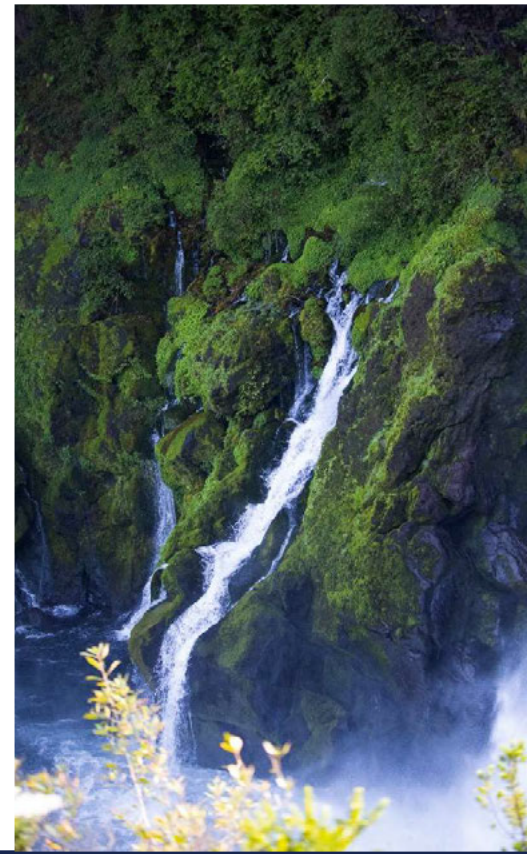




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Flood risk, water and environment

## Flood Risk Assessment and Surface Water Drainage Strategy AEG02758\_SO32\_Botley\_07

Site Address: Boorley Park Primary School  
Nairn Road  
Botley  
Hampshire  
SO32 2SH

UK Experts in Flood Modelling, Flood Risk  
Assessments, and Surface Water Drainage Strategies

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Flood risk, water and environment

# Document Issue Record

**Project:** Flood Risk Assessment and Surface Water Drainage Strategy

**Prepared for:** NHDH Ltd

**Reference:** AEG02758\_SO32\_Botley\_07

**Site Location:** Boorley Park Primary School, Nairn Road, Botley, Hampshire, SO32 2SH

| Consultant     |                      | Date       | Signature |
|----------------|----------------------|------------|-----------|
| Author         | Jack Allen           | 01/09/2023 |           |
| Document Check | Oliver Manston       | 01/09/2023 |           |
| Authorisation  | Nick Darling-Drewett | 04/09/2023 |           |

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Flood risk, water and environment

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# Summary

| Development Description                       | Existing                                                                                                                                                                                    | Proposed                                                                                                                                                                                  |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Development Type                              | A greenfield site                                                                                                                                                                           | Erection of a single-storey children's nursery with off road car parking                                                                                                                  |
| EA Vulnerability Classification               | N/A                                                                                                                                                                                         | More Vulnerable                                                                                                                                                                           |
| Ground Floor Level                            | The maximum ground elevation at the site is approximately 26.37m AOD (Above Ordnance Datum) in the northwest and the minimum ground elevation is approximately 22.59m AOD in the southeast. | As the site is located within Flood Zone 1 and is considered to be at a low flood risk from pluvial sources, no raising of Finished Floor Levels is required.                             |
| Impermeable Surface Area                      | N/A                                                                                                                                                                                         | Approximately 2,021m <sup>2</sup>                                                                                                                                                         |
| Surface Water Drainage                        | N/A <sup>1</sup>                                                                                                                                                                            | The Surface Water Drainage Strategy in Section 6 of this report will address the measures required to manage surface water generated on site.                                             |
| Site Size                                     | 0.29ha                                                                                                                                                                                      | No change                                                                                                                                                                                 |
| Risk to Development                           | Summary                                                                                                                                                                                     | Comment                                                                                                                                                                                   |
| EA Flood Zone                                 | Flood Zone 1                                                                                                                                                                                |                                                                                                                                                                                           |
| Flood Source                                  | Groundwater                                                                                                                                                                                 | Moderate risk of groundwater flooding according to SFRA susceptibility mapping and a high water table in historical borehole records.                                                     |
| SFRA Available                                | Eastleigh Borough Council SFRA (2007)<br>Eastleigh Borough Council SFRA Update (2016)                                                                                                       |                                                                                                                                                                                           |
| Management Measures                           | Summary                                                                                                                                                                                     | Comment                                                                                                                                                                                   |
| Ground floor level above extreme flood levels | Yes                                                                                                                                                                                         | Site is not located within any modelled fluvial or pluvial flood extents.                                                                                                                 |
| Safe Access/Egress Route                      | Yes                                                                                                                                                                                         | Safe access/ egress is available to the east of the development on Nairn Road.                                                                                                            |
| Flood Resilient Design                        | No                                                                                                                                                                                          | Site is not located within any modelled fluvial or pluvial flood extents. If groundwater is encountered during site investigation works then appropriate measures should be incorporated. |

|                                                    |                |                                                                                                                                                                                            |
|----------------------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Site Drainage Plan</b>                          | Yes            | See Section 6.                                                                                                                                                                             |
| <b>Flood Warning &amp; Evacuation Plan</b>         | No             | The site is not located within any EA flood warning or alert zones.<br>An evacuation plan is not required as the site is not located within any modelled fluvial or pluvial flood extents. |
| <b>Offsite Impacts</b>                             | <b>Summary</b> | <b>Comment</b>                                                                                                                                                                             |
| <b>Displacement of floodwater</b>                  | No             | Site is not located within any modelled fluvial or pluvial flood extents.                                                                                                                  |
| <b>Increase in surface run-off generation</b>      | Yes            | The Surface Water Drainage Strategy in Section 6 of this report will address the measures required to manage surface water generated on site.                                              |
| <b>Impact on hydraulic performance of channels</b> | No             | The site is not located adjacent to any watercourses.                                                                                                                                      |

<sup>1</sup> not required for this assessment

<sup>2</sup> data not available.

# 1. Introduction

- 1.1. Aegaea were commissioned by NHDH Ltd to undertake a Flood Risk Assessment (FRA) and Surface Water Drainage Strategy (SWDS) to facilitate a planning application for the proposed development. This FRA and SWDS has been prepared in accordance with the requirements set out in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance.
- 1.2. This FRA and SWDS is intended to support a full planning application and as such the level of detail included is commensurate and subject to the nature of the proposals.

## Site Overview

- 1.3. The site of the proposed development is Boorley Park Primary School, Nairn Road, Botley, Hampshire, SO32 2SH (Figure 1).



Figure 1: Site Location (Base map and data from Google Satellite Imagery)

- 1.4. The existing site is an undeveloped field adjacent to a school. It is understood that the proposed development is for the erection of a single-storey children's nursery with off road car parking (development proposals are included as Appendix A).
- 1.5. Environment Agency (EA) Light Detection and Ranging (LiDAR) data Digital Terrain Model has been used to review the topography of the site (Figure 2). The maximum ground elevation at the site is

approximately 26.37m AOD (Above Ordnance Datum) in the northwest and the minimum ground elevation is approximately 22.59m AOD in the southeast. A topographical survey from a planning application from 0304/2020 was used to confirm the ground elevations at the site.

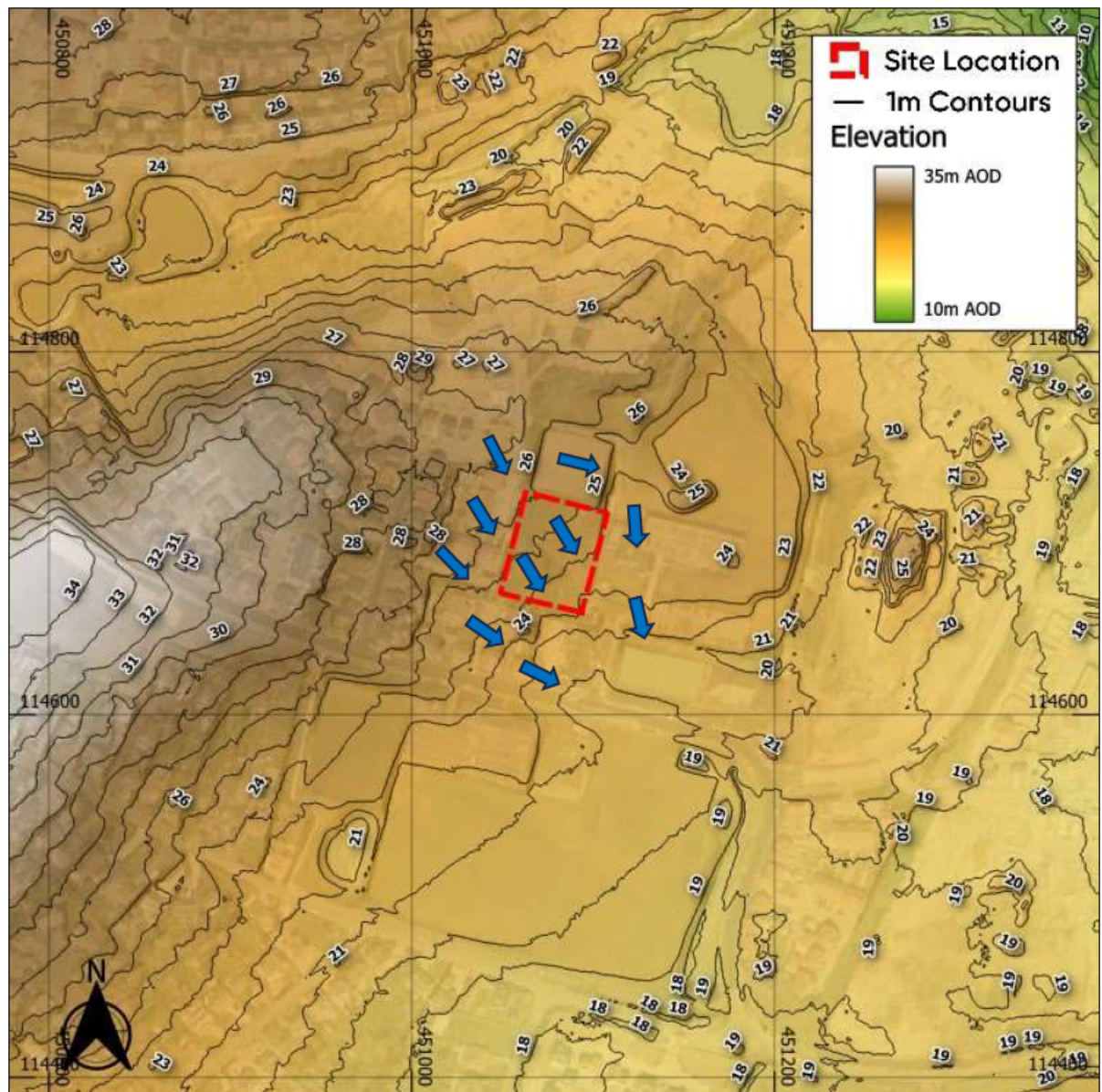


Figure 2: Site Topography and Existing Overland Flow Pathways Base map and data from Google Satellite Imagery)

- 1.6. Eastleigh Borough Council is the Local Planning Authority (LPA) for the site and Hampshire Council is the designated Lead Local Flood Authority (LLFA). The site sits within the Environment Agency's Solent and South Downs region.

## Planning Policy and Guidance

1.7. UK government planning guidance states<sup>1</sup> that an FRA is required for developments which are:

- *in flood zone 2 or 3 including minor development and change of use*
- *more than 1 hectare (ha) in flood zone 1*
- *less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)*
- *in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency*

1.8. The site is located within Flood Zone 1. However, we understand that Hampshire County Council (HCC) as the Lead Local Flood Authority (LLFA) were consulted on the planning application (Eastleigh Ref F/22/94242) and they stated that they would expect to see an assessment of flood risk both to the site and the wider area. As such, we understand that an FRA is required to accompany a resubmission.

1.9. The objective of this FRA is to demonstrate that the proposals are acceptable in terms of flood risk. This report summarises the findings of the study and specifically addresses the following issues in the context of the current legislative regime:

- Fluvial flood risk
- Surface water flood risk
- Risk of flooding from other sources

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<sup>1</sup> <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications#when-you-need-an-assessment>

## 2. Planning Policy

- 2.1. Inappropriate development in a flood risk area could pose significant risk in terms of personal safety and damage to property for the occupiers of the development or for people elsewhere. The approach taken in the assessment of flood risk at the planning stage is set out in national, regional, and local planning policy and associated guidance. This section summarises the key policies and guidance relevant to the proposed development.

### National Planning Policy Framework (NPPF)

- 2.2. The National Planning Policy Framework<sup>2</sup> (NPPF) (DLUHC, 2021) which includes UK Government policy on development and flood risk states:

*“159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.*

*167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*

- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;*
- b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;*
- c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;*
- d) any residual risk can be safely managed; and*
- e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.*

- 2.3. Footnote 55 of the NPPF states:

*“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*

---

<sup>2</sup> <https://www.gov.uk/guidance/national-planning-policy-framework>, last updated July 2021

*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.”*

2.4. Flood Zones in England are defined as follows:

Table 1: Flood Zone Definitions

| Flood Zone                        | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Zone 1 Low Probability            | Land having less than 1 in 1,000 annual probability of river or sea flooding (all land outside Zones 2 and 3).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Zone 2 Medium Probability         | Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Zone 3a High Probability          | Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Zone 3b The Functional Floodplain | <p>This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:</p> <p>land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or</p> <p>land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).</p> <p>Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)</p> |

- 2.5. An FRA should be appropriate to the scale, nature, and location of the development. It should identify and assess the risk from all sources of flooding to and from the development and demonstrate how any flood risks will be managed over the lifetime of the development.
- 2.6. An assessment of hydrological impacts should be undertaken, including to surface water runoff and impacts to drainage networks in order to demonstrate how flood risk to others will be managed following development and taking climate change into account.

## The Local Plan

- 2.7. The Local Plan prepared by the Local Planning Authority, Eastleigh Borough Council, sets out the policies for development in the local area<sup>3</sup>.

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<sup>3</sup> <https://www.eastleigh.gov.uk/media/11234/eastleigh-borough-local-plan.pdf>

- 2.8. Policy DM3, *Adaptation to climate change* – Outlines the requirements for new development in terms of adapting to climate change which is relevant in terms of reducing the impacts of surface water flooding in the future.

*1. All development should be designed to adapt to the predicted climate change impacts for the Borough.*

*a. To reduce the potential impacts of surface water flooding, sustainable drainage systems need to be implemented as part of an integrated SuDS strategy for the site in accordance with policy DM6 (Sustainable surface water management and watercourse management) and as part of the landscape framework for the site including green open space and green roofs where appropriate.*

*b. New development should have a cooling strategy which can include:*

*i. cooling through generous green infrastructure and trees*

*ii. areas of shade*

*iii. water cooling*

*iv. building design and orientation to reduce overheating*

*v. 'cool roofs' or green roofs and green walls vi. porous cool pavements*

*c. To adapt to water stress, new development should be designed to reduce demand. Measures can include:*

*i. reduced residential mains water consumption (as per policy DM2)*

*ii. water efficient appliances, fittings and leak detection devices for nonresidential and non C3 use class residential development*

*iii. rainwater harvesting and grey water recycling*

*iv. drought resistant landscape design and planting*

- 2.9. Policy DM5, *Managing Flood Risk* – Sets out the requirements for new developments in terms of reducing 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 62 Adopted Eastleigh Borough Local Plan 2022*

*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.*

2.10. Policy DM6, Sustainable Surface Water Management and Watercourse Management – sets out the requirements for how and when Sustainable Drainage Systems should be utilised.

*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.*

## Sequential and Exception Tests

- 2.11. The Sequential and Exception Tests are applied in specific cases defined by UK Government policy. Their purpose is to drive development to areas of low flood risk and to support developments which improve flood risk for developments in areas at risk of flooding.

### Sequential Test

- 2.12. Under the NPPF all new planning applications should undergo a Sequential Test unless a Minor Development or a change of use application in accordance with paragraph 168 and footnotes 55 and 56. This test should be implemented by local planning authorities with a view to location particularly vulnerable new developments outside of the flood plain.
- 2.13. The proposed development is shown to be located wholly within Flood Zone 1 (low risk) and as such could be considered to be sequentially located with regards to fluvial flooding. Similarly the site is not affected in the modelled 1:1000 year pluvial event as modelled by the EA and thus could be considered to be sequentially located with regards to pluvial flooding.

### Exception Test

- 2.14. The Exception Test is applied to sites based on the Flood Zone and the nature of the development. As the proposed development consists of a nursery it would be classed as 'More Vulnerable' in line with government development use classes.
- 2.15. The Flood Risk Vulnerability Classification table<sup>4</sup> provided below in Table 2 shows which vulnerabilities are appropriate in each Flood Zone.
- 2.16. Table 2 shows Flood Zone 1 is an appropriate location for 'More Vulnerable' uses without the need for an Exception Test.

Table 2: Flood Risk Vulnerability Classification

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<sup>4</sup> <https://www.gov.uk/guidance/flood-risk-and-coastal-change#table2>

| Flood Zones | Flood Risk Vulnerability Classification |                         |                         |                 |                  |
|-------------|-----------------------------------------|-------------------------|-------------------------|-----------------|------------------|
|             | 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               | ✓                |

## Summary

- 2.17. This flood risk assessment has been prepared with due consideration to the above local and national policy.

## 3. Consultation and Review

### Consultation

- 3.1. The site is within the remit of Hampshire County Council as Lead Local Flood Authority (LLFA).
- 3.2. It is understood that the site is part of a previous application (Ref: F22/94242) for the same proposed development of a single-storey children's nursery with off road car parking, however, the application was refused and Hampshire Council made the following comments;

*There is insufficient information provided on the site, wider area and flood risk. We would expect to see location plans, detail to show how this development connects to the surrounding area, topographical information and any other hydrological features in the vicinity. We would also expect to see an assessment of flood risk both to the site and the wider area.*

*The proposed discharge rate of 0.4l/s is small and will be extremely prone to blockage. It is not clear how this is expected to be achieved and we would query whether it is feasible to discharge at such a low rate.*

*It is currently proposed to discharge into a surface water sewer. Confirmation of who is currently responsible for this asset is required together with evidence that they would accept the connection and the allowance flow rates.*

*The drainage drawing lacks sufficient detail to show how water will be captured and conveyed around the site. Although specific features are referenced, the interaction between permeable paving, pipes, raingardens ect has not been detailed. Further details of the slot drains will be required with an assessment of surface flows to demonstrate that they are capable of collecting expected flows.*

*Calculations have been provided however it is not clear how bespoke features are modelled as no dimensions or specifications have been provided. Summer storms need to be included in the model and storm durations increased to 1 day. The climate change figure used is based on the old guidance. Please refer to current guidance for the latest climate change figures.*

*The outputs for the relevant storms are difficult to understand. The 1:100 + climate change outputs need to include the critical storm per item and show that the features are approximately linked to identify any sensitivities in the system as a whole.*

*The maintenance plan does not include the flow control device which will be a specialist item and needs to be referenced. Notes should also refer back to the maintenance requirements in the drainage strategy as the drawing is insufficient in isolation.*

*High level exceedance arrows have been added to the drainage plan but a comparison of pre and post development exceedance is required. No topographic survey is available to evidence the current situation.*

- 3.3. These comments have been taken into consideration in this FRA and SWDS and detail is provided to ensure each requirement is sufficiently met.

## Documents and Online Mapping

- 3.4. Local Governments and Lead Local Flood Authorities provide documents which contain data and policies on flood risk and new development in their areas. These documents are introduced and briefly summarised below. For the purposes of this FRA, these documents have been reviewed for relevant information and any relevant data is discussed within the appropriate sub heading of this report.
- 3.5. The following sources of information have been reviewed for this assessment:
- Flood Map for Planning on the Environment Agency website <https://flood-map-for-planning.service.gov.uk/>
  - Long Term Flood Risk Information on the Environment Agency website <https://www.gov.uk/check-long-term-flood-risk>
  - National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2021)
  - Planning Practice Guidance - Flood Risk and Coastal Change (Department for Levelling Up, Housing and Communities, 2022)
  - Geoindex Onshore (British Geological Survey, 2022)
  - Eastleigh Borough Local Plan (2016-2036) (Eastleigh Borough Council, 2022)
  - Hampshire County Council Preliminary Flood Risk Assessment (2011)<sup>5</sup>
  - Hampshire County Council Local Flood and Water Management Strategy (2020)<sup>6</sup>
  - Eastleigh Borough Council Strategic Flood Risk Assessment, Update (2016)<sup>7</sup>

## Preliminary Flood Risk Assessment (PFRA)

- 3.6. The PFRA, published in 2020, is a high-level appraisal of flood risk across Lead Local Flood Authority, Hampshire County Council. The flood risk from all sources, including fluvial, surface water, groundwater and surcharged sewers is evaluated. It is the basis upon which the Local Flood Risk Management Strategy is produced.
- 3.7. The PFRA summarises historical flood incidents in Hampshire. The site is not recorded as having been affected by any flood event.

---

<sup>5</sup> <https://documents.hants.gov.uk/flood-water-management/watercourses/PFRAResultsJan2016.pdf>

<sup>6</sup> <https://documents.hants.gov.uk/flood-water-management/local-flood-water-management-strategy.pdf>

<sup>7</sup> <https://www.push.gov.uk/wp-content/uploads/2018/05/Eastleigh.pdf>

## **Strategic Flood Risk Assessment (SFRA)**

- 3.8. The SFRA, published in 2007, provides the evidence base for the Local Planning Authority Eastleigh Borough Council Local Plan and guidance for consideration when determining planning applications.
- 3.9. The SFRA seeks to place new development into areas of lower flood risk taking into account current flood risk, future flood risk, and the effect a proposed development would have on the risk of flooding.
- 3.10. The SFRA mapping provided by Eastleigh Borough Council has been used throughout production of this report as a source of information, particularly pertaining to historical flood incidents.

## **Local Flood Risk Management Strategy (LFRMS)**

- 3.11. The Local Flood Risk Management Strategy sets out roles and responsibilities for flood risk management, assesses the risk of flooding in the area, where funding can be found to manage flood risk, and the policies, objectives, and actions of the Lead Local Flood Authority. The LFRMS is used within this report to identify any flood management infrastructure and historical incidences of flooding.

## 4. Sources of Flood Risk

### Fluvial

- 4.1. Flooding from watercourses arises when flows exceed the capacity of the channel, or where a restrictive structure is encountered, resulting in water overtopping the banks into the floodplain.

#### Main Rivers and Ordinary Watercourses

- 4.2. The nearest Main River to the site is the Ford Lake River situated approximately 450m to the east of the site flowing south towards Botley.
- 4.3. There is a series of Ordinary Watercourses located approximately 114m southeast of the site that are assumed to be field drains providing positive drainage to the school fields north of the site.

#### Historical Fluvial Flooding

- 4.4. There is no record of historical fluvial flooding on-site based on the EA Recorded Flood Outlines dataset.

#### EA Map for Planning

- 4.5. Examination of the EA's Flood Map for Planning (Figure 3) shows that the site is located within Flood Zone 1 (an area with less than a 0.1% annual probability of flooding). The nearest area of Flood Zone 3 (an area with greater than a 1% chance of flooding each year) is located approximately 300m to the northeast of the site adjacent to the Ford Lake River.
- 4.6. The site is considered to be at a low risk of fluvial flooding.

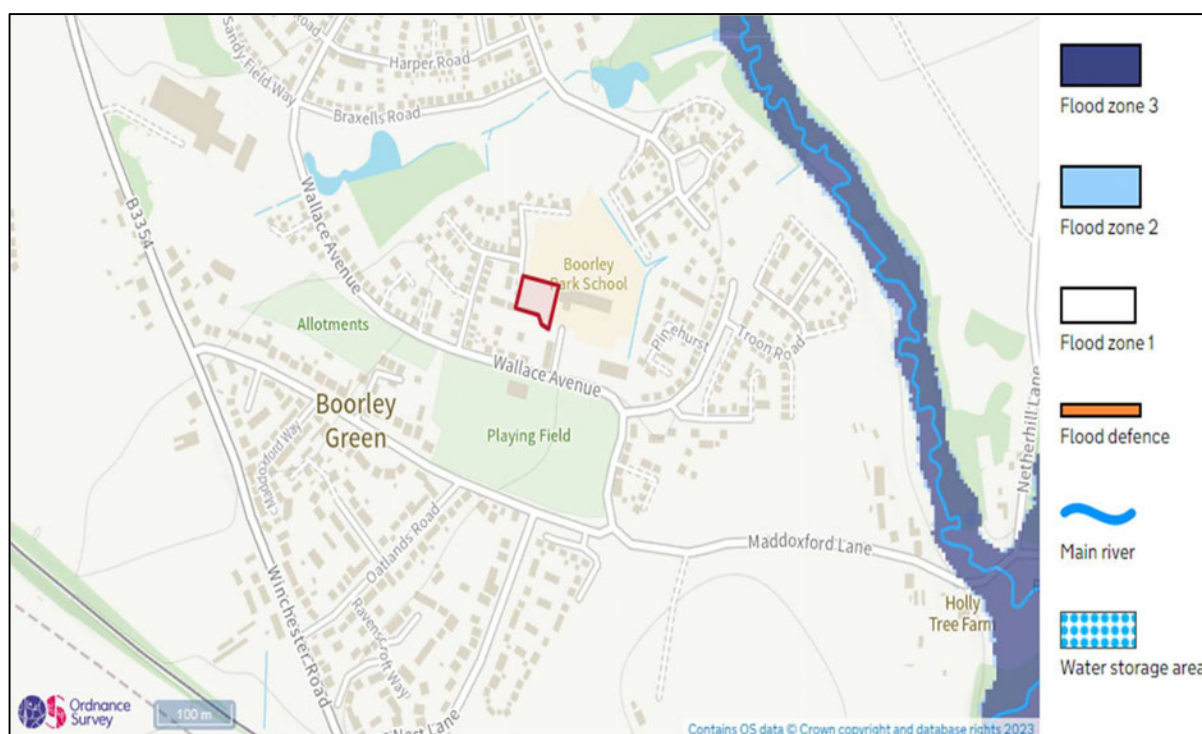


Figure 3: EA Flood Map for Planning (Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors. Contains public sector information licensed under the Open Government Licence v3.0)

## Tidal

- 4.7. Tidal flooding occurs when a high tide and high winds combine to elevate sea levels. An area behind coastal flood defences can still flood if waves overtop the defences or break through them. Tidal flooding can also occur a long way from the coast by raising river levels. Water may overtop the river bank or river defences when tide levels are high.
- 4.8. The site is a significant distance from any tidal source and above the anticipated extreme tidal levels, even when considering the impacts of climate change. The risk of flooding from tidal sources is considered low.

## Canals

- 4.9. The Canal and River Trust (CRT) generally maintains canal levels using reservoirs, feeders, and boreholes and manages water levels by transferring it within the canal system.
- 4.10. Water in a canal is typically maintained at predetermined levels by control weirs. When rainfall or other water enters the canal, the water level rises and flows out over the weir. If the level continues rising it will reach the level of the storm weirs. Control weirs and storm weirs are normally designed to take the water that legally enters the canal under normal conditions. However, it is possible for unexpected water to enter the canal or for the weirs to become obstructed. In such instances the increased water levels could result in water overtopping the towpath and flowing onto the surrounding land.

- 4.11. There are no canals in the vicinity of the site.
- 4.12. The risk of flooding to this site from canals is considered to be low.

## Pluvial

- 4.13. Pluvial flooding can occur during prolonged or intense storm events when the infiltration potential of soils, or the capacity of drainage infrastructure is overwhelmed leading to the accumulation of surface water and the generation of overland flow routes.
- 4.14. Annual surface water flood risk is labelled by the EA as:
- 'High Risk'; >3.3% AEP (annual probability greater than 1 in 30).
  - 'Medium Risk'; 1.1% to 3.3% AEP (annual probability between 1 in 100 and 1 in 30).
  - 'Low Risk'; 0.1% to 1% AEP (annual probability between 1 in 1000 and 1 in 100).
  - 'Very Low Risk'; <0.1% AEP (annual probability less than 1 in 1000).
- 4.15. Examination of the EA's Flood Risk from Surface Water mapping for High Risk, Medium Risk, and Low Risk AEP flood events (Figure 4) shows the site lies outside the extent of any of the modelled surface water flood events.



Figure 4: EA Surface Water Flood Risk Mapping (Base map and data from Google Satellite Imagery)

- 4.16. The SFRA provides mapping of historical surface water flood incident records kept by the local authority. No historical surface water incidents have been recorded in the vicinity of the site.
- 4.17. The site is therefore considered to be at a low risk of pluvial flooding.

## Reservoirs

- 4.18. Flooding can occur from large waterbodies or reservoirs if they are impounded above the surrounding ground levels or are used to retain floodwater. Although unlikely, reservoirs and large waterbodies could overtop or breach leading to rapid inundation of the downstream floodplain.
- 4.19. According to the EA's Flood Risk from Reservoirs mapping (Figure 5) the site is outside modelled flood extents in the event of reservoir flooding.



Figure 5: EA Reservoir Flood Risk Mapping (Base map and data from Google Satellite Imagery)

- 4.20. The site has not been flagged as being at risk of flooding following a reservoir failure.

## Groundwater

- 4.21. Groundwater flooding occurs in areas where underlying geology is permeable, and water can rise within the strata sufficiently to breach the surface.

- 4.22. The British Geological Survey's (BGS) mapping shows no superficial deposits underlying the site. The bedrock underlying the site is Wittering Formation comprised of sand, silt and clay.
- 4.23. Historical BGS boreholes approximately 20m to the northeast of the site (BGS Ref: SU51SW110) show the standing water level was encountered at 1.7m below ground level (bgl). The standing water level was measured twice more at the same borehole site at 1.5m bgl, and 4.6m bgl.
- 4.24. Hampshire Council presents the EA's Areas Susceptible to Groundwater Flooding mapping. An extract is included as Figure 6 below and it shows that it is unclear which 1km<sup>2</sup> grid the site falls into, therefore, the site could be located in an area with a high susceptibility to groundwater flooding.

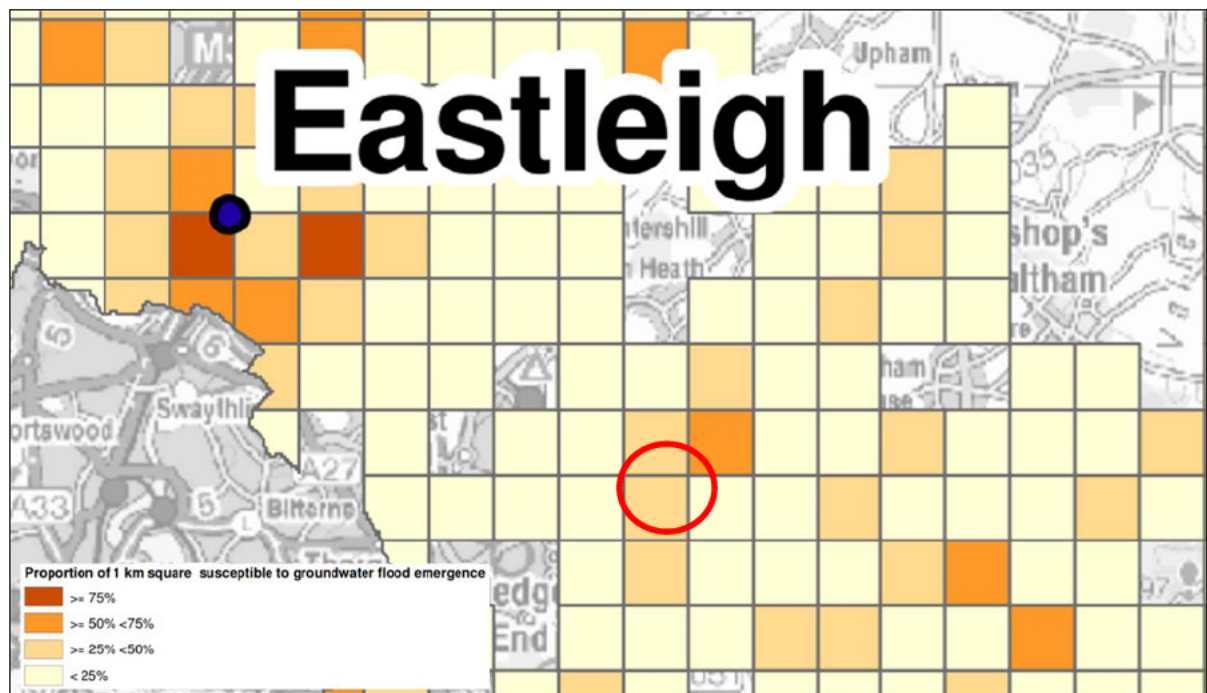


Figure 6. EA's Areas Susceptible to Groundwater Flooding mapping (Source: Eastleigh SFRA).

- 4.25. Based on the available information the site is considered to be at a moderate risk of groundwater flooding.

## Sewers

- 4.26. Foul or surface water sewers can be a cause of flooding if the drainage network becomes overwhelmed, either by blockage or due to local development beyond the designed capabilities of the drainage system.
- 4.27. The SFRA provides mapping of historical sewer flood incident records kept by the local authority. No incidents have been recorded in the vicinity of the site.
- 4.28. The site is located on an undeveloped field, therefore, the extent of sewers in the area that could cause sewer flooding in the site may be limited. It is noted that there is an existing sewer located below the school access road.

- 4.29. Any new surface water drainage infrastructure as a result of the proposed development will be designed to accommodate flows for the 1.0 AEP + Climate Change storm event.
- 4.30. It is recommended that all new drainage associated with the scheme be fitted with non-return valves and that any new plumbing should be constructed in a closed cell design.
- 4.31. Local policy documentation does not identify the site as being in a Critical Drainage Area.
- 4.32. The development is therefore considered to be at low risk of flooding from sewers.

## 5. Flood Risk Mitigation

### Fluvial

- 5.1. The proposed development is located within Flood Zone 1, therefore, no specific mitigation is recommended to manage the fluvial flood risk.

### Groundwater

- 5.2. The site proposed development is considered to be at a moderate risk of groundwater flooding. However, at the time of writing there has been no detailed ground investigation, therefore, prior to any new construction it is advised to undertake a groundwater monitoring assessment to confirm the below ground water level. If groundwater is encountered during excavation then appropriate measures should be implemented.

### All Other Sources

- 5.3. Flood risk from pluvial, canals, reservoirs, sewers, and tidal sources is considered to be low, therefore mitigation is not required.

### Increase to Flood Risk Elsewhere

- 5.4. The existing site is an undeveloped area of land adjacent to a school, therefore, the Surface Water Drainage Strategy outlines how the increased volume and rate of surface water runoff will be managed for the 1.0 AEP + Climate Change storm event.

## 6. Surface Water Drainage Strategy

### Watercourses

- 6.1. The nearest Main River to the site is the Ford Lake River situated approximately 450m to the east of the site flowing south towards Botley.
- 6.2. There is a series of Ordinary Watercourses located approximately 114m southeast of the site that are assumed to be field drains providing positive drainage to the school fields north of the site.
- 6.3. Therefore, it is not feasible to discharge surface water runoff from the proposed development into watercourses this distance from the site.

### Ground Conditions

- 6.4. The British Geological Survey's (BGS) mapping shows no superficial deposits underlying the site. The bedrock underlying the site is Wittering Formation comprising sand, silt and clay.
- 6.5. Historical BGS boreholes approximately 20m northeast of the site (BGS Ref: SU51SW110) show the standing water level was encountered at 1.7m below ground level (bgl). The standing water level was measured twice more at the same borehole site at 1.5m bgl, and 4.6m bgl.
- 6.6. Due to the potentially high water table at the site it is not considered feasible to use infiltration drainage at the site.

### Sewers

- 6.7. Southern Water Asset Plans were provided and are included in this report as Appendix B – Southern Water Consultation (a section of the plan is reproduced as Figure 7 below). Figure 7 shows that there are no public sewers in the immediate vicinity of the site.
- 6.8. However, despite this, it is understood that the surrounding residential development has a sewer network with a surface water sewer beneath Nairn Road adjacent to the site.
- 6.9. While the Southern Water asset plan shows no public sewers in the area, this may be due to the sewers being new and not yet reflected on the Southern Water system. The client has provided liaison with Southern Water that there is an agreement in principle (Section 106 Agreement – 11740 - 26/03/2020) for the connection to the manhole beneath Nairn Road. Liaison is ongoing to determine the flow rates that are acceptable from the proposed development.



Figure 7. Sewer Asset Plan (Source: Southern Water)

## Greenfield Runoff Rate

- 6.10. The total site area is approximately 0.29ha.
- 6.11. The proposed plans indicate that the development includes a total hardstanding area of approximately 2,021m<sup>2</sup> (0.202ha).
- 6.12. The IH-124 method was developed as part of the original Flood Studies Report (FSR) in 1975 and was devised to calculate runoff from small catchments by estimating the mean annual flood flow (Qbar) using the following equation:

$$QBAR_{rural} = 0.00180 \times AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$$

Where:

Qbar<sub>rural</sub> is the mean annual flood flow from a rural catchment (approximately 2.3 year return period).

AREA is the area of the hardstanding surfaces in ha.

SAAR is the Standard Average Annual Rainfall for the period 1941 to 1970 in mm.

SPR is Standard Percentage Runoff coefficient for the SOIL category. The SOIL category is extracted from UK Winter Rainfall Acceptance Potential (WRAP) map.

- 6.13. The ICP SuDS variation is a scaled-down version of the IH-124 runoff method for estimating peak flow rates from both undeveloped and partly urbanised catchments that are smaller than 50 ha in size, which is appropriate in this instance.
- 6.14. The parameters used for estimating the greenfield runoff rates for the site are presented in Table 3.

Table 3. IH-124 Input Parameters

| Greenfield runoff rates from the site - simulation criteria |          |
|-------------------------------------------------------------|----------|
| <b>Rainfall Data</b>                                        | FSR      |
| <b>Area</b>                                                 | 0.202 Ha |
| <b>SAAR</b>                                                 | 800.0    |
| <b>SOIL</b>                                                 | 0.470    |
| <b>Region</b>                                               | Region 7 |

Table 4 displays the estimated  $Q_{BAR}$  greenfield runoff rate for an impermeable area of 0.202ha is 1.1l/s.

Table 4. Greenfield Runoff Rates

| Return Period                             | Greenfield Runoff Rate (l/s) |
|-------------------------------------------|------------------------------|
| <b>1 in 1 Year</b>                        | 1.0                          |
| <b>1 in 2 Year (<math>Q_{BAR}</math>)</b> | 1.1                          |
| <b>1 in 30 Year</b>                       | 2.6                          |
| <b>1 in 100 Year</b>                      | 3.6                          |

## Surface Water Drainage Strategy

- 6.15. In accordance with the SuDS Management train approach, the use of various SuDS measures to reduce and control surface water flows have been considered in detail for the development.
- 6.16. The management of surface water has been considered in respect to the SuDS hierarchy below, as detailed in the CIRIA 753 “The SuDS Manual” (section 3.2.3).

Table 5. SuDS Drainage Hierarchy

| SUDS DRAINAGE HIERARCHY                                                            |    |                                                                                      |             |                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                    |    |                                                                                      | Suitability | Comment                                                                                                                                                                                                                                                  |
|  | 1. | Store rainwater for later use                                                        | ✓           | There are opportunities for rainwater harvesting measures such as water butts and these should be implemented where practical.                                                                                                                           |
|                                                                                    | 2. | Use infiltration techniques, such as porous surfaces in non-clay areas               | x           | Infiltration testing has not been undertaken at the site. However, desktop geology investigations indicates that the ground conditions may be associated with high groundwater levels, so infiltration may not be possible.                              |
|                                                                                    | 3. | Attenuate rainwater in ponds or open water features for gradual release              | x/✓         | Space on site within the confines of the proposed layout and safety concerns does not allow for large above ground SuDS such as basins or ponds. However, there is an opportunity to use rainwater planter bioretention systems beneath rainwater pipes. |
|                                                                                    | 4. | Attenuate rainwater by storing in tanks or sealed water features for gradual release | ✓           | Has been deemed an appropriate option for attenuation in the form of a geocellular storage tank.                                                                                                                                                         |
|                                                                                    | 5. | Discharge rainwater direct to a watercourse                                          | x           | No watercourses within a feasible distance from the site.                                                                                                                                                                                                |
|                                                                                    | 6. | Discharge rainwater to a surface water sewer/drain                                   | ✓           | The proposed outfall for surface water runoff generated on site is to the surface water sewer beneath Nairn Road. The proposed outfall is subject to capacity checks and approval from Southern Water or the developer as required.                      |
|                                                                                    | 7. | Discharge rainwater to Combined Sewer                                                | x           | No combined sewers within the vicinity of the site. Surface water sewers considered to be more sustainable.                                                                                                                                              |

6.17. On review of the SuDS drainage hierarchy, and with reference to both national and local policy, it is proposed that the surface water runoff from the development is managed via permeable paving and geocellular storage. The primary method of attenuation will be a series of an underground attenuation tank; however, additional storage will be provided by permeable paving units where feasible and rainwater planter bioretention systems located at the ground level beneath rainwater downpipes. Surface water from the proposed development will ultimately be discharged to public surface water sewer beneath Nairn Road at a restricted rate of 1.1l/s (the  $Q_{BAR}$  greenfield rate) via a hydrobrake, or other flow restriction device. We understand from liaison with Southern Water that there is an agreement in principle (Section 106 Agreement – 11740 – 26/03/2020) for the connection to the

manhole beneath Nairn Road. Liaison is ongoing to determine the flow rates that are acceptable from the proposed development.

- 6.18. Rainwater planter bioretention systems have not been accounted for within the storage calculations in the subsequent sections of this report but would provide additional benefit. This represents a conservative approach whereby these SuDS features have been assumed to be at full capacity at the onset of the modelled storm events.
- 6.19. The proposed Surface Water Drainage Layout is included as Appendix C.

## InfoDrainage Calculations

- 6.20. A network model has been produced in InfoDrainage software (v2024.0).
- 6.21. The model comprises;
- 7no. contributing catchment area representing the proposed roof area, patio areas, carpark, play area, and building roof for a total of 0.2ha;
  - 1 geocellular attenuation unit 6m (W) x 17.5m (L) x 1.5m (H), with 95% porosity (150.225m<sup>3</sup> storage provided);
  - 4no. lined permeable paving (Type C) units representing the patio area to the west, south and east of the building, and the play area to the north, with a total plan area of 485m<sup>2</sup>, porosity of 30%. The depth of the permeable paving for the west, east, and south patios is 0.20m, and the depth of the play area is 0.250m;
  - 3no proposed surface water manholes;
  - 1 Proposed hydrobrake manhole, restricting flows into the existing public sewer to 1.1l/s (the greenfield rate).
  - 1 existing manhole representing the outfall to the site beneath Nairn Road. Roof runoff, and runoff from the trafficked carpark and access road have been applied as point inflows into the geocellular attenuation unit.
- 6.22. Runoff from the patio areas has been applied as a lateral inflow into the associated permeable paving units.
- 6.23. Table 6 summarises the simulation criteria for the InfoDrainage model.

Table 6. Simulation Parameters

| Catchment Area Simulation Parameters |                                                                                       |
|--------------------------------------|---------------------------------------------------------------------------------------|
| Rainfall Data                        | FSR                                                                                   |
| Total Area                           | 0.202 Ha                                                                              |
| Return Periods                       | 1, 30, 30+40% for climate change, 100, 100 +45% for Climate Change. Summer and Winter |

|                               |                                                              |
|-------------------------------|--------------------------------------------------------------|
| Storm Durations               | 15, 30, 60, 120, 240, 360 (6hr), 480, 960, 1440, 2660 minute |
| Volumetric Runoff Coefficient | 0.9 (summer and winter storms)                               |
| Percentage Impervious         | 100%                                                         |
| Time of Concentration         | 5 minutes                                                    |

## Results for the 1 in 100 Year +45% Climate Change Critical Storm Event

- 6.24. The full calculation outputs can be found in Appendix D of this report although the 1in100year +45% climate change results have been summarised below:
- The maximum flow rate through the hydrobrake manhole and into the public surface water sewer would be 1.1l/s for the critical storm event (960 minute winter).
  - The maximum depth in the 1.5m deep geocellular storage tank would be 1.486m for the critical storm event (1440 minute winter).
  - The maximum depth in the 0.20m deep permeable paving (West, East, and South Paving Units) is 0.177 for the critical storm event (240 minute summer).
  - The maximum depth in the 0.250m deep permeable paving (West Paving and Play Area Units) is 0.213 for the critical storm event (120 minute summer).
- 6.25. No flooding is observed in the critical storm event based on the InfoDrainage model.
- 6.26. As such, these results indicate that the runoff from the proposed development could be accommodated within a drainage system of the approximate size modelled, with surface water runoff restricted to 1.1l/s.
- 6.27. Any sewer connection is subject to capacity checks and approval from Southern Water.

## Maintenance

- 6.28. Table 7 presents details regarding the maintenance requirements for the proposed SuDS included as part of the development, taken from the CIRIA C753 The SuDS manual. Each manufacturer will have bespoke requirements however the below should be used as a guide. All SuDS are to be maintained by the property owner.
- 6.29. The Hydro-International maintenance requirements for a hydrobrake are included below;

*Normally, little maintenance is required as there are no moving parts within the Flow Control. Experience has shown that if blockages occur they do so at the intake, and the cause on such occasions has been due to a lack of attention to engineering detail such as approach velocities being too low, inadequate benching, or the use of units below the minimum recommended size. The Flow Control (where applicable) is fitted with a pivoting bypass door,*

which allows the manhole chamber to be drained down should blockage occur. The smaller conical units, below the minimum recommended size, are also supplied with rodding facilities or vortex suppressor pipes as standard.

Following installation of the Flow Control it is vitally important that any extraneous material i.e. building materials are removed from the unit and the chamber. After the system is made live, and assuming that the chamber design is satisfactory, it is recommended that each unit be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. If problems are experienced, please do not hesitate to contact the company so that an investigation may be made.

All Flow Control units are typically manufactured from grade 304 Stainless Steel, and if required they can also be manufactured in grade 316 Stainless Steel. Both materials have an estimated life span in excess of the design life of drainage systems

Table 7: Specific SuDS Maintenance Requirements (Source: CIRIA SuDS Manual)

| Maintenance Schedule          | Required Action                                                                                                                                                                      | Typical Frequency                                                                                                                                        |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Permeable Paving</b>       |                                                                                                                                                                                      |                                                                                                                                                          |
| <b>Regular Maintenance</b>    | Brushing and vacuuming (standard cosmetic sweep over whole surface)                                                                                                                  | Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations |
| <b>Occasional Maintenance</b> | Stabilise and mow contributing and adjacent areas                                                                                                                                    | As required                                                                                                                                              |
|                               | Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than a sprayer                                                               | As required                                                                                                                                              |
| <b>Remedial Actions</b>       | Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving                                              | As required                                                                                                                                              |
|                               | Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material | As required                                                                                                                                              |
|                               | Rehabilitation of surface and upper structure by remedial sweeping                                                                                                                   | Every 10 to 15 years as required (if infiltration performance is reduced due to significant clogging)                                                    |
| <b>Monitoring</b>             | Initial inspection                                                                                                                                                                   | Monthly for three months after installation                                                                                                              |

|                            |                                                                                                                                                                                                        |                                                            |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
|                            | Inspect for evidence of poor operation and/or weed growth – if required, take remedial action                                                                                                          | Three-monthly, 48hr after large storms in first six months |
|                            | Inspect silt accumulation rates and establish appropriate brushing frequencies                                                                                                                         | Annually                                                   |
|                            | Monitor inspection chambers                                                                                                                                                                            | Annually                                                   |
| <b>Geocellular Storage</b> |                                                                                                                                                                                                        |                                                            |
| <b>Regular Maintenance</b> | Inspect and identify any area 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 risks to performance)                                                                                                                     | Monthly                                                    |
|                            | For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary. | Annually                                                   |
|                            | Remove sediment from pre-treatment structures and/or internal forebays                                                                                                                                 | Annually, or as required                                   |
| <b>Remedial Actions</b>    | Repair/ rehabilitate inlets, outlet, overflows and vents                                                                                                                                               | As required                                                |
| <b>Monitoring</b>          | Inspect/ check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed                                                                            | Annually                                                   |
|                            | Survey inside of tank for sediment build-up and remove if necessary                                                                                                                                    | Every 5 years or as required                               |

## Designing for Exceedance

- 6.30. Periods of exceedance occur when the rate of surface water runoff exceeds the drainage system capacity. Conveyance beneath ground cannot, generally, be economically or sustainably constructed to the scale required for the most extreme rainfall events. This may result, on occasion, in the surface water runoff exceeding the capacity of the drainage network, with excess water (exceedance flow) being conveyed above ground.
- 6.31. For situations where extreme rainfall intensity exceeds inlet capacities, or for extreme storm events exceeding the design flood event considered for drainage design, surface water would flow overland towards the south/ southeast towards landscaped area adjacent to the carpark.

## Water Quality

- 6.32. In order to protect the downstream receiving water body, a key element of SuDS is that they have the potential to improve the quality of surface water discharged from a site. In order to assess this, the “Pollution hazard indices for different land use classifications”, provided in table 26.2 of the CIRIA SuDS

Manual (C753) has been reviewed (Table 8). The indices use four different indicators for assessing pollution potential based on the hazard level, total suspended solids (TSS), Metals, and Hydrocarbons.

- 6.33. Runoff from a school roof and associated hardstanding are generally considered to have a Low pollution hazard Indices In the CIRIA SuDS Manual guidance (Table 8). As they are considered low contamination risk they do not usually warrant any significant treatment. All downpipes should be fitted with silt traps to reduce the amount of sediment entering the subsurface piped network.
- 6.34. As not all sections of the site will flow through the same SuDS mitigation features, Table 8 has been divided into sections to show what mitigation is proposed for each section of the site.

Table 8. Pollution Hazard Indices and Indicative SuDS Mitigation Indices – Roof, Patios, and Play Area

|                                          | Pollution Hazard Level | Total Solids (TSS)                                                                                                                                                                                                                                 | Suspended Solids | Metals | Hydrocarbons |
|------------------------------------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------|--------------|
| Land Use                                 |                        |                                                                                                                                                                                                                                                    |                  |        |              |
| Roof                                     | Low                    | 0.3                                                                                                                                                                                                                                                |                  | 0.2    | 0.05         |
| Mitigation                               |                        |                                                                                                                                                                                                                                                    |                  |        |              |
| Bioretention System (rainwater planters) |                        | 0.8                                                                                                                                                                                                                                                |                  | 0.8    | 0.8          |
| Land Use                                 |                        |                                                                                                                                                                                                                                                    |                  |        |              |
| Patios and Play Area                     | Low                    | 0.5                                                                                                                                                                                                                                                |                  | 0.4    | 0.4          |
| Mitigation                               |                        |                                                                                                                                                                                                                                                    |                  |        |              |
| Permeable Paving                         |                        | 0.7                                                                                                                                                                                                                                                | 0.6              |        | 0.7          |
| Land Use                                 |                        |                                                                                                                                                                                                                                                    |                  |        |              |
| Hardstanding Carpark and Access Road     | Medium                 | 0.7                                                                                                                                                                                                                                                | 0.6              |        | 0.7          |
| Mitigation                               |                        |                                                                                                                                                                                                                                                    |                  |        |              |
| Proprietary Treatment Device             |                        | 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. |                  |        |              |

## 7. Conclusions

- 7.1. This FRA and SWDS has been undertaken with reference to the requirements of NPPF and Planning Practice Guidance with respect to the development at Boorley Park Primary School, Nairn Road, Botley, Hampshire, SO32 2SH. It has been written to support a planning application and has been prepared with due consideration to the nature of the proposed development to provide the appropriate level of detail.
- 7.2. An assessment of the risk of flooding from all sources has been undertaken and is summarised in the table below:

| Source of Flooding                                 | Flood Risk Summary                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fluvial                                            | The site is located in Flood Zone 1 (an area with less than a 0.1% annual probability of flooding), therefore, the risk of flooding is considered to be low.                                                                                                                                                                                                                                                                    |
| Groundwater                                        | Boreholes within the vicinity of the site suggest that the water table is potentially high at the site, therefore, the risk of groundwater flooding is considered to be moderate.<br><br>Prior to any new construction it is advised to undertake a groundwater monitoring assessment to confirm the below ground water level. If groundwater is encountered during excavation then appropriate measures should be implemented. |
| Tidal<br>Reservoirs<br>Pluvial<br>Sewers<br>Canals | The risk of flooding from all other reviewed sources is considered to be low.                                                                                                                                                                                                                                                                                                                                                   |

- 7.3. The FRA supports the planning application and demonstrates that there is an acceptable level of flood risk to the site if the mitigation strategies recommended are implemented in the scheme. The development does not increase flood risk off site or to the wider area if the accompanying Surface Water Drainage Strategy is implemented.
- 7.4. On review of the SuDS drainage hierarchy, and with reference to both national and local policy, it is proposed that the surface water runoff from the development is managed via permeable paving and geocellular storage. The primary method of attenuation will be a series of an underground attenuation tank; however, additional storage will be provided by permeable paving units where feasible and rainwater planter bioretention systems located at the ground level beneath rainwater downpipes. Surface water from the proposed development will ultimately be discharged to public surface water sewer beneath Nairn Road. We understand from liaison with Southern Water that there is an agreement in principle (Section 106 Agreement – 11740 – 26/03/2020) for the connection to the manhole beneath Nairn Road. Liaison is ongoing to determine the flow rates that are acceptable from the proposed development.

7.5. The 1in100year +45% climate change results have been summarised below:

- The maximum flow rate through the hydrobrake manhole and into the public surface water sewer would be 1.1l/s for the critical storm event (960 minute winter).
- The maximum depth in the 1.5m deep geocellular storage tank would be 1.486m for the critical storm event (1440 minute winter).
- The maximum depth in the 0.20m deep permeable paving (West, East, and South Paving Units) is 0.177 for the critical storm event (240 minute summer).
- The maximum depth in the 0.250m deep permeable paving (West Paving and Play Area Units) is 0.213 for the critical storm event (120 minute summer).

7.6. No flooding is observed in the critical storm event based on the InfoDrainage model.

7.7. This Flood Risk Assessment and Surface Water Drainage Strategy should be submitted as part of the planning application to satisfy the requirements under NPPF.

# Appendix A - Development Proposals



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                        |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------|------------|----|----|----|----|----|-------------|---|---|---|---|---|-------------|---|----|----|----|----|--------------|---|----|----|----|----|--------------|---|----|----|----|----|
| I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 13/04/2023                                             | Sno. Air conditioner units                |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| H                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 12/04/2023                                             | Front entrance planting                   |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| G                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 14/03/2023                                             | Fenestration and other aits.              |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| F                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 10/02/2023                                             | Road made wider                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| E                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 07/02/2023                                             | Site Plan Extended                        |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 18/10/2022                                             | Additional RWP included                   |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 29/09/2022                                             | Internal aits and fenestration adjustment |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 21/09/2022                                             | Fenestration and material aits            |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 25/08/2022                                             | Fenestration and material aits            |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| REV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | DATE                                                   | DESCRIPTION                               |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| CLIENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Jim Atkins                                             |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| PROJECT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | New Day Care                                           |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| ADDRESS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Land North and East of Boorley Green, Botley, SO32 2UA |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| DRAWING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Proposed Site Plan                                     |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| STATUS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Planning                                               |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| DATE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | July 2022                                              |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| SCALE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | @ A1<br>1:100                                          |                                           |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| DRAWING NO                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1980-00-03                                             | REVISION<br>1                             |            |    |    |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| <div>Asplan</div> <div>DESIGN - PLANNING - APPROVAL</div> <div>Architecture, Planning &amp; Building Consultancy<br/>Chartered Surveyors &amp; Building Engineers<br/>info@asplan.co.uk07968 585858</div> <div><div></div></div> <div><div><div>Preliminary<br/>Planning</div><div><input checked="" type="checkbox"/><br/><input type="checkbox"/></div></div><div><div>ISSUE SCHEDULE</div><div>Building Regs<br/>Construction</div><div><input type="checkbox"/><br/><input type="checkbox"/></div></div></div> <div><small>Asplan Registered Trade Mark No. UK0000210822. Copyright © 2017 Asplan Associates Ltd. This drawing has copyright protection and should not be reproduced without written permission from Asplan Associates Ltd. The Contractor is responsible for checking the dimensions on site and any discrepancy to be verified with Asplan Associates Ltd prior to the commencement of any building works or fabrication. This drawing is not to be scaled and must be read in accordance with all associated architectural, surveying, engineering and service drawings. IF IN DOUBT ASK!</small></div> <div><table><tr><td>0m at 1:50</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td></tr><tr><td>0m at 1:100</td><td>0</td><td>2</td><td>4</td><td>6</td><td>8</td></tr><tr><td>0m at 1:500</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td></tr><tr><td>0m at 1:1000</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td></tr><tr><td>0m at 1:2500</td><td>0</td><td>10</td><td>20</td><td>30</td><td>40</td></tr></table></div> |                                                        |                                           | 0m at 1:50 | 0  | 10 | 20 | 30 | 40 | 0m at 1:100 | 0 | 2 | 4 | 6 | 8 | 0m at 1:500 | 0 | 10 | 20 | 30 | 40 | 0m at 1:1000 | 0 | 10 | 20 | 30 | 40 | 0m at 1:2500 | 0 | 10 | 20 | 30 | 40 |
| 0m at 1:50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0                                                      | 10                                        | 20         | 30 | 40 |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| 0m at 1:100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0                                                      | 2                                         | 4          | 6  | 8  |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| 0m at 1:500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0                                                      | 10                                        | 20         | 30 | 40 |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| 0m at 1:1000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0                                                      | 10                                        | 20         | 30 | 40 |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |
| 0m at 1:2500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0                                                      | 10                                        | 20         | 30 | 40 |    |    |    |             |   |   |   |   |   |             |   |    |    |    |    |              |   |    |    |    |    |              |   |    |    |    |    |

GF-Site Plan  
1:100

## Appendix B - Southern Water Consultation



Mr Nick Atkins  
185 A Tuckton Road  
Bournemouth  
Dorset  
BH6 3LA

Your ref

-----

Our ref  
11740

Date  
25 August 2023

Contact  
Tel 0330 303 0119

Dear Mr Atkins,

#### Application to Connect to the Public Sewerage System - Section 106.

Location: Happy Days Nursery, Borley Green, Nairn Road, Southampton, Hampshire, SO32 2DD - Foul.

We are pleased to advise that your Section 106 application to connect to the public foul sewer, as shown on your drawing 10100 Revision P2 dated 26/03/2020, is approved by Southern Water. Our approval means we are satisfied with your connection method.

Connections to existing/new Southern Water assets (i.e., manholes) and the arrangement of Southern Water assets (i.e., pipe junctions within manholes) should always be in accordance with the new Design and Construction Guidance manual ("the Code") and Southern Water's guidance documentation. [water.org.uk/sewerage-sector-guidance-approved-documents/](https://www.water.org.uk/sewerage-sector-guidance-approved-documents/)

This Section 106 approval does not confirm that public sewer network capacity is available at your location for the proposed development. The availability of capacity may be assessed through the Pre-Planning Enquiry process.

Please note that your connection should not proceed if:

- There are unapproved changes to your submitted plan or to the intended connection point. Any unapproved changes may lead to us disconnecting your connection under S109 of the Water Industry Act 1991.
- The relevant Planning Authority has set out conditions relating to the site's drainage and those conditions have not yet been discharged.

- You have not consulted our Health and Safety Advisory that can be viewed at the following link [southernwater.co.uk/developing-building/health-and-safety](https://southernwater.co.uk/developing-building/health-and-safety)
- You have not obtained the necessary Building Regulations Approvals or, if relevant, obtained a Highway Authority Road Opening License.
- Landowner consent has not been obtained where your connection is to be made through another Party's land.

### What Comes Next?

To progress, select the 'Accept' option on the Get Connected customer dashboard. Or, if you have further questions, please select the 'Query' option. If you do not wish to progress with the application, then please select the 'Withdraw' option.

Now you have received our approval, you will need to arrange with your contractor to carry out your works on site to connect into our sewer. Once the connection has been made it is a mandatory requirement for the point of connection to be inspected by one of our Assistant Adoption Managers.

To arrange this inspection, please select 'Ready for Inspection' on your Get Connected customer dashboard. Once this has been selected, please contact **Andy Gayle** our Assistant Adoption Manager for this area on **07788 183938** and request an inspection giving at least two full working days' notice.

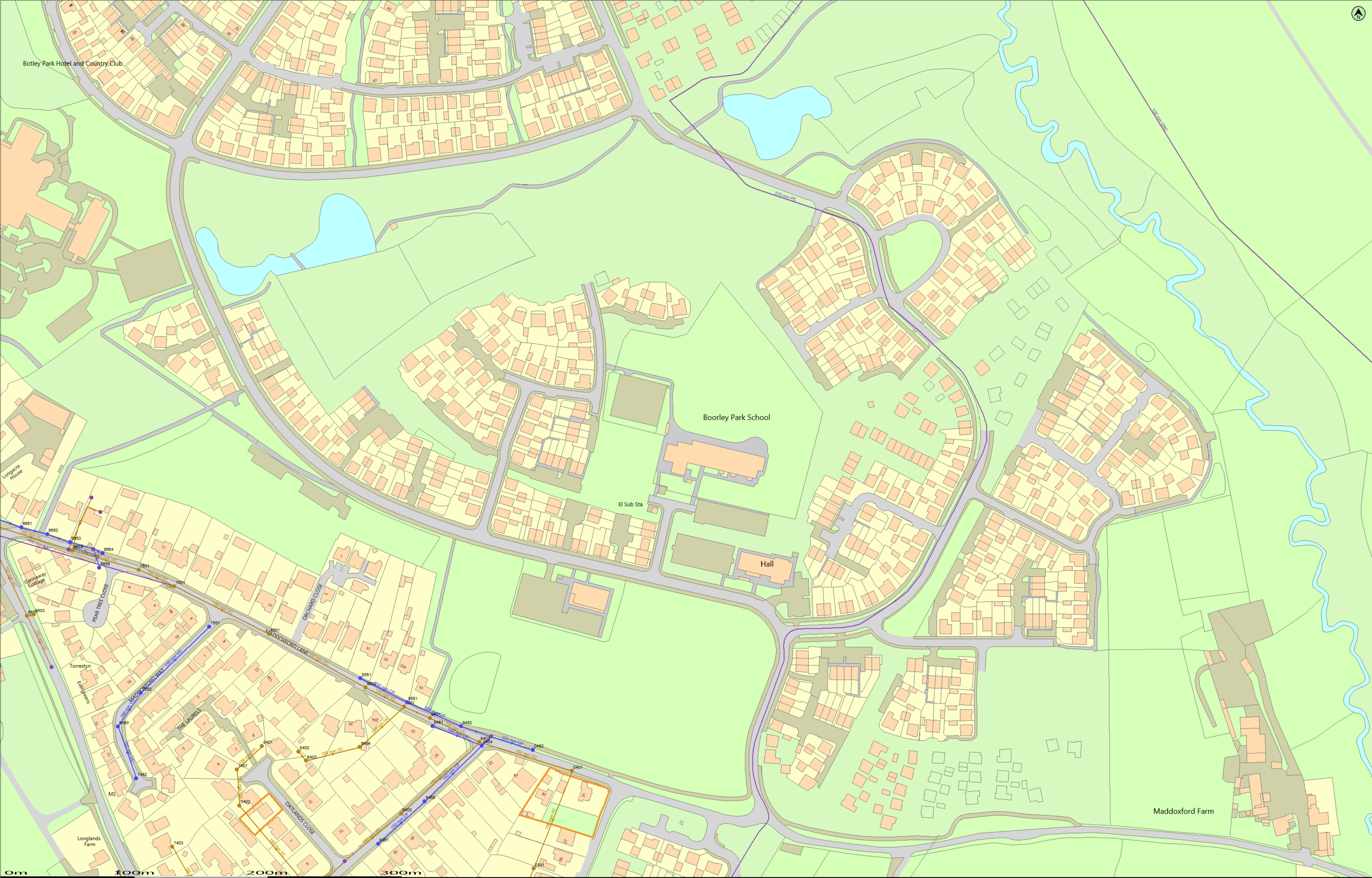
We have prepared a site inspection checklist so that inspection of your sewer connection can be passed first time [southernwater.co.uk/media/3028/ds-site-inspection-checklist.pdf](https://southernwater.co.uk/media/3028/ds-site-inspection-checklist.pdf)

Once we are happy that your connection to the public sewer complies with our requirements and have passed our inspection, we will send you a completion letter within 7 working days. It's important to ensure your connection is inspected to prevent any risk of disconnection at a later date.

Yours sincerely,



Shanthya Yoganathan  
Technical Coordinator  
**Developer Services**



(c) Crown copyright and database rights 2023 Ordnance Survey 100031673 Date: 07/08/23 Scale: 1:1250 Map Centre: 451125,114708 Data updated: 05/05/23 Our Ref: 1243162 - 1 Wastewater Plan A1

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2023 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|
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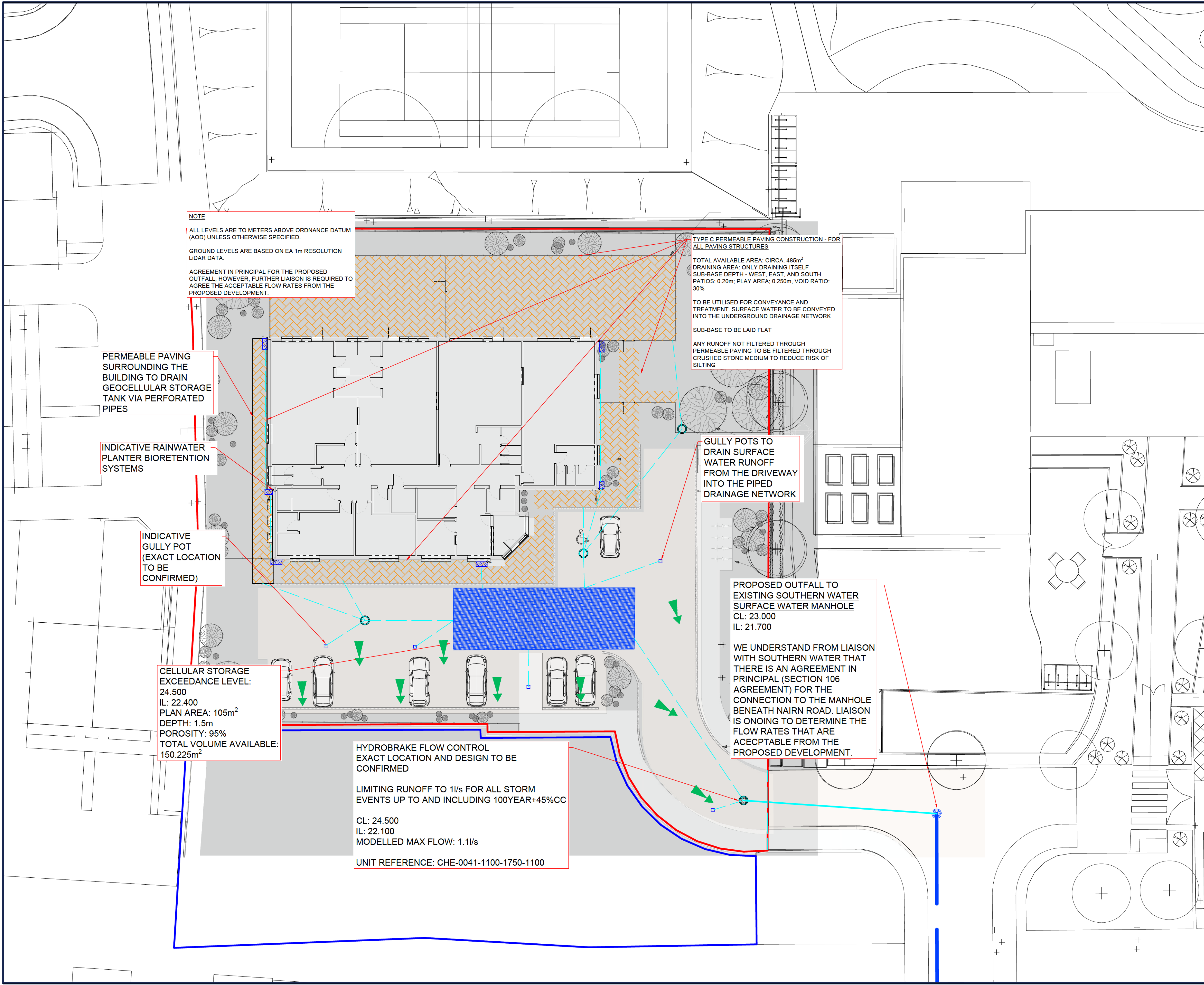
nick@aegaea.com

2758





## Appendix C – Surface Water Drainage Layout



- NOTES:**
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT REPORTS, PLANS AND ARCHITECTURAL DRAWINGS.
  2. THIS DRAWING SHOULD NOT BE SCALED. THERE SHOULD BE NO RELIANCE ON THIS DRAWING WITH REGARDS TO DIMENSIONS. ALL DIMENSIONS SHOULD BE CONFIRMED ON SITE.
  3. ANY DISCREPANCY ON THIS DRAWING SHOULD BE REPORTED TO AEGAEA IMMEDIATELY FOR CLARIFICATION.
  4. THE CONTRACTOR IS RESPONSIBLE FOR ALL WORKS AND FOR THE STABILITY, INSTALLATION AND HEALTH AND SAFETY OF THE WORKS.
  5. AEGAEA HAVE PRODUCED THIS DRAWING BASED ON THE DRAWINGS AND INFORMATION PROVIDED BY THE CLIENT AVAILABLE AT THE TIME OF PRODUCTION. WE CANNOT ACCEPT RESPONSIBILITY FOR DISCREPANCIES RESULTING FROM NEW PLANS/ INFORMATION BEING ISSUED POST-ISSUE OF THIS DRAWING. THE CONTRACTOR SHOULD REVIEW THIS DRAWING IN LIGHT OF WIDER SITE INFORMATION SUCH AS CONTAMINATION, UTILITIES SURVEYS AND SITE INVESTIGATIONS.
  6. IT IS THE RESPONSIBILITY OF THE PRINCIPLE CONTRACTOR TO MAKE THE DESIGNER AND CLIENT AWARE OF SITE-SPECIFIC RISKS AND HAZARDS THAT MAY AFFECT THE DRAWING AND SPECIFICATION.

**LEGEND**

- PUBLIC SURFACE WATER SEWER
- EXISTING SURFACE WATER DRAIN
- PROPOSED SURFACE WATER DRAIN
- PROPOSED SLOT DRAIN
- HYDROBRAKE MANHOLE
- SURFACE WATER MANHOLE
- ATTENUATION
- PERMEABLE PAVING
- RAINWATER PIPE
- RAINWATER PLANTER BIORETENTION SYSTEM
- OVERLAND FLOW EXCEEDANCE ROUTES

CLIENT: DHPC

SITE: BOORLEY PRIMARY SCHOOL,  
NAIRN ROAD, BOTLEY, HAMPSHIRE,  
SO32 2SH

DRAWING: SURFACE WATER DRAINAGE  
LAYOUT

DRAWING NUMBER: AEG02758\_DR001

DATE: 05/09/2023      REV: A

DRAWN BY: JA

DRAWING SCALE: NTS

PRELIMINARY DRAWING  
FOR PLANNING ONLY - NOT FOR  
CONSTRUCTION

## Appendix D – Full InfoDrainage Outputs

|                                                        |                       |             |              |
|--------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                               | Date:<br>06/08/2023   |             |              |
|                                                        | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Inflows<br>Storm Phase: Phase | Company Address:      |             |              |



**Play Area**

Type : Catchment Area

|           |      |
|-----------|------|
| Area (ha) | 0.03 |
|-----------|------|

**Dynamic Sizing**

| Runoff Method                | Time of Concentration |
|------------------------------|-----------------------|
| Summer Volumetric Runoff     | 0.900                 |
| Winter Volumetric Runoff     | 0.900                 |
| Time of Concentration (mins) | 5                     |
| Percentage Impervious (%)    | 100                   |



**West Patio**

Type : Catchment Area

|           |       |
|-----------|-------|
| Area (ha) | 0.004 |
|-----------|-------|

**Dynamic Sizing**

| Runoff Method                | Time of Concentration |
|------------------------------|-----------------------|
| Summer Volumetric Runoff     | 0.900                 |
| Winter Volumetric Runoff     | 0.900                 |
| Time of Concentration (mins) | 5                     |
| Percentage Impervious (%)    | 100                   |



**Roof**

Type : Catchment Area

|           |       |
|-----------|-------|
| Area (ha) | 0.064 |
|-----------|-------|

**Dynamic Sizing**

| Runoff Method                | Time of Concentration |
|------------------------------|-----------------------|
| Summer Volumetric Runoff     | 0.900                 |
| Winter Volumetric Runoff     | 0.900                 |
| Time of Concentration (mins) | 5                     |
| Percentage Impervious (%)    | 100                   |



**Carpark**

Type : Catchment Area

|           |       |
|-----------|-------|
| Area (ha) | 0.066 |
|-----------|-------|

**Dynamic Sizing**

| Runoff Method                | Time of Concentration |
|------------------------------|-----------------------|
| Summer Volumetric Runoff     | 0.900                 |
| Winter Volumetric Runoff     | 0.900                 |
| Time of Concentration (mins) | 5                     |
| Percentage Impervious (%)    | 100                   |

|                                                        |                       |             |              |                                                                                     |
|--------------------------------------------------------|-----------------------|-------------|--------------|-------------------------------------------------------------------------------------|
| Project:                                               | Date:<br>06/08/2023   |             |              |  |
|                                                        | Designed by:<br>Chris | Checked by: | Approved By: |                                                                                     |
| Report Details:<br>Type: Inflows<br>Storm Phase: Phase | Company Address:      |             |              |                                                                                     |


**Access Road**
Type : Catchment Area

|           |       |
|-----------|-------|
| Area (ha) | 0.025 |
|-----------|-------|

| Dynamic Sizing               |                       |
|------------------------------|-----------------------|
| Runoff Method                | Time of Concentration |
| Summer Volumetric Runoff     | 0.900                 |
| Winter Volumetric Runoff     | 0.900                 |
| Time of Concentration (mins) | 5                     |
| Percentage Impervious (%)    | 100                   |


**Catchment Area**
Type : Catchment Area

|           |       |
|-----------|-------|
| Area (ha) | 0.007 |
|-----------|-------|

| Dynamic Sizing               |                       |
|------------------------------|-----------------------|
| Runoff Method                | Time of Concentration |
| Summer Volumetric Runoff     | 0.900                 |
| Winter Volumetric Runoff     | 0.900                 |
| Time of Concentration (mins) | 5                     |
| Percentage Impervious (%)    | 100                   |


**East Patio**
Type : Catchment Area

|           |       |
|-----------|-------|
| Area (ha) | 0.007 |
|-----------|-------|

| Dynamic Sizing               |                       |
|------------------------------|-----------------------|
| Runoff Method                | Time of Concentration |
| Summer Volumetric Runoff     | 0.900                 |
| Winter Volumetric Runoff     | 0.900                 |
| Time of Concentration (mins) | 5                     |
| Percentage Impervious (%)    | 100                   |

|                                                                    |                       |             |              |
|--------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls<br>Storm Phase: Phase | Company Address:      |             |              |





West PP

Type : Porous Paving

| Dimensions                  |        |
|-----------------------------|--------|
| Exceedance Level (m)        | 24.500 |
| Depth (m)                   | 0.200  |
| Base Level (m)              | 24.300 |
| Paving Layer Depth (mm)     | 5      |
| Membrane Percolation (m/hr) | 3.0    |
| Porosity (%)                | 30     |
| Length (m)                  | 18.500 |
| Long. Slope (1:X)           | 500.00 |
| Width (m)                   | 2.000  |
| Total Volume (m³)           | 2.164  |

| Inlets             |                |
|--------------------|----------------|
| Inlet              |                |
| Inlet Type         | Lateral Inflow |
| Incoming Item(s)   | West Patio     |
| Bypass Destination | (None)         |
| Capacity Type      | No Restriction |

| Outlets             |                |
|---------------------|----------------|
| Outlet              |                |
| Outgoing Connection | 2.003          |
| Outlet Type         | Free Discharge |

| Advanced            |       |
|---------------------|-------|
| Conductivity (m/hr) | 500.0 |

|                                                                    |                       |                  |              |
|--------------------------------------------------------------------|-----------------------|------------------|--------------|
| Project:                                                           | Date:<br>06/08/2023   |                  |              |
|                                                                    | Designed by:<br>Chris | Checked by:      | Approved By: |
| Report Details:<br>Type: Stormwater Controls<br>Storm Phase: Phase |                       | Company Address: |              |





Play Area PP

Type : Porous Paving

| Dimensions                  |        |
|-----------------------------|--------|
| Exceedance Level (m)        | 24.500 |
| Depth (m)                   | 0.250  |
| Base Level (m)              | 24.250 |
| Paving Layer Depth (mm)     | 5      |
| Membrane Percolation (m/hr) | 3.0    |
| Porosity (%)                | 30     |
| Length (m)                  | 38.500 |
| Long. Slope (1:X)           | 500.00 |
| Width (m)                   | 8.000  |
| Total Volume (m³)           | 22.638 |

| Inlets             |                |
|--------------------|----------------|
| Inlet              |                |
| Inlet Type         | Lateral Inflow |
| Incoming Item(s)   | Play Area      |
| Bypass Destination | (None)         |
| Capacity Type      | No Restriction |

| Outlets             |                |
|---------------------|----------------|
| Outlet              |                |
| Outgoing Connection | 3.004          |
| Outlet Type         | Free Discharge |

| Advanced            |       |
|---------------------|-------|
| Conductivity (m/hr) | 500.0 |

|                                                                    |                       |             |              |
|--------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls<br>Storm Phase: Phase | Company Address:      |             |              |





Type : Porous Paving

| Dimensions                  |        |
|-----------------------------|--------|
| Exceedance Level (m)        | 24.000 |
| Depth (m)                   | 0.200  |
| Base Level (m)              | 23.800 |
| Paving Layer Depth (mm)     | 5      |
| Membrane Percolation (m/hr) | 3.0    |
| Porosity (%)                | 30     |
| Length (m)                  | 17.500 |
| Long. Slope (1:X)           | 500.00 |
| Width (m)                   | 4.000  |
| Total Volume (m³)           | 4.095  |

| Inlets             |                |
|--------------------|----------------|
| Inlet              |                |
| Inlet Type         | Lateral Inflow |
| Incoming Item(s)   | East Patio     |
| Bypass Destination | (None)         |
| Capacity Type      | No Restriction |

| Outlets             |                |
|---------------------|----------------|
| Outlet              |                |
| Outgoing Connection | 3.002          |
| Outlet Type         | Free Discharge |

| Advanced            |       |
|---------------------|-------|
| Conductivity (m/hr) | 500.0 |

|                                                                    |                       |             |              |                                                                                     |
|--------------------------------------------------------------------|-----------------------|-------------|--------------|-------------------------------------------------------------------------------------|
| Project:                                                           | Date:<br>06/08/2023   |             |              |  |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |                                                                                     |
| Report Details:<br>Type: Stormwater Controls<br>Storm Phase: Phase | Company Address:      |             |              |                                                                                     |



Type : Porous Paving

| Dimensions                  |        |
|-----------------------------|--------|
| Exceedance Level (m)        | 24.500 |
| Depth (m)                   | 0.200  |
| Base Level (m)              | 24.300 |
| Paving Layer Depth (mm)     | 5      |
| Membrane Percolation (m/hr) | 3.0    |
| Porosity (%)                | 30     |
| Length (m)                  | 17.500 |
| Long. Slope (1:X)           | 500.00 |
| Width (m)                   | 4.000  |
| Total Volume (m³)           | 4.095  |

| Inlets             |                |
|--------------------|----------------|
| Inlet              |                |
| Inlet Type         | Lateral Inflow |
| Incoming Item(s)   | Catchment Area |
| Bypass Destination | (None)         |
| Capacity Type      | No Restriction |

| Outlets             |                |
|---------------------|----------------|
| Outlet              |                |
| Outgoing Connection | 2.002          |
| Outlet Type         | Free Discharge |

| Advanced            |       |
|---------------------|-------|
| Conductivity (m/hr) | 500.0 |

|                                                                    |                       |             |              |
|--------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls<br>Storm Phase: Phase | Company Address:      |             |              |





## Cellular Storage

Type : Cellular Storage

### Dimensions

|                       |         |
|-----------------------|---------|
| Exceedance Level (m)  | 24.500  |
| Depth (m)             | 1.500   |
| Base Level (m)        | 22.400  |
| Number of Crates Long | 1       |
| Number of Crates Wide | 1       |
| Number of Crates High | 1       |
| Porosity (%)          | 95      |
| Crate Length (m)      | 17.5    |
| Crate Width (m)       | 6       |
| Crate Height (m)      | 1.5     |
| Total Volume (m³)     | 150.225 |

### Inlets

#### Inlet

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

#### Inlet (2)

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

#### Inlet (3)

|                    |                |
|--------------------|----------------|
| Inlet Type         | Point Inflow   |
| Incoming Item(s)   | 2.001          |
| Bypass Destination | (None)         |
| Capacity Type      | No Restriction |

#### Inlet (4)

|                    |                |
|--------------------|----------------|
| Inlet Type         | Point Inflow   |
| Incoming Item(s)   | 3.001          |
| Bypass Destination | (None)         |
| Capacity Type      | No Restriction |

### Outlets

#### Outlet

|                     |                |
|---------------------|----------------|
| Outgoing Connection | 1.002          |
| Outlet Type         | Free Discharge |

|                                                               |  |                       |             |              |
|---------------------------------------------------------------|--|-----------------------|-------------|--------------|
| Project:                                                      |  | Date:<br>06/08/2023   |             |              |
|                                                               |  | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Inflow Summary<br>Storm Phase: Phase |  | Company Address:      |             |              |



| Inflow Label   | Connected To     | Flow (L/s) | Runoff Method         | Area (ha)    | Percentage Impervious (%) | Urban Creep (%) | Adjusted Percentage Impervious (%) | Area Analysed (ha) |
|----------------|------------------|------------|-----------------------|--------------|---------------------------|-----------------|------------------------------------|--------------------|
| Access Road    | MH1              |            | Time of Concentration | 0.025        | 100                       | 0               | 100                                | 0.025              |
| Carpark        | Cellular Storage |            | Time of Concentration | 0.066        | 100                       | 0               | 100                                | 0.066              |
| Catchment Area | South PP         |            | Time of Concentration | 0.007        | 100                       | 0               | 100                                | 0.007              |
| East Patio     | East PP          |            | Time of Concentration | 0.007        | 100                       | 0               | 100                                | 0.007              |
| Play Area      | Play Area PP     |            | Time of Concentration | 0.030        | 100                       | 0               | 100                                | 0.030              |
| Roof           | Cellular Storage |            | Time of Concentration | 0.064        | 100                       | 0               | 100                                | 0.064              |
| West Patio     | West PP          |            | Time of Concentration | 0.004        | 100                       | 0               | 100                                | 0.004              |
| <b>TOTAL</b>   |                  | <b>0.0</b> |                       | <b>0.202</b> |                           |                 |                                    | <b>0.202</b>       |

|                            |                  |             |              |                                                                                     |
|----------------------------|------------------|-------------|--------------|-------------------------------------------------------------------------------------|
| Project:                   | Date:            |             |              |  |
|                            | 06/08/2023       |             |              |                                                                                     |
|                            | Designed by:     | Checked by: | Approved By: |                                                                                     |
|                            | Chris            |             |              |                                                                                     |
| Report Title:              | Company Address: |             |              |                                                                                     |
| Rainfall Analysis Criteria |                  |             |              |                                                                                     |

|                                 |                          |
|---------------------------------|--------------------------|
| Runoff Type                     | Dynamic                  |
| Output Interval (mins)          | 5                        |
| Time Step                       | Default                  |
| Urban Creep                     | Apply Global Value       |
| Urban Creep Global Value (%)    | 0                        |
| Junction Flood Risk Margin (mm) | 300                      |
| Perform No Discharge Analysis   | <input type="checkbox"/> |

|                                                         |                       |             |              |                                                                                     |
|---------------------------------------------------------|-----------------------|-------------|--------------|-------------------------------------------------------------------------------------|
| Project:                                                | Date:<br>06/08/2023   |             |              |  |
|                                                         | Designed by:<br>Chris | Checked by: | Approved By: |                                                                                     |
| Report Title:<br>UK and Ireland Rural Runoff Calculator | Company Address:      |             |              |                                                                                     |

ICP SUDS / IH 124

Details

|                       |          |
|-----------------------|----------|
| Method                | ICP SUDS |
| Area (ha)             | 0.202    |
| SAAR (mm)             | 800.0    |
| Soil                  | 0.47     |
| Region                | Region 7 |
| Urban                 | 0        |
| Return Period (years) | 0        |

Results

| Region   | QBAR Rural<br>(L/s) | QBAR Urban<br>(L/s) | Q 1 (years)<br>(L/s) | Q 30 (years)<br>(L/s) | Q 100 (years)<br>(L/s) |
|----------|---------------------|---------------------|----------------------|-----------------------|------------------------|
| Region 7 | 1.1                 | 1.1                 | 1.0                  | 2.6                   | 3.6                    |

|                                                                |                       |                  |              |
|----------------------------------------------------------------|-----------------------|------------------|--------------|
| Project:                                                       | Date:<br>06/08/2023   |                  |              |
|                                                                | Designed by:<br>Chris | Checked by:      | Approved By: |
| Report Details:<br>Type: Inflows Summary<br>Storm Phase: Phase |                       | Company Address: |              |





**FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow**

| Inflow         | Storm Event                            | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow Volume (m³) |
|----------------|----------------------------------------|------------------|-------------------|--------------------------|
| Play Area      | FSR: 1 years:<br>+0 %: 15 mins: Summer | 0.03             | 4.4               | 1.912                    |
| West Patio     | FSR: 1 years:<br>+0 %: 15 mins: Summer | 0.00             | 0.5               | 0.230                    |
| Roof           | FSR: 1 years:<br>+0 %: 15 mins: Summer | 0.06             | 9.3               | 4.055                    |
| Carpark        | FSR: 1 years:<br>+0 %: 15 mins: Summer | 0.07             | 9.5               | 4.181                    |
| Access Road    | FSR: 1 years:<br>+0 %: 15 mins: Summer | 0.02             | 3.6               | 1.595                    |
| Catchment Area | FSR: 1 years:<br>+0 %: 15 mins: Summer | 0.01             | 1.1               | 0.464                    |
| East Patio     | FSR: 1 years:<br>+0 %: 15 mins: Summer | 0.01             | 1.0               | 0.446                    |

|                                                                |                       |             |              |
|----------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                       | Date:<br>06/08/2023   |             |              |
|                                                                | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Inflows Summary<br>Storm Phase: Phase | Company Address:      |             |              |



**FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow**

| Inflow         | Storm Event                          | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow Volume (m³) |
|----------------|--------------------------------------|------------------|-------------------|--------------------------|
| Play Area      | FSR: 30 years: +0 %: 15 mins: Summer | 0.03             | 10.7              | 4.692                    |
| West Patio     | FSR: 30 years: +0 %: 15 mins: Summer | 0.00             | 1.3               | 0.563                    |
| Roof           | FSR: 30 years: +0 %: 15 mins: Summer | 0.06             | 22.8              | 9.950                    |
| Carpark        | FSR: 30 years: +0 %: 15 mins: Summer | 0.07             | 23.4              | 10.244                   |
| Access Road    | FSR: 30 years: +0 %: 15 mins: Summer | 0.02             | 8.9               | 3.911                    |
| Catchment Area | FSR: 30 years: +0 %: 15 mins: Summer | 0.01             | 2.6               | 1.132                    |
| East Patio     | FSR: 30 years: +0 %: 15 mins: Summer | 0.01             | 2.5               | 1.093                    |

|                                                                |                       |             |              |
|----------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                       | Date:<br>06/08/2023   |             |              |
|                                                                | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Inflows Summary<br>Storm Phase: Phase | Company Address:      |             |              |

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DRN



**FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Inflow**

| Inflow         | Storm Event                           | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow Volume (m³) |
|----------------|---------------------------------------|------------------|-------------------|--------------------------|
| Play Area      | FSR: 100 years: +0 %: 15 mins: Summer | 0.03             | 13.9              | 6.065                    |
| West Patio     | FSR: 100 years: +0 %: 15 mins: Summer | 0.00             | 1.7               | 0.728                    |
| Roof           | FSR: 100 years: +0 %: 15 mins: Summer | 0.06             | 29.5              | 12.876                   |
| Carpark        | FSR: 100 years: +0 %: 15 mins: Summer | 0.07             | 30.4              | 13.254                   |
| Access Road    | FSR: 100 years: +0 %: 15 mins: Summer | 0.02             | 11.6              | 5.053                    |
| Catchment Area | FSR: 100 years: +0 %: 15 mins: Summer | 0.01             | 3.4               | 1.465                    |
| East Patio     | FSR: 100 years: +0 %: 15 mins: Summer | 0.01             | 3.2               | 1.417                    |

|                                                                |                       |             |              |
|----------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                       | Date:<br>06/08/2023   |             |              |
|                                                                | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Inflows Summary<br>Storm Phase: Phase | Company Address:      |             |              |

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DRN



**FSR: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Inflow**

| Inflow         | Storm Event                           | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow Volume (m³) |
|----------------|---------------------------------------|------------------|-------------------|--------------------------|
| Play Area      | FSR: 30 years: +40 %: 15 mins: Summer | 0.03             | 15.0              | 6.569                    |
| West Patio     | FSR: 30 years: +40 %: 15 mins: Summer | 0.00             | 1.8               | 0.785                    |
| Roof           | FSR: 30 years: +40 %: 15 mins: Summer | 0.06             | 31.9              | 13.932                   |
| Carpark        | FSR: 30 years: +40 %: 15 mins: Summer | 0.07             | 32.8              | 14.342                   |
| Access Road    | FSR: 30 years: +40 %: 15 mins: Summer | 0.02             | 12.5              | 5.473                    |
| Catchment Area | FSR: 30 years: +40 %: 15 mins: Summer | 0.01             | 3.6               | 1.585                    |
| East Patio     | FSR: 30 years: +40 %: 15 mins: Summer | 0.01             | 3.5               | 1.534                    |

|                                                                |                       |             |              |
|----------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                       | Date:<br>06/08/2023   |             |              |
|                                                                | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Inflows Summary<br>Storm Phase: Phase | Company Address:      |             |              |



**FSR: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Inflow**

| Inflow         | Storm Event                            | Inflow Area (ha) | Max. Inflow (L/s) | Total Inflow Volume (m³) |
|----------------|----------------------------------------|------------------|-------------------|--------------------------|
| Play Area      | FSR: 100 years: +45 %: 15 mins: Summer | 0.03             | 20.2              | 8.805                    |
| West Patio     | FSR: 100 years: +45 %: 15 mins: Summer | 0.00             | 2.4               | 1.055                    |
| Roof           | FSR: 100 years: +45 %: 15 mins: Summer | 0.06             | 42.8              | 18.674                   |
| Carpark        | FSR: 100 years: +45 %: 15 mins: Summer | 0.07             | 44.0              | 19.222                   |
| Access Road    | FSR: 100 years: +45 %: 15 mins: Summer | 0.02             | 16.8              | 7.331                    |
| Catchment Area | FSR: 100 years: +45 %: 15 mins: Summer | 0.01             | 4.9               | 2.127                    |
| East Patio     | FSR: 100 years: +45 %: 15 mins: Summer | 0.01             | 4.7               | 2.052                    |

|                                                                  |                       |             |              |
|------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                         | Date:<br>06/08/2023   |             |              |
|                                                                  | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Junctions Summary<br>Storm Phase: Phase | Company Address:      |             |              |





FSR: 1 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. Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Status     |
|----------|--------------------------------------|-----------------|------------------|----------------|----------------|-------------------|---------------------------|--------------------------|--------------------|-----------------------------|------------|
| MH1      | FSR: 1 years: +0 %: 480 mins: Winter | 24.500          | 22.100           | 22.642         | 0.542          | 0.7               | 0.613                     | 0.000                    | 0.6                | 30.087                      | Surcharged |
| 23       | FSR: 1 years: +0 %: 480 mins: Winter | 23.000          | 21.700           | 21.715         | 0.015          | 0.6               | 0.000                     | 0.000                    | 0.6                | 30.070                      | OK         |
| MH4      | FSR: 1 years: +0 %: 60 mins: Summer  | 24.500          | 23.900           | 23.912         | 0.012          | 0.4               | 0.014                     | 0.000                    | 0.4                | 0.743                       | OK         |
| MH2      | FSR: 1 years: +0 %: 30 mins: Summer  | 24.500          | 23.300           | 23.310         | 0.010          | 0.4               | 0.012                     | 0.000                    | 0.4                | 0.327                       | OK         |
| MH3      | FSR: 1 years: +0 %: 60 mins: Summer  | 24.500          | 23.300           | 23.313         | 0.013          | 0.6               | 0.015                     | 0.000                    | 0.6                | 1.064                       | OK         |

|                                                                  |                       |             |              |
|------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                         | Date:<br>06/08/2023   |             |              |
|                                                                  | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Junctions Summary<br>Storm Phase: Phase | Company Address:      |             |              |



**FSR: 30 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. Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Status     |
|----------|------------------------------------------|-----------------|------------------|----------------|----------------|-------------------|---------------------------|--------------------------|--------------------|-----------------------------|------------|
| MH1      | FSR: 30 years: +0<br>%: 960 mins: Winter | 24.50<br>0      | 22.10<br>0       | 23.085         | 0.985          | 0.8               | 1.114                     | 0.000                    | 0.8                | 78.334                      | Surcharged |
| 23       | FSR: 30 years: +0<br>%: 960 mins: Winter | 23.00<br>0      | 21.70<br>0       | 21.718         | 0.018          | 0.8               | 0.000                     | 0.000                    | 0.8                | 78.314                      | OK         |
| MH4      | FSR: 30 years: +0<br>%: 30 mins: Summer  | 24.50<br>0      | 23.90<br>0       | 23.921         | 0.021          | 1.3               | 0.024                     | 0.000                    | 1.3                | 1.333                       | OK         |
| MH2      | FSR: 30 years: +0<br>%: 15 mins: Summer  | 24.50<br>0      | 23.30<br>0       | 23.317         | 0.017          | 1.1               | 0.019                     | 0.000                    | 1.0                | 0.578                       | OK         |
| MH3      | FSR: 30 years: +0<br>%: 30 mins: Summer  | 24.50<br>0      | 23.30<br>0       | 23.323         | 0.023          | 1.9               | 0.026                     | 0.000                    | 1.8                | 1.896                       | OK         |

|                                                                  |                       |             |              |
|------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                         | Date:<br>06/08/2023   |             |              |
|                                                                  | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Junctions Summary<br>Storm Phase: Phase | Company Address:      |             |              |





FSR: 100 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. Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Status     |
|----------|----------------------------------------|-----------------|------------------|----------------|----------------|-------------------|---------------------------|--------------------------|--------------------|-----------------------------|------------|
| MH1      | FSR: 100 years: +0 %: 960 mins: Winter | 24.500          | 22.100           | 23.341         | 1.241          | 0.9               | 1.404                     | 0.000                    | 0.9                | 87.730                      | Surcharged |
| 23       | FSR: 100 years: +0 %: 960 mins: Winter | 23.000          | 21.700           | 21.719         | 0.019          | 0.9               | 0.000                     | 0.000                    | 0.9                | 87.676                      | OK         |
| MH4      | FSR: 100 years: +0 %: 30 mins: Summer  | 24.500          | 23.900           | 23.925         | 0.025          | 1.8               | 0.028                     | 0.000                    | 1.8                | 1.816                       | OK         |
| MH2      | FSR: 100 years: +0 %: 960 mins: Winter | 24.500          | 23.300           | 23.345         | 0.045          | 0.2               | 0.051                     | 0.000                    | 0.2                | 7.581                       | OK         |
| MH3      | FSR: 100 years: +0 %: 960 mins: Winter | 24.500          | 23.300           | 23.345         | 0.045          | 0.6               | 0.051                     | 0.000                    | 0.6                | 23.337                      | OK         |

|                                                                  |                       |             |              |
|------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                         | Date:<br>06/08/2023   |             |              |
|                                                                  | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Junctions Summary<br>Storm Phase: Phase | Company Address:      |             |              |





FSR: 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. Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Status     |
|----------|----------------------------------------|-----------------|------------------|----------------|----------------|-------------------|---------------------------|--------------------------|--------------------|-----------------------------|------------|
| MH1      | FSR: 30 years: +40 %: 960 mins: Winter | 24.500          | 22.100           | 23.457         | 1.357          | 1.0               | 1.534                     | 0.000                    | 1.0                | 91.859                      | Surcharged |
| 23       | FSR: 30 years: +40 %: 960 mins: Winter | 23.000          | 21.700           | 21.719         | 0.019          | 1.0               | 0.000                     | 0.000                    | 1.0                | 91.595                      | OK         |
| MH4      | FSR: 30 years: +40 %: 30 mins: Summer  | 24.500          | 23.900           | 23.926         | 0.026          | 1.9               | 0.029                     | 0.000                    | 1.9                | 1.968                       | OK         |
| MH2      | FSR: 30 years: +40 %: 960 mins: Winter | 24.500          | 23.300           | 23.460         | 0.160          | 0.3               | 0.181                     | 0.000                    | 0.3                | 8.350                       | Surcharged |
| MH3      | FSR: 30 years: +40 %: 960 mins: Winter | 24.500          | 23.300           | 23.461         | 0.161          | 0.7               | 0.182                     | 0.000                    | 0.7                | 25.724                      | Surcharged |

|                                                                  |                       |             |              |
|------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                         | Date:<br>06/08/2023   |             |              |
|                                                                  | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Junctions Summary<br>Storm Phase: Phase | Company Address:      |             |              |





FSR: 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. Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Status     |
|----------|------------------------------------------------|-----------------|------------------|----------------|----------------|-------------------|---------------------------|--------------------------|--------------------|-----------------------------|------------|
| MH1      | FSR: 100 years:<br>+45 %: 1440 mins:<br>Winter | 24.50<br>0      | 22.10<br>0       | 23.881         | 1.781          | 1.1               | 2.015                     | 0.000                    | 1.1                | 152.948                     | Surcharged |
| 23       | FSR: 100 years:<br>+45 %: 1440 mins:<br>Winter | 23.00<br>0      | 21.70<br>0       | 21.721         | 0.021          | 1.1               | 0.000                     | 0.000                    | 1.1                | 152.926                     | OK         |
| MH4      | FSR: 100 years:<br>+45 %: 30 mins:<br>Summer   | 24.50<br>0      | 23.90<br>0       | 23.931         | 0.031          | 2.7               | 0.035                     | 0.000                    | 2.7                | 2.804                       | OK         |
| MH2      | FSR: 100 years:<br>+45 %: 1440 mins:<br>Winter | 24.50<br>0      | 23.30<br>0       | 23.886         | 0.586          | 0.3               | 0.662                     | 0.000                    | 0.3                | 12.260                      | Surcharged |
| MH3      | FSR: 100 years:<br>+45 %: 1440 mins:<br>Winter | 24.50<br>0      | 23.30<br>0       | 23.886         | 0.586          | 0.8               | 0.663                     | 0.000                    | 0.8                | 40.048                      | Surcharged |

|                                                                            |                       |             |              |
|----------------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                                   | Date:<br>06/08/2023   |             |              |
|                                                                            | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls Summary<br>Storm Phase: Phase | Company Address:      |             |              |





**FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Resident Volume**

| Stormwater Control | Storm Event                           | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|--------------------|---------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|--------------------------|------------------------|--------------------|-----------------------------|--------------------------|--------|
| Cellular Storage   | FSR: 1 years: +0 %: 480 mins: Winter  | 22.644            | 22.644            | 0.244             | 0.244             | 2.8               | 24.289                    | 0.000                    | 0.000                  | 0.6                | 25.152                      | 83.831                   | OK     |
| West PP            | FSR: 1 years: +0 %: 960 mins: Summer  | 24.388            | 24.303            | 0.051             | 0.003             | 0.1               | 0.388                     | 0.000                    | 0.000                  | 0.0                | 1.026                       | 82.085                   | OK     |
| Play Area PP       | FSR: 1 years: +0 %: 1440 mins: Summer | 24.384            | 24.258            | 0.057             | 0.008             | 0.4               | 4.820                     | 0.000                    | 0.000                  | 0.1                | 8.165                       | 78.708                   | OK     |
| East PP            | FSR: 1 years: +0 %: 960 mins: Summer  | 23.884            | 23.805            | 0.049             | 0.005             | 0.1               | 0.716                     | 0.000                    | 0.000                  | 0.1                | 1.808                       | 82.523                   | OK     |
| South PP           | FSR: 1 years: +0 %: 480 mins: Summer  | 24.385            | 24.305            | 0.050             | 0.005             | 0.2               | 0.726                     | 0.000                    | 0.000                  | 0.1                | 1.360                       | 82.263                   | OK     |

|                                                                            |                       |                  |              |
|----------------------------------------------------------------------------|-----------------------|------------------|--------------|
| Project:                                                                   | Date:<br>06/08/2023   |                  |              |
|                                                                            | Designed by:<br>Chris | Checked by:      | Approved By: |
| Report Details:<br>Type: Stormwater Controls Summary<br>Storm Phase: Phase |                       | Company Address: |              |





**FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Resident Volume**

| Stormwater Control | Storm Event                           | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|--------------------|---------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|--------------------------|------------------------|--------------------|-----------------------------|--------------------------|--------|
| Cellular Storage   | FSR: 30 years: +0 %: 960 mins: Winter | 23.088            | 23.088            | 0.688             | 0.688             | 3.8               | 68.640                    | 0.000                    | 0.000                  | 0.8                | 65.022                      | 54.309                   | OK     |
| West PP            | FSR: 30 years: +0 %: 480 mins: Summer | 24.435            | 24.306            | 0.098             | 0.006             | 0.2               | 0.722                     | 0.000                    | 0.000                  | 0.1                | 1.527                       | 66.636                   | OK     |
| Play Area PP       | FSR: 30 years: +0 %: 960 mins: Summer | 24.446            | 24.263            | 0.119             | 0.013             | 1.2               | 8.983                     | 0.000                    | 0.000                  | 0.4                | 14.118                      | 60.320                   | OK     |
| East PP            | FSR: 30 years: +0 %: 360 mins: Summer | 23.934            | 23.809            | 0.099             | 0.009             | 0.6               | 1.379                     | 0.000                    | 0.000                  | 0.2                | 2.667                       | 66.316                   | OK     |
| South PP           | FSR: 30 years: +0 %: 360 mins: Summer | 24.437            | 24.307            | 0.102             | 0.007             | 0.6               | 1.412                     | 0.000                    | 0.000                  | 0.2                | 2.772                       | 65.507                   | OK     |

|                                                                            |                       |                  |              |
|----------------------------------------------------------------------------|-----------------------|------------------|--------------|
| Project:                                                                   | Date:<br>06/08/2023   |                  |              |
|                                                                            | Designed by:<br>Chris | Checked by:      | Approved By: |
| Report Details:<br>Type: Stormwater Controls Summary<br>Storm Phase: Phase |                       | Company Address: |              |





FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Resident Volume

| Stormwater Control | Storm Event                            | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|--------------------|----------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|--------------------------|------------------------|--------------------|-----------------------------|--------------------------|--------|
| Cellular Storage   | FSR: 100 years: +0 %: 960 mins: Winter | 23.345            | 23.345            | 0.945             | 0.945             | 4.8               | 94.232                    | 0.000                    | 0.000                  | 0.9                | 70.766                      | 37.273                   | OK     |
| West PP            | FSR: 100 years: +0 %: 360 mins: Summer | 24.460            | 24.308            | 0.123             | 0.008             | 0.4               | 0.898                     | 0.000                    | 0.000                  | 0.2                | 1.789                       | 58.509                   | OK     |
| Play Area PP       | FSR: 100 years: +0 %: 960 mins: Summer | 24.478            | 24.265            | 0.151             | 0.015             | 1.5               | 11.069                    | 0.000                    | 0.000                  | 0.5                | 18.416                      | 51.103                   | OK     |
| East PP            | FSR: 100 years: +0 %: 360 mins: Summer | 23.959            | 23.810            | 0.124             | 0.010             | 0.7               | 1.712                     | 0.000                    | 0.000                  | 0.3                | 3.526                       | 58.185                   | OK     |
| South PP           | FSR: 100 years: +0 %: 360 mins: Summer | 24.463            | 24.309            | 0.128             | 0.009             | 0.7               | 1.756                     | 0.000                    | 0.000                  | 0.3                | 3.684                       | 57.107                   | OK     |

|                                                                            |                       |                  |              |
|----------------------------------------------------------------------------|-----------------------|------------------|--------------|
| Project:                                                                   | Date:<br>06/08/2023   |                  |              |
|                                                                            | Designed by:<br>Chris | Checked by:      | Approved By: |
| Report Details:<br>Type: Stormwater Controls Summary<br>Storm Phase: Phase |                       | Company Address: |              |





**FSR: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Resident Volume**

| Stormwater Control | Storm Event                            | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|--------------------|----------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|--------------------------|------------------------|--------------------|-----------------------------|--------------------------|--------|
| Cellular Storage   | FSR: 30 years: +40 %: 960 mins: Winter | 23.460            | 23.460            | 1.060             | 1.060             | 5.4               | 105.760                   | 0.000                    | 0.000                  | 1.0                | 73.291                      | 29.599                   | OK     |
| West PP            | FSR: 30 years: +40 %: 480 mins: Summer | 24.469            | 24.308            | 0.132             | 0.008             | 0.3               | 0.957                     | 0.000                    | 0.000                  | 0.2                | 2.212                       | 55.807                   | OK     |
| Play Area PP       | FSR: 30 years: +40 %: 960 mins: Summer | 24.493            | 24.266            | 0.166             | 0.016             | 1.6               | 12.010                    | 0.000                    | 0.000                  | 0.6                | 20.447                      | 46.949                   | OK     |
| East PP            | FSR: 30 years: +40 %: 360 mins: Summer | 23.968            | 23.810            | 0.133             | 0.010             | 0.8               | 1.826                     | 0.000                    | 0.000                  | 0.4                | 3.843                       | 55.415                   | OK     |
| South PP           | FSR: 30 years: +40 %: 360 mins: Summer | 24.472            | 24.309            | 0.137             | 0.009             | 0.8               | 1.871                     | 0.000                    | 0.000                  | 0.4                | 3.996                       | 54.314                   | OK     |

|                                                                            |                       |             |              |
|----------------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                                   | Date:<br>06/08/2023   |             |              |
|                                                                            | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Stormwater Controls Summary<br>Storm Phase: Phase | Company Address:      |             |              |





**FSR: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Resident Volume**

| Stormwater Control | Storm Event                              | Max. US Level (m) | Max. DS Level (m) | Max. US Depth (m) | Max. DS Depth (m) | Max. Inflow (L/s) | Max. Resident Volume (m³) | Max. Flooded Volume (m³) | Total Lost Volume (m³) | Max. Outflow (L/s) | Total Discharge Volume (m³) | Percentage Available (%) | Status |
|--------------------|------------------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|---------------------------|--------------------------|------------------------|--------------------|-----------------------------|--------------------------|--------|
| Cellular Storage   | FSR: 100 years: +45 %: 1440 mins: Winter | 23.886            | 23.886            | 1.486             | 1.486             | 5.3               | 148.199                   | 0.000                    | 0.000                  | 1.1                | 125.612                     | 1.349                    | OK     |
| West PP            | FSR: 100 years: +45 %: 240 mins: Summer  | 24.507            | 24.310            | 0.170             | 0.010             | 0.7               | 1.222                     | 0.000                    | 0.000                  | 0.3                | 2.264                       | 43.539                   | OK     |
| Play Area PP       | FSR: 100 years: +45 %: 480 mins: Summer  | 24.540            | 24.272            | 0.213             | 0.022             | 3.6               | 15.193                    | 0.000                    | 0.000                  | 1.0                | 19.812                      | 32.888                   | OK     |
| East PP            | FSR: 100 years: +45 %: 240 mins: Summer  | 24.007            | 23.813            | 0.172             | 0.013             | 1.4               | 2.338                     | 0.000                    | 0.000                  | 0.6                | 4.484                       | 42.903                   | OK     |
| South PP           | FSR: 100 years: +45 %: 240 mins: Summer  | 24.512            | 24.311            | 0.177             | 0.011             | 1.4               | 2.397                     | 0.000                    | 0.000                  | 0.6                | 4.665                       | 41.470                   | OK     |

|                                                                    |                       |             |              |
|--------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Connections Summary<br>Storm Phase: Phase | Company Address:      |             |              |





**FSR: 1 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow**

| Connection | Storm Event                          | Connection Type | From             | To               | Upstream Cover Level (m) | Max. US Water Level (m) | Max. Flow Depth (m) | Discharge Volume (m³) | Max. Velocity (m/s) | Flow / Capacity | Max. Flow (L/s) | Status     |
|------------|--------------------------------------|-----------------|------------------|------------------|--------------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------|-----------------|------------|
| 1.002      | FSR: 1 years: +0 %: 120 mins: Summer | Pipe            | Cellular Storage | MH1              | 24.500                   | 22.594                  | 0.100               | 4.485                 | 0.1                 | 0.09            | 0.7             | Surcharged |
| 1.001      | FSR: 1 years: +0 %: 480 mins: Winter | Pipe            | MH1              | 23               | 24.500                   | 22.642                  | 0.016               | 30.070                | 0.8                 | 0.05            | 0.6             | Surcharged |
| 2.002      | FSR: 1 years: +0 %: 30 mins: Summer  | Pipe            | South PP         | MH2              | 24.535                   | 24.320                  | 0.009               | 0.224                 | 0.7                 | 0.01            | 0.2             | OK         |
| 2.003      | FSR: 1 years: +0 %: 30 mins: Summer  | Pipe            | West PP          | MH2              | 24.537                   | 24.318                  | 0.008               | 0.108                 | 0.4                 | 0.01            | 0.1             | OK         |
| 2.001      | FSR: 1 years: +0 %: 30 mins: Summer  | Pipe            | MH2              | Cellular Storage | 24.500                   | 23.310                  | 0.064               | 0.327                 | 0.1                 | 0.02            | 0.4             | OK         |
| 3.004      | FSR: 1 years: +0 %: 60 mins: Summer  | Pipe            | Play Area PP     | MH4              | 24.577                   | 24.279                  | 0.013               | 0.748                 | 0.7                 | 0.04            | 0.4             | OK         |
| 3.002      | FSR: 1 years: +0 %: 30 mins: Summer  | Pipe            | East PP          | MH3              | 24.035                   | 23.819                  | 0.011               | 0.214                 | 0.6                 | 0.01            | 0.2             | OK         |
| 3.001      | FSR: 1 years: +0 %: 60 mins: Summer  | Pipe            | MH3              | Cellular Storage | 24.500                   | 23.313                  | 0.083               | 1.064                 | 0.1                 | 0.04            | 0.6             | OK         |
| 3.003      | FSR: 1 years: +0 %: 60 mins: Summer  | Pipe            | MH4              | MH3              | 24.500                   | 23.912                  | 0.012               | 0.743                 | 0.7                 | 0.03            | 0.4             | OK         |

|                                                                    |                       |             |              |
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| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Connections Summary<br>Storm Phase: Phase | Company Address:      |             |              |





**FSR: 30 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow**

| Connection | Storm Event                           | Connection Type | From             | To               | Upstream Cover Level (m) | Max. US Water Level (m) | Max. Flow Depth (m) | Discharge Volume (m³) | Max. Velocity (m/s) | Flow / Capacity | Max. Flow (L/s) | Status     |
|------------|---------------------------------------|-----------------|------------------|------------------|--------------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------|-----------------|------------|
| 1.002      | FSR: 30 years: +0 %: 960 mins: Winter | Pipe            | Cellular Storage | MH1              | 24.500                   | 23.088                  | 0.100               | 65.022                | 0.1                 | 0.1             | 0.8             | Surcharged |
| 1.001      | FSR: 30 years: +0 %: 960 mins: Winter | Pipe            | MH1              | 23               | 24.500                   | 23.085                  | 0.018               | 78.314                | 0.8                 | 0.07            | 0.8             | Surcharged |
| 2.002      | FSR: 30 years: +0 %: 15 mins: Summer  | Pipe            | South PP         | MH2              | 24.535                   | 24.337                  | 0.015               | 0.395                 | 1.0                 | 0.03            | 0.7             | OK         |
| 2.003      | FSR: 30 years: +0 %: 15 mins: Summer  | Pipe            | West PP          | MH2              | 24.537                   | 24.335                  | 0.014               | 0.196                 | 0.5                 | 0.03            | 0.4             | OK         |
| 2.001      | FSR: 30 years: +0 %: 15 mins: Summer  | Pipe            | MH2              | Cellular Storage | 24.500                   | 23.317                  | 0.100               | 0.578                 | 0.2                 | 0.07            | 1.0             | OK         |
| 3.004      | FSR: 30 years: +0 %: 30 mins: Summer  | Pipe            | Play Area PP     | MH4              | 24.577                   | 24.306                  | 0.023               | 1.344                 | 1.0                 | 0.12            | 1.3             | OK         |
| 3.002      | FSR: 30 years: +0 %: 15 mins: Summer  | Pipe            | East PP          | MH3              | 24.035                   | 23.836                  | 0.016               | 0.378                 | 0.8                 | 0.04            | 0.7             | OK         |
| 3.001      | FSR: 30 years: +0 %: 30 mins: Summer  | Pipe            | MH3              | Cellular Storage | 24.500                   | 23.323                  | 0.100               | 1.896                 | 0.2                 | 0.12            | 1.8             | OK         |
| 3.003      | FSR: 30 years: +0 %: 30 mins: Summer  | Pipe            | MH4              | MH3              | 24.500                   | 23.921                  | 0.022               | 1.333                 | 1.0                 | 0.1             | 1.3             | OK         |

|                                                                    |                       |             |              |
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| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Connections Summary<br>Storm Phase: Phase | Company Address:      |             |              |





**FSR: 100 years: Increase Rainfall (%): +0: Critical Storm Per Item: Rank By: Max. Flow**

| Connection | Storm Event                            | Connection Type | From             | To               | Upstream Cover Level (m) | Max. US Water Level (m) | Max. Flow Depth (m) | Discharge Volume (m³) | Max. Velocity (m/s) | Flow / Capacity | Max. Flow (L/s) | Status     |
|------------|----------------------------------------|-----------------|------------------|------------------|--------------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------|-----------------|------------|
| 1.002      | FSR: 100 years: +0 %: 960 mins: Summer | Pipe            | Cellular Storage | MH1              | 24.500                   | 23.336                  | 0.100               | 71.023                | 0.1                 | 0.12            | 0.9             | Surcharged |
| 1.001      | FSR: 100 years: +0 %: 960 mins: Winter | Pipe            | MH1              | 23               | 24.500                   | 23.341                  | 0.019               | 87.676                | 0.9                 | 0.08            | 0.9             | Surcharged |
| 2.002      | FSR: 100 years: +0 %: 15 mins: Summer  | Pipe            | South PP         | MH2              | 24.535                   | 24.347                  | 0.017               | 0.523                 | 1.1                 | 0.04            | 1.0             | OK         |
| 2.003      | FSR: 100 years: +0 %: 15 mins: Summer  | Pipe            | West PP          | MH2              | 24.537                   | 24.344                  | 0.016               | 0.260                 | 0.6                 | 0.03            | 0.5             | OK         |
| 2.001      | FSR: 100 years: +0 %: 15 mins: Summer  | Pipe            | MH2              | Cellular Storage | 24.500                   | 23.320                  | 0.100               | 0.766                 | 0.2                 | 0.09            | 1.3             | OK         |
| 3.004      | FSR: 100 years: +0 %: 30 mins: Summer  | Pipe            | Play Area PP     | MH4              | 24.577                   | 24.322                  | 0.027               | 1.828                 | 1.1                 | 0.16            | 1.8             | OK         |
| 3.002      | FSR: 100 years: +0 %: 15 mins: Summer  | Pipe            | East PP          | MH3              | 24.035                   | 23.846                  | 0.019               | 0.501                 | 0.8                 | 0.05            | 0.9             | OK         |
| 3.001      | FSR: 100 years: +0 %: 30 mins: Summer  | Pipe            | MH3              | Cellular Storage | 24.500                   | 23.327                  | 0.100               | 2.586                 | 0.3                 | 0.17            | 2.5             | OK         |
| 3.003      | FSR: 100 years: +0 %: 30 mins: Summer  | Pipe            | MH4              | MH3              | 24.500                   | 23.925                  | 0.026               | 1.816                 | 1.1                 | 0.13            | 1.8             | OK         |

|                                                                    |                       |             |              |
|--------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Connections Summary<br>Storm Phase: Phase | Company Address:      |             |              |





**FSR: 30 years: Increase Rainfall (%): +40: Critical Storm Per Item: Rank By: Max. Flow**

| Connection | Storm Event                            | Connection Type | From             | To               | Upstream Cover Level (m) | Max. US Water Level (m) | Max. Flow Depth (m) | Discharge Volume (m³) | Max. Velocity (m/s) | Flow / Capacity | Max. Flow (L/s) | Status     |
|------------|----------------------------------------|-----------------|------------------|------------------|--------------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------|-----------------|------------|
| 1.002      | FSR: 30 years: +40 %: 960 mins: Winter | Pipe            | Cellular Storage | MH1              | 24.500                   | 23.460                  | 0.100               | 73.048                | 0.1                 | 0.12            | 1.0             | Surcharged |
| 1.001      | FSR: 30 years: +40 %: 960 mins: Winter | Pipe            | MH1              | 23               | 24.500                   | 23.457                  | 0.020               | 91.595                | 0.9                 | 0.08            | 1.0             | Surcharged |
| 2.002      | FSR: 30 years: +40 %: 15 mins: Summer  | Pipe            | South PP         | MH2              | 24.535                   | 24.351                  | 0.018               | 0.570                 | 1.1                 | 0.05            | 1.1             | OK         |
| 2.003      | FSR: 30 years: +40 %: 15 mins: Summer  | Pipe            | West PP          | MH2              | 24.537                   | 24.348                  | 0.017               | 0.282                 | 0.6                 | 0.04            | 0.5             | OK         |
| 2.001      | FSR: 30 years: +40 %: 15 mins: Summer  | Pipe            | MH2              | Cellular Storage | 24.500                   | 23.321                  | 0.100               | 0.835                 | 0.2                 | 0.1             | 1.5             | OK         |
| 3.004      | FSR: 30 years: +40 %: 30 mins: Summer  | Pipe            | Play Area PP     | MH4              | 24.577                   | 24.327                  | 0.028               | 1.981                 | 1.1                 | 0.18            | 1.9             | OK         |
| 3.002      | FSR: 30 years: +40 %: 15 mins: Summer  | Pipe            | East PP          | MH3              | 24.035                   | 23.850                  | 0.021               | 0.546                 | 0.8                 | 0.06            | 1.0             | OK         |
| 3.001      | FSR: 30 years: +40 %: 30 mins: Summer  | Pipe            | MH3              | Cellular Storage | 24.500                   | 23.328                  | 0.100               | 2.801                 | 0.3                 | 0.18            | 2.7             | OK         |
| 3.003      | FSR: 30 years: +40 %: 30 mins: Summer  | Pipe            | MH4              | MH3              | 24.500                   | 23.926                  | 0.027               | 1.968                 | 1.1                 | 0.14            | 1.9             | OK         |

|                                                                    |                       |             |              |
|--------------------------------------------------------------------|-----------------------|-------------|--------------|
| Project:                                                           | Date:<br>06/08/2023   |             |              |
|                                                                    | Designed by:<br>Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Connections Summary<br>Storm Phase: Phase | Company Address:      |             |              |





**FSR: 100 years: Increase Rainfall (%): +45: Critical Storm Per Item: Rank By: Max. Flow**

| Connection | Storm Event                              | Connection Type | From             | To               | Upstream Cover Level (m) | Max. US Water Level (m) | Max. Flow Depth (m) | Discharge Volume (m³) | Max. Velocity (m/s) | Flow / Capacity | Max. Flow (L/s) | Status     |
|------------|------------------------------------------|-----------------|------------------|------------------|--------------------------|-------------------------|---------------------|-----------------------|---------------------|-----------------|-----------------|------------|
| 1.002      | FSR: 100 years: +45 %: 960 mins: Winter  | Pipe            | Cellular Storage | MH1              | 24.500                   | 23.882                  | 0.100               | 79.983                | 0.1                 | 0.14            | 1.1             | Surcharged |
| 1.001      | FSR: 100 years: +45 %: 1440 mins: Winter | Pipe            | MH1              | 23               | 24.500                   | 23.881                  | 0.021               | 152.926               | 0.9                 | 0.1             | 1.1             | Surcharged |
| 2.002      | FSR: 100 years: +45 %: 15 mins: Summer   | Pipe            | South PP         | MH2              | 24.535                   | 24.367                  | 0.021               | 0.790                 | 1.2                 | 0.06            | 1.5             | OK         |
| 2.003      | FSR: 100 years: +45 %: 15 mins: Summer   | Pipe            | West PP          | MH2              | 24.537                   | 24.363                  | 0.020               | 0.387                 | 0.6                 | 0.05            | 0.7             | OK         |
| 2.001      | FSR: 100 years: +45 %: 15 mins: Summer   | Pipe            | MH2              | Cellular Storage | 24.500                   | 23.325                  | 0.100               | 1.158                 | 0.3                 | 0.15            | 2.1             | OK         |
| 3.004      | FSR: 100 years: +45 %: 30 mins: Summer   | Pipe            | Play Area PP     | MH4              | 24.577                   | 24.353                  | 0.033               | 2.820                 | 1.2                 | 0.25            | 2.7             | Surcharged |
| 3.002      | FSR: 100 years: +45 %: 15 mins: Summer   | Pipe            | East PP          | MH3              | 24.035                   | 23.865                  | 0.026               | 0.753                 | 0.9                 | 0.08            | 1.4             | OK         |
| 3.001      | FSR: 100 years: +45 %: 30 mins: Summer   | Pipe            | MH3              | Cellular Storage | 24.500                   | 23.334                  | 0.100               | 4.001                 | 0.5                 | 0.26            | 3.8             | OK         |
| 3.003      | FSR: 100 years: +45 %: 30 mins: Summer   | Pipe            | MH4              | MH3              | 24.500                   | 23.931                  | 0.032               | 2.804                 | 1.2                 | 0.2             | 2.7             | OK         |

|                                                                 |                    |             |              |
|-----------------------------------------------------------------|--------------------|-------------|--------------|
| Project:                                                        | Date: 06/08/2023   |             |              |
|                                                                 | Designed by: Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Phase Management<br>Storm Phase: Phase | Company Address:   |             |              |





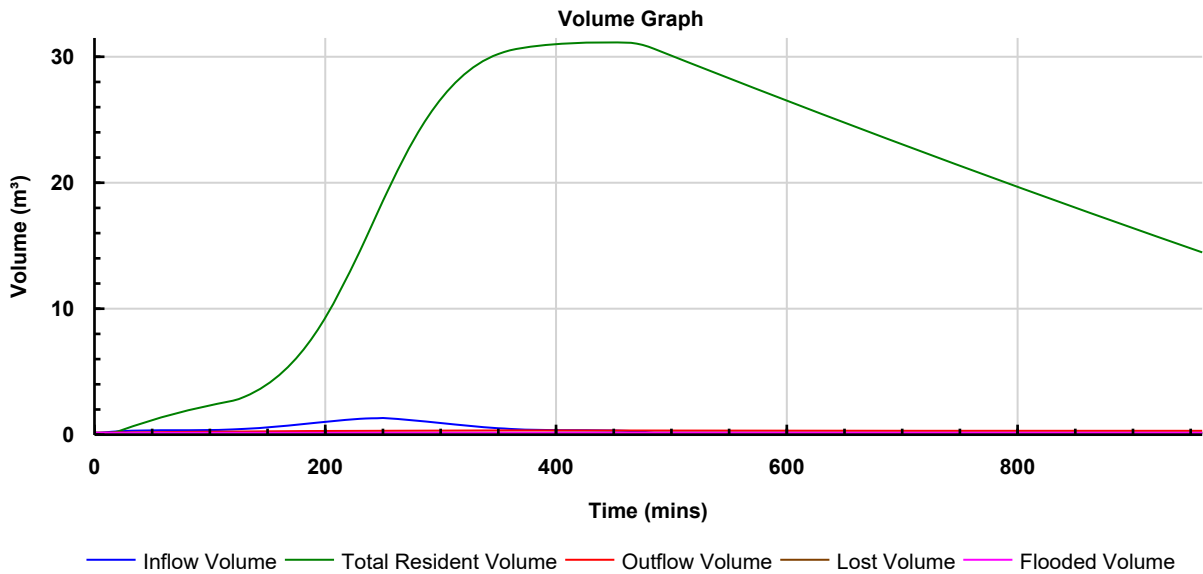
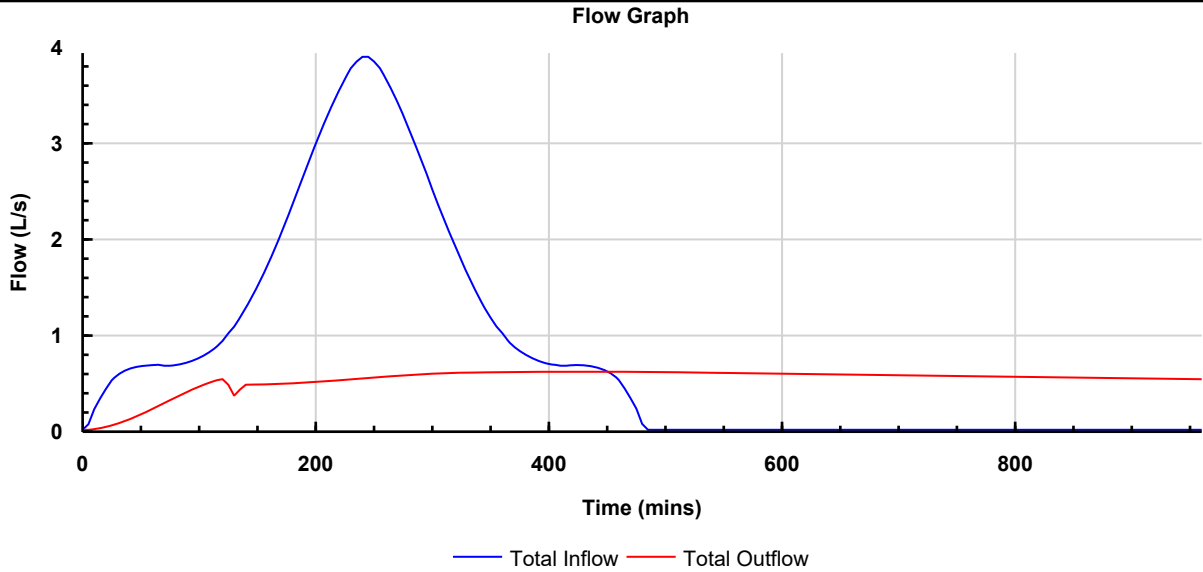
Phase

FSR: 1 years: Increase Rainfall (%): +0: 480 mins: Winter

Tables

| Name  | Max. Inflow (L/s) | Total Inflow Volume (m³) | Max. Outflow (L/s) | Total Outflow Volume (m³) |
|-------|-------------------|--------------------------|--------------------|---------------------------|
| 23    |                   |                          | 0.6                | 30.070                    |
| TOTAL | 3.9               | 44.378                   | 0.6                | 30.070                    |

Graphs



|                        |                    |             |              |
|------------------------|--------------------|-------------|--------------|
| Project:               | Date: 06/08/2023   |             |              |
|                        | Designed by: Chris | Checked by: | Approved By: |
| Report Details:        | Company Address:   |             |              |
| Type: Phase Management |                    |             |              |
| Storm Phase: Phase     |                    |             |              |





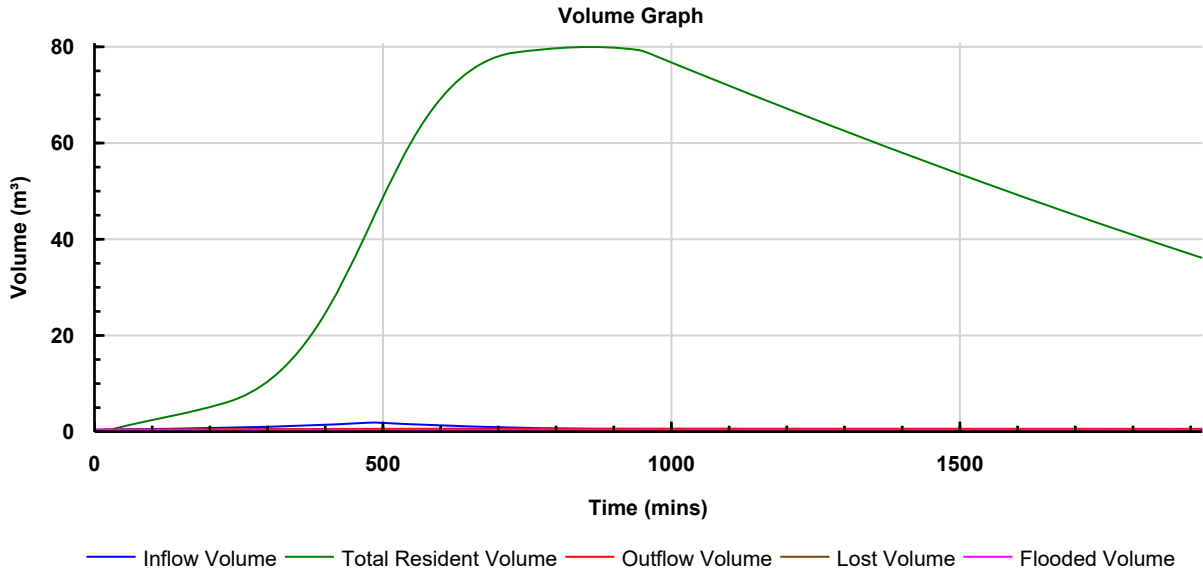
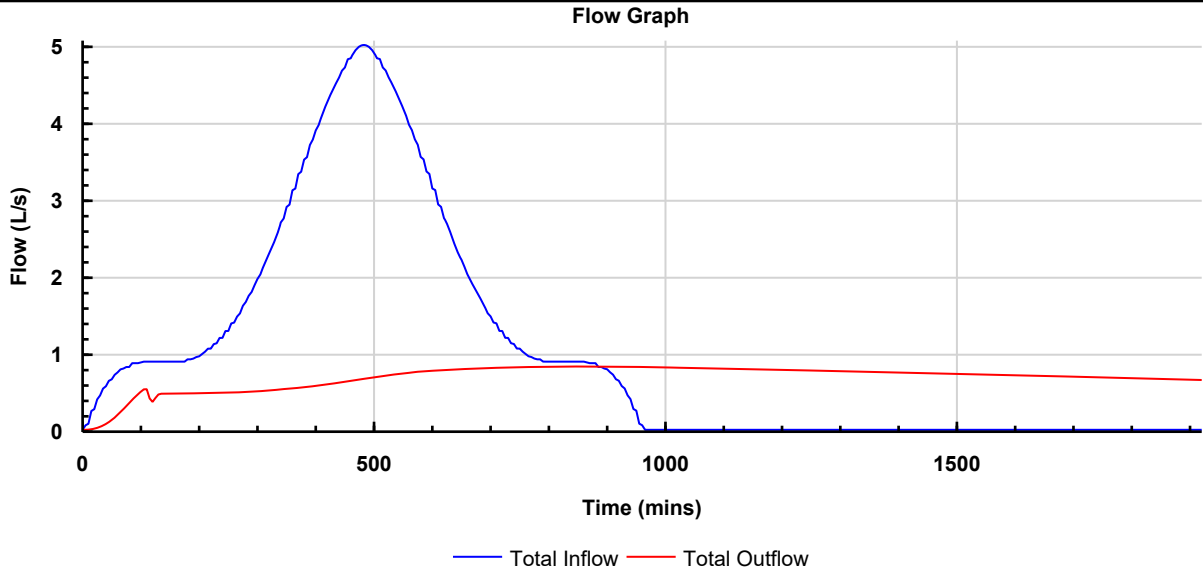
Phase

FSR: 30 years: Increase Rainfall (%): +0: 960 mins: Winter

Tables

| Name  | Max. Inflow (L/s) | Total Inflow Volume (m³) | Max. Outflow (L/s) | Total Outflow Volume (m³) |
|-------|-------------------|--------------------------|--------------------|---------------------------|
| 23    |                   |                          | 0.8                | 78.314                    |
| TOTAL | 5.0               | 114.278                  | 0.8                | 78.314                    |

Graphs



|                                                                 |                    |             |              |
|-----------------------------------------------------------------|--------------------|-------------|--------------|
| Project:                                                        | Date: 06/08/2023   |             |              |
|                                                                 | Designed by: Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Phase Management<br>Storm Phase: Phase | Company Address:   |             |              |





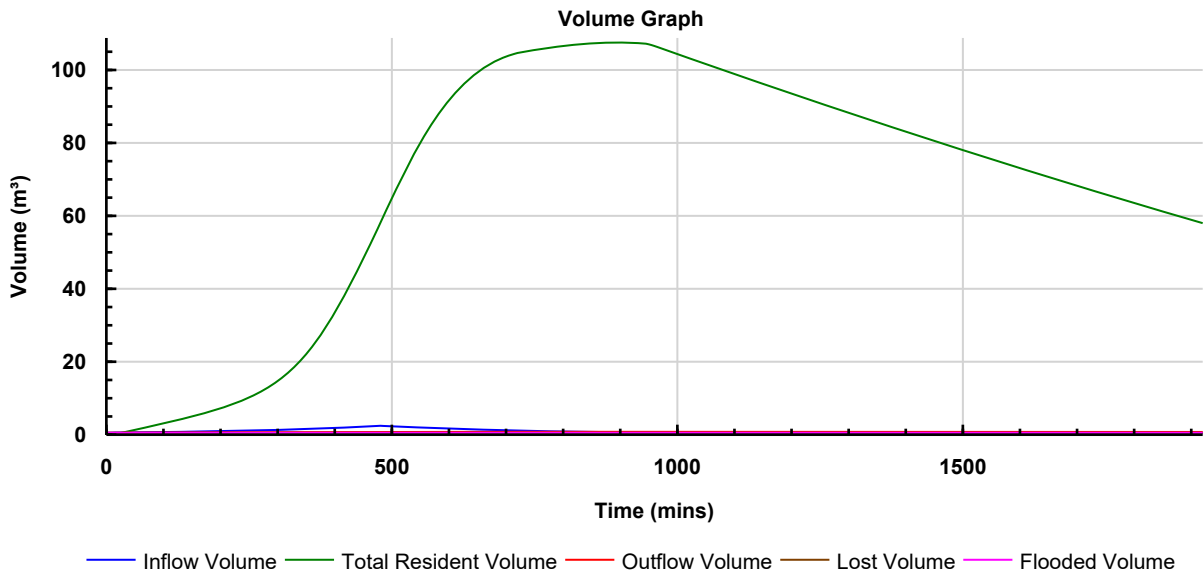
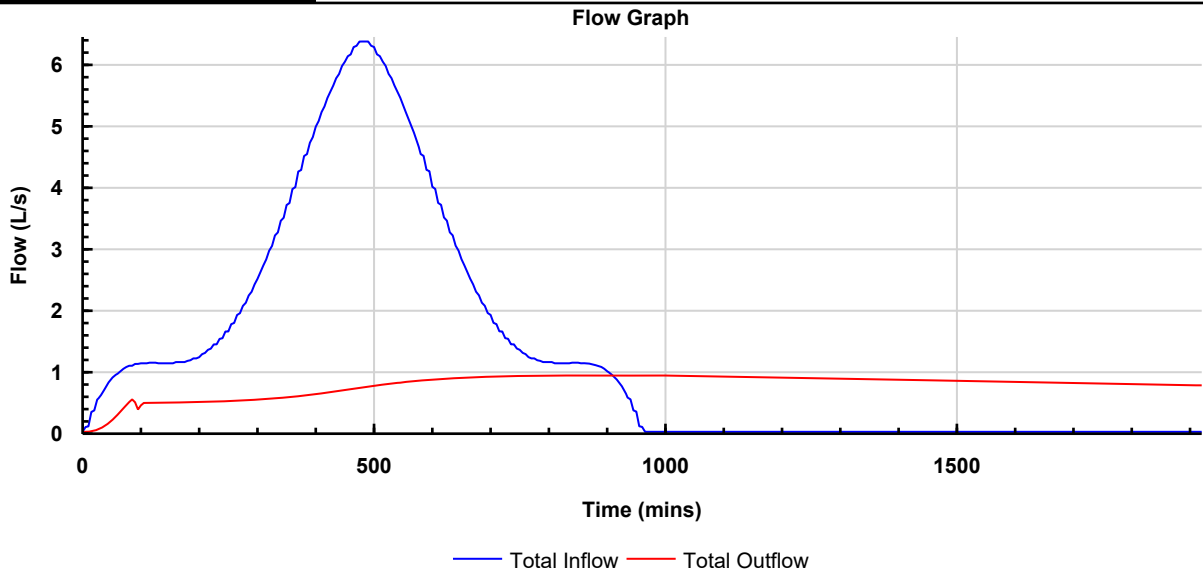
Phase

FSR: 100 years: Increase Rainfall (%): +0: 960 mins: Winter

Tables

| Name  | Max. Inflow (L/s) | Total Inflow Volume (m³) | Max. Outflow (L/s) | Total Outflow Volume (m³) |
|-------|-------------------|--------------------------|--------------------|---------------------------|
| 23    |                   |                          | 0.9                | 87.676                    |
| TOTAL | 6.4               | 145.519                  | 0.9                | 87.676                    |

Graphs



|                                                                 |                    |             |              |
|-----------------------------------------------------------------|--------------------|-------------|--------------|
| Project:                                                        | Date: 06/08/2023   |             |              |
|                                                                 | Designed by: Chris | Checked by: | Approved By: |
| Report Details:<br>Type: Phase Management<br>Storm Phase: Phase | Company Address:   |             |              |





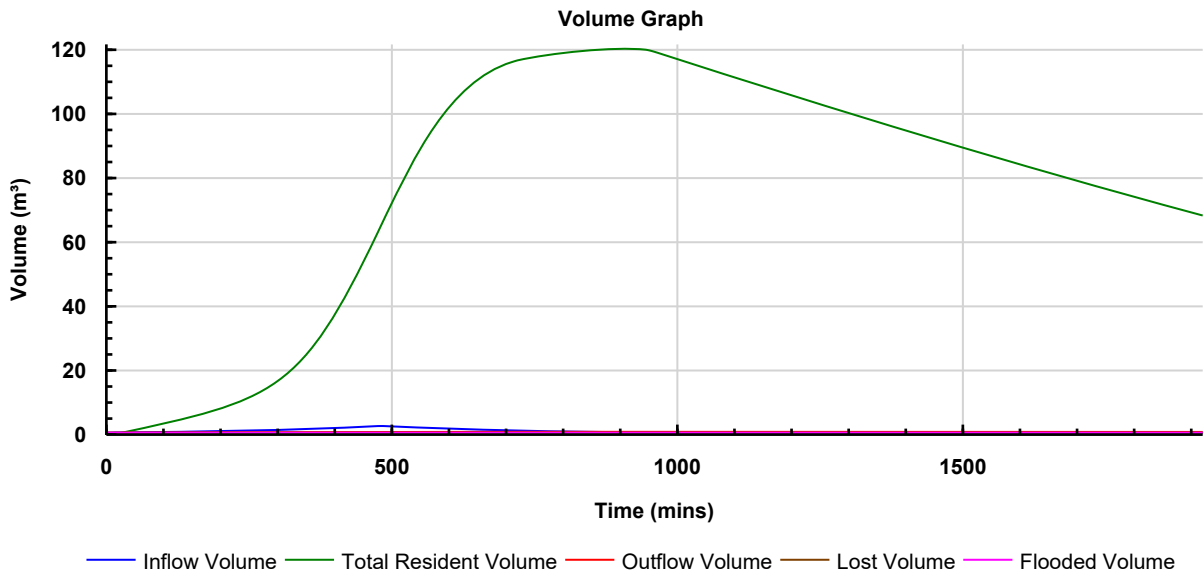
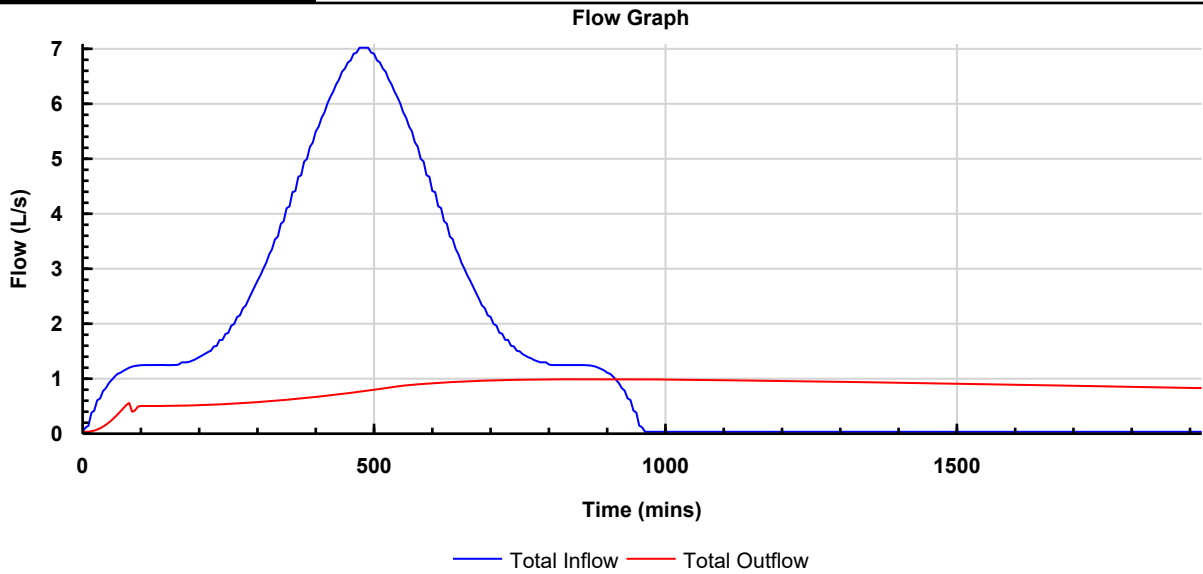
Phase

FSR: 30 years: Increase Rainfall (%): +40: 960 mins: Winter

Tables

| Name  | Max. Inflow (L/s) | Total Inflow Volume (m³) | Max. Outflow (L/s) | Total Outflow Volume (m³) |
|-------|-------------------|--------------------------|--------------------|---------------------------|
| 23    |                   |                          | 1.0                | 91.595                    |
| TOTAL | 7.0               | 159.761                  | 1.0                | 91.595                    |

Graphs



|                                              |                       |             |              |                                                                                     |
|----------------------------------------------|-----------------------|-------------|--------------|-------------------------------------------------------------------------------------|
| Project:                                     | Date:<br>06/08/2023   |             |              |  |
|                                              | Designed by:<br>Chris | Checked by: | Approved By: |                                                                                     |
| Report Details:                              | Company Address:      |             |              |                                                                                     |
| Type: Phase Management<br>Storm Phase: Phase |                       |             |              |                                                                                     |



**Phase**  
FSR: 100 years: Increase Rainfall (%): +45: 1440 mins: Winter

Tables

| Name  | Max. Inflow (L/s) | Total Inflow Volume (m³) | Max. Outflow (L/s) | Total Outflow Volume (m³) |
|-------|-------------------|--------------------------|--------------------|---------------------------|
| 23    |                   |                          | 1.1                | 152.926                   |
| TOTAL | 6.8               | 231.036                  | 1.1                | 152.926                   |

Graphs

