

Drainage Strategy

Land North of The Oysters

Furniss Way, Hayling Island, PO11 0FG

for

Hayling Island Builders Ltd

1140

July 2025

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Hayling Island Builders Ltd

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Executive Summary

Description	
CGV Transport Consultants Ltd has been instructed by Hayling Island Builders Ltd, to produce a Drainage Strategy to support the Planning Application for the site at Land North of The Oysters, Furniss Way, Hayling Island, PO11 0FG.	
Site Parameters	
Total Area:	11,000m ² (1.1 Ha)
Greenfield:	YES
Brownfield:	NO
Mixed Green and Brownfield:	NO
Existing Runoff Location:	Ground and existing ditches
Ground Conditions:	Clay
Method of Study:	Desk Investigation
Ground Infiltration Potential:	Low
Drainage Strategy / SuDS	
Infiltration Viable:	NO
Discharge Point (SW):	Watercourse
Flow Control:	3.7 l/s
Storage Provided:	1 in 100 Year + 45% Climate Change
Discharge Point (FW):	Sewer
SuDS Elements:	Porous Surfacing, Swales, Water Butts and a Pond
Water Quality Measures:	Catchpits, Geotextiles
Exceedance flows:	Managed within site
Conclusions	
Infiltration is unlikely to be viable on site and so attenuation is provided in open sustainable drainage features such as ponds and swales, with additional storage in porous surfacing systems.	

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1.0 Introduction

- 1.1.1 Hayling Island Builders Ltd is planning a proposed development on the site at Land North of The Oysters, Furniss Way, Hayling Island, PO11 0FG.
- 1.1.2 CGV Transport Consultants Ltd has been instructed by Hayling Island Builders Ltd, to produce a Drainage Strategy to support the Planning Application.
- 1.1.3 This report aims to demonstrate that a reduction in surface water run-off from the site can be achieved.
- 1.1.4 This report demonstrates that the objectives of the “National standards for sustainable drainage systems (SuDS) “can be achieved.
- 1.1.5 The general limitations of this assessment are that:
- Several data sources have been used in compiling this report. Whilst CGV Transport Consultants Ltd believe them to be trustworthy; it is unable to guarantee the accuracy of the information that has been provided by others.
 - This report is based on information available at the time of preparation. There is potential for further information to become available, which may create a need to modify conclusions drawn in this report.

2.0 Location of Site

- 2.1.1 The site is located north of The Oysters in Hayling Island. A location plan is enclosed in **Appendix A**.
- 2.1.2 The Local Authorities are Havant Borough Council and Hampshire County Council.

3.0 Site Description

3.1 Existing Site

- 3.1.1 The existing site is the parcel of land to the north of The Oysters. A topographical survey has been commissioned for the site and can be found in **Appendix B**.

3.2 Existing Drainage System

- 3.2.1 Sewer records were obtained from Southern Water and can be found at **Appendix C**. There are public foul water and surface water sewers located within Furniss Way.
- 3.2.2 There is a public 150mm diameter foul water sewer within Furniss Way. The closest public manhole is No. 9801 with cover level 5.63m AOD and an invert level of 4.70m AOD.
- 3.2.3 There is a public 225mm diameter surface water sewer within Furniss Way. The closest public manhole is No. 9850 with cover level 5.82m AOD and an unknown invert level.

3.3 Existing Geology

- 3.3.1 The geology of the site has been ascertained by reference to the 1:50,000 British Geological Survey website. The data provided on the website indicates the bedrock and superficial drift geology for the site.
- 3.3.2 The strata of the site (bedrock geology) comprises London Clay formation, described as follows:

“London Clay Formation - Clay, Silt and Sand. Sedimentary Bedrock formed approximately 48 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas. These sedimentary rocks are marine in origin. They are detrital and comprise coarse- to fine-grained slurries of debris from the continental shelf flowing into a deep-sea environment, forming distinctively graded beds.”

- 3.3.3 The strata of the site (superficial drift) comprises River Terrace Deposits, described as follows:

“River Terrace Deposits (undifferentiated) - Sand, Silt and Clay. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by rivers (U). These sedimentary deposits are fluvial in origin. They are detrital, ranging from coarse- to fine-grained and form beds and lenses of deposits reflecting the channels, floodplains and levees of a river or estuary (if in a coastal setting).”

3.4 Geological Assessment

- 3.4.1 Boreholes in the local area indicate predominantly clay with seams of sand and gravel. They also indicate a groundwater strike at approximately 1.5m below ground level.

3.4.2 It has not been possible to undertake site investigations at the time of writing this report to determine the underlying geology. It is recommended that a full geotechnical investigation be completed prior to any detailed design of the scheme.

3.4.3 Based on the desk study information on the geology of the site, infiltration is not likely to be suitable for the development. The requirement for a positive surface water discharge has been considered in this report.

3.5 Hydrogeology Setting

3.5.1 The Environment Agency (EA) mapping service, as provided by Magic Map, indicates the aquifer designation for the bedrock and superficial drift geology and the groundwater vulnerability in the area. The mapping, as included at **Appendix D**, provide the following information for the site:

Geology Map	Site Description
Aquifer Designation (Bedrock)	Unproductive
Aquifer Designation (Superficial Drift)	Secondary A
Groundwater Vulnerability	Medium / Low
Groundwater Source Protection Zone	None

4.0 Site Run-Off

4.1 Existing Surface Water Runoff

- 4.1.1 The site has not been previously developed, so an analysis of the Greenfield run-off rate is appropriate and will be made for the developable site area of 1.10 hectares (excluding the existing pond area).
- 4.1.2 The Greenfield run-off rates have been calculated for the existing site. The existing site run-off rates have been calculated based on the Interim Code of Practice for Sustainable Drainage Systems, Chapter 6 using the Micro Drainage design software. The output from the software analysis can be found at **Appendix E**.
- 4.1.3 The Qbar (rural) value for the site is 3.7 litres per second.

4.2 Greenfield Run-Off Assessment

- 4.2.1 An assessment of the most appropriate flow restriction on site can be made with an engineering judgement made on the following parameters:
- Proposed depth of surface water system. Shallow systems will not be able to construct certain flow controls.
 - Risk of blockages, open drainage systems and conventional piped systems will have a significantly higher chance of blockage.
 - Potential for soakage or a hybrid solution with some infiltration and some positive discharge.
 - The existing use of the site (green/brown field) and the most appropriate reduction in surface water flows from the proposed development.
 - Potential development costs and the viability of achieving very low flow rates on sites.
 - Manufacturer limits, with Hydro-International stating they can achieve between 0.7 and 550 l/s on their product range.
- 4.2.2 Infiltration has not been selected, based on the geotechnical information provided within this report.
- 4.2.3 A flow control of 3.7 litres per second has been proposed, which is equivalent to the greenfield run-off rate.

4.3 Runoff destinations

- 4.3.1 An assessment of the most appropriate management of surface water will be addressed as part of this strategy. The runoff from the development shall meet the priorities as listed below where practicable:
- priority 1: collected for non-potable use
 - priority 2: infiltrated to ground
 - priority 3: discharged to an above ground surface water body

- priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- priority 5: discharged to a combined sewer

4.3.2 The most appropriate management of surface water for this site will be a mixture of priority 1 by providing a water butt for each unit and priority 3 by discharging into the above ground surface water body (ditches and pond).

5.0 Proposed Development

5.1.1 The proposal is for 32 No. residential units. A site layout can be found at **Appendix F**.

5.2 Infiltration Potential

5.2.1 The geotechnical information provided in this report indicates that standard infiltration methods will not be suitable on site.

5.2.2 The table below summarises the potential for infiltration.

Low infiltration potential: There is a low potential for infiltration SuDS in parts of the Site. Comments: It is likely that the underlying geology at the Site, or in areas of the site, is relatively impermeable which would limit the effectiveness of a proposed infiltration SuDS scheme. Recommendations: Infiltration SuDS should be focused in more suitable parts of the site. If a site investigation confirms that infiltration SuDS are not possible at the site, then attenuation SuDS with a controlled discharge into a nearby surface water feature or existing surface water drainage is recommended.	YES
Moderate infiltration potential: There is a moderate potential for infiltration SuDS in parts of the Site. Comments: It is likely that the permeability of the underlying material at the site would be suitable for infiltration drainage. However, there may be constraints on the use of infiltration SuDS because of any of the following: a high water-table, the limited thickness of the receiving formation, the potential for a significant range in permeability in the underlying geology and confirmation of the infiltration capacity is recommended. Recommendations: A site investigation is recommended to investigate groundwater levels and formation thickness and to confirm that infiltration rates at the site are sufficient to accommodate an infiltration SuDS feature. If a site investigation confirms that infiltration SuDS are possible at the Site then assorted options can be considered for infiltration SuDS and these include infiltration trenches, soakaways, swales, permeable pavements and infiltration basins without outlets.	NO
High infiltration potential: There is a high potential for infiltration SuDS in parts of the Site. Comments: It is likely that the underlying geology at the Site is highly permeable and an infiltration SuDS scheme should be possible at the Site. Groundwater levels are expected to be sufficiently deep at the site. Recommendations: A site investigation is recommended to confirm the high infiltration capacity and the depth of the winter water table. Assorted options can be considered for infiltration SuDS and these include infiltration trenches, soakaways, swales, permeable pavements and infiltration basins without outlets.	NO

6.0 Sustainable Drainage Assessment

6.1 SuDS Hierarchy

- 6.1.1 Options for the destination for the run-off generated on site have been assessed in line with the prioritisation set out in the Building Regulations Part H document and DEFRA's Draft National Standards for SuDS as follows:

Discharge to Ground	Not viable based on desk study
Discharge to Watercourse	Selected Option
Discharge to Surface Water Sewer	N/A
Discharge to Other Sewer	N/A

- 6.1.2 The indicative potential for different SuDS devices has been assessed and can be seen in the table below:

SuDS Feature	Environmental benefits	Water quality improvement	Suitability for low permeability soils ($k < 10^{-6}$)	Ground-water recharge	Suitable for small / confined sites?	Site specific restrictions	Appropriate for subject site?
Wetlands	✓	✓	✓	X	X	None	Yes
Retention ponds	✓	✓	✓	X	X	None	Yes
Detention basins	✓	✓	✓	X	X	None	Yes
Infiltration basins	✓	✓	X	✓	X	Poor Ground	No
Soakaways	X	✓	X	✓	✓	Poor Ground	No
Underground storage	X	X	✓	X	✓	None	Yes
Swales	✓	✓	✓	✓	X	None	Yes
Filter strips	✓	✓	✓	✓	X	None	Yes
Rainwater harvesting	X	✓	✓	✓	✓	None	Yes
Permeable paving	X	✓	✓	✓	✓	None	Yes
Green roofs	✓	✓	✓	X	✓	N/A	No
Rain Garden (external)	✓	✓	✓	X	X	Site Constraints	No
Rain Garden (planter)	✓	✓	✓	X	X	None	No

6.2 Detailed SuDS Assessment

6.2.1 To maximize the potential use of SuDS at the site, a review has been undertaken in accordance with the SuDS Hierarchy (refer to SuDS: A Practical Guide prepared by the Environment Agency).

6.2.2 The following table indicates the potential setting for SuDS elements:

	Description	Setting	Required Area
Green Roof	A planted soil layer is constructed on the roof of a building to create a living surface. Water is stored in the soil layer and absorbed by vegetation.	Building	Building integrated
Rainwater Harvesting	Rainwater is collected from the roof of a building or from other paved surfaces and stored in an overground or underground tank for treatment and reuse locally. Water could be used for toilet flushing and irrigation.	Building	Water storage (underground or above ground)
Soakaway	A soakaway is designed to allow water to quickly soak into permeable layers of soil. Constructed like a dry well, an underground pit is dug filled with gravel or rubble. Water can be piped to a soakaway where it will be stored and allowed to gradually seep into the ground.	Open Space	Dependant on Run-off volumes and soils
Filter Strip	Filter strips are grassed or planted areas that runoff can run across to promote infiltration and cleansing.	Open Space	Maximum length 5 metres
Permeable Paving	Paving which allows water to soak through. Can be in the form of paving blocks with gaps between solid blocks or porous paving where water filters through the block itself. Water can be stored in the sub-base beneath or allowed to infiltrate into ground below.	Street / Open Space	Can typically drain double its area
Bioretention Area	A vegetated area with gravel and sand layers below designed to channel, filter and cleanse water vertically. Water can infiltrate into the ground below or drain to a perforated pipe and be conveyed elsewhere. Bioretention systems can be integrated with tree-pits or gardens.	Street / Open Space	Typically, surface area is 5-10% of drained area with storage below.
Swale	Swales are vegetated shallow depressions designed to convey and filter water. These can be 'wet' where water gathers above the surface, or 'dry' where water gathers in a gravel layer beneath. Can be lined or unlined to allow infiltration.	Street / Open Space	Account for width to allow safe maintenance typically 2-3 metres wide.
Hardscape Storage	Hardscape water features can be used to store run-off above ground within a constructed container. Storage features can be integrated into public realm areas with a more urban character.	Open Space	Could be above or below ground and sized to storage need.
Pond / Basin	Ponds can be used to store and treat water. 'Wet' ponds have a constant body of water and run-off is additional, while 'dry' ponds are empty during periods without rainfall. Ponds can be designed to allow infiltration into the ground or to store water for a period of time before discharge.	Open Space	Dependant on runoff volumes and soils.
Wetland	Wetlands are shallow vegetated water bodies with a varying water level. Specially selected plant species are used to filter water. Water flows horizontally and is gradually treated before being discharged. Wetlands can be integrated with a natural or hardscape environment.	Open Space	Typically, 5-15% of drainage area to provide good treatment.
Underground Storage	Water can be stored in tanks, gravel or plastic crates beneath the ground to provide attenuation.	Open Space	Dependant on runoff volumes and soils.

6.2.3 This review highlights the components referenced in the SuDS Hierarchy and provides recommendations on whether the components could be incorporated into the development.

Component	Recommendation / Opinion	
Green (living) roofs or Blue/Green roof systems	There is no scope for blue or green roofs on the development.	↓
Basins and Ponds	There is some potential for basins and ponds on the site, which have been selected as the primary attenuation device.	↓
Filter Strips and Swales	There is some scope for use of surface mounted SuDS on the scheme to convey water, subject to further design.	↓
Infiltration Devices	Infiltration devices are unlikely to be viable on site.	↓
Permeable Surfaces and Filter Drains	Porous surfaces should be viable on site in a tanked configuration.	↓
Tanked Systems	It is unlikely that these will be required.	↓

6.2.4 The proposed drainage system incorporates sustainable drainage features in accordance with the SuDS hierarchy, current legislation and best practice as much as practicable on site.

6.2.5 There may be opportunity for small scale bespoke SuDS elements (such as planters) to be included as part of the landscaping proposals. These should be considered fully before construction commences.

7.0 Drainage Proposal

7.1 Surface Water Drainage

7.1.1 Surface water drainage at the site will follow the Sustainable Drainage Systems (SuDS) management train. The surface water from the site will discharge into the existing watercourse at a restricted rate. A Drainage Plan can be found at **Appendix G**.

7.1.2 All rainwater will pass through some form of treatment before it enters the watercourse as indicated on the Drainage Layout.

7.2 Climate Change

7.2.1 It is globally recognised that the rise in carbon dioxide and other greenhouse gases (such as methane) in the atmosphere enhance the 'greenhouse effect' where more of the Sun's energy is trapped, causing the Earth to warm. It is also recognised that this process has been aggravated by human activities and forecasts predict significant changes to the planet's temperatures and weather.

7.2.2 The Environment Agency publish climate change allowances to be used in Flood Risk Assessments and drainage calculations and the current estimates were published in May 2022. For drainage calculations Peak rainfall intensity allowances are used.

7.2.3 The peak rainfall intensity allowances to be applied to the drainage calculations for a specific site are obtained from the EA's peak rainfall allowances map. The site is located within the Arun and Western Management Catchment and the predicted increase in rainfall intensities are as follows:

EPOCH	CENTRAL ALLOWANCE	UPPER END ALLOWANCE
2050'S	20%	35%
2070'S	25%	40%

Table: 3.3% (1 in 30) Annual Exceedance Rainfall Events Climate Change Allowances

EPOCH	CENTRAL ALLOWANCE	UPPER END ALLOWANCE
2050'S	20%	45%
2070'S	25%	45%

Table: 1% (1 in 100) Annual Exceedance Rainfall Events Climate Change Allowances

- 7.2.4 The 2050s epoch allowances are used for development with a lifetime up to 2060 and the 2070s epoch allowances are used for development with a lifetime between 2061 and 2125.
- 7.2.4 For development with a lifetime up to 2060, use the central allowance for the 2050s epoch (2022 to 2060) should be used. For development with a lifetime between 2061 and 2100 the central allowance for the 2070s epoch (2061 to 2125) should be used. For development with a lifetime beyond 2100 the upper end allowances should be used for both the 1% and 3.3% annual exceedance probability events for the 2070s epoch (2061 to 2125).
- 7.2.5 The development lifetime guidance should be used to work out the lifetime of a development, however, the guidance says that residential development should be considered to have a minimum lifetime of 100 years. For this development the upper end allowance for the 2070s epoch should be used i.e. 40% for the 3.3% annual exceedance rainfall event, and 45% for the 1% annual exceedance rainfall event. The latter event should prove the following:
- there is no increase in flood risk elsewhere
 - your development will be safe from surface water flooding
- The following guidance should be used to do this:
- Planning practice guidance on flood risk
 - Preparing a flood risk assessment: standing advice – Surface water management section
 - Sustainable drainage systems: non-statutory technical standards
 - CIRIA SuDS manual
 - Water UK sewerage sector guidance – Design and construction standards
 - ICE SuDS route maps
- 7.2.6 Any water up to a 1 in 100 year storm event including 45% climate change will be attenuated within the curtilage of the site in the proposed drainage system.
- 7.2.7 National standards for sustainable drainage systems (SuDS) published 19 June 2025 the Design and Construction Guidance 2020 and Sewers for Adoption recommend that the 1 in 30 year storm event is managed below ground with exceedance flows managed above ground.
- 7.2.8 Causeway Flow calculations have been undertaken, which can be found at **Appendix H**. Although the application is outline, an extensive system has been designed, and the model has shown that for all surface water events the water can be accommodated in the system. At the detailed design stage when more pipework, chambers and SuDs features are added to the system more storage and treatment will be provided.

7.3 Existing Watercourse

- 7.3.1 It is intended to culvert the existing watercourse on the southern boundary of the site due to secure by design constraints on the proposed units.
- 7.3.2 If the Lead Local Flood Authority are opposed to the culverting of this watercourse, there are a few options that can be explored. These have been detailed in the drainage plan.

7.4 Designing for Exceedance Events

- 7.4.1 Current best practice guidance on flood risk requires an evaluation of how rainfall events beyond the design capacity of the proposed drainage system would be managed and what effects they are likely to have on flood risk at the site or surrounding areas.
- 7.4.2 Should a rainfall event exceeding the 1.0% AEP (1 in 100 year) event plus climate change event occur, the proposed storage and flow paths of surface water should be considered.
- 7.4.3 The surface water SuDS features included for the 1 in 100 year storm will be designed with sufficient resilience to manage and convey exceedance flows away from any properties to minimise risk.
- 7.4.4 Indicative exceedance pathways have been shown on the drainage layout, with further information to be defined once the detailed levels of the scheme have been developed.

7.5 Designing for System Failure

- 7.5.1 Current best practice on sustainable drainage design should consider failure of the surface water system and potential blockages from multiple sources. The potential risks to the surface water system have been indicated below:

Risk	Description	Comments / Recommendations
Blockage	Potential blockage of outfall from surface water system	Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report
Failure	Potential blockage of outfall from flow control failure or build-up of debris	Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report
Surcharge	Potential back-up of system due to surcharging or poorly maintained public surface water infrastructure or watercourse	Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report
Blockage	Potential risk of flooding due to build-up of sediment within system	Catchpit manholes have been provided to remove solids and sediment. Regular inspection and maintenance of the drainage system should be undertaken in line with the findings of this report.
Failure	Potential risk of surface water flows from poor maintenance of surface mounted SuDS features (such as porous paving or swales)	Regular inspection and maintenance of the surface mounted SuDS should be undertaken in line with the findings of this report.
Surcharge	Potential risk of additional surface water flows or overland flows from extreme (exceedance storm) events in adjacent sites causing the surface water system to be overloaded.	Exceedance flow routes have been assessed and shown on the drainage layout.
Failure	Potential risk from failure of third-party specialist equipment such as pump stations or interceptors	Any pump stations or interceptors installed on site should be maintained in line with the specialist manufacturer's recommendations.

Blockage	Potential risk from poor maintenance of gullies	Regular inspection and maintenance of the underground drainage system should be undertaken in line with the findings of this report.
Blockage	Potential reduction in infiltration on site from compaction of soils during the construction phase	Ground consolidation should not have a major impact.
Failure	Poor planting and maintenance of green areas could reduce the hydraulic properties of SuDS devices (and amenity/biodiversity benefits)	Regular inspection and maintenance of the surface mounted SuDS should be undertaken in line with the findings of this report. The high groundwater table should be noted, and any observed risks reported.

7.6 Urban Creep

- 7.6.1 Urban Creep is the conversion of permeable surfaces to impermeable over time. e.g. impermeable surfacing of front gardens to provide additional parking spaces, extensions to existing buildings, creation of large patio areas. The consideration of urban creep (is best) assessed on a site by site basis but is limited to residential development only.
- 7.6.2 It is important that the appropriate allowance for urban creep is included in the design of the drainage system over the lifetime of the proposed development. The allowances set out below are applied to the impermeable area within the property curtilage:

Residential development density Dwellings per hectar	Change allowance % of impermeable area
≤ 25	10
30	8
35	6
45	4
≥ 50	2
Flats & apartments	0

- 7.6.3 Note where the inclusion of the appropriate allowance would increase the total impermeable area to greater than 100%, 100% should be used as the maximum.
- 7.6.4 The proposed development has some scope for expansion. Based on this, 5% allowance for urban creep is required for the development.

7.7 Construction Phase Drainage

- 7.7.1 It is an offence to cause or knowingly permit the entry of poisonous, noxious or polluting material into the water environment. Prosecution may ensue if the pollution is serious enough to lower the ecological status of the water body in terms set by the Water Framework Directive (2000/60/EC).

- 7.7.2 The polluter does not have to be prosecuted first for remediation of damage to be required. If water pollution is serious enough to be classed as environmental damage the damage will require to be remediated such that the area is returned to the condition it would have been in if the damage had not occurred.
- 7.7.3 An offence may also be committed if environmental damage or the threat of environmental damage is not reported by the polluter or if no action is taken by the polluter to prevent further damage. Third parties (e.g. private water supply users, landowners, recreational users and the public) who may be affected by possible damage may also report 'risk' of environmental damage to the enforcing authority; in this instance an offence may be committed if action is not taken to prevent the potential environmental damage occurring.
- 7.7.4 The principles of Sustainable Drainage Systems (SuDS) shall be applied to all components of design and construction regarding surface water management. Any design or site works that may impact on the site drainage or water quality shall:
- Soakaway where soils allow
 - Consider and manage erosion
 - Retain any silts on site and prevent silts from discharging into watercourses or drains
 - Remove pollutants in surface water
 - Keep runoff rates at existing greenfield runoff
 - Prevent accidental spillages reaching watercourses.
- 7.7.5 As infiltration is not expected to be viable on site, the temporary drainage for the development will be in the form of land drainage with discharge into the existing sewer, with the appropriate levels of treatment.
- 7.7.6 Pollution will be controlled via the use of catchpit manholes and geotextiles.
- 7.7.7 Any potentially hazardous substances (i.e. from plant / deliveries) will be within a controlled compound with a separate drainage system that will contain a penstock valve / containment kit in the event of a spillage.

7.8 Foul Water Drainage

- 7.8.1 The foul water for the development will discharge into the existing public sewer. Foul water flows are anticipated to be 1.48 litres per second based on 4000 litres per dwelling per day in accordance with Sewers for Adoption 7th Edition and the Design and Construction Guidance 2020.

8.0 Water Quality

8.1 Water Quality Overview

- 8.1.1 A key requirement of any SuDS system is that it protects the receiving water body from the risk of pollution. This can be effectively managed by an appropriate “train” or sequence of SuDS components that are connected in series.
- 8.1.2 The frequent and short duration rainfall events are those that are most loaded with potential contaminants (silts, fines, heavy metals and various organic and inorganic contaminants). Therefore, the first 5-10 mm of rainfall (first flush) should be adequately treated with SuDS.
- 8.1.3 The minimum number of treatment stages will depend on the sensitivity of the receiving water body and the potential hazard associated with the proposed development SuDS Manual (CIRIA, 2015).
- 8.1.4 The proposed development is a combination of very low (roof water) to low hazard (runoff from small car parking areas), as indicated on the table below:

Hazard	Source of Hazard	Present
Very Low	Residential Roof drainage.	YES
Low	Residential amenity uses including low usage car parking spaces and roads, other roof drainage	YES
Medium	Commercial, industrial uses including car parking spaces and roads (excluding low usage road, trunk roads and motorways)	NO
High	Areas used for handling and storage of chemicals and fuels, handling of storage and waste	NO

- 8.1.5 The site does lie within a source protection zone and therefore additional treatment stages are required.
- 8.1.6 The treatment processes provided by different SuDS components will have varying capabilities for removal of different types of contaminants as per the table below:

Hazard	Requirements for discharge to surface water and groundwater	Present
Very Low	Removal of gross solids and sediments only.	YES
Low	Simple index approach	YES
Medium	Surface water: Simple index approach Ground water: Simple index approach and risk screening	NO
High	Guidance and risk assessment process in HA (2009). Discharge may require environmental permit or licence. Obtain pre-permitting advice from environmental regulator. Risk assessment likely to be required.	NO

8.2 Simple Index Approach

- 8.2.1 The index approach as defined by CIRIA C753 (the SuDS Manual) defines the index approach to water quality in three steps as defined in Box 26.2 below:

**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:

¹ Designated as those protected for the supply of drinking water (Table 4.3).

8.3 Step 1- Allocate Potential Hazards

- 8.3.1 To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type):

Total SuDS mitigation index $\geq$ pollution hazard index

(for each contaminant type) (for each contaminant type)

- 8.3.2 Where the only destination of the runoff is to a surface water – that is there is no infiltration from the SuDS to groundwater – the surface water indices should be used.
- 8.3.3 In England and Wales, where the principal destination of the runoff is to a surface water, but small amounts of infiltration may occur from unlined components (Interception), then the groundwater indices should be used for the discharge to groundwater, and the surface water indices should be used for the main surface water discharge (as suggested in Table 26.3).
- 8.3.4 Where the principal destination of the runoff is to groundwater, but discharges to surface waters may occur once the infiltration capacity is exceeded, the groundwater indices should be used, as suggested in Table 26.4. The risk to surface waters will be low, as dilution will be high for large events, so treatment is not required.
- 8.3.5 The pollution indices for this site have been selected using the guidance in CIRIA C753 and are as per Table 26.2 below:

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 sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

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.

Where a site land use falls outside the defined categories, the indices should be adapted (and agreed with the drainage approving body) or else the more detailed risk assessment method should be adopted.

Where nutrient or bacteria and pathogen removal is important for a particular receiving water, equivalent indices should be developed for these pollutants (if acceptable to the drainage approving body) or the risk assessment method adopted.

8.3.6 The identified hazard levels are as follows:

- Total Suspended Solids (TSS) 0.70
- Metals 0.60
- Hydrocarbons 0.45

8.3.7 Treatment has been provided in the form of catchpit manholes to remove sediment and contaminated particles and geotextiles within the porous paving as a filter medium. Where rainwater planters are provided, they will also remove contaminated particles.

Additional treatment could be provided in the pond with appropriate planting and reeds.

8.4 Treatment with Discharge to Surface Water

8.5 As the site is discharging to a watercourse or sewer, Table 26.3 of the CIRIA C753 manual is used to evaluate the water quality mitigation measures offered by the proposed drainage system.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters				
Type of SuDS component	Mitigation indices¹			
	TSS	Metals	Hydrocarbons	
Filter strip	0.4	0.4	0.5	
Filter drain	0.4 ²	0.4	0.4	
Swale	0.5	0.6	0.6	
Bioretention system	0.8	0.8	0.8	
Permeable pavement	0.7	0.6	0.7	
Detention basin	0.5	0.5	0.5	
Pond ⁴	0.7 ³	0.7	0.5	
Wetland	0.8 ³	0.8	0.8	
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.			

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://tinyurl.com/qf7yuj7>
- 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.

8.5.1 The identified hazard remediation levels are as follows:

	Hazard	Treatment	Result
– Total Suspended Solids (TSS)	0.70	1.4	0
– Metals	0.60	1.3	0
– Hydrocarbons	0.45	1.2	0

9.0 Ownership Responsibility

9.1.1 The drainage has been separated by ownership as part of this strategy. The separation is as follows:

Drainage Element	Ownership	Adopted
Private Surface Water system *	Maintenance company appointed by Hayling Island Builders Ltd	Private
Private / Residential Foul Water System *	Maintenance company appointed by Hayling Island Builders Ltd	Private
Public / Road Surface Water system	Southern Water (offered under S104)	Public
Public / Road Foul Water system	Southern Water (offered under S104)	Public
Sustainable drainage features	Maintenance company appointed by Hayling Island Builders Ltd	Private
Riparian Foul Plot Drainage	Property Owner	Private
Riparian Surface Water Plot Drainage	Private Owner	Private

***Note*:** Predominately two units or more

9.2 Adoptable Drainage

9.2.1 Sewers for Adoption (7th and 6th Edition) are guidance documents used by the water companies to approve and review drainage designs that are offered to them (or vested) for adoption. This is usually via a S104 or similar agreement.

9.2.2 As of 1st April 2020, the Design and Construction Guidance documentation will replace both the previous versions and will be mandatory as part of the Code for Adoption agreements.

9.2.3 Appendix C of the Design and Construction Guidance (DCG) is in effect the replacement for Sewers for Adoption (SfA) 6th and 7th edition.

9.3 Adoptable Systems

9.3.1 The table below indicates the type of drainage element that is currently allowed to be offered for adoption under DCG 2020, with the previous allowances shown for reference.

	SfA6 / 7	DCG	LA	PRIVATE
Rainwater Harvesting	X	X	X	✓
Green Roofs	X	X	X	✓
Infiltration Systems	X	✓	✓	✓
Proprietary Treatment Systems	✓	✓	✓	✓
Filter Strips	X	X	✓	✓
Filter Drains	X	✓	✓	✓
Swales	X	✓	✓	✓
Bioretention Systems	X	✓	X	✓
Trees	X	X	✓	✓
Pervious Pavements	X	X	✓	✓
Attenuation Storage Tanks	✓	✓	✓	✓
Detention Basins	X	✓	✓	✓
Ponds and Wetlands	X	✓	✓	✓

9.3.2 The drainage elements on this system that are intended to be offered for adoption have been shown on the drainage plan as appropriate but these are likely to be foul water runs only.

10.0 Drainage Maintenance

10.1.1 Regular inspection and maintenance is particularly important to ensure the effective long-term operation of surface water drainage, sewers and sustainable drainage systems (SuDS).

10.1.2 When designing, we have considered the required maintenance over the design life of the project, ensuring sufficient and permanent access to all areas of the system.

10.1.3 Maintenance operations can be divided into the following categories:

- Regular (or routine frequent) - this covers items that are carried out typically with a frequency from monthly to annually. It includes items such as inspection and monitoring, litter removal, grass cutting or other vegetation management, sweeping permeable pavements.
- Infrequent (or routine infrequent) - this covers items that are required typically with a frequency from annually up to 25 years (or possibly greater). It includes items such as wetland vegetation management, silt removal from swales, ponds or wetlands, scarifying and spiking infiltration basins and gravel replacement to filter drains.
- Remedial (or reactive) - this covers maintenance that is not usually required, but may be necessary as a result of vandalism, accidental damage, rainfall that exceeds the design capacity or similar events. Examples include repair of erosion in a swale or repair of permeable surfaces blocked for example by mixing concrete on them.

10.2 Riparian Responsibility

10.2.1 If an occupier owns land adjoining, above or with a portion of the drainage system running through it, they have certain rights and responsibilities. In legal terms they are a 'riparian owner'. If they rent the land, they should agree with the owner who will manage these rights and responsibilities.

10.2.2 It is recommended that the owner's appointed Management Company handle the maintenance of all underground drainage and all SuDS devices, with the following exceptions:

- Inspecting and cleaning out any surface mounted hard drainage systems (such as channel drains);
- Inspecting and cleaning out (or reporting) SuDS systems on a small scale (such as garden ditches and swales).

10.3 Allowing for Replacement

10.3.1 The design life of some SuDS elements and drainage elements of the proposed system is shorter than the predicted design life of the development. Therefore, the design and maintenance regime consider any potential replacement works (such as replacing permeable paving).

10.3.2 Regular inspection of the underground drainage system should be as per the tables below.

Operation and maintenance requirements for Surface Water and Foul Systems		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect for sediment and debris in catchpit manholes and gullies. Clean out as required	Twice Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional Maintenance	Remove sediment and debris from catchpits, gullies, attenuation devices and inside of concrete manhole rings	As required, based on inspections
Remedial Actions	Reconstruct and/or replace components, if performance deteriorates or failure/blockage occurs	As required
	Replacement of clogged components (flow restriction)	As required
Monitoring	Inspect silt traps/gullies/catchpits and note rate of sediment accumulation	Monthly in the first year and then annually
	Check flow control chamber and attenuation devices	Annually

11.0 Suds Maintenance

- 11.1.1 Like all drainage systems, SuDS components should be inspected and maintained. This ensures efficient operation and prevents failure. Usually SuDS components are on or near the surface and most can be managed using landscape maintenance techniques.
- 11.1.2 For below-ground SuDS such as permeable paving and modular geocellular storage the manufacturer or designer should provide maintenance advice. This should include routine and long-term actions that can be incorporated into a maintenance plan.
- 11.1.3 The design process considers the maintenance of the components (access, waste management etc.) including any corrective maintenance to repair defects or improve performance.
- 11.1.4 In the absence of legislation funding for the adopter to maintain their SuDS may need to be resolved at the start of the development process to ensure that either the local authority, a maintenance company, local residents or the water company have sufficient resources to maintain the system in the long-term.
- 11.1.5 Further information on maintenance can be found in The SUDS Manual (CIRIA publication C697), which has been used as a guide for this report.
- 11.1.6 The SuDS scheme is unlikely to be handed over for maintenance until all parties are confident that the scheme is constructed and performs as designed. An interim maintenance plan can be incorporated on larger or phased schemes.
- 11.1.7 Maintenance of SuDS drainage should be in accordance with the guidance presented in CIRIA Factsheet “Maintenance of SuDS” May 2017. A detailed maintenance plan for the scheme will be generated by the appointed owner/maintainer of the site or a selected maintenance company and this section is for guidance only.

11.1.8 Regular inspection of the sustainable drainage system should be as per the tables below.

Operation and maintenance requirements for Swales		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseedling	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Operation and maintenance requirements for Pervious Pavements		
Maintenance Schedule	Required Action	Typical 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 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	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
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	As required
	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 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Operation and maintenance requirements for Ponds and Wetlands		
Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass – public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc. for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May – October)
	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
	Check any mechanical devices eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1 m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge to a minimum of 1 m above water level	Annually
	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 required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
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	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows.	As required

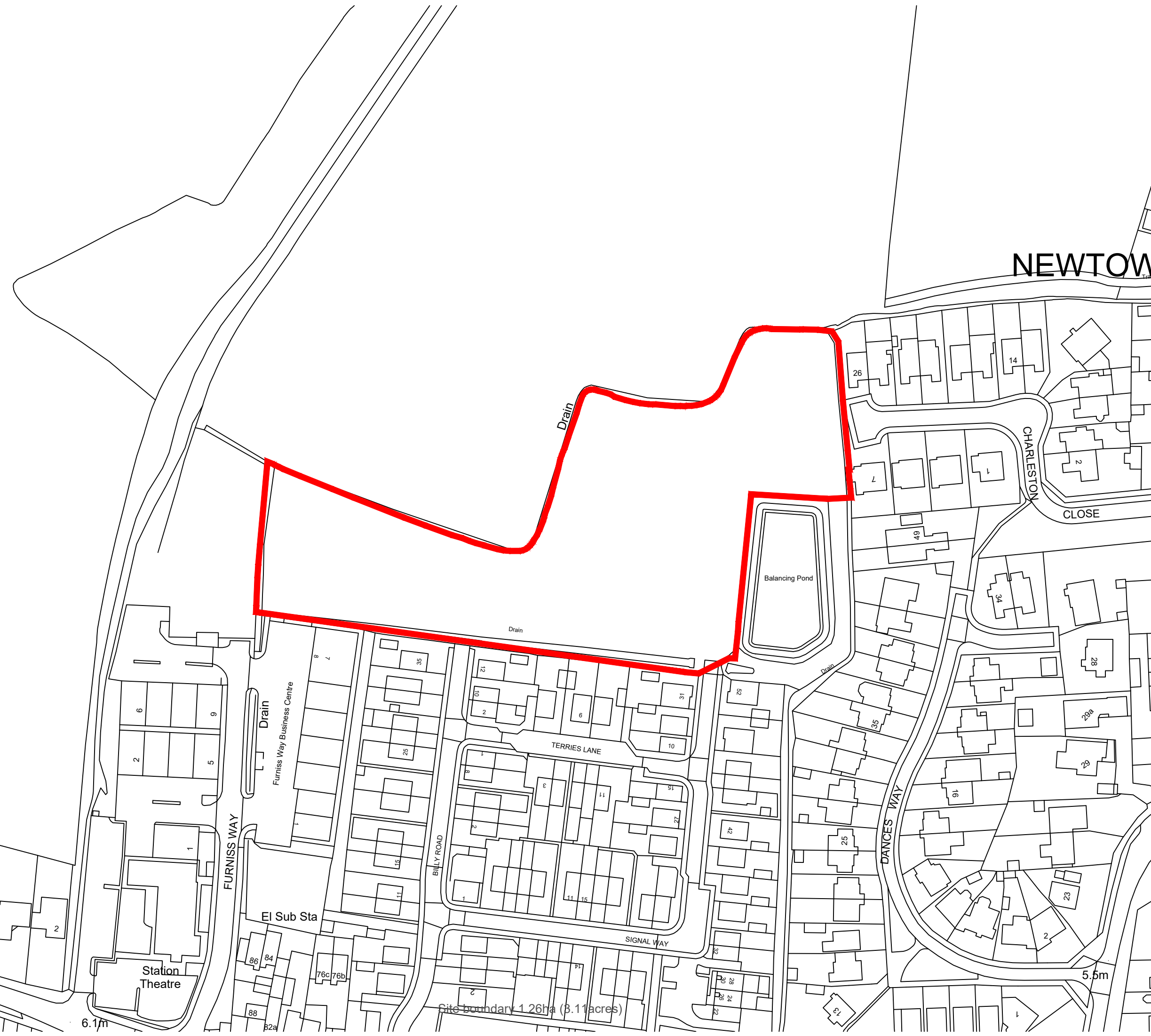
12.0 Summary and Conclusions

- 12.1.1 Hayling Island Builders Ltd is planning a proposed development on the site at Land North of The Oysters, Furniss Way, Hayling Island, PO11 0FG.
- 12.1.2 CGV Transport Consultants Ltd has been instructed by Hayling Island Builders Ltd, to produce a Drainage Strategy to support the Planning Application.
- 12.1.3 The surface water system will discharge into the existing watercourse at a restricted rate.
- 12.1.4 The foul water will discharge into the existing public sewer.
- 12.1.5 The report has demonstrated that the proposed drainage measures ensure that no property will be at risk of flooding if the development proceeds and that suitable means of surface water and foul drainage can be achieved for the proposed development.

Appendix A

Location Plan

Site boundary 1.26ha (3.11acres)



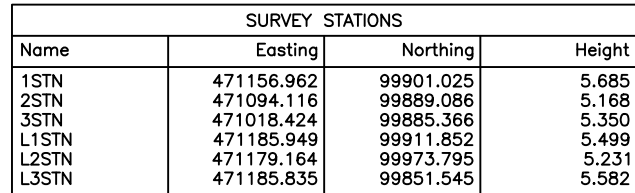
Project
Land North of the Oysters

Drawing Title
Site Location Plan

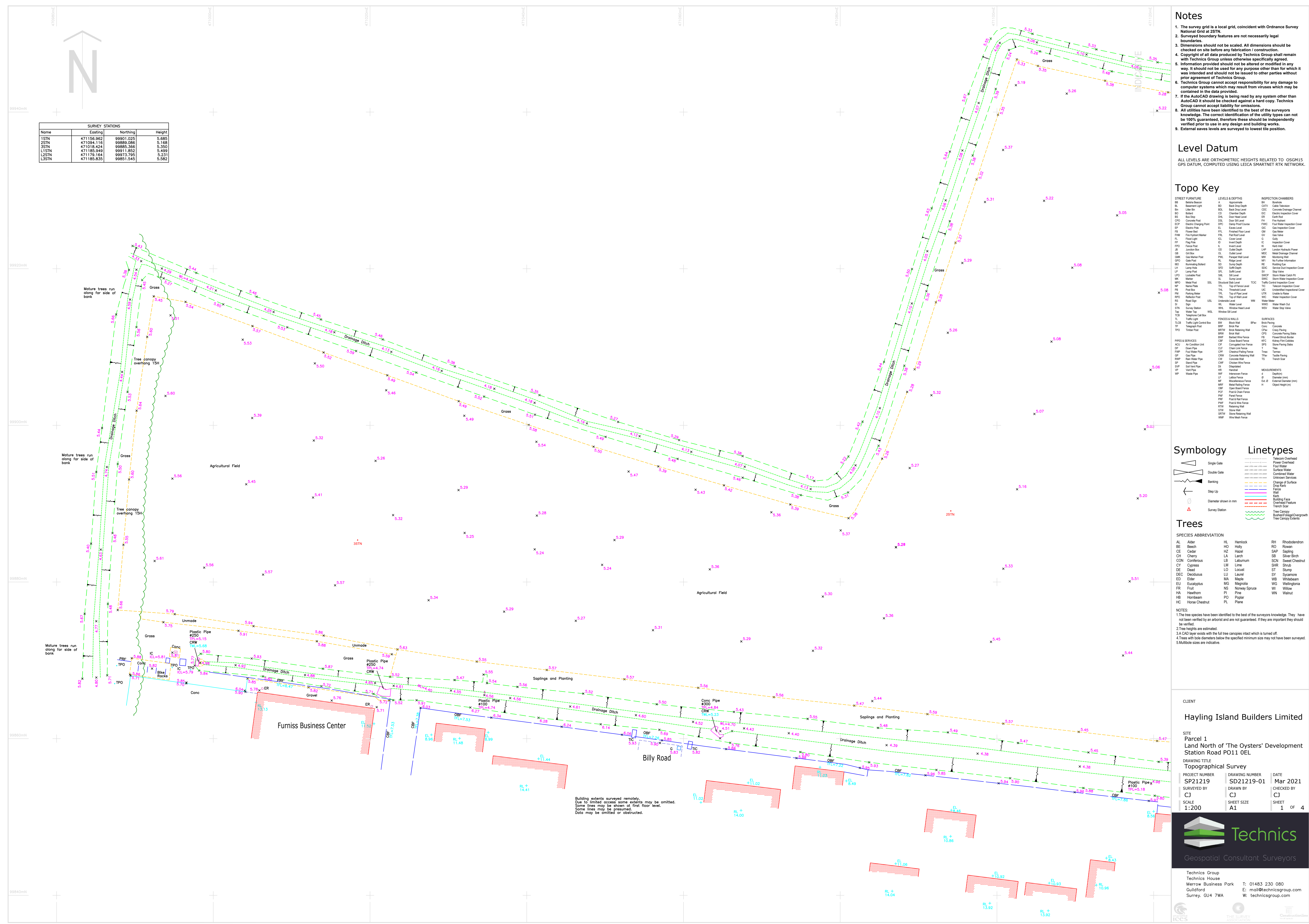
Date	Scale	Drawn by	Check by
08/03/2021	1:1,250 at A3	ML	SR
Project No	Drawing No	Revision	
1239	001	-	

Appendix B

Topographical Survey



SURVEY STATIONS			
Name	Easting	Northing	Height
1STN	471156.962	99901.025	5.685
2STN	471094.116	99889.086	5.168
3STN	471018.424	99885.366	5.350
L1STN	471185.949	99911.852	5.499
L2STN	471179.164	99973.795	5.231
L3STN	471185.835	99851.545	5.582



1. The survey grid is a local grid, coincident with Ordnance Survey National Grid at 237N.
2. Boundary features are not necessarily legal boundaries.
3. Dimensions should not be fabricated. All dimensions should be checked site by site.
4. Copyright of all data produced by Technics Group shall remain with Technics Group unless otherwise specifically agreed.
5. The drawings are for information only and are not to be used in any way. It should not be used for any purpose other than for which it was intended and should not be issued to other parties without the written consent of Technics Group.
6. Technics Group cannot accept responsibility for any damage to computer systems which may result from viruses which may be present on the drawings.
7. If the AutoCAD drawing is being read by any system other than AutoCAD it should be checked against a hard copy. Technics Group cannot accept liability for omissions.
8. The drawings have been prepared from the best of the surveyors knowledge. The correct identification of the utility types can not be 100% guaranteed, therefore these should be independently checked.
9. External elevations are surveyed to lowest tile position.

ALL LEVELS ARE ORTHOMETRIC HEIGHTS RELATED TO OSGM15
GPS DATUM, COMPUTED USING LEICA SMARTNET RTK NETWORK

[illegible]

	Single Gate		Power Overhead Foul Water
	Double Gate		Surface Water Combined Wastes
	Banking		Unknown Services
	Step Up		Change of Surface Drop Kerb
	Diameter shown in mm		Wall
	Survey Station		Kerb
			Building Face
			Overhead Feature
			Trench Symbol
			Tree Canopy
			Bushes/Foliage/Overhanging Feature

Power Overhead
Foul Water
Surface Water
Combined Water
Unknown Services
Change of Surface
Drop Kerb
Fence
Wall
Kerb
Building Face
Overhead Feature
Trench Scar
Tree Canopy
Bushes/Foliage/Overgrowth

SPECIES ABBREVIATION					
AL	Alder	HL	Hemlock	RH	Rhododendron
BE	Beech	HO	Holly	RO	Rowan
CE	Cedar	HZ	Hazel	SA	Sapling
CH	Cherry	LA	Larch	SB	Shirubush
CO	Cornus	LB	Lamburnum	SCN	Sweet Cherry
CY	Cypress	LM	Lime	SHR	Shrub
DE	Dead	LO	Locust	ST	Stump
DEC	Deciduous	LU	Laurel	SY	Sycamore
DI	Dwarf	MY	Myrtle	WB	Whitebark
EU	Eucalyptus	MG	Magnolia	WG	Weigelliana
FR	Frut	NS	Norway Spruce	WI	Willow
HA	Hawthorn	PI	Pine	WN	Walnut
HB	Hornbeam				
HC	Horse Chestnut	PL	Plane		

NOTES:

1. The tree species have been identified to the best of the surveyors knowledge. They have not been verified by an arborist and are not guaranteed. If they are important they should be verified.
2. Tree heights are estimated.
3. A CAD layer exists with the full tree canopies intact which is turned off.
4. Trees with bole diameters below the specified minimum size may not have been surveyed.
5. Multiple sizes are indicative.

CLIENT

Hayling Island Builders Limited

SITE
Parcel 1
Land North of 'The Oysters' Development
Station Road PO11 0EL

DRAWING TITLE
Topographical Survey

PROJECT NUMBER SP21219	DRAWING NUMBER SD21219-01	DATE Mar 2021
SURVEYED BY CJ	DRAWN BY CJ	CHECKED BY CJ
SCALE 1:200	SHEET SIZE A1	SHEET 1 OF 4



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Surrey, GU4 7WA W: technicsgroup.com

ALL LEVELS ARE ORTHOMETRIC HEIGHTS RELATED TO OSGM15
GPS DATUM, COMPUTED USING LEICA SMARTNET RTK NETWORK

STREET FURNITURE		LEVELS & DEPTHS		INSPECTION CHAMBERS	
MB	Manhole	MB	Bottom Depth	MB	Manhole
BL	Basement Light	BD	Back Drop Depth	CBV	Cable Valve
BL	Basement Light	BD	Back Drop Depth	CBV	Cable Valve
BO	Bottom	CB	Chamber Depth	EC	Electric Inspection Cover
BO	Bottom	CB	Chamber Depth	EC	Electric Inspection Cover
CPD	Covered Road	CSL	Over Side Level	FC	Fire Hydrant
CPD	Covered Road	CSL	Over Side Level	FC	Fire Hydrant
EP	Electric Pole	ESL	Event Level	GC	Gas Inspection Cover
EP	Electric Pole	ESL	Event Level	GC	Gas Inspection Cover
FR	Fire Fighting Pump	FL	Fire Floor Level	GV	Gas Valve
FR	Fire Fighting Pump	FL	Fire Floor Level	GV	Gas Valve
FP	Flag Pole	IO	Inward Depth	IC	Inspection Cover
FP	Flag Pole	IO	Inward Depth	IC	Inspection Cover
JS	Joint	OD	Outer Depth	LHP	Lateral Hydraulic Power
JS	Joint	OD	Outer Depth	LHP	Lateral Hydraulic Power
CMK	Gas Main Post	PWL	Pipe Wall Level	ML	Monitoring
CMK	Gas Main Post	PWL	Pipe Wall Level	ML	Monitoring
GRD	Grass	SD	Side Depth	NE	Non-Electric
GRD	Grass	SD	Side Depth	NE	Non-Electric
BL	Burrowing Insect	SD	Side Depth	RF	Rocking Fire
BL	Burrowing Insect	SD	Side Depth	RF	Rocking Fire
LP	Lamp Post	SFL	Soil Level	SV	Stop Valve
LP	Lamp Post	SFL	Soil Level	SV	Stop Valve
MC	Manhole	SL	Soil Level	SHWC	Shallow Water Inspection Cover
MC	Manhole	SL	Soil Level	SHWC	Shallow Water Inspection Cover
MP	Manhole	SS	Side of Force Level	TC	Teknicon Inspection Cover
MP	Manhole	SS	Side of Force Level	TC	Teknicon Inspection Cover
NP	Non-Parking	TFL	Top of Force Level	UTR	Underground Inspection Cover
NP	Non-Parking	TFL	Top of Force Level	UTR	Underground Inspection Cover
RS	Road Side	USL	Underground Level	WM	Water Inspection Cover
RS	Road Side	USL	Underground Level	WM	Water Inspection Cover
W	Water	WFL	Water Level	WHO	Water Inspection Cover
W	Water	WFL	Water Level	WHO	Water Inspection Cover
STN	Station	WFL	Water Level	WHO	Water Inspection Cover
STN	Station	WFL	Water Level	WHO	Water Inspection Cover

	Single Gate	-----	Telecom Overhead
	Double Gate	-----	Power Overhead
	Banking	-----	Foot Water
	Step Up	-----	Surface Water
	Diameter shown in mm	-----	Combined Water
	Survey Station	-----	Unsewered Services
		-----	Change of Surface
		-----	Drop Kerb
		-----	Fence
		-----	Wall
		-----	Kerb
		-----	Building Foot
		-----	Overhead Feature
		-----	Trench Scar
		-----	Tree Canopy
		-----	Burner Pothole/Overgrowth
		-----	Tree Crown

AL	Alder	HL	Hemlock	RH	Rhododendron
BE	Beech	HO	Holly	RO	Rowan
CE	Cedar	HZ	Hazel	SAP	Sawing
CH	Cherry	LA	Larch	SB	Silver Birch
COM	Comiferous	LB	Lb. Lignum	SCN	Sweet Chestnut
CY	Cypress	LM	Lamarque	SHR	Shrub
DE	Deadwood	LO	Locust	ST	Stump
DEC	Decid.	LU	Lurel	SV	Shrub
EL	Elm	MA	Maple	WB	Whitebark
EU	Eucalyptus	MG	Magnolia	WG	Willow
FR	Fruit	MS	Monrovia Spruce	WI	Wilding
HA	Hawthorn	PI	Pine	WN	Walnut
HB	Hornbeam	PP	Poplar		
HC	Horse Chestnut	PL	Plane		

NOTES:

1. The tree species have been identified to the best of the surveyors knowledge. They have not been verified by an arborist and are not guaranteed. If they are important they should be verified.
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CLIENT

Hayling Island Builders Limited

SITE
Parcel 1
Land North of 'The Oysters' Development
Station Road PO11 0EL

DRAWING TITLE
Topographical Survey

PROJECT NUMBER	DRAWING NUMBER	DATE
SP21219	SD21219-01	Mar 2021

SURVEYED BY _____ DRAWN BY _____ CHECKED BY _____

SCALE 1:200 SHEET SIZE A1 SHEET 3 OF 4

1.200	A1	2	3	4
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Technics

Geospatial Consultant Supervisors

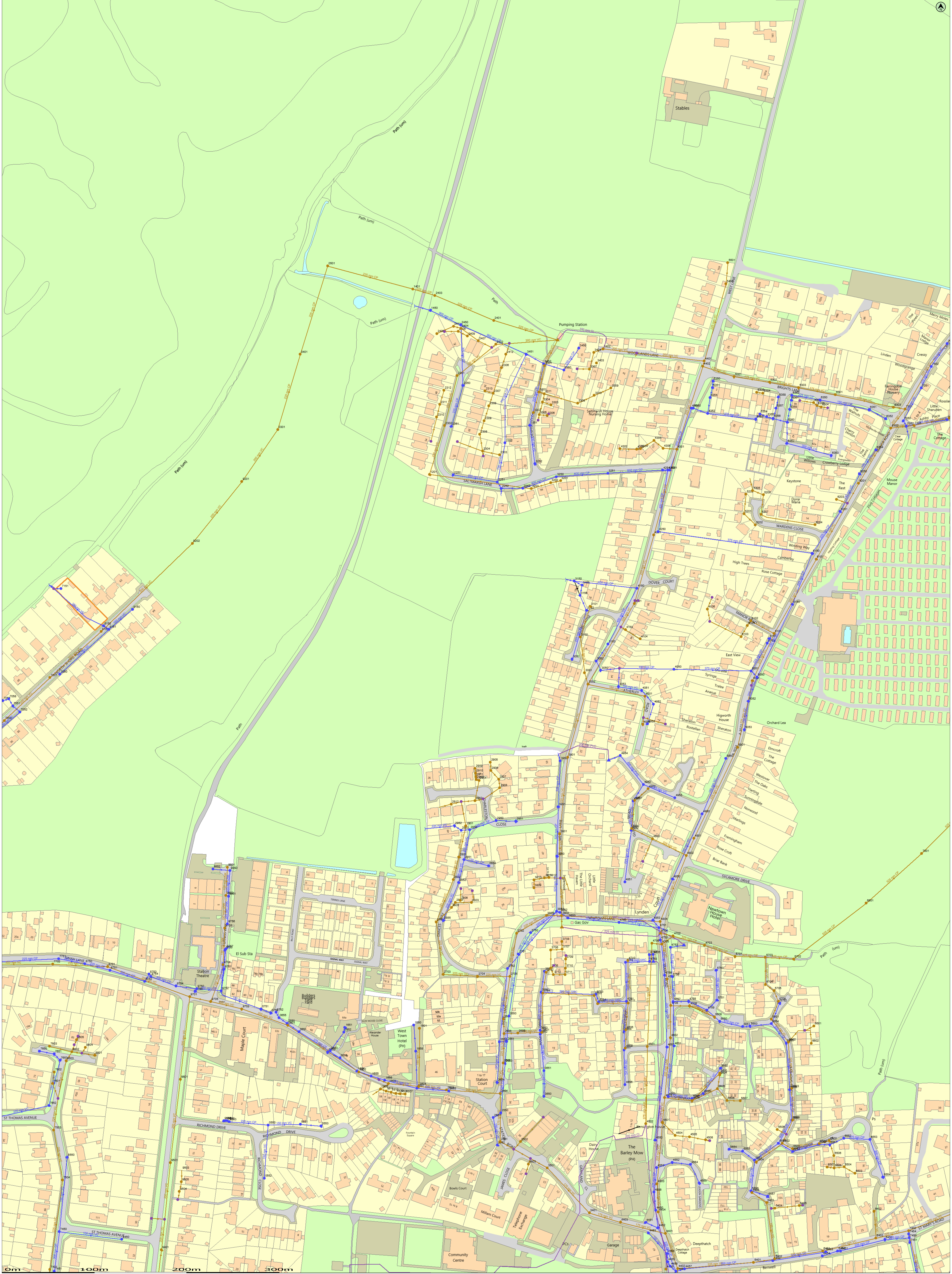
Geospatial Consultant Services

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Guildford Surrey, GU4 7WA E: mail@technicsgroup.com W: technicsgroup.com

Appendix C

Southern Water Sewer Records



Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0301	F	5.08	0.00	
0401	F	4.28	0.00	
0501	F	2.10	0.58	
0601	F	5.84	3.48	
1201	F	4.36	0.36	
1401	F	1.98	0.30	
1601	F	6.08	4.30	
1802	F	5.98	3.24	
1603	F	5.71	3.13	
1604	F	5.56	3.02	
1605	F	0.00	0.00	
1607	F	0.00	0.00	
1608	F	0.00	0.00	
1609	F	0.00	0.00	
1610	F	0.00	0.00	
1611	F	0.00	0.00	
2301	F	2.71	-0.14	
2302	F	3.70	0.12	
2303	F	0.00	0.00	
2304	F	0.00	0.00	
2305	F	0.00	0.00	
2306	F	0.00	0.00	
2307	F	0.00	0.00	
2308	F	0.00	0.00	
2309	F	0.00	0.00	
2310	F	0.00	0.00	
2311	F	0.00	0.00	
2312	F	0.00	0.00	
2313	F	0.00	0.00	
2401	F	3.66	0.00	
2402	F	0.00	0.00	
2403	F	1.89	0.13	
2404	F	0.00	0.00	
2406	F	0.00	0.00	
2407	F	0.00	0.00	
2408	F	0.00	0.00	
2409	F	0.00	0.00	
2411	F	0.00	0.00	
2412	F	0.00	0.00	
2501	F	6.33	4.50	
2502	F	0.00	0.00	
2601	F	5.78	2.58	
2602	F	5.68	2.72	
2603	F	5.73	2.99	
2604	F	5.87	2.81	
2605	F	5.80	2.81	
2606	F	5.73	2.63	
2701	F	5.43	3.72	
2702	F	5.31	2.34	
2703	F	5.68	3.48	
2704	F	5.68	3.30	
2705	F	5.58	2.44	
2801	F	5.85	3.95	
2802	F	5.69	3.84	
2803	F	0.00	0.00	
2804	F	0.00	0.00	
2805	F	0.00	0.00	
2806	F	0.00	0.00	
2901	F	5.58	4.10	
2902	F	0.00	0.00	
2903	F	0.00	0.00	
2904	F	0.00	0.00	
2905	F	0.00	0.00	
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2907	F	0.00	0.00	
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2909	F	0.00	0.00	
2910	F	0.00	0.00	
2911	F	0.00	0.00	
2912	F	0.00	0.00	
3001	F	0.00	0.00	
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3101	F	4.99	3.75	
3102	F	4.83	3.43	
3201	F	0.00	0.00	
3202	F	0.00	0.00	
3203	F	0.00	0.00	
3301	F	2.61	1.53	
3302	F	2.78	1.77	
3303	F	0.00	0.00	
3304	F	0.00	0.00	
3305	F	0.00	0.00	
3306	F	0.00	0.00	
3307	F	0.00	0.00	
3308	F	0.00	0.00	
3309	F	0.00	0.00	
3310	F	0.00	0.00	
3311	F	0.00	0.00	
3401	F	7.10	5.44	
3401	F	2.89	0.00	
3402	F	3.53	2.21	
3403	F	0.00	0.00	
3404	F	0.00	0.00	
3501	F	6.96	4.90	
3503	F	0.00	0.00	
3601	F	6.17	3.00	
3701	F	5.99	4.07	
3702	F	5.75	3.81	
3703	F	5.94	4.00	
3704	F	5.90	3.28	
3705	F	0.00	0.00	
3706	F	0.00	0.00	
3707	F	0.00	0.00	
3708	F	0.00	0.00	
3709	F	0.00	0.00	
3710	F	0.00	0.00	
3711	F	0.00	0.00	
3712	F	0.00	0.00	
3801	F	5.17	0.48	
3802	F	5.30	0.00	
3803	F	5.30	2.20	
3809	F	0.00	0.00	
3810	F	0.00	0.00	
3811	F	0.00	0.00	
3812	F	0.00	0.00	
3901	F	4.93	0.63	
4001	F	5.36	3.16	
4002	F	5.44	3.48	
4101	F	4.92	1.09	
4103	F	0.00	0.00	
4104	F	0.00	0.00	
4106	F	0.00	0.00	
4201	F	4.86	1.31	
4301	F	4.78	1.54	
4302	F	0.00	0.00	
4303	F	0.00	0.00	
4304	F	0.00	0.00	
4305	F	0.00	0.00	
4306	F	0.00	0.00	
4401	F	6.65	4.32	
4401	F	4.57	1.77	
4402	F	6.73	4.23	
4402	F	4.59	1.72	
4403	F	7.05	4.84	
4404	F	6.67	4.43	
4405	F	6.62	5.12	
4501	F	6.50	4.69	
4502	F	6.66	0.00	
4503	F	6.76	4.53	
4504	F	0.00	0.00	
4505	F	0.00	0.00	
4506	F	0.00	0.00	
4601	F	6.48	4.83	
4602	F	6.14	4.34	
4603	F	6.43	0.00	
4604	F	6.64	0.00	
4605	F	6.46	4.80	
4606	F	6.33	4.60	
4702	F	5.97	4.32	
4703	F	6.27	4.31	
4704	F	0.00	0.00	
4705	F	5.71	4.41	
4706	F	6.14	4.51	
4707	F	5.99	4.10	
4708	F	6.10	4.25	
4709	F	6.24	4.75	
4710	F	6.12	4.74	
4711	F	6.16	4.28	
4801	F	5.80	2.64	
4802	F	5.75	2.57	
4803	F	5.63	2.91	
4804	F	5.79	2.49	
4900	F	0.00	0.00	
4901	F	5.23	3.22	
4902	F	5.28	3.41	
5001	F	5.48	3.08	
5101	F	5.45	3.25	
5102	F	5.46	4.32	
5103	F	0.00	0.00	
5104	F	0.00	0.00	
5201	F	0.00	0.00	
5202	F	0.00	0.00	
5203	F	0.00	0.00	
5205	F	0.00	0.00	
5206	F	0.00	0.00	
5207	F	0.00	0.00	
5301	F	4.81	3.31	
5302	F	5.01	3.48	
5303	F	5.15	3.57	
5304	F	0.00	0.00	
5305	F	0.00	0.00	
5401	F	6.33	4.56	
5401	F	4.68	0.00	
5402	F	6.34	4.52	
5403	F	6.94	5.36	
5404	F	0.00	0.00	
5405	F	0.00	0.00	
5501	F	7.16	5.53	
5501	F	0.00	0.00	
5502	F	7.29	5.67	
5503	F	7.32	5.81	
5504	F	7.29	5.92	
5505	F	7.01	5.65	
5506	F	0.00	0.00	
5601	F	6.35	5.02	
5602	F	6.76	5.18	
5603	F	6.92	5.43	
5604	F	0.00	0.00	
5605	F	0.00	0.00	
5606	F	0.00	0.00	
5607	F	0.00	0.00	
5608	F	6.42	5.03	
5610	F	6.40	5.48	
5701	F	6.27	4.31	
5702	F	6.61	4.13	
5703	F	6.48	4.24	
5704	F	6.61	4.81	
5705	F	6.74	4.92	
5706	F	6.47	4.95	
5901	F	5.80	2.90	
6101	F	5.56	3.48	
6201	F	5.49	3.75	
6203	F	0.00	0.00	
6204	F	0.00	0.00	
6301	F	5.37	3.72	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
6302	F	5.54	3.91	
6303	F	0.00	0.00	
6304	F	0.00	0.00	
6305	F	0.00	0.00	
6306	F	0.00	0.00	
6401	F	6.16	4.36	
6402	F	6.37	4.56	
6403	F	6.16	4.15	
6501	F	7.16	6.16	
6502	F	7.20	6.30	
6503	F	0.00	0.00	
6504	F	0.00	0.00	
6505	F	0.00	0.00	
6506	F	7.20	0.00	
6507	F	0.00	0.00	
6601	F	0.00	0.00	
6602	F	0.00	0.00	
6801	F	6.45	3.91	
7001	F	5.28	2.37	
7002	F	5.54	2.62	
7301	F	5.74	3.96	
7302	F	5.86	4.36	
7305	F	5.57	4.13	
7401	F	6.10	4.83	
7402	F	6.33	4.01	
7503	F	7.39	5.86	
7504	F	6.91	5.34	
7601	F	7.48	6.66	
7602	F	7.39	6.88	
7603	F	7.39	6.56	
7702	F	6.04	3.95	
7801	F	6.51	3.87	
8101	F	5.10	2.17	
8601	F	7.24	6.53	
8602	F	7.53	6.38	
8603	F	7.39	6.28	
8604	F	0.00	0.00	
8605	F	0.00	0.00	
8701	F	6.04	4.96	
9201	F	5.49	0.00	
9202	F	5.69	0.00	
9401	F	7.28	5.23	
9501	F	7.00	4.81	
9503	F	0.00	0.00	
9504	F	0.00	0.00	
9505	F	0.00	0.00	
9601	F	6.54	4.35	
9701	F	6.13	3.79	
9702	F	5.96	3.62	
9703	F	6.17	4.27	
9704	F	6.19	4.00	
9705	F	6.12	3.73	
9801	F	5.63	4.70	
9802	F	5.94	4.50	
0550	S	4.57	3.02	
0551	S	0.00	0.00	
0552	S	0.00	0.00	
0553	S	5.73	4.50	
0650	S	5.85	4.78	
0651	S	5.83	4.76	
0652	S	5.77	4.72	
0653	S	5.82	4.78	
0654	S	5.93	4.69	
0655	S	5.81	5.08	
0750	S	5.98	5.27	
0751	S	5.95	5.19	
0752	S	5.87	5.12	
1450	S	2.57	0.90	
1650	S	4.60	0.00	
1651	S	6.02	4.82	
1652	S	6.02	4.80	
1654	S	5.98	4.67	
1655	S	5.94	4.60	
1656	S	5.79	4.58	
1657	S	5.60	4.40	
1658	S	0.00	0.00	
2250	S	3.77	2.93	
2251	S	3.54	1.94	
2252	S	3.53	1.98	
2253	S	3.70	2.14	
2350	S	2.79	1.46	
2351	S	3.68	2.65	
2352	S	0.00	0.00	
2450	S	2.37	0.98	
2550	S	6.03	5.13	
2551	S	6.07	5.39	
2552	S	6.35	5.49	
2550	S	5.55	0.00	
2651	S	0.00	0.00	
2652	S	5.79	0.00	
2653	S	5.56	0.00	
2654	S	5.72	0.00	
2655	S	5.75	4.80	
2656	S	5.46	4.53	
2752	S	5.62	4.63	
2850	S	5.75	4.34	
2851	S	5.74	4.45	
2852	S	5.79	4.59	
2853	S	5.60	4.22	
2854	S	5.73	4.78	
2855	S	5.38	4.74	
2950	S	5.62	4.62	
2951	S	5.55	4.70	
2952	S	5.54	4.18	
3050	S	5.09	3.87	
3051	S	5.04	4.05	
3052	S	5.19	3.84	
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3152	S	0.95	0.00	
3153	S	0.99	3.82	
3155	S	9.92	8.81	
3156	S	10.00	8.89	
3250	S	3.69	2.37	
3251	S	4.21	2.71	
3252	S	3.50	2.60	
3350	S	0.00	0.00	
3351	S	2.92	2.24	
3450	S	0.00	0.00	
3451	S	2.86	1.15	
3452	S	2.91	1.71	
3650	S	7.02	5.15	
3651	S	6.76	4.92	
3652	S	6.17	4.68	
3653	S	6.16	4.65	
3750	S	5.29	4.48	
3751	S	5.76	4.37	
3752	S	5.87	4.12	
3753	S	5.91	3.76	
3850	S	5.99	3.74	
3851	S	5.16	4.10	
3852	S	5.36	4.19	
3853	S	5.30	4.21	
3854	S	5.11	4.26	
3951	S	4.92	3.98	
3952	S	5.11	3.83	
4050	S	5.54	4.44	
4051	S	5.43	4.64	
4052	S	5.49	0.00	
4053	S	5.25	4.58	
4054	S	5.48	4.86	
4150	S	4.80	3.54	
4250	S	4.92	3.29	
4251	S	4.67	3.11	
4252	S	4.66	0.00	
4254	S	4.91	3.01	
4350	S	4.65	3.26	
4351	S	4.79	3.19	
4352	S	5.02	3.28	
4354	S	5.06	3.56	
4450	S	6.75	0.00	
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4452	S	6.72	5.29	
4453	S	6.90	6.16	
4454	S	6.73	5.60	
4455	S	6.72	5.46	
4456	S	6.77	5.29	
4457	S	0.00	0.00	
4458	S	6.76	4.64	
4550	S	6.68	5.61	
4551	S	6.83	5.48	
4553	S	6.92	5.63	
4554	S	7.04	6.23	
4555	S	7.16	6.38	
4556	S	6.88	0.00	
4557	S	6.39	3.98	
4652	S	6.13	4.96	
4653	S	6.38	4.17	
4654	S	6.64	4.28	
4655	S	6.73	4.39	
4656	S	6.68	5.22	
4750	S	6.48	4.51	
4751	S	5.57	4.31	
4752	S	5.77	4.47	
4753	S	5.72	4.57	
4754	S	5.96	0.00	
4755	S	6.06	3.38	
4756	S	5.91	4.66	
4757	S	6.17	3.44	
4758	S	6.31	3.49	
4759	S	6.40	3.51	
4761	S	6.15	3.59	
4762	S	6.09	3.50	
4763	S	6.05	3.24	
4764	S	5.97	3.23	
4765	S	5.91	3.22	
4850	S	5.82	4.64	
4851	S	5.47	4.34	
4852	S	0.00	0.00	
4853	S	5.67	4.53	
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4951	S	0.00	0.00	
4952	S	5.29	3.71	
4953	S	0.00	4.12	
4954	S	0.00	0.00	
5050	S	5.33	4.55	
5051	S	5.48	4.48	
5052	S	5.58	4.97	
5053	S	5.84	5.05	
5150	S	5.40	4.47	
5151	S	5.47	4.89	
5152	S	5.43	4.79	
5350	S	4.72	3.66	
5351	S	4.90	3.59	
5353	S	5.30	3.75	
5354	S	5.20	3.67	
5355	S	5.27	0.00	
5356	S	5.28	0.00	
5357	S	5.25	3.74	
5358	S	5.26	3.84	
5359	S	5.38	3.67	
5360	S	5.38	3.58	
5361	S	5.37	3.91	
5362	S	5.23	3.97	
5363	S	5.31	3.47	

Appendix D

Magic Map Geology Information

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- ☐ Access
- ☐ Administrative Geographies
- ☐ Countryside Stewardship Targeting & Scoring Layers
- ☐ Designations
- ☐ Habitats and Species
- ☐ Land Based Schemes
- ☒ Landscape

☒ Geology and Soils☒ Aquifer Designation Map (Bedrock) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unproductive

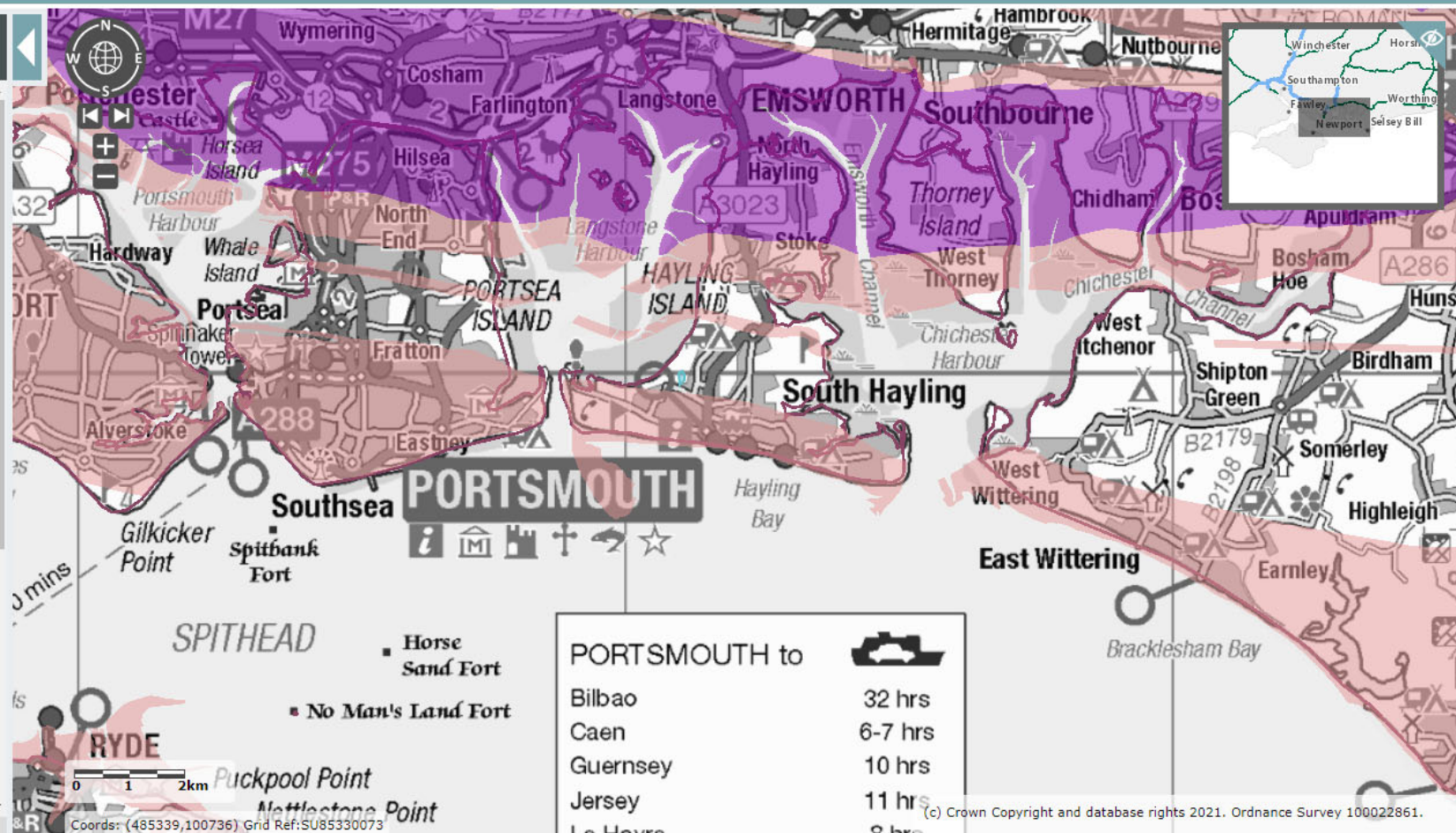
☐ Aquifer Designation Map (Superficial Drift) (England)☐ Groundwater Vulnerability Map (England)☐ Geological Places to Visit (England)☐ Geological Descriptions

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- ☐ Access
- ☐ Administrative Geographies
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- ☐ Designations
- ☐ Habitats and Species
- ☐ Land Based Schemes
- ☒ Landscape

☒ Geology and Soils☐ Aquifer Designation Map (Bedrock) (England)☒ Aquifer Designation Map (Superficial Drift) (England)

- Principal
- Secondary A
- Secondary B
- Secondary (undifferentiated)
- Unknown (lakes+landslip)
- Unproductive

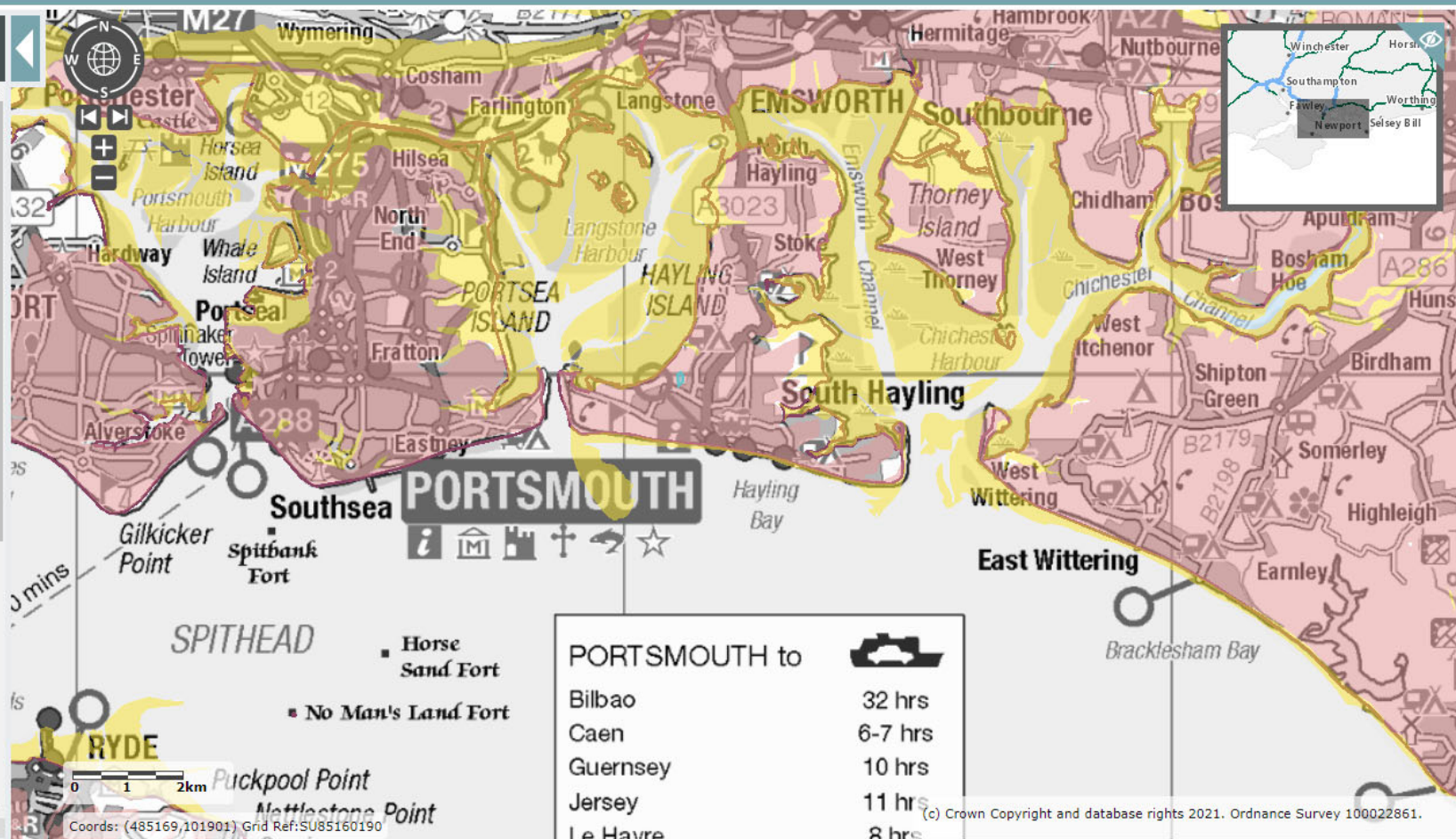
☐ Groundwater Vulnerability Map (England)☐ Geological Places to Visit (England)

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☐ Countryside Stewardship Targeting & Scoring Layers☐ Designations☐ Habitats and Species☐ Land Based Schemes☒ Landscape☒ Geology and Soils☐ Aquifer Designation Map (Bedrock) (England)☐ Aquifer Designation Map (Superficial Drift) (England)☒ Groundwater Vulnerability Map (England)

Local Information

Soluble Rock Risk

High

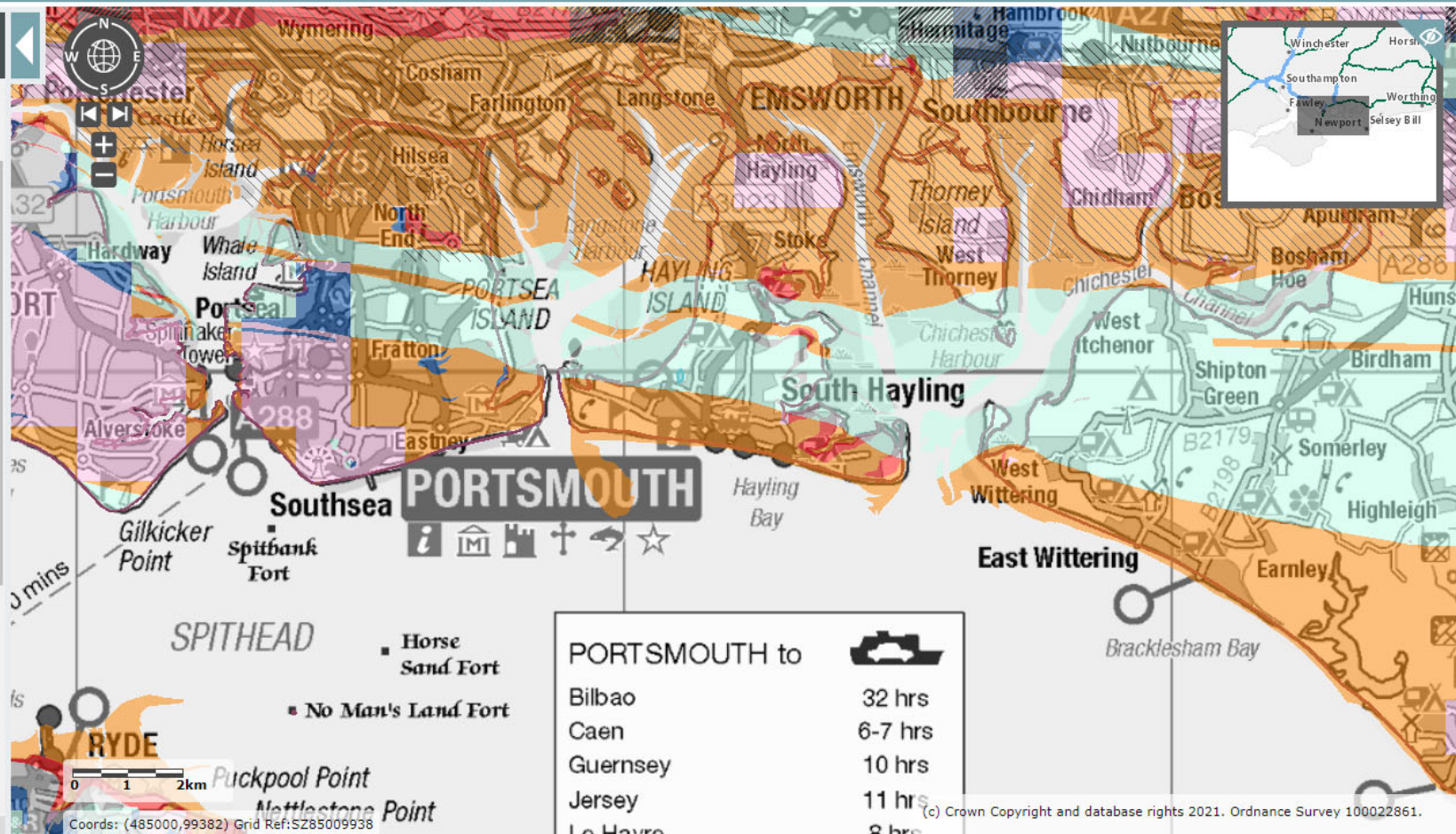
Medium - High

Medium

Medium - Low

Low

Unproductive

☐ Geological Places to Visit (England)☐ Geological Descriptions (England)

Appendix E

Greenfield Run-Off

Patrick Parsons Limited		Page 1
Waterloo House Thornton Street Newcastle Upon Tyne, NE1 4AP	The Oysters	
Date 31/03/2021 09:04 File	Designed by A Johnson Checked by D Brooke	
Innovyze Source Control 2020.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	1	Soil	0.400
Area (ha)	1.100	Urban	0.000
SAAR (mm)	700	Region Number	Region 7

Results 1/s

QBAR Rural	3.7
QBAR Urban	3.7
Q1 year	3.2
Q1 year	3.2
Q30 years	8.5
Q100 years	11.9

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Appendix F

Site Plan

05 Site Layout

The Land to the North of the Oysters provides an opportunity to create a new, high-quality neighbourhood of up to 32 homes.

Proposed mix

- 2 bed - 27%
- 3 bed - 50%
- 4 bed - 23%

Density: 35 dwellings per hectare

Parking Standards

Car parking will be set out in accordance with the highway authorities standards.

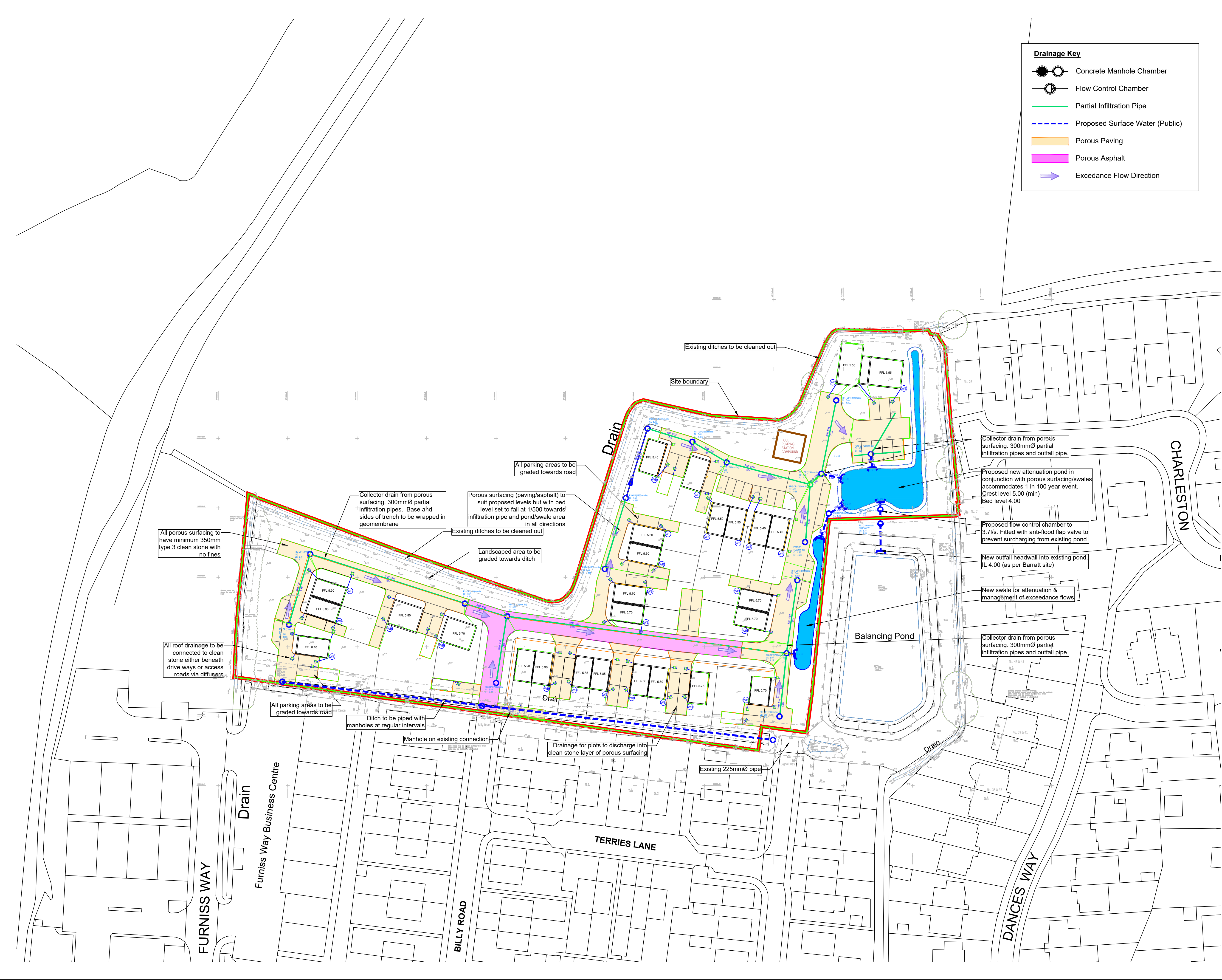
- ① Proposed vehicular access
- ② Proposed pedestrian access
- ③ Sustainable drainage system infiltration pond
- ④ Existing tree planting
- ⑤ Proposed vegetation



0m 50m

Appendix G

Drainage Layouts



Drainage Key

- Concrete Manhole Chamber
- Flow Control Chamber
- Partial Infiltration Pipe
- Proposed Surface Water (Public)
- Porous Paving
- Porous Asphalt
- Exceedance Flow Direction

GENERAL NOTES

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- 1.3. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
- 1.4. ALL LEVELS IN METRES.
- 1.5. SIZES HEREON SHALL NOT BE MODIFIED WITHOUT THE WRITTEN APPROVAL OF THE ENGINEER.
- 1.6. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS DRAWINGS & SPECIFICATIONS.
- 1.7.

- Drainage Construction Notes**
1. All materials and workmanship related to private sewers shall be in accordance with Part H of the Building Regulations and BS EN752 and best practice
 2. All materials and workmanship related to adoptable sewers shall be in accordance with the Design and Construction Guidance 2020 as published by the Water Services Association and any subsequent revisions shown by the water authority
 3. All sustainable drainage systems to be designed and maintained in accordance with CIRIA C753 The SuDS Manual and best practice guidance.

P1	INITIAL ISSUE			
	DB	19.07.25	DB	19.07.25
REV.	REVISION NOTE/COMMENT			
	DRW BY	DATE	CHK BY	DATE

Revisions

CGV Transport Consultants Ltd
TRANSPORT PLANNING & HIGHWAY ENGINEERING

Client
Hayling Island Builders

Project
Land North of The Oysters

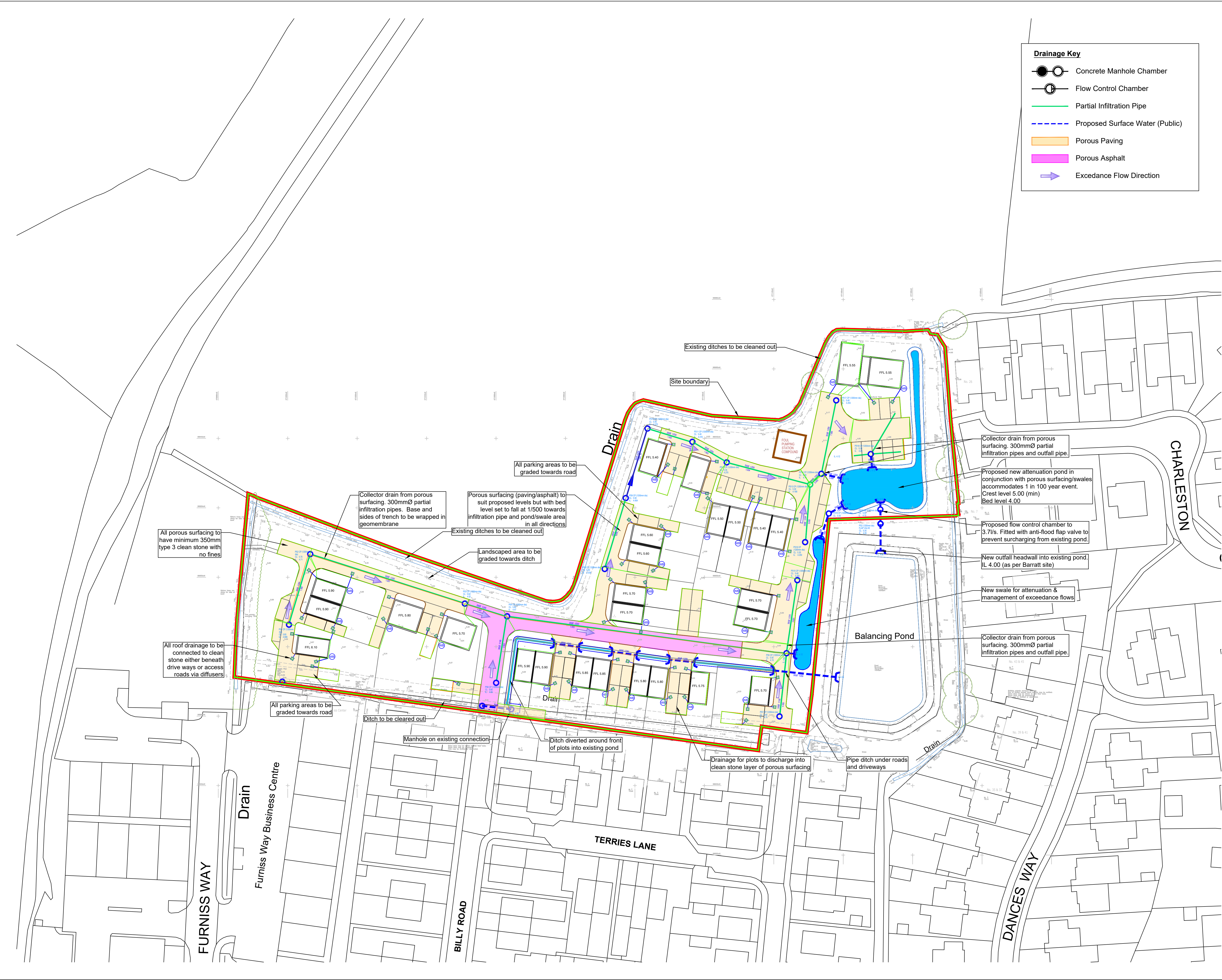
Drawing
Drainage Strategy Plan
Surface Water
Option A

Scales 1:500 At original size A1

Drawn DB	Checked CV
Date July 2025	

Status
PRELIMINARY

Drawing No. CGV-1140-201 Rev. P1



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Drainage Construction Notes

1. All materials and workmanship related to private sewers shall be in accordance with Part H of the Building Regulations and BS EN752 and best practice

2. All materials and workmanship related to adoptable sewers shall be in accordance with the Design and Construction Guidance 2020 as published by the Water Services Association and any subsequent revisions shown by the water authority

3. All sustainable drainage systems to be designed and maintained in accordance with CIRIA C753 The SuDS Manual and best practice guidance.

P1

INITIAL ISSUE

DB

19.07.25

DB

19.07.25

CV

19.07.25

REV.

REVISION NOTE/COMMENT

DRW BY

DATE

CHK BY

DATE

APP BY

DATE

Revisions

CGV Transport Consultants Ltd

TRANSPORT PLANNING & HIGHWAY ENGINEERING

Client

Hayling Island Builders

Project

Land North of The Oysters

Drawing

Drainage Strategy Plan
Surface Water
Option B

Scales

1:500

At original size

A1

Drawn

DB

Checked

CV

Date

July 2025

Status

PRELIMINARY

Drawing No.

CGV-1140-202

Rev.

P1

Appendix H

Causeway Flow Calculations

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	5	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	x
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
PS1	0.007	5.00	5.850	1200	471000.334	99886.352	1.044
PS2	0.010	5.00	5.700	1200	471006.511	99906.668	1.290
PS3	0.016	5.00	5.620	1200	471051.002	99892.408	1.400
PS4	0.002	5.00	5.600	1200	471063.236	99888.687	1.430
PS5	0.035	5.00	5.500	1200	471143.669	99878.129	1.650
PS6		5.00	5.800	1200	471060.030	99870.141	1.500
PS7	0.007	5.00	5.600	1200	471141.479	99859.765	1.200
PS8	0.010	5.00	5.500	1200	471091.287	99902.381	1.262
PS9	0.010	5.00	5.500	1200	471097.417	99922.810	1.346
PS10			5.450	1200	471103.616	99942.837	1.380
PS11	0.007	5.00	5.400	1200	471116.554	99939.010	1.384
PS12	0.015	5.00	5.350	1200	471126.432	99933.082	1.380
PS13	0.020	5.00	5.300	1200	471150.481	99926.699	1.432
PS14			5.300	1200	471153.677	99929.799	1.450
PS16	0.001	5.00	5.350	1200	471149.029	99910.102	1.400
PS17	0.008	5.00	5.400	1200	471157.979	99950.904	1.445
PS15	0.031	5.00	5.400	1200	471146.771	99899.161	1.450
Swale			5.500		471158.061	99900.580	1.380
PS19			5.450	1200	471155.835	99918.358	1.640
PS18	0.010	5.00	5.300	1200	471167.928	99935.508	1.400
Pond 1			5.500		471169.710	99925.999	1.400
PS20 HB			5.500	1200	471170.707	99919.494	1.600
Headwall			5.760	1200	471171.121	99915.464	1.760

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	PS1	PS2	21.222	0.600	4.806	4.710	0.096	221.1	300	5.34	50.0
1.001	PS2	PS3	46.753	0.600	4.710	4.520	0.190	246.1	300	6.12	50.0
1.002_1	PS3	PS4	12.787	0.600	4.520	4.470	0.050	255.7	300	6.33	50.0
1.003_1	PS4	PS5	81.123	0.600	4.470	4.150	0.320	253.5	300	7.71	50.0
2.000	PS6	PS4	18.839	0.600	4.600	4.470	0.130	144.9	300	5.24	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.053	74.4	1.0	0.744	0.690	0.007	0.0	24	0.372
1.001	0.998	70.5	2.4	0.690	0.800	0.017	0.0	38	0.469
1.002_1	0.978	69.2	4.7	0.800	0.830	0.033	0.0	52	0.562
1.003_1	0.983	69.5	5.0	0.830	1.050	0.035	0.0	54	0.576
2.000	1.304	92.2	0.0	0.900	0.830	0.000	0.0	0	0.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
4.000	PS7	PS5	18.326	0.600	4.700	4.600	0.100	183.3	300	5.26	50.0
1.000_1	PS8	PS9	21.329	0.600	4.538	4.454	0.084	253.9	300	5.36	50.0
1.001_1	PS9	PS10	20.964	0.600	4.454	4.370	0.084	249.6	300	5.71	50.0
1.002	PS10	PS11	13.492	0.600	4.370	4.316	0.054	249.9	300	5.94	50.0
1.003	PS11	PS12	11.521	0.600	4.316	4.270	0.046	250.5	300	6.14	50.0
1.004	PS12	PS13	24.882	0.600	4.270	4.168	0.102	243.9	300	6.55	50.0
5.000	PS16	PS13	16.660	0.600	4.250	4.168	0.082	203.2	300	5.25	50.0
5.005	PS13	PS14	4.452	0.600	4.168	4.150	0.018	247.4	300	6.62	50.0
7.000	PS17	PS14	21.539	0.600	4.255	4.150	0.105	205.1	300	5.33	50.0
3.000	PS15	PS5	21.260	0.600	4.250	4.150	0.100	212.6	300	5.33	50.0
1.004_1	PS5	Swale	26.668	0.600	4.150	4.120	0.030	888.9	300	8.57	50.0
1.005	Swale	PS19	17.917	0.600	4.120	4.110	0.010	1791.7	300	9.39	50.0
8.000	PS18	Pond 1	9.675	0.600	4.200	4.100	0.100	96.7	300	5.10	50.0
5.006	PS14	Pond 1	16.477	0.600	4.150	4.120	0.030	549.2	300	7.04	50.0
1.006	PS19	Pond 1	15.824	0.600	4.110	4.100	0.010	1582.4	300	10.07	50.0
1.007	Pond 1	PS20 HB	6.602	0.600	4.100	4.050	0.050	132.0	300	10.15	50.0
1.008	PS20 HB	Headwall	4.051	0.600	4.050	4.000	0.050	81.0	300	10.19	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.000	1.158	81.8	1.0	0.600	0.600	0.007	0.0	23	0.397
1.000_1	0.982	69.4	1.4	0.662	0.746	0.010	0.0	30	0.394
1.001_1	0.990	70.0	2.8	0.746	0.780	0.020	0.0	41	0.492
1.002	0.990	70.0	2.8	0.780	0.784	0.020	0.0	41	0.492
1.003	0.989	69.9	3.8	0.784	0.780	0.027	0.0	48	0.537
1.004	1.002	70.8	6.0	0.780	0.832	0.042	0.0	58	0.613
5.000	1.099	77.7	0.1	0.800	0.832	0.001	0.0	10	0.206
5.005	0.995	70.3	9.0	0.832	0.850	0.063	0.0	72	0.687
7.000	1.094	77.3	1.1	0.845	0.850	0.008	0.0	25	0.399
3.000	1.074	75.9	4.4	0.850	1.050	0.031	0.0	49	0.592
1.004_1	0.519	36.7	15.4	1.050	1.080	0.108	0.0	135	0.496
1.005	0.363	25.6	15.4	1.080	1.040	0.108	0.0	167	0.378
8.000	1.598	113.0	1.4	0.800	1.100	0.010	0.0	24	0.560
5.006	0.664	46.9	10.1	0.850	1.080	0.071	0.0	94	0.531
1.006	0.386	27.3	15.4	1.040	1.100	0.108	0.0	161	0.397
1.007	1.366	96.6	26.9	1.100	1.150	0.189	0.0	108	1.176
1.008	1.748	123.5	26.9	1.150	1.460	0.189	0.0	95	1.406

Pipeline Schedule

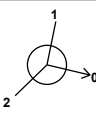
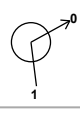
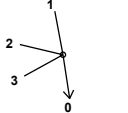
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	21.222	221.1	300	Circular	5.850	4.806	0.744	5.700	4.710	0.690
1.001	46.753	246.1	300	Circular	5.700	4.710	0.690	5.620	4.520	0.800
1.002_1	12.787	255.7	300	Circular	5.620	4.520	0.800	5.600	4.470	0.830
1.003_1	81.123	253.5	300	Circular	5.600	4.470	0.830	5.500	4.150	1.050
2.000	18.839	144.9	300	Circular	5.800	4.600	0.900	5.600	4.470	0.830
4.000	18.326	183.3	300	Circular	5.600	4.700	0.600	5.500	4.600	0.600
1.000_1	21.329	253.9	300	Circular	5.500	4.538	0.662	5.500	4.454	0.746
1.001_1	20.964	249.6	300	Circular	5.500	4.454	0.746	5.450	4.370	0.780
1.002	13.492	249.9	300	Circular	5.450	4.370	0.780	5.400	4.316	0.784
1.003	11.521	250.5	300	Circular	5.400	4.316	0.784	5.350	4.270	0.780
1.004	24.882	243.9	300	Circular	5.350	4.270	0.780	5.300	4.168	0.832
5.000	16.660	203.2	300	Circular	5.350	4.250	0.800	5.300	4.168	0.832
5.005	4.452	247.4	300	Circular	5.300	4.168	0.832	5.300	4.150	0.850
7.000	21.539	205.1	300	Circular	5.400	4.255	0.845	5.300	4.150	0.850
3.000	21.260	212.6	300	Circular	5.400	4.250	0.850	5.500	4.150	1.050
1.004_1	26.668	888.9	300	Circular	5.500	4.150	1.050	5.500	4.120	1.080
1.005	17.917	1791.7	300	Circular	5.500	4.120	1.080	5.450	4.110	1.040
8.000	9.675	96.7	300	Circular	5.300	4.200	0.800	5.500	4.100	1.100
5.006	16.477	549.2	300	Circular	5.300	4.150	0.850	5.500	4.120	1.080
1.006	15.824	1582.4	300	Circular	5.450	4.110	1.040	5.500	4.100	1.100
1.007	6.602	132.0	300	Circular	5.500	4.100	1.100	5.500	4.050	1.150
1.008	4.051	81.0	300	Circular	5.500	4.050	1.150	5.760	4.000	1.460

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PS1	1200	Manhole	Adoptable	PS2	1200	Manhole	Adoptable
1.001	PS2	1200	Manhole	Adoptable	PS3	1200	Manhole	Adoptable
1.002_1	PS3	1200	Manhole	Adoptable	PS4	1200	Manhole	Adoptable
1.003_1	PS4	1200	Manhole	Adoptable	PS5	1200	Manhole	Adoptable
2.000	PS6	1200	Manhole	Adoptable	PS4	1200	Manhole	Adoptable
4.000	PS7	1200	Manhole	Adoptable	PS5	1200	Manhole	Adoptable
1.000_1	PS8	1200	Manhole	Adoptable	PS9	1200	Manhole	Adoptable
1.001_1	PS9	1200	Manhole	Adoptable	PS10	1200	Manhole	Adoptable
1.002	PS10	1200	Manhole	Adoptable	PS11	1200	Manhole	Adoptable
1.003	PS11	1200	Manhole	Adoptable	PS12	1200	Manhole	Adoptable
1.004	PS12	1200	Manhole	Adoptable	PS13	1200	Manhole	Adoptable
5.000	PS16	1200	Manhole	Adoptable	PS13	1200	Manhole	Adoptable
5.005	PS13	1200	Manhole	Adoptable	PS14	1200	Manhole	Adoptable
7.000	PS17	1200	Manhole	Adoptable	PS14	1200	Manhole	Adoptable
3.000	PS15	1200	Manhole	Adoptable	PS5	1200	Manhole	Adoptable
1.004_1	PS5	1200	Manhole	Adoptable	Swale		Junction	
1.005	Swale		Junction		PS19	1200	Manhole	Adoptable
8.000	PS18	1200	Manhole	Adoptable	Pond 1		Junction	
5.006	PS14	1200	Manhole	Adoptable	Pond 1		Junction	
1.006	PS19	1200	Manhole	Adoptable	Pond 1		Junction	
1.007	Pond 1		Junction		PS20 HB	1200	Manhole	Adoptable
1.008	PS20 HB	1200	Manhole	Adoptable	Headwall	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PS1	471000.334	99886.352	5.850	1.044	1200				
						0	1.000	4.806	300
PS2	471006.511	99906.668	5.700	1.290	1200				
						0	1.001	4.710	300
PS3	471051.002	99892.408	5.620	1.400	1200				
						0	1.002_1	4.520	300
PS4	471063.236	99888.687	5.600	1.430	1200				
						1	2.000	4.470	300
						2	1.002_1	4.470	300
						0	1.003_1	4.470	300
PS5	471143.669	99878.129	5.500	1.650	1200				
						1	4.000	4.600	300
						2	3.000	4.150	300
						3	1.003_1	4.150	300
						0	1.004_1	4.150	300
PS6	471060.030	99870.141	5.800	1.500	1200				
						0	2.000	4.600	300
PS7	471141.479	99859.765	5.600	1.200	1200				
						0	4.000	4.700	300
PS8	471091.287	99902.381	5.500	1.262	1200				
						0	1.000_1	4.538	300
PS9	471097.417	99922.810	5.500	1.346	1200				
						1	1.000_1	4.454	300
						0	1.001_1	4.454	300
PS10	471103.616	99942.837	5.450	1.380	1200				
						1	1.001_1	4.370	300
						0	1.002	4.370	300
PS11	471116.554	99939.010	5.400	1.384	1200				
						1	1.002	4.316	300
						0	1.003	4.316	300
PS12	471126.432	99933.082	5.350	1.380	1200				
						1	1.003	4.270	300
						0	1.004	4.270	300
PS13	471150.481	99926.699	5.300	1.432	1200				
						1	5.000	4.168	300
						2	1.004	4.168	300
						0	5.005	4.168	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PS14	471153.677	99929.799	5.300	1.450	1200		1 7.000 2 5.005 0 5.006	4.150 4.150 4.150	300 300 300
PS16	471149.029	99910.102	5.350	1.400	1200		0 5.000	4.250	300
PS17	471157.979	99950.904	5.400	1.445	1200		0 7.000	4.255	300
PS15	471146.771	99899.161	5.400	1.450	1200		0 3.000	4.250	300
Swale	471158.061	99900.580	5.500	1.380			1 1.004_1 0 1.005	4.120	300
PS19	471155.835	99918.358	5.450	1.640	1200		1 1.005 0 1.006	4.110	300
PS18	471167.928	99935.508	5.300	1.400	1200		0 8.000	4.200	300
Pond 1	471169.710	99925.999	5.500	1.400			1 8.000 2 5.006 3 1.006 0 1.007	4.100 4.120 4.100 4.100	300 300 300 300
PS20 HB	471170.707	99919.494	5.500	1.600	1200		1 1.007 0 1.008	4.050	300
Headwall	471171.121	99915.464	5.760	1.760	1200		1 1.008	4.000	300

Simulation Settings

Rainfall Methodology	FEH-13	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	x
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	20.0		

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	40	0	0
100	45	0	0

Node PS20 HB Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	4.050	Product Number	CTL-SHE-0092-3700-0930-3700
Design Depth (m)	0.930	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	3.7	Min Node Diameter (mm)	1200

Node Swale Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	4.120
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	1.300	76.0	0.0

Node Pond 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	4.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	0.0	1.400	330.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	PS1	70	4.834	0.028	1.4	0.0430	0.0000	OK
120 minute summer	PS2	72	4.752	0.042	3.1	0.0674	0.0000	OK
120 minute summer	PS3	72	4.580	0.060	5.7	0.1111	0.0000	OK
120 minute summer	PS4	74	4.533	0.063	7.2	0.0938	0.0000	OK
360 minute summer	PS5	256	4.292	0.142	10.2	0.3597	0.0000	OK
15 minute summer	PS6	1	4.600	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PS7	11	4.725	0.025	1.2	0.0376	0.0000	OK
15 minute summer	PS8	11	4.570	0.032	1.7	0.0489	0.0000	OK
120 minute summer	PS9	70	4.499	0.045	3.4	0.0759	0.0000	OK
120 minute summer	PS10	72	4.414	0.044	3.3	0.0501	0.0000	OK
120 minute summer	PS11	72	4.368	0.052	4.3	0.0731	0.0000	OK
15 minute summer	PS12	12	4.330	0.060	6.5	0.0955	0.0000	OK
360 minute summer	PS13	256	4.291	0.123	5.3	0.1830	0.0000	OK
360 minute summer	PS14	256	4.291	0.141	5.6	0.1598	0.0000	OK
360 minute summer	PS16	256	4.291	0.041	0.9	0.0625	0.0000	OK
360 minute summer	PS17	256	4.291	0.036	0.4	0.0462	0.0000	OK
15 minute summer	PS15	10	4.303	0.053	5.3	0.0882	0.0000	OK
360 minute summer	Swale	256	4.291	0.171	10.1	8.8689	0.0000	OK
360 minute summer	PS19	256	4.291	0.181	8.8	0.2051	0.0000	OK
480 minute summer	PS18	320	4.291	0.091	1.0	0.1491	0.0000	OK
360 minute summer	Pond 1	256	4.291	0.191	15.1	31.0312	0.0000	OK
600 minute summer	PS20 HB	390	4.298	0.248	10.4	0.2808	0.0000	OK
15 minute summer	Headwall	1	4.000	0.000	3.3	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)
120 minute summer	PS1	1.000	PS2	1.4	0.342	0.019	0.0975	
120 minute summer	PS2	1.001	PS3	3.0	0.385	0.042	0.3709	
120 minute summer	PS3	1.002_1	PS4	5.7	0.559	0.082	0.1317	
120 minute summer	PS4	1.003_1	PS5	6.9	0.353	0.099	1.6269	
360 minute summer	PS5	1.004_1	Swale	10.1	0.449	0.275	0.9915	
15 minute summer	PS6	2.000	PS4	0.0	0.000	0.000	0.0779	
15 minute summer	PS7	4.000	PS5	1.1	0.414	0.014	0.0502	
15 minute summer	PS8	1.000_1	PS9	1.6	0.319	0.024	0.1115	
120 minute summer	PS9	1.001_1	PS10	3.3	0.511	0.047	0.1362	
120 minute summer	PS10	1.002	PS11	3.3	0.457	0.048	0.0983	
120 minute summer	PS11	1.003	PS12	4.3	0.497	0.062	0.1005	
15 minute summer	PS12	1.004	PS13	6.3	0.474	0.089	0.3391	
360 minute summer	PS13	5.005	PS14	5.3	0.448	0.075	0.1333	
360 minute summer	PS14	5.006	Pond 1	5.4	0.488	0.115	0.6109	
360 minute summer	PS16	5.000	PS13	0.9	0.140	0.011	0.2758	
360 minute summer	PS17	7.000	PS14	0.4	0.070	0.005	0.4033	
15 minute summer	PS15	3.000	PS5	5.2	0.403	0.069	0.3293	
360 minute summer	Swale	1.005	PS19	8.8	0.374	0.342	0.7717	
360 minute summer	PS19	1.006	Pond 1	8.5	0.427	0.310	0.7271	
480 minute summer	PS18	8.000	Pond 1	1.0	0.186	0.009	0.3147	
360 minute summer	Pond 1	1.007	PS20 HB	15.3	0.503	0.158	0.3613	
600 minute summer	PS20 HB	Hydro-Brake®	Headwall	3.7				97.5

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	PS1	22	4.861	0.055	5.5	0.0827	0.0000	OK
30 minute winter	PS2	23	4.795	0.085	12.9	0.1378	0.0000	OK
360 minute winter	PS3	352	4.783	0.263	6.7	0.4884	0.0000	OK
360 minute winter	PS4	352	4.783	0.313	8.3	0.4647	0.0000	SURCHARGED
360 minute winter	PS5	352	4.783	0.633	19.5	1.6067	0.0000	SURCHARGED
360 minute winter	PS6	352	4.783	0.183	0.2	0.2069	0.0000	OK
360 minute winter	PS7	352	4.783	0.083	1.4	0.1254	0.0000	OK
360 minute winter	PS8	360	4.790	0.252	1.6	0.3900	0.0000	OK
360 minute winter	PS9	360	4.788	0.334	3.9	0.5636	0.0000	SURCHARGED
360 minute winter	PS10	360	4.786	0.416	3.9	0.4710	0.0000	SURCHARGED
360 minute summer	PS11	368	4.785	0.469	6.8	0.6610	0.0000	SURCHARGED
360 minute summer	PS12	368	4.785	0.515	8.8	0.8205	0.0000	SURCHARGED
360 minute summer	PS13	376	4.788	0.620	12.0	0.9199	0.0000	SURCHARGED
360 minute winter	PS14	360	4.786	0.636	8.5	0.7190	0.0000	SURCHARGED
360 minute summer	PS16	368	4.786	0.536	2.4	0.8105	0.0000	SURCHARGED
360 minute winter	PS17	344	4.784	0.529	0.7	0.6723	0.0000	SURCHARGED
360 minute winter	PS15	352	4.783	0.533	2.5	0.8902	0.0000	SURCHARGED
360 minute winter	Swale	352	4.783	0.663	18.6	37.5417	0.0000	SURCHARGED
360 minute winter	PS19	352	4.783	0.673	13.0	0.7608	0.0000	SURCHARGED
360 minute winter	PS18	352	4.782	0.582	2.2	0.9553	0.0000	SURCHARGED
360 minute winter	Pond 1	352	4.782	0.682	23.0	132.3121	0.0000	SURCHARGED
360 minute winter	PS20 HB	352	4.782	0.732	9.7	0.8283	0.0000	SURCHARGED
15 minute summer	Headwall	1	4.000	0.000	3.7	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)
30 minute winter	PS1	1.000	PS2	5.5	0.454	0.074	0.2671	
30 minute winter	PS2	1.001	PS3	12.7	0.547	0.181	1.1111	
360 minute winter	PS3	1.002_1	PS4	6.7	0.568	0.097	0.8686	
360 minute winter	PS4	1.003_1	PS5	8.3	0.285	0.119	5.7126	
360 minute winter	PS5	1.004_1	Swale	18.6	0.460	0.507	1.8779	
360 minute winter	PS6	2.000	PS4	-0.2	-0.013	-0.002	1.0870	
360 minute winter	PS7	4.000	PS5	1.4	0.441	0.017	0.5579	
360 minute winter	PS8	1.000_1	PS9	1.6	0.294	0.023	1.4251	
360 minute winter	PS9	1.001_1	PS10	3.9	0.526	0.056	1.4763	
360 minute winter	PS10	1.002	PS11	3.6	0.466	0.052	0.9501	
360 minute summer	PS11	1.003	PS12	5.9	0.508	0.085	0.8113	
360 minute summer	PS12	1.004	PS13	7.8	0.398	0.110	1.7522	
360 minute summer	PS13	5.005	PS14	11.4	0.422	0.162	0.3135	
360 minute winter	PS14	5.006	Pond 1	8.2	0.485	0.175	1.1603	
360 minute summer	PS16	5.000	PS13	2.0	0.131	0.025	1.1732	
360 minute winter	PS17	7.000	PS14	0.7	0.095	0.009	1.5168	
360 minute winter	PS15	3.000	PS5	2.2	0.179	0.029	1.4971	
360 minute winter	Swale	1.005	PS19	13.0	0.352	0.508	1.2617	
360 minute winter	PS19	1.006	Pond 1	12.9	0.397	0.472	1.1143	
360 minute winter	PS18	8.000	Pond 1	2.1	0.443	0.019	0.6813	
360 minute winter	Pond 1	1.007	PS20 HB	9.7	0.422	0.101	0.4649	
360 minute winter	PS20 HB	Hydro-Brake®	Headwall	3.7				101.6

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	PS1	352	4.980	0.174	2.0	0.2635	0.0000	OK
360 minute winter	PS2	352	4.980	0.270	4.4	0.4363	0.0000	OK
360 minute winter	PS3	352	4.980	0.460	8.5	0.8546	0.0000	SURCHARGED
360 minute winter	PS4	352	4.980	0.510	10.4	0.7573	0.0000	SURCHARGED
360 minute winter	PS5	352	4.980	0.830	23.5	2.1062	0.0000	SURCHARGED
360 minute winter	PS6	352	4.980	0.380	0.4	0.4297	0.0000	SURCHARGED
360 minute winter	PS7	352	4.980	0.280	1.7	0.4223	0.0000	OK
480 minute winter	PS8	464	4.983	0.445	1.6	0.6881	0.0000	SURCHARGED
480 minute winter	PS9	464	4.983	0.529	3.9	0.8910	0.0000	SURCHARGED
480 minute winter	PS10	464	4.982	0.612	3.8	0.6925	0.0000	SURCHARGED
360 minute winter	PS11	368	4.982	0.666	5.5	0.9384	0.0000	SURCHARGED
360 minute winter	PS12	368	4.982	0.712	7.3	1.1344	0.0000	SURCHARGED
360 minute winter	PS13	368	4.985	0.817	10.4	1.2123	0.0000	SURCHARGED
360 minute winter	PS14	352	4.980	0.830	13.0	0.9388	0.0000	SURCHARGED
360 minute winter	PS16	368	4.982	0.732	2.1	1.1070	0.0000	SURCHARGED
360 minute winter	PS17	352	4.980	0.725	0.8	0.9214	0.0000	SURCHARGED
360 minute winter	PS15	352	4.980	0.730	3.2	1.2188	0.0000	SURCHARGED
360 minute winter	Swale	360	4.980	0.860	22.4	50.3796	0.0000	SURCHARGED
360 minute winter	PS19	360	4.980	0.870	15.4	0.9837	0.0000	SURCHARGED
360 minute winter	PS18	360	4.980	0.780	2.8	1.2787	0.0000	SURCHARGED
360 minute winter	Pond 1	360	4.980	0.880	27.8	181.7090	0.0000	SURCHARGED
360 minute winter	PS20 HB	360	4.980	0.930	11.9	1.0514	0.0000	SURCHARGED
15 minute summer	Headwall	1	4.000	0.000	3.7	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 winter	PS1	1.000	PS2	2.0	0.335	0.027	1.1583	
360 minute winter	PS2	1.001	PS3	4.4	0.422	0.062	3.2075	
360 minute winter	PS3	1.002_1	PS4	8.4	0.597	0.122	0.9005	
360 minute winter	PS4	1.003_1	PS5	9.9	0.284	0.142	5.7126	
360 minute winter	PS5	1.004_1	Swale	22.4	0.496	0.611	1.8779	
360 minute winter	PS6	2.000	PS4	-0.4	-0.020	-0.004	1.3266	
360 minute winter	PS7	4.000	PS5	1.7	0.467	0.021	1.2720	
480 minute winter	PS8	1.000_1	PS9	1.6	0.297	0.023	1.5020	
480 minute winter	PS9	1.001_1	PS10	3.8	0.510	0.054	1.4763	
480 minute winter	PS10	1.002	PS11	3.2	0.446	0.046	0.9501	
360 minute winter	PS11	1.003	PS12	4.9	0.483	0.070	0.8113	
360 minute winter	PS12	1.004	PS13	6.6	0.402	0.093	1.7522	
360 minute winter	PS13	5.005	PS14	12.1	0.426	0.172	0.3135	
360 minute winter	PS14	5.006	Pond 1	10.8	0.468	0.231	1.1603	
360 minute winter	PS16	5.000	PS13	1.9	0.134	0.025	1.1732	
360 minute winter	PS17	7.000	PS14	0.9	0.077	0.012	1.5168	
360 minute winter	PS15	3.000	PS5	3.0	0.164	0.039	1.4971	
360 minute winter	Swale	1.005	PS19	15.4	0.344	0.600	1.2617	
360 minute winter	PS19	1.006	Pond 1	15.2	0.374	0.558	1.1143	
360 minute winter	PS18	8.000	Pond 1	2.6	0.440	0.023	0.6813	
360 minute winter	Pond 1	1.007	PS20 HB	11.9	0.439	0.123	0.4649	
360 minute winter	PS20 HB	Hydro-Brake®	Headwall	3.7				113.1