



**PROPOSED RESIDENTIAL DEVELOPMENT AT LAND EAST OF
COLLEGE ROAD, CAMPDOWN**

FLOOD RISK ASSESSMENT

JUNE 2023

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1.0 Executive Summary

Rogers Cory Partnership Limited have been instructed on behalf of Dandara Southern Developments to prepare a Flood Risk Assessment (FRA) in accordance with the guidance set out in the Department of Communities and Local Government National Planning Policy Framework (NPPF).

This report summaries the methodology and results of the FRA in relation to the proposed residential development at the Land East of College Road, Campdown, Purbrook, Waterlooville.

With reference to the Environment Agency's Flood Map for Planning, the site is confirmed to be located in Flood Zone 1 (an area with low probability of flooding from rivers and seas). This report therefore focuses on the surface water management in line with Environment Agency (EA) standing advice, the NPPF, and Hampshire County Council Planning Policies.

This report has therefore been prepared in support of a planning application for the development site for planning permission sought for 628 residential units.

The report also aims to assess potential flood risk sources to and from the site and detail the drainage strategy for implementation on the scheme.

2.0 Introduction

Rogers Cory Partnership Limited have been instructed on behalf of Dandara Southern Developments Ltd to prepare a Flood Risk Assessment (FRA) and surface water drainage strategy in support of planning application for the proposed residential development at the Land East of College Road at Waterloooville.

The development site seeks planning permission from Havant Borough Council for the proposal of residential units with their private gardens, access, services and associated development infrastructure.

The National Planning Policy Framework (NPPF) was published in March 2012 by the Department of Communities and Local Government and replaced all planning policy statements including Planning Policy Statement 25 (PPS 25): Development and Flood Risk. The NPPF set out the Government's planning policy for England and how these are expected to be applied. The Planning Practice Guidance (PPG), published in March 2014, provides additional guidance and retains key elements of the now superseded PPS 25.

Initial searches into the Environment Agency's (EA) website has identified the development site to be located mainly within a flood zone 1 where the risk of flooding is very low. In this respect requirements in the NPPF (foot note 55) states the following:

"A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

The EA's standing advice (published in March 2014 and updated February 2017) highlights that a FRA is required to ensure flood risk to the proposed development is considered as well as the impact the development will have elsewhere on people and property. In addition the FRA should consider the risk of flooding from other sources (groundwater, overland flow, sewers).

The PPG sets out the objectives of a site specific FRA as to establish the following:

- *"Whether the proposed development is likely to be affected by current or future flooding from any source;*
- *Whether it will increase flood risk elsewhere;*
- *Whether the measures proposed to deal with these effects and risks are appropriate;*

The survey shows levels across the site generally falling in a southerly and easterly direction towards A3(M), ranging from 61.32m AOD at the western point to 25.25m AOD at the south eastern corner. (See **Appendix B**).

3.3 Development Proposals

The proposed development comprises of 628 residential dwellings with private gardens, access, services and associated development infrastructure. (see **Appendix C**).

3.4 Existing Geological Information

Based on the British Hydrogeological Survey Maps, the site is largely located over the London Clay Formation, comprising of Clay, Silt and Sand, whilst the southern portion of the site is located over the Lambeth Group comprising of Clay, Silt and Sand. There is a localized seam of the Bognor Sand Member formation which comprises of sand which crosses the central part of the site... There is a Superficial Head Deposits over this bedrock geology. Within the southern part of the site. An initial site investigation carried out by RSK in October 2016 has indicated groundwater levels ranging from 1.20 to 2.5mbgl. Infiltration testing carried out indicated very low permeability rates

The EA groundwater vulnerability maps indicates that the site lies within the InnerZone – subsurface activity only (Zone 1c) groundwater protection zone with the south eastern part of the site within Zone 1 Groundwater source protection zone. The superficial deposit is designated as a Secondary (undifferentiated), whilst the majority of the site is not located over and designate bedrock aquifer, a small portion along the southern boundary is noted to lie within the Secondary A bedrock aquifer which is described as “permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers”

Details and extracts of the borehole logs and factual ground investigations can be found in **Appendix D**.

3.5 National Policy Context

National policy regarding flood risk is contained within the National Planning Policy Framework (updated July 2021) and Planning Practice Guidance (updated 20th August 2021)

The Department for Environment, Food and Rural Affairs (DEFRA) released the Non-statutory technical standards for sustainable drainage systems in March 2015. The document sets out non-statutory technical standards for SuDS to be read in conjunction with the NPPF and PPG.

As of the 15th April 2015, Hampshire County Council as the Lead Local Flood Authority (LLFA) has now become a statutory consultee on all major planning

applications and as such will assess planning applications in respect of surface water drainage and sustainable drainage systems which was previously the responsibility of the Environment Agency. The LLFA's primary duties will be to ensure that flood risks from surface water run-off, groundwater and ordinary watercourses are identified and managed properly. The use of SuDS will be a material consideration in planning conditions and as such the proposed use of SuDS will need to be demonstrated on all major developments unless it can be demonstrated otherwise.

3.6 Local Planning Policies

As the site is located within Havant administrative boundary, any future development would need to accord with the policies set out in the Havant Borough Council Strategic Flood Risk Assessment (2018).

3.7 Existing Flood Defences

The site does not benefit from any current flood defences.

3.8 NPPF Flood Zone and Vulnerability

The Planning Practice Guidance (Table 1) confirms the flood zone Classification based upon the probability of flooding. The site is shown to lie mainly within Flood Zone 1.

Table 2 of the Planning Practice Guidance confirms the 'Flood Risk Vulnerability Classification' of a site, depending on its proposed use. The classification is then applied to Table 3 to determine whether:

- The proposed development is suitable for the flood zone in which it is located
- An Exception Test is required for the proposed development.

The proposed development is classified as 'More Vulnerable' according to the NPPF and suited for the flood zone in which it is located.

4.0 Flood Risk to the Site

The degree of detail appropriate to an FRA depends upon the scale and potential impact of the proposed development to and from the surrounding boundaries. In this case, the applicant has the intention of re-developing an area of land which is located mainly within Flood Zone 1 considered low risk of flooding from fluvial and tidal sources.

4.1 Strategic Flood Risk Assessment

The National Planning Policy Framework confirms that Regional Planning Bodies (RPBs) or local planning authorities (LPAs) should prepare strategic Flood Risk Assessments (SFRAs) in consultation with the EA. The SFRA is then used to refine information on areas liable to flooding by taking into account other sources of

flooding and the impacts associated with climate change in addition to the EA flood map data.

The document informs the Council's policies in the emerging Local Development framework and a strategic approach to the allocation of sites for development and the future management of flood risk, in line with the National Planning Policy Framework.

The Partnership for Urban South Hampshire (PUSH) is made up of 10 local planning authorities within Hampshire. Atkins were commissioned in 2006 to undertake a Strategic Flood Risk Assessment (SFRA), which was divided into two stages.

The first stage of the SFRA included for the collation of data and production of scoping appraisal. This stage also provided a high-level analysis of flood risk within each sub-region. This stage was developed to assist in assessing the feasibility of the PUSH housing allocation.

4.2 Existing Information on Flooding

Fluvial Flood Risk

Based on a review of the EA's Flood Zone maps (see **Figure 2**), the development site appears to lie wholly within Flood Zone 1, considered to be at low risk from fluvial and tidal flooding.

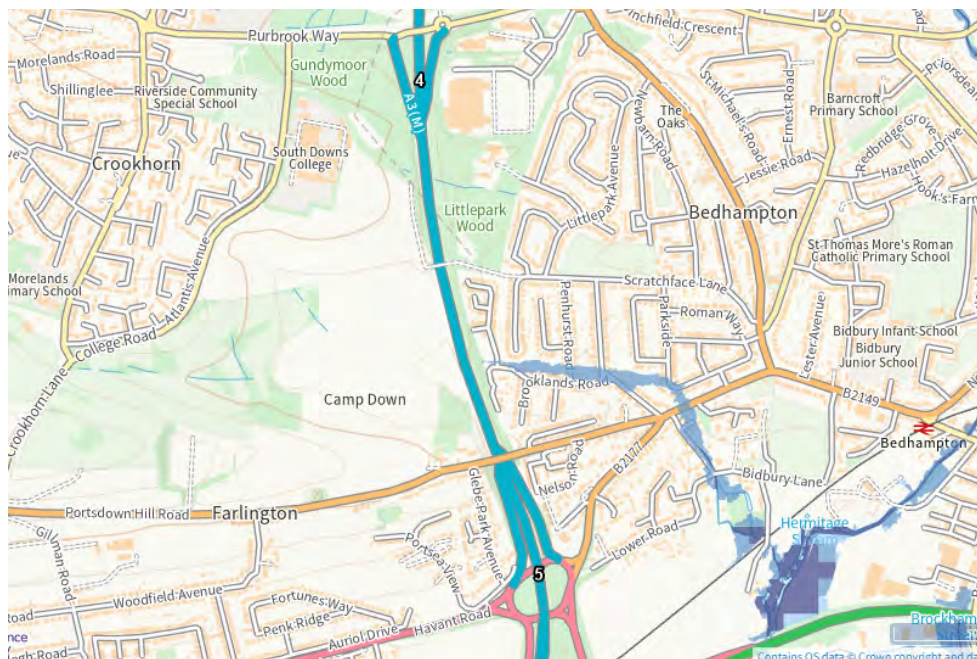


Figure 2: Extract of Flood Zone Map from DEFRA gov.uk website

Surface Water Flood Risk

The risk of surface water flooding to the site is low. There are localised overland flow routes shown on the DEFRA flood risk maps, which indicate the potential for overland flow routes which follow the existing topography of the land in the southern and south western part of the site. This assessment has been made on the information provided within the EA maps for surface water flooding (DEFRA.gov.uk) in conjunction with a review of the topography of the site and appropriate mitigation measures have been incorporated into the development proposals.

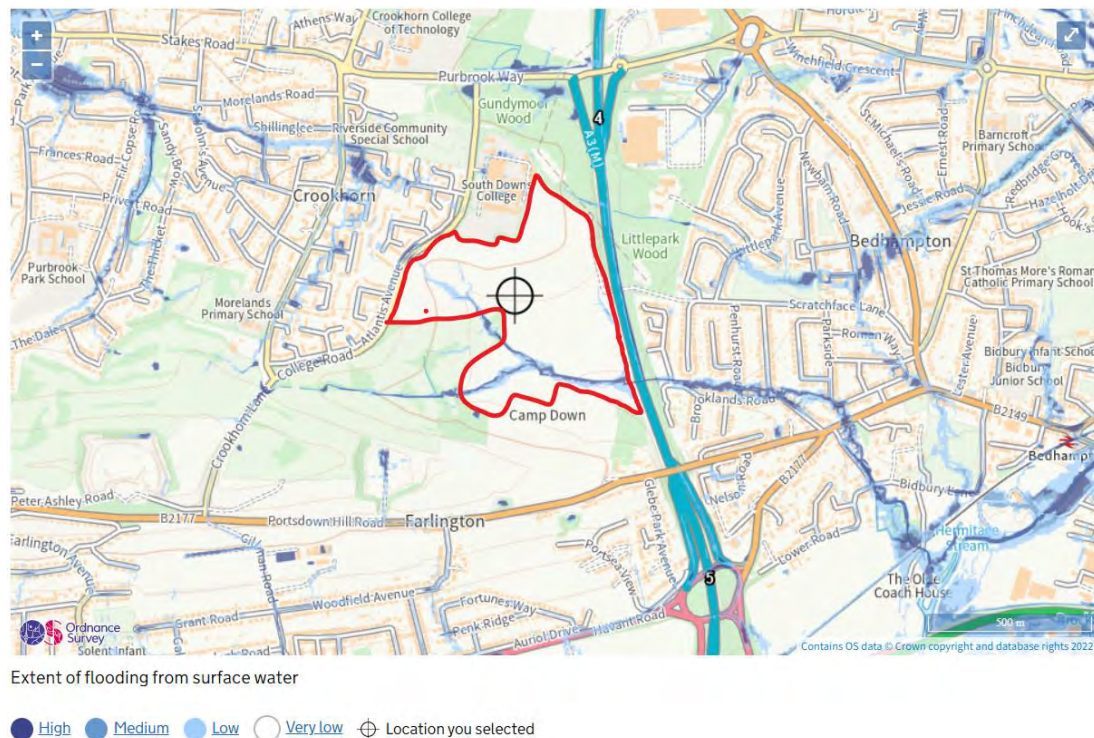


Figure 3: Extract of the EA's risk of surface water flooding from DEFRA gov.uk website

Ground Water Flooding

Searches of the EA groundwater map confirm that the site does not fall within any groundwater protection zones. A review of the SFRA suggests there are no records of groundwater flooding at the site.

Furthermore, the groundwater monitoring carried out to date indicate that the risk of groundwater flooding to this site should be considered as low and can be mitigated through the onsite final design levels.

4.3 Climate Change

As of the 19th February 2016 (updated May 2022), the EA has updated guidance on the application of climate changes allowances for the following:

- peak river flow by river basin district
- peak rainfall intensity
- sea level rise
- offshore wind speed and extreme wave height

Peak river flow allowances are now to be based on River Basin areas thus making them more geographically relevant, based on the range of predicted allowances.

Rainfall – increases in peak rainfall over time is to be assessed on two scenarios to assess the sensitivity of the areas as per table 1 below

East Hampshire Management Catchment peak rainfall allowances	3.3% annual exceedance rainfall event 2050s	3.3% annual exceedance rainfall event 2070s	1%annual exceedance rainfall event 2050s	1%annual exceedance rainfall event 2070s
Upper end	+35%	+40%	+40%	+45%
Central	+20%	+25%	+20%	+25%

Table 1: Extract from DEFRA website for East Hampshire Management Catchment peak rainfall allowances

As a conservative approach, a lifetime of the development should be considered of up to 100 years (i.e. up to 2123) when assessing flood risk for residential developments. According to Table 1 above, an increase of 45% on the peak rainfall intensity should be expected. To mitigate any residual risk at the site as a result of climate change, an appropriate climate change allowance (i.e. 45% increase in rainfall intensity) will therefore be considered and accommodated within the design strategy for managing surface water run-off.

4.4 The Sequential Test

The sequential test approach is aimed to steer new development to areas of lowest probability of flooding. In this regard to determine the suitability and classification of the development, as a check of the proposed scheme, consultation has been made to tables 2 and 3 of the NPPF.

Table 2 of the NPPF technical guidance determines that the proposed development is considered to be a 'more vulnerable' land class usage, in terms of flood risk, as illustrated in Figure 4.

More vulnerable - Hospitals. - Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and educational establishments. - Landfill and sites used for waste management facilities for hazardous waste⁶. - Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan</i>.⁷

Figure 4: Extract of Table 2: Flood Risk Vulnerability Classification

Table 3 of the NPPF considers sites providing a 'more vulnerable' land-class usage in a Flood Risk Zone 1 area as acceptable in terms of compatibility (see Figure 4):

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	✗	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	✗	✗	✗

Key: ✓ Development is appropriate.
 ✗ Development should not be permitted.

Figure 5: Table 3 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

5.0 Surface Water Management

Hampshire County Council (HCC) are the Lead local flood Authority for Havant Borough Council and statutory consultee on surface water management on all planning applications within the County.

The surface water management section should ensure that there is no adverse impact on flood risk elsewhere as a result of a change in the surface water runoff regime from the development.

The drainage strategy has been developed with the above key items in consideration. Infiltration has not been deemed suitable based on the current geology of the site. The use of both attenuation basins along with bio-retention areas within the basins are proposed within the surface water drainage scheme.

5.1 Existing Surface Water Drainage Regime

The existing site is greenfield with no existing drainage features. Any existing exceedance flows would continue south and south eastwards overland to the existing watercourse which runs along the southern boundary.

5.2 Design Principles

Key design principles in the following guidance documents steer the approach to managing surface water runoff at sites:

- Building Regulations hierarchy of drainage (H3);
- Interim Code of Practice for SuDS; and
- CIRIA best practice guidance, including the use of the 'SUDS management train'

Building Regulations hierarchy of drainage outlines the preferred methods for the disposal of surface water with infiltration methods being the preferred option. If this is not possible the next favoured option is to drain to an existing watercourse. If neither of these options are feasible, the regulations state that rainwater discharge should be directed to a sewer.

The Interim Code of Practice for SUDS provides guidance about the hydraulic design criteria for Sustainable drainage systems. This in general refers to both peak rate of runoff and the volume of runoff, post development. Prior to mitigation measures such as the use of SuDS attenuation features, both the volume and peak rate of runoff may increase post development.

The design principles for surface water management extend beyond simple hydraulic criteria. CIRIA guidance promotes the use of the SUDS management train, a concept where SUDS techniques are used to treat, convey and store surface

water runoff. This approach is considered as part of the SUDS selection methodology.

5.3 Sustainable Drainage Systems

To drain the development in a sustainable manner whilst complying with the requirements of the NPPF, the scheme should seek to adopt an appropriate form(s) of sustainable urban drainage systems (SuDS).

SuDS techniques comprise of implementation of infiltration drainage devices to discharge surface water to the underlying soil stratum (where ground conditions permit). These may be in the form of conventional soakaways, infiltration basins and ponds, filter strips, bio-retention areas, swales, permeable surfaces, green roofs, over-sized pipes/tanks or geo-cellular attenuation units.

An additional 45% storage provision should be provided as an allowance for any potential climate change impact (as stated in Table 1: Peak rainfall intensity allowance in small and urban catchment associated with a residential scheme).

The SuDS philosophy is steered to maximize the benefits and minimise the negative impacts of surface water runoff from developed areas. CIRIA C753 The SuDS Manual determines the design criteria for SuDS to be based upon water quantity, water quality, amenity and biodiversity. Table 7.1 of The SuDS Manual assesses each SuDS component to the delivery of the design criteria. Where broadly ranking the SuDS, components depicted in Table 7.2 by applying a score for the deliverance of the design criteria, a theoretical SuDS hierarchy can be determined for the selection of SuDS against the design criteria as represented in Table 3.

SuDS in the form of an attenuation basins with bio-retention areas have been incorporated within the scheme. It has therefore been concluded that the SuDS design criteria as described in the SuDS Manual has been met and accords with current best practice.

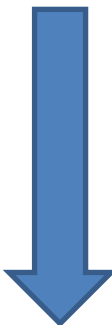
SuDS Component	Potential of delivering SuDS Design Criteria
Infiltration Systems	High  Low
Swales	
Bioretention systems	
Pervious Pavements	
Detention Basins	
Trees	
Green Roofs	
Ponds and Wetlands	
Filter Drains	
Filter Strips	
Rainwater Harvesting Systems	
Proprietary Treatment Systems	
Attenuation Storage Tanks	

Table 2: Theoretical SuDS Hierarchy

Infiltration Drainage

Based on the existing geology of the site full infiltration drainage has not been deemed suitable for this site.

Existing Watercourses

There is an existing watercourse which runs along the eastern, western and southern boundary of the site which currently accommodates run-off from the existing site.

In reviewing the hierarchy for a proposed outfall and constraints associated with the development we have determined the proposed discharge from the residential site will continue to the existing watercourse in the southern boundary to closely replicate the existing drainage regime and greenfield discharge arrangement.

5.4 Surface Water Drainage Strategy

In view of the requirements of the NPPF, PPG, HCC the design parameters and constraints associated with redeveloping this site, a surface water drainage strategy design has been devised and hydraulically modeled to demonstrate that the scheme can be suitably implemented without increasing the level of flood risk, when the surface water drainage system experiences a 1:100 year rainfall event (including climate change).

The surface water drainage scheme has been designed to ensure:

- A reduction in the pre-development site discharge for peak storm events.
- Sustainable Urban Drainage systems are wholly incorporated within the scheme.
- Consideration is given for the improvement of water quality within the design.
- The designed drainage scheme can satisfactorily retain a critical 1 in 100 Year storm event with climate change.

Having taken into consideration the above points, a scheme has been devised and hydraulically modelled based on attenuation techniques with a restricted discharge to the existing watercourse at the predevelopment Greenfield run-off rates. A copy of the proposed surface water strategy can be found in **Appendix E**.

5.4.1 Access Roads, Shared Surfaces, Private Drives and Roof Drainage

The proposed run-off from the access roads, drives and parking bays will be conveyed to the new below ground surface water network via trapped gullies. Rainfall run-off from the roofs of the new properties will discharge directly into the below ground surface water network

The surface water network will convey the flows, under gravity, westwards and southwards towards the new series of attenuation basin with bio-retention areas which will provide attenuation of the restricted flows prior to discharging to the existing watercourse south of the residential portion of the site.

5.4.2 Flow Control

A maximum overall development discharge is proposed to be limited to the Mean Annual Average greenfield equivalent run-off rate (Q_{bar})

The hydraulic models of the proposed surface water networks, incorporating the SUDs attenuation basins and flow control devices can be found in **Appendix F**.

The hydraulic calculations have been simulated under various scenarios up to and included the critical 1 in 100 Year storm event with additional 45% allowance for

climate change. The simulations confirm that the storm can be managed and maintained within the site without flooding.

The hydraulic model of the proposed surface water network, incorporating the SuDS attenuation systems can be found in **Appendix F**.

The hydraulic calculations have been simulated under various scenarios up to and included the critical 1 in 100 Year storm event with additional 45% allowance for climate change plus an additional 10% to account for urban creep. The simulations confirm that the storm can be managed and maintained within the site without offsite flooding.

Impermeable Development Area (Ha)	Q1 Year (L/sec)	Q30 Year (L/Sec)	Q100 Year Plus Climate (L/Sec)
23.449	120	120	120.7

Table 3: Summary of Post Development Runoff with mitigation measures

5.4.3 Water Quality

It is important to address issues with regards to quality when considering surface water management. As the surface water is proposed to be discharge to the existing downstream watercourses, treatment is proposed as part of a SuDS Management Train in accordance with the recommendations of the SuDS Manual (CIRIA 753) and as required by the LLFA.

Chapter 26 of the CIRIA SuDS Manual (2015) provides guidance on methods that should be used to design SuDS to meet the water quality design criteria and good practice design standards. Diffuse urban pollution is a significant factor in compromising groundwater and receiving water standards that are required under the EA Water Framework Directive. Chapter 4 of the SuDs Manual summarises factors, which influence pollution levels in urban run-off. This summary is presented in **Table 4 below**:

Factors influencing pollution levels in urban run-off
The amount and type of pollution washed off a surface will depend on many things including: - Planning activities on, above and adjacent to the surface that affect the deposition of pollutants, their retention on the surface and the extent to which they are mixed with runoff (including pollution prevention strategies) - Unplanned activities (accidents and spillages) that can cause temporary unexpected high pollution concentrations

- The surface location and type, affecting wash-off rates and contaminant movement mechanisms
- The drainage path
- The length of the dry weather period before the rainfall event
- The intensity and the duration of the rainfall, and the associated flow velocities

Any further pollutant transformations occurring during residence and conveyance within gullies, chambers, pipe or channel networks, gravels, soils and vegetation and quiescent bodies of water.

Table 4: Extract of Box 4.1 of the SuDS Manual (CIRIA 753)

Table 4.3 of the SuDS Manual classifies the pollution hazard level for residential sites, including residential car parks, low traffic roads as being “low” and thus only requiring a “Simple index approach” in terms of the requirements for the discharge to surface waters, including coasts and estuaries.

The SuDS Manual summarises the steps for the simple index approach:

Step 1 – *Allocated suitable pollution hazard indices for the proposed land use*

Step 2 – *Select SuDS with a total pollution mitigation index that equals or exceeds the pollution index*

Step 3 – *Where the discharge to a protected surface waters or groundwater, consider the need for a more precautionary approach*

The SuDS Manual describes “protected surface waters” as protected surface water resources, which include those designated for drinking water abstraction or for other environmental protection reasons

Table 26.2 of the SuDS manual notes the following pollution hazard indices for residential land use development:

Land Use	Pollution Hazard Level	Total suspended solids (TSS)	Metals	Hydrocarbons
Individual property driveways, residential car parks, low traffic roads (eg. cul-de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offices)ie. Less than 300 vehicle movements/day	Low	0.5	0.4	0.4

Figure 6: Extract of Table 26.2 of SuDS Manual (2015)

Table 26.3 of the SuDS Manual provides details of the SuDS pollution mitigation indices for various types of SuDS components

Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter Strip	0.4	0.4	0.5
Filter Drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable Paving	0.7	0.6	0.7
Detention Basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

Figure 7: Extract of Table 26.3 of SuDS Manual (2015)

As such the total SuDS mitigation index (figure 7) must be greater than the pollution hazard index (figure 6), furthermore when used in combination of two or more SuDS components, a factor of 0.5 is used to account for the reduced performance of the secondary or tertiary components associated with the already reduced inflow of concentration, therefore:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5(\text{mitigation index}_2)$$

As such all the run-off from the development site is proposed to be conveyed through attenuation basin and bioretention areas thus providing a far greater SuDS mitigation index than what is required to meet the minimum standards

Long Term Maintenance

Consideration has been given to the long-term maintenance of the proposed drainage structures. SuDS permeable pavements and SuDS basins and all associated external pipework, chambers and manholes will be the responsibility of a management company.

A detailed maintenance schedule will be provided by the designers during the detailed design stage of the surface water proposals.

Exceedance

Whilst the drainage system has been designed to a very high standard (1 in 100 Year storm event including climate change), it is possible that a more extreme event will occur and that the design standard for the system will be exceeded. It is best

practice to design the drainage system to shed water, primarily into landscaped and other areas, therefore reducing the risk of flooding areas of built development during extreme events.

A strategy for directing overland flows for the site will be confirmed using overland flow modeling as part of the detailed design once key ground levels or development levels across the site have been finalized.

6.0 Foul Water Drainage Strategy

Southern Water Utility Services Limited are the Local Sewerage Authority in this area. The development proposals will seek to discharge to the existing Southern Water public sewer network located within the eastern part of the development.

The proposed connection to the existing foul water network will be carried out under a Section 106 Agreement with Southern Water.

All domestic foul drainage should be designed in accordance with Part H of the Building Regulations

7.0 Conclusions

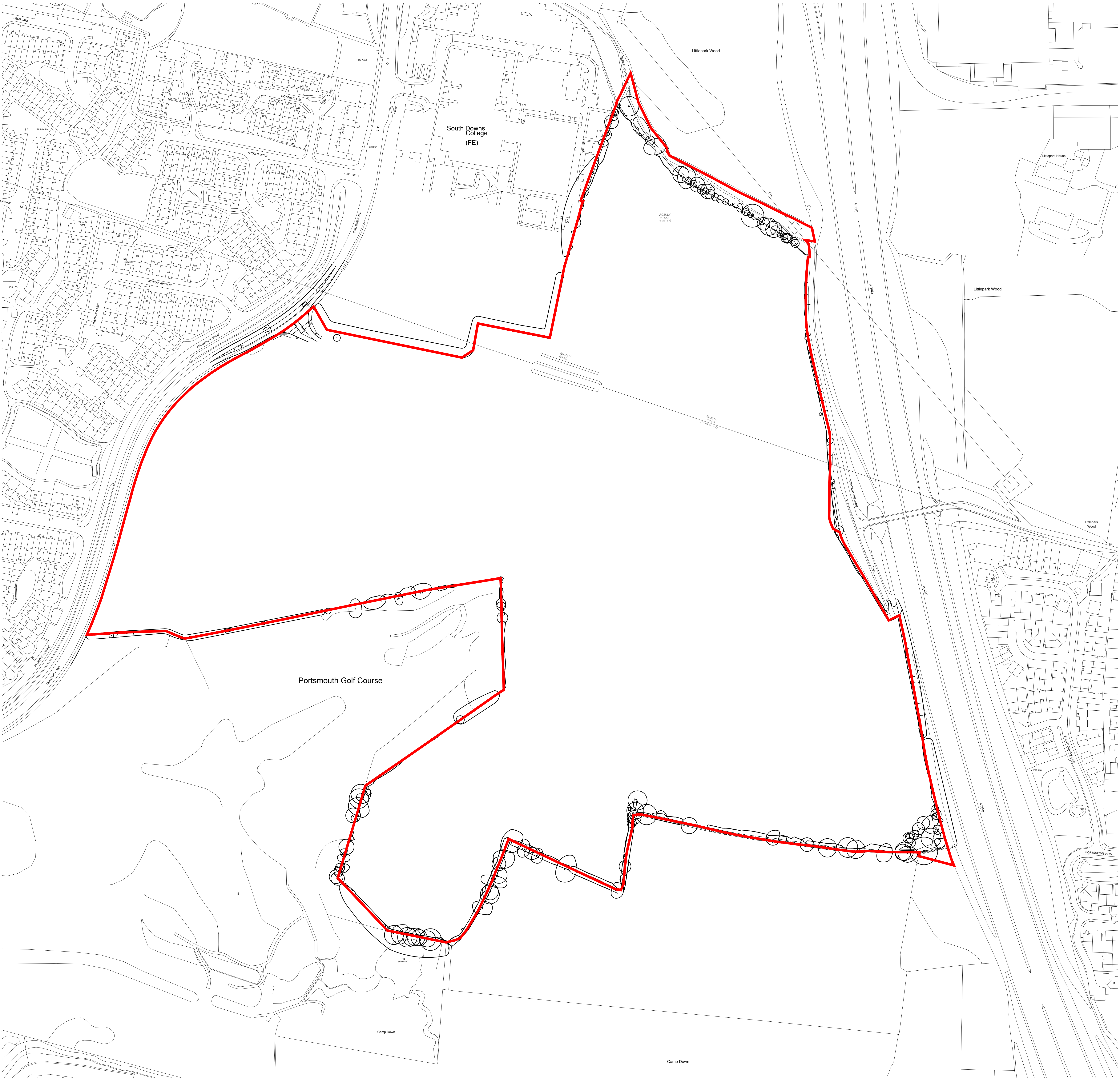
A preliminary design surface water drainage strategy has been prepared and hydraulically modelled which demonstrates that the redevelopment proposals can be successfully implemented and designed to withstand the impact of a 1:100 year rainfall event (including 45% climate change allowance), in accordance with the NPPF, PPG and HCC requirements

In view of this assessment, the report concludes that:

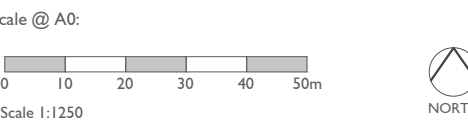
- i. That the site is located mainly within Flood Zones 1;
- ii. The Development and its occupants are not at an increased risk of flooding;
- iii. The Development does not increase the risk of flooding elsewhere;
- iv. The Development can be drained in a sustainable manner utilizing SuDS techniques;
- v. The Development will satisfactorily manage and maintain a 1 in 100 Year storm event with allowance for climate change.

The findings of this report identify the opportunity to promote the sustainable re-use of existing resources and potential to implement an appropriate SUDS strategy.

Appendix (A)
Site Location Plan



1:1250 Location Plan
Site Boundary
66.102ac / 26.751ha
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Rev	Date	Drawn	Checked
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Date: NOVEMBER 2022
Drawn by: MAH
Checked by: BB

Proj No: CB_62_265_000
Rev: -

Project: CAMPDOWN, RURBROOK, PORTSMOUTH
Title: SITE LOCATION PLAN
Client: dandara



Appendix (B)
Topographical Survey

- TREES
- a

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- Ash

Alder

Apple

Beech

Cherry

Copper Beech

Cypress

Elder

Euonymus

Fruit

Hazel

Horse Chestnut

Horn Oak

Hawthorn

Holly

Larch

Lime

Liquidambar

Magnolia

Oak

Pear

Roadside

Rhododendron

Silver Birch

Sweet Chestnut

Sycamore

Ulm

Willow

Yew
- Dia / Sp / Ht

- KEY
- BT

CB

CL

CTV

EL

EP

EV

GV

HVC

I

LP

LM

MIR

O

RP

RNP

SA

SV

TS

TH

TP

UTL

VM

WSV
- British Telecom

Control Box

Cover Level

Cable Television

Electric

Electric Pole

Fire Hydrant

Gas Stop Valve

High Voltage Cable

Inspection Cover

Invert Level

Lamp Post

Manhole

Marker

Overhead

Road Cully

Road Box

Road Name Plate

Road Sign

Scavenger

Stop Valve (Unidentified)

Telephone Box

Telephone Pole

Telephone Pole

Unidentified

Water Stop Valve

- FENCES
- BWF

CBF

CLF

CP

CPF

CWF

PCF

PPF

SP

WMP

WPF
- Barbed Wire Fence

Closed Board Fence

Chain Link Fence

Concrete Post

Chestnut Paling Fence

Chicken Wire Fence

Picket Fence

Post & Rail Fence

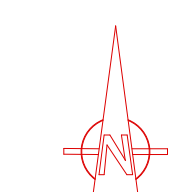
Post & Wire Fence

Steel Post

Wire Mesh Fence

Wood Panel Fence

STN	EASTINGS	NORTHINGS	LEVEL	TYPE
BASE	8984.974	7144.382	56.35	PCM
1	8713.754	7055.888	52.71	Nail
2	8806.837	7156.249	55.00	Nail
3	8670.692	6964.540	57.92	Nail
5	9046.184	7163.487	59.32	Peg
6	9076.400	7137.344	46.79	Nail
7	9356.760	7001.073	41.89	Nail
8	9300.079	6879.774	35.19	PCM
9	9164.847	6980.035	35.87	PCM
10	8933.760	6794.921	38.44	Peg
11	9008.334	6977.595	40.51	Peg
12	8728.277	6899.907	58.43	Nail



NOTES:
Levels are based on OS datum determined from National GPS Network using OSGM02.
The level is to standard Ordnance Survey datum (OSD) and should be corrected when comparing to other data sets based on OS datum.
Coordinates based on OS datum determined from National GPS Network using OSGM02.
No responsibility is accepted for any errors or omissions.
Damage claims have been referred to the relevant authority and should be referred to at all times.

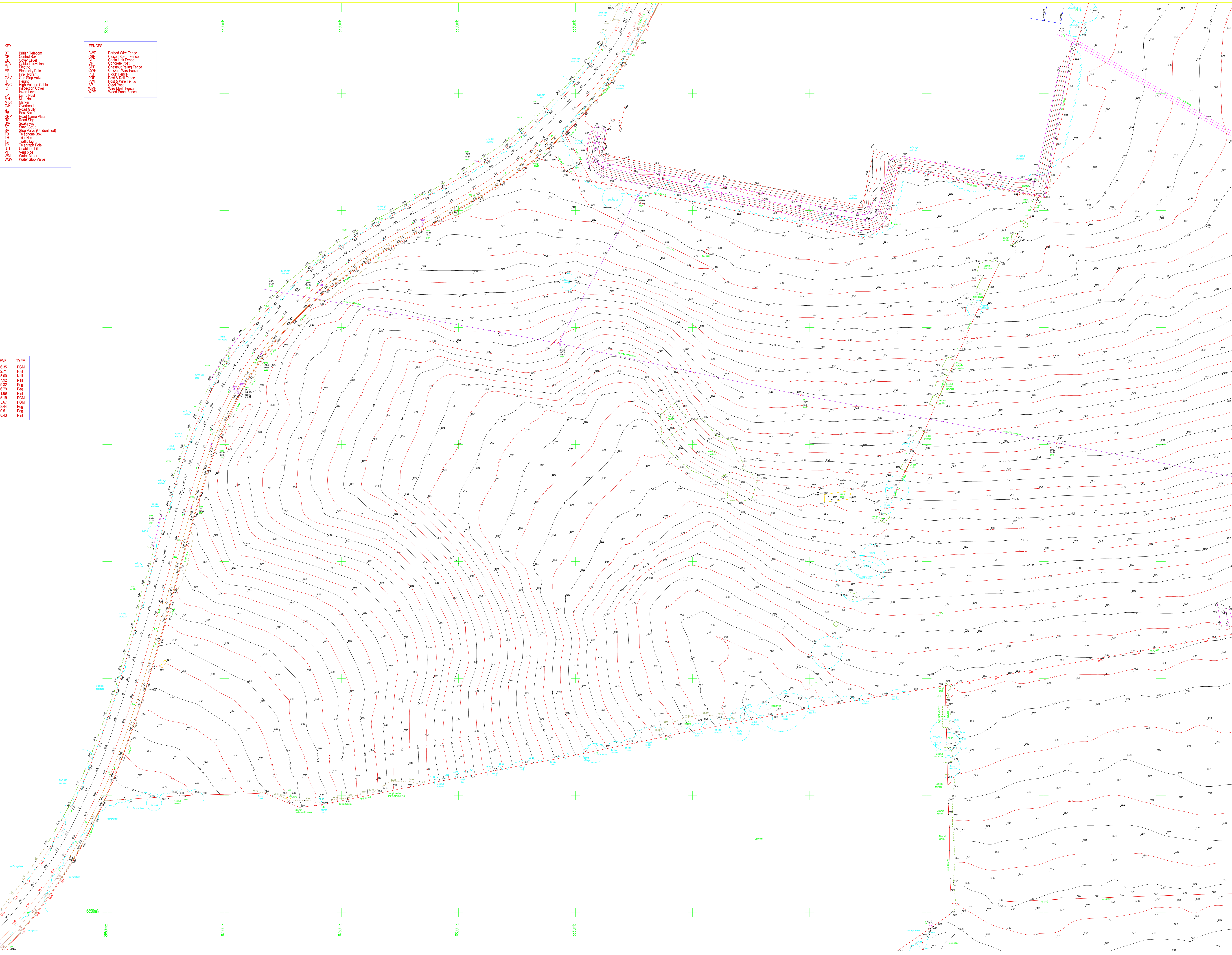
Geomatic Surveys

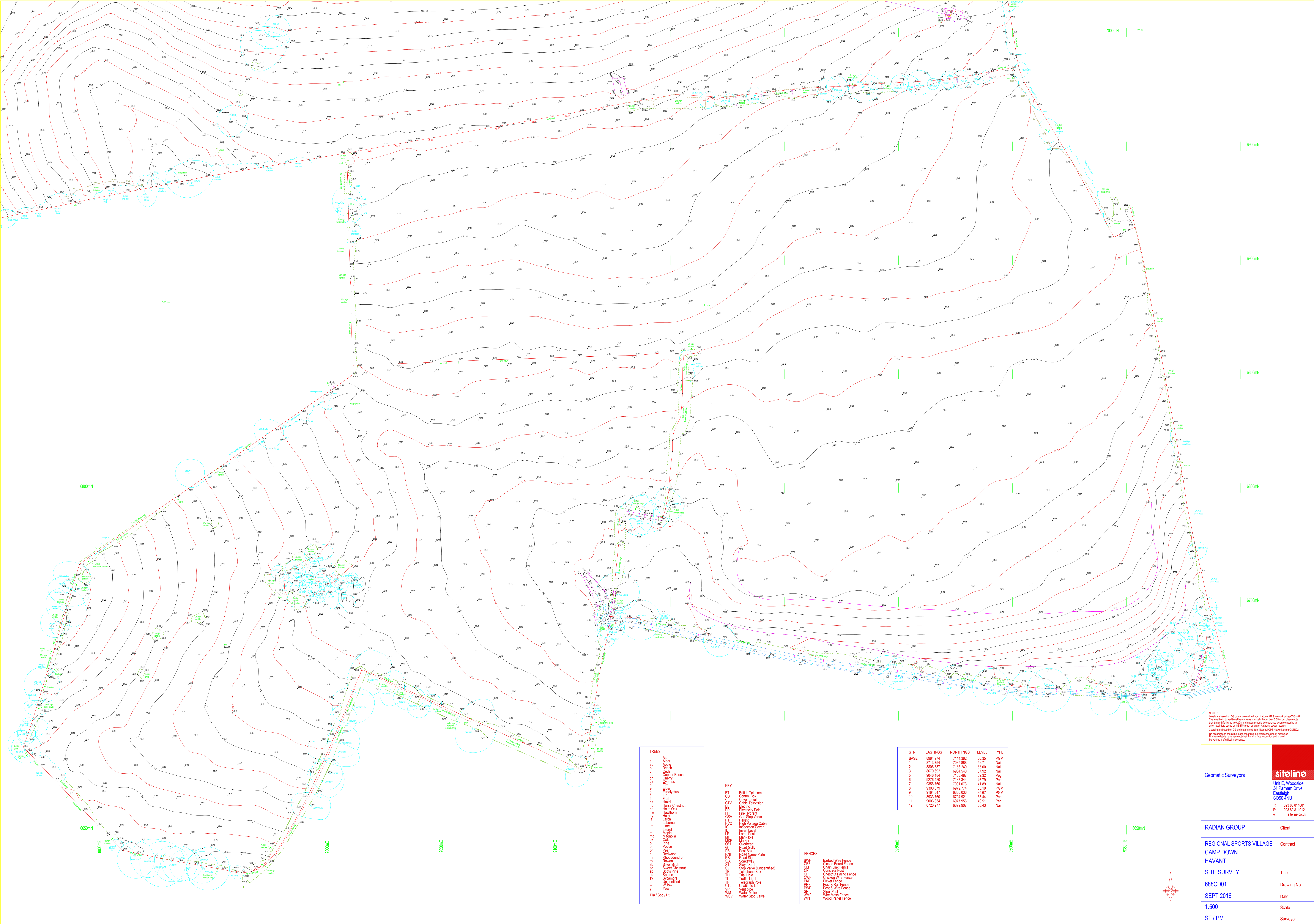
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RADIAN GROUP	Client
REGIONAL SPORTS VILLAGE CAMP DOWN HAVANT	Contract
SITE SURVEY	Title
688CD01	Drawing No.
SEPT 2016	Date
1:500	Scale
ST / PM	Surveyor





NOTES:
The level data is based on OS data derived from National GPS Network using CHTR2002.
The level data is to traditional benchmarks is usually better than 10cm, but please note that the data is based on OS data and should be treated with caution.
Coordinates are based on OS grid and should be treated with caution.
No assumptions should be made regarding the interpretation of the map.
Changes should be made to the map if it is found to be incorrect.

TREES	
a	Ash
ap	Aspen
c	Cedar
cb	Copper Beech
ch	Cherry
e	Elm
eu	Eucalyptus
f	Fruit
h	Hazel
hc	Horse Chestnut
h	Horn Oak
hw	Hawthorn
h	Hornbeam
l	Larch
la	Laurum
l	Laurel
m	Maple
mg	Magnolia
o	Oak
p	Pine
po	Poplar
pr	Pear
rh	Rhododendron
o	Olive
sb	Silver Birch
sc	Sweet Chestnut
so	Son Pine
g	Ginkgo
ry	Sycamore
u	Unidentified
w	Willow
y	Yew
Dia / Spd / Ht	

KEY	
BT	British Telecom
CB	Cover Level
CTV	Cable Television
EL	Electric
EP	Electric Pole
FH	Fire Hydrant
GSV	Gas Stop Valve
HVC	High Voltage Cable
I	Inspection Cover
L	Level
LP	Lamp Post
M	Manhole
MR	Manhole
OH	Overhead
RSP	Road Sign
RP	Road Pole
RS	Road Sign
ST	Street Light
SV	Stop Valve (Unidentified)
TB	Telephone Box
TH	Traffic Light
TL	Traffic Light
TP	Telephone Pole
UTL	Unusable to Lift
VP	Water Valve
WM	Water Meter
WSV	Water Stop Valve

FENCES	
RWF	Barbed Wire Fence
CBF	Closed Barbed Fence
CLF	Chain Link Fence
CP	Concrete Post
CF	Chestnut Fencing
CWF	Chicken Wire Fence
PCF	Picket Fence
PPF	Post & Rail Fence
RF	Rail & Wire Fence
WMF	Wire Mesh Fence
WPF	Wood Panel Fence

STN	EASTINGS	NORTHINGS	LEVEL	TYPE
BASE	6984.974	7144.382	56.35	PGM
1	8713.754	7085.888	52.71	Nail
2	8806.837	7156.249	55.00	Nail
3	8870.692	6964.540	57.92	Nail
4	8846.184	7163.467	58.52	Flag
5	8278.420	7137.344	46.79	Flag
6	8356.760	7001.073	41.89	Nail
7	8300.078	6978.774	35.19	PGM
8	9164.847	6880.036	35.67	PGM
9	8533.760	6794.921	38.44	Flag
10	9006.334	6977.556	40.51	Flag
11	8728.277	6899.907	58.43	Nail

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RADIAN GROUP

Client

RAMP SPORTS VILLAGE
CAMP DOWN
HAVANT

Contract

SITE SURVEY

Title

688CD01

Drawing No.

SEPT 2016

Date

1:500

Scale

ST / PM

Surveyor

Appendix (C)

Proposed Site Layout

REF	NAME	DESCRIPTION	SQ.FT	HEIGHT	NO	CALC
-----	------	-------------	-------	--------	----	------

SUB TOTAL	440	466167
-----------	-----	--------

OAK	OAKHAM	4 BEDROOM HOUSE	1180	2.0	2	2360
-----	--------	-----------------	------	-----	---	------

SUB TOTAL	188	146970
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Appendix (D)
Geotechnical Report



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH1
Contract Ref: 28720	Start: 07.09.16 End: 02.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water Backfill & Instru- mentation	Description of Strata	Depth (Thick- ness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			MADE GROUND: (Firm) orange brown sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium of brick. (Topsoil)	(0.35)	
	0.50	2	D			Firm medium strength orange brown mottled grey slightly sandy CLAY. Sand is fine. (HEAD DEPOSITS)	0.35	
	0.50		V	c _r =66				
	1.00-1.45	1	SPT	N=10				
	1.10		V	c _r =66				
	1.50	3	D					
	2.00-2.45	2	SPT	N=16				
	2.50	4	D					
	3.00-3.45	3	SPT	N=23		... Below 3.00m bgl, high strength		
							3.45	
						Borehole terminated at 3.45m depth.		

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)				
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m depth			
All dimensions in metres						Scale:	1:25		
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson	Logged By:	RSpeight
						Checked By:			



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH2
Contract Ref: 28720	Start: 02.08.16 End: 02.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				MADE GROUND: (Firm) orange brown sandy slightly gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium of brick. (Topsoil)	(0.35)	
	0.50	2	D				Firm medium strength orange brown mottled grey sandy CLAY. Sand is fine. (HEAD DEPOSITS)	0.35	
	0.50		V	$c_u=57$					
	1.00		V	$c_u=67$					
	1.50	3	D					(2.65)	
							... Below 2.00m bgl, orange red brown mottled grey,		
	2.30		V	$c_u=80$			... Below 2.30m bgl, high strength		
	2.50	4	D					3.00	
							Borehole terminated at 3.00m depth.		

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)				
						1. No groundwater was encountered 2. Borehole backfilled with arisings upon completion			
All dimensions in metres						Scale:	1:25		
Method Used: Tracked window sampling	Plant Used: Archway Competitor			Drilled By: Michael O'Shea	Logged By: RSpeight	Checked By:			



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH3
Contract Ref: 28720	Start: 07.09.16 End: 02.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water Backfill & Instru- mentation	Description of Strata	Depth (Thick- ness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			MADE GROUND: Grass over friable sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of flint. (Topsoil)	(0.30)	
							0.30	
	0.50	2	D			Firm medium strength orange brown mottled grey slightly sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of flint. (HEAD DEPOSITS)	(0.60)	
	0.60		V	c _v =45			0.90	
	1.00-1.45	1	SPT	N=11		Firm medium strength orange red brown mottled grey slightly sandy CLAY. Sand is fine. (HEAD DEPOSITS)	(1.10)	
	1.40		V	c _v =61				
	1.50	3	D					
							2.00	
	2.00-2.45	2	SPT	N=7		Firm medium strength orange brown mottled grey slightly sandy silty CLAY. (HEAD DEPOSITS)	(1.45)	
	2.30		V	c _v =41				
	2.50	4	D					
	3.00-3.45	3	SPT	N=7			3.45	
						Borehole terminated at 3.45m depth.		

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m depth	
All dimensions in metres						Scale:	1:25
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson
						Logged By:	RSpeight
						Checked By:	AGS



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH4
Contract Ref: 28720	Start: 02.08.16 End: 02.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				MADE GROUND: Grass over friable sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of flint. (Topsoil)	(0.30)	
	0.50	2	D				Firm medium strength orange brown mottled grey sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to medium of flint. (HEAD DEPOSITS)	(0.70)	
	0.80	V		c _u =44			Firm grey brown slightly sandy CLAY with occasional flint gravel. Sand is fine. Gravel is angular to subrounded fine to medium. (HEAD DEPOSITS)	1.00	
	1.40	3	D				... Between 1.20 and 1.25m bgl, gravel band with water.	(1.00)	
	2.40	4	D				... Between 1.90 and 2.00m bgl, gravel band with water. Firm orange grey brown mottled sandy silty CLAY. Sand is fine. (HEAD DEPOSITS)	(1.00)	
							Borehole terminated at 3.00m depth.	3.00	

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. Groundwater was encountered between 1.20-1.25m 2. Borehole backfilled with arisings upon completion	
All dimensions in metres						Scale:	1:25
Method Used: Tracked window sampling	Plant Used: Archway Competitor			Drilled By: Michael O'Shea	Logged By: RSpeight	Checked By:	



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH5
Contract Ref: 28720	Start: 07.09.16 End: 02.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water Backfill & Instru- mentation	Description of Strata	Depth (Thick- ness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			MADE GROUND: Grass over friable sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of flint. (Topsoil)	(0.30)	
	0.50	2	D			Firm medium strength orange brown grey mottled silty CLAY. (HEAD DEPOSITS)	0.30	
	0.50		V	c _r =67				
	1.00-1.45	1	SPT	N=10		... Below 0.80m bgl, flint gravel with red orange clay band.		
	1.50	3	D			... Below 1.40m bgl, grey brown with occasional decomposed plant matter and flint gravel.		
	1.60		V	c _r =60				
	2.00-2.45	2	SPT	N=10				
	2.70	4	D					
	3.00-3.45	3	SPT	N=8				
						Borehole terminated at 3.45m depth.	3.45	

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)				
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m			
All dimensions in metres						Scale:	1:25		
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson	Logged By:	RSpeight
						Checked By:			



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH6
Contract Ref: 28720	Start: 02.08.16 End: 02.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				MADE GROUND: Grass over friable sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of flint. (Topsoil)	(0.30)	
	0.50	2	D				Firm medium to high strength orange brown mottled grey slightly sandy CLAY. (HEAD DEPOSITS)	0.30	
	0.60		V	c _v =58					
	0.90		V	c _v =75					
	1.00-1.45	1	SPT	N=11					
	1.50		V	c _v =89					
	1.60	3	D				... At 1.60m bgl, single flint gravel, subrounded, coarse.	(3.15)	
	2.00-2.45	2	SPT	N=12			... Below 2.00m bgl, firm to stiff red orange brown grey mottled.		
	2.50		V	c _v =89					
	2.60	4	D						
	3.00-3.45	3	SPT	N=12					
							Borehole terminated at 3.45m depth.	3.45	

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)				
						1. No groundwater was encountered 2. Rootlets to 1.00m depth 3. Borehole backfilled with arisings upon completion			
All dimensions in metres						Scale:	1:25		
Method Used: Tracked window sampling	Plant Used: Archway Competitor			Drilled By: Michael O'Shea	Logged By: RSpeight	Checked By:			



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH7
Contract Ref: 28720	Start: 07.09.16 End: 02.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				MADE GROUND: Grass over friable sandy gravelly CLAY. Sand is fine. Gravel is angular to subrounded fine to coarse of flint. (Topsoil)	(0.30)	
	0.50	2	ES				MADE GROUND: Orange brown sandy slightly gravelly CLAY with occasional pockets of grey clay. Sand is fine. Gravel is angular to subrounded fine to coarse of flint. (Reworked Natural)	(0.70)	
	1.10-1.20	3	ES				MADE GROUND: (Firm) grey brown silty slightly gravelly CLAY. Gravel is subrounded to subangular fine to coarse of brick and clinker.	(0.50)	
	1.70		V	c _u =35			Soft becoming firm low strength orange brown mottled grey silty CLAY. (HEAD DEPOSITS)	(1.50)	
	2.30	4	D					3.00	
							Borehole terminated at 3.00m depth.		

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)				
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m			
All dimensions in metres						Scale:	1:25		
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson	Logged By:	RSpeight
						Checked By:			



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH8
Contract Ref: 28720	Start: 03.08.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.00-0.20	1	ES				TOPSOIL: Light brown slightly clayey SAND. Sand is fine.	0.20	
	0.50	2	D				Dense orange brown very silty clayey fine SAND. (BOGNOR SAND MEMBER) ... At 0.60m bgl, single subangular coarse flint gravel.		
	1.00-1.45	1	SPT	N=38					
	1.30	3	D						
	2.00-2.45	2	SPT	N=41					
	2.50	4	D						
	3.00-3.45	3	SPT	N=40					
							Borehole terminated at 3.45m depth.	3.45	

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Borehole backfilled with arisings upon completion	
All dimensions in metres						Scale:	1:25
Method Used: Tracked window sampling	Plant Used: Archway Competitor			Drilled By: Michael O'Shea	Logged By: RSpeight	Checked By:	



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH9
Contract Ref: 28720	Start: 07.09.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water	Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				TOPSOIL: Brown sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse of flint.	(0.35)	
	0.50	2	D				Firm medium to high strength orange brown mottled grey silty CLAY. (HEAD DEPOSITS)	0.35	
	0.50		V	c _r =65					
	1.00-1.45	1	SPT	N=7			... Below 1.00m bgl, occasional orange brown silty sand parting.		
	1.15		V	c _r =66					
	1.40	3	D						
	1.80		V	c _r =76			... Below 2.00m bgl, red orange brown grey mottled.	(3.10)	
	2.00-2.45	2	SPT	N=8					
	2.60	4	D						
	3.00-3.45	3	SPT	N=17					
							Borehole terminated at 3.45m depth.	3.45	

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m	
All dimensions in metres						Scale:	1:25
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson
						Logged By:	RSpeight
						Checked By:	



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH10
Contract Ref: 28720	Start: 07.09.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				TOPSOIL: Brown sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse of flint.	(0.30)	
	0.50	2	D				Firm medium strength orange brown mottled grey slightly gravelly silty CLAY. Gravel is subangular to subrounded fine to coarse of flint. (HEAD DEPOSITS)	0.30	
	0.50		V	c _r =52					
	1.30	3	D				... Below 1.00m bgl, red brown orange grey mottled and no gravel.		
	1.30		V	c _r =53					
	2.50	4	D						
	2.50		V	c _r =63					
							Borehole terminated at 3.00m depth.	3.00	

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Borehole backfilled with arisings upon completion	
All dimensions in metres						Scale:	1:25
Method Used: Tracked window sampling	Plant Used: Archway Competitor+		Drilled By: ADavidson	Logged By: RSpeight	Checked By:		



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH11
Contract Ref: 28720	Start: 03.08.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				TOPSOIL: Brown sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse of flint.	0.20	
	0.40	2	D				Firm brown sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to coarse of flint. (HEAD DEPOSITS)	(0.30) 0.50	
	0.70 0.80	3	V D	c _u =46			Firm medium strength orange grey brown mottled slightly sandy silty CLAY with occasional silty sand partings. (HEAD DEPOSITS)		
	1.00-1.45	1	SPT	N=8					
	1.50 1.60	4	V D	c _u =63					
	2.00-2.45	2	SPT	N=11			... Below 2.00m bgl, red orange grey brown mottled.	(2.95)	
	2.50 2.50	5	D V	c _u =64					
	3.00-3.45	3	SPT	N=13					
							Borehole terminated at 3.45m depth.	3.45	

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Borehole backfilled with arisings upon completion	
All dimensions in metres						Scale:	1:25
Method Used: Tracked window sampling	Plant Used: Archway Competitor			Drilled By: Michael O'Shea	Logged By: RSpeight	Checked By:	



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH12
Contract Ref: 28720	Start: 03.08.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				TOPSOIL: Red brown grey mottled sandy CLAY.	(0.30)	
								0.30	
	0.40	2	D				Firm medium strength orange brown grey mottled sandy CLAY. (HEAD DEPOSITS)		
	0.50		V	c _u =72					
								(1.40)	
	1.40	3	D						
	1.50		V	c _u =65				1.70	
							Orange brown silty SAND. (BOGNOR SAND MEMBER)		
	1.90	4	D				... Below 2.00m bgl, slightly damp.		
								(1.30)	
	2.50	5	D						
								3.00	
							Borehole terminated at 3.00m depth.		

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Borehole backfilled with arisings upon completion	
All dimensions in metres						Scale:	1:25
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor		Drilled By:	Michael O'Shea
						Logged By:	RSpeight
						Checked By:	



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH13
Contract Ref: 28720	Start: 07.09.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			TOPSOIL: Red brown grey mottled sandy CLAY.	(0.30)	
	0.50	2	D			Firm medium strength orange brown mottled grey slightly sandy silty CLAY. Sand is fine. (HEAD DEPOSITS)	0.30	
	0.50	V		c _v =50			(0.70)	
	1.00-1.45	1	SPT	N=8		Firm medium strength red orange brown grey mottled CLAY. (LAMBETH GROUP) ... Below 1.00m bgl, red orange brown grey mottled.	1.00	
	1.50	3	D			... Below 2.50m bgl, becoming fissured with no sand.		
	1.50	V		c _v =65				
	2.00-2.45	2	SPT	N=10			(2.45)	
	2.70	4	D					
	3.00-3.45	3	SPT	N=16				
						Borehole terminated at 3.45m depth.	3.45	

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m	
All dimensions in metres						Scale:	1:25
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson
						Logged By:	RSpeight
						Checked By:	AGS



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH14
Contract Ref: 28720	Start: 03.08.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water	Backfill	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results					
	0.10-0.20	1	ES				TOPSOIL: Red brown grey mottled sandy CLAY.	(0.30)	
	0.60	2	D				Orange brown slightly sandy gravelly CLAY. Sand is fine. Gravel is angular to subangular medium to coarse of flint. (HEAD DEPOSITS)	(0.80)	
	1.30	3	D				Firm high strength red grey mottled slightly sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to rounded fine to coarse of flint. (LAMBETH GROUP)	1.10	
	1.60	V		c _u >= 120			... Below 1.50m bgl, becoming stiff to very stiff with no gravel.	(1.90)	
	2.40	4	D					3.00	
							Borehole terminated at 3.00m depth.		

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)				
						1. No groundwater was encountered 2. Borehole backfilled with arisings upon completion			
All dimensions in metres						Scale:	1:25		
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor		Drilled By:	Michael O'Shea	Logged By:	RSpeight
						Checked By:			



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH15
Contract Ref: 28720	Start: 07.09.16 End: 03.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water Backfill & Instru- mentation	Description of Strata	Depth (Thick- ness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			TOPSOIL: Red brown grey mottled sandy CLAY.	(0.30)	
	0.50	2	D			Soft orange grey brown mottled very sandy slightly gravelly CLAY. Sand is fine. Gravel is angular to subangular fine to medium of flint. (HEAD DEPOSITS)	(0.70)	
	1.00-1.45	1	SPT	N=24		Grey high strength orange mottled clayey SAND with rare flint gravel and occasional band of clay. Gravel is angular to subangular fine to coarse. (HEAD DEPOSITS)	1.00	
	1.40	3	D					
	2.00-2.45	2	SPT	N=16		... Below 2.00m bgl, medium strength.	(2.45)	
	2.70	4	D					
	3.00-3.45	3	SPT	N=9			3.45	
						Borehole terminated at 3.45m depth.		

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. Groundwater encountered between 2.00-2.50m 2. Gas and groundwater monitoring well installed to 3.00m depth.	
All dimensions in metres						Scale:	1:25
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson
						Logged By:	RSpeight
						Checked By:	AGS



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH16
Contract Ref: 28720	Start: 07.09.16 End: 04.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water Backfill & Instru- mentation	Description of Strata	Depth (Thick- ness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			Grass over firm medium strength orange brown mottled grey slightly sandy silty CLAY with occasional silty sand partings. Sand is fine. (HEAD DEPOSITS)		
	0.50	2	D					
	0.50		V	$c_v=75$				
	1.00-1.45	1	SPT	N=10		... Below 1.00m bgl, becoming sandy silty clay.		
	1.20		V	$c_v=54$				
	1.40	3	D					
	2.00-2.45	2	SPT	N=18			(3.45)	
	2.50	4	D					
	3.00-3.45	3	SPT	N=18				
							3.45	
						Borehole terminated at 3.45m depth.		

Drilling Progress and Water Observations						General Remarks			
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)				
						1. No groundwater was encountered 2. Roots present to 0.80m 3. Gas and groundwater monitoring well installed to 3.00m			
All dimensions in metres						Scale:	1:25		
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson	Logged By:	RSpeight
						Checked By:			



WINDOW SAMPLE LOG

Contract: Campdown		Client: Radian		Window Sample: BH17
Contract Ref: 28720	Start: 07.09.16 End: 04.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress	Samples / Tests				Water Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			TOPSOIL: Firm brown sandy gravelly CLAY. Sand is fine. Gravel is subangular to subrounded fine to medium of chalk and rare brick.	0.25	
	0.50	2	D			Firm medium to high strength orange brown slightly sandy CLAY. Sand is fine. Occasional mottled grey. (HEAD DEPOSITS)		
	0.50		V	c _r =64				
	1.00-1.45	1	SPT	N=10				
	1.20		V	c _r =71				
	1.30	3	D					
	1.60		V	c _r =86			(3.20)	
	2.00-2.45	2	SPT	N=13		Below 2.00m bgl, occasional pockets of fine to medium sand.		
	2.40	4	D					
	3.00-3.45	3	SPT	N=13				
							3.45	
						Borehole terminated at 3.45m depth.		

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m depth	
All dimensions in metres						Scale:	1:25
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson
						Logged By:	RSpeight
						Checked By:	



WINDOW SAMPLE LOG

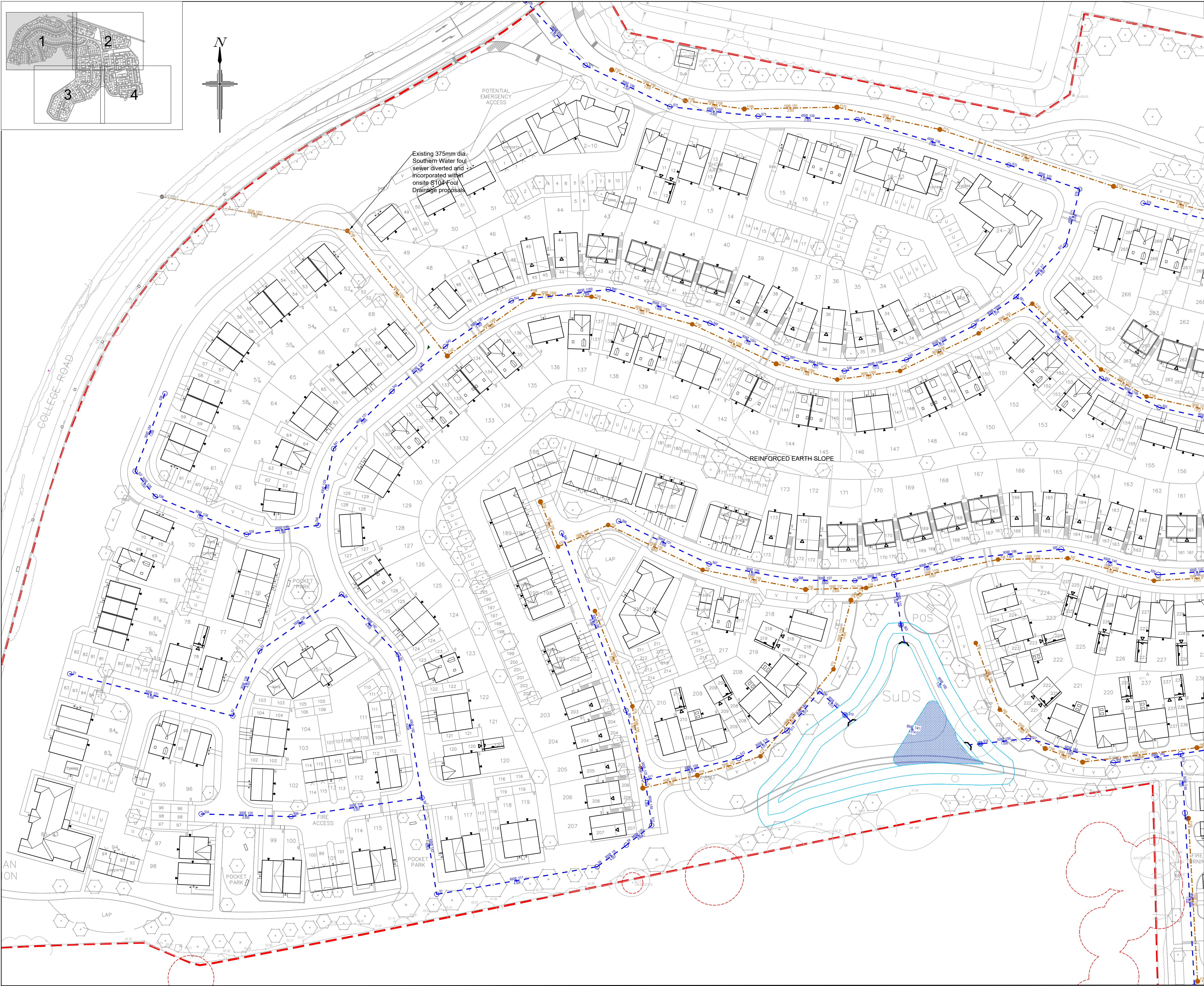
Contract: Campdown		Client: Radian		Window Sample: BH18
Contract Ref: 28720	Start: 07.09.16 End: 04.08.16	Ground Level: ---	Co-ordinates: ---	Sheet: 1 of 1

Progress		Samples / Tests			Water Backfill & Instrumentation	Description of Strata	Depth (Thickness)	Material Graphic Legend
Window Run	Depth	No	Type	Results				
	0.10-0.20	1	ES			TOPSOIL: Brown grey mottled slightly sandy silty CLAY.	0.25	
	0.40	2	D			Firm medium strength orange brown grey mottled sandy silty CLAY. Sand is fine. (HEAD DEPOSITS)		
	0.50		V	c _r =43				
	0.80		V	c _r =48				
	1.00-1.45	1	SPT	N=9		... Below 1.00m bgl, red brown grey mottled, slightly sandy.		
	1.20	3	D					
	1.40		V	c _r =70				
	1.90		V	c _r =75				
	2.00-2.45	2	SPT	N=11				
	2.30	4	D					
	3.00-3.45	3	SPT	N=12			(3.20)	
							3.45	
						Borehole terminated at 3.45m depth.		

Drilling Progress and Water Observations						General Remarks	
Date	Time	Borehole Depth (m)	Casing Depth (m)	Borehole Diameter (mm)	Water Depth (m)		
						1. No groundwater was encountered 2. Gas and groundwater monitoring well installed to 3.00m depth	
All dimensions in metres						Scale:	1:25
Method Used:	Tracked window sampling		Plant Used:	Archway Competitor+		Drilled By:	ADavidson
						Logged By:	RSpeight
						Checked By:	AGS

Appendix (E)

Proposed Surface and Foul Water Drainage Strategy



NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on Cooper Baillie Sketch Layout drawing no: CB_62_265_001, revision A, dated 06/06/2023
4. Drainage strategy is indicative only and subject to further design development.
5. Only strategic main drainage are shown. Private connections are not shown at this stage.
6. All construction to be in accordance with Design & Construction Guidelines and Southern Water specific requirements.

KEY

Site Boundary

MAIN DRAINAGE KEY

- Existing Foul Sewer Manhole
- Adoptable Foul Sewer
- Adoptable Surface Water Sewer
- Wet Pond
- Proposed Headwall
- Proposed SuDS basins
(Subject to Detailed Design)
- Proposed Surface Water Swale
(Subject to Detailed Design)

Root Protection Areas
(Based on Barrel Tree Consultancy Tree Constraints Plan,
drawing number 22062-1 A, issued to RCP in .dwg format on
26/10/2022.)

Any proposed works within Root Protection Areas are subject to supervision and approval by the Arboriculturist.

CDM NOTES

1. EXISTING SERVICES. Depth of existing services must be determined prior to works commencing. The contractor is responsible for establishing underground services in accordance with HSE Guidance note HS (G) 47. Any services which would be within the proposed construction layers must be lowered to below the sub-base.

Rev. Date Details By Chkd Appd

Client:-



Site:-
Roman Fields
Campdown,
Purbrook

Drawing Title:-
Drainage Strategy
Layout

Sheet 1 of 4

Date: June 2023 Scales: 1:500 at A1
Drawn: TRS Checked: TRS Approved: TS

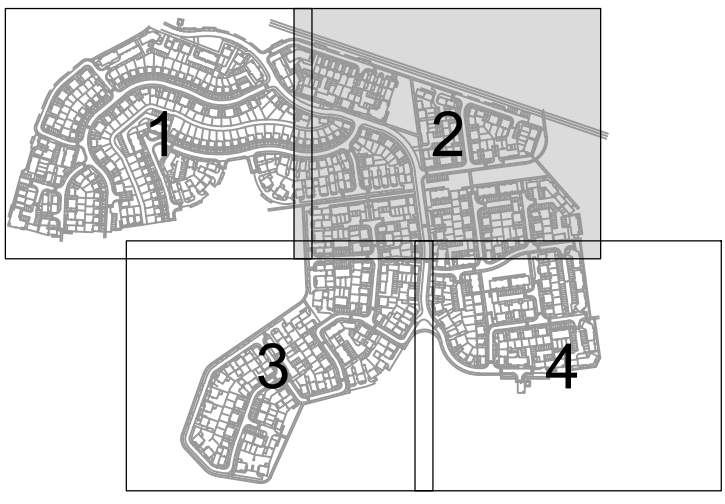
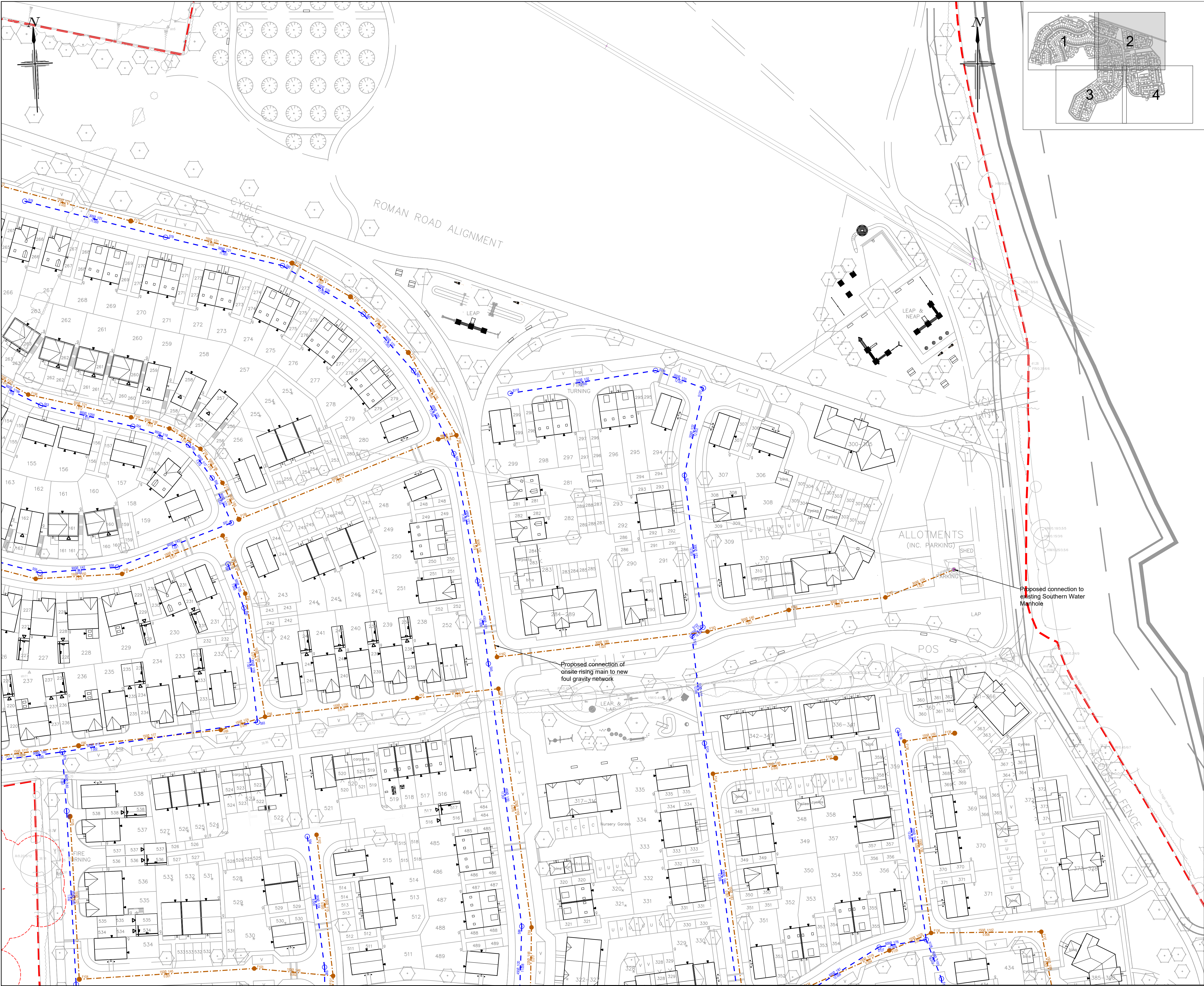
Drawing No. DAN/E4993/013

FOR INFORMATION ONLY



Rogers Cory Partnership
Architectural and Civil Consultants
The Old School Old School Road
Hook Hampshire RG27 9NJ

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- NOTES**
1. All dimensions are in metres unless stated otherwise.
 2. Do not scale from this drawing. Only written dimensions are to be used.
 3. Site layout based on Cooper Baillie Sketch Layout drawing no: CB_62_265_001, revision A, dated 06/06/2023
 4. Drainage strategy is indicative only and subject to further design development.
 5. Only strategic main drainage are shown. Private connections are not shown at this stage.
 6. All construction to be in accordance with Design & Construction Guidelines and Southern Water specific requirements.

KEY

Site Boundary

MAIN DRAINAGE KEY

Existing Foul Sewer Manhole

Adoptable Foul Sewer

Adoptable Surface Water Sewer

Wet Pond

Proposed Headwall

Proposed SuDS basins
(Subject to Detailed Design)

Proposed Surface Water Swale
(Subject to Detailed Design)

Root Protection Areas
(Based on Barrel Tree Consultancy Tree Constraints Plan, drawing number 22062-1 A, issued to RCP in .dwg format on 26/10/2022.)

Any proposed works within Root Protection Areas are subject to supervision and approval by the Arboriculturist.

CDM NOTES

1. **EXISTING SERVICES.** Depth of existing services must be determined prior to works commencing. The contractor is responsible for establishing underground services in accordance with HSE Guidance note HS (G) 47. Any services which would be within the proposed construction layers must be lowered to below the sub-base.

Rev.	Date	Details	By	Chkd	Appd

Client:- **dandara**

Site:- **Roman Fields Campdown, Purbrook**

Drawing Title:- **Drainage Strategy Layout**

Sheet 2 of 4

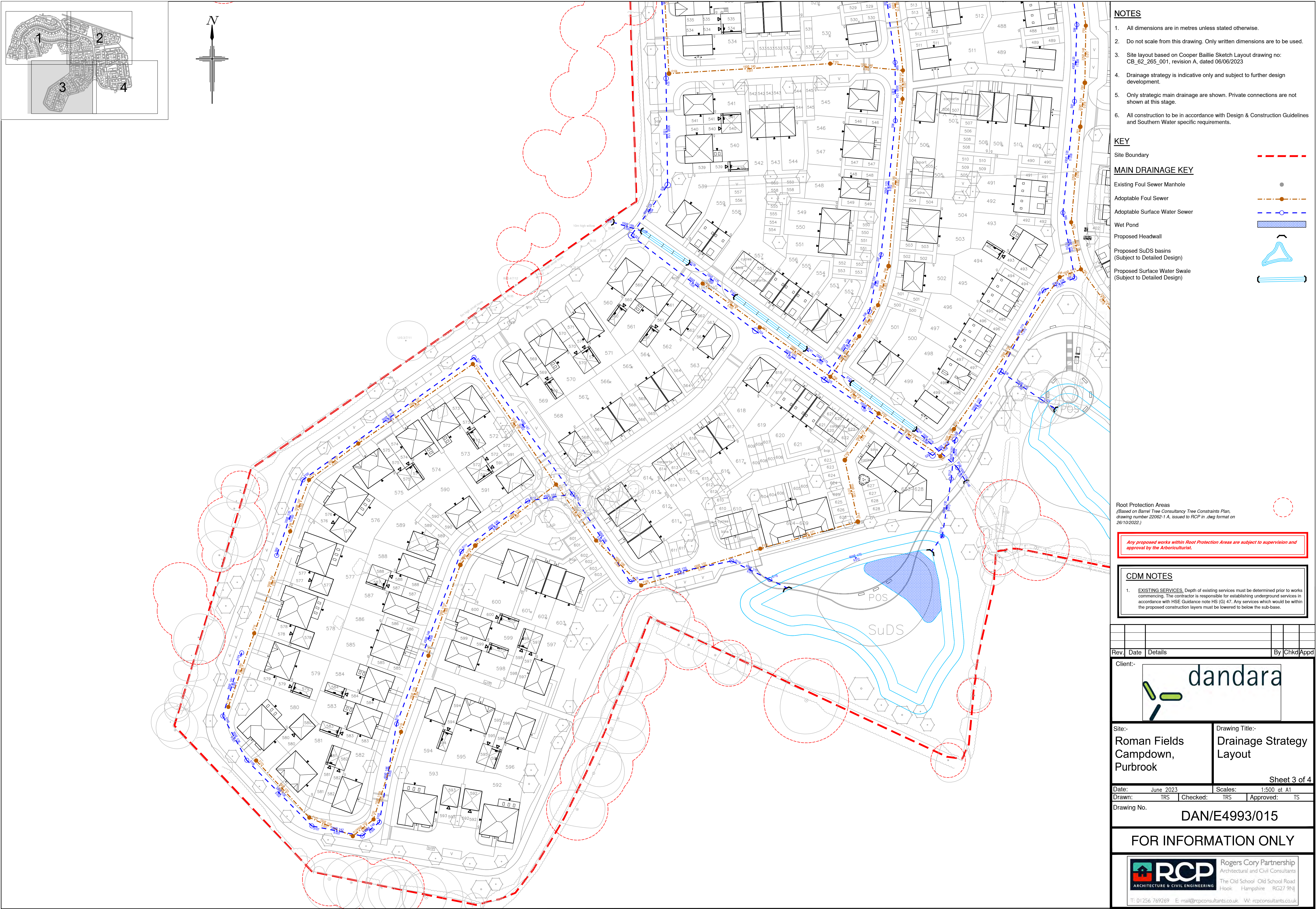
Date: June 2023 Scales: 1:500 at A1

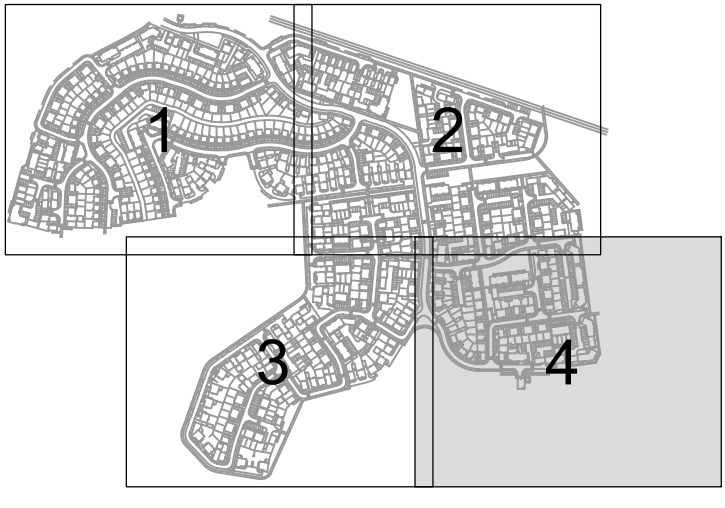
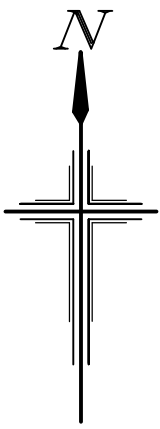
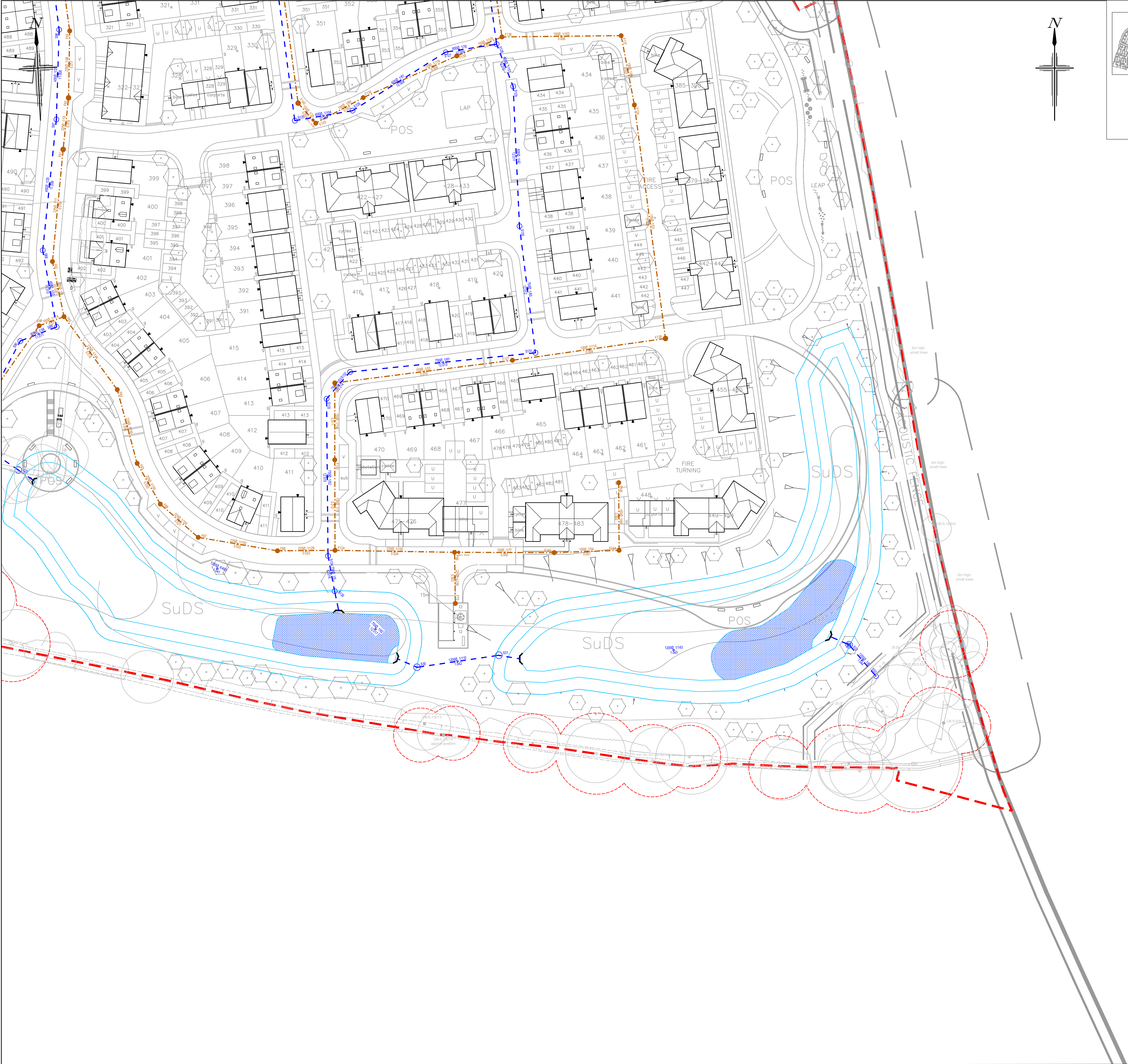
Drawn: TRS Checked: TRS Approved: TS

Drawing No. **DAN/E4993/014**

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NOTES

1. All dimensions are in metres unless stated otherwise.
2. Do not scale from this drawing. Only written dimensions are to be used.
3. Site layout based on Cooper Baillie Sketch Layout drawing no: CB_62_265_001, revision A, dated 06/06/2023
4. Drainage strategy is indicative only and subject to further design development.
5. Only strategic main drainage are shown. Private connections are not shown at this stage.
6. All construction to be in accordance with Design & Construction Guidelines and Southern Water specific requirements.

KEY

Site Boundary



MAIN DRAINAGE KEY

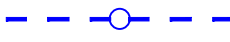
Existing Foul Sewer Manhole



Adoptable Foul Sewer



Adoptable Surface Water Sewer



Wet Pond



Proposed Headwall



Proposed SuDS basins
(Subject to Detailed Design)



Proposed Surface Water Swale
(Subject to Detailed Design)



Root Protection Areas
(Based on Barrel Tree Consultancy Tree Constraints Plan,
drawing number 22062-1 A, issued to RCP in .dwg format on
26/10/2022.)



Any proposed works within Root Protection Areas are subject to supervision and approval by the Arboriculturalist.

CDM NOTES

1. **EXISTING SERVICES.** Depth of existing services must be determined prior to works commencing. The contractor is responsible for establishing underground services in accordance with HSE Guidance note HS (G) 47. Any services which would be within the proposed construction layers must be lowered to below the sub-base.

Rev.	Date	Details	By	Chkd	Appd

Client:-

Site:- Roman Fields
Campdown,
Purbrook

Drawing Title:-
Drainage Strategy
Layout

Sheet 1 of 4

Date:	June 2023	Scales:	1:500 at A1
Drawn:	TRS	Checked:	TRS
		Approved:	TS

Drawing No. **DAN/E4993/016**

FOR INFORMATION ONLY

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Appendix (F)

Microdrainge Calculations

Rogers Cory Partnership		Page 0
The Old School Old School Road Hook Hampshire RG27 9NJ		
Date 10/06/2023 10:53 File E4993 -	Designed by Terry Checked by	
Innovyze	Network 2017.1.2	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Surface Network 1

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.400	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Surface Network 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	23.890	0.286	83.6	0.179	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	9.301	0.265	35.1	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	28.384	0.742	38.3	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	20.760	0.434	47.8	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	22.446	0.768	29.2	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.005	23.581	0.759	31.1	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	20.002	0.553	36.2	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	23.099	0.115	200.9	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.008	28.053	0.140	200.4	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.009	30.769	0.154	199.8	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.010	24.279	0.121	200.7	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	5.23	50.109	0.179	0.0	0.0	0.0	1.72	121.6	24.2
1.001	50.00	5.29	49.824	0.358	0.0	0.0	0.0	2.66	188.2	48.5
1.002	50.00	5.48	49.559	0.537	0.0	0.0	0.0	2.55	180.3	72.7
1.003	50.00	5.59	48.817	0.716	0.0	0.0	0.0	2.95	468.4	97.0
1.004	50.00	5.69	48.383	0.895	0.0	0.0	0.0	3.77	599.9	121.2
1.005	50.00	5.80	47.614	1.074	0.0	0.0	0.0	3.66	581.8	145.4
1.006	50.00	5.90	46.856	1.253	0.0	0.0	0.0	3.39	539.0	169.7
1.007	50.00	6.07	46.302	1.432	0.0	0.0	0.0	2.21	1404.2	193.9
1.008	50.00	6.28	46.187	1.611	0.0	0.0	0.0	2.21	1405.9	218.1
1.009	50.00	6.52	45.896	1.790	0.0	0.0	0.0	2.21	1407.9	242.4
1.010	50.00	6.70	45.743	1.969	0.0	0.0	0.0	2.21	1404.9	266.6

Rogers Cory Partnership		Page 1
The Old School Old School Road Hook Hampshire RG27 9NJ		
Date 10/06/2023 10:53 File E4993 -	Designed by Terry Checked by	
Innovyze	Network 2017.1.2	

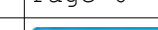
Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.011	17.034	0.085	200.4	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.012	18.147	0.091	199.4	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.013	21.643	0.108	200.4	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.014	14.820	0.074	200.3	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
2.000	25.374	0.266	95.4	0.179	5.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	27.101	0.281	96.4	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	25.539	0.251	101.7	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.003	28.546	1.024	27.9	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.004	45.505	1.250	36.4	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.005	21.557	0.990	21.8	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.006	16.529	1.490	11.1	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.007	20.616	2.817	7.3	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.015	33.912	0.170	199.5	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.016	18.535	0.093	199.3	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.017	27.145	0.136	199.6	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.018	16.877	0.914	18.5	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.019	11.696	0.678	17.3	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.020	14.024	0.671	20.9	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.021	35.226	0.843	41.8	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	
1.022	22.310	0.535	41.7	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.011	50.00	6.83	45.621	2.148	0.0	0.0	0.0	2.21	1405.8	290.9
1.012	50.00	6.96	45.536	2.327	0.0	0.0	0.0	2.22	1409.3	315.1
1.013	50.00	7.13	45.445	2.506	0.0	0.0	0.0	2.21	1405.8	339.3
1.014	50.00	7.24	45.337	2.685	0.0	0.0	0.0	2.21	1406.3	363.6
2.000	50.00	5.26	53.782	0.179	0.0	0.0	0.0	1.61	113.8	24.2
2.001	50.00	5.54	53.516	0.358	0.0	0.0	0.0	1.60	113.2	48.5
2.002	50.00	5.76	53.235	0.537	0.0	0.0	0.0	2.02	320.5	72.7
2.003	50.00	5.88	52.984	0.716	0.0	0.0	0.0	3.86	614.3	97.0
2.004	50.00	6.10	51.960	0.895	0.0	0.0	0.0	3.38	537.3	121.2
2.005	50.00	6.19	50.710	1.074	0.0	0.0	0.0	4.37	695.3	145.4
2.006	50.00	6.23	49.720	1.253	0.0	0.0	0.0	6.13	975.0	169.7
2.007	50.00	6.28	48.230	1.432	0.0	0.0	0.0	7.55	1200.9	193.9
1.015	50.00	7.49	45.263	4.296	0.0	0.0	0.0	2.21	1409.1	581.7
1.016	50.00	7.63	45.093	4.475	0.0	0.0	0.0	2.22	1409.7	606.0
1.017	50.00	7.84	45.001	4.654	0.0	0.0	0.0	2.21	1408.7	630.2
1.018	50.00	7.88	44.733	4.833	0.0	0.0	0.0	7.31	4650.3	654.4
1.019	50.00	7.90	43.820	5.012	0.0	0.0	0.0	7.56	4811.4	678.7
1.020	50.00	7.94	43.142	5.191	0.0	0.0	0.0	6.87	4370.5	702.9
1.021	50.00	8.06	42.471	5.370	0.0	0.0	0.0	4.85	3088.4	727.2
1.022	50.00	8.13	41.477	5.549	0.0	0.0	0.0	4.86	3091.6	751.4

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Network Design Table for Surface Network 1												
PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section	Type	Auto Design
4.006	46.819	4.446	10.5	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit		
4.007	10.451	1.838	5.7	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
4.008	9.231	0.472	19.6	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
4.009	13.168	0.234	56.3	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
6.000	54.275	1.874	29.0	0.179	5.00	0.0	0.600	o	300	Pipe/Conduit		
6.001	20.754	0.950	21.8	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit		
4.010	27.551	0.470	58.6	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
4.011	16.044	0.890	18.0	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
4.012	14.659	0.320	45.8	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
4.013	10.046	0.150	67.0	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
4.014	39.746	0.960	41.4	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
1.028	13.874	0.231	60.1	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
1.029	25.421	0.424	60.0	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
1.030	19.566	0.326	60.0	0.179	0.00	0.0	0.600	o	900	Pipe/Conduit		
7.000	13.448	0.409	32.9	0.179	5.00	0.0	0.600	o	300	Pipe/Conduit		
7.001	33.047	0.877	37.7	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit		
7.002	56.770	4.462	12.7	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit		
Network Results Table												
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)		
4.006	50.00	6.23	47.130	1.611	0.0	0.0	0.0	7.53	2129.6	218.1		
4.007	50.00	6.24	42.684	1.790	0.0	0.0	0.0	13.18	8386.8	242.4		
4.008	50.00	6.26	40.846	1.969	0.0	0.0	0.0	7.10	4518.3	266.6		
4.009	50.00	6.31	40.374	2.148	0.0	0.0	0.0	4.18	2660.2	290.9		
6.000	50.00	5.31	43.114	0.179	0.0	0.0	0.0	2.93	207.3	24.2		
6.001	50.00	5.41	41.240	0.358	0.0	0.0	0.0	3.38	238.8	48.5		
4.010	50.00	6.42	39.990	2.685	0.0	0.0	0.0	4.10	2606.3	363.6		
4.011	50.00	6.46	39.520	2.864	0.0	0.0	0.0	7.40	4706.5	387.8		
4.012	50.00	6.51	38.630	3.043	0.0	0.0	0.0	4.64	2949.3	412.1		
4.013	50.00	6.56	38.310	3.222	0.0	0.0	0.0	3.83	2437.8	436.3		
4.014	50.00	6.69	38.160	3.401	0.0	0.0	0.0	4.88	3102.8	460.5		
1.028	49.51	8.72	37.200	10.740	0.0	0.0	0.0	4.05	2574.7	1440.0		
1.029	49.21	8.82	36.969	10.919	0.0	0.0	0.0	4.05	2577.0	1455.3		
1.030	48.99	8.90	36.545	11.098	0.0	0.0	0.0	4.05	2575.6	1472.5		
7.000	50.00	5.08	42.266	0.179	0.0	0.0	0.0	2.75	194.4	24.2		
7.001	50.00	5.30	41.858	0.358	0.0	0.0	0.0	2.57	181.6	48.5		
7.002	50.00	5.51	40.981	0.537	0.0	0.0	0.0	4.43	313.2	72.7		
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Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
11.005	37.239	1.812	20.5	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
11.006	23.975	1.169	20.5	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
11.007	76.098	3.713	20.5	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
11.008	23.854	1.167	20.4	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
11.009	34.978	1.710	20.5	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
11.010	20.682	0.959	21.6	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
11.011	10.377	0.271	38.3	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit	
11.012	28.719	2.007	14.3	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.040	15.730	1.640	9.6	0.179	0.00	0.0	0.600	o	1050	Pipe/Conduit	
1.041	118.233	0.240	492.6	0.179	0.00	0.0	0.600	o	1200	Pipe/Conduit	
12.000	42.366	1.312	32.3	0.179	5.00	0.0	0.600	o	300	Pipe/Conduit	
12.001	14.649	0.424	34.6	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.002	25.659	1.181	21.7	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.003	43.994	2.125	20.7	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.004	4.046	0.360	11.2	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.005	30.968	2.850	10.9	0.179	0.00	0.0	0.600	o	300	Pipe/Conduit	
12.006	77.452	1.940	39.9	0.179	0.00	0.0	0.600	o	450	Pipe/Conduit	
12.007	15.571	0.150	103.8	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit	
12.008	29.250	0.360	81.3	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit	
12.009	13.705	0.180	76.1	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
11.005	50.00	5.83	42.358	1.074	0.0	0.0	0.0	4.50	715.8	145.4
11.006	50.00	5.92	40.545	1.253	0.0	0.0	0.0	4.50	716.4	169.0
11.007	50.00	6.21	39.377	1.432	0.0	0.0	0.0	4.51	716.7	193.9
11.008	50.00	6.29	35.664	1.611	0.0	0.0	0.0	4.51	717.8	218.1
11.009	50.00	6.42	34.497	1.790	0.0	0.0	0.0	4.51	717.4	242.4
11.010	50.00	6.50	32.787	1.969	0.0	0.0	0.0	4.39	698.7	266.6
11.011	50.00	6.54	31.828	2.148	0.0	0.0	0.0	3.94	1115.0	290.9
11.012	50.00	6.62	31.557	2.327	0.0	0.0	0.0	6.46	1826.4	315.1
1.040	46.40	9.91	29.100	19.869	0.0	0.0	0.0	11.16	9661.5	2496.6
1.041	43.77	11.08	27.000	20.048	0.0	0.0	0.0	1.68	1898.6	2496.6
12.000	50.00	5.25	43.812	0.179	0.0	0.0	0.0	2.78	196.2	24.2
12.001	50.00	5.35	42.500	0.358	0.0	0.0	0.0	2.68	189.7	48.5
12.002	50.00	5.47	42.076	0.537	0.0	0.0	0.0	3.39	239.5	72.7
12.003	50.00	5.68	40.895	0.716	0.0	0.0	0.0	3.47	245.4	97.0
12.004	50.00	5.70	38.770	0.895	0.0	0.0	0.0	4.72	333.3	121.2
12.005	50.00	5.80	38.410	1.074	0.0	0.0	0.0	4.80	339.0	145.4
12.006	50.00	6.20	35.560	1.253	0.0	0.0	0.0	3.23	513.0	169.7
12.007	50.00	6.31	33.620	1.432	0.0	0.0	0.0	2.39	675.8	193.9
12.008	50.00	6.49	33.470	1.611	0.0	0.0	0.0	2.70	764.3	218.1
12.009	50.00	6.58	33.110	1.790	0.0	0.0	0.0	2.79	789.7	242.4

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Network Design Table for Surface Network 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
13.000	60.698	1.357	44.7	0.179	5.00	0.0	0.600	o	300	Pipe/Conduit	
12.010	12.074	0.080	150.9	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit	
12.011	37.179	0.880	42.2	0.179	0.00	0.0	0.600	o	600	Pipe/Conduit	
12.012	33.916	0.397	85.4	0.179	0.00	0.0	0.600	o	750	Pipe/Conduit	
12.013	49.557	0.512	96.8	0.179	0.00	0.0	0.600	o	750	Pipe/Conduit	
12.014	9.475	0.180	52.6	0.179	0.00	0.0	0.600	o	750	Pipe/Conduit	
12.015	41.777	0.810	51.6	0.179	0.00	0.0	0.600	o	750	Pipe/Conduit	
12.016	9.504	1.920	5.0	0.179	0.00	0.0	0.600	o	750	Pipe/Conduit	
12.017	29.822	0.480	62.1	0.179	0.00	0.0	0.600	o	750	Pipe/Conduit	
1.042	22.007	0.200	110.0	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
1.043	93.131	0.650	143.3	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	
1.044	11.050	1.471	7.5	0.000	0.00	0.0	0.600	o	1200	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
13.000	50.00	5.43	34.287	0.179	0.0	0.0	0.0	2.36	166.6	24.2
12.010	50.00	6.68	32.930	2.148	0.0	0.0	0.0	1.98	559.8	290.9
12.011	50.00	6.84	32.850	2.327	0.0	0.0	0.0	3.75	1061.4	315.1
12.012	50.00	7.03	31.970	2.506	0.0	0.0	0.0	3.03	1338.2	339.3
12.013	50.00	7.32	31.572	2.685	0.0	0.0	0.0	2.84	1256.9	363.6
12.014	50.00	7.36	31.060	2.864	0.0	0.0	0.0	3.86	1706.4	387.8
12.015	50.00	7.54	30.880	3.043	0.0	0.0	0.0	3.90	1723.9	412.1
12.016	50.00	7.55	30.070	3.222	0.0	0.0	0.0	12.63	5577.6	436.3
12.017	50.00	7.69	28.150	3.401	0.0	0.0	0.0	3.55	1570.2	460.5
1.042	43.56	11.18	26.760	23.449	0.0	0.0	0.0	3.57	4033.4	2766.4
1.043	42.58	11.68	26.560	23.449	0.0	0.0	0.0	3.12	3532.9	2766.4
1.044	42.55	11.69	25.910	23.449	0.0	0.0	0.0	13.69	15479.2	2766.4

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<u>Simulation Criteria for Surface Network 1</u> <table border="0"> <tr> <td>Volumetric Runoff Coeff</td> <td>0.750</td> <td>Additional Flow - % of Total Flow</td> <td>0.000</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.000</td> <td>MADD Factor * 10m³/ha</td> <td>Storage 2.000</td> </tr> <tr> <td>Hot Start (mins)</td> <td>0</td> <td>Inlet Coefficient</td> <td>0.800</td> </tr> <tr> <td>Hot Start Level (mm)</td> <td>0</td> <td>Flow per Person per Day (l/per/day)</td> <td>0.000</td> </tr> <tr> <td>Manhole Headloss Coeff (Global)</td> <td>0.500</td> <td>Run Time (mins)</td> <td>1920</td> </tr> <tr> <td>Foul Sewage per hectare (l/s)</td> <td>0.000</td> <td>Output Interval (mins)</td> <td>16</td> </tr> </table> <table border="0"> <tr> <td>Number of Input Hydrographs</td> <td>0</td> <td>Number of Storage Structures</td> <td>4</td> </tr> <tr> <td>Number of Online Controls</td> <td>3</td> <td>Number of Time/Area Diagrams</td> <td>0</td> </tr> <tr> <td>Number of Offline Controls</td> <td>3</td> <td>Number of Real Time Controls</td> <td>0</td> </tr> </table> <u>Synthetic Rainfall Details</u> <table border="0"> <tr> <td>Rainfall Model</td> <td>FSR</td> <td>Profile Type</td> <td>Summer</td> </tr> <tr> <td>Return Period (years)</td> <td>100</td> <td>Cv (Summer)</td> <td>0.750</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> <td>Cv (Winter)</td> <td>0.840</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.400</td> <td>Storm Duration (mins)</td> <td>960</td> </tr> <tr> <td>Ratio R</td> <td>0.350</td> <td></td> <td></td> </tr> </table>			Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000	Areal Reduction Factor	1.000	MADD Factor * 10m³/ha	Storage 2.000	Hot Start (mins)	0	Inlet Coefficient	0.800	Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000	Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	1920	Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	16	Number of Input Hydrographs	0	Number of Storage Structures	4	Number of Online Controls	3	Number of Time/Area Diagrams	0	Number of Offline Controls	3	Number of Real Time Controls	0	Rainfall Model	FSR	Profile Type	Summer	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	19.400	Storm Duration (mins)	960	Ratio R	0.350		
Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000																																																							
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Online Controls for Surface Network 1

Hydro-Brake® Optimum Manhole: S16, DS/PN: 1.028, Volume (m³): 53.6

Unit Reference	MD-CCU-0477-3000-1500-3000
Design Head (m)	1.500
Design Flow (l/s)	300.0
Flush-Flo™	Calculated
Objective	Linear discharge profile
Application	Surface
Sump Available	Yes
Diameter (mm)	477
Invert Level (m)	37.200
Minimum Outlet Pipe Diameter (mm)	500
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	300.0	Kick-Flo®	0.756	217.0
Flush-Flo™	0.686	223.3	Mean Flow over Head Range	-	189.9

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	12.5	1.200	268.8	3.000	421.8	7.000	640.1
0.200	45.6	1.400	290.0	3.500	455.1	7.500	662.2
0.300	91.7	1.600	309.7	4.000	486.0	8.000	683.6
0.400	140.2	1.800	328.1	4.500	515.0	8.500	704.3
0.500	178.4	2.000	345.6	5.000	542.4	9.000	724.4
0.600	209.7	2.200	362.2	5.500	568.4	9.500	743.9
0.800	220.6	2.400	378.0	6.000	593.3		
1.000	245.8	2.600	393.2	6.500	617.1		

Orifice Manhole: S116, DS/PN: 9.013, Volume (m³): 17.9

Diameter (m) 0.044 Discharge Coefficient 0.600 Invert Level (m) 31.200

Hydro-Brake® Optimum Manhole: S32, DS/PN: 1.044, Volume (m³): 112.4

Unit Reference	MD-SHE-0392-1204-3500-1204
Design Head (m)	3.500
Design Flow (l/s)	120.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	392
Invert Level (m)	25.910

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<u>Hydro-Brake® Optimum Manhole: S32, DS/PN: 1.044, Volume (m³): 112.4</u> Minimum Outlet Pipe Diameter (mm) Site Specific Design (Contact Hydro International) Suggested Manhole Diameter (mm) Site Specific Design (Contact Hydro International) <table border="1"> <thead> <tr> <th>Control Points</th> <th>Head (m)</th> <th>Flow (l/s)</th> <th>Control Points</th> <th>Head (m)</th> <th>Flow (l/s)</th> </tr> </thead> <tbody> <tr> <td>Design Point (Calculated)</td> <td>3.500</td> <td>119.7</td> <td>Kick-Flo®</td> <td>2.202</td> <td>95.6</td> </tr> <tr> <td>Flush-Flo™</td> <td>1.020</td> <td>119.7</td> <td>Mean Flow over Head Range</td> <td>-</td> <td>103.7</td> </tr> </tbody> </table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table border="1"> <thead> <tr> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> <th>Depth (m)</th> <th>Flow (l/s)</th> </tr> </thead> <tbody> <tr><td>0.100</td><td>10.9</td><td>1.200</td><td>119.1</td><td>3.000</td><td>111.1</td><td>7.000</td><td>167.9</td></tr> <tr><td>0.200</td><td>38.7</td><td>1.400</td><td>117.6</td><td>3.500</td><td>119.7</td><td>7.500</td><td>173.7</td></tr> <tr><td>0.300</td><td>74.4</td><td>1.600</td><td>115.2</td><td>4.000</td><td>127.8</td><td>8.000</td><td>179.2</td></tr> <tr><td>0.400</td><td>104.0</td><td>1.800</td><td>111.6</td><td>4.500</td><td>135.3</td><td>8.500</td><td>184.6</td></tr> <tr><td>0.500</td><td>109.9</td><td>2.000</td><td>105.6</td><td>5.000</td><td>142.5</td><td>9.000</td><td>189.9</td></tr> <tr><td>0.600</td><td>114.0</td><td>2.200</td><td>96.0</td><td>5.500</td><td>149.2</td><td>9.500</td><td>195.0</td></tr> <tr><td>0.800</td><td>118.4</td><td>2.400</td><td>99.7</td><td>6.000</td><td>155.7</td><td></td><td></td></tr> <tr><td>1.000</td><td>119.6</td><td>2.600</td><td>103.6</td><td>6.500</td><td>161.9</td><td></td><td></td></tr> </tbody> </table>			Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	3.500	119.7	Kick-Flo®	2.202	95.6	Flush-Flo™	1.020	119.7	Mean Flow over Head Range	-	103.7	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	10.9	1.200	119.1	3.000	111.1	7.000	167.9	0.200	38.7	1.400	117.6	3.500	119.7	7.500	173.7	0.300	74.4	1.600	115.2	4.000	127.8	8.000	179.2	0.400	104.0	1.800	111.6	4.500	135.3	8.500	184.6	0.500	109.9	2.000	105.6	5.000	142.5	9.000	189.9	0.600	114.0	2.200	96.0	5.500	149.2	9.500	195.0	0.800	118.4	2.400	99.7	6.000	155.7			1.000	119.6	2.600	103.6	6.500	161.9		
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<u>Offline Controls for Surface Network 1</u> <u>Weir Manhole: S63, DS/PN: 1.027, Loop to PN: 1.029</u> Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 39.000 <u>Weir Manhole: S15, DS/PN: 4.014, Loop to PN: 1.029</u> Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 39.000 <u>Weir Manhole: S16, DS/PN: 1.028, Loop to PN: 1.029</u> Discharge Coef 0.544 Width (m) 3.000 Invert Level (m) 39.000		
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<u>Storage Structures for Surface Network 1</u> <u>Tank or Pond Manhole: S16, DS/PN: 1.028</u> Invert Level (m) 37.200 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>954.0</td><td>0.800</td><td>1419.0</td><td>1.800</td><td>2023.0</td></tr></table> <u>Tank or Pond Manhole: S116, DS/PN: 9.013</u> Invert Level (m) 31.200 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1189.0</td><td>0.800</td><td>1709.0</td><td>1.800</td><td>2288.0</td></tr></table> <u>Tank or Pond Manhole: S29, DS/PN: 1.041</u> Invert Level (m) 27.000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1331.0</td><td>0.800</td><td>2087.0</td><td>1.800</td><td>2902.0</td></tr></table> <u>Tank or Pond Manhole: S32, DS/PN: 1.044</u> Invert Level (m) 27.000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1927.0</td><td>0.800</td><td>2879.0</td><td>1.800</td><td>3958.0</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	954.0	0.800	1419.0	1.800	2023.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1189.0	0.800	1709.0	1.800	2288.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1331.0	0.800	2087.0	1.800	2902.0	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1927.0	0.800	2879.0	1.800	3958.0
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1

PN	US/MH Name	Surcharged		Flooded		Pipe Flow (l/s)	Status	Level Exceeded
		Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)			
1.000	S36	0.163	0.000	0.61	66.0	SURCHARGED		
1.001	S37	0.340	0.000	1.01	130.6	SURCHARGED		
1.002	S38	0.329	0.000	1.20	195.8	SURCHARGED		
1.003	S39	-0.165	0.000	0.71	262.0	OK		
1.004	S40	-0.024	0.000	0.66	325.9	OK		
1.005	S41	0.449	0.000	0.78	375.0	SURCHARGED		
1.006	S42	0.791	0.000	1.01	424.8	FLOOD RISK		
1.007	S43	0.349	0.000	0.50	481.5	FLOOD RISK		
1.008	S44	0.427	0.000	0.56	537.9	SURCHARGED		
1.009	S45	0.674	0.000	0.62	597.3	SURCHARGED		
1.010	S46	0.777	0.000	0.68	647.6	SURCHARGED		
1.011	S47	0.846	0.000	0.79	704.2	FLOOD RISK		
1.012	S48	0.878	0.000	0.83	760.1	SURCHARGED		
1.013	S49	0.904	0.000	0.85	815.1	SURCHARGED		
1.014	S50	0.932	0.000	1.02	869.7	SURCHARGED		
2.000	S70	0.092	0.000	0.67	68.6	SURCHARGED		
2.001	S71	0.241	0.000	1.34	136.0	SURCHARGED		
2.002	S72	-0.148	0.000	0.75	203.3	OK		
2.003	S73	-0.214	0.000	0.52	271.2	OK		

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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1</u>									
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
2.004	S74	60 Summer	100	+45%					52.249
2.005	S75	60 Summer	100	+45%					51.007
2.006	S76	60 Summer	100	+45%					50.007
2.007	S77	60 Summer	100	+45%					48.484
1.015	S51	60 Summer	100	+45%	100/60 Summer				47.090
1.016	S52	60 Summer	100	+45%	100/60 Summer				46.667
1.017	S53	60 Summer	100	+45%	100/60 Summer				46.212
1.018	S54	60 Summer	100	+45%					45.321
1.019	S55	60 Summer	100	+45%					44.489
1.020	S56	60 Summer	100	+45%					43.891
1.021	S57	60 Summer	100	+45%					43.360
1.022	S58	60 Summer	100	+45%	100/60 Summer				42.792
1.023	S59	60 Summer	100	+45%	100/60 Summer				42.197
1.024	S60	60 Summer	100	+45%	100/60 Summer				41.572
1.025	S61	60 Summer	100	+45%	100/60 Summer				40.919
3.000	S66	60 Summer	100	+45%					42.801
3.001	S67	60 Summer	100	+45%	100/60 Summer				42.176
3.002	S68	60 Summer	100	+45%	100/60 Summer				41.761
3.003	S69	60 Summer	100	+45%	100/60 Summer				41.091
1.026	S62	60 Summer	100	+45%	100/60 Summer				40.245
1.027	S63	60 Winter	100	+45%	100/60 Summer		100/60 Summer	16	39.471
4.000	S1	60 Summer	100	+45%					52.824
4.001	S2	60 Summer	100	+45%	100/60 Summer				50.756
4.002	S3	60 Summer	100	+45%	100/60 Summer				50.343
4.003	S4	60 Summer	100	+45%					49.139
4.004	S5	60 Summer	100	+45%					48.870
5.000	S34	60 Summer	100	+45%					51.763
5.001	S35	60 Summer	100	+45%					50.485
4.005	S6	60 Summer	100	+45%					48.034
4.006	S7	60 Summer	100	+45%					47.374
4.007	S8	60 Summer	100	+45%					42.978
4.008	S9	60 Summer	100	+45%					41.302
4.009	S10	60 Summer	100	+45%					40.983
6.000	S64	60 Summer	100	+45%					43.238
6.001	S65	60 Summer	100	+45%					41.425
4.010	S11	60 Summer	100	+45%					40.547
4.011	S12	60 Summer	100	+45%					39.991
4.012	S13	60 Summer	100	+45%	100/60 Summer				39.615
4.013	S14	60 Summer	100	+45%	100/60 Summer				39.330
4.014	S15	120 Winter	100	+45%	100/60 Summer		100/60 Summer	16	39.265
1.028	S16	120 Winter	100	+45%	100/60 Summer		100/60 Summer	16	39.248
1.029	S17	60 Winter	100	+45%	100/60 Winter				38.139
1.030	S18	60 Winter	100	+45%	100/60 Winter				37.711
7.000	S91	60 Summer	100	+45%					42.406
7.001	S92	60 Summer	100	+45%					42.076
7.002	S93	60 Summer	100	+45%					41.175
1.031	S19	120 Winter	100	+45%	100/60 Winter				37.274
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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1</u>							
		Surcharged Flooded			Pipe		
PN	US/MH Name	Depth (m)	Volume (m ³)	Flow / Overflow Cap. (l/s)	Flow (l/s)	Status	Level Exceeded
1.031	S19	0.155	0.000	1.31	1575.6	SURCHARGED	
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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1</u>								
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.032	S20	120 Winter	100	+45%				
1.033	S21	120 Winter	100	+45%				
1.034	S22	120 Winter	100	+45%				
1.035	S23	120 Winter	100	+45%				
1.036	S24	120 Winter	100	+45%	100/60 Winter			
8.000	S94	60 Summer	100	+45%				
8.001	S95	60 Summer	100	+45%				
8.002	S96	60 Summer	100	+45%	100/60 Summer			
8.003	S97	60 Summer	100	+45%	100/60 Summer			
8.004	S98	60 Summer	100	+45%				
1.037	S25	120 Winter	100	+45%				
1.038	S26	120 Winter	100	+45%	100/60 Summer			
9.000	S104	60 Summer	100	+45%	100/60 Summer			
9.001	S105	60 Summer	100	+45%	100/60 Summer			
9.002	S106	60 Summer	100	+45%	100/60 Summer	100/60 Summer		
9.003	S107	60 Summer	100	+45%	100/60 Summer	100/60 Summer		
9.004	S108	60 Summer	100	+45%	100/60 Summer			
9.005	S109	60 Summer	100	+45%	100/60 Summer			
9.006	S110	60 Summer	100	+45%	100/60 Summer			
9.007	S111	60 Summer	100	+45%	100/60 Summer			
9.008	S112	60 Summer	100	+45%	100/60 Summer			
10.000	S99	60 Summer	100	+45%				
10.001	S100	60 Summer	100	+45%				
10.002	S101	60 Summer	100	+45%				
9.009	S102	60 Summer	100	+45%	100/60 Summer			
9.010	S113	60 Summer	100	+45%	100/60 Summer			
9.011	S114	60 Summer	100	+45%	100/60 Summer			
9.012	S115	60 Summer	100	+45%	100/60 Summer			
9.013	S116	1440 Winter	100	+45%	100/60 Summer			
9.014	S117	60 Summer	100	+45%				
1.039	S27	120 Winter	100	+45%				
11.000	S78	60 Summer	100	+45%				
11.001	S79	60 Summer	100	+45%				
11.002	S80	60 Summer	100	+45%	100/60 Summer			
11.003	S81	60 Summer	100	+45%	100/60 Summer			
11.004	S82	60 Summer	100	+45%				
11.005	S83	60 Summer	100	+45%				
11.006	S84	60 Summer	100	+45%				
11.007	S85	60 Summer	100	+45%				
11.008	S86	60 Summer	100	+45%	100/60 Summer			
11.009	S87	60 Summer	100	+45%	100/60 Summer			
11.010	S88	60 Summer	100	+45%	100/60 Summer			
11.011	S89	60 Summer	100	+45%	100/60 Summer			
11.012	S90	60 Summer	100	+45%				
1.040	S28	60 Summer	100	+45%				
1.041	S29	960 Winter	100	+45%	100/60 Summer			
12.000	S118	60 Summer	100	+45%				
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<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Surface Network 1</u>									
PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.032	S20	36.532	-0.303	0.000	0.78		1593.8	OK	
1.033	S21	35.390	-0.436	0.000	0.53		1613.8	OK	
1.034	S22	33.395	-0.278	0.000	0.82		1630.4	OK	
1.035	S23	32.656	-0.233	0.000	0.69		1640.3	OK	
1.036	S24	32.116	0.326	0.000	1.22		1647.7	SURCHARGED	
8.000	S94	37.063	-0.180	0.000	0.33		69.9	OK	
8.001	S95	35.631	-0.029	0.000	0.71		139.4	OK	
8.002	S96	35.277	0.381	0.000	0.93		199.9	SURCHARGED	
8.003	S97	33.728	0.630	0.000	1.36		265.9	SURCHARGED	
8.004	S98	32.315	-0.184	0.000	0.64		332.1	OK	
1.037	S25	31.567	-0.013	0.000	0.75		1758.7	OK	
1.038	S26	31.228	0.231	0.000	1.50		1777.9	SURCHARGED	
9.000	S104	40.284	0.614	0.000	0.38		58.8	SURCHARGED	
9.001	S105	40.197	1.035	0.000	0.72		113.3	FLOOD RISK	
9.002	S106	39.923	1.201	0.898	1.03		167.9	FLOOD	1
9.003	S107	39.172	1.200	0.182	1.53		222.0	FLOOD	1
9.004	S108	38.313	0.573	0.000	1.32		279.4	SURCHARGED	
9.005	S109	38.068	0.469	0.000	0.82		336.7	SURCHARGED	
9.006	S110	37.615	0.688	0.000	0.91		389.8	SURCHARGED	
9.007	S111	36.608	0.866	0.000	1.14		448.1	FLOOD RISK	
9.008	S112	35.922	0.714	0.000	1.88		501.6	SURCHARGED	
10.000	S99	39.531	-0.166	0.000	0.41		69.9	OK	
10.001	S100	38.822	-0.129	0.000	0.61		142.5	OK	
10.002	S101	35.696	-0.207	0.000	0.54		210.8	OK	
9.009	S102	35.127	0.142	0.000	0.99		748.7	SURCHARGED	
9.010	S113	34.559	0.156	0.000	0.83		800.9	SURCHARGED	
9.011	S114	33.916	0.442	0.000	0.99		857.6	SURCHARGED	
9.012	S115	33.182	0.462	0.000	1.27		911.0	SURCHARGED	
9.013	S116	32.916	1.116	0.000	0.01		5.3	FLOOD RISK	
9.014	S117	30.591	-0.679	0.000	0.14		76.1	OK	
1.039	S27	30.520	-0.415	0.000	0.67		1815.9	OK	
11.000	S78	50.020	-0.186	0.000	0.30		69.9	OK	
11.001	S79	48.047	-0.124	0.000	0.63		142.6	OK	
11.002	S80	46.863	0.364	0.000	0.91		203.3	SURCHARGED	
11.003	S81	45.732	0.561	0.000	1.25		269.0	SURCHARGED	
11.004	S82	44.061	-0.209	0.000	0.55		335.0	OK	
11.005	S83	42.624	-0.184	0.000	0.64		401.7	OK	
11.006	S84	40.856	-0.140	0.000	0.79		469.3	OK	
11.007	S85	39.692	-0.135	0.000	0.80		537.6	OK	
11.008	S86	37.198	1.084	0.000	0.98		585.5	FLOOD RISK	
11.009	S87	36.073	1.126	0.000	1.01		636.0	FLOOD RISK	
11.010	S88	34.273	1.036	0.000	1.26		695.6	FLOOD RISK	
11.011	S89	32.713	0.285	0.000	1.44		749.8	SURCHARGED	
11.012	S90	31.887	-0.270	0.000	0.57		810.3	OK	
1.040	S28	29.708	-0.442	0.000	0.62		2452.7	OK	
1.041	S29	29.488	1.288	0.000	0.18		299.4	FLOOD RISK	
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Network 2017.1.2

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
12.000	S118	43.941	-0.171	0.000	0.38		69.9	OK	

Date 10/06/2023 10:53
File E4993 -

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Network 2017.1.2

PN	US/MH Name	Water	Surcharged	Flooded			Pipe	Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)		
1.044	S32	29.468	2.358	0.000	0.02		120.7	FLOOD RISK	