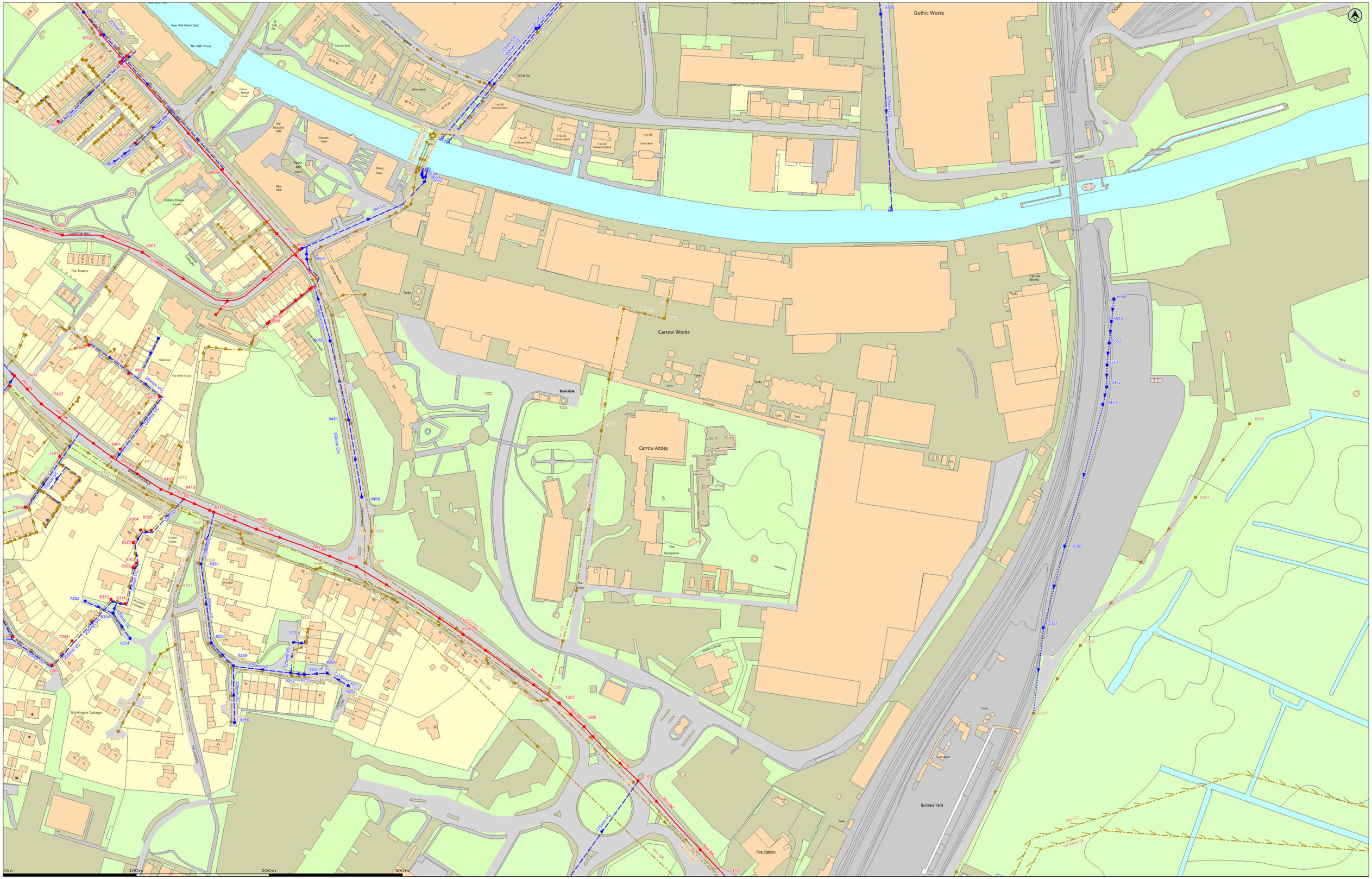
drawing number
2962-11-13

status
FOR COMMENT

scale 1:1000@A1

0 1000 2000

Appendix D – Public Sewer records



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This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2022 Ordnance Survey 100022432.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

Foul Sewer	Outfall*	Sewage Treatment Works	
Surface Sewer			
Combined Sewer			
Final Effluent	Inlet*	Public Pumping Station	
Rising Main*			
Private Sewer*	Manhole*	Decommissioned Pumping Station	
Decommissioned Sewer*		*(Colour denotes effluent type)	

mike.smith9293@gmail.com

Carrow Works

love every drop anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
0306	624079	307301	C	16.871	13.946	2.925
1206	624170	307232	C	12.06	9.06	3
1207	624151	307249	C	-	-	2.845
2105	624211	307191	C	9.99	6.84	3.15
7202	623741	307299	C	36.245	34.205	2.04
7203	623770	307278	C	-	-	2.25
7204	623785	307296	C	-	-	2.03
7301	623750	307397	C	-	-	2.04
7401	623776	307434	C	-	-	1.83
7407	623762	307474	C	-	-	3.33
7408	623739	307487	C	-	-	4.825
7411	623742	307495	C	-	-	-
7504	623798	307518	C	-	-	2.59
7602	623778	307601	C	31.61	30.125	1.485
7603	623775	307686	C	9.822	8.007	1.815
8302	623831	307351	C	29.44	27.68	1.76
8303	623834	307355	C	29.43	27.64	1.79
8304	623837	307379	C	28.69	27	1.69
8305	623845	307379	C	28.39	-	1.55
8311	623892	307393	C	25.45	22.49	2.96
8312	623831	307370	C	28.79	27.2	1.59
8313	623814	307327	C	-	-	0.9
8314	623825	307324	C	-	-	1.2
8401	623821	307440	C	-	-	1.22
8405	623851	307480	C	32.54	30.71	1.83
8407	623852	307410	C	-	-	3.355
8413	623869	307403	C	-	-	-
8415	623828	307497	C	31.271	29.556	1.715
8501	623838	307588	C	26.005	24.69	1.315
8502	623902	307551	C	-	-	1.45
8503	623893	307541	C	-	-	-
8603	623833	307670	C	8.259	6.589	1.67
8604	623898	307650	C	9.281	6.906	2.375
8702	623807	307751	C	5.38	-4.56	9.94
8709	623821	307731	C	6.184	4.539	1.645
9305	623924	307380	C	23.46	20.61	2.85
9307	623999	307352	C	21.13	17.53	3.6
9502	623956	307590	C	11.333	9.318	2.015
9507	623934	307536	C	-	-	-
9508	623932	307534	C	-	-	-
9602	623939	307602	C	10.862	-4.788	15.65
0201	624098	307279	F	15.489	13.599	1.89
0202	624096	307283	F	15.579	13.844	1.735
0301	624061	307308	F	17.89	15.19	2.7
0304	624030	307325	F	19.855	17.725	2.13
0305	624026	307328	F	19.958	17.698	2.26
0308	624006	307354	F	20.622	0.962	19.66
0309	624010	307378	F	-	-	17.83
0310	624005	307378	F	-	-	24.5
0311	624018	307331	F	20.561	18.256	2.305
0501	624005	307556	F	-	-	-
0602	624057	307677	F	1.45	-3.6	5.05
0603	624024	307615	F	5.84	-4.1	9.94
0604	624085	307690	F	2.44	-2.65	5.09
0605	624040	307624	F	4.55	-4.15	8.7
0607	624044	307648	F	4.07	-4.09	8.16
0608	624056	307674	F	-	-	-
0609	624045	307651	F	-	-	-
0610	624069	307677	F	-	-	-
0700	624100	307713	F	-	-	-
0701	624092	307716	F	-	-	-
0702	624074	307723	F	-	-	-
0703	624055	307733	F	-	-	-
0704	624035	307746	F	-	-	-
1201	624142	307252	F	13.2	-	-
1203	624118	307264	F	-	-	4.01
1204	624135	307251	F	-	-	3.68
1208	624143	307257	F	-	-	13.715
1209	624135	307217	F	13.29	-5.71	19
1301	624164	307334	F	13.8	0.85	12.95
1401	624188	307493	F	4.62	-	2.95
1402	624183	307454	F	12.5	1.33	11.17
1501	624200	307546	F	-	-	-
1701	624135	307753	F	1.61	-2.2	3.81
2102	624207	307190	F	-	-	10.67
2501	624230	307538	F	-	-	-
4101	624450	307123	F	-	-	7.85
5201	624508	307242	F	-	-	-
5203	624543	307293	F	-	-	-
5302	624588	307355	F	-	-	-
6401	624630	307404	F	-	-	-
6402	624670	307459	F	-	-	-
7402	623784	307446	F	-	-	3.645
7403	623759	307468	F	-	-	4.42
7503	623795	307524	F	-	-	-
7705	623787	307724	F	-	-	-
7706	623790	307726	F	-	-	-
7707	623786	307725	F	-	-	-
8202	623836	307256	F	-	-	1.19
8203	623844	307272	F	-	-	0.89
8204	623863	307294	F	-	-	1.42
8205	623820	307228	F	-	-	1.29
8206	623888	307294	F	29.33	23.94	5.39
8207	623852	307286	F	-	-	3.015
8208	623828	307243	F	-	-	1.37
8301	623865	307338	F	-	-	1.445
8306	623880	307355	F	26.15	23.57	2.58
8307	623887	307386	F	-	-	2.765
8309	623879	307377	F	25.75	24.65	1.1
8315	623861	307397	F	-	-	-
8410	623818	307424	F	-	-	3.34
8412	623812	307428	F	-	-	-
8414	623842	307406	F	28.98	-	-
8416	623836	307467	F	-	-	-
8417	623836	307429	F	-	-	-
8418	623867	307442	F	-	-	-
8419	623860	307416	F	-	-	-
8605	623817	307698	F	-	-	-
8701	623846	307709	F	7.017	5.397	1.62
8704	623820	307741	F	5.8	-0.19	5.99
8706	623814	307738	F	5.852	3.452	2.4
8708	623800	307756	F	5.24	2.94	2.3
8710	623891	307708	F	-	-	-
9201	623993	307260	F	-	-	0.7
9202	623978	307270	F	-	-	1.2
9203	623960	307269	F	27.37	24.97	2.4
9204	623951	307270	F	-	-	2.4
9205	623953	307290	F	27.08	25.12	1.96
9206	623905	307276	F	29.7	24.29	5.41
9207	623905	307235	F	30.85	28.93	1.92
9208	623961	307292	F	-	-	-
9209	623961	307296	F	-	-	-
9210	623961	307299	F	-	-	-
9301	623994	307342	F	-	-	2.58
9302	623914	307369	F	-	-	2.39
9303	623968	307350	F	-	-	2.44
9304	623972	307351	F	-	-	2.29
9309	623912	307376	F	23.95	21.87	2.08
9310	623963	307305	F	-	-	-
9503	623952	307593	F	11.187	-0.483	11.67
9504	623972	307592	F	10.092	-4.558	14.65
9505	623969	307568	F	-	-	-
9506	623980	307541	F	-	-	-
9509	623922	307525	F	-	-	-
9510	623920	307519	F	-	-	-
9601	623935	307604	F	10.943	7.878	3.065
0450	624003	307404	S	-	-	-
0652	624050	307641	S	3.87	0.83	3.04
0653	624048	307646	S	3.95	1.5	2.45
0654	624049	307644	S	3.87	1.65	2.22
1750	624136	307757	S	1.49	-	-
1751	624134	307756	S	1.49	0.03	1.46
3750	624393	307767	S	2	0.22	1.78
5351	624515	307306	S	-	-	-
5352	624531	307367	S	-	-	-
5451	624560	307474	S	-	-	-
5452	624563	307487	S	-	-	-
5551	624563	307503	S	-	-	-
5552	624565	307520	S	-	-	-
5553	624566	307536	S	-	-	-
5554	624568	307553	S	-	-	-
7352	623795	307326	S	-	-	1.15
7755	623794	307768	S	4.881	3.201	1.68
8251	623890	307295	S	29.39	24.23	5.16
8254	623829	307298	S	-	-	1.1
8351	623882	307354	S	-	-	2.31
8354	623816	307317	S	-	-	1.05
8655	623817	307656	S	8.732	8.73	0.002
9251	623952	307295	S	26.99	25.56	1.43
9252	623950	307272	S	-	-	2.1
9253	623993	307262	S	26.29	25.59	0.7
9254	623977	307272	S	-	-	0.89
9255	623960	307271	S	27.38	25.22	2.16
9256	623907	307235	S	30.84	29.12	1.72
9259	623906	307277	S	29.67	24.6	5.07
9451	623993	307462	S	16.1	14.68	1.42
9552	623962	307583	S	-	-	-
9555	623979	307522	S	13.92	12.48	1.44

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

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