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FLOOD RISK AND SUSTAINABLE DRAINAGE STRATEGY REPORT MONKS HOUSE LANE, WEST SPALDING

Report prepared on behalf of Seagate Homes Ltd

06/02/2026

Rev. P03

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FLOOD RISK ASSESSMENT & SUDS STRATEGY

Revision List

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1.0 Introduction

1.1 General

1.1.1 This report relates to the proposed full planning application for phase 1 of the development of the land west of Monks House Lane, West Spalding, PE11 3WE, with reference to the outline planning application being submitted for phase 2 of the project.

1.1.2 This report sets out the results of a flood risk assessment (FRA) required in support of a planning application for this extension. The assessment has been carried out in accordance with the general principles set out in National Planning Policy Framework, Technical Guidance to the National Planning Policy Framework and Flood Risk and Coastal Change Planning Practice Guidance.

1.1.3 This report is prepared solely for the benefit of Seagate Homes Ltd. This report may not be assigned without prior written permission from Clancy Consulting Ltd.

1.1.4 The site is consisted of two phases. Phase 1 refers to south area of 5.7 hectares, and Phase 2 to north area of 8.2 hectares. The main body of this report refers to Phase 1 only, with a small portion dedicated to phase 2.

1.2 Background Information

1.2.1 In 2001 the Department for Transport Local Government Regions (DTLR) published Planning Policy Guidance Note 25 (PPG25), which explains how flood risk should be taken into consideration during the planning and development process.

PPG25 has now been replaced by Planning Policy Statement 25: Development and Flood Risk published in March 2010. This latest Policy Statement has been introduced to place more emphasis on the increased flood risk from climate change.

PPS25 specifies a sequential test which local planning authorities should apply to all future proposed development sites. An exception test may also be applied to provide a method of managing flood risk while still allowing necessary development to occur.

1.2.2 In March 2012, the Government released National Planning Policy Framework (NPPF) aiming to make the planning system less complex and more accessible, to protect the environment and promote sustainable growth.

NPPF accompanied with the Technical Guidance published also in March 2012 superseded PPS25 although the principles set out in the newer publication remain similar in terms of the flood risk aspect.

The NPPF was further supplemented with a Planning Practice Guide which was available online from March 2014 and in July 2018 the NPPF was further updated highlighting the need for further awareness of flood risk issues for new developments.

The NPPF was again updated in February 2019, July 2021 and September and December 2023 by the Department for Communities & Local Government (now referred to as the Ministry of Housing, Communities and Local Government) and is now considered the standard for Flood Risk and Surface Water Management.

1.2.3 The following zones define the levels of flood risk:

Zone 1: Low Probability
This zone comprises land assessed as having a less than 1 in 1000 annual probability of river or sea flooding in any one year. (<0.1%)

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Zone 2: Medium Probability
This zone comprises land assessed as having between 1 in 100 and 1 in 1000 annual probability of river flooding (1%-0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% - 0.1%) in any year.
Zone 3a: High Probability
This zone comprises land assessed as having between 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of
flooding from the sea (>0.5%) in any year.

Zone 3b: Functional Flood Plain
This zone comprises land where water must flow or be stored in times of flood. Strategic Flood Risk Assessments should identify this zone.

1.2.4 As part of its general obligations under the Water Resources Act 1991, The Environment Agency has carried out surveys of its existing defences against flooding and has published a series of nationwide 'Indicative Floodplain Maps' based upon information from historic flood events and basic hydraulic modelling. In general terms, these maps give a good indication of the areas likely to be affected by flooding. More recently, the Environment Agency have published the 'Flood Map' on their website which is based on improved hydraulic modelling and detailed local data. The map indicates Zones 2 and 3 with Flood Zone 1 being all the land falling outside the Zones 2 and 3.

1.2.5 The EA Flood Map for the area of the proposed development indicates that the development lies in an area of **flood risk zone 3**. A copy of the report can be found in Appendix E.

1.2.6 Due to the flood risk zone classification of the site, the product 4 and 6 data have been obtained for the purpose of analysing the susceptibility of the site to all forms of flooding, allowing for appropriate recommendations to be made on potential protections measures which are to be introduced to limit the adverse effects of flooding. The product 4 and 6 data can also be found within Appendix E.

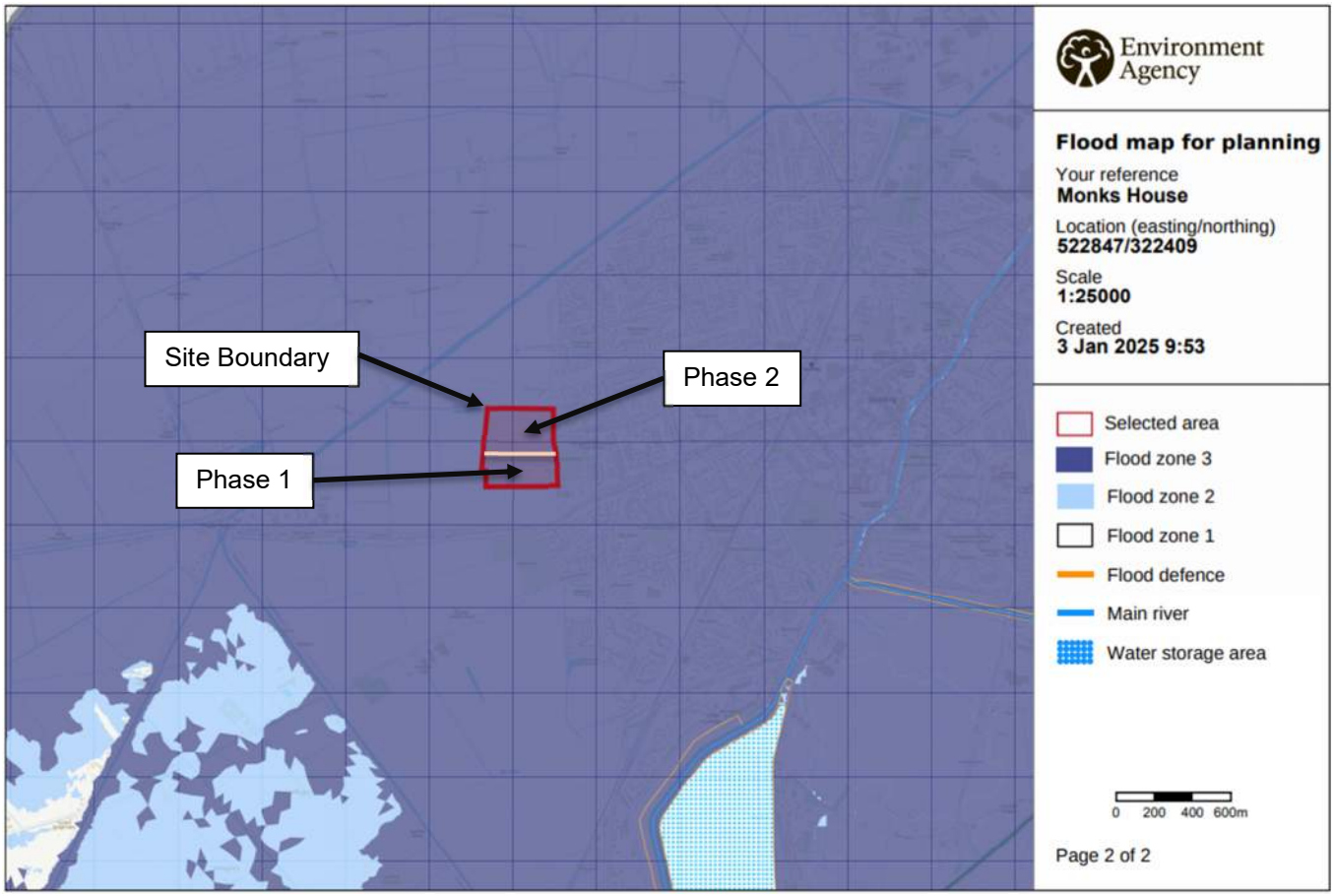


Figure 1 – EA Flood Map for Planning

2.0 Structure of the Report

2.1 The report has been structured to follow the general principles set out in the Technical Guidance published in March 2014 along with subsequent revisions.

2.2 The methodology for this FRA has comprised a desktop study making reference to the Environment Agency (EA) Mapping, Lincolnshire County Council Strategic Flood Risk Assessment (FRA) and Lincolnshire County Council LLFA Guidance with relevant plans and information.

2.3 Sources of information

- Flood maps from the Environment Agency published online
- South East Lincolnshire Strategic Flood Risk Assessment (FRA)
- Anglian Water Asset Data
- British Geological Survey
- MAGIC map
- Existing site topographic survey
- Lincolnshire Flood Risk and Drainage Management Partnership Framework (2012-2025)

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3.0 Site Description

3.1 Location

3.1.1 The site is located detailed as below.

OS X (Eastings)	522794
OS Y (Northings)	322840
Nearest Post Code	PE11 3WE

Table 1 – Site Location Details



Figure 2 - Existing Aerial Plan (Google Earth)



Figure 3 - Site Location (Google Maps)

3.2 Existing Site Layout and Topography

3.2.1 The Existing site comprises a brownfield site of 5.7 hectares which consists of an existing warehouse, dwellings and sheds with associated hardstanding and soft landscaped recreation areas. The majority of the site, however, is made up of arable land.

3.2.2 The site is accessible via the Monks House Lane.

3.2.3 A topographic survey has been undertaken by Daniel Charles Surveys (drawing ref 24-58-01, dated 15/05/2024) and is included in Appendix B. The ground levels slope down from the North-east corner of the site at approximately 3.13m AOD to 2.60m AOD in the South-west corner of the site.

3.3 Geology

3.3.1 The British Geological Survey's (BGS) online geological map indicates the site has tidal flat formation – clay and silt superficial deposits, and Oxford Clay Formation bedrock comprising of mudstone.

Results from nearby British Geological Survey (BGS) historic boreholes identify the following:

- Historical borehole TF22SW213 located east of the site boundary identified 0.90m thick Clay, on top of Silt 1.70m thick. No groundwater was encountered.
- Historical borehole TF22SW214 located east-south of the site boundary identified 0.50m thick of Clay, on top of Silt 1.60m thick. No groundwater was encountered.

Refer to Appendix F for British Geological Survey historic boreholes.

3.3.2 An intrusive ground investigation has been undertaken for the site within which a few trial pits and soakaway test pits were dug to ascertain the infiltration rates and groundwater levels present at the development site. The results of these investigations found that at present the groundwater levels on site are at an average depth of approximately 2.00m bgl.

3.3.3 In addition to this, all 7 of the soakaway tests were unable to yield infiltration rate results due to the rate of infiltration achieved being too slow to utilise the required calculations. Refer to appendix M for relevant extracts from the ground investigation report.

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3.4 Hydrology

3.4.1 There are three watercourses near the site, and one watercourse within the site boundary which consists of a ditch.

3.4.2 Vernatt's Drain River is located 540m west of the site boundary (river of 20m width).

3.4.3 The nearest ordinary watercourses and river are highlighted on the Ordnance survey map below.

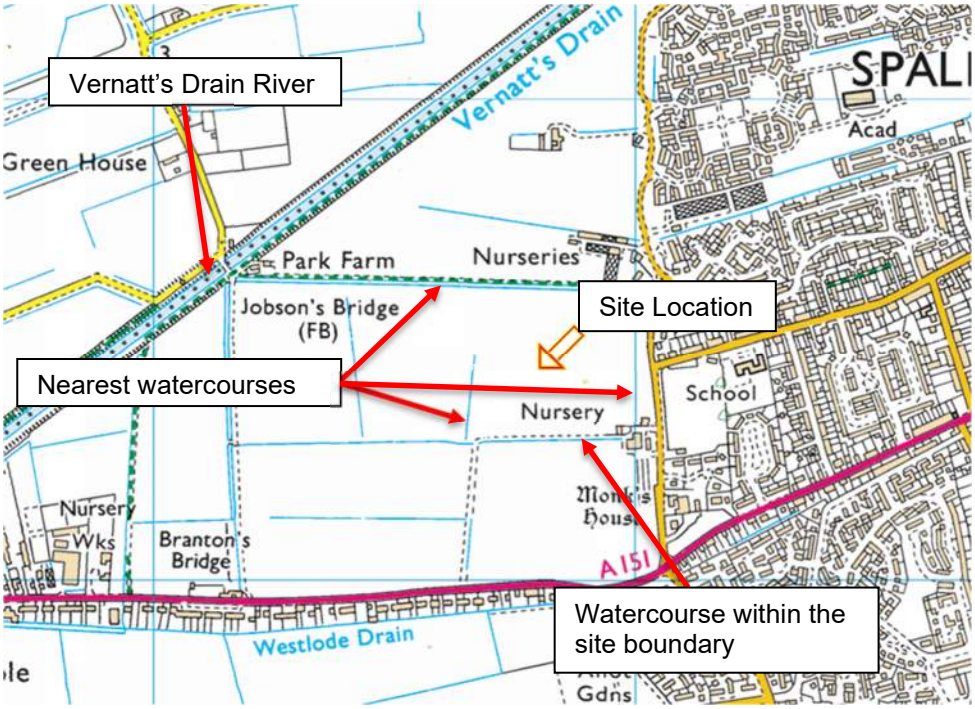


Figure 4 – Ordinary Water Courses (OS Maps)

3.5 Hydrogeology

3.5.1 Based on the Environment Agency's Groundwater Map, the site has no information about the groundwater zone.

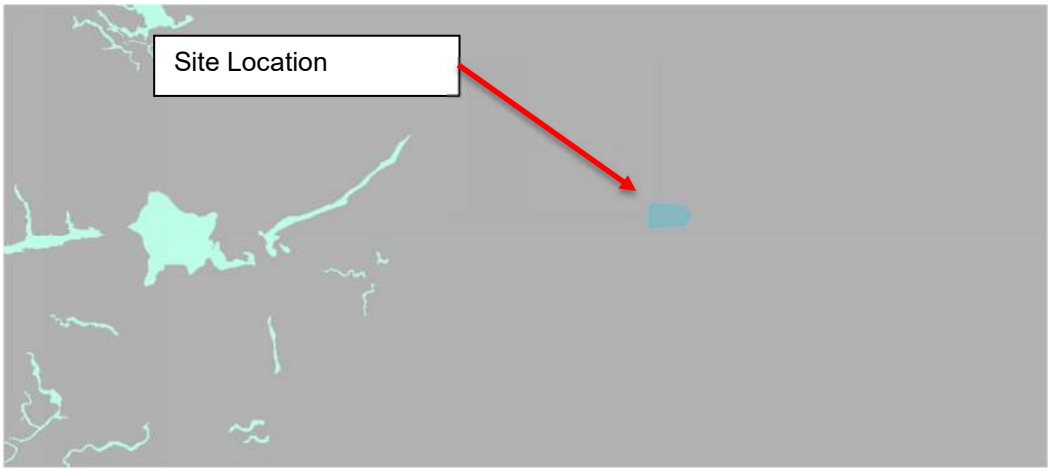


Figure 5 – Groundwater Source Vulnerability Map (MAGIC Maps)

4.0 Proposed Development

4.1 Description

4.1.1 The proposed development comprises a residential development, with associated external hard and soft landscaping features, which will be separated into two phases. Proposed development plans can be found in Appendix A.

4.1.2 The development proposals provide an impermeable area of 2.7 hectares for phase 1 and our estimations approximate 4.1 hectares of impermeable for phase 2, in the absence of a more developed site plan. In total the proposed impermeable area will be 6.8 hectares.

4.2 Vulnerability and Classification

4.2.1 The gov.uk website provides information on the flood risk vulnerability for the development in conjunction with the flood zone classification.

4.2.2 Annex 3 of the NPPF indicates that residential developments are to be classified as "**More Vulnerable"**, see **Table 2**.

	Flood Risk Vulnerability Classification				
Flood Zones	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✔	✔	✔	✔	✔
Zone 2	✔	Exception Test Required	✔	✔	✔
Zone 3a†	Exception Test Required†	✘	Exception Test Required	✔	✔
Zone 3b*	Exception Test Required*	✘	✘	✘	✔

Table 2 - Flood Risk Vulnerability and Flood Zone 'Compatibility' (Gov.uk)

Key:
✓ Development is appropriate
✗ Development should not be permitted

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

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

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

The NPPF (Technical Guidance) Table 3, Flood Risk Vulnerability and Flood Zone Compatibility matrix, indicates that "**More Vulnerable**" development proposals in **Flood Zone 3** will require an "**exception test**", which we will be required to submit to the local planning authority in addition to a flood risk planning application.

The exception test consists of two additional elements that must be satisfied to permit construction within high flood risk areas for more vulnerable developments. These elements stipulate that it should be demonstrated that:

- "Development that has to be in a flood risk area will provide wider sustainability benefits to the community that outweigh flood risk; and
- the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall".

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To help achieve the criteria mentioned above it is proposed to implement features which will go towards increasing the level of sustainability of the development and reducing the vulnerability of its inhabitants. These features are as follows:

- The proposed drainage network will be designed to contain all water within the system during all storm events up to and including the 1% AEP + 40% climate change event, ensuring the development and the surrounding community are not at elevated risk of flooding during extreme weather events due to the increase in impermeable area.

- Rather on the contrary, the system provides a benefit in terms of discharge rate from the site for several of the design storm events (both in the case of brownfield and greenfield) – see section 6.1.6 for further details. In addition to directing all runoff to a chosen discharge location rather than allowing the water to be directed by the existing topography. Both of these factors will help to reduce the risk of flooding to the surrounding area, providing a sustainability benefit to the wider community.

- The drainage system will also incorporate a number of SuDS features to help increase the overall sustainability of the network in line with the 4 pillars of SuDS set out within the Ciria SuDS manual. These features will include the introduction of detention basins, permeable paving and filter strips which will help to improve the biodiversity and amenity value of the site, whilst ensuring that water quality and water quantity are controlled to the required level.

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5.0 Flood Potential

5.1 Potential for Flooding

5.1.1 The site is located within Flood Zone 3 in terms of flooding from any nearby watercourse, meaning the risk is **high**:

5.1.2 There are, therefore, five potential sources of flooding at the site which will be addressed in more detail in this report, i.e.

(i) From rivers and the sea
(ii) From surface-water overland flow off site.
(iii) From high groundwater levels.
(iv) From artificial sources, such as reservoirs.
(v) From the surcharging of drains or sewers on the site.

5.2 Rivers and the Sea

5.2.1 During extreme rainfall events, there will be times when water levels within watercourses will rise, leading to the water overtopping their respective embankments causing overland flooding. Mapping for this form of flooding is shown on the Environment Agency website and presented below.



Figure 6 – Flood Risk from rivers and the sea (Gov.uk)

5.2.2 It can be seen from the flood mapping (Fig 6) that the site is at high risk of flooding from rivers and the sea.

5.2.3 To allow us to adequately plan and implement effective control measures to protect against water ingress and flooding in the event of a breach, a review of the Flood Risk Assessment advice from the Environment Agency in conjunction with flood modelling data within the South East Lincolnshire Strategic Flood Risk Assessment has been undertaken to allow us to provide accurate recommendations that comply with local policy requirements with regards to flood mitigation.

5.2.4 The SFRA has been reviewed and flood mapping extracted and shown below '*Residual Peak Depth 1% Fluvial/0.5% Tidal Event Probability Mapping*' (figure 7) and '*Residual Flood Hazard 1%*

Fluvial/0.5% Tidal Event Probability Mapping' (figure 8) respectively, these show the development to be within an area of extremely low risk and depth, therefore not requiring any additional protection measures, however we propose that all dwellings on site have FFLs 150mm above surrounding ground levels.

5.2.5 In doing so, this also ensures that the development complies with the exception test specified for by Lincolnshire County Council by ensuring the development does not increase flood risk on-site or elsewhere whilst managing risk to life. Further to the above, the EA indicate that the existing fluvial defences in the area (Crowland-Cowbit Washes and embankment) are in fair condition and are inspected regularly, so a breach is unlikely.

5.2.6 Following the below, the Lincolnshire strategic flood risk assessment indicates the site is at low risk of flooding. The Vernatt's Drain's peak depth doesn't reach the site boundary.

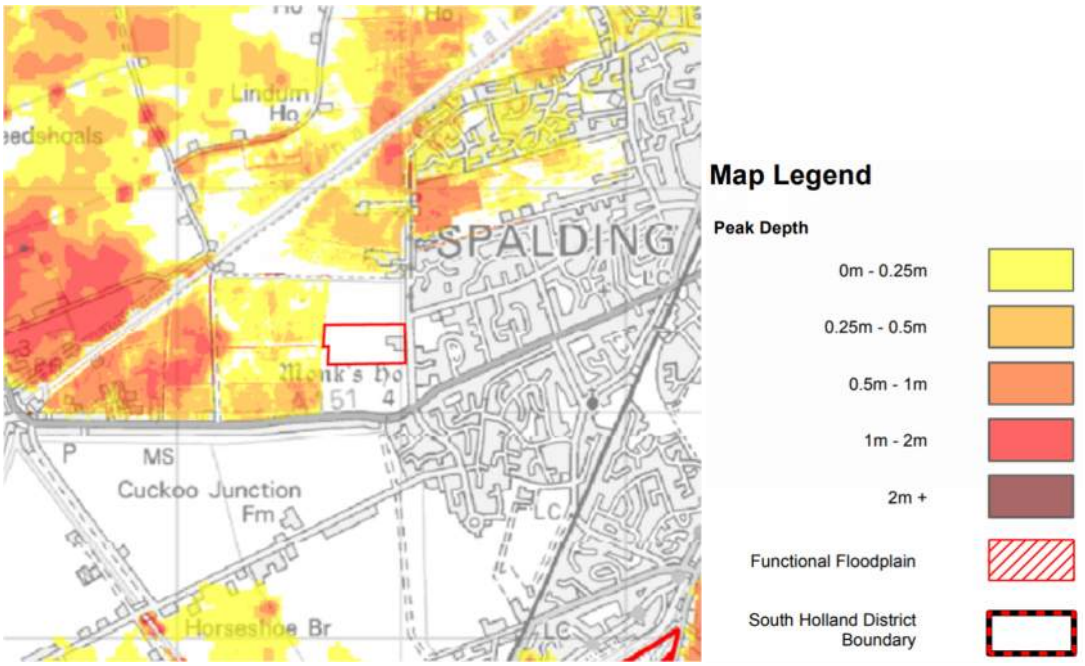


Figure 7 – Residual Peak Depth 1% Fluvial/0.5% Tidal Event Probability Mapping (South East Lincolnshire Strategic Flood Risk Assessment 2017)

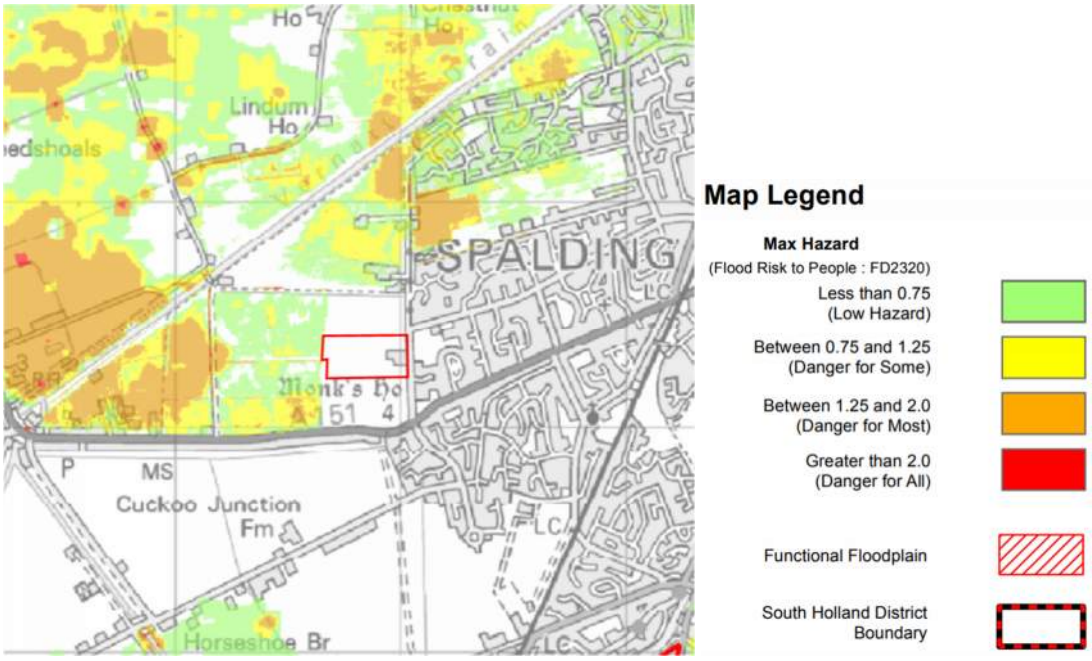


Figure 8 – Residual Flood Hazard 1% Fluvial/0.5% Tidal Event Probability Mapping (South East Lincolnshire Strategic Flood Risk Assessment 2017)

5.3 Surface Water

5.3.1 During extreme rainfall events, or due to poor gully drainage maintenance, there will be times when gully capacity is exceeded which will lead to surface flow within the surrounding roads. Mapping for this form of flooding is shown on the Environment Agency website and presented below.



Figure 9 - Flood Risk from Surface Water (Gov.uk)

5.3.2 It can be seen from the flood mapping (Fig 7) and the surface water depth-velocity mapping (Fig 8 and 9) that the site is at very low risk from surface water.

5.3.3 Review of the EA surface water flood mapping identifies the development to be within the very low flooding extent.

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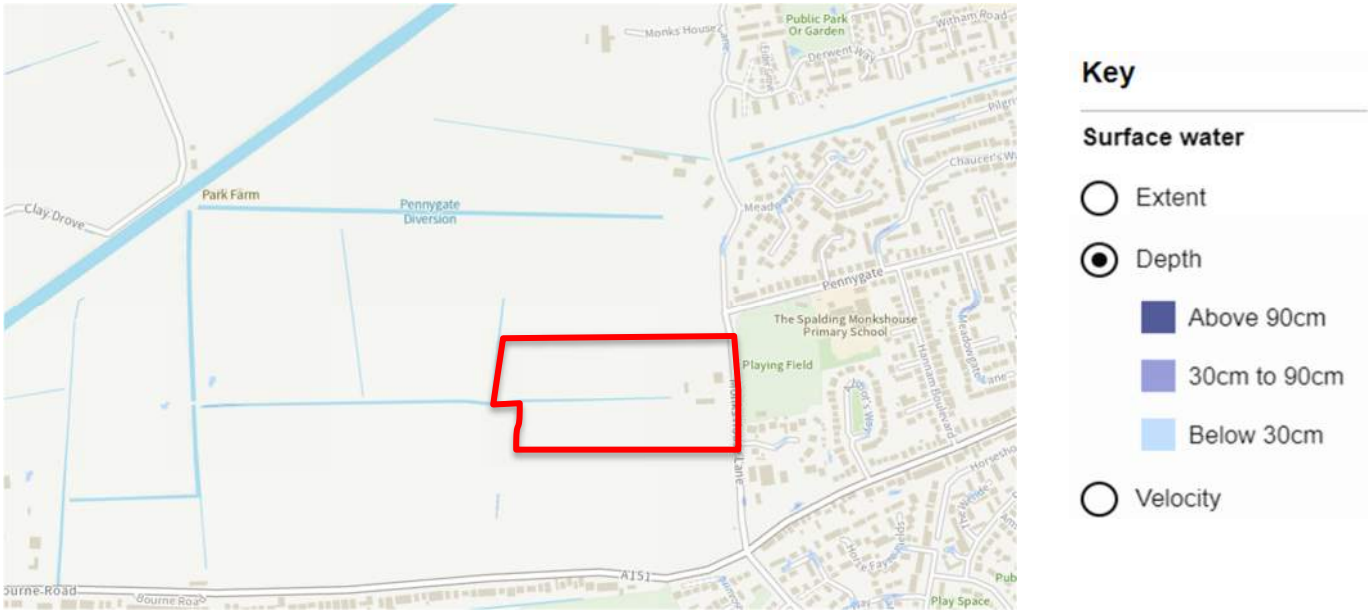


Figure 10 - Flood Risk from Surface Water – velocity / flow direction (Gov.uk)



Figure 11 - Flood Risk from Surface Water – velocity / flow direction (Gov.uk) – More frequent.

5.4 Ground Water

5.4.1 Reference has been made to the Lincolnshire County Council "Preliminary Flood Risk Assessment". Mapping has been provided for several flood risk scenarios which include areas susceptible to ground water flooding. The development site shown to be at low flood risk. This is consistent with the impermeable strata identified as part of the desk-based information review from the British

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Geological Society. In addition to this, the long-term flood risk service on the government website indicates 'flooding from groundwater is unlikely in this area'.

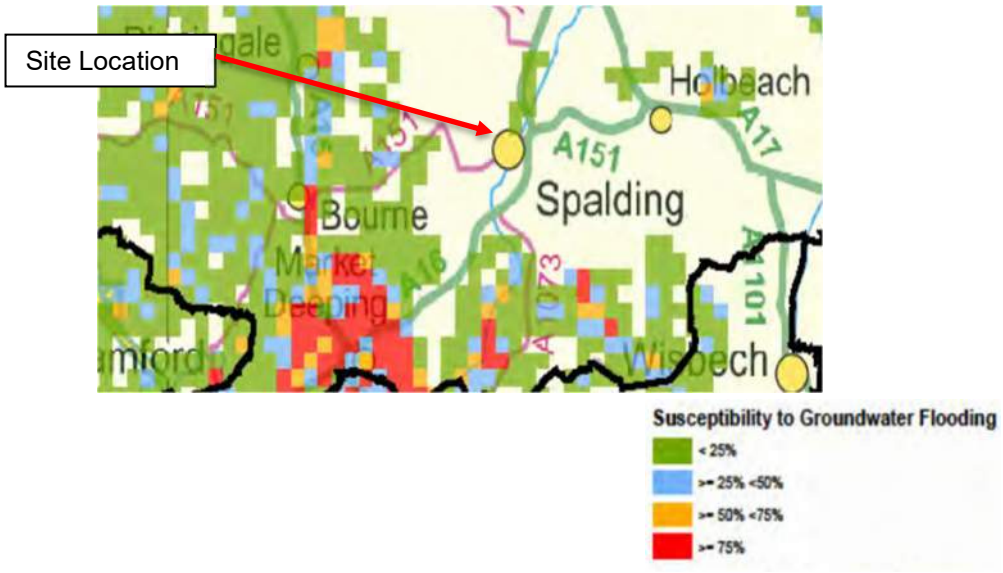


Figure 12 – Preliminary Flood Risk Assessment mapping for potential ground water flooding.

5.5 Artificial Sources

5.5.1 Artificial sources of flooding are potentially from man-made structures and infrastructure. In this instance, the risk of flooding from reservoirs at this site is **low** as per the map below.



Figure 13 – Extent of Flooding from Reservoirs (Gov.uk)

5.6 Flooding from Drainage onsite

5.6.1 Flooding could occur if the on-site drainage system becomes blocked, or a rainfall event exceeds the design capacity. See Section 6 for details of the drainage system for the development.

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5.6.2 The development should ensure that all drainage runs are easily accessible to allow for blockage removal. Drainage issues and details of the proposed drainage system are discussed in Section 6.

5.7 Historic Flooding Events

5.7.1 Following the Historic published flooding events in Lincolnshire FRA report, there are few flooding incidents in the surrounding area of the east side of Spalding, occurred by surface water, based on Lincolnshire County Council FRA report.



Figure 14 – Historic Flooding Events (Lincolnshire County Council FRA report)

1.1.1 The Lincolnshire County Council Preliminary Flood Risk Assessment (FRA) indicates there are no recorded incidents of historical local flooding. There are few incidents in the Spalding area, however there are no records near the site.

1.1.2 Map indicating historical recorded incidents is in Appendix K.

1.1.3 Flood Risk Management Action Plan, prepared by Lincolnshire County Council, is in Appendix D for information.

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6.0 DRAINAGE

6.1 Existing Drainage

6.1.1 On site

6.1.2 S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

6.1.3 The current drainage system in place on phase 1 of the site has been investigated via the use of the topographical survey, google maps and historical maps, in addition to on-site investigation. These investigations uncovered a culverted pipe at the Eastern end of the ditch. This in combination with the lack of nearby public surface water infrastructure, indicates it is likely the existing development utilised a discharge to the existing ditch located in the middle of the site, which is intended to be re-utilised within the proposed network.

6.1.4 Pre and Post Development Runoff Rates

6.1.5 As part of the development, the client will be seeking to improve the surface water run-off from the site by restricting the flows to as close to the greenfield runoff rate as practicable.

6.1.6 Phase 1

6.1.7 In phase 1 of the project, the existing site is largely greenfield with a percentage of the site classified as brownfield due to the presence of the hardstanding area to the East of the site. Therefore, the existing flow rates for the site have been calculated with this in mind.

6.1.8 The greenfield QBAR rate for the greenfield areas on site (5.0l/s) in addition to the 1 in 1 year brownfield rate calculated for the hardstanding on site (19.2l/s) equate to a total of **24.2l/s**. However, despite this, the flow rate has been based purely off the brownfield rate for the site with the strategy being to achieve a 50% reduction from this rate.

6.1.9 Therefore, this phase has been restricted to a discharge rate of **9.6l/s** for all storm events up to and including the 1 in 100 year + 40% climate change plus 10% urban creep. This allows for a 50% betterment to the brownfield rates for all modelled storm events, and a betterment to the greenfield rates during the 1 in 30 and 1 in 100 year storm events.

Brownfield Runoff Rates (calculated from 2435m^2 of hardstanding on existing site)

Existing 1 in 1 year = 19.2l/s
Existing 1 in 10 year = 38.5l/s
Existing 1 in 30 year = 47.1l/s
Existing 1 in 100 year = 60.7l/s

Greenfield Runoff Rates (calculated from remaining site area of 56,900m^2)

Existing QBAR = 5.0l/s
Existing 1 in 1 year = 4.4l/s
Existing 1 in 10 year = 8.3l/s
Existing 1 in 30 year = 12.8l/s
Existing 1 in 100 year = 17.9l/s

See appendix H for calculations.

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6.1.10 Phase 2

6.1.11 With regards to phase 2 of the project, this portion of the site is to be designated as a greenfield area and therefore will be required to restrict flows from site to the greenfield QBAR rate or as close as practicable. Henceforth the target for flow restriction from this portion of the site is to be **7.2l/s** for all storm events up to and including the 1 in 100 year + 40% climate change, to mimic the existing natural dispersal of surface water runoff from the site.

Greenfield Runoff Rates

Existing QBAR	= 7.2l/s
Existing 1 in 1 year	= 6.2l/s
Existing 1 in 10 year	= 12.0l/s
Existing 1 in 30 year	= 14.1l/s
Existing 1 in 100 year	= 18.0l/s

See appendix L for calculations.

6.2 Anglian Water Sewers

6.2.1 Anglian Water (AW) asset mapping indicates that no surface water sewers are within a feasible distance from the site to purport a proposed connection and would also require the crossing of third-party land. However, in line with the SuDS hierarchy, a connection to the public network is one of the least favourable options so this would unlikely be considered anyway.

6.2.2 Refer to Appendix C for further details of Anglian Water mapping.

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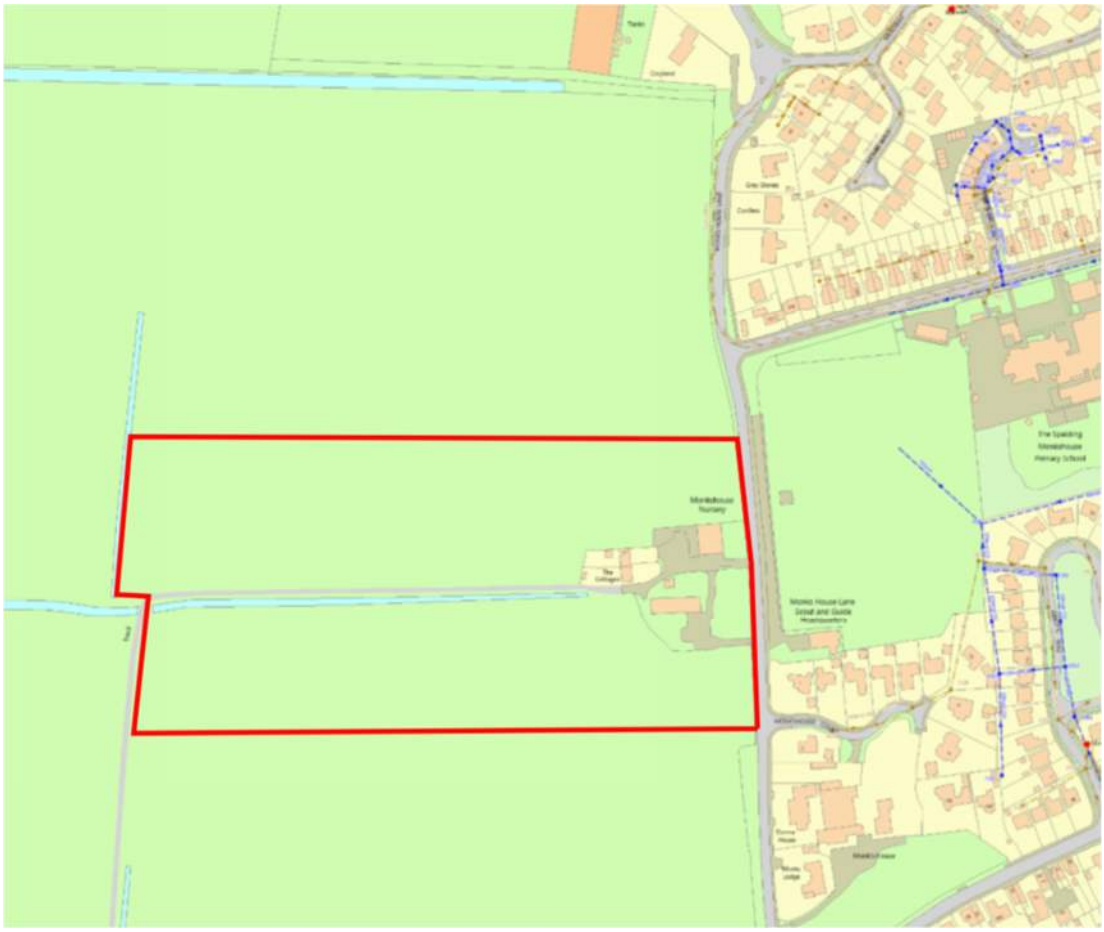


Figure 15 - Anglian Water Asset Plan (Anglian Water)

6.3 Proposed Drainage

6.3.1 Disposal of Surface Water

6.3.2 In accordance with Southeast Lincolnshire Strategic Flood Risk Assessment March 2017 and national guidance the disposal of surface water should be considered in the following order of priority:

1. Infiltration into the subsoil via soakaways or permeable paving
2. Discharge to a water course or the sea.
3. Discharge to a surface water sewer.
4. Discharge to a combined sewer.

6.4 Infiltration

As mentioned within section 3.3, an intrusive ground investigation has been undertaken for the site within which a number of trial pits and soakaway test pits were dug to ascertain the infiltration rates and groundwater levels present at the development site. The results of these investigations found that at present the groundwater levels on site are at an average depth of approximately 2.00m begl, which while not completely discounting the use of infiltration systems, the application is vastly limited due to the requirement to retain a 1m offset between the bottom of any infiltration feature and the groundwater level below.

In addition to this, all 7 of the soakaway tests were unable to yield infiltration rate results due to the rate of infiltration achieved being too slow to utilise the required calculations. This is in accordance with the information gathered from the BGS website in section 3.3 which displays the presence of

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cohesive soils in the area (clay), which generally have poor infiltration rates. Therefore, infiltration is deemed to be unfeasible for this site.

6.5 Discharge to Watercourse or Sea

Upon investigation it has been discovered that there is a large existing ditch running through the centre of the site which is proposed to be utilised as the method of discharge for the proposed surface water network. The ditch will require a level of re-grading to suit the depths of the proposed drainage network outfalls, and to ensure an effective flow path away from the site is maintained.

It is proposed that the existing ditch will provide the main source of attenuation for the development, with this ensuring that the network will be sufficient to accommodate the critical 1 in 100 years plus 40% climate change storm event. The ditch has been modelled in the calculations to represent its use as an above ground attenuation feature

Due to the decision to utilise the ditch as the preferred method of discharge, in line with the SuDS hierarchy, a connection to the public network has been discounted and therefore deemed unsuitable.

6.6 SuDS Strategy

6.6.1 Proposed Surface Water Drainage – Phase 1

6.6.2 The impermeable areas from roofs and driveways will drain via localised tanked permeable pavements which are under drained to transfer the collected runoff into the main network.

6.6.3 These proposed tanked permeable pavements will be utilised to both attenuate and convey surface water from localised areas to the main network and shared attenuation prior to final discharge into the local watercourse. The under drained permeable paving will provide sufficient level of pollution mitigation to offset the hydrocarbons produced by any cars within the driveways.

6.6.4 In the same surface water network, filter drains will serve the main (adoptable) site road, capturing the runoff from the roads whilst providing a level of pollution mitigation prior to transfer into the main network and shared attenuation prior to final discharge into the local watercourse.

6.6.5 Following the capture of surface water runoff via the methods mentioned above, the main network is then proposed to utilise the existing ditch within the centre of the site as a form of above ground attenuation prior to a restricted discharge (9.2l/s) to the western outfall ditch via a culvert.

6.6.6 The adoptable road located in the Northwestern corner of phase 1 will capture surface water runoff via road gullies prior to discharging to the new attenuation basin which will provide attenuation before ultimate discharge to the existing watercourse which will be restricted to 0.4l/s.

6.6.7 Surface water design includes 10% urban creep, as per the calculations in Appendix H.

6.6.8 The central and western ditch are both crossing the site and are located within the site boundary. Both ditches will require re-grading works to be undertaken to accommodate the proposed depth of the drainage networks whilst ensuring surface water runoff drains away from the site development.

6.6.9 The drainage strategy and associated information is provided in Appendix G.

6.6.10 Highways drainage will be adopted by Anglian Water as a later stage.

6.6.11 Proposed Surface Water Drainage – Phase 2

6.6.12 As phase 2 of the project is currently only at the conceptual stage of design, we do not yet have accurate estimates on the proportion of impermeable area that is to be positively drained for the site. As a result, we have opted to utilise an equivalent proportion of permeable to impermeable area as

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was in place for phase 1 of the development as an initial estimate. This therefore equates to approximately 50% of the total site area being impermeable.

6.6.13 This area is likely to utilise the same methods of capture as phase 1 of the site, permeable paving and filter drains, with the network utilising attenuation basins prior to a restricted discharge to an existing ditch to the north of the site.

6.6.14 At this stage of the development, detailed design of the proposed system is yet to be undertaken. Instead, a source control calculation has been conducted for the site using the rates calculated within section 6.1.8, in addition to the approximate impermeable area calculated above, to determine the approximate level of storage that will be required to restrict the flows from the development to the proposed design flow rate.

6.6.15 These calculations detail that the approximate volume of storage that will be required for phase 2 will be 5931m^3.

6.6.16 The phase 2 outline drainage strategy general arrangement and calculations are provided within appendix L.

6.7 Proposed Foul Water Drainage

6.7.1 Disposal of Foul Water

6.7.2 The strategy for the disposal of the foul water from the site utilises the implementation of a pumping station which has been indicated between plots 141 and 142 on the proposed development site. The pumping station will serve phase 1 and 2 of the development, with the rising main directing all foul water runoff to a demarcation chamber within Bourne Road to purport a proposed gravity connection to Anglian Water manhole 4202. Refer to appendix C for further details on the location of the proposed connection point.

6.7.3 The outfall location has been recommended by Anglian Water within the pre-planning report due to the capacity within the chosen outfall manhole being sufficient to support the proposed number of developments being served by the connection. Following this correspondence, the on-site pumping station and rising main will be offered for adoption to Anglian Water and as such will be subject to their technical approval process as the design progresses.

6.7.4 Exceedance

6.7.5 During extreme rainfall events over and above those designed for or if blockages occur within the drainage systems, there will be times when there are additional overland flows.

6.7.6 Exceedance flows will generally be directed west through the site. To suit the current topographic falls. There are no residential developments to the west of the site, so this is considered an acceptable, low risk exceedance route without significant modification or temporary storage.

6.7.7 Drainage and SuDS Maintenance

6.7.8 All of the measures described in this document will form part of the building O&M manual. All of the measures and designs will need to be adhered to in order to maintain the design life and design capacity of the surface and foul water drainage systems. Health and Safety risks have been communicated on design drawings. All responsibility for the on-site surface, foul water drainage and maintenance will lie with the site/unit owner or adopting body.

6.7.9 The below ground drainage network is to be designed in accordance with Building Regulations Part H 2015, BSEN 752-2008, LASOO Non-Statutory Technical Standards for Sustainable Drainage 2015 and Chapter 32 of CIRIA C753 – The SUDS Manual.

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6.7.10 General Maintenance

6.7.11 Inspection chambers and access points are to be provided at regular intervals which can be jetted / cleaned. General checking of the below ground drainage systems should be every three (3) months. General maintenance / cleaning of the below ground systems should be after each major storm event and on an annual basis. This applies to all pipes, inspection chambers, manholes, rodding eyes, gullies, channels etc.

6.8 Suds Management and Maintenance Plan

6.8.1 To maintain adequate function of the sustainable drainage features please refer to the guidance within Appendix I. It should be noted that any supplier guidance would typically supersede this information, and it has been presented as guidance information only.

6.9 Water Quality

6.9.1 All well designed SuDS should manage the quality of runoff so that receiving waters and / or groundwater are protected from pollution hazards. The methods to achieve the required water quality requirements specific to this site have been designed in accordance with The SuDS Manual (CIRIA 2015) using the simple Indices method.

6.9.2 The below table defines the pollution hazard indices for varying use classifications.

	Pollution hazard indices for different land use classifcations			
Land use	**Pollution hazard level**	**Total suspended solids (TSS)**	**Metals**	**Hydro-carbons**
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones and general access roads) and non-residential car parking with infrequent change (eg schools, offces) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to	High	0.8[2]	0.8[2]	0.9[2]

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industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways				

Table 3 - Pollution hazard indices for different land use classifications (The SuDS Manual 2015)

Notes

1. *Motorways and trunk roads should follow the guidance and risk assessment process set out in Highways Agency (2009).*
2. *These should only be used if considered appropriate as part of a detailed risk assessment – required for all these land use types (Table 4.3). When dealing with high hazard sites, the environmental regulator should first be consulted for pre-permitting advice. This will help determine the most appropriate approach to the development of a design solution.*

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

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

6.10 Proposed Pollution Mitigation

6.10.1 The use classifications for this site have been highlighted green in table 4. The site presents a low risk from runoff generated by roof areas, the access road and parking. Typically roof areas are considered to not require further water quality measures.

6.10.2 Calculations have been conducted which indicate that permeable paving, filter strips, swales (the existing ditch) and the detention basin are suitable water quality control measures to decontaminate surface water collected from parking areas, access roads and roofs prior to discharge to the outfall.

6.10.3 Refer to Appendix J for the Ciria Simple Index Pollution Mitigation Calculations.

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8.0 Flood Mitigation and Management Measures

8.1 The site is at a low risk of flooding from all sources, however due to being situated within flood zone 3 a number of mitigation measures are proposed to help increase the level of fluvial flood protection on site in the unlikely event of a flood barrier breach during heavy rainfall.

It is proposed that all dwellings on site are of a flood resilient construction to help protect against any residual fluvial/surface water flooding. This would include the provision of FFLs 300mm above ground level, appropriate levels of water proofing and internal egress routes providing refuge to occupants during flooding events.

The site drainage will also look to utilise the introduction of SuDS features that will help increase the overall sustainability of the network in addition to providing the required level of mitigation against extreme rainfall events by capturing all runoff within the network before safe discharge to an existing ditch. This ditch will then naturally carry the water West away from the town and the proposed development, helping to manage flood risk.

The existing topography also shows the ground generally falling from East to West away from the town and the development, and since the site proposes to match existing ground levels wherever possible, this overland flow route will continue to be maintained. In addition to this, the ditch proposed as the surface water outfall will carry all overland flows away from the site in the same direction once re-graded.

It is also recommended that all residents are made aware of the potential for fluvial flooding. We recommend the following actions:

Register for the UK Government flood warnings
https://www.fws.environment-agency.gov.uk/app/olr/home

Have copies of the latest flood helpline phone numbers and sewerage/potable water phone numbers available to staff:

- Environment Agency Floodline 24hr 08459 881188
- Anglian Water (sewerage) 03457 145 145

Residents should be made aware of the potential for fluvial flooding and the most suitable escape routes in the instance of flooding occurring.

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9.0 Conclusions and Recommendations

9.1 This report gives details of the flood risk assessment and sustainable and drainage design, which has been carried out in relation to the proposed residential development at the Land West of Monks House Lane, Spalding, PE11 3WE.

9.2 The site is situated within flood zone 3 but, upon detailed investigation, can be considered at low risk from all forms of flooding. Despite this, it is recommended to ensure the units are constructed to a flood resilient standard to provide a level of additional flood protection to the site. In addition to this, the existing topography indicates that any overland flows will be directed West away from the surrounding community into the adjacent arable land.

9.3 The site drainage has been designed in accordance with LLFA and statutory guidance and recommendations. SUDS features have been introduced to satisfy the 4 pillars of SuDS, as per the SuDS manual, by proposing an increased level of biodiversity and amenity whilst providing water quality and quantity benefits prior to discharge to the existing ditch.

9.4 Allowances have been made in the proposed drainage modelling to account for an increase in rainfall event severity as a result of climate change, and hence systems have been designed for the maximum design rainfall event required by the LLFA.

9.5 The Proposed development meets NPPF and Local Policy requirements.

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Appendix A – Development Proposals

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MONKS HOUSE LANE - WEST



Google image N.T.S.

Tree lined with rain garden verges.
(planting species to be detailed)

Links to Boundary
(vehicular & pedestrian)

Pedestrian Link
(upto boundary)

Recreation Ground

MONKS HOUSE LANE

MONKSHOUSE COURT

Primary Site Access



Google image N.T.S.

Entrance example
To be tree lined with rain garden verges.
(planting species to be detailed)

Green Space

Play Area
(LEAP)

Existing ditch

Footbridge

Basin

Shared Surface Roadway

Parking Court

Private Courtyard

Private Drive

SCOUT HUT

Pedestrian Link
(upto boundary)

DETAILED SITE LAYOUT

1:500 @ A0

Scale : 1:500 — 0, 5m, 10, 20, 25, 50, 70m

NOTES:

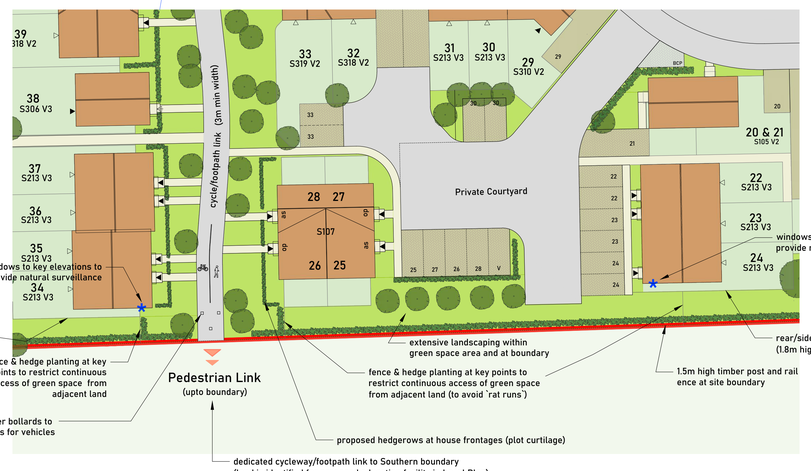
The details depicted on this drawing are the copyright to Seagate Homes and may not be reproduced without permission. This drawing must not be re-issued, loaned or copied without the consent. Errors omissions and discrepancies should be reported to the originator immediately.

All dimensions to be checked on site prior to construction or off-site fabrication by the Contractor, his Sub-contractor or Supplier.

Do not scale plans - use figure or grid dimensions where given.
Any deviation from the drawing is to be reported to the originator immediately.

IF IN DOUBT ASK !





INSET AREAS

1:250@A0

Scale : 1:250 — 0, 5m, 10, 20, 25m

LEGEND

- Application Site Boundary
- Proposed Housing
- Private Gardens/Green Space
- SUDS
- Drives/Parking
- Adoptable road/ Footpaths
- Private Footpaths
- Indicative Tree Planting
- Trees/hedge to be removed
- Play Area (LEAP)
- Rain Garden - adoptable SW run off areas. (may also include adoptable tree pits)
- House with dummy chimney(s) - These locations take precedent over house type drawings. (Refer to house type drawing for positions on roof)
- Garage personnel door
- Suds filter strip
- Primary Site Access
- Pedestrian/Cycle way Access
- Optional Window in dwelling to provide natural surveillance
- Cycle Rack fixed to concrete base. For each dwelling (if No Garage) and install rack adj. to LEAP
- BCP - Bin Collection Point. Individual collections will be at junction with adoptable surface/plot curtilage.

House Type Schedule (Phases 1 & 2)

1 Bed Houses		
S107 (61.0m² / 593ft²)	25, 26, 27, 28, 41, 42, 43, 44	8
S105 (49.6m² / 532 ft ²)	20, 21, 84, 85	4
S108 (49.7m² / 535 ft²)	109, 110, 111, 112	4
2 Bed Houses		
S202 (70m² / 753 ft²)	66	1
S203 V1 (75.5m² / 811 ft²)	6, 9, 10, 11, 12, 54, 57, 58, 59, 107, 108, 150, 151, 152, 153	15
S206 (66.7m² / 718 ft²)	65	1
S213 V1 (68.6m² / 738.5ft²)	15, 16, 17, 22, 23, 24, 30, 31, 34, 35, 36, 37, 69, 70, 52, 53, 75, 76, 77, 80, 81, 82, 83, 86, 87, 88, 94, 97, 98, 99, 100, 101, 122, 123, 124, 125, 126, 127, 148, 149	41
3 Bed Houses		
S303 V1 (93.3m² / 894ft²)	4, 7, 54, 55, 60, 61, 63, 64, 68, 69, 114, 115	10
S303 V2 (84.6m² / 912ft²)	130, 131, 132, 133, 142, 143, 144, 145, 154, 155	22
S303 V3 (84.6m² / 910ft²)	6, 70, 119, 138, 146, 157	6
S306 V3 (84.8m² / 916ft²)	5, 38, 72, 90, 93, 95, 106, 156	8
S308 V3 (86.6m² / 932ft²)	118	1
S310 V2 (89.6 m² / 962 ft²)	29	1
S312 V2 (89.3m² / 961 ft²)	67, 74, 89, 96, 117	5
S318 V2 (82m² / 882 ft²)	14, 32, 39, 40, 72, 78, 100, 103, 104, 128, 147	11
S319 V2 (89m² / 958ft²)	13, 33, 40, 63, 71, 79, 101, 102, 105, 129, 144	11
4 Bed Houses		
S403 (99.2m² / 1068ft²)	44, 113	2
S405 (107.44 m² / 1156ft²)	116, 136, 139	3
S406 V2 (118.8m² / 1279 ft²)	137, 140	2
S409 V2 (113.8m² / 1225 ft²)	91, 92	2
S430 V3 (116.5m²/1254ft²)	18, 19, 49, 50, 134, 135	6
S412 (120m²/1414 ft²)	2, 159	2
S415 (126m²/2625 ft²)	3, 158	2
5 Bed Houses		
S503 (134m²/2304 ft²)	1, 160	2
	Total =	160

House Breakdown (Phases 1 & 2)

1 Bed Houses	16
2 Bed Houses	58
3 Bed Houses	65
4 Bed Houses	19
5 Bed Houses	2
Total =	160

Rev	Notes	Date	By
P03	Site Layout updated following discussions with LCC Highways.	04.11.25	MD
P02	Legend updated	10.06.25	MD
P01	First Issue	21.05.25	MD

SEAGATE HOMES

Project: PROPOSED RESIDENTIAL DEVELOPMENT, MONKS HOUSE LANE WEST SPALDING, LINCS.

Drawing: SITE LAYOUT

Drawn: MD — Date: 21.05.2025

Status: PLANNING — Scale: 1:500 @A0

Drawing Number: 10034-SGH-SL-AR-1006 — Issue: P03

Appendix B – Topographic Survey

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NOTES

ABBREVIATIONS & SYMBOLS

AV	AIR VALVE	OHC	OVERHEAD CABLE
BH	BORE HOLE	PB	POST BOX
BOL	BOLLARD	PINV	PIPE INVERT LEVEL
CATV	CABLE TV MH	PM	PARKING METER
CCTV	SECURITY CAM	PO	POST
CL	CABLE LEVEL	PTL	POST TOP LEVEL
CH	CHANNEL	P/R	POST & RAIL FENCE
COL	COLUMN	P/W	POST & WIRE FENCE
CP	CONC POST LIO	RK	ROLLED TOP KERB
DP	DOWN PIPE	RE	RIDGE END POINT
DR	DRAIN	RL	RIDGE LEVEL
EL	EAVES LEVEL	RP	REFLECTIVE POST
EP	ELECTRIC POLE	RS	ROAD SIGN
ER	ELECTRIC BOX	SL	SOFFIT LEVEL
FB	FLOWER BED	SOF	SOFFIT LEVEL
FH	FIRE HYDRANT	SV	VALVE
FL	FINISHED FLOOR LEVEL	TW	TRADE WATER
FP	FLAG POLE	TAC	TACTILE PAVING
FW	FOUL WATER	TH	TRIAL HOLE
GV	GAS VALVE	TL	TRAFFIC LIGHTS
HW	HEADWALL	TLW	TARMAC LEVEL
IC	INSPECTION COVER	TOW	TOP OF WALL LEVEL
IL	INVERT LEVEL	TP	TELEGRAPH POLE
KB	KERB BOTTOM	TRK	TRACK
KO	KERB OFFLET	UO	UNABLE TO LIFT
KT	KERB TOP	UPV	UPVC PIPE
LP	LAMP POST	WL	WATER LEVEL
LC	LIGHT COLUMN	WLVL	WATER LEVEL
MH	MANHOLE	WM	WATER METER
MP	MARKER POST	WO	WASH-OUT POINT

FENCE, HEDGE, ELECTRIC, STORM LINE, FOUL LINE, TELECOM LINE, GAS LINE, LARSON PILES, CHANNELS, WATER MAIN; TREE, BOREHOLE, STATION, TBM, MANHOLE, GULLY, BATTER, WATER LVL, GATE

1. THE POSITION OF THIS SURVEY IS BASED ON GPS OSTN15 GRID.
2. ALL LEVELS RELATE TO GPS DATA ACQUIRED WITH TRIMBLE VRS.
3. TREES SPREADS ARE DRAWN TO SCALE AND SHOW THE GENERAL AVERAGE CANOPY SPREAD.
4. ALL BELOW GROUND LEVEL INFORMATION INCLUDING VOIDS, DRAINAGE & SERVICES HAVE BEEN IDENTIFIED FROM THE SURFACE LEVEL ONLY, THEREFORE PIPE SIZES ETC ARE APPROXIMATE AND ALL BELOW GROUND INFORMATION MUST BE CHECKED PRIOR TO THE COMMENCEMENT OF ANY SITE WORKS
5. EVERY EFFORT HAS BEEN MADE TO LOCATE AND SURVEY ALL VISIBLE FEATURES, IT SHOULD BE NOTED THAT SOME ITEMS MAY HAVE BEEN OBSCURED AT THE TIME OF THE SURVEY AND THEREFORE NOT SHOWN ON THIS DRAWING.
6. PHYSICAL BOUNDARY FEATURES SHOWN ON THIS DRAWING DO NOT NECESSARILY REPRESENT THE ACTUAL LEGAL BOUNDARIES, THIS INFORMATION SHOULD BE CONFIRMED WITH THE RELEVANT DOCUMENTATION.
7. THE CONTRACTOR MUST CHECK AND VERIFY ALL SITE LEVELS, DIMENSIONS AND SETTING OUT BEFORE ANY WORKS ARE TO COMMENCE AND ANY SITE WORKS DISCREPANCIES MUST BE NOTIFIED TO DANIEL CHARLES SURVEYS LTD.
8. ALL SURVEY STATION CONTROL POINTS MUST BE CHECKED BY THE CONTRACTOR PRIOR TO STARTING ANY SITE WORKS.

SURVEY CONTROL POINT INFORMATION

Point	Easting	Northing	Elevation
9006	522028.058	322577.007	2.716
9003	523108.396	321982.744	2.970
9005	523047.473	322148.082	3.068
9002	523053.649	322257.656	3.096
9007	523043.610	322648.922	3.280
9004	523059.816	322018.423	3.961
9000	523042.518	322406.750	3.046

SURVEY DATE	MAY 2024	INITIALS	CED/MJW/MH

Rev.	Amendments	Drn.	Date

Client:
SEAGATE HOMES

Project Title:
MONKS HOUSE LANE - SPALDING

Drawing Title:
TOPOGRAPHICAL SURVEY (1 OF 2)

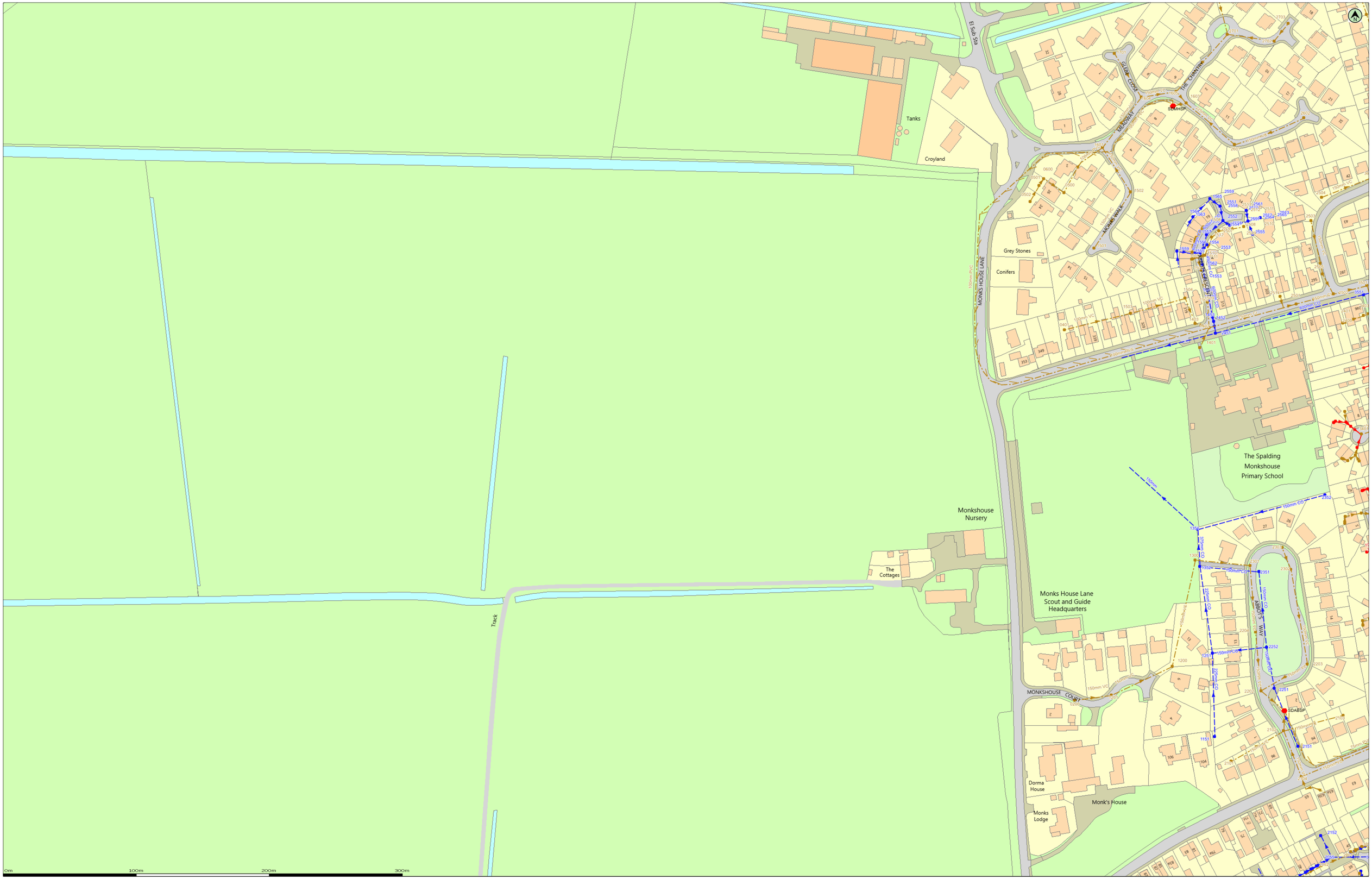
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Drawn By:	CED/ MJW/ MH	Checked By:	MJW

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N320400.00
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N320300.00
N320250.00
N320200.00
N320150.00
N320100.00
N320050.00
N320000.00
N319950.00
CULTIVATED FIELD
CULTIVATED FIELD
WORKSHOUSE COURT
A151 / BOURNE ROAD
A151 / BOURNE ROAD
SHED
SHED
GLOSSBOARD WOODEN FN
WORKSHOP
WAREHOUSE
BRICK PLT
GATE
GATE
GATE

Appendix C – Anglian Water Mapping

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Date: 03/01/25 | Scale: 1:1250 | Map Centre: 522801,322407 | Data updated: 30/11/24 | Our Ref: 1650603 - 1

Wastewater Plan A1
Powered by digdat

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. This plan is produced by Anglian Water Services Limited (c) Crown copyright and database rights 2024 Ordnance Survey AC0000813445.This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

- Foul Sewer
- Surface Sewer
- Combined Sewer
- Final Effluent
- Rising Main*
- Private Sewer*
- Decommissioned Sewer*
- Outfall*
- Inlet*
- Manhole*
- Sewage Treatment Works
- Public Pumping Station
- Decommissioned Pumping Station

*(Colour denotes effluent type)

charlie.neville@clancy.co.uk

Monks House

love every drop anglianwater

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
3345	523313	322322	C	-	-	-
0200	523093	322211	F	-	-	-
0401	523086	322489	F	2.98	2.65	0.33
0500	523085	322592	F	-	-	-
0501	523067	322597	F	-	-	-
0502	523060	322585	F	-	-	-
0600	523070	322602	F	-	-	-
1200	523167	322236	F	-	-	-
1201	523121	322215	F	-	-	-
1300	523184	322316	F	-	-	-
1401	523187	322476	F	2.8	2.1	0.7
1402	523194	322491	F	2.83	1.98	0.85
1403	523184	322494	F	2.94	2.03	0.91
1501	523108	322550	F	2.875	1.465	1.41
1502	523135	322592	F	2.9	1.16	1.74
1503	523135	322501	F	2.99	2.33	0.66
1504	523176	322513	F	2.941	2.091	0.85
1505	523186	322543	F	3.63	2.45	1.18
1506	523188	322534	F	3.6	2.41	1.19
1507	523193	322510	F	3.39	2.19	1.2
1510	523191	322545	F	-	-	-
1512	523196	322558	F	-	-	-
1601	523114	322626	F	2.76	0.9	1.86
1603	523177	322659	F	2.982	-0.238	3.22
1604	523144	322664	F	2.767	1.044	1.723
1605	523170	322668	F	2.8	-0.22	3.02
1701	523123	322696	F	2.696	1.3	1.396
2001	523298	322094	F	-	-	-
2002	523279	322086	F	-	-	-
2101	523211	322165	F	2.76	1.61	1.15
2102	523250	322188	F	3.14	1.3	1.84
2103	523295	322199	F	2.69	1.6	1.09
2104	523264	322153	F	10.936	8.373	2.563
2202	523233	322218	F	2.53	0.5	2.03
2203	523268	322238	F	2.22	0.77	1.45
2204	523229	322262	F	2.6	0.82	1.78
2301	523225	322312	F	2.38	0.98	1.4
2302	523256	322309	F	2.21	1.25	0.96
2303	523249	322325	F	2.21	1.37	0.84
2400	523295	322494	F	-	-	-
2401	523297	322495	F	-	-	-
2501	523260	322508	F	2.73	1.4	1.33
2502	523288	322516	F	2.7	1.17	1.53
2503	523271	322571	F	2.7	1.65	1.05
2504	523279	322588	F	2.89	-	-
2505	523280	322531	F	-	-	-
2506	523202	322563	F	-	-	-
2508	523220	322566	F	-	-	-
2514	523248	322514	F	-	-	-
2601	523214	322628	F	3.106	1.303	1.803
2602	523266	322648	F	2.997	1.638	1.359
2701	523208	322711	F	2.712	1.369	1.343
2702	523243	322706	F	2.773	1.593	1.18
2703	523254	322719	F	2.92	1.7	1.22
3004	523312	322102	F	-	-	-
3401	523309	322411	F	2.65	1.8	0.85
3403	523310	322500	F	-	-	-
3501	523313	322522	F	2.71	1.05	1.66
3701	523313	322725	F	3.09	1.79	1.3
1151	523199	322183	S	-	-	-
1251	523197	322246	S	-	-	-
1351	523186	322339	S	-	-	-
1352	523187	322311	S	-	-	-
1452	523198	322495	S	2.85	1.41	1.44
1551	523193	322560	S	3.62	1.98	1.64
1552	523188	322547	S	3.6	1.93	1.67
1553	523191	322527	S	3.51	1.91	1.6
1554	523193	322553	S	-	-	-
1555	523182	322546	S	-	-	-
1559	523170	322548	S	-	-	-
1563	523182	322574	S	-	-	-
1565	523195	322587	S	-	-	-
2055	523287	322093	S	3.1	1.245	1.855
2151	523261	322176	S	-	-	-
2152	523278	322109	S	2	-	-
2251	523243	322220	S	-	-	-
2252	523238	322251	S	-	-	-
2351	523232	322307	S	-	-	-
2352	523281	322365	S	-	-	-
2451	523199	322486	S	2.84	1.12	1.72
2551	523203	322582	S	3.59	2.06	1.53
2552	523205	322571	S	3.48	1.98	1.5
2555	523227	322561	S	-	-	-
2556	523210	322567	S	-	-	-
2557	523223	322570	S	-	-	-
2560	523222	322579	S	-	-	-
2562	523233	322573	S	-	-	-
3551	523310	322515	S	-	-	-

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix D – Flood Risk Management Action Plan

Lincolnshire Flood Risk and Water Management Partnership



Joint Lincolnshire Flood Risk and Water Management Strategy 2019-2050

Part 3 of 3

Action Plan 2021-2022

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Front cover photo: Stamp End Flood Alleviation Scheme, Lincoln

1 Introduction

Lincolnshire County Council, as the Lead Local Flood Authority for the county, is required by legislation to work with other Risk Management Authorities to develop, maintain, apply and monitor a Local Flood Risk Management Strategy, which must be consistent with the Environment Agency's National Flood and Coastal Erosion Risk Management Strategy.

The Risk Management Authorities are:

- Lincolnshire County Council
- The Environment Agency
- The 14 internal drainage boards operating in Lincolnshire
- The 7 district councils in Lincolnshire
- The two water and sewerage companies operating in Lincolnshire

To improve the way we work together, these organisations created the Lincolnshire Flood Risk and Water Management Partnership in April 2010, and they are joined by:

- Natural England
- The regional flood & coastal committee
- The Lincolnshire Resilience Forum (authorities responsible for planning for and responding to emergencies of all kinds)

The partnership has worked together to agree the Joint Lincolnshire Flood Risk and Water Management Strategy. The purpose of the strategy is to increase the safety of people across Lincolnshire by reducing the number of people at risk of flooding, increasing the resilience of local communities and reducing the impact of flooding.

The original strategy was developed through public and stakeholder consultation during 2011 and 2012 and was fully revised and updated during 2018 and 2019. This is part 3 of the strategy – the action plan. It sets out the planned improvement schemes and maintenance work activities that Risk Management Authorities intend to do in partnership, to help achieve the overall aims of the strategy. These joint actions form the common works programme set out in this document. The action plan will be updated annually and will include key organisational, management and business actions, in addition to the physical works on site contained in the common works programme.

Where possible, the action plan seeks to identify activities that are planned to commence in the current financial year i.e April 2021-March 2022, and those where completion extends into future years. However, because the action plan will be updated to take account of issues that emerge within the 2021-2022 year, actions identified are provisional, and may be subject to change. In addition to those

identified schemes it should be noted that investigation works are being undertaken by Risk Management Authorities on potential future schemes which, if progressed in year will be captured and recorded in subsequent updates to this programme.

2 Risk-based prioritisation

When determining our priorities and actions, the Lincolnshire Flood Risk and Water Management Partnership will direct its resources to areas where there is the greatest need, and where investment will bring the greatest benefits. However, demand for schemes and works is always likely to exceed resource, so we must be able to clearly define which work has the highest priority.

The most important priority will always be minimising risk to human life, followed by risk to health, critical infrastructure, property, businesses including agriculture, and the environment. These are key factors in the National Flood Risk and Coastal Erosion Management Strategy and the partnership will work within this framework when prioritising flood risk management measures in Lincolnshire. This has been the approach used to develop this action plan for 2021-22.

The type of action that will be undertaken to manage flood risk and drainage will depend on the severity of the risk in each circumstance, including factors such as the likelihood of flooding, the level of danger posed by flooding, its impacts and the physical and economic feasibility of implementing a specific scheme or activity.

3 Funding

Funding for flood risk management comes from a range of sources, including national funding from the Department for the Environment, Food and Rural Affairs (Defra), via the Environment Agency, from the Ministry of Housing, Communities and Local Government, and locally from the county council, internal drainage boards and district councils. Water and sewerage companies also invest in works which have a significant impact on managing flood risk.

National funds for works, known as ‘Grant in Aid’, will be maximised, and are allocated according to a national formula that uses a range of different criteria to establish the relative priority of schemes, and thereby to establish how much national funding each scheme can attract. This formula now provides for contributions of local funds to enable the allocation of some national funding to schemes that might not previously have attracted any, but it does mean that fewer schemes will now be fully funded from this source.

Funds raised by internal drainage boards and district councils are generally spent within their own areas, while government funding direct to the county council is allocated across Lincolnshire to discharge its duties as Lead Local Flood Authority. Funding provided by the Government to the Environment Agency is allocated at regional level by the regional flood and coastal committee. This is also true of funds raised locally (called 'Local Levy') and provided to the Environment Agency by the

county council. Other county council funds provided for flood risk management are allocated and spent within the county.

4 The action plan, including the common works programme

This action plan includes schemes, works and other initiatives undertaken by Risk Management Authorities across Lincolnshire. Many of these activities are already the responsibility of individual organisations, such as the maintenance of an organisation's own assets, or the fulfilment of particular legal obligations.

In some cases, two or more authorities have come together through the Lincolnshire partnership to deliver work that would not have been possible, or would have taken longer to achieve, if undertaken by one organisation alone.

These works form the common works programme.

5 Programme delivery

This programme will be refreshed annually (with an option to provide a 6 monthly programme update) and all Risk Management Authorities will retain the maximum flexibility to respond to schemes and works needs as they arise.

By combining resources, partners have been able to attract inward investment at a national level and raise the priority of proposed schemes regionally.

6 Partner organisations

Partner organisations include:

- The Environment Agency
- Lincolnshire County Council
- West Lindsey District Council
- East Lindsey District Council
- City of Lincoln Council
- North Kesteven District Council
- South Kesteven District Council
- Boston Borough Council
- South Holland District Council
- Scunthorpe and Gainsborough Water Management Board
- Trent Valley IDB

- Ancholme IDB
- North East Lindsey IDB
- Lindsey Marsh DB
- Witham First District IDB
- Upper Witham IDB
- Witham Third IDB
- Witham Fourth District IDB
- Black Sluice IDB
- Welland & Deepings IDB
- South Holland IDB
- North Level IDB
- King's Lynn IDB
- Anglian Water
- Severn Trent Water
- Anglian (Northern) RFCC

7 2021-2022 common works programme

This common works programme provides an overview of planned flood risk and drainage management works, from all inundation sources, to be carried out across Lincolnshire by relevant Risk Management Authorities, commencing 1st April 2021. This information is provisional, and is subject to availability of funding and other resources, and possible changes in priorities during the period.

7.1 Joint programme of work attracting Government grant in aid and partnership funding

Work name	Lead Risk Management Authority *(Other Risk Management Authority partners involved)*	Flood risk source	Planned delivery (years)
Asset recondition programme	Environment Agency	Main rivers	2013-2022
Boston Barrier works	Environment Agency *(Lincolnshire Lead Local Flood Authority, Boston Borough Council, Black Sluice and Witham 4th Internal Drainage Boards)*	Sea	2013-2022
Flood risk mapping	Environment Agency *(All Risk Management Authorities)*	All	2013-2022
Bridges replacement and refurbishment	Environment agency *(All Risk Management Authorities)*	All	2013-2022

Work name	Lead Risk Management Authority *(Other Risk Management Authority partners involved)*	Flood risk source	Planned delivery (years)
Area incident room improvements	Environment Agency *(All Risk Management Authorities)*	All	2013-2022
Saltfleet to Gibraltar Point Beach Management	Environment Agency *(Lincolnshire Lead Local Flood Authority, East Lindsey District Council, Lindsey Marsh Drainage Board)*	Sea	2021-2026
Enhancing Lincolnshire coast	Environment Agency *(Lincolnshire Lead Local Flood Authority, East Lindsey District Council, Lindsey Marsh Drainage Board)*	Sea	2021-2035
Swaton Resilience Scheme	Environment Agency *(Black Sluice Internal Drainage Board, North Kesteven District Council, Anglian Water)*	Main rivers	2014-2021
Boston upstream tidal System	Environment Agency *(Lincolnshire Lead Local Flood Authority, Witham 4th Internal Drainage Board)*	Sea	2019-2022
Boston Haven Banks Flood Defence Scheme	Environment Agency *(Lincolnshire Lead Local Flood Authority, Witham 4th Internal Drainage Board)*	Sea	2016-2021

Work name	Lead Risk Management Authority *(Other Risk Management Authority partners involved)*	Flood risk source	Planned delivery (years)
Lincoln defences	Environment Agency *(Lincolnshire Lead Local Flood Authority, Upper Witham Internal Drainage Board)*	Main rivers	2016-2021
Lincoln Washlands control panel	Environment Agency *(Lincolnshire Lead Local Flood Authority, Upper Witham Internal Drainage Board)*	Main rivers	2019-2021
Gibraltar Point to Freiston Shore System Sustain Project	Environment Agency *(Lincolnshire Lead Local Flood Authority, East Lindsey District Council, Lindsey Marsh Drainage Board)*	Main rivers	2021-2023
River Rase - Sustain Project	Environment Agency *(Lincolnshire Lead Local Flood Authority, West Lindsey District Council, Ancholme Internal Drainage Board)*	Main rivers	2021-2026
River Slea Flood Resilience Project	Environment Agency *(Lincolnshire Lead Local Flood Authority, Witham 1st Internal Drainage Board)*	Main rivers	2021-2026

Work name	Lead Risk Management Authority *(Other Risk Management Authority partners involved)*	Flood risk source	Planned delivery (years)
Wainfleet Flood Resilience Scheme	Environment Agency *(Lindsey Marsh Drainage Board, Lincolnshire Lead Local Flood Authority, East Lindsey District Council)*	Main rivers	2021-2023
Lower Witham Flood Resilience Project	Environment Agency *(Lincolnshire Lead Local Flood Authority, Witham 1st, 3rd & 4th Internal Drainage Boards; Black Sluice Internal Drainage Board)*	Main rivers	2021-2027
Crowland and Cowbit Washes (Welland flood banks) refurbishment	Environment Agency *(Lincolnshire Lead Local Flood Authority, Welland & Deepings Internal Drainage Board)*	Main rivers	2021-2026
River Steeping Enhanced catchment programme	Environment Agency & Lindsey Marsh Drainage Board *(Lincolnshire Lead Local Flood Authority, East Lindsey District Council)*	Main rivers	2017-2022
River Steeping dredging	Lindsey Marsh Drainage Board (Environment Agency, East Lindsey District Council)	Main rivers	2020-2021

Work name	Lead Risk Management Authority *(Other Risk Management Authority partners involved)*	Flood risk source	Planned delivery (years)
South Lincolnshire Water Management Partnership initiatives	Lincolnshire Lead Local Flood Authority *(Environment Agency, Anglian Water, Black Sluice IDB, Welland & Deepings IDB)*	Lowland ordinary watercourses	2020-2023
Spalding, Acacia Avenue	South Holland IDB *(Lincolnshire Lead Local Flood Authority)*	Lowland ordinary watercourses	2020-2023
Culverted watercourse lining in Boston	Witham 4th District Internal Drainage Board *(Lead Local Flood Authority)*	Lowland ordinary watercourses	2016-2022
Trusthorpe pumping station refurbishment	Lindsey Marsh Drainage Board *(Environment Agency)*	Lowland ordinary watercourses and main rivers	2021-2022
Saltfleet pumping station refurbishment (incorporating EA Black Gowt outfall)	Lindsey Marsh Drainage Board *(Environment Agency)*	Lowland ordinary watercourses	2019-2023
LMDB, EA PSCA - recovery works - embankment repairs to Great Eau, Long Eau, Greyfleet Drain and River Steeping	Lindsey Marsh Drainage Board *(Environment Agency)*	Main rivers	2020-2021
Culverts at Thorpe culvert	Lindsey Marsh Drainage Board *(Environment Agency, Witham 4th Internal Drainage Board)*	Main Rivers, lowland ordinary watercourses	2020-2022

Work name	Lead Risk Management Authority *(Other Risk Management Authority partners involved)*	Flood risk source	Planned delivery (years)
Billinghay pumping station refurbishment	Witham First District IDB *(Environment Agency)*	Lowland ordinary watercourses	2020-2021
SFF Upper Catchment natural flood management and control analysis	Black Sluice IDB *(Environment Agency)*	Lowland ordinary watercourses	2020-2021
Binbrook – Louth Road	East Lindsey District Council *(Lindsey Marsh Drainage Board, Anglian Water, Lincolnshire Lead Local Flood Authority)*	Lowland ordinary watercourses, groundwater	2021-2022
Scopwick , groundwater flood risk investigations, improvement options and potential works	Lincolnshire Lead Local Flood Authority *(Anglian Water, North Kesteven District Council, Witham 1st Internal Drainage Board)*	groundwater	2020-2022
The Gride, Boston	Witham 4th Internal Drainage Board *(Lincolnshire Lead Local Flood Authority)*	Lowland ordinary watercourses	2020-2022
The Fodderdyke, Midville	Witham 4th Internal Drainage Board *(Lincolnshire Lead Local Flood Authority)*	Lowland ordinary watercourses	2020-2022
Goosemuck Lane, Sibsey	Witham 4th Internal Drainage Board *(Lincolnshire Lead Local*	Lowland ordinary watercourses	2021-2022

Work name	Lead Risk Management Authority *(Other Risk Management Authority partners involved)*	Flood risk source	Planned delivery (years)
	Flood Authority)Anglian Water Services, Private Landowners		
Wrangle pumping station refurbishment, Wrangle	Witham 4th Internal Drainage Board *Environment Agency , Private Landowners*	Lowland ordinary watercourses	2021-2023
Capital main drain dredging, Witham Fourth catchment	Witham 4th Internal Drainage Board *Environment Agency , Private Landowners*	Lowland ordinary watercourses	2021-2027
Telemetry upgrade, Witham Fourth catchment	Witham 4th Internal Drainage Board *Environment Agency , Private Landowners*	Lowland ordinary watercourses	2021-2022
Whaplode - Millgate	South Holland IDB *(Lincolnshire Lead Local Flood Authority)*	Lowland ordinary watercourses	2021-2022
Gedney Drove End	South Holland IDB *(Lincolnshire Lead Local Flood Authority, Anglian Water)*	Lowland ordinary watercourses	2021-2022
North Scarle - Eagle Road flood relief	Trent Valley Internal Drainage Board *(Lincolnshire Lead Local Flood Authority, Developer)*	Lowland ordinary watercourses	2020-2021

7.2 Joint programme of annual core activities

Description of activities	Risk Management Authority	Flood risk source
Minor improvements to assets: • Feasibility studies and scheme appraisal; • Detailed design and procurement of contracts and materials etc; and • Delivery of works.	Environment Agency	Main rivers and sea
Routine maintenance of assets: • Asset condition inspection; • System monitoring and operation; • Maintaining structures; • Grass cutting (hand or mechanical); • Weed control (mechanical and chemical); • Pest, and vermin control and tree works; • Defence repairs; • Work on flood storage reservoirs; • Obstruction removal and debris clearance from rivers; • De silting and dredging; • Pumping operations; • Control of river water levels and flows on main rivers; • Consenting and enforcement; • Flood bank and channel reprofiling and reinstatement; and • Environmental management.	Environment Agency	Main rivers and sea
Emergency incidents, response and recovery:	Environment Agency	Main rivers and sea

• Issue flood warnings; • Raise awareness amongst staff and site operatives; • Monitor rainfall and water levels across Lincolnshire; • Liaise with other Risk Management Authorities and emergency services; • Implement pre-determined emergency response plans; • Pre-plan resources and deploy staff and equipment; • Open control rooms and manage and respond to incidents; and • Work with partners on single agency and multi-agency responses.		

Description of activities	Risk Management Authority	Flood risk source
Minor improvements to assets: • Replacement or installing of linear drainage units, chambers, covers, drain pipes and surface water sewers; • Connections with new or existing installations; • Replacement or installing of pipes outfalls to ditches, combination drainage units; and • Undertake drainage system studies and CCTV investigations • Minor works to prevent surface water flooding	Lincolnshire Lead Local Flood Authority	Surface water, groundwater and flooding from ordinary watercourses
Routine maintenance of assets: • Cleaning and jetting of gullies; • Drainage channel clearing; • Manhole maintenance; • Watercourse cleansing; • Inspection and maintenance of bridges and culverts; • Catchpit cleansing; and • Grip cutting and clearing	Lincolnshire Lead Local Flood Authority	Surface water, groundwater and flooding from ordinary watercourses

Emergency incidents, response and recovery: • Raise awareness within organisations and with alliance partners; • Implement pre-determined emergency response plans; • Pre-plan resources and deploy staff and equipment; • Work with partners and emergency services on single agency and multi-agency responses; and • Open control rooms and manage and respond to incidents.	Lincolnshire Lead Local Flood Authority	Surface water, groundwater and flooding from ordinary watercourses

Description of activities	Risk Management Authority	Flood risk source
Repair, refurbishment and replacement of assets (including minor improvements): • Feasibility studies and scheme appraisal; • Detailed design and procurement of contracts and materials etc; and • Delivery of works.	Internal Drainage Boards	Lowland ordinary watercourses
Routine maintenance of assets: • Bridge and culvert inspections and cleansing; • Removal of debris and blockages; • Bank mowing my machine and by hand; • Mechanical and hand weed clearance from channels; • Chemical weed control; • Bush and tree clearance; • Silt removal from channels and culverts; • Operation and maintenance of pumping stations, outfalls and sluices; • Asset inspections and condition assessments; • Consenting and enforcement; • Reforming of watercourse banks and slip repairs; and	Internal Drainage Boards	Lowland ordinary watercourses

• Control of lowland ordinary watercourse water levels within district.		
Land Drainage Act management; • Consenting and enforcing of culverts, weirs, structures etc on board maintained and also riparian owned ordinary watercourses • Enforcement in order to maintain flows on board maintained and all riparian owned ordinary watercourses	Internal Drainage Boards	All non main river watercourses in existing IDB areas and extended areas throughout the county
Emergency incidents, response and recovery: • Raise awareness amongst staff and site operatives; • Monitor rainfall and water levels within the drainage district; • Liaise with other Risk Management Authorities; • Implement pre-determined emergency response plans; • Pre-plan resources and deploy staff and equipment; • Open control rooms and manage and respond to incidents; and • Work with partners and emergency services on single agency and multi-agency responses.	Internal Drainage Boards	Lowland ordinary watercourses

Description of activities	Risk Management Authority	Flood risk source
Major and minor improvements to assets: • Investigation of root cause; • Feasibility studies and scheme appraisal;	Water companies	Public and transferred sewers and

• Detailed design through in house and contract resource; • Delivery of works; and • Provision of new assets.		drains
Routine maintenance of assets: • Asset condition inspection; • Monitoring and response to telemetered assets; • Maintenance of sewers; • Maintenance of pumping stations; • Maintenance of sewage treatment works; • Reactive response to issues arising from public assets; and • Maintenance of adopted flood storage reservoirs and structures.	Water companies	Public and transferred sewers and drains
Emergency incidents, response and recovery: • Resilience focused response; • Response to sewage and water related incidents; • Raise awareness amongst staff and site operatives; • Liaise with other Risk Management Authorities and emergency services; • Plan resources and deploy staff and equipment; • Open Incident room and manage and respond to incidents; and • Work with partners on single agency and multi-agency responses.	Water companies	Public and transferred sewers and drains

Description of activities	Risk Management Authority	Flood risk source
Minor improvements and maintenance of assets: • Undertake works on ordinary watercourses and liaise with riparian owners • Bridge and culvert inspections and cleansing; • Removal of debris and blockages; • Silt removal from channels and culverts;	District, borough and city councils	Surface water, groundwater and flooding from ordinary

• Asset inspections and condition assessments; and • Operation and maintenance of pumping stations, outfalls and sluices.		watercourses
Emergency incidents, response and recovery: • Raise awareness amongst staff and site operatives; • Monitor rainfall and water levels within the district; • Liaise with other Risk Management Authorities; • Implement pre-determined emergency response plans; • Pre-plan resources and deploy staff and equipment; • Open control rooms and manage and respond to incidents; and • Work with public, partners and emergency services on single agency and multi-agency responses.	District, borough and city councils	Surface water, groundwater and flooding from ordinary watercourses

8 Find Out More

Read more about this strategy.

Hard copies are available on request. Postal enquiries should be sent to:

Joint Lincolnshire Flood Risk and Water Management Strategy
Lincolnshire County Council
Place
Lancaster House
36 Orchard Street
Lincoln LN1 1XX

Email enquiries should be sent to FloodRisk@lincolnshire.gov.uk

For telephone enquiries please contact 01522 552222

Appendix E – Product 4 and 6 Data, EA Flood Report

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NOTES

1. The potential flooding consequences shown on this map primarily relate to flooding from the sea and main rivers taking into account the presence of current flood risk management measures such as flood defences.

2. This update only included new flood risk information from River Welland (Fluvial), River Glen (Fluvial) and Tidal hazard mapping (River Welland, River Nene and the Wash sea defences). No new information from the Internal Drainage Boards and associated systems was used for this update.

3. In addition to the potential flood extents shown on this map, there may be shallow flooding in low-lying rural areas

4. The consequences designated as being a Residual Risk arise from direct overtopping of defences, where this would occur, together with breach failure which is assumed could occur at any point along the defences.

5. Functional Floodplain encompasses areas where water is intended to flow or be stored in times of flood.

6. Land outside South Holland District is not considered.

7. This map shows the extents only of the flooding probability bands relevant to the map Title

Map Legend

Peak Depth

- 0m - 0.25m
- 0.25m - 0.5m
- 0.5m - 1m
- 1m - 2m
- 2m +
- Functional Floodplain
- South Holland District Boundary

REV	DATE	REMARKS
2	Feb 17	Modelling and Mapping Update
1	Dec 16	Modelling and Mapping Update

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UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

Residual Peak Depth
District - Present Day
1% Fluvial / 0.5% Tidal Event Probability

DATE OF ISSUE: Feb 2017 **REV NO:** 2

SCALE: 1 : 60,000 @ A1

MAP NO:

N

NOTES

1. The potential flooding consequences shown on this map primarily relate to flooding from the sea and main rivers taking into account the presence of current flood risk management measures such as flood defences.

2. This update only included new flood risk information from River Welland (Fluvial), River Glen (Fluvial) and Tidal hazard mapping (River Welland, River Nene and the Wash sea defences). No new information from the Internal Drainage Boards and associated systems was used for this update.

3. In addition to the potential flood extents shown on this map, there may be shallow flooding in low-lying rural areas

4. The consequences designated as being a Residual Risk arise from direct overtopping of defences, where this would occur, together with breach failure which is assumed could occur at any point along the defences.

5. Functional Floodplain encompasses areas where water is intended to flow or be stored in times of flood.

6. Land outside South Holland District is not considered.

7. This map shows the extents only of the flooding probability bands relevant to the map Title

Map Legend

Max Hazard
(Flood Risk to People : FD2320)

- Less than 0.75 (Low Hazard)
- Between 0.75 and 1.25 (Danger for Some)
- Between 1.25 and 2.0 (Danger for Most)
- Greater than 2.0 (Danger for All)
- Functional Floodplain
- South Holland District Boundary

REV	DATE	REMARKS
2	Feb 17	Modelling and Mapping Update
1	Dec 16	Modelling and Mapping Update

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UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

Residual Flood Hazard
District - Present Day
1% Fluvial / 0.5% Tidal Event Probability

DATE OF ISSUE: Feb 2017 **REV NO:** 2

SCALE: 1 : 60,000 @ A1

MAP NO:

Charlie Neville

charlie.neville@clancy.co.uk

Our ref: CCN-2025-391453

Date: 07/02/2025

Dear Charlie

Provision of Flood Risk Information for Monks House Lane, Spalding, PE11 3WE

Thank you for your request for our flood risk information for the above site. The information is set out below and attached. It is important you read any contextual notes on the maps provided.

If you are preparing a Flood Risk Assessment (FRA) for this site, please note this information may not be sufficient by itself to produce an adequate FRA to demonstrate the development is safe over its lifetime. Additional information may be required to carry out an appropriate assessment of all risk, such as consequence of a breach in defences.

We aim to review our information on a regular basis, so if you are using this data more than twelve months from the date of this letter, please contact us again to check it is still valid.

Please read the letter in full as the information covered has been updated in **December 2024.**

1. Flood Map for Planning

The attached map includes the current Flood Map for Planning for your area. The map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

The Flood Map for Planning also shows the location of formal raised flood defences and flood storage reservoirs. It represents areas at risk of flooding for present day only and does not take account of climate change.

The Flood Map for Planning only indicates the extent and likelihood of flooding from rivers or the sea. It should also be remembered flooding may occur from other sources such as surface water sewers, road drainage, etc.

2. Recorded Flood Outlines

With regards to the history of flooding I can advise we do not have any records of flooding in this area. It is possible recent flooding may have occurred which we are currently investigating, therefore this information may be subject to change. It is possible other flooding may have occurred which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

3. Schemes in the area

There are no ongoing capital projects to reduce or sustain the current flood risk to this site.

4. Fluvial Flood Risk Information

The site may be at risk from main rivers in the form of residual risk due to the failure of flood management infrastructure such as a breach of a raised flood defence. You may need to undertake further assessment of this residual risk using the data provided.

The site may also be at risk from local ordinary watercourses for which other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist) have responsibility.

4.1 Fluvial Defence Information

The existing fluvial defences reducing the risk of flooding to this site consist of Crowland-Cowbit Washes and embankment. They are in fair condition and provide protection against a flood event with a 1% chance of occurring in any year (1 in 100). We inspect these defences regularly to ensure that any potential defects are identified early.

4.2 Fluvial Modelled Levels and Flows

Available modelled fluvial flood levels and flows for the model nodes shown on the attached map are set out in the data table attached. This data is taken from the model named on the data table, which is the most up-to-date model currently available.

Please note these levels are “in-channel” levels and therefore may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences.

Our models may not have the most up to date climate change allowances. In time we will update our models for the latest allowances. You should refer to 'Flood risk assessments: climate change allowances' to check if the allowances modelled are appropriate for the type of development you are proposing and its location. You may need to undertake further assessment of future flood risk using different allowances to ensure your assessment of future flood risk is based on best available evidence.

4.3 Fluvial Modelled Flood Extents

Our modelled flood extents, which take into account flood defences, do not impact this site.

There may still be a residual risk of fluvial flooding to your site due to the failure of flood management infrastructure such as a breach of a raised flood defence. You may need to undertake further assessment of this residual risk using the data provided.

4.4 Fluvial Hazard Mapping

For certain locations we have carried out modelling to map the maximum values of flood depth, velocity and hazard rating (danger to people) resulting from overtopping and / or breaching of defences at specific locations for a number of scenarios.

At present this information is available for fluvial flood risk in Northampton, Lincoln, Wainfleet and some isolated rural locations.

The number of locations we have this information for is expected to increase in time.

At present this site is not covered by any Environment Agency hazard mapping.

Detailed Hazard Mapping is available within the 2017 Update of South Holland Strategic Flood Risk Assessment. This can be downloaded via the following link:
http://www.southeastlincslocalplan.org/water/

5. Tidal Flood Risk Information

This site is not considered to be at risk from tidal flooding.

6. Development Planning

If you would like local guidance on preparing a flood risk assessment for a planning application, please contact our Sustainable Places team at LNplanning@environment-agency.gov.uk. It will help if you mention this data request and attach your site location plan.

We provide free preliminary advice; additional/detailed advice, review of draft FRAs and meetings are chargeable at a rate set to cover our costs, currently £100 (plus VAT) per hour of staff time. Further details are available on our website at https://www.gov.uk/guidance/developers-get-environmental-advice-on-your-planning-proposals.

General advice on flood risk assessment for planning applications can be found on GOV.UK at https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications

Climate change will increase flood risk due to overtopping of defences. Please note, unless specified otherwise, the climate change data included has an allowance for 20% increase in flow. Updated guidance on how climate change could affect flood risk to new development - 'Flood risk assessments: climate change allowances' was published on GOV.UK in **July 2021**. The appropriate updated climate change allowance should be applied in a Flood Risk Assessment.

You should also consult the Strategic Flood Risk Assessment produced by your local planning authority.

7. Data Licence and Other Supporting Information

We respond to requests for recorded information we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

This information is provided in accordance with the Open Government Licence which can be found here: http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

Further information on flood risk can be found on the GOV.UK website at:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

8. Other Flood Risk Management Authorities

The information provided with this letter relates to flood risk from main river or the sea. The Flood Map for Surface Water can be viewed at https://www.gov.uk/check-long-term-flood-risk

Additional information may be available from other risk management authorities, such as the Lead Local Flood Authority (ie top tier council) or Internal Drainage Board (where they exist).

I hope we have correctly interpreted your request. If you have any queries or would like to discuss the content of this letter further please contact Rachael Storey using the email address below and quoting our CCN reference number above.

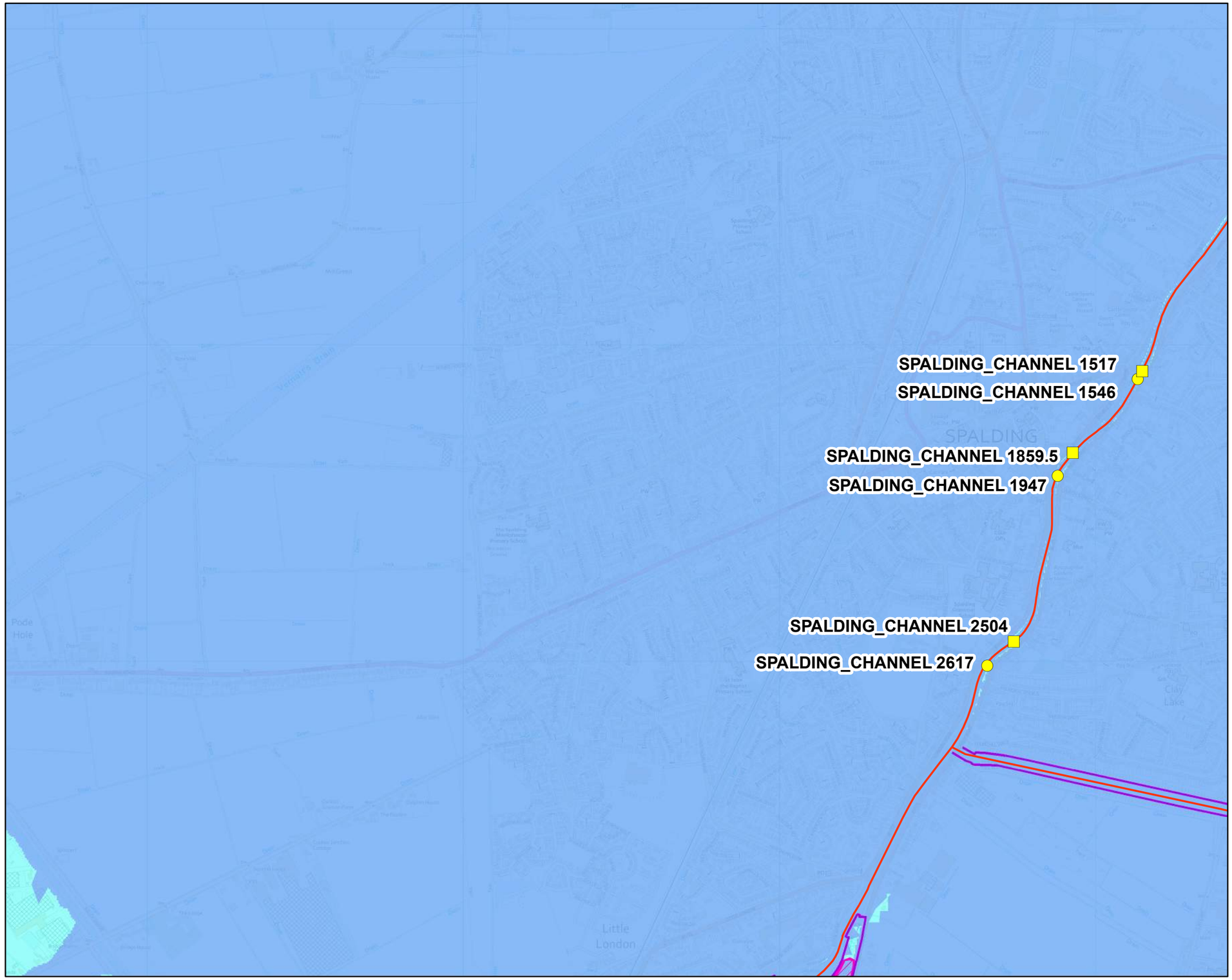
Yours sincerely,

Rachael Storey

for John O'Neill
Welland and Nene Partnerships and Strategic Overview Team Leader
e-mail PSOWN@environment-agency.gov.uk

Enc.
Flood Map for Planning
Modelled Fluvial Levels and Flows Data Sheet

Flood Map centred on TF 23485 22542 - created February 2025 [Ref: CCN-2025-391453]



Environment Agency

Scale 1:12,500

N

Legend

- Welland Glen Flows
- Welland Glen Levels
- Main Rivers
- Raised Defences
- Flood Storage Areas
- Areas at Risk of Flooding from Rivers or the Sea
- Extreme Flood Outline

Dark blue shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded:

- from the sea by a flood that has a 0.5% (1 in 200) or greater chance of happening each year.

- or from a river by a flood that has a 1% (1 in 100) or greater chance of happening each year.

Light blue shows the extent of the Extreme Flood Outline, which represents the extent of a flood event with a 0.1% chance of occurring in any year, or the highest recorded historic extent if greater.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements. Sites outside the two extents, but behind raised defences, may be affected by flooding if the defences are overtopped or fail.

Created by the Partnerships and Strategic Overview Team, Kettering

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Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Fluvial Flood Levels (mODN)

The fluvial flood levels for the model nodes shown on the attached map are set out in the table below. They are measured in metres above Ordnance Datum Newlyn (mODN).

			Annual Exceedance Probability - Maximum Water Levels (mODN)											
Node Label	Easting	Northing	50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	3.33% (1in 30)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
SPALDING_CHANNEL	525133	322892	3.70	3.98	4.17	4.44	4.49	4.51	4.52	4.52	4.67	4.53	4.55	4.67
SPALDING_CHANNEL	524880	322587	3.69	3.98	4.17	4.44	4.49	4.50	4.51	4.51	4.67	4.53	4.55	4.67
SPALDING_CHANNEL	524658	321986	3.68	3.96	4.17	4.42	4.48	4.49	4.50	4.50	4.67	4.52	4.54	4.67

Fluvial Flood Flows (m^3/s)

The fluvial flood flows for the model nodes shown on the attached map are set out in the table below. They are measured in metres cubed per second (m^3/s).

			Annual Exceedance Probability - Maximum Flows (m^3/s)											
Node Label	**Easting**	**Northing**	**50% (1 in 2)**	**20% (1 in 5)**	**10% (1 in 10)**	**5% (1 in 20)**	**3.33% (1in 30)**	**2% (1 in 50)**	**1.33% (1 in 75)**	**1% (1 in 100)**	**1% (1 in 100) inc 20% Climate Change**	**0.5% (1 in 200)**	**0.1% (1 in 1000)**	**0.1% (1 in 1000) inc 20% Climate Change**
SPALDING_CHANNEL 1517	525148	322917	3.15	4.45	4.74	5.44	5.52	5.20	5.81	6.15	8.24	5.99	5.51	8.24
SPALDING_CHANNEL 1859.5	524928	322659	3.69	4.97	5.86	6.68	6.87	6.45	7.03	7.47	9.83	7.43	6.90	9.44
SPALDING_CHANNEL 2504	524741	322062	4.52	6.70	7.54	8.64	9.10	8.47	8.88	9.38	11.84	9.66	9.13	11.85

Flood map for planning

Your reference	Location (easting/northing)	Created
Monks House	**522847/322409**	**3 Jan 2025 9:53**

Your selected location is in flood zone 3
– an area with a high probability of flooding.

This means:

- you may need to complete a flood risk assessment for development in this area
- you should ask the Environment Agency about the level of flood protection at your location and request a Flood Defence Breach Hazard Map (You can email the Environment Agency at: enquiries@environment-agency.gov.uk)
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (find out more at www.gov.uk/guidance/flood-risk-assessment-standing-advice)

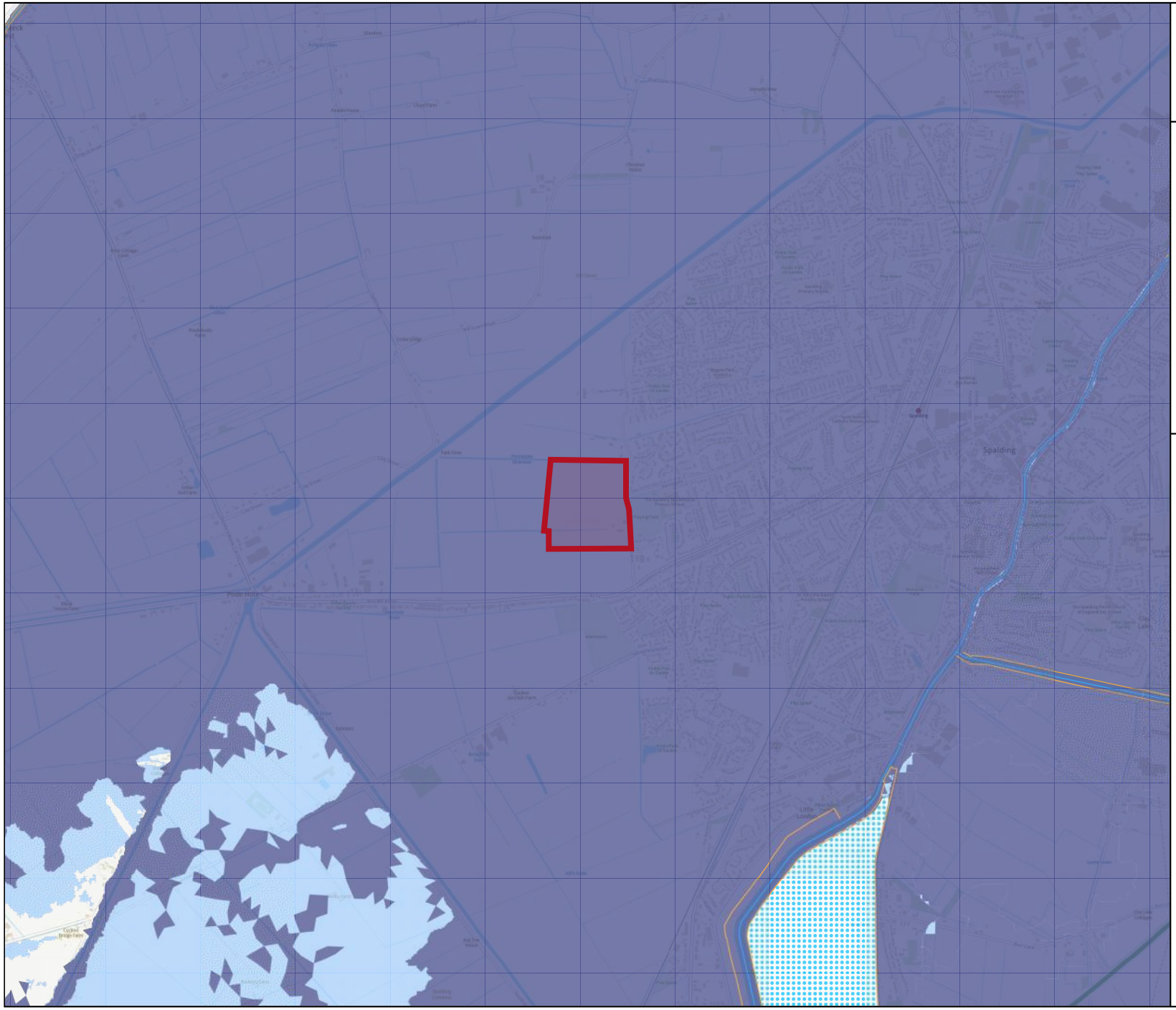
Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence which sets out the terms and conditions for using government data. https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/

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Environment Agency

Flood map for planning

Your reference
Monks House

Location (easting/northing)
522847/322409

Scale
1:25000

Created
3 Jan 2025 9:53

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 200 400 600m

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Appendix F – British Geological Survey Information Extracts

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Job Number: 27439 | **Site:** Wygate Park Relief Road, Spalding | **Trial Pit.:** TP2 | **Sheet 1 of 1**

Remarks : Surface: area adjacent to field, area marked out with pegs, finished road level + 0.5m is 0.75m above GL. BA1. No groundwater encountered. Pit stable.

Location: See Plan | **Orientation:** N-S | **Dimensions:** Length : 2.20m, Width : 0.80m, Depth : 1.70 m

Client: Allison Homes Eastern Limited | **Face Logged :** E

Excavation Method: Beckhoe Loader | **Logged By:** BA | **Log Scale:** 2.00 m/page | **Ground Level:** - m AOD

Date (2005)	Depth of Casing (m)	Depth of Water (m)	Sample/Test No	Sample/Test Type	Sample/Test Depth (m)	Change of Strata Legend	Depth below GL (m)	Reduced Level m AOD	Thickness of Stratum (m)	Description of Strata	MPT Test Result	NMC %	Atterberg Limits LL %	Atterberg Limits PL %	Atterberg Limits PI %	CBR %	Density Bulk Mg/m3	Density Dry Mg/m3	Shear Strength Cu kPa	Shear Strength Øu°	Shear Strength Type of Shear Test	Chemical SO_4 g/l	Chemical pH	Other Tests
							0.02		0.02	Firm dark brown silty CLAY with a trace roots and fine to coarse gravel.														
										Stiff light grey to light brown mottled very fine sandy CLAY. (TB)									120.0		V			
			1	B	0.50-0.90				0.88			26.0				(T)3.30 (B)3.30		1.550	96.0		V	<0.00	7.5	
							0.90			Light brown to light grey cohesive SILT. (TB)														
20/01									0.80															
							1.70			End of Trial Pit at 1.70 m														

Scale as Shown

Disturbed Samples
W Weter Sample
D Small Beg
B Large Bag
T Tin J Jer

Undisturbed Samples
U100 105mm Diamater
U38 U100

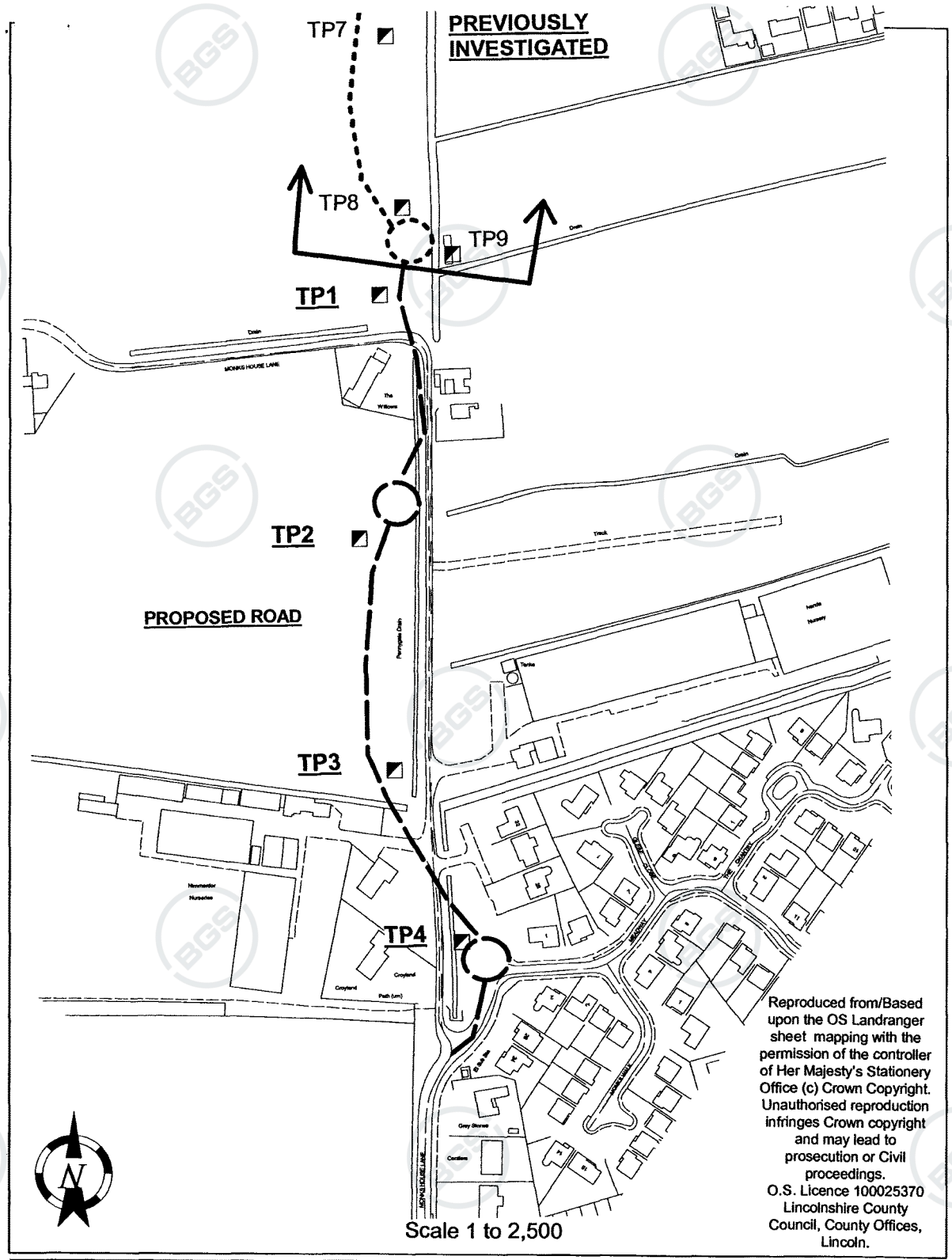
Groundwater:
▼ Struck ▽ Rose to

Symbols
PT Penetration Tests
P Probe CBR
(i) Other Tests Undertaken

Type of Shear Test
V Shear Vane Cu Undrained Cohesive Strength
SB Sheer Box Øu° Internal Friction Angle
TX Triaxial (Undrained)

Notes : Geology and Other Tests :
See "Sample Descriptions & Symbols" at end of logs

LINCS LAB
Telephone (01522) 530355



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Jan 2005 Dwg No 2	Wygate Park Relief Road, Spalding Proposed Road and Trial Pit Location Plan	LINCS LAB Tel 01522 530355

British Geological Survey

BGS ID: 18112267 : BGS Reference: TF22SW214
British National Grid (27700) : 523010,322720

Job Number: 27439 | **Site:** Wygate Park Relief Road, Spalding | **Trial Pit.:** TP3 | **Sheet 1 of 1**

Remarks : Surface: area adjacent to field. Close to dyke running alongside the proposed road. BA1. No groundwater encountered. Finished road level + 0.5m marked on site as 0.8m above existing GL. Pit stable.

Location: See Plan | **Orientation:** N-S | **Dimensions:** Length : 2.20m, Width : 0.80m, Depth : 1.60 m

Client: Allison Homes Eastern Limited | **Face Logged :** E

Excavation Method: Backhoe Loader | **Logged By:** BA | **Log Scale:** 2.00 m/page | **Ground Level:** - m AOD

Date (2005)	Depth of Casing (m)	Depth of Water (m)	Sample/Test No	Sample/Test Type	Sample/Test Depth (m)	Legend	Change of Strata: Depth below GL (m)	Change of Strata: Reduced Level m AOD (m)	Change of Strata: Thickness of Stratum (m)	Description of Strata	MPT Test Result	NMC %	Atterberg Limits: LL %	Atterberg Limits: PL %	Atterberg Limits: PI %	CBR %	Density: Bulk Mg/m3	Density: Dry Mg/m3	Shear Strength: Cu kPa	Shear Strength: Øu°	Shear Strength: Type of Shear Test	Chemical: SO4 g/l	Chemical: pH	Other Tests
							0.00		0.20	Stiff dark brown silty thinly laminated CLAY with a trace of sugar beet remains and siliceous gravel.														
			1	B	0.20-0.50		0.20		0.30	Stiff light grey to light brown very fine sandy CLAY with a trace of fine to medium siliceous gravel. (TB)									120.0		V			
																			118.0		V			
			2	B	0.50-1.00		0.50			Light brown grey very cohesive SILT. (TB)		28.0				(T)0.90 (B)0.80		1.550						
20/01							1.40		0.20	Soft to firm light brown orange reddish fine sandy SILT. (TB)														
							1.60			End of Trial Pit at 1.60 m														

Scale as Shown

Disturbed Samples
W Weter Sample
D Small Bag
B Large Bag
T Tin J Jar

Undisturbed Samples
U100 105mm Diemeter
U38 U100

Groundwater:
▼ Struck ▽ Rose to

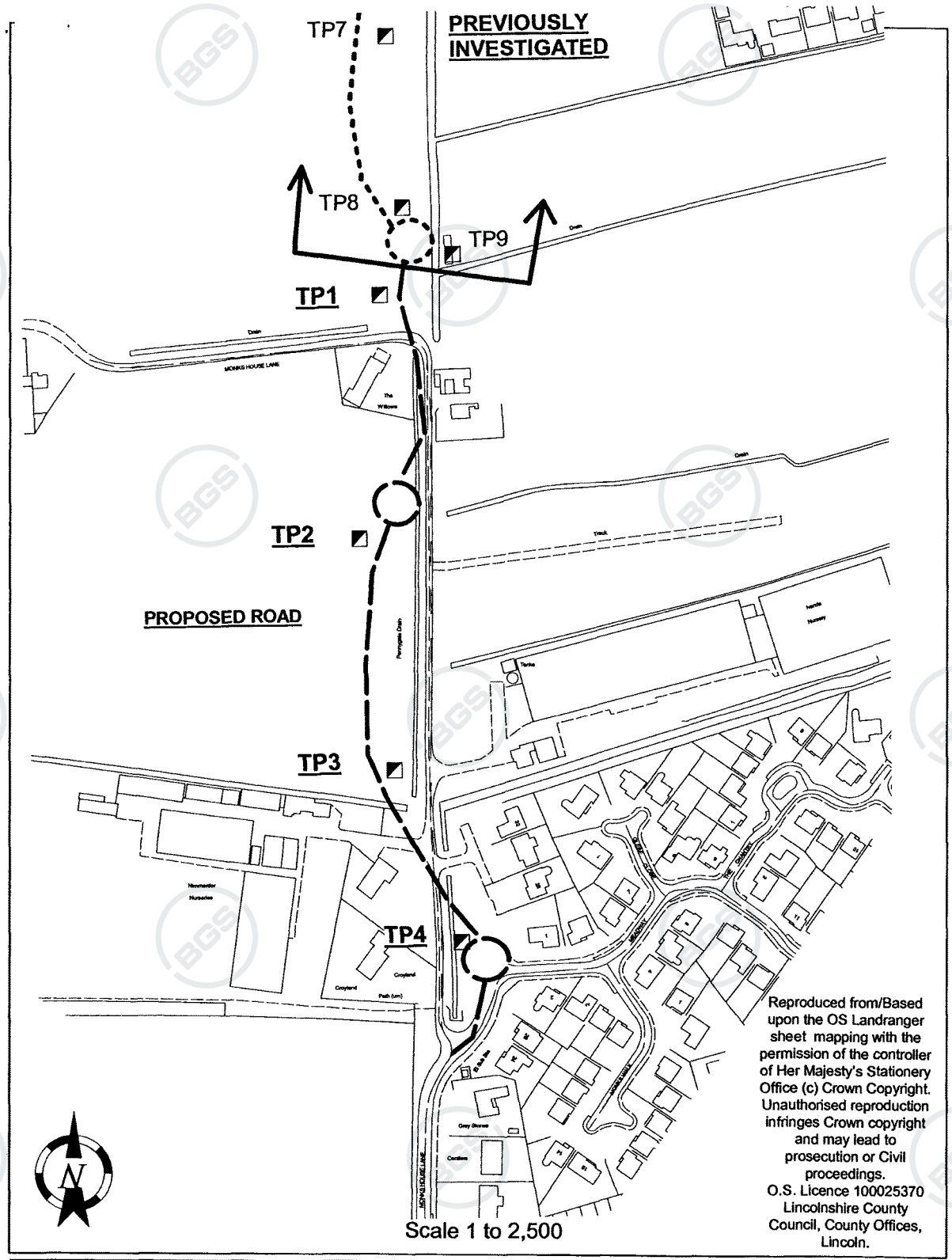
Symbols
PT Penetration Tests
P Probe CBR
(i) Other Tests Undertaken

Type of Shear Test
V Shear Vane Cu Undrained Cohesive Strength
SB Shear Box Øu° Internal Friction Angle
TX Triaxial (Undrained)

Notes : Geology and Other Tests :
See "Sample Descriptions & Symbols" at end of logs

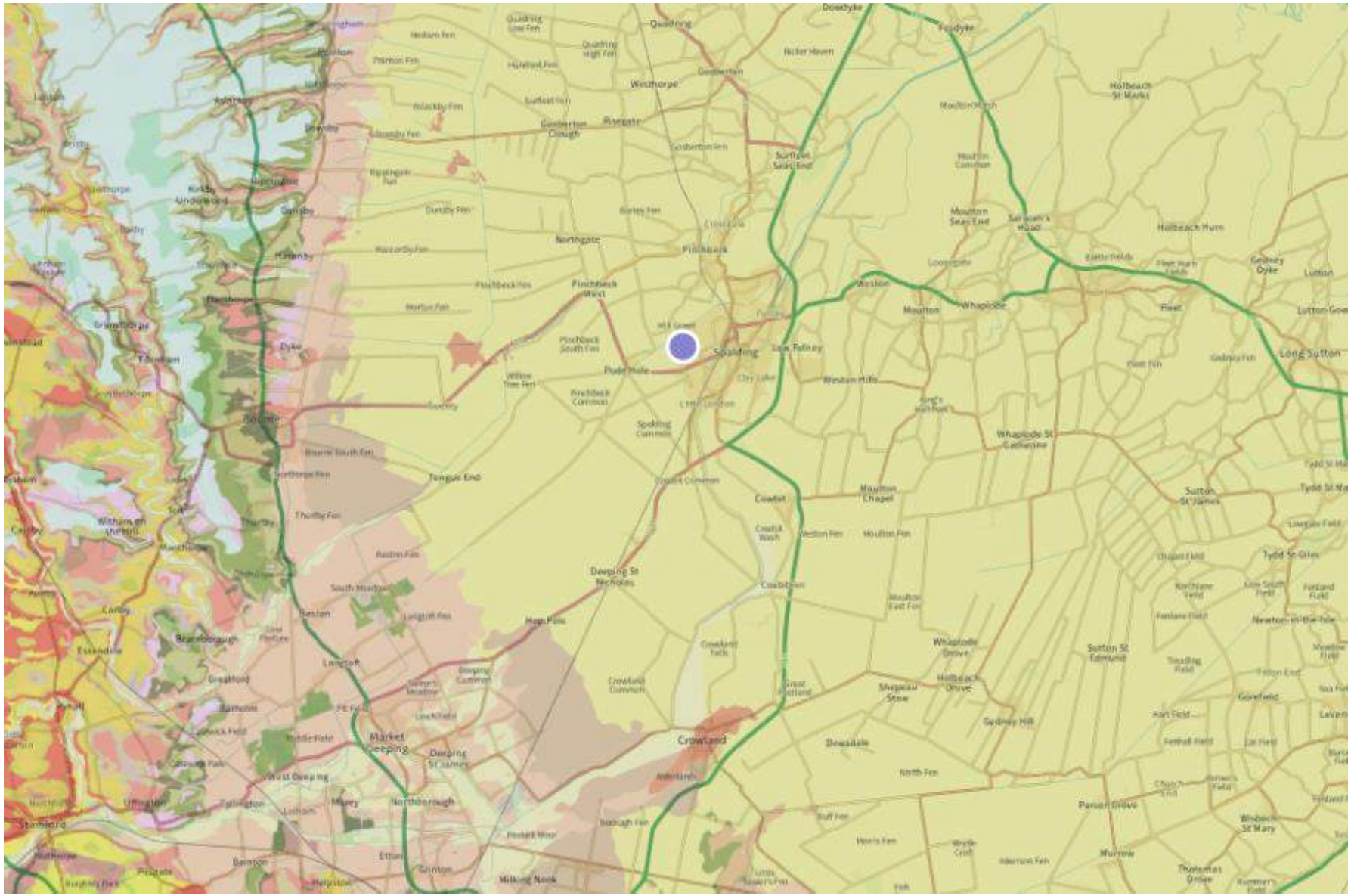
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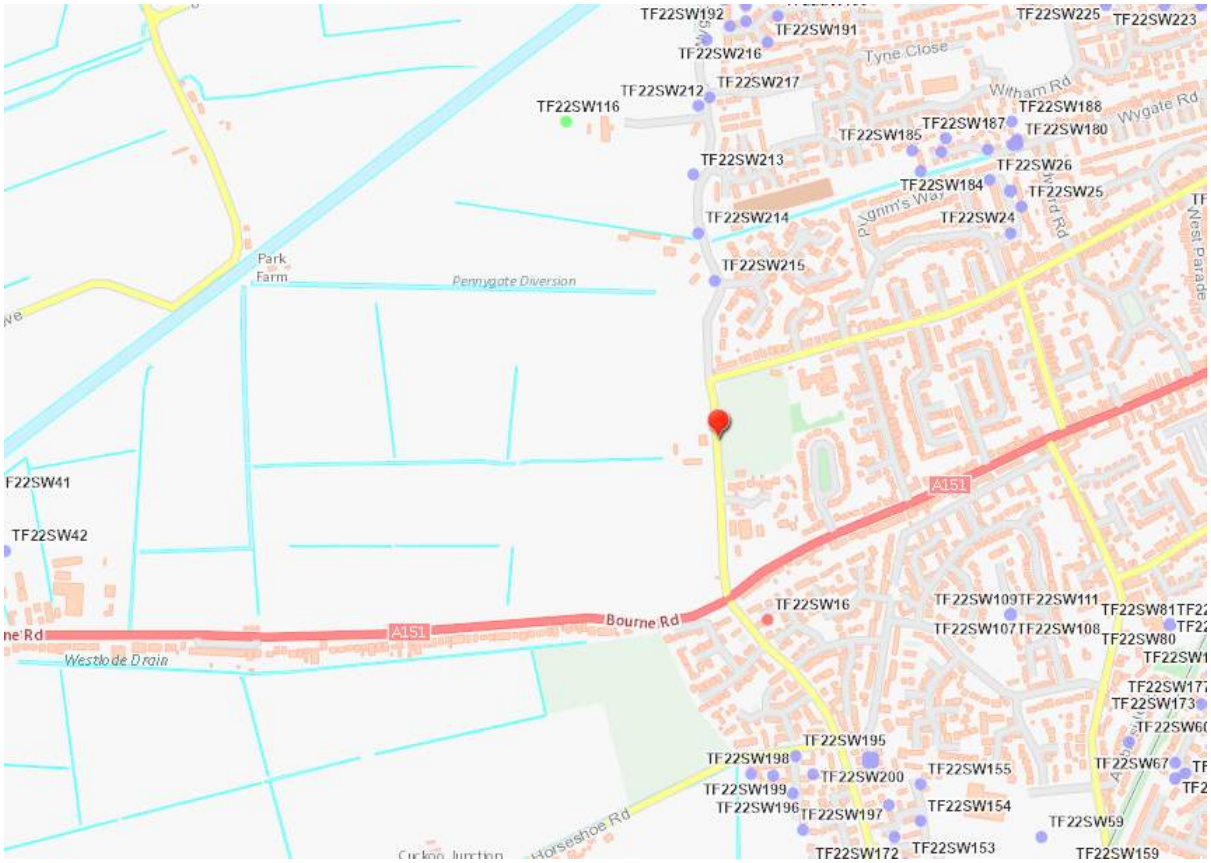
Contact BGS: ngdc@bgs.ac.uk



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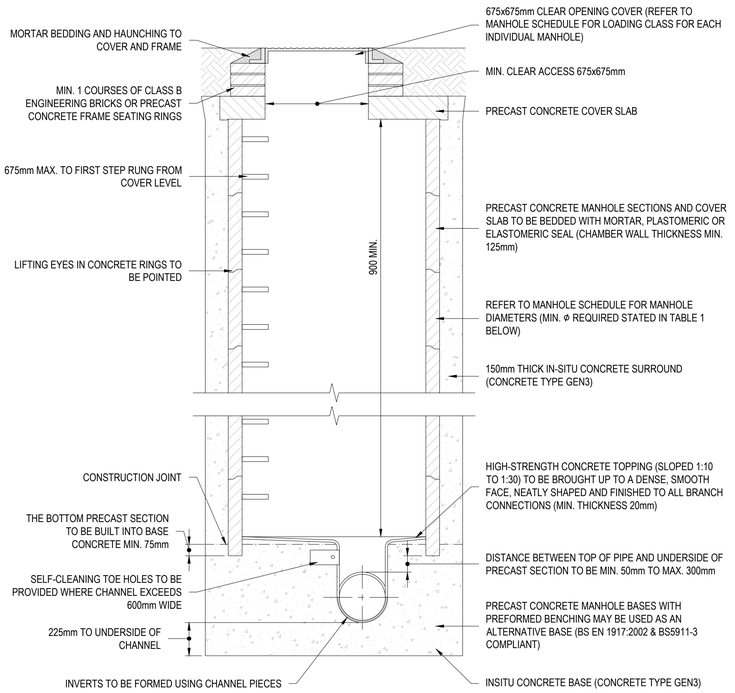
Jan 2005 Dwg No 2	Wygate Park Relief Road, Spalding Proposed Road and Trial Pit Location Plan	LINCS LAB Tel 01522 530355


Spalding
Pinchbeck
Pinchbeck West
Surfleet
Surfleet Seas End
Gosberton
Gosberton Clough
Quadring
Westhorpe
Moulton
Moulton Seas End
Whaplode
Holbeach Hurn
Holbeach St Marks
Long Sutton
Sutton St James
Whaplode St Catherine
Moulton Chapel
Coastal
Tongue End
Dowsby
Dowsdale
Crowland
Market Deeping
Deeping St James
Deeping St Nicholas
Bourne
Thurlby
Langtoft
Baston
Barholme
Greatford
Stamford
Uffington
Barnack
Ufford
Helpston
Glinton
Northborough
Maxey
Etton
Milking Nook
Sutton St Edmund
Newton-in-the-Isle
Tydd St Giles
Tydd St Mary
Parson Drove
Murrow
Wisbech St Mary
Thomas Drove
Gedney Hill
Gedney Dyke
Lutton
Lutton Gowt
Fleet
Fleet Hurn
Long Sutton
Whaplode Drove
Holbeach Drove
Sheepeau Stow
Great Postland
Crowland Common
Crowland Fen
Crowland Wash
Coastal Wash
Moulton Fen
Moulton East Fen
Moulton Common
Weston Fen
Weston Hills
Low Fulney
Fulney
Spalding Common
Pode Hole
Pinchbeck Common
Pinchbeck South Fen
Pinchbeck West Fen
Willow Tree Fen
Quadring Low Fen
Quadring High Fen
Quadring Eaudyke
Eaudyke
Nicker Haven
Surfleet Fen
Gosberton Fen
Gosberton Clough
Risegate
Ripingale Fen
Dunsby Fen
Barley Fen
Northgate
Hubberts Bridge
Hubberts Bridge Fen
Morton Fen
Dyke
Bourne South Fen
Northorpe Fen
Thurlby Fen
Baston Fen
South Marsh
Langtoft Fen
Maxey Fen
Deeping Common
Deeping Fen
Northborough Fen
Etton Fen
Glinton Fen
Helpston Heath
Witham on the Hill
Carlby
Essendine
Bourne
Pinchbeck
Spalding
Holbeach
Long Sutton
Crowland
Deeping St Nicholas
Market Deeping
Stamford

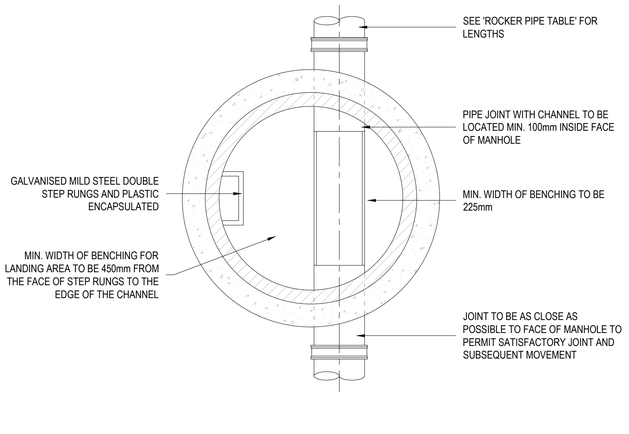

TF22SW192
TF22SW191
TF22SW216
TF22SW225
TF22SW223
Tyne Close
TF22SW212
TF22SW217
TF22SW116
Witham Rd
TF22SW188
Wygate Rd
TF22SW185
TF22SW187
TF22SW180
TF22SW213
TF22SW26
TF22SW184
TF22SW25
TF22SW214
TF22SW24
Pilgrim's Way
Park Rd
Nest Parade
Park Farm
Pennygate Diversion
TF22SW215
F22SW41
TF22SW42
A151
Bourne Rd
TF22SW16
TF22SW109
TF22SW111
TF22SW81
TF22SW107
TF22SW108
TF22SW80
Westlode Drain
TF22SW173
TF22SW195
TF22SW198
TF22SW200
TF22SW155
TF22SW67
TF22SW199
TF22SW196
TF22SW197
TF22SW154
TF22SW59
Horseshoe Rd
TF22SW172
TF22SW153
TF22SW159

Appendix G – Phase 1 – Proposed Drainage Strategy General Arrangement and Details

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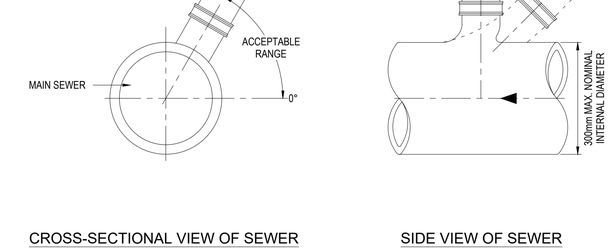
SECTIONAL VIEW



PLAN VIEW

TYPE B MANHOLE (DEPTH TO SOFFIT 1.5 - 3.0m)

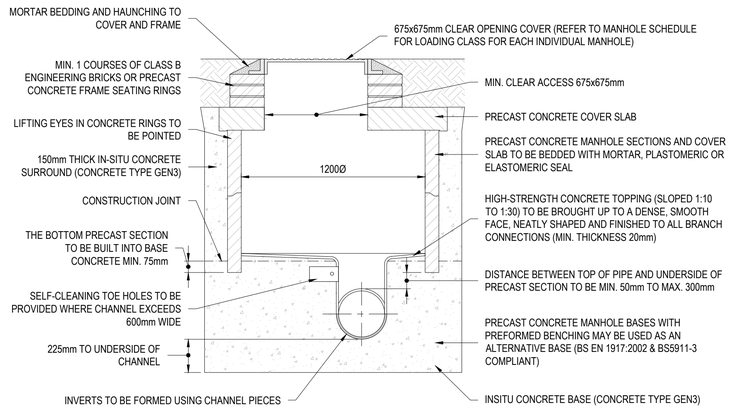
SCALE 1:20



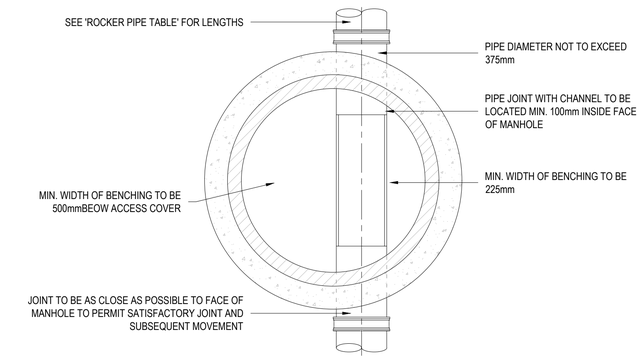
CROSS-SECTIONAL VIEW OF SEWER SIDE VIEW OF SEWER

SADDLE CONNECTION

SCALE 1:20



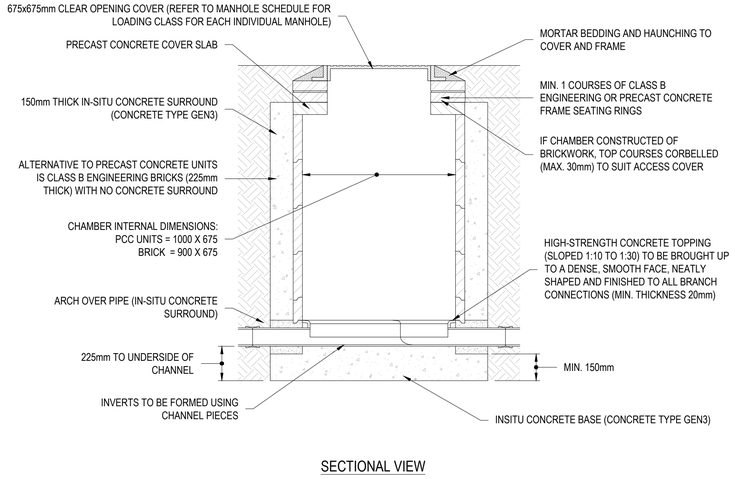
SECTIONAL VIEW



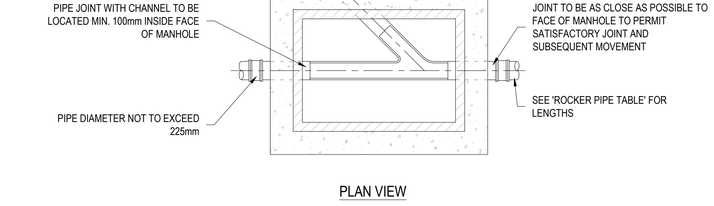
PLAN VIEW

TYPE C1 MANHOLE (DEPTH TO SOFFIT 1.0 - 1.5m)

SCALE 1:20



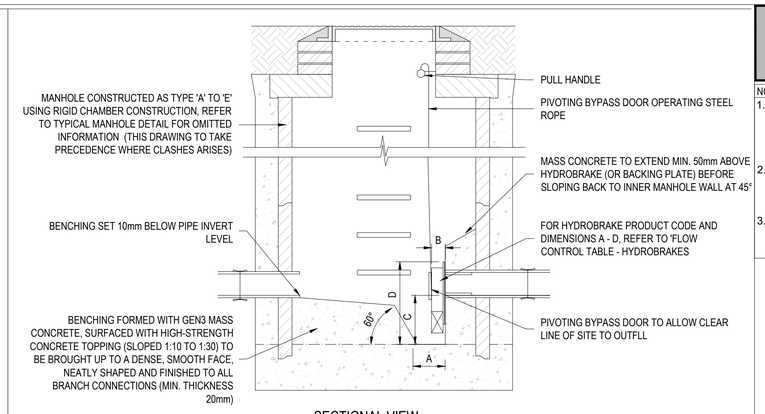
SECTIONAL VIEW



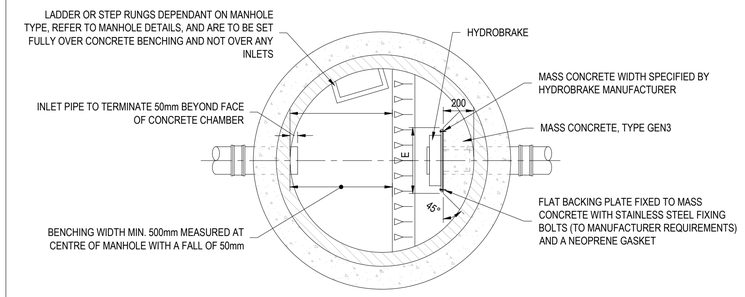
PLAN VIEW

TYPE D MANHOLE (DEPTH TO SOFFIT UP TO 1.0m)

SCALE 1:20

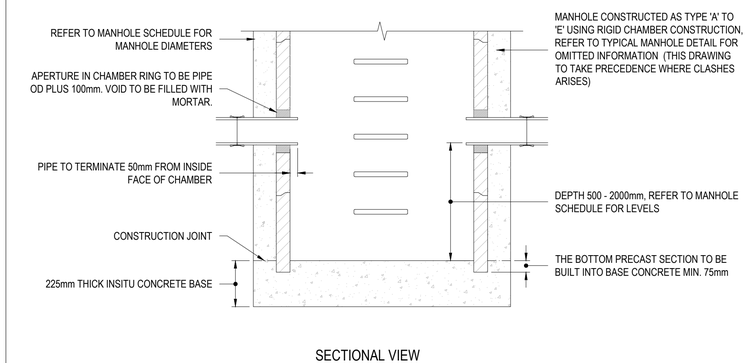


SECTIONAL VIEW

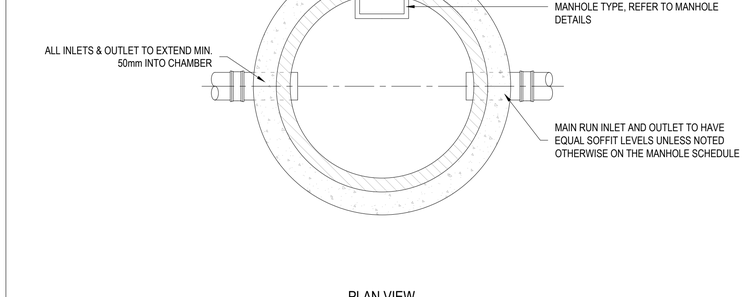


FLOW CONTROL CHAMBER - HYDROBRAKE (FLAT BACKING PLATE)

SCALE 1:20



SECTIONAL VIEW



PLAN VIEW

CATCHPIT (CP1) - RIGID CHAMBER

SCALE 1:20

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3. ALL DRAINAGE TO COMPLETED AS PER THE LATEST EDITION OF SEWERS FOR ADOPTION AND BUILDING REGULATIONS DOCUMENT H

Rev	Date	Description	By	Check	App.
P01	01/04/2025	ISSUE FOR PLANNING	CN	KE	KE

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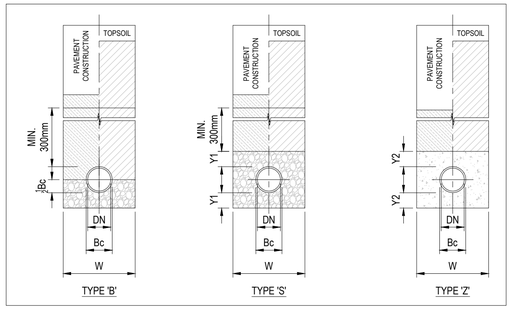
Title: DRAINAGE DETAILS SHEET 1 OF 3

Scale @ A1: 1:20 | Status: PRELIMINARY

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Project Ref	Originator	Volume	Level
8/3024	CCL	XX	XX
File Type	Discipline	Drawing No.	Revision
DR	C	4410	P01

Date of Print = Apr 01 2025 - File Name = 8.3024-CCL-XX-XX-DR-C-4410_LIVE_DRAINAGE DETAILS.dwg



RIGID PIPES

FLEXIBLE PIPES

HATCHING LEGEND:

- SELECTED AS-DUG MATERIAL (MAX. AGGREGATE SIZE 40mm)
- TYPE 1 GRANULAR MATERIAL TO SHW CLAUSE 803
- GRANULAR MATERIAL, REFER TO GRANULAR FILL TABLE FOR DETAILS
- GEN1 CONCRETE (18mm COMPRESSIBLE BOARDS TO BE INSERTED AT ALL PIPE JOINTS).

DIMENSIONS LEGEND:

DN = PIPE INSIDE DIAMETER
Bc = PIPE OUTSIDE DIAMETER (BARREL)
W = TRENCH WIDTH (SEE TABLE 1)
Y1 = 1/6Bc OR MIN. 100mm ALONG BARRELS & 50mm AT SOCKETS
Y2 = 1/4DN OR MIN. 100mm ALONG BARRELS & 50mm AT SOCKETS
Y3 = 100mm ALONG BARRELS & SOCKETS

TRENCH WIDTH & GRANULAR FILL TABLE:

PIPE SIZE (DN)	TRENCH WIDTH (W)		GRANULAR FILL SINGLE STONE SIZE
	PIPE TYPE: A, B	PIPE TYPE: C	
100	450	450	10mm NOMINAL SIZE
150	500	500	10, 14mm NOMINAL SIZE
225 - 300	800	700	10, 14, 20mm NOMINAL SIZE
375 - 450	1050	1050	
525 - 675	1650	1400	
750 - 900	2520	2050	
1050 - 1200	2900	x	
1350 - 1500	3600	x	
1600 - 1800	4400	x	

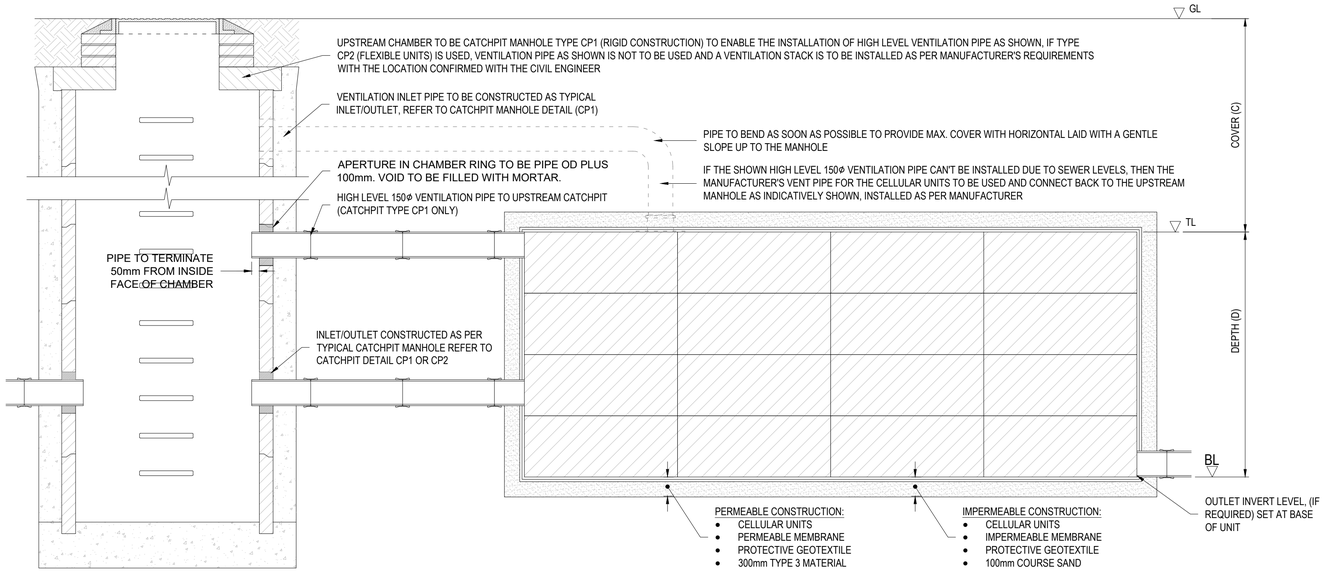
PIPE TYPE A - PLASTIC PIPEWORK
PIPE TYPE B - CLAYWARE PIPEWORK
PIPE TYPE C - CONCRETE PIPEWORK
ALL DIMENSIONS ARE IN mm

BEDDING LOCATION & DEPTH TABLE

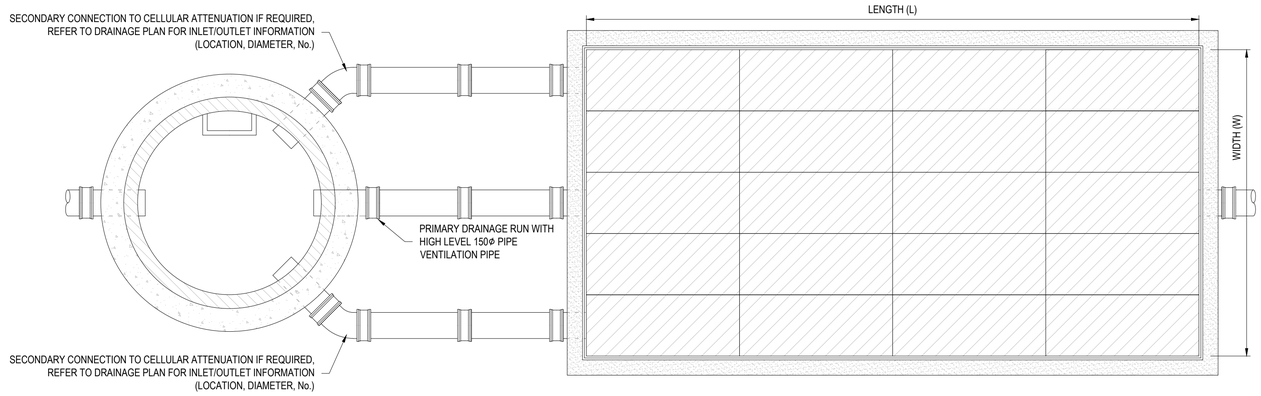
	PIPE BEDDING TYPE & LOCATION	COVER DEPTH (mm)
B	- LOCATED UNDER BUILDINGS (REFER TO PIPEWORK UNDER BUILDING DETAILS FOR MIN. DEPTH)	-
	- ADOPTABLE DRAINAGE IN ANY LOCATION	NOT PERMITTED
	- NONADOPTABLE DRAINAGE LOCATED WITHIN VERGE AREAS NOT SUBJECTED TO VEHICLE LOADS (AS NOTED ON DRAINAGE PLANS OR UPON THE APPROVAL OF SPECIFIC REQUESTED LOCATIONS)	-
S	- LOCATED UNDER BUILDINGS (REFER TO PIPEWORK UNDER BUILDING DETAILS FOR MIN. DEPTH)	--
	- LOCATED WITHIN PAVED AREAS SUBJECTED TO VEHICLE LOADS (ADOPTABLE / PRIVATE)	>600 / >600
	- LOCATED WITHIN PAVED AREAS NOT SUBJECTED TO VEHICLE LOADS (ADOPTABLE / PRIVATE)	>900 / >750
Z	- LOCATED UNDER BUILDINGS (REFER TO PIPEWORK UNDER BUILDING DETAILS FOR MIN. DEPTH)	--
	- LOCATED WITHIN PAVED AREAS SUBJECTED TO VEHICLE LOADS (ADOPTABLE / PRIVATE)	<1200 / <900
	- LOCATED WITHIN PAVED AREAS NOT SUBJECTED TO VEHICLE LOADS (ADOPTABLE / PRIVATE)	<900 / <750

PIPE BEDDING

SCALE 1:20



SECTIONAL VIEW



PLAN VIEW

CELLULAR UNITS COVER DEPTHS & LOADINGS

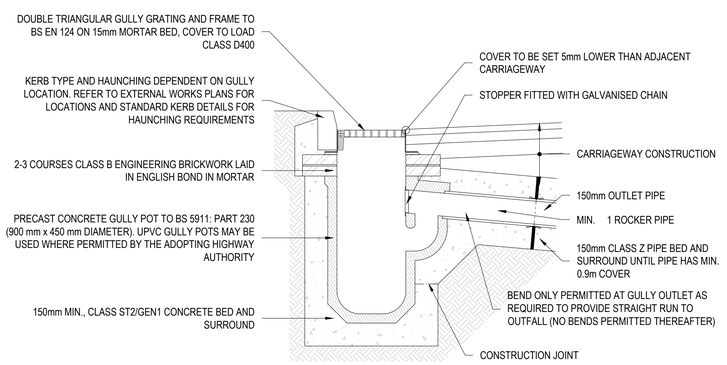
UNIT TYPE	SIZE	COVER	MIN. & MAX.* COVER LOCATION / LOADING TYPE L1	V1	V2	V3	V4
AUQUACELL ECO	ALL SINGLE UNITS 1.0x0.5x0.4m (LARGEPIPE)	MIN.	0.50	N/A	N/A	N/A	N/A
		MAX A.W.T.	1.53				
		MAX. B.W.T.	N/A				
AUQUACELL CORE		MIN.	0.50	0.50	0.75	N/A	N/A
		MAX A.W.T.	2.53	2.53	2.53		
		MAX. B.W.T.	1.99	1.99	1.99		
AUQUACELL PRIME		MIN.	0.30	0.71	0.71	0.71	
		MAX A.W.T.	1.98	1.73	1.73	1.73	N/A
		MAX. B.W.T.	1.78	1.60	1.60	1.60	
AUQUACELL PLUS		MIN.	0.50	0.50	0.75	0.75	1.30
		MAX A.W.T.	3.21	3.21	3.21	3.21	2.96
		MAX. B.W.T.	1.99	1.99	1.99	1.99	2.24

TABLE DEFINITIONS:
*MAX COVER BASED ON SOIL TYPE BEING CLAY, MAX. DEPTH MAY BE INCREASED DEPENDANT ON SOIL TYPES USED AS BACKFILL, SEE MANUFACTURER RECOMMENDATIONS

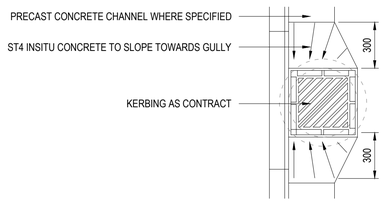
L1 = LANDSCAPING WITH NO VEHICLE LOADING IN EXCESS OF DRIVE-ON MOWERS
V1 = CAR PARK WITH VEHICLE MASS <3,000kg GVW
V2 = CAR PARK WITH OCCASIONAL VEHICLE MASS <9,000kg GVW
V3 = CAR PARK WITH OCCASIONAL VEHICLE MASS <12,000kg; LIGHT ACCESS ROADS
V4 = CAR PARK WITH OCCASIONAL VEHICLE MASS <60,000kg GVW; ROADS <15mph
MAX. A.W.T. = BASE OF UNITS ABOVE WATER TABLE
MAX. B.W.T. = BASE OF UNITS BELOW WATER TABLE

CELLULAR ATTENUATION

SCALE 1:20



SECTIONAL VIEW



PLAN VIEW WHERE CONCRETE CHANNEL BLOCKS ARE REQUIRED

ROAD GULLY

SCALE 1:20

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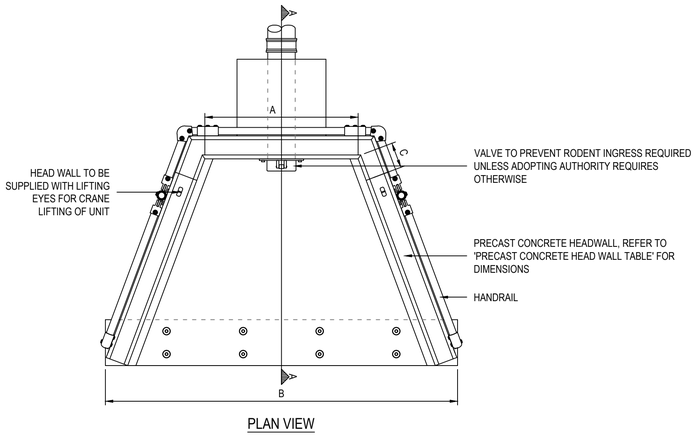
Title: DRAINAGE DETAILS SHEET 2 OF 3

Scale @ A1: 1:20 | Status: PRELIMINARY

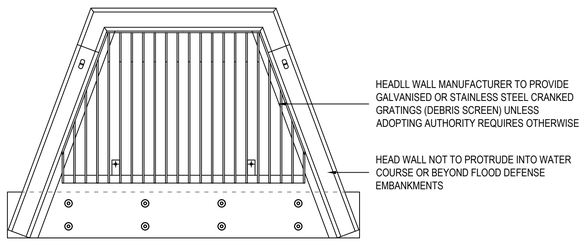
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Project Ref	Originator	Volume	Level
8/3024	CCL	XX	XX
File Type	Discipline	Drawing No.	Revision
DR	C	4411	P01

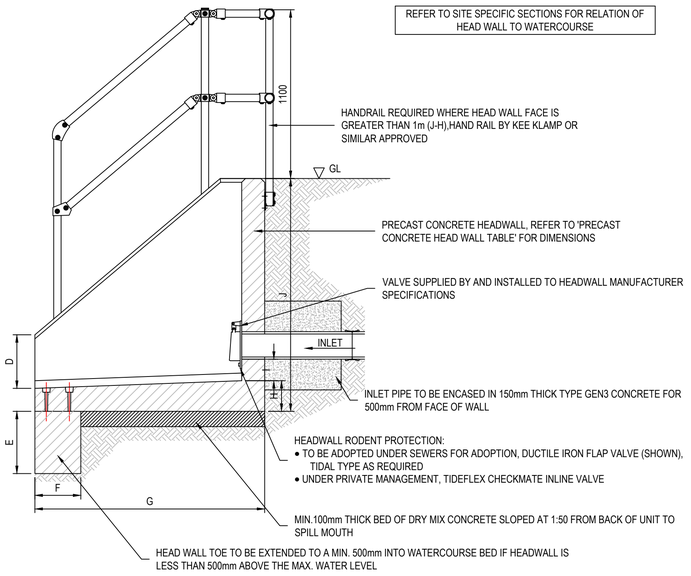
Date of Print = Apr 07 2025. File Name = 8.3024-CCL-XX-XX-DR-C-4411_LHE_DRAINAGE DETAILS.dwg



PLAN VIEW

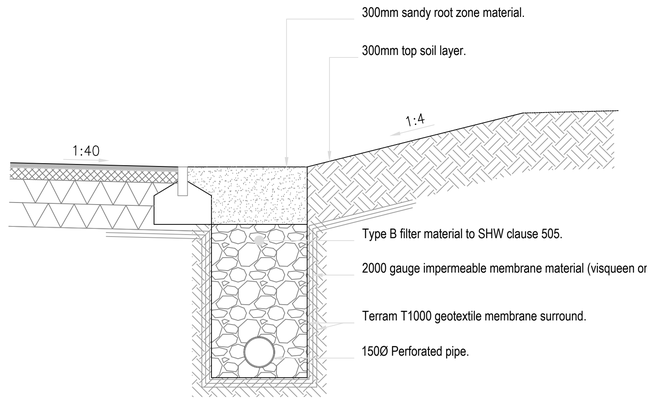


PLAN VIEW WITH DEBRIS SCREEN



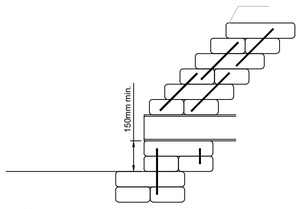
PRECAST CONCRETE HEADWALL

SCALE 1:20



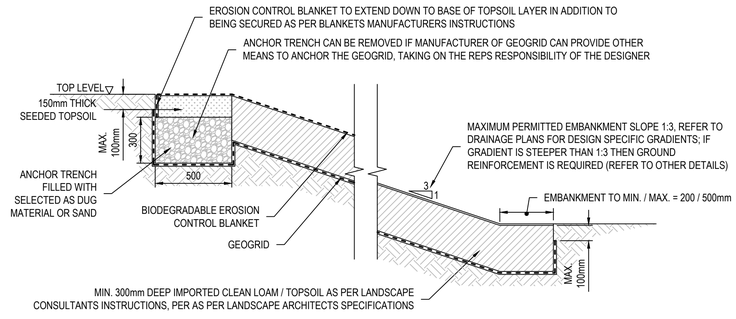
French Drain / Land Drain Detail

1:15



TYPICAL BANK REINFORCEMENT/CONCRETE BAGWORK HEADWALL

SCALE 1:20



SWALE EMBANKMENT

SCALE 1:20

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Rev	Date	Description	By	Check	App.
P02	07/11/2025	DRAINAGE DETAILS ADDED	DT	CN	KE
P01	01/04/2025	ISSUE FOR PLANNING	CN	KE	KE

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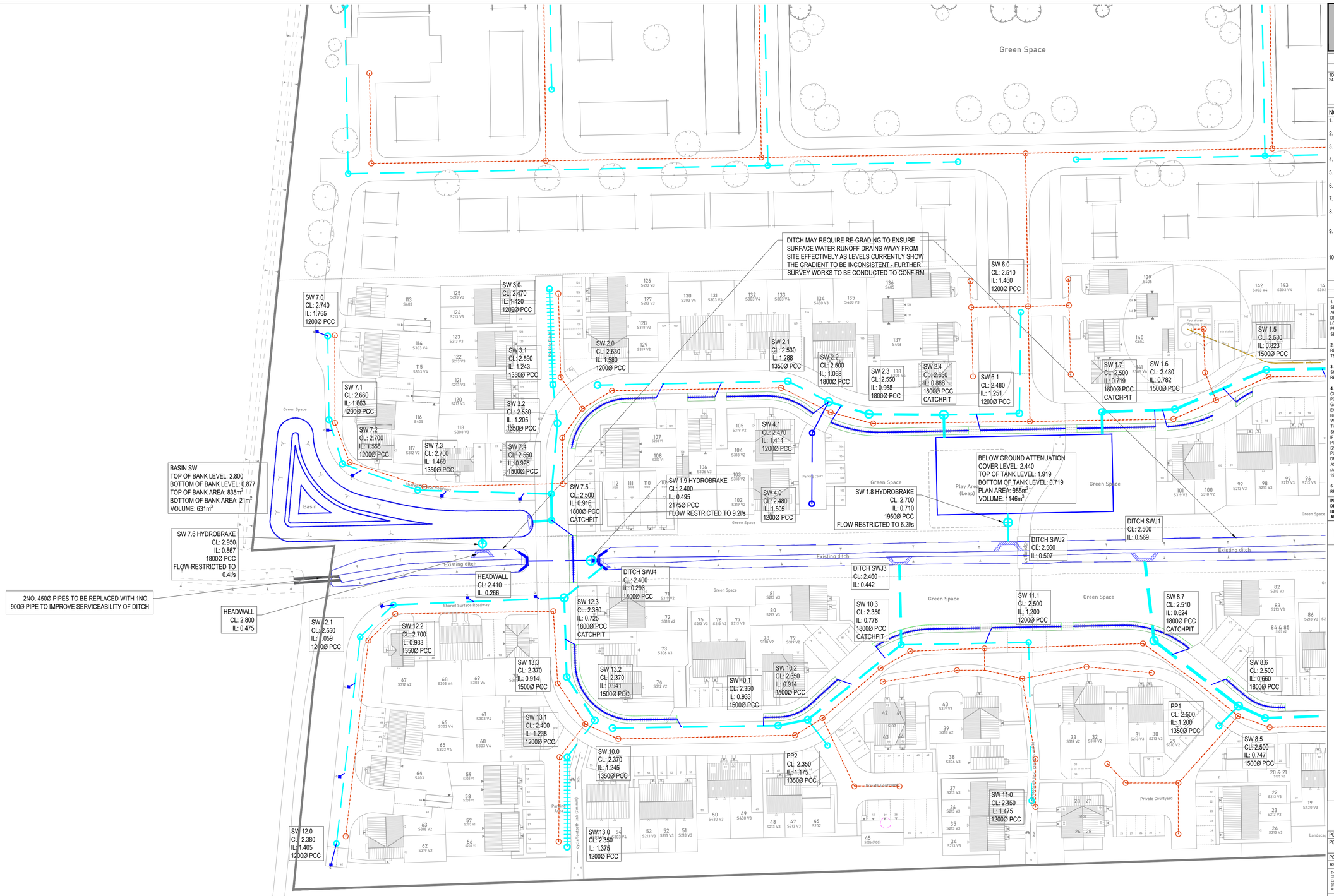
Title: DRAINAGE DETAILS SHEET 3 OF 3

Scale @ A1: 1:20 | Status: PRELIMINARY

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Project Ref	Originator	Volume	Level
8/3024	CCL	XX	XX
File Type	Discipline	Drawing No.	Revision
DR	C	4412	P02

Date of Print = Nov 07 2025, File Name = 8.3024-CCL-XX-XX-DR-C-4410_LVE_DRAINAGE DETAILS.dwg



SCALE 1:500m
0m 10m 20m 30m 40m 50m

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DRAWING REFERENCE LIST

DRAWING NUMBER	REV	DATE	CREATOR
10034-SGH-SL-AR-1006	P03	06/11/2025	SEAGATE HOMES
24-58-01/02	N/A	15/05/2024	DANIEL CHARLES SURVEYS

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2. REFER TO THE ARCHITECT & SERVICES ENGINEER FOR FINAL SETTING OUT OF ALL BUILDINGS & INTERNAL DOWN PIPES & RWPS
3. REFER TO SERVICE ENGINEER FOR ABOVE GROUND PLUMBING ROUTES FROM APPLIANCES TO STUB STACKS ETC
4. EXISTING DRAINAGE THAT IS TO BE ABANDONED TO BE 'PLUGGED' IN WITH MASS CONCRETE (150mm MIN) OR REMOVED ENTIRELY
5. ANY EXISTING SERVICES TO BE LOCATED AND CLEARLY MARKED PRIOR TO EXCAVATIONS BY CONTRACTOR
6. ALL LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO CONSTRUCTION
7. IT IS ASSUMED THAT ALL RWPS, SINK AND TOILET DRAINAGE POINTS WILL HAVE RODDING ACCESS AT THE APPLIANCE BASE
8. CONTRACTOR TO AVOID UNDERMINING ANY EXISTING FOOTPATHS/BUILDINGS DURING WORKS BY ALLOWING ADEQUATE PROTECTION ADJACENT TO THESE AREAS
9. ALL BELOW GROUND DRAINAGE PIPES WITH LESS THAN 900mm COVER TO SOFFIT LEVEL IN TRAFFICKED AREAS I.E. CAR PARK AND SERVICE YARD, TO HAVE CLASS Z BEDDING SURROUND. REFER TO THE MANHOLE SCHEDULE AND DETAIL SHEETS FOR FURTHER DETAILS
10. ALL BELOW GROUND DRAINAGE WITHIN THE SITE BOUNDARY HAS BEEN DESIGNED TO BSEN 752:2008 AND BUILDING REGULATIONS - PART H 2015. THE OFF SITE DRAINAGE TO THE PUBLIC SEWER ARE DESIGNED TO THE SEWERAGE SECTOR GUIDANCE

HEALTH SAFETY AND ENVIRONMENTAL RISKS BOX

CONSTRUCTION RISKS	MAINTENANCE RISKS	DEMOLITION/ ADAPTATION RISKS
1. REFER TO EXISTING SERVICES DRAWING AND TO ARCHITECTS SERVICES DRAWINGS FOR DETAILS & LOCATION OF EXTG AND PROPOSED DRAINAGE & SERVICES. 2. DRAINAGE CONNECTION REQUIRES DEEP EXCAVATION. TEMP WORKS REQUIRED 3. EXISTING DRAINS NOT SHOWN ON PLAN TO EITHER BE REMOVED OR GRUBBED UP. 4. CONSTRUCTING NEW CONNECTIONS DRAINAGE POTENTIAL FOR HAZARDOUS GASES. PERMIT TO ENTER EXISTING MANHOLES SHOULD BE OBTAINED FROM ANGLIAN WATER BEFORE UNDERTAKING THE WORK. RELEVANT P P E SHOULD BE WORN AT ALL TIMES. IF ANY ASBESTOS CEMENT PIPES ARE FOUND, THEN SAFE SYSTEM OF WORK NEED TO BE PUT IN PLACE WITH ATTENTION DRAWN TO THE CONTROL ASBESTOS AT WORK (AMENDMENT) REGULATIONS 1992. 5. HIGHWAY WORKS REQUIRED	1. PERMEABLE PAVING, ATTENUATION TANKS AND CHAMBERS REQUIRE THE STANDARD PERIODIC INSPECTION REGIME AND CLEANING ROUTINE TO ENSURE CONTINUED PERFORMANCE. 2. CONFINED SPACE ENTRY. 3. ALL MAINTENANCE MUST COMPLY WITH THE LEAD LOCAL FLOOD AUTHORITY'S REGULATIONS.	1. APPARATUS LOCATED IN LANDSCAPED AREAS HAS NOT BEEN DESIGNED TO SUPPORT HEAVY VEHICLE LOADING. 2. THE SURFACE WATER DRAINAGE APPARATUS HAS BEEN DESIGNED TO ACCOMMODATE THE DESIGNED CATCHMENT AREA. NO ADDITIONAL AREAS OF HARDSTANDING CAN BE CONNECTION INTO THE SYSTEM WITHOUT RISK OF LOCALIZED FLOODING ON SITE. 3. THE SURFACE WATER DRAINAGE HAS BEEN DESIGNED TO BE CONTROLLED TO A RATE OF 9 l/s BEFORE DISCHARGE INTO THE PUBLIC NETWORK, PENDING APPROVAL FROM ANGLIAN WATER BEFORE ANY CONNECTION IS MADE. 4. HAZARDOUS WASTE MATERIALS

IN ADDITION TO THE HAZARDS & RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, TAKE NOTE OF THE ABOVE. IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

LEGEND:

- SW — ADOPTABLE SURFACE WATER SEWER PIPE AND MANHOLES
- SW — PRIVATE SURFACE WATER SEWER PIPE AND MANHOLES
- FW — ADOPTABLE FOUL WATER SEWER PIPE AND MANHOLES
- FW — ADOPTABLE FOUL WATER RISING MAIN
- PERFORATED PIPES
- DETENTION BASIN
- PERMEABLE PAVED SURFACE WITH SUBBASE SURFACE WATER ATTENUATION STORAGE.
- EXISTING DITCH
- CULVERT
- FILTER STRIP
- G — ROAD GULLY
- HEADWALL

Rev	Date	Description	By	Check	App.
P03	06/02/2026	UPDATE TO SUIT NEW SITE PLAN	HB	CN	KE
P02	07/11/2025	DRAINAGE UPDATED FOLLOWING LATEST MASTERPLAN	DT	CN	KE
P01	01/04/2025	ISSUE FOR PLANNING	CN	KE	KE

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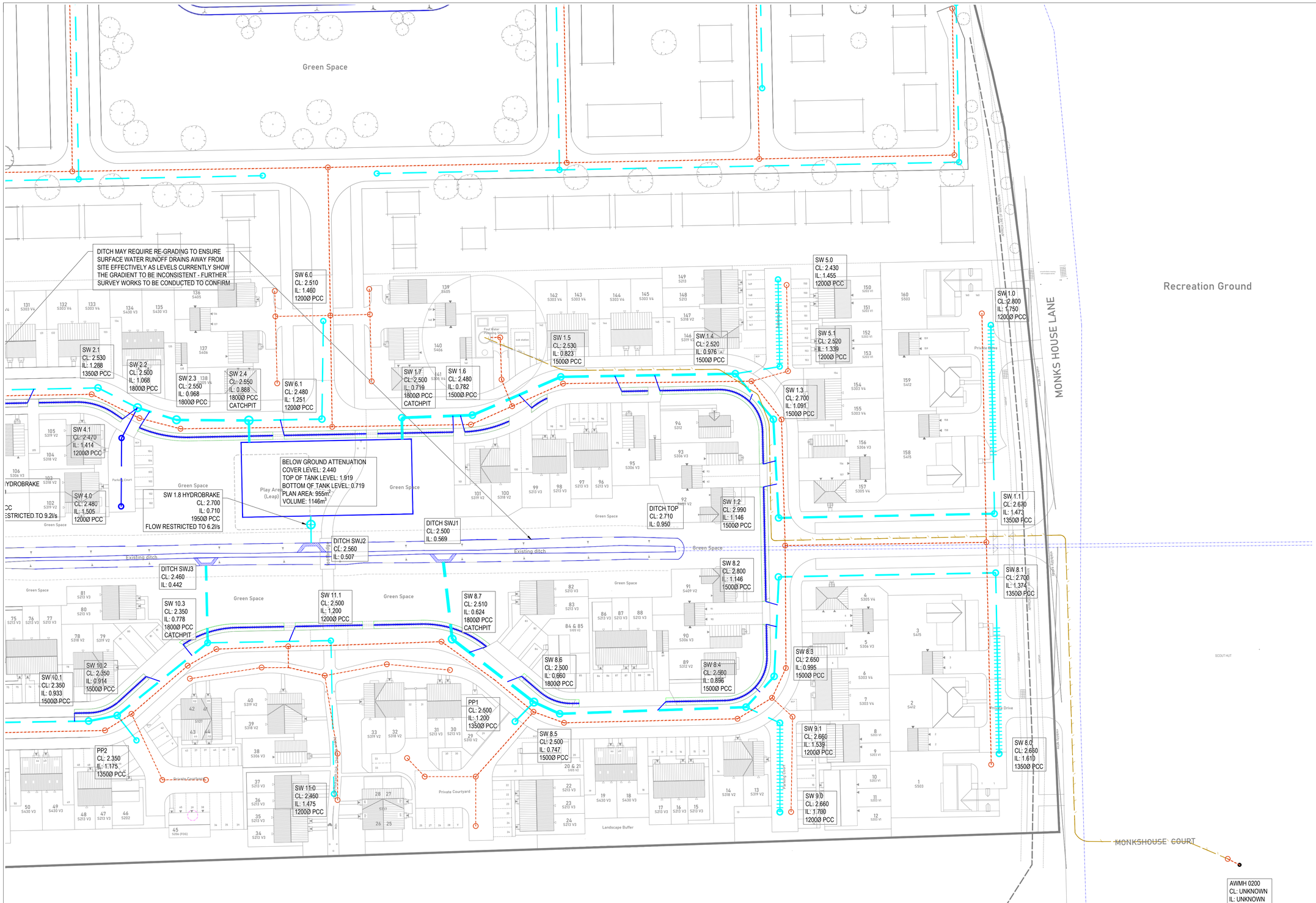
Title: PHASE 1 - DRAINAGE STRATEGY GENERAL ARRANGEMENT SHEET 1 OF 2

Scale @ A1: 1:500 | Status: PRELIMINARY

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Project Ref	Originator	Volume	Level
8/3024	CCL	XX	XX
File Type	**Discipline**	**Drawing No.**	**Revision**
DR	C	4400	P03

Date of Print = Feb 05 2026, File Name = X:\8324-CCL-00-XX-DRC-A400_P02_DRAINAGE GA.dwg



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DRAWING NUMBER	REV	DATE	CREATOR
10034-SGH-SL-AR-1006	P03	06/11/2025	SEAGATE HOMES
24-58-01/02	N/A	15/05/2024	DANIEL CHARLES SURVEYS

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1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS AND SPECIFICATIONS
2. REFER TO THE ARCHITECT & SERVICES ENGINEER FOR FINAL SETTING OUT OF ALL BUILDINGS & INTERNAL DOWN PIPES & RWPS
3. REFER TO SERVICE ENGINEER FOR ABOVE GROUND PLUMBING ROUTES FROM APPLIANCES TO STUB STACKS ETC
4. EXISTING DRAINAGE THAT IS TO BE ABANDONED TO BE 'PLUGGED' IN WITH MASS CONCRETE (150mm MIN) OR REMOVED ENTIRELY
5. ANY EXISTING SERVICES TO BE LOCATED AND CLEARLY MARKED PRIOR TO EXCAVATIONS BY CONTRACTOR
6. ALL LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO CONSTRUCTION
7. IT IS ASSUMED THAT ALL RWPS, SINK AND TOILET DRAINAGE POINTS WILL HAVE RODDING ACCESS AT THE APPLIANCE BASE
8. CONTRACTOR TO AVOID UNDERMINING ANY EXISTING FOOTPATHS/BUILDINGS DURING WORKS BY ALLOWING ADEQUATE PROTECTION ADJACENT TO THESE AREAS.
9. ALL BELOW GROUND DRAINAGE PIPES WITH LESS THAN 900mm COVER TO SOFFIT LEVEL IN TRAFFICKED AREAS I.E. CAR PARK AND SERVICE YARD, TO HAVE CLASS Z BEDDING SURROUND. REFER TO THE MANHOLE SCHEDULE AND DETAIL SHEETS FOR FURTHER DETAILS
10. ALL BELOW GROUND DRAINAGE WITHIN THE SITE BOUNDARY HAS BEEN DESIGNED TO BSEN 752:2008 AND BUILDING REGULATIONS - PART H 2015. THE OFF SITE DRAINAGE TO THE PUBLIC SEWER ARE DESIGNED TO THE SEWERAGE SECTOR GUIDANCE

HEALTH SAFETY AND ENVIRONMENTAL RISKS BOX

CONSTRUCTION RISKS	MAINTENANCE RISKS	DEMOLITION/ ADAPTATION RISKS
1. REFER TO EXISTING SERVICES DRAWING AND TO ARCHITECTS SERVICES DRAWINGS FOR DETAILS & LOCATION OF EXTG AND PROPOSED DRAINAGE & SERVICES. 2. DRAINAGE CONNECTION REQUIRES DEEP EXCAVATION. TEMP WORKS REQUIRED 3. EXISTING DRAINS NOT SHOWN ON PLAN TO EITHER BE REMOVED OR GRUBBED UP. 4. CONSTRUCTING NEW CONNECTIONS DRAINAGE POTENTIAL FOR HAZARDOUS GASES. PERMIT TO ENTER EXISTING MANHOLES SHOULD BE OBTAINED FROM ANGLIAN WATER BEFORE UNDERTAKING THE WORK. RELEVANT PPE SHOULD BE WORN AT ALL TIMES. IF ANY ASBESTOS CEMENT PIPES ARE FOUND, THEN SAFE SYSTEM OF WORK NEED TO BE PUT IN PLACE WITH ATTENTION DRAWN TO THE CONTROL ASBESTOS AT WORK (AMENDMENT) REGULATIONS 1992. 5. HIGHWAY WORKS REQUIRED	1. PERMEABLE PAVING, ATTENUATION TANKS AND CHAMBERS REQUIRE THE STANDARD PERIODIC INSPECTION REGIME AND CLEANING ROUTINE TO ENSURE CONTINUED PERFORMANCE. 2. CONFINED SPACE ENTRY. 3. ALL MAINTENANCE MUST COMPLY WITH THE LEAD LOCAL FLOOD AUTHORITY'S REGULATIONS.	1. APPARATUS LOCATED IN LANDSCAPED AREAS HAS NOT BEEN DESIGNED TO SUPPORT HEAVY VEHICLE LOADING. 2. THE SURFACE WATER DRAINAGE APPARATUS HAS BEEN DESIGNED TO ACCOMMODATE THE DESIGNED CATCHMENT AREA. NO ADDITIONAL AREAS OF HARDSTANDING CAN BE CONNECTION INTO THE SYSTEM WITHOUT RISK OF LOCALIZED FLOODING ON SITE. 3. THE SURFACE WATER DRAINAGE HAS BEEN DESIGNED TO BE CONTROLLED TO A RATE OF 9 l/s BEFORE DISCHARGE INTO THE PUBLIC NETWORK, PENDING APPROVAL FROM ANGLIAN WATER BEFORE ANY CONNECTION IS MADE. 4. HAZARDOUS WASTE MATERIALS

IN ADDITION TO THE HAZARDS & RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, TAKE NOTE OF THE ABOVE. IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

LEGEND:

- SW — ADOPTABLE SURFACE WATER SEWER PIPE AND MANHOLES
- SW — PRIVATE SURFACE WATER SEWER PIPE AND MANHOLES
- FW — ADOPTABLE FOUL WATER SEWER PIPE AND MANHOLES
- FW — ADOPTABLE FOUL WATER RISING MAIN
- PERFORATED PIPES
- DETENTION BASIN
- PERMEABLE PAVED SURFACE WITH SUBBASE SURFACE WATER ATTENUATION STORAGE.
- EXISTING DITCH
- CULVERT
- FILTER STRIP
- G — ROAD GULLY
- HEADWALL

P03	06/02/2026	UPDATE TO SUIT NEW SITE PLAN	HB CN KE
P02	07/11/2025	DRAINAGE UPDATED FOLLOWING LATEST MASTERPLAN	DT CN KE
P01	01/04/2025	ISSUE FOR PLANNING	CN KE KE
Rev	Date	Description	By Check App.

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE DRAWINGS, DETAILS AND SPECIFICATION FROM THE ARCHITECT, OTHER RELEVANT ENGINEERS AND ANY SPECIALIST SUPPLIER INFORMATION. THE COPYRIGHT OF THIS DRAWING IS VESTED IN CLANCY CONSULTING. IT SHALL NOT BE USED WITHOUT PERMISSION BY ANYONE FOR ANY PURPOSE. DO NOT SCALE THIS DRAWING ELECTRONICALLY OR MANUALLY. WORK TO FIGURED DIMENSIONS ONLY. ALL DIMENSIONS IN mm UNO. ALL LEVELS IN m A.O.D.(NO. IF IN DOUBT ABOUT THE INFORMATION SHOWN ON THIS DRAWING OR ANY RELATED DRAWING - ASK.

Client: SEAGATE HOMES (UK) LTD

Project: MONKS HOUSE LANE WEST SPALDING

Office: NORWICH - 01603 305 190

Title: PHASE 1 - DRAINAGE STRATEGY GENERAL ARRANGEMENT SHEET 2 OF 2

Scale @ A1: 1:500 | Status: PRELIMINARY

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Project Ref	Originator	Volume	Level
8/3024	CCL	XX	XX
File Type	Discipline	Drawing No.	Revision
DR	C	4401	P03

Date of Print = Feb 09 2026, File Name = I:\3024-CCL-00-XX-DR-C-4401_P03_DRAINAGE GA.dwg

Appendix H – Phase 1 – Drainage Calculations

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DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Nottingham
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.400**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.3** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.63**
Rainfall for 15min storm with 5 year return period	$M5_15min_i = Z1 \times M5_60min$ = **11.6** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.94**
Rainfall for 15min storm with 100 year return period	$M100_15min = Z2 \times M5_15min_i$ = **22.4** mm
Design rainfall intensity	I_{max} = M100_15min / D = **89.7** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2435** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **60.7** l/s

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	0.750
Time of Entry (mins)	4.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	x
Maximum Rainfall (mm/hr)	200.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW 1.0	0.100	4.00	2.800	1200	523026.238	322354.504	1.050
SW 1.1	0.062	4.00	2.670	1350	523027.217	322304.107	1.197
SW 1.2	0.070	4.00	2.990	1500	522969.547	322302.987	1.844
SW 1.3			2.700	1500	522969.036	322329.302	1.609
SW 5.0	0.020	4.00	2.430	1200	522969.383	322366.682	0.975
SW 5.1	0.064	4.00	2.520	1200	522969.836	322343.393	1.181
DITCH 2			2.500	2175	522708.793	322290.587	2.234
SW 1.4	0.120	4.00	2.520	1500	522954.407	322341.489	1.544
SW 1.5			2.530	1500	522911.360	322340.653	1.707
SW 1.6	0.042	4.00	2.480	1500	522888.179	322329.648	1.698
OUTFALL			2.500	2175	522669.682	322286.670	2.313
SW 7.4			2.500	1500	522728.098	322309.249	1.572
SW 3.2	0.012	4.00	2.530	1350	522728.180	322324.812	1.325
SW 3.0	0.065	4.00	2.470	1200	522726.091	322361.540	1.050
SW 3.1	0.029	4.00	2.590	1350	522727.007	322336.163	1.347
SW 7.5	0.020	4.00	2.500	1800	522728.202	322303.028	1.584
SW 2.0	0.120	4.00	2.630	1200	522741.709	322336.711	1.050
SW 2.1	0.050	4.00	2.530	1350	522785.145	322337.703	1.242
SW 4.0	0.011	4.00	2.480	1200	522793.891	322306.043	0.975
SW 4.1	0.034	4.00	2.470	1200	522793.998	322324.316	1.056
SW 2.2	0.130	4.00	2.500	1800	522798.260	322332.418	1.432
SW 2.3	0.110	4.00	2.550	1800	522808.679	322328.104	1.582
SW 6.0	0.100	4.00	2.510	1200	522847.912	322355.575	1.050
SW 6.1	0.027	4.00	2.480	1200	522848.638	322328.881	1.229
TANK		4.00	2.440	1800	522848.609	322312.678	1.721
DITCH SWJ2			2.900		522848.973	322293.876	2.393
SW 7.6 - HYDROBRAKE			2.900	1500			2.033
SW 8.0	0.104	4.00	2.660	1350	523028.462	322239.989	1.050
SW 8.1	0.062	4.00	2.700	1350	523027.538	322288.313	1.326
SW 8.2	0.099	4.00	2.800	1500	522970.298	322287.202	1.654
SW 9.0	0.082	4.00	2.660	1200	522971.368	322225.924	0.975
SW 9.1			2.660	1200	522971.368	322249.753	1.176
SW 8.3	0.017	4.00	2.650	1500	522966.943	322255.477	1.655
SW 8.4	0.040	4.00	2.560	1500	522955.378	322250.649	1.664
SW 8.5	0.060	4.00	2.500	1500	522910.729	322249.782	1.753
PP1	0.077	4.00	2.500	1350	522899.119	322248.588	1.300
SW 8.6	0.059	4.00	2.500	1800	522903.841	322253.439	1.840
SW 8.7			2.510	1800	522882.348	322269.541	1.886
SW 1.9 - HYDROBRAKE			2.400	2175	522736.865	322291.365	2.117
SW 1.8 - HYDROBRAKE			2.700	1950	522848.694	322308.284	1.990
SW 11.0	0.031	4.00	2.450	1200	522850.752	322229.263	0.975
SW 11.1	0.128	4.00	2.500	1200	522849.939	322270.201	1.300

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SW 2.4			2.450	1800	522831.718	322328.656	1.731
SW 10.3	0.132	4.00	2.350	1800	522818.648	322269.594	1.572
PP2	0.056	4.00	2.350	1350	522801.629	322247.272	1.175
SW 10.2	0.100	4.00	2.350	1500	522796.788	322252.757	1.436
SW 10.1	0.065	4.00	2.350	1500	522790.090	322247.599	1.417
SW 10.0		4.00	2.370	1350	522741.587	322246.657	1.125
SW 13.0		4.00	2.350	1200	522730.677	322217.305	0.975
SW 13.2	0.072	4.00	2.370	1500	522738.110	322250.375	1.429
SW 13.3			2.370	1500	522730.852	322258.136	1.456
SW 13.1			2.400	1200	522730.677	322240.558	1.162
SW 12.3	0.033	4.00	2.380	1800	522728.094	322280.282	1.655
SW 7.3	0.016	4.00	2.700	1350	522706.144	322308.444	1.231
SW 7.2	0.060	4.00	2.700	1200	522689.011	322313.066	1.142
SW 7.1	0.026	4.00	2.660	1200	522679.449	322331.792	0.997
SW 7.0	0.013	4.00	2.740	1200	522679.050	322352.271	0.975
BASIN SW			2.500	1500	522708.543	322300.866	1.623
SW 12.2	0.029	4.00	2.700	1350	522687.179	322278.078	1.767
SW 12.1	0.032	4.00	2.550	1200	522676.725	322271.434	1.491
SW 12.0	0.075	4.00	2.380	1200	522669.020	322217.883	0.975
DITCH SWJ4			2.400		522742.013	322291.459	2.107
DITCH SWJ3			2.750		522816.491	322292.835	2.308
DITCH SWJ1			2.950		522879.936	322293.316	2.381
DITCH TOP		4.00	2.950		522941.884	322294.624	2.000
SW 1.7			2.500	1800	522865.119	322329.307	1.781

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	SW 1.0	SW 1.1	50.407	0.600	1.750	1.548	0.202	249.5	300	4.85	200.0
1.002	SW 1.1	SW 1.2	57.681	0.600	1.473	1.296	0.177	325.9	375	5.81	195.4
1.003	SW 1.2	SW 1.3	26.320	0.600	1.146	1.091	0.055	478.5	525	6.24	190.7
1.004	SW 1.3	SW 1.4	19.040	0.600	1.091	1.051	0.040	476.0	525	6.55	187.1
5.000	SW 5.0	SW 5.1	23.293	0.600	1.455	1.339	0.116	200.8	225	4.42	200.0
5.001	SW 5.1	SW 1.4	15.546	0.600	1.339	1.261	0.078	199.3	225	4.70	200.0
1.005	SW 1.4	SW 1.5	43.055	0.600	0.976	0.898	0.078	552.0	600	7.25	179.1
1.006	SW 1.5	SW 1.6	25.661	0.600	0.823	0.782	0.041	625.9	675	7.66	175.1
1.007	SW 1.6	SW 1.7	39.548	0.600	0.782	0.719	0.063	627.7	675	8.30	171.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.991	70.0	72.3	0.750	0.822	0.100	0.0	258	1.119
1.002	0.998	110.2	114.4	0.822	1.319	0.162	0.0	325	1.125
1.003	1.017	220.2	159.9	1.319	1.084	0.232	0.0	333	1.105
1.004	1.020	220.7	156.9	1.084	0.944	0.232	0.0	328	1.103
5.000	0.919	36.5	14.5	0.750	0.956	0.020	0.0	98	0.865
5.001	0.922	36.7	60.7	0.956	1.034	0.084	0.0	225	0.939
1.005	1.029	291.0	282.2	0.944	1.032	0.436	0.0	480	1.164
1.006	1.040	372.2	275.9	1.032	1.023	0.436	0.0	434	1.133
1.007	1.038	371.6	296.8	1.023	1.106	0.478	0.0	458	1.147

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	SW 3.0	SW 3.1	25.394	0.600	1.420	1.318	0.102	249.0	300	4.43	200.0
3.001	SW 3.1	SW 3.2	11.411	0.600	1.243	1.205	0.038	300.3	375	4.61	200.0
7.004	SW 7.3	SW 7.4	6.502	0.600	1.469	1.153	0.316	20.6	375	4.98	200.0
3.002	SW 3.2	SW 7.4	15.563	0.600	1.205	1.153	0.052	299.3	375	4.86	200.0
11.006	BASIN SW	SW 7.6 - HYDROBRAKE	5.189	0.600	0.877	0.867	0.010	518.9	600	5.47	198.7
7.005	SW 7.4	SW 7.5	6.222	0.600	0.928	0.916	0.012	518.5	600	5.08	199.0
2.000	SW 2.0	SW 2.1	43.447	0.600	1.580	1.363	0.217	200.2	300	4.65	199.5
2.001	SW 2.1	SW 2.2	14.140	0.600	1.288	1.218	0.070	202.0	375	4.84	196.7
4.000	SW 4.0	SW 4.1	18.273	0.600	1.505	1.414	0.091	200.8	225	4.33	200.0
4.001	SW 4.1	SW 2.2	9.155	0.600	1.414	1.368	0.046	199.0	225	4.50	200.0
2.002	SW 2.2	SW 2.3	11.277	0.600	1.068	1.043	0.025	451.1	525	5.02	194.1
2.003	SW 2.3	SW 2.4	39.967	0.600	0.968	0.888	0.080	499.6	600	5.63	186.2
6.000	SW 6.0	SW 6.1	26.704	0.600	1.460	1.326	0.134	199.3	300	4.40	200.0
16.006	DITCH 2	OUTFALL	39.626	0.600	0.266	0.187	0.079	501.6	1275	10.99	174.5
8.000	SW 8.0	SW 8.1	48.333	0.600	1.610	1.449	0.161	300.2	300	4.89	200.0
8.001	SW 8.1	SW 8.2	57.251	0.600	1.374	1.221	0.153	374.2	375	5.92	195.1
8.002	SW 8.2	SW 8.3	34.399	0.600	1.146	1.070	0.076	452.6	450	6.52	188.1
9.000	SW 9.0	SW 9.1	23.829	0.600	1.685	1.559	0.126	189.1	225	4.42	200.0
9.001	SW 9.1	SW 8.4	7.235	0.600	1.484	1.196	0.288	25.1	300	4.46	200.0
8.003	SW 8.3	SW 8.4	12.532	0.600	0.995	0.971	0.024	522.2	525	6.74	185.8
8.004	SW 8.4	SW 8.5	44.657	0.600	0.896	0.822	0.074	603.5	600	7.49	177.4
8.005	SW 8.5	SW 8.6	7.798	0.600	0.747	0.735	0.012	649.8	675	7.62	176.2
14.000	PP1	SW 8.6	6.770	0.600	1.200	1.035	0.165	41.0	375	4.04	200.0
8.006	SW 8.6	SW 8.7	26.856	0.600	0.660	0.624	0.036	746.0	750	8.06	171.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	0.992	70.1	47.0	0.750	0.972	0.065	0.0	180	1.061
3.001	1.040	114.9	67.9	0.972	0.950	0.094	0.0	208	1.082
7.004	4.009	442.8	83.1	0.856	0.972	0.115	0.0	109	3.105
3.002	1.042	115.1	76.6	0.950	0.972	0.106	0.0	224	1.113
11.006	1.062	300.2	173.1	1.023	1.433	0.241	0.0	327	1.098
7.005	1.062	300.4	158.9	0.972	0.984	0.221	0.0	310	1.076
2.000	1.107	78.3	86.5	0.750	0.867	0.120	0.0	300	1.122
2.001	1.271	140.4	120.8	0.867	0.907	0.170	0.0	269	1.422
4.000	0.919	36.5	8.0	0.750	0.831	0.011	0.0	71	0.736
4.001	0.923	36.7	32.5	0.831	0.907	0.045	0.0	166	1.039
2.002	1.048	226.8	242.0	0.907	0.982	0.345	0.0	483	1.161
2.003	1.082	306.0	306.2	0.982	0.962	0.455	0.0	497	1.224
6.000	1.110	78.5	72.3	0.750	0.854	0.100	0.0	228	1.253
16.006	1.727	2204.4	1078.4	0.959	1.038	1.710	0.0	629	1.718
8.000	0.902	63.8	75.2	0.750	0.951	0.104	0.0	300	0.914
8.001	0.930	102.8	117.0	0.951	1.204	0.166	0.0	375	0.942
8.002	0.949	150.9	180.1	1.204	1.130	0.265	0.0	450	0.961
9.000	0.947	37.7	59.3	0.750	0.876	0.082	0.0	225	0.965
9.001	3.149	222.6	59.3	0.876	1.064	0.082	0.0	105	2.676
8.003	0.973	210.6	189.4	1.130	1.064	0.282	0.0	391	1.094
8.004	0.984	278.2	259.0	1.064	1.078	0.404	0.0	461	1.110
8.005	1.020	365.1	295.5	1.078	1.090	0.464	0.0	463	1.130
14.000	2.835	313.2	55.7	0.925	1.090	0.077	0.0	107	2.164
8.006	1.017	449.1	372.1	1.090	1.136	0.600	0.0	524	1.130

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
8.007	SW 8.7	DITCH SWJ1	41.305	0.600	0.624	0.569	0.055	751.0	750	8.74	165.1
16.005	SW 1.9 - HYDROBRAKE	DITCH 2	8.453	0.600	0.283	0.266	0.017	497.2	225	10.61	151.6
13.003	SW 13.3	SW 12.3	22.317	0.600	0.914	0.725	0.189	118.1	450	4.97	200.0
13.002	SW 13.2	SW 13.3	10.626	0.600	0.941	0.914	0.027	393.6	450	4.77	189.7
16.000	DITCH TOP	DITCH SWJ1	61.962	0.030	0.950	0.569	0.381	162.6	2000	4.40	200.0
10.000	SW 10.0	SW 10.1	48.512	0.600	1.245	1.083	0.162	299.5	375	4.78	200.0
10.001	SW 10.1	SW 10.2	8.454	0.600	0.933	0.914	0.019	444.9	525	4.91	200.0
10.002	SW 10.2	SW 10.3	27.592	0.600	0.914	0.853	0.061	452.3	525	5.35	196.5
10.003	SW 10.3	DITCH SWJ3	23.341	0.600	0.778	0.442	0.336	69.5	600	5.48	191.5
1.009	SW 1.8 - HYDROBRAKE	DITCH SWJ2	14.294	0.600	0.710	0.507	0.203	70.4	150	4.26	166.5
13.001	SW 13.1	SW 13.2	12.314	0.600	1.238	1.166	0.072	171.0	225	4.59	200.0
15.000	PP2	SW 10.2	7.316	0.600	1.175	1.139	0.036	203.2	300	4.11	200.0
11.000	SW 11.0	SW 11.1	40.946	0.600	1.475	1.275	0.200	204.7	225	4.75	200.0
13.000	SW 13.0	SW 13.1	23.253	0.600	1.375	1.238	0.137	169.7	225	4.39	200.0
11.001	SW 11.1	SW 10.3	31.297	0.600	1.200	1.078	0.122	256.5	300	5.28	200.0
7.000	SW 7.0	SW 7.1	20.483	0.600	1.765	1.663	0.102	200.8	225	4.37	200.0
7.001	SW 7.1	SW 7.2	21.026	0.600	1.663	1.558	0.105	200.2	300	4.69	200.0
7.002	SW 7.2	SW 7.3	17.745	0.600	1.558	1.469	0.089	199.4	300	4.95	200.0
7.006	SW 7.5	BASIN SW	19.717	0.600	0.916	0.877	0.039	505.6	600	5.38	194.8
7.008	SW 7.6 - HYDROBRAKE	DITCH 2	5.097	0.600	0.867	0.857	0.010	509.7	150	5.66	193.5
12.000	SW 12.0	SW 12.1	54.102	0.600	1.405	1.134	0.271	199.6	225	4.98	200.0
12.001	SW 12.1	SW 12.2	12.387	0.600	1.059	1.008	0.051	242.9	300	5.18	200.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
8.007	1.013	447.6	358.0	1.136	1.631	0.600	0.0	510	1.119
16.005	0.580	23.0	804.8	1.892	2.009	1.469	0.0	225	0.590
13.003	1.870	297.4	52.0	1.006	1.205	0.072	0.0	126	1.417
13.002	1.018	162.0	49.4	0.979	1.006	0.072	0.0	170	0.899
16.000	2.576	18028.5	21.0	0.000	0.381	0.029	0.0	43	0.312
10.000	1.042	115.0	0.0	0.750	0.892	0.000	0.0	0	0.000
10.001	1.055	228.4	47.0	0.892	0.911	0.065	0.0	161	0.838
10.002	1.046	226.5	156.9	0.911	0.972	0.221	0.0	322	1.126
10.003	2.924	826.7	354.3	0.972	1.708	0.512	0.0	274	2.816
1.009	1.200	21.2	0.0	1.840	2.243	0.000	0.0	0	0.000
13.001	0.997	39.6	0.0	0.937	0.979	0.000	0.0	0	0.000
15.000	1.099	77.7	40.5	0.875	0.911	0.056	0.0	154	1.110
11.000	0.910	36.2	22.4	0.750	1.000	0.031	0.0	128	0.956
13.000	1.000	39.8	0.0	0.750	0.937	0.000	0.0	0	0.000
11.001	0.977	69.0	114.9	1.000	0.972	0.159	0.0	300	0.989
7.000	0.919	36.5	9.4	0.750	0.772	0.013	0.0	78	0.773
7.001	1.107	78.3	28.2	0.697	0.842	0.039	0.0	125	1.020
7.002	1.110	78.4	71.6	0.842	0.931	0.099	0.0	226	1.252
7.006	1.076	304.2	169.7	0.984	1.023	0.241	0.0	321	1.104
7.008	0.438	7.7	168.5	1.883	1.493	0.241	0.0	150	0.447
12.000	0.922	36.6	54.2	0.750	1.191	0.075	0.0	225	0.939
12.001	1.004	71.0	77.3	1.191	1.392	0.107	0.0	300	1.017

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
12.002	SW 12.2	SW 12.3	34.953	0.600	0.933	0.805	0.128	273.1	375	5.72	195.0
16.001	DITCH SWJ1	DITCH SWJ2	30.968	0.030	0.569	0.507	0.062	499.5	2000	9.09	163.3
16.002	DITCH SWJ2	DITCH SWJ3	32.499	0.030	0.507	0.442	0.065	500.0	2000	9.46	158.8
16.003	DITCH SWJ3	DITCH SWJ4	74.491	0.030	0.442	0.293	0.149	499.9	2000	10.31	178.8
16.004	DITCH SWJ4	SW 1.9 - HYDROBRAKE	5.149	0.030	0.293	0.283	0.010	514.9	2000	10.37	178.0
12.004	SW 12.3	DITCH SWJ4	17.851	0.600	0.725	0.293	0.432	41.3	450	5.81	192.1
6.001	SW 6.1	SW 2.4	16.921	0.600	1.251	1.113	0.138	122.6	375	4.57	200.0
1.008	TANK	SW 1.8 - HYDROBRAKE	4.395	0.600	0.719	0.710	0.009	488.3	750	4.06	200.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
12.002	1.091	120.5	95.8	1.392	1.200	0.136	0.0	254	1.206
16.001	1.470	10287.3	388.3	0.381	0.393	0.658	0.0	347	0.605
16.002	1.469	10282.1	394.3	0.393	0.308	0.687	0.0	350	0.607
16.003	1.469	10282.6	793.5	0.308	0.107	1.228	0.0	524	0.748
16.004	1.447	10132.1	945.0	0.107	0.117	1.469	0.0	583	0.778
12.004	3.169	504.1	167.3	1.205	1.657	0.241	0.0	178	2.860
6.001	1.635	180.6	91.8	0.854	0.962	0.127	0.0	189	1.641
1.008	1.259	556.3	0.0	0.971	1.240	0.000	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	50.407	249.5	300	Circular	2.800	1.750	0.750	2.670	1.548	0.822
1.002	57.681	325.9	375	Circular	2.670	1.473	0.822	2.990	1.296	1.319
1.003	26.320	478.5	525	Circular	2.990	1.146	1.319	2.700	1.091	1.084
1.004	19.040	476.0	525	Circular	2.700	1.091	1.084	2.520	1.051	0.944
5.000	23.293	200.8	225	Circular	2.430	1.455	0.750	2.520	1.339	0.956
5.001	15.546	199.3	225	Circular	2.520	1.339	0.956	2.520	1.261	1.034
1.005	43.055	552.0	600	Circular	2.520	0.976	0.944	2.530	0.898	1.032
1.006	25.661	625.9	675	Circular	2.530	0.823	1.032	2.480	0.782	1.023
1.007	39.548	627.7	675	Circular	2.480	0.782	1.023	2.500	0.719	1.106
3.000	25.394	249.0	300	Circular	2.470	1.420	0.750	2.590	1.318	0.972
3.001	11.411	300.3	375	Circular	2.590	1.243	0.972	2.530	1.205	0.950

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SW 1.0	1200	Manhole	Adoptable	SW 1.1	1350	Manhole	Adoptable
1.002	SW 1.1	1350	Manhole	Adoptable	SW 1.2	1500	Manhole	Adoptable
1.003	SW 1.2	1500	Manhole	Adoptable	SW 1.3	1500	Manhole	Adoptable
1.004	SW 1.3	1500	Manhole	Adoptable	SW 1.4	1500	Manhole	Adoptable
5.000	SW 5.0	1200	Manhole	Adoptable	SW 5.1	1200	Manhole	Adoptable
5.001	SW 5.1	1200	Manhole	Adoptable	SW 1.4	1500	Manhole	Adoptable
1.005	SW 1.4	1500	Manhole	Adoptable	SW 1.5	1500	Manhole	Adoptable
1.006	SW 1.5	1500	Manhole	Adoptable	SW 1.6	1500	Manhole	Adoptable
1.007	SW 1.6	1500	Manhole	Adoptable	SW 1.7	1800	Manhole	Adoptable
3.000	SW 3.0	1200	Manhole	Adoptable	SW 3.1	1350	Manhole	Adoptable
3.001	SW 3.1	1350	Manhole	Adoptable	SW 3.2	1350	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.004	6.502	20.6	375	Circular	2.700	1.469	0.856	2.500	1.153	0.972
3.002	15.563	299.3	375	Circular	2.530	1.205	0.950	2.500	1.153	0.972
11.006	5.189	518.9	600	Circular	2.500	0.877	1.023	2.900	0.867	1.433
7.005	6.222	518.5	600	Circular	2.500	0.928	0.972	2.500	0.916	0.984
2.000	43.447	200.2	300	Circular	2.630	1.580	0.750	2.530	1.363	0.867
2.001	14.140	202.0	375	Circular	2.530	1.288	0.867	2.500	1.218	0.907
4.000	18.273	200.8	225	Circular	2.480	1.505	0.750	2.470	1.414	0.831
4.001	9.155	199.0	225	Circular	2.470	1.414	0.831	2.500	1.368	0.907
2.002	11.277	451.1	525	Circular	2.500	1.068	0.907	2.550	1.043	0.982
2.003	39.967	499.6	600	Circular	2.550	0.968	0.982	2.450	0.888	0.962
6.000	26.704	199.3	300	Circular	2.510	1.460	0.750	2.480	1.326	0.854
16.006	39.626	501.6	1275	Circular	2.500	0.266	0.959	2.500	0.187	1.038
8.000	48.333	300.2	300	Circular	2.660	1.610	0.750	2.700	1.449	0.951
8.001	57.251	374.2	375	Circular	2.700	1.374	0.951	2.800	1.221	1.204
8.002	34.399	452.6	450	Circular	2.800	1.146	1.204	2.650	1.070	1.130
9.000	23.829	189.1	225	Circular	2.660	1.685	0.750	2.660	1.559	0.876
9.001	7.235	25.1	300	Circular	2.660	1.484	0.876	2.560	1.196	1.064
8.003	12.532	522.2	525	Circular	2.650	0.995	1.130	2.560	0.971	1.064
8.004	44.657	603.5	600	Circular	2.560	0.896	1.064	2.500	0.822	1.078
8.005	7.798	649.8	675	Circular	2.500	0.747	1.078	2.500	0.735	1.090
14.000	6.770	41.0	375	Circular	2.500	1.200	0.925	2.500	1.035	1.090
8.006	26.856	746.0	750	Circular	2.500	0.660	1.090	2.510	0.624	1.136
8.007	41.305	751.0	750	Circular	2.510	0.624	1.136	2.950	0.569	1.631
16.005	8.453	497.2	225	Circular	2.400	0.283	1.892	2.500	0.266	2.009
13.003	22.317	118.1	450	Circular	2.370	0.914	1.006	2.380	0.725	1.205

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.004	SW 7.3	1350	Manhole	Adoptable	SW 7.4	1500	Manhole	Adoptable
3.002	SW 3.2	1350	Manhole	Adoptable	SW 7.4	1500	Manhole	Adoptable
11.006	BASIN SW	1500	Manhole	Adoptable	SW 7.6 - HYDROBRAKE	1500	Manhole	Adoptable
7.005	SW 7.4	1500	Manhole	Adoptable	SW 7.5	1800	Manhole	Adoptable
2.000	SW 2.0	1200	Manhole	Adoptable	SW 2.1	1350	Manhole	Adoptable
2.001	SW 2.1	1350	Manhole	Adoptable	SW 2.2	1800	Manhole	Adoptable
4.000	SW 4.0	1200	Manhole	Adoptable	SW 4.1	1200	Manhole	Adoptable
4.001	SW 4.1	1200	Manhole	Adoptable	SW 2.2	1800	Manhole	Adoptable
2.002	SW 2.2	1800	Manhole	Adoptable	SW 2.3	1800	Manhole	Adoptable
2.003	SW 2.3	1800	Manhole	Adoptable	SW 2.4	1800	Manhole	Adoptable
6.000	SW 6.0	1200	Manhole	Adoptable	SW 6.1	1200	Manhole	Adoptable
16.006	DITCH 2	2175	Manhole	Adoptable	OUTFALL	2175	Manhole	Adoptable
8.000	SW 8.0	1350	Manhole	Adoptable	SW 8.1	1350	Manhole	Adoptable
8.001	SW 8.1	1350	Manhole	Adoptable	SW 8.2	1500	Manhole	Adoptable
8.002	SW 8.2	1500	Manhole	Adoptable	SW 8.3	1500	Manhole	Adoptable
9.000	SW 9.0	1200	Manhole	Adoptable	SW 9.1	1200	Manhole	Adoptable
9.001	SW 9.1	1200	Manhole	Adoptable	SW 8.4	1500	Manhole	Adoptable
8.003	SW 8.3	1500	Manhole	Adoptable	SW 8.4	1500	Manhole	Adoptable
8.004	SW 8.4	1500	Manhole	Adoptable	SW 8.5	1500	Manhole	Adoptable
8.005	SW 8.5	1500	Manhole	Adoptable	SW 8.6	1800	Manhole	Adoptable
14.000	PP1	1350	Manhole	Adoptable	SW 8.6	1800	Manhole	Adoptable
8.006	SW 8.6	1800	Manhole	Adoptable	SW 8.7	1800	Manhole	Adoptable
8.007	SW 8.7	1800	Manhole	Adoptable	DITCH SWJ1		Junction	
16.005	SW 1.9 - HYDROBRAKE	2175	Manhole	Adoptable	DITCH 2	2175	Manhole	Adoptable
13.003	SW 13.3	1500	Manhole	Adoptable	SW 12.3	1800	Manhole	Adoptable

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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
13.002	10.626	393.6	450	Circular	2.370	0.941	0.979	2.370	0.914	1.006
16.000	61.962	162.6	2000	Ditch	2.950	0.950	0.000	2.950	0.569	0.381
10.000	48.512	299.5	375	Circular	2.370	1.245	0.750	2.350	1.083	0.892
10.001	8.454	444.9	525	Circular	2.350	0.933	0.892	2.350	0.914	0.911
10.002	27.592	452.3	525	Circular	2.350	0.914	0.911	2.350	0.853	0.972
10.003	23.341	69.5	600	Circular	2.350	0.778	0.972	2.750	0.442	1.708
1.009	14.294	70.4	150	Circular	2.700	0.710	1.840	2.900	0.507	2.243
13.001	12.314	171.0	225	Circular	2.400	1.238	0.937	2.370	1.166	0.979
15.000	7.316	203.2	300	Circular	2.350	1.175	0.875	2.350	1.139	0.911
11.000	40.946	204.7	225	Circular	2.450	1.475	0.750	2.500	1.275	1.000
13.000	23.253	169.7	225	Circular	2.350	1.375	0.750	2.400	1.238	0.937
11.001	31.297	256.5	300	Circular	2.500	1.200	1.000	2.350	1.078	0.972
7.000	20.483	200.8	225	Circular	2.740	1.765	0.750	2.660	1.663	0.772
7.001	21.026	200.2	300	Circular	2.660	1.663	0.697	2.700	1.558	0.842
7.002	17.745	199.4	300	Circular	2.700	1.558	0.842	2.700	1.469	0.931
7.006	19.717	505.6	600	Circular	2.500	0.916	0.984	2.500	0.877	1.023
7.008	5.097	509.7	150	Circular	2.900	0.867	1.883	2.500	0.857	1.493
12.000	54.102	199.6	225	Circular	2.380	1.405	0.750	2.550	1.134	1.191
12.001	12.387	242.9	300	Circular	2.550	1.059	1.191	2.700	1.008	1.392
12.002	34.953	273.1	375	Circular	2.700	0.933	1.392	2.380	0.805	1.200
16.001	30.968	499.5	2000	Ditch	2.950	0.569	0.381	2.900	0.507	0.393
16.002	32.499	500.0	2000	Ditch	2.900	0.507	0.393	2.750	0.442	0.308
16.003	74.491	499.9	2000	Ditch	2.750	0.442	0.308	2.400	0.293	0.107

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
13.002	SW 13.2	1500	Manhole	Adoptable	SW 13.3	1500	Manhole	Adoptable
16.000	DITCH TOP		Junction		DITCH SWJ1		Junction	
10.000	SW 10.0	1350	Manhole	Adoptable	SW 10.1	1500	Manhole	Adoptable
10.001	SW 10.1	1500	Manhole	Adoptable	SW 10.2	1500	Manhole	Adoptable
10.002	SW 10.2	1500	Manhole	Adoptable	SW 10.3	1800	Manhole	Adoptable
10.003	SW 10.3	1800	Manhole	Adoptable	DITCH SWJ3		Junction	
1.009	SW 1.8 - HYDROBRAKE	1950	Manhole	Adoptable	DITCH SWJ2		Junction	
13.001	SW 13.1	1200	Manhole	Adoptable	SW 13.2	1500	Manhole	Adoptable
15.000	PP2	1350	Manhole	Adoptable	SW 10.2	1500	Manhole	Adoptable
11.000	SW 11.0	1200	Manhole	Adoptable	SW 11.1	1200	Manhole	Adoptable
13.000	SW 13.0	1200	Manhole	Adoptable	SW 13.1	1200	Manhole	Adoptable
11.001	SW 11.1	1200	Manhole	Adoptable	SW 10.3	1800	Manhole	Adoptable
7.000	SW 7.0	1200	Manhole	Adoptable	SW 7.1	1200	Manhole	Adoptable
7.001	SW 7.1	1200	Manhole	Adoptable	SW 7.2	1200	Manhole	Adoptable
7.002	SW 7.2	1200	Manhole	Adoptable	SW 7.3	1350	Manhole	Adoptable
7.006	SW 7.5	1800	Manhole	Adoptable	BASIN SW	1500	Manhole	Adoptable
7.008	SW 7.6 - HYDROBRAKE	1500	Manhole	Adoptable	DITCH 2	2175	Manhole	Adoptable
12.000	SW 12.0	1200	Manhole	Adoptable	SW 12.1	1200	Manhole	Adoptable
12.001	SW 12.1	1200	Manhole	Adoptable	SW 12.2	1350	Manhole	Adoptable
12.002	SW 12.2	1350	Manhole	Adoptable	SW 12.3	1800	Manhole	Adoptable
16.001	DITCH SWJ1		Junction		DITCH SWJ2		Junction	
16.002	DITCH SWJ2		Junction		DITCH SWJ3		Junction	
16.003	DITCH SWJ3		Junction		DITCH SWJ4		Junction	

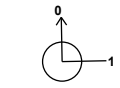
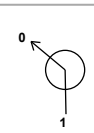
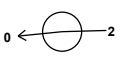
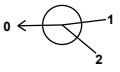
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Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
16.004	5.149	514.9	2000	Ditch	2.400	0.293	0.107	2.400	0.283	0.117
12.004	17.851	41.3	450	Circular	2.380	0.725	1.205	2.400	0.293	1.657
6.001	16.921	122.6	375	Circular	2.480	1.251	0.854	2.450	1.113	0.962
1.008	4.395	488.3	750	Circular	2.440	0.719	0.971	2.700	0.710	1.240

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
16.004	DITCH SWJ4		Junction		SW 1.9 - HYDROBRAKE	2175	Manhole	Adoptable
12.004	SW 12.3	1800	Manhole	Adoptable	DITCH SWJ4		Junction	
6.001	SW 6.1	1200	Manhole	Adoptable	SW 2.4	1800	Manhole	Adoptable
1.008	TANK	1800	Manhole	Adoptable	SW 1.8 - HYDROBRAKE	1950	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW 1.0	523026.238	322354.504	2.800	1.050	1200	 0	1.000	1.750	300
SW 1.1	523027.217	322304.107	2.670	1.197	1350	 1	1.000	1.548	300
						0	1.002	1.473	375
SW 1.2	522969.547	322302.987	2.990	1.844	1500	 1	1.002	1.296	375
						0	1.003	1.146	525
SW 1.3	522969.036	322329.302	2.700	1.609	1500	 1	1.003	1.091	525
						0	1.004	1.091	525
SW 5.0	522969.383	322366.682	2.430	0.975	1200	 0	5.000	1.455	225
SW 5.1	522969.836	322343.393	2.520	1.181	1200	 1	5.000	1.339	225
						0	5.001	1.339	225
DITCH 2	522708.793	322290.587	2.500	2.234	2175	 1	7.008	0.857	150
						2	16.005	0.266	225
						0	16.006	0.266	1275
SW 1.4	522954.407	322341.489	2.520	1.544	1500	 1	5.001	1.261	225
						2	1.004	1.051	525
						0	1.005	0.976	600

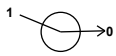
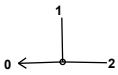
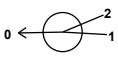
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW 1.5	522911.360	322340.653	2.530	1.707	1500	1	1.005	0.898	600
						0	1.006	0.823	675
SW 1.6	522888.179	322329.648	2.480	1.698	1500	1	1.006	0.782	675
						0	1.007	0.782	675
OUTFALL	522669.682	322286.670	2.500	2.313	2175	1	16.006	0.187	1275
SW 7.4	522728.098	322309.249	2.500	1.572	1500	1	3.002	1.153	375
						2	7.004	1.153	375
						0	7.005	0.928	600
SW 3.2	522728.180	322324.812	2.530	1.325	1350	1	3.001	1.205	375
						0	3.002	1.205	375
SW 3.0	522726.091	322361.540	2.470	1.050	1200	0	3.000	1.420	300
SW 3.1	522727.007	322336.163	2.590	1.347	1350	1	3.000	1.318	300
						0	3.001	1.243	375
SW 7.5	522728.202	322303.028	2.500	1.584	1800	1	7.005	0.916	600
						0	7.006	0.916	600
SW 2.0	522741.709	322336.711	2.630	1.050	1200	0	2.000	1.580	300
SW 2.1	522785.145	322337.703	2.530	1.242	1350	1	2.000	1.363	300
						0	2.001	1.288	375
SW 4.0	522793.891	322306.043	2.480	0.975	1200	0	4.000	1.505	225
SW 4.1	522793.998	322324.316	2.470	1.056	1200	1	4.000	1.414	225
						0	4.001	1.414	225
SW 2.2	522798.260	322332.418	2.500	1.432	1800	1	4.001	1.368	225
						2	2.001	1.218	375
						0	2.002	1.068	525

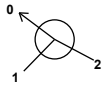
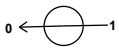
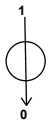
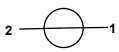
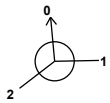
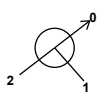
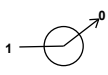
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW 2.3	522808.679	322328.104	2.550	1.582	1800	 1	2.002	1.043	525
						0	2.003	0.968	600
SW 6.0	522847.912	322355.575	2.510	1.050	1200	 0	6.000	1.460	300
SW 6.1	522848.638	322328.881	2.480	1.229	1200	 1	6.000	1.326	300
						0	6.001	1.251	375
TANK	522848.609	322312.678	2.440	1.721	1800	 0	1.008	0.719	750
DITCH SWJ2	522848.973	322293.876	2.900	2.393		 1	1.009	0.507	150
						2	16.001	0.507	2000
						0	16.002	0.507	2000
SW 7.6 - HYDROBRAKE			2.900	2.033	1500	 1	11.006	0.867	600
						0	7.008	0.867	150
SW 8.0	523028.462	322239.989	2.660	1.050	1350	 0	8.000	1.610	300
SW 8.1	523027.538	322288.313	2.700	1.326	1350	 1	8.000	1.449	300
						0	8.001	1.374	375
SW 8.2	522970.298	322287.202	2.800	1.654	1500	 1	8.001	1.221	375
						0	8.002	1.146	450
SW 9.0	522971.368	322225.924	2.660	0.975	1200	 0	9.000	1.685	225
SW 9.1	522971.368	322249.753	2.660	1.176	1200	 1	9.000	1.559	225
						0	9.001	1.484	300
SW 8.3	522966.943	322255.477	2.650	1.655	1500	 1	8.002	1.070	450
						0	8.003	0.995	525
SW 8.4	522955.378	322250.649	2.560	1.664	1500	1	9.001	1.196	300
						 2	8.003	0.971	525
						0	8.004	0.896	600

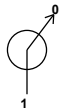
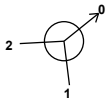
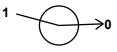
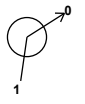
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW 8.5	522910.729	322249.782	2.500	1.753	1500		1	8.004	0.822	600
							0	8.005	0.747	675
PP1	522899.119	322248.588	2.500	1.300	1350		0	14.000	1.200	375
SW 8.6	522903.841	322253.439	2.500	1.840	1800		1	14.000	1.035	375
							2	8.005	0.735	675
							0	8.006	0.660	750
SW 8.7	522882.348	322269.541	2.510	1.886	1800		1	8.006	0.624	750
							0	8.007	0.624	750
SW 1.9 - HYDROBRAKE	522736.865	322291.365	2.400	2.117	2175		1	16.004	0.283	2000
							0	16.005	0.283	225
SW 1.8 - HYDROBRAKE	522848.694	322308.284	2.700	1.990	1950		1	1.008	0.710	750
							0	1.009	0.710	150
SW 11.0	522850.752	322229.263	2.450	0.975	1200		0	11.000	1.475	225
SW 11.1	522849.939	322270.201	2.500	1.300	1200		1	11.000	1.275	225
							0	11.001	1.200	300
SW 2.4	522831.718	322328.656	2.450	1.731	1800		1	6.001	1.113	375
							2	2.003	0.888	600
SW 10.3	522818.648	322269.594	2.350	1.572	1800		1	11.001	1.078	300
							2	10.002	0.853	525
							0	10.003	0.778	600
PP2	522801.629	322247.272	2.350	1.175	1350		0	15.000	1.175	300
SW 10.2	522796.788	322252.757	2.350	1.436	1500		1	15.000	1.139	300
							2	10.001	0.914	525
							0	10.002	0.914	525
SW 10.1	522790.090	322247.599	2.350	1.417	1500		1	10.000	1.083	375
							0	10.001	0.933	525

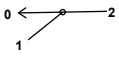
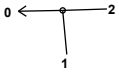
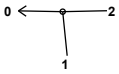
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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW 10.0	522741.587	322246.657	2.370	1.125	1350		0	10.000	1.245	375
SW 13.0	522730.677	322217.305	2.350	0.975	1200		0	13.000	1.375	225
SW 13.2	522738.110	322250.375	2.370	1.429	1500		1	13.001	1.166	225
							0	13.002	0.941	450
SW 13.3	522730.852	322258.136	2.370	1.456	1500		1	13.002	0.914	450
							0	13.003	0.914	450
SW 13.1	522730.677	322240.558	2.400	1.162	1200		1	13.000	1.238	225
							0	13.001	1.238	225
SW 12.3	522728.094	322280.282	2.380	1.655	1800		1	13.003	0.725	450
							2	12.002	0.805	375
							0	12.004	0.725	450
SW 7.3	522706.144	322308.444	2.700	1.231	1350		1	7.002	1.469	300
							0	7.004	1.469	375
SW 7.2	522689.011	322313.066	2.700	1.142	1200		1	7.001	1.558	300
							0	7.002	1.558	300
SW 7.1	522679.449	322331.792	2.660	0.997	1200		1	7.000	1.663	225
							0	7.001	1.663	300
SW 7.0	522679.050	322352.271	2.740	0.975	1200		0	7.000	1.765	225
BASIN SW	522708.543	322300.866	2.500	1.623	1500		1	7.006	0.877	600
							0	11.006	0.877	600
SW 12.2	522687.179	322278.078	2.700	1.767	1350		1	12.001	1.008	300
							0	12.002	0.933	375
SW 12.1	522676.725	322271.434	2.550	1.491	1200		1	12.000	1.134	225
							0	12.001	1.059	300

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Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SW 12.0	522669.020	322217.883	2.380	0.975	1200				
						0	12.000	1.405	225
DITCH SWJ4	522742.013	322291.459	2.400	2.107			1	12.004	0.293	450
							2	16.003	0.293	2000
							0	16.004	0.293	2000
DITCH SWJ3	522816.491	322292.835	2.750	2.308			1	10.003	0.442	600
							2	16.002	0.442	2000
							0	16.003	0.442	2000
DITCH SWJ1	522879.936	322293.316	2.950	2.381			1	8.007	0.569	750
							2	16.000	0.569	2000
							0	16.001	0.569	2000
DITCH TOP	522941.884	322294.624	2.950	2.000						
							0	16.000	0.950	2000
SW 1.7	522865.119	322329.307	2.500	1.781	1800		1	1.007	0.719	675
										

Simulation Settings

Rainfall Methodology	FEH-22	Drain Down Time (mins)	240	10 year (l/s)	8.3
Rainfall Events	Singular	Additional Storage (m³/ha)	0.0	30 year (l/s)	12.8
Winter CV	1.000	Starting Level (m)		100 year (l/s)	17.9
Analysis Speed	Detailed	Check Discharge Rate(s)	✓	Check Discharge Volume	x
Skip Steady State	x	1 year (l/s)	4.4		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	5
Greenfield Method	FEH	QBar/QMed conversion factor	1.124
Positively Drained Area (ha)	5.690	Growth Factor 1 year	0.87
SAAR (mm)	561	Growth Factor 10 year	1.65
Host	1	Growth Factor 30 year	2.55
BFIHost	0.680	Growth Factor 100 year	3.56

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Pre-development Discharge Rate

Betterment (%)	0	Q 10 year (l/s)	8.3
QMed	4.5	Q 30 year (l/s)	12.8
QBar	5.0	Q 100 year (l/s)	17.9
Q 1 year (l/s)	4.4		

Node SW 7.6 - HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	0.867	Product Number	CTL-SHE-0027-4000-1210-4000
Design Depth (m)	1.210	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.4	Min Node Diameter (mm)	1200

Node SW 1.8 - HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.009	Sump Available	✓
Replaces Downstream Link	x	Product Number	CTL-SHE-0112-6200-1300-6200
Invert Level (m)	0.710	Min Outlet Diameter (m)	0.150
Design Depth (m)	1.300	Min Node Diameter (mm)	1200
Design Flow (l/s)	6.2		

Node SW 1.9 - HYDROBRAKE Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	0.283	Product Number	CTL-SHE-0130-9200-1700-9200
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	9.2	Min Node Diameter (mm)	1500

Node TANK Tank Storage Structure

Invert Level (m)	0.719	Time to half empty (mins)		Analyse flow through structure	x

Inlets

SW 1.7	SW 2.4

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	955.0	1.200	955.0	1.201	0.0

Node BASIN SW Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.877
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	21.0	21.0	0.600	163.0	164.2	0.601	291.0	292.2	1.623	835.0	842.5

Node SW 3.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.420
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	473.0	0.0	0.600	473.0	0.0	0.601	0.0	0.0

Node SW 4.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.505
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	230.0	0.0	0.600	230.0	0.0	0.601	0.0	0.0

Node SW 5.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.339
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	440.0	0.0	0.600	440.0	0.0	0.601	0.0	0.0

Node SW 1.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.750
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	0.600	200.0	0.0	0.601	0.0	0.0

Node SW 8.2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.146
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	175.0	175.0	0.600	175.0	203.1	0.601	0.0	203.1

Node DITCH 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.266
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	81.0	81.0	1.500	300.0	310.9

Node SW 8.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.610
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	490.0	490.0	0.600	490.0	537.1	0.601	0.0	537.1

Node PP1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	770.0	770.0	0.600	770.0	829.0	0.601	0.0	829.0

Node SW 9.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.685
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	460.0	460.0	0.600	460.0	505.6	0.601	0.0	505.6

Node SW 8.4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.896
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	303.0	303.0	0.600	303.0	340.0	0.601	0.0	340.0

Node SW 13.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	260.0	260.0	0.600	260.0	294.3	0.601	0.0	294.3

Node SW 8.6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.660
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	65.0	65.0	0.600	65.0	82.1	0.601	0.0	82.1

Node PP2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.175
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	560.0	560.0	0.600	560.0	610.3	0.601	0.0	610.3

Node SW 10.3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.778
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	87.0	87.0	0.600	87.0	106.8	0.601	0.0	106.8

Node SW 10.2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.914
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	100.0	100.0	0.600	100.0	121.3	0.601	0.0	121.3

Node SW 10.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.933
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	260.0	260.0	0.600	260.0	294.3	0.601	0.0	294.3

Node SW 13.2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.941
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	30.0	30.0	0.600	30.0	41.6	0.601	0.0	41.6

Node SW 12.3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.725
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	95.0	95.0	0.600	95.0	115.7	0.601	0.0	115.7

Node SW 12.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.405
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	4

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	27.0	27.0	0.600	27.0	38.1	0.601	0.0	38.1

Node SW 12.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.059
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	115.0	115.0	0.600	115.0	137.8	0.601	0.0	137.8

Node SW 12.2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.933
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	120.0	120.0	0.600	120.0	143.3	0.601	0.0	143.3

Node SW 7.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.765
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	40.0	40.0	0.600	40.0	53.5	0.601	0.0	53.5

Node SW 7.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.663
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	60.0	60.0	0.600	60.0	76.5	0.601	0.0	76.5

Node SW 7.3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.469
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	50.0	0.600	50.0	65.0	0.601	0.0	65.0

Node SW 7.5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.916
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	70.0	70.0	0.600	70.0	87.8	0.601	0.0	87.8

Node SW 3.2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.205
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	25.0	25.0	0.600	25.0	35.6	0.601	0.0	35.6

Node SW 2.1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.288
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	215.0	215.0	0.600	215.0	246.2	0.601	0.0	246.2

Node SW 2.2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.068
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	150.0	150.0	0.600	150.0	176.0	0.601	0.0	176.0

Node SW 6.0 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.460
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	190.0	190.0	0.600	190.0	219.3	0.601	0.0	219.3

Node SW 1.6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.782
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	200.0	0.600	200.0	230.1	0.601	0.0	230.1

Node SW 1.4 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	0.976
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

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Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	240.0	240.0	0.600	240.0	273.0	0.601	0.0	273.0

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW 1.0	13	1.821	0.071	17.9	4.3240	0.0000	OK
15 minute winter	SW 1.1	12	1.570	0.097	16.5	0.1387	0.0000	OK
15 minute winter	SW 1.2	11	1.272	0.126	26.1	0.2226	0.0000	OK
15 minute winter	SW 1.3	11	1.213	0.122	26.2	0.2163	0.0000	OK
15 minute winter	SW 5.0	9	1.507	0.052	3.6	0.0585	0.0000	OK
120 minute winter	SW 5.1	76	1.387	0.048	5.1	6.3900	0.0000	OK
720 minute winter	DITCH 2	735	0.328	0.062	9.5	5.5474	0.0000	OK
30 minute winter	SW 1.4	22	1.109	0.133	37.7	9.8319	0.0000	OK
600 minute winter	SW 1.5	600	0.973	0.150	8.5	0.2643	0.0000	OK
600 minute winter	SW 1.6	600	0.973	0.191	9.3	11.7699	0.0000	OK
720 minute winter	OUTFALL	735	0.233	0.046	9.5	0.0000	0.0000	OK
960 minute winter	SW 7.4	945	1.355	0.427	3.0	0.7552	0.0000	OK
960 minute winter	SW 3.2	945	1.355	0.150	1.5	1.3433	0.0000	OK
120 minute winter	SW 3.0	76	1.459	0.039	3.9	5.5578	0.0000	OK
960 minute winter	SW 3.1	945	1.355	0.112	1.3	0.1609	0.0000	OK
960 minute winter	SW 7.5	945	1.355	0.439	3.3	10.3460	0.0000	OK
15 minute winter	SW 2.0	10	1.689	0.109	21.5	0.1233	0.0000	OK
15 minute winter	SW 2.1	13	1.385	0.097	30.2	6.3934	0.0000	OK
120 minute winter	SW 4.0	82	1.520	0.015	0.7	1.0855	0.0000	OK
15 minute winter	SW 4.1	10	1.479	0.065	6.2	0.0738	0.0000	OK
15 minute winter	SW 2.2	13	1.209	0.141	41.4	6.7082	0.0000	OK
15 minute winter	SW 2.3	12	1.129	0.161	46.8	0.4097	0.0000	OK
15 minute winter	SW 6.0	12	1.533	0.073	17.9	4.2145	0.0000	OK
15 minute winter	SW 6.1	12	1.320	0.069	12.6	0.0786	0.0000	OK
480 minute winter	TANK	488	0.970	0.251	9.8	239.4822	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW 1.0	1.000	SW 1.1	8.4	0.680	0.120	0.6255	
15 minute winter	SW 1.1	1.002	SW 1.2	15.8	0.744	0.143	1.2267	
15 minute winter	SW 1.2	1.003	SW 1.3	26.2	0.674	0.119	1.0249	
15 minute winter	SW 1.3	1.004	SW 1.4	25.6	0.755	0.116	0.6480	
15 minute winter	SW 5.0	5.000	SW 5.1	3.7	0.860	0.100	0.1109	
120 minute winter	SW 5.1	5.001	SW 1.4	3.5	0.579	0.096	0.0942	
720 minute winter	DITCH 2	16.006	OUTFALL	9.5	0.533	0.004	0.7284	422.5
30 minute winter	SW 1.4	1.005	SW 1.5	30.5	0.751	0.105	1.7577	
600 minute winter	SW 1.5	1.006	SW 1.6	8.5	0.424	0.023	1.8117	
600 minute winter	SW 1.6	1.007	SW 1.7	8.8	0.403	0.024	4.0534	
960 minute winter	SW 7.4	7.005	SW 7.5	3.0	0.275	0.010	1.3562	
960 minute winter	SW 3.2	3.002	SW 7.4	1.5	0.392	0.013	0.7931	
120 minute winter	SW 3.0	3.000	SW 3.1	2.4	0.481	0.035	0.1294	
960 minute winter	SW 3.1	3.001	SW 3.2	1.3	0.332	0.011	0.3937	
960 minute winter	SW 7.5	7.006	BASIN SW	2.6	0.257	0.008	4.5557	
15 minute winter	SW 2.0	2.000	SW 2.1	21.3	0.940	0.272	0.9825	
15 minute winter	SW 2.1	2.001	SW 2.2	18.8	0.870	0.134	0.3061	
120 minute winter	SW 4.0	4.000	SW 4.1	0.3	0.220	0.009	0.0500	
15 minute winter	SW 4.1	4.001	SW 2.2	6.1	0.668	0.167	0.0840	
15 minute winter	SW 2.2	2.002	SW 2.3	34.8	0.826	0.153	0.4758	
15 minute winter	SW 2.3	2.003	SW 2.4	46.7	0.862	0.153	2.1728	
15 minute winter	SW 6.0	6.000	SW 6.1	9.6	0.755	0.123	0.3419	
15 minute winter	SW 6.1	6.001	SW 2.4	12.7	0.935	0.070	0.2301	
480 minute winter	TANK	1.008	SW 1.8 - HYDROBRAKE	4.8	0.083	0.009	0.5821	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	DITCH SWJ2	320	0.937	0.430	14.1	0.0000	0.0000	OK
360 minute winter	16.002:50%	312	0.937	0.463	13.7	2.2784	0.0000	OK
960 minute winter	SW 7.6 - HYDROBRAKE	945	1.355	0.488	0.3	0.8630	0.0000	SURCHARGED
120 minute winter	SW 8.0	76	1.663	0.053	6.3	7.9270	0.0000	OK
15 minute winter	SW 8.1	11	1.460	0.086	12.2	0.1230	0.0000	OK
15 minute winter	SW 8.2	13	1.252	0.106	28.3	5.7783	0.0000	OK
120 minute winter	SW 9.0	76	1.731	0.046	5.0	6.3911	0.0000	OK
120 minute winter	SW 9.1	76	1.511	0.027	3.4	0.0301	0.0000	OK
15 minute winter	SW 8.3	13	1.102	0.107	19.1	0.1892	0.0000	OK
120 minute winter	SW 8.4	76	1.001	0.105	18.6	9.6896	0.0000	OK
360 minute winter	SW 8.5	312	0.938	0.191	12.4	0.3383	0.0000	OK
120 minute winter	PP1	76	1.227	0.027	4.7	6.3323	0.0000	OK
360 minute winter	SW 8.6	312	0.938	0.278	16.0	6.1344	0.0000	OK
360 minute winter	SW 8.7	320	0.938	0.314	14.7	0.7982	0.0000	OK
360 minute winter	SW 1.9 - HYDROBRAKE	312	0.938	0.655	9.8	2.4322	0.0000	SURCHARGED
480 minute winter	SW 1.8 - HYDROBRAKE	488	0.970	0.260	4.8	0.7772	0.0000	SURCHARGED
15 minute winter	SW 11.0	10	1.534	0.059	5.5	0.0672	0.0000	OK
15 minute winter	SW 11.1	10	1.337	0.137	28.4	0.1554	0.0000	OK
600 minute winter	SW 2.4	600	0.973	0.254	11.4	0.0000	0.0000	OK
360 minute winter	SW 10.3	312	0.941	0.163	14.2	4.6753	0.0000	OK
120 minute winter	PP2	80	1.207	0.032	3.4	5.4842	0.0000	OK
30 minute winter	SW 10.2	22	0.997	0.083	13.6	2.6479	0.0000	OK
30 minute winter	SW 10.1	22	1.000	0.067	10.9	5.3350	0.0000	OK
15 minute winter	SW 10.0	1	1.245	0.000	0.0	0.0000	0.0000	OK
15 minute winter	SW 13.0	1	1.375	0.000	0.0	0.0006	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	DITCH SWJ2	16.002	16.002:50%	13.5	0.120	0.001	14.1341	
360 minute winter	DITCH SWJ2	16.002	DITCH SWJ3	12.6	0.087	0.001	15.4275	
960 minute winter	SW 7.6 - HYDROBRAKE	7.008	DITCH 2	0.3	0.242	0.035	0.0057	
120 minute winter	SW 8.0	8.000	SW 8.1	4.3	0.540	0.067	0.3822	
15 minute winter	SW 8.1	8.001	SW 8.2	11.4	0.656	0.111	0.9934	
15 minute winter	SW 8.2	8.002	SW 8.3	17.8	0.698	0.118	0.8782	
120 minute winter	SW 9.0	9.000	SW 9.1	3.4	0.587	0.089	0.1364	
120 minute winter	SW 9.1	9.001	SW 8.4	3.4	1.134	0.015	0.0214	
15 minute winter	SW 8.3	8.003	SW 8.4	19.2	0.686	0.091	0.3509	
120 minute winter	SW 8.4	8.004	SW 8.5	17.6	0.629	0.063	1.2545	
360 minute winter	SW 8.5	8.005	SW 8.6	12.4	0.585	0.034	0.6764	
120 minute winter	PP1	14.000	SW 8.6	3.1	0.896	0.010	0.0234	
360 minute winter	SW 8.6	8.006	SW 8.7	14.7	0.465	0.033	4.3347	
360 minute winter	SW 8.7	8.007	DITCH SWJ1	13.4	0.633	0.030	8.0514	
360 minute winter	SW 1.9 - HYDROBRAKE	16.005	DITCH 2	9.2	0.791	0.399	0.0989	
480 minute winter	SW 1.8 - HYDROBRAKE	1.009	DITCH SWJ2	4.8	0.316	0.226	0.2516	
15 minute winter	SW 11.0	11.000	SW 11.1	5.5	0.638	0.152	0.3544	
15 minute winter	SW 11.1	11.001	SW 10.3	27.7	0.928	0.402	0.9375	
360 minute winter	SW 10.3	10.003	DITCH SWJ3	20.4	0.770	0.025	3.6306	
120 minute winter	PP2	15.000	SW 10.2	1.8	0.454	0.023	0.0288	
30 minute winter	SW 10.2	10.002	SW 10.3	11.9	0.609	0.053	0.5411	
30 minute winter	SW 10.1	10.001	SW 10.2	4.6	0.270	0.020	0.1602	
15 minute winter	SW 10.0	10.000	SW 10.1	0.0	0.000	0.000	0.0001	
15 minute winter	SW 13.0	13.000	SW 13.1	0.0	0.000	0.000	0.0000	

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Results for 2 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW 13.2	10	1.024	0.083	12.9	0.8946	0.0000	OK
15 minute winter	SW 13.3	10	0.979	0.065	12.6	0.1143	0.0000	OK
15 minute winter	SW 13.1	1	1.238	0.000	0.0	0.0000	0.0000	OK
360 minute winter	SW 12.3	328	0.939	0.214	6.9	6.6446	0.0000	OK
15 minute winter	SW 7.3	11	1.522	0.053	16.6	0.8700	0.0000	OK
15 minute winter	SW 7.2	10	1.647	0.089	14.1	0.1007	0.0000	OK
15 minute winter	SW 7.1	12	1.712	0.049	6.0	0.9357	0.0000	OK
15 minute winter	SW 7.0	12	1.797	0.032	2.3	0.4248	0.0000	OK
960 minute winter	BASIN SW	945	1.355	0.478	2.6	37.9761	0.0000	OK
30 minute winter	SW 12.2	23	1.014	0.081	14.1	3.0232	0.0000	OK
15 minute winter	SW 12.1	13	1.148	0.089	17.1	3.1836	0.0000	OK
15 minute winter	SW 12.0	11	1.494	0.089	13.4	0.8256	0.0000	OK
360 minute winter	DITCH SWJ4	312	0.938	0.645	14.5	0.0000	0.0000	OK
360 minute winter	DITCH SWJ3	312	0.938	0.496	20.4	0.0000	0.0000	OK
360 minute winter	16.003:50%	312	0.937	0.570	17.8	3.6798	0.0000	OK
360 minute winter	DITCH SWJ1	328	0.938	0.369	14.2	0.0000	0.0000	OK
360 minute winter	16.001:50%	328	0.938	0.400	14.2	0.0000	0.0000	OK
15 minute winter	DITCH TOP	1	0.950	0.000	0.0	0.0000	0.0000	OK
360 minute winter	16.000:50%	328	0.939	0.179	7.3	0.0000	0.0000	OK
600 minute winter	SW 1.7	600	0.973	0.254	8.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW 13.2	13.002	SW 13.3	12.6	0.745	0.078	0.1808	
15 minute winter	SW 13.3	13.003	SW 12.3	12.5	0.966	0.042	0.2965	
15 minute winter	SW 13.1	13.001	SW 13.2	0.0	0.000	0.000	0.0000	
360 minute winter	SW 12.3	12.004	DITCH SWJ4	9.3	0.518	0.019	2.0774	
15 minute winter	SW 7.3	7.004	SW 7.4	16.4	1.833	0.037	0.0581	
15 minute winter	SW 7.2	7.002	SW 7.3	13.8	1.096	0.175	0.2275	
15 minute winter	SW 7.1	7.001	SW 7.2	4.6	0.432	0.059	0.2565	
15 minute winter	SW 7.0	7.000	SW 7.1	1.6	0.346	0.045	0.1008	
960 minute winter	BASIN SW	11.006	SW 7.6 - HYDROBRAKE	0.3	0.052	0.001	1.2625	
30 minute winter	SW 12.2	12.002	SW 12.3	12.0	0.710	0.099	0.5890	
15 minute winter	SW 12.1	12.001	SW 12.2	12.5	0.741	0.176	0.2090	
15 minute winter	SW 12.0	12.000	SW 12.1	12.0	0.828	0.328	0.7852	
360 minute winter	DITCH SWJ4	16.004	SW 1.9 - HYDROBRAKE	9.8	0.020	0.001	7.1924	
360 minute winter	DITCH SWJ3	16.003	16.003:50%	17.5	0.108	0.002	40.4168	
360 minute winter	DITCH SWJ3	16.003	DITCH SWJ4	14.5	0.077	0.001	47.7268	
360 minute winter	DITCH SWJ1	16.001	16.001:50%	14.0	0.145	0.001	11.2179	
360 minute winter	DITCH SWJ1	16.001	DITCH SWJ2	14.1	0.137	0.001	12.3103	
15 minute winter	DITCH TOP	16.000	16.000:50%	0.0	0.000	0.000	0.4045	
15 minute winter	DITCH TOP	16.000	DITCH SWJ1	4.5	0.157	0.000	2.4517	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW 1.0	12	1.907	0.157	53.8	9.5731	0.0000	OK
15 minute winter	SW 1.1	11	1.679	0.206	62.5	0.2942	0.0000	OK
15 minute winter	SW 1.2	11	1.399	0.253	92.9	0.4477	0.0000	OK
15 minute winter	SW 1.3	11	1.330	0.239	92.9	0.4223	0.0000	OK
15 minute winter	SW 5.0	10	1.541	0.086	10.8	0.0977	0.0000	OK
30 minute winter	SW 5.1	22	1.449	0.110	33.9	14.6736	0.0000	OK
5760 minute winter	DITCH 2	4440	0.328	0.062	9.5	5.5598	0.0000	OK
960 minute winter	SW 1.4	960	1.323	0.347	13.1	25.6292	0.0000	OK
960 minute winter	SW 1.5	960	1.323	0.500	13.0	0.8843	0.0000	OK
960 minute winter	SW 1.6	960	1.323	0.541	13.7	33.4431	0.0000	OK
5760 minute winter	OUTFALL	4440	0.234	0.047	9.5	0.0000	0.0000	OK
2160 minute winter	SW 7.4	2100	1.592	0.664	2.9	1.1732	0.0000	SURCHARGED
2160 minute winter	SW 3.2	2100	1.592	0.387	1.5	3.4561	0.0000	SURCHARGED
2160 minute winter	SW 3.0	2100	1.592	0.172	1.3	24.5957	0.0000	OK
2160 minute winter	SW 3.1	2100	1.592	0.349	1.4	0.4994	0.0000	OK
2160 minute winter	SW 7.5	2100	1.592	0.676	3.1	14.3308	0.0000	SURCHARGED
15 minute winter	SW 2.0	10	1.797	0.217	64.6	0.2456	0.0000	OK
15 minute winter	SW 2.1	12	1.496	0.208	91.2	13.7064	0.0000	OK
30 minute winter	SW 4.0	23	1.537	0.032	4.4	2.2494	0.0000	OK
15 minute winter	SW 4.1	10	1.531	0.117	18.3	0.1320	0.0000	OK
15 minute winter	SW 2.2	12	1.372	0.304	146.4	14.4524	0.0000	OK
960 minute winter	SW 2.3	960	1.324	0.356	13.6	0.9052	0.0000	OK
15 minute winter	SW 6.0	12	1.617	0.157	53.8	9.1286	0.0000	OK
15 minute winter	SW 6.1	11	1.397	0.146	51.0	0.1656	0.0000	OK
960 minute winter	TANK	960	1.321	0.602	9.4	572.2339	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW 1.0	1.000	SW 1.1	36.1	1.012	0.515	1.7966	
15 minute winter	SW 1.1	1.002	SW 1.2	60.7	1.079	0.551	3.2820	
15 minute winter	SW 1.2	1.003	SW 1.3	92.9	0.936	0.422	2.6151	
15 minute winter	SW 1.3	1.004	SW 1.4	92.1	1.075	0.417	1.6503	
15 minute winter	SW 5.0	5.000	SW 5.1	10.8	1.005	0.297	0.3155	
30 minute winter	SW 5.1	5.001	SW 1.4	16.2	0.872	0.441	0.2886	
5760 minute winter	DITCH 2	16.006	OUTFALL	9.5	0.534	0.004	0.7319	2254.2
960 minute winter	SW 1.4	1.005	SW 1.5	13.0	0.575	0.045	8.2407	
960 minute winter	SW 1.5	1.006	SW 1.6	12.4	0.396	0.033	7.5776	
960 minute winter	SW 1.6	1.007	SW 1.7	11.3	0.457	0.030	12.7344	
2160 minute winter	SW 7.4	7.005	SW 7.5	2.8	0.192	0.009	1.7526	
2160 minute winter	SW 3.2	3.002	SW 7.4	1.2	0.316	0.011	1.7166	
2160 minute winter	SW 3.0	3.000	SW 3.1	1.0	0.351	0.014	1.3869	
2160 minute winter	SW 3.1	3.001	SW 3.2	1.3	0.295	0.011	1.2393	
2160 minute winter	SW 7.5	7.006	BASIN SW	2.7	0.151	0.009	5.5538	
15 minute winter	SW 2.0	2.000	SW 2.1	64.3	1.237	0.821	2.2570	
15 minute winter	SW 2.1	2.001	SW 2.2	72.9	1.235	0.519	0.8345	
30 minute winter	SW 4.0	4.000	SW 4.1	1.6	0.384	0.044	0.1868	
15 minute winter	SW 4.1	4.001	SW 2.2	17.1	0.869	0.466	0.1801	
15 minute winter	SW 2.2	2.002	SW 2.3	140.8	1.208	0.621	1.3321	
960 minute winter	SW 2.3	2.003	SW 2.4	13.6	0.592	0.044	7.8575	
15 minute winter	SW 6.0	6.000	SW 6.1	39.5	1.095	0.503	0.9625	
15 minute winter	SW 6.1	6.001	SW 2.4	50.7	1.351	0.281	0.6355	
960 minute winter	TANK	1.008	SW 1.8 - HYDROBRAKE	3.4	0.087	0.006	1.6772	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	DITCH SWJ2	472	1.302	0.795	15.4	0.0000	0.0000	OK
480 minute winter	16.002:50%	472	1.302	0.827	13.6	7.2761	0.0000	OK
2160 minute winter	SW 7.6 - HYDROBRAKE	2100	1.592	0.725	0.3	1.2810	0.0000	SURCHARGED
30 minute winter	SW 8.0	22	1.729	0.119	42.0	17.7179	0.0000	OK
15 minute winter	SW 8.1	11	1.544	0.170	43.7	0.2435	0.0000	OK
15 minute winter	SW 8.2	12	1.373	0.227	90.3	12.3335	0.0000	OK
30 minute winter	SW 9.0	22	1.790	0.105	33.1	14.5866	0.0000	OK
30 minute winter	SW 9.1	23	1.542	0.058	15.7	0.0657	0.0000	OK
480 minute winter	SW 8.3	472	1.302	0.307	14.7	0.5425	0.0000	OK
480 minute winter	SW 8.4	472	1.302	0.406	21.0	37.6249	0.0000	OK
480 minute winter	SW 8.5	472	1.302	0.555	21.2	0.9807	0.0000	OK
480 minute winter	PP1	472	1.302	0.102	6.6	23.7104	0.0000	OK
480 minute winter	SW 8.6	472	1.302	0.642	25.7	13.3437	0.0000	OK
480 minute winter	SW 8.7	472	1.302	0.678	22.8	1.7255	0.0000	OK
480 minute winter	SW 1.9 - HYDROBRAKE	472	1.302	1.019	10.8	3.7856	0.0000	SURCHARGED
960 minute winter	SW 1.8 - HYDROBRAKE	960	1.321	0.611	3.4	1.8251	0.0000	SURCHARGED
15 minute winter	SW 11.0	10	1.581	0.106	16.7	0.1200	0.0000	OK
15 minute winter	SW 11.1	10	1.529	0.329	85.5	0.3720	0.0000	SURCHARGED
960 minute winter	SW 2.4	960	1.324	0.605	17.4	0.0000	0.0000	OK
480 minute winter	SW 10.3	472	1.302	0.524	24.8	15.0106	0.0000	OK
480 minute winter	PP2	472	1.302	0.127	4.5	21.5233	0.0000	OK
480 minute winter	SW 10.2	472	1.302	0.388	10.3	12.3262	0.0000	OK
480 minute winter	SW 10.1	472	1.302	0.369	9.6	29.4358	0.0000	OK
480 minute winter	SW 10.0	472	1.302	0.057	0.2	0.0816	0.0000	OK
15 minute winter	SW 13.0	1	1.375	0.000	0.0	0.0006	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	DITCH SWJ2	16.002	16.002:50%	12.1	0.117	0.001	30.4646	
480 minute winter	DITCH SWJ2	16.002	DITCH SWJ3	9.0	0.087	0.001	32.1310	
2160 minute winter	SW 7.6 - HYDROBRAKE	7.008	DITCH 2	0.3	0.256	0.041	0.0064	
30 minute winter	SW 8.0	8.000	SW 8.1	20.4	0.833	0.320	1.1871	
15 minute winter	SW 8.1	8.001	SW 8.2	41.2	0.933	0.401	2.5300	
15 minute winter	SW 8.2	8.002	SW 8.3	74.8	1.044	0.495	2.4653	
30 minute winter	SW 9.0	9.000	SW 9.1	15.7	0.892	0.416	0.4193	
30 minute winter	SW 9.1	9.001	SW 8.4	15.7	1.738	0.070	0.0653	
480 minute winter	SW 8.3	8.003	SW 8.4	14.6	0.635	0.069	1.7202	
480 minute winter	SW 8.4	8.004	SW 8.5	18.2	0.596	0.065	9.9285	
480 minute winter	SW 8.5	8.005	SW 8.6	19.4	0.603	0.053	2.4724	
480 minute winter	PP1	14.000	SW 8.6	8.3	0.961	0.027	0.3661	
480 minute winter	SW 8.6	8.006	SW 8.7	22.8	0.449	0.051	11.0122	
480 minute winter	SW 8.7	8.007	DITCH SWJ1	20.6	0.595	0.046	17.6857	
480 minute winter	SW 1.9 - HYDROBRAKE	16.005	DITCH 2	9.2	0.792	0.399	0.0988	
960 minute winter	SW 1.8 - HYDROBRAKE	1.009	DITCH SWJ2	3.3	0.507	0.155	0.2516	
15 minute winter	SW 11.0	11.000	SW 11.1	16.7	0.622	0.461	1.1909	
15 minute winter	SW 11.1	11.001	SW 10.3	84.2	1.237	1.219	1.9947	
480 minute winter	SW 10.3	10.003	DITCH SWJ3	31.1	0.817	0.038	6.3342	
480 minute winter	PP2	15.000	SW 10.2	3.5	0.514	0.045	0.2468	
480 minute winter	SW 10.2	10.002	SW 10.3	10.3	0.554	0.045	5.0742	
480 minute winter	SW 10.1	10.001	SW 10.2	-6.2	0.196	-0.027	1.4089	
480 minute winter	SW 10.0	10.000	SW 10.1	-0.2	-0.010	-0.002	1.8758	
15 minute winter	SW 13.0	13.000	SW 13.1	0.0	0.000	0.000	0.0000	

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Results for 30 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	SW 13.2	472	1.302	0.361	4.0	3.8869	0.0000	OK
480 minute winter	SW 13.3	472	1.302	0.388	4.7	0.6856	0.0000	OK
480 minute winter	SW 13.1	472	1.302	0.064	0.3	0.0725	0.0000	OK
480 minute winter	SW 12.3	472	1.302	0.577	12.7	17.9135	0.0000	SURCHARGED
2160 minute winter	SW 7.3	2100	1.592	0.123	1.7	2.0203	0.0000	OK
15 minute winter	SW 7.2	10	1.731	0.173	48.8	0.1953	0.0000	OK
15 minute winter	SW 7.1	11	1.760	0.097	19.9	1.8475	0.0000	OK
15 minute winter	SW 7.0	11	1.827	0.062	7.0	0.8174	0.0000	OK
2160 minute winter	BASIN SW	2100	1.592	0.715	2.7	93.3111	0.0000	SURCHARGED
480 minute winter	SW 12.2	472	1.302	0.369	7.4	13.8121	0.0000	OK
480 minute winter	SW 12.1	472	1.302	0.243	5.7	8.6580	0.0000	OK
15 minute winter	SW 12.0	11	1.597	0.192	40.4	1.7768	0.0000	OK
480 minute winter	DITCH SWJ4	472	1.302	1.009	20.0	0.0000	0.0000	OK
480 minute winter	DITCH SWJ3	472	1.302	0.860	31.1	0.0000	0.0000	OK
480 minute winter	16.003:50%	472	1.302	0.934	20.8	9.8822	0.0000	OK
480 minute winter	DITCH SWJ1	472	1.302	0.733	24.4	0.0000	0.0000	OK
480 minute winter	16.001:50%	472	1.302	0.764	17.9	0.0000	0.0000	OK
480 minute winter	DITCH TOP	472	1.302	0.352	4.6	0.0000	0.0000	OK
480 minute winter	16.000:50%	472	1.302	0.542	10.8	0.0000	0.0000	OK
960 minute winter	SW 1.7	960	1.323	0.604	11.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	SW 13.2	13.002	SW 13.3	4.7	0.510	0.029	1.4964	
480 minute winter	SW 13.3	13.003	SW 12.3	4.6	0.455	0.015	3.3898	
480 minute winter	SW 13.1	13.001	SW 13.2	-0.3	-0.038	-0.007	0.2117	
480 minute winter	SW 12.3	12.004	DITCH SWJ4	19.8	0.644	0.039	2.8284	
2160 minute winter	SW 7.3	7.004	SW 7.4	1.7	0.806	0.004	0.4606	
15 minute winter	SW 7.2	7.002	SW 7.3	48.0	1.518	0.612	0.5631	
15 minute winter	SW 7.1	7.001	SW 7.2	17.9	0.624	0.229	0.6348	
15 minute winter	SW 7.0	7.000	SW 7.1	6.2	0.498	0.170	0.2581	
2160 minute winter	BASIN SW	11.006	SW 7.6 - HYDROBRAKE	0.3	0.025	0.001	1.4616	
480 minute winter	SW 12.2	12.002	SW 12.3	6.5	0.558	0.054	3.8477	
480 minute winter	SW 12.1	12.001	SW 12.2	5.9	0.601	0.083	0.8126	
15 minute winter	SW 12.0	12.000	SW 12.1	36.5	1.092	0.995	1.7963	
480 minute winter	DITCH SWJ4	16.004	SW 1.9 - HYDROBRAKE	10.8	0.051	0.001	13.1276	
480 minute winter	DITCH SWJ3	16.003	16.003:50%	19.3	0.126	0.002	80.1454	
480 minute winter	DITCH SWJ3	16.003	DITCH SWJ4	11.1	0.075	0.001	89.4946	
480 minute winter	DITCH SWJ1	16.001	16.001:50%	16.4	0.134	0.002	26.0673	
480 minute winter	DITCH SWJ1	16.001	DITCH SWJ2	15.4	0.126	0.001	27.5209	
480 minute winter	DITCH TOP	16.000	16.000:50%	-4.6	0.015	0.000	27.2459	
480 minute winter	DITCH TOP	16.000	DITCH SWJ1	-9.3	0.036	-0.001	42.5048	

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW 1.0	12	1.955	0.205	75.3	12.5157	0.0000	OK
15 minute winter	SW 1.1	11	1.738	0.265	92.2	0.3791	0.0000	OK
1440 minute winter	SW 1.2	1440	1.543	0.397	6.9	0.7023	0.0000	OK
1440 minute winter	SW 1.3	1440	1.543	0.452	6.9	0.7995	0.0000	OK
15 minute winter	SW 5.0	10	1.559	0.104	15.1	0.1178	0.0000	OK
1440 minute winter	SW 5.1	1440	1.543	0.204	2.5	27.2202	0.0000	OK
10080 minute winter	DITCH 2	7740	0.328	0.062	9.5	5.5656	0.0000	OK
1440 minute winter	SW 1.4	1440	1.543	0.567	12.9	41.8597	0.0000	OK
1440 minute winter	SW 1.5	1440	1.543	0.720	11.3	1.2731	0.0000	SURCHARGED
1440 minute winter	SW 1.6	1440	1.543	0.761	11.9	37.3755	0.0000	SURCHARGED
10080 minute winter	OUTFALL	7740	0.234	0.047	9.5	0.0000	0.0000	OK
2160 minute winter	SW 7.4	2160	1.714	0.786	6.0	1.3880	0.0000	SURCHARGED
2160 minute winter	SW 3.2	2160	1.714	0.509	2.4	4.5415	0.0000	SURCHARGED
2160 minute winter	SW 3.0	2160	1.714	0.294	1.8	41.9802	0.0000	OK
2160 minute winter	SW 3.1	2160	1.714	0.471	1.6	0.6733	0.0000	SURCHARGED
2160 minute winter	SW 7.5	2160	1.714	0.798	4.0	14.6402	0.0000	SURCHARGED
15 minute winter	SW 2.0	10	1.910	0.330	90.3	0.3732	0.0000	SURCHARGED
15 minute winter	SW 2.1	12	1.557	0.269	126.7	17.7608	0.0000	OK
15 minute winter	SW 4.0	13	1.553	0.048	11.3	3.3654	0.0000	OK
15 minute winter	SW 4.1	10	1.553	0.139	25.6	0.1573	0.0000	OK
1440 minute winter	SW 2.2	1440	1.543	0.475	10.3	22.6055	0.0000	OK
1440 minute winter	SW 2.3	1440	1.543	0.575	13.1	1.4645	0.0000	OK
15 minute winter	SW 6.0	11	1.662	0.202	75.3	11.7262	0.0000	OK
1440 minute winter	SW 6.1	1440	1.543	0.292	3.8	0.3308	0.0000	OK
1440 minute winter	TANK	1440	1.541	0.822	8.3	780.4987	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW 1.0	1.000	SW 1.1	53.9	1.121	0.770	2.4633	
15 minute winter	SW 1.1	1.002	SW 1.2	89.1	1.197	0.808	4.3187	
1440 minute winter	SW 1.2	1.003	SW 1.3	6.9	0.465	0.031	4.9134	
1440 minute winter	SW 1.3	1.004	SW 1.4	6.9	0.517	0.031	3.8879	
15 minute winter	SW 5.0	5.000	SW 5.1	15.0	1.035	0.412	0.4368	
1440 minute winter	SW 5.1	5.001	SW 1.4	2.5	0.525	0.068	0.6039	
10080 minute winter	DITCH 2	16.006	OUTFALL	9.5	0.534	0.004	0.7336	3657.4
1440 minute winter	SW 1.4	1.005	SW 1.5	11.3	0.535	0.039	12.0035	
1440 minute winter	SW 1.5	1.006	SW 1.6	10.8	0.336	0.029	9.1604	
1440 minute winter	SW 1.6	1.007	SW 1.7	9.8	0.446	0.026	14.1178	
2160 minute winter	SW 7.4	7.005	SW 7.5	3.6	0.200	0.012	1.7526	
2160 minute winter	SW 3.2	3.002	SW 7.4	1.8	0.316	0.016	1.7166	
2160 minute winter	SW 3.0	3.000	SW 3.1	1.1	0.361	0.016	1.7834	
2160 minute winter	SW 3.1	3.001	SW 3.2	1.5	0.308	0.013	1.2586	
2160 minute winter	SW 7.5	7.006	BASIN SW	5.3	0.221	0.018	5.5538	
15 minute winter	SW 2.0	2.000	SW 2.1	89.0	1.303	1.138	2.8022	
15 minute winter	SW 2.1	2.001	SW 2.2	104.4	1.318	0.743	1.1208	
15 minute winter	SW 4.0	4.000	SW 4.1	3.7	0.482	0.101	0.2696	
15 minute winter	SW 4.1	4.001	SW 2.2	22.6	0.933	0.615	0.2214	
1440 minute winter	SW 2.2	2.002	SW 2.3	9.8	0.583	0.043	2.3571	
1440 minute winter	SW 2.3	2.003	SW 2.4	12.7	0.540	0.041	11.1810	
15 minute winter	SW 6.0	6.000	SW 6.1	56.8	1.188	0.724	1.2805	
1440 minute winter	SW 6.1	6.001	SW 2.4	3.8	0.659	0.021	1.7135	
1440 minute winter	TANK	1.008	SW 1.8 - HYDROBRAKE	3.6	0.083	0.007	1.9343	

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	DITCH SWJ2	705	1.523	1.016	14.9	0.0000	0.0000	OK
720 minute winter	16.002:50%	705	1.522	1.048	13.1	11.6792	0.0000	OK
2160 minute winter	SW 7.6 - HYDROBRAKE	2160	1.714	0.847	0.4	1.4958	0.0000	SURCHARGED
30 minute winter	SW 8.0	22	1.766	0.156	58.8	23.1219	0.0000	OK
15 minute winter	SW 8.1	11	1.597	0.223	66.0	0.3189	0.0000	OK
720 minute winter	SW 8.2	705	1.523	0.377	14.1	20.4472	0.0000	OK
30 minute winter	SW 9.0	22	1.822	0.137	46.3	19.0547	0.0000	OK
30 minute winter	SW 9.1	22	1.557	0.073	24.0	0.0829	0.0000	OK
720 minute winter	SW 8.3	705	1.523	0.528	15.0	0.9326	0.0000	SURCHARGED
720 minute winter	SW 8.4	705	1.523	0.627	20.7	55.6930	0.0000	SURCHARGED
720 minute winter	SW 8.5	705	1.523	0.776	17.8	1.3708	0.0000	SURCHARGED
720 minute winter	PP1	705	1.523	0.323	10.1	75.0239	0.0000	OK
720 minute winter	SW 8.6	705	1.523	0.863	24.2	13.9055	0.0000	SURCHARGED
720 minute winter	SW 8.7	705	1.523	0.899	22.3	2.2874	0.0000	SURCHARGED
720 minute winter	SW 1.9 - HYDROBRAKE	705	1.523	1.240	10.0	4.6057	0.0000	SURCHARGED
1440 minute winter	SW 1.8 - HYDROBRAKE	1440	1.541	0.831	3.6	2.4804	0.0000	SURCHARGED
15 minute winter	SW 11.0	10	1.848	0.373	23.4	0.4220	0.0000	SURCHARGED
15 minute winter	SW 11.1	10	1.755	0.555	118.8	0.6281	0.0000	SURCHARGED
1440 minute winter	SW 2.4	1440	1.543	0.824	16.5	0.0000	0.0000	OK
720 minute winter	SW 10.3	705	1.523	0.745	19.7	17.5685	0.0000	SURCHARGED
720 minute winter	PP2	705	1.523	0.348	8.2	58.9228	0.0000	SURCHARGED
720 minute winter	SW 10.2	705	1.523	0.609	8.2	19.0907	0.0000	SURCHARGED
720 minute winter	SW 10.1	705	1.523	0.590	5.9	47.0440	0.0000	SURCHARGED
720 minute winter	SW 10.0	705	1.523	0.278	0.4	0.3975	0.0000	OK
720 minute winter	SW 13.0	705	1.523	0.148	0.1	0.1678	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	DITCH SWJ2	16.002	16.002:50%	12.1	0.119	0.001	42.4576	
720 minute winter	DITCH SWJ2	16.002	DITCH SWJ3	8.5	0.083	0.001	44.3571	
2160 minute winter	SW 7.6 - HYDROBRAKE	7.008	DITCH 2	0.3	0.262	0.044	0.0067	
30 minute winter	SW 8.0	8.000	SW 8.1	32.5	0.946	0.509	1.6592	
15 minute winter	SW 8.1	8.001	SW 8.2	64.8	0.992	0.631	3.7408	
720 minute winter	SW 8.2	8.002	SW 8.3	14.1	0.637	0.093	5.1624	
30 minute winter	SW 9.0	9.000	SW 9.1	24.0	0.984	0.638	0.5818	
30 minute winter	SW 9.1	9.001	SW 8.4	24.0	1.940	0.108	0.0896	
720 minute winter	SW 8.3	8.003	SW 8.4	14.4	0.595	0.068	2.7067	
720 minute winter	SW 8.4	8.004	SW 8.5	14.6	0.543	0.052	12.5789	
720 minute winter	SW 8.5	8.005	SW 8.6	16.9	0.525	0.046	2.7837	
720 minute winter	PP1	14.000	SW 8.6	-6.1	0.891	-0.019	0.7150	
720 minute winter	SW 8.6	8.006	SW 8.7	22.3	0.402	0.050	11.8199	
720 minute winter	SW 8.7	8.007	DITCH SWJ1	20.8	0.562	0.046	18.1792	
720 minute winter	SW 1.9 - HYDROBRAKE	16.005	DITCH 2	9.2	0.791	0.399	0.0988	
1440 minute winter	SW 1.8 - HYDROBRAKE	1.009	DITCH SWJ2	3.6	0.610	0.169	0.2516	
15 minute winter	SW 11.0	11.000	SW 11.1	23.1	0.620	0.638	1.6285	
15 minute winter	SW 11.1	11.001	SW 10.3	118.8	1.690	1.721	2.1283	
720 minute winter	SW 10.3	10.003	DITCH SWJ3	16.9	0.793	0.020	6.5746	
720 minute winter	PP2	15.000	SW 10.2	-5.3	0.512	-0.068	0.5152	
720 minute winter	SW 10.2	10.002	SW 10.3	8.0	0.527	0.035	5.9608	
720 minute winter	SW 10.1	10.001	SW 10.2	-2.8	0.182	-0.012	1.8263	
720 minute winter	SW 10.0	10.000	SW 10.1	-0.4	-0.017	-0.003	4.7986	
720 minute winter	SW 13.0	13.000	SW 13.1	-0.1	-0.007	-0.002	0.7839	

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Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	SW 13.2	705	1.523	0.582	3.9	6.2639	0.0000	SURCHARGED
720 minute winter	SW 13.3	705	1.523	0.609	3.6	1.0757	0.0000	SURCHARGED
720 minute winter	SW 13.1	705	1.523	0.285	0.3	0.3221	0.0000	SURCHARGED
720 minute winter	SW 12.3	705	1.523	0.798	9.8	19.1446	0.0000	SURCHARGED
2160 minute winter	SW 7.3	2160	1.714	0.245	2.4	4.0174	0.0000	OK
15 minute winter	SW 7.2	10	1.770	0.212	68.2	0.2392	0.0000	OK
15 minute winter	SW 7.1	11	1.790	0.127	28.3	2.4288	0.0000	OK
15 minute winter	SW 7.0	11	1.840	0.075	9.8	0.9842	0.0000	OK
2160 minute winter	BASIN SW	2160	1.714	0.837	5.3	140.1987	0.0000	SURCHARGED
720 minute winter	SW 12.2	705	1.523	0.590	6.4	22.0761	0.0000	SURCHARGED
720 minute winter	SW 12.1	705	1.523	0.464	5.7	16.5247	0.0000	SURCHARGED
15 minute winter	SW 12.0	11	1.743	0.338	56.5	3.1216	0.0000	SURCHARGED
720 minute winter	DITCH SWJ4	705	1.523	1.230	14.9	0.0000	0.0000	OK
720 minute winter	DITCH SWJ3	705	1.523	1.081	20.5	0.0000	0.0000	OK
720 minute winter	16.003:50%	705	1.522	1.155	16.8	15.1054	0.0000	OK
720 minute winter	DITCH SWJ1	705	1.523	0.954	21.0	0.0000	0.0000	OK
720 minute winter	16.001:50%	705	1.523	0.985	17.7	0.0000	0.0000	OK
720 minute winter	DITCH TOP	705	1.523	0.573	3.4	0.0000	0.0000	OK
720 minute winter	16.000:50%	705	1.522	0.763	8.8	0.0000	0.0000	OK
1440 minute winter	SW 1.7	1440	1.543	0.824	9.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	SW 13.2	13.002	SW 13.3	3.6	0.462	0.022	1.6836	
720 minute winter	SW 13.3	13.003	SW 12.3	3.3	0.378	0.011	3.5360	
720 minute winter	SW 13.1	13.001	SW 13.2	-0.3	-0.013	-0.007	0.4897	
720 minute winter	SW 12.3	12.004	DITCH SWJ4	13.7	0.318	0.027	2.8284	
2160 minute winter	SW 7.3	7.004	SW 7.4	5.1	0.778	0.011	0.6059	
15 minute winter	SW 7.2	7.002	SW 7.3	66.9	1.637	0.853	0.7211	
15 minute winter	SW 7.1	7.001	SW 7.2	26.1	0.705	0.334	0.8433	
15 minute winter	SW 7.0	7.000	SW 7.1	8.9	0.527	0.244	0.3547	
2160 minute winter	BASIN SW	11.006	SW 7.6 - HYDROBRAKE	0.4	0.118	0.001	1.4616	
720 minute winter	SW 12.2	12.002	SW 12.3	5.2	0.507	0.043	3.8552	
720 minute winter	SW 12.1	12.001	SW 12.2	5.0	0.565	0.070	0.8723	
15 minute winter	SW 12.0	12.000	SW 12.1	46.2	1.184	1.260	1.9945	
720 minute winter	DITCH SWJ4	16.004	SW 1.9 - HYDROBRAKE	10.0	0.020	0.001	17.3892	
720 minute winter	DITCH SWJ3	16.003	16.003:50%	15.3	0.123	0.001	109.0475	
720 minute winter	DITCH SWJ3	16.003	DITCH SWJ4	9.6	0.078	0.001	119.6221	
720 minute winter	DITCH SWJ1	16.001	16.001:50%	16.5	0.128	0.002	37.0675	
720 minute winter	DITCH SWJ1	16.001	DITCH SWJ2	14.9	0.125	0.001	38.7329	
720 minute winter	DITCH TOP	16.000	16.000:50%	-3.4	0.018	0.000	45.1317	
720 minute winter	DITCH TOP	16.000	DITCH SWJ1	-7.4	0.028	0.000	62.9965	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW 1.0	12	1.944	0.194	70.2	11.8323	0.0000	OK
15 minute winter	SW 1.1	11	1.723	0.250	85.2	0.3580	0.0000	OK
1440 minute winter	SW 1.2	1440	1.518	0.372	6.7	0.6580	0.0000	OK
1440 minute winter	SW 1.3	1410	1.518	0.427	6.7	0.7552	0.0000	OK
15 minute winter	SW 5.0	10	1.555	0.100	14.0	0.1127	0.0000	OK
1440 minute winter	SW 5.1	1440	1.518	0.179	2.4	23.8847	0.0000	OK
7200 minute winter	DITCH 2	6120	0.328	0.062	9.5	5.5633	0.0000	OK
1440 minute winter	SW 1.4	1440	1.518	0.542	12.4	40.0116	0.0000	OK
1440 minute winter	SW 1.5	1440	1.518	0.695	10.9	1.2288	0.0000	SURCHARGED
1440 minute winter	SW 1.6	1440	1.518	0.736	11.5	37.3312	0.0000	SURCHARGED
7200 minute winter	OUTFALL	6120	0.234	0.047	9.5	0.0000	0.0000	OK
1440 minute winter	SW 7.4	1440	1.700	0.772	11.0	1.3633	0.0000	SURCHARGED
1440 minute winter	SW 3.2	1440	1.700	0.495	4.9	4.4165	0.0000	SURCHARGED
1440 minute winter	SW 3.0	1440	1.700	0.280	2.5	39.9792	0.0000	OK
1440 minute winter	SW 3.1	1440	1.700	0.457	2.4	0.6533	0.0000	SURCHARGED
1440 minute winter	SW 7.5	1440	1.700	0.784	7.3	14.6046	0.0000	SURCHARGED
15 minute winter	SW 2.0	10	1.863	0.283	84.1	0.3202	0.0000	OK
15 minute winter	SW 2.1	12	1.540	0.252	117.7	16.6311	0.0000	OK
15 minute winter	SW 4.0	13	1.549	0.044	10.2	3.0711	0.0000	OK
15 minute winter	SW 4.1	10	1.548	0.134	23.9	0.1516	0.0000	OK
1440 minute winter	SW 2.2	1410	1.519	0.451	9.8	21.4210	0.0000	OK
1440 minute winter	SW 2.3	1410	1.519	0.551	12.7	1.4011	0.0000	OK
15 minute winter	SW 6.0	11	1.651	0.191	70.2	11.1103	0.0000	OK
1440 minute winter	SW 6.1	1410	1.519	0.268	3.7	0.3026	0.0000	OK
1440 minute winter	TANK	1440	1.516	0.797	8.1	756.7294	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW 1.0	1.000	SW 1.1	50.0	1.107	0.714	2.2750	
15 minute winter	SW 1.1	1.002	SW 1.2	82.5	1.172	0.749	4.0753	
1440 minute winter	SW 1.2	1.003	SW 1.3	6.7	0.455	0.030	4.6334	
1440 minute winter	SW 1.3	1.004	SW 1.4	6.7	0.509	0.030	3.7260	
15 minute winter	SW 5.0	5.000	SW 5.1	14.0	1.028	0.383	0.4078	
1440 minute winter	SW 5.1	5.001	SW 1.4	2.4	0.519	0.065	0.5731	
7200 minute winter	DITCH 2	16.006	OUTFALL	9.5	0.534	0.004	0.7329	2995.6
1440 minute winter	SW 1.4	1.005	SW 1.5	10.9	0.528	0.038	11.8336	
1440 minute winter	SW 1.5	1.006	SW 1.6	10.4	0.342	0.028	9.1604	
1440 minute winter	SW 1.6	1.007	SW 1.7	9.5	0.450	0.026	14.1178	
1440 minute winter	SW 7.4	7.005	SW 7.5	5.0	0.229	0.017	1.7526	
1440 minute winter	SW 3.2	3.002	SW 7.4	3.8	0.349	0.033	1.7166	
1440 minute winter	SW 3.0	3.000	SW 3.1	1.6	0.399	0.023	1.7620	
1440 minute winter	SW 3.1	3.001	SW 3.2	2.2	0.328	0.019	1.2586	
1440 minute winter	SW 7.5	7.006	BASIN SW	10.4	0.221	0.034	5.5538	
15 minute winter	SW 2.0	2.000	SW 2.1	82.6	1.311	1.055	2.7248	
15 minute winter	SW 2.1	2.001	SW 2.2	96.9	1.312	0.690	1.0436	
15 minute winter	SW 4.0	4.000	SW 4.1	3.1	0.466	0.084	0.2552	
15 minute winter	SW 4.1	4.001	SW 2.2	21.3	0.917	0.580	0.2126	
1440 minute winter	SW 2.2	2.002	SW 2.3	9.5	0.578	0.042	2.2722	
1440 minute winter	SW 2.3	2.003	SW 2.4	12.4	0.548	0.040	11.0395	
15 minute winter	SW 6.0	6.000	SW 6.1	52.8	1.167	0.672	1.2075	
1440 minute winter	SW 6.1	6.001	SW 2.4	3.7	0.654	0.020	1.6449	
1440 minute winter	TANK	1.008	SW 1.8 - HYDROBRAKE	3.9	0.084	0.007	1.9343	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	DITCH SWJ2	705	1.481	0.974	24.6	0.0000	0.0000	OK
720 minute winter	16.002:50%	705	1.481	1.006	22.6	10.7696	0.0000	OK
1440 minute winter	SW 7.6 - HYDROBRAKE	1440	1.700	0.833	0.4	1.4711	0.0000	SURCHARGED
30 minute winter	SW 8.0	22	1.758	0.148	55.0	21.9979	0.0000	OK
15 minute winter	SW 8.1	11	1.584	0.210	60.4	0.3010	0.0000	OK
720 minute winter	SW 8.2	705	1.481	0.335	13.4	18.1882	0.0000	OK
30 minute winter	SW 9.0	22	1.815	0.130	43.4	18.0992	0.0000	OK
30 minute winter	SW 9.1	22	1.554	0.070	22.2	0.0794	0.0000	OK
720 minute winter	SW 8.3	705	1.481	0.486	14.4	0.8590	0.0000	OK
720 minute winter	SW 8.4	705	1.481	0.585	19.9	54.2252	0.0000	OK
720 minute winter	SW 8.5	705	1.481	0.734	17.1	1.2973	0.0000	SURCHARGED
720 minute winter	PP1	705	1.481	0.281	8.9	65.3488	0.0000	OK
720 minute winter	SW 8.6	705	1.481	0.821	22.9	13.7996	0.0000	SURCHARGED
720 minute winter	SW 8.7	705	1.481	0.857	20.8	2.1815	0.0000	SURCHARGED
720 minute winter	SW 1.9 - HYDROBRAKE	705	1.481	1.198	10.4	4.4511	0.0000	SURCHARGED
1440 minute winter	SW 1.8 - HYDROBRAKE	1440	1.516	0.806	3.9	2.4054	0.0000	SURCHARGED
15 minute winter	SW 11.0	10	1.769	0.294	21.8	0.3327	0.0000	SURCHARGED
15 minute winter	SW 11.1	10	1.687	0.487	111.5	0.5504	0.0000	SURCHARGED
1440 minute winter	SW 2.4	1410	1.519	0.800	16.0	0.0000	0.0000	OK
720 minute winter	SW 10.3	705	1.481	0.703	20.3	17.4626	0.0000	SURCHARGED
720 minute winter	PP2	705	1.481	0.306	7.4	51.8736	0.0000	SURCHARGED
720 minute winter	SW 10.2	705	1.481	0.567	8.0	18.0172	0.0000	SURCHARGED
720 minute winter	SW 10.1	705	1.481	0.548	6.4	43.7253	0.0000	SURCHARGED
720 minute winter	SW 10.0	705	1.481	0.236	0.3	0.3379	0.0000	OK
720 minute winter	SW 13.0	705	1.481	0.106	0.1	0.1206	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	DITCH SWJ2	16.002	16.002:50%	21.5	0.115	0.002	40.0753	
720 minute winter	DITCH SWJ2	16.002	DITCH SWJ3	16.5	0.083	0.002	41.9310	
1440 minute winter	SW 7.6 - HYDROBRAKE	7.008	DITCH 2	0.3	0.261	0.044	0.0066	
30 minute winter	SW 8.0	8.000	SW 8.1	29.9	0.924	0.468	1.5627	
15 minute winter	SW 8.1	8.001	SW 8.2	59.0	0.980	0.574	3.4476	
720 minute winter	SW 8.2	8.002	SW 8.3	13.5	0.637	0.089	4.7898	
30 minute winter	SW 9.0	9.000	SW 9.1	22.2	0.968	0.591	0.5477	
30 minute winter	SW 9.1	9.001	SW 8.4	22.2	1.903	0.100	0.0846	
720 minute winter	SW 8.3	8.003	SW 8.4	13.7	0.586	0.065	2.6512	
720 minute winter	SW 8.4	8.004	SW 8.5	14.0	0.560	0.050	12.5378	
720 minute winter	SW 8.5	8.005	SW 8.6	16.0	0.539	0.044	2.7837	
720 minute winter	PP1	14.000	SW 8.6	-5.4	0.905	-0.017	0.6734	
720 minute winter	SW 8.6	8.006	SW 8.7	20.8	0.395	0.046	11.8199	
720 minute winter	SW 8.7	8.007	DITCH SWJ1	19.6	0.553	0.044	18.1792	
720 minute winter	SW 1.9 - HYDROBRAKE	16.005	DITCH 2	9.2	0.791	0.399	0.0988	
1440 minute winter	SW 1.8 - HYDROBRAKE	1.009	DITCH SWJ2	3.9	0.608	0.182	0.2516	
15 minute winter	SW 11.0	11.000	SW 11.1	22.5	0.632	0.621	1.6285	
15 minute winter	SW 11.1	11.001	SW 10.3	108.3	1.549	1.568	2.0964	
720 minute winter	SW 10.3	10.003	DITCH SWJ3	22.6	0.785	0.027	6.5746	
720 minute winter	PP2	15.000	SW 10.2	-4.8	0.502	-0.061	0.5152	
720 minute winter	SW 10.2	10.002	SW 10.3	7.8	0.517	0.034	5.9608	
720 minute winter	SW 10.1	10.001	SW 10.2	-3.4	0.184	-0.015	1.8263	
720 minute winter	SW 10.0	10.000	SW 10.1	-0.3	-0.007	-0.003	4.4480	
720 minute winter	SW 13.0	13.000	SW 13.1	-0.1	-0.005	-0.002	0.6765	

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Results for 100 year Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	SW 13.2	705	1.481	0.540	3.7	5.8160	0.0000	SURCHARGED
720 minute winter	SW 13.3	705	1.481	0.567	3.4	1.0022	0.0000	SURCHARGED
720 minute winter	SW 13.1	705	1.481	0.243	0.2	0.2750	0.0000	SURCHARGED
720 minute winter	SW 12.3	705	1.481	0.756	9.0	19.0387	0.0000	SURCHARGED
1440 minute winter	SW 7.3	1440	1.700	0.231	4.2	3.7876	0.0000	OK
15 minute winter	SW 7.2	10	1.760	0.202	63.5	0.2290	0.0000	OK
15 minute winter	SW 7.1	11	1.781	0.118	26.2	2.2536	0.0000	OK
15 minute winter	SW 7.0	11	1.837	0.072	9.1	0.9449	0.0000	OK
1440 minute winter	BASIN SW	1440	1.700	0.823	10.4	134.4019	0.0000	SURCHARGED
720 minute winter	SW 12.2	705	1.481	0.548	6.7	20.5181	0.0000	SURCHARGED
720 minute winter	SW 12.1	705	1.481	0.422	5.4	15.0421	0.0000	SURCHARGED
15 minute winter	SW 12.0	11	1.700	0.295	52.6	2.7248	0.0000	SURCHARGED
720 minute winter	DITCH SWJ4	705	1.481	1.188	18.3	0.0000	0.0000	OK
720 minute winter	DITCH SWJ3	705	1.481	1.039	24.7	0.0000	0.0000	OK
720 minute winter	16.003:50%	705	1.481	1.113	23.9	14.0363	0.0000	OK
720 minute winter	DITCH SWJ1	705	1.481	0.912	22.9	0.0000	0.0000	OK
720 minute winter	16.001:50%	705	1.481	0.943	25.6	0.0000	0.0000	OK
720 minute winter	DITCH TOP	705	1.481	0.531	3.5	0.0000	0.0000	OK
720 minute winter	16.000:50%	705	1.481	0.721	7.0	0.0000	0.0000	OK
1440 minute winter	SW 1.7	1440	1.518	0.799	9.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute winter	SW 13.2	13.002	SW 13.3	3.4	0.457	0.021	1.6836	
720 minute winter	SW 13.3	13.003	SW 12.3	4.2	0.404	0.014	3.5360	
720 minute winter	SW 13.1	13.001	SW 13.2	-0.2	-0.018	-0.005	0.4897	
720 minute winter	SW 12.3	12.004	DITCH SWJ4	18.3	0.400	0.036	2.8284	
1440 minute winter	SW 7.3	7.004	SW 7.4	7.1	0.867	0.016	0.5895	
15 minute winter	SW 7.2	7.002	SW 7.3	62.6	1.614	0.798	0.6863	
15 minute winter	SW 7.1	7.001	SW 7.2	23.9	0.685	0.306	0.7858	
15 minute winter	SW 7.0	7.000	SW 7.1	8.2	0.529	0.225	0.3272	
1440 minute winter	BASIN SW	11.006	SW 7.6 - HYDROBRAKE	0.4	0.032	0.001	1.4616	
720 minute winter	SW 12.2	12.002	SW 12.3	4.9	0.517	0.041	3.8552	
720 minute winter	SW 12.1	12.001	SW 12.2	5.3	0.572	0.074	0.8723	
15 minute winter	SW 12.0	12.000	SW 12.1	43.9	1.132	1.198	1.9737	
720 minute winter	DITCH SWJ4	16.004	SW 1.9 - HYDROBRAKE	10.4	0.020	0.001	16.5475	
720 minute winter	DITCH SWJ3	16.003	16.003:50%	22.7	0.119	0.002	103.3217	
720 minute winter	DITCH SWJ3	16.003	DITCH SWJ4	15.3	0.079	0.001	113.6651	
720 minute winter	DITCH SWJ1	16.001	16.001:50%	24.5	0.129	0.002	34.8781	
720 minute winter	DITCH SWJ1	16.001	DITCH SWJ2	24.6	0.121	0.002	36.5037	
720 minute winter	DITCH TOP	16.000	16.000:50%	-3.5	-0.009	0.000	41.5297	
720 minute winter	DITCH TOP	16.000	DITCH SWJ1	9.0	0.025	0.000	58.9027	

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SW 1.0	12	2.008	0.258	98.2	15.7545	0.0000	OK
1440 minute winter	SW 1.1	1440	1.839	0.366	6.5	0.5231	0.0000	OK
1440 minute winter	SW 1.2	1440	1.839	0.693	9.3	1.2238	0.0000	SURCHARGED
1440 minute winter	SW 1.3	1440	1.839	0.748	9.0	1.3210	0.0000	SURCHARGED
1440 minute winter	SW 5.0	1440	1.839	0.384	0.8	0.4338	0.0000	SURCHARGED
1440 minute winter	SW 5.1	1440	1.839	0.500	4.7	66.5098	0.0000	SURCHARGED
10080 minute winter	DITCH 2	9480	0.328	0.062	9.5	5.5692	0.0000	OK
1440 minute winter	SW 1.4	1440	1.839	0.863	16.8	44.7602	0.0000	SURCHARGED
1440 minute winter	SW 1.5	1440	1.839	1.016	13.7	1.7945	0.0000	SURCHARGED
1440 minute winter	SW 1.6	1440	1.839	1.057	14.7	37.8970	0.0000	SURCHARGED
10080 minute winter	OUTFALL	9480	0.234	0.047	9.5	0.0000	0.0000	OK
2880 minute winter	SW 7.4	2820	1.851	0.923	4.2	1.6308	0.0000	SURCHARGED
2880 minute winter	SW 3.2	2820	1.851	0.646	1.5	5.4280	0.0000	SURCHARGED
2880 minute winter	SW 3.0	2820	1.851	0.431	1.9	61.6313	0.0000	SURCHARGED
2880 minute winter	SW 3.1	2820	1.851	0.608	1.4	0.8699	0.0000	SURCHARGED
2880 minute winter	SW 7.5	2820	1.851	0.935	3.7	14.9898	0.0000	SURCHARGED
15 minute winter	SW 2.0	10	2.151	0.571	117.9	0.6458	0.0000	SURCHARGED
1440 minute winter	SW 2.1	1440	1.839	0.551	6.8	36.3180	0.0000	SURCHARGED
1440 minute winter	SW 4.0	1440	1.839	0.334	1.7	23.4132	0.0000	SURCHARGED
1440 minute winter	SW 4.1	1440	1.839	0.425	1.8	0.4805	0.0000	SURCHARGED
1440 minute winter	SW 2.2	1440	1.839	0.771	13.8	28.9843	0.0000	SURCHARGED
1440 minute winter	SW 2.3	1440	1.839	0.871	16.5	2.2163	0.0000	SURCHARGED
1440 minute winter	SW 6.0	1440	1.839	0.379	4.0	22.0229	0.0000	SURCHARGED
1440 minute winter	SW 6.1	1440	1.839	0.588	5.1	0.6649	0.0000	SURCHARGED
1440 minute winter	TANK	1440	1.836	1.117	10.7	1060.2870	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SW 1.0	1.000	SW 1.1	68.8	1.172	0.983	3.2201	
1440 minute winter	SW 1.1	1.002	SW 1.2	6.5	0.580	0.059	6.3395	
1440 minute winter	SW 1.2	1.003	SW 1.3	9.0	0.470	0.041	5.6860	
1440 minute winter	SW 1.3	1.004	SW 1.4	8.6	0.523	0.039	4.1133	
1440 minute winter	SW 5.0	5.000	SW 5.1	0.8	0.304	0.022	0.9264	
1440 minute winter	SW 5.1	5.001	SW 1.4	3.5	0.571	0.095	0.6183	
10080 minute winter	DITCH 2	16.006	OUTFALL	9.5	0.534	0.004	0.7346	4408.8
1440 minute winter	SW 1.4	1.005	SW 1.5	13.7	0.518	0.047	12.1276	
1440 minute winter	SW 1.5	1.006	SW 1.6	13.0	0.335	0.035	9.1604	
1440 minute winter	SW 1.6	1.007	SW 1.7	12.0	0.500	0.032	14.1178	
2880 minute winter	SW 7.4	7.005	SW 7.5	3.3	0.209	0.011	1.7526	
2880 minute winter	SW 3.2	3.002	SW 7.4	1.5	0.291	0.013	1.7166	
2880 minute winter	SW 3.0	3.000	SW 3.1	0.9	0.338	0.013	1.7882	
2880 minute winter	SW 3.1	3.001	SW 3.2	1.2	0.268	0.010	1.2586	
2880 minute winter	SW 7.5	7.006	BASIN SW	5.9	0.135	0.020	5.5538	
15 minute winter	SW 2.0	2.000	SW 2.1	117.6	1.674	1.502	2.9692	
1440 minute winter	SW 2.1	2.001	SW 2.2	6.9	0.644	0.049	1.5596	
1440 minute winter	SW 4.0	4.000	SW 4.1	-1.4	0.166	-0.038	0.7267	
1440 minute winter	SW 4.1	4.001	SW 2.2	1.8	0.475	0.049	0.3641	
1440 minute winter	SW 2.2	2.002	SW 2.3	12.1	0.588	0.053	2.4362	
1440 minute winter	SW 2.3	2.003	SW 2.4	15.9	0.545	0.052	11.2578	
1440 minute winter	SW 6.0	6.000	SW 6.1	4.0	0.586	0.051	1.8805	
1440 minute winter	SW 6.1	6.001	SW 2.4	5.1	0.676	0.028	1.8663	
1440 minute winter	TANK	1.008	SW 1.8 - HYDROBRAKE	3.8	0.071	0.007	1.9343	

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	DITCH SWJ2	930	1.795	1.288	21.2	0.0000	0.0000	OK
960 minute winter	16.002:50%	930	1.794	1.320	19.6	18.5320	0.0000	OK
2880 minute winter	SW 7.6 - HYDROBRAKE	2820	1.851	0.984	0.4	1.7385	0.0000	SURCHARGED
30 minute winter	SW 8.0	21	1.802	0.192	77.1	28.5096	0.0000	OK
960 minute winter	SW 8.1	930	1.795	0.421	9.3	0.6022	0.0000	SURCHARGED
960 minute winter	SW 8.2	930	1.795	0.649	14.9	32.6728	0.0000	SURCHARGED
30 minute winter	SW 9.0	22	1.856	0.171	60.8	23.8438	0.0000	OK
960 minute winter	SW 9.1	930	1.795	0.311	4.6	0.3516	0.0000	SURCHARGED
960 minute winter	SW 8.3	930	1.795	0.800	13.7	1.4133	0.0000	SURCHARGED
960 minute winter	SW 8.4	930	1.795	0.899	19.0	56.1737	0.0000	SURCHARGED
960 minute winter	SW 8.5	930	1.795	1.048	19.9	1.8516	0.0000	SURCHARGED
960 minute winter	PP1	930	1.795	0.595	10.9	138.2607	0.0000	SURCHARGED
960 minute winter	SW 8.6	930	1.795	1.135	22.4	14.5980	0.0000	SURCHARGED
960 minute winter	SW 8.7	930	1.795	1.171	19.7	2.9798	0.0000	SURCHARGED
960 minute winter	SW 1.9 - HYDROBRAKE	930	1.795	1.512	9.7	5.6167	0.0000	SURCHARGED
1440 minute winter	SW 1.8 - HYDROBRAKE	1440	1.836	1.126	3.8	3.3617	0.0000	SURCHARGED
15 minute winter	SW 11.0	10	2.262	0.787	30.5	0.8899	0.0000	FLOOD RISK
15 minute winter	SW 11.1	10	2.101	0.901	155.9	1.0187	0.0000	SURCHARGED
1440 minute winter	SW 2.4	1440	1.839	1.120	21.0	0.0000	0.0000	OK
960 minute winter	SW 10.3	930	1.795	1.017	19.5	18.2610	0.0000	SURCHARGED
960 minute winter	PP2	930	1.795	0.620	8.8	101.7712	0.0000	SURCHARGED
960 minute winter	SW 10.2	930	1.795	0.881	7.8	19.5716	0.0000	SURCHARGED
960 minute winter	SW 10.1	930	1.795	0.862	6.3	48.3621	0.0000	SURCHARGED
960 minute winter	SW 10.0	930	1.795	0.550	0.5	0.7871	0.0000	SURCHARGED
960 minute winter	SW 13.0	930	1.795	0.420	0.2	0.4756	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	DITCH SWJ2	16.002	16.002:50%	18.7	0.117	0.002	59.4175	
960 minute winter	DITCH SWJ2	16.002	DITCH SWJ3	14.8	0.085	0.001	61.6051	
2880 minute winter	SW 7.6 - HYDROBRAKE	7.008	DITCH 2	0.4	0.267	0.047	0.0070	
30 minute winter	SW 8.0	8.000	SW 8.1	44.9	1.032	0.704	2.2036	
960 minute winter	SW 8.1	8.001	SW 8.2	9.3	0.609	0.091	6.3146	
960 minute winter	SW 8.2	8.002	SW 8.3	12.8	0.610	0.085	5.4503	
30 minute winter	SW 9.0	9.000	SW 9.1	32.6	1.071	0.866	0.7250	
960 minute winter	SW 9.1	9.001	SW 8.4	4.6	1.178	0.020	0.5095	
960 minute winter	SW 8.3	8.003	SW 8.4	13.1	0.570	0.062	2.7073	
960 minute winter	SW 8.4	8.004	SW 8.5	17.1	0.503	0.062	12.5789	
960 minute winter	SW 8.5	8.005	SW 8.6	19.6	0.498	0.054	2.7837	
960 minute winter	PP1	14.000	SW 8.6	-6.8	0.872	-0.022	0.7467	
960 minute winter	SW 8.6	8.006	SW 8.7	19.7	0.376	0.044	11.8199	
960 minute winter	SW 8.7	8.007	DITCH SWJ1	18.2	0.558	0.041	18.1792	
960 minute winter	SW 1.9 - HYDROBRAKE	16.005	DITCH 2	9.2	0.791	0.399	0.0989	
1440 minute winter	SW 1.8 - HYDROBRAKE	1.009	DITCH SWJ2	3.8	0.456	0.178	0.2516	
15 minute winter	SW 11.0	11.000	SW 11.1	30.6	0.770	0.847	1.6285	
15 minute winter	SW 11.1	11.001	SW 10.3	155.7	2.211	2.255	2.1792	
960 minute winter	SW 10.3	10.003	DITCH SWJ3	16.4	0.789	0.020	6.5746	
960 minute winter	PP2	15.000	SW 10.2	-5.7	0.490	-0.074	0.5152	
960 minute winter	SW 10.2	10.002	SW 10.3	6.2	0.480	0.027	5.9608	
960 minute winter	SW 10.1	10.001	SW 10.2	-3.4	0.177	-0.015	1.8263	
960 minute winter	SW 10.0	10.000	SW 10.1	-0.5	-0.010	-0.004	5.3507	
960 minute winter	SW 13.0	13.000	SW 13.1	-0.2	-0.008	-0.005	0.9248	

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Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	SW 13.2	930	1.795	0.854	4.1	6.9132	0.0000	SURCHARGED
960 minute winter	SW 13.3	930	1.795	0.881	3.8	1.5564	0.0000	SURCHARGED
960 minute winter	SW 13.1	930	1.795	0.557	0.4	0.6298	0.0000	SURCHARGED
960 minute winter	SW 12.3	930	1.795	1.070	9.1	19.8371	0.0000	SURCHARGED
2880 minute winter	SW 7.3	2820	1.851	0.382	3.3	6.2749	0.0000	SURCHARGED
2880 minute winter	SW 7.2	2820	1.851	0.293	2.2	0.3313	0.0000	OK
2880 minute winter	SW 7.1	2820	1.851	0.188	0.9	3.5946	0.0000	OK
15 minute winter	SW 7.0	10	1.852	0.087	12.8	1.1395	0.0000	OK
2880 minute winter	BASIN SW	2820	1.851	0.974	5.9	202.6683	0.0000	SURCHARGED
960 minute winter	SW 12.2	930	1.795	0.862	5.9	22.8513	0.0000	SURCHARGED
960 minute winter	SW 12.1	930	1.795	0.736	6.0	21.5495	0.0000	SURCHARGED
15 minute winter	SW 12.0	11	1.960	0.555	73.7	5.1230	0.0000	SURCHARGED
960 minute winter	DITCH SWJ4	930	1.795	1.502	17.2	0.0000	0.0000	OK
960 minute winter	DITCH SWJ3	930	1.795	1.353	19.6	0.0000	0.0000	OK
960 minute winter	16.003:50%	930	1.794	1.427	16.5	23.0625	0.0000	OK
960 minute winter	DITCH SWJ1	930	1.795	1.226	19.5	0.0000	0.0000	OK
960 minute winter	16.001:50%	930	1.795	1.257	21.9	0.0000	0.0000	OK
960 minute winter	DITCH TOP	930	1.795	0.845	6.6	0.0000	0.0000	OK
960 minute winter	16.000:50%	930	1.794	1.035	9.0	0.0000	0.0000	OK
1440 minute winter	SW 1.7	1440	1.839	1.120	12.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	SW 13.2	13.002	SW 13.3	3.8	0.440	0.023	1.6836	
960 minute winter	SW 13.3	13.003	SW 12.3	3.2	0.390	0.011	3.5360	
960 minute winter	SW 13.1	13.001	SW 13.2	-0.4	-0.020	-0.011	0.4897	
960 minute winter	SW 12.3	12.004	DITCH SWJ4	17.2	0.530	0.034	2.8284	
2880 minute winter	SW 7.3	7.004	SW 7.4	4.2	0.715	0.009	0.7172	
2880 minute winter	SW 7.2	7.002	SW 7.3	2.2	0.584	0.028	1.2457	
2880 minute winter	SW 7.1	7.001	SW 7.2	0.9	0.266	0.011	1.2239	
15 minute winter	SW 7.0	7.000	SW 7.1	11.7	0.525	0.321	0.4802	
2880 minute winter	BASIN SW	11.006	SW 7.6 - HYDROBRAKE	0.4	0.022	0.001	1.4616	
960 minute winter	SW 12.2	12.002	SW 12.3	4.4	0.467	0.036	3.8552	
960 minute winter	SW 12.1	12.001	SW 12.2	4.6	0.556	0.065	0.8723	
15 minute winter	SW 12.0	12.000	SW 12.1	56.1	1.416	1.531	2.0718	
960 minute winter	DITCH SWJ4	16.004	SW 1.9 - HYDROBRAKE	9.7	0.048	0.001	23.3330	
960 minute winter	DITCH SWJ3	16.003	16.003:50%	15.1	0.116	0.001	149.6672	
960 minute winter	DITCH SWJ3	16.003	DITCH SWJ4	11.9	0.076	0.001	161.7541	
960 minute winter	DITCH SWJ1	16.001	16.001:50%	21.0	0.128	0.002	52.7014	
960 minute winter	DITCH SWJ1	16.001	DITCH SWJ2	21.2	0.124	0.002	54.6279	
960 minute winter	DITCH TOP	16.000	16.000:50%	-6.6	-0.034	0.000	71.3305	
960 minute winter	DITCH TOP	16.000	DITCH SWJ1	9.0	0.025	0.000	92.4062	

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Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	2	Maximum Rainfall (mm/hr)	200.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	1.000	Connection Type	Level Soffits		
Time of Entry (mins)	4.00	Minimum Backdrop Height (m)	0.200		

Nodes

	Name	T of E (mins)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
✓	1	4.00	10.000	Manhole	Adoptable	1200	1.174	61.790	1.300
✓	2		10.000	Manhole	Adoptable	1200	44.924	61.506	2.036

Links

	Name	US Node	DS Node	Length (m)	ks (mm) / n	Velocity Equation	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	Link Type	T of C (mins)	Rain (mm/hr)
?	1.000	1	2	43.751	0.600	Colebrook-White	8.700	7.964	0.736	59.4	100	Circular	4.73	55.2

	Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
?	1.000	1	2	1.001	7.9	0.0	1.200	1.936	1.200	1.936	0.000	0.0	0	0.000

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	1 year (l/s)	10.7	Check Discharge Volume	x
Summer CV	1.000	Drain Down Time (mins)	240	10 year (l/s)	20.3		
Winter CV	1.000	Additional Storage (m³/ha)	20.0	30 year (l/s)	31.3		
Analysis Speed	Normal	Check Discharge Rate(s)	✓	100 year (l/s)	43.7		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.680	Growth Factor 30 year	2.55	Q 1 year (l/s)	10.7
Greenfield Method	FEH	Region	5	Growth Factor 100 year	3.56	Q 10 year (l/s)	20.3
Positively Drained Area (ha)	13.895	QBar/QMed conversion factor	1.124	Betterment (%)	0	Q 30 year (l/s)	31.3
SAAR (mm)	561	Growth Factor 1 year	0.87	QMed	10.9	Q 100 year (l/s)	43.7
Host	1	Growth Factor 10 year	1.65	QBar	12.3		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
2 year 15 minute summer	110.261	31.200	2 year 720 minute summer	9.104	2.440
2 year 15 minute winter	77.376	31.200	2 year 720 minute winter	6.119	2.440
2 year 30 minute summer	69.973	19.800	2 year 960 minute summer	7.341	1.933
2 year 30 minute winter	49.104	19.800	2 year 960 minute winter	4.863	1.933
2 year 60 minute summer	46.165	12.200	2 year 1440 minute summer	5.195	1.392
2 year 60 minute winter	30.671	12.200	2 year 1440 minute winter	3.491	1.392
2 year 120 minute summer	32.732	8.650	2 year 2160 minute summer	3.640	1.006
2 year 120 minute winter	21.746	8.650	2 year 2160 minute winter	2.508	1.006
2 year 180 minute summer	26.284	6.764	2 year 2880 minute summer	2.997	0.803
2 year 180 minute winter	17.085	6.764	2 year 2880 minute winter	2.014	0.803
2 year 240 minute summer	21.156	5.591	2 year 4320 minute summer	2.275	0.595
2 year 240 minute winter	14.056	5.591	2 year 4320 minute winter	1.498	0.595
2 year 360 minute summer	16.279	4.189	2 year 5760 minute summer	1.902	0.487
2 year 360 minute winter	10.582	4.189	2 year 5760 minute winter	1.231	0.487
2 year 480 minute summer	12.729	3.364	2 year 7200 minute summer	1.649	0.421
2 year 480 minute winter	8.457	3.364	2 year 7200 minute winter	1.065	0.421
2 year 600 minute summer	10.321	2.823	2 year 8640 minute summer	1.474	0.376
2 year 600 minute winter	7.052	2.823	2 year 8640 minute winter	0.951	0.376

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DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Nottingham
Storm duration	D = **15** min
Return period	Period = **1** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.400**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.3** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.63**
Rainfall for 15min storm with 5 year return period	$M5_15min_i = Z1 \times M5_60min$ = **11.6** mm
Factor Z2 (Wallingford procedure)	Z2 = **0.61**
Rainfall for 15min storm with 1 year return period	$M1_15min = Z2 \times M5_15min_i$ = **7.1** mm
Design rainfall intensity	I_{max} = M1_15min / D = **28.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2435** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **19.2** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Nottingham
Storm duration	D = **15** min
Return period	Period = **10** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.400**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.3** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.63**
Rainfall for 15min storm with 5 year return period	$M5_15min_i = Z1 \times M5_60min$ = **11.6** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.23**
Rainfall for 15min storm with 10 year return period	$M10_15min = Z2 \times M5_15min_i$ = **14.2** mm
Design rainfall intensity	I_{max} = M10_15min / D = **56.9** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2435** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **38.5** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Nottingham
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.400**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.3** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **40** %
Factor Z1 (Wallingford procedure)	Z1 = **0.63**
Rainfall for 15min storm with 5 year return period	$M5_15min_i = Z1 \times M5_60min \times (1 + p_{climate})$ = **16.2** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.53**
Rainfall for 15min storm with 30 year return period	$M30_15min = Z2 \times M5_15min_i$ = **24.8** mm
Design rainfall intensity	I_{max} = M30_15min / D = **99.4** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2435** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **67.2** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Nottingham
Storm duration	D = **15** min
Return period	Period = **30** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.400**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.3** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **0** %
Factor Z1 (Wallingford procedure)	Z1 = **0.63**
Rainfall for 15min storm with 5 year return period	$M5_15min_i = Z1 \times M5_60min$ = **11.6** mm
Factor Z2 (Wallingford procedure)	Z2 = **1.50**
Rainfall for 15min storm with 30 year return period	$M30_15min = Z2 \times M5_15min_i$ = **17.4** mm
Design rainfall intensity	I_{max} = M30_15min / D = **69.6** mm/hr

Maximum surface water runoff

Catchment area	A_{catch} = **2435** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **47.1** l/s

DESIGN RAINFALL

In accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Nottingham
Storm duration	D = **15** min
Return period	Period = **100** yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = **0.400**
5-year return period rainfall of 60 minutes duration	M5_60min = **18.3** mm
Increase of rainfall intensity due to global warming	$p_{climate}$ = **40** %
Factor Z1 (Wallingford procedure)	Z1 = **0.63**
Rainfall for 15min storm with 5 year return period	$M5_15min_i = Z1 \times M5_60min \times (1 + p_{climate})$ = **16.2** mm
Factor Z2 (Wallingford procedure)	Z2 = **2.00**
Rainfall for 15min storm with 100 year return period	$M100_15min = Z2 \times M5_15min_i$ = **32.4** mm
Design rainfall intensity	I_{max} = M100_15min / D = **129.8** mm/hr

Maximum surface water runoff

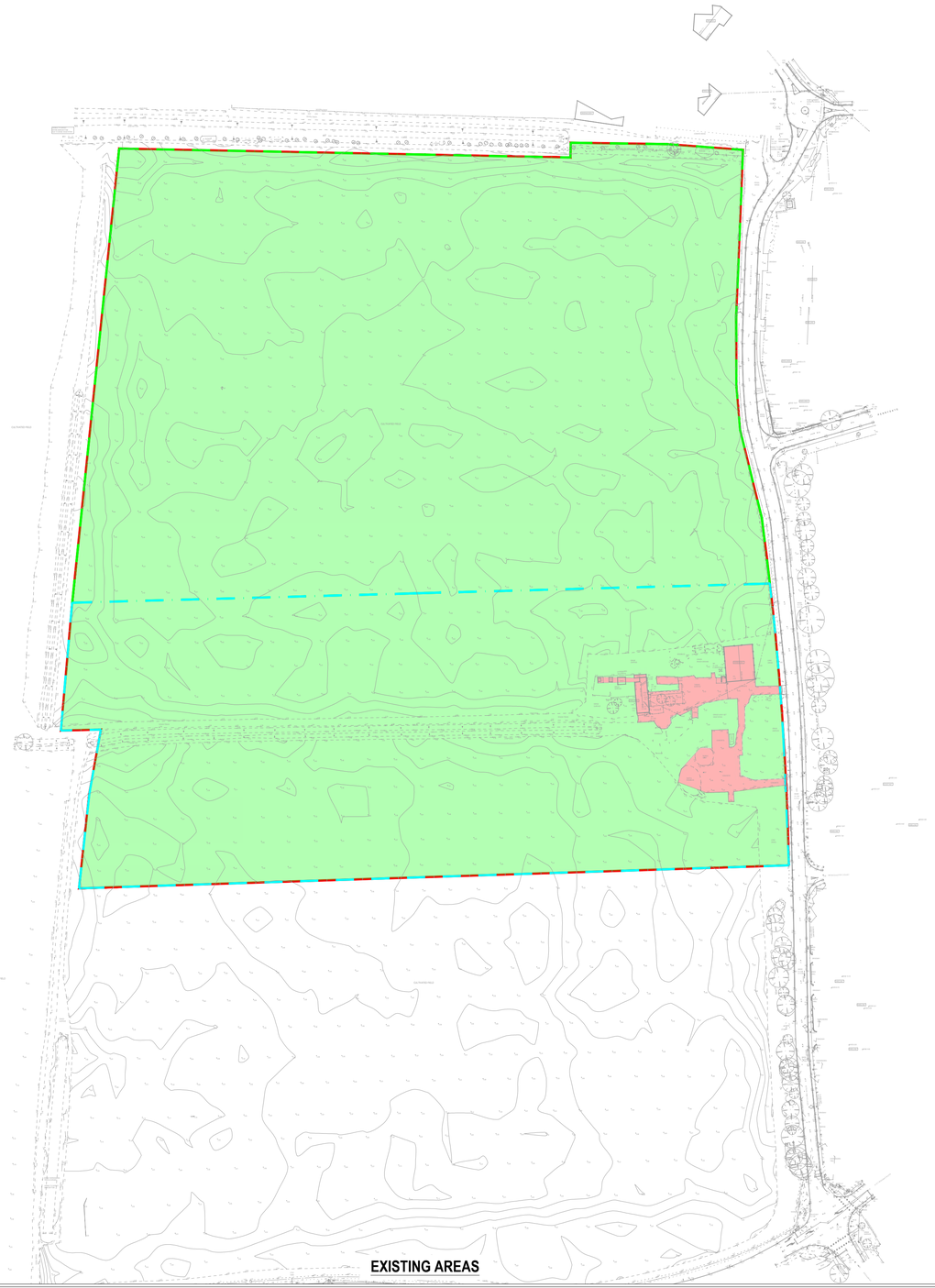
Catchment area	A_{catch} = **2435** m^2
Percentage of area that is impermeable	p = **100** %
Maximum surface water runoff	$Q_{max} = A_{catch} \times p \times I_{max}$ = **87.8** l/s

DRAINAGE STRATEGY

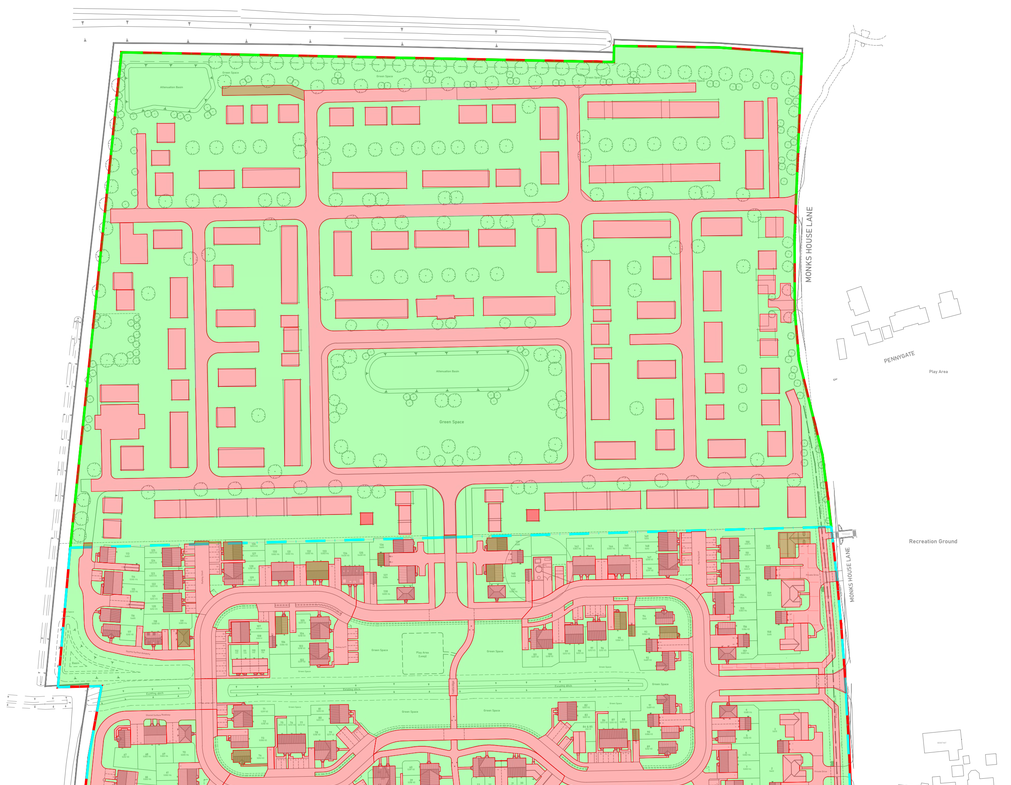
THE FOLLOWING TEXT DESCRIBES THE SURFACE WATER DRAINAGE DISPOSAL STRATEGY FOR THIS DEVELOPMENT.

THE SITE IS CLASSIFIED AS GREENFIELD. KEY POINTS FOR THE STRATEGY ARE AS FOLLOWS:

- THE BROWNFIELD RUNOFF RATE FOR PHASE 1 OF THE SITE HAS BEEN CALCULATED TO BE **19.2l/s**. FACTORING IN A 50% REDUCTION OF THIS, AS WILL BE REQUIRED BY THE LLFA, THE MAXIMUM ALLOWABLE DISCHARGE RATE WILL BE **9.6l/s**.
- THE GREENFIELD RUNOFF RATE (QBAR) FOR PHASE 2 OF THE SITE HAS BEEN CALCULATED TO BE APPROXIMATELY **7.2l/s**
- PHASE 1 QUICK STORAGE ESTIMATE (9.6l/s) = **3123-3801m³**
- PHASE 2 QUICK STORAGE ESTIMATE (7.2l/s) = **3487-4119m³**



EXISTING AREAS



PROPOSED AREAS

SCALE 1:1500m
0m 20m 40m 60m 80m 100m 120m 140m

PRELIMINARY DRAWING

THIS DRAWING IS FOR PRELIMINARY INFORMATION PURPOSES ONLY AND MUST NOT BE READ AS A CONSTRUCTION ISSUE. IT INDICATES DESIGN INTENT ONLY AND IS SUBJECT TO AMENDMENT DURING FINAL DESIGN DEVELOPMENT

DRAWING REFERENCE LIST

DRAWING NUMBER	REV	DATE	CREATOR

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS AND SPECIFICATIONS
2. REFER TO THE ARCHITECT & SERVICES ENGINEER FOR FINAL SETTING OUT OF ALL BUILDINGS & INTERNAL DOWN PIPES & RWPS
3. REFER TO SERVICE ENGINEER FOR ABOVE GROUND PLUMBING ROUTES FROM APPLIANCES TO STUB STACKS ETC
4. EXISTING DRAINAGE THAT IS TO BE ABANDONED TO BE 'PLUGGED' IN WITH MASS CONCRETE (150mm MIN) OR REMOVED ENTIRELY
5. ANY EXISTING SERVICES TO BE LOCATED AND CLEARLY MARKED PRIOR TO EXCAVATIONS BY CONTRACTOR
6. ALL LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO CONSTRUCTION
7. IT IS ASSUMED THAT ALL RWPS, SINK AND TOILET DRAINAGE POINTS WILL HAVE RODDING ACCESS AT THE APPLIANCE BASE
8. CONTRACTOR TO AVOID UNDERMINING ANY EXISTING FOOTPATHS/BUILDINGS DURING WORKS BY ALLOWING ADEQUATE PROTECTION ADJACENT TO THESE AREAS
9. ALL BELOW GROUND DRAINAGE PIPES WITH LESS THAN 900mm COVER TO SOFFIT LEVEL IN TRAFFICKED AREAS I.E. CAR PARK AND SERVICE YARD, TO HAVE CLASS Z BEDDING SURROUND. REFER TO THE MANHOLE SCHEDULE AND DETAIL SHEETS FOR FURTHER DETAILS
10. ALL BELOW GROUND DRAINAGE WITHIN THE SITE BOUNDARY HAS BEEN DESIGNED TO BSEN 752:2008 AND BUILDING REGULATIONS - PART H 2015. THE OFF SITE DRAINAGE TO THE PUBLIC SEWER ARE DESIGNED TO THE SEWERAGE SECTOR GUIDANCE

EXISTING AREAS:

PHASE 1 - IMPERMEABLE AREA = 2,435m²
PHASE 2 - IMPERMEABLE AREA = 0m²

PHASE 1 - PERMEABLE AREA = 54,500m²
PHASE 2 - PERMEABLE AREA = 81,988m²

PHASE 1 - TOTAL AREA = 56,935m²
PHASE 2 - TOTAL AREA = 81,988m²

PROPOSED AREAS:

PHASE 1 - IMPERMEABLE AREA = 25,850m²
PHASE 1 - IMPERMEABLE AREA + 10% URBAN CREEP = 26,707m²
PHASE 2 - IMPERMEABLE AREA = 27,295m²
PHASE 2 - IMPERMEABLE AREA + 10% URBAN CREEP = 30,025m²

PHASE 1 - PERMEABLE AREA = 28,284m²
PHASE 2 - PERMEABLE AREA = 54,693m²

PHASE 1 - TOTAL AREA = 56,935m²
PHASE 2 - TOTAL AREA = 81,988m²

LEGEND:

SITE PLAN
PHASE 1 BOUNDARY
PHASE 2 BOUNDARY

Rev	Date	Description	By	Check	App.
P03	06/02/2026	UPDATE TO SUIT NEW SITE LAYOUT	HB	CN	KE
P02	07/11/2025	ISSUE FOR PLANNING	HB	CN	KE
P01	24/09/2024	ISSUE FOR PLANNING	CN	KE	KE

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Client: SEAGATE HOMES (UK) LTD

Project: MONKS HOUSE LANE WEST
SPALDING

Office: NORWICH - 01603 305 190

Title: AREAS PLAN
GENERAL ARRANGEMENT

Scale @ A1: 1:1500 | Status: PRELIMINARY

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Project Ref	Originator	Volume	Level
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DR	C	4000	P03

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Appendix I – SUDS Maintenance Plan

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Geocellular Attenuation Storage

Description

Attenuation storage tanks are used to create a below-ground space for the temporary storage of surface water before infiltration, controlled release or use. Geocellular storage crates are advantageous as they allow for spatial versatility as opposed to in situ concrete tanks.

Maintenance Issues

For Geocellular attenuation tanks typical issues relate to the build-up of silt within the tank, causing a decrease in capacity over time.

Maintenance Regime

Schedule	Action Required	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. Take remedial action as appropriate	For 3 months after installation, then annually.
	Remove debris from the catchment surface (where it may cause a risk to performance)	Monthly
	For systems where rainfall infiltrate into the tank from above, check surface of filter for blockage by sediment, algae or other matter. Remove blockage and replace surface infiltration medium as appropriate.	Annually
	Remove Sediment from pre-treatment structures and/or internal forebays.	Annual, or as needed
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As needed
Monitoring	Check all inlets, outlets, vents and overflows to ensure that they are working as designed.	Annually
	Survey inside of tank for sediment build-up and remove as appropriate.	Every 5 years or as needed.

Filter Drains

Description

Filter drains are shallow trenches filled with stone/gravel that create temporary subsurface storage for the reduction, transportation, and filtration of surface water. The stone could be contained in a simple trench lined with a geotextile, geomembrane or impermeable liner. Often filter drains have a 50mm-100mm depth of permeable material that is separated from the main gravel/stone trench by a permeable geotextile. This top layer is intended to be sacrificial, collecting silt over time and needing replacement every 5 – 10 years, or as appropriate if ponding is apparent.

Maintenance Issues

As time passes the top permeable material layer will trap silt and other materials. The trapped material on a highway could include heavy metals. The top layer, and associated geotextile, will become less permeable with time and should be replaced as identified below.

Where the filter drain includes pipework, it could become blocked over time. The pipe should be kept clear of silt and debris.

If the main filter material becomes silted up there could be a requirement to excavate and replace the entire filter drain.

Any material removed must be tested and could require disposal at landfill.

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	Remove litter (including foliage) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as needed)
	Check filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Check pre-treatment systems, inlets and perforated pipework for silt accumulation, and identify appropriate silt removal frequencies	6 monthly
	Remove sediment from pre-treatment devices	6 monthly, or as needed
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As needed
	In areas with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium. This could also be necessary where there are high silt loads.	5 yearly, or as needed
	Clear perforated pipework of blockages	As needed

Swales and Ditches

Description

Swales are shallow flat bottomed, vegetated open channels designed to convey, treat and often attenuate surface water runoff. Swales could include some planting, but this must be specified to not impede the flow in the channel.

Maintenance Issues

Sufficient access to the swales must be provided. The grass at the base of the swale ought be cut to a length of between 75mm and 100mm. Grass clippings/cuttings must be removed to prevent nutrients/pollutants entering the drainage system.

Occasionally sediment will need to be removed (once deposits exceed 25mm in depth).

Maintenance Regime

Activity	Action Required	Frequency
Regular maintenance	Remove litter and debris	Monthly, or as needed
	Cut grass – to retain grass height within specified design range (typically 75-100mm)	Monthly (during growing season), or as needed
	Manage other foliage and remove nuisance plants	Monthly at start then as needed
	Inspect inlets, outlets and overflows for blockages, and clear if appropriate	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation and record areas where water is ponding for > 48 hours	Monthly, or when needed
	Inspect foliage coverage	Monthly for 6 months, quarterly for 2 years, then 6 monthly
	Inspect inlets and facility surface for silt accumulation, identify appropriate silt removal frequencies	6 monthly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if necessary.	As needed or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Reseeding or re-turfing erosion or other damage	As needed
	Relevel uneven surfaces and restore design levels	As needed
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and minimise compaction of the soil surface	As needed
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As needed
	Remove and dispose of oils or petrol residues using safe standard practices	As needed

Permeable Pavements

Description

Pervious pavements provide a pavement suitable for pedestrian and vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface and into the underlying structural layers.

Maintenance Issues

For permeable pavements typical issues relate to the build-up of silt within the voids, causing a decrease in capacity and porosity over time.

Maintenance Regime

Schedule	Action Required	Frequency
Regular Maintenance	Surface brushing for appearance and to reduce silt accumulation.	Monthly
	Brushing and suction sweep or jet wash and suction sweep in autumn after leaf fall.	Annually
	Mow grass edges to paving at 35-50mm and remove weeds and leaves.	As required
	Check outlets and control structures.	Monthly depending on detail
Occasional tasks	Jetting and suction where silt has accumulated in joints or voids.	As required
Remedial Work	Where sinkage or surface damage occurs, cut out the affected layers of asphalt and reinstate to the existing design profile as a minimum, ensuring tie in with the surrounding surfacing.	As required

Detention Basins

Description

Detention basins are vegetated depressions in the ground designed to store surface water runoff and either allow it to soak into the ground or flow out at a controlled rate. Within development, these basins are usually grassed areas, sometimes with a micropool or planted area at a low point where some standing water can accumulate

Detention basins may be used to manage construction runoff and trap construction sediments, provided they are fully rehabilitated to original design formation levels before handover.

Maintenance Issues

For detention basins typical issues relate to the build-up of nutrients and pollutants.

The major maintenance requirement for detention basins is usually mowing. Regular mowing in and around the basins is only required along maintenance access routes, amenity areas (e.g. footpaths), across any embankment and across the main storage area. The remaining areas can be managed as “meadow” unless additional management is required for landscape/amenity/recreational or aesthetic reasons.

Maintenance Regime

Schedule	Action Required	Frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets and forebay and main basin when required	Every 5 years, or as required (likely

		to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Pumped Systems

Description

Pumped systems come in the form of package pump systems, sump pumps, or stand alone products. The need for a pump comes when a pipe falling by gravity is too deep when compared to the outfall.

Maintenance Issues

It is recommended that maintenance is proactive, rather than reactive. The party responsible for maintenance, usually the owner or occupier, should consult the manufacturer to identify a suitable maintenance regime.

Maintenance Regime

Activity	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Check manufacturer's specification. Inspect and identify any parts that are not operating correctly. Take remedial action as appropriate	For 3 months after installation
	Monitor working of drainage at ground level. Where localised flooding occurs, check the condition of all system elements.	Monthly
Routine/regular maintenance (inc. inspections and monitoring)	• Check manufacturer's specification • Check the function of the warning device (if fitted)	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	• Check manufacturer's specification. • Check watertightness of system • Check structural condition • Check internal coatings • Check built-in parts • Check electrical devices and installations	5 Yearly maximum
Remedial maintenance	Inspect, and carry out remedial actions to ensure that the features are in working order.	As required

Manholes and Inspection Chambers

Description

Manholes providing rodding and jetting access to pipe work.

Normally manholes, in similarity to inspection chambers, are designed for access by operatives. Manholes must only be accessed after a risk assessment, and the implementation of a safe system of work, which identifies the specific risk to confined space.

Maintenance Issues

It is not likely that Manholes will present maintenance issues. However, they allow both the access to the drainage infrastructure and allow visual inspection from the surface of any key maintenance issues.

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Remove covers and ensure that there are no blockages. Inspect and ascertain any parts that are not operating correctly and resolve.	For 3 months after installation
	Check covers do not need repairing.	Monthly
	Check drainage is running freely by inspecting manholes and inspection chambers.	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	Suction sweeping and cleansing (to Water Jetting Association standards) and CCTV where appropriate.	2 – 4 Years
Remedial maintenance	• Silt removal • Inlet/outlet repair • Erosion repairs • System recovery following a pollution event • Manhole Cover replacement • Repairs to brickwork or concrete • Chanel repair	When required (tasks to repair problems due to wear, damage or vandalism)

Catchpits

Description

Catchpits are similar to manholes, however, they include a sump to the base which is designed to capture silt and prevent it reaching other parts of the drainage network. Catchpits provide a useful location to remove silt for drainage networks. Catchpits must only be accessed after a risk assessment, and the implementation of a safe system of work, which identifies the specific risk to confined space.

Maintenance Issues

If the silt captured in catchpits does not get removed regularly it will cause silt to move downstream to other part of the drainage network, some of which may be difficult to access, or totally inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Remove manhole covers and ensure that there are no blockages. Inspect and identify any parts that are not operating correctly and resolve. Inspect silt storage in sump. Remove silt as appropriate using subcontractor with vacuum extraction plant.	For 3 months after installation
	Check covers do not need repairing. Repair/replace as required.	Monthly
	Inspect catchpits to ensure that the drainage is running freely, and free of debris. Inspect silt storage in sump. Remove silt as appropriate using subcontractor with vacuum extraction plant.	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	Suction sweeping and cleansing (to Water Jetting Association standards) and CCTV where appropriate. Resolve any chamber structural defects, or any defects that could reduce the free flow of water.	2 – 4 Years
Remedial maintenance	• Silt removal • Inlet/outlet repair • Erosion repairs • System recovery following a pollution event • Manhole Cover Replacement • Repairs to brickwork or concrete	When required (tasks to repair problems due to wear, damage or vandalism)

Gullies

Description

Surface Water is drained over impermeable areas towards grated gullies at low points and water is carried to below ground pipework.

Maintenance Issues

Gullies can become blocked by silt or debris, causing flooding.

Gullies include integral silt traps which can cause siltation of downstream drainage infrastructure if the appropriate maintenance is not undertaken.

Gullies frequently include a trapped outlet which prevents liquids lighter than water (ie oil and fuel) departing the gully. If silt and light liquids do not get removed regularly silt and oil will move downstream to other areas of the drainage network, some of which may be difficult to access, or totally inaccessible.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Inspect to ensure that there are no blockages at surface level, and that the outfall is operating efficiently. Inspect and identify any parts that are not operating correctly and resolve.	For 3 months after installation
	Check that there are no blockages at surface level.	Monthly
	Remove covers to check for blockages or siltation.	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	Remove oil and silt using specialist vacuum extraction plant.	1 – 2 Years
Remedial maintenance	• Silt removal • Inlet/outlet repair • Erosion repairs • System rehabilitation following a pollution event • Cover replacement • Structural failure of gully pot • Ensure that impermeable surfaces surrounding linear drains have not settled below top of gully cover level, causing ponding	When required (tasks to repair problems due to wear, damage or vandalism)

Pipework

Description

Below ground drainage pipework connects drainage inlets (gullies, linear drains etc) to manholes as well as providing connections between manholes.

Maintenance Issues

Pipes could become blocked by silt, debris fat, grease, or collapse. In addition, it's possible for pipe joints to become displaced or for roots to grow from the surrounding ground into the pipes.

These factors can cause a reduction in, or loss of, the hydraulic capability of the pipes which could cause flooding to land and buildings.

Defects in pipes could cause a reduction in stability to ground underlying foundations, thus, causing settlement and damage to buildings and external surfaces.

The material of pipes and associated couplings can be damaged if aggressive liquids are passed through the pipes.

It is recommended that trees are not planted within 3m of pipes to reduce the risk of root ingress.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Inspect and identify any parts that are not operating correctly and resolve.	For 3 months after installation.
	Monitor working of drainage at ground level. The indications damaged pipework's may include localised flooding or emission of smells.	Monthly
	Remove manholes covers to check for blockages.	Every 6 months
Occasional maintenance	CCTV pipework, clean to WRC Sewer Jetting Code of Practice. Resolve issues as appropriate.	1 – 2 Years
Remedial maintenance	• Silt removal. • Fat and Grease removal. • Erosion repairs. • Joint displacement. • Structural failure, cracking or collapse. • System rehabilitation following a pollution event.	When required (tasks to repair problems due to wear, damage or vandalism)

Vortex Controls

Description

Vortex controls, often called Hydrobrakes, are installed in some manholes to limit the rate of flow. Vortex controls are normally constructed in steel and installed in a manhole with a sump.

Maintenance Issues

Vortex controls could become blocked by debris, plastic bags or other sheet material. If silt is allowed to build up in the sump the operation of the device could be impeeded causing flooding upstream.

Maintenance Regime

Schedule	Action Required	Frequency
Routine/regular maintenance (inc. inspections and monitoring)	Check manufacturer's specification. Inspect and identify any parts that are not operating, consult supplier and remediate as required.	For 3 months after installation
	Monitor working of drainage at ground level. Where localised flooding occurs, check the condition of all system elements.	Monthly
	Remove manholes covers to check for blockages. Remove sediment from pre-treatment structures, gullies, catchpits etc.	Every 6 months and following the leaf fall in autumn.
Occasional maintenance	Clean to WRC Sewer Jetting Code of Practice. Resolve issues as appropriate.	1 – 2 Years
Remedial maintenance	Inspect, and remedy to ensure that the features are in fully working order.	As required (tasks to repair problems due to wear, damage or vandalism).

Appendix J – Ciria Simple Index Pollution Mitigation Calculations

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SIMPLE INDEX APPROACH: TOOL

HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tools, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Residential parking	Low	0.5	0.4	0.4
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**Low**	**0.5**	**0.4**	**0.4**

DESIGN CONDITIONS

1	2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Pervious pavement (where the pavement is not designed as an infiltration component)	0.7	0.6	0.7
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	None			
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None			
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:				
	Aggregated Surface Water Pollution Mitigation Index	**0.7**	**0.6**	**0.7**

DESIGN CONDITIONS

1	2	3
SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: → None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS

1	2	3	4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.7**	**0.6**	**0.7**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS

1
Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

SIMPLE INDEX APPROACH: TOOL

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1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Residential roofing	Very low	0.2	0.2	0.05
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**Very low**	**0.2**	**0.2**	**0.05**

DESIGN CONDITIONS: 1 | 2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Pervious pavement (where the pavement is not designed as an infiltration component)	0.7	0.6	0.7
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	None			
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None			
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:				
	Aggregated Surface Water Pollution Mitigation Index	**0.7**	**0.6**	**0.7**

DESIGN CONDITIONS: 1 | 2 | 3

SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

		Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: →	None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:				
	Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS: 1 | 2 | 3 | 4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.7**	**0.6**	**0.7**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS: 1

Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

SIMPLE INDEX APPROACH: TOOL

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1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

	DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
	USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)	Low	0.5	0.4	0.4
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**Low**	**0.5**	**0.4**	**0.4**

DESIGN CONDITIONS

1	2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Detention basin	0.5	0.5	0.6
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	None			
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None			
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:				
	Aggregated Surface Water Pollution Mitigation Index	**0.5**	**0.5**	**0.6**

DESIGN CONDITIONS

1	2	3
SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: → None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS

1	2	3	4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.5**	**0.5**	**0.6**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS

1
Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

SIMPLE INDEX APPROACH: TOOL

HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tools, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

	DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
	USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)	Low	0.5	0.4	0.4
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
	Landuse Pollution Hazard Index	**Low**	**0.5**	**0.4**	**0.4**

DESIGN CONDITIONS

1	2

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Filter drain (where the trench is not designed as an infiltration component)	0.4	0.4	0.4
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	Swale	0.5	0.6	0.6
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None			
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:				
	Aggregated Surface Water Pollution Mitigation Index	**0.65**	**0.7**	**0.7**

DESIGN CONDITIONS

1	2	3
SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Filter drains should be preceded by upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events	
SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

	Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Select type of groundwater protection from the drop down list: → None			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:			
Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**

DESIGN CONDITIONS

1	2	3	4

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.65**	**0.7**	**0.7**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Sufficient	**Sufficient**	**Sufficient**

DESIGN CONDITIONS

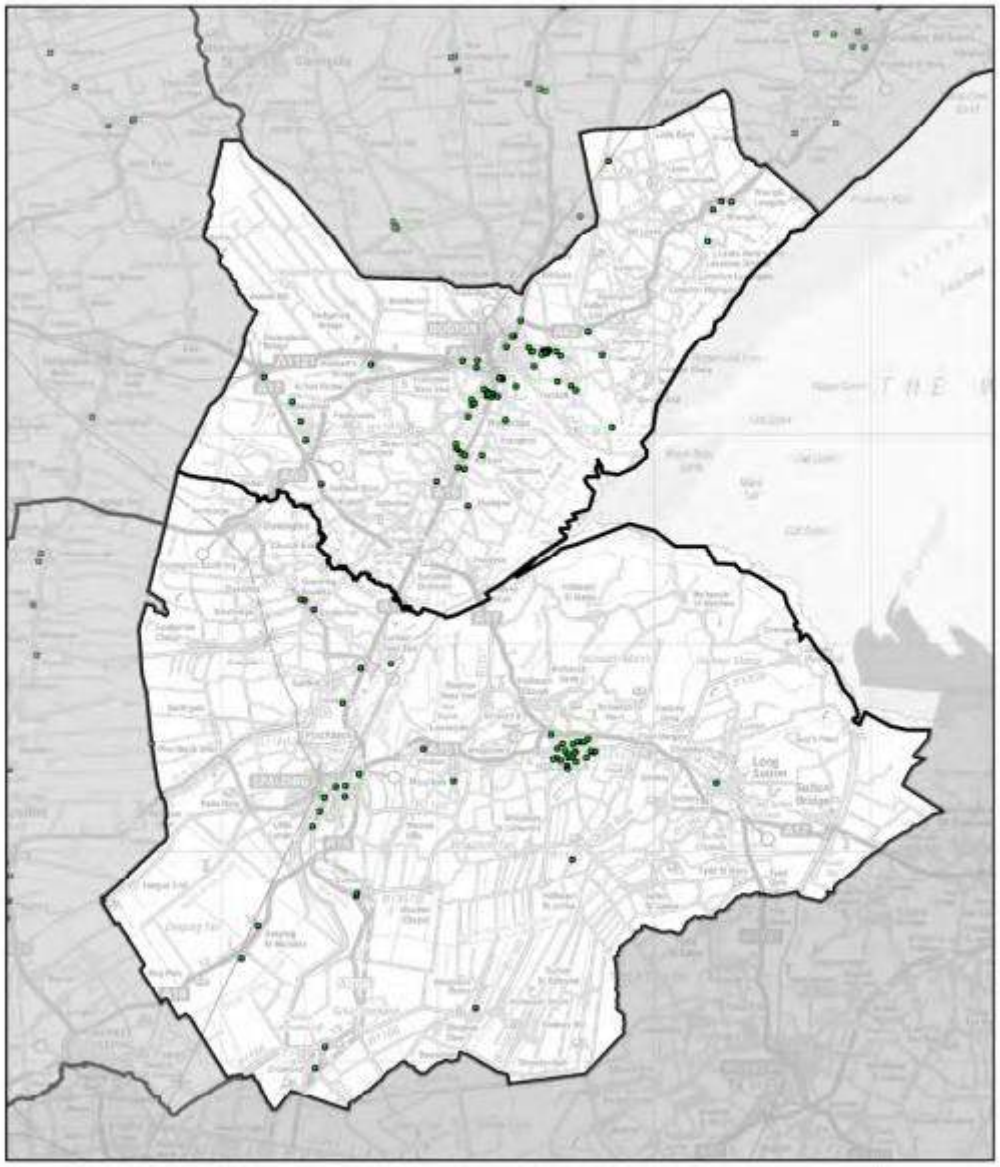
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Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

Appendix K – Historic Flood Incidents

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Boston and South Holland FR&DMG – Recorded incidents of historical local flooding

NOTE: MAP SHOULD BE VIEWED AT NO LARGER THAN 1:50,000 SCALE



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Legend – Recorded incidents of historical local flooding shown as

Appendix L – Phase 2 – Proposed Drainage Strategy General Arrangement and Calculations

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Storage Estimate

Return Period (years)	100
Climate Change (%)	40
Impermeable Area (ha)	4.099
Peak Discharge (l/s)	7.200
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m^3)	Calc
from	5078
to	5931

Flow+ v14.0 Copyright © 1988-2025 Causeway Technologies Ltd

HEADWALL
CL: 2.800
IL: 0.210

Attenuation Basin

Green Space

Green Space

Green Space

Green Space

PROPOSED ATTENUATION BASIN LOCATIONS - SIZES AND DESIGNS TO BE DETERMINED DURING PRODUCTION OF THE FULL DRAINAGE STRATEGY

Attenuation Basin

Green Space

MONKS HOUSE LANE

SCALE 1:500m
0m 10m 20m 30m 40m 50m

PHASE 2 - OUTLINE DRAINAGE STRATEGY

AN OUTLINE DRAINAGE STRATEGY HAS BEEN FORMULATED IN RELATION TO PHASE 2 OF THE MONKS HOUSE LANE PROJECT WITH A VIEW TO ACHIEVING OUTLINE PLANNING PERMISSION FOR THIS PHASE OF THE DEVELOPMENT. THE STRATEGY IS AS FOLLOWS:

TO COUNTERACT THE INTRODUCTION OF ADDITIONAL HARDSTANDING AREAS TO THE LARGELY GREENFIELD EXISTING SITE, IT IS PROPOSED TO INTRODUCE THE PROVISION OF PERMEABLE PAVING WHEREVER POSSIBLE TO PROVIDE WATER ATTENUATION AND WATER QUALITY IMPROVEMENTS TO COLLECTED RUNOFF.

FLOW RESTRICTION DEVICES IN COMBINATION WITH ATTENUATION BASINS IS ALSO TO BE INTRODUCED TO PROVIDE ADDITIONAL SURFACE WATER ATTENUATION AS THE SYSTEM DISCHARGE IS RESTRICTED TO MATCH THE QBAR RATE FOR THE DEVELOPMENT.

ALL RUNOFF FROM THE DEVELOPMENT IS PROPOSED TO DISCHARGE TO THE EXISTING DITCH NORTH OF THE SITE.

THE SYSTEM WILL BE MODELLED TO PREVENT SURFACE FLOODING FOR ALL EVENTS UP TO AND INCLUDING THE 1 IN 100 + 40% CLIMATE CHANGE EVENT. THIS IS THE EVENT WHICH THE SOURCE CONTROL CALCULATIONS HAVE BEEN BASED ON.

THE CALCULATED QBAR RATE FOR THE SITE IS 7.2l/s.

THE REQUIRED LEVEL OF STORAGE TO ACHIEVE THE QBAR DISCHARGE RATE IS APPROXIMATELY 5931m³ ASSUMING 50% OF THE SITE AREA IS TO BE IMPERMEABLE (40,994m²), WHICH WILL BE CAPTURED USING THE FEATURES NOTED ABOVE.

PRELIMINARY DRAWING

THIS DRAWING IS FOR PRELIMINARY INFORMATION PURPOSES ONLY AND MUST NOT BE READ AS A CONSTRUCTION ISSUE. IT INDICATES DESIGN INTENT ONLY AND IS SUBJECT TO AMENDMENT DURING FINAL DESIGN DEVELOPMENT

DRAWING REFERENCE LIST

DRAWING NUMBER	REV	DATE	CREATOR
10034-SGH-MP-AR-1000	P06	27/03/2025	SEAGATE HOMES
24-58-01/02	N/A	15/05/2024	DANIEL CHARLES SURVEYS

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS AND SPECIFICATIONS
2. REFER TO THE ARCHITECT & SERVICES ENGINEER FOR FINAL SETTING OUT OF ALL BUILDINGS & INTERNAL DOWN PIPES & RWPS
3. REFER TO SERVICE ENGINEER FOR ABOVE GROUND PLUMBING ROUTES FROM APPLIANCES TO STUB STACKS ETC
4. EXISTING DRAINAGE THAT IS TO BE ABANDONED TO BE 'PLUGGED' IN WITH MASS CONCRETE (150mm MIN) OR REMOVED ENTIRELY
5. ANY EXISTING SERVICES TO BE LOCATED AND CLEARLY MARKED PRIOR TO EXCAVATIONS BY CONTRACTOR
6. ALL LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO CONSTRUCTION
7. IT IS ASSUMED THAT ALL RWPS, SINK AND TOILET DRAINAGE POINTS WILL HAVE RODDING ACCESS AT THE APPLIANCE BASE
8. CONTRACTOR TO AVOID UNDERMINING ANY EXISTING FOOTPATHS/BUILDINGS DURING WORKS BY ALLOWING ADEQUATE PROTECTION ADJACENT TO THESE AREAS
9. ALL BELOW GROUND DRAINAGE PIPES WITH LESS THAN 900mm COVER TO SOFFIT LEVEL IN TRAFFICKED AREAS I.E. CAR PARK AND SERVICE YARD, TO HAVE CLASS Z BEDDING SURROUND. REFER TO THE MANHOLE SCHEDULE AND DETAIL SHEETS FOR FURTHER DETAILS
10. ALL BELOW GROUND DRAINAGE WITHIN THE SITE BOUNDARY HAS BEEN DESIGNED TO BSEN 752:2008 AND BUILDING REGULATIONS - PART H 2015. THE OFF SITE DRAINAGE TO THE PUBLIC SEWER ARE DESIGNED TO THE SEWERAGE SECTOR GUIDANCE

HEALTH SAFETY AND ENVIRONMENTAL RISKS BOX

CONSTRUCTION RISKS	MAINTENANCE RISKS	DEMOLITION/ ADAPTATION RISKS
1. REFER TO EXISTING SERVICES DRAWING AND TO ARCHITECTS SERVICES DRAWINGS FOR DETAILS & LOCATION OF EXTG AND PROPOSED DRAINAGE & SERVICES. 2. DRAINAGE CONNECTION REQUIRES DEEP EXCAVATION. TEMP WORKS REQUIRED 3. EXISTING DRAINS NOT SHOWN ON PLAN TO EITHER BE REMOVED OR GRUBBED UP. 4. CONSTRUCTING NEW CONNECTIONS DRAINAGE POTENTIAL FOR HAZARDOUS GASES. PERMIT TO ENTER EXISTING MANHOLES SHOULD BE OBTAINED FROM ANGLIAN WATER BEFORE UNDERTAKING THE WORK. RELEVANT P P E SHOULD BE WORN AT ALL TIMES. IF ANY ASBESTOS CEMENT PIPES ARE FOUND, THEN SAFE SYSTEM OF WORK NEED TO BE PUT IN PLACE WITH ATTENTION DRAWN TO THE CONTROL ASBESTOS AT WORK (AMENDMENT) REGULATIONS 1992. 5. HIGHWAY WORKS REQUIRED	1. PERMEABLE PAVING, ATTENUATION TANKS AND CHAMBERS REQUIRE THE STANDARD PERIODIC INSPECTION REGIME AND CLEANING ROUTINE TO ENSURE CONTINUED PERFORMANCE. 2. CONFINED SPACE ENTRY. 3. ALL MAINTENANCE MUST COMPLY WITH THE LEAD LOCAL FLOOD AUTHORITY'S REGULATIONS.	1. APPARATUS LOCATED IN LANDSCAPED AREAS HAS NOT BEEN DESIGNED TO SUPPORT HEAVY VEHICLE LOADING. 2. THE SURFACE WATER DRAINAGE APPARATUS HAS BEEN DESIGNED TO ACCOMMODATE THE DESIGNED CATCHMENT AREA. NO ADDITIONAL AREAS OF HARDSTANDING CAN BE CONNECTION INTO THE SYSTEM WITHOUT RISK OF LOCALIZED FLOODING ON SITE. 3. THE SURFACE WATER DRAINAGE HAS BEEN DESIGNED TO BE CONTROLLED TO A RATE OF 5 l/s BEFORE DISCHARGE INTO THE PUBLIC NETWORK, PENDING APPROVAL FROM ANGLIAN WATER BEFORE ANY CONNECTION IS MADE. 4. HAZARDOUS WASTE MATERIALS

IN ADDITION TO THE HAZARDS & RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, TAKE NOTE OF THE ABOVE. IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

LEGEND:

SW	ADOPTABLE SURFACE WATER SEWER PIPE AND MANHOLES
SW	PRIVATE SURFACE WATER SEWER PIPE AND MANHOLES
FW	ADOPTABLE FOUL WATER SEWER PIPE AND MANHOLES
FW	ADOPTABLE FOUL WATER RISING MAIN
	PERFORATED PIPES
	DETENTION BASIN
	PERMEABLE PAVED SURFACE WITH SUBBASE SURFACE WATER ATTENUATION STORAGE.
	EXISTING DITCH
	CULVERT
	FILTER STRIP
G	ROAD GULLY
	HEADWALL

Rev	Date	Description	By	Check	App.
P01	01/04/2025	ISSUE FOR OUTLINE PLANNING	CN	KE	KE

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Client
SEAGATE HOMES (UK) LTD

Project
MONKS HOUSE LANE WEST
SPALDING

Office
NORWICH - 01603 305 190

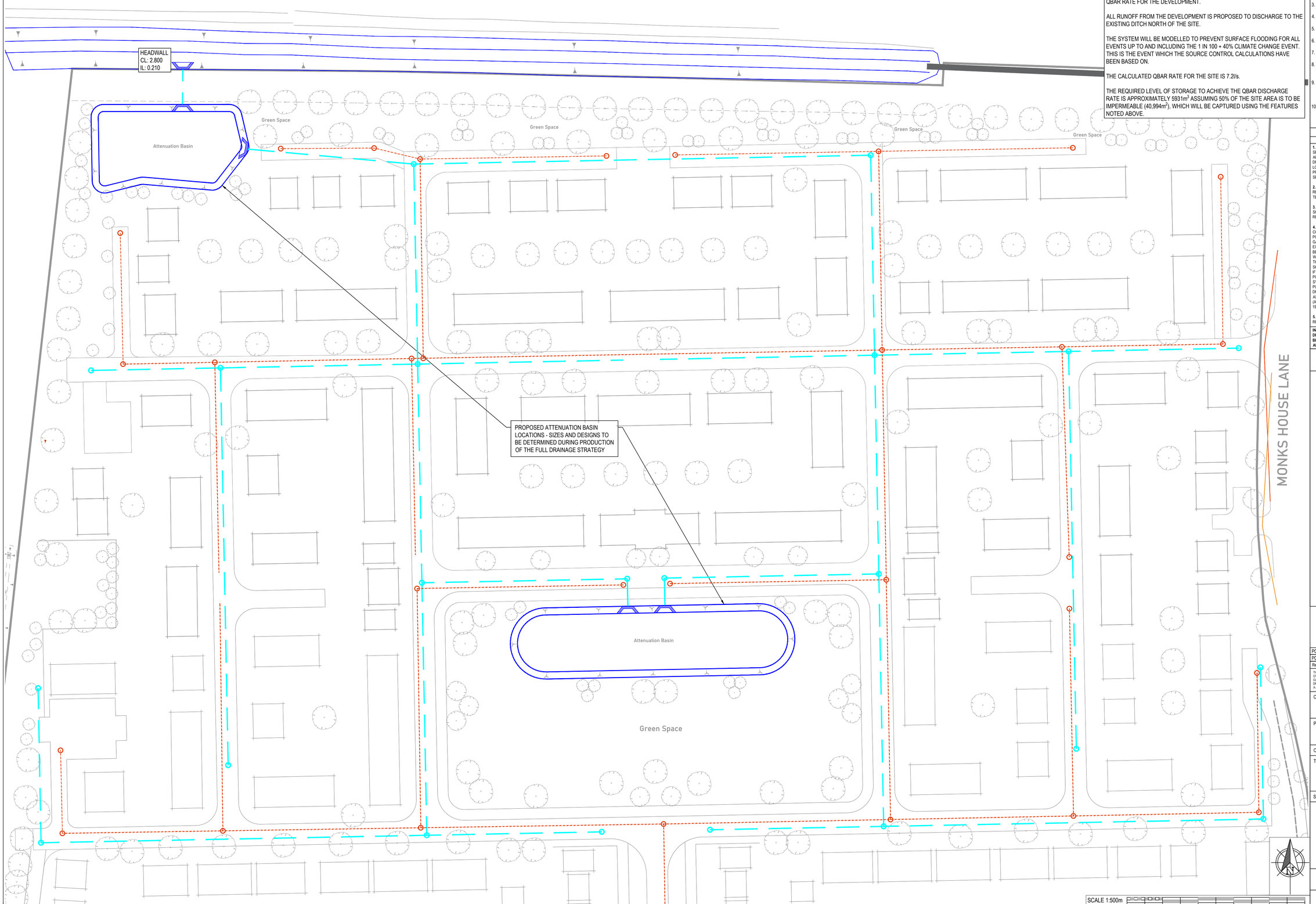
Title
PHASE 2
OUTLINE DRAINAGE STRATEGY
GENERAL ARRANGEMENT

Scale @ A1 1:500 | Status PRELIMINARY

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Project Ref	Originator	Volume	Level
8/3024	CCL	XX	XX
File Type	Discipline	Drawing No.	Revision
DR	C	4420	P01

Date of Print = Apr 01 2025, File Name = 8 3024-CCL-00-XX-DR-C-4420_LIVE_DRAINAGE GA SG (UPDATE.dwg)



PHASE 2 - OUTLINE DRAINAGE STRATEGY

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THE CALCULATED QBAR RATE FOR THE SITE IS 7.2l/s.

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DRAWING REFERENCE LIST

DRAWING NUMBER	REV	DATE	CREATOR
10034-SGH-SL-AR-1006 24-06-0102	P03 N/A	06/11/2025 15/05/2024	SEAGATE HOMES DANIEL CHARLES SURVEYS

NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER ENGINEER'S AND ARCHITECT'S DRAWINGS, DETAILS AND SPECIFICATIONS
2. REFER TO THE ARCHITECT & SERVICES ENGINEER FOR FINAL SETTING OUT OF ALL BUILDINGS & INTERNAL DOWN PIPES & RWPS
3. REFER TO SERVICE ENGINEER FOR ABOVE GROUND PLUMBING ROUTES FROM APPLIANCES TO STUB STACKS ETC
4. EXISTING DRAINAGE THAT IS TO BE ABANDONED TO BE 'PLUGGED' IN WITH MASS CONCRETE (150mm MIN) OR REMOVED ENTIRELY
5. ANY EXISTING SERVICES TO BE LOCATED AND CLEARLY MARKED PRIOR TO EXCAVATIONS BY CONTRACTOR
6. ALL LEVELS ARE TO BE CONFIRMED BY THE CONTRACTOR ON SITE PRIOR TO CONSTRUCTION
7. IT IS ASSUMED THAT ALL RWPS, SINK AND TOILET DRAINAGE POINTS WILL HAVE RODDING ACCESS AT THE APPLIANCE BASE
8. CONTRACTOR TO AVOID UNDERMINING ANY EXISTING FOOTPATHS/BUILDINGS DURING WORKS BY ALLOWING ADEQUATE PROTECTION ADJACENT TO THESE AREAS
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10. ALL BELOW GROUND DRAINAGE WITHIN THE SITE BOUNDARY HAS BEEN DESIGNED TO BSEN 752:2008 AND BUILDING REGULATIONS - PART H 2015. THE OFF SITE DRAINAGE TO THE PUBLIC SEWER ARE DESIGNED TO THE SEWERAGE SECTOR GUIDANCE

HEALTH SAFETY AND ENVIRONMENTAL RISKS BOX

CONSTRUCTION RISKS	MAINTENANCE RISKS	DEMOLITION/ ADAPTATION RISKS
1. REFER TO EXISTING SERVICES DRAWING AND TO ARCHITECTS SERVICES DRAWINGS FOR DETAILS & LOCATION OF EXTG AND PROPOSED DRAINAGE & SERVICES. 2. DRAINAGE CONNECTION REQUIRES DEEP EXCAVATION. TEMP WORKS REQUIRED 3. EXISTING DRAINS NOT SHOWN ON PLAN TO EITHER BE REMOVED OR GRUBBED UP. 4. CONSTRUCTING NEW CONNECTIONS DRAINAGE POTENTIAL FOR HAZARDOUS GASES. PERMIT TO ENTER EXISTING MANHOLES SHOULD BE OBTAINED FROM ANGLIAN WATER BEFORE UNDERTAKING THE WORK. RELEVANT P P E SHOULD BE WORN AT ALL TIMES. IF ANY ASBESTOS CEMENT PIPES ARE FOUND, THEN SAFE SYSTEM OF WORK NEED TO BE PUT IN PLACE WITH ATTENTION DRAWN TO THE CONTROL ASBESTOS AT WORK (AMENDMENT) REGULATIONS 1992. 5. HIGHWAY WORKS REQUIRED	1. PERMEABLE PAVING, ATTENUATION TANKS AND CHAMBERS REQUIRE THE STANDARD PERIODIC INSPECTION REGIME AND CLEANING ROUTINE TO ENSURE CONTINUED PERFORMANCE. 2. CONFINED SPACE ENTRY. 3. ALL MAINTENANCE MUST COMPLY WITH THE LEAD LOCAL FLOOD AUTHORITY'S REGULATIONS.	1. APPARATUS LOCATED IN LANDSCAPED AREAS HAS NOT BEEN DESIGNED TO SUPPORT HEAVY VEHICLE LOADING. 2. THE SURFACE WATER DRAINAGE APPARATUS HAS BEEN DESIGNED TO ACCOMMODATE THE DESIGNED CATCHMENT AREA. NO ADDITIONAL AREAS OF HARDSTANDING CAN BE CONNECTION INTO THE SYSTEM WITHOUT RISK OF LOCALIZED FLOODING ON SITE. 3. THE SURFACE WATER DRAINAGE HAS BEEN DESIGNED TO BE CONTROLLED TO A RATE OF 9 l/s BEFORE DISCHARGE INTO THE PUBLIC NETWORK, PENDING APPROVAL FROM ANGLIAN WATER BEFORE ANY CONNECTION IS MADE. 4. HAZARDOUS WASTE MATERIALS

IN ADDITION TO THE HAZARDS & RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, TAKE NOTE OF THE ABOVE. IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR, WORKING WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

LEGEND:

SW	ADOPTABLE SURFACE WATER SEWER PIPE AND MANHOLES
SW	PRIVATE SURFACE WATER SEWER PIPE AND MANHOLES
FW	ADOPTABLE FOUL WATER SEWER PIPE AND MANHOLES
FW	ADOPTABLE FOUL WATER RISING MAIN
	PERFORATED PIPES
	DETENTION BASIN
	PERMEABLE PAVED SURFACE WITH SUBBASE SURFACE WATER ATTENUATION STORAGE.
	EXISTING DITCH
	CULVERT
	FILTER STRIP
G	ROAD GULLY
	HEADWALL

Rev	Date	Description	By	Check	App.
P02	07/11/2025	MASTERPLAN UPDATED	DT	CN	KE
P01	01/04/2025	ISSUE FOR OUTLINE PLANNING	CN	KE	KE

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE DRAWINGS, DETAILS AND SPECIFICATION FROM THE ARCHITECT, OTHER RELEVANT ENGINEERS AND ANY SPECIALIST SUPPLIER INFORMATION. THE COPYRIGHT OF THIS DRAWING IS VESTED IN CLANCY CONSULTING. IT SHALL NOT BE USED WITHOUT PERMISSION BY ANYONE FOR ANY PURPOSE. DO NOT SCALE THIS DRAWING ELECTRONICALLY OR MANUALLY. WORK TO FIGURED DIMENSIONS ONLY. ALL DIMENSIONS IN mm UNLESS ALL LEVELS IN m A.O.D.LNG. IF IN DOUBT ABOUT THE INFORMATION SHOWN ON THIS DRAWING OR ANY RELATED DRAWING - ASK

Client: SEAGATE HOMES (UK) LTD

Project: MONKS HOUSE LANE WEST SPALDING

Office: NORWICH - 01603 305 190

Title: PHASE 2 OUTLINE DRAINAGE STRATEGY GENERAL ARRANGEMENT

Scale @ A1: 1:500

Status: PRELIMINARY

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www.clancy.co.uk

Project Ref	Originator	Volume	Level
8/3024	CCL	XX	XX
File Type	**Discipline**	**Drawing No.**	**Revision**
DR	C	4420	P02

Date of Print = Nov 07 2025, File Name = X:\8324\CCL-00\XX\DR\C-4400_LIVE_DRAINAGE_GA.dwg

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)		30 year (l/s)	14.1
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	18.0
Summer CV	1.000	Drain Down Time (mins)	240	1 year (l/s)	6.2	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	20.0	10 year (l/s)	11.9		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

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

Pre-development Discharge Rate

Site Makeup	Greenfield	BFIHost	0.680	Growth Factor 30 year	1.95	Q 1 year (l/s)	6.2
Greenfield Method	FEH	Region	5	Growth Factor 100 year	2.48	Q 10 year (l/s)	11.9
Positively Drained Area (ha)	8.190	QBar/QMed conversion factor	1.124	Betterment (%)	0	Q 30 year (l/s)	14.1
SAAR (mm)	561	Growth Factor 1 year	0.85	QMed	6.4	Q 100 year (l/s)	18.0
Host	1	Growth Factor 10 year	1.65	QBar	7.2		

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Appendix M – Ground Investigation Report

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GeoDyne

Geotechnical &
Environmental
Consultants

Monks House Lane West
Spalding

Combined Phase I Desk Study and Phase II Exploratory Investigation For Seagate Homes

GeoDyne Limited
9 Brunel Parkway, Pride Park
Derby DE24 8HR
Tel: 01332 290 798 email: info@geodyne.co.uk

5.0 GROUND INVESTIGATION

5.1 Introduction

Sub-Surface Utility Avoidance Scan

Prior to the commencement of our intrusive works, a sub-contracted sub-surface utility scan of proposed exploratory hole locations was undertaken to attempt to avoid buried services during the intrusive works. Based on the results of the service scan and taking account of the requirement to avoid buried services, the exploratory holes were positioned to maximise the amount of information obtained at the site.

It should be noted that it was not possible to advance exploratory holes inside the dilapidated outbuildings in the southeastern portion of the site for health and safety reasons and due to the height restriction of the building roofs. In view of this, exploratory holes were advanced in close proximity to the buildings, where access permitted.

Trial Pitting and Soakaway Works

A total of 28No. trial pits (designated TP1 to TP28) were excavated at the site between 20th and 24th January 2025. The trial pits were mechanically excavated to depths ranging between 2.00m and 3.20m below existing ground level (begl).

A total of 7No. soakaway test pits (designated SA1 to SA7) were excavated at the site between 20th and 24th January 2025. The soakaway test pits were mechanically excavated to depths ranging between 1.00m and 1.40m begl.

Window Sample Borehole Works

A total of 6No. window sampling boreholes (designated WS1 to WS6) were advanced at the site on 27th January 2025. The boreholes were advanced to depths ranging between 2.00m and 5.00m begl.

Exploratory Hole Locations/Logs

The approximate locations of the exploratory holes are indicated on the plan presented in Appendix IX of this report (Figure No. D44118/08). The exploratory hole logs are presented in Appendix X of this report.

5.2 Ground Conditions

The general ground conditions encountered during the exploratory works may be summarised as follows.

5.2.1 Topsoil

Topsoil was encountered at surface within all of the trial pits, soakaway pits and WS1 to depths ranging between 0.30m and 0.50m begl, with an average thickness of approximately 0.36m.

A plan showing the thickness of the Topsoil in each of the exploratory holes is presented in Appendix XI of this report (Drawing No. D44118/09).

5.2.2 Made Ground

Made Ground was encountered within boreholes WS2 to WS6 which were all located in the southeastern portion of the site around the former and existing buildings. The Made Ground was encountered to depths of 0.40m and 1.20m begl. It should be noted that WS3 had no recovery between 0.40m and 2.00m due to a concrete obstruction being pushing down the sampling tube.

A summary of the Made Ground soils encountered in the above exploratory holes is provided as follows:

- Concrete surfacing (WS3 and WS6 only).
- Grass over dark brown clay (WS4 and WS5 only).
- Loose grey sandy gravel of concrete and brick (WS4 only).
- Soft locally firm brown mottled dark grey, black and dark brown gravelly locally sandy clay. Gravel constituents comprised clinker, brick, concrete and coal (WS2, WS4 to WS6).

A plan showing the depth of the Made Ground in each of the exploratory holes (where locally encountered) is presented in Appendix XI of this report (Drawing No. D44118/09). It is anticipated that further Made Ground will be present in the areas around the existing buildings and beneath the existing concrete hardstanding.

5.2.3 Natural Strata

Tidal Flat Deposits

The Natural Strata encountered directly beneath the localised Made Ground or Natural Topsoil typically comprised the following drift deposits:

- Firm light brown mottled orange-brown and light grey sandy SILT locally progressing into a silty SAND at depth;
- Soft to firm light brown/orange-brown/light grey slightly silty (locally very silty) slightly sandy CLAY;
- Loose to medium dense wet light grey slightly silty to silty SAND, locally with occasional pockets of clay and rare black organic staining.

Within the Silt deposits, the Sand content appeared to vary markedly with depth, with some Silt soils appearing to contain significant quantities of Sand. However, the overall granular content of the Silt appeared relatively low with some of the Silt soils with a visually high sand content still appearing visibly cohesive in nature.

5.3 Visual & Olfactory Evidence of Soil Contamination

We would note that no obvious visual or olfactory evidence of significant soil contamination was identified during the course of the site works (such as hydrocarbons or visible fragments of asbestos, for example).

This included window sample borehole WS6 targeted to the location of the small above ground storage tank in the southeastern portion of the site (on the southwestern corner of the derelict warehouse building). There was no obvious evidence of any staining to the external concrete hardstanding, which could indicate potential small historical spillages (i.e. oils, for example).

The localised Made Ground in the far southeastern portion of the site around the existing residential dwelling and warehouse together with the concrete hardstanding included fragments of clinker, brick, concrete and coal.

5.4 Water

Water was encountered within the majority of the exploratory holes during their excavation / drilling. The water was encountered from depths ranging between 1.15m to 2.70m begl, with an average depth of approximately 2.00m begl.

The majority of the water observations were recorded as seepages within the trial pits within the silty Sand strata at depth. These seepages typically collected as standing water at the base of the pit upon completion of the excavation.

It should be noted that the long term monitoring of groundwater levels has not been carried out and therefore, due to the relatively low permeability of the soils, the steady groundwater level across the site may be shallower than the recorded seepage levels in the trial pits.

5.5 Stability

The trial pits and soakaways pits were initially generally stable in the short term but the sides became unstable when excavating generally beyond approximately 2.00m begl. This instability of the pit sides typically occurred below the depths where the water seepages were noted within natural Sand soils. In all the trial pits (28No.) and 1No. soakaway pit (SA4), this resulted in collapse of the pit sides.

Due to the nature of the ground it is considered likely that instability and collapse of shallow foundations could occur when left open or when exposed to wet weather conditions.

Casing was used during the drilling of the majority of the window sample boreholes (to depths of between 1m and 3m begl) as a precautionary measure.

5.6 Plates

A photographic record of the exploratory investigation was obtained during the intrusive works. Selected photographs are presented in the Plates included in Appendix XII of this report (Plate Nos. D44118/P1 to D44118/P39).

5.7 Shear Vane Values

In-situ shear vane testing was undertaken within the natural Clay soils within the trial pits and selected window sample boreholes at various depths ranging between 0.40m and 2.60m begl. The results revealed soil shear strength values of between 5kN/m^2 and 140kN/m^2.

A chart showing the shear vane values in relation to depth recorded in the trial pits is provided on the following page for information. Individual shear vane results are provided on the exploratory hole logs included in Appendix X of this report.

GeoDyne

APPENDIX XIII

Preliminary In-Situ Soakaway Test Results

SOIL INFILTRATION RATE CALCULATIONS

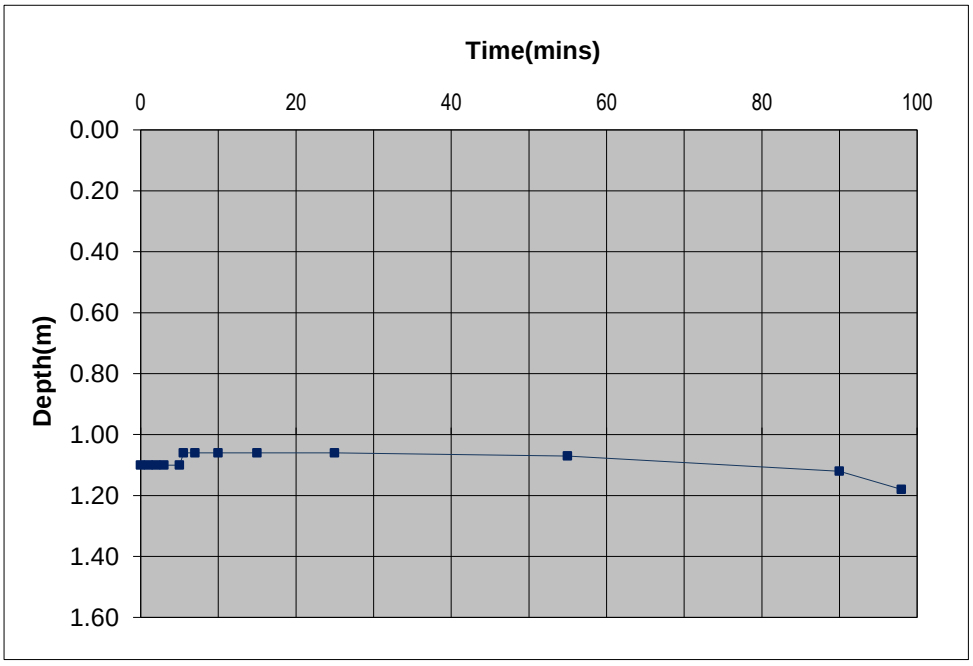
SA1 **Test 1**

Time(mins)	Depth(m)
0	1.10
1	1.10
2	1.10
3	1.10
5	1.10
5.5	1.06
7	1.06
10	1.06
15	1.06
25	1.06
55	1.07
90	1.12
98	1.18

Client :	Seagate Homes
Site :	Monks House Lane West, Spalding
Site ref :	D44118

Trial pit dimensions		
Width(m)	Length(m)	Depth(m)
0.70	5.00	1.40

Depth from water level at start of test to bottom of pit =	0.30
Enter Assumed Void Ratio (fraction of 1, where 1 equates to open pit. 0.3 to stone fill and 0 equates to no voids)	1



75% effective depth(m)	=	NA
25% effective depth(m)	=	NA

Time at 75% effective depth(mins)	=	NA
Time at 25% effective depth(mins)	=	NA

Volume outflowing, V_{p75-25} = NA

Area, a_{p50} = NA

Time, T_{75-25} = NA

Infiltration Rate, F = NA m/s

Please note:
Side collapse occurred at 5.5mins and 98mins, with catatrosphic collapse at 100mins after which the test was terminated.

SOIL INFILTRATION RATE CALCULATIONS

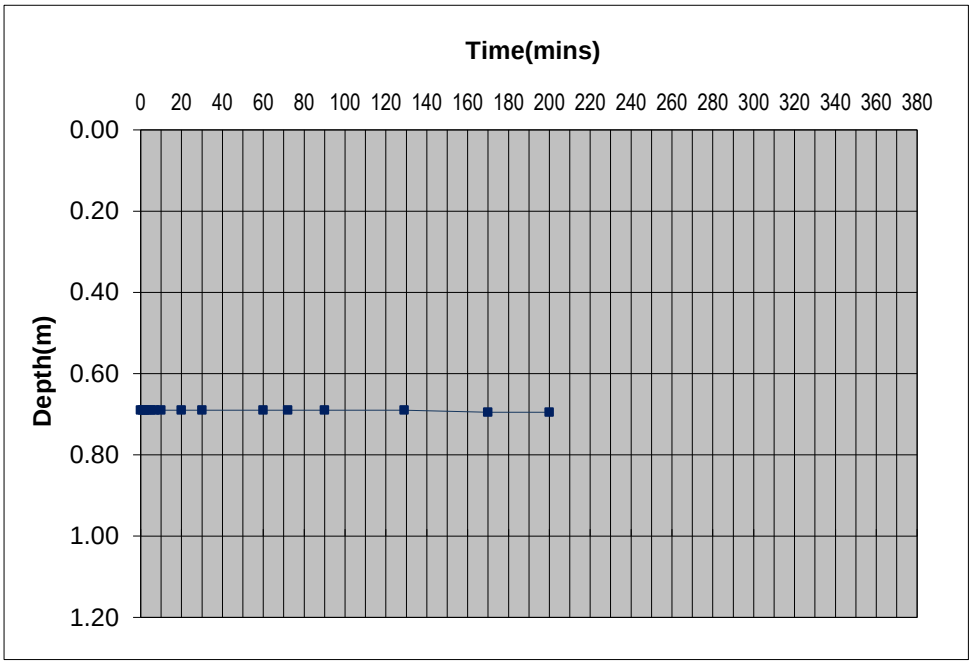
SA2 **Test 1**

Time(mins)	Depth(m)
0	0.69
1	0.69
2	0.69
3	0.69
5	0.69
7	0.69
10	0.69
20	0.69
30	0.69
60	0.69
72	0.69
90	0.69
129	0.69
170	0.70
200	0.70

Client :	Seagate Homes
Site :	Monks House Lane West, Spalding
Site ref :	D44118

Trial pit dimensions		
Width(m)	Length(m)	Depth(m)
0.60	4.70	1.00

Depth from water level at start of test to bottom of pit =	0.31
Enter Assumed Void Ratio (fraction of 1, where 1 equates to open pit. 0.3 to stone fill and 0 equates to no voids)	1



75% effective depth(m)	=	NA
25% effective depth(m)	=	NA

Time at 75% effective depth(mins)	=	NA
Time at 25% effective depth(mins)	=	NA

Volume outflowing, V_{p75-25} = NA

Area, a_{p50} = NA

Time, T_{75-25} = NA

Infiltration Rate, F = NA m/s

Please note:
Infiltration Calculation not possible due to too slow infiltration rates, projected trajectory even with favourable conditions are highly unlikely to meet the 50% empty within 24hrs.

SOIL INFILTRATION RATE CALCULATIONS

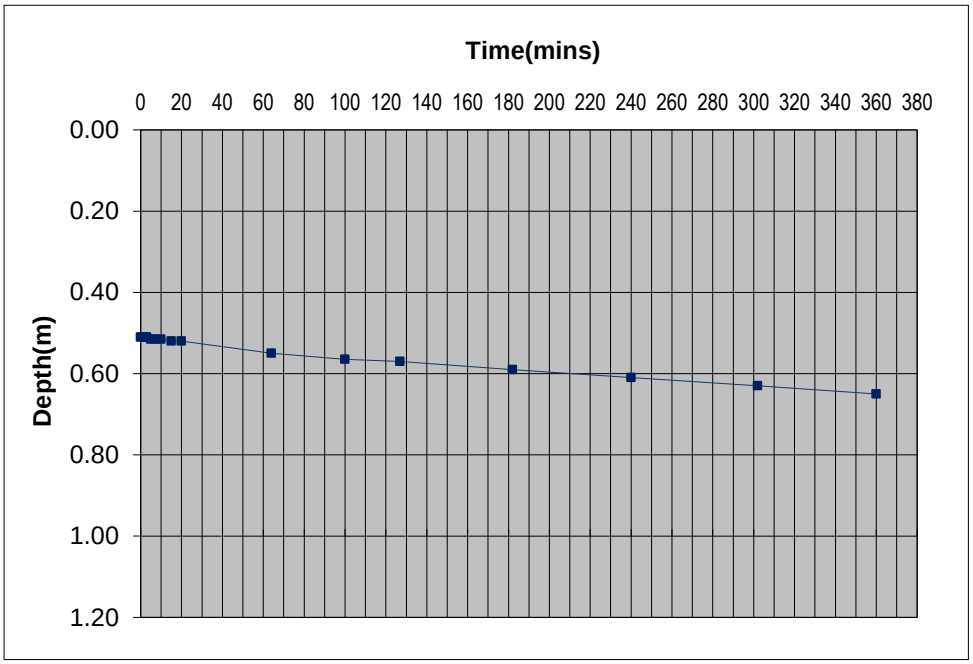
SA3 **Test 1**

Time(mins)	Depth(m)
0	0.51
1	0.51
2	0.51
3	0.51
5	0.52
7	0.52
10	0.52
15	0.52
20	0.52
64	0.55
100	0.57
127	0.57
182	0.59
240	0.61
302	0.63
360	0.65

Client :	Seagate Homes
Site :	Monks House Lane West, Spalding
Site ref :	D44118

Trial pit dimensions		
Width(m)	Length(m)	Depth(m)
0.70	2.60	1.10

Depth from water level at start of test to bottom of pit =	0.59
Enter Assumed Void Ratio (fraction of 1, where 1 equates to open pit. 0.3 to stone fill and 0 equates to no voids)	1



75% effective depth(m)	=	NA
25% effective depth(m)	=	NA

Time at 75% effective depth(mins)	=	NA
Time at 25% effective depth(mins)	=	NA

Volume outflowing, V_{p75-25} = NA

Area, a_{p50} = NA

Time, T_{75-25} = NA

Infiltration Rate, F = NA m/s

Please note:
Infiltration Calculation not possible due to too slow infiltration rates, projected trajectory even with favourable conditions are highly unlikely to meet the 50% empty within 24hrs.

SOIL INFILTRATION RATE CALCULATIONS

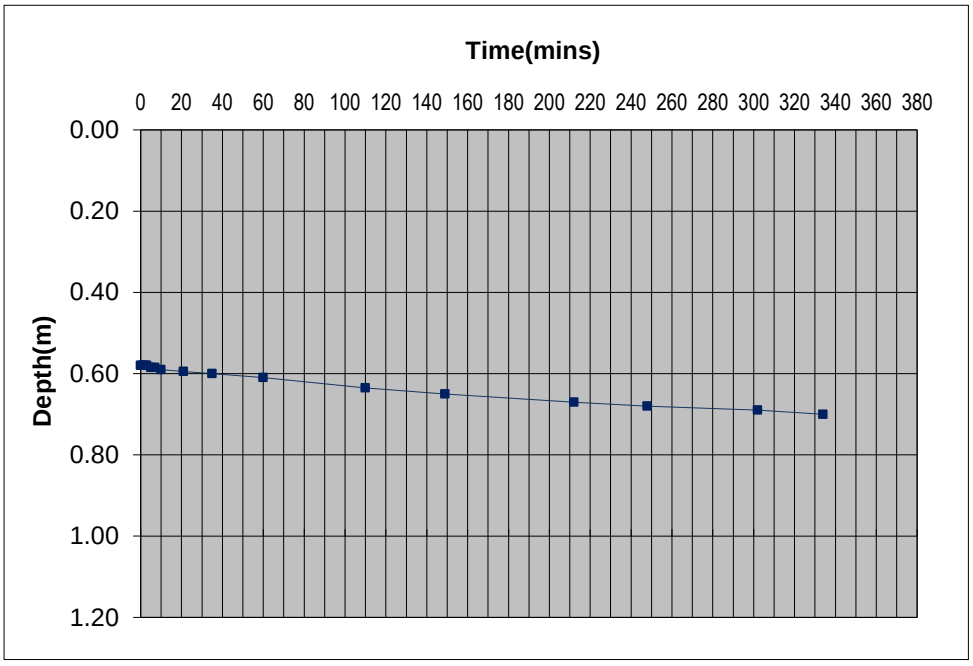
SA4 **Test 1**

Time(mins)	Depth(m)
0	0.58
1	0.58
2	0.58
3	0.58
5	0.59
7	0.59
10	0.59
21	0.60
35	0.60
60	0.61
110	0.64
149	0.65
212	0.67
248	0.68
302	0.69
334	0.70

Client :	Seagate Homes
Site :	Monks House Lane West, Spalding
Site ref :	D44118

Trial pit dimensions		
Width(m)	Length(m)	Depth(m)
0.70	2.60	1.15

Depth from water level at start of test to bottom of pit =	0.57
Enter Assumed Void Ratio (fraction of 1, where 1 equates to open pit. 0.3 to stone fill and 0 equates to no voids)	1



75% effective depth(m)	=	NA
25% effective depth(m)	=	NA

Time at 75% effective depth(mins)	=	NA
Time at 25% effective depth(mins)	=	NA

Volume outflowing, V_{p75-25} = NA

Area, a_{p50} = NA

Time, T_{75-25} = NA

Infiltration Rate, F = NA m/s

Please note:
Infiltration Calculation not possible due to too slow infiltration rates, projected trajectory even with favourable conditions are highly unlikely to meet the 50% empty within 24hrs.

SOIL INFILTRATION RATE CALCULATIONS

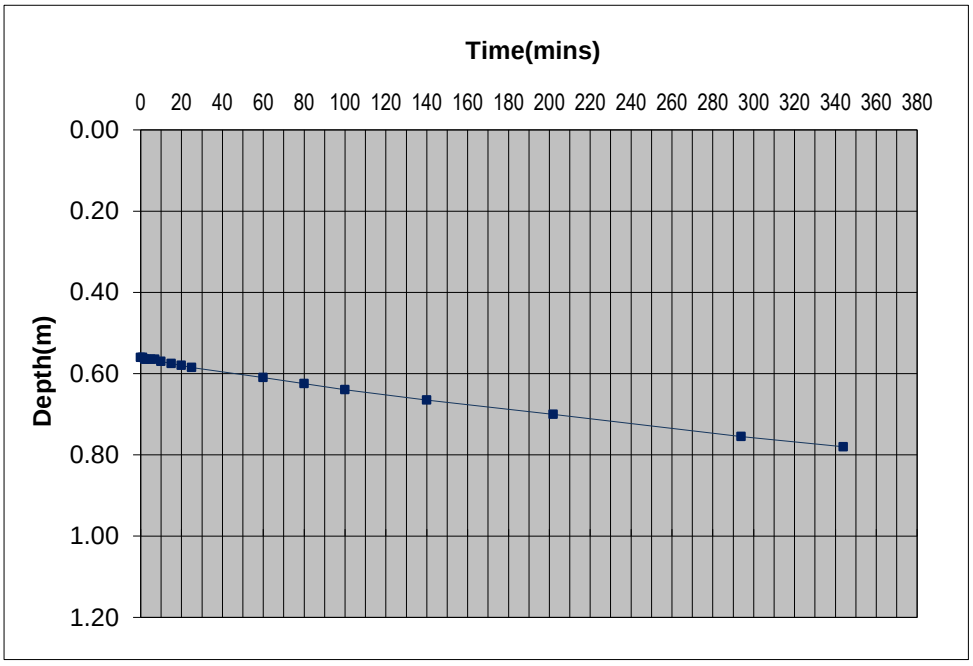
SA5 **Test 1**

Time(mins)	Depth(m)
0	0.56
1	0.56
2	0.57
3	0.57
5	0.57
7	0.57
10	0.57
15	0.58
20	0.58
25	0.59
60	0.61
80	0.63
100	0.64
140	0.67
202	0.70
294	0.76
344	0.78

Client :	Seagate Homes
Site :	Monks House Lane West, Spalding
Site ref :	D44118

Trial pit dimensions		
Width(m)	Length(m)	Depth(m)
0.75	2.80	1.25

Depth from water level at start of test to bottom of pit =	0.69
Enter Assumed Void Ratio (fraction of 1, where 1 equates to open pit. 0.3 to stone fill and 0 equates to no voids)	1



75% effective depth(m)	=	NA
25% effective depth(m)	=	NA

Time at 75% effective depth(mins)	=	NA
Time at 25% effective depth(mins)	=	NA

Volume outflowing, V_{p75-25} = NA

Area, a_{p50} = NA

Time, T_{75-25} = NA

Infiltration Rate, F = NA m/s

Please note:
Infiltration Calculation not possible due to too slow infiltration rates, projected trajectory even with favourable conditions are highly unlikely to meet the 50% empty within 24hrs.

SOIL INFILTRATION RATE CALCULATIONS

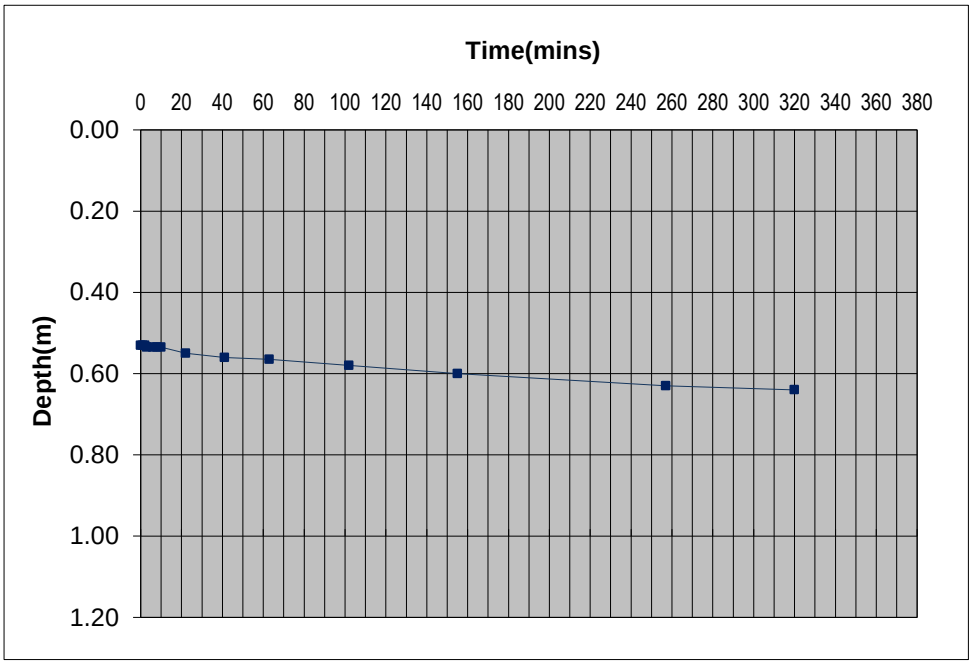
SA6 **Test 1**

Time(mins)	Depth(m)
0	0.53
1	0.53
2	0.53
3	0.54
6	0.54
8	0.54
10	0.54
22	0.55
41	0.56
63	0.57
102	0.58
155	0.60
257	0.63
320	0.64

Client :	Seagate Homes
Site :	Monks House Lane West, Spalding
Site ref :	D44118

Trial pit dimensions		
Width(m)	Length(m)	Depth(m)
0.75	3.00	1.10

Depth from water level at start of test to bottom of pit =	0.57
Enter Assumed Void Ratio (fraction of 1, where 1 equates to open pit. 0.3 to stone fill and 0 equates to no voids)	1



75% effective depth(m)	=	NA
25% effective depth(m)	=	NA

Time at 75% effective depth(mins)	=	NA
Time at 25% effective depth(mins)	=	NA

Volume outflowing, V_{p75-25} = NA

Area, a_{p50} = NA

Time, T_{75-25} = NA

Infiltration Rate, F = NA m/s

Please note:
Infiltration Calculation not possible due to too slow infiltration rates, projected trajectory even with favourable conditions are highly unlikely to meet the 50% empty within 24hrs.

SOIL INFILTRATION RATE CALCULATIONS

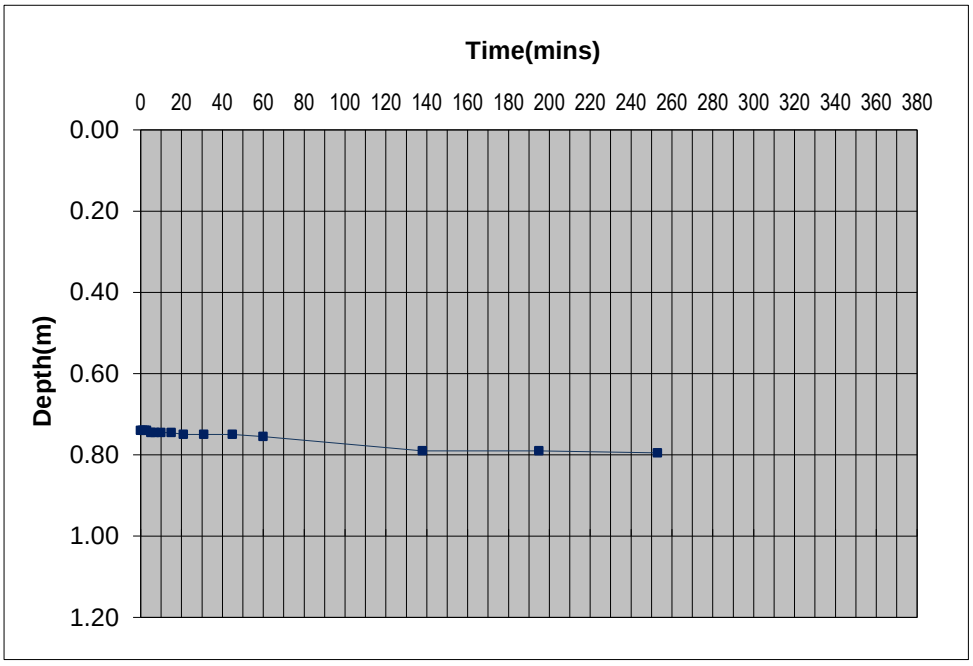
SA7 **Test 1**

Time(mins)	Depth(m)
0	0.74
1	0.74
2	0.74
3	0.74
5	0.75
7	0.75
10	0.75
15	0.75
21	0.75
31	0.75
45	0.75
60	0.76
138	0.79
195	0.79
253	0.80

Client :	Seagate Homes
Site :	Monks House Lane West, Spalding
Site ref :	D44118

Trial pit dimensions		
Width(m)	Length(m)	Depth(m)
0.70	2.40	1.40

Depth from water level at start of test to bottom of pit =	0.66
Enter Assumed Void Ratio (fraction of 1, where 1 equates to open pit. 0.3 to stone fill and 0 equates to no voids)	1



75% effective depth(m)	=	NA
25% effective depth(m)	=	NA

Time at 75% effective depth(mins)	=	NA
Time at 25% effective depth(mins)	=	NA

Volume outflowing, V_{p75-25} = NA

Area, a_{p50} = NA

Time, T_{75-25} = NA

Infiltration Rate, F = NA m/s

Please note:
Infiltration Calculation not possible due to too slow infiltration rates, projected trajectory even with favourable conditions are highly unlikely to meet the 50% empty within 24hrs.