Broadway Farm, Botley

Flood Risk Assessment & Drainage Strategy

April 2025

CCW Services

paulbasham associates

Transport Planning

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Civil & Structural Engineering

COMMERCIAL
BROADWAY FARM
BOTLEY

Flood Risk Assessment & Drainage Strategy

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1. EXECUTIVE SUMMARY

1.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Paul Basham Associates on behalf of CCW Services Ltd to support the planning application for a proposed commercial storage yard within the CCW Services Ltd property. The land is located to the north of Broad Oak. The nearest postcode is SO30 2EU.

1.2 The development is in Flood Zone 1 and has been categorized as "less vulnerable"; therefore, in accordance with the NPPF, the proposals are acceptable, and the site will not require and exception test.

1.3 The Proposed parking area has a design life of 60 years. As such flood risk has been assessed up to 2090 (allowing a buffer of five years from the preparation of this report).

1.4 The site has been assessed for Rivers (fluvial) and Tidal, reservoirs, surface water (pluvial), groundwater and public sewer flooding. The summary of residual flood risk for the design lifetime of the development is shown below:

- Fluvial and tidal flooding is considered to be Very low Risk
- Reservoir flooding is considered to be Very Low Risk
- Surface water flooding is considered to be Very Low Risk
- Groundwater flooding is considered to be Low Risk
- Public Sewer flooding is considered to be Very Low Risk

1.5 Surface water runoff will be managed through attenuation features and a controlled discharge rate of 2l/s into the watercourse located to the North of the site.

2. INTRODUCTION

2.1 This site-specific Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Paul Basham Associates on behalf of CCW Services Ltd to support the planning application for a proposed commercial storage yard within the CCW Services Ltd property.

2.2 The land is located to the north of Broad Oak. The nearest postcode is SO30 2EU. *Figure 1* shows the site location plan.

2.3 The plot size is approximately 3.5ha and the land is currently comprises of logistic buildings, associated parking, The development aspirations are for a commercial storage yard, Sustainable urban drainage systems (SUDS) and landscaping. A concept masterplan can be found in Appendix A

Figure 1: Site Location Plan

3. SITE DESCRIPTION

Topography

3.1 The Topographical survey (**Appendix B**) shows the site is sloping from a level of circa 16.5m middle of the site to the level of circa 12.17 at the northeastern corner of the site.

Geology

3.2 A review of the British Geological Survey (BGS) mapping indicates that the bedrock geology beneath the site is "Earnley Sand Formation - Sand, silt and clay. Sedimentary bedrock formed between 47.8 and 41.2 million years ago during the Palaeogene period." See *Figure 2* for the BGS map extract.

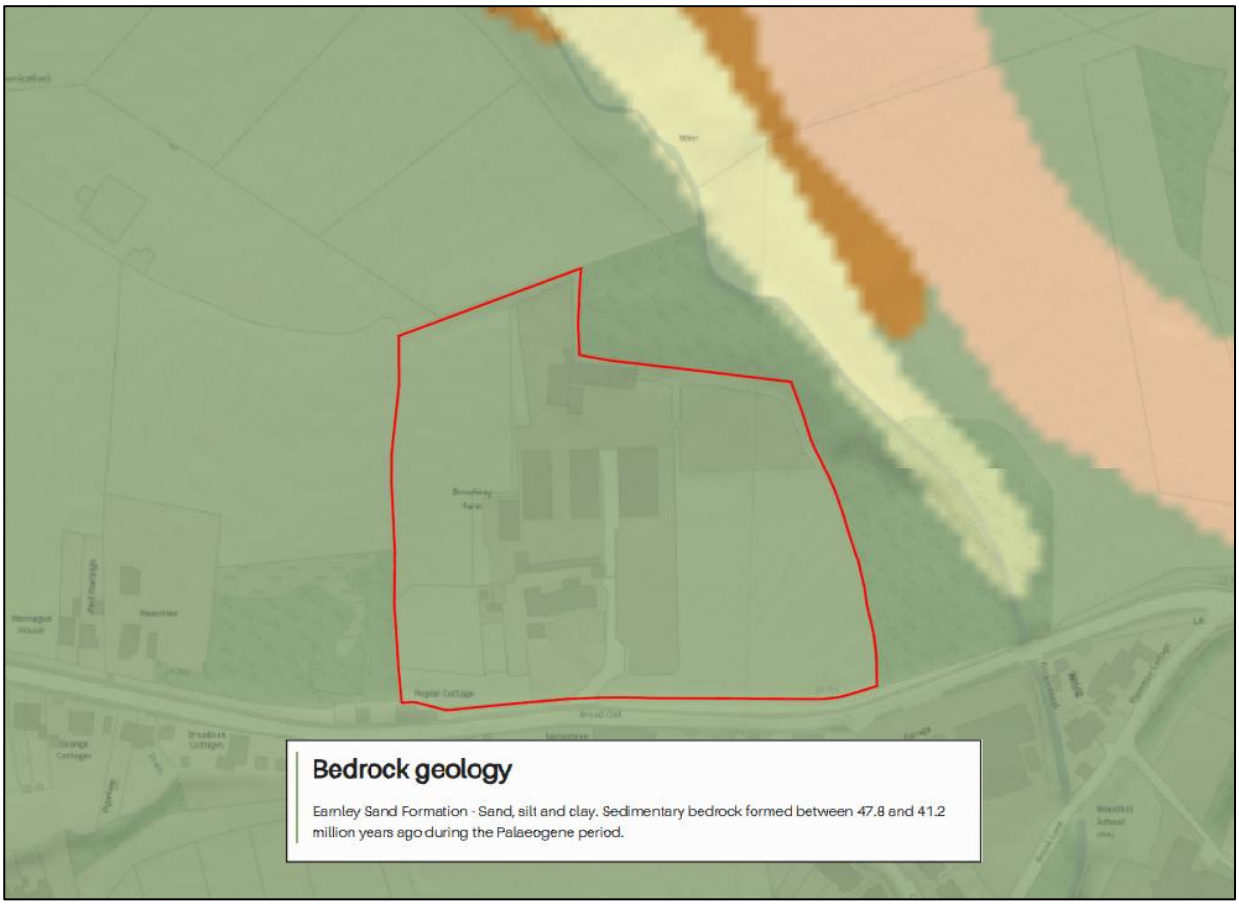

Figure 2: BGS bedrock mapping

3.3 A BGS borehole reference SU51SW8 approximately 240m southeast of the site indicates the first 2.5m consists of Sandy Clay and groundwater was encountered 1.3m below ground level. The borehole log is shown in **Appendix B**

3.4 A previous application completed for Phase A development, as per RJWatkinson Consulting Civil and Structural Engineers report – Drainage Philosophy dated October 2021, BRE365 soakage tests were conducted on site. Two 2m deep trial holes were undertaken, with groundwater entering the excavation of one trial hole and the water level only dropping 90mm over a period of 17 hours. Therefore, it was found that infiltration was not a viable means of discharging the surface water. See **Appendix C** for the report.

Hydrology

3.5 There is an existing watercourse, Pudbrook Lake which is located approximately 40m to the East of the site. This is identified as a main river by the Environment Agency this is shown below in *Figure 3*.

3.6 Located along the northern boundary is a watercourse which runs into Pudbrook Lake

Figure 3: EA Main River Map

Hydrogeology

3.7 The DEFRA (Department for Environmental, Food and Rural Affairs) “Magic Map” identifies areas of groundwater source protection. The site is identified as not being within an area of source protection. As shown in *Figure 4*.

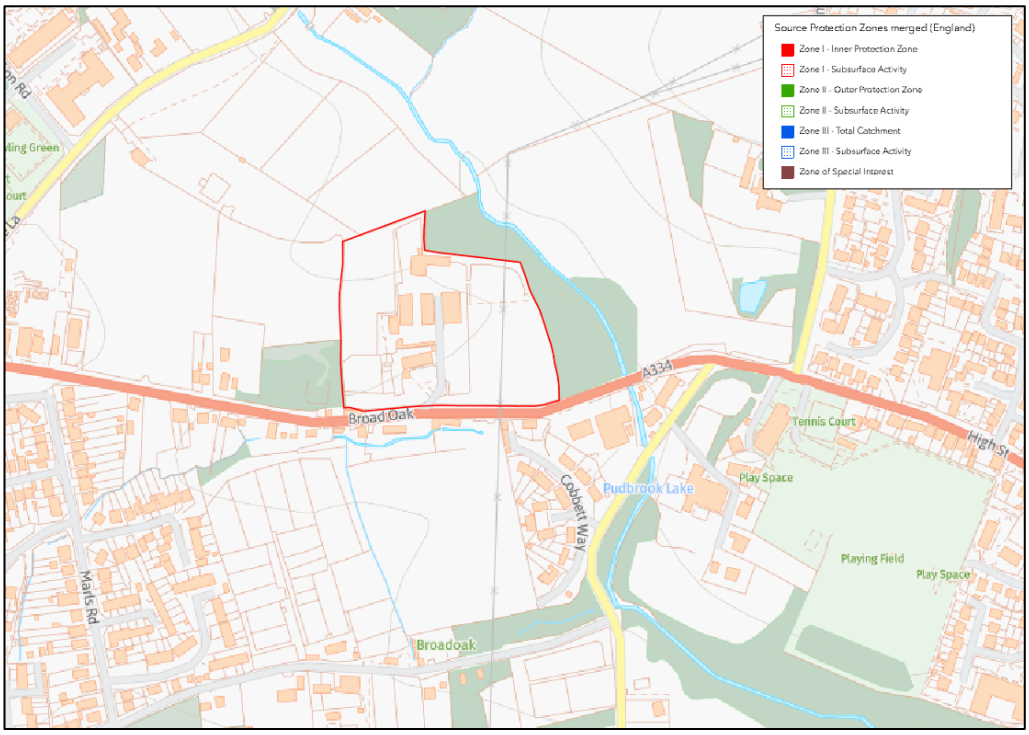

Figure 4: "Magic Map" Source Protection Zones

3.8 The DEFRA "Magic Map" identifies areas of groundwater vulnerability. The site is identified as an area of medium groundwater vulnerability (*Figure 5*).

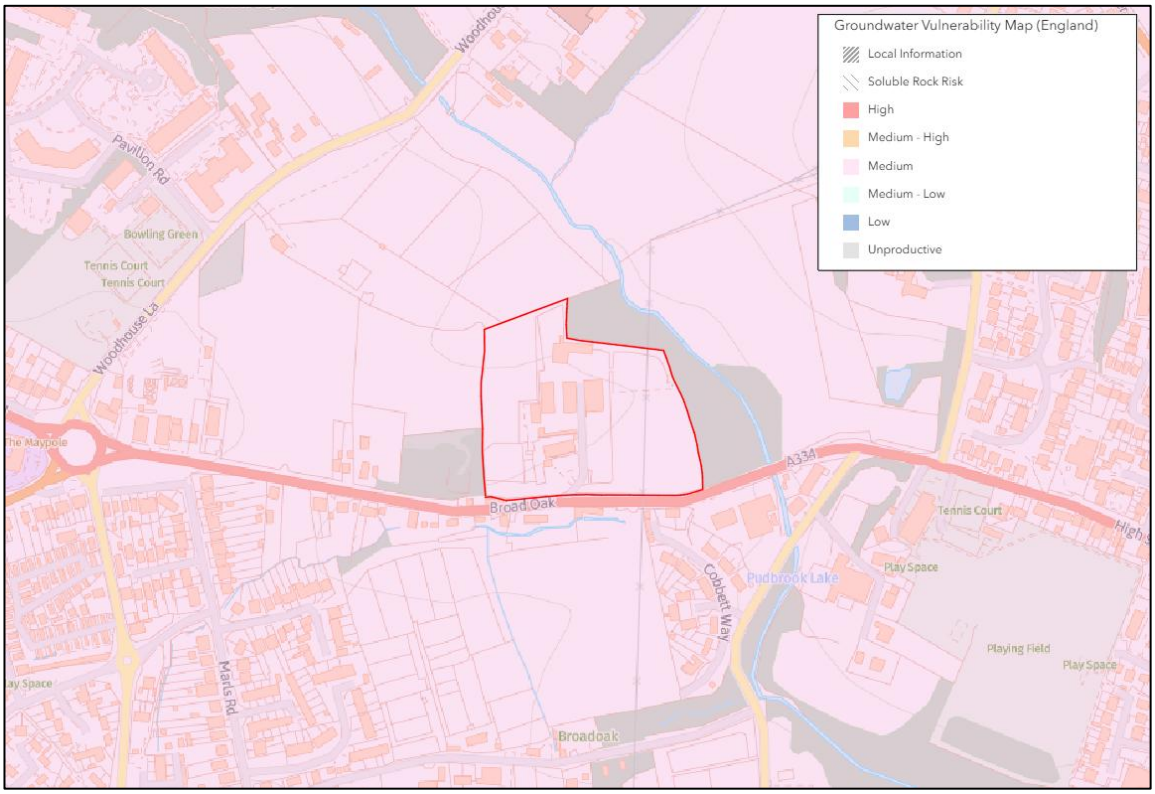

Figure 5: Ground water vulnerability (Magic Map)

Pre-development drainage, greenfield rates and volumes

3.9 The greenfield run-off rates for the existing site have been estimated using the HR Wallingford online calculator on the UK SuDS website. The Q_{bar} for the 0.21ha developable area is 1.7l/s.

Rainfall event	Greenfield Rate l/s
Q_{bar}	1.7
1 in 2 years	1.5
1 in 30 years	4.0
1 in 100 years	5.5

Figure 6: Greenfield runoff rates

4. PLANNING POLICY

4.1 The planning policies and guidance that are relevant to the proposed Development with regard to flood risk and surface water management are outlined below.

National Planning policy

4.2 2024 updated National Planning Policy Framework (NPPF) and the associated 2022 updated Planning Practice Guidance (PPG) by the Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government

- 2022 updated EA Standing Advice
- EA National Strategy for Flood and Coastal Erosion Risk Management 2020
- DEFRA Sustainable Drainage System: Non-Statutory Technical Standards 2015
- CIRIA C753 The SuDS Manual 2015
- Flood and Water Management Act 2010
- Flood Risk Regulations 2009
- Flood risk assessments: climate change allowances 2016 (updated in 2022).

Regional and Local Planning policy

4.3 The Lead Local Flood Authorities Management of Surface Water contain the following policies.

- Eastleigh Borough Council Strategic Flood Risk Assessment level 1 2024
- Hampshire County Council Surface Water Checklist & Checklist Guidance

4.4 The Eastleigh Borough Council local plan 2016-2036 contains the following policies relating to flooding, drainage, and surface water.

Policy DM5, Managing flood risk

1. Development will only be permitted within the areas at risk of flooding, now and in the future, as identified on the Environment Agency most recent flood maps and the Council's Strategic Flood Risk Assessment provided that:

   a. it meets the sequential and exception test (where required) as outlined in Government guidance;

   b. a site–specific flood risk assessment demonstrates that the development, including the access, will be safe without increasing flooding elsewhere, and where possible, will reduce flood risk overall;

   c. the scheme incorporates flood protection, flood resilience and resistance measures appropriate to the character and biodiversity of the area and the specific requirements of the site and where appropriate takes advantage of opportunities to utilise natural flood management techniques;

   d. appropriate flood warning and evacuation plans are in place; and

   e. new site drainage systems are designed taking account of events which exceed the normal design standard.

2. Development should not increase flooding elsewhere.

3. Sustainable Drainage Systems (SuDS) must be designed in accordance with policy DM6.

Figure 7: Policy DM5 Managing flood Risk (Local Plan 2016-2036)

Policy DM6, Sustainable surface water management and watercourse management

1. New development (excluding extensions to dwellings and changes of use), will only be permitted if it incorporates Sustainable Drainage Systems (SuDS). Wherever feasible, naturalised filtration should be included within the treatment train as follows:

   a. On sites of 1 hectare or more, or within 100m of the River Itchen SAC or Solent Maritime SAC, SuDS schemes should include at least three forms of naturalised filtration. On sites within 100m of headwaters and tributaries draining into a SAC, SuDS schemes should include at least three forms of naturalised filtration unless hydrological studies and project-level Habitats Regulations Assessment demonstrate this to be unnecessary to protect the integrity of the SAC and its qualifying features;

   b. On other sites of between 0.5 hectares and 1 hectare, SuDS schemes should include at least two forms of naturalised filtration; and

   c. On other sites of less than 0.5 hectares non-naturalised SuDS e.g. permeable paving will be considered where justified.

2. In order to reduce flooding and maintain water quality (in accordance with DM8) SuDS schemes should:

a. be designed and monitored in accordance with the CIRIA C753 SuDs Manual or equivalent national or local guidance, noting that all receiving waters in the Borough should be classified as protected waters;

b. manage surface water runoff as close to its source as possible;

c. ensure that discharge rates are reduced as far as possible and that on greenfield sites these should at least mirror greenfield rates before development;

d. be provided as part of any application for outline or full planning permission;

e. where discharge is to a wetland or wet woodland habitat, flows off site must mirror the natural hydrological pathways;

f. include clear arrangements for their whole life management and maintenance.

3. Where a watercourse is present on a development site, it should be retained or restored into a natural state and enhanced where possible. The culverting of any watercourse will not generally be permitted, and development should wherever possible remove any existing culverts and increase on-site flood storage. Development should be laid out to enable maintenance of the watercourse.

4. Where development drains into a waterway connected to the Natura 2000 or Ramsar network a site specific Construction Environment Management Plan must be prepared before permission.

Figure 8: Policy DM6, Sustainable surface water management and watercourse management (Local Plan 2016-2036)

4.5 Based on the above policies, the key requirements in relation to the surface water management and flood risk for the proposed Development are considered as to be follows:

- National Planning Policy Framework (2024): "A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

- Environment Agency Standing Advice: "The surface water management needs to meet requirements set out in either your local authority's Surface Water Management Plan (SWMP), Strategic Flood Risk Assessment (SFRA) and Building Regulations Part H. Emergency escape plans for any parts of a building that are below the estimated flood level are required"

- CIRIA C753 The SuDS manual 2015: "Control the quantity of runoff to support the management of flood risk and maintain and protect the natural water cycle. To ensure that the surface water runoff from a developed site does not have a detrimental impact on people, property, and the environment, it is important to control how fast runoff is discharged from the site (i.e., the peak runoff rate) and how much runoff is discharged from the site (i.e., the runoff volume). Suds that are designed to manage water quantity in this way reduce the likelihood of flooding caused by the development. They can help protect natural water cycles by promoting the recharge of soil moisture levels, by maintaining stream and river baseflows and by replenishing groundwater".

5. CLIMATE CHANGE

Peak Rainfall Intensity Allowance

5.1 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.

5.2 Table 1 shows anticipated changes in peak rainfall intensity in small and urban catchments within England. The development is classed as less vulnerable, and the design lifetime is approximately 60 years.

5.3 The peak rainfall intensity allowance is 45% for the 1% AEP event and 40% for the 3% AEP event.

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

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

Table 3: Peak Rainfall Intensity allowance in small and urban catchments. 3.3%AEP Events

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

National Planning Policy Framework (NPPF)

5.4 This report has been prepared considering the National Planning Policy Framework (NPPF) Technical Guidance and the Environment Agency's (EA) flood risk standing advice.

5.5 Table 2 from the Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government Flood risk and coastal change guidance has been included as **Figure 9** below. This provides the classes of development (based on flood risk vulnerability) that are permitted within each of the flood zones. The Flood Risk Vulnerability Classification for the site is 'Less Vulnerable' as it is a commercial storage area, which is defined in Annexxe 3 of the NPPF.

5.6 The development is in Flood Zone 1; therefore no sequential test or exception test is required.

Flood Zones	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Table 2 - Flood risk vulnerability and flood zone 'compatibility'

Key: ✓ Exception test not required X Development should not be permitted.

Notes to table 2:

- *This table does not show the application of the Sequential Test which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;*
- *The Sequential and Exception Tests do not need to be applied to minor developments and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;*
- *Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.*

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

*" * "In Flood Zone 3b (functional floodplain) essential infrastructure that has passed the Exception Test, and water-compatible uses, should be designed and constructed to:*

- *remain operational and safe for users in times of flood;*
- *result in no net loss of floodplain storage;*
- *not impede water flows and not increase flood risk elsewhere.*

Figure 9: NPPF Planning Practice Guidance Table – Flood Risk Vulnerability and Flood Zone Compatibility

6. FLOOD RISK

6.1 In line with the EA Standing Advice, the estimated flood level is considered to be the higher of:

- A river flood level with a 1 in 100 or greater annual probability plus an allowance for climate change; and
- A tidal flood level with a 1 in 200 or greater annual probability plus an allowance for climate change.

6.2 The following Flood Zone definitions ignoring flood defence, are set out in the Planning Practice Guidance:

- Zone 1 Low Probability - Land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 Medium Probability - Land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%– 0.1%) in any year; and
- Zone 3 High Probability - Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Fluvial and Tidal Flood Risk

6.3 Flood mapping obtained from the government's 'flood map for planning' website has identified that the site falls within Flood Zone 1

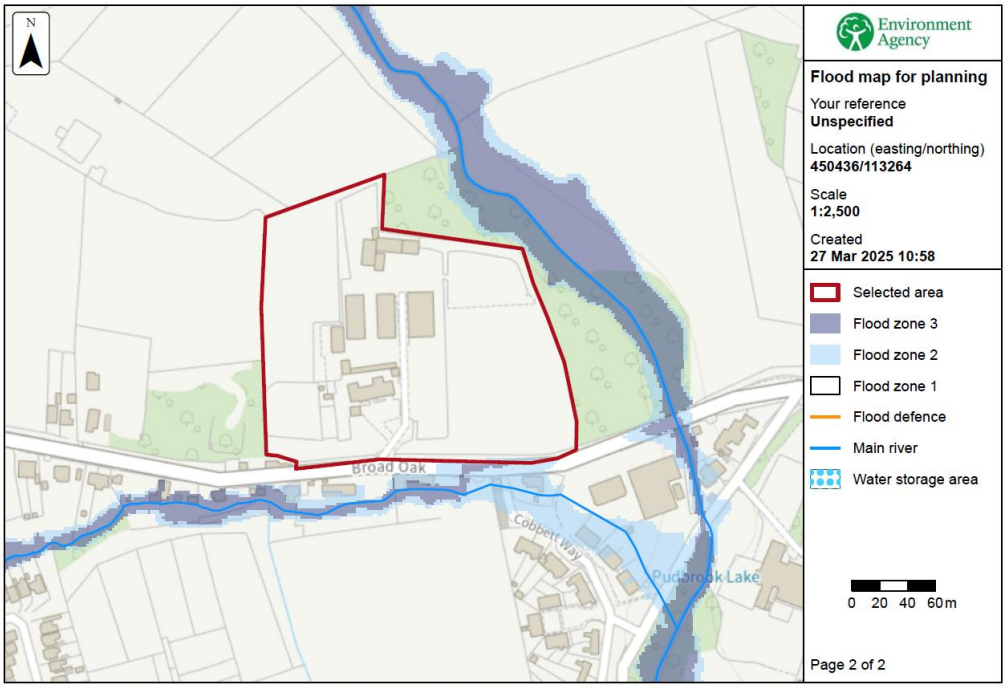

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Figure 10: Flood Map for Rivers and Seas

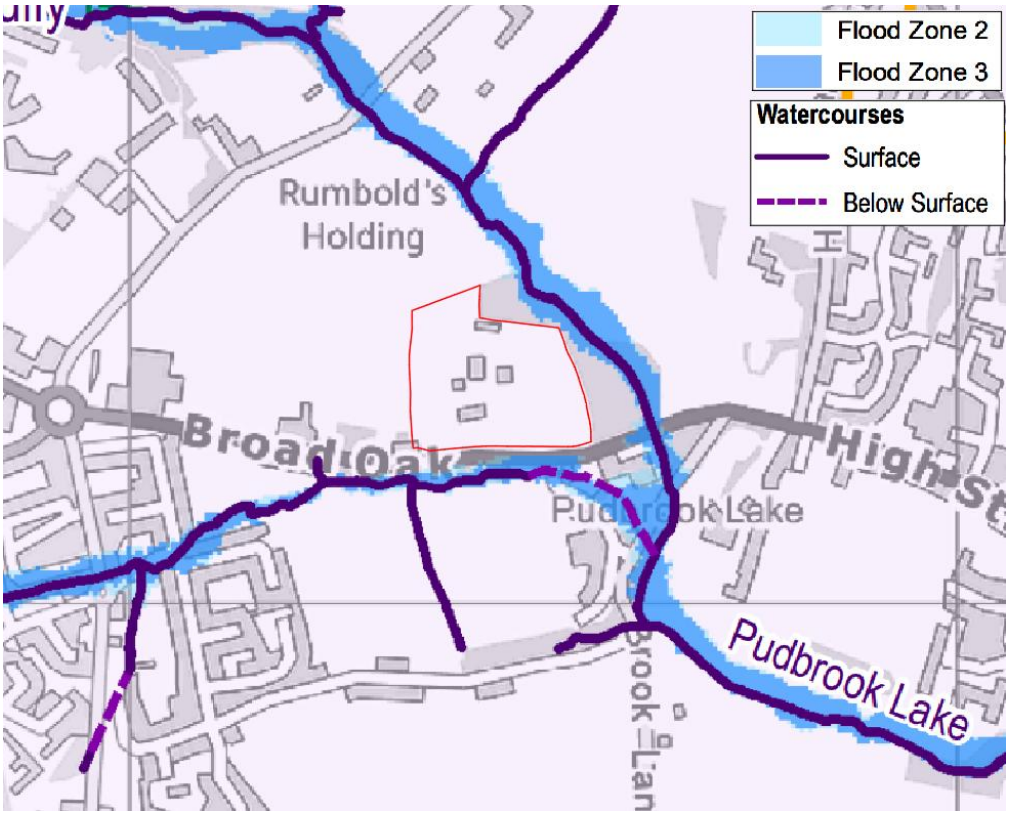

Figure 11: SFRA Flood Map for Rivers and Seas

6.4 The long-term flood risk and from rivers and seas mapping shows that the site is considered to be very low risk of flooding from rivers & seas.

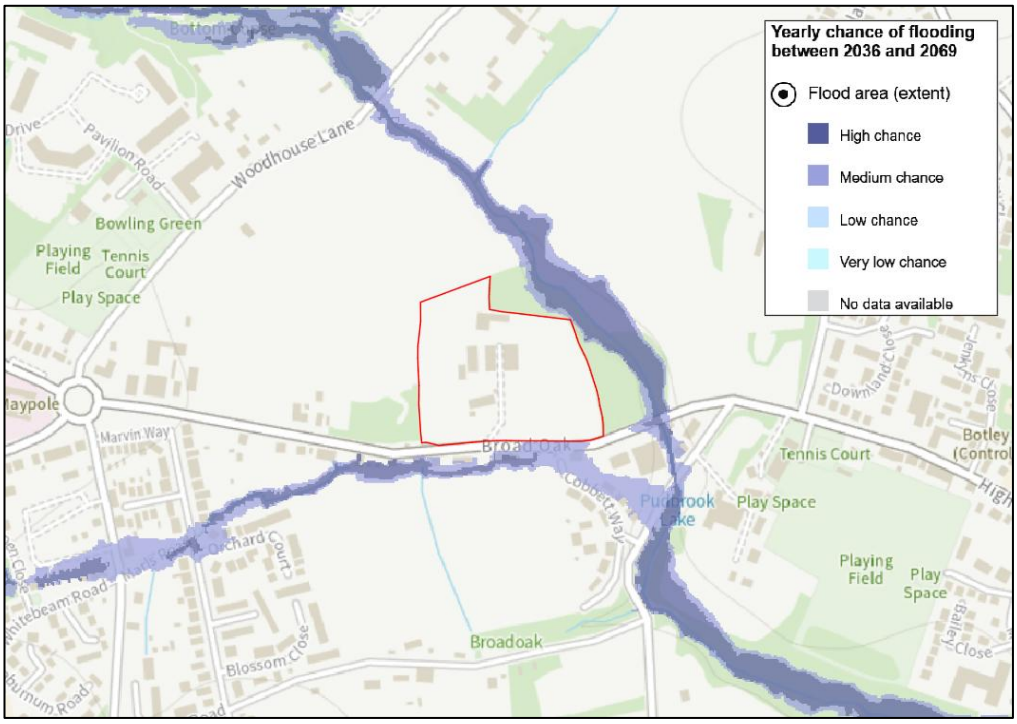

Figure 12: Long-term flood risk from rivers and seas map

Fluvial and Tidal flooding – Residual Risk

6.5 Based on the above information, the site is considered to be very low risk of flooding from rivers and seas.

Reservoirs Flood Risk

6.6 The EA long-term flood risk from reservoirs identifies areas of flooding during a "wet day event" and a "dry day event" *Figure 13* shows that the site is considered to be very low risk of flooding from reservoirs.

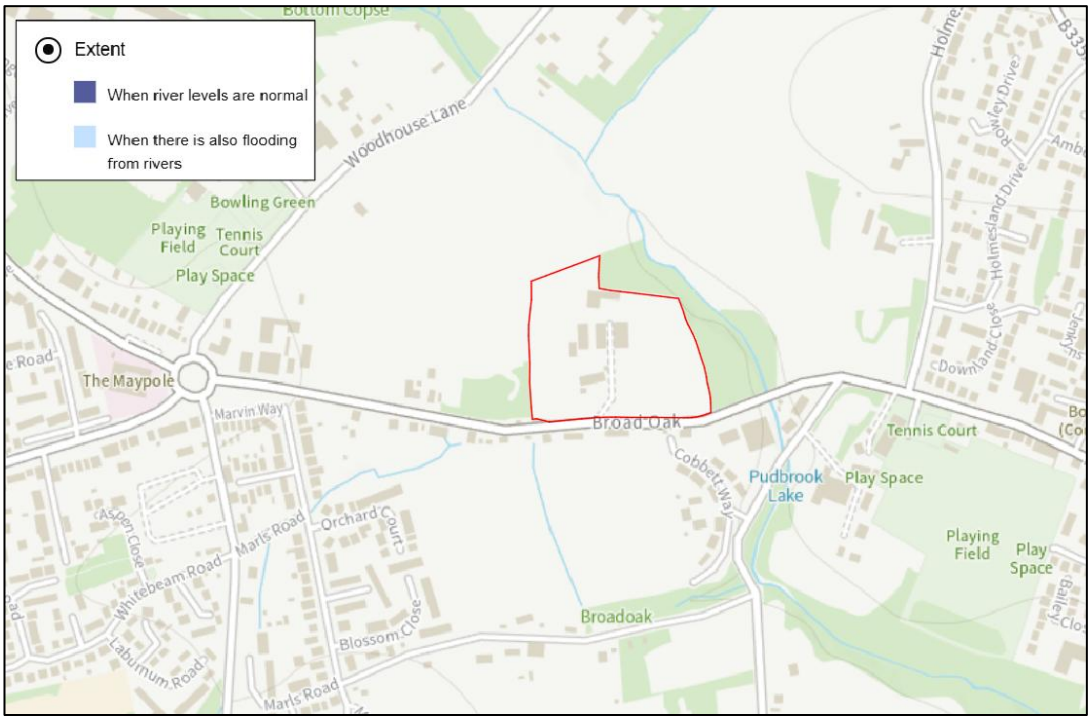

Figure 13: Long term flood risk from reservoirs map

Reservoirs – Residual Risk

6.7 Based on the above information the site is considered to be very low risk of flooding from reservoirs.

Surface Water Flood Risk

6.8 Surface water or 'pluvial' flooding results from rainfall running over ground before eventually entering a watercourse or sewer. It is usually associated with high intensity rainfall events but can also occur with lower intensity rainfall or melting snow where the ground is already saturated, frozen, developed (for example in an urban setting), or otherwise has low permeability.

6.9 The surface water flood risk map is shown in Figure 14 and indicates that the majority of the site is not considered to be at risk of flooding from surface water. A ditch located to the north of the site is considered to be at high risk of surface water flooding which extends into the site slightly.

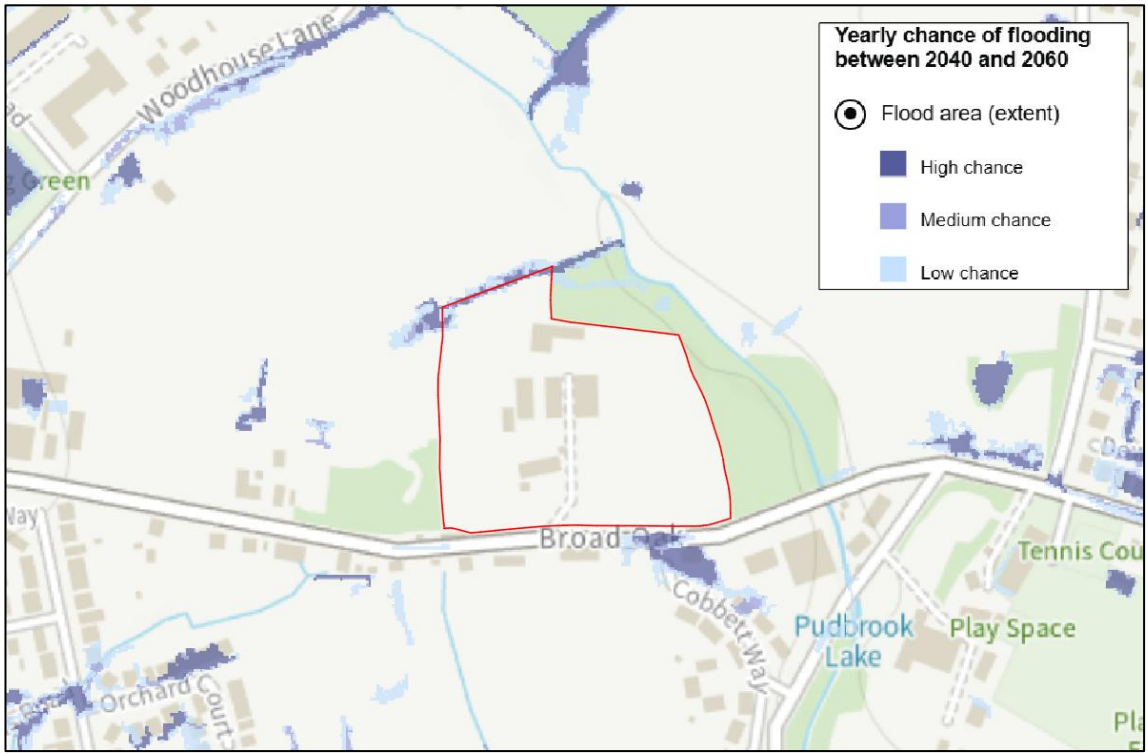

Figure 14: Long term flood risk from surface water

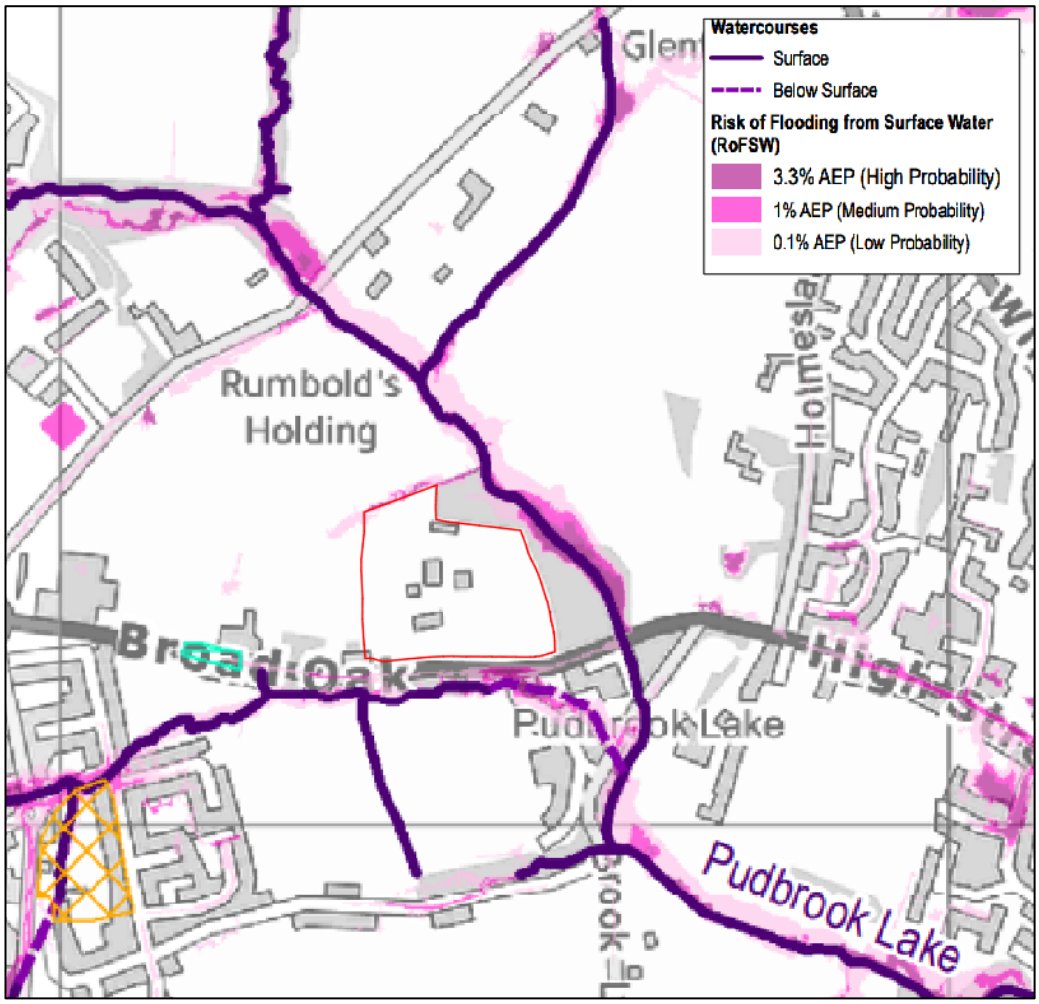

Figure 15: Risk of Surface Water Flooding (Eastleigh Borough Council SFRA)

Surface Water – Mitigation Measures and Considerations

6.10 Flood risk due to surface water will be mitigated through the use of levels and SuDS features which will capture store and slowly discharge surface water runoff. The proposed development does not extend into the area of flooding and therefore does not increase the risk of flooding.

Surface Water – Residual Risk

6.11 Based on the above mapping and given the variety of SuDS utilised on site, the site is considered to be very low risk of flooding from surface water.

Groundwater Flood Risk

6.12 Groundwater flooding occurs when groundwater levels increase sufficiently for the water table to intersect the ground surface. Groundwater flooding can occur in a variety of geological settings including valleys and in areas underlain by chalk, and in river valleys with thick deposits of alluvium and river gravels.

6.13 The Eastleigh Borough Council Strategic Flood Risk Assessment, Identifies areas susceptible to groundwater flooding. The site has been identified as an area with limited potential for groundwater flooding to occur. The stie is considered to be very low risk of flooding from groundwater.

6.14 A BGS borehole reference SU51SW8 approximately 240m southeast of the site and indicates that groundwater was encountered 1.3m below ground level.

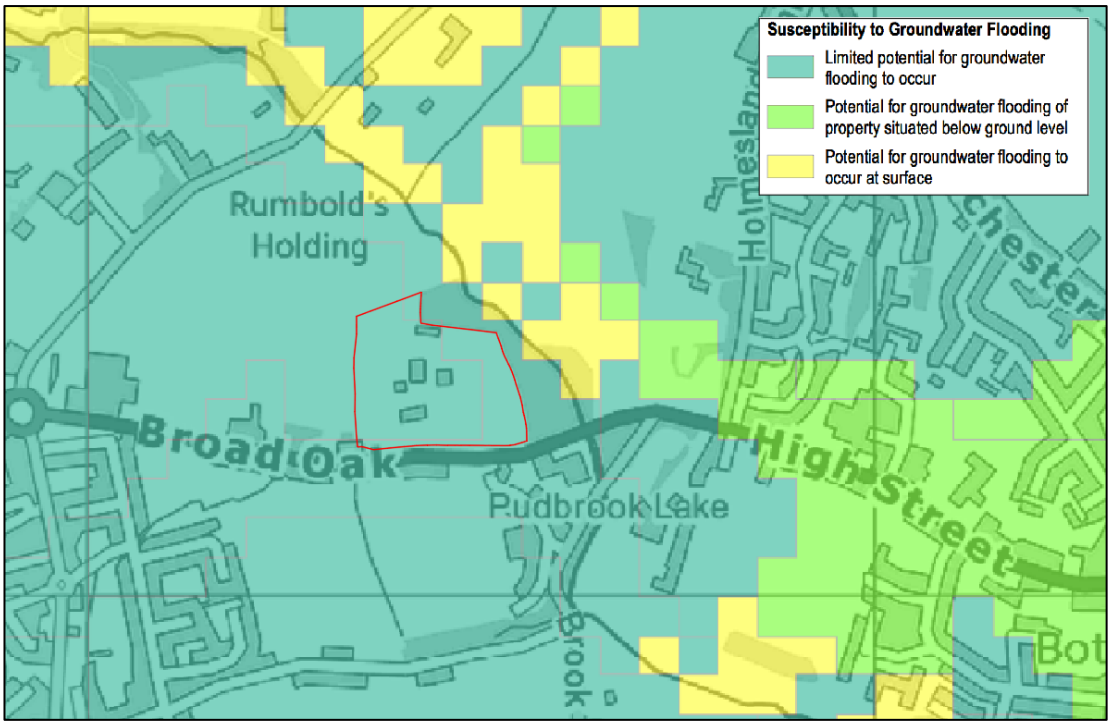

Figure 16: Susceptibility to groundwater flooding SFRA

Groundwater – Residual Risk

6.15 Based on the above information, the site is considered to be low risk of flooding from groundwater.

Public Sewers Flood Risk

6.16 Southern Water BRAVA flood risk maps identify the site as being within Band 1 (Moderately Significant) risk for sewer flooding in a 1 in 50 year storm.

6.17 The SFRA identified a recorded historic public sewer flooding between 2018 and 2020 located to the southwest of the site.

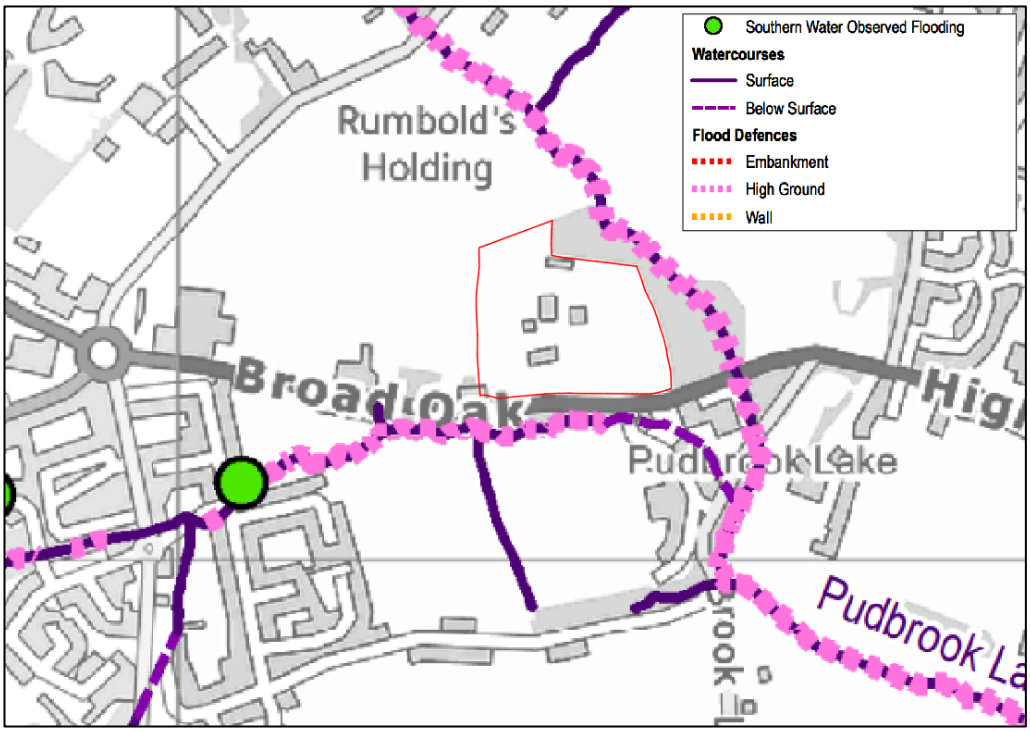

Figure 17: Southern Water flooding observed between 2018 & 2020 and flood defences

Public Sewers – Residual Risk

6.18 As the proposed developable area does not have any sewers passing through nor are any new sewer proposed therefore, the site is considered to be very low risk of flooding due to public sewers.

7. RESIDUAL FLOOD RISK

7.1 Table 2 outlines the initial qualitative assessment of risk posed by the potential sources of flooding, the mechanisms for flooding and the likely consequences. It also includes a review of possible mitigation measures and the effect that the proposed mitigation measures are likely to have on the residual risk posed by the potential flood source.

Flood Risk	Flood Mechanism and Possible Consequences	Existing Assessment of Risk	Mitigation Measures	Residual Risk
Fluvial and Tidal	Flooding caused because of Pudbrook lake exceeding capacity	Very Low	N/A	Very Low
Reservoirs	structural failure of reservoirs	Very Low	N/A	Very Low
Surface Water (Pluvial)	Rainfall collecting in localised low points on site.	High	The site will utilise SuDS features to store and slowly discharge surface water runoff. The proposed development will be outside the area of existing flood risk.	Very Low
Groundwater	Underlaying water table and low topography	Low	N/A	Low
Sewers	Overloaded Sewers	Very Low	N/A	Very Low

Table 2: Summary of Existing and Residual Flood Risk

8. DRAINAGE STRATEGY

Potential Surface Water Drainage Strategy

8.1 In line with the Building Regulations Part H3, surface water shall discharge to one of the following, listed in order of priority:

- An adequate infiltration system: or, where not reasonably practicable,
- A watercourse; or, where not reasonably practicable,
- A sewer.

8.2 Due to the low infiltration rates identified on-site during the investigations completed for a previous application, along with this ground water was encountered 1.3m below ground level at BGS borehole reference SU51SW8 and during the tests conducted onsite for a previous application. It is therefore assumed that infiltration is not a viable solution to drain the proposed commercial storage yard. As a result, the proposed surface water strategy includes on-site attenuation, with discharge to a nearby watercourse. The closest feasible connection point is located to the north of the site, where there is an existing ditch connecting into the Pudbrook Lake water course which ultimately feeds into the River Hamble.

8.3 The pre-development greenfield runoff rates for the industrial parking yard with an impermeable area of 0.21ha have been calculated using the HR Wallingford Greenfield Runoff Rate Estimation Tool. The rate of 2 l/s is used instead of the Q_{bar} rate of 1.7 l/s to avoid the risk of blockages in the system that could occur when trying to reduce flows to the Q_{bar} rate. Refer to Table 3 for the pre-development and post development runoff rates.

Rainfall Event	Total Area	Greenfield Rate	Post Development Rate
	Ha.	l/s	l/s
Catchment 1			
Q_{bar}	0.21	1.7	/
1:2 yr		1.5	2.0
1:30 Yr		4.0	2.0
1:100 Yr		5.5	2.0

Table 3: Pre-Development and Post Development Runoff Rates

8.4 The proposed drainage strategy for the commercial storage yard includes a private gravity drainage network designed to collect runoff from the yard and parking area (see Drainage Strategy drawing 020.0961.0501 in **Appendix D**).

8.5 The parking yard will fall towards a 600mm wide filter drain with a 300mm diameter perforated pipe, which will direct runoff into a 920mm deep Detention basin before discharging into an existing ditch north of the site at a restricted rate of 2l/s.

8.6 The proposed drainage network was simulated using Site3D software to ensure that no flooding occurs during the 100% AEP event, the 3.33% AEP event (with a 40% allowance for climate change), or the 1% AEP event (with a 45% allowance for climate change). The calculations are included in **Appendix E.**

Hydraulic Calculations

8.7 Hydraulic calculations have been undertaken and show that there is no flooding during any of the 50% AEP, 3.3% AEP and 1% AEP events (including climate change allowances. Table 4 contains the parameters used in the supporting hydraulic calculations. The full calculations are shown in **Appendix E**

Parameter	Input	Guidance/notes
Rainfall Data	FEH 22	
Urban Creep	0%	Due to the proposal being commercial storage yard (non-residential)
CV (Summer and Winter)	1.0	SFA 7
Climate Change 50% AEP 3.3% AEP 1% AEP	 - 40% 45%	EA Climate change allowances for peak rainfall in England https://environment.data.gov.uk/hydrology/climate-change-allowances/rainfall

Table 4: Hydraulic Modelling Parameters

9. WATER QUALITY

9.1 *Figure 18* to *Figure 19* 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 18: Table 26.2 of the SuDS Manual

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

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

Figure 19: Table 26.3 of the SuDS Manual

9.2 Eastleigh Borough Council policy DM6 (*Figure 8*) states that sites greater than 1ha need to have at least 3 forms of naturalised filtration.

9.3 The UKSuDS Water Quality toolkits (based on the Simple Index Assessment method) has been used to assess water quality improvement for the site. Table 5 below summarises the results of the toolkit, and a full copy of the toolkit can be found in Appendix F.

Land Use			SuDS Component			Water Treatment
Lorry Park			Mitigation Indices			Sufficient
			Filter drain (where trench is not designed as an infiltration component)			
Pollution Indices			TSS	Metals	Hydrocarbons	
			0.4	0.4	0.4	
			Hydro International Downstream Defender Advanced Vortex Separator			
TSS	Metals	Hydrocarbons	TSS	Metals	Hydrocarbons	
			0.25	0.25	0.3	
			Detention Basin			
			TSS	Metals	Hydrocarbons	
			0.25	0.25	0.25	
0.8	**0.8**	**0.9**	**0.9**	**0.85**	**0.95**	

Table 5: Water Quality Summary

10. MAINTENANCE AND MANAGEMENT SCHEDULE

Detention Basin

10.1 Detention basins are landscaped depressions that are normally dry expect 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.

10.2 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.

10.3 Below in **Table 6** is the maintenance and management schedule for the detention basin in line with Ciria C753 SuDS Manual.

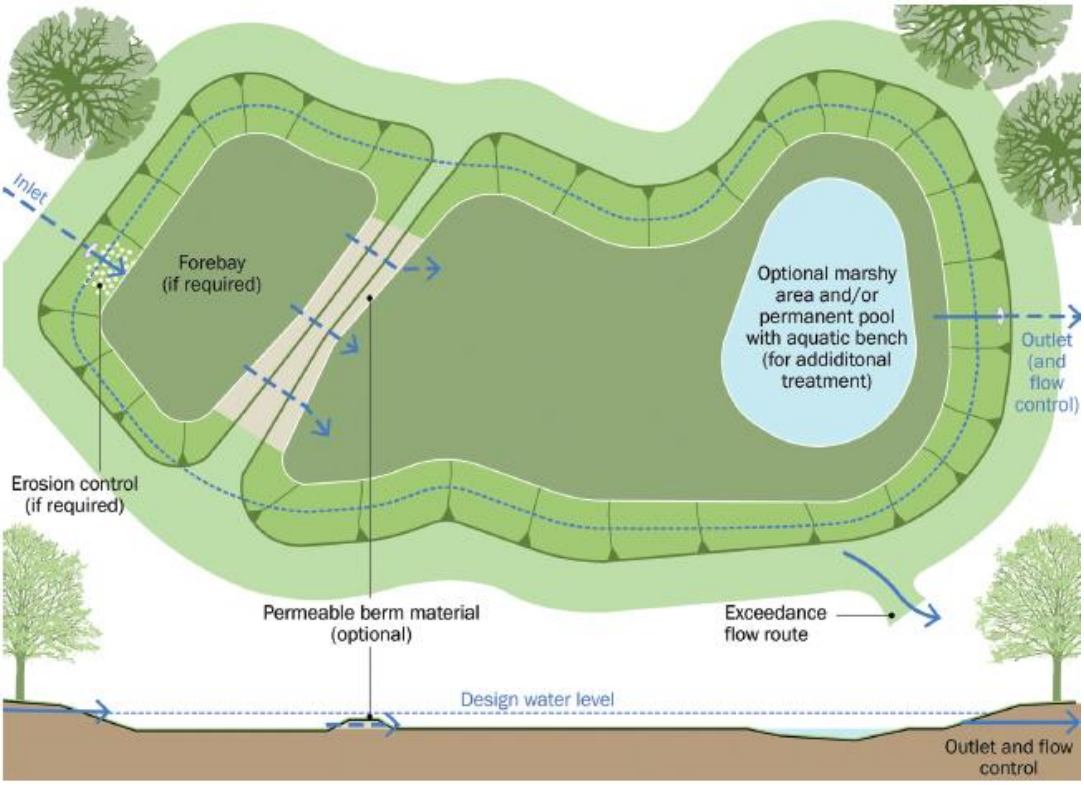

Figure 20: Typical Detention basin (Ciria C753 SuDS Manual)

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly
	Cut grass – spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring and autumn)
	Manage vegetation and remove nuisance plants	Monthly (initially), then as required
	Inspect inlets, outlets, and overflows for blockages	Monthly
	Inspect banksides, structures, and pipework for damage	Monthly
	Inspect inlets and surface for silt accumulation; set removal frequency	Monthly (first year), then annually or as required
	Check penstocks and mechanical devices	Annually
	Tidy dead growth before growing season	Annually
	Remove sediment from inlets, outlets, and forebay	Annually (or as required)
	Manage wetland plants in outlet pool (if provided)	Annually (as per Chapter 23)
Occasional Maintenance	Reseed areas with poor vegetation growth	As required
	Prune and trim trees; remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay, and basin (if needed)	Every 5 years, or as required
Remedial Actions	Repair erosion or damage by reseeding or re-turfing	As required
	Realign rip-rap	As required
	Repair/rehabilitate inlets, outlets, and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table 6: Detention basin Maintenance and Management Schedule

Filter Drains

10.4 Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the attenuation, conveyance and filtration of surface water runoff. The stone may be contained in a simple trench lined with a geotextile, geomembrane or other impermeable liner, or within a more structural facility such as a concrete trough. Filter drains may be lined (if required) or may allow infiltration depending on the suitability of the underlying soils and the protection they afford to the groundwater.

10.5 Filter drains should ideally receive lateral inflow from an adjacent impermeable surface that is pre-treated using a vegetated filter strip or equivalent. They are not normally intended to function as sediment traps and should be implemented downstream of a pre-treatment system in order to prevent clogging and failure. Where there is no effective upstream removal of sediments and silts, a geotextile (or other effective filtration) layer below the filter drain surface, at a shallow depth, is required that can be regularly removed and cleaned or replaced.

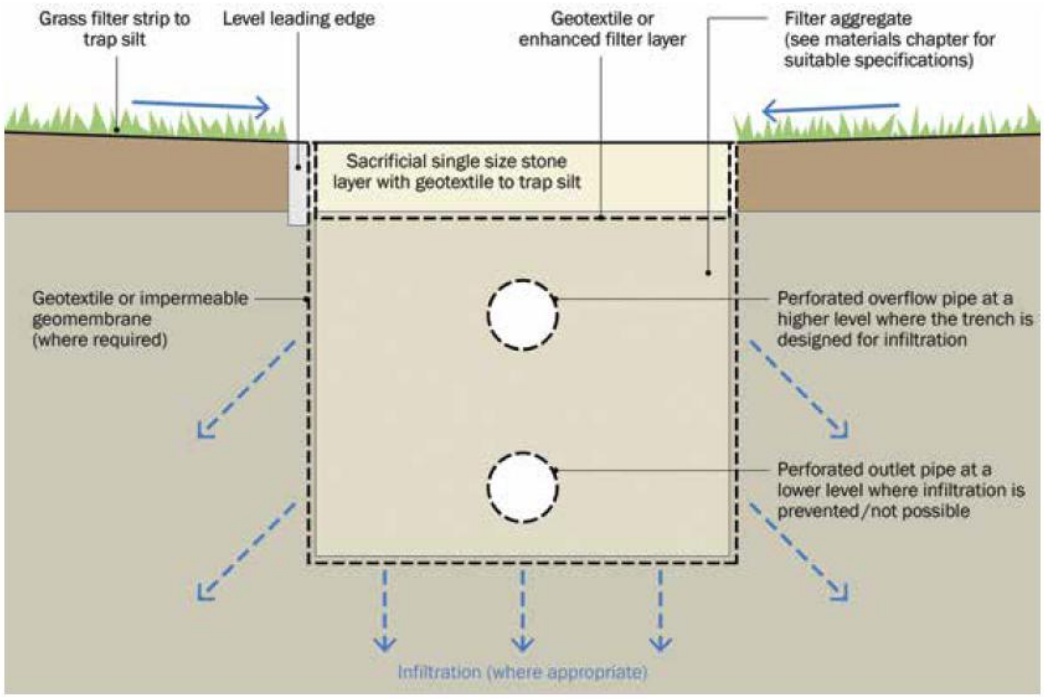

Figure 21: Typical Filter drain section (Ciria C753 SuDS Manual)

10.6 Below in **Table 7** is a summary of the maintenance and management for the filter drains.

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers, and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework, and control systems for blockages, clogging, standing water, and structural damage	Monthly
	Inspect pre-treatment systems, inlets, and perforated pipework for silt accumulation; establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional Maintenance	Remove or control tree roots encroaching the sides of the filter drain using recommended methods (e.g., NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace; wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Table 7: Maintenance and Management of Filter Drains

Pipework

10.7 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.

10.8 To achieve this, all pipework has a minimum diameter of 100mm and the gradients have been selected to provide self-cleansing velocity.

10.9 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

10.10 Headwall inlets and outlets are surface structures required for all inflows and outflows from detention basins and discharge locations. Inspection chambers and rodding eyes are installed at changes in pipe direction or where multiple pipes connect, allowing access for cleaning and maintenance.

10.11 All inspections and maintenance must be carried out by competent personnel following appropriate health and safety procedures.

10.12 Access routes to headwalls and inspection chambers should be kept clear and stable.

10.13 Temporary barriers or signage should be installed to ensure public safety during works.

10.14 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.

10.15 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.

10.16 Please see **Table 8** 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 8: Headwall inlets, outlets and Inspection Chambers

Downstream Defender

10.17 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.

10.18 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.

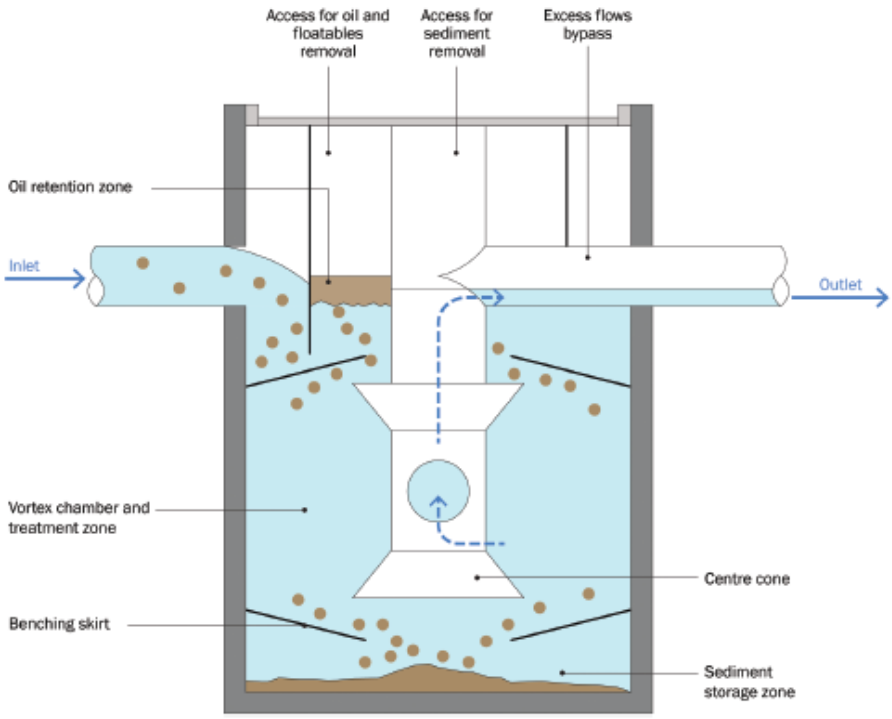

Figure 22: Illustrative section through Downstream Defender (Hydro International)

10.19 Below in **Table 9** is the maintenance and management schedule for a downstream defender.

Activity	Frequency
Inspection	Regularly during first year of installation Every 6 months after the first year of installation
Oil and Floatables Removal	Once per year, with sediment removal Following a spill in the drainage area
Sediment Removal	Once per year or as needed Following a spill in the drainage area

Table 9: Maintenance and Management for a downstream defender

Note: For most cleanouts it is not necessary to remove the entire volume of liquid in the vessel. Only removing the first few inches of oils/floatables and the sediment storage volume is required.

11. SUMMARY AND CONCLUSION

11.1 This Flood Risk Assessment (FRA) and Drainage Strategy has been prepared by Paul Basham Associates on behalf of CCW Services Ltd to support the planning application for a proposed commercial storage yard within the CCW Services Ltd property. The land is located to the north of Broad Oak. The nearest postcode is SO30 2EU.

11.2 The development is in Flood Zone 1 and has been categorized as "less vulnerable"; therefore, in accordance with the NPPF, the proposals are acceptable, and the site will not require and exception test.

11.3 The Proposed parking area has a design life of 60 years. As such flood risk has been assessed up to 2090 (allowing a buffer of five years from the preparation of this report).

11.4 The site has been assessed for Rivers (fluvial) and Tidal, reservoirs, surface water (pluvial), groundwater and public sewer flooding. The summary of residual flood risk for the design lifetime of the development is shown below:

- Fluvial and tidal flooding is considered to be **Very low Risk**
- Reservoir flooding is considered to be **Very Low Risk**
- Surface water flooding is considered to be **Very Low Risk**
- Groundwater flooding is considered to be **Low Risk**
- Public Sewer flooding is considered to be **Very Low Risk**

11.5 Surface water runoff will be managed through attenuation features and a controlled discharge rate of 2l/s into the watercourse located to the North of the site.

Appendix A

SITE LAYOUT

0 5 10 15 20 25 30 35 40 45 50m

LINEAR SCALE 1:500

A1 @ 1:500

N
W E
S

Indicative

RIBA Chartered Practice

arb Architects Registration Board

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SCHEDULE OF AREAS

	sqm
Proposed new hardstanding	1915
Area to revert back to landscaping	2083

- Existing hardstanding rea to revert back to landcaping subject to ecologist requirements
- Proposed landscaped buffer of mixed scrub (subject to ecologist requirements & detailed landscape design)
- Proposed hardstanding area
- Proposed attenuation basin
- Proposed landscaped buffer (subject to detailed landscape design)
- Proposed informal landscaping (subject to detailed landscape design)
- Existing trees (see arb. report for full details)

NOTE: For full detailed design see engineers drawings, landscape proposals, tree and ecology assessments

rev:	date:	note:
D	14.04.25	Pond & landscape upate
C	5.02.25	Landscape/biodiversity update
B	5.02.25	Buffer update
A	31.01.25	Planning issue

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project name/address:
CCW
Broadway Farm
Broad Oak
Botley

client:
CCW Services Ltd

drawing title:
Site Layout

job number:	drawing number:	revision:
2013	103	D

drawing scale/size:	date:	drawn:
1:500 (A1)	Aug 24	

Appendix B

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Tree List

			East	East	South	West	
Ref No	Name	Type	Spread	Spread	Spread	Spread	Height
			MM	M	M	M	M
No.1	Unk	BD	0	0	0	0	15
No.2	Unk	BD	0	0	0	0	15
No.3	Unk	Sh	0	0	0	0	15
No.4	Unk	Hbk	0	7	0	0	15
No.5	Unk	BD	0	0	0	0	15
No.6	ash	Sh	0	0	4.5	0	15
No.7	Unk	Hbk	0	0	0	0	15
No.8	Unk	Sh	0	0	0	0	15
No.9	ash	BD	0	0	0	0	15
No.10	Unk	BD	0	0	0	0	15
No.11	Unk	BD	0	0	0	0	15
No.12	Hbk	Ch	0.5	0.5	0.5	0.5	7
No.13	Unk	BD	0	0	0	0	15
No.14	Cyp	BD	0	0	0	0	15
No.15	Sy	BD	0	0	0	0	15
No.16	Unk	Ch	0	0	0	0	15
No.17	Unk	BD	0	0	0	0	15
No.18	Ch1	Hbk	0	0	0	0	15
No.19	Unk	BD	0	0	0	0	15
No.20	Hbk	Ch	0	0	0	0	15
No.21	Unk	BD	0	0	0	0	15
No.22	Unk	BD	1.5	1.5	1.5	1.5	7
No.23	Unk	BD	0	0	0	0	15
No.24	Unk	BD	1.5	1.5	1.5	1.5	7
No.25	ash	BD	0	0	0	0	15
No.26	ash	HD	0	0	0	0	7
No.27	ash	BD	0	0	0	0	15
No.28	ash	BD	0	0	0	0	15
No.29	ash	BD	0	0	0	0	15
No.30	ash	BD	0	0	0	0	15
No.31	ash	HD	0	0	0	0	7
No.32	ash	BD	0	0	0	0	15
No.33	ash	BD	1	1	1	1	7
No.34	ash	BD	1	1	1	1	7
No.35	ash	BD	0	0	0	0	15
No.36	ash	BD	1	1	1	1	7
No.37	ash	BD	1	1	1	1	7
No.38	ash	BD	1	1	1	1	7

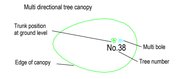
Abbreviations

wl	brick wall	ne	nodding eye
bol	bollard	rnp	road name plate
bs	bus stop	rwp	rainwater pipe
bt	tel inspection chamber	rs	road sign
cbv	cable tv cover	+ Sh	survey station
dl	drainage channel	sc	stop cock
dk	dropped kerb	st	stop
d	diameter	sv	stop valve
ep	electricity pole	tl	traffic light
er	earth rod	tp	telegraph pole
fb	flower bed	vp	vent pipe
fh	fire hydrant	wm	water meter
fp	footpath	wsc	water stop cock
g	gully	wsv	water stop valve
gsc	gas stop cock		
gsv	gas stop valve	Fence details	
fh	hydrant	bwf	barbed wire
ic	inspection chamber	cb	crash barrier
jbx	junction box	cl	corrugated iron
kb	kerb	clf	chain link
lbx	letter box	chp	chestnut paling
lp	lamp post	if	iron railing
mh	manhole	pnw	post and wire
mkr	marker	pwm	post and wire mesh
h	height	prr	post and rail
		cbf	close board fence
p	post		
pb	post box		
lp	lamp post		

Line types

- Fences
- Kerb
- Walls
- Stairs
- Change of Surface
- Footpath
- Bank Top
- Bank Bottom
- Building
- Building Overhead
- Roof heights
- Flower Bed
- Overhead Cable
- Road Edge
- Hedge Row
- Canopy
- Edge of vegitation

Multi directional tree canopy



Notes

Tree species should be confirmed by a arboricultural consultant if critical
Trunk sizes are measured at 1.5m above ground level

Eaves heights (where shown) are taken at the end of the tile / top of guttering.
Ridge heights are taken at the top of the ridge tile.
Service covers indicated where visible at time of survey

Grid North

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Land Surveyors & Engineers

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Tel: 023 9259 1970
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Client	Louisa Jane Doe
Drawing Title	Topographic Land Survey
Location	Broadway Farm Broadoak SO30 2EU

Revisions / Status / Notes

The grid and datum for this survey is based on the Ordinance Survey grid OSGB36, site centered on control station GPS1 with a scale factor of 1.00

LEVELS BASED ON	OSGB36	Surveyor: SB	Assistant: TC
GRID BASED ON	OSGB36	Drawn By: SB	Checked by: JB

Drawing & CAD Ref: JOB - 22384		REVISIONS
SCALE (when prtinted) 1:500 @ A1	Date 22nd August 2022	MEMBERS OF THE SURVEY

Removal of this block also removes all warranties
This drawing has been created for use at a scale of 1:500.
All critical dimensions, positions and levels to be checked on site

Appendix C

Job No. 21173

RJWatkinson
Consulting Civil and Structural Engineers

BROADWAY FARM, BOTLEY

NEW INDUSTRIAL BUILDING

DRAINAGE PHILOSOPHY

OCTOBER 2021

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R J Watkinson & Partners Limited. Company Registration. No. 2117644. Registered Office 63/64 The Avenue, Southampton SO17 1XS. VAT Registration No. 188 7395 95.

PROPOSED DRAINAGE METHODOLOGY

1.0 Existing Site

The existing site is currently a greenfield site offering an open field which is laid to grass.

2.0 Proposed Storm Water Drainage Strategy

The surface water drainage strategy for the new development will consider both a 1 in 30 year event and a 1 in 100 year event plus a 30% allowance for climate change.

Percolation tests conducted on the site in accordance with BRE Digest 365 have found that it will not be viable for rainwater to infiltrate on site. Two tests were undertaken using 2m deep trial holes, with groundwater entering the excavation of one trial hole and the water (which was filled 1m deep) only dropping 90mm over a period of 17 hours. The intention is therefore for any surface water to be discharged to the stream that surrounds the lower part of the site, which then feeds into the River Hamble.

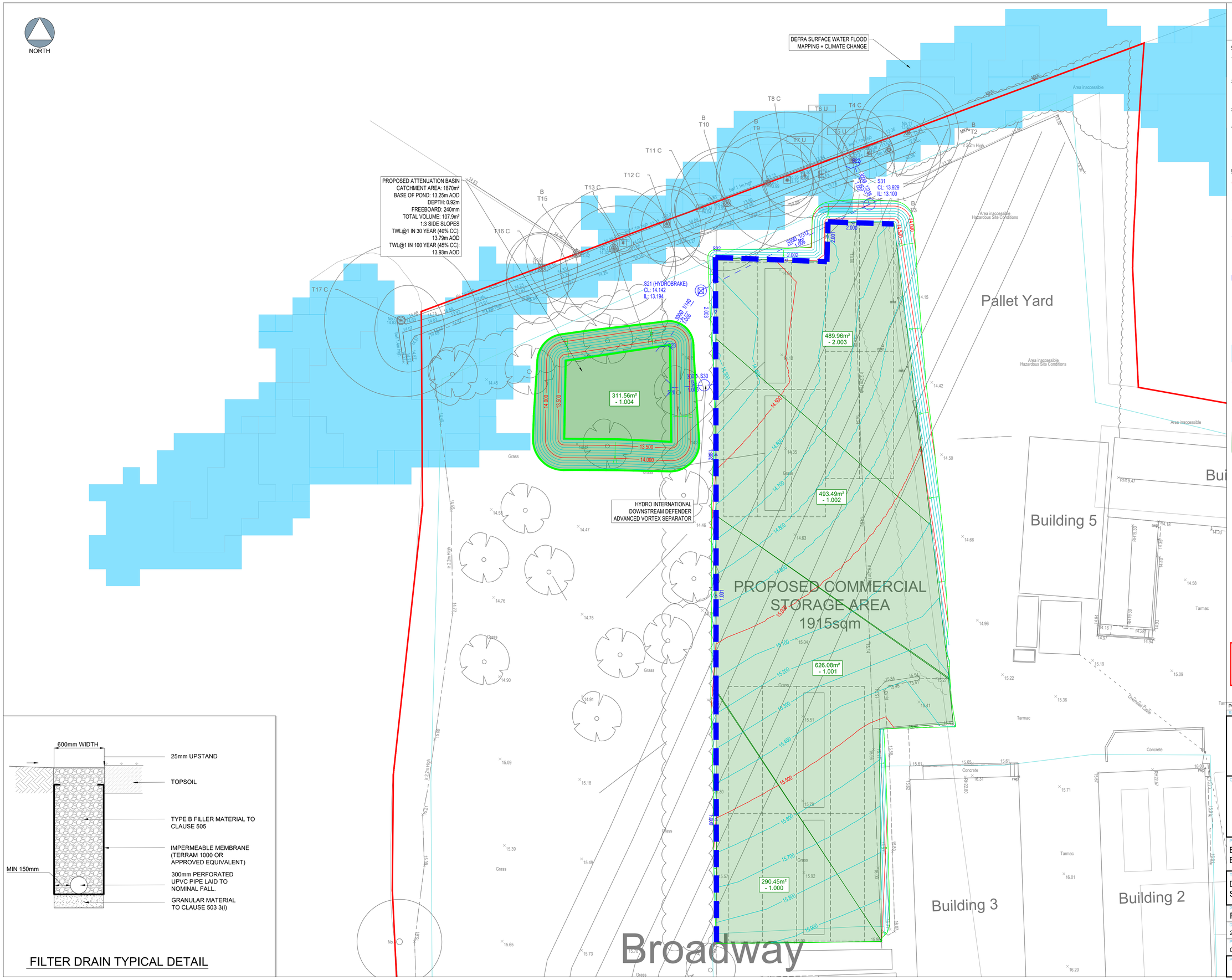
The surface water will be collected from the new roof using downpipes and underground drainage pipework, and will discharge directly to the water course.

The new external hardstanding areas will be constructed using impermeable asphalt, to allow for the site to be used by medium to heavy duty vehicles. The surface water from the external hardstanding areas will be collected using gullies and a network of underground pipework, before being treated by an oil interceptor and then subsequently also being discharged to the existing perimeter stream.

Based on a total new impermeable surface area of 5000m^2 for the site, the equivalent greenfield run-off rate would be just under 9 l/s for a 1 in 100 year event. Please refer to the calculations provided in Appendix A.

The discharge rate off site will be restricted by a flow control device to an equivalent rate as the greenfield run-off rate and limited to 9l/s. During a 1 in 100 year event plus a 30% allowance for climate change some surface ponding will be permitted should this discharge rate be exceeded, but the site levels will be designed to ensure that the new building will not be at risk of flooding. Any excess rainwater will be stored below ground in storage crates before dissipating as the peak flow rate subsides. Please refer to the calculations provided in Appendix B and the drawing provided in Appendix C.

Appendix D



FILTER DRAIN TYPICAL DETAIL

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   ARCHITECTS LAYOUT: DRAWING REF: 2013.103.C
   TOPOGRAPHICAL SURVEY: DRAWING REF: JOB - 22384

LEGEND

- SITE BOUNDARY
- MAJOR CONTOUR (500mm INTERVALS)
- MINOR CONTOUR (100mm INTERVALS)
- SURFACE WATER SEWER
- SURFACE WATER MANHOLE/INSPECTION CHAMBER
- 600mm WIDE FILTER DRAIN WITH 300Ø PERFORATED PIPE TO CAPTURE OVERLAND FLOW FROM CAR PARK
- HYDROBRAKE FLOW CONTROL DISCHARGE RATE 2l/s
- HEADWALL
- EXISTING FLOOD RISK FROM SURFACE WATER
- 20m WOODLAND OFFSET
- PROPOSED ATTENUATION BASIN
- 311.56m² - 1.004 IMPERMEABLE AREA - CORRESPONDING DRAINAGE PIPE NUMBER

1:200 0m 10m

NOT APPROVED
DRAWING/DESIGN IS STILL 'SUBJECT TO APPROVAL'
YOU ARE ADVISED TO MAKE DUE ALLOWANCE

Rev	Description	Date	By	Appd
P01	FIRST ISSUE	23.04.2025	SF	MDW

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Client: CCW SERVICES

Project Name: BROADAWAY FARM, BROAD OAK, BOTLEY

Title: DRAINAGE STRATEGY
SITE D PROPOSED PARKING AREA

Project Phase: PRELIMINARY

Date Created	Drawn By	Approved By	Suitability Code
23.04.2025	SF	MDW	-

PBA Project Number	Scale
020.0961	1:200 (AT A1)

PBA Drawing No:	Revision:
020.0961.0511	P01

QMS2010/v9/310723/JM

Appendix E

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
S33	0.029	0.600	Unknown	15.856	15.406	0.150	450371.960	113280.057
S27	0.063	0.600	Unknown	15.132	14.682	0.150	450371.892	113309.739
S34	0.049	0.600	Unknown	14.635	14.185	0.150	450371.910	113330.150
S32	0.049	0.600	Unknown	14.293	13.843	0.150	450371.842	113360.739
S30	0.000	1.350	Type C	14.254	13.460	0.494	450371.879	113345.763
S20	0.000	0.000	Type C	14.200	13.320	0.580	450366.505	113345.382
S23	0.000	0.000	Type C	13.900	13.250	0.350	450365.743	113350.261
S21	0.000	1.350	Type C	14.142	13.194	0.648	450370.119	113356.825
S31	0.000	1.350	Type C	13.835	13.100	0.435	450389.994	113366.997
S22	0.000	0.000	Type C	13.060	13.080	-0.320	450388.271	113371.409

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	S33	15.406	S27	14.682	Circ	0.3mØ	29.682	41.0	0.600	0.150	0.150
1.001	S27	14.682	S34	14.185	Circ	0.3mØ	20.412	41.0	0.600	0.150	0.150
1.002	S34	14.185	S30	13.804	Circ	0.3mØ	15.613	41.0	0.600	0.150	0.150
2.000	S32	13.843	S30	13.744	Circ	0.3mØ	14.975	150.0	0.600	0.150	0.211
1.003	S30	13.460	S20	13.320	Circ	0.3mØ	5.388	38.5	0.600	0.494	0.580
1.004	S20	13.320	S23	13.250	Circ	0.3mØ	4.938	70.5	0.600	0.580	0.350
1.005	S23	13.250	S21	13.194	Circ	0.3mØ	7.889	140.2	0.600	0.350	0.648
1.006	S21	13.194	S31	13.100	Circ	0.3mØ	22.327	238.0	0.600	0.648	0.435
1.007	S31	13.100	S22	13.080	Circ	0.3mØ	4.737	238.0	0.600	0.435	-0.320

Outfall Details

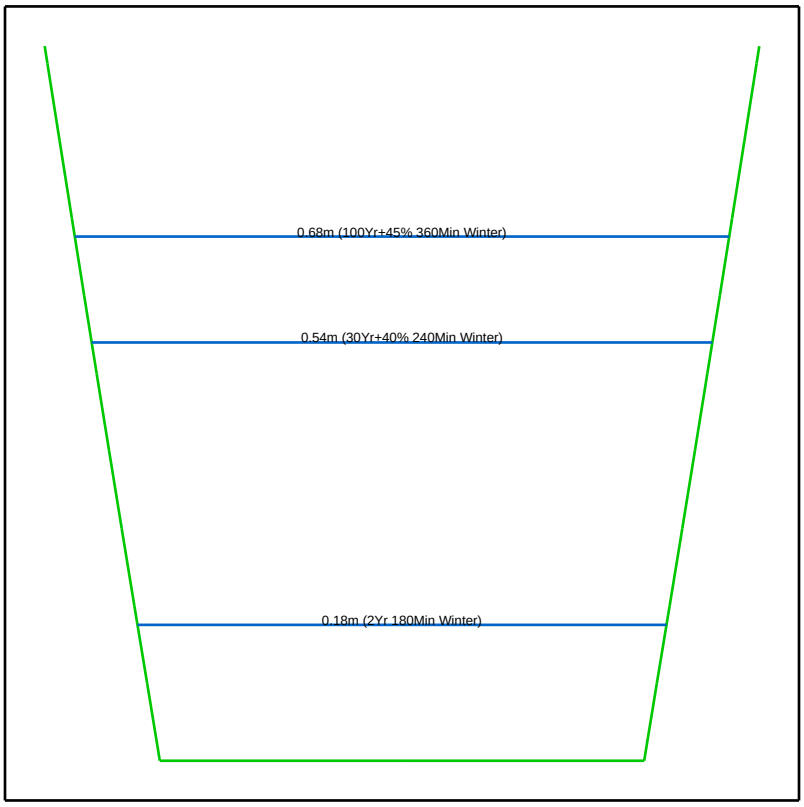
Outfall Manhole S22 : Free Discharge

Flow Control Details

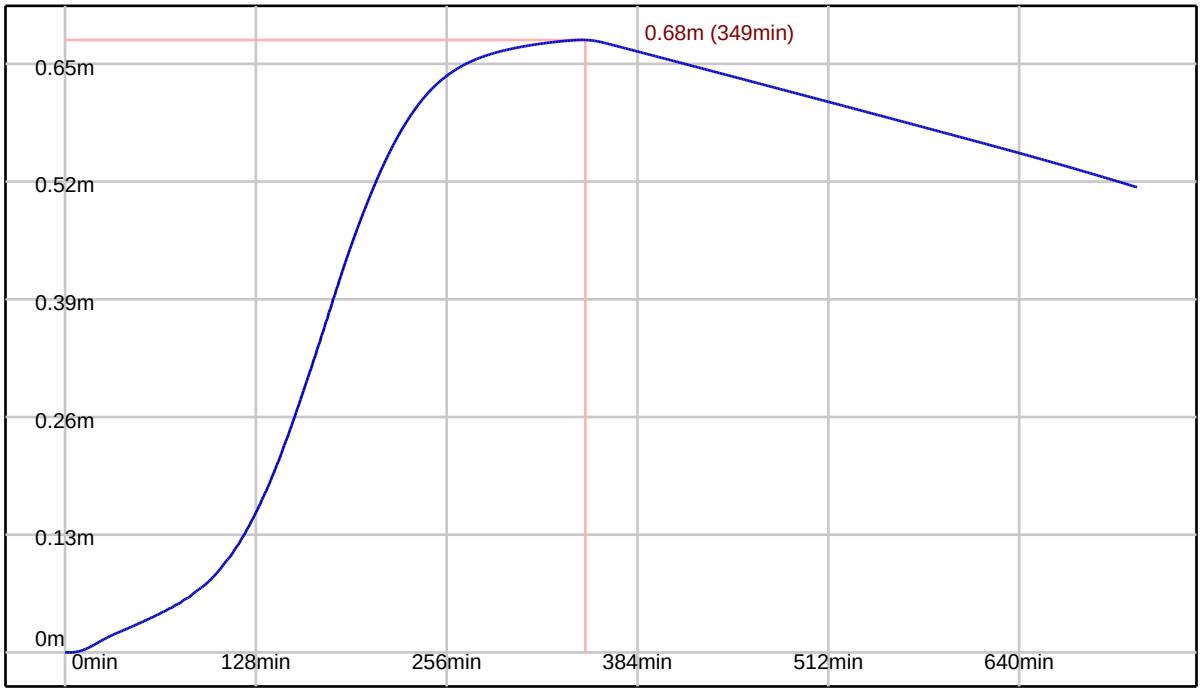
Pond Structure at Manhole S23

Pond Invert (m)	Max Depth (m)	Volume To Water Level (m3)	Water Level (m)	Freeboard (m)	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
13.250	0.922	107.851	13.872	0.300	0.00000000	0.00000000	2.00

Pond Depth/Area Diagram at S23



Pond at S23 (100Yr+45% 360Min Winter)

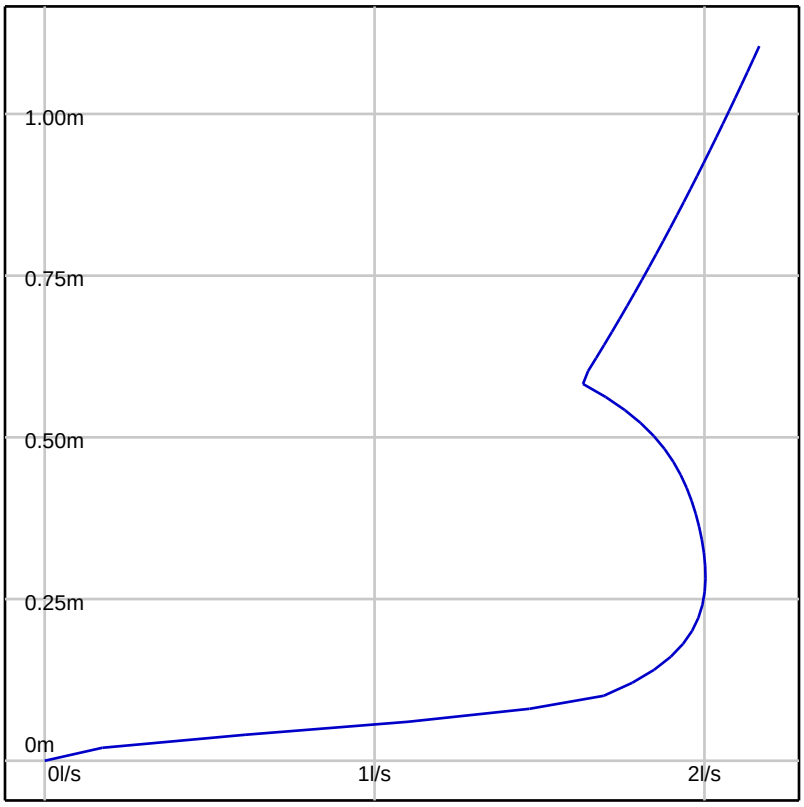


Controls within Manhole S21 (HYDROBRAKE)

Hydro-Brake® Optimum Control at Manhole S21 (HYDROBRAKE)

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0068-2000-0930-2000	0.930	2.000	0.000	0.284	2.003	0.584	1.624

Hydro-Brake® Optimum Control at S21



Simulation Settings

FEH2022 (point): Filename=FEH_Point_Descriptors_450417_113293_v5_0_1.xml

Summer (Cv: 1.00), Winter (Cv: 1.00)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (2, +0%), (30, +40%), (100, +45%)

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
2Yr 15Min Winter	32.875	0.00	0.00	30Yr+40% 720Min Winter	6.344	0.00	0.00
2Yr 15Min Summer	32.875	0.00	0.00	30Yr+40% 960Min Summer	5.070	0.00	0.00
2Yr 30Min Winter	21.438	0.00	0.00	30Yr+40% 960Min Winter	5.070	0.00	0.03
2Yr 30Min Summer	21.438	0.00	0.00	30Yr+40% 1440Min Summer	3.715	0.00	0.03
2Yr 60Min Winter	13.600	0.00	0.12	30Yr+40% 1440Min Winter	3.715	0.00	0.08
2Yr 60Min Summer	13.600	0.00	0.13	30Yr+40% 2160Min Summer	2.749	0.00	0.06
2Yr 120Min Winter	8.870	0.00	0.15	30Yr+40% 2160Min Winter	2.749	0.00	0.12
2Yr 120Min Summer	8.870	0.00	0.18	30Yr+40% 2880Min Summer	2.234	0.00	0.06
2Yr 180Min Summer	6.820	0.00	0.14	30Yr+40% 2880Min Winter	2.234	0.00	0.14
2Yr 180Min Winter	6.820	0.00	0.16	30Yr+40% 4320Min Summer	1.690	0.00	0.09
2Yr 240Min Summer	5.573	0.00	0.15	30Yr+40% 4320Min Winter	1.690	0.00	0.01
2Yr 240Min Winter	5.573	0.00	0.20	30Yr+40% 5760Min Summer	1.402	0.00	0.10
2Yr 360Min Summer	4.199	0.00	0.17	30Yr+40% 5760Min Winter	1.402	0.00	0.00
2Yr 360Min Winter	4.199	0.00	0.22	30Yr+40% 7200Min Summer	1.224	0.00	0.18
2Yr 480Min Summer	3.434	0.00	0.18	30Yr+40% 7200Min Winter	1.224	0.00	0.00
2Yr 480Min Winter	3.434	0.00	0.21	30Yr+40% 8640Min Summer	1.103	0.00	0.00
2Yr 600Min Summer	2.929	0.00	0.18	30Yr+40% 8640Min Winter	1.103	0.00	0.00
2Yr 600Min Winter	2.929	0.00	0.14	30Yr+40% 10080Min Summer	1.014	0.00	0.00
2Yr 720Min Summer	2.569	0.00	0.17	30Yr+40% 10080Min Winter	1.014	0.00	0.00
2Yr 720Min Winter	2.569	0.00	0.00	100Yr+45% 15Min Summer	140.273	0.00	0.24
2Yr 960Min Summer	2.095	0.00	0.00	100Yr+45% 15Min Winter	140.273	0.00	0.22
2Yr 960Min Winter	2.095	0.00	0.00	100Yr+45% 30Min Summer	94.048	0.00	0.46
2Yr 1440Min Winter	1.579	0.00	0.00	100Yr+45% 30Min Winter	94.048	0.00	0.46
2Yr 1440Min Summer	1.579	0.00	0.00	100Yr+45% 60Min Summer	60.364	0.00	0.58
2Yr 2160Min Winter	1.199	0.00	0.00	100Yr+45% 60Min Winter	60.364	0.00	0.58
2Yr 2160Min Summer	1.199	0.00	0.00	100Yr+45% 120Min Summer	34.314	0.00	0.54
2Yr 2880Min Summer	0.992	0.00	0.00	100Yr+45% 120Min Winter	34.314	0.00	0.53
2Yr 2880Min Winter	0.992	0.00	0.00	100Yr+45% 180Min Summer	24.351	0.00	0.47
2Yr 4320Min Summer	0.769	0.00	0.00	100Yr+45% 180Min Winter	24.351	0.00	0.47
2Yr 4320Min Winter	0.769	0.00	0.00	100Yr+45% 240Min Summer	19.441	0.00	0.42
2Yr 5760Min Summer	0.649	0.00	0.00	100Yr+45% 240Min Winter	19.441	0.00	0.41
2Yr 5760Min Winter	0.649	0.00	0.00	100Yr+45% 360Min Summer	13.965	0.00	0.29
2Yr 7200Min Summer	0.573	0.00	0.00	100Yr+45% 360Min Winter	13.965	0.00	0.29
2Yr 7200Min Winter	0.573	0.00	0.00	100Yr+45% 480Min Summer	11.039	0.00	0.17
2Yr 8640Min Summer	0.521	0.00	0.00	100Yr+45% 480Min Winter	11.039	0.00	0.17
2Yr 8640Min Winter	0.521	0.00	0.00	100Yr+45% 600Min Summer	9.239	0.00	0.05
2Yr 10080Min Winter	0.482	0.00	0.00	100Yr+45% 600Min Winter	9.239	0.00	0.04
2Yr 10080Min Summer	0.482	0.00	0.00	100Yr+45% 720Min Summer	8.001	0.00	0.00
30Yr+40% 15Min Summer	108.750	0.00	0.07	100Yr+45% 720Min Winter	8.001	0.00	0.00
30Yr+40% 15Min Winter	108.750	0.00	0.07	100Yr+45% 960Min Summer	6.376	0.00	-0.02
30Yr+40% 30Min Summer	72.422	0.00	0.23	100Yr+45% 960Min Winter	6.376	0.00	0.00
30Yr+40% 30Min Winter	72.422	0.00	0.23	100Yr+45% 1440Min Summer	4.649	0.00	0.02
30Yr+40% 60Min Summer	45.962	0.00	0.40	100Yr+45% 1440Min Winter	4.649	0.00	0.04
30Yr+40% 60Min Winter	45.962	0.00	0.40	100Yr+45% 2160Min Summer	3.416	0.00	0.04
30Yr+40% 120Min Summer	26.591	0.00	0.36	100Yr+45% 2160Min Winter	3.416	0.00	0.07
30Yr+40% 120Min Winter	26.591	0.00	0.36	100Yr+45% 2880Min Summer	2.754	0.00	0.05
30Yr+40% 180Min Summer	19.099	0.00	0.29	100Yr+45% 2880Min Winter	2.754	0.00	0.09
30Yr+40% 180Min Winter	19.099	0.00	0.28	100Yr+45% 4320Min Summer	2.057	0.00	0.07
30Yr+40% 240Min Summer	15.269	0.00	0.21	100Yr+45% 4320Min Winter	2.057	0.00	0.11
30Yr+40% 240Min Winter	15.269	0.00	0.19	100Yr+45% 5760Min Summer	1.689	0.00	0.08
30Yr+40% 360Min Summer	11.017	0.00	0.05	100Yr+45% 5760Min Winter	1.689	0.00	0.20
30Yr+40% 360Min Winter	11.017	0.00	0.05	100Yr+45% 7200Min Summer	1.464	0.00	0.08
30Yr+40% 480Min Summer	8.737	0.00	0.00	100Yr+45% 7200Min Winter	1.464	0.00	0.00
30Yr+40% 480Min Winter	8.737	0.00	0.00	100Yr+45% 8640Min Summer	1.311	0.00	0.09
30Yr+40% 600Min Summer	7.321	0.00	0.00	100Yr+45% 8640Min Winter	1.311	0.00	0.00

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
30Yr+40% 600Min Winter	7.321	0.00	-0.03	100Yr+45% 10080Min Winter	1.201	0.00	0.00
30Yr+40% 720Min Summer	6.344	0.00	0.00	100Yr+45% 10080Min Summer	1.201	0.00	0.11

Simulation Results

Return Period Yrs: 2.0

Climate Change %: 0

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S33	15 min Summer	8	15.442	0.037	5.648		OK
S27	15 min Summer	8	14.746	0.064	17.781		OK
S34	15 min Summer	8	14.264	0.079	27.156		OK
S32	15 min Summer	8	13.908	0.065	9.528		OK
S30	15 min Summer	8	13.551	0.091	36.377		OK
S20	180 min Winter	132	13.461	0.141	5.989		OK
S23	180 min Winter	145	13.425	0.175	1.059		OK
S21	180 min Winter	127	13.439	0.245	0.430		OK
S31	180 min Winter	140	13.133	0.033	1.954		OK
S22	180 min Winter	144	13.112	0.032	1.958		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S33	S27	0.050	0.720	5.606	0.032	OK
1.001	15 min Summer	8	S27	S34	0.071	1.368	17.632	0.101	OK
1.002	15 min Summer	8	S34	S30	0.079	1.814	26.941	0.155	OK
2.000	15 min Summer	8	S32	S30	0.065	0.844	9.436	0.104	OK
1.003	15 min Summer	8	S30	S20	0.098	1.803	36.298	0.202	OK
1.004	180 min Winter	132	S20	S23	0.158	1.108	15.979	0.121	OK
1.005	240 min Summer	170	S23	S21	0.210	0.395	10.595	0.113	OK
1.006	180 min Winter	143	S21	S31	0.033	0.452	1.961	0.027	OK
1.007	180 min Winter	144	S31	S22	0.033	0.465	1.958	0.027	OK

Return Period Yrs: 30.0

Climate Change %: 40

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S33	15 min Summer	8	15.471	0.065	18.688		OK
S27	15 min Summer	8	14.801	0.118	58.871		OK
S34	15 min Summer	8	14.336	0.151	90.031		OK
S32	15 min Summer	8	13.964	0.120	31.524		OK
S30	240 min Winter	233	13.790	0.330	1.663		Surcharged
S20	240 min Winter	233	13.790	0.470	1.664		Surcharged
S23	240 min Winter	233	13.790	0.540	1.664		Surcharged
S21	240 min Summer	243	13.791	0.597	2.905		Surcharged
S31	720 min Summer	1042	13.134	0.034	2.003		OK
S22	960 min Winter	1164	13.113	0.033	2.003		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S33	S27	0.092	1.012	18.590	0.107	OK
1.001	15 min Summer	8	S27	S34	0.135	1.904	58.520	0.336	OK
1.002	15 min Summer	8	S34	S30	0.151	2.517	89.493	0.515	OK
2.000	15 min Summer	8	S32	S30	0.120	1.184	31.284	0.346	OK
1.003	240 min Winter	176	S30	S20	0.300	1.359	44.610	0.248	Surcharged
1.004	30 min Winter	23	S20	S23	0.300	2.397	86.504	0.653	Surcharged
1.005	60 min Summer	32	S23	S21	0.300	0.368	18.125	0.194	Surcharged
1.006	600 min Summer	971	S21	S31	0.034	0.455	2.003	0.028	OK
1.007	720 min Summer	1042	S31	S22	0.033	0.468	2.003	0.028	OK

Return Period Yrs: 100.0

Climate Change %: 45

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
S33	15 min Summer	8	15.480	0.074	24.105		OK
S27	15 min Summer	8	14.819	0.136	75.950		OK
S34	15 min Summer	8	14.361	0.177	116.166		OK
S32	15 min Summer	8	13.982	0.139	40.664		OK
S30	360 min Winter	347	13.926	0.466	1.731		Surcharged
S20	360 min Winter	347	13.926	0.606	1.734		Flood Risk
S23	360 min Winter	347	13.926	0.676	1.734		Flood Risk
S21	240 min Summer	240	13.928	0.734	2.019		Flood Risk
S31	2160 min Winter	2123	13.134	0.034	2.003		OK
S22	2160 min Winter	2123	13.113	0.033	2.003		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	S33	S27	0.105	1.082	23.989	0.138	OK
1.001	15 min Summer	8	S27	S34	0.156	2.025	75.520	0.434	OK
1.002	15 min Summer	8	S34	S30	0.176	2.674	115.486	0.664	OK
2.000	15 min Summer	8	S32	S30	0.138	1.267	40.368	0.446	OK
1.003	60 min Winter	38	S30	S20	0.300	1.815	76.873	0.428	Surcharged
1.004	15 min Winter	12	S20	S23	0.300	3.182	143.195	1.082	Surcharged
1.005	15 min Winter	11	S23	S21	0.300	0.505	23.891	0.255	Surcharged
1.006	960 min Winter	1553	S21	S31	0.034	0.455	2.003	0.028	OK
1.007	2160 min Winter	2123	S31	S22	0.033	0.468	2.003	0.028	OK

Appendix F

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Lorry park	These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment.		
Pollution Hazard Level	High				
Pollution Hazard Indices					
TSS	0.8				
Metals	0.8				
Hydrocarbons	0.9				
SuDS components proposed					
Component 1	Filter drain (where the trench is not designed as an infiltration component)	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Filter drains should be preceded by upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events		
Component 2	Proprietary treatment system	Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	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. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: 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://www.britishwater.co.uk/Publications/codes-of-practise.aspx.	
Component 3	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
SuDS Pollution Mitigation Indices					
TSS	0.9				
Metals	0.85				
Hydrocarbons	0.95				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.9	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.85				
Hydrocarbons	0.95				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				