

Project Name:	Land West of Hulbert Road, Havant
Document Reference:	020.5923.DTN
Document Name:	Drainage Technical Note
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Revision Record				
Rev	Date	By	Summary of Changes	Aprvd
01	30.05.2025	RRD	First Issue	MW
02	14.11.2025	JS	Items added to Maintenance and Management section	MW

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1. INTRODUCTION

- 1.1 This Technical Note has been prepared by Paul Basham Associates on behalf of BRiCS Development to support a Reserved Matters Application to Havant Borough Council in relation to Land West of Hulbert Road, Havant.
- 1.2 This report aims to apply for the discharge of conditions the following conditions from the approved outline planning application (Ref: APP/20/00441):
 - 14 - No development shall commence until a detailed surface water drainage scheme for the site, based on the principles within the Flood Risk Assessment ref: WYG Flood Risk & Drainage Assessment (FRDA) (ref. A096474, dated April 2020), has been submitted to and approved in writing by the Local Planning Authority.
 - 15 - No development hereby permitted shall commence until plans and particulars specifying the layout, depth and capacity of all foul and surface water drains and sewers proposed to serve the same, and details of any other proposed ancillary drainage works/plant (e.g. pumping stations) have been submitted to and approved in writing by the Local Planning Authority.
 - 30 - Details for the long-term maintenance arrangements for the surface water drainage system shall be submitted to and approved in writing by the Local Planning Authority prior to the first occupation of any of the dwellings.

- 1.3 The site is located on land to the West of Hulbert Road ~305m north of the B2150/Purbrook Way/Hulbert Road roundabout. The site location boundary can be seen in **Figure 1** below:



Figure 1: Site Location Boundary

2. SITE GEOLOGY

- 2.1 Site investigation was completed by TetraTech in June 2023 (ref: 874-A096474) and identified that the underlying geology of the site consists of Made Ground, Weathered London Clay Formation and London Clay Formation. Infiltration testing was completed in 3no. locations, and all locations did not reach the required 25% effective depth over a 72hr period to calculate a soil infiltration rate (as per BRE 365). Therefore, confirming that infiltration is not a viable method of surface water discharge. An extract of this report can be found in **Appendix A**.

3. SURFACE WATER DRAINAGE STRATEGY (CONDITION 14 & 15)

Existing Drainage

- 3.1 The surface water runoff generated by the site currently flows overland into a ditch system located at the North, East and Southern boundaries of the site. The site is currently greenfield and so there is no existing surface water sewer within the site boundary.

Proposed Drainage

- 3.2 The site is proposed to be split into two catchments, both of which outfall into the existing watercourse network. In accordance with the approved outline Flood Risk Assessment and Drainage Strategy produced by WYG (ref: A096474), surface water runoff will be conveyed to attenuation basin systems via a gravity-led sewer network. The northern network consists of an enhanced swale, and the southern network consists of an attenuation basin and crates. These systems will then be discharged, at a rate equal to the existing greenfield runoff, into the existing watercourse system. The proposed drainage layout can be found in Appendix B.
- 3.3 The two catchments are shown indicatively in orange and pink in Figure 2 below. The orange catchment measures at 0.21Ha, and the pink catchment measures at 2.76Ha.

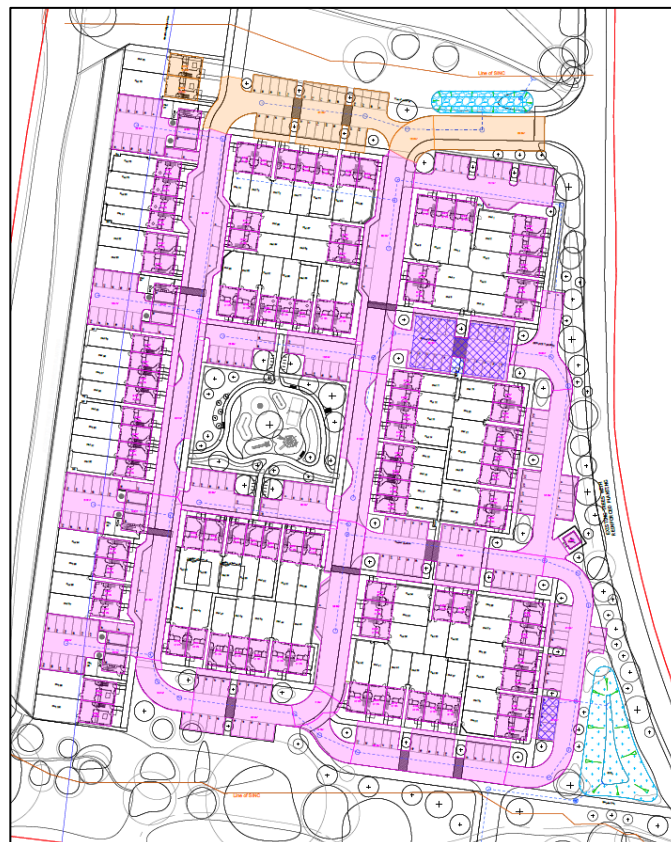


Figure 2: Drainage Catchments

- 3.4 A typical section showing the attenuation basin with underlying crates can be seen in **Figure 3**, and typical sections showing an attenuation crates system and an enhanced swale, extracted from the CIRIA SuDS Manual, can be seen in **Figure 4** and **Figure 5** respectively.

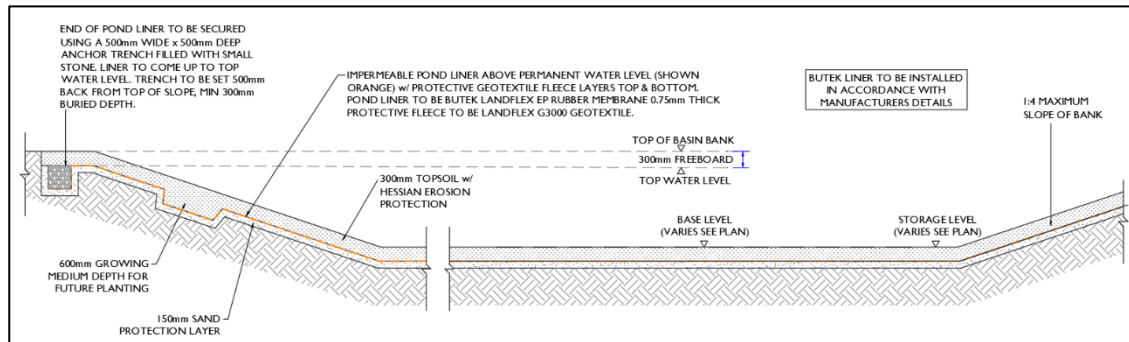


Figure 3: Typical Section through Attenuation Basin

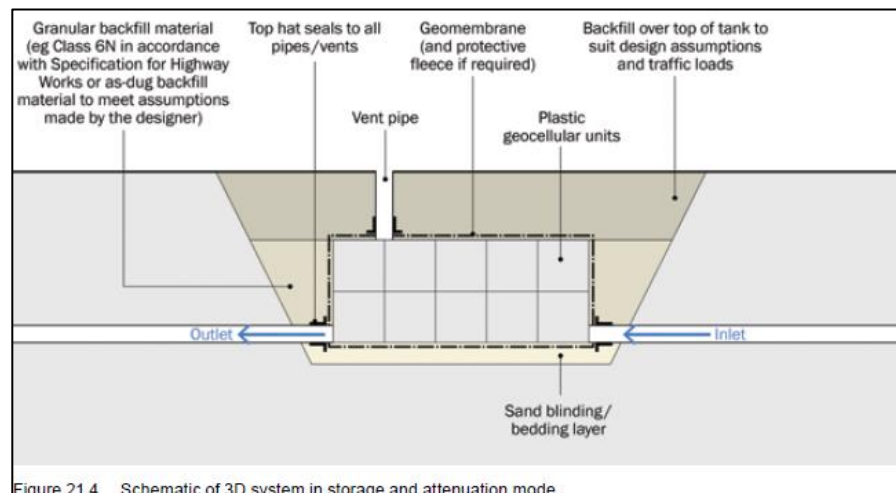


Figure 21.4 Schematic of 3D system in storage and attenuation mode

Figure 4: Typical Section through Attenuation Crates

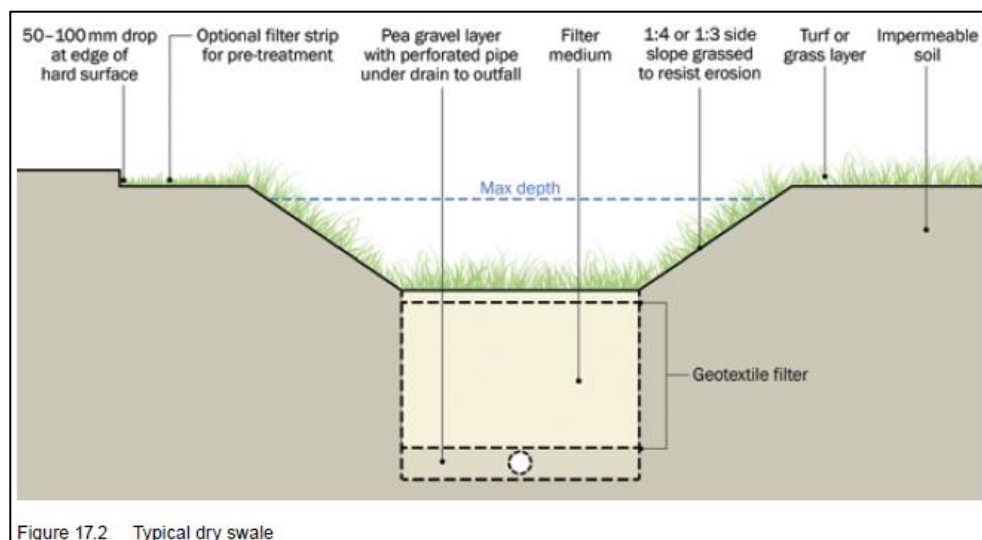


Figure 17.2 Typical dry swale

Figure 5: Typical enhanced (dry) swale section

Greenfield Runoff Rates

- 3.5 Greenfield runoff rates for the site have been estimated using the HR Wallingford online calculator. The Q_{bar} for the site is estimated to be 5.3 l/s/Ha. See **Appendix C** for the full calculations.
- 3.6 All runoff (up to and including the 1-in-100-year rainfall event (+45% Climate Change)) shall be restricted to the proposed impermeable area's Q_{bar} (5.3l/s/Ha), per section 3.3.1 of The CIRIA SuDS manual, discharging all run-off at Q_{bar} is considered the more conservative approach when compared to the long-term storage approach (where discharge up to the 1-100-year volume is discharged at the 1-in-100-year greenfield rate).
- 3.7 The outfall for the southern catchment is restricted, via a HydroBrake, to 14.6l/s (2.73Ha x 5.3l/s). The greenfield rate for the northern catchment is 1.13l/s (0.21Ha x 5.31l/s), however 2l/s has been used to avoid blockages in accordance with the CIRIA SuDS Manual section 3.3.1.

Peak Rainfall Intensity Allowance

- 3.8 The "Flood Risk Assessments: Climate Change Allowances Guidance" 2016 (updated in 2022) published by the EA indicates that climate change is currently expected to result in increased peak rainfall and rising sea levels.
- 3.9 **Table 1** and **Table 2** show anticipated changes in peak rainfall intensity in small and urban catchments within England for the 1%AEP and the 3.3% AEP, respectively.
- 3.10 The peak rainfall intensity allowance for the 1% AEP event is **45%**

Epoch	Central Allowance	Upper End Allowance
2050s	20%	40%
2070s	25%	45%

Table 1: Peak Rainfall Intensity allowance in small and urban catchments. 1%AEP Events*

- 3.11 The peak rainfall intensity allowance for the 3.3% AEP is **40%**

Epoch	Central Allowance	Upper End Allowance
2050s	20%	35%
2070s	25%	40%

Table 2: Peak Rainfall Intensity allowance in small and urban catchments. 3.3%AEP Events*

*Source: <https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall>

Hydraulic Calculations

- 3.12 InfoDrainage calculations were completed for the 1:1-yr, 1:30-yr+40% Climate Change Allowance and the 1:100-yr+45% Climate Change Allowance return periods. A 10% allowance for urban creep was added to the residential dwelling catchments. No flooding occurs in either system for any rainfall event. See **Appendix D** for the Hydraulic Calculations.

Water Quality

- 3.13 *Figure 6 & Figure 7* are extracted from the SuDS Manual and demonstrate the pollution risks associated with various discharge situations.

TABLE 26.2 Pollution hazard indices for different land use classifications				
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

Figure 6: Table 26.2 of the SuDS Manual

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	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{5,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 7: Table 26.3 of the SuDS Manual

- 3.14 The UKSuDS Water Quality toolkits (based on the Simple Index Assessment method) has been used to assess water quality improvement for the site. **Table 3** and **Table 4** below summarises the results of the toolkit for the southern and northern catchment respectively.

Land Use			SuDS Component			Water Treatment
Low Traffic Roads			Detention Basin			Sufficient
Pollution Indices			Mitigation Indices			
TSS	Metals	Hydrocarbons	TSS	Metals	Hydrocarbons	
0.5	0.4	0.4	0.5	0.5	0.6	

Table 3: Water Quality Summary for Southern Catchment

Land Use			SuDS Component			Water Treatment
Low Traffic Roads			Downstream Defender + Filter Drain			Sufficient
Pollution Indices			Mitigation Indices			
TSS	Metals	Hydrocarbons	TSS	Metals	Hydrocarbons	
0.5	0.4	0.4	0.7	0.6	>0.95	

Table 4: Water Quality Summary for Northern Catchment

4. FOUL WATER DRAINAGE STRATEGY (CONDITON 15)

Existing Drainage

- 4.1 There is an existing Southern Water foul rising main located within Hulbert Road that connects into a gravity sewer north of the site. See **Appendix C** for a copy of the Southern Water Sewer Mapping

Proposed Drainage

- 4.2 The foul water drainage strategy comprises a gravity-led sewer system that will discharge into an existing Southern Water sewer located within Hulbert Road. It is proposed that a new manhole is constructed on the pipe between manholes 5301 and 5302. The foul drainage layout can be seen within **Appendix B**.

5. SUDS MANAGEMENT AND MAINTENANCE STRATEGY (CONDITION 30)

- 5.1 It is anticipated that the estate management company will maintain the attenuation basins and crates, and the sewer system will be adopted by Southern Water through the S104 process. The final agreed management and maintenance responsibilities will be subject to S104 approval.

Vortex separator

- 5.2 Hydrodynamic or vortex separators are structures that use gravity and centrifugal force to separate out and collect medium-sized (63 to 250 μm) sediments and other litter or debris; smaller particles may be able to be removed by varying the flow rate into the system.

Hydrodynamic systems such as these typically consist of a standard concrete manhole with internal components made from either polypropylene or stainless steel. The service life will depend on a number of factors including the operational life of the internal components and the long-term structural integrity of the system and its chamber. With routine maintenance, they should typically function effectively for a period in excess of 40 years.

- 5.3 A typical vortex separator diagram is shown in **Figure 8**.

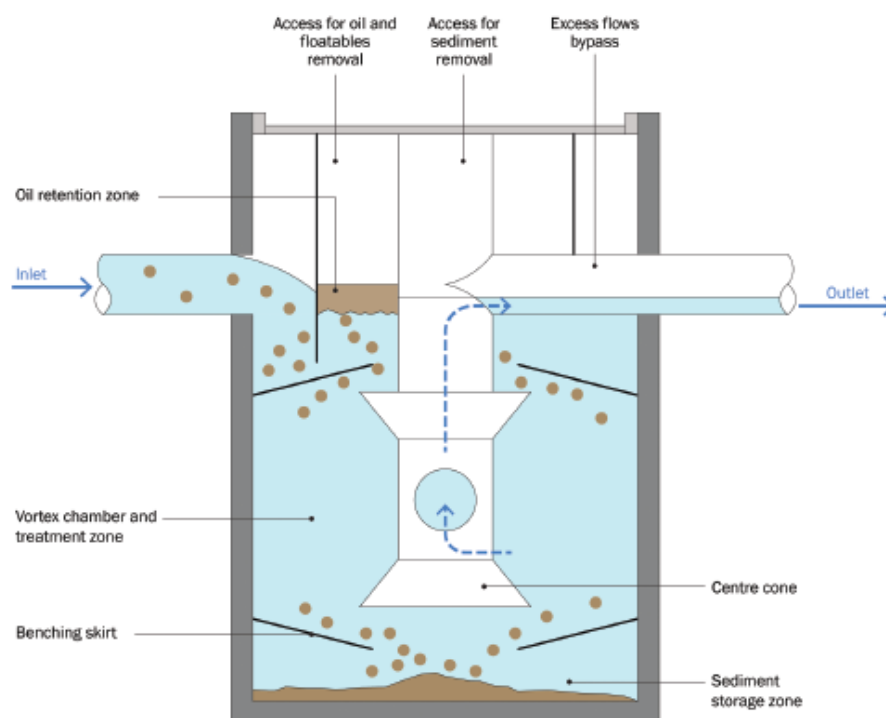


Figure 8: Typical vortex separator (courtesy of Hydro International)

5.4 The proposed maintenance schedule for a vortex separator is shown in **Table 5**.

Maintenance Schedule	Required Action	Typical Frequency
Monitoring	Lift manhole cover and inspect for evidence of poor operation	Annually
	Note sediment accumulation rates and establish appropriate removal frequencies	Monthly for first six months of operation, then annually
Occasional Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	As required, determined by routine monitoring
	Remove sediment, oil, grease and floatables	As required, determined by routine monitoring
Remedial Actions	Replace malfunctioning components or structures	As required

Table 5: Maintenance schedule for a vortex separator

Enhanced swale

5.5 Swales are shallow, flat bottomed, vegetated open channels designed to convey, treat and often attenuate surface water runoff. When incorporated into site design, they can enhance the natural landscape and provide aesthetic and biodiversity benefits. They are often used to drain roads, paths or parks, where it is convenient to collect distributed inflows of runoff, or as means of conveying runoff on the surface while enhancing access corridors or other open space.

Swales can replace conventional pipework as a means on conveying runoff, and the use of adjacent filter strips and or flow spreaders can also remove the need for kerbs and gullies.

5.6 An enhanced swale is a vegetated conveyance channel, designed to include a filter bed of prepared soil that overlays an underdrain system. This underdrain provides additional treatment and conveyance capacity beneath the base of the swale and prevents water logging. A typical enhanced swale diagram is in shown in **Figure 9**

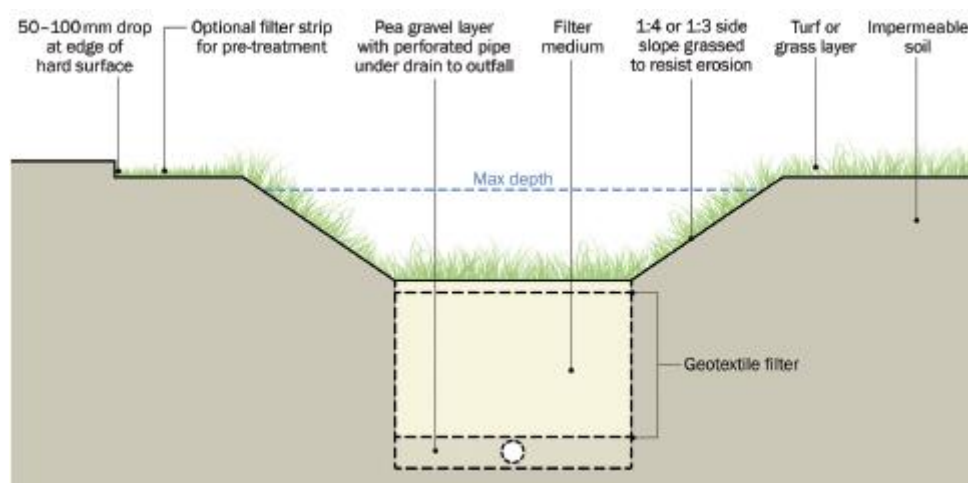


Figure 9: Typical enhanced swale

5.7 The proposed maintenance schedule for an enhanced swale is shown in **Table 6**

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly or as required
	Cut grass	Monthly (during growing season) or as required
	Manage other vegetation and remove nuisance plants	Monthly or as required
	Inspect inlets, outlets and overflows for blockage and silt accumulation	Every six months
	Inspect vegetation coverage	Monthly for first six months then every six months
Occasional Maintenance	Reseed areas of poor vegetation growth and replant suitable plant types	As required or where bare soil is over 10% of the swale surface
Remedial Actions	Repair erosion by returfing or reseeding	As required
	Relevel uneven surfaces	As required
	Scarify and spike topsoil layer to improve infiltration and break up silt deposits	As required
	Remove sediment build up	As required
	Remove and dispose of oils and petrol residues using safe standard practices	As required

Table 6: Maintenance schedule for an enhanced swale

Attenuation Crates

5.8 A geocellular crate system is a lightweight, flexible, high-capacity and low-maintenance modular structure that has high strength characteristic making it ideal for use beneath roads, car parks and industrial areas. It can be customised to suit shallow, deep, or irregular sites. A typical setup is shown below in **Figure 10**.

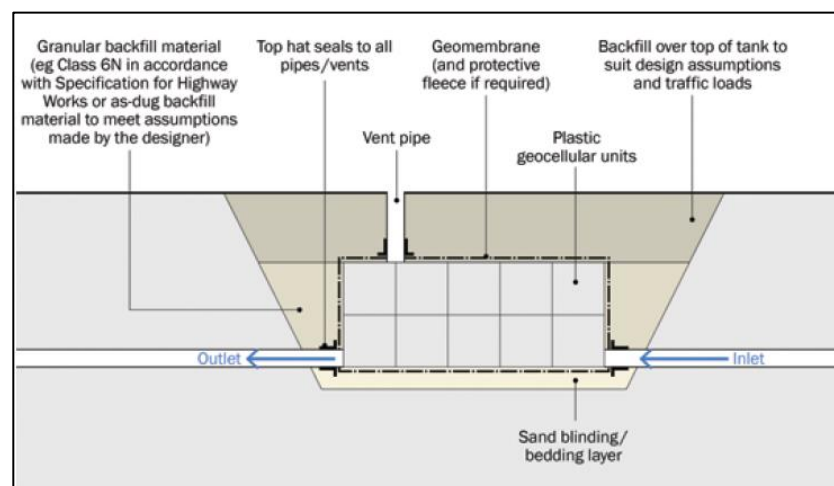


Figure 10: Typical Geocellular Attenuation Crate System Detail

5.9 The proposed maintenance schedule for the attenuation crates is shown in **Table 7**

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risk to performance)	Monthly
	For systems where rainfall infiltrates the tank from above, check surface or filter for blockage by sediment, algae or other matter, removed and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures.	Annually, or as required
Occasional Maintenance	Remove sediment from inlets / outlets	As required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents.	As required.
Monitoring	Survey inside of tank for sediment build up and remove if necessary.	Every 5 years or as required
	Inspect/check all inlets, outlet, vents and overflows to ensure that they are in good condition and operating as designed.	Annually

Table 7 : Maintenance schedule for Attenuation Crates

Detention Basins

5.10 Detention basins are landscaped depressions that are normally dry except during and immediately following storm events. They can be on-line components where surface runoff from regular events is routed through the basin and when the flows rise, because the outlet is restricted, the basin fills and provides storage of runoff and flow attenuation.

Detention basins can be vegetated depressions that can provide treatment when designed to manage regular flows. Where the basin is vegetated, the soil surface can absorb some runoff, so can be used to support prevention of runoff from the site for small rainfall events (Interception), provided that small amounts of infiltration would not pose risk to groundwater.

Where designed appropriately, some or all of the basin area can also be used as a recreational or other amenity facility.

5.11 A typical vegetated detention basin diagram is in shown in **Figure 11**.

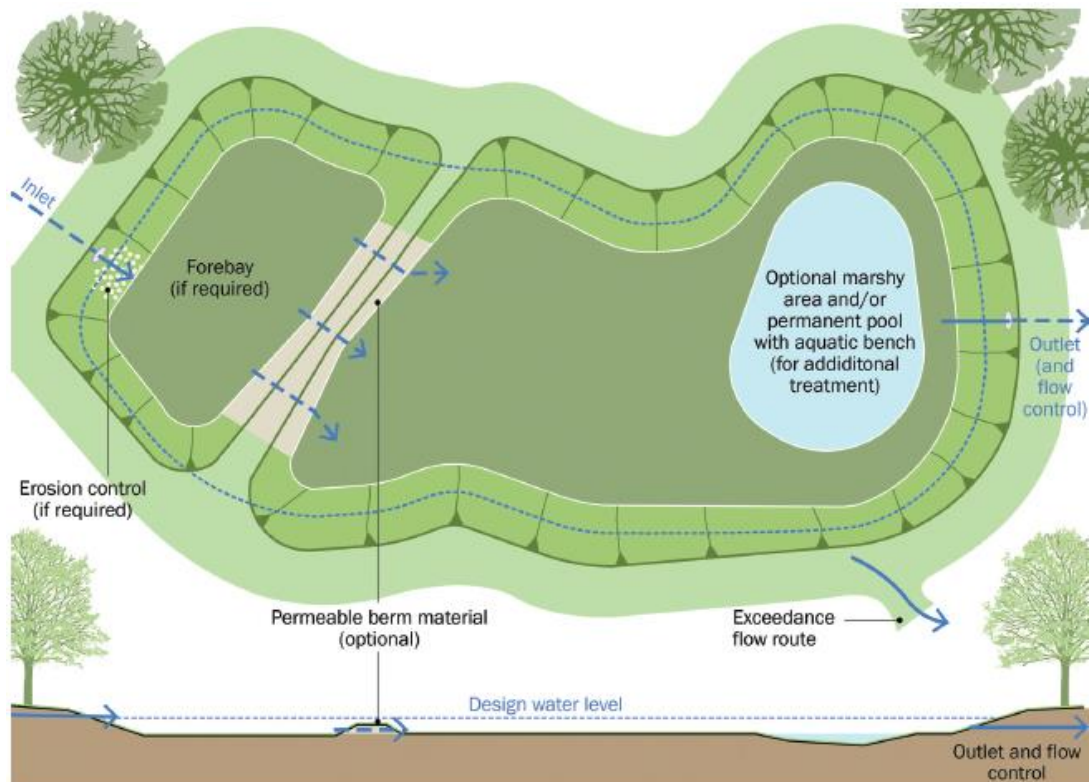


Figure 11: Typical detention basin

5.12 The proposed maintenance schedule for a vegetated detention basin is shown in **Table 8**

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly or as required
	Cut grass	Monthly (during growing season) or as required
	Manage other vegetation and remove nuisance plants	Monthly or as required
	Inspect inlets, outlets and overflows for blockage and silt accumulation	Every six months
	Inspect vegetation coverage	Monthly for first six months then every six months
	Remove litter and debris	Monthly or as required
Occasional Maintenance	Reseed areas of poor vegetation growth and replant suitable plant types	As required
	Remove sediment build up	Every 5 years, or sooner if required as determined from routine inspection
Remedial Actions	Repair erosion by returfing or reseeding	As required
	Relevel uneven surfaces	As required
	Scarify and spike topsoil layer to improve infiltration and break up silt deposits	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required

Table 8: Maintenance schedule for a vegetated detention basin

Gullies and Catchpits

Surface water runoff is in some cases first intercepted by gullies or channels. These devices are the first line of defence in removing silt and particulate matter from the receiving drainage network. Therefore, it is important to ensure they get regular maintenance, so they perform well. Please see **Table 9** below for the proposed maintenance schedule.

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect and identify any areas that are not operating correctly. If required, take remedial action. Ponding surface water is usually a good indication of a blocked inlet. Remove debris from grates.	As required
	Jetting gullies and washing through grated channels to remove silt	Monthly in the first 6 months due to silt runoff from newly grassed verges and then annually, or as required especially after storm events.
	Repair/ rehabilitate inlets, outlets and overflows,	As required
	Inspect/ check all inlets, outlets, grates and overflows to ensure that they are in good condition and operating as designed	Annually
Occasional Maintenance	Survey inside of the gully traps and ensure that the structure is sound and connections to wider network are sound and free from obstruction.	Every 5 years or as required.
	Inspect channel grates to ensure that they are secure and stable. Replace grating if required.	Every 5 years or as required.

Table 9: Maintenance schedule for Gullies and Catchpits

Pipe work

- 5.13 The SuDS systems within the development are connected via various piped networks, these networks require minimal maintenance since the system is designed to filter and capture sediments to reduce the risk of blockages.
- 5.14 To achieve this, all pipework has a minimum diameter of 100mm and the gradients have been selected to provide self-cleansing velocity.
- 5.15 The maintenance schedule for the piped networks should be after extreme weather events, when the system should be checked for siltation. This should be linked in with the inspection of the existing ditches to ensure that it is free flowing.

Headwall inlets, outlets and Inspection chambers

- 5.16 Headwall inlets and outlets are surface structures required for all inflows and outflows from enhanced swales, detention basins, and other SuDS components. Inspection chambers and rodding eyes are installed at changes in pipe direction or where multiple pipes connect, allowing access for cleaning and maintenance.
- 5.17 All inspections and maintenance must be carried out by competent personnel following appropriate health and safety procedures.
- 5.18 Access routes to headwalls and inspection chambers should be kept clear and stable.
- 5.19 Temporary barriers or signage should be installed to ensure public safety during works.
- 5.20 Headwall structures and inspection chambers must be kept free from obstructions, silt, vegetation, and debris at all times. Regular inspections should identify any deterioration, damage, or blockages affecting flow capacity or structural integrity.
- 5.21 Where feasible, monitoring of flow and silt accumulation should be undertaken to identify areas prone to blockage or erosion. Photographic records should be taken during inspections to track condition changes over time.
- 5.22 Please see **Table 10** below for the proposed maintenance schedule.

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect surface structures, removing obstructions, vegetation, and silt as necessary. Check for physical damage or signs of erosion.	Monthly
	Strim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly
	Remove cover of inspection chambers and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt as necessary.	Monthly / After Storm Events
	Undertake detailed inspection following leaf fall in autumn to remove accumulated organic matter.	Annually
Occasional Maintenance	Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	Every 5 years or as required.
Remedial work	Repair physical damage to headwalls, aprons, or chamber covers. Replace missing or damaged gratings or safety grilles.	As required

Table 10: Headwall inlets, outlets and Inspection Chambers

6. CONCLUSION AND SUMMARIES

- 6.1 Ground investigation indicated infiltration is unfeasible based on BRE 365 testing (see section 2.1), therefore surface water outfalls into the existing watercourse network has been proposed, in accordance with the approved outline Flood Risk Assessment and Drainage Strategy produced by WYG (ref: A096474), (See section 3.2). The site is divided into two drainage catchments discharging to existing watercourses at rates restricted to greenfield runoff (5.3 l/s/Ha) using HydroBrakes. (See section 3.5). Surface water runoff will be attenuated using a basin and crates system for the southern catchment, and an enhanced swale for the northern catchment. [Conditions 14 & 15]
- 6.2 Hydraulic modelling was completed using InfoDrainage modelling software. No flooding occurs in either system for all design storm events up to and including the 1 in 100 year return period +45%CC. (See section 6.2). [Conditions 14& 15]
- 6.3 The proposed foul water drainage includes for a gravity sewer network that connects to an existing Southern Water sewer within Hulbert Road. A direct connection is proposed by construction of a new manhole on the line of existing public sewer between existing manholes 5301 and 5302. (See section 4.2). [Condition 15]
- 6.4 Water quality treatment was assessed in based on the Simple Index Assessment method. Both systems were deemed to have sufficient treatment. (See section 3.14). [Conditions 14 & 15]
- 6.5 It is anticipated that the estate management company will maintain the attenuation basins and crates, and the sewer system will be adopted by Southern Water through the S104 process. (See section 5). [Condition 30]
- 6.6 The information provided within this technical note is deemed suitable to allow for discharge of conditions 14, 15 and 30.

Appendix A

4.0 GROUND CONDITIONS ENCOUNTERED

4.1 STRATA ENCOUNTERED

The sequence of strata encountered beneath the site was;

- Topsoil
- Made Ground
- Weathered London Clay Formation
- London Clay Formation

A summary of each stratum depth is provided in the table below, with descriptions of each stratum detailed in the subsequent sections. Exploratory hole logs including photographic plates can also be seen in Appendix C.

Table 4-1 – Summary of Ground Conditions Encountered

Location	Top and Base Depth of strata (m bgl)				
	Topsoil	Made Ground	Reworked Natural material	Weathered London Clay Formation	London Clay Formation
BH01	GL-0.30	ne	ne	0.30-5.90	5.90-13.00*
BH02	GL-0.30	ne	ne	0.30-5.90	5.90-13.00*
BH03	ne	GL-0.30	0.30-0.90	0.90-6.50	6.50-12.50*
BH04	GL-0.30	ne	ne	0.30-5.00	5.00-8.20*
WS01	GL-0.25	ne	ne	0.25-5.00*	ne
WS02	GL-0.30	ne	ne	0.30-5.00*	ne
WS03	GL-0.25	ne	ne	0.25-5.00*	ne
WS04	GL-0.30	ne	ne	0.30-5.00*	ne
WS05	ne	GL-0.40	ne	0.40-5.00*	ne
WS08	GL-0.25	ne	ne	0.25-4.75*	4.75-5.00*
WS09	ne	GL-0.30	0.30-1.00	1.00-5.00*	ne
WS10	GL-0.30	ne	ne	0.30-4.50	ne
WS11	ne	GL-0.30	0.30-1.00	1.00-5.00*	ne
WS12	GL-0.25	ne	ne	0.25-5.00	ne
TPSA01	GL-0.30	ne	ne	0.30-1.10*	ne
TPSA02	GL-0.30	ne	ne	0.30-2.10*	ne
TPSA03	GL-0.30	ne	ne	0.30-2.50*	ne
TP04	GL-0.30	ne	ne	0.30-3.00*	ne
TP05	GL-0.30	ne	ne	0.30-3.00*	ne
TP06	GL-0.30	ne	ne	0.30-3.00*	ne
TP07	ne	GL-0.30	0.30-0.60	0.60-2.50*	ne
TP08	ne	GL-0.30	0.30-0.70	0.70-2.50*	ne
TP09	ne	GL-0.30	0.30-1.00	1.00-2.50*	ne
TP10	ne	GL-0.30	0.30-0.90	0.90-2.50*	ne

Location	Top and Base Depth of strata (m bgl)				
	Topsoil	Made Ground	Reworked Natural material	Weathered London Clay Formation	London Clay Formation
TP11	ne	GL-0.50*	ne	ne	ne
TP12	ne	GL-0.50*	ne	ne	ne

4.1.1 Topsoil

Topsoil was encountered in a total of 17no. locations across the site (excluding the raised platform in the southwest) to a maximum depth of 0.30m bgl. It is generally described as soft brown slightly sandy to sandy silt with varying content of roots, where sand is fine to medium. Occasional gravel of chalk and chert was noted in a small number of locations.

4.1.2 Made Ground

Made Ground was noted in a total of 10no. locations on site. Of these, 7no. were located in the southwest of the site in the area of the raised platform with Made Ground noted to a maximum depth of 0.30m bgl and comprised of a layer of grey sandy angular gravel of limestone and chert with occasional brick overlying a triple membrane of a plastic mesh over a geotextile over a plastic membrane.

The three remaining locations where Made Ground was noted were TP11, TP12 and WS05. TP11 and TP12 were excavated in the bund of the raised platform and described as slightly gravelly very sandy silt, where sand is fine to medium and gravel is fine to coarse subangular to subrounded of chert, chalk and rare brick.

WS05 was excavated adjacent to the platform bund as was described as dark brown and grey mottled slightly sandy slightly gravelly silty clay, where sand is fine to medium and gravel is fine to medium subangular to subrounded of siltstone.

4.1.3 Reworked Natural

In the area of the raised platform, in the southwest of the site, a layer of soft orangish brown sandy silty clay was noted to underly the Made Ground as described above in all 7no. locations in this area. It was noted to maximum depth of 1.00m bgl in WS09 and WS11. It is assumed that this material has been reworked as part of the cut and fill exercise during the construction of the platform.

4.1.4 Weathered London Clay Formation

Weathered London Clay Formation was noted in 24no. locations across the site from a minimum depth of 0.30m bgl to a maximum depth of 6.50m bgl at BH02. Across the site it is generally noted to comprise two layers, namely soft to firm orangish brown/ brown sandy silty clay overlying firm brown/ brown and grey friable clayey silt/ silty clay.

In the east of the site (WS02, WS08, BH04) deposits of orangish brown/yellowish brown clayey/silty sand were noted to a maximum depth of 5.00m bgl.

4.1.5 London Clay Formation

London Clay was encountered in 5no. locations (BH01 to BH04 and WS08) from a minimum depth of 4.75m bgl (WS08) to a maximum termination depth of 13.00m bgl. It is generally described as brownish grey to dark grey very silty sand/ very sandy silt, where sand is fine or fine to medium.

4.2 GROUNDWATER

Groundwater strikes were noted in a number of locations during the ground investigation as indicated in the table below.

Table 4-2 – Summary of Groundwater strikes during drilling

Location	Depth of groundwater strike (m bgl)	Depth of groundwater strike after 20 minutes (m bgl)
BH01	6.90	5.10
BH02	6.80	4.40
BH03	8.20	6.80
BH04	4.30	4.30
WS02	4.50	3.30
WS04	4.50	3.90
WS08	3.40	1.80
WS10	4.50	4.30

As well as the strikes above, it should be noted that perched water was noted in all locations within the raised platform within the Made Ground material between ground level and 0.30m bgl. It is assumed that this perched water is derived from rainwater infiltration and is restricted from vertical infiltration by the presence of the triple membrane at 0.30m bgl across this area and instead the water migrates to the drainage ditches along the north, south and east of the site.

4.3 IN SITU TESTING

4.3.1 Soil Infiltration Testing

Soil infiltration tests were carried out at 3no. locations, as shown in Figure 3. The tests were undertaken within the weathered London Clay Formation as per the table below.

Table 4-3 – Summary of Soil Infiltration Test Locations

Location	Depth of test section (m bgl)	Strata
TPSA01	0.66-1.20	Weathered London Clay
TPSA02	1.60-2.10	Weathered London Clay
TPSA03	1.90-2.50	Weathered London Clay

The testing at TPSA01 was undertaken over a 72 hr period, with regular manual measurements taken throughout testing. The results show that the water level rose from 0.66m bgl at the start of the test to 0.36m bgl by the end of the 72hr test period. As such, the test did not reach the required 25% effective depth to calculate a soil infiltration rate (as per BRE 365).

The testing at TPSA02 and TPSA03 was intended to be undertaken over a 72hr period. However, significant collapse of the side walls was noted in both locations within the first 24hrs raising the water level in the pit. Whilst the base of the pit was measured following the side wall collapse the dimension of the pit was no longer known and as such the test was terminated after 24hrs.

During the first 24hrs the water level was noted to rise from:

- 1.60m bgl to 1.18m bgl in TPSA02.
- 1.95m bgl to 1.10m bgl in

As such, the tests did not reach the required 25% effective depth to calculate a soil infiltration rate (as per BRE 365).

The results of these tests can be found in Appendix D

4.3.2 Dynamic Cone Penetrometer – TRL Probes

DCP probing, via TRL method, to provide California Bearing Ratio values for pavement design was undertaken in eleven exploratory positions (CBR01-CBR11) up to 1.0m bgl across the site or until refusal. Where shallow refusal was encountered, the test was relocated nearby.

Results are presented in Appendix E

4.4 VISUAL OR OLFACTORY EVIDENCE OF CONTAMINATION

Significant visual or olfactory evidence of contamination was not noted during the ground investigation.

APPENDIX D – SOIL INFILTRATION TEST RESULTS

Appendix B

SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Please be aware the Client is a duty holder under CDM 2015. By default, the client assumes the duties of the principal designer (PD) until such a time a PD is appointed.

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks. Reference shall also be made to the Designer Risk Assessment ref: 020.5923.DRA

CONSTRUCTION

1. Connection into live Southern Water foul sewer network - appropriate contractor RAMS and Southern Water approvals to be in place prior to commencement of works.

2. Live highway - Contractor to implement appropriate traffic management prior to commencement of works.

3. (Site wide compulsory action) Unknown services - investigation to be undertaken to determine presence of existing services on site prior to commencement of works.

4. (Site wide compulsory action) Unknown ground conditions - intrusive site investigation to be undertaken prior to commencement of works.

MAINTENANCE/CLEANING/OPERATION

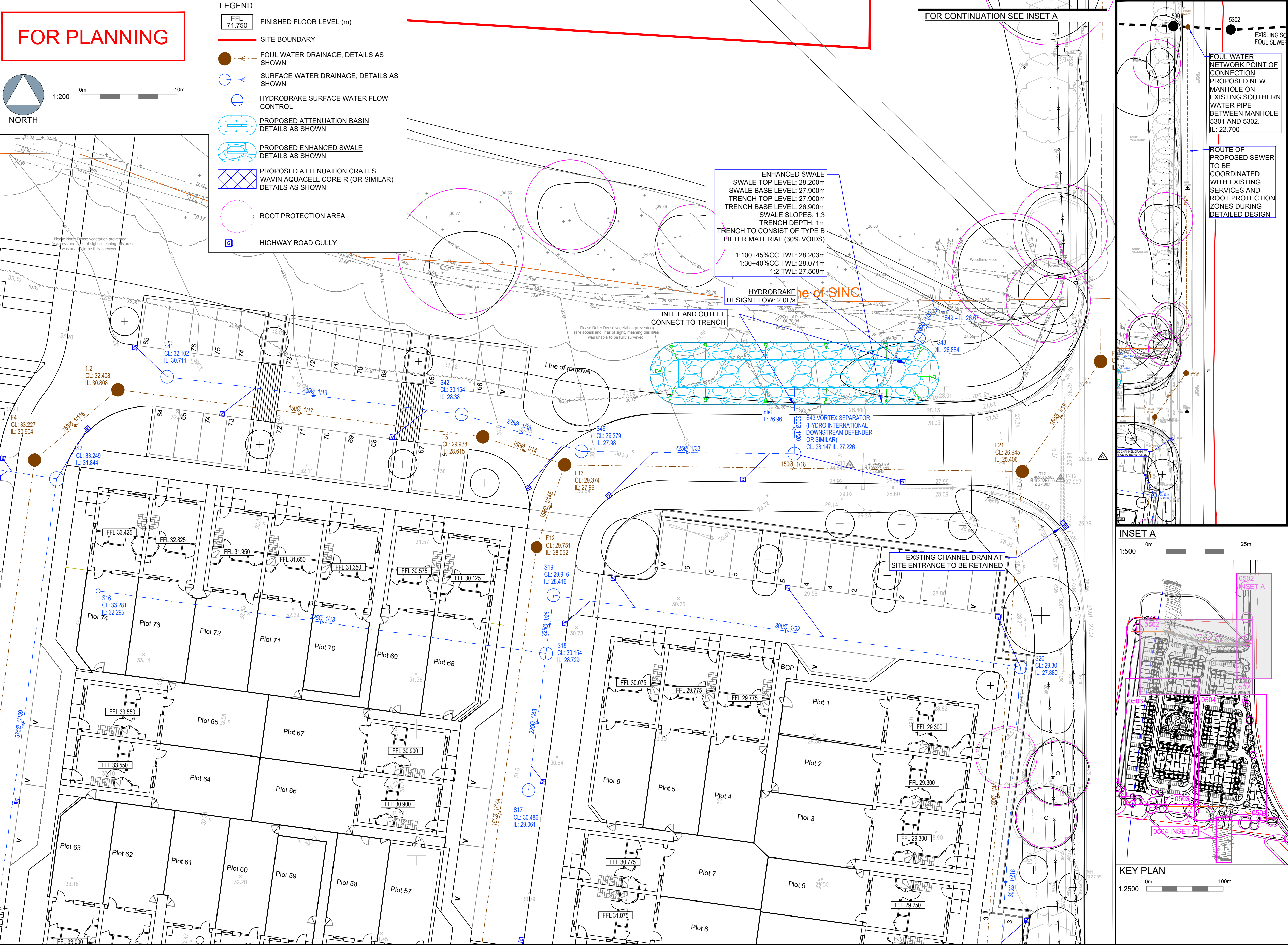
No abnormal maintenance/cleaning/operation risks.

USE

No abnormal use risks.

DECOMMISSIONING/DEMOLITION

No abnormal decommissioning/demolition risks.



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Please be aware the Client is a duty holder under CDM 2015. By default, the client assumes the duties of the principal designer (PD) until such a time a PD is appointed.

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks. Reference shall also be made to the Designer Risk Assessment ref. 020.5923.DRA

CONSTRUCTION

1. Former oil drilling pit - appropriate contamination testing to be completed and contractor RAMS to be in place prior to commencement of works.

2. (Site wide compulsory action) Unknown services - investigation to be undertaken to determine presence of existing services on site prior to commencement of works.

3. (Site wide compulsory action) Unknown ground conditions - intrusive site investigation to be undertaken prior to commencement of works.

MAINTENANCE/CLEANING/OPERATION

No abnormal maintenance/cleaning/operation risks.

USE

No abnormal use risks.

DECOMMISSIONING/DEMOLITION

No abnormal decommissioning/demolition risks.

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GENERAL NOTES

1. All drawings are to be read in conjunction with the project health and safety information, including the project hazard log for any identified potential risks.

2. All works are to be in accordance with the following specifications UON:

2.1. All private external works, including carriageways, shall be per NHBC Standards Chapter 10 External Works.

2.2. Private drainage shall be per NHBC Standards 5.3 Drainage below ground.

2.3. Adopted highways shall be per the MCHW and adopted drainage per SSG Appendix C (DCG).

3. Any variations or discrepancies between these drawings in terms of dimensions or details should be drawn to the attention of the Architect and/or the Engineer for clarification.

4. All figured dimensions to be taken in preference to scaled dimensions. do not scale this drawing.

5. Paul Basham Associates accepts no responsibility for the accuracy of background information produced by third parties - this must be treated as indicative only. Third party plans as per the following:

5.1. TOPOGRAPHICAL SURVEY - 26479-200-01-HULBERTROAD AND A066474 - HULBERT ROAD TOPOGRAPHICAL SURVEY - REV A

5.2. EXTENDED TOPO BEYOND SITE BOUNDARY

5.3. TREE PROTECTION PLAN - SJA TCP NL 25022-011

6. The main contractor shall be responsible for the setting out and accuracy of all dimensions.

7. It is the main contractor's sole responsibility for ascertaining safe disposal of any off-site excavated spoil. no claim resulting from abnormal tip requirements will be entertained.

8. The main contractor to provide and fix suitable bracing and propping for all elements in the temporary condition during construction stage, such as to ensure structure stability at all times.

9. This drawing should only be used for construction if the project phase in the title frame below is shown as "construction". Paul Basham Associates take no responsibility for construction works undertaken to drawings which are not marked under this phase.

LEGEND

FFL 71.750

FINISHED FLOOR LEVEL (m)

SITE BOUNDARY

FOUL WATER DRAINAGE, DETAILS AS SHOWN

SURFACE WATER DRAINAGE, DETAILS AS SHOWN

HYDROBRAKE SURFACE WATER FLOW CONTROL

PROPOSED ATTENUATION BASIN DETAILS AS SHOWN

PROPOSED ENHANCED SWALE DETAILS AS SHOWN

PROPOSED ATTENUATION CRATES W/AVIN AQUACELL CORE-R (OR SIMILAR) DETAILS AS SHOWN

ROOT PROTECTION AREA

HIGHWAY ROAD GULLY

KEY PLAN

0m

100m

1:2500

P03

REVISED TO LATEST LAYOUT (10.11.25)

14.11.2025

LC

MW

P02

KEY PLAN UPDATED

09.06.25

RRD

LEC

P01

FIRST ISSUE

30.05.25

RRD

MDW

Rev

Description

Date

By

App

Paul Basham Associates Ltd

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info@paulbashamassociates.com

www.paulbashamassociates.com

Client

BRICS

DEVELOPMENT

Project Name

LAND WEST OF HULBERT ROAD, HAVANT

Title

DRAINAGE LAYOUT SHEET 2

Project Phase

PRELIMINARY

Date Created

25.05.2025

Drawn

RRD

Approved

MDW

Suitability Code

--

PBA Project Number

020.5923

Scale

AS SHOWN

(AT A1)

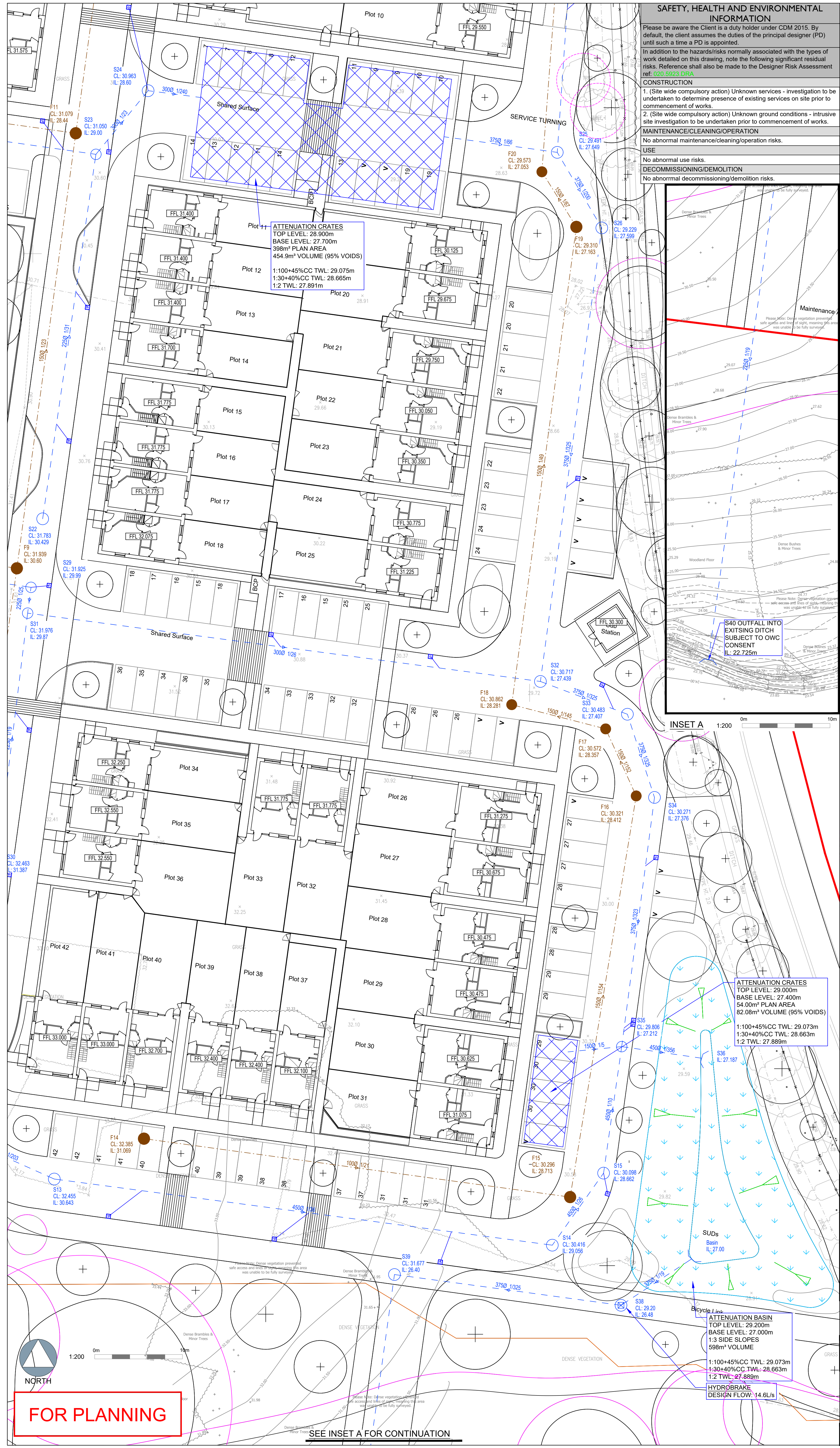
Drawing No.

020.5923.0503

Revision

P03

FOR PLANNING



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION

Please be aware the Client is a duty holder under CDM 2015. By default, the client assumes the duties of the principal designer (PD) until such a time a PD is appointed.

In addition to the hazards/risks normally associated with the types of work detailed on this drawing, note the following significant residual risks. Reference shall also be made to the Designer Risk Assessment ref. 020.5923.DRA

CONSTRUCTION

1. (Site wide compulsory action) Unknown services - investigation to be undertaken to determine presence of existing services on site prior to commencement of works.

2. (Site wide compulsory action) Unknown ground conditions - intrusive site investigation to be undertaken prior to commencement of works.

MAINTENANCE/CLEANING/OPERATION

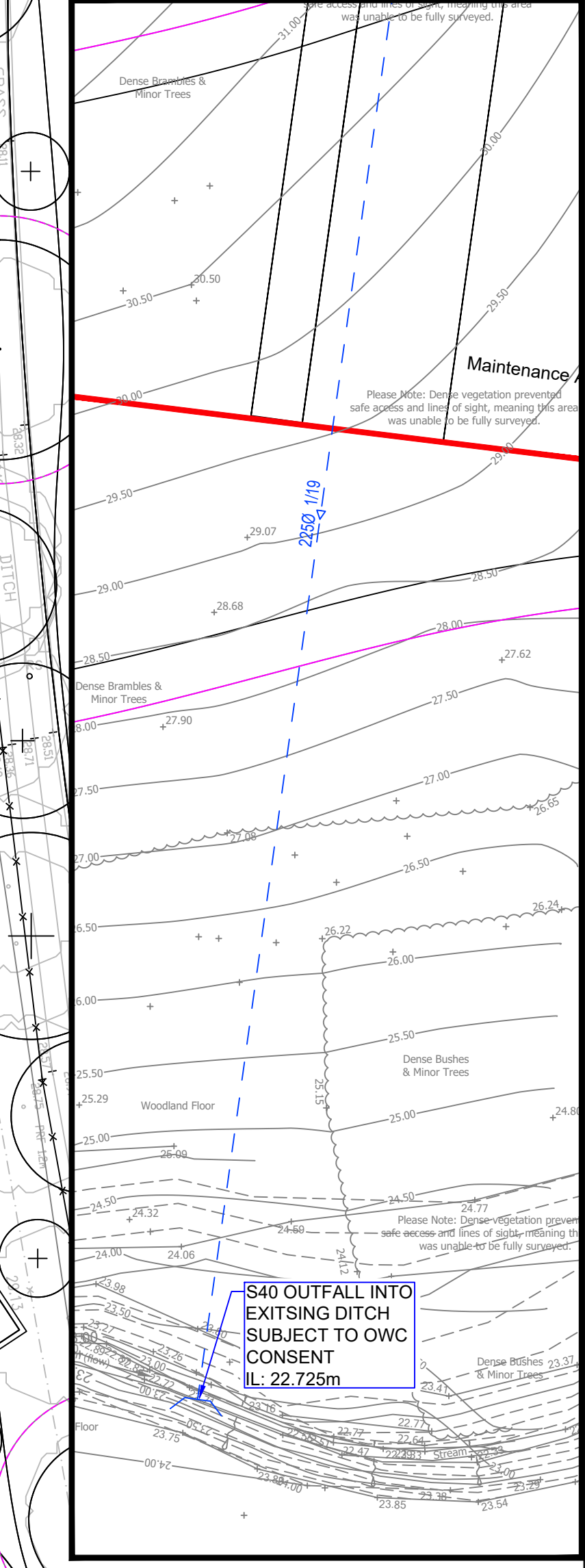
No abnormal maintenance/cleaning/operation risks.

USE

No abnormal use risks.

DECOMMISSIONING/DEMOLITION

No abnormal decommissioning/demolition risks.



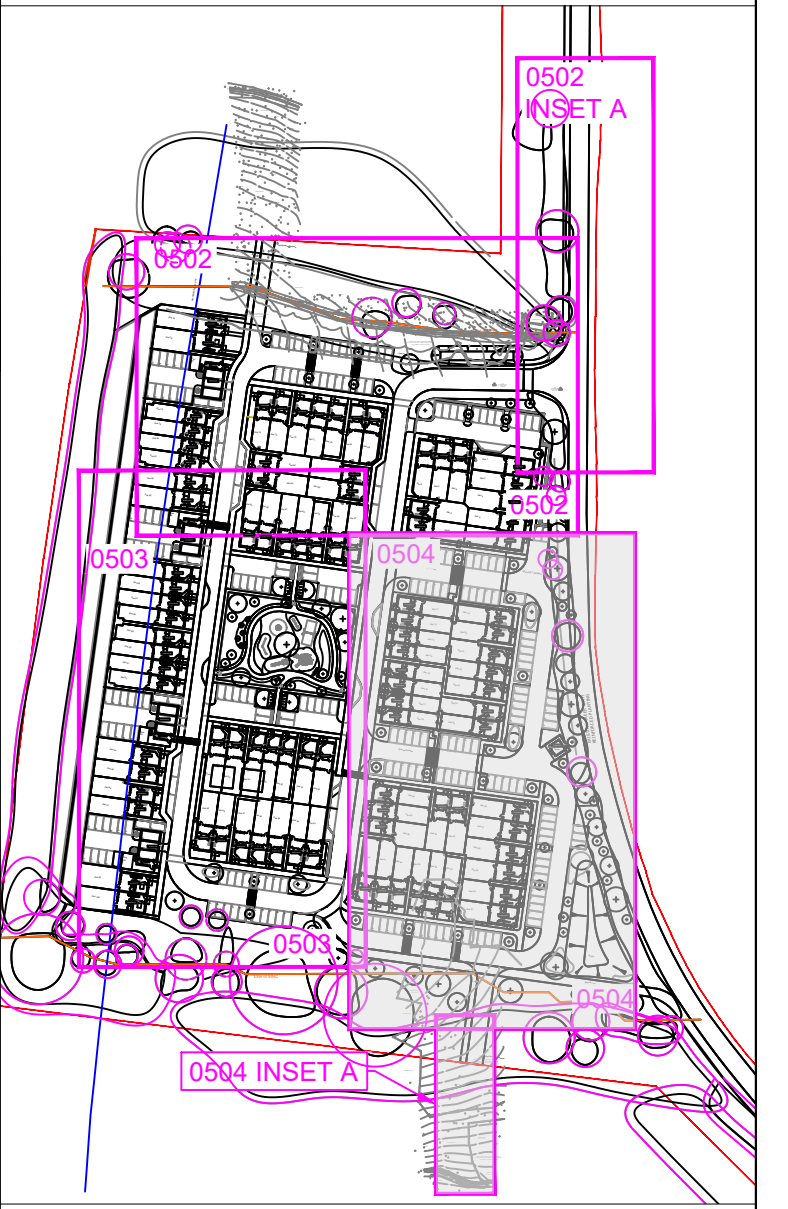
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GENERAL NOTES

- All drawings are to be read in conjunction with the project health and safety information, including the project hazard log for any identified potential risks.
- All works are to be in accordance with the following specifications UON:
 - All private external works, including carriageways, shall be per NHC Standards Chapter 10 External Works.
 - Private drainage shall be per NHC Standards 5.3 Drainage below ground.
 - Adopted highways shall be per the MCHW and adopted drainage per SSG Appendix C (DGS).
- Any variations or discrepancies between these drawings in terms of dimensions or details should be drawn to the attention of the Architect and/or the Engineer for clarification.
- All figured dimensions to be taken in preference to scaled dimensions. do not scale this drawing.
- Paul Basham Associates accepts no responsibility for the accuracy of background information produced by third parties - this must be treated as indicative only. Third party plans are per the following:
 - TOPOGRAPHICAL SURVEY - 26479-200-01-HULBERTROAD AND A096474 - HULBERT ROAD TOPOGRAPHICAL SURVEY - REV A
- 251103 - EXTENDED TOPO BEYOND SITE BOUNDARY
- SITE LAYOUT - 10_11_25 POST PLANNING UPDATE
- TREE PROTECTION PLAN - SJA TOP NL 25022-011
- The main contractor shall be responsible for the setting out and accuracy of all dimensions.
- It is the main contractor's sole responsibility for ascertaining safe disposal of any off-site excavated spoil. no claim resulting from abnormal tip requirements will be entertained.
- The main contractor to provide and fix suitable bracing and propping for all elements in the temporary condition during construction stage, such as to ensure structure stability at all times.
- This drawing should only be used for construction if the project phase in the title frame below is shown as "construction". Paul Basham Associates take no responsibility for construction works undertaken to drawings which are not marked under this phase.

LEGEND

- FFL 71.750 FINISHED FLOOR LEVEL (m)
- SITE BOUNDARY
- FOUL WATER DRAINAGE, DETAILS AS SHOWN
- SURFACE WATER DRAINAGE, DETAILS AS SHOWN
- HYDROBRAKE SURFACE WATER FLOW CONTROL
- PROPOSED ATTENUATION BASIN DETAILS AS SHOWN
- PROPOSED ENHANCED SWALE DETAILS AS SHOWN
- PROPOSED ATTENUATION CRATES WAVING AQUACELL CORE-R (OR SIMILAR) DETAILS AS SHOWN
- ROOT PROTECTION AREA
- HIGHWAY ROAD GULLY



KEY PLAN

1:2500 0m 100m

Rev	Description	Date	By	App'd
P03	REVISED TO LATEST LAYOUT (10.11.25)	14.11.2025	LC	MW
P02	KEY PLAN UPDATED	09.06.2025	RRD	LEC
P01	FIRST ISSUE	23.05.2025	RRD	MDW

Client: **BRICS DEVELOPMENT**

Project Name: **LAND WEST OF HULBERT ROAD, HAVANT**

Title: **DRAINAGE LAYOUT SHEET 3**

Project Phase: **PRELIMINARY**

Date Created	Drawn	Approved	Suitability Code
25.05.2025	RRD	MDW	--

PBA Project Number: 020.5923

Drawing No: 020.5923.0504

Revision: P03

Appendix C

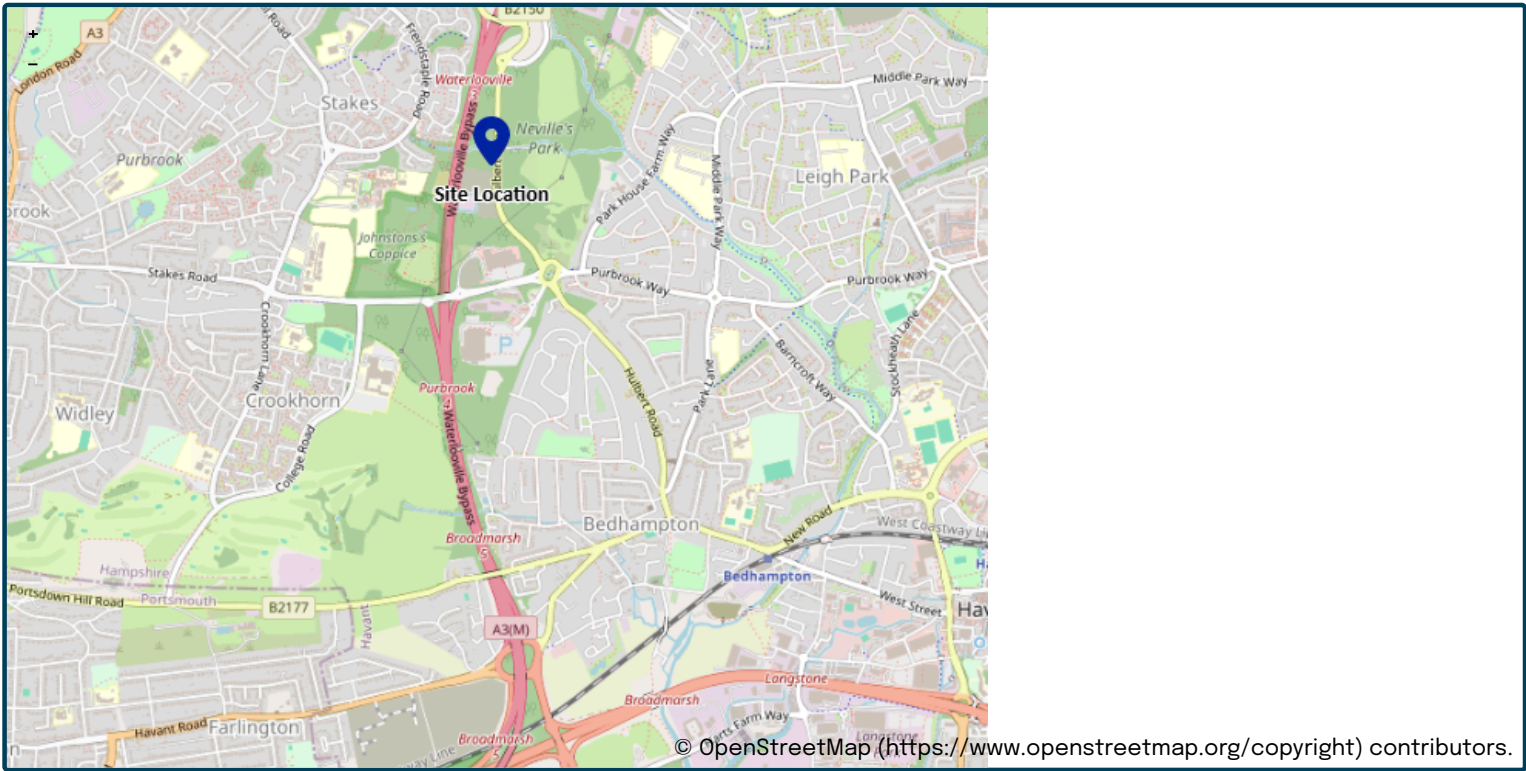
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	14/05/2025
Calculated by	Ryan Diboll
Reference	020.5923
Model version	2.0.0

Location

Site name	Land West of Hulbert Road
Site location	Havant



Site easting	469501
Site northing	108165

Site details

Total site area (ha)	1	ha
----------------------	---	----

Greenfield runoff

Method

Method	IH124
--------	-------

IH124

	<u>My value</u>		<u>Map value</u>
SAAR (mm)	<div><div>761</div><div>mm</div></div>	☐	<div><div>761</div></div>
How should SPR be derived?	<div><div>WRAP soil type</div></div>		
WRAP soil type	<div><div>4</div></div>	☐	<div><div>4</div></div>
SPR	<div><div>0.47</div><div></div></div>		
QBar (IH124) (l/s)	<div><div>5.3</div><div>l/s</div></div>		

Growth curve factors

	<u>My value</u>		<u>Map value</u>
Hydrological region	<div><div>7</div></div>	☐	<div><div>7</div></div>
1 year growth factor	<div><div>0.85</div><div></div></div>		
2 year growth factor	<div><div>0.88</div><div></div></div>		
10 year growth factor	<div><div>1.62</div><div></div></div>		
30 year growth factor	<div><div>2.3</div><div></div></div>		
100 year growth factor	<div><div>3.19</div><div></div></div>		
200 year growth factor	<div><div>3.74</div><div></div></div>		

Results

Method	<div><div>IH124</div><div></div></div>
Flow rate 1 year (l/s)	<div><div>4.5</div><div>l/s</div></div>
Flow rate 2 year (l/s)	<div><div>4.7</div><div>l/s</div></div>
Flow rate 10 years (l/s)	<div><div>8.6</div><div>l/s</div></div>
Flow rate 30 years (l/s)	<div><div>12.2</div><div>l/s</div></div>
Flow rate 100 years (l/s)	<div><div>17</div><div>l/s</div></div>
Flow rate 200 years (l/s)	<div><div>19.9</div><div>l/s</div></div>

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.0.0) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>).

The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix D

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 1	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		





Enhanced Swale

Type : Swale

Swale	
Exceedance Level (m)	28.500
Depth (m)	0.600
Base Level (m)	27.900
Top Width (m)	8.300
Side Slope (1:X)	3.00
Base Width (m)	4.700
Freeboard (mm)	300
Length (m)	30.000
Long. Slope (1:X)	300.00
Filtration Rate (m/hr)	50.0
Friction Scheme	Manning's n
n	0.35
Total Volume (m³)	92.700

Trench	
Trench Depth (m)	1.000
Trench Porosity (%)	30

Inlets	
Inlet	
Inlet Type	Point Inflow
Incoming Item(s)	Inlet-Outlet
Bypass Destination	(None)
Inlet Destination	Subsurface Area
Capacity Type	No Restriction

Outlets	
Outlet	
Outgoing Connection	Outlet-S48
Outlet Type	Free Discharge

Advanced	
Swale	
Porosity (%)	100
Trench	
Trench Conductivity (m/hr)	500.0

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Inflow Summary Storm Phase: Surface Network 1		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
63.61m - 1.000	S41		Time of Concentration	0.006	100	10	110	0.007
63.71m - 1.000	S41		Time of Concentration	0.006	100	10	110	0.007
122.87m - 1.001	S42		Time of Concentration	0.012	100	0	100	0.012
329.20m - 1.003	S43		Time of Concentration	0.033	100	0	100	0.033
821.44m - 1.000	S41		Time of Concentration	0.082	100	0	100	0.082
TOTAL		0.0		0.140				0.141

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		



Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Shortest
Urban Creep	Use Catchment Values
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall		
FEH		Type: FEH
Site Location	GB 469409 108136 SU 69409 08136	
Rainfall Version	2022	
Summer	☒	
Winter	☒	

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	40.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment		Date: 12/11/2025	
		Designed by: LEC	Checked by: Approved By:
Report Details: Type: Junctions Summary Storm Phase: Surface Network 1		Paul Basham Associates: The Bothy Cams Hall Estate Fareham	





FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Inflow (L/s)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Status
S41	FEH: 2 years: +0 %: 15 mins: Summer	32.10 2	30.71 2	30.768	20.5	0.000	20.2	OK
S42	FEH: 2 years: +0 %: 15 mins: Summer	30.15 4	28.38 0	28.460	22.8	0.000	22.0	OK
S43	FEH: 2 years: +0 %: 120 mins: Summer	28.14 7	27.22 7	27.960	13.3	0.000	12.5	Surcharged
S46	FEH: 2 years: +0 %: 15 mins: Summer	29.27 9	27.98 0	28.057	22.0	0.000	22.1	OK
S48	FEH: 2 years: +0 %: 480 mins: Summer	28.50 0	26.88 4	27.336	2.1	0.000	1.9	Surcharged
S49	FEH: 2 years: +0 %: 120 mins: Summer	27.67 0	26.67 0	26.695	1.9	0.000	1.9	OK
Inlet	FEH: 2 years: +0 %: 120 mins: Summer	28.46 7	26.96 0	27.960	12.5	0.000	11.8	Surcharged

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment		Date: 12/11/2025	
		Designed by: LEC	Checked by: Approved By:
Report Details: Type: Junctions Summary Storm Phase: Surface Network 1		Paul Basham Associates: The Bothy Cams Hall Estate Fareham	





FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Inflow (L/s)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Status
S41	FEH: 30 years: +40 %: 15 mins: Summer	32.10 2	30.71 2	30.814	61.4	0.000	60.6	OK
S42	FEH: 30 years: +40 %: 15 mins: Summer	30.15 4	28.38 0	28.563	68.5	0.000	54.0	OK
S43	FEH: 30 years: +40 %: 15 mins: Summer	28.14 7	27.22 7	28.099	77.3	0.000	77.4	Surcharged
S46	FEH: 30 years: +40 %: 15 mins: Summer	29.27 9	27.98 0	28.398	54.0	0.000	56.2	Surcharged
S48	FEH: 30 years: +40 %: 60 mins: Summer	28.50 0	26.88 4	27.902	3.9	0.000	2.2	Surcharged
S49	FEH: 30 years: +40 %: 60 mins: Summer	27.67 0	26.67 0	26.696	2.2	0.000	2.2	OK
Inlet	FEH: 30 years: +40 %: 15 mins: Summer	28.46 7	26.96 0	28.044	77.4	0.000	77.5	Surcharged

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment		Date: 12/11/2025	
		Designed by: LEC	Checked by: Approved By:
Report Details: Type: Junctions Summary Storm Phase: Surface Network 1		Paul Basham Associates: The Bothy Cams Hall Estate Fareham	





FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Depth

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Inflow (L/s)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Status
S41	FEH: 100 years: +45 %: 15 mins: Summer	32.102	30.712	30.831	79.7	0.000	79.1	OK
S42	FEH: 100 years: +45 %: 15 mins: Summer	30.154	28.380	29.024	89.3	0.000	78.3	Surcharged
S43	FEH: 100 years: +45 %: 15 mins: Summer	28.147	27.227	28.147	98.6	0.014	95.3	Surcharged
S46	FEH: 100 years: +45 %: 15 mins: Summer	29.279	27.980	28.638	78.3	0.000	71.3	Surcharged
S48	FEH: 100 years: +45 %: 30 mins: Summer	28.500	26.884	27.901	6.1	0.000	2.2	Surcharged
S49	FEH: 100 years: +45 %: 30 mins: Summer	27.670	26.670	26.696	2.2	0.000	2.2	OK
Inlet	FEH: 100 years: +45 %: 15 mins: Summer	28.467	26.960	28.066	95.3	0.000	95.5	Surcharged

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Surface Network 1		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			



FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Velocity (m/s)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Enhanced Swale	FEH: 2 years: +0 %: 480 mins: Summer	27.908	27.336	27.508	0.608	5.5	25.731	0.000	0.0	2.1	39.940	72.242	OK

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Surface Network 1		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			



FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Velocity (m/s)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Enhanced Swale	FEH: 30 years: +40 %: 360 mins: Summer	28.121	28.121	28.071	1.171	17.6	69.181	0.000	0.0	3.2	71.947	25.371	OK

020.5923.IDC.2.B: Land West of Hulbert Road Surface Water Calcs Northern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Surface Network 1		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			



FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By:
Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Velocity (m/s)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Enhanced Swale	FEH: 100 years: +45 %: 360 mins: Winter	28.253	28.253	28.203	1.303	14.8	93.430	0.000	0.0	3.0	77.783	-0.787	Flood Risk

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 2	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		





Pond

Type : Pond

Dimensions

Exceedance Level (m)	29.200
Depth (m)	2.200
Base Level (m)	27.000
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.212
Total Volume (m³)	462.911

Depth (m)	Area (m²)	Volume (m³)
0.000	88.860	0.000
0.100	102.957	9.582
0.200	117.671	20.605
0.300	132.718	33.117
0.400	148.099	47.151
0.500	163.812	62.740
0.600	179.859	79.917
0.700	196.239	98.716
0.800	212.953	119.170
0.900	229.999	141.312
1.000	247.379	165.176
1.100	265.092	190.794
1.200	283.137	218.201
1.300	301.517	247.429
1.400	320.229	278.511
1.500	339.275	311.482
1.600	358.653	346.374
1.700	378.365	383.220
1.800	398.410	422.055
1.900	418.789	462.911
2.000	439.500	505.821
2.100	460.545	550.819
2.200	481.923	597.938

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	S35-S36
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Basin - S38
Outlet Type	Free Discharge

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 2	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		



Advanced

Perimeter	Circular
Length (m)	42.386
Friction Scheme	Manning's n
n	0.35



Tank

Type : Tank

Dimensions

Exceedance Level (m)	29.600
Depth (m)	1.900
Base Level (m)	27.700
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:X)	0.00
Total Volume (m³)	454.569

Depth (m)	Area (m²)	Volume (m³)
0.000	398.131	95.984
1.200	398.131	95.984

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Pipe
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (1)
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	31.773

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Details: Type: Stormwater Controls Storm Phase: Surface Network 2	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		





Tank (1)

Type : Tank

Dimensions

Exceedance Level (m)	30.000
Depth (m)	2.600
Base Level (m)	27.400
Freeboard (mm)	0
Initial Depth (m)	0.000
Porosity (%)	95
Average Slope (1:X)	0.00
Total Volume (m³)	83.080

Depth (m)	Area (m²)	Volume (m³)
0.000	54.00	0.000
1.600	54.00	82.080

Inlets

Outlets

Outlet

Outgoing Connection	Pipe (2)
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	10.780

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment		Date: 12/11/2025		
		Designed by: LEC	Checked by:	
		Approved By:		
Report Details: Type: Inflow Summary Storm Phase: Surface Network 2		Paul Basham Associates: The Bothy Cams Hall Estate Fareham		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
16.00m - 5.005	S26		Time of Concentration	0.002	100	0	100	0.002
37.16m - 7.000	S21		Time of Concentration	0.004	100	10	110	0.004
37.17m - 1.001	S2		Time of Concentration	0.004	100	10	110	0.004
37.21m - 1.001	S2		Time of Concentration	0.004	100	10	110	0.004
38.68m - 7.000	S21		Time of Concentration	0.004	100	10	110	0.004
38.71m - 1.001	S2		Time of Concentration	0.004	100	10	110	0.004
38.73m - 1.001	S2		Time of Concentration	0.004	100	10	110	0.004
38.73m - 7.000	S21		Time of Concentration	0.004	100	10	110	0.004
42.93m - 1.009	S13		Time of Concentration	0.004	100	10	110	0.005
43.00m - 8.000	S22		Time of Concentration	0.004	100	10	110	0.005
43.05m - 8.000	S22		Time of Concentration	0.004	100	10	110	0.005
44.42m - 1.003	S6		Time of Concentration	0.004	100	10	110	0.005
44.52m - 8.000	S22		Time of Concentration	0.004	100	10	110	0.005
44.62m - 1.009	S13		Time of Concentration	0.004	100	10	110	0.005
44.62m - 1.009	S13		Time of Concentration	0.004	100	10	110	0.005
44.64m - 8.000	S22		Time of Concentration	0.004	100	10	110	0.005
44.83m - 1.003	S6		Time of Concentration	0.004	100	10	110	0.005
46.54m - 9.000	S28		Time of Concentration	0.005	100	10	110	0.005
46.86m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
46.97m - 8.000	S22		Time of Concentration	0.005	100	10	110	0.005
46.97m - 10.000	S30		Time of Concentration	0.005	100	10	110	0.005
46.98m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
46.98m - 1.009	S13		Time of Concentration	0.005	100	10	110	0.005
46.99m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
47.08m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
47.20m - 8.000	S22		Time of Concentration	0.005	100	10	110	0.005
48.60m - 7.000	S21		Time of Concentration	0.005	100	10	110	0.005
48.66m - 5.005	S26		Time of Concentration	0.005	100	10	110	0.005
48.67m - 9.002	S31		Time of Concentration	0.005	100	10	110	0.005
48.68m - 9.000	S28		Time of Concentration	0.005	100	10	110	0.005
48.70m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
48.71m - 1.001	S2		Time of Concentration	0.005	100	10	110	0.005

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Surface Network 2	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		



48.71m - 1.009	S13		Time of Concentration	0.005	100	10	110	0.005
48.72m - 1.001	S2		Time of Concentration	0.005	100	10	110	0.005
48.72m - 1.003	S6		Time of Concentration	0.005	100	10	110	0.005
48.72m - 1.003	S6		Time of Concentration	0.005	100	10	110	0.005
48.72m - 1.006	S10		Time of Concentration	0.005	100	10	110	0.005
48.72m - 1.007	S11		Time of Concentration	0.005	100	10	110	0.005
48.72m - 5.000	S16		Time of Concentration	0.005	100	10	110	0.005
48.72m - 5.000	S16		Time of Concentration	0.005	100	10	110	0.005
48.72m - 5.000	S16		Time of Concentration	0.005	100	10	110	0.005
48.72m - 5.000	S16		Time of Concentration	0.005	100	10	110	0.005
48.72m - 5.005	S26		Time of Concentration	0.005	100	10	110	0.005
48.72m - 5.005	S26		Time of Concentration	0.005	100	10	110	0.005
48.72m - 5.005	S26		Time of Concentration	0.005	100	10	110	0.005
48.72m - 6.000	S17		Time of Concentration	0.005	100	10	110	0.005
48.72m - 6.000	S17		Time of Concentration	0.005	100	10	110	0.005
48.72m - 6.000	S17		Time of Concentration	0.005	100	10	110	0.005
48.72m - 6.000	S17		Time of Concentration	0.005	100	10	110	0.005
48.72m - 9.002	S31		Time of Concentration	0.005	100	10	110	0.005
48.72m - 9.002	S31		Time of Concentration	0.005	100	10	110	0.005
48.72m - 10.000	S30		Time of Concentration	0.005	100	10	110	0.005
48.72m - 10.000	S30		Time of Concentration	0.005	100	10	110	0.005
48.75m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
48.81m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
48.82m - 7.000	S21		Time of Concentration	0.005	100	10	110	0.005
48.83m - 7.000	S21		Time of Concentration	0.005	100	10	110	0.005
48.84m - 1.002	S4		Time of Concentration	0.005	100	10	110	0.005
48.84m - 1.009	S13		Time of Concentration	0.005	100	10	110	0.005
48.84m - 7.000	S21		Time of Concentration	0.005	100	10	110	0.005
48.85m - 8.000	S22		Time of Concentration	0.005	100	10	110	0.005
49.34m - 9.000	S28		Time of Concentration	0.005	100	10	110	0.005
50.97m - 5.002	S19		Time of Concentration	0.005	100	10	110	0.006
51.03m - 5.000	S16		Time of Concentration	0.005	100	10	110	0.006
52.65m - 5.003	S20		Time of Concentration	0.005	100	10	110	0.006
52.81m - 5.000	S16		Time of Concentration	0.005	100	10	110	0.006

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Details: Type: Inflow Summary Storm Phase: Surface Network 2	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		



52.81m - 5.000	S16		Time of Concentration	0.005	100	10	110	0.006
52.81m - 5.002	S19		Time of Concentration	0.005	100	10	110	0.006
52.81m - 5.002	S19		Time of Concentration	0.005	100	10	110	0.006
52.96m - 5.003	S20		Time of Concentration	0.005	100	10	110	0.006
54.51m - 1.006	S10		Time of Concentration	0.005	100	10	110	0.006
54.56m - 5.005	S26		Time of Concentration	0.005	100	10	110	0.006
54.65m - 5.003	S20		Time of Concentration	0.005	100	10	110	0.006
56.34m - 5.003	S20		Time of Concentration	0.006	100	10	110	0.006
56.36m - 9.000	S28		Time of Concentration	0.006	100	10	110	0.006
56.44m - 1.003	S6		Time of Concentration	0.006	100	10	110	0.006
56.45m - 1.001	S2		Time of Concentration	0.006	100	10	110	0.006
56.49m - 5.005	S26		Time of Concentration	0.006	100	10	110	0.006
56.50m - 9.000	S28		Time of Concentration	0.006	100	10	110	0.006
56.52m - 1.006	S10		Time of Concentration	0.006	100	10	110	0.006
56.52m - 9.000	S28		Time of Concentration	0.006	100	10	110	0.006
56.58m - 1.001	S2		Time of Concentration	0.006	100	10	110	0.006
56.58m - 5.005	S26		Time of Concentration	0.006	100	10	110	0.006
56.59m - 1.003	S6		Time of Concentration	0.006	100	10	110	0.006
56.61m - 1.006	S10		Time of Concentration	0.006	100	10	110	0.006
56.65m - 5.003	S20		Time of Concentration	0.006	100	10	110	0.006
56.67m - 9.000	S28		Time of Concentration	0.006	100	10	110	0.006
61.60m - 5.008	S34		Time of Concentration	0.006	100	10	110	0.007
61.64m - 5.008	S34		Time of Concentration	0.006	100	10	110	0.007
61.69m - 1.011	S15		Time of Concentration	0.006	100	10	110	0.007
61.74m - 5.008	S34		Time of Concentration	0.006	100	10	110	0.007
61.78m - 1.009	S13		Time of Concentration	0.006	100	10	110	0.007
61.78m - 5.008	S34		Time of Concentration	0.006	100	10	110	0.007
63.61m - 1.004	S8		Time of Concentration	0.006	100	10	110	0.007
63.66m - 1.005	S9		Time of Concentration	0.006	100	10	110	0.007
80.92m - 1.000	S1		Time of Concentration	0.008	100	0	100	0.008
80.92m - 2.000	S3		Time of Concentration	0.008	100	0	100	0.008
80.92m - 3.000	S5		Time of Concentration	0.008	100	0	100	0.008
80.92m - 4.000	S7		Time of Concentration	0.008	100	0	100	0.008
91.94m - 1.008	S12		Time of Concentration	0.009	100	0	100	0.009

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Inflow Summary Storm Phase: Surface Network 2		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			

102.78m - 1.008	S12		Time of Concentration	0.010	100	0	100	0.010
140.74m - 1.006	S10		Time of Concentration	0.014	100	0	100	0.014
222.08m - 9.000	S28		Time of Concentration	0.022	100	0	100	0.022
223.52m - 7.001	S23		Time of Concentration	0.022	100	0	100	0.022
226.53m - 7.000	S21		Time of Concentration	0.023	100	0	100	0.023
230.04m - 9.000	S28		Time of Concentration	0.023	100	0	100	0.023
238.50m - 5.004	S25		Time of Concentration	0.024	100	0	100	0.024
252.67m - 1.000	S1		Time of Concentration	0.025	100	0	100	0.025
252.81m - 3.000	S5		Time of Concentration	0.025	100	0	100	0.025
252.87m - 4.000	S7		Time of Concentration	0.025	100	0	100	0.025
253.47m - 2.000	S3		Time of Concentration	0.025	100	0	100	0.025
301.22m - 1.013	S35		Time of Concentration	0.030	100	0	100	0.030
401.83m - 8.000	S22		Time of Concentration	0.040	100	0	100	0.040
416.10m - 5.002	S19		Time of Concentration	0.042	100	0	100	0.042
453.54m - 1.006	S10		Time of Concentration	0.045	100	0	100	0.045
468.12m - 1.002	S4		Time of Concentration	0.047	100	0	100	0.047
474.02m - 5.008	S34		Time of Concentration	0.047	100	0	100	0.047
509.90m - 10.000	S30		Time of Concentration	0.051	100	0	100	0.051
521.03m - 1.003	S6		Time of Concentration	0.052	100	0	100	0.052
535.26m - 7.003	S24		Time of Concentration	0.054	100	0	100	0.054
536.20m - 1.009	S13		Time of Concentration	0.054	100	0	100	0.054
576.23m - 5.005	S26		Time of Concentration	0.058	100	0	100	0.058
601.85m - 1.001	S2		Time of Concentration	0.060	100	0	100	0.060
685.53m - 6.000	S17		Time of Concentration	0.069	100	0	100	0.069
728.06m - 9.002	S31		Time of Concentration	0.073	100	0	100	0.073
TOTAL		0.0		1.475				1.522

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment	Date: 12/11/2025		
	Designed by: LEC	Checked by:	Approved By:
Report Title: Rainfall Analysis Criteria	Paul Basham Associates: The Bothy Cams Hall Estate Fareham		



Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Shortest
Urban Creep	Use Catchment Values
Junction Flood Risk Margin (mm)	0
Perform No Discharge Analysis	☐

Rainfall		
FEH		Type: FEH
Site Location	GB 469409 108136 SU 69409 08136	
Rainfall Version	2022	
Summer	☒	
Winter	☒	

Return Period

Return Period (years)	Increase Rainfall (%)
2.0	0.000
30.0	40.000
100.0	45.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
240	480
360	720
480	960
960	1920
1440	2880

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Surface Network 2		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			



FEH: 2 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max.
Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Residual Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 2 years: +0 %: 360 mins: Winter	27.889	27.889	27.889	0.889	36.3	138.811	0.000	13.6	399.264	70.013	OK
Tank	FEH: 2 years: +0 %: 360 mins: Winter	27.891	27.891	27.891	0.191	19.3	72.080	0.000	5.7	86.002	84.143	OK
Tank (1)	FEH: 2 years: +0 %: 360 mins: Winter	27.889	27.889	27.889	0.489	9.1	25.105	0.000	1.9	24.959	69.782	OK

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Surface Network 2		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			



FEH: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max.
Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 30 years: +40 %: 360 mins: Winter	28.663	28.663	28.663	1.663	54.7	369.284	0.000	14.4	512.303	20.226	OK
Tank	FEH: 30 years: +40 %: 360 mins: Winter	28.665	28.665	28.665	0.965	61.5	364.870	0.000	6.3	146.658	19.733	OK
Tank (1)	FEH: 30 years: +40 %: 360 mins: Winter	28.663	28.663	28.663	1.263	8.6	64.801	0.000	0.9	18.410	22.002	OK

020.5923.IDC.1.B: Land West of Hulbert Road Surface Water Calcs Southern Catchment		Date: 12/11/2025			
		Designed by: LEC	Checked by:		Approved By:
Report Details: Type: Stormwater Controls Summary Storm Phase: Surface Network 2		Paul Basham Associates: The Bothy Cams Hall Estate Fareham			



FEH: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By:
Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. Avg. Level (m)	Max. Avg. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FEH: 100 years: +45 %: 480 mins: Winter	29.073	29.073	29.073	2.073	60.2	538.329	0.000	14.8	732.074	-16.292	Flood Risk
Tank	FEH: 100 years: +45 %: 480 mins: Winter	29.075	29.075	29.075	1.375	58.2	454.167	0.000	8.3	184.952	0.088	OK
Tank (1)	FEH: 100 years: +45 %: 480 mins: Winter	29.073	29.073	29.073	1.673	9.0	82.168	0.000	1.8	24.845	1.097	OK