

**LAND AT COURTHOUSE FARM,
COPTHORNE COMMON ROAD
COPTHORNE, WEST SUSSEX
[RETIREMENT VILLAGE]**

**FLOOD RISK ASSESSMENT &
DRAINAGE STRATEGY**



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DRAINAGE

- Drainage Strategies
- S104 Drainage Design
- SUDS
- Flood Risk Assessments
- CSH SUR1

HIGHWAYS

- Transportation Assessments
- S38/278 Highway Design
- Junction Modelling
- Traffic & Parking Surveys
- Remedial Assessments

STRUCTURAL ENGINEERING

- All Structural Design
- Temporary Works
- Specialist Foundations
- Multi Storey & Basements
- RC Detailing

SPECIALIST SERVICES

- Site Assessments
- CDM 2015 Support
- TEKLA - Steelwork Fabrication drawings
- Expert Witness

Document Control Sheet

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1.0 Introduction

- 1.1 BdR has been appointed by Option Two Development Ltd (the Client) to undertake a Flood Risk Assessment and Drainage Strategy for the proposed retirement village development comprising 101 units at Land at Courthouse Farm, Copthorne Common Road, Copthorne, West Sussex RH10 3LA.
- 1.2 This assessment has been prepared in accordance with the provisions of the National Planning Policy Framework (NPPF) December 2024, The Non-Statutory Technical Standards For Sustainable Drainage (NSTSSD), Practice Guide, BS8582:2013 Code of Practice for Surface Water Management for Development Sites, BS 8533:2011 Assessing and Managing Flood Risk in Development Code of Practice, CIRIA C753 The SuDS Manual 2015 and West Sussex County Council's SuDS Design Guide – Water, People, Places, prepared by the Lead Local Flood Authorities [LLFA] of South East England.
- 1.3 The NPPF sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it is safe without increasing flood risk elsewhere. The key definitions are:
- “Areas at risk of flooding” means land within Flood Zones 2 and 3; or land within Flood Zone 1 which has critical drainage problems, and which has been notified to the local planning authority by the Environment Agency;
 - “Flood risk” means risk from all sources of flooding - including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.
- 1.4 The objectives of this assessment are;
- Identify and assess the risks of all forms of flooding to and from the development.
 - Demonstrate how these flood risks will be managed so that the development and elsewhere remains safe throughout its lifetime, taking climate change into account.
 - Meeting the requirements of the key stakeholders.

2.0 Existing Site

2.1 Location

2.1.1 The site is located on the south side of Copthorne Common Road, Copthorne, approximately 2km east of J10 of the M23 and sits outside of the defined settlement confines of Copthorne. The northern boundary adjoins the A264. The eastern boundary adjoins the access road to Courthouse Farm, this boundary is heavily wooded and within this, there is a second access road to residential properties. The southern boundary abuts an area of dense mature mixed deciduous woodland. This returns along the western boundary of the site as a substantial belt of mature trees,

2.1.2 The site is centered at National Grid Reference 532402 , 139032.

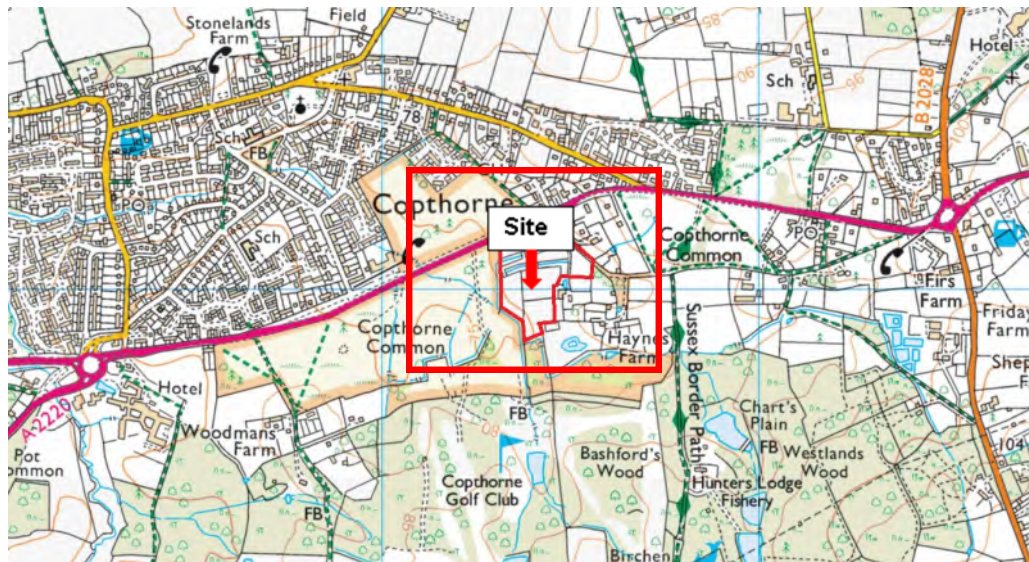


Fig.2.1 Site Identification



Fig 2.2 Aerial View

2.2 Existing Development

2.2.1 The site is a greenfield site currently used as grazing land.

2.2.2 The existing areas are;

- Total site area = 4.339 ha
- Roof Areas = 0 ha
- External Hardstanding Areas = 0 ha
- Soft Landscaped Area = 4.339 ha
- Site Impermeability = 0 %.

2.3 Topography

2.3.1 The site slopes gently from east to west. Levels range between 77.6m Above Ordnance Datum [AOD] along the eastern boundary to 74.4m AOD in the far south west corner. Average gradient is approximately 1 in 150.

2.3.2 A copy of the topographical survey is included in Appendix 1.

2.4 Geology

2.4.1 No intrusive Geotechnical Investigation has been undertaken to date. Reference to the British Geological Survey (BGS) Map indicates the site to be underlain by Upper Tunbridge Wells Sand - Sandstone and siltstone, interbedded - Sedimentary Bedrock.

2.5 Soils

2.5.1 Soil type provides a generic description of the drainage characteristics of the soil i.e. susceptibility to water logging or capacity of soil to freely drain. Reference to the Land Information System [LandIS] Soils Scapes Viewer describes the soils in this area as "slightly acid loamy and clayey soils with impeded drainage".

2.6 Hydrology

2.6.1 There are two ditches crossing the middle of the site and ditches immediately adjacent the site running along the western and southern boundaries. These converge in the far south west corner before heading west across the golf course.

2.7 Hydrogeology

2.7.1 The Department of Food & Rural Affairs [DEFRA] Multi-Agency Geographic Information for the Countryside [MAGIC] map indicates the site is not within a Source Protection Zone.

2.7.2 The Aquifer Map – Superficial & Bedrock designation indicates a Secondary A Aquifer (Bedrock) underlying the site. Secondary A Aquifers are 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.

2.7.3 Extracts from the BGS, LandIS & MAGIC websites are included within Appendix 2.

2.8 **Surface Water Site Drainage**

2.8.1 The site is a greenfield site and surface water drainage is via natural infiltration / evaporation / evapotranspiration and natural runoff. Due to the local topography runoff from the site is intercepted by the existing ditches crossing the site and those immediately to the west and south.

2.9 **Foul Water Site Drainage**

2.9.1 The site is a greenfield site and consequently there are no existing foul sewers serving the site.

2.10 **Public Sewerage Network**

2.10.1 The sewer records show the following public sewers close to the site;

- 375mm dia. foul water sewer approximately 3m deep heading north along the access drive leading to Court House Farm.
- 375mm dia. surface water sewer approximately 1.7m deep heading west along Copthorne Common Road.

2.10.2 It should be noted that whilst the sewer records show the Sewerage Company's recorded assets, there may be other adopted sewers in the vicinity which are not shown on the records. These assets were automatically transferred to the Sewerage Company in October 2011 as part of the first phase of sewer asset transfers.

2.10.3 A copy of the sewer record is included in Appendix 2.

3.0 Proposed Development

3.1 The proposed development comprises 101 no. retirement living units with associated access roads, parking areas, public open spaces, pavilion restaurant and private garden areas.

3.1.1 The proposed development areas are;

- Total site area = 4.339 ha
- Roof Area = 0.781 ha
- External Hardstanding Areas = 0.723 ha
- Soft Landscaped areas = 2.105 ha
- Site Impermeability = 34.7%.

3.1.2 Details of the proposed development are included in Appendix 3.

3.2 Vulnerability Classification

3.2.1 The development is classed as residential. The Vulnerability Classification in accordance with Table 2 of the Technical Guidance to the NPPF is 'More Vulnerable'.

3.3 Sequential Test

3.3.1 As set out in the NPPF, the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The flood zones are the starting point for this sequential approach. Zones 2 and 3 are shown on the Environment Agency [EA] flood map with Flood Zone 1 being all the land falling outside Zones 2 and 3. These flood zones refer to the probability of flooding from any source, ignoring the presence of existing defenses.

Zone 1 – Low Probability

This Zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Zone 2 – Medium Probability

This Zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year.

Zone 3a – High Probability

This Zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (0.5%) in any year.

Zone 3b – The Functional Floodplain

This Zone comprises land where water has to flow or be stored in times of flood. Generally, this is land which would flood with a annual probability of 1 in 20 (5%) or

greater in any year, or is designed to flood in an extreme (0.1%) flood.

- 3.3.2 Reference to the EA Flood Map for Planning indicates the site is located in Zone 1 – Low Probability. In accordance with Table 3 of the Technical Guidance to the NPPF (August 2022) all development in Flood Zone 1 is appropriate.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Comparable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test Required	✓	✓	✓
Zone 3a	Exception Test Required	✗	Exception Test Required	✓	✓
Zone 3b	Exception Test Required	✗	✗	✗	✓

Table 3.1: Flood Risk Vulnerability and Flood Zone ‘Compatibility’

4.0 Climate Change

- 4.1 The EA published updated guidance on climate change allowances on the 10th May 2022. Table 4.1 below shows the updated allowances. The predicted flood levels and surface water management strategy for the proposed development takes account potential increases in rainfall intensities and flood flows/levels predicted to occur in the future over the lifetime of the development.

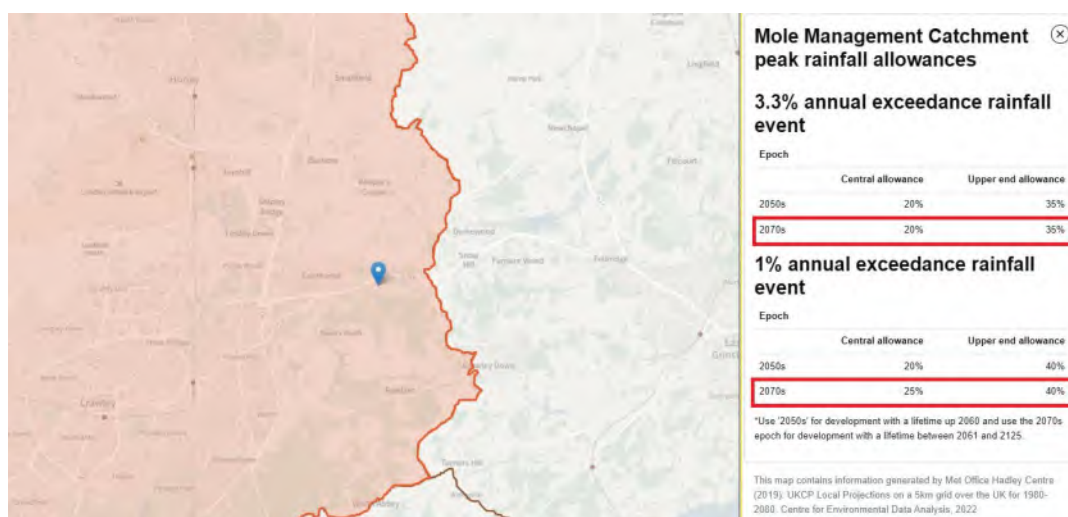


Table 4.1: Peak Rainfall Allowances

5.0 Flood Risk

5.1 Potential Sources of Flooding

5.1.1 The main sources of flooding which could potentially affect the development site are listed below. An assessment of how these forms of flooding may affect the site and details on how they will be managed safely within the development proposal are also considered.

5.1.2 The main sources of flooding and the level of risk associated with each are;

- | | |
|---|--------|
| ➤ Flooding from Rivers [Fluvial] | - None |
| ➤ Flooding from the Sea [Tidal] | - None |
| ➤ Flooding from Land [Surface Water] | - Low |
| ➤ Flooding from Groundwater | - Low |
| ➤ Flooding from Sewers | - Low |
| ➤ Flooding from Other Artificial Sources [Infrastructure] | - None |

5.2 Flooding from Rivers [Fluvial]

5.2.1 The site is located within Flood Zone 1 – Low Probability There is consequently no risk of flooding from rivers.

5.3 Flooding from the Sea [Tidal]

5.3.1 The site is located within Flood Zone 1 – Low Probability There is consequently no risk of flooding from the sea.

5.4 Flooding from Land [Surface Water]

5.4.1 Surface water flooding is the term used to describe flooding which occurs when intense, often short duration rainfall is unable to soak into the ground or to enter drainage systems and therefore runs over the land surface causing flooding. It is most likely to occur when soils are saturated and unable to infiltrate any additional water or in urban areas where buildings tarmac and concrete prevent water soaking into the ground. The excess water can pond (collect) in low points and result in the development of flow pathways often along roads but also through built up areas and open spaces. This type of flooding is usually short lived and associated with heavy downpours of rain.

5.4.2 There are four levels of surface water flood risk;

Very Low Risk

Each year, the area has a chance of flooding of less than 1 in 1000 (0.1%).

Low Risk

Each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%).

Medium Risk

Each year, the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%).

High Risk

Each year, the area has a chance of flooding of greater than 1 in 30 (3.3%).

- 5.4.3 Reference to the Governments Long Term Flood Risk Map for Surface Water shows one small area within the site located to the west between the ditches at high risk of flooding and two small areas within the site located to the east and west between the ditches at Medium risk of flooding. Reference to the topographical survey shows both these areas to be relatively flat, however there is a fall towards the western boundary. Therefore, these areas are unlikely to flood. There is consequently a low risk of flooding from surface water.

5.5 Flooding from Groundwater

- 5.5.1 Groundwater flooding occurs when water levels in the ground rise above surface elevations. It is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Water levels below the ground rise during the wet winter months and fall again in the summer as water flows out into rivers. In very wet winters, rising groundwater levels may lead to flooding of normally dry land, as well as reactivating flow in “bournes” (streams that only flow for part of the time). Groundwater floods tend to be long in duration developing over weeks or months and prevailing for days or weeks.
- 5.5.2 The predominant solid geology underlying the site is the Upper Tunbridge Wells Sand - Sandstone and siltstone, interbedded - Sedimentary Bedrock. Reference to the Mid Sussex County Council Strategic Flood Risk Assessment (SFRA) indicates the area to have a limited potential for groundwater flooding. The risk of groundwater flooding is therefore considered to be low.

5.6 Flooding from Sewers

- 5.6.1 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface water and wastewater known as combined sewers. Flooding can result when the sewer is overwhelmed by heavy rainfall, becomes blocked or is of inadequate capacity and will continue until the water drains away.
- 5.6.2 Reference to the Mid Sussex County Council SFRA indicates there have been no reported incidents of foul or surface water flooding in the immediate area. Due to the local topography the risk of flooding from sewers is considered very low.

5.7 **Flooding from Artificial Sources**

- 5.7.1 Non-natural or artificial sources of flooding can include reservoirs, canals and lakes where water is retained above natural ground level, operation and redundant industrial processes including mining, quarrying and sand and gravel extraction, as they may increase floodwater depths and velocities in adjacent areas.
- 5.7.2 Reference to the Governments Long Term Flood Risk Map for Surface Water shows the site is not at risk of flooding from artificial sources.

6.0 Flood Risk Management

- 6.1 In view of the inherent uncertainties in predicting flooding from surface water and sewers the following flood risk management measures are proposed to safeguard the development and to ensure no increase in flood risk to surrounding areas;
- Ground floor finished floor levels will be set a minimum 150mm above existing ground levels.
 - On-site surface water drainage design will meet the design standards required of Approved Document H of the Building Regulations, The National Standards For Sustainable Drainage Systems June 2025 and best practice guidance given in C753 the SUDS Manual 2015.

7.0 Off-Site Impacts

- 7.1 The proposed development will have no impact on flood risk elsewhere.
- 7.2 Refer to Section 10.0 and 11.0 for details of the proposed drainage strategy for the development.

8.0 Residual Risks

- 8.1 Flooding from extreme storm events which overwhelm on-site/off site drainage systems is the only residual risks which could result in flooding on the development site.

9.0 Access & Egress

- 9.1 A safe dry access route is available to and from the site during the 100 year event.

10.0 Proposed Surface Water Drainage

10.1 Runoff Rates & Volumes

- 10.1.1 The peak surface water runoff rates and volumes generated for the pre and post development conditions have been calculated using the Causeway Flow design and analysis suite for a variety of storm events of critical duration including for a 40% increase in rainfall intensity to account for climate change in line with EA guidance.
- 10.1.2 For previously developed sites, site runoff rates should be reduced to the greenfield rates wherever possible. Allowable discharge rates should not be greater than for the pre-development scenario.
- 10.1.3 The method currently adopted for determining greenfield runoff rates for sites between 0-50 ha is the Institute of Hydrology Report 124 'Flood Estimation for Small Catchments'. This determines the mean annual flood flow for Greenfield sites (Qbar). Greenfield peak flow rates for other probabilities can be estimated using the appropriate growth curve contained in the Flood Studies Supplementary Report (FSSR) 14.
- 10.1.4 The runoff volume for the 100 year storm has been calculated based on a 6 hour event in line with CIRIA C753 The SuDS Manual 2015 guidance and BS8582:2013 Code of Practice for Surface Water Management for Development Sites. A summary of the results is given in the table below;

RP (Years)	Pre Dev [Greenfield] Rate (l/s)	Post Dev (l/s) (no mitigation)	Pre Dev [Greenfield] Vol (m ³)	Post Dev Vol (m ³) (no mitigation)
1	15.8	136.5		
Qbar (2yr)	18.6	207.3		
30	44.6	738.2		
100	59.3	958.5	387.0	1070.6

Table 10.1

- 10.1.5 Copies of the Causeway Flow results are included in Appendix 4.

10.2 Surface Water Management

- 10.2.1 The surface water drainage arrangements for any development site need to be such that the peak flow rates and volumes of surface water leaving the developed site are no greater than the rates and volumes prior to the proposed development. Runoff rates and volumes should also be reduced wherever possible using infiltration and attenuation techniques.

10.2.2 The NPPF requires the use of Sustainable Drainage Systems (SuDS) on all new developments wherever possible. This requirement is supported by Building Regulations Part H and The National Standards For Sustainable Drainage Systems June 2025 which sets out a hierarchy for surface water disposal listed in order of priority;

- Collected for non-portable use.
- An infiltration system, or where that is not reasonably practicable,
- A watercourse, or where that is not reasonably practicable,
- A sewer.

10.2.3 From the figures shown in Table 10.1 the proposed development will significantly increase peak flow rates and runoff volumes for the 1, Qbar, 30 and 100 year events if no surface water management is incorporated.

10.3 Sustainable Drainage Systems

10.3.1 SuDS are a varied collection of techniques designed to manage storm water in a sustainable manner. SuDS achieve this by seeking to manage surface water from new developments as close to its source as possible and by mimicking the surface water flow regime present on the site prior to development. The key objectives of SuDS are;

- To minimise the impacts from the development on the quantity of runoff.
- To minimise the impacts from the development on the quality of runoff.
- Maximise amenity and biodiversity opportunities.

10.3.2 There are several processes that can be used to manage and control the runoff from development areas. These can be defined as;

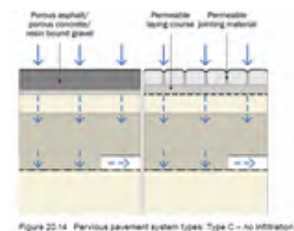
- Infiltration – This is the soaking of water into the ground.
- Detention/attenuation – Detention or attenuation is the slowing down of surface water flows before transfer downstream.
- Conveyance – This is the transfer of surface water runoff from one place to another.
- Water harvesting – This is the direct capture and use of runoff on site.

10.3.3 The effectiveness of SuDS utilising infiltration relies on the suitability of the underlying soils to receive and disperse the runoff rates. At the time of preparing this report no BRE DG365 soakage tests had been undertaken. Reference to the British Geological Survey (BGS) Map indicates the site to be underlain by Upper Tunbridge Wells Sand - Sandstone and siltstone, interbedded - Sedimentary Bedrock. This strata is known to exhibit poor soakage potential, together with the LandIS Soilscales description “slightly acid loamy and clayey soils with impeded drainage” it is therefore unlikely that infiltration SuDS will work effectively on this site.

- 10.3.4 This drainage strategy assumes that infiltration SuDS is not a feasible option for the disposal of surface water runoff, however BRE DG365 soakage tests will be undertaken at the start of re-development and should the results prove infiltration is a viable option the detailed drainage design will incorporate SuDS infiltration into the final scheme.
- 10.3.5 SuDS techniques which are considered appropriate for this development are listed below. An operation and maintenance sheet for each SuDS component is included in Appendix 5.

SuDS Component	Area Served
Green Roofs	Roofs – Pavillion Restaurant / Apartments 61-69
Rainwater Harvesting - Basic	Roofs
Pervious Pavement – Type C (No Infiltration)	Roads / Private Drives / Parking Areas
Sub-surface Storage	Roofs / Roads / Private Drives / Parking Areas
Pond	Roofs / Roads / Private Drives / Parking Areas

Table 10.2

SUDS Component	Description	Examples
Green Roof [Extensive Sedum]	Green roofs are systems which cover a building's roof with vegetation. They are laid over a drainage layer, with other layers providing protection, waterproofing and insulation. The Blue roof element provides a storage reservoir below the green roof which attenuates and restricts outflow rates.	
Rainwater Harvesting - Basic	Includes simple water butts	
Pervious Pavement – Type C – No Infiltration	Pervious surfaces allow rainwater to infiltrate through the surface into an underlying storage layer, where water is stored before infiltration to the ground, reuse, or release to surface water	

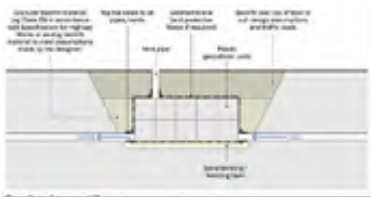
Sub-surface storage	Storage of run-off in underground tanks or other structures such as oversized pipes. Tanks can take the form of oversized pipes, concrete tanks, corrugated steel pipes and plastic modular geocellular tank systems.	
Pond	Ponds are basins that have a permanent pool of water for water quality treatment. They provide temporary storage for additional storm runoff above the permanent water level. Wet ponds may also provide amenity and wildlife benefits.	

Table 10.3

- 10.3.6 The following SuDS techniques were considered for this development but have been discounted for the following reasons;

SuDS Component	Reasons for not implementing
Green roofs	Apart from the Pavillion Restaurant / Apartments 61-69 the roofs are traditional pitched roof construction.
Rainwater Harvesting [Complex]	Other water saving devices within the building are considered to provide greater sustainability than expensive complex rainwater harvesting systems.
Rain Garden	Unable to guarantee future maintenance.
Swales	Insufficient space due to presence of Site topography too steep.
Infiltration Basin	Insufficient room. Poor subsoil soakage potential.
Detention Basin	Insufficient room / safety concerns.
Pervious Pavement	Poor subsoil soakage potential.
Bio-Retention	Insufficient room.
Soakaways	Poor subsoil soakage potential

Table 10.4

- 10.3.7 SUDS components will be designed in accordance with CIRIA C753 The SuDS Manual 2015.
- 10.3.8 Detailed Causeway Flow SuDS analysis has been undertaken to determine the on-site storage volumes required for the 1 in 100 year return period event including an allowance of 40% climate change in line with the NPPF. The peak outflow rate has been restricted to the existing greenfield Qbar runoff rate or 3 l/s/ha whichever is the greater in accordance with The National Standards For Sustainable Drainage Systems

June 2025 for storms up to the 1 in 100 year plus climate change. The runoff rate for the 1 year event will be restricted to the 1 year greenfield rate.

A summary of the SuDS analysis is given in the table below;

Rp (Year)	Pre-Dev Runoff Rate (l/s)	Post-Dev Runoff Rate (l/s)	Storage Volume (m ³)
100	1 yr = 15.8	15.8	839.8

Table 10.5

- 10.3.9 The volume of on-site storage resulting from the 100 year event + 40% CC can be accommodated within the following SuDS components;

SuDS Component	Size
Attenuation Crates	65m x 8.5m x 1.6m effective depth.

Table 10.6

- 10.3.10 Surface Water runoff from roofs, access roads and driveways connects to the underground drainage network. A flow control chamber restricts peak flows to a maximum rate of 15.8 l/s during the 100 year event. Flows back-up and utilize the storage volume within the geocellular crates located underneath the pond. The surface water pumping station pumps flow at a maximum rate of 15.8 l/s to the pond. The outlet from the pond connects to the existing ditch.
- 10.3.11 The drainage network has been designed not to flood up to and including the 1 in 100 year plus climate change event.
- 10.3.12 A 10% urban creep uplift factor has been applied to the impermeable area within the property curtilages.
- 10.3.13 Copies of the SuDS hydraulic analysis are included in Appendix 5.
- 10.3.14 A Conceptual Drainage Layout is included in Appendix 6.

10.4 Water Quality Management

- 10.4.1 Managing the quality of surface water runoff so that receiving surface waters and / or groundwater are protected is strongly linked to the hydraulic control of runoff. The risk posed by surface water runoff to groundwater is often low because of the protection afforded by the layers of unsaturated soils that lie between the infiltration surface and the groundwater receptor. The risk posed is a function of;
- The pollution hazard at a particular site (i.e the pollutant source)
 - The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, and / or the effectiveness of underlying soil layers in protecting the receiving groundwater (i.e the pollutant

pathway)

- The sensitivity of the receiving environment (i.e the environmental receptor)

The effect of the proposed development on local water quality has been assessed using the simple qualitative method as set out in Ciria Report C753 The SuDS Manual 2015 (Chapter 26).

Box 26.2. Steps of the Simple Index Approach

Step 1	Allocate 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 hazard index
Step 3	Where the discharge is to protected ¹ surface waters or groundwater, consider the need for more precautionary approach

1 Designated as those for the supply drinking water (table 4.3)

Table 10.6 - Extract from CIRIA Report C753 – Steps of the simple index approach.

TABLE 26.2. Pollution Hazard Indices for Different Land Use Classifications

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Other Roofs (Typically Commercial/Industrial Roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual Property Driveways, Residential Car Parks, Low Traffic Roads (eg Cul de Sac, Homezones and General Access Roads) and Non-residential Car Parking with Infrequent Change (eg Schools) ie<300 Traffic Movements/Day	Low	0.5	0.4	0.4

Table 10.7 - Extract from CIRIA Report C753 – Pollution hazard indices for different land use classifications.

TABLE 26.3. Indicative SuDS Mitigation Indices for Discharges to Surface Water

Type of SuDS Components	Total Suspended Solids (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 Pavement	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
Proprietary Treatment Systems	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Table 10.8 - Extract from CIRIA Report C753 – Indicative SuDS mitigation indices for discharge to surface waters.

- 10.4.2 Based on the incorporation of permeable paving and a pond with 300mm depth of soil it can be seen that the total pollution mitigation index for this SuDS component exceeds the pollution hazard index from access road / private parking areas.

10.5 Management of Runoff from Construction

- 10.5.1 During the stages of site preparation, earthworks, and construction there is the potential for contaminants and/or suspended sediments in surface water runoff entering the surrounding watercourses and existing drainage.
- 10.5.2 A strategy for managing surface water runoff during the construction phase, including specific measures tailored to the level of risk should be developed and agreed with West Sussex County Council. The extent of sediment/contaminant runoff will vary across the construction cycle, and a strategy should be developed to encompass potential pollution from all stages of construction.
- 10.5.3 The strategy should include details of how during the earthworks and site preparation stages the contracting engineer will employ the approaches outlined in CIRIA C532 Control of Water Pollution from Construction Sites. This will require a proper understanding of the sensitivity of the downstream watercourses in terms of existing water quality and the potential impact of change. It is expected potential mitigation measures will include;
- Avoiding mass overburden stripping at the site; exposing only that part of the site essential for operation.
 - Placing silt fences of geo-fabric or similar material around open or exposed ground and stockpiles.

- Re-seeding any exposed ground and stockpiles to stabilise the ground and reduce erosion and gullyng of such features.

10.5.4 The strategy should be developed and agreed during detailed design and should be implemented prior to the commencement of any enabling and/or construction works onsite.

10.6 A strategy for managing surface water runoff during the construction phase, including specific measures tailored to the level of risk at the site should be developed and agreed with West Sussex County Council during the detailed design.

10.7 **Private & Adopted Sewers**

10.7.1 Private surface water drainage will be designed in accordance with BS EN 752:2008 'Drain & Sewer Systems Outside Buildings' and Building Regulations Part H.

10.7.2 Sewers to be adopted will be designed in accordance with the current national Design and Construction Guidance document and offered for adoption under S104 of the Water Industry Act 1991.

10.7.3 Ordinary Water Course Consent will be obtained from the Council for the pond outlet to the existing ditch.

10.8 **Exceedance Flood Routing**

10.8.1 During extreme rainfall events i.e (in excess of the 1 in 100 year event plus climate change) when the design performance criteria for the drainage system is likely to be exceeded, the surface water drainage network capacity may become overwhelmed resulting in surface flooding and overland flows. These flood flows are referred to as exceedance flows. Flooding of properties can occur if these flows are not managed or controlled effectively.

10.8.2 An assessment of the exceedance flood routes has been undertaken and in the event of overland flood flows occurring, these will be routed away from the proposed dwellings and directed along the main access roads and towards the ditch networks along the western and southern boundaries.

10.8.3 The exceedance flood routes are shown on the Conceptual Drainage Layout included in Appendix 6.

11.0 Proposed Foul Water Drainage

11.1 Flow Rates

- 11.1.1 Foul flows from the development site have been calculated based on the hydraulic design requirements set out in the current national design and construction guidance document November 2023.

Development Type	No. of units	Peak Loading (l/unit/day)	Peak Flow (l/s)
Residential	101	4000	4.7
Total	101		4.7

Table 11.1

11.2 Private & Adopted Systems

- 11.2.1 Private foul water drainage will be designed in accordance with BS EN 752:2008 'Drain & Sewer Systems Outside Buildings' and Building Regulations Part H.
- 11.2.2 Sewers to be adopted will be designed in accordance with the current national Design and Construction Guidance document and offered for adoption under S104 of the Water Industry Act 1991.
- 11.2.3 Foul water from the proposed development will connect by gravity to the on-site pumping station. Flows will be pumped to the site entrance where a short length of gravity sewer will connect to the existing public foul sewer in Copthorne Common Road.
- 11.2.4 A Pre-Planning Enquiry to Thames Water. confirms capacity is available within the existing sewerage network to serve the proposed development. A copy of Thames Water's response is included in Appendix 8.
- 11.2.5 An application under Section 106 of the WIA 1991 – Connection to Public Sewer, will be submitted to Thames Water prior to works commencing.
- 11.2.6 A Conceptual Drainage Layout is included in Appendix 6.

12.0 Operation and Maintenance

12.1 The operation and maintenance of the development's drainage infrastructure needs to be agreed with the various parties early in the planning and design stage to ensure all elements of the system work effectively to achieve the design standards over the lifetime of the development. The following stakeholders are considered most appropriate to undertake this task;

System	Responsibility
Private Plot Foul / SW drains	Property Owners
Adopted Foul / SW Sewers	Water Company
SuDS systems	Water Company / Management Company

Table 12.1

12.2 The Management Company will receive annual contributions from all Owners / Tenants for maintenance of private foul and surface water drainage systems, including SuDS. A part of these contributions will go towards a "sinking fund" for future works.

12.3 SuDS operational and maintenance requirements are included in Appendix 5.

13.0 Conclusions

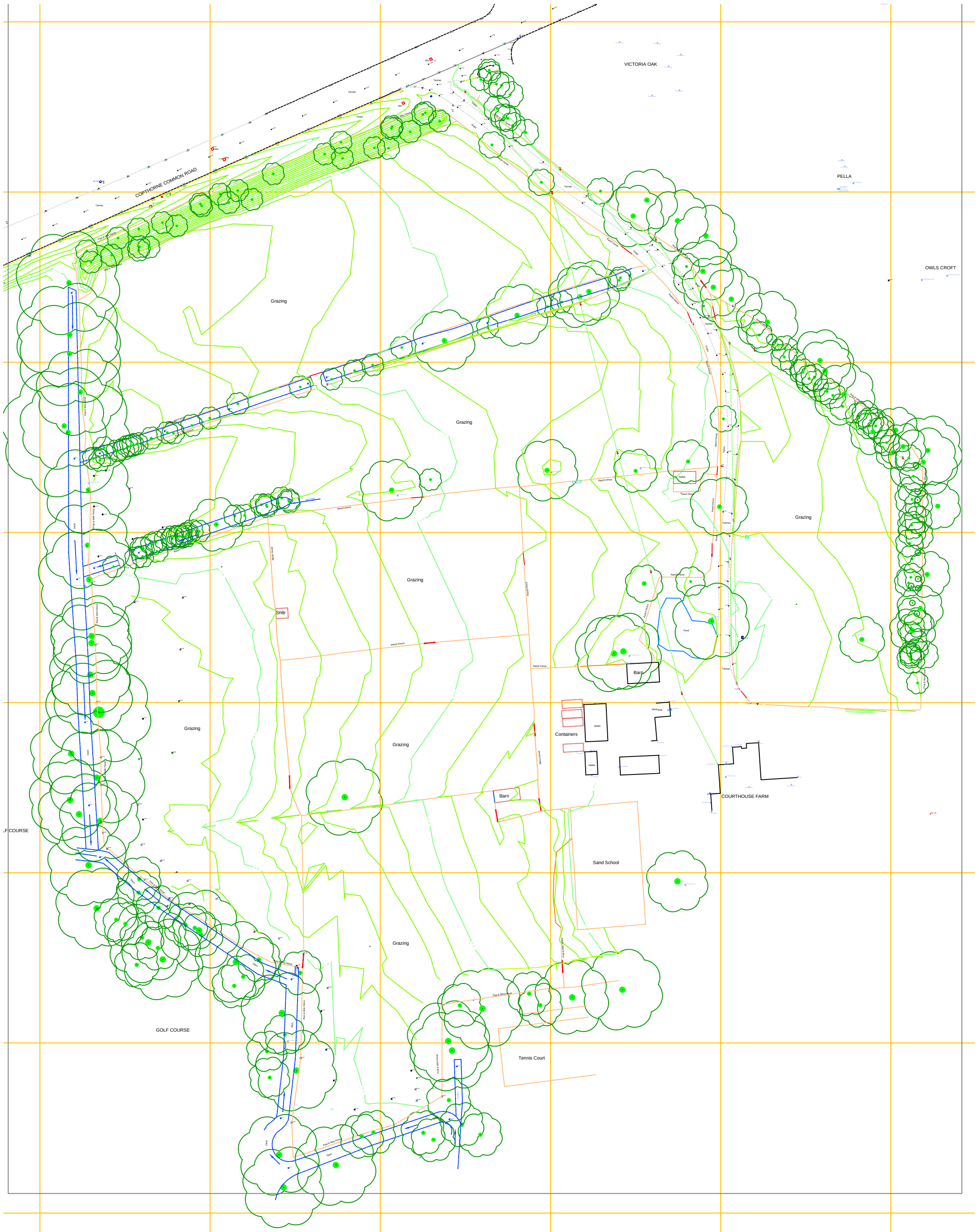
13.1 This Flood Risk Assessment and Drainage Strategy has concluded the following;

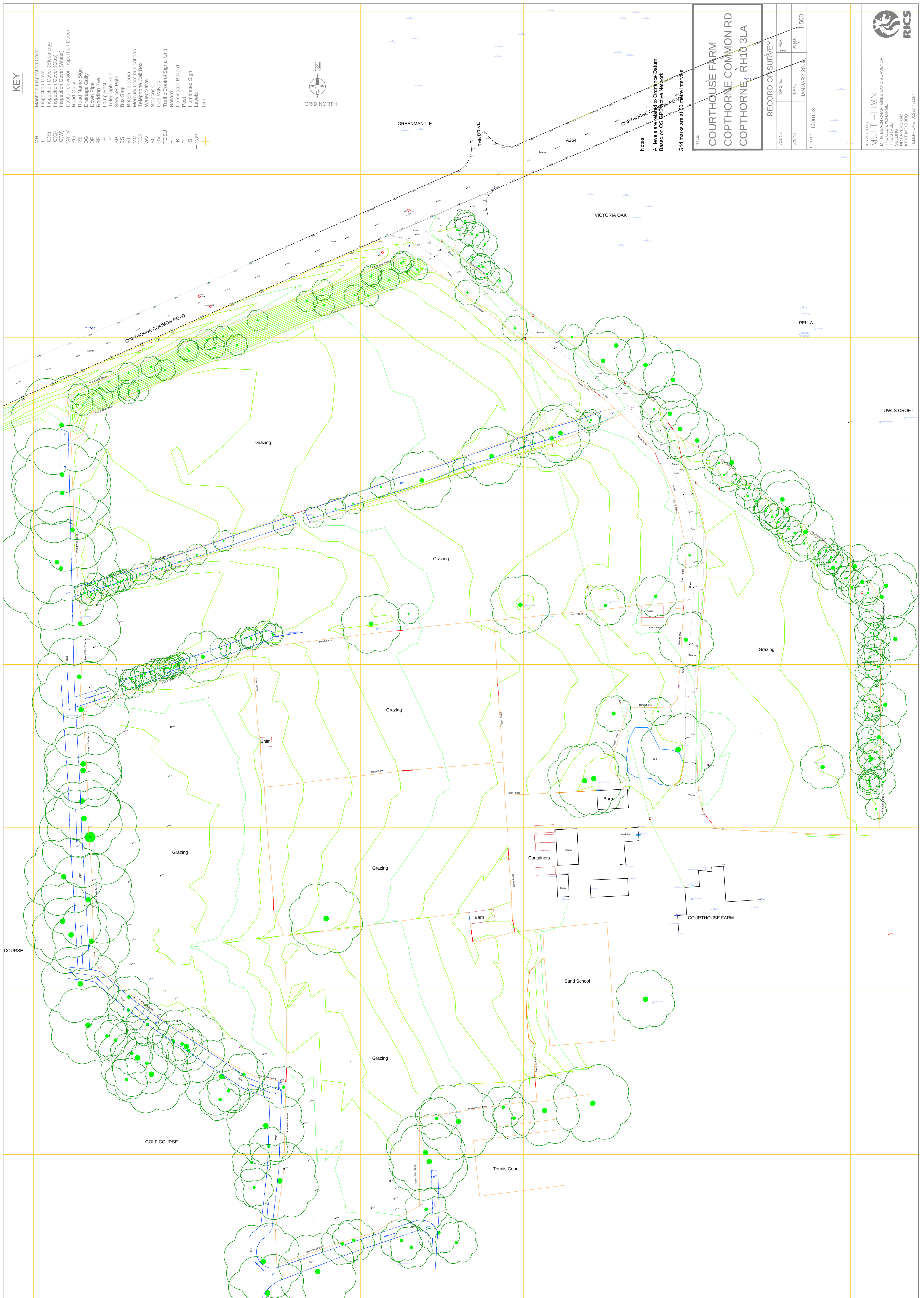
- The site lies within Flood Zone 1 – Low Probability.
- The risk of flooding from other sources is low/negligible.
- Surface water runoff from the proposed development will be managed utilising SuDS attenuation techniques to reduce runoff rates and volumes. Surface water will be pumped to the existing ditch on-site.
- Foul water will be pumped to the existing public foul sewer in Copthorne Common Road.
- Thames Water has confirmed capacity is available in the public foul sewerage network to serve the proposed development.
- The development does not increase flood risk either on site or elsewhere.
- The drainage strategy meets with the Government, County Council and District Council's Policy Objectives concerning development and flood risk within its district.

13.2 The flood risk assessment and drainage strategy has established that appropriate surface water management arrangements can be incorporated within the proposed development such that there will be no increase in flood risk either on or off site for a range of storm events up to the 1 in 100 year event (1% annual probability) including an allowance of 40% for climate change. The proposals are consistent with the Government's National Planning Policy Framework and it has been demonstrated that the occupants and buildings will remain safe for the lifetime of the development.

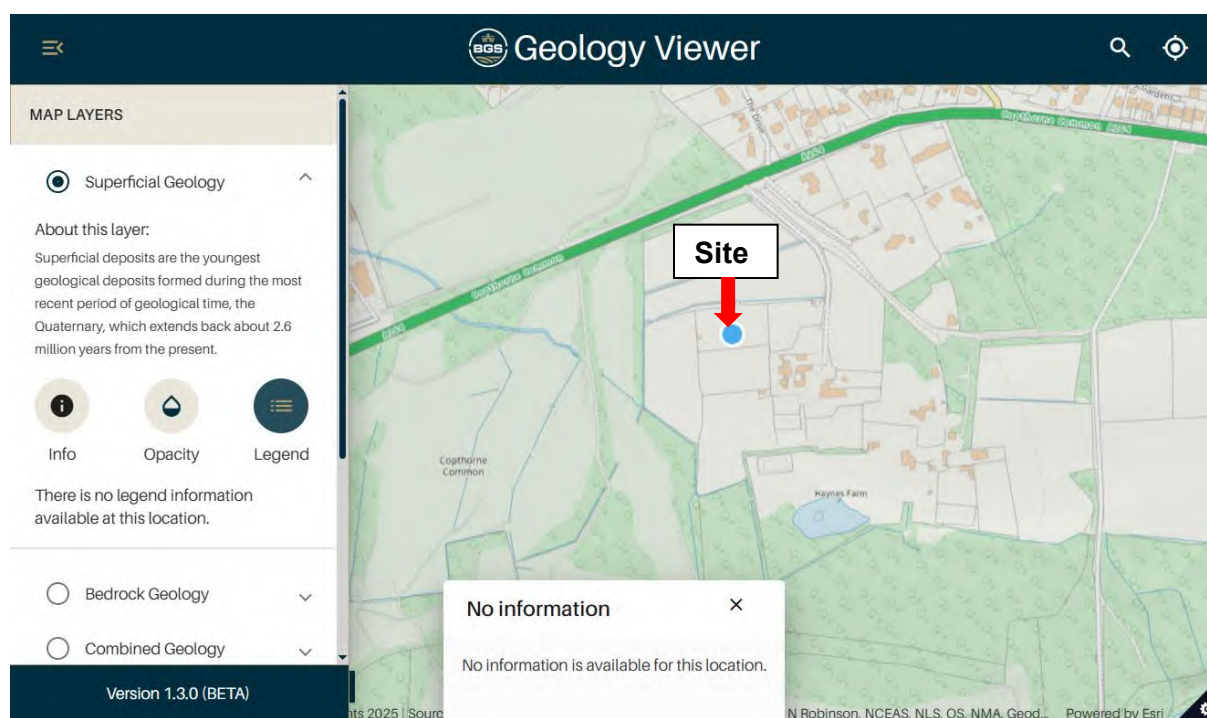
Appendix 1

Topographical Survey





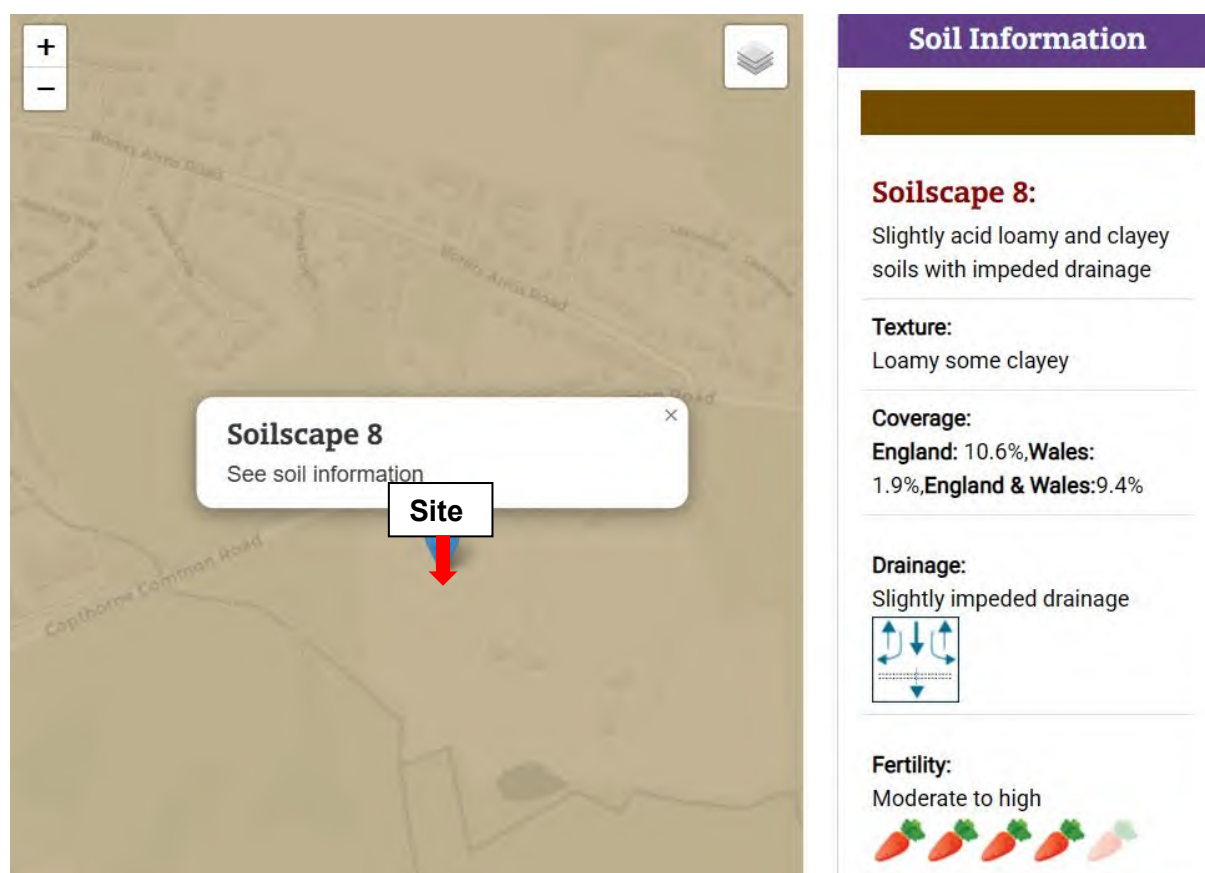
Appendix 2
Extracts from the BGS, LandIS Soilscales, EA websites
Sewer Record



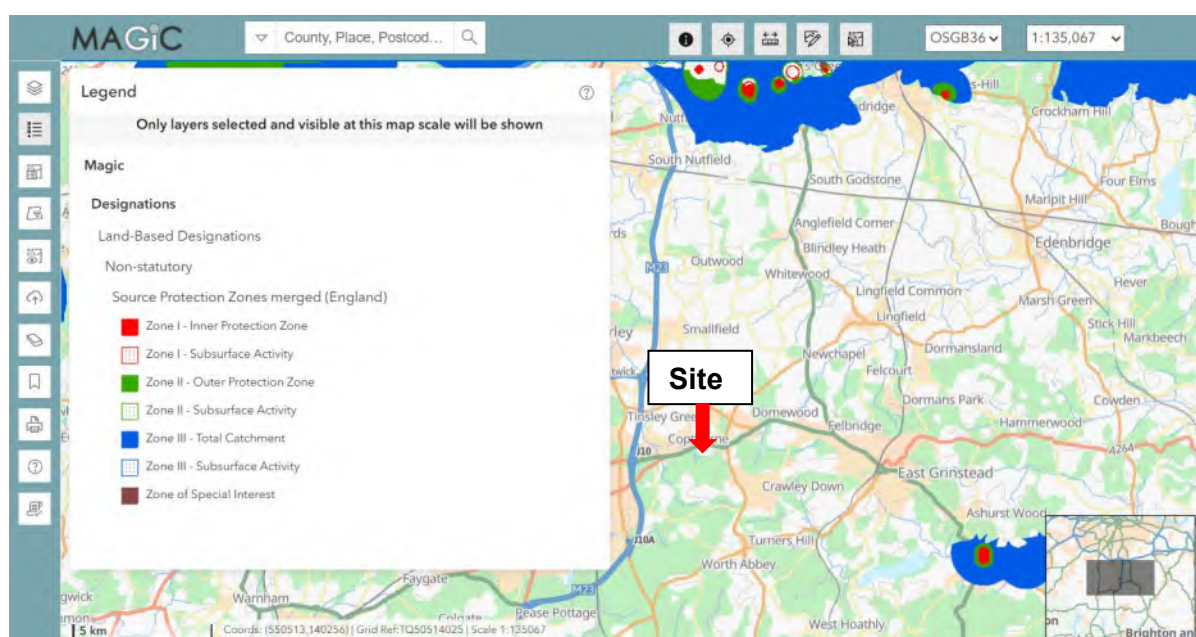
Extract from BGS Geology Viewer (Superficial).



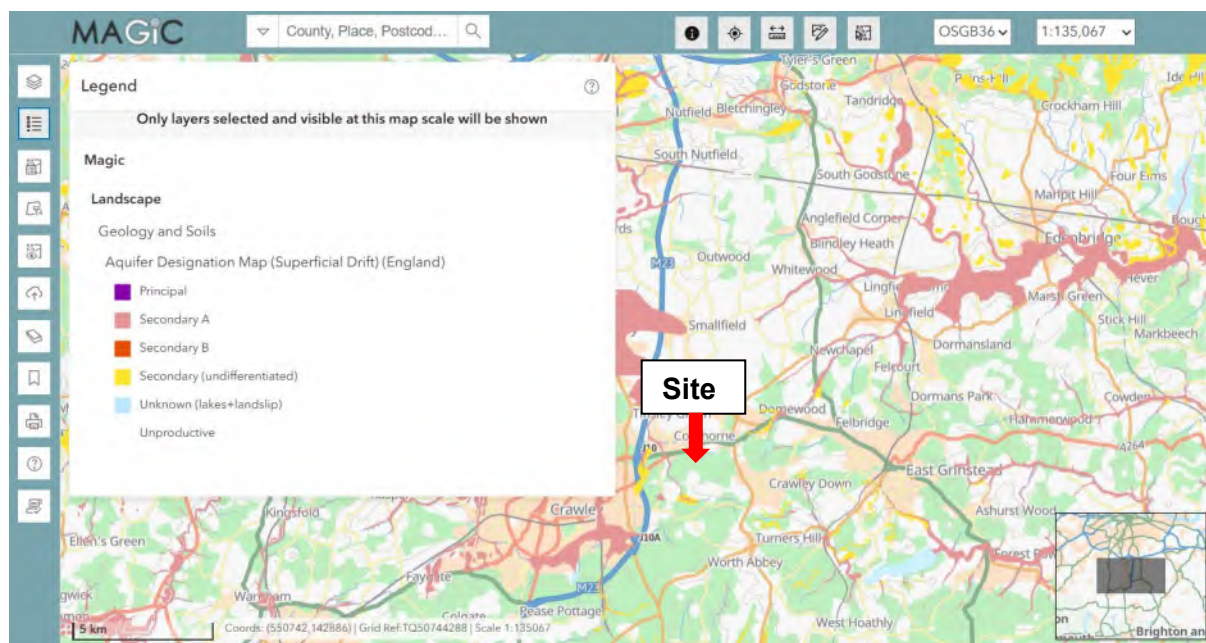
Extract from BGS Geology Viewer (Bedrock).



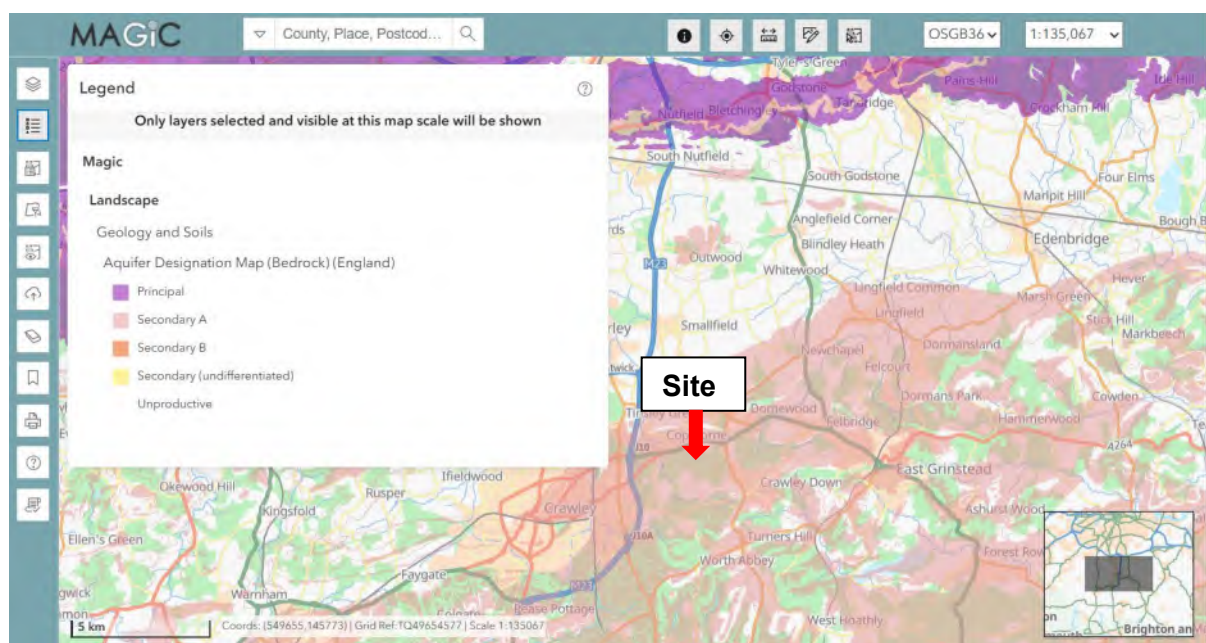
Extract from LandIS Soilscape Map.



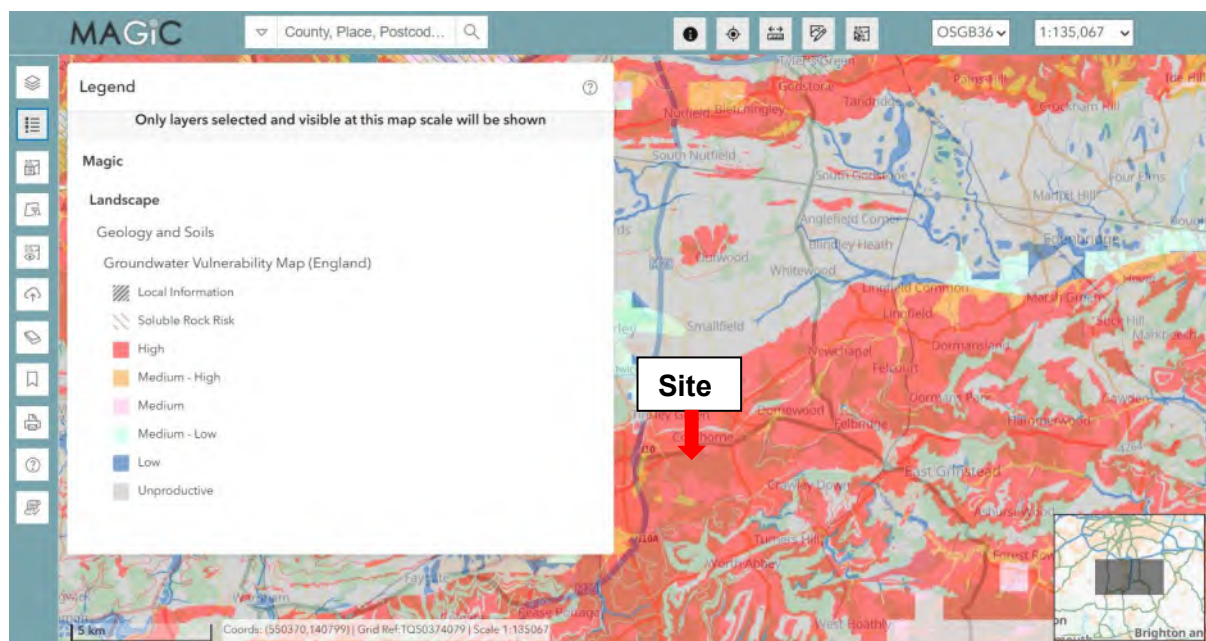
Extract from Magic Maps - Groundwater Source Protection Zones



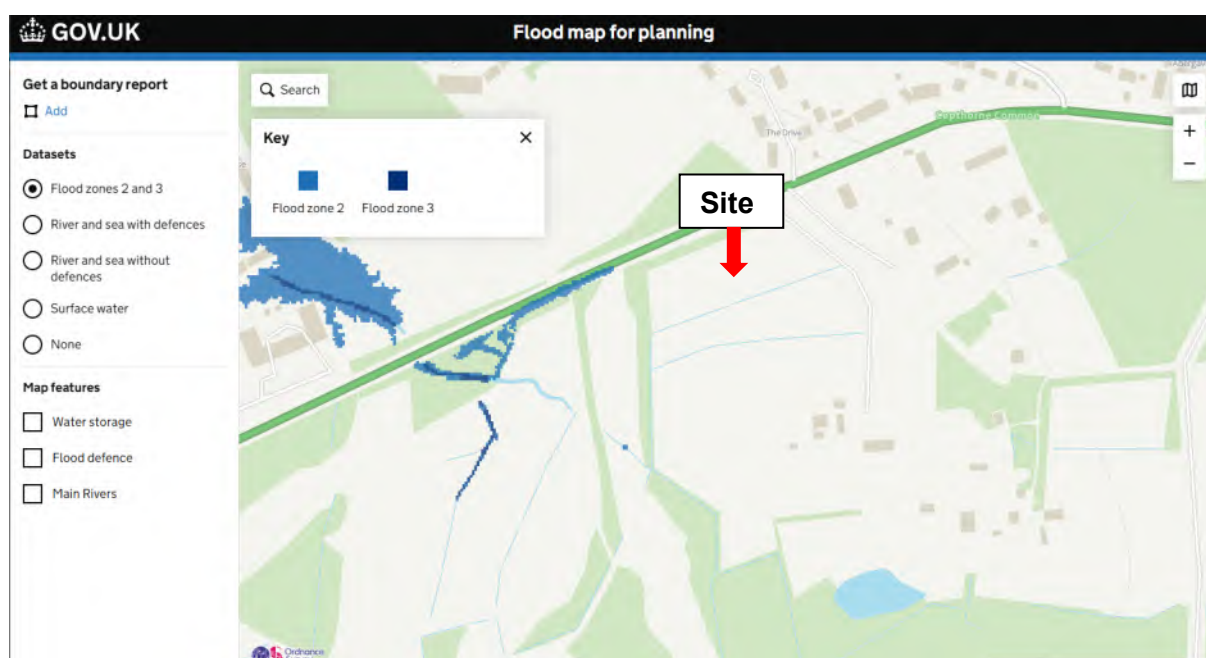
Extract from Magic Maps – Aquifer Designation [Superficial]



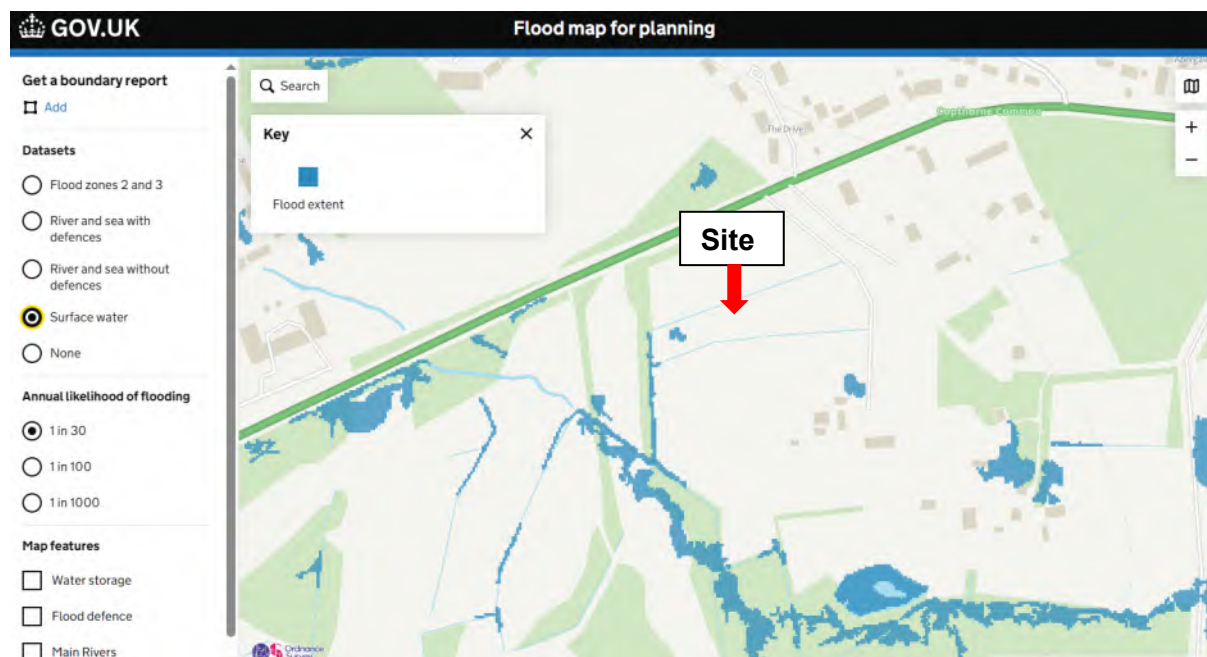
Extract from Magic Maps – Aquifer Designation [Bedrock]



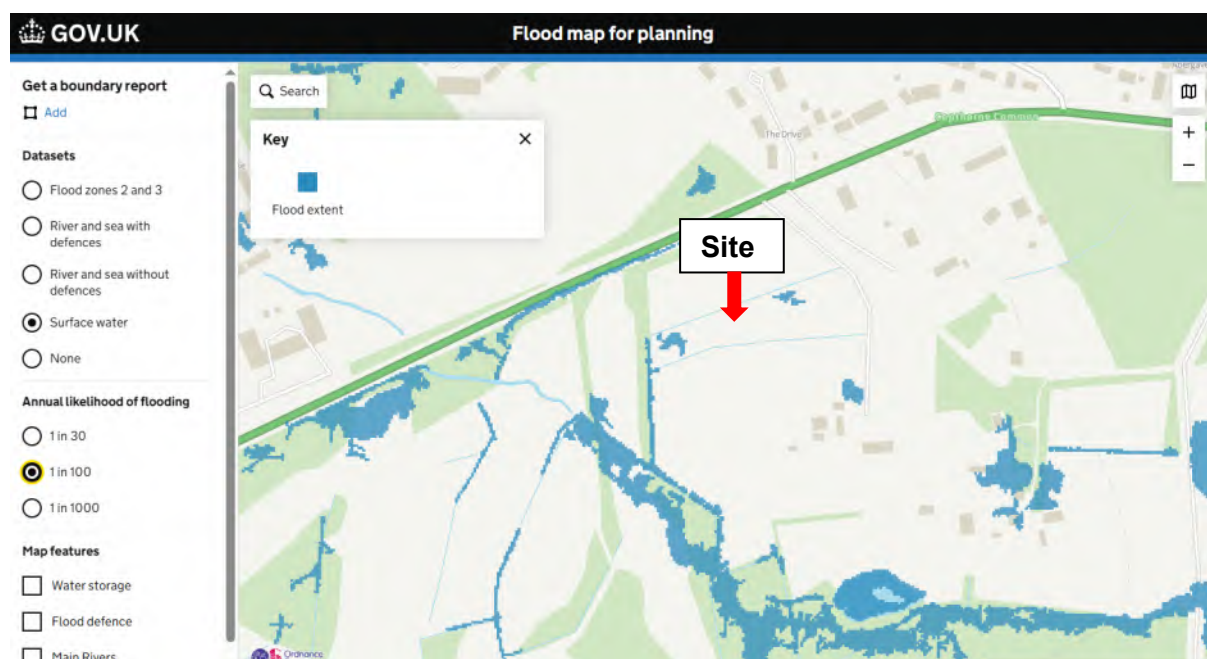
Extract from Magic Maps -Groundwater Vulnerability



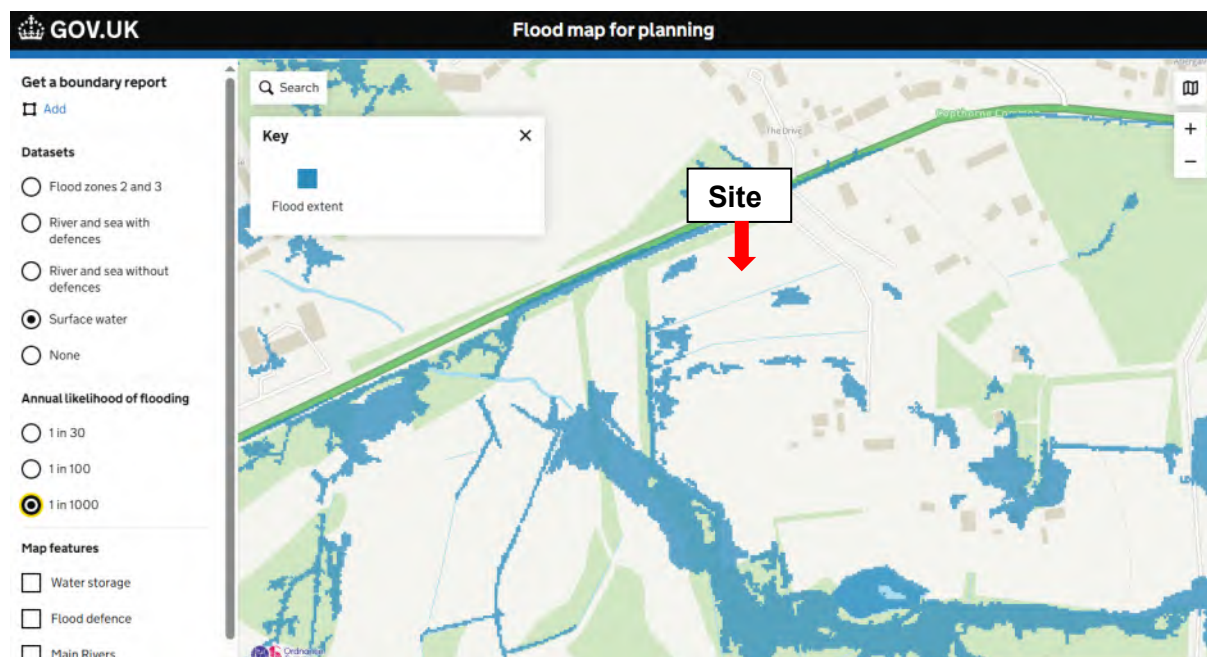
Extract from EA Flood Map for Planning (Rivers & Sea)



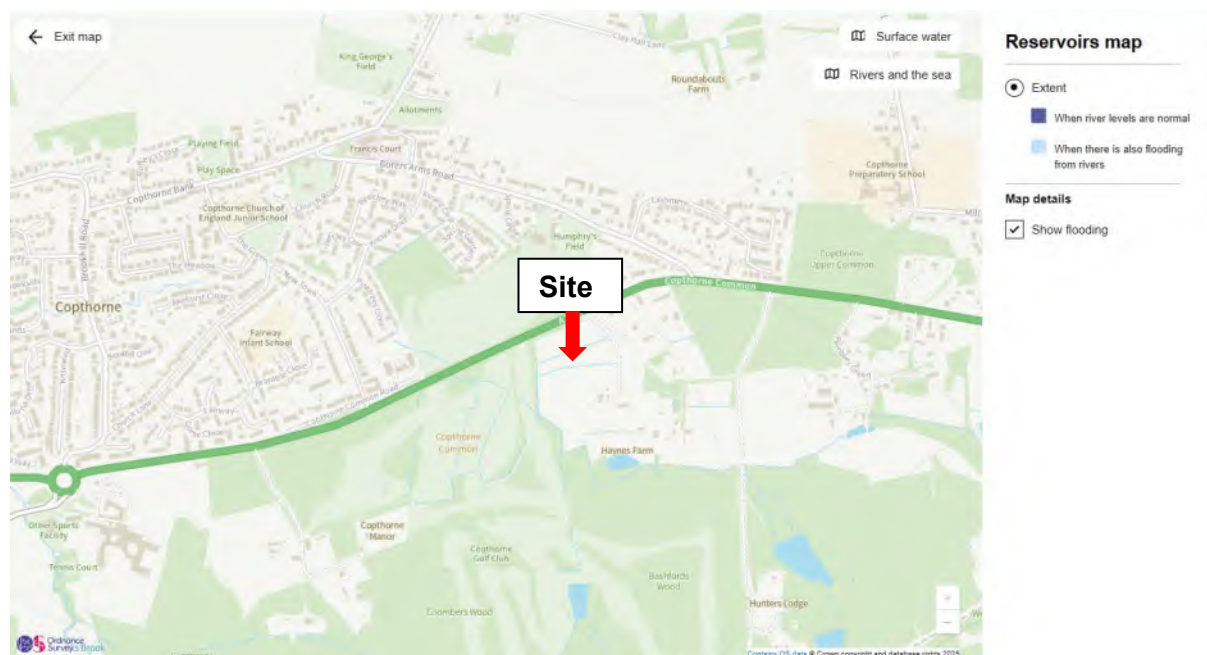
Extract from EA Flood Map for Planning [Surface Water] – High Risk



Extract from EA Flood Map for Planning [Surface Water] – Medium Risk



Extract from EA Flood Map for Planning [Surface Water] – Low Risk



Extract from EA Flood Map for Planning [Reservoirs]

BdR Civil and Structural Engineering Ltd
UNIT 1 THE OLD ENGINE HOUSE, G
TONBRIDGE
TN11 0DP

Search address supplied Courthouse Farm
Cophorne Common
Cophorne
Crawley
RH10 3LA

Your reference 25-0093 Court House Farm

Our reference ALS/ALS Standard/2025_5153137

Search date 29 April 2025

Keeping you up-to-date

We have a new website and email address

Website URL: thameswater.co.uk/propertysearches

Email address: property.searches@thameswater.co.uk

Please do get in contact with us if you have any questions.



Thames Water Utilities Ltd
Property Searches,
Clearwater Court, Vastern Road, Reading RG1 8DB



property.searches@thameswater.co.uk
thameswater.co.uk/propertysearches



0800 009 4540

Search address supplied: Courthouse Farm, Copthorne Common, Copthorne, Crawley, RH10 3LA

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position and size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the contact details below:

Thames Water Utilities Ltd
Property Searches
Clearwater Court
Vastern Road
Reading
RG1 8DB

Email: property.searches@thameswater.co.uk

Web: thameswater.co.uk/propertysearches

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority. Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners. The public sewer map relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus. The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

South East Water

Asset Location Search



Property Searches

Rocfort Road
Snodland
Kent
ME6 5AH

Tel: 0845 301 0845

www.southeastwater.co.uk.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. You can do this by emailing customer.feedback@thameswater.co.uk with the email subject header 'Enquiry – TWOSA', along with details of the request.

If you have any questions regarding sewer connections, budget estimates, diversions or building over issues please direct them to our service desk which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

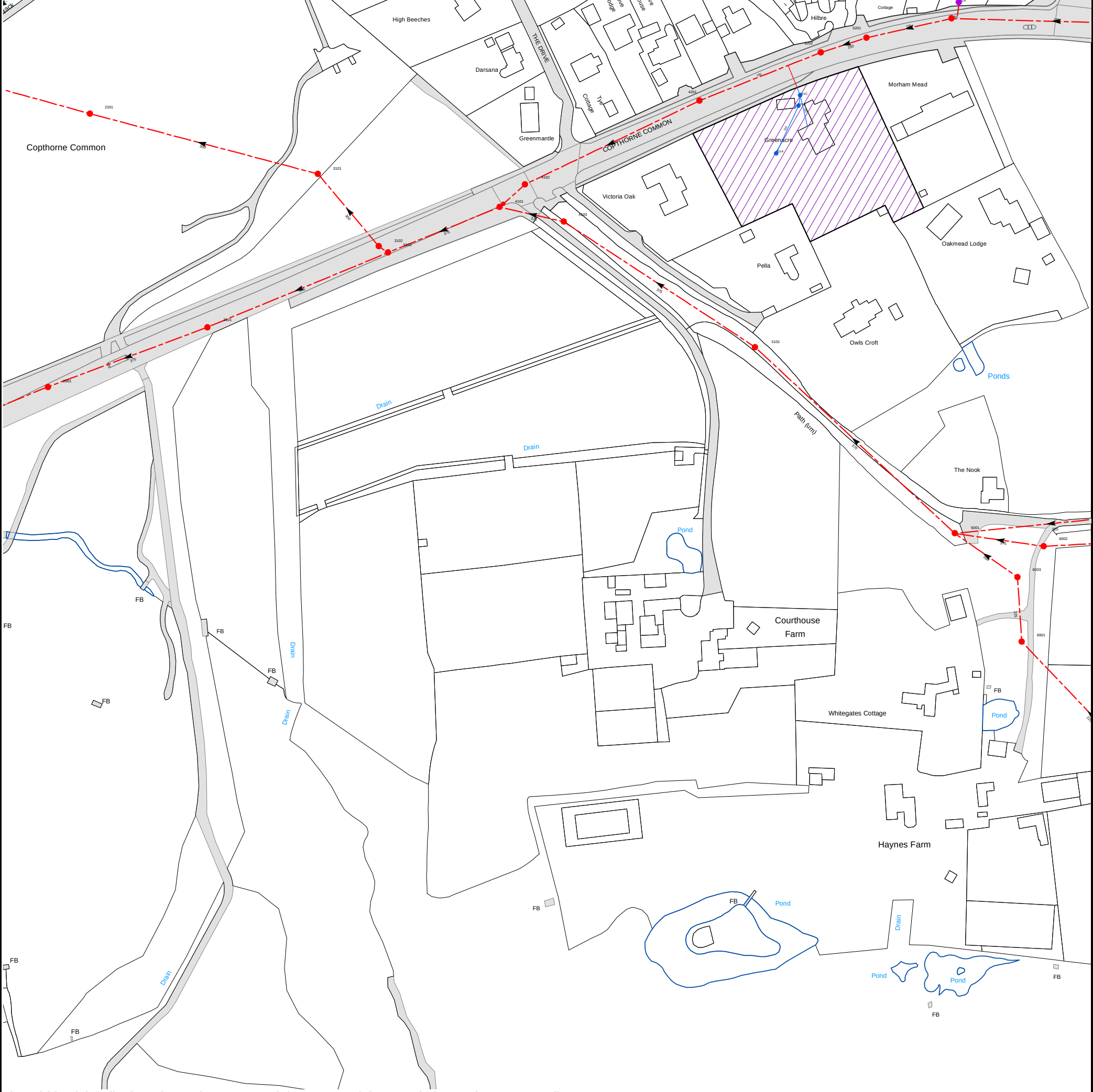
Clean Water queries

Should you require any advice concerning clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2025 5153137



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 532429,139026
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map (2024) with the Sanction of the controller of H.M. Stationery Office, License no. AC0000849556 Crown Copyright Reserved.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5201	83.89	81.92
6201	86.06	84.03
621A	n/a	n/a
6901	79.93	77.1
6003	n/a	n/a
6002	81.59	80.41
6001	79.51	77.63
5101	78.31	75.66
3103	76.17	74.47
4103	77.89	74.96
4101	77.31	74.83
4102	77.81	76.08
521A	n/a	n/a
521B	n/a	n/a
4201	80.81	79.13
521C	n/a	n/a
5202	82.97	82
2001	74.02	71.77
2101	75.07	72.92
3102	76.16	74.16
3101	n/a	n/a
2201	74.51	73.06
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

	Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Storm Sewer
	Sludge Sewer
	Foul Trunk Sewer
	Surface Trunk Sewer
	Combined Trunk Sewer
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Vacuum
	Thames Water Proposed
	Vent Pipe
	Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

	Sewer
	Culverted Watercourse
	Proposed
	Decommissioned Sewer
	Content of this drainage network is currently unknown
	Ownership of this drainage network is currently unknown

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plan are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve		Meter
	Dam Chase		Vent
	Fitting		

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Ancillary		Drop Pipe
	Control Valve		Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Inlet		Outfall
	Undefined End		

Other Symbols

Symbols used on maps which do not fall under other general categories.

	Change of Characteristic Indicator		Public / Private Pumping Station
	Invert Level		Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Chamber
	Operational Site

Ducts or Crossings

	Casement	Ducts may contain high voltage cables. Please check with Thames Water.
	Conduit Bridge	
	Subway	
	Tunnel	

5) 'na' or '0' on a manhole indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Appendix 3

Details of Proposed Development



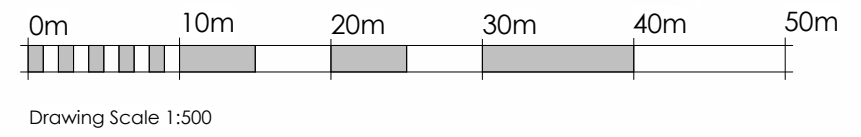
NOTE
This drawing is copyright.
Do not scale, use figured dimensions only.
The contractor is to check all dimensions on site before commencement
of the works.
Discrepancies must be reported immediately to the architect before
proceeding.

- 1B2P
 - 2B3P-Terrace
 - 2B4P
 - 2B4P-Above Pavilion
 - 3B6P
- Development Site
- Root protection zones
- Badger Sett protection zone

Proposed Accommodation Houses				
Occupancy	Area per Type	Total Unit Count	Total Area	Comments
1B2P	60.8 m ²	4	243.4 m ²	2 Storey Apps
1B2P	62.7 m ²	2	125.4 m ²	2 Storey Apps
1B2P	63.8 m ²	2	127.7 m ²	2 Storey Apps
1B2P	89.4 m ²	6	416.6 m ²	2 Storey Apps
1B2P	71.1 m ²	2	142.2 m ²	2 Storey Apps
2B3P-Terrace	63.9 m ²	14	895.2 m ²	Ground Floor
2B4P	88.3 m ²	2	176.7 m ²	2 Storey Apps
2B4P	89.6 m ²	6	537.7 m ²	2 Storey Apps
2B4P	89.8 m ²	24	2155.1 m ²	2 Storey Apps
2B4P	182.9 m ²	2	365.8 m ²	2 Storey Apps
2B4P	92.3 m ²	4	369.0 m ²	2 Storey Apps
2B4P	92.8 m ²	6	556.9 m ²	2 Storey Apps
2B4P	95.8 m ²	2	191.6 m ²	2 Storey Apps
2B4P	97.2 m ²	2	194.4 m ²	2 Storey Apps
2B4P-Above Pavilion	136.6 m ²	9	1229.1 m ²	Above Pavilion
3B6P	109.2 m ²	2	218.3 m ²	2 Storey Apps
3B6P	110.8 m ²	2	221.7 m ²	2 Storey Apps
3B6P	113.1 m ²	4	452.5 m ²	2 Storey Apps
3B6P	113.6 m ²	4	454.2 m ²	2 Storey Apps
3B6P	114.4 m ²	2	228.8 m ²	2 Storey Apps
Grand total		101	9119.5 m ²	

Parking Schedule-Master	
Comments	Parking-Quat
	0
Private	61
Service Parking	2
Visitors	11
	74

REV	DATE	DESCRIPTION	CHK
I	01.08.25	Parking area amended to avoid T29	PT
H	25.07.25	Plots around Badger Sett omitted and re-arranged	PT
G	10.07.25	Adjustments made to observe critical tree protection area	PT
F	19.06.25	RPA comments assessed	PT
E	16.06.25	Pumping Stations re-positioned	PT
D	12.06.25	Pumping Station added	PT
C	10.06.25	Works in progress	PT
B	16.05.25	Revised Scheme	PT
A	02.05.25	First Issue	PT



Drawing Scale 1:500

jane duncan
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The Old Warehouse
Chalfont Station Road
Little Chalfont, Amersham
Bucks HP7 9PN

+44 (0)1494 766 999
info@janeduncanarchitects.co.uk
janeduncanarchitects.co.uk

CLIENT
Option Two Development Ltd

ADDRESS
Cophorne Common Rd
Cophorne, RH10 3LA

PROJECT
Court House Farm, Cophorne

DRAWING TITLE
Option C - Retirement Village

DRAWING NO.
ECF485_110

REV
I

SCALE
1 : 500

DATE
02.05.25

DRAWN
BB

CHECKED
PT



NOTE
This drawing is copyright.
Do not scale, use figured dimensions only.
The contractor is to check all dimensions on site before commencement
of the works.
Discrepancies must be reported immediately to the architect before
proceeding.

J	29.08.05	Issued for Information	
I	01.08.25	Parking area amended to avoid T29	PT
H	25.07.25	Plots around Badger Sett omitted and re-arranged	PT
G	10.07.25	Adjustments made to observe critical tree protection area	PT
F	19.06.25	RPA comments assessed	PT
E	16.06.25	Pumping Station and Delivery access reconfigured	PT
D	12.06.25	Pumping Station added	PT
C	10.06.25	Works in progress	PT
B	16.05.25	Revised Scheme	PT
A	02.05.25	First Issue	PT
REV	DATE	DESCRIPTION	CHK

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interiors

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Chalfont Station Road
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janeduncanarchitects.co.uk

CLIENT

Option Two Development Ltd

ADDRESS
Copthorne Common Rd
Copthorne, RH10 3LA

PROJECT

Court House Farm, Copthorne

DRAWING TITLE

Option C - Retirement Village Roof
Plan

DRAWING NO. REV
ECF485_111 J

SCALE DATE DRAWN CHECKED
1 : 500 02.05.25 BB PT

0m 10m 20m 30m 40m 50m

Drawing Scale 1:500

Appendix 4

Runoff Rates & Volumes

Appendix 4/1

Greenfield Runoff Rates & Volumes

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Links (Results)

Name	US Node	DS Node	Σ Area (ha)	Pro Velocity (m/s)
1.000	RE70.0	S80	0.020	0.656
1.001	S80	S70	0.072	0.748
2.000	RE70.2	S70	0.000	0.000
1.002	S70	S70-80	0.088	0.783
3.000	RE80.1	S70-80	0.044	1.375
1.003	S70-80	S70-80.1	0.132	0.751
1.004	S70-80.1	SW1.2	0.183	0.734
4.000	RE1	SW1.0	0.040	1.173
4.001	SW1.0	SW1.1	0.094	1.083
5.000	RE2	S1.0	0.030	0.952
5.001	S1.0	S1.1	0.030	1.409
6.000	S1.2	S1.1	0.000	0.000
5.002	S1.1	S1.3	0.103	0.841
5.003	S1.3	SW1.1	0.103	0.917
4.002	SW1.1	SW1.2	0.270	2.055
1.005	SW1.2	SW1.3	0.453	0.774
1.006	SW1.3	SW1.4	0.453	0.868
7.000	S88-99.1	S88-99.2	0.032	0.752
7.001	S88-99.2	S88-99.3	0.058	0.702
8.000	RE23-34.1	S88-99.3	0.022	1.112
7.002	S88-99.3	S23-34.1	0.086	0.554
7.003	S23-34.1	S12-22.3	0.086	1.752
9.000	RE12-22.0	S13-22.0	0.019	0.643
9.001	S13-22.0	S13-22.1	0.034	0.920
10.000	RE23-34.0	S23-34.0	0.027	0.812
11.000	RE23-34.2	S23-34.0	0.017	0.704
10.001	S23-34.0	S13-22.1	0.061	0.721
12.000	RE12-22.1	S13-22.3	0.020	0.656
12.001	S13-22.3	S13-22.1	0.035	1.231
9.002	S13-22.1	S13-22.2	0.130	1.237
9.003	S13-22.2	S12-22.3	0.172	1.982
7.004	S12-22.3	SW1.4	0.272	1.945
1.007	SW1.4	SW1.5	0.726	0.786
1.008	SW1.5	SW1.6	0.776	2.570
13.000	RE101	S101.0	0.013	0.592
13.001	S101.0	SW2.0	0.013	0.673
13.002	SW2.0	SW2.1	0.069	0.668
14.000	RE35-46.0	S35-46.1	0.020	0.571
15.000	S35-46.2	S35-46.1	0.014	1.195
14.001	S35-46.1	SW2.1	0.034	0.661
16.000	RE99	S99	0.013	0.659
16.001	S99	SW2.1	0.013	1.942

Name	US Node	DS Node	Σ Area (ha)	Pro Velocity (m/s)
13.003	SW2.1	SW2.2	0.177	0.827
13.004	SW2.2	SW1.6	0.228	0.718
17.000	RE61-69.1	SW1.6	0.029	1.742
1.009	SW1.6	SW1.7	1.074	1.797
18.000	RE47-60.0	S47-60.0	0.026	0.709
19.000	S35-46.0	S47-60.0	0.019	0.689
18.001	S47-60.0	S35-46.5	0.057	0.794
20.000	S35-46.3	S35-46.4	0.017	0.853
20.001	S35-46.4	SW1.7.1	0.017	0.722
20.002	SW1.7.1	S35-46.5	0.044	1.716
18.002	S35-46.5	SW1.7	0.127	1.625
21.000	RE47-60.1	S47-60	0.028	0.727
21.001	S47-60	SW1.7	0.043	1.225
1.010	SW1.7	FC	1.243	2.307
22.000	RE61-69.0	S61-69.0	0.025	0.706
22.001	S61-69.0	SW1.8	0.108	1.501
23.000	GEOCELLULAR STORAGE	SW1.8	0.056	0.427
22.002	SW1.8	FC	0.240	0.652
1.011	FC	SWPS	1.504	3.456

Rainfall Methodology	FEH-22	Drain Down Time (mins)	1440	10 year (l/s)	30.1
Rainfall Events	Singular	Additional Storage (m³/ha)	20.0	30 year (l/s)	44.6
Summer CV	0.750	Starting Level (m)		100 year (l/s)	59.3
Winter CV	0.840	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Analysis Speed	Detailed	1 year (l/s)	15.8	100 year 360 minute (m³)	387
Skip Steady State	x	2 year (l/s)	16.4		

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
10	0	0	0
30	35	0	0
100	40	0	0

Site Makeup	Greenfield	Growth Factor 10 year	1.62
Greenfield Method	FEH	Growth Factor 30 year	2.40
Positively Drained Area (ha)	4.339	Growth Factor 100 year	3.19
SAAR (mm)	793	Betterment (%)	0
Host	1	QMed	16.4
BFIHost	0.520	QBar	18.6
Region	6	Q 1 year (l/s)	15.8
QBar/QMed conversion factor	1.136	Q 2 year (l/s)	16.4
Growth Factor 1 year	0.85	Q 10 year (l/s)	30.1
Growth Factor 2 year	0.88	Q 30 year (l/s)	44.6

Pre-development Discharge Rate

Q 100 year (l/s) 59.3 |

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	4.339	Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	0.131
CWI	118.963	Runoff Volume (m³)	387

Appendix 4/2

Post-Development Runoff Rates & Volumes [No Mitigation]

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Name	US Node	DS Node	Σ Area (ha)	Pro Velocity (m/s)
1.000	S1	S2	0.500	1.197
1.001	S2	S3	1.000	1.447
1.002	S3	S4	1.504	1.607
1.003	S4	S5	1.504	1.596

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s) x
Summer CV	0.750	Drain Down Time (mins)	1440	Check Discharge Volume x
Winter CV	0.840	Additional Storage (m³/ha)	20.0	

15	30	60	120	180	240	360	480	600	720	960	1440
----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	------

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
10	0	0	0
30	35	0	0
100	40	0	0

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	74.487	21.077	10 year 60 minute summer	98.924	26.143
1 year 15 minute winter	52.272	21.077	10 year 60 minute winter	65.723	26.143
1 year 30 minute summer	48.175	13.632	10 year 120 minute summer	61.541	16.263
1 year 30 minute winter	33.807	13.632	10 year 120 minute winter	40.886	16.263
1 year 60 minute summer	32.865	8.685	10 year 180 minute summer	47.340	12.182
1 year 60 minute winter	21.835	8.685	10 year 180 minute winter	30.772	12.182
1 year 120 minute summer	24.674	6.521	10 year 240 minute summer	37.363	9.874
1 year 120 minute winter	16.393	6.521	10 year 240 minute winter	24.823	9.874
1 year 180 minute summer	20.547	5.288	10 year 360 minute summer	28.319	7.287
1 year 180 minute winter	13.356	5.288	10 year 360 minute winter	18.408	7.287
1 year 240 minute summer	16.999	4.492	10 year 480 minute summer	22.129	5.848
1 year 240 minute winter	11.294	4.492	10 year 480 minute winter	14.702	5.848
1 year 360 minute summer	13.626	3.506	10 year 600 minute summer	17.999	4.923
1 year 360 minute winter	8.857	3.506	10 year 600 minute winter	12.298	4.923
1 year 480 minute summer	10.990	2.904	10 year 720 minute summer	15.949	4.275
1 year 480 minute winter	7.302	2.904	10 year 720 minute winter	10.719	4.275
1 year 600 minute summer	9.130	2.497	10 year 960 minute summer	12.988	3.420
1 year 600 minute winter	6.238	2.497	10 year 960 minute winter	8.603	3.420
1 year 720 minute summer	8.216	2.202	10 year 1440 minute summer	9.338	2.503
1 year 720 minute winter	5.522	2.202	10 year 1440 minute winter	6.276	2.503
1 year 960 minute summer	6.833	1.799	30 year +35% CC 15 minute summer	392.752	111.135
1 year 960 minute winter	4.527	1.799	30 year +35% CC 15 minute winter	275.616	111.135
1 year 1440 minute summer	5.054	1.354	30 year +35% CC 30 minute summer	261.280	73.933
1 year 1440 minute winter	3.397	1.354	30 year +35% CC 30 minute winter	183.355	73.933
2 year 15 minute summer	112.108	31.723	30 year +35% CC 60 minute summer	177.950	47.027
2 year 15 minute winter	78.672	31.723	30 year +35% CC 60 minute winter	118.226	47.027
2 year 30 minute summer	73.507	20.800	30 year +35% CC 120 minute summer	106.911	28.253
2 year 30 minute winter	51.584	20.800	30 year +35% CC 120 minute winter	71.029	28.253
2 year 60 minute summer	49.676	13.128	30 year +35% CC 180 minute summer	81.078	20.864
2 year 60 minute winter	33.004	13.128	30 year +35% CC 180 minute winter	52.703	20.864
2 year 120 minute summer	34.404	9.092	30 year +35% CC 240 minute summer	63.499	16.781
2 year 120 minute winter	22.857	9.092	30 year +35% CC 240 minute winter	42.187	16.781
2 year 180 minute summer	27.755	7.142	30 year +35% CC 360 minute summer	47.752	12.288
2 year 180 minute winter	18.042	7.142	30 year +35% CC 360 minute winter	31.040	12.288
2 year 240 minute summer	22.526	5.953	30 year +35% CC 480 minute summer	37.187	9.828
2 year 240 minute winter	14.966	5.953	30 year +35% CC 480 minute winter	24.706	9.828
2 year 360 minute summer	17.615	4.533	30 year +35% CC 600 minute summer	30.207	8.262
2 year 360 minute winter	11.450	4.533	30 year +35% CC 600 minute winter	20.640	8.262
2 year 480 minute summer	14.021	3.705	30 year +35% CC 720 minute summer	26.762	7.172
2 year 480 minute winter	9.315	3.705	30 year +35% CC 720 minute winter	17.985	7.172
2 year 600 minute summer	11.548	3.159	30 year +35% CC 960 minute summer	21.834	5.749
2 year 600 minute winter	7.890	3.159	30 year +35% CC 960 minute winter	14.463	5.749
2 year 720 minute summer	10.326	2.767	30 year +35% CC 1440 minute summer	15.744	4.220
2 year 720 minute winter	6.940	2.767	30 year +35% CC 1440 minute winter	10.581	4.220
2 year 960 minute summer	8.512	2.241	100 year +40% CC 15 minute summer	516.534	146.161
2 year 960 minute winter	5.638	2.241	100 year +40% CC 15 minute winter	362.480	146.161
2 year 1440 minute summer	6.211	1.665	100 year +40% CC 30 minute summer	346.638	98.087
2 year 1440 minute winter	4.174	1.665	100 year +40% CC 30 minute winter	243.255	98.087
10 year 15 minute summer	221.352	62.635	100 year +40% CC 60 minute summer	237.723	62.823
10 year 15 minute winter	155.335	62.635	100 year +40% CC 60 minute winter	157.937	62.823
10 year 30 minute summer	145.903	41.286	100 year +40% CC 120 minute summer	139.815	36.949
10 year 30 minute winter	102.388	41.286	100 year +40% CC 120 minute winter	92.890	36.949

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 180 minute summer	105.070	27.038	100 year +40% CC 600 minute summer	39.417	10.781
100 year +40% CC 180 minute winter	68.298	27.038	100 year +40% CC 600 minute winter	26.932	10.781
100 year +40% CC 240 minute summer	81.976	21.664	100 year +40% CC 720 minute summer	35.114	9.411
100 year +40% CC 240 minute winter	54.463	21.664	100 year +40% CC 720 minute winter	23.599	9.411
100 year +40% CC 360 minute summer	61.667	15.869	100 year +40% CC 960 minute summer	28.928	7.617
100 year +40% CC 360 minute winter	40.085	15.869	100 year +40% CC 960 minute winter	19.162	7.617
100 year +40% CC 480 minute summer	48.256	12.753	100 year +40% CC 1440 minute summer	21.163	5.672
100 year +40% CC 480 minute winter	32.060	12.753	100 year +40% CC 1440 minute winter	14.223	5.672

Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	11	73.776	0.107	48.0	0.6674	0.0000	OK
15 minute winter	S2	11	73.205	0.150	93.6	1.2184	0.0000	OK
15 minute winter	S3	11	72.779	0.189	137.5	1.4325	0.0000	OK
15 minute winter	S4	12	72.356	0.191	135.7	0.4865	0.0000	OK
15 minute winter	S5	12	72.015	0.182	136.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	46.1	0.934	0.046	4.6527	
15 minute winter	S2	1.001	S3	91.9	1.230	0.091	5.2275	
15 minute winter	S3	1.002	S4	135.7	1.560	0.135	5.5526	
15 minute winter	S4	1.003	S5	136.5	1.603	0.135	4.2448	66.5

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	11	73.799	0.130	72.1	0.8144	0.0000	OK
15 minute winter	S2	11	73.243	0.188	141.4	1.5207	0.0000	OK
15 minute winter	S3	11	72.828	0.238	208.3	1.7961	0.0000	OK
15 minute winter	S4	12	72.404	0.239	207.5	0.6078	0.0000	OK
15 minute winter	S5	12	72.057	0.224	207.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	69.5	1.036	0.069	6.3138	
15 minute winter	S2	1.001	S3	139.7	1.362	0.139	7.1704	
15 minute winter	S3	1.002	S4	207.5	1.729	0.206	7.6634	
15 minute winter	S4	1.003	S5	207.3	1.795	0.206	5.7576	100.1

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.98%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	73.852	0.183	142.4	1.1460	0.0000	OK
15 minute winter	S2	11	73.333	0.278	281.0	2.2476	0.0000	OK
15 minute winter	S3	11	72.944	0.354	414.0	2.6795	0.0000	OK
15 minute winter	S4	11	72.523	0.358	416.6	0.9106	0.0000	OK
15 minute winter	S5	11	72.157	0.324	411.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	138.7	1.218	0.138	10.6129	
15 minute winter	S2	1.001	S3	278.7	1.582	0.276	12.2941	
15 minute winter	S3	1.002	S4	416.6	2.023	0.413	13.1456	
15 minute winter	S4	1.003	S5	411.6	2.140	0.408	9.6924	197.5

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	73.915	0.246	252.6	1.5404	0.0000	OK
15 minute winter	S2	10	73.447	0.392	499.9	3.1745	0.0000	OK
15 minute winter	S3	11	73.114	0.524	735.4	3.9607	0.0000	OK
15 minute winter	S4	11	72.687	0.522	742.2	1.3289	0.0000	OK
15 minute winter	S5	11	72.292	0.459	738.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	247.3	1.386	0.245	16.5157	
15 minute winter	S2	1.001	S3	495.0	1.758	0.491	19.5606	
15 minute winter	S3	1.002	S4	742.2	2.264	0.737	20.9279	
15 minute winter	S4	1.003	S5	738.2	2.436	0.732	15.1960	350.5

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S1	10	73.954	0.285	332.2	1.7826	0.0000	OK
15 minute winter	S2	11	73.526	0.471	658.1	3.8141	0.0000	OK
15 minute winter	S3	11	73.271	0.681	968.8	5.1503	0.0000	OK
15 minute winter	S4	11	72.814	0.649	965.0	1.6514	0.0000	OK
15 minute winter	S5	11	72.389	0.556	958.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S1	1.000	S2	325.9	1.468	0.323	20.4617	
15 minute winter	S2	1.001	S3	649.4	1.803	0.644	24.7886	
15 minute winter	S3	1.002	S4	965.0	2.338	0.958	26.3278	
15 minute winter	S4	1.003	S5	958.5	2.547	0.951	18.8079	460.9

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Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Links (Results)

Name	US Node	DS Node	Σ Area (ha)	Pro Velocity (m/s)
1.000	S1	S2	0.500	1.197
1.001	S2	S3	1.000	1.447
1.002	S3	S4	1.504	1.607
1.003	S4	S5	1.504	1.596

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	0.750	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	20.0		

Storm Durations

360

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

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100 year +40% CC 360 minute winter

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute summer	S1	184	73.794	0.125	64.2	0.7800	0.0000	OK
360 minute summer	S2	184	73.233	0.178	127.8	1.4416	0.0000	OK
360 minute summer	S3	184	72.815	0.225	190.8	1.7029	0.0000	OK
360 minute summer	S4	184	72.392	0.227	189.0	0.5788	0.0000	OK
360 minute summer	S5	184	72.046	0.213	187.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute summer	S1	1.000	S2	63.6	1.005	0.063	5.8841	
360 minute summer	S2	1.001	S3	126.2	1.326	0.125	6.6540	
360 minute summer	S3	1.002	S4	189.0	1.690	0.188	7.1390	
360 minute summer	S4	1.003	S5	187.5	1.740	0.186	5.3688	1070.6

Appendix 5

SuDS Design, SuDS O&M Requirements

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	200.0		

Links (Results)

Name	US Node	DS Node	Σ Area (ha)	Pro Velocity (m/s)
1.000	RE70.0	S80	0.020	0.656
1.001	S80	S70	0.072	0.748
2.000	RE70.2	S70	0.000	0.000
1.002	S70	S70-80	0.088	0.783
3.000	RE80.1	S70-80	0.044	1.375
1.003	S70-80	S70-80.1	0.132	0.751
1.004	S70-80.1	SW1.2	0.183	0.734
4.000	RE1	SW1.0	0.040	1.173
4.001	SW1.0	SW1.1	0.094	1.083
5.000	RE2	S1.0	0.030	0.952
5.001	S1.0	S1.1	0.030	1.409
6.000	S1.2	S1.1	0.000	0.000
5.002	S1.1	S1.3	0.103	0.841
5.003	S1.3	SW1.1	0.103	0.917
4.002	SW1.1	SW1.2	0.270	2.055
1.005	SW1.2	SW1.3	0.453	0.774
1.006	SW1.3	SW1.4	0.453	0.868
7.000	S88-99.1	S88-99.2	0.032	0.752
7.001	S88-99.2	S88-99.3	0.058	0.702
8.000	RE23-34.1	S88-99.3	0.022	1.112
7.002	S88-99.3	S23-34.1	0.086	0.554
7.003	S23-34.1	S12-22.3	0.086	1.752
9.000	RE12-22.0	S13-22.0	0.019	0.643
9.001	S13-22.0	S13-22.1	0.034	0.920
10.000	RE23-34.0	S23-34.0	0.027	0.812
11.000	RE23-34.2	S23-34.0	0.017	0.704
10.001	S23-34.0	S13-22.1	0.061	0.721
12.000	RE12-22.1	S13-22.3	0.020	0.656
12.001	S13-22.3	S13-22.1	0.035	1.231
9.002	S13-22.1	S13-22.2	0.130	1.237
9.003	S13-22.2	S12-22.3	0.172	1.982
7.004	S12-22.3	SW1.4	0.272	1.945
1.007	SW1.4	SW1.5	0.726	0.786
1.008	SW1.5	SW1.6	0.776	2.570
13.000	RE101	S101.0	0.013	0.592
13.001	S101.0	SW2.0	0.013	0.673
13.002	SW2.0	SW2.1	0.069	0.668
14.000	RE35-46.0	S35-46.1	0.020	0.571
15.000	S35-46.2	S35-46.1	0.014	1.195
14.001	S35-46.1	SW2.1	0.034	0.661
16.000	RE99	S99	0.013	0.659
16.001	S99	SW2.1	0.013	1.942

Name	US Node	DS Node	Σ Area (ha)	Pro Velocity (m/s)
13.003	SW2.1	SW2.2	0.177	0.827
13.004	SW2.2	SW1.6	0.228	0.718
17.000	RE61-69.1	SW1.6	0.029	1.742
1.009	SW1.6	SW1.7	1.074	1.797
18.000	RE47-60.0	S47-60.0	0.026	0.709
19.000	S35-46.0	S47-60.0	0.019	0.689
18.001	S47-60.0	S35-46.5	0.057	0.794
20.000	S35-46.3	S35-46.4	0.017	0.853
20.001	S35-46.4	SW1.7.1	0.017	0.722
20.002	SW1.7.1	S35-46.5	0.044	1.716
18.002	S35-46.5	SW1.7	0.127	1.625
21.000	RE47-60.1	S47-60	0.028	0.727
21.001	S47-60	SW1.7	0.043	1.225
1.010	SW1.7	FC	1.243	2.307
22.000	RE61-69.0	S61-69.0	0.025	0.706
22.001	S61-69.0	SW1.8	0.108	1.501
23.000	GEOCELLULAR STORAGE	SW1.8	0.056	0.427
22.002	SW1.8	FC	0.240	0.652
1.011	FC	SWPS	1.504	3.456

Rainfall Methodology	FEH-22	Drain Down Time (mins)	1440	10 year (l/s)	30.1
Rainfall Events	Singular	Additional Storage (m³/ha)	20.0	30 year (l/s)	44.6
Summer CV	0.750	Starting Level (m)		100 year (l/s)	59.3
Winter CV	0.840	Check Discharge Rate(s)	✓	Check Discharge Volume	✓
Analysis Speed	Detailed	1 year (l/s)	15.8	100 year 360 minute (m³)	387
Skip Steady State	x	2 year (l/s)	16.4		

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
2	0	0	0
10	0	0	0
30	35	0	0
100	40	0	0

Site Makeup	Greenfield	Growth Factor 10 year	1.62
Greenfield Method	FEH	Growth Factor 30 year	2.40
Positively Drained Area (ha)	4.339	Growth Factor 100 year	3.19
SAAR (mm)	793	Betterment (%)	0
Host	1	QMed	16.4
BFIHost	0.520	QBar	18.6
Region	6	Q 1 year (l/s)	15.8
QBar/QMed conversion factor	1.136	Q 2 year (l/s)	16.4
Growth Factor 1 year	0.85	Q 10 year (l/s)	30.1
Growth Factor 2 year	0.88	Q 30 year (l/s)	44.6

Pre-development Discharge Rate

Q 100 year (l/s) 59.3

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	4.339	Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	0.131
CWI	118.963	Runoff Volume (m³)	387

Node FC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	71.975	Product Number	CTL-SHE-0160-1580-2300-1580
Design Depth (m)	2.300	Min Outlet Diameter (m)	0.225
Design Flow (l/s)	15.8	Min Node Diameter (mm)	1800

Node GEOCELLULAR STORAGE Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	72.050
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	248

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	552.5	0.0	1.600	552.5	0.0	1.601	0.0	0.0

Approval Settings

Node Size	x	Coordinates	x	Full Bore Velocity	x	Time to Half Empty	✓
Node Losses	x	Crossings	x	Proportional Velocity	x	Return Period (years)	30
Link Size	x	Cover Depth	x	Surcharged Depth	x	Discharge Rates	x
Link Length	x	Backdrops	x	Flooding	x	Discharge Volume	x

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year 15 minute summer	74.487	21.077	1 year 480 minute winter	7.302	2.904
1 year 15 minute winter	52.272	21.077	1 year 600 minute summer	9.130	2.497
1 year 30 minute summer	48.175	13.632	1 year 600 minute winter	6.238	2.497
1 year 30 minute winter	33.807	13.632	1 year 720 minute summer	8.216	2.202
1 year 60 minute summer	32.865	8.685	1 year 720 minute winter	5.522	2.202
1 year 60 minute winter	21.835	8.685	1 year 960 minute summer	6.833	1.799
1 year 120 minute summer	24.674	6.521	1 year 960 minute winter	4.527	1.799
1 year 120 minute winter	16.393	6.521	1 year 1440 minute summer	5.054	1.354
1 year 180 minute summer	20.547	5.288	1 year 1440 minute winter	3.397	1.354
1 year 180 minute winter	13.356	5.288	2 year 15 minute summer	112.108	31.723
1 year 240 minute summer	16.999	4.492	2 year 15 minute winter	78.672	31.723
1 year 240 minute winter	11.294	4.492	2 year 30 minute summer	73.507	20.800
1 year 360 minute summer	13.626	3.506	2 year 30 minute winter	51.584	20.800
1 year 360 minute winter	8.857	3.506	2 year 60 minute summer	49.676	13.128
1 year 480 minute summer	10.990	2.904	2 year 60 minute winter	33.004	13.128

	BDR Civil & Structural Engineeri The Old Engine House Goblands Farm Business Park, H TN11 ODP	File: 25-0093 Hydraulic Calculati Network: Retirement Santiago Garnes 03/09/2025	Page 4 25-0093 Court house Farm Cophthorne Common Road Cophthorne, West Sussex		
Rainfall					
Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 120 minute summer	34.404	9.092	30 year +35% CC 30 minute winter	183.355	73.933
2 year 120 minute winter	22.857	9.092	30 year +35% CC 60 minute summer	177.950	47.027
2 year 180 minute summer	27.755	7.142	30 year +35% CC 60 minute winter	118.226	47.027
2 year 180 minute winter	18.042	7.142	30 year +35% CC 120 minute summer	106.911	28.253
2 year 240 minute summer	22.526	5.953	30 year +35% CC 120 minute winter	71.029	28.253
2 year 240 minute winter	14.966	5.953	30 year +35% CC 180 minute summer	81.078	20.864
2 year 360 minute summer	17.615	4.533	30 year +35% CC 180 minute winter	52.703	20.864
2 year 360 minute winter	11.450	4.533	30 year +35% CC 240 minute summer	63.499	16.781
2 year 480 minute summer	14.021	3.705	30 year +35% CC 240 minute winter	42.187	16.781
2 year 480 minute winter	9.315	3.705	30 year +35% CC 360 minute summer	47.752	12.288
2 year 600 minute summer	11.548	3.159	30 year +35% CC 360 minute winter	31.040	12.288
2 year 600 minute winter	7.890	3.159	30 year +35% CC 480 minute summer	37.187	9.828
2 year 720 minute summer	10.326	2.767	30 year +35% CC 480 minute winter	24.706	9.828
2 year 720 minute winter	6.940	2.767	30 year +35% CC 600 minute summer	30.207	8.262
2 year 960 minute summer	8.512	2.241	30 year +35% CC 600 minute winter	20.640	8.262
2 year 960 minute winter	5.638	2.241	30 year +35% CC 720 minute summer	26.762	7.172
2 year 1440 minute summer	6.211	1.665	30 year +35% CC 720 minute winter	17.985	7.172
2 year 1440 minute winter	4.174	1.665	30 year +35% CC 960 minute summer	21.834	5.749
10 year 15 minute summer	221.352	62.635	30 year +35% CC 960 minute winter	14.463	5.749
10 year 15 minute winter	155.335	62.635	30 year +35% CC 1440 minute summer	15.744	4.220
10 year 30 minute summer	145.903	41.286	30 year +35% CC 1440 minute winter	10.581	4.220
10 year 30 minute winter	102.388	41.286	100 year +40% CC 15 minute summer	516.534	146.161
10 year 60 minute summer	98.924	26.143	100 year +40% CC 15 minute winter	362.480	146.161
10 year 60 minute winter	65.723	26.143	100 year +40% CC 30 minute summer	346.638	98.087
10 year 120 minute summer	61.541	16.263	100 year +40% CC 30 minute winter	243.255	98.087
10 year 120 minute winter	40.886	16.263	100 year +40% CC 60 minute summer	237.723	62.823
10 year 180 minute summer	47.340	12.182	100 year +40% CC 60 minute winter	157.937	62.823
10 year 180 minute winter	30.772	12.182	100 year +40% CC 120 minute summer	139.815	36.949
10 year 240 minute summer	37.363	9.874	100 year +40% CC 120 minute winter	92.890	36.949
10 year 240 minute winter	24.823	9.874	100 year +40% CC 180 minute summer	105.070	27.038
10 year 360 minute summer	28.319	7.287	100 year +40% CC 180 minute winter	68.298	27.038
10 year 360 minute winter	18.408	7.287	100 year +40% CC 240 minute summer	81.976	21.664
10 year 480 minute summer	22.129	5.848	100 year +40% CC 240 minute winter	54.463	21.664
10 year 480 minute winter	14.702	5.848	100 year +40% CC 360 minute summer	61.667	15.869
10 year 600 minute summer	17.999	4.923	100 year +40% CC 360 minute winter	40.085	15.869
10 year 600 minute winter	12.298	4.923	100 year +40% CC 480 minute summer	48.256	12.753
10 year 720 minute summer	15.949	4.275	100 year +40% CC 480 minute winter	32.060	12.753
10 year 720 minute winter	10.719	4.275	100 year +40% CC 600 minute summer	39.417	10.781
10 year 960 minute summer	12.988	3.420	100 year +40% CC 600 minute winter	26.932	10.781
10 year 960 minute winter	8.603	3.420	100 year +40% CC 720 minute summer	35.114	9.411
10 year 1440 minute summer	9.338	2.503	100 year +40% CC 720 minute winter	23.599	9.411
10 year 1440 minute winter	6.276	2.503	100 year +40% CC 960 minute summer	28.928	7.617
30 year +35% CC 15 minute summer	392.752	111.135	100 year +40% CC 960 minute winter	19.162	7.617
30 year +35% CC 15 minute winter	275.616	111.135	100 year +40% CC 1440 minute summer	21.163	5.672
30 year +35% CC 30 minute summer	261.280	73.933	100 year +40% CC 1440 minute winter	14.223	5.672
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Results for 1 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE70.0	11	75.374	0.033	1.9	0.0223	0.0000	OK
15 minute winter	S80	10	75.078	0.062	6.8	0.0694	0.0000	OK
15 minute summer	RE70.2	1	75.350	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S70	11	74.859	0.069	8.2	0.0320	0.0000	OK
15 minute winter	RE80.1	10	76.350	0.034	4.2	0.0514	0.0000	OK
15 minute winter	S70-80	11	74.611	0.095	12.0	0.0151	0.0000	OK
15 minute winter	S70-80.1	11	74.592	0.111	16.7	0.0773	0.0000	OK
15 minute winter	RE1	11	76.808	0.036	3.8	0.0474	0.0000	OK
15 minute winter	SW1.0	11	75.522	0.059	8.8	0.1256	0.0000	OK
15 minute winter	RE2	10	76.596	0.036	2.8	0.0358	0.0000	OK
15 minute winter	S1.0	11	76.147	0.026	2.8	0.0041	0.0000	OK
15 minute summer	S1.2	1	75.560	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1.1	10	75.182	0.078	9.7	0.0774	0.0000	OK
15 minute winter	S1.3	10	75.091	0.074	9.6	0.0118	0.0000	OK
15 minute winter	SW1.1	11	74.950	0.074	24.8	0.1375	0.0000	OK
15 minute winter	SW1.2	11	74.379	0.157	41.6	0.2778	0.0000	OK
15 minute winter	SW1.3	12	74.273	0.148	41.5	0.2615	0.0000	OK
15 minute winter	S88-99.1	11	76.155	0.042	3.1	0.0515	0.0000	OK
15 minute winter	S88-99.2	11	75.679	0.055	5.3	0.0362	0.0000	OK
15 minute winter	RE23-34.1	10	76.330	0.029	2.1	0.0233	0.0000	OK
15 minute winter	S88-99.3	11	75.506	0.084	7.9	0.0229	0.0000	OK
15 minute winter	S23-34.1	11	75.416	0.039	7.9	0.0062	0.0000	OK
15 minute winter	RE12-22.0	10	76.846	0.032	1.8	0.0204	0.0000	OK
15 minute winter	S13-22.0	11	76.666	0.038	3.3	0.0213	0.0000	OK
15 minute winter	RE23-34.0	10	76.601	0.035	2.5	0.0314	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE70.0	1.000	S80	1.8	0.649	0.104	0.0708	
15 minute winter	S80	1.001	S70	6.7	0.715	0.167	0.3593	
15 minute summer	RE70.2	2.000	S70	0.0	0.000	0.000	0.0000	
15 minute winter	S70	1.002	S70-80	7.9	0.781	0.199	0.3403	
15 minute winter	RE80.1	3.000	S70-80	4.1	1.347	0.113	0.1232	
15 minute winter	S70-80	1.003	S70-80.1	12.0	0.560	0.167	0.1787	
15 minute winter	S70-80.1	1.004	SW1.2	16.6	0.763	0.270	0.2390	
15 minute winter	RE1	4.000	SW1.0	3.7	1.154	0.122	0.1379	
15 minute winter	SW1.0	4.001	SW1.1	8.7	1.069	0.146	0.3171	
15 minute winter	RE2	5.000	S1.0	2.8	1.070	0.109	0.0562	
15 minute winter	S1.0	5.001	S1.1	2.8	1.371	0.063	0.0315	
15 minute summer	S1.2	6.000	S1.1	0.0	0.000	0.000	0.0000	
15 minute winter	S1.1	5.002	S1.3	9.6	0.817	0.237	0.1664	
15 minute winter	S1.3	5.003	SW1.1	9.6	0.882	0.207	0.0906	
15 minute winter	SW1.1	4.002	SW1.2	25.0	1.960	0.116	0.1477	
15 minute winter	SW1.2	1.005	SW1.3	41.5	0.806	0.186	2.3343	
15 minute winter	SW1.3	1.006	SW1.4	41.2	0.890	0.157	0.5328	
15 minute winter	S88-99.1	7.000	S88-99.2	3.0	0.745	0.166	0.1641	
15 minute winter	S88-99.2	7.001	S88-99.3	5.3	0.509	0.132	0.3559	
15 minute winter	RE23-34.1	8.000	S88-99.3	2.1	1.103	0.178	0.0389	
15 minute winter	S88-99.3	7.002	S23-34.1	7.9	0.893	0.315	0.1723	
15 minute winter	S23-34.1	7.003	S12-22.3	7.8	1.730	0.063	0.0660	
15 minute winter	RE12-22.0	9.000	S13-22.0	1.8	0.573	0.100	0.0576	
15 minute winter	S13-22.0	9.001	S13-22.1	3.2	0.913	0.138	0.1100	
15 minute winter	RE23-34.0	10.000	S23-34.0	2.4	0.800	0.115	0.0796	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE23-34.2	10	76.388	0.034	1.6	0.0214	0.0000	OK
15 minute winter	S23-34.0	11	76.176	0.059	5.7	0.0310	0.0000	OK
15 minute winter	RE12-22.1	10	76.805	0.033	1.9	0.0225	0.0000	OK
15 minute winter	S13-22.3	10	76.606	0.032	3.4	0.0168	0.0000	OK
15 minute winter	S13-22.1	11	76.012	0.062	12.1	0.0099	0.0000	OK
15 minute winter	S13-22.2	11	75.692	0.052	16.0	0.0435	0.0000	OK
15 minute winter	S12-22.3	11	74.553	0.083	25.2	0.0252	0.0000	OK
15 minute winter	SW1.4	12	74.199	0.183	64.9	0.3235	0.0000	OK
15 minute winter	SW1.5	12	74.043	0.094	69.5	0.2147	0.0000	OK
15 minute winter	RE101	10	74.479	0.032	1.2	0.0093	0.0000	OK
15 minute winter	S101.0	11	74.324	0.024	1.2	0.0038	0.0000	OK
15 minute winter	SW2.0	11	73.995	0.067	6.6	0.1450	0.0000	OK
15 minute winter	RE35-46.0	10	74.963	0.036	1.9	0.0251	0.0000	OK
15 minute winter	S35-46.2	11	75.718	0.020	1.3	0.0134	0.0000	OK
15 minute winter	S35-46.1	11	74.866	0.049	3.2	0.0078	0.0000	OK
15 minute winter	RE99	11	76.066	0.032	1.2	0.0157	0.0000	OK
15 minute winter	S99	11	75.832	0.014	1.2	0.0022	0.0000	OK
15 minute winter	SW2.1	11	73.824	0.096	16.3	0.1522	0.0000	OK
15 minute winter	SW2.2	11	73.528	0.116	20.4	0.1796	0.0000	OK
15 minute winter	RE61-69.1	10	74.338	0.027	2.8	0.0119	0.0000	OK
15 minute winter	SW1.6	11	73.205	0.135	95.1	0.2810	0.0000	OK
15 minute winter	RE47-60.0	10	74.031	0.038	2.5	0.0331	0.0000	OK
15 minute winter	S35-46.0	10	74.052	0.031	1.8	0.0246	0.0000	OK
15 minute winter	S47-60.0	11	73.782	0.050	5.2	0.0202	0.0000	OK
15 minute winter	S35-46.3	10	74.851	0.030	1.6	0.0232	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE23-34.2	11.000	S23-34.0	1.6	0.687	0.232	0.0205	
15 minute winter	S23-34.0	10.001	S13-22.1	5.6	0.705	0.141	0.1233	
15 minute winter	RE12-22.1	12.000	S13-22.3	1.9	0.654	0.105	0.0567	
15 minute winter	S13-22.3	12.001	S13-22.1	3.3	1.202	0.098	0.0362	
15 minute winter	S13-22.1	9.002	S13-22.2	12.2	1.309	0.086	0.1788	
15 minute winter	S13-22.2	9.003	S12-22.3	16.0	1.382	0.065	0.2878	
15 minute winter	S12-22.3	7.004	SW1.4	25.2	1.773	0.124	0.0659	
15 minute winter	SW1.4	1.007	SW1.5	65.8	1.336	0.234	2.0041	
15 minute winter	SW1.5	1.008	SW1.6	69.7	2.579	0.049	0.5098	
15 minute winter	RE101	13.000	S101.0	1.2	0.664	0.206	0.0287	
15 minute winter	S101.0	13.001	SW2.0	1.2	0.662	0.055	0.0294	
15 minute winter	SW2.0	13.002	SW2.1	6.4	0.665	0.185	0.2692	
15 minute winter	RE35-46.0	14.000	S35-46.1	1.9	0.456	0.129	0.0681	
15 minute winter	S35-46.2	15.000	S35-46.1	1.3	1.178	0.085	0.0145	
15 minute winter	S35-46.1	14.001	SW2.1	3.2	0.646	0.218	0.0631	
15 minute winter	RE99	16.000	S99	1.2	0.889	0.177	0.0242	
15 minute winter	S99	16.001	SW2.1	1.2	1.908	0.038	0.0043	
15 minute winter	SW2.1	13.003	SW2.2	15.8	0.837	0.214	1.0287	
15 minute winter	SW2.2	13.004	SW1.6	20.1	0.763	0.196	0.4200	
15 minute winter	RE61-69.1	17.000	SW1.6	2.8	1.684	0.146	0.0113	
15 minute winter	SW1.6	1.009	SW1.7	95.7	1.780	0.090	3.3605	
15 minute winter	RE47-60.0	18.000	S47-60.0	2.4	0.697	0.135	0.0642	
15 minute winter	S35-46.0	19.000	S47-60.0	1.7	0.674	0.091	0.0473	
15 minute winter	S47-60.0	18.001	S35-46.5	5.2	0.792	0.108	0.3039	
15 minute winter	S35-46.3	20.000	S35-46.4	1.6	0.822	0.182	0.0205	

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S35-46.4	10	74.581	0.027	1.6	0.0043	0.0000	OK
15 minute winter	SW1.7.1	10	74.330	0.030	4.0	0.0270	0.0000	OK
15 minute winter	S35-46.5	11	73.309	0.049	11.6	0.0246	0.0000	OK
15 minute winter	RE47-60.1	10	74.117	0.041	2.7	0.0331	0.0000	OK
15 minute winter	S47-60	11	73.762	0.031	4.1	0.0141	0.0000	OK
15 minute winter	SW1.7	12	72.615	0.265	110.0	0.6737	0.0000	OK
15 minute winter	RE61-69.0	10	75.383	0.038	2.4	0.0328	0.0000	OK
15 minute winter	S61-69.0	11	75.182	0.051	10.3	0.1097	0.0000	OK
360 minute winter	GEOCELLULAR STORAGE	256	72.248	0.198	18.9	104.3167	0.0000	OK
15 minute winter	SW1.8	12	72.604	0.583	130.2	1.3146	0.0000	SURCHARGED
15 minute winter	FC	12	72.640	0.665	126.1	1.7833	0.0000	SURCHARGED
15 minute winter	SWPS	12	71.572	0.055	15.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S35-46.4	20.001	SW1.7.1	1.5	0.677	0.072	0.0394	
15 minute winter	SW1.7.1	20.002	S35-46.5	4.0	1.656	0.081	0.0282	
15 minute winter	S35-46.5	18.002	SW1.7	11.6	1.579	0.055	0.0936	
15 minute winter	RE47-60.1	21.000	S47-60	2.7	0.812	0.150	0.1135	
15 minute winter	S47-60	21.001	SW1.7	4.0	1.204	0.041	0.0740	
15 minute winter	SW1.7	1.010	FC	125.0	0.631	0.066	4.3948	
15 minute winter	RE61-69.0	22.000	S61-69.0	2.4	0.688	0.133	0.0480	
15 minute winter	S61-69.0	22.001	SW1.8	10.0	1.482	0.112	0.4700	
360 minute winter	GEOCELLULAR STORAGE	23.000	SW1.8	-17.7	-0.475	-0.083	1.2029	
15 minute winter	SW1.8	22.002	FC	-118.5	-0.553	-0.546	4.8979	
15 minute winter	FC	1.011	SWPS	15.8	2.018	0.130	0.0663	63.8

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE70.0	10	75.382	0.041	2.9	0.0276	0.0000	OK
15 minute winter	S80	10	75.093	0.077	10.3	0.0862	0.0000	OK
15 minute summer	RE70.2	1	75.350	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S70	11	74.877	0.087	12.3	0.0402	0.0000	OK
15 minute winter	RE80.1	10	76.359	0.043	6.4	0.0637	0.0000	OK
15 minute winter	S70-80	11	74.640	0.124	18.3	0.0197	0.0000	OK
15 minute winter	S70-80.1	11	74.621	0.140	25.3	0.0974	0.0000	OK
15 minute winter	RE1	10	76.816	0.044	5.7	0.0584	0.0000	OK
15 minute winter	SW1.0	11	75.536	0.073	13.3	0.1557	0.0000	OK
15 minute winter	RE2	10	76.604	0.044	4.3	0.0445	0.0000	OK
15 minute winter	S1.0	10	76.153	0.032	4.2	0.0051	0.0000	OK
15 minute summer	S1.2	1	75.560	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1.1	10	75.203	0.099	14.8	0.0979	0.0000	OK
15 minute winter	S1.3	10	75.111	0.094	14.6	0.0149	0.0000	OK
15 minute winter	SW1.1	11	74.968	0.092	37.6	0.1723	0.0000	OK
15 minute winter	SW1.2	11	74.419	0.197	63.0	0.3477	0.0000	OK
15 minute winter	SW1.3	12	74.309	0.184	63.1	0.3260	0.0000	OK
15 minute winter	S88-99.1	11	76.165	0.052	4.7	0.0642	0.0000	OK
15 minute winter	S88-99.2	11	75.692	0.068	8.1	0.0447	0.0000	OK
15 minute winter	RE23-34.1	10	76.337	0.036	3.1	0.0287	0.0000	OK
15 minute winter	S88-99.3	11	75.526	0.104	11.9	0.0281	0.0000	OK
15 minute winter	S23-34.1	11	75.426	0.048	11.9	0.0077	0.0000	OK
15 minute winter	RE12-22.0	10	76.853	0.039	2.7	0.0249	0.0000	OK
15 minute winter	S13-22.0	11	76.675	0.047	4.9	0.0263	0.0000	OK
15 minute winter	RE23-34.0	10	76.609	0.043	3.8	0.0389	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE70.0	1.000	S80	2.8	0.730	0.157	0.0955	
15 minute winter	S80	1.001	S70	10.0	0.788	0.250	0.4876	
15 minute summer	RE70.2	2.000	S70	0.0	0.000	0.000	0.0000	
15 minute winter	S70	1.002	S70-80	12.1	0.876	0.304	0.4638	
15 minute winter	RE80.1	3.000	S70-80	6.2	1.516	0.172	0.1666	
15 minute winter	S70-80	1.003	S70-80.1	18.3	0.612	0.255	0.2490	
15 minute winter	S70-80.1	1.004	SW1.2	25.3	0.858	0.411	0.3231	
15 minute winter	RE1	4.000	SW1.0	5.5	1.295	0.183	0.1845	
15 minute winter	SW1.0	4.001	SW1.1	13.1	1.198	0.220	0.4269	
15 minute winter	RE2	5.000	S1.0	4.2	1.204	0.166	0.0761	
15 minute winter	S1.0	5.001	S1.1	4.2	1.544	0.095	0.0423	
15 minute summer	S1.2	6.000	S1.1	0.0	0.000	0.000	0.0000	
15 minute winter	S1.1	5.002	S1.3	14.6	0.902	0.358	0.2282	
15 minute winter	S1.3	5.003	SW1.1	14.5	0.982	0.314	0.1233	
15 minute winter	SW1.1	4.002	SW1.2	37.7	2.179	0.176	0.2005	
15 minute winter	SW1.2	1.005	SW1.3	63.1	0.894	0.283	3.1949	
15 minute winter	SW1.3	1.006	SW1.4	62.2	0.994	0.237	0.7211	
15 minute winter	S88-99.1	7.000	S88-99.2	4.5	0.838	0.254	0.2226	
15 minute winter	S88-99.2	7.001	S88-99.3	8.1	0.581	0.201	0.4718	
15 minute winter	RE23-34.1	8.000	S88-99.3	3.0	1.227	0.262	0.0515	
15 minute winter	S88-99.3	7.002	S23-34.1	11.9	1.013	0.476	0.2282	
15 minute winter	S23-34.1	7.003	S12-22.3	11.9	1.947	0.095	0.0890	
15 minute winter	RE12-22.0	9.000	S13-22.0	2.6	0.638	0.149	0.0773	
15 minute winter	S13-22.0	9.001	S13-22.1	4.8	1.024	0.208	0.1475	
15 minute winter	RE23-34.0	10.000	S23-34.0	3.7	0.899	0.173	0.1074	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE23-34.2	10	76.397	0.043	2.4	0.0269	0.0000	OK
15 minute winter	S23-34.0	10	76.190	0.073	8.6	0.0386	0.0000	OK
15 minute winter	RE12-22.1	10	76.813	0.041	2.8	0.0274	0.0000	OK
15 minute winter	S13-22.3	10	76.614	0.040	5.0	0.0206	0.0000	OK
15 minute winter	S13-22.1	11	76.027	0.077	18.2	0.0122	0.0000	OK
15 minute winter	S13-22.2	11	75.703	0.063	23.9	0.0530	0.0000	OK
15 minute winter	S12-22.3	11	74.575	0.105	37.8	0.0320	0.0000	OK
15 minute winter	SW1.4	11	74.239	0.223	98.8	0.3947	0.0000	OK
15 minute winter	SW1.5	12	74.066	0.117	104.9	0.2671	0.0000	OK
15 minute winter	RE101	10	74.488	0.041	1.9	0.0119	0.0000	OK
15 minute winter	S101.0	11	74.330	0.030	1.9	0.0048	0.0000	OK
15 minute winter	SW2.0	11	74.012	0.084	10.0	0.1818	0.0000	OK
15 minute winter	RE35-46.0	10	74.972	0.045	2.9	0.0311	0.0000	OK
15 minute winter	S35-46.2	10	75.723	0.025	2.0	0.0166	0.0000	OK
15 minute winter	S35-46.1	11	74.878	0.061	4.8	0.0098	0.0000	OK
15 minute winter	RE99	10	76.075	0.041	1.9	0.0199	0.0000	OK
15 minute winter	S99	10	75.835	0.017	1.9	0.0027	0.0000	OK
15 minute winter	SW2.1	11	73.849	0.121	24.7	0.1922	0.0000	OK
15 minute winter	SW2.2	11	73.558	0.146	31.3	0.2260	0.0000	OK
15 minute winter	RE61-69.1	10	74.344	0.033	4.2	0.0148	0.0000	OK
15 minute winter	SW1.6	12	73.235	0.165	144.1	0.3423	0.0000	OK
15 minute winter	RE47-60.0	10	74.040	0.047	3.7	0.0409	0.0000	OK
15 minute winter	S35-46.0	10	74.059	0.038	2.7	0.0305	0.0000	OK
15 minute winter	S47-60.0	11	73.794	0.062	8.0	0.0250	0.0000	OK
15 minute winter	S35-46.3	10	74.859	0.038	2.5	0.0295	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE23-34.2	11.000	S23-34.0	2.4	0.766	0.351	0.0279	
15 minute winter	S23-34.0	10.001	S13-22.1	8.5	0.788	0.212	0.1662	
15 minute winter	RE12-22.1	12.000	S13-22.3	2.8	0.728	0.156	0.0755	
15 minute winter	S13-22.3	12.001	S13-22.1	4.9	1.342	0.145	0.0482	
15 minute winter	S13-22.1	9.002	S13-22.2	18.2	1.466	0.129	0.2395	
15 minute winter	S13-22.2	9.003	S12-22.3	24.0	1.509	0.098	0.3950	
15 minute winter	S12-22.3	7.004	SW1.4	37.9	1.951	0.186	0.0903	
15 minute winter	SW1.4	1.007	SW1.5	99.3	1.515	0.354	2.6570	
15 minute winter	SW1.5	1.008	SW1.6	105.7	2.880	0.074	0.6914	
15 minute winter	RE101	13.000	S101.0	1.9	0.753	0.322	0.0394	
15 minute winter	S101.0	13.001	SW2.0	1.9	0.752	0.085	0.0401	
15 minute winter	SW2.0	13.002	SW2.1	9.8	0.747	0.283	0.3663	
15 minute winter	RE35-46.0	14.000	S35-46.1	2.8	0.510	0.197	0.0925	
15 minute winter	S35-46.2	15.000	S35-46.1	2.0	1.327	0.129	0.0196	
15 minute winter	S35-46.1	14.001	SW2.1	4.8	0.721	0.330	0.0853	
15 minute winter	RE99	16.000	S99	1.9	1.001	0.277	0.0334	
15 minute winter	S99	16.001	SW2.1	1.9	2.166	0.059	0.0059	
15 minute winter	SW2.1	13.003	SW2.2	24.3	0.938	0.330	1.4096	
15 minute winter	SW2.2	13.004	SW1.6	31.0	0.859	0.303	0.5741	
15 minute winter	RE61-69.1	17.000	SW1.6	4.2	1.879	0.220	0.0153	
15 minute winter	SW1.6	1.009	SW1.7	144.9	1.968	0.137	6.4040	
15 minute winter	RE47-60.0	18.000	S47-60.0	3.6	0.780	0.203	0.0861	
15 minute winter	S35-46.0	19.000	S47-60.0	2.7	0.758	0.138	0.0638	
15 minute winter	S47-60.0	18.001	S35-46.5	7.9	0.892	0.164	0.4095	
15 minute winter	S35-46.3	20.000	S35-46.4	2.4	0.926	0.283	0.0283	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.91%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S35-46.4	10	74.588	0.034	2.4	0.0054	0.0000	OK
15 minute winter	SW1.7.1	10	74.337	0.037	6.2	0.0336	0.0000	OK
15 minute winter	S35-46.5	11	73.321	0.061	17.5	0.0305	0.0000	OK
15 minute winter	RE47-60.1	10	74.127	0.051	4.1	0.0411	0.0000	OK
15 minute winter	S47-60	11	73.769	0.038	6.1	0.0172	0.0000	OK
15 minute summer	SW1.7	12	72.776	0.426	158.8	1.0830	0.0000	OK
15 minute winter	RE61-69.0	10	75.393	0.048	3.7	0.0412	0.0000	OK
15 minute winter	S61-69.0	11	75.194	0.063	15.6	0.1358	0.0000	OK
240 minute winter	GEOCELLULAR STORAGE	184	72.342	0.292	38.2	153.9419	0.0000	OK
15 minute winter	SW1.8	11	72.739	0.718	251.5	1.6183	0.0000	SURCHARGED
15 minute winter	FC	11	72.779	0.804	219.1	2.1551	0.0000	SURCHARGED
15 minute summer	SWPS	11	71.572	0.055	15.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S35-46.4	20.001	SW1.7.1	2.4	0.761	0.111	0.0545	
15 minute winter	SW1.7.1	20.002	S35-46.5	6.1	1.866	0.124	0.0384	
15 minute winter	S35-46.5	18.002	SW1.7	17.6	1.774	0.083	0.1266	
15 minute winter	RE47-60.1	21.000	S47-60	4.0	0.914	0.227	0.1529	
15 minute winter	S47-60	21.001	SW1.7	6.0	1.355	0.061	0.0986	
15 minute summer	SW1.7	1.010	FC	221.2	0.738	0.116	5.5590	
15 minute winter	RE61-69.0	22.000	S61-69.0	3.6	0.774	0.205	0.0656	
15 minute winter	S61-69.0	22.001	SW1.8	15.2	1.671	0.171	0.6346	
240 minute winter	GEOCELLULAR STORAGE	23.000	SW1.8	-36.3	-0.639	-0.170	1.9227	
15 minute winter	SW1.8	22.002	FC	-233.9	-1.083	-1.079	4.8979	
15 minute winter	FC	1.011	SWPS	15.8	2.019	0.130	0.0664	97.4

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE70.0	10	75.399	0.058	5.6	0.0396	0.0000	OK
15 minute winter	S80	10	75.130	0.114	20.2	0.1271	0.0000	OK
15 minute summer	RE70.2	1	75.350	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S70	11	74.921	0.131	24.5	0.0605	0.0000	OK
15 minute winter	RE80.1	10	76.378	0.062	12.6	0.0919	0.0000	OK
15 minute winter	S70-80	11	74.715	0.199	36.3	0.0316	0.0000	OK
15 minute winter	S70-80.1	11	74.692	0.211	50.3	0.1465	0.0000	OK
15 minute winter	RE1	10	76.836	0.064	11.4	0.0852	0.0000	OK
15 minute winter	SW1.0	11	75.570	0.107	26.5	0.2284	0.0000	OK
15 minute winter	RE2	10	76.624	0.064	8.5	0.0646	0.0000	OK
15 minute winter	S1.0	10	76.165	0.044	8.4	0.0071	0.0000	OK
15 minute summer	S1.2	1	75.560	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1.1	10	75.257	0.153	29.2	0.1516	0.0000	OK
15 minute winter	S1.3	10	75.159	0.142	28.8	0.0226	0.0000	OK
15 minute winter	SW1.1	10	75.014	0.138	74.9	0.2581	0.0000	OK
15 minute winter	SW1.2	11	74.517	0.295	125.0	0.5211	0.0000	OK
15 minute winter	SW1.3	11	74.403	0.278	125.5	0.4909	0.0000	OK
15 minute winter	S88-99.1	11	76.189	0.076	9.2	0.0943	0.0000	OK
15 minute winter	S88-99.2	11	75.722	0.098	16.1	0.0644	0.0000	OK
15 minute winter	RE23-34.1	10	76.354	0.053	6.2	0.0427	0.0000	OK
15 minute winter	S88-99.3	11	75.572	0.150	23.7	0.0406	0.0000	OK
15 minute winter	S23-34.1	11	75.443	0.066	23.8	0.0106	0.0000	OK
15 minute winter	RE12-22.0	10	76.870	0.056	5.3	0.0359	0.0000	OK
15 minute winter	S13-22.0	11	76.697	0.069	9.7	0.0384	0.0000	OK
15 minute winter	RE23-34.0	10	76.629	0.063	7.6	0.0567	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE70.0	1.000	S80	5.5	0.876	0.307	0.1558	
15 minute winter	S80	1.001	S70	19.9	0.922	0.495	0.8171	
15 minute summer	RE70.2	2.000	S70	0.0	0.000	0.000	0.0004	
15 minute winter	S70	1.002	S70-80	24.2	1.040	0.606	0.7799	
15 minute winter	RE80.1	3.000	S70-80	12.3	1.826	0.342	0.2739	
15 minute winter	S70-80	1.003	S70-80.1	36.3	0.710	0.507	0.4264	
15 minute winter	S70-80.1	1.004	SW1.2	50.4	1.056	0.820	0.5221	
15 minute winter	RE1	4.000	SW1.0	11.1	1.561	0.367	0.3069	
15 minute winter	SW1.0	4.001	SW1.1	26.1	1.437	0.438	0.7088	
15 minute winter	RE2	5.000	S1.0	8.4	1.461	0.330	0.1244	
15 minute winter	S1.0	5.001	S1.1	8.3	1.620	0.190	0.1065	
15 minute summer	S1.2	6.000	S1.1	0.0	0.000	0.000	0.0184	
15 minute winter	S1.1	5.002	S1.3	28.8	1.043	0.707	0.3890	
15 minute winter	S1.3	5.003	SW1.1	28.6	1.156	0.620	0.2069	
15 minute winter	SW1.1	4.002	SW1.2	74.6	2.566	0.348	0.3372	
15 minute winter	SW1.2	1.005	SW1.3	125.5	1.043	0.563	5.4501	
15 minute winter	SW1.3	1.006	SW1.4	124.3	1.186	0.474	1.2331	
15 minute winter	S88-99.1	7.000	S88-99.2	8.9	1.001	0.502	0.3683	
15 minute winter	S88-99.2	7.001	S88-99.3	16.0	0.716	0.398	0.7543	
15 minute winter	RE23-34.1	8.000	S88-99.3	6.1	1.466	0.526	0.0865	
15 minute winter	S88-99.3	7.002	S23-34.1	23.8	1.264	0.950	0.3583	
15 minute winter	S23-34.1	7.003	S12-22.3	23.9	2.199	0.191	0.1737	
15 minute winter	RE12-22.0	9.000	S13-22.0	5.2	0.756	0.295	0.1288	
15 minute winter	S13-22.0	9.001	S13-22.1	9.5	1.229	0.412	0.2437	
15 minute winter	RE23-34.0	10.000	S23-34.0	7.4	1.082	0.347	0.1784	

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE23-34.2	10	76.420	0.066	4.8	0.0415	0.0000	OK
15 minute winter	S23-34.0	10	76.225	0.108	17.1	0.0570	0.0000	OK
15 minute winter	RE12-22.1	10	76.831	0.059	5.6	0.0397	0.0000	OK
15 minute winter	S13-22.3	10	76.632	0.058	9.9	0.0300	0.0000	OK
15 minute winter	S13-22.1	10	76.061	0.111	36.0	0.0177	0.0000	OK
15 minute winter	S13-22.2	11	75.729	0.089	47.7	0.0748	0.0000	OK
15 minute winter	S12-22.3	11	74.632	0.162	75.2	0.0493	0.0000	OK
15 minute winter	SW1.4	11	74.335	0.319	199.9	0.5638	0.0000	OK
15 minute winter	SW1.5	11	74.120	0.171	212.4	0.3896	0.0000	OK
15 minute winter	RE101	10	74.508	0.061	3.7	0.0176	0.0000	OK
15 minute winter	S101.0	10	74.342	0.042	3.7	0.0067	0.0000	OK
15 minute winter	SW2.0	11	74.052	0.124	19.7	0.2700	0.0000	OK
15 minute winter	RE35-46.0	10	74.992	0.065	5.8	0.0450	0.0000	OK
15 minute winter	S35-46.2	10	75.733	0.035	4.0	0.0233	0.0000	OK
15 minute winter	S35-46.1	11	74.911	0.094	9.7	0.0149	0.0000	OK
15 minute winter	RE99	10	76.094	0.060	3.7	0.0292	0.0000	OK
15 minute winter	S99	10	75.842	0.024	3.7	0.0038	0.0000	OK
15 minute winter	SW2.1	11	73.911	0.183	49.1	0.2921	0.0000	OK
15 minute winter	SW2.2	11	73.628	0.216	62.4	0.3337	0.0000	OK
15 minute winter	RE61-69.1	10	74.361	0.050	8.3	0.0220	0.0000	OK
30 minute summer	SW1.6	19	73.307	0.237	256.7	0.4912	0.0000	OK
15 minute winter	RE47-60.0	10	74.062	0.069	7.3	0.0598	0.0000	OK
15 minute winter	S35-46.0	10	74.076	0.055	5.4	0.0440	0.0000	OK
15 minute winter	S47-60.0	11	73.822	0.090	15.8	0.0361	0.0000	OK
15 minute winter	S35-46.3	10	74.877	0.056	4.9	0.0442	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE23-34.2	11.000	S23-34.0	4.7	0.897	0.700	0.0473	
15 minute winter	S23-34.0	10.001	S13-22.1	16.8	0.941	0.420	0.2768	
15 minute winter	RE12-22.1	12.000	S13-22.3	5.5	0.870	0.312	0.1260	
15 minute winter	S13-22.3	12.001	S13-22.1	9.8	1.613	0.289	0.0799	
15 minute winter	S13-22.1	9.002	S13-22.2	36.1	1.761	0.255	0.3944	
15 minute winter	S13-22.2	9.003	S12-22.3	47.6	1.731	0.194	0.6785	
15 minute winter	S12-22.3	7.004	SW1.4	75.6	2.269	0.372	0.1547	
15 minute winter	SW1.4	1.007	SW1.5	199.0	1.853	0.709	4.3365	
15 minute winter	SW1.5	1.008	SW1.6	211.2	3.343	0.148	1.1927	
15 minute winter	RE101	13.000	S101.0	3.7	0.897	0.627	0.0641	
15 minute winter	S101.0	13.001	SW2.0	3.6	0.907	0.164	0.0645	
15 minute winter	SW2.0	13.002	SW2.1	19.3	0.900	0.557	0.5986	
15 minute winter	RE35-46.0	14.000	S35-46.1	5.7	0.603	0.396	0.1565	
15 minute winter	S35-46.2	15.000	S35-46.1	4.0	1.518	0.259	0.0375	
15 minute winter	S35-46.1	14.001	SW2.1	9.5	0.850	0.658	0.1444	
15 minute winter	RE99	16.000	S99	3.7	1.175	0.539	0.0545	
15 minute winter	S99	16.001	SW2.1	3.6	2.619	0.115	0.0095	
15 minute winter	SW2.1	13.003	SW2.2	48.6	1.123	0.659	2.3504	
15 minute winter	SW2.2	13.004	SW1.6	62.2	1.049	0.608	0.9408	
15 minute winter	RE61-69.1	17.000	SW1.6	8.3	2.227	0.434	0.0255	
30 minute summer	SW1.6	1.009	SW1.7	256.5	2.412	0.243	5.4052	
15 minute winter	RE47-60.0	18.000	S47-60.0	7.2	0.933	0.403	0.1425	
15 minute winter	S35-46.0	19.000	S47-60.0	5.3	0.915	0.275	0.1055	
15 minute winter	S47-60.0	18.001	S35-46.5	15.7	1.078	0.327	0.6770	
15 minute winter	S35-46.3	20.000	S35-46.4	4.8	1.095	0.559	0.0473	

Results for 10 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S35-46.4	10	74.603	0.049	4.8	0.0077	0.0000	OK
15 minute winter	SW1.7.1	10	74.353	0.053	12.3	0.0485	0.0000	OK
30 minute summer	S35-46.5	18	73.343	0.083	30.9	0.0412	0.0000	OK
15 minute winter	RE47-60.1	10	74.151	0.075	8.1	0.0601	0.0000	OK
15 minute winter	S47-60	10	73.784	0.053	12.0	0.0237	0.0000	OK
15 minute winter	SW1.7	11	73.232	0.882	336.1	2.2437	0.0000	SURCHARGED
15 minute winter	RE61-69.0	10	75.415	0.070	7.3	0.0603	0.0000	OK
15 minute winter	S61-69.0	11	75.222	0.091	30.7	0.1948	0.0000	OK
240 minute winter	GEOCELLULAR STORAGE	204	72.627	0.577	95.2	304.2690	0.0000	SURCHARGED
15 minute summer	SW1.8	11	73.040	1.019	411.2	2.2961	0.0000	SURCHARGED
15 minute winter	FC	11	73.198	1.223	396.4	3.2792	0.0000	SURCHARGED
120 minute winter	SWPS	90	71.572	0.055	15.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S35-46.4	20.001	SW1.7.1	4.8	0.910	0.221	0.0904	
15 minute winter	SW1.7.1	20.002	S35-46.5	12.2	2.243	0.246	0.0634	
30 minute summer	S35-46.5	18.002	SW1.7	30.8	2.057	0.146	0.1914	
15 minute winter	RE47-60.1	21.000	S47-60	7.9	1.109	0.447	0.2474	
15 minute winter	S47-60	21.001	SW1.7	11.9	1.580	0.122	0.5222	
15 minute winter	SW1.7	1.010	FC	391.9	1.087	0.206	7.0116	
15 minute winter	RE61-69.0	22.000	S61-69.0	7.2	0.924	0.404	0.1084	
15 minute winter	S61-69.0	22.001	SW1.8	29.9	2.012	0.337	1.0373	
240 minute winter	GEOCELLULAR STORAGE	23.000	SW1.8	-93.5	-0.668	-0.437	3.1744	
15 minute summer	SW1.8	22.002	FC	-378.8	-1.754	-1.747	4.8979	
15 minute winter	FC	1.011	SWPS	15.8	2.019	0.130	0.0663	194.3

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE70.0	10	75.423	0.082	10.0	0.0552	0.0000	OK
15 minute winter	S80	11	75.204	0.188	36.0	0.2087	0.0000	OK
15 minute summer	RE70.2	1	75.350	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S70	11	75.073	0.283	43.9	0.1311	0.0000	SURCHARGED
15 minute winter	RE80.1	10	76.401	0.085	22.3	0.1266	0.0000	OK
15 minute winter	S70-80	11	74.844	0.328	60.8	0.0522	0.0000	SURCHARGED
15 minute winter	S70-80.1	11	74.799	0.318	85.8	0.2213	0.0000	SURCHARGED
15 minute winter	RE1	10	76.863	0.091	20.1	0.1205	0.0000	OK
15 minute winter	SW1.0	10	75.618	0.155	47.0	0.3313	0.0000	OK
15 minute winter	RE2	10	76.651	0.091	15.0	0.0911	0.0000	OK
15 minute winter	S1.0	10	76.181	0.060	14.8	0.0095	0.0000	OK
15 minute summer	S1.2	1	75.560	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1.1	11	75.444	0.340	51.8	0.3376	0.0000	SURCHARGED
15 minute winter	S1.3	11	75.266	0.249	50.3	0.0396	0.0000	SURCHARGED
15 minute winter	SW1.1	10	75.076	0.200	131.5	0.3746	0.0000	OK
15 minute winter	SW1.2	11	74.662	0.440	217.8	0.7769	0.0000	OK
15 minute winter	SW1.3	11	74.532	0.407	217.8	0.7188	0.0000	OK
15 minute winter	S88-99.1	11	76.226	0.113	16.3	0.1399	0.0000	OK
15 minute winter	S88-99.2	11	75.763	0.139	28.5	0.0914	0.0000	OK
15 minute winter	RE23-34.1	10	76.379	0.078	10.9	0.0623	0.0000	OK
15 minute winter	S88-99.3	11	75.679	0.257	42.2	0.0695	0.0000	SURCHARGED
15 minute winter	S23-34.1	11	75.466	0.089	41.8	0.0142	0.0000	OK
15 minute winter	RE12-22.0	10	76.894	0.080	9.4	0.0508	0.0000	OK
15 minute winter	S13-22.0	10	76.727	0.099	17.3	0.0554	0.0000	OK
15 minute winter	RE23-34.0	10	76.655	0.089	13.4	0.0801	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE70.0	1.000	S80	9.9	0.952	0.556	0.2933	
15 minute winter	S80	1.001	S70	35.8	1.008	0.890	1.4088	
15 minute summer	RE70.2	2.000	S70	0.0	0.000	0.000	0.1037	
15 minute winter	S70	1.002	S70-80	40.5	1.073	1.014	1.3320	
15 minute winter	RE80.1	3.000	S70-80	22.1	1.938	0.613	0.5673	
15 minute winter	S70-80	1.003	S70-80.1	61.1	0.868	0.852	0.5866	
15 minute winter	S70-80.1	1.004	SW1.2	86.0	1.276	1.398	0.7014	
15 minute winter	RE1	4.000	SW1.0	19.6	1.793	0.651	0.4739	
15 minute winter	SW1.0	4.001	SW1.1	46.1	1.630	0.774	1.1052	
15 minute winter	RE2	5.000	S1.0	14.8	1.676	0.583	0.1904	
15 minute winter	S1.0	5.001	S1.1	14.7	1.616	0.336	0.1897	
15 minute summer	S1.2	6.000	S1.1	0.0	0.000	0.000	0.1092	
15 minute winter	S1.1	5.002	S1.3	50.3	1.265	1.236	0.5608	
15 minute winter	S1.3	5.003	SW1.1	50.5	1.284	1.095	0.3137	
15 minute winter	SW1.1	4.002	SW1.2	131.8	2.792	0.614	0.6016	
15 minute winter	SW1.2	1.005	SW1.3	217.8	1.168	0.977	8.4361	
15 minute winter	SW1.3	1.006	SW1.4	216.2	1.301	0.825	1.9387	
15 minute winter	S88-99.1	7.000	S88-99.2	15.8	1.124	0.889	0.5808	
15 minute winter	S88-99.2	7.001	S88-99.3	28.1	0.813	0.702	1.1059	
15 minute winter	RE23-34.1	8.000	S88-99.3	10.9	1.607	0.941	0.1494	
15 minute winter	S88-99.3	7.002	S23-34.1	41.8	1.388	1.667	0.5149	
15 minute winter	S23-34.1	7.003	S12-22.3	41.8	2.190	0.335	0.3386	
15 minute winter	RE12-22.0	9.000	S13-22.0	9.3	0.852	0.524	0.2026	
15 minute winter	S13-22.0	9.001	S13-22.1	16.9	1.403	0.733	0.3800	
15 minute winter	RE23-34.0	10.000	S23-34.0	13.1	1.244	0.617	0.2757	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE23-34.2	11	76.521	0.167	8.5	0.1050	0.0000	SURCHARGED
15 minute winter	S23-34.0	10	76.273	0.156	30.0	0.0823	0.0000	OK
15 minute winter	RE12-22.1	10	76.855	0.083	9.9	0.0556	0.0000	OK
15 minute winter	S13-22.3	10	76.655	0.081	17.5	0.0421	0.0000	OK
15 minute winter	S13-22.1	10	76.105	0.155	63.6	0.0246	0.0000	OK
15 minute winter	S13-22.2	11	75.760	0.120	84.3	0.1011	0.0000	OK
15 minute winter	S12-22.3	11	74.713	0.243	132.6	0.0742	0.0000	OK
15 minute winter	SW1.4	11	74.450	0.434	349.2	0.7665	0.0000	OK
15 minute winter	SW1.5	11	74.171	0.222	371.7	0.5039	0.0000	OK
15 minute winter	RE101	12	74.612	0.165	6.5	0.0475	0.0000	SURCHARGED
15 minute winter	S101.0	12	74.480	0.180	6.6	0.0286	0.0000	SURCHARGED
15 minute winter	SW2.0	12	74.450	0.522	34.5	1.1371	0.0000	SURCHARGED
15 minute winter	RE35-46.0	11	75.032	0.105	10.2	0.0721	0.0000	OK
15 minute winter	S35-46.2	10	75.746	0.048	7.1	0.0319	0.0000	OK
15 minute winter	S35-46.1	11	74.987	0.170	16.6	0.0271	0.0000	SURCHARGED
15 minute winter	RE99	11	76.129	0.095	6.5	0.0465	0.0000	OK
15 minute summer	S99	10	75.849	0.031	6.1	0.0050	0.0000	OK
15 minute winter	SW2.1	11	74.361	0.633	84.4	1.0076	0.0000	SURCHARGED
15 minute winter	SW2.2	11	74.070	0.658	100.3	1.0153	0.0000	SURCHARGED
15 minute winter	RE61-69.1	11	74.403	0.092	14.7	0.0407	0.0000	OK
15 minute winter	SW1.6	11	74.004	0.934	506.8	1.9383	0.0000	SURCHARGED
15 minute winter	RE47-60.0	10	74.092	0.099	12.9	0.0861	0.0000	OK
15 minute winter	S35-46.0	10	74.099	0.078	9.6	0.0616	0.0000	OK
15 minute winter	S47-60.0	12	73.939	0.207	28.1	0.0832	0.0000	OK
15 minute winter	S35-46.3	10	74.912	0.091	8.7	0.0713	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE23-34.2	11.000	S23-34.0	8.1	1.041	1.205	0.0684	
15 minute winter	S23-34.0	10.001	S13-22.1	29.8	1.067	0.744	0.4297	
15 minute winter	RE12-22.1	12.000	S13-22.3	9.8	0.992	0.551	0.1951	
15 minute winter	S13-22.3	12.001	S13-22.1	17.3	1.851	0.509	0.1227	
15 minute winter	S13-22.1	9.002	S13-22.2	63.8	2.029	0.451	0.6045	
15 minute winter	S13-22.2	9.003	S12-22.3	84.1	1.911	0.342	1.0575	
15 minute winter	S12-22.3	7.004	SW1.4	133.0	2.536	0.655	0.2411	
15 minute winter	SW1.4	1.007	SW1.5	348.0	2.262	1.239	6.2050	
15 minute winter	SW1.5	1.008	SW1.6	374.0	3.283	0.262	3.5422	
15 minute winter	RE101	13.000	S101.0	6.4	0.972	1.103	0.1231	
15 minute winter	S101.0	13.001	SW2.0	7.8	1.014	0.356	0.2859	
15 minute winter	SW2.0	13.002	SW2.1	39.5	0.994	1.143	1.1123	
15 minute winter	RE35-46.0	14.000	S35-46.1	9.8	0.658	0.677	0.2538	
15 minute winter	S35-46.2	15.000	S35-46.1	7.1	1.561	0.460	0.0756	
15 minute winter	S35-46.1	14.001	SW2.1	16.6	0.962	1.149	0.2104	
15 minute winter	RE99	16.000	S99	6.3	1.274	0.929	0.0835	
15 minute summer	S99	16.001	SW2.1	6.1	3.014	0.193	0.0334	
15 minute winter	SW2.1	13.003	SW2.2	82.1	1.264	1.113	3.8217	
15 minute winter	SW2.2	13.004	SW1.6	106.3	1.181	1.039	1.7490	
15 minute winter	RE61-69.1	17.000	SW1.6	13.9	2.465	0.730	0.0527	
15 minute winter	SW1.6	1.009	SW1.7	519.8	1.753	0.492	18.1370	
15 minute winter	RE47-60.0	18.000	S47-60.0	12.7	1.063	0.717	0.2613	
15 minute winter	S35-46.0	19.000	S47-60.0	9.4	1.059	0.491	0.2264	
15 minute winter	S47-60.0	18.001	S35-46.5	29.1	1.087	0.606	1.8146	
15 minute winter	S35-46.3	20.000	S35-46.4	8.5	1.190	0.982	0.0802	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.45%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S35-46.4	10	74.621	0.067	8.5	0.0107	0.0000	OK
15 minute winter	SW1.7.1	11	74.373	0.073	21.8	0.0668	0.0000	OK
15 minute winter	S35-46.5	11	73.849	0.589	61.7	0.2940	0.0000	SURCHARGED
15 minute winter	RE47-60.1	10	74.186	0.110	14.4	0.0880	0.0000	OK
15 minute winter	S47-60	11	73.841	0.110	21.3	0.0494	0.0000	OK
15 minute winter	SW1.7	11	73.805	1.455	600.1	3.7019	0.0000	SURCHARGED
15 minute winter	RE61-69.0	10	75.446	0.101	12.9	0.0871	0.0000	OK
15 minute winter	S61-69.0	10	75.257	0.126	54.5	0.2691	0.0000	OK
360 minute winter	GEOCELLULAR STORAGE	352	73.230	1.180	113.8	621.6597	0.0000	SURCHARGED
15 minute winter	SW1.8	10	73.312	1.291	690.3	2.9094	0.0000	SURCHARGED
15 minute winter	FC	11	73.725	1.750	618.4	4.6924	0.0000	SURCHARGED
960 minute winter	SWPS	480	71.572	0.055	15.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S35-46.4	20.001	SW1.7.1	8.5	1.079	0.390	0.1381	
15 minute winter	SW1.7.1	20.002	S35-46.5	21.6	2.450	0.436	0.1528	
15 minute winter	S35-46.5	18.002	SW1.7	60.7	2.028	0.287	0.8994	
15 minute winter	RE47-60.1	21.000	S47-60	14.2	1.276	0.800	0.4621	
15 minute winter	S47-60	21.001	SW1.7	21.1	1.573	0.216	0.6589	
15 minute winter	SW1.7	1.010	FC	610.3	1.387	0.321	7.0116	
15 minute winter	RE61-69.0	22.000	S61-69.0	12.7	1.051	0.716	0.1687	
15 minute winter	S61-69.0	22.001	SW1.8	53.7	2.319	0.606	2.1028	
360 minute winter	GEOCELLULAR STORAGE	23.000	SW1.8	-110.1	-0.510	-0.515	3.1744	
15 minute winter	SW1.8	22.002	FC	-613.2	-2.839	-2.827	4.8979	
15 minute winter	FC	1.011	SWPS	15.8	2.020	0.130	0.0664	345.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE70.0	12	75.846	0.505	13.1	0.3417	0.0000	FLOOD RISK
15 minute winter	S80	12	75.732	0.716	44.6	0.7971	0.0000	SURCHARGED
15 minute winter	RE70.2	12	75.499	0.149	1.7	0.0027	0.0000	SURCHARGED
15 minute winter	S70	12	75.491	0.701	50.4	0.3247	0.0000	SURCHARGED
15 minute winter	RE80.1	10	76.418	0.102	29.4	0.1524	0.0000	OK
15 minute winter	S70-80	12	75.173	0.657	74.5	0.1045	0.0000	SURCHARGED
15 minute winter	S70-80.1	12	75.110	0.629	106.4	0.4374	0.0000	SURCHARGED
15 minute winter	RE1	10	76.882	0.110	26.5	0.1455	0.0000	OK
15 minute winter	SW1.0	12	75.774	0.311	62.4	0.6665	0.0000	SURCHARGED
15 minute winter	RE2	10	76.669	0.109	19.7	0.1101	0.0000	OK
15 minute winter	S1.0	11	76.196	0.075	19.5	0.0119	0.0000	OK
15 minute winter	S1.2	12	75.737	0.177	1.9	0.0282	0.0000	SURCHARGED
15 minute winter	S1.1	11	75.709	0.605	68.0	0.5998	0.0000	SURCHARGED
15 minute winter	S1.3	12	75.475	0.458	64.2	0.0729	0.0000	SURCHARGED
15 minute winter	SW1.1	12	75.309	0.433	171.6	0.8086	0.0000	SURCHARGED
15 minute winter	SW1.2	12	74.967	0.745	274.3	1.3170	0.0000	SURCHARGED
15 minute winter	SW1.3	12	74.808	0.683	267.1	1.2066	0.0000	SURCHARGED
15 minute winter	S88-99.1	11	76.479	0.366	21.4	0.4514	0.0000	FLOOD RISK
15 minute winter	S88-99.2	11	75.950	0.326	35.0	0.2151	0.0000	SURCHARGED
15 minute winter	RE23-34.1	12	76.752	0.451	14.4	0.3622	0.0000	FLOOD RISK
15 minute winter	S88-99.3	11	75.773	0.351	50.8	0.0950	0.0000	SURCHARGED
15 minute winter	S23-34.1	12	75.482	0.105	50.5	0.0167	0.0000	OK
15 minute winter	RE12-22.0	10	76.908	0.094	12.4	0.0600	0.0000	OK
15 minute winter	S13-22.0	10	76.753	0.125	22.8	0.0699	0.0000	OK
15 minute winter	RE23-34.0	10	76.673	0.107	17.7	0.0971	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE70.0	1.000	S80	12.2	0.936	0.688	0.4399	
15 minute winter	S80	1.001	S70	40.3	1.020	1.003	1.4913	
15 minute winter	RE70.2	2.000	S70	2.7	0.351	0.353	0.2073	
15 minute winter	S70	1.002	S70-80	49.0	1.232	1.227	1.3320	
15 minute winter	RE80.1	3.000	S70-80	29.1	1.911	0.808	0.6183	
15 minute winter	S70-80	1.003	S70-80.1	72.8	1.033	1.014	0.5866	
15 minute winter	S70-80.1	1.004	SW1.2	104.2	1.480	1.694	0.7714	
15 minute winter	RE1	4.000	SW1.0	26.3	1.837	0.874	0.6659	
15 minute winter	SW1.0	4.001	SW1.1	59.5	1.642	0.999	1.5522	
15 minute winter	RE2	5.000	S1.0	19.5	1.740	0.768	0.2404	
15 minute winter	S1.0	5.001	S1.1	19.2	1.562	0.439	0.2072	
15 minute winter	S1.2	6.000	S1.1	3.4	0.498	0.515	0.2184	
15 minute winter	S1.1	5.002	S1.3	64.2	1.614	1.576	0.5608	
15 minute winter	S1.3	5.003	SW1.1	63.7	1.604	1.382	0.3326	
15 minute winter	SW1.1	4.002	SW1.2	170.2	2.799	0.793	0.8163	
15 minute winter	SW1.2	1.005	SW1.3	267.1	1.243	1.198	9.7789	
15 minute winter	SW1.3	1.006	SW1.4	254.7	1.341	0.971	2.4872	
15 minute winter	S88-99.1	7.000	S88-99.2	19.0	1.113	1.070	0.7286	
15 minute winter	S88-99.2	7.001	S88-99.3	34.6	0.871	0.864	1.3440	
15 minute winter	RE23-34.1	8.000	S88-99.3	12.3	1.613	1.061	0.1630	
15 minute winter	S88-99.3	7.002	S23-34.1	50.5	1.529	2.013	0.5483	
15 minute winter	S23-34.1	7.003	S12-22.3	50.4	2.200	0.404	0.4220	
15 minute winter	RE12-22.0	9.000	S13-22.0	12.3	0.895	0.693	0.2535	
15 minute winter	S13-22.0	9.001	S13-22.1	22.4	1.448	0.971	0.5082	
15 minute winter	RE23-34.0	10.000	S23-34.0	17.5	1.272	0.821	0.3729	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	RE23-34.2	11	76.668	0.314	11.2	0.1978	0.0000	FLOOD RISK
15 minute winter	S23-34.0	11	76.313	0.196	39.4	0.1035	0.0000	OK
15 minute winter	RE12-22.1	10	76.872	0.100	13.0	0.0668	0.0000	OK
15 minute winter	S13-22.3	10	76.672	0.098	23.0	0.0508	0.0000	OK
15 minute winter	S13-22.1	11	76.135	0.185	83.7	0.0294	0.0000	OK
15 minute winter	S13-22.2	11	75.780	0.140	110.6	0.1178	0.0000	OK
15 minute winter	S12-22.3	12	74.974	0.504	169.2	0.1539	0.0000	SURCHARGED
15 minute winter	SW1.4	12	74.740	0.724	416.2	1.2789	0.0000	SURCHARGED
15 minute winter	SW1.5	12	74.543	0.594	444.3	1.3508	0.0000	OK
15 minute winter	RE101	12	75.293	0.846	8.6	0.2436	0.0000	FLOOD RISK
15 minute winter	S101.0	12	75.141	0.841	8.0	0.1337	0.0000	FLOOD RISK
15 minute winter	SW2.0	12	75.116	1.188	41.8	2.5861	0.0000	SURCHARGED
15 minute winter	RE35-46.0	12	75.223	0.296	13.4	0.2040	0.0000	SURCHARGED
15 minute winter	S35-46.2	10	75.754	0.056	9.3	0.0376	0.0000	OK
15 minute winter	S35-46.1	12	75.144	0.327	21.6	0.0521	0.0000	SURCHARGED
15 minute winter	RE99	11	76.312	0.278	8.6	0.1355	0.0000	FLOOD RISK
15 minute winter	S99	11	75.852	0.034	7.8	0.0054	0.0000	OK
15 minute winter	SW2.1	12	74.956	1.228	95.0	1.9551	0.0000	SURCHARGED
15 minute winter	SW2.2	12	74.495	1.083	123.1	1.6712	0.0000	SURCHARGED
15 minute winter	RE61-69.1	12	75.048	0.737	19.4	0.3264	0.0000	SURCHARGED
15 minute winter	SW1.6	12	74.401	1.331	609.2	2.7625	0.0000	SURCHARGED
15 minute winter	RE47-60.0	11	74.573	0.580	17.0	0.5047	0.0000	FLOOD RISK
15 minute winter	S35-46.0	12	74.501	0.480	12.7	0.3807	0.0000	FLOOD RISK
15 minute winter	S47-60.0	11	74.416	0.684	33.7	0.2752	0.0000	FLOOD RISK
15 minute winter	S35-46.3	11	75.092	0.271	11.4	0.2119	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	RE23-34.2	11.000	S23-34.0	10.6	1.354	1.569	0.0696	
15 minute winter	S23-34.0	10.001	S13-22.1	39.1	1.143	0.975	0.5236	
15 minute winter	RE12-22.1	12.000	S13-22.3	12.9	1.044	0.724	0.2437	
15 minute winter	S13-22.3	12.001	S13-22.1	22.8	1.961	0.672	0.1527	
15 minute winter	S13-22.1	9.002	S13-22.2	84.0	2.160	0.594	0.7459	
15 minute winter	S13-22.2	9.003	S12-22.3	110.6	1.987	0.450	1.2401	
15 minute winter	S12-22.3	7.004	SW1.4	161.4	2.556	0.795	0.3268	
15 minute winter	SW1.4	1.007	SW1.5	418.3	2.197	1.490	11.1714	
15 minute winter	SW1.5	1.008	SW1.6	460.0	3.178	0.322	5.3009	
15 minute winter	RE101	13.000	S101.0	8.0	1.021	1.370	0.1231	
15 minute winter	S101.0	13.001	SW2.0	14.5	1.072	0.659	0.2859	
15 minute winter	SW2.0	13.002	SW2.1	40.9	1.029	1.183	1.1123	
15 minute winter	RE35-46.0	14.000	S35-46.1	12.4	0.702	0.855	0.2910	
15 minute winter	S35-46.2	15.000	S35-46.1	9.3	1.547	0.603	0.0811	
15 minute winter	S35-46.1	14.001	SW2.1	20.9	1.189	1.445	0.2272	
15 minute winter	RE99	16.000	S99	7.8	1.296	1.153	0.0874	
15 minute winter	S99	16.001	SW2.1	7.8	3.004	0.248	0.0348	
15 minute winter	SW2.1	13.003	SW2.2	94.8	1.346	1.285	3.8217	
15 minute winter	SW2.2	13.004	SW1.6	123.4	1.194	1.206	1.7490	
15 minute winter	RE61-69.1	17.000	SW1.6	16.2	2.488	0.855	0.0537	
15 minute winter	SW1.6	1.009	SW1.7	615.2	1.947	0.582	18.1370	
15 minute winter	RE47-60.0	18.000	S47-60.0	15.0	1.089	0.847	0.3272	
15 minute winter	S35-46.0	19.000	S47-60.0	11.3	1.099	0.586	0.3211	
15 minute winter	S47-60.0	18.001	S35-46.5	33.0	1.063	0.689	1.8498	
15 minute winter	S35-46.3	20.000	S35-46.4	10.7	1.366	1.239	0.0831	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.49%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	S35-46.4	11	74.628	0.074	10.7	0.0118	0.0000	OK
15 minute winter	SW1.7.1	11	74.524	0.224	27.7	0.2032	0.0000	SURCHARGED
15 minute winter	S35-46.5	11	74.212	0.952	73.8	0.4752	0.0000	SURCHARGED
15 minute winter	RE47-60.1	11	74.559	0.483	18.9	0.3880	0.0000	FLOOD RISK
480 minute winter	S47-60	464	74.205	0.474	3.2	0.2127	0.0000	SURCHARGED
480 minute winter	SW1.7	464	74.205	1.855	253.7	4.7200	0.0000	SURCHARGED
15 minute winter	RE61-69.0	10	75.471	0.126	16.9	0.1095	0.0000	OK
15 minute winter	S61-69.0	10	75.282	0.151	71.6	0.3227	0.0000	OK
480 minute winter	GEOCELLULAR STORAGE	464	74.205	2.155	178.1	844.6866	0.0000	SURCHARGED
480 minute winter	SW1.8	464	74.205	2.184	121.1	4.9220	0.0000	SURCHARGED
480 minute winter	FC	464	74.205	2.230	91.4	5.9776	0.0000	SURCHARGED
180 minute winter	SWPS	84	71.572	0.055	15.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	S35-46.4	20.001	SW1.7.1	10.7	1.003	0.493	0.2254	
15 minute winter	SW1.7.1	20.002	S35-46.5	26.5	2.556	0.537	0.2055	
15 minute winter	S35-46.5	18.002	SW1.7	74.6	1.967	0.352	0.8994	
15 minute winter	RE47-60.1	21.000	S47-60	17.1	1.253	0.961	0.6082	
480 minute winter	S47-60	21.001	SW1.7	3.2	1.127	0.033	0.8879	
480 minute winter	SW1.7	1.010	FC	-168.0	-0.485	-0.088	7.0116	
15 minute winter	RE61-69.0	22.000	S61-69.0	16.5	1.097	0.934	0.2116	
15 minute winter	S61-69.0	22.001	SW1.8	70.7	2.385	0.797	2.3757	
480 minute winter	GEOCELLULAR STORAGE	23.000	SW1.8	-174.4	-0.808	-0.816	3.1744	
480 minute winter	SW1.8	22.002	FC	-108.3	-0.501	-0.499	4.8979	
480 minute winter	FC	1.011	SWPS	15.8	2.020	0.130	0.0664	1283.1

Manholes and Inspection Chambers

Schedule	Action Required	Frequency
Regular maintenance	Lift covers and ensure there are no blockages. Inspect and identify any parts that are not operating correctly and rectify.	For 3 months following installation
	Ensure covers are in a good state of repair.	Monthly
	Inspect manholes, and inspection chambers, to ensure that the drainage system is running freely.	Six monthly and every Autumn after leaf fall
Occasional maintenance	High pressure jetting (to Water Jetting Association standards) and CCTV where necessary.	Every 2 – 4 years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repair. • System rehabilitation following a pollution event. • Manhole cover replacement. • Repairs to brickwork or concrete. • Channel repair.	As required (tasks to repair problems due to wear, damage or vandalism).

Catchpits

Schedule	Action Required	Frequency
Regular maintenance	Lift covers and ensure there are no blockages. Inspect and identify any parts that are not operating correctly and rectify. Inspect silt storage in sump. Remove silt as required using sub-contractor with vacuum suction plant.	For 3 months following installation
	Ensure covers are in a good state of repair. Repair/replace as necessary.	Monthly
	Inspect catchpits to ensure that the drainage is running freely, and free of debris. Inspect silt storage in sump. Remove silt as required using sub-contractor with vacuum suction plant.	Six Monthly and every autumn after leaf fall
Occasional maintenance	High pressure jetting (to Water Jetting Association standards) and CCTV where necessary. Remediate any chamber structural defects, or any defects that may reduce the free flow of water.	Every 2 – 4 Years
Remedial maintenance	- Silt removal. - Inlet/outlet repair. - Erosion repair. - System rehabilitation following a pollution event. - Manhole cover replacement. - Repairs to brickwork or concrete.	As required (tasks to repair problems due to wear, damage or vandalism).

Linear Drains

Schedule	Action Required	Frequency
Regular maintenance	Inspect linear drains to ensure there are no blockages at surface level. Lift covers to outflow sumps and check for blockages or siltation. Inspect and identify any parts that are not operating correctly and rectify.	For 3 months following installation
	Inspect linear drains to ensure that there are no blockages at surface level.	Monthly
	Lift covers to outflow sumps and check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Jetting of linear drains and vacuum suction of outlet sumps (to Water Jetting Association standards). CCTV where necessary.	Every 1 – 2 Years
Remedial maintenance	- Silt removal. - Inlet/outlet repair. - Erosion repair. - System rehabilitation following a pollution event. - Linear drain cover replacement. - Channel repair. - Ensure that impermeable surfaces surrounding linear drains have not settled below top of linear drain level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Gullies

Schedule	Action Required	Frequency
Regular maintenance	Inspect to ensure that there are no blockages at surface level, and that the outfall is operating effectively. Inspect and identify any parts that are not operating correctly and rectify.	For 3 months following installation
	Ensure that there are no blockages at surface level.	Monthly
	Lift covers to check for blockages or siltation.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Remove oil and silt using specialist vacuum suction plant.	Every 1 – 2 Years
Remedial maintenance	• Silt removal. • Inlet/outlet repair. • Erosion repair. • System rehabilitation following a pollution event. • Cover replacement. • Structural failure of gully pot. • Ensure that impermeable surfaces surrounding linear drains have not settled below top of gully cover level, causing ponding.	As required (tasks to repair problems due to wear, damage or vandalism).

Pipework

Schedule	Action Required	Frequency
Regular maintenance	Refer to manufacturer's specification. Inspect and identify any parts that are not operating correctly, consult supplier and rectify as required.	For 3 months following installation
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
	Lift manholes covers to check for blockages. Remove sediment from pre-treatment structures, gullies, catchpits etc.	Six Monthly and every autumn after leaf fall
Occasional maintenance	Jetting of pipe runs (to Water Jetting Association standards). Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	Inspect, and carry out remediation works to ensure that the features are in fully working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Vortex Flow Controls

Schedule	Action Required	Frequency
Regular maintenance	Refer to manufacturer's specification. Inspect and identify any parts that are not operating correctly, consult supplier and rectify as required.	For 3 months following installation
	Monitor working of drainage at ground level. If there is localised flooding check the condition of all system elements.	Monthly
	Lift manholes covers to check for blockages. Remove sediment from pre-treatment structures, gullies, catchpits.	Six monthly and every autumn after leaf fall
Occasional maintenance	Jetting of pipe runs (to Water Jetting Association standards). Remediate as necessary.	Every 1 – 2 Years
Remedial maintenance	Inspect, and carry out remediation works to ensure that the components are in full working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Rainwater Harvesting

Any property with an RWH system installed should be provided with appropriate information as to what equipment has been installed, its purpose, its operation and maintenance requirements, the actions needed to address any potential failure and the expected performance of the system. Information on the options for external maintenance support should also be provided.

Most systems require periodic checking and maintenance to ensure trouble-free and reliable operation. There are wide differences in the extent of maintenance required for different systems, and manufacturers' guidelines should always be followed. The table provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Maintenance requirements are largely dependent on the runoff source and the runoff use (and thus treatment processes provided). This will range from weekly input through to rare intervention. Routine inspection of the filter system at quarterly annual intervals is advised, even if they do not appear to need specific intervention. Pumps need very little attention, but their design life is generally regarded as only being 10 years. Where automatic provision of potable water occurs (if and when rainwater is either not available or the system has failed), it is useful to have sensor warnings relayed in such a manner as to inform the user of the current status of the system.

RWH systems should be designed so that when there is an absence of rain, or a need to disconnect the system for maintenance or repair, that potable water is safely available for all appliances to avoid inconvenience.

Tanks should be accessible for internal inspection, and the cover should preferably be lockable. For more guidance on operation and maintenance of RWH systems, see BS 8515:2009+A1:2013.

Activity	Action Required	Frequency
Regular maintenance	Inspection of the tank for debris and sediment build-up, inlets/outlets/withdrawal devices, overflow areas, pumps, filters. Cleaning of tank, inlets, outlets, withdrawal devices and roof drain filters of silts and other debris.	Annually (and following poor performance)
Occasional maintenance	Cleaning and/or replacement of any filters.	3 Monthly (or as required)
Remedial maintenance	Repair of overflow erosion damage or damage to tank. Pump repairs.	As required

The maintenance responsibility for an RWH system is usually with the owner of the property, but any communal systems require the participating community to be informed of the system, as detailed, but also be provided with information of who the organization is that is maintaining the system and any financial commitments and any legally binding maintenance agreement.

Green/Blue Roof

Intensive green roofs are likely to require regular inspection and maintenance. Grassed areas may require mowing weekly or fortnightly, plant beds may require weeding on a weekly or fortnightly basis during the growing season, and wildflower meadows may require annual mowing with the cuttings removed. Extensive green roofs should normally only require biannual or annual visits to remove litter, check fire breaks and drains and, in some cases, remove unwanted invasive plants. The most maintenance is generally required during the establishment stage (12 to 15 months), and this should usually be made the responsibility of the green roof provider. Maintenance contractors with specialist training in green roof care should be used, where possible.

The table provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required. Actual requirements will depend on the planting, the desired aesthetic and visual effect and the biodiversity objectives for the system. Maintenance specifications and schedules should therefore be specified for any individual green roof.

If mechanical systems are located on the roof, then spill prevention measures should be exercised to ensure that roof runoff is not contaminated. The mechanical system area should be bunded and provided with separate drainage.

All maintenance actions carried out at roof level must be in full compliance with the appropriate health and safety regulations, and particularly those specifically dealing with working at height. Training and guidance information on operating and maintaining the roof should be provided to all property owners and tenants. Safety fastenings will be required for personnel working on the roof.

Access routes to the roof should be designed and maintained to be safe and efficient, and walkways should always be kept clear of obstructions. Secure points for harness attachments should be provided when access near to the roof edges is required.

Specific maintenance needs of the green roof should be monitored and maintenance schedules adjusted to suit requirements.

Activity	Action Required	Frequency
Regular inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability. Inspect soil substrate for evidence of erosion channels and identify any sediment sources. Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system. Inspect underside of roof for evidence of leakage.	Annually and after severe storms
Regular maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth. Remove fallen leaves and debris from deciduous plant foliage. Remove nuisance and invasive vegetation, including weeds. Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate.	6 Monthly and Annually or as required
	During establishment (ie year one), replace dead plants as required.	Monthly (usually manufacture's responsibility)
	Post establishment, replace dead plants as required (where >5 % of coverage)	Annually (in Autumn)
Remedial maintenance	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled If drain inlet has settle, cracked or moved, investigate and repair as appropriate.	As required

CDM 2015 requires designers to ensure that all maintenance risks have been identified and eliminated, reduced or controlled where appropriate. This information will be required as part of the health and safety file.

Pervious Pavements

Regular inspection and maintenance is important for the effective operation of pervious pavements. Maintenance responsibility for a pervious pavement and its surrounding area should be placed with an appropriate responsible organization. Before handing over the pavement to the client, it should

be inspected for clogging, litter, weeds and water ponding, and all failures should be rectified. After handover, the pavement should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious pavements need to be regularly cleaned of silt and other sediments to preserve their infiltration capacity. Extensive experience suggests that sweeping once per year should be sufficient to maintain an acceptable infiltration rate on most sites. However, in some instances, more or less sweeping may be required and the frequency should be adjusted to suit site-specific circumstances and should be informed by inspection reports.

A brush and suction cleaner (which can be a lorry-mounted device or a smaller precinct sweeper) should be used for regular sweeping. Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced. It is also possible to clean the surface using lightweight rotating brush cleaners combined with power spraying using hot water, as shown in **Figure 20.30 of CIRIA SuDS Manual 2015**. This is done every two years at the site shown.

If the surface has clogged then a more specialist sweeper with water jetting and oscillating and rotating brushes may be required, especially for porous asphalt surfaces, to restore the surface infiltration rate to an acceptable level. The specialist equipment should be adjusted so that it does not strip binder from the aggregate in the asphalt. The likely design life of grass reinforcement will be dictated by trafficking and is likely to be about 20 years if designed correctly. For concrete block permeable paving the design life should be no different from standard paving, assuming that an effective maintenance regime is in place to minimize risks of infiltration clogging. Porous asphalt will lose strength and begin to fatigue due to oxidation of the binder. This is likely to occur slightly faster in porous asphalt than normal asphalt, so the design life will be reduced slightly. Porous concrete should have a similar design life to a normal concrete slab.

The reconstruction of failed areas of concrete block pavement should be less costly and disruptive than the rehabilitation of continuous concrete or asphalt porous surfaces due to the reduced area that is likely to be affected. Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

The table provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Maintenance Plans and schedules should be prepared during the design phase. Specific maintenance needs of the pervious pavement should be monitored, and maintenance schedules adjusted to suit requirements.

Many of the specific maintenance activities for pervious pavements can be undertaken as part of a general site cleaning contract (many car parks or roads are swept to remove litter and for visual reasons to keep them tidy) and therefore, if litter management is already required at site, this should have marginal cost implications.

Generally, pervious pavements require less frequent gritting in winter to prevent ice formation. There is also less risk of ice formation after snow melt, as the melt water drains directly into the underlying sub-base and does not have chance to refreeze. A slight frost may occur more frequently on the surface of pervious pavements compared to adjacent impermeable surfaces, but this is only likely to last for a few hours. It does not happen in all installations and, if necessary, this can be dealt with by application of salt. It is not likely to pose a hazard to vehicle movements.

Activity	Action Required	Frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas. Removal of weeds or management using glyphosate applied directly into weeds by an applicator rather than spraying.	As required
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving. Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48 hr after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies. Monitor inspection chambers	Annually

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

Geocellular Attenuation Storage Tanks

Regular inspection and maintenance is required to ensure the effective long-term operation of below-ground storage systems. Maintenance responsibility for systems should be placed with a responsible organization. The table provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required.

Schedule	Action Required	Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris from the catchment surface (where it may cause a risk to performance).	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter geotextile for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays.	Annual, or as required
Remedial actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary.	Every five years or as required

Maintenance Plans and schedules should be developed during the design phase and will be specific to the type of tank that is adopted. Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements. Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32 of CIRIA SuDS Manual 2015**.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

Ponds and Wetlands

Ponds and wetlands will require regular maintenance to ensure continuing operation to design performance standards, and all designers should provide detailed specifications and frequencies for the required maintenance activities, along with likely machinery requirements and typical annual costs – within the Maintenance Plan. The treatment performance of ponds and wetlands is dependent on maintenance, and robust management plans will be required to ensure maintenance is carried out in the long term. Different designs will have different operation and maintenance requirements, but this section gives some generic guidance.

Maintenance of ponds is relatively straightforward for landscape contractors, and typically there should only be a small amount of extra work required for a SuDS pond or wetland feature over and above what is necessary for standard public open space.

Regular inspection and maintenance is important for the effective operation of ponds as designed. Maintenance responsibility for a pond and its surrounding area should always be placed with a responsible organization. Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All litter should be removed from site.

Any invasive maintenance work such as silt or vegetation removal is only required intermittently, but it should be planned to be sympathetic to the requirements of wildlife in a pond. Care should be taken to avoid disturbance to nesting birds during the breeding season and habitats of target species (eg great crested newt and water voles) at critical times. The window for carrying out maintenance to achieve this is usually towards the end of the growing season (typically September/October), although this will vary with species). Invasive silt and vegetation removal should only be carried out to limited areas at any one time (25–30% of the pond area on one occasion each year to minimize the impact on biodiversity. Plant management, to achieve particular desired habitat effects, should be clearly specified in a maintenance schedule.

Site vegetation should be trimmed as necessary to keep the pond free of leaves and to maintain the aesthetic appearance of the site. Slope areas that have become bare should be re-vegetated and any eroded areas should be regraded before replanting. Maintenance access (or “easement”) should be provided to the pond from a public or private road. An assessment should be made at the planning stage regarding the maintenance and associated access requirements. Ideally, access should be at least 3.5 m wide, have a maximum cross fall of 1 in 7, and be sufficiently robust to withstand maintenance equipment and vehicles. However, temporary access routes for infrequent operations could be considered where permanent routes are not appropriate. The access should extend to any forebay, safety and aquatic benches, inlet and outlet infrastructure. Consideration should be given as to whether maintenance vehicles will need to turn around. Wherever possible SuDS ponds and wetlands should be designed so that special machinery is not required to undertake maintenance.

The table provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive and some actions may not always be required. Consideration should be given to the need to control risks to biosecurity during maintenance operations and guidance is provided in **Chapter 29 of CIRIA SuDS Manual 2015**.

Sediments excavated from ponds or forebays that receive runoff from residential or standard road and roof areas should be safely disposed of in accordance with current waste management legislation. However, consultation should take place with the environmental regulator to confirm appropriate protocols. Chemical testing of the sediment may be required, before sediment excavation, to determine its classification and appropriate disposal methods. For industrial site runoff, sediment testing will be essential. In the majority of cases on low-risk sites with source control and a Management Train, it will be acceptable to distribute the sediment on site, if there is an appropriate safe and acceptable location to do so. Further detail on waste management is provided in **Chapter 33 of CIRIA SuDS Manual 2015**. If ponds are to be drawn down, care should be taken to prevent downstream discharge of sediments and anoxic water. The environmental regulator should be notified before such activities.

New ponds may become rapidly dominated by invasive native plants, particularly common bulrush (*Typha latifolia*). As it is not desirable for all new ponds to be bulrush dominated, it should be ensured that in the first five years, while vegetation is establishing, certain plant growth is controlled. After this time, ponds can usually be allowed to develop naturally recognizing that, unless the margins are occasionally managed, they are likely to become dominated by trees and shrubs. Eutrophication of SuDS ponds can occur during the summer months. This is best alleviated by controlling the nutrient source or providing a continuous baseflow to the pond. Unless eutrophication is severe, aeration can be used as a stop-gap measure to save aquatic animal species and reduce risks to receiving waters. However, the addition of barley straw bales, dredging or rendering the nutrients inactive by chemical means can also be successful.

Maintenance Plans and schedules should be developed during the design phase. Specific maintenance needs of the pond should be monitored, and maintenance schedules adjusted to suit requirements. Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32 of CIRIA SuDS Manual 2015**.

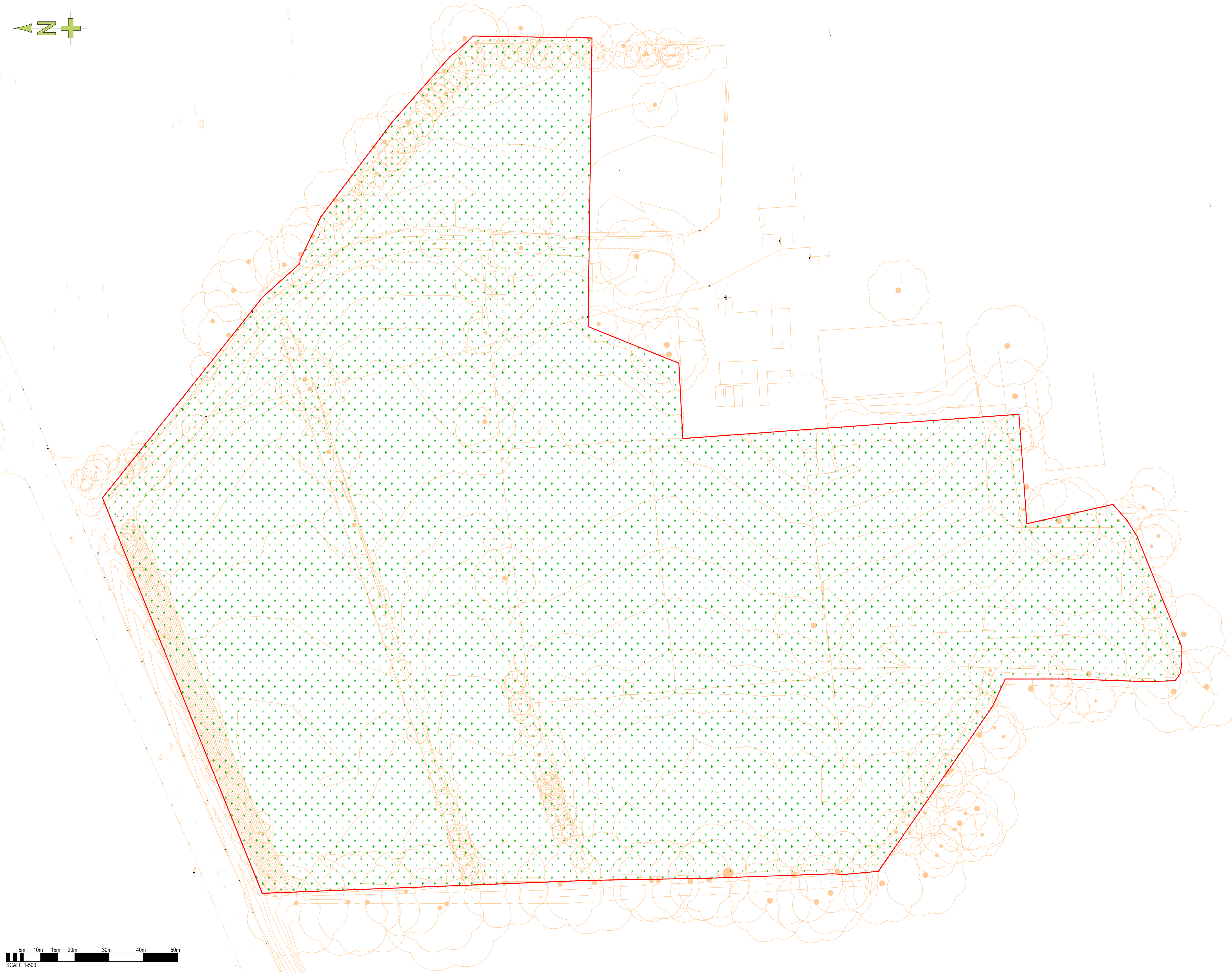
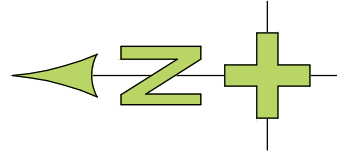
Generic health and safety guidance is provided in **Chapter 36 of CIRIA SuDS Manual 2015**. CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

Activity	Action Required	Frequency
Regular maintenance	Remove litter and debris. Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage. Inspect marginal and bankside vegetation and remove nuisance plants	Monthly
	Cut grass – public areas	Monthly during growing season
	Cut the meadow grass	Half yearly (spring – before nesting season and autumn)
	Inspect water body for signs of poor water quality.	Monthly (May-October)
	Check any penstocks and other mechanical devices. Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options.	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above the pond base; include max. 25% of pond surface) Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay.	Every 1-5 years, or as requested
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as requested
Occasional maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25-50 years
Remedial actions	Repair erosion or other damage. Replant, where necessary. Aerate pond when signs of eutrophication are detected. Realign rip-rap or repair other damage. Repair/rehabilitation of inlets, outlets and overflows.	As required

Appendix 6

Pre & Post-Development Impermeable Area Plans

Conceptual Drainage Layout



Notes:
1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS AND SPECIFICATIONS ASSOCIATED WITH THIS PROJECT.
3. THE SURVEY HAS BEEN TAKEN FROM JANE DUNCAN THE FROM MULTIJIMNS TOPOGRAPHICAL LAND SURVEY DATED JANUARY 2018.

KEY			
	SITE BOUNDARY	4.338 HA	
	TOTAL SOFT LANDSCAPE AREA	4.338 HA	
	TOTAL IMPERMEABLE AREA	0 HA	
	SITE IMPERMEABILITY	0%	

A	FOR APPROVAL	SGS	CJM	03.09.25
Rev	Description	Drm	Chk	Date



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Client
OPTION TWO DEVELOPMENT LMT

Project
COURTHOUSE FARM
COPTHORNE COMMON ROAD
COPTHORNE, WEST SUSSEX, RH10 3LA

Drawing
PRE DEVELOPMENT IMPERMEABLE
AREA PLAN
RETIREMENT VILLAGE

FOR APPROVAL

Scale @ A1 1:500	Date 02.09.25	Drawn by SGS	Checked CJM
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Job No. 25-0093 Drg. No. C10522 Rev A



Notes:

1. DO NOT SCALE FROM THIS DRAWING.

2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS.

3. THE DEVELOPMENT LAYOUT HAS BEEN TAKEN FROM JANE DUNCAN ARCHITECTS'S OPTION C - RETIREMENT VILLAGE DRG. NO. ECF485_110 REV I DATED 01.08.25 & THE SURVEY FROM MULTIMIN'S TOPOGRAPHICAL LAND SURVEY DATED JANUARY 2019.

KEY		
[Red line]	SITE BOUNDARY	4.339 HA
[Pink hatched]	TOTAL HARDSTANDING AREA	0.723HA
[Blue hatched]	TOTAL ROOF AREA (INC. 10% URBAN CREEP ALLOWANCE)	0.781HA
[Green hatched]	TOTAL SOFT LANDSCAPE AREA	2.178HA
	TOTAL IMPERMEABLE AREA	1.504HA
	SITE IMPERMEABILITY	34.7%

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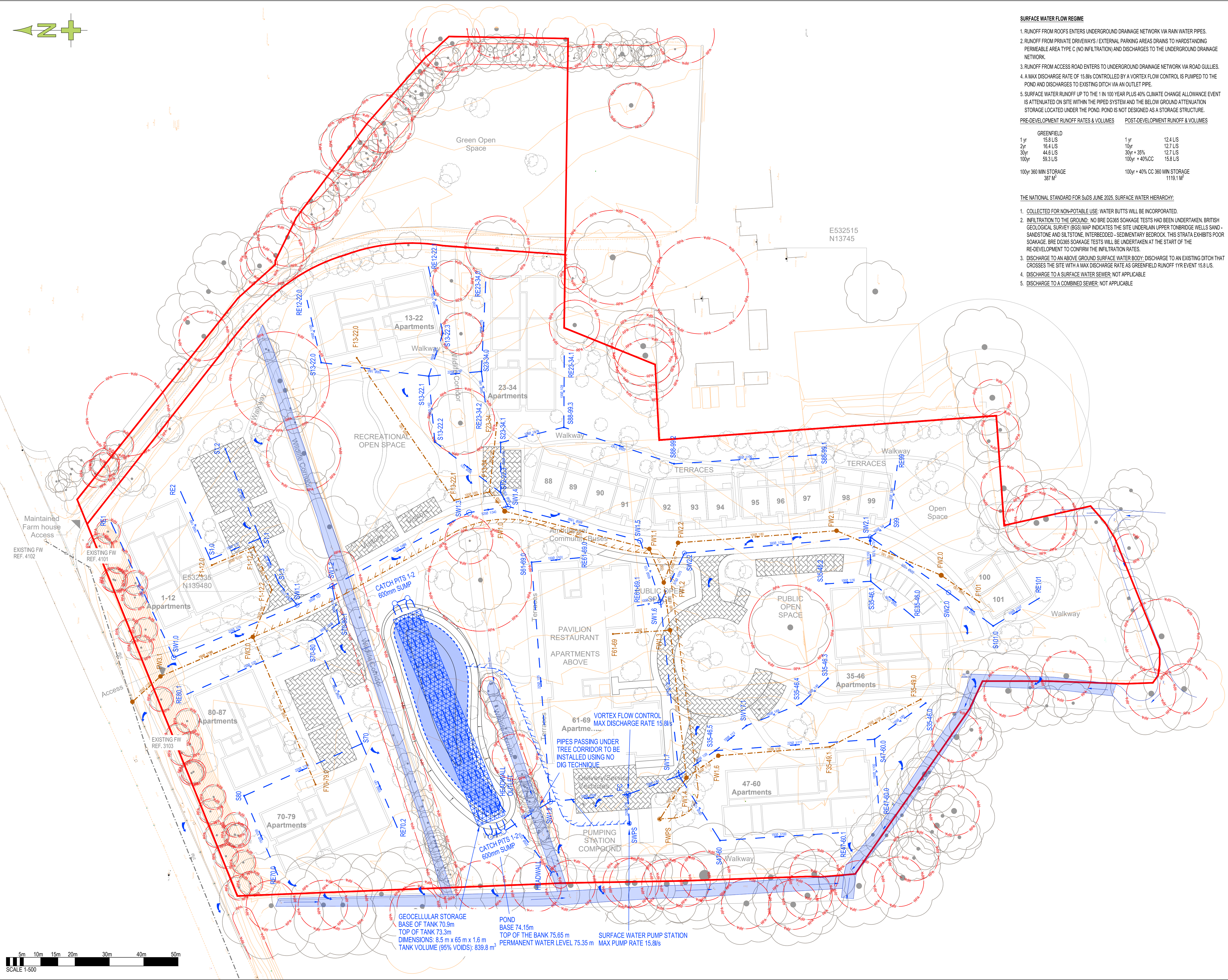
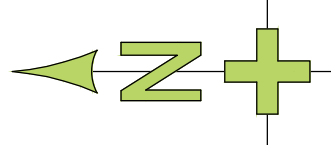
Client
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Project
**COURTHOUSE FARM
COPTHORNE COMMON ROAD
COPTHORNE, WEST SUSSEX, RH10 3LA**

Drawing
**POST DEVELOPMENT IMPERMEABLE
AREA PLAN
RETIREMENT VILLAGE**

FOR APPROVAL

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SURFACE WATER FLOW REGIME

1. RUNOFF FROM ROOFS ENTERS UNDERGROUND DRAINAGE NETWORK VIA RAIN WATER PIPES.
2. RUNOFF FROM PRIVATE DRIVEWAYS / EXTERNAL PARKING AREAS DRAINS TO HARDSTANDING PERMEABLE AREA TYPE C (NO INFILTRATION) AND DISCHARGES TO THE UNDERGROUND DRAINAGE NETWORK.
3. RUNOFF FROM ACCESS ROAD ENTERS TO UNDERGROUND DRAINAGE NETWORK VIA ROAD GULLIES.
4. A MAX DISCHARGE RATE OF 15.8l/s CONTROLLED BY A VORTEX FLOW CONTROL IS PUMPED TO THE POND AND DISCHARGES TO EXISTING DITCH VIA AN OUTLET PIPE.
5. SURFACE WATER RUNOFF UP TO THE 1 IN 100 YEAR PLUS 40% CLIMATE CHANGE ALLOWANCE EVENT IS ATTENUATED ON SITE WITHIN THE PIPED SYSTEM AND THE BELOW GROUND ATTENUATION STORAGE LOCATED UNDER THE POND. POND IS NOT DESIGNED AS A STORAGE STRUCTURE.

PRE-DEVELOPMENT RUNOFF RATES & VOLUMES POST-DEVELOPMENT RUNOFF & VOLUMES

GREENFIELD		100yr + 40% CC 360 MIN STORAGE	
1 yr	15.8 L/S	1 yr	12.4 L/S
2 yr	16.4 L/S	10 yr	12.7 L/S
30 yr	44.6 L/S	30 yr + 35%	12.7 L/S
100 yr	59.3 L/S	100 yr + 40%CC	15.8 L/S
100yr 360 MIN STORAGE		100yr + 40% CC 360 MIN STORAGE	
387 M ³		1119.1 M ³	

THE NATIONAL STANDARD FOR SUDS JUNE 2025. SURFACE WATER HIERARCHY:

1. COLLECTED FOR NON-POTABLE USE. WATER BUTTS WILL BE INCORPORATED.
2. INFILTRATION TO THE GROUND. NO BRE DG385 SOAKAGE TESTS HAD BEEN UNDERTAKEN. BRITISH GEOLOGICAL SURVEY (BGS) MAP INDICATES THE SITE UNDERLAIN UPPER TORBRIDGE WELLS SAND - SANDSTONE AND SILTSTONE. INTERBEDDED - SEDIMENTARY BEDROCK. THIS STRATA EXHIBITS POOR SOAKAGE. BRE DG385 SOAKAGE TESTS WILL BE UNDERTAKEN AT THE START OF THE RE-DEVELOPMENT TO CONFIRM THE INFILTRATION RATES.
3. DISCHARGE TO AN ABOVE GROUND SURFACE WATER BODY. DISCHARGE TO AN EXISTING DITCH THAT CROSSES THE SITE WITH A MAX DISCHARGE RATE AS GREENFIELD RUNOFF 1YR EVENT 15.8 L/S.
4. DISCHARGE TO A SURFACE WATER SEWER: NOT APPLICABLE
5. DISCHARGE TO A COMBINED SEWER: NOT APPLICABLE

Notes:

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS.
3. THE DEVELOPMENT LAYOUT HAS BEEN TAKEN FROM JANE DUNCAN ARCHITECTS'S OPTION C - RETIREMENT VILLAGE DRG. NO. ECF485 110 REV1 DATED 01.08.25 & THE SURVEY FROM MULTIMIN'S TOPOGRAPHICAL LAND SURVEY DATED JANUARY 2019.

KEY

- EXISTING
 - FOUL WATER SEWER
 - EXISTING DITCH / WATERCOURSE
- PROPOSED
 - SURFACE WATER DRAINAGE - DIA GRADIENT
 - FOUL WATER DRAINAGE - DIA GRADIENT
 - RISING MAIN SURFACE WATER
 - RISING MAIN FOUL WATER
 - GEOCELLULAR STORAGE CRATE
 - HEADWALL
 - EXCEEDANCE FLOW ROUTE
 - SURFACE WATER PUMPING STATION
 - FOUL WATER PUMPING STATION
 - FLOW CONTROL
 - HARDSTANDING PERMEABLE AREA TYPE C (NO INFILTRATION)
 - ROOT PROTECTION AREA

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Drawing
**DRAINAGE LAYOUT
RETIREMENT VILLAGE**

FOR APPROVAL

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INDEXES HAVE BEEN OBTAINED FROM THE FOLLOWING TABLES:

BOX 26.2: STEPS OF THE SIMPLE INDEX APPROACH:

- STEP 1 - ALLOCATE 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 HAZARD INDEX
- STEP 3 - WHERE THE DISCHARGE IS TO PROTECTED1 SURFACE WATERS OR GROUNDWATER, CONSIDER THE NEED FOR A MORE PRECAUTIONARY APPROACH
- NOTE: DESIGNATED AS THOSE PROTECTED FOR THE SUPPLY OF DRINKING WATER (TABLE 4.3).

TABLE 26.2: POLLUTION HAZARD INDICES FOR DIFFERENT LAND USE CLASSIFICATIONS:

LAND USE	POLLUTION HAZARD LEVEL	TOTAL SUSPENDED SOLIDS (TSS)	METALS	HYDROCARBONS
RESIDENTIAL ROOFS	VERY LOW	0.2	0.2	0.05
OTHER ROOF (TYPICALLY COMMERCIAL / INDUSTRIAL ROOFS)	LOW	0.3	0.2 (UP TO 0.8 WHERE THERE IS POTENTIAL FOR METALS TO LEACH FROM THE ROOF)	0.05
INDIVIDUAL PROPERTY DRIVEWAYS, RESIDENTIAL CAR PARKS, LOW TRAFFIC ROADS (EG CUL DE SACS, HOMEZONES AND GENERAL ACCESS ROADS) AND NON-RESIDENTIAL CAR PARKING WITH INFREQUENT CHANGE (EG SCHOOLS, OFFICES) I.E < 300 TRAFFIC MOVEMENTS/DAY	LOW	0.5	0.4	0.4
COMMERCIAL YARD AND DELIVERY AREAS, NON-RESIDENTIAL CAR PARKING WITH FREQUENT CHANGE (EG HOSPITALS, RETAIL), ALL ROADS EXCEPT LOW TRAFFIC ROADS AND TRUNK ROADS/MOTORWAYS ¹	LOW	0.7	0.6	0.7
SITES WITH HEAVY POLLUTION (EG HAULAGE YARDS, LORRY PARKS, HIGHLY FREQUENTED LORRY APPROACHES TO INDUSTRIAL ESTATES, WASTE SITES), SITES WHERE CHEMICALS AND FUELS (OTHER THAN DOMESTIC FUEL OIL) ARE TO BE DELIVERED, HANDLED, STORED, USED OR MANUFACTURED, INDUSTRIAL SITES, TRUNK ROADS AND MOTORWAYS ²	HIGH	0.8 ²	0.8 ²	0.9 ²

NOTES:

1. MOTORWAYS AND TRUNK ROADS SHOULD FOLLOW THE GUIDANCE AND RISK ASSESSMENT PROCESS SET OUT IN HIGHWAYS AGENCY (2009).
2. THESE SHOULD ONLY BE USED IF CONSIDERED APPROPRIATE AS PART OF A DETAILED RISK ASSESSMENT - REQUIRED FOR ALL THESE LAND USE TYPES (TABLE 4.3). WHEN DEALING WITH HIGH HAZARD SITES, THE ENVIRONMENTAL REGULATOR SHOULD FIRST BE CONSULTED FOR PRE-PERMITTING ADVICE. THIS WILL HELP DETERMINE THE MOST APPROPRIATE APPROACH TO THE DEVELOPMENT OF A DESIGN SOLUTION.

TABLE 26.3: INDICATIVE SUDS MITIGATION INDICES FOR DISCHARGES TO SURFACE WATERS

TYPE OF SUDS COMPONENT	MITIGATION INDICES ¹		
	TSS	METALS	HYDROCARBONS
FILTER STRIP	0.4	0.4	0.5
FILTER DRAIN	0.42	0.4	0.4
SWALE	0.5	0.6	0.6
BIORETENTION SYSTEM	0.8	0.8	0.8
PERMEABLE PAVEMENT	0.7	0.6	0.7
DETENTION BASIN	0.5	0.5	0.6
POND ²	0.73	0.7	0.5
WETLAND	0.83	0.8	0.8
PROPRIETARY TREATMENT SYSTEMS ^{3,4}	THESE MUST DEMONSTRATE THAT THEY CAN ADDRESS EACH OF THE CONTAMINANT TYPES TO ACCEPTABLE LEVELS FOR FREQUENT EVENTS UP TO APPROXIMATELY THE 1 IN 1 YEAR RETURN PERIOD EVENT, FOR INFLOW CONCENTRATIONS RELEVANT TO THE CONTRIBUTING DRAINAGE AREA.		

NOTES:

1. SUDS COMPONENTS ONLY DELIVER THESE INDICES IF THEY FOLLOW DESIGN GUIDANCE WITH RESPECT TO HYDRAULICS AND TREATMENT SET OUT IN THE RELEVANT TECHNICAL COMPONENT CHAPTERS.
2. FILTER DRAINS CAN REMOVE COARSE SEDIMENTS, BUT THEIR USE FOR THIS PURPOSE WILL HAVE SIGNIFICANT IMPLICATIONS WITH RESPECT TO MAINTENANCE REQUIREMENTS, AND THIS SHOULD BE TAKEN INTO ACCOUNT IN THE DESIGN AND MAINTENANCE PLAN.
3. PONDS AND WETLANDS CAN REMOVE COARSE SEDIMENTS, BUT THEIR USE FOR THIS PURPOSE WILL HAVE SIGNIFICANT IMPLICATIONS WITH RESPECT TO THE MAINTENANCE REQUIREMENTS AND AMENITY VALUE OF THE SYSTEM. SEDIMENT SHOULD NORMALLY BE REMOVED UPSTREAM, UNLESS THEY ARE SPECIFICALLY DESIGNED TO RETAIN SEDIMENT IN A SEPARATE PART OF THE COMPONENT, WHERE IT CANNOT EASILY MIGRATE TO THE MAIN BODY OF WATER.
4. WHERE A WETLAND IS NOT SPECIFICALLY DESIGNED TO PROVIDE SIGNIFICANTLY ENHANCED TREATMENT, IT SHOULD BE CONSIDERED AS HAVING THE SAME MITIGATION INDICES AS A POND.
5. SEE CHAPTER 14 FOR APPROACHES TO DEMONSTRATE PRODUCT PERFORMANCE. A BRITISH WATER/ENVIRONMENT AGENCY ASSESSMENT CODE OF PRACTICE IS CURRENTLY UNDER DEVELOPMENT THAT WILL ALLOW MANUFACTURERS TO COMPLETE AN AGREED TEST PROTOCOL FOR SYSTEMS INTENDED TO TREAT CONTAMINATED SURFACE WATER RUNOFF. FULL DETAILS CAN BE FOUND AT: <http://brnyul.com/qf7yq7>
6. SEPA ONLY CONSIDERS PROPRIETARY TREATMENT SYSTEMS AS APPROPRIATE IN EXCEPTIONAL CIRCUMSTANCES WHERE OTHER TYPES OF SUDS COMPONENT ARE NOT PRACTICABLE. PROPRIETARY TREATMENT SYSTEMS MAY ALSO BE CONSIDERED APPROPRIATE FOR EXISTING SITES THAT ARE CAUSING POLLUTION WHERE THERE IS A REQUIREMENT TO RETROFIT TREATMENT. SEPA (2014) ALSO PROVIDES A FLOWCHART WITH A SUMMARY OF CHECKS ON SUITABILITY OF A PROPRIETARY SYSTEM.

WATER QUALITY MANAGEMENT

THE EFFECT OF THE PROPOSED WORK ON LOCAL WATER QUALITY HAS BEEN ASSESSED USING THE SIMPLE QUALITATIVE METHOD AS SET OUT IN CIRIA REPORT C753 THE SUDS MANUAL 2015 [CHAPTER 26].

RUNOFF FROM ROOFS						
	TSS		METALS		HYDROCARBONS	
	POLLUTION INDEX	MITIGATION INDEX	POLLUTION INDEX	MITIGATION INDEX	POLLUTION INDEX	MITIGATION INDEX
POND	0.2	0.7	0.2	0.7	0.05	0.5

RUNOFF FROM DRIVEWAYS AND PARKING AREAS						
	TSS		METALS		HYDROCARBONS	
	POLLUTION INDEX	MITIGATION INDEX	POLLUTION INDEX	MITIGATION INDEX	POLLUTION INDEX	MITIGATION INDEX
PERMEABLE PAVEMENT		0.70		0.60		0.70
POND		0.70		0.70		0.50
TOTAL SUDS MITIGATION INDEX	0.50	1.05	0.40	0.95	0.40	0.95

RUNOFF FROM ACCESS ROAD						
	TSS		METALS		HYDROCARBONS	
	POLLUTION INDEX	MITIGATION INDEX	POLLUTION INDEX	MITIGATION INDEX	POLLUTION INDEX	MITIGATION INDEX
POND	0.5	0.7	0.4	0.7	0.4	0.5

BASED ON THE INCORPORATION OF PERMEABLE PAVEMENT IN DRIVEWAYS AND PARKING AREAS FOR TREATMENT OF RUNOFF AND THE POND UPSTREAM DISCHARGING TO THE DITCH FOR TREATMENT OF ROOF, DRIVEWAYS, PARKING AREAS AND ACCESS ROAD RUNOFF, THE TOTAL POLLUTION MITIGATION INDEX FOR THESE SUDS COMPONENTS IS HIGHER THAN THE POLLUTION HAZARD INDEX FOR TSS, METALS AND HYDROCARBONS.

Notes:

1. DO NOT SCALE FROM THIS DRAWING.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS.

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Client
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COPTHORNE, WEST SUSSEX, RH10 3LA

Drawing
SURFACE WATER QUALITY ANALISYS
RETIREMENT

FOR APPROVAL

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Job No.	Org. No.	Rev
25-0093	C10506	A

Appendix 7

WSCC Flood Risk Validation Checklist For Planning Applications
WSCC Surface Water Drainage Proforma

Flood Risk Validation Checklist for Planning Applications

SITE NAME	Land at Courthouse Farm, Copthorne
DATE	04/09/2025

1. Proforma

Description	Document/Drawing Ref and Page No. APPLICANT TO COMPLETE	Submitted? (Yes/No) LPA TO CHECK
Application only be validated by LPA if the LLFA surface water proforma is completed and attached	FRADS Ref 25-0093	

2. Site Surveys (if appropriate)

Description	Document/Drawing Ref and Page No. APPLICANT TO COMPLETE	Submitted? (Yes/No) LPA TO CHECK
Topographic survey	FRADS Appendix 1	
Details of existing site layout, drainage, and catchment areas plus pre- and post-development impermeable areas	FRADS Appendix 3 & 6	
Evidence of % increase for urban creep and how it has been applied to post-development calculations	FRADS Appendix 5 & 6	
Ground investigation including groundwater level information (for seasonally high groundwater level), potential contamination and infiltration testing (to BRE365 or similar)	No Ground Investigation or BRE DG365 testing undertaken to date.	
Existing drainage scheme survey, e.g., CCTV or historic plans	FRADS Appendix 1	
Survey of existing waterbodies, e.g., watercourses, ponds or springs and culverts or bridges	FRADS Appendix 1	

3. Plans and Drawings

Description	Document/Drawing Ref and Page No. APPLICANT TO COMPLETE	Submitted? (Yes/No) LPA TO CHECK
Layout drawing including drainage scheme SuDS and other water features. Including invert levels, cover levels, conveyance systems any pipe gradients, flow directions and labels that match any drainage modelling calculations. Outfall locations, control devices, attenuation systems and water quality treatment features.	FRADS Appendix 6	

Description	Document/Drawing Ref and Page No. APPLICANT TO COMPLETE	Submitted? (Yes/No) LPA TO CHECK
High level construction management plan including phasing access arrangements and operational characteristics. Temporary drainage and water pollution including discharge points and flow controls should be included.	Not applicable	
Landscaping planting scheme for vegetated SuDS	Not applicable	
Maintenance plan and confirmation in principle of adopting authority for the lifetime of the development	FRADS Appendix 5	

4. Assessments

Description	Document/Drawing Ref and Page No. APPLICANT TO COMPLETE	Submitted? (Yes/No) LPA TO CHECK
Evidence that that the SuDS hierarchy and the 4 pillars have been met	FRADS Page 16	
Full supporting calculations for the drainage design including design parameters using FEH and predevelopment greenfield runoff rates/volumes	FRADS Appendix 5	
Critical storm simulation results of the conveyance network by level and discharge for events 100% AEP, 3.33% AEP, 3.33% AEP plus climate change, 1% AEP and 1% AEP plus climate change	FRADS Appendix 5	
Evidence of calculations to support the sizing of storage features to accommodate the 3.33% AEP plus climate change and 1% AEP climate change critical storms	FRADS Appendix 5	
Evidence and drawing of where any flooding would occur during a 1% AEP plus climate change critical storm event would occur. Information should include extent, depth, and velocity of flooding, demonstrating that it would not leave the site boundary.	No flooding	
Flood resistance and resilience measures 300mm above flood levels	Not applicable	
Drawing showing exceedance flows greater than 1% AEP plus climate change or if the drainage system is compromised	FRADS Appendix 6	

5. Supplementary Evidence

Description	Document/Drawing Ref and Page No. APPLICANT TO COMPLETE	Submitted? (Yes/No) LPA TO CHECK
Confirmation of discharge location approval (in principal agreements from third parties if appropriate)	FRADS Appendix 8	
Confirmation of any consents required	FRADS Page 22 & 23	
Evidence of predevelopment discharge capacity analysis (where discharging from an existing pipe)	Not applicable	

Surface Water Drainage Proforma

West Sussex County Council (WSCC) as Lead Local Flood Authority recommends this proforma is completed and submitted to support any planning application for a major development. The information contained in this form will be used by WSCC officers in their role as 'statutory consultee' on surface water drainage. The proforma should accompany the site-specific Flood Risk Assessment and Drainage Strategy submitted as part of the planning application.

1. Site Details

No.	Requirement	Answer	Application Type
1.1	Address including postcode	Land at Courthouse Farm, Copthorne Common Road, Copthorne RH10 3LA	Outline & Full
1.2	OS grid reference (easting and northing)	532402 , 139032	Outline & Full
1.3	Planning application reference	TBA	Outline & Full
1.4	Total site area (hectares)	4.339 ha	Outline & Full
1.5	Pre-development use	Greenfield / Grazing	Outline & Full
1.6	Proposed design life	60 years	Outline & Full
1.7	Have agreements in principle for discharge been provided (where applicable)? (YES/NO)	No	Outline & Full
1.8	Topographic Survey Plan showing existing site layout, site levels and drainage system	Yes included in FRADS Appendix 1	Outline & Full

2. Discharge Hierarchy/Methods of Discharge¹

No.	Requirement	Answer	Application Type
2.1	Store rainwater for later use (reuse) (YES/NO)	N/A	Full
2.2	Infiltration techniques such as soakaways, permeable paving, etc (YES/NO)	Type C Permeable pavements for private driveways	Outline & Full
2.3	Hybrid (YES/NO)	No	Outline & Full

¹ Runoff may be discharged via one or multiple methods.

No.	Requirement	Answer	Application Type
2.4	Attenuation with restricted discharge to watercourse (YES/NO)	Yes	Outline & Full
2.5	Attenuation with restricted discharge to surface water sewer (YES/NO)	No	Outline & Full
2.6	Attenuation with restricted discharge to combined sewer (YES/NO)	No	Outline & Full

3. Calculation Inputs

No.	Requirement	Answer	Application Type
3.1	Area within site which is drained by SuDS ² (hectares)	4.339	Outline & Full
3.2	Impermeable area drained pre-development ³ (hectares)	0	Outline & Full
3.3	Impermeable area drained post-development ³ (hectares)	1.504	Outline & Full
3.4	Urban Creep (hectares)	0.071	Outline & Full
3.5	Climate change factor applied (1 in 30 and 1 in 100) (percentage)	1 in 30 = 35% 1 in 100 = 40%	Outline & Full

4. Infiltration Feasibility/Ground Investigations

No.	Requirement	Answer	Application Type
4.1	Has winter groundwater monitoring and infiltration been undertaken? (YES/NO)	No	Outline & Full
4.2	Period of winter groundwater monitoring (from/to)	N/A	Outline & Full
4.3	Depth to highest recorded groundwater level (mAOD)	N/A	Full
4.4	Infiltration rate	N/A	Outline & Full

² Impermeable area should be measured pre and post development. Impermeable surfaces include roofs, pavements, driveways and paths, where runoff is conveyed to the drainage system.

³ 10% Urban Creep should be added to the volumes required for storage and not increase discharge rates.

No.	Requirement	Answer	Application Type
4.5	Depth of infiltration structure (mAOD)	N/A	Full
4.6	Safety factor used for sizing infiltration storage	N/A	Outline & Full

5. Calculation Outputs: Greenfield Runoff Rates⁴

No.	Requirement	Answer	Application Type
5.1	Qbar (l/s)	18.6	Outline & Full
5.2	1 in 1 year rainfall (l/s)	15.8	Outline & Full
5.3	1 in 30 year rainfall (l/s)	44.6	Outline & Full
5.4	1 in 100 year rainfall (l/s)	59.3	Outline & Full

6. Calculation Outputs: Brownfield Runoff Rates (including Urban Creep) (if applicable)

No.	Requirement	Answer	Application Type
6.1	1 in 1 year rainfall (l/s)	N/A	Outline & Full
6.2	1 in 30 year rainfall (l/s)	N/A	Outline & Full
6.3	1 in 100 year rainfall (l/s)	N/A	Outline & Full

7. Calculation Outputs: Volume Control/Infiltration Provision

No.	Requirement	Answer	Application Type
7.1	Infiltration (m ³)	N/A	Outline & Full
7.2	Attenuation (m ³)	839.8	Outline & Full
7.3	Separate volume designated as long-term storage ⁵ (m ³)	N/A	Full
7.4	Total volume control (sum of inputs for 7.1 to 7.3) (m ³)	N/A	Full

⁴ Flows within long term storage areas should be infiltrated to the ground or discharged at low flow rate of maximum 2 litres per second per hectare (l/s/ha).

⁵ In calculations and for the avoidance of doubt FEH shall be used FSR is not acceptable, and CV values must equal 1.

8. Calculation Outputs: Attenuation/Restricted Discharge

No.	Requirement		Answer	Application Type
8.1	Proposed discharge rate (critical storm)	1 in 1 (100%) AEP (m/s)	15.8	Outline & Full
		1 in 30 (3.33%) AEP (m/s)	15.8	Outline & Full
		1 in 30 (3.33%) AEP plus climate change (m/s)	15.8	Outline & Full
		1 in 100 (1%) AEP (m/s)	15.8	Outline & Full
		1 in 100 (1%) AEP plus climate change (m/s)	15.8	Outline & Full
8.2	Calculations show critical storm durations (both by max height and max discharge) for 1 in 1, 1 in 30, 1 in 30 plus climate change, 1 in 100 and 1 in 100 year plus climate change allowance can be accommodated on site (YES/NO)		Yes	Outline & Full
8.3	Has treatment of potential contaminants been considered? (YES/NO)		Yes	Outline & Full
8.4	Demonstration of source control features with substantive evidence why these cannot be used if not (YES/NO)		Yes	Full
8.5	If discharging into a watercourse, piped system or the sea, has the proposed drainage network been modelled against predicted top water levels for the 1 in 100 year storm event plus climate change allowance, within the existing system? (YES/NO)		N/A	Full

9. Other Supporting Details

No.	Requirement	Answer	Application Type
9.1	Plan detailing location of groundwater monitoring and infiltration testing	N/A	Outline & Full
9.2	Detailed drainage design layout	FRADS Appendix 6	Full
9.3	Maintenance strategy	FRADS Appendix 5	Full

No.	Requirement	Answer	Application Type
9.4	Detailed development layout	FRADS Appendix 3	Full
9.5	Impermeable area plan	FRADS Appendix 6	Full
9.6	Phasing plan?	N/A	Full
9.7	If ground levels are being raised over 300mm above existing levels and is unavoidable, have detailed plans been provided, together with drainage proposals, to address any potential drainage related issues?	N/A	Full

The above form should be completed using evidence from information which should be appended to this form. The information being submitted should be proportionate to the site conditions, flood risks and magnitude of development. It should serve as a summary of the drainage proposals and should clearly show that the proposed discharge rate and volume as a result of development will not be increasing. Where there is an increase in discharge rate or volume, then the relevant section of this form must be completed with clear evidence demonstrating how the requirements will be met.

This form is completed using factual information and can be used as a summary of the surface water drainage strategy on this site.

Form completed by	C J Mellett
Qualification of person responsible for signing off this proforma	lEng MICE
Company	BdR [Civil & Structural Engineering] Ltd
On behalf of (client's details)	Option Two Developments Ltd
Date	04/09/25

Appendix 8
Pre-Application Advice from WSCC LLFA
Pre-Planning Enquiry Response from Thames Water

Eleanor Read

Flood Risk Management Officer
Flood Risk Management Team, Planning Services
Eleanor.read@westsussex.gov.uk
www.westsussex.gov.uk

Ground Floor,
Northleigh,
County Hall,
Chichester,
PO19 1RH



Chris Mellett - BdR [Civil & Structural
Engineering] Ltd
The Old Engine House
Goblands Farm
Cemetery Lane
Tonbridge
TN11 0DP

Dear Mr Mellett,

4th June 2025

**WSSC-714976663 – Court House Farm, Copthorne Common Road,
Copthorne, RH10 3LA**

WSSC Flood Risk Management Team Level 1 Pre-Application Advice has been sought for an approximately 4.3ha site in Mid Sussex district. It is expected that 93 dwellings will be built.

Flood Risk for Court House Farm

The proposed site does not lie within Flood Zones 2 or 3, however it is over 1ha therefore a Flood Risk Assessment in line with guidance from the Environment Agency ([Flood risk assessments: applying for planning permission](#)), NPPF (December 2024 version) and PPG Flood risk and coastal change (August 2022 version; this includes a Site-specific flood risk assessment checklist) will be required. Within the FRA all sources of flooding should be assessed, including flood risk from surface water, ordinary watercourses including ditches, groundwater, artificial sources such as reservoirs and existing drainage infrastructure. The site is not currently located in EA flood warning or alert areas.

The proposed site is in an area of predominantly very low risk of surface water flooding as identified by the Environment Agency Flood Map for Planning. There are areas of low to high risk associated with watercourses along the western and southern site boundaries and two crossing the upper third of the site, along with isolated low spots presenting increased risk. According to our records there are four ordinary watercourses crossing or bordering the site (Appendix A).

According to BGS data the bedrock for the site is Upper Tunbridge Wells Sand. It is noted that winter groundwater monitoring and infiltration testing results have not been provided for our review. These will need to be provided when the application is submitted to the Local Planning Authority. As this is an outline application a preliminary investigation of the soil and geology is acceptable, although ideally we'd need infiltration testing to demonstrate at outline stage that infiltration is not viable. Given the geology of the site, we'd suggest 4 tests are completed across the site. We'll also need winter groundwater monitoring to support the detailed design work, to ensure there is 1m clearance between the highest winter groundwater level and

the base of any attenuation features such as basins. Groundwater flood risk details can be found in Appendix B.

On EA mapping there are no records of fluvial flooding. Copthorne is identified as a wet spot in the WSCC Local Flood Risk Management Strategy (2013). Please note this is in the process of being updated. WSCC have no records of surface water or groundwater flood events within the site, however there are events recorded in the surrounding area (Appendix C). Please note, this does not guarantee that no flooding has occurred within the site boundary or as flood events might not have been reported to the Flood Risk Management Team.

SuDS Guidance:

The use of Sustainable Drainage Systems (SuDS) should be considered at an early stage in the design process, to integrate SuDS with road networks and other infrastructure. The drainage system should consider the four pillars of SuDS (water quantity, water quality, amenity, and biodiversity) and follow the surface water discharge hierarchy. We expect that investigation into infiltration potential is undertaken using methods in accordance with BRE365. If infiltration testing and groundwater monitoring results are unfavourable for draining the site using infiltration SuDS, any existing runoff rates/volumes must be controlled to a pre-development greenfield runoff rate (Q_{bar}). We would expect that above ground SuDS are used as much as possible to maximise controlling surface water runoff where it falls (e.g. water reuse, green roofs, bioretention areas, ponds, basins, swales etc.).

The FRA/Drainage Strategy should demonstrate there will be sufficient surface water quality treatment by implementing an appropriate amount of water quality treatment stages through the use of SuDS. Chapter 26 of the CIRIA SuDS Manual has lots of guidance for managing surface water quality, including tables for suitability of different SuDS components and the Simple Index Approach. Interception storage should be used in the beginning of the treatment train to ensure the drainage system manages pollutants as close to the source as possible and remove sediment upstream in the system rather than closer to the discharge location.

We would expect that any proposed surface water drainage scheme takes all opportunities to improve any existing risk of flooding to the surrounding road networks. Opportunities should also be considered on how the development may improve flood risk overall by assessing if any additional flood mitigation can be integrated into the scheme, such as storage areas in blue green corridors.

Any phasing of the development must be shown to be able to be developed with a dedicated drainage infrastructure that does not rely on any other phase to be developed. A drainage phasing timeline will be required to show how each element of the drainage system will be implemented prior to completion of the building phase. Details of the required maintenance of any SuDS features and structures and who will be adopting these features for the lifetime of the development must be provided in accordance with the NPPF.

We require the applicant to submit information and drawings which clearly shows the proposed drainage strategy and exceedance flood flow routes for all areas of

development. These plans should include the finished floor levels of all buildings, the proposed finished floor levels and potential exceedance flow route.

Details of the construction phase temporary drainage arrangements are required by the LLFA to ensure there will be no increase in flood risk due to the construction works of the development either onsite or elsewhere. A high-level assessment is required at an initial planning stage. Furthermore, the applicant will also need to submit the proposed construction phasing plans for the development to demonstrate that prior to completing the site there will be no increase in flood risk due to the interim development phases either onsite or elsewhere.

When submitting the application to the Local Planning Authority, please submit the SuDS proforma and validation checklist to assist us in reviewing the application and expedite the process. These can be found here: [Flood Risk Management: Pre-application advice](#).

Further guidance on surface water drainage requirements for planning applications within Mid Sussex District can be found on [Flood Risk and Drainage for Planning - Mid Sussex District Council](#).

Yours sincerely,

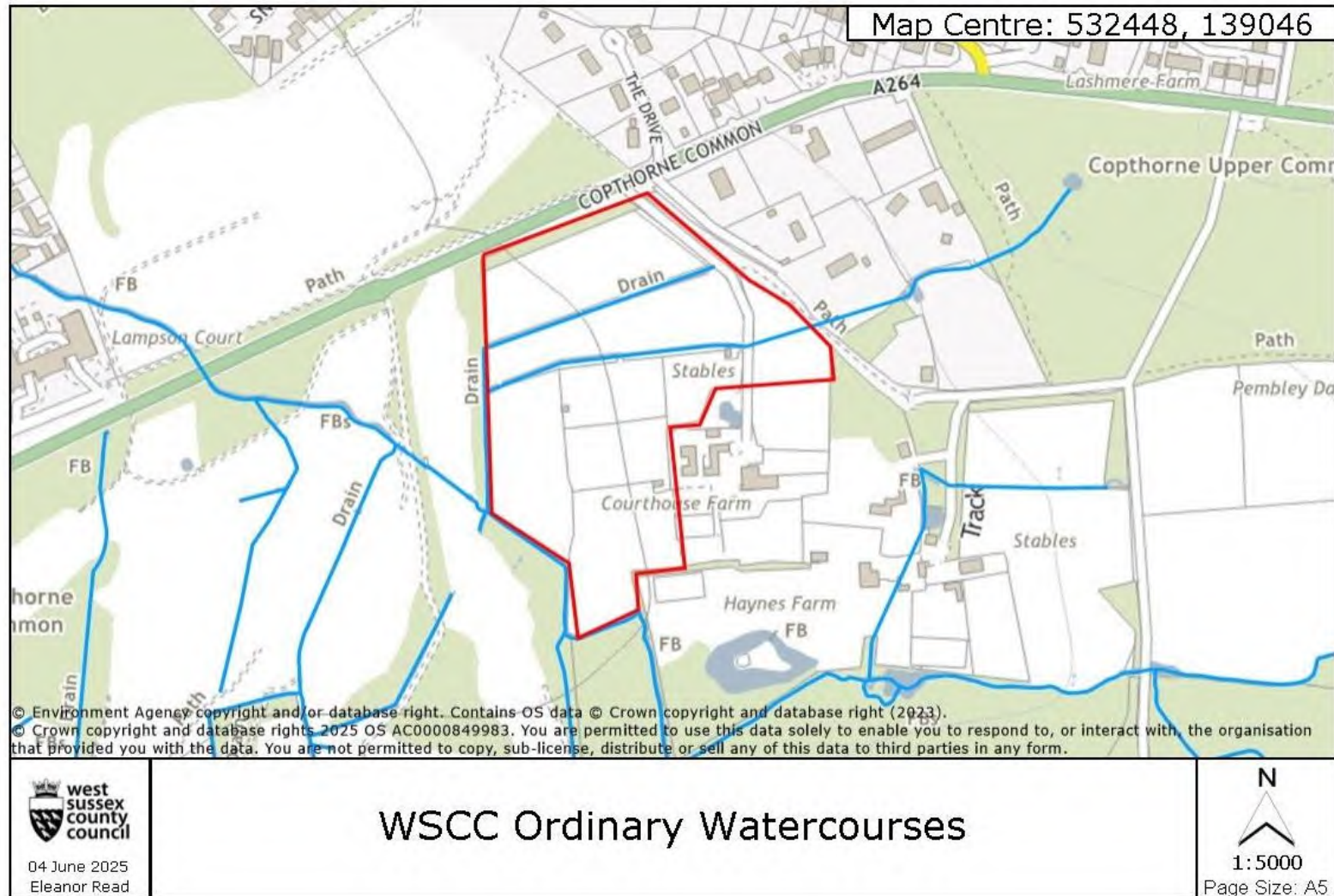
Eleanor Read

Eleanor.read@westsussex.gov.uk

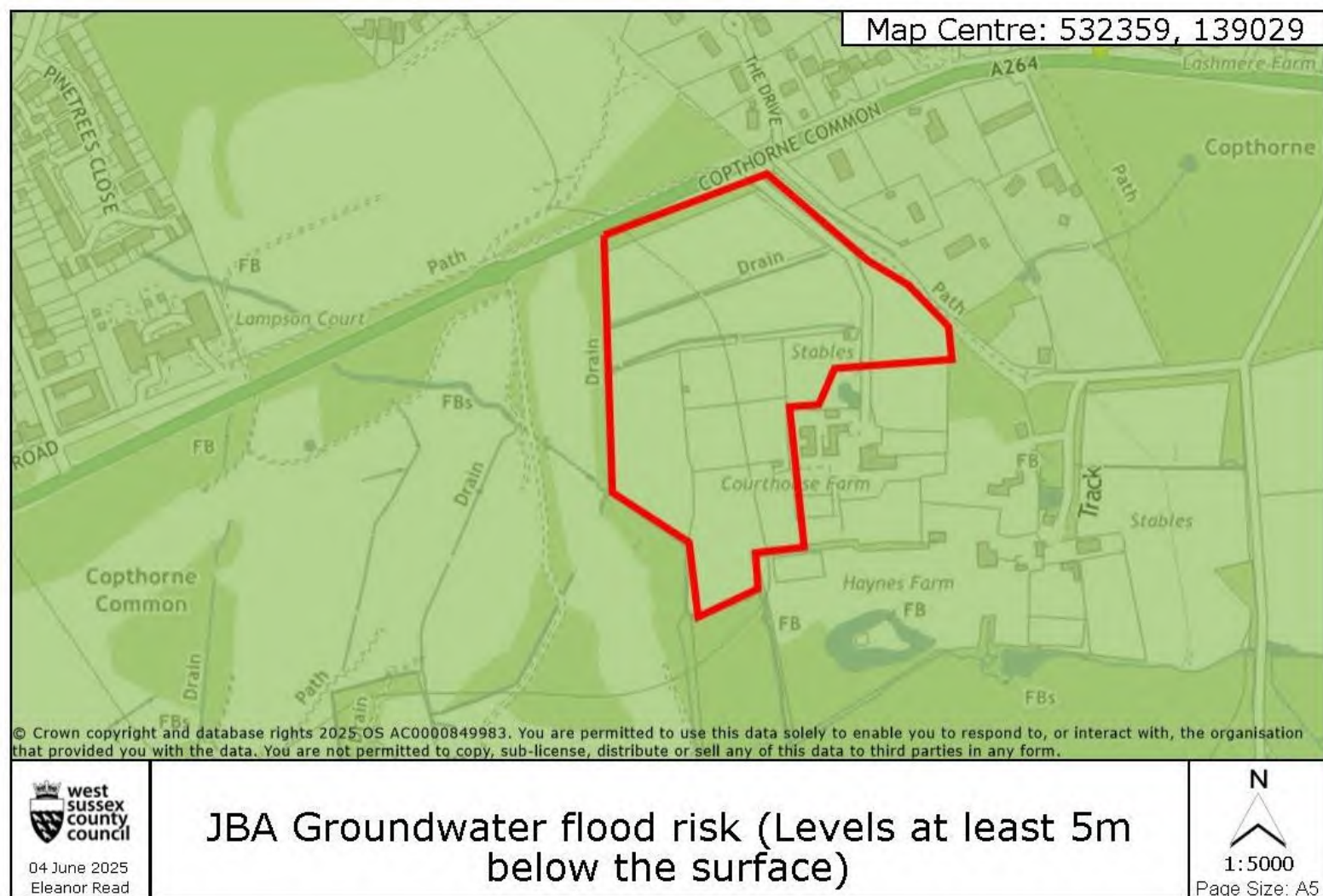
Flood Risk Management Team

Appendices

Appendix A-Ordinary Watercourses



Appendix B-Susceptibility to groundwater flooding



Appendix C-Historic Flood Incidents (WSCC)

No records within site itself

Flood caused by surface water and/or groundwater on Copthorne Common Road

Floods caused by the ordinary watercourse on Pine Trees Close



Chris Mellett

BdR [Civil & Structural Engineering] Ltd
The Old Engine House
Goblands Farm Business Park
Hadlow
TN11 0DP



24 June 2025

Pre-planning enquiry: Confirmation of sufficient capacity

Site Address: Land at Court House Farm, Copthorne Common Road, Copthorne, RH10 3LA

Dear Chris

Thank you for providing information on your development of the existing greenfield site with two phases of 53 and 40 general housing, totalling 93 general housing at site.

Foul water proposal: foul water to be pumped at 5l/s to manhole TQ32393103 serving the 375mm foul water sewer within Copthorne Common Road.

Surface water proposal:

We have completed the assessment of the foul water flows based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you

have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

- 1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
- 2) rainwater infiltration to ground at or close to source
- 3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
- 4) rainwater discharge direct to a watercourse (unless not appropriate)
- 5) controlled rainwater discharge to a surface water sewer or drain
- 6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

Please see our [FAQ's leaflet](#) for additional information.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on **0800 009 3921**

Yours sincerely

Gemma Connolley

Adoptions & Pre-Planning Engineer

Developer Services