

LAND OFF LINDLEY MOOR ROAD, LINDLEY, HUDDERSFIELD, HD3 3SX

FLOOD RISK AND DRAINAGE ASSESSMENT

Final Report v1.1
April 2022

Report Title **Land off Lindley Moor Road, Lindley, Huddersfield, HD3 3SX**
Flood Risk Assessment
Final Report v1.1

Client 2SH Developments

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Prepared by Keely Bonser BSc (Hons) MSc PhD MCIWEM *Director*
Tim Brook BSc (Hons) *Principal Engineer*

Checked and Approved by Kevin Tilford BSc MSc PhD MBA CWEM FCIWEM CEnv *Managing Director*

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1 INTRODUCTION

1.1 Purpose of Report

Weetwood Services Ltd ('Weetwood') has been instructed by 2SH Developments to prepare a Flood Risk and Drainage Assessment (FRDA) report to accompany a hybrid planning application for the proposed development of land off Lindley Moor Road, Lindley ("the site") for mixed-uses.

The assessment has been undertaken in accordance with the requirements of the revised National Planning Policy Framework (NPPF) updated on 27 July 2021 and the Planning Practice Guidance (PPG) updated on 20 August 2021.

This report presents an assessment of flood risk from all identified sources and presents measures to mitigate the identified risk so that the development would be safe for its lifetime and would not increase flood risk elsewhere, in accordance with planning policy. The report includes a drainage strategy for foul and surface water.

1.2 Structure of the Report

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Provides background information relating to the development site
- Section 3** Presents national and local flood risk and drainage planning policy
- Section 4** Assesses the potential sources of flooding to the development site and presents flood risk mitigation measures based on the findings of the assessment
- Section 5** Presents an illustrative foul water drainage scheme
- Section 6** Presents an illustrative surface water drainage scheme
- Section 7** Presents a summary of key findings and the recommendations

1.3 Relevant Documents

1.4 Relevant Documents

The assessment has been informed by the following documents:

- Calder Catchment Strategic Flood Risk Assessment (SFRA), Volume I, Kirklees Council, Calderdale Metropolitan Borough Council and Wakefield Council, April 2016
- Calder Catchment Strategic Flood Risk Assessment (SFRA), Volume II, Kirklees Council, July 2016
- Consultation Response from Kirklees Council Lead Local Flood Authority, ref: 2020/20447, 5 December 2020

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The approximately 6.26 hectare (ha) greenfield site is located to the south of Lindley Moor Road, Lindley, Huddersfield at Ordnance Survey National Grid Reference SE 109 190, as shown in **Figure 1**. The site is bounded by Crosland Road to the west, Weatherhill Road to the east and residential dwellings and open fields to the south.

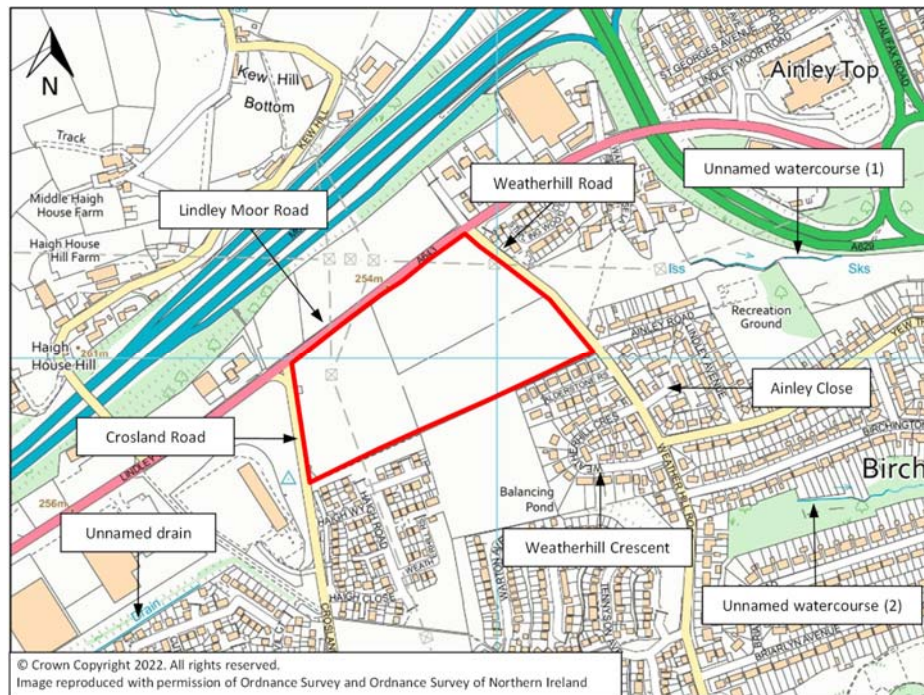


Figure 1: Site Location

2.2 Proposed Development

The development proposals entail the construction of 15 units accommodating a fast-food outlet, supermarket, restaurant, café/takeaways and a number of industrial and storage/distribution warehouses with associated access via Lindley Moor Road and areas of landscaping (**Appendix A**).

The detailed element of the planning application is for the proposed access road and Unit P, with the outline element being for Units A – N.

The PPG classifies food and general industry development as Less Vulnerable to flood risk.

2.3 Waterbodies in the Vicinity of the Site

An unnamed watercourse (referred to as Unnamed Watercourse (1) for the purposes of this report) emerges approximately 190 m to the east of the site and flows in an easterly direction.

An unnamed watercourse (Unnamed Watercourse (2)) emerges approximately 380 m to the south-east of the site and flows in an easterly direction.

An unnamed drain is located approximately 195 m to the south-west of the site.

The above watercourses are classed as ordinary watercourses. Lead local flood authorities, district councils and internal drainage boards carry out flood risk management work on ordinary watercourses.

2.4 Ground Conditions

According to the Soilsmap soils dataset produced by the Cranfield Soil and AgriFood Institute¹, soil conditions at the site and within the surrounding area are freely draining loamy soils.

British Geological Survey mapping of surface geology² indicates the underlying bedrock formation comprises Sandstone (80 Yard Rock) within the northern portion and Pennine Lower Coal Measures Formation (mudstone, siltstone and sandstone) within the southern portion. No superficial deposits are recorded at the site.

According to the MAGIC website³ the underlying Sandstone and Pennine Lower Coal Measures Formation bedrock are classified as Secondary A aquifers. The site is not shown to be located within a designated groundwater source protection zone.

2.5 Site Levels

A topographic survey of the site has been undertaken by Martin Walsh Architectural and is provided in **Appendix B**. LiDAR data has been used to develop a digital terrain model of the site and surrounding area as illustrated in **Figure 2**.

Ground levels are highest towards the western boundary and lowest to the east of the site with site gradients falling away from the high point in a northerly/easterly/southerly direction. Ground levels across the site range between 236.0 metres Above Ordnance Datum (m AOD) to 265.5 m AOD.

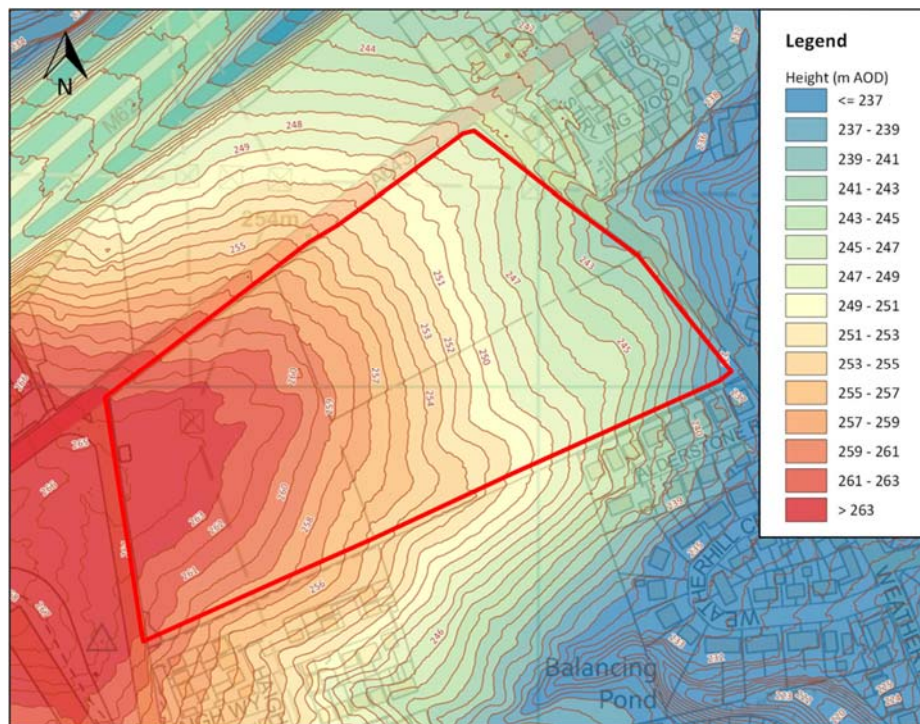


Figure 2: Digital Terrain Model from LiDAR Data

¹ www.landis.org.uk/soilsmap/
² <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>
³ <https://magic.defra.gov.uk/MagicMap.aspx>

3 PLANNING POLICY AND GUIDANCE

3.1 National Planning Policy and Policy Guidance

The thrust of national planning policy, as articulated in the NPPF is that inappropriate development in areas at risk of flooding should be avoided where possible, as summarised below:

- Inappropriate development in areas at risk of flooding should be avoided and that development should be directed away from areas at highest risk (whether existing or future), but where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere (NPPF para. 159).
- The policy of seeking to steer development to areas with the lowest risk of flooding, from any source, is implemented through the application of the flood risk sequential test. Development should not be allocated or permitted if there are reasonably available sites, appropriate for the proposed development in areas with a lower risk of flooding. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding (NPPF para. 162).
- If it is not possible for development to be located in zones with a lower risk of flooding (taking into account wider sustainable development objectives) the exception test may have to be applied. The need for the test will depend on the potential vulnerability of the site and of the vulnerability of the development proposed (as set out in Annex 3 of NPPF; also PPG Table 2 and Table 3) (NPPF para. 163). For example, the exception test need not be applied for less vulnerable development in any flood zone, or for more vulnerable development in flood zones 1 or 2.
- Where the exception test must be applied, application of the test for development proposals at the application stage should be informed by a site-specific flood risk assessment. For the test to be passed it should be demonstrated that: (a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; (b) 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 (NPPF para. 164). Both elements of the test should be satisfied for the development to be permitted (NPPF para. 165).
- Development should not increase flood risk elsewhere (NPPF para. 167).
- Where appropriate, planning applications should be supported by a site-specific flood risk assessment, and development should only be allowed in areas at risk of flooding where the flood risk assessment (and the sequential and exception tests, as required), demonstrate that: a) within the site, the most vulnerable development is located in areas of lowest flood risk (unless there are overriding reasons to prefer a different location); b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment; c) the development incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate; d) any residual (flood) risk can be safely managed; and e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan (NPPF para.167).
- NPPF para. 167 references Footnote 55. The footnote states that a site-specific flood risk assessment should be provided for all development in flood zones 2 and 3 [whilst] in flood zone 1, an assessment should accompany all proposals involving: sites of 1 ha or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use (NPPF para. 167).
- Applications for some minor development and changes of use should not be subject to the sequential or exception tests (NPPF para. 168). The exceptions are stated in Footnote 56.
- Major development should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems should: a) take account of advice from the lead local flood authority; b) have appropriate proposed minimum operational standards; c) have maintenance

arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and d) where possible, provide multifunctional benefits (NPPF para. 169).

Guidance on application of the sequential and exception test is provided in the PPG. For example:

- This general approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim should be to keep development out of medium and high flood risk areas (flood zones 2 and 3) and other areas affected by other sources of flooding where possible (PPG para. 18).
- Where there are no reasonably available sites in flood zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in flood zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in flood zones 1 or 2 should the suitability of sites in flood zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the exception test if required. Within each flood zone, surface water and other sources of flooding also need to be taken into account in applying the sequential approach to the location of development (PPG para. 19).
- The sequential test does not need to be applied for individual developments on sites which have been allocated in development plans through the sequential test, or for applications for minor development or change of use (except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site) (PPG para. 33)
- It should not normally be necessary to apply the sequential test to development proposals in flood zone 1, unless the Strategic Flood Risk Assessment for the area, or other more recent information, indicates there may be flooding issues now or in the future (for example, through the impact of climate change) (PPG para. 33).
- For individual planning applications where there has been no sequential testing of the allocations in the development plan, or where the use of the site being proposed is not in accordance with the development plan, the area to apply the sequential test across will be defined by local circumstances relating to the catchment area for the type of development proposed. For some developments this may be clear, for example, the catchment area for a school. In other cases it may be identified from other Local Plan policies, such as the need for affordable housing within a town centre, or a specific area identified for regeneration. For example, where there are large areas in flood zones 2 and 3 (medium to high probability of flooding) and development is needed in those areas to sustain the existing community, sites outside them are unlikely to provide reasonable alternatives (PPG para. 33).
- When applying the Sequential Test, a pragmatic approach on the availability of alternatives should be taken. For example, in considering planning applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere. For nationally or regionally important infrastructure the area of search to which the Sequential Test could be applied will be wider than the local planning authority boundary.
- Any development proposal should take into account the likelihood of flooding from other sources, as well as from rivers and the sea. The sequential approach to locating development in areas at lower flood risk should be applied to all sources of flooding, including development in an area which has critical drainage problems, as notified to the local planning authority by the Environment Agency, and where the proposed location of the development would increase flood risk elsewhere (PPG para. 33).

3.2 Local Planning Policy and Guidance

The Kirklees Local Plan was adopted on 27 February 2019. The following policies are relevant in respect of flood risk and drainage:

- Policy LP5: Masterplanning Sites Part M states, in part, that masterplans will be expected to provide appropriate measures to mitigate flood risk and ensure that the development is resilient to the potential impacts of climate change.
- Policy LP24: Design Part D vii states, in part, that proposals should promote good design by ensuring high levels of sustainability through designing buildings that are resilient and resistant to flood risk.
- Policy LP27: Flood Risk is summarised as follows:
 - Proposals for development which require a Sequential Test will need to demonstrate that development has been directed to areas at the lowest probability of flooding, following a sequential risk-based approach
 - Proposals within flood zone 3ai will be assessed in accordance with national policies relating to flood zone 3a but with all of the following additional restrictions:
 - No new highly vulnerable or more vulnerable uses will be permitted;
 - Less vulnerable uses may only be permitted where the sequential test has been passed and
 - where extensions are linked operationally to an existing business or
 - where redevelopment of a site provides buildings with the same or a smaller footprint
 - All proposals will be expected to include flood mitigation measures which should be identified and considered through a site-specific flood risk assessment
 - Development will not be permitted within the functional floodplain
- Policy LP28: Drainage is summarised as follows:
 - SuDS will be used to assist in achieving the following:
 - Greenfield runoff rates should not be exceeded
 - Brownfield sites should have a minimum 30% reduction in runoff where previous positive surface water connections from the site can be proven. New connections will be subject to at least greenfield restrictions
 - No negative impact on local water quality
 - Consider whether proposed open spaces and green infrastructure within sites can contribute to sustainable drainage of the site
 - Local conditions may require a lower runoff rate to be agreed to reflect volume control, local surface water risks, watercourse capacity and flood risk further downstream
 - There will be a general presumption against pumping surface water. Also demonstrate that the surface water management solution is designed for the lifetime of the development including maintenance arrangements
 - Accommodate flow paths by ensuring paths are designed to avoid buildings and curtilages
 - Development will only be permitted if water supply and waste water infrastructure is available or can be co-ordinated to meet the demand from the new development.

3.3 Legislation Originating from the European Union

The Water Framework Directive (WFD) provides a legal framework for the protection, improvement and sustainable use of inland surface waters, groundwater, transitional waters, and coastal waters across England, and seeks to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters
- Achieve at least 'good' status for all waterbodies by 2015
- Promote the sustainable use of water as a natural resource
- Conserve habitats and species that depend directly on water
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Contribute to mitigating the effects of floods and droughts.

The WFD applies to any proposed development which has the potential to impact on a waterbody. Where this is the case, the Environment Agency may require evidence demonstrating that the proposed development does not compromise the aims of the WFD.

3.4 Land Drainage Consent

Land drainage consent may be required from the lead local flood authority (LLFA) or drainage board for work to an ordinary watercourse.

Undertaking activities controlled by local byelaws also requires the relevant consent.

4 REVIEW OF FLOOD RISK

4.1 Historical Records of Flooding

The Environment Agency Recorded Flood Outlines map⁴ (not shown) and the SFRA do not hold any records of historic flooding within the vicinity of the site.

However, Kirklees Council has advised by way of a pre-application consultation response letter (ref: 2020/20447; 5 December 2020) that it holds several records of surface water flooding incidents within the vicinity of the site including on Lindley Moor Road adjacent to the site due to blocked gullies, on Weatherhill Road to the east of the site, and to the rear gardens on Ainley Close and Weatherhill Crescent to the south/south-east of the site.

4.2 Flood Zone Designation

The Environment Agency Flood Map for Planning (Rivers and Sea)⁵ (Error! Reference source not found.) indicates the site to be located in flood zone 1. Table 1 of the PPG defines flood zones in the vicinity of the site as follows⁶:

- Flood zone 1: Low Probability. Land having a less than 1 in 1,000 annual probability of river or sea flooding
- Flood zone 2: Medium Probability. Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding
- Flood zone 3a: High Probability. Land having a 1 in 100 or greater annual probability of river flooding or a 1 in 200 or greater annual probability of sea flooding
- Flood zone 3b: Functional Floodplain. Land where water has to flow or be stored in times of flood.

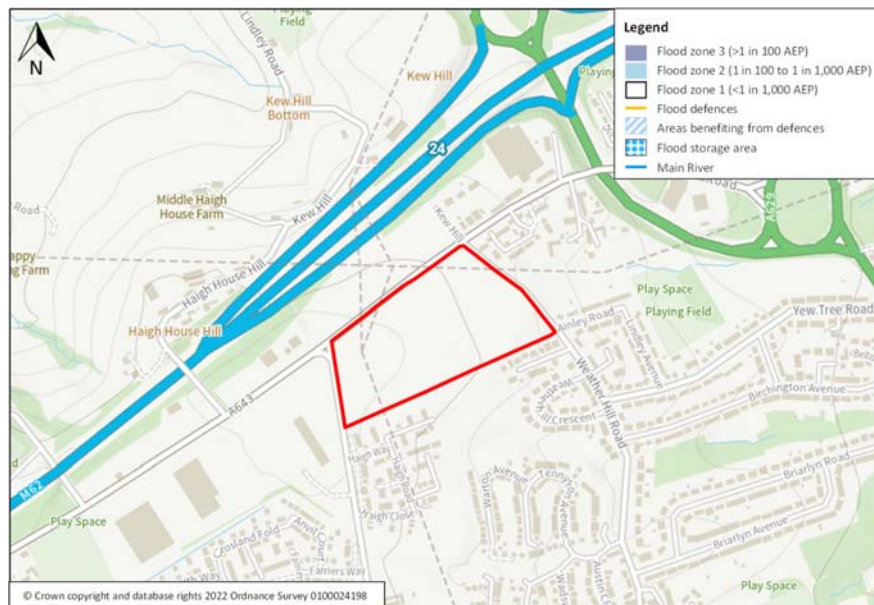


Figure 3: Flood Map for Planning

Source: gov.uk website; Accessed: February 2022

⁴ <https://environment.data.gov.uk/DefraDataDownload/?mapService=EA/RecordedFloodOutlines&Mode=spatial>

⁵ <https://flood-map-for-planning.service.gov.uk/>

⁶ <https://www.gov.uk/guidance/flood-risk-and-coastal-change#flood-zone-and-flood-risk-tables>

The eastern portion of the site is located approximately 15 m and 33 m above Unnamed Watercourses (1) and (2) respectively, with the western portion of the site located approximately 5 m above the unnamed drain. On this basis, and given that the site is located within flood zone 1 on the Flood Map for Planning, the site is assessed not to be at risk of flooding from fluvial sources.

4.3 Flood Risk from Surface Water

The Flood Risk from Surface Water map (**Figure 4**) indicates that the site is at 'Very Low' risk of flooding from surface water.

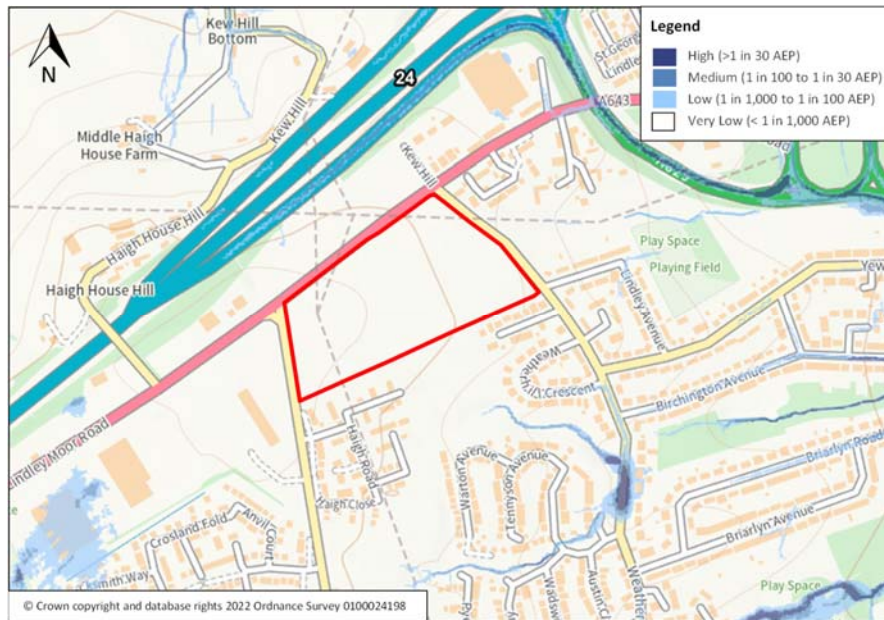


Figure 4: Flood Risk from Surface Water

Source: gov.uk website; Accessed: February 2022

Notwithstanding this, given the historic flooding issues reported by the lead local flood authority outlined in **Section 4.1**, 2D direct rainfall-runoff hydraulic modelling has been undertaken by Weetwood for the 1 in 100 AEP and 1 in 100 AEP event plus climate change events to determine the overland flow routes of surface water and to inform the drainage proposals so that the development proposals will not increase off-site flood risk.

The model outputs are presented in **Appendix C**. The outputs indicate the following:

- The majority of surface water runoff from the site flows in an easterly direction towards Unnamed Watercourse (1)
- Runoff adjacent to the south-eastern boundary of the site flows in a southerly direction along Weatherhill Road away from the site boundary.
- Runoff from the south-west corner of the site flows in a south-easterly direction, following the natural topography of the land to a localised valley that bisects Weatherhill Crescent and Warton Avenue.

No accumulation of surface water on the site is indicated. This is due to the sloping terrain and absence of localised depression.

4.4 Flood Risk from Reservoirs, Canals and Other Artificial Sources

There are no canals or other impounded waterbodies located within the immediate vicinity of the site. The Flood Risk from Reservoirs map indicates that the site is not at risk of flooding from such sources. The site is therefore assessed not to be at risk of flooding from reservoirs, canals or other artificial sources.

4.5 Flood Risk from Groundwater

The JBA Groundwater Flood Risk Indicator map (**Figure 5**) indicates that the site is at 'Negligible' and 'Very Low' risk of flooding from groundwater during a 1 in 100 AEP groundwater flooding event.

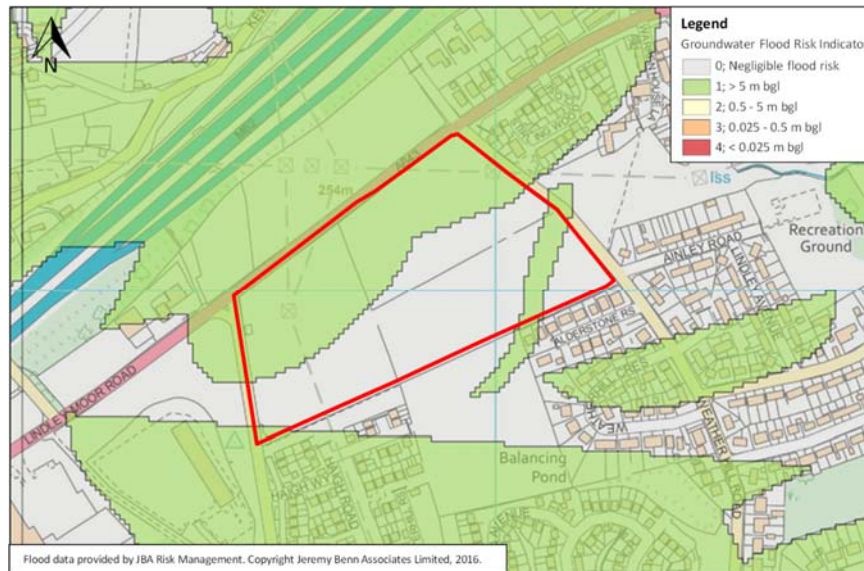


Figure 5: JBA Groundwater Flood Risk Indicator Map

Source: Blue Sky Maps; Accessed: February 2022

4.6 Sequential Test and Exception Test

The site is assessed as being at very low risk of flooding from all known sources. As such, the proposals satisfy the requirements of the sequential test and the exception test need not be applied. Nevertheless, the proposals are still required to meet the requirements for site specific flood risk assessments.

4.7 Flood Risk Mitigation Measures

The risk of flooding to the proposed development is assessed to be very low from all known sources. As such, no specific mitigation measures are required. However, finished floor levels of buildings should be set at a minimum of 0.15 m above adjacent ground levels following reprofiling of the site.

This will, subject to the implementation of an appropriately designed surface water drainage scheme (**Section 6**), enable any potential overland flows to be conveyed safely across the site without affecting property in accordance with the approach promoted by government policy⁷.

⁷ Making Space for Water, Taking forward a new Government strategy for flood and coastal erosion risk management in England, March 2005, Dept for Environment, Food and Rural Affairs

5 FOUL WATER MANAGEMENT

5.1 Existing Assets

Yorkshire Water public sewer records (**Appendix D**) indicate that there are no wastewater assets location on site. The following wastewater assets are present within the surrounding area:

- A 225 mm diameter public combined sewer is located adjacent to the south-eastern corner of the site in Weatherhill Road and flows in a southerly direction
- A 150 mm diameter public foul water sewer is located approximately 75 m to the east of the site and flows in an easterly direction
- A 150 mm diameter Section 104 foul water sewer is located in Stirling Wood Close and flows into the aforementioned sewer.

5.2 Foul Water Loadings

The anticipated domestic foul flows from the site have been calculated in accordance with British Flows and Loads. The expected total peak flow rate from the development would be 8.0 l/s.

5.3 New Connections

Yorkshire Water has advised, by way of a pre-planning sewerage enquiry response (**Appendix E**), that there is existing capacity in the local foul sewerage network to receive and treat domestic foul water from the proposed development and that foul water can discharge without restriction into the 225 mm diameter combined sewer in Weatherhill Road at a point to the south-east of the site.

6 SURFACE WATER MANAGEMENT

6.1 Existing Assets

Yorkshire Water public sewer records (**Appendix D**) indicate that a 150 mm diameter public surface water sewer is located approximately 75 m to the east of the site. The sewer flows from Stirling Wood Close and outfalls into the unnamed watercourse (1).

6.2 Surface Water Drainage at the Existing Site

The site is undeveloped greenfield. Given the sloping nature of the site and ground conditions, surface water runoff would be expected to slowly infiltrate where conditions allow and flow overland in a direction determined by topography, with the majority of the site flowing in an easterly direction.

The greenfield surface water runoff rates for the site, calculated using the ICP SUDS method within MicroDrainage are presented in **Table 1**. Details of the input parameters and the output results are provided in **Appendix F**.

Table 1: Greenfield Runoff Rate

AEP of Rainfall Event	Greenfield Runoff Rate (l/s/ha)	Greenfield Runoff Rate for 6.26 ha Site (l/s)
1 in 1	2.9	18.2
QBAR	3.4	21.3
1 in 30	6.0	37.6
1 in 100	7.1	44.4

6.3 Surface Water Drainage at the Developed Site

6.3.1 Disposal of Surface Water

In accordance with the PPG⁸, surface water runoff should be disposed of according to the following hierarchy: Into the ground (infiltration); To a surface water body; To a surface water sewer, highway drain, or another drainage system; To a combined sewer.

Kirklees Council has advised by way of a pre-application consultation response letter (ref: 2020/20447; 5 December 2020) that the disposal of surface water via infiltration is not viable due to the following reasons:

- Perched water tables within the immediate vicinity of the site
- Reports of flooding in the locality due to rapid runoff and a fast-responding catchment; and
- The site has a 1 in 10 gradient in the eastern portion.

It is subsequently proposed to direct all runoff from the developed site to the Unnamed Watercourse (1) to the east of the site via a connection to the downstream manhole chamber MH2103 subject to Yorkshire Water approval.

6.3.2 Post Development Impermeable Area and Peak Flow Control

Kirklees Council LLFA has advised by way of a pre-application consultation response letter (ref: 2020/20447; 5 December 2020) that peak flows may be restricted to 5.0 l/s/ha for the developed area that would naturally drain towards the Unnamed Watercourse (1) to the east of the site. Areas draining in other directions and landscaped areas that continue to perform a greenfield discharge should be discounted from calculations.

⁸ Paragraph 080, Reference ID: 7-080-20150323

Based on the topographic survey (**Appendix B**), the area of land which currently falls towards the Unnamed Watercourse (1) is calculated to be 4.291 ha (see **Appendix G**). The area of impermeable surfaces within the proposed development is calculated to be 3.862 ha (i.e., 90% of the development platform).

It is therefore proposed to restrict surface water runoff from impermeable surfaces to a peak flow rate of 19.3 l/s post development.

6.3.3 Volume Control

Where reasonably practicable, for sites which have been previously developed, the runoff volume from the proposed development to any highway drain, sewer or surface water body in the 1 in 100 AEP, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

As outlined within the CIRIA SuDS Manual 2015 extra runoff volumes in extreme events may be managed by releasing all runoff (above the 1 in 1 AEP event) from the site at a maximum rate of 2 l/s/ha or QBAR, whichever is the higher value.

It is proposed to restrict peak discharge rates to 19.3 l/s in up to the 1 in 100 AEP event, including an allowance for climate change, which is similar to the QBAR rate for 90% impermeable surfaces for the whole site (19.2 l/s).

6.3.4 Attenuation Storage

Attenuation storage will be provided to store surface water runoff generated across roofs and hardstanding.

The attenuation storage facilities for the detailed planning extents (access road and Unit P) and the outline planning extents (Units A – N) have been modelled using the Network (**Appendix H**) and Source Control (**Appendix I**) modules of MicroDrainage respectively.

The required storage volumes have been sized to store the 1 in 100 AEP rainfall event including a 40% increase in rainfall intensity to allow for climate change in accordance with Environment Agency guidance⁹.

A preliminary surface water drainage layout is provided in **Appendix J**.

Access Road and Unit P (Detailed Planning Application)

Assuming a peak discharge rate of 19.3 l/s, a total storage volume of 2,338.6 m³ would be required. It should be noted that the storage volume also allows for a nominal discharge rate of 3.0 l/s from specific units within the outline planning extent.

The storage volume serving the access road and Unit P could be accommodated within an attenuation basin (1,636.1 m² x 1.0 m deep, 1,302.8 m³ capacity), a pre-cast concrete tank (300.0 m² x 1.5 m deep, 450.0 m³ capacity), a geo-cellular tank (418.0 m² x 1.6 m deep, 635.4 m³ capacity) and the proposed pipe and manhole network.

Units A – N (Outline Planning Application)

Assuming a peak discharge rate of 3.0 l/s, the following storage volumes would be required:

- Unit A: 108.2 m³, utilising a geo-cellular storage tank (150.0 m² x 0.8 m deep, 114.0 m³ capacity)
- Unit B: 115.7 m³, utilising a geo-cellular storage tank (80.0 m² x 1.6 m deep, 121.6 m³ capacity)
- Unit C: 436.9 m³, utilising a geo-cellular storage tank (600.0 m² x 0.8 m deep, 456.0 m³ capacity)
- Unit D-E: 377.1 m³, utilising a geo-cellular storage tank (550.0 m² x 0.8 m deep, 418.0 m³ capacity)

⁹ Flood Risk Assessments: climate change allowances (<https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>)

- Unit F: 479.8 m³, utilising a geo-cellular storage tank (650.0 m² x 0.8 m deep, 494.0 m³ capacity)
- Unit G: 503.1 m³, utilising a geo-cellular storage tank (700.0 m² x 0.8 m deep, 532.0 m³ capacity)
- Unit H-N: 850.9 m³, utilising a geo-cellular storage tank (1.150.0 m² x 0.8 m deep, 874.0 m³ capacity)

It should be noted that the calculations for the outline planning extents assume that all storage is provided within the formal attenuation storage facilities; with no storage being provided in the proposed pipe network. As such, the volumes of storage presented are likely to be an overestimate.

6.3.5 Exceedance Routes

Flows resulting from rainfall in excess of the 1 in 100 AEP rainfall event including an allowance for climate change will be managed in exceedance routes, as illustrated in **Appendix J**. It is assumed that as the development proposals progress, the design of the site would ensure flood flows are directed towards carriageways, with the site being profiled to ensure that flood flows are directed away from built development.

6.3.6 Pollution Control

Table 26.2 of the CIRIA SuDS Manual and Table G3.1 of the Statutory Standards for SuDS identifies highly frequented lorry approaches to industrial estates, commercial yard and delivery areas, and commercial/industrial roofs as having a high to medium to low pollution hazard level.

Table 26.2 of the CIRIA SuDS Manual 2015 indicates that the pollution hazard indices for total suspended solids, hydrocarbons and metals are 0.80, 0.80 and 0.90, and 0.70, 0.60 and 0.70, and 0.3, 0.2 and 0.05 for highly frequented lorry approaches to industrial estates, commercial yard and delivery areas, and commercial/industrial roofs respectively.

Vegetated filter strips can remove coarse sediments and enables pollutants to be easily seen and trapped early in the treatment train. Table 26.3 of the CIRIA SuDS Manual 2015 indicates that the SuDS mitigation indices for filter strips for total suspended solids, hydrocarbons and metals are 0.40, 0.40 and 0.50 respectively.

Attenuation basins can provide water quality benefits via the settlement of pollutants in still or slow moving water, adsorption by the soil, and biological activity. Table 26.3 of the CIRIA SuDS Manual 2015 indicates that the SuDS mitigation indices for attenuation basins for total suspended solids, hydrocarbons and metals are 0.50, 0.50 and 0.60 respectively.

The use of catchpit manholes, silt traps in gullies/channel drains and the use of Class 1 bypass separators within each unit will prevent contaminants discharging into the downstream receptor.

The potential for additional SuDS features to be utilised at the site would be investigated further at the detailed design stage.

6.3.7 Adoption and Maintenance of SuDS

The pipe network, including the attenuation basin, designed in accordance with the Design and Construction Guidance¹⁰, may be adopted by the sewerage undertaker.

Pipe networks and SuDS elements within the curtilage of individual units would be the responsibility of the owner of the property.

SuDS in open spaces may be maintained by a management company.

An indicative maintenance schedule is presented in **Table 2**.

¹⁰ Design and Construction Guidance for foul and surface water sewers offered for adoption under the Code for adoption agreements for water and sewerage companies operating wholly or mainly in England ("the Code"), Approved Version 2.0, 10 March 2020

Table 2: Maintenance Requirements

Schedule	Required action	Frequency
Attenuation Basin		
Regular maintenance	Remove litter and debris	Monthly
	Cut grass	Monthly during grow season Or as required)
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect 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
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets/outlets	Annually (or as required)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every two years, or as required
	Remove sediments from inlets/outlets and main basin when required	
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	
	Repair/rehabilitation of inlets/outlets	
	Relevel uneven surface and reinstate design levels	
Geo-cellular attenuation storage tank		
Regular maintenance	Inspect and identify any areas that are not operating correctly	Monthly for 3 months, then annually
	Remove debris from the catchment surface	Monthly
	Remove sediment from internal forebays	Annually, or as required
Remedial action	Repair inlet/outlet and vents	As required
Monitoring	Inspect catchpit manholes and note rate of sediment accumulation	Monthly in the first year and then annually
	Inspect inlet/outlet and vents to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years, or as required
Filter strip		
Regular maintenance	Remove sediments, litter, surface debris and weeds	Monthly or as required
	Mow amenity grass access paths and verges surrounding the filter strips at 35-60 mm minimum and 75 mm maximum	
	Mow filter strips at 100 mm with 150 mm maximum to filter and control runoff, removing first and last cut in season, and if grass is longer than 150 mm removing cuttings to wildlife piles on site	
Occasional maintenance	Where there is a build-up of silt on the filter strip, i.e. 50 mm or more above the design level, then remove and spread on site	As required
	Undertake when ground is damp in autumn or early spring and transplant turf and overseed to original design levels	
	Spread excavated material on site above SuDS design profile, e.g. top of banks	
Remedial actions	Remove and replace filter material and vegetation above	As required
Flow Control Unit		
Routine maintenance	Remove litter and debris and inspect for sediment accumulation	Six Monthly

Schedule	Required action	Frequency
	Remove sediment from sump	As necessary – Indicated by system inspections
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six Monthly
	Inspect flow control unit and establish appropriate replacement frequencies	Six Monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first year of operation, then every six months

7 SUMMARY AND RECOMMENDATIONS

This report has been prepared on behalf of 2SH Developments and relates to the proposed development of land off Lindley Moor Road, Lindley for mixed-uses.

According to the Flood Map for Planning the proposed development is located outside the 1 in 1,000 AEP flood outline and is therefore defined by the NPPF as being situated within flood zone 1.

The site is assessed as not being at risk of flooding from fluvial sources, surface water, reservoirs, canals or other artificial sources and at a very low risk of flooding from groundwater. As such, the proposals satisfy the requirements of the sequential test and the exception test need not be applied.

This report has demonstrated that the proposed development may be completed in accordance with the requirements of planning policy subject to the following:

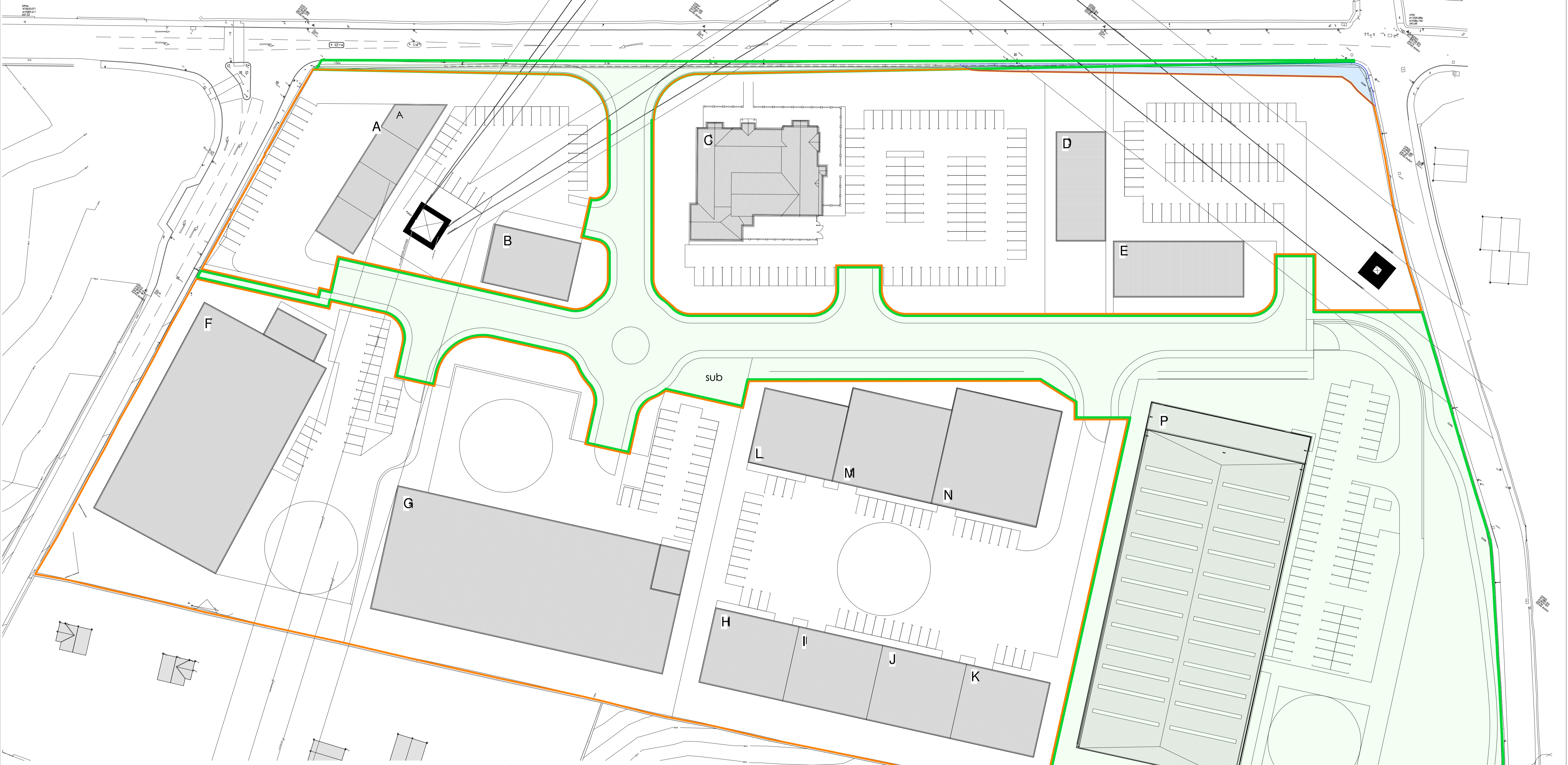
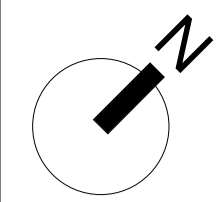
- Finished floor levels to be set 150 mm above adjacent ground levels
- The detailed drainage design to be submitted to and approved by the local planning authority prior to the commencement of development.

The proposals are not expected to impact flood risk elsewhere.

Yorkshire Water has advised that there is existing capacity in the local foul sewerage network to receive and treat the additional foul flows from the proposed development.

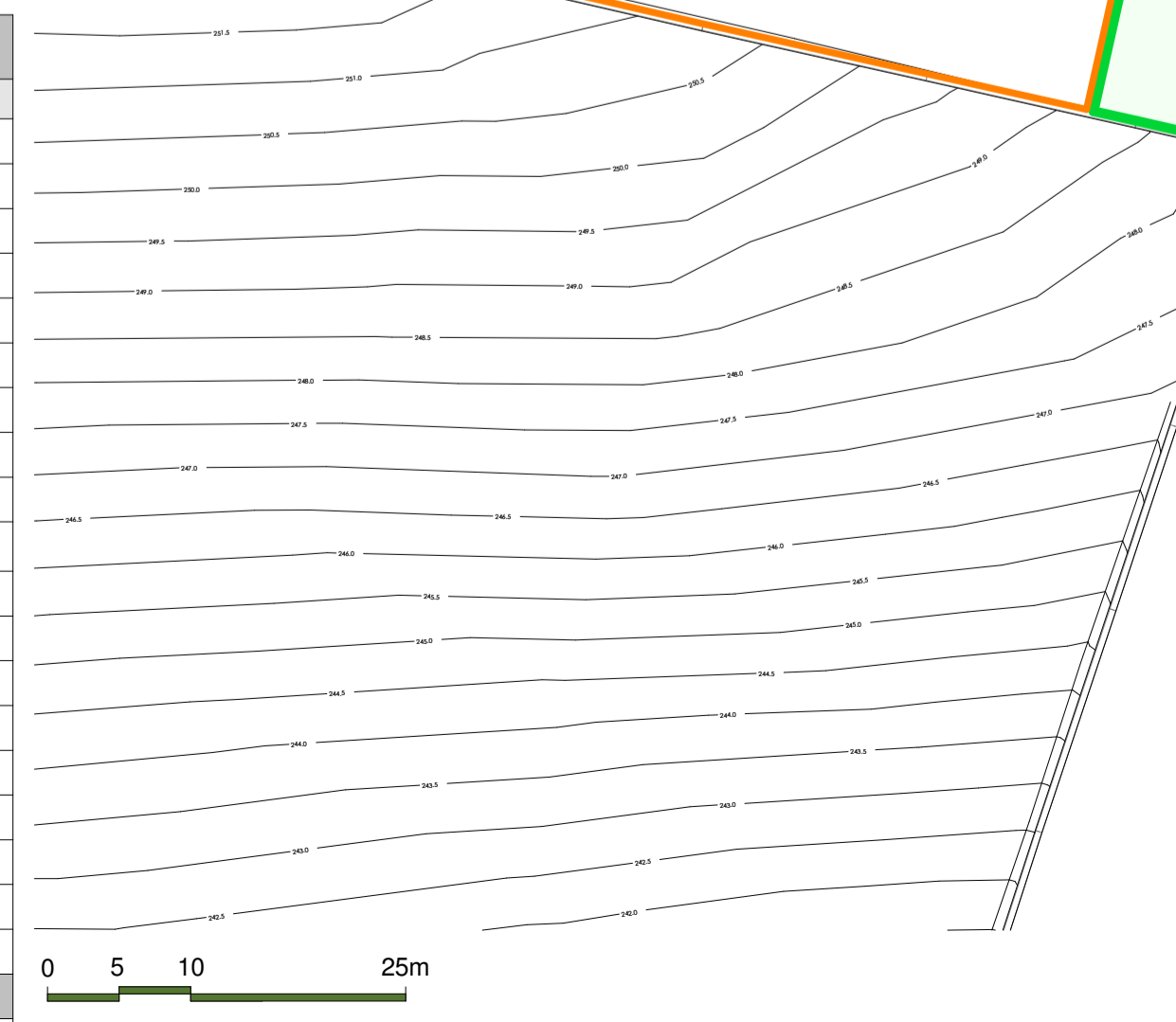
APPENDIX A

Proposed Layout (Partly Illustrative)



Document Status: **S2** FOR PLANNING
MARTIN WALSH ARCHITECTURAL
 Firth Buildings, 99 - 103 Leeds Rd, Dewsbury, WF12 7BU
 t: 01924 464342 e: info@martinwalsh.co.uk w: www.martinwalsh.co.uk
 Project: Proposed Development at Lindley Moor Road, Lindley Huddersfield
 Title: Proposed Site Application Plan
 Client: 2SH Developments
 MWA Project Ref: 6194 Scale: 1:500 Original Paper Size: @A1 Paper Orientation: Landscape Drawn: CS
 File Identifier: LMSH - MWA - ZZ - XX - DR - A - 0004 P2

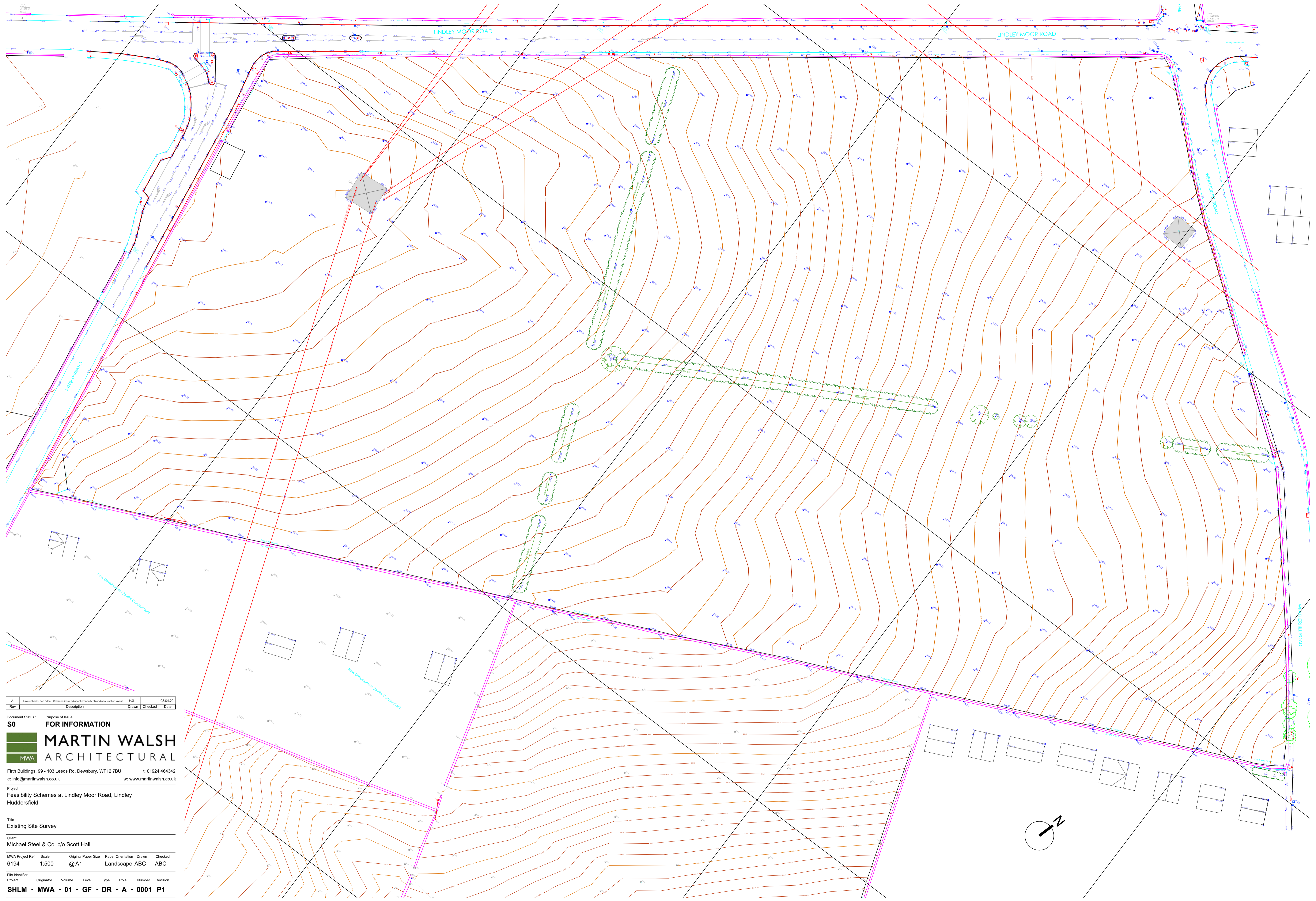
Area Schedule														
	Supermarket		Restaurant		Cafe / Take away		Warehouse		Office		Industrial			
Class Use	A1		A3		A3 / A5		B8		B1		B2			
2020 Class...	E (a)		E (b)		A3 / A5		B8		E (g)		B2		Total sq/m	Total sq/ft
	sq/m	sq/ft	sq/m	sq/ft	sq/m	sq/ft	sq/m	sq/ft	sq/m	sq/ft	sq/m	sq/ft		
A											525	5651	525	5651
B	377	4058											377	4058
C			908	9774									908	9774
D					391	4208							391	4208
E					525	5651							525	5651
F							2330	25079	242	2605			2572	27684
G							2615	28147	192	2066			2807	30213
H							314	3379			157	1689	471	5068
I							314	3379			157	1689	471	5068
J							314	3379			157	1689	471	5068
K							314	3379			157	1689	471	5068
L							314	3379			157	1689	471	5068
M							614	6609			232	2498	846	9107
N							307	3304			614	6609	921	9913
P							910	9795	1019	10968	2840	30569	4769	51332
Total	377	4058	908	9774	916	9859	8346	89829	1453	15639	4996	53763	16996	182932



- Outline Application Boundary
- Detailed Application Boundary
- Not within client ownership

APPENDIX B

Topographic Survey



Rev	Description	HSL	Drawn	Checked	Date
A	Survey Checks, Rec. Plan + Colours positions, adjacent property lines and new junction layout				08.04.20

Document Status: **S0** Purpose of Issue: **FOR INFORMATION**

MARTIN WALSH ARCHITECTURAL

Firth Buildings, 99 - 103 Leeds Rd, Dewsbury, WF12 7BU t: 01924 464342
 e: info@martinwalsh.co.uk w: www.martinwalsh.co.uk

Project: Feasibility Schemes at Lindley Moor Road, Lindley Huddersfield

Title: Existing Site Survey

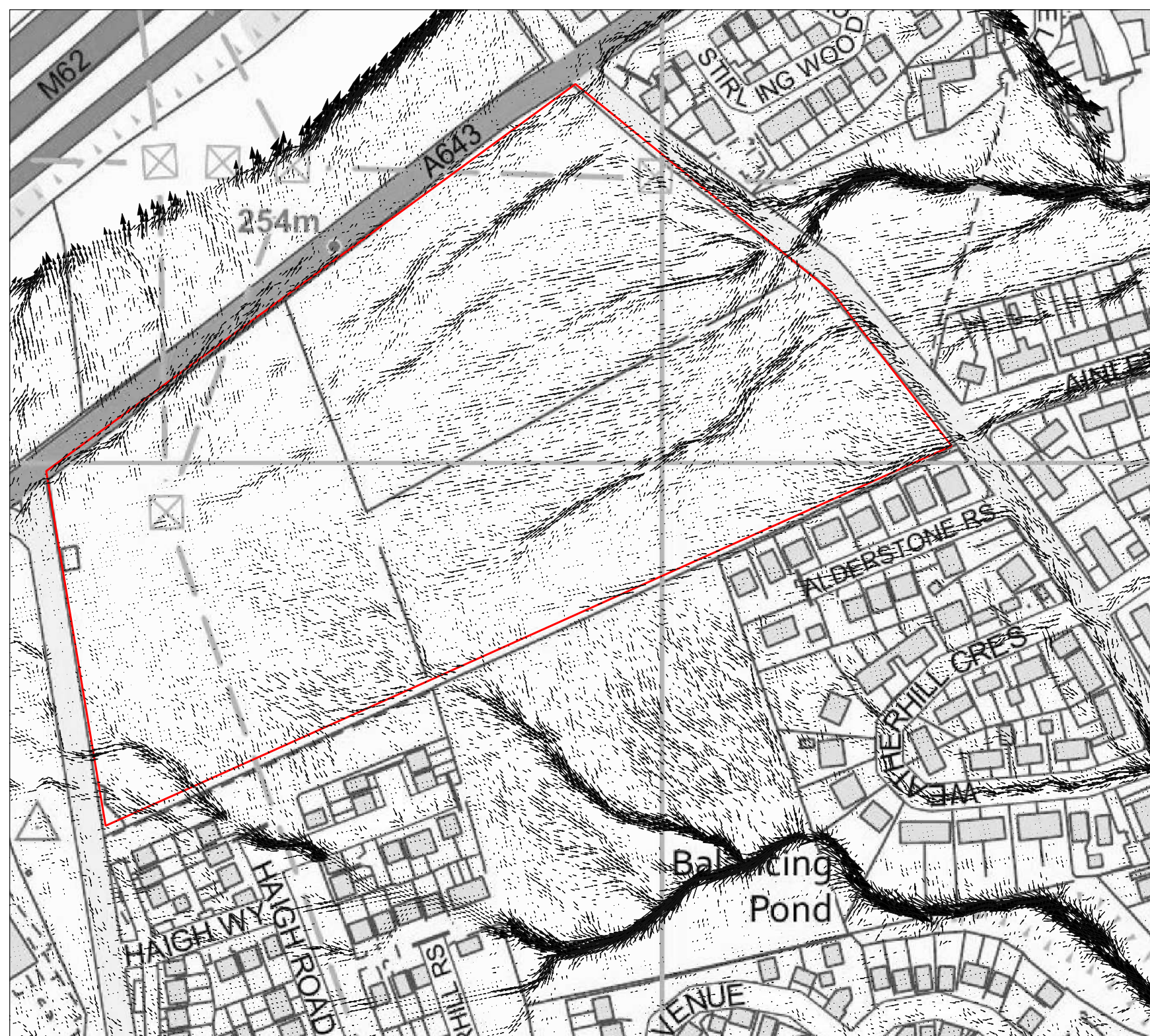
Client: Michael Steel & Co. c/o Scott Hall

MWA Project Ref: 6194 Scale: 1:500 Original Paper Size: @A1 Paper Orientation: Landscape Drawn: ABC Checked: ABC

File Identifier: SHLM - MWA - 01 - GF - DR - A - 0001 P1

APPENDIX C

2D Direct Rainfall Modelling Outputs



Notes:

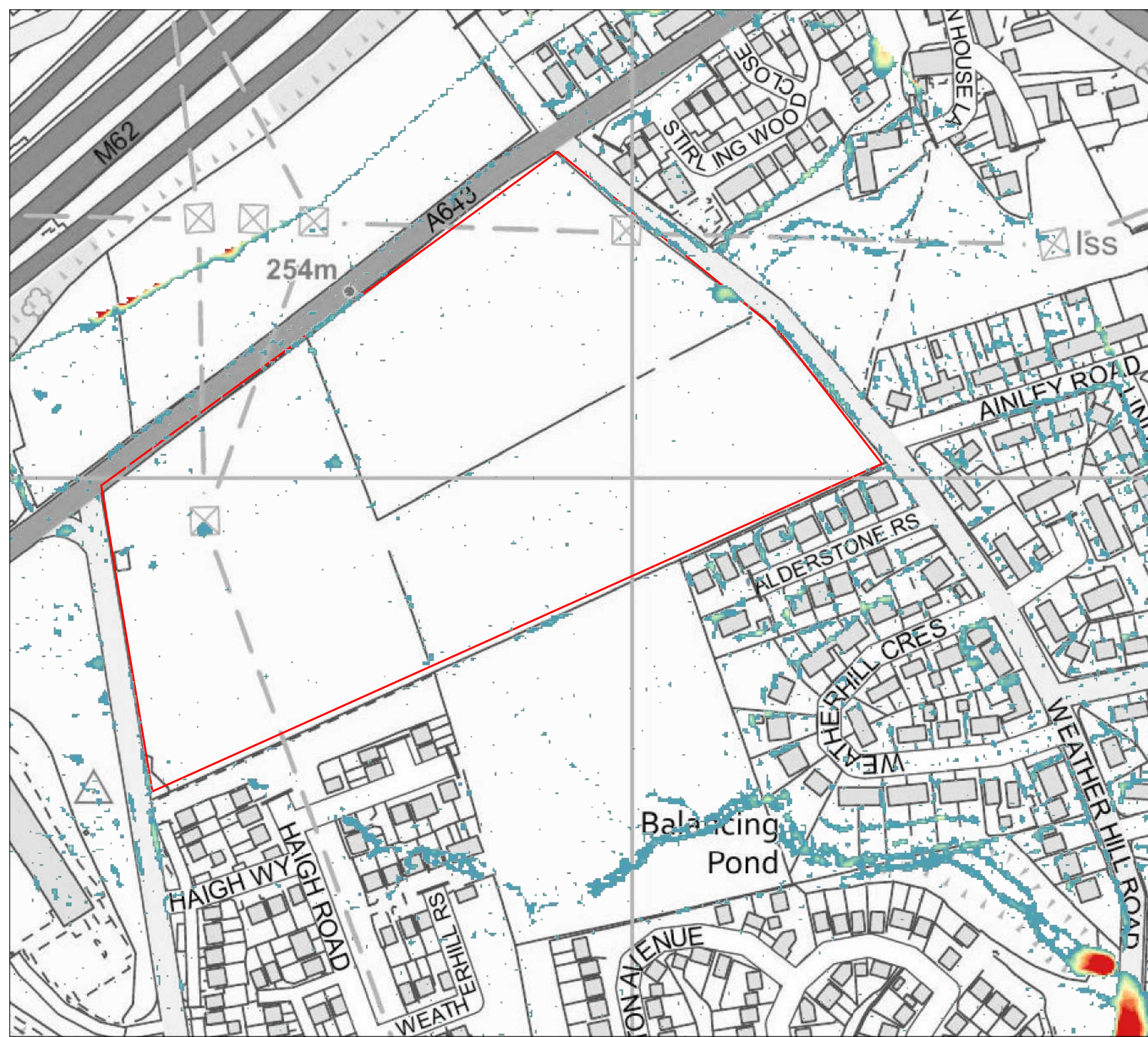
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Legend

→ Flow Direction

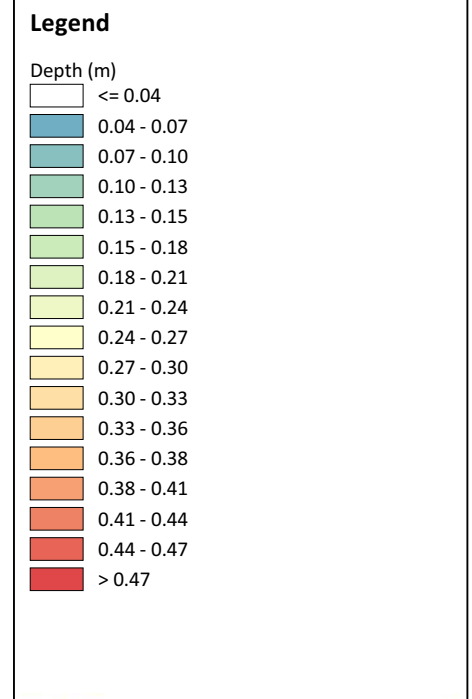
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 Development • Planning • Environment
 Suite C22
 Joseph's Well
 Hanover Walk
 Leeds
 LS3 1AB
 T: 0113 244 1377
 E: info@weetwood.net
 W: www.weetwood.net

Client:			2SH Developments		
Project Title:			Land Off Lindley Moor Road, Lindley, Huddersfield		
Drawing Title:			Baseline Scenario - Flow Pathways 1 in 100 plus climate change (40%) AEP		
Map Orientation:		Scale:			
Drawn:	Checked:	Date:			
MN	KB	28 February 2022			
Project No:	Drawing No:	Rev:			
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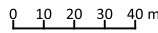


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Client: **2SH Developments**

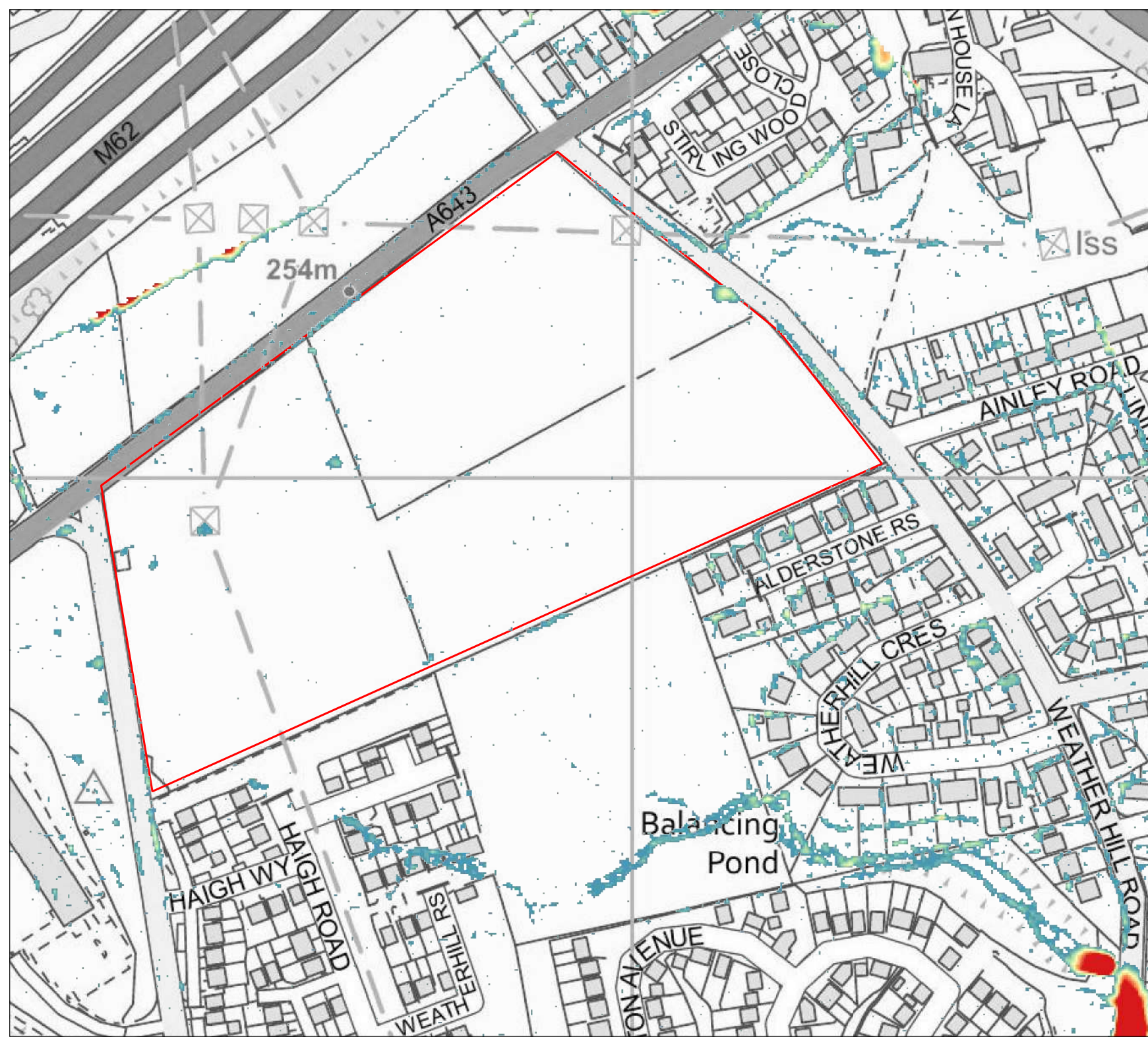
Project Title: **Land Off Lindley Moor Road, Lindley, Huddersfield**

Drawing Title: **Baseline Scenario - Runoff Depths
1 in 30 AEP**

Map Orientation:  Scale: 

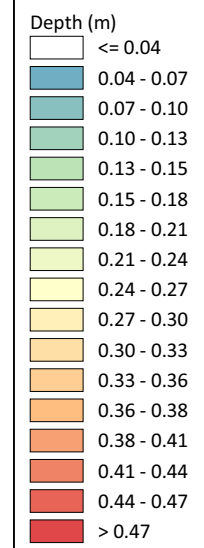
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Project No: 5474	Drawing No: 5474_001_30yr_d	Rev: A
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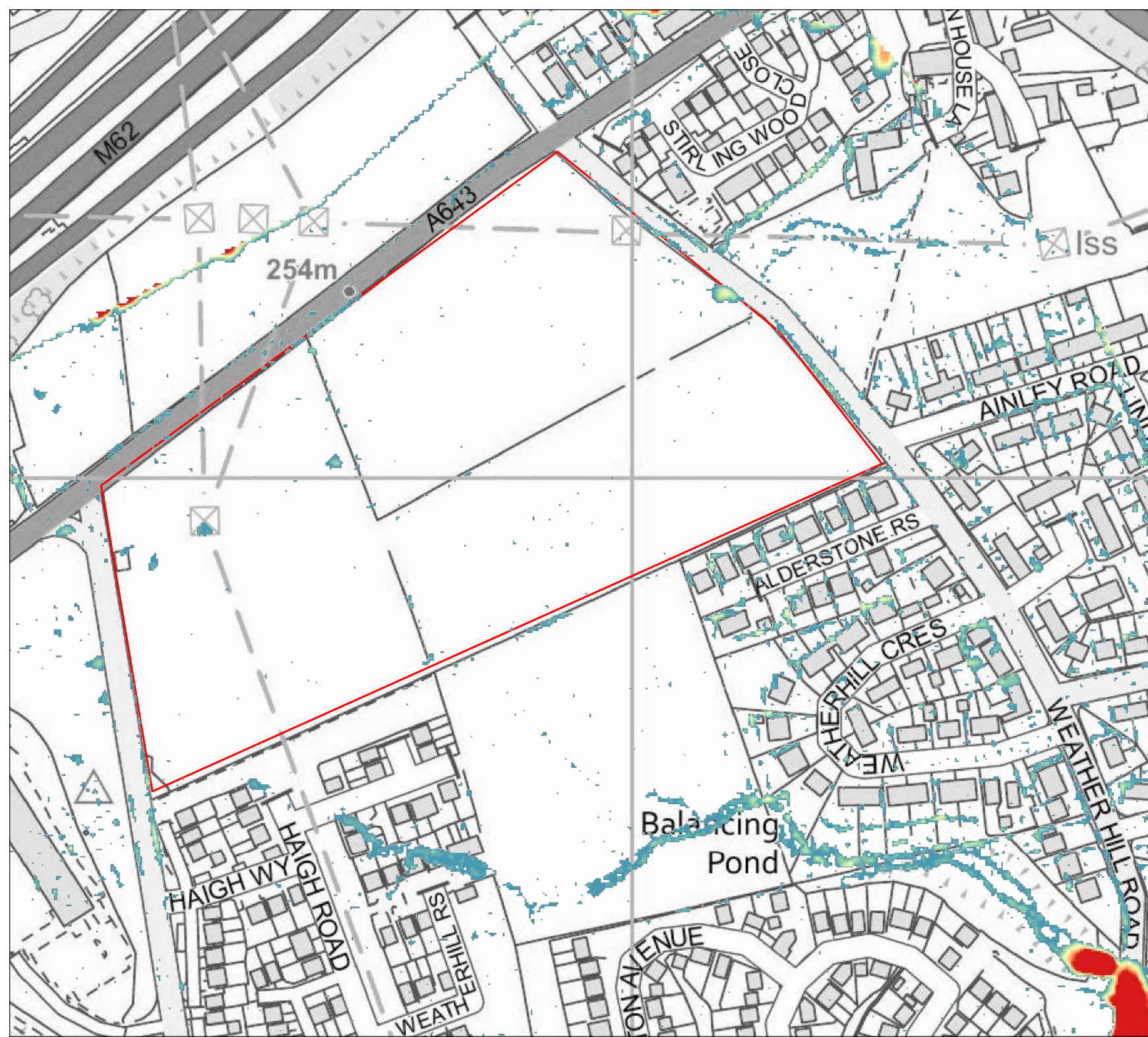
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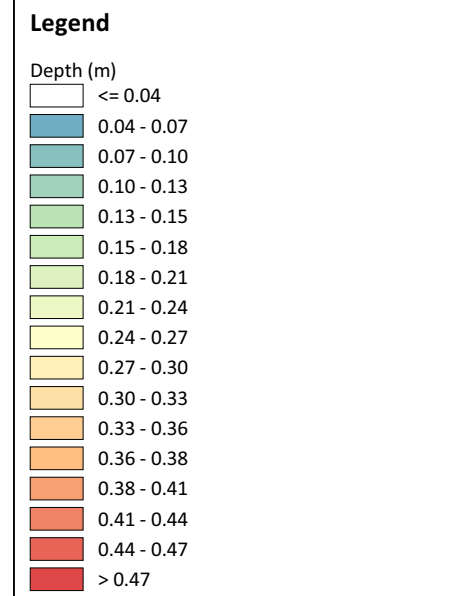


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 Leeds
 LS3 1AB
 T: 0113 244 1377
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 W: www.weetwood.net

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2SH Developments		
Project Title:		
Land Off Lindley Moor Road, Lindley, Huddersfield		
Drawing Title:		
Baseline Scenario - Runoff Depths 1 in 100 AEP		
Map Orientation:		Scale:
Drawn:	Checked:	Date:
MN	KB	1 March 2022
Project No:	Drawing No:	Rev:
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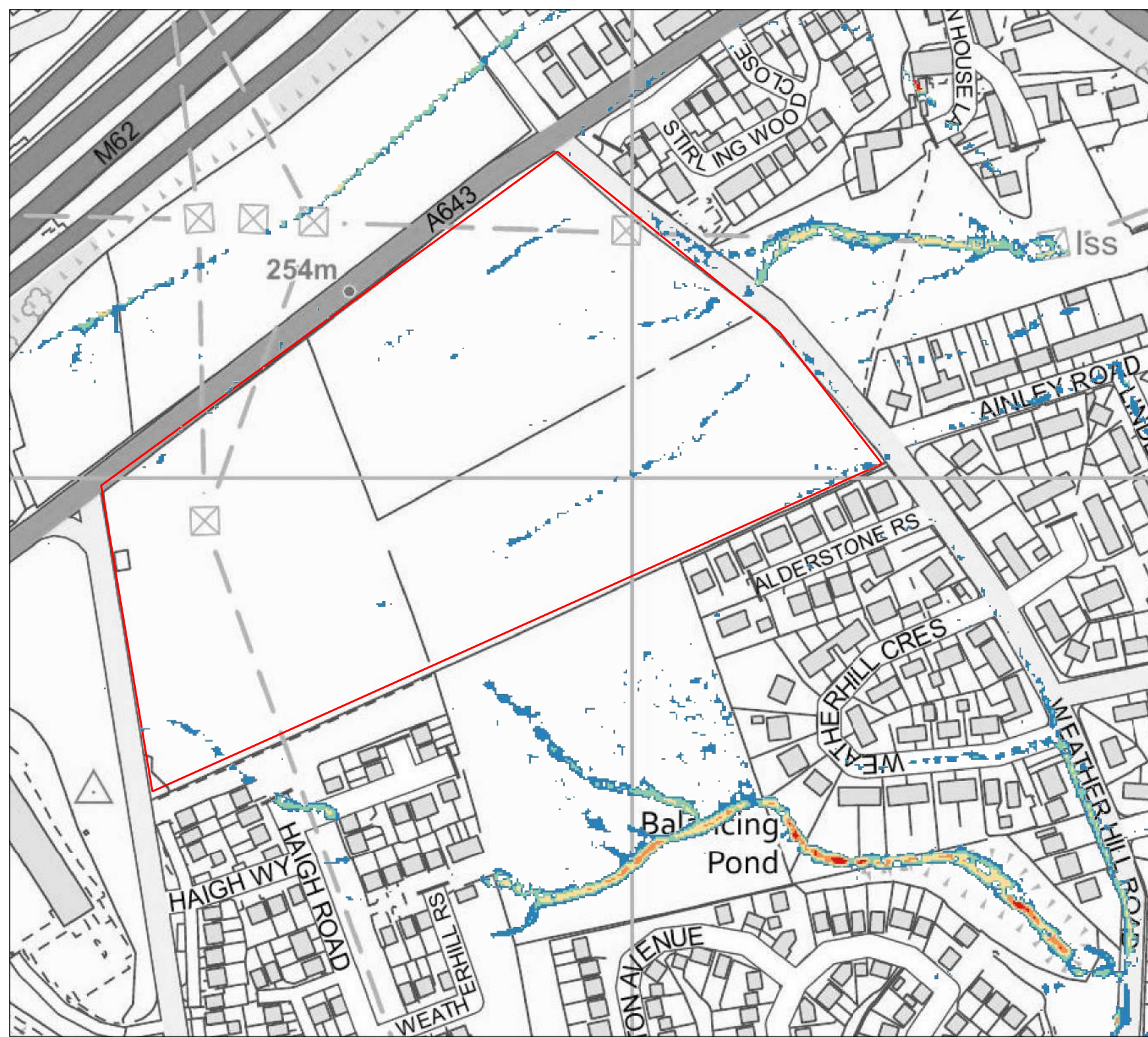


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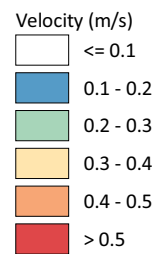
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2SH Developments		
Project Title:		
Land Off Lindley Moor Road, Lindley, Huddersfield		
Drawing Title:		
Baseline Scenario - Runoff Depths 1 in 100 plus climate change (40%) AEP		
Map Orientation:		Scale:
Drawn:	Checked:	Date:
MN	KB	1 March 2022
Project No:	Drawing No:	Rev:
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
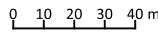


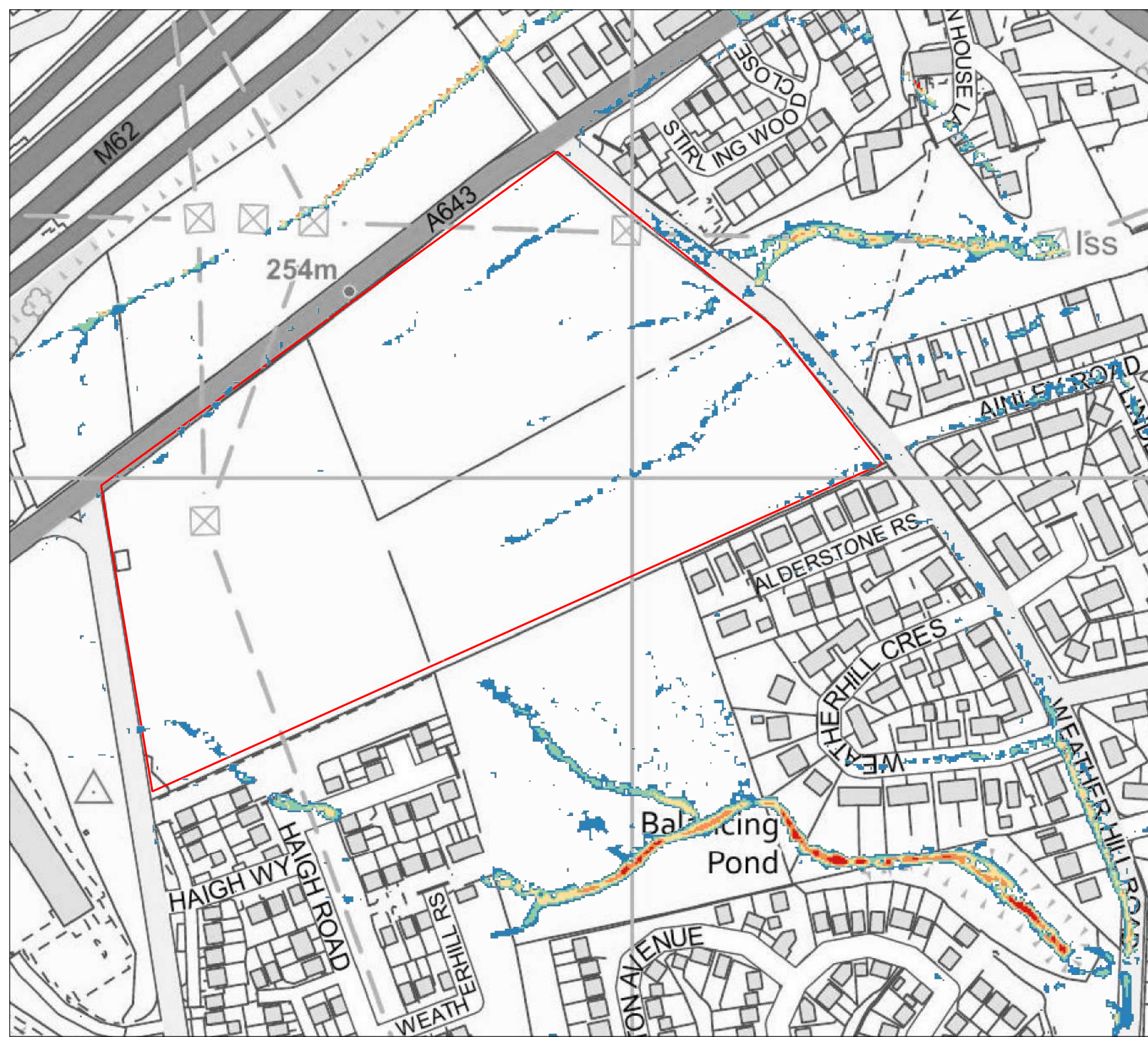
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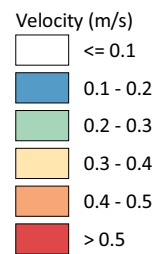
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2SH Developments		
Project Title:		
Land Off Lindley Moor Road, Lindley, Huddersfield		
Drawing Title:		
Baseline Scenario - Runoff Velocity 1 in 30 AEP		
Map Orientation:		Scale:
		
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MN	KB	07 March 2022
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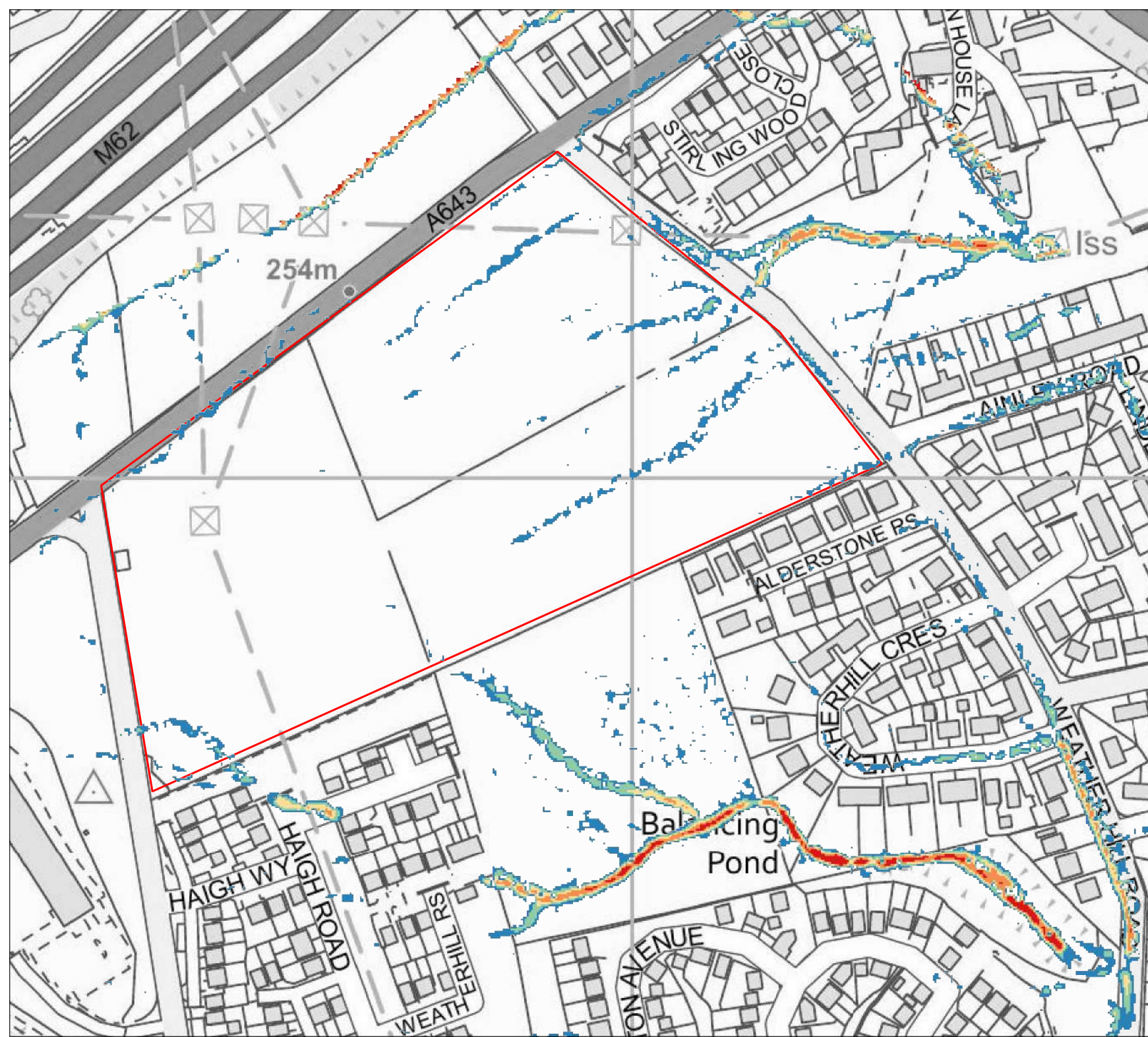
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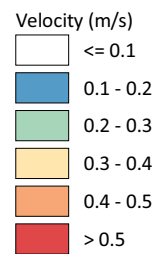
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2SH Developments		
Project Title:		
Land Off Lindley Moor Road, Lindley, Huddersfield		
Drawing Title:		
Baseline Scenario - Runoff Velocity 1 in 100 AEP		
Map Orientation:		Scale:
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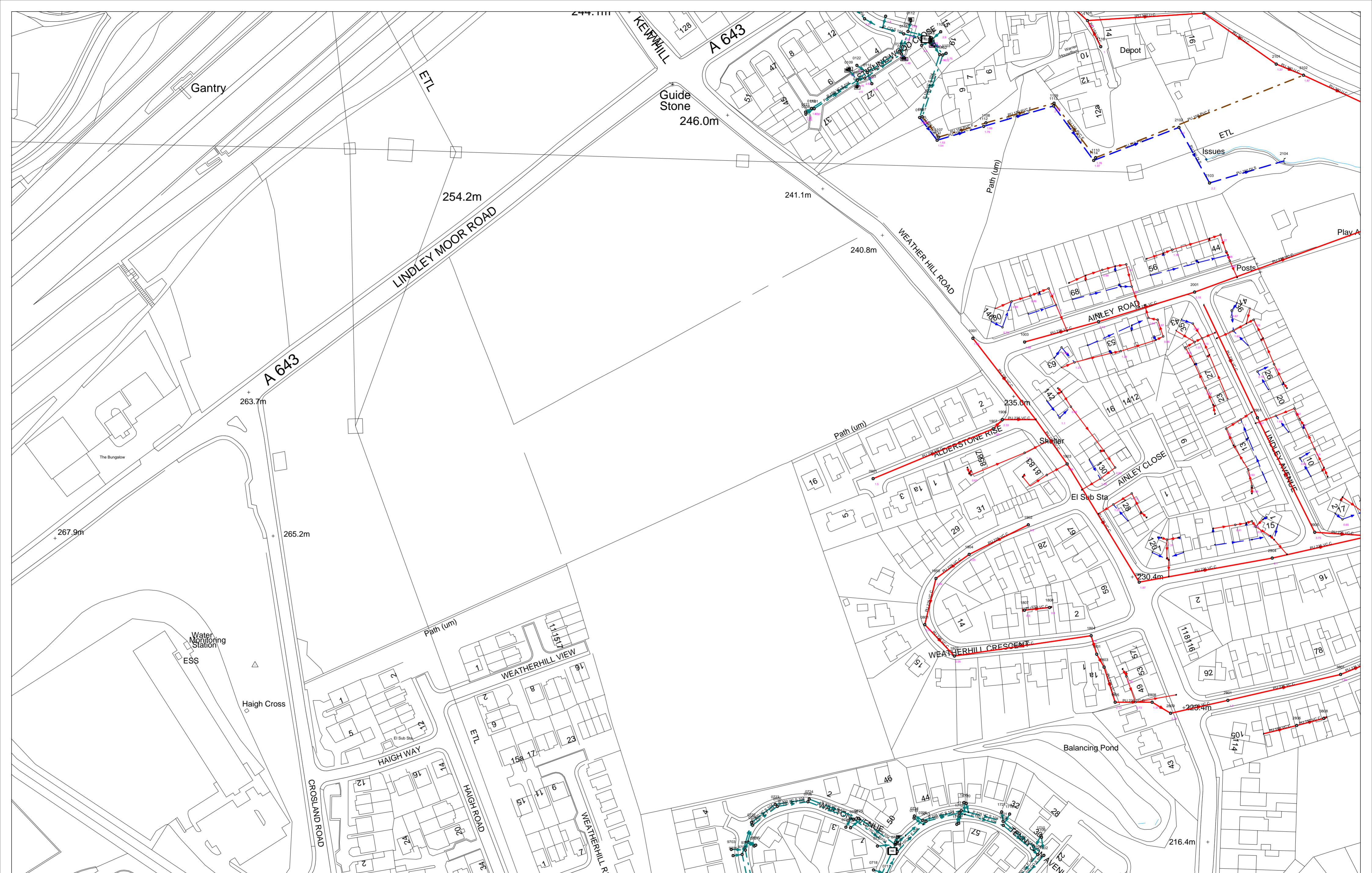



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Drawing Title:		
Baseline Scenario - Runoff Velocity 1 in 100 plus climate change (40%) AEP		
Map Orientation:		Scale:
Drawn:	Checked:	Date:
MN	KB	07 March 2022
Project No:	Drawing No:	Rev:
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APPENDIX D

Public Sewer Record



410799 : 418860	Map Name : SE1018NE	Title	Partial Key	This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.
 Yorkshire Water, PO Box 500, Halifax Road, Bradford BD6 2LZ Contact Name : YorMap Advisor C ROBERTS Contact Tel : 87 2582	Notes	Foul Sewer = F Combined Sewer = C Surface Water Sewer = SW Trade Sewer = TD Partially Separate = PS	Date Req : 14/02/2022, 10:10:36	
		(Ord) COPYRIGHT STATEMENTS: Reproduced by permission of Ordnance Survey on behalf of HMISO © Crown copyright and database 2014. All rights reserved Ordnance Survey Licence number 100022322	Date Req : 14/02/2022, 10:10:36	Date Gen : 14/02/2022, 10:11:03
			Source : Sewer Network Enquiry	

APPENDIX E

Correspondence with Yorkshire Water



YorkshireWater

Mr T Brook
Weetwood Services Ltd
22C Josephs Well
Hannover Walk
Leeds
LS3 1AB
tim.brook@weetwood.net

Yorkshire Water Services
Developer Services
Pre-Development Team
PO BOX 52
Bradford
BD3 7AY

Tel: 0345 120 8482

Fax:

Your Ref:
Our Ref: Y001281

Email:
technical.sewerage@yorkshirewater.co.uk

For telephone enquiries ring:
Chris Roberts on 0345 120 8482

14th February 2022

Dear Mr Brook,

**Lindley Moor Road, Lindley, Huddersfield, HD3 3TB – Pre-Planning
Sewerage Enquiry U541537**

Thank you for your recent enquiry and remittance. Our official VAT receipt has been sent to you under separate cover. Please find enclosed a complimentary extract from the Statutory Sewer Map which indicates the recorded position of the public sewers. Please note that as of October 2011 and the private to public sewer transfer, there are many uncharted Yorkshire Water assets currently not shown on our records.

The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site and are valid for a maximum period of twelve months:

Development of the site should take place with separate systems for foul and surface water drainage.



The separate systems should extend to the points of discharge to be agreed.

Foul Water

Foul water domestic waste can discharge to the 225 mm diameter public combined sewer recorded in Weather Hill Road, at a point to the south-east of the site.

Foul water from kitchens and/or food preparation areas of any restaurants and/or canteens etc. must pass through a fat and grease trap of adequate design before any discharge to the public sewer network.

Surface Water

As the proposed site is currently undeveloped no surface water is known to have previously discharged to the public sewer network

As such, the local public sewer network does not have capacity to accept any surface water from the proposed site. If SuDS are not viable, the developer is advised to contact the Environment Agency/Local Land Drainage Authority/Internal Drainage Board with a view to establishing a suitable watercourse for discharge.

It is understood that a watercourse is located to the east of the site. This appears to be the obvious place for surface water disposal (if SuDS are not viable).

Please note further restrictions on surface water disposal from the site may be imposed by other parties. You are strongly advised to seek advice/comments from the Environment Agency/Land Drainage Authority/Internal Drainage Board, with regard to surface water disposal from the site.

Surface water run-off from communal parking (greater than 800 sq metres or more than 50 car parking spaces) and hardstanding must pass through an oil, petrol and grit interceptor/separator of adequate design before any discharge to the public sewer network.



Roof water should not pass through the traditional 'stage' or full retention type of interceptor/separator. It is good drainage practice for any interceptor/separator to be located upstream of any on-site balancing, storage or other means of flow attenuation that may be required.

Surface water run-off from areas of vehicular parking and/or hardstanding etc. must pass through an oil, petrol and grit interceptor/separator of adequate design before any discharge to the public sewer network. Roof water should not pass through the traditional 'stage' or full retention type of interceptor/separator.

It is imperative, however that surface water run-off from the forecourt of petrol stations, areas used for the delivery of fuel, areas used for and immediately adjacent to vehicle washing facilities and/or other similar areas where detergent is likely to be used is not discharged to any public surface water sewer network. Surface water from such areas must pass through an oil, petrol and grit interceptor/separator of adequate design before discharge to the public foul or combined sewer network. A trade effluent consent – that may be conditional and, amongst other things, place a restriction on the rate of discharge to public sewer – may be required for such discharges. The developer is advised to contact Yorkshire Water's Industrial Waste Section (telephone 0345 1242424) about any such proposal.

It is good drainage practice for any interceptor/separator to be located upstream of any on-site balancing, storage or other means of flow attenuation that may be required.

Other Observations

Any new connection to an existing public sewer will require the prior approval of Yorkshire Water. You may apply on line or obtain an application form from our website (www.yorkshirewater.com) or by telephoning 0345 120 84 82.

An off-site foul and surface water sewer may be required which may be provided by the developer and considered for Code for Adoption under Section 104 of the Water Industry Act 1991.



YorkshireWater

Please telephone 0345 120 84 82 for advice on sewer adoptions. Alternatively, the developer may in certain circumstances be able to requisition off-site sewers under Section 98 of the Water Industry Act 1991 for which an application must be made in writing. For further information, please telephone 0345 120 84 82.

Prospectively adoptable sewers and pumping stations must be designed and constructed in accordance with the Code for Adoption 2021/22, pursuant to an agreement under Section 104 of the Water Industry Act 1991. We are happy to offer pre-development technical advice on any prospective sites that you would like to put forward for for adoption, prior to submission of your adoption application.

An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our Sewer Adoption, Diversion and Requisition (telephone 0345 120 84 82) or email technical.sewerage@yorkshirewater.co.uk or visit - <https://www.yorkshirewater.com/developers/sewerage/sewer-adoptions/> for further information.

Yorkshire Water's Trade Effluent team must be consulted in respect of any proposed trade effluent discharge to the public sewer.

All the above comments are based upon the information and records available at the present time and is subject to formal planning approval agreement. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith.



YorkshireWater


Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours sincerely

Chris Roberts
Development Services Technician

APPENDIX F

Greenfield Runoff Calculations

Weetwood		Page 1
Suite 1 Park House Broncoed Bus Park Wrexham Rd Mold		
Date 26/01/2022 16:30 File	Designed by ModellingMold Checked by	
Micro Drainage	Source Control 2020.1	

ICP SUDS Mean Annual Flood

Input

Return Period (years) 1 SAAR (mm) 1200 Urban 0.000
Area (ha) 1.000 Soil 0.300 Region Number Region 3

Results 1/s

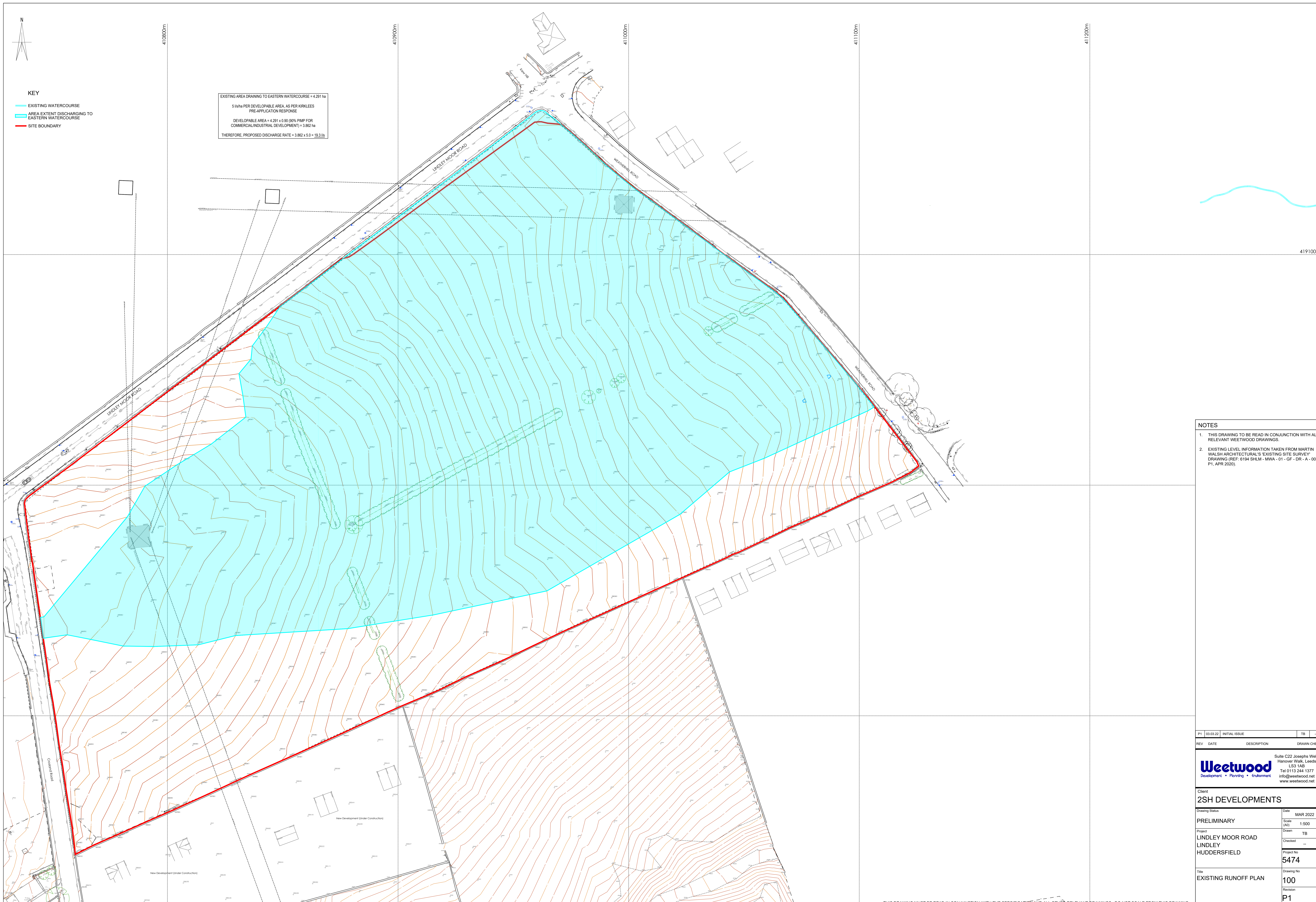
QBAR Rural 3.4
QBAR Urban 3.4

Q1 year 2.9

Q1 year 2.9
Q30 years 6.0
Q100 years 7.1

APPENDIX G

Existing Runoff Plan



KEY

- EXISTING WATERCOURSE
- AREA EXTENT DISCHARGING TO EASTERN WATERCOURSE
- SITE BOUNDARY

EXISTING AREA DRAINING TO EASTERN WATERCOURSE = 4.291 ha
 5 l/s/ha PER DEVELOPABLE AREA, AS PER KIRKLEES PRE-APPLICATION RESPONSE
 DEVELOPABLE AREA = 4.291 x 0.90 (90% PIMP FOR COMMERCIAL/INDUSTRIAL DEVELOPMENT) = 3.862 ha
 THEREFORE, PROPOSED DISCHARGE RATE = 3.862 x 5.0 = 19.3 l/s

- NOTES**
1. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT WEETWOOD DRAWINGS.
 2. EXISTING LEVEL INFORMATION TAKEN FROM MARTIN WALSH ARCHITECTURAL'S 'EXISTING SITE SURVEY' DRAWING (REF: 6194 SHLM - MWA - 01 - GF - DR - A - 001 P1, APR 2020).


REV	DATE	DESCRIPTION	DRAWN	CHECK
P1	03.03.22	INITIAL ISSUE	TB	--
<p>Client 2SH DEVELOPMENTS</p>				
<p>Drawing Status PRELIMINARY</p>			Date	MAR 2022
<p>Project LINDLEY MOOR ROAD LINDLEY HUDDERSFIELD</p>			Scale (A0)	1:500
<p>Title EXISTING RUNOFF PLAN</p>			Drawn	TB
			Checked	--
			Project No	5474
			Drawing No	100
			Revision	P1

THIS DRAWING MUST BE READ IN CONJUNCTION WITH THE SPECIFICATION AND ALL OTHER RELEVANT DRAWINGS. DO NOT SCALE FROM THIS DRAWING.

Weetwood
 Development • Planning • Environment
 Suite C22 Josephs Wells
 Hanover Walk, Leeds
 LS3 1AB
 Tel 0113 244 1377
 info@weetwood.net
 www.weetwood.net

APPENDIX H

Surface Water Attenuation – Detailed Planning Storage Volume Calculations

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.312	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm


Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.458	4-8	0.868	8-12	0.029

Total Area Contributing (ha) = 1.355

Total Pipe Volume (m³) = 97.480


Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - Indicates pipe capacity < flow











PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	36.926	0.400	92.3	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.59	257.650	0.053	0.0	0.0	0.0	1.05	18.5	7.2


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Network Design Table for Storm











PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S2.000	16.000	1.600	10.0	0.000	5.00	3.0	0.600	o	150	Pipe/Conduit	
S1.001	19.209	0.100	192.1	0.028	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	13.312	0.750	17.7	0.024	0.00	0.0	0.600	o	300	Pipe/Conduit	
S3.000	30.000	1.950	15.4	0.025	5.00	3.0	0.600	o	150	Pipe/Conduit	
S4.000	25.000	0.250	100.0	0.000	5.00	3.0	0.600	o	150	Pipe/Conduit	
S3.001	55.060	3.900	14.1	0.088	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.000	31.350	0.350	89.6	0.019	5.00	3.0	0.600	o	150	Pipe/Conduit	
S3.002	9.869	0.150	65.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	86.871	5.750	15.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	10.000	0.350	28.6	0.000	5.00	3.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S2.000	50.00	5.08	258.850	0.000	3.0	0.0	0.0	3.20	56.6	3.0
S1.001	50.00	5.87	257.100	0.081	3.0	0.0	0.0	1.13	79.9	14.0
S1.002	50.00	5.93	257.000	0.105	3.0	0.0	0.0	3.75	265.0	17.2
S3.000	50.00	5.19	262.400	0.025	3.0	0.0	0.0	2.58	45.6	6.4
S4.000	50.00	5.41	260.700	0.000	3.0	0.0	0.0	1.00	17.8	3.0
S3.001	50.00	5.63	260.300	0.113	6.0	0.0	0.0	4.21	297.3	21.3
S5.000	50.00	5.49	256.900	0.019	3.0	0.0	0.0	1.06	18.8	5.6
S3.002	50.00	5.72	256.400	0.132	9.0	0.0	0.0	1.94	137.2	26.9
S1.003	50.00	6.29	256.250	0.237	12.0	0.0	0.0	4.07	287.4	44.1
S6.000	50.00	5.09	251.000	0.000	3.0	0.0	0.0	1.89	33.4	3.0


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Network Design Table for Storm














PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	15.032	1.050	14.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S7.000	15.007	1.050	14.3	0.173	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.005	12.918	1.000	12.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S8.000	25.754	0.500	51.5	0.000	5.00	3.0	0.600	o	150	Pipe/Conduit	
S1.006	52.832	4.200	12.6	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S9.000	21.500	0.600	35.8	0.000	5.00	3.0	0.600	o	150	Pipe/Conduit	
S1.007	10.215	0.450	22.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S10.000	14.974	0.150	99.8	0.129	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.008	15.920	0.700	22.7	0.021	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.009	15.920	0.500	31.8	0.017	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	6.35	250.500	0.237	15.0	0.0	0.0	4.18	295.2	47.1
S7.000	50.00	5.06	250.500	0.173	0.0	0.0	0.0	4.18	295.5	23.4
S1.005	50.00	6.40	249.450	0.410	15.0	0.0	0.0	4.40	310.8	70.5
S8.000	50.00	5.31	249.100	0.000	3.0	0.0	0.0	1.40	24.8	3.0
S1.006	50.00	6.55	248.300	0.410	18.0	0.0	0.0	5.76	915.5	73.5
S9.000	50.00	5.21	245.000	0.000	3.0	0.0	0.0	1.69	29.8	3.0
S1.007	50.00	6.59	244.100	0.410	21.0	0.0	0.0	4.28	680.9	76.5
S10.000	50.00	5.16	243.950	0.129	0.0	0.0	0.0	1.57	111.2	17.5
S1.008	50.00	6.65	243.650	0.560	21.0	0.0	0.0	4.28	680.3	96.8
S1.009	50.00	6.72	242.950	0.577	21.0	0.0	0.0	3.61	574.6	99.1


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Network Design Table for Storm








PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.010	42.136	1.300	32.4	0.032	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.011	35.195	1.000	35.2	0.027	0.00	0.0	0.600	o	600	Pipe/Conduit	
S11.000	37.500	0.300	125.0	0.065	5.00	0.0	0.600	o	300	Pipe/Conduit	
S11.001	10.308	0.100	103.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.002	36.250	2.240	16.2	0.115	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.000	31.000	2.200	14.1	0.111	5.00	0.0	0.600	o	300	Pipe/Conduit	
S11.003	4.000	0.050	80.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	4.000	0.050	80.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.000	94.934	0.450	211.0	0.220	5.00	0.0	0.600	o	300	Pipe/Conduit	
S14.000	95.000	0.550	172.7	0.208	5.00	0.0	0.600	o	300	Pipe/Conduit	
S14.001	49.810	0.300	166.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.001	18.000	1.800	10.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.002	34.573	0.850	40.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.010	50.00	6.89	242.300	0.609	21.0	0.0	0.0	4.29	1212.3	103.5
S1.011	50.00	7.03	241.000	0.636	21.0	0.0	0.0	4.11	1163.2	107.1
S11.000	50.00	5.44	243.500	0.065	0.0	0.0	0.0	1.40	99.3	8.8
S11.001	50.00	5.56	243.200	0.065	0.0	0.0	0.0	1.55	109.5	8.8
S11.002	50.00	5.71	243.100	0.180	0.0	0.0	0.0	3.93	277.6	24.4
S12.000	50.00	5.12	243.050	0.111	0.0	0.0	0.0	4.21	297.6	15.0
S11.003	50.00	5.75	240.850	0.291	0.0	0.0	0.0	1.76	124.4	39.4
S11.004	50.00	5.79	240.700	0.291	0.0	0.0	0.0	1.76	124.4	39.4
S13.000	50.00	6.47	243.750	0.220	0.0	0.0	0.0	1.08	76.2	29.8
S14.000	50.00	6.33	244.150	0.208	0.0	0.0	0.0	1.19	84.4	28.2
S14.001	50.00	7.01	243.600	0.208	0.0	0.0	0.0	1.22	86.1	28.2
S13.001	50.00	7.07	243.300	0.428	0.0	0.0	0.0	5.00	353.4	58.0
S13.002	50.00	7.25	241.350	0.428	0.0	0.0	0.0	3.20	508.2	58.0

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.005	5.000	0.050	100.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.012	7.668	0.250	30.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	2.900#	0.250	11.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.000	10.456	0.050	209.1	0.000	5.00	0.0	0.600	o	600	Pipe/Conduit	
S1.014	17.000	1.700	10.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.015	65.000	3.000	21.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.016	90.000	4.850	18.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S11.005	50.00	7.33	240.500	0.719	0.0	0.0	0.0	1.00	17.8<	97.4
S1.012	49.91	7.37	240.000	1.355	21.0	0.0	0.0	3.28	362.5	204.2
S1.013	49.88	7.38	239.750	1.355	21.0	0.0	0.0	4.64	328.1	204.2
S15.000	50.00	5.10	237.450	0.000	0.0	0.0	0.0	1.68	475.1	0.0
S1.014	49.67	7.45	237.350	1.355	21.0	0.0	0.0	4.16	165.5<	204.2
S1.015	48.22	7.95	235.650	1.355	21.0	0.0	0.0	2.17	38.4<	204.2
S1.016	46.51	8.59	232.650	1.355	21.0	0.0	0.0	2.35	41.5<	204.2

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	Pipe Out PN	Invert Level (m)	Diameter (mm)	Pipes In PN	Invert Level (m)	Diameter (mm)	Ba
S38	259.000	1.350	Open Manhole	1200	S1.000	257.650	150				
S37-FC (B)	261.250	2.400	Open Manhole	1200	S2.000	258.850	150				
S36	260.850	3.750	Open Manhole	1200	S1.001	257.100	300	S1.000	257.250	150	
								S2.000	257.250	150	
S35	260.500	3.500	Open Manhole	1200	S1.002	257.000	300	S1.001	257.000	300	
S34-FC (A)	264.000	1.600	Open Manhole	1200	S3.000	262.400	150				
S33-FC (F)	262.300	1.600	Open Manhole	1200	S4.000	260.700	150				
S32	263.750	3.450	Open Manhole	1200	S3.001	260.300	300	S3.000	260.450	150	
								S4.000	260.450	150	
S31-FC (G)	258.500	1.600	Open Manhole	1200	S5.000	256.900	150				
S30	260.150	3.750	Open Manhole	1200	S3.002	256.400	300	S3.001	256.400	300	
								S5.000	256.550	150	
S29	259.400	3.150	Open Manhole	1200	S1.003	256.250	300	S1.002	256.250	300	
								S3.002	256.250	300	
S28-FC (C)	253.000	2.000	Open Manhole	1200	S6.000	251.000	150				
S27	252.500	2.000	Open Manhole	1200	S1.004	250.500	300	S1.003	250.500	300	
								S6.000	250.650	150	
S-FS02	251.800	1.300	Open Manhole	600	S7.000	250.500	300				
S26	251.350	1.900	Open Manhole	1200	S1.005	249.450	300	S1.004	249.450	300	
								S7.000	249.450	300	
S25-FC (H-N)	250.600	1.500	Open Manhole	1200	S8.000	249.100	150				
S24	250.100	1.800	Open Manhole	1500	S1.006	248.300	450	S1.005	248.450	300	
								S8.000	248.600	150	
S23-FC (D-E)	247.000	2.000	Open Manhole	1200	S9.000	245.000	150				
S22	245.900	1.800	Open Manhole	1500	S1.007	244.100	450	S1.006	244.100	450	
								S9.000	244.400	150	
S-FS01	245.350	1.400	Open Manhole	600	S10.000	243.950	300				
S21	245.600	1.950	Open Manhole	1500	S1.008	243.650	450	S1.007	243.650	450	
								S10.000	243.800	300	
S20	244.800	1.850	Open Manhole	1500	S1.009	242.950	450	S1.008	242.950	450	
S19	244.400	2.100	Open Manhole	1500	S1.010	242.300	600	S1.009	242.450	450	
S18	244.000	3.000	Open Manhole	1500	S1.011	241.000	600	S1.010	241.000	600	
S17	245.000	1.500	Open Manhole	1200	S11.000	243.500	300				

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)
S16	245.000	1.800	Open Manhole	1200	S11.001	243.200	300	S11.000	243.200	300
S15	244.750	1.650	Open Manhole	1200	S11.002	243.100	300	S11.001	243.100	300
S14	244.550	1.500	Open Manhole	1200	S12.000	243.050	300			
S13-TANK	244.650	3.800	Open Manhole	1200	S11.003	240.850	300	S11.002	240.860	300
								S12.000	240.850	300
S12-BS	244.400	3.700	Open Manhole	1200	S11.004	240.700	300	S11.003	240.800	300
S11	245.250	1.500	Open Manhole	1200	S13.000	243.750	300			
S10	245.350	1.200	Open Manhole	600	S14.000	244.150	300			
S9	245.350	1.750	Open Manhole	600	S14.001	243.600	300	S14.000	243.600	300
S8	245.200	1.900	Open Manhole	1200	S13.001	243.300	300	S13.000	243.300	300
								S14.001	243.300	300
S7	244.500	3.150	Open Manhole	1500	S13.002	241.350	450	S13.001	241.500	300
S6-FC (P)	243.580	3.080	Open Manhole	1500	S11.005	240.500	150	S11.004	240.650	300
								S13.002	240.500	450
S5	244.000	4.000	Open Manhole	1500	S1.012	240.000	375	S1.011	240.000	600
								S11.005	240.450	150
S4-HEADWALL	240.750	1.000	Open Manhole	1350	S1.013	239.750	300	S1.012	239.750	375
S-OFFLINE TANK	239.750	2.300	Sealed Manhole	1200	S15.000	237.450	600			
S3-FC (BASIN)	240.750	3.400	Open Manhole	1800	S1.014	237.350	225	S1.013	239.500	300
								S15.000	237.400	600
S2	237.000	1.350	Open Manhole	1200	S1.015	235.650	150	S1.014	235.650	225
S1	234.000	1.350	Open Manhole	1200	S1.016	232.650	150	S1.015	232.650	150
S-Ex.MH 2103	230.000	2.200	Open Manhole	1200		OUTFALL		S1.016	227.800	150















MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S38	410810.268	419041.808	410810.268	419041.808	Required	
S37-FC (B)	410817.963	419005.728	410817.963	419005.728	Required	















Manhole Schedules for Storm


MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S36	410832.529	419012.348	410832.529	419012.348	Required	
S35	410844.110	418997.022	410844.110	418997.022	Required	
S34-FC (A)	410774.120	418952.666	410774.120	418952.666	Required	
S33-FC (F)	410811.775	418942.318	410811.775	418942.318	Required	
S32	410801.432	418965.078	410801.432	418965.078	Required	
S31-FC (G)	410864.529	418959.317	410864.529	418959.317	Required	
S30	410851.558	418987.858	410851.558	418987.858	Required	
S29	410857.369	418995.835	410857.369	418995.835	Required	
S28-FC (C)	410920.649	419056.185	410920.649	419056.185	Required	
S27	410926.678	419048.207	410926.678	419048.207	Required	
S-FS02	410939.480	419042.284	410939.480	419042.284	Required	
S26	410938.671	419057.269	410938.671	419057.269	Required	
S25-FC (H-N)	410964.504	419044.509	410964.504	419044.509	Required	
S24	410948.978	419065.057	410948.978	419065.057	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S23-FC (D-E)	410978.168	419114.061	410978.168	419114.061	Required	
S22	410991.130	419096.908	410991.130	419096.908	Required	
S-FS01	411000.087	419088.114	411000.087	419088.114	Required	
S21	410999.280	419103.066	410999.280	419103.066	Required	
S20	411014.687	419107.072	411014.687	419107.072	Required	
S19	411028.414	419099.010	411028.414	419099.010	Required	
S18	411053.817	419065.392	411053.817	419065.392	Required	
S17	411015.739	419093.043	411015.739	419093.043	Required	
S16	411031.442	419058.989	411031.442	419058.989	Required	
S15	411041.570	419060.906	411041.570	419060.906	Required	
S14	411069.730	418999.836	411069.730	418999.836	Required	
S13-TANK	411056.749	419027.988	411056.749	419027.988	Required	
S12-BS	411060.382	419029.663	411060.382	419029.663	Required	
S11	411015.967	419076.388	411015.967	419076.388	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S10	410970.734	419055.530	410970.734	419055.530	Required	
S9	411010.514	418969.260	411010.514	418969.260	Required	
S8	411055.719	418990.177	411055.719	418990.177	Required	
S7	411072.065	418997.715	411072.065	418997.715	Required	
S6-FC (P)	411064.014	419031.338	411064.014	419031.338	Required	
S5	411068.555	419033.431	411068.555	419033.431	Required	
S4-HEADWALL	411075.643	419036.355	411075.643	419036.355	Required	
S-OFFLINE TANK	411089.563	419038.317			No Entry	
S3-FC (BASIN)	411090.003	419048.764	411090.003	419048.764	Required	
S2	411103.119	419059.579	411103.119	419059.579	Required	
S1	411165.564	419077.627	411165.564	419077.627	Required	
S-Ex.MH 2103	411249.592	419109.863			No Entry	

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PIPELINE SCHEDULES for Storm


Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	150	S38	259.000	257.650	1.200	Open Manhole	1200
S2.000	o	150	S37-FC (B)	261.250	258.850	2.250	Open Manhole	1200
S1.001	o	300	S36	260.850	257.100	3.450	Open Manhole	1200
S1.002	o	300	S35	260.500	257.000	3.200	Open Manhole	1200
S3.000	o	150	S34-FC (A)	264.000	262.400	1.450	Open Manhole	1200
S4.000	o	150	S33-FC (F)	262.300	260.700	1.450	Open Manhole	1200
S3.001	o	300	S32	263.750	260.300	3.150	Open Manhole	1200
S5.000	o	150	S31-FC (G)	258.500	256.900	1.450	Open Manhole	1200
S3.002	o	300	S30	260.150	256.400	3.450	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	36.926	92.3	S36	260.850	257.250	3.450	Open Manhole	1200
S2.000	16.000	10.0	S36	260.850	257.250	3.450	Open Manhole	1200
S1.001	19.209	192.1	S35	260.500	257.000	3.200	Open Manhole	1200
S1.002	13.312	17.7	S29	259.400	256.250	2.850	Open Manhole	1200
S3.000	30.000	15.4	S32	263.750	260.450	3.150	Open Manhole	1200
S4.000	25.000	100.0	S32	263.750	260.450	3.150	Open Manhole	1200
S3.001	55.060	14.1	S30	260.150	256.400	3.450	Open Manhole	1200
S5.000	31.350	89.6	S30	260.150	256.550	3.450	Open Manhole	1200
S3.002	9.869	65.8	S29	259.400	256.250	2.850	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.003	o	300	S29	259.400	256.250	2.850	Open Manhole	1200
S6.000	o	150	S28-FC (C)	253.000	251.000	1.850	Open Manhole	1200
S1.004	o	300	S27	252.500	250.500	1.700	Open Manhole	1200
S7.000	o	300	S-FS02	251.800	250.500	1.000	Open Manhole	600
S1.005	o	300	S26	251.350	249.450	1.600	Open Manhole	1200
S8.000	o	150	S25-FC (H-N)	250.600	249.100	1.350	Open Manhole	1200
S1.006	o	450	S24	250.100	248.300	1.350	Open Manhole	1500
S9.000	o	150	S23-FC (D-E)	247.000	245.000	1.850	Open Manhole	1200
S1.007	o	450	S22	245.900	244.100	1.350	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.003	86.871	15.1	S27	252.500	250.500	1.700	Open Manhole	1200
S6.000	10.000	28.6	S27	252.500	250.650	1.700	Open Manhole	1200
S1.004	15.032	14.3	S26	251.350	249.450	1.600	Open Manhole	1200
S7.000	15.007	14.3	S26	251.350	249.450	1.600	Open Manhole	1200
S1.005	12.918	12.9	S24	250.100	248.450	1.350	Open Manhole	1500
S8.000	25.754	51.5	S24	250.100	248.600	1.350	Open Manhole	1500
S1.006	52.832	12.6	S22	245.900	244.100	1.350	Open Manhole	1500
S9.000	21.500	35.8	S22	245.900	244.400	1.350	Open Manhole	1500
S1.007	10.215	22.7	S21	245.600	243.650	1.500	Open Manhole	1500

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.000	o	300	S-FS01	245.350	243.950	1.100	Open Manhole	600
S1.008	o	450	S21	245.600	243.650	1.500	Open Manhole	1500
S1.009	o	450	S20	244.800	242.950	1.400	Open Manhole	1500
S1.010	o	600	S19	244.400	242.300	1.500	Open Manhole	1500
S1.011	o	600	S18	244.000	241.000	2.400	Open Manhole	1500
S11.000	o	300	S17	245.000	243.500	1.200	Open Manhole	1200
S11.001	o	300	S16	245.000	243.200	1.500	Open Manhole	1200
S11.002	o	300	S15	244.750	243.100	1.350	Open Manhole	1200
S12.000	o	300	S14	244.550	243.050	1.200	Open Manhole	1200
S11.003	o	300	S13-TANK	244.650	240.850	3.500	Open Manhole	1200
S11.004	o	300	S12-BS	244.400	240.700	3.400	Open Manhole	1200
S13.000	o	300	S11	245.250	243.750	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.000	14.974	99.8	S21	245.600	243.800	1.500	Open Manhole	1500
S1.008	15.920	22.7	S20	244.800	242.950	1.400	Open Manhole	1500
S1.009	15.920	31.8	S19	244.400	242.450	1.500	Open Manhole	1500
S1.010	42.136	32.4	S18	244.000	241.000	2.400	Open Manhole	1500
S1.011	35.195	35.2	S5	244.000	240.000	3.400	Open Manhole	1500
S11.000	37.500	125.0	S16	245.000	243.200	1.500	Open Manhole	1200
S11.001	10.308	103.1	S15	244.750	243.100	1.350	Open Manhole	1200
S11.002	36.250	16.2	S13-TANK	244.650	240.860	3.490	Open Manhole	1200
S12.000	31.000	14.1	S13-TANK	244.650	240.850	3.500	Open Manhole	1200
S11.003	4.000	80.0	S12-BS	244.400	240.800	3.300	Open Manhole	1200
S11.004	4.000	80.0	S6-FC (P)	243.580	240.650	2.630	Open Manhole	1500
S13.000	94.934	211.0	S8	245.200	243.300	1.600	Open Manhole	1200

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PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Diam Sect (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S14.000	o 300	S10	245.350	244.150	0.900	Open Manhole	600
S14.001	o 300	S9	245.350	243.600	1.450	Open Manhole	600
S13.001	o 300	S8	245.200	243.300	1.600	Open Manhole	1200
S13.002	o 450	S7	244.500	241.350	2.700	Open Manhole	1500
S11.005	o 150	S6-FC (P)	243.580	240.500	2.930	Open Manhole	1500
S1.012	o 375	S5	244.000	240.000	3.625	Open Manhole	1500
S1.013	o 300	S4-HEADWALL	240.750	239.750	0.700	Open Manhole	1350
S15.000	o 600	S-OFFLINE TANK	239.750	237.450	1.700	Sealed Manhole	1200
S1.014	o 225	S3-FC (BASIN)	240.750	237.350	3.175	Open Manhole	1800
S1.015	o 150	S2	237.000	235.650	1.200	Open Manhole	1200
S1.016	o 150	S1	234.000	232.650	1.200	Open Manhole	1200

Downstream Manhole


PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S14.000	95.000	172.7	S9	245.350	243.600	1.450	Open Manhole	600
S14.001	49.810	166.0	S8	245.200	243.300	1.600	Open Manhole	1200
S13.001	18.000	10.0	S7	244.500	241.500	2.700	Open Manhole	1500
S13.002	34.573	40.7	S6-FC (P)	243.580	240.500	2.630	Open Manhole	1500
S11.005	5.000	100.0	S5	244.000	240.450	3.400	Open Manhole	1500
S1.012	7.668	30.7	S4-HEADWALL	240.750	239.750	0.625	Open Manhole	1350
S1.013	2.900#	11.6	S3-FC (BASIN)	240.750	239.500	0.950	Open Manhole	1800
S15.000	10.456	209.1	S3-FC (BASIN)	240.750	237.400	2.750	Open Manhole	1800
S1.014	17.000	10.0	S2	237.000	235.650	1.125	Open Manhole	1200
S1.015	65.000	21.7	S1	234.000	232.650	1.200	Open Manhole	1200
S1.016	90.000	18.6	S-Ex.MH 2103	230.000	227.800	2.050	Open Manhole	1200

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.053	0.053	0.053
2.000	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.028	0.028	0.028
1.002	-	-	100	0.024	0.024	0.024
3.000	-	-	100	0.025	0.025	0.025
4.000	-	-	100	0.000	0.000	0.000
3.001	-	-	100	0.088	0.088	0.088
5.000	-	-	100	0.019	0.019	0.019
3.002	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.173	0.173	0.173
1.005	-	-	100	0.000	0.000	0.000
8.000	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
10.000	-	-	100	0.129	0.129	0.129
1.008	-	-	100	0.021	0.021	0.021
1.009	-	-	100	0.017	0.017	0.017
1.010	-	-	100	0.032	0.032	0.032
1.011	-	-	100	0.027	0.027	0.027
11.000	-	-	100	0.065	0.065	0.065
11.001	-	-	100	0.000	0.000	0.000
11.002	-	-	100	0.115	0.115	0.115
12.000	-	-	100	0.111	0.111	0.111
11.003	-	-	100	0.000	0.000	0.000
11.004	-	-	100	0.000	0.000	0.000
13.000	-	-	100	0.220	0.220	0.220
14.000	-	-	100	0.208	0.208	0.208
14.001	-	-	100	0.000	0.000	0.000
13.001	-	-	100	0.000	0.000	0.000
13.002	-	-	100	0.000	0.000	0.000
11.005	-	-	100	0.000	0.000	0.000
1.012	-	-	100	0.000	0.000	0.000
1.013	-	-	100	0.000	0.000	0.000
15.000	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.000	0.000	0.000
1.015	-	-	100	0.000	0.000	0.000
1.016	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.355	1.355	1.355

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Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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S1.016	S-Ex.MH 2103	230.000	227.800	0.000	1200	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	0.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.312		

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Online Controls for Storm

Hydro-Brake® Optimum Manhole: S6-FC (P), DS/PN: S11.005, Volume (m³): 10.9

Unit Reference MD-SHE-0074-3000-1600-3000
 Design Head (m) 1.600
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 74
 Invert Level (m) 240.500
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	3.0	Kick-Flo®	0.661	2.0
Flush-Flo™	0.323	2.5	Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated


Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	2.6	3.000	4.0	7.000	6.0
0.200	2.4	1.400	2.8	3.500	4.3	7.500	6.2
0.300	2.5	1.600	3.0	4.000	4.6	8.000	6.4
0.400	2.5	1.800	3.2	4.500	4.9	8.500	6.5
0.500	2.4	2.000	3.3	5.000	5.1	9.000	6.7
0.600	2.2	2.200	3.5	5.500	5.3	9.500	6.9
0.800	2.2	2.400	3.6	6.000	5.6		
1.000	2.4	2.600	3.8	6.500	5.8		

Orifice Manhole: S5, DS/PN: S1.012, Volume (m³): 16.7

Diameter (m) 0.320 Discharge Coefficient 0.600 Invert Level (m) 240.000

Hydro-Brake® Optimum Manhole: S3-FC (BASIN), DS/PN: S1.014, Volume (m³): 11.3

Unit Reference MD-SHE-0162-1930-3350-1930
 Design Head (m) 3.350
 Design Flow (l/s) 19.3
 Flush-Flo™ Calculated

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Hydro-Brake® Optimum Manhole: S3-FC (BASIN), DS/PN: S1.014, Volume (m³): 11.3

Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	162
Invert Level (m)	237.350
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	3.350	19.3	Kick-Flo®	1.442	12.9
Flush-Flo™	0.698	16.5	Mean Flow over Head Range	-	15.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.8	1.200	15.2	3.000	18.3	7.000	27.5
0.200	13.0	1.400	13.5	3.500	19.7	7.500	28.4
0.300	14.7	1.600	13.6	4.000	21.0	8.000	29.3
0.400	15.6	1.800	14.4	4.500	22.2	8.500	30.2
0.500	16.2	2.000	15.1	5.000	23.4	9.000	31.0
0.600	16.4	2.200	15.8	5.500	24.5	9.500	31.8
0.800	16.4	2.400	16.5	6.000	25.5		
1.000	16.0	2.600	17.1	6.500	26.5		

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Storage Structures for Storm

Cellular Storage Manhole: S13-TANK, DS/PN: S11.003

Invert Level (m) 240.850 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	418.0	0.0	1.601	0.0	0.0
1.600	418.0	0.0			

Tank or Pond Manhole: S4-HEADWALL, DS/PN: S1.013


Invert Level (m) 239.750

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	995.9	1.000	1636.1

Tank or Pond Manhole: S-OFFLINE TANK, DS/PN: S15.000

Invert Level (m) 237.450


Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	300.0	1.500	300.0	1.501	0.0

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Volume Summary (Static)


Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m ³)	Pipe Volume (m ³)	Storage Structure Volume (m ³)	Total Volume (m ³)
S1.000	S38	1.527	0.631	0.000	2.158
S2.000	S37-FC (B)	2.714	0.262	0.000	2.976
S1.001	S36	4.241	1.273	0.000	5.514
S1.002	S35	3.958	0.856	0.000	4.815
S3.000	S34-FC (A)	1.810	0.509	0.000	2.318
S4.000	S33-FC (F)	1.810	0.421	0.000	2.230
S3.001	S32	3.902	3.807	0.000	7.709
S5.000	S31-FC (G)	1.810	0.533	0.000	2.342
S3.002	S30	4.241	0.613	0.000	4.854
S1.003	S29	3.563	6.056	0.000	9.618
S6.000	S28-FC (C)	2.262	0.156	0.000	2.417
S1.004	S27	2.262	0.978	0.000	3.240
S7.000	S-FS02	0.368	0.997	0.000	1.365
S1.005	S26	2.149	0.818	0.000	2.967
S8.000	S25-FC (H-N)	1.696	0.431	0.000	2.128
S1.006	S24	3.181	8.164	0.000	11.345
S9.000	S23-FC (D-E)	2.262	0.356	0.000	2.618
S1.007	S22	3.181	1.386	0.000	4.567
S10.000	S-FS01	0.396	0.984	0.000	1.380
S1.008	S21	3.446	2.293	0.000	5.739
S1.009	S20	3.269	2.293	0.000	5.563
S1.010	S19	3.711	11.490	0.000	15.201
S1.011	S18	5.301	9.527	0.000	14.828
S11.000	S17	1.696	2.566	0.000	4.262
S11.001	S16	2.036	0.644	0.000	2.680
S11.002	S15	1.866	2.478	0.000	4.344
S12.000	S14	1.696	2.106	0.000	3.803
S11.003	S13-TANK	4.298	0.198	635.492	639.988
S11.004	S12-BS	4.185	0.187	0.000	4.372
S13.000	S11	1.696	6.626	0.000	8.322
S14.000	S10	0.339	6.673	0.000	7.012
S14.001	S9	0.495	3.457	0.000	3.952
S13.001	S8	2.149	1.177	0.000	3.326
S13.002	S7	5.567	5.260	0.000	10.827
S11.005	S6-FC (P)	5.443	0.062	0.000	5.505
S1.012	S5	7.069	0.690	0.000	7.758
S1.013	S4-HEADWALL	1.431	0.094	1302.825	1304.351
S15.000	S-OFFLINE TANK	2.601	2.532	450.100	455.233
S1.014	S3-FC (BASIN)	8.652	0.616	0.000	9.268
S1.015	S2	1.527	1.127	0.000	2.654
S1.016	S1	1.527	1.569	0.000	3.096

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Volume Summary (Static)

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
Total		117.331	92.895	2388.418	2598.644

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.312
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON


Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water			Flow / Cap.
				Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	
S1.000	S38	15 minute 1 year Winter I+0%	259.000	257.713	-0.087	0.000	0.36
S2.000	S37-FC (B)	15 minute 1 year Summer I+0%	261.250	258.873	-0.127	0.000	0.06
S1.001	S36	15 minute 1 year Winter I+0%	260.850	257.185	-0.215	0.000	0.18
S1.002	S35	15 minute 1 year Winter I+0%	260.500	257.051	-0.249	0.000	0.07
S3.000	S34-FC (A)	15 minute 1 year Winter I+0%	264.000	262.437	-0.113	0.000	0.14
S4.000	S33-FC (F)	15 minute 1 year Summer I+0%	262.300	260.742	-0.108	0.000	0.18
S3.001	S32	15 minute 1 year Winter I+0%	263.750	260.350	-0.250	0.000	0.06
S5.000	S31-FC (G)	15 minute 1 year Winter I+0%	258.500	256.956	-0.094	0.000	0.29
S3.002	S30	15 minute 1 year Winter I+0%	260.150	256.500	-0.200	0.000	0.24
S1.003	S29	15 minute 1 year Winter I+0%	259.400	256.324	-0.226	0.000	0.14
S6.000	S28-FC (C)	15 minute 1 year Summer I+0%	253.000	251.032	-0.118	0.000	0.10
S1.004	S27	15 minute 1 year Winter I+0%	252.500	250.581	-0.219	0.000	0.17
S7.000	S-FS02	15 minute 1 year Winter I+0%	251.800	250.559	-0.241	0.000	0.09

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm


PN	US/MH Name	Overflow (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S38		0.065	0.9		6.4	OK
S2.000	S37-FC (B)		0.020	1.7		3.0	OK
S1.001	S36		0.091	0.8		12.3	OK
S1.002	S35		0.122	1.9		14.7	OK
S3.000	S34-FC (A)		0.036	1.8		6.0	OK
S4.000	S33-FC (F)		0.042	0.7		3.0	OK
S3.001	S32		0.050	2.4		18.1	OK
S5.000	S31-FC (G)		0.057	0.9		5.3	OK
S3.002	S30		0.119	1.1		23.3	OK
S1.003	S29		0.121	2.8		38.0	OK
S6.000	S28-FC (C)		0.030	1.1		3.0	OK
S1.004	S27		0.096	2.6		40.9	OK
S7.000	S-FS02		0.015	2.2		21.1	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm


PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
S1.005	S26	15 minute 1 year Winter I+0%	251.350	249.551	-0.199	0.000
S8.000	S25-FC (H-N)	15 minute 1 year Summer I+0%	250.600	249.135	-0.115	0.000
S1.006	S24	15 minute 1 year Winter I+0%	250.100	248.382	-0.368	0.000
S9.000	S23-FC (D-E)	15 minute 1 year Summer I+0%	247.000	245.033	-0.117	0.000
S1.007	S22	15 minute 1 year Winter I+0%	245.900	244.227	-0.323	0.000
S10.000	S-FS01	15 minute 1 year Winter I+0%	245.350	244.033	-0.217	0.000
S1.008	S21	15 minute 1 year Winter I+0%	245.600	243.778	-0.322	0.000
S1.009	S20	15 minute 1 year Winter I+0%	244.800	243.091	-0.309	0.000
S1.010	S19	15 minute 1 year Winter I+0%	244.400	242.418	-0.482	0.000
S1.011	S18	15 minute 1 year Winter I+0%	244.000	241.123	-0.477	0.000
S11.000	S17	15 minute 1 year Winter I+0%	245.000	243.559	-0.241	0.000
S11.001	S16	15 minute 1 year Winter I+0%	245.000	243.263	-0.237	0.000
S11.002	S15	15 minute 1 year Winter I+0%	244.750	243.155	-0.245	0.000
S12.000	S14	15 minute 1 year Winter I+0%	244.550	243.093	-0.257	0.000
S11.003	S13-TANK	600 minute 1 year Winter I+0%	244.650	241.084	-0.066	0.000
S11.004	S12-BS	15 minute 1 year Summer I+0%	244.400	241.187	0.187	0.000
S13.000	S11	15 minute 1 year Winter I+0%	245.250	243.875	-0.175	0.000
S14.000	S10	15 minute 1 year Winter I+0%	245.350	244.265	-0.185	0.000
S14.001	S9	15 minute 1 year Winter I+0%	245.350	243.710	-0.190	0.000
S13.001	S8	15 minute 1 year Winter I+0%	245.200	243.379	-0.221	0.000
S13.002	S7	15 minute 1 year Winter I+0%	244.500	241.447	-0.353	0.000
S11.005	S6-FC (P)	15 minute 1 year Summer I+0%	243.580	241.244	0.594	0.000
S1.012	S5	15 minute 1 year Winter I+0%	244.000	240.392	0.017	0.000
S1.013	S4-HEADWALL	1440 minute 1 year Winter I+0%	240.750	240.342	0.292	0.000
S15.000	S-OFFLINE TANK	1440 minute 1 year Summer I+0%	239.750	239.750	1.700	0.000
S1.014	S3-FC (BASIN)	1440 minute 1 year Winter I+0%	240.750	240.337	2.762	0.000
S1.015	S2	1440 minute 1 year Winter I+0%	237.000	235.724	-0.076	0.000
S1.016	S1	1440 minute 1 year Winter I+0%	234.000	232.720	-0.080	0.000

PN	US/MH Name	Flow / Overflow Cap.	Maximum (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.005	S26	0.24		0.130	3.0		61.3	OK
S8.000	S25-FC (H-N)	0.13		0.034	0.9		3.0	OK
S1.006	S24	0.08		0.137	3.2		64.2	OK
S9.000	S23-FC (D-E)	0.11		0.031	1.1		3.0	OK
S1.007	S22	0.18		0.241	1.8		67.1	OK
S10.000	S-FS01	0.17		0.022	1.0		15.7	OK
S1.008	S21	0.18		0.262	2.3		84.2	OK
S1.009	S20	0.21		0.297	2.0		85.6	OK

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flow / Overflow Cap.	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.010	S19	0.09	0.200	2.3		88.4	OK
S1.011	S18	0.09	0.281	2.2		91.1	OK
S11.000	S17	0.08	0.062	0.8		7.7	OK
S11.001	S16	0.10	0.126	0.7		7.8	OK
S11.002	S15	0.08	0.096	2.2		19.5	OK
S12.000	S14	0.05	0.043	2.2		13.5	OK
S11.003	S13-TANK	0.04	93.391	0.5	436	2.5	OK
S11.004	S12-BS	0.05	0.741	0.1		3.2	SURCHARGED
S13.000	S11	0.33	0.136	1.0		24.4	OK
S14.000	S10	0.29	0.031	1.0		23.4	OK
S14.001	S9	0.28	0.205	1.0		23.0	OK
S13.001	S8	0.16	0.317	3.2		47.1	OK
S13.002	S7	0.11	0.163	1.9		47.1	OK
S11.005	S6-FC (P)	0.18	4.672	0.7		2.5	SURCHARGED
S1.012	S5	0.48	1.791	2.8		93.5	SURCHARGED
S1.013	S4-HEADWALL	0.23	694.773	1.5		29.2	SURCHARGED
S15.000	S-OFFLINE TANK	0.00	454.866	0.0		0.0	FLOOD RISK*
S1.014	S3-FC (BASIN)	0.12	10.214	2.8		18.3	SURCHARGED
S1.015	S2	0.49	0.082	2.1		18.3	OK
S1.016	S1	0.45	0.081	2.3		18.3	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0


Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.312
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON


Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water			Flow / Cap.
				Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)	
S1.000	S38	15 minute 2 year Winter I+0%	259.000	257.722	-0.078	0.000	0.46
S2.000	S37-FC (B)	15 minute 2 year Summer I+0%	261.250	258.873	-0.127	0.000	0.06
S1.001	S36	15 minute 2 year Winter I+0%	260.850	257.195	-0.205	0.000	0.22
S1.002	S35	15 minute 2 year Winter I+0%	260.500	257.058	-0.242	0.000	0.08
S3.000	S34-FC (A)	15 minute 2 year Winter I+0%	264.000	262.440	-0.110	0.000	0.16
S4.000	S33-FC (F)	15 minute 2 year Summer I+0%	262.300	260.742	-0.108	0.000	0.18
S3.001	S32	15 minute 2 year Winter I+0%	263.750	260.355	-0.245	0.000	0.08
S5.000	S31-FC (G)	15 minute 2 year Winter I+0%	258.500	256.960	-0.090	0.000	0.33
S3.002	S30	15 minute 2 year Winter I+0%	260.150	256.509	-0.191	0.000	0.28
S1.003	S29	15 minute 2 year Winter I+0%	259.400	256.331	-0.219	0.000	0.16
S6.000	S28-FC (C)	15 minute 2 year Summer I+0%	253.000	251.032	-0.118	0.000	0.10
S1.004	S27	15 minute 2 year Winter I+0%	252.500	250.590	-0.210	0.000	0.20
S7.000	S-FS02	15 minute 2 year Winter I+0%	251.800	250.566	-0.234	0.000	0.11

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm


PN	US/MH Name	Overflow (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S38		0.076	1.0		8.3	OK
S2.000	S37-FC (B)		0.020	1.7		3.0	OK
S1.001	S36		0.102	0.8		15.1	OK
S1.002	S35		0.141	1.9		18.2	OK
S3.000	S34-FC (A)		0.039	1.9		6.9	OK
S4.000	S33-FC (F)		0.042	0.7		3.0	OK
S3.001	S32		0.057	2.4		21.7	OK
S5.000	S31-FC (G)		0.062	0.9		6.0	OK
S3.002	S30		0.132	1.2		27.5	OK
S1.003	S29		0.135	3.0		45.7	OK
S6.000	S28-FC (C)		0.030	1.1		3.0	OK
S1.004	S27		0.107	2.7		48.6	OK
S7.000	S-FS02		0.017	2.4		27.3	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm


PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
S1.005	S26	15 minute 2 year Winter I+0%	251.350	249.562	-0.188	0.000
S8.000	S25-FC (H-N)	15 minute 2 year Summer I+0%	250.600	249.135	-0.115	0.000
S1.006	S24	15 minute 2 year Winter I+0%	250.100	248.392	-0.358	0.000
S9.000	S23-FC (D-E)	15 minute 2 year Summer I+0%	247.000	245.033	-0.117	0.000
S1.007	S22	15 minute 2 year Winter I+0%	245.900	244.240	-0.310	0.000
S10.000	S-FS01	15 minute 2 year Winter I+0%	245.350	244.045	-0.205	0.000
S1.008	S21	15 minute 2 year Winter I+0%	245.600	243.792	-0.308	0.000
S1.009	S20	15 minute 2 year Winter I+0%	244.800	243.106	-0.294	0.000
S1.010	S19	15 minute 2 year Winter I+0%	244.400	242.429	-0.471	0.000
S1.011	S18	15 minute 2 year Winter I+0%	244.000	241.135	-0.465	0.000
S11.000	S17	15 minute 2 year Winter I+0%	245.000	243.567	-0.233	0.000
S11.001	S16	15 minute 2 year Winter I+0%	245.000	243.271	-0.229	0.000
S11.002	S15	15 minute 2 year Winter I+0%	244.750	243.163	-0.237	0.000
S12.000	S14	15 minute 2 year Winter I+0%	244.550	243.100	-0.250	0.000
S11.003	S13-TANK	600 minute 2 year Winter I+0%	244.650	241.165	0.015	0.000
S11.004	S12-BS	15 minute 2 year Summer I+0%	244.400	241.199	0.199	0.000
S13.000	S11	15 minute 2 year Winter I+0%	245.250	243.895	-0.155	0.000
S14.000	S10	15 minute 2 year Winter I+0%	245.350	244.283	-0.167	0.000
S14.001	S9	15 minute 2 year Winter I+0%	245.350	243.727	-0.173	0.000
S13.001	S8	15 minute 2 year Winter I+0%	245.200	243.391	-0.209	0.000
S13.002	S7	15 minute 2 year Winter I+0%	244.500	241.460	-0.340	0.000
S11.005	S6-FC (P)	15 minute 2 year Winter I+0%	243.580	241.263	0.613	0.000
S1.012	S5	15 minute 2 year Winter I+0%	244.000	240.450	0.075	0.000
S1.013	S4-HEADWALL	1440 minute 2 year Winter I+0%	240.750	240.386	0.336	0.000
S15.000	S-OFFLINE TANK	1440 minute 2 year Summer I+0%	239.750	239.750	1.700	0.000
S1.014	S3-FC (BASIN)	1440 minute 2 year Winter I+0%	240.750	240.381	2.806	0.000
S1.015	S2	1440 minute 2 year Winter I+0%	237.000	235.724	-0.076	0.000
S1.016	S1	1440 minute 2 year Winter I+0%	234.000	232.720	-0.080	0.000

PN	US/MH Name	Flow / Overflow Cap.	Maximum (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.005	S26	0.30		0.151	3.1		74.9	OK
S8.000	S25-FC (H-N)	0.13		0.034	0.9		3.0	OK
S1.006	S24	0.09		0.154	3.3		77.8	OK
S9.000	S23-FC (D-E)	0.11		0.031	1.1		3.0	OK
S1.007	S22	0.21		0.272	1.9		80.7	OK
S10.000	S-FS01	0.22		0.025	1.1		20.3	OK
S1.008	S21	0.22		0.302	2.4		102.9	OK
S1.009	S20	0.26		0.339	2.1		104.8	OK

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2 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flow / Overflow Cap.	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.010	S19	0.10	0.221	2.4		108.4	OK
S1.011	S18	0.11	0.323	2.4		111.7	OK
S11.000	S17	0.11	0.070	0.9		10.0	OK
S11.001	S16	0.13	0.144	0.8		10.1	OK
S11.002	S15	0.10	0.111	2.4		25.3	OK
S12.000	S14	0.06	0.051	2.3		17.5	OK
S11.003	S13-TANK	0.04	125.610	0.4	502	2.4	SURCHARGED
S11.004	S12-BS	0.05	0.756	0.0		3.0	SURCHARGED
S13.000	S11	0.43	0.159	1.0		31.5	OK
S14.000	S10	0.37	0.036	1.1		30.3	OK
S14.001	S9	0.37	0.314	1.1		29.6	OK
S13.001	S8	0.20	0.370	3.4		60.9	OK
S13.002	S7	0.14	0.186	2.0		60.9	OK
S11.005	S6-FC (P)	0.18	4.824	0.7		2.5	SURCHARGED
S1.012	S5	0.58	2.314	2.9		114.0	SURCHARGED
S1.013	S4-HEADWALL	0.24	754.703	1.5		30.2	SURCHARGED
S15.000	S-OFFLINE TANK	0.00	454.952	0.0		0.0	FLOOD RISK*
S1.014	S3-FC (BASIN)	0.12	10.325	2.8		18.4	SURCHARGED
S1.015	S2	0.49	0.083	2.1		18.4	OK
S1.016	S1	0.45	0.082	2.3		18.4	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model FSR Ratio R 0.312
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40


WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Event	US/CL (m)	Water	Surcharged	Flooded	Flow / Cap.
				Level (m)	Depth (m)	Volume (m ³)	
S1.000	S38	15 minute 30 year Winter I+0%	259.000	257.760	-0.040	0.000	0.88
S2.000	S37-FC (B)	15 minute 30 year Summer I+0%	261.250	258.873	-0.127	0.000	0.06
S1.001	S36	15 minute 30 year Winter I+0%	260.850	257.232	-0.168	0.000	0.39
S1.002	S35	15 minute 30 year Winter I+0%	260.500	257.080	-0.220	0.000	0.16
S3.000	S34-FC (A)	15 minute 30 year Winter I+0%	264.000	262.450	-0.100	0.000	0.24
S4.000	S33-FC (F)	15 minute 30 year Summer I+0%	262.300	260.742	-0.108	0.000	0.18
S3.001	S32	15 minute 30 year Winter I+0%	263.750	260.376	-0.224	0.000	0.15
S5.000	S31-FC (G)	15 minute 30 year Winter I+0%	258.500	256.973	-0.077	0.000	0.48
S3.002	S30	15 minute 30 year Winter I+0%	260.150	256.553	-0.147	0.000	0.51
S1.003	S29	15 minute 30 year Winter I+0%	259.400	256.363	-0.187	0.000	0.30

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm


PN	US/MH Name	Overflow (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S38		0.119	1.1		15.7	OK
S2.000	S37-FC (B)		0.020	1.7		3.0	OK
S1.001	S36		0.146	0.9		26.8	OK
S1.002	S35		0.201	2.3		33.9	OK
S3.000	S34-FC (A)		0.051	2.1		10.4	OK
S4.000	S33-FC (F)		0.042	0.7		3.0	OK
S3.001	S32		0.081	2.9		41.4	OK
S5.000	S31-FC (G)		0.078	1.0		8.6	OK
S3.002	S30		0.208	1.4		49.8	OK
S1.003	S29		0.206	3.5		82.9	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm


PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
S6.000	S28-FC (C)	15 minute 30 year Summer I+0%	253.000	251.032	-0.118	0.000
S1.004	S27	15 minute 30 year Winter I+0%	252.500	250.623	-0.177	0.000
S7.000	S-FS02	15 minute 30 year Winter I+0%	251.800	250.593	-0.207	0.000
S1.005	S26	15 minute 30 year Winter I+0%	251.350	249.610	-0.140	0.000
S8.000	S25-FC (H-N)	15 minute 30 year Summer I+0%	250.600	249.135	-0.115	0.000
S1.006	S24	15 minute 30 year Winter I+0%	250.100	248.424	-0.326	0.000
S9.000	S23-FC (D-E)	15 minute 30 year Summer I+0%	247.000	245.033	-0.117	0.000
S1.007	S22	15 minute 30 year Winter I+0%	245.900	244.292	-0.258	0.000
S10.000	S-FS01	15 minute 30 year Winter I+0%	245.350	244.085	-0.165	0.000
S1.008	S21	15 minute 30 year Winter I+0%	245.600	243.847	-0.253	0.000
S1.009	S20	15 minute 30 year Winter I+0%	244.800	243.170	-0.230	0.000
S1.010	S19	15 minute 30 year Winter I+0%	244.400	242.478	-0.422	0.000
S1.011	S18	15 minute 30 year Winter I+0%	244.000	241.187	-0.413	0.000
S11.000	S17	15 minute 30 year Winter I+0%	245.000	243.593	-0.207	0.000
S11.001	S16	15 minute 30 year Winter I+0%	245.000	243.300	-0.200	0.000
S11.002	S15	15 minute 30 year Winter I+0%	244.750	243.195	-0.205	0.000
S12.000	S14	15 minute 30 year Winter I+0%	244.550	243.120	-0.230	0.000
S11.003	S13-TANK	960 minute 30 year Winter I+0%	244.650	241.523	0.373	0.000
S11.004	S12-BS	960 minute 30 year Winter I+0%	244.400	241.523	0.523	0.000
S13.000	S11	15 minute 30 year Winter I+0%	245.250	243.972	-0.078	0.000
S14.000	S10	15 minute 30 year Winter I+0%	245.350	244.348	-0.102	0.000
S14.001	S9	15 minute 30 year Winter I+0%	245.350	243.787	-0.113	0.000
S13.001	S8	15 minute 30 year Winter I+0%	245.200	243.428	-0.172	0.000
S13.002	S7	15 minute 30 year Winter I+0%	244.500	241.623	-0.177	0.000
S11.005	S6-FC (P)	15 minute 30 year Winter I+0%	243.580	241.529	0.879	0.000
S1.012	S5	15 minute 30 year Winter I+0%	244.000	241.009	0.634	0.000
S1.013	S4-HEADWALL	1440 minute 30 year Winter I+0%	240.750	240.537	0.487	0.000
S15.000	S-OFFLINE TANK	1440 minute 30 year Summer I+0%	239.750	239.750	1.700	0.000
S1.014	S3-FC (BASIN)	1440 minute 30 year Winter I+0%	240.750	240.532	2.957	0.000
S1.015	S2	1440 minute 30 year Winter I+0%	237.000	235.725	-0.075	0.000
S1.016	S1	1440 minute 30 year Winter I+0%	234.000	232.721	-0.079	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S6.000	S28-FC (C)	0.10		0.030	1.1		3.0	OK
S1.004	S27	0.35		0.156	3.2		86.5	OK
S7.000	S-FS02	0.21		0.025	2.8		51.6	OK
S1.005	S26	0.55		0.249	3.6		136.8	OK
S8.000	S25-FC (H-N)	0.13		0.034	0.9		3.0	OK

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.006	S24	0.17		0.210	4.0		140.3	OK
S9.000	S23-FC (D-E)	0.11		0.031	1.1		3.0	OK
S1.007	S22	0.38		0.393	2.2		143.4	OK
S10.000	S-FS01	0.41		0.037	1.3		38.5	OK
S1.008	S21	0.40		0.458	2.8		186.5	OK
S1.009	S20	0.48		0.527	2.5		191.0	OK
S1.010	S19	0.19		0.309	2.9		199.3	OK
S1.011	S18	0.21		0.503	2.8		205.9	OK
S11.000	S17	0.21		0.100	1.0		18.9	OK
S11.001	S16	0.24		0.206	0.9		19.1	OK
S11.002	S15	0.21		0.171	2.9		54.8	OK
S12.000	S14	0.12		0.073	2.7		33.1	OK
S11.003	S13-TANK	0.04		269.193	0.4		2.4	SURCHARGED
S11.004	S12-BS	0.04		1.123	0.4		2.4	SURCHARGED
S13.000	S11	0.81		0.245	1.2		59.6	OK
S14.000	S10	0.70		0.055	1.3		57.2	OK
S14.001	S9	0.69		0.697	1.2		56.1	OK
S13.001	S8	0.38		0.757	4.0		115.2	OK
S13.002	S7	0.25		0.489	2.2		112.7	OK
S11.005	S6-FC (P)	0.18		6.748	0.7		2.5	SURCHARGED
S1.012	S5	1.00		8.540	3.3		194.8	SURCHARGED
S1.013	S4-HEADWALL	0.27		972.351	1.5		34.3	FLOOD RISK
S15.000	S-OFFLINE TANK	0.00		455.306	0.0		0.0	FLOOD RISK*
S1.014	S3-FC (BASIN)	0.13		10.711	2.8		18.8	FLOOD RISK
S1.015	S2	0.50		0.084	2.1		18.8	OK
S1.016	S1	0.46		0.083	2.3		18.8	OK

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 0.000
Hot Start Level (mm) 0 Inlet Coefficient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details


Rainfall Model FSR Ratio R 0.312
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
720, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40


WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Event	US/CL (m)	Water	Surcharged	Flooded	Flow / Cap.
				Level (m)	Depth (m)	Volume (m ³)	
S1.000	S38	15 minute 100 year Winter I+40%	259.000	258.299	0.499	0.000	1.48
S2.000	S37-FC (B)	15 minute 100 year Summer I+40%	261.250	258.873	-0.127	0.000	0.06
S1.001	S36	15 minute 100 year Winter I+40%	260.850	257.275	-0.125	0.000	0.62
S1.002	S35	15 minute 100 year Winter I+40%	260.500	257.105	-0.195	0.000	0.26
S3.000	S34-FC (A)	15 minute 100 year Winter I+40%	264.000	262.464	-0.086	0.000	0.38
S4.000	S33-FC (F)	15 minute 100 year Summer I+40%	262.300	260.742	-0.108	0.000	0.18
S3.001	S32	15 minute 100 year Winter I+40%	263.750	260.401	-0.199	0.000	0.25
S5.000	S31-FC (G)	15 minute 100 year Winter I+40%	258.500	256.996	-0.054	0.000	0.72
S3.002	S30	15 minute 100 year Winter I+40%	260.150	256.615	-0.085	0.000	0.85
S1.003	S29	15 minute 100 year Winter I+40%	259.400	256.401	-0.149	0.000	0.49

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm


PN	US/MH Name	Overflow (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S38		0.728	1.5		26.5	SURCHARGED
S2.000	S37-FC (B)		0.020	1.7		3.0	OK
S1.001	S36		0.199	1.0		43.1	OK
S1.002	S35		0.266	2.6		55.3	OK
S3.000	S34-FC (A)		0.067	2.3		16.5	OK
S4.000	S33-FC (F)		0.042	0.7		3.0	OK
S3.001	S32		0.109	3.4		70.0	OK
S5.000	S31-FC (G)		0.103	1.1		13.0	OK
S3.002	S30		0.327	1.5		82.6	OK
S1.003	S29		0.345	3.9		136.8	OK

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Suite 1 Park House Broncoed Bus Park Wrexham Rd Mold	5474 Lindley Moor Road, Lindley Surface Water Calculations	
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m ³)
S6.000	S28-FC (C)	15 minute 100 year Summer I+40%	253.000	251.032	-0.118	0.000
S1.004	S27	15 minute 100 year Winter I+40%	252.500	250.663	-0.137	0.000
S7.000	S-FS02	15 minute 100 year Winter I+40%	251.800	250.628	-0.172	0.000
S1.005	S26	15 minute 100 year Winter I+40%	251.350	249.679	-0.071	0.000
S8.000	S25-FC (H-N)	15 minute 100 year Summer I+40%	250.600	249.135	-0.115	0.000
S1.006	S24	15 minute 100 year Winter I+40%	250.100	248.463	-0.287	0.000
S9.000	S23-FC (D-E)	15 minute 100 year Summer I+40%	247.000	245.033	-0.117	0.000
S1.007	S22	15 minute 100 year Winter I+40%	245.900	244.360	-0.190	0.000
S10.000	S-FS01	15 minute 100 year Winter I+40%	245.350	244.145	-0.105	0.000
S1.008	S21	15 minute 100 year Winter I+40%	245.600	243.923	-0.177	0.000
S1.009	S20	15 minute 100 year Winter I+40%	244.800	243.261	-0.139	0.000
S1.010	S19	15 minute 100 year Winter I+40%	244.400	242.607	-0.293	0.000
S1.011	S18	15 minute 100 year Winter I+40%	244.000	242.502	0.902	0.000
S11.000	S17	15 minute 100 year Winter I+40%	245.000	243.629	-0.171	0.000
S11.001	S16	15 minute 100 year Winter I+40%	245.000	243.339	-0.161	0.000
S11.002	S15	15 minute 100 year Winter I+40%	244.750	243.230	-0.170	0.000
S12.000	S14	15 minute 100 year Winter I+40%	244.550	243.146	-0.204	0.000
S11.003	S13-TANK	1440 minute 100 year Winter I+40%	244.650	242.249	1.099	0.000
S11.004	S12-BS	1440 minute 100 year Winter I+40%	244.400	242.248	1.248	0.000
S13.000	S11	15 minute 100 year Winter I+40%	245.250	244.738	0.688	0.000
S14.000	S10	15 minute 100 year Winter I+40%	245.350	244.943	0.493	0.000
S14.001	S9	15 minute 100 year Winter I+40%	245.350	244.007	0.107	0.000
S13.001	S8	15 minute 100 year Winter I+40%	245.200	243.477	-0.123	0.000
S13.002	S7	15 minute 100 year Winter I+40%	244.500	242.604	0.804	0.000
S11.005	S6-FC (P)	15 minute 100 year Winter I+40%	243.580	242.338	1.688	0.000
S1.012	S5	15 minute 100 year Winter I+40%	244.000	242.205	1.830	0.000
S1.013	S4-HEADWALL	1440 minute 100 year Winter I+40%	240.750	240.723	0.673	0.000
S15.000	S-OFFLINE TANK	1440 minute 100 year Summer I+40%	239.750	239.750	1.700	0.000
S1.014	S3-FC (BASIN)	1440 minute 100 year Winter I+40%	240.750	240.718	3.143	0.000
S1.015	S2	1440 minute 100 year Winter I+40%	237.000	235.726	-0.074	0.000
S1.016	S1	1440 minute 100 year Winter I+40%	234.000	232.722	-0.078	0.000

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m ³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S6.000	S28-FC (C)	0.10		0.030	1.1		3.0	OK
S1.004	S27	0.57		0.224	3.6		140.8	OK
S7.000	S-FS02	0.38		0.035	3.3		93.4	OK
S1.005	S26	0.93		0.410	4.0		231.8	OK
S8.000	S25-FC (H-N)	0.13		0.034	0.9		3.0	OK


Weetwood		Page 37
Suite 1 Park House Broncoed Bus Park Wrexham Rd Mold	5474 Lindley Moor Road, Lindley Surface Water Calculations	
Date 25/04/2022 14:05 File 2022-04-25 5474 R2.MDX	Designed by TB Checked by	
Micro Drainage	Network 2020.1	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.006	S24	0.28		0.280	4.6		235.5	OK
S9.000	S23-FC (D-E)	0.11		0.031	1.1		3.0	OK
S1.007	S22	0.63		0.583	2.5		238.8	OK
S10.000	S-FS01	0.75		0.054	1.4		69.6	OK
S1.008	S21	0.67		0.850	3.2		316.7	OK
S1.009	S20	0.82		0.864	2.8		324.9	OK
S1.010	S19	0.33		0.622	3.3		340.0	OK
S1.011	S18	0.30		12.929	2.8		294.0	SURCHARGED
S11.000	S17	0.37		0.140	1.2		34.2	OK
S11.001	S16	0.44		0.402	1.1		34.6	OK
S11.002	S15	0.39		0.282	3.4		98.6	OK
S12.000	S14	0.22		0.102	3.1		59.9	OK
S11.003	S13-TANK	0.05		559.580	0.4		3.1	SURCHARGED
S11.004	S12-BS	0.05		1.943	0.3		3.1	SURCHARGED
S13.000	S11	1.46		1.111	1.6		107.5	SURCHARGED
S14.000	S10	1.25		0.223	1.6		102.2	SURCHARGED
S14.001	S9	1.17		3.176	1.4		94.5	SURCHARGED
S13.001	S8	0.65		1.460	4.6		196.6	OK
S13.002	S7	0.44		2.828	2.3		195.4	SURCHARGED
S11.005	S6-FC (P)	0.18		8.687	0.7		2.5	SURCHARGED
S1.012	S5	1.51		13.478	3.6		296.4	SURCHARGED
S1.013	S4-HEADWALL	0.31		1261.367	1.6		39.1	FLOOD RISK
S15.000	S-OFFLINE TANK	0.00		455.687	0.0		0.0	FLOOD RISK*
S1.014	S3-FC (BASIN)	0.13		11.184	2.8		19.3	FLOOD RISK
S1.015	S2	0.51		0.085	2.1		19.3	OK
S1.016	S1	0.47		0.084	2.3		19.3	OK

APPENDIX I

Surface Water Attenuation – Outline Planning Storage Volume Calculations


Weetwood		Page 1
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit A SW Calculations	
Date 03/03/2022 11:29 File 2022-03-03 5474 R1 - A....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 310 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	262.899	0.299	0.0	3.0	3.0	42.6	O K
30 min Summer	263.002	0.402	0.0	3.0	3.0	57.3	O K
60 min Summer	263.108	0.508	0.0	3.0	3.0	72.4	O K
120 min Summer	263.205	0.605	0.0	3.0	3.0	86.2	O K
180 min Summer	263.244	0.644	0.0	3.0	3.0	91.8	O K
240 min Summer	263.256	0.656	0.0	3.0	3.0	93.4	O K
360 min Summer	263.256	0.656	0.0	3.0	3.0	93.5	O K
480 min Summer	263.247	0.647	0.0	3.0	3.0	92.2	O K
600 min Summer	263.233	0.633	0.0	3.0	3.0	90.1	O K
720 min Summer	263.215	0.615	0.0	3.0	3.0	87.6	O K
960 min Summer	263.175	0.575	0.0	3.0	3.0	81.9	O K
1440 min Summer	263.095	0.495	0.0	3.0	3.0	70.6	O K
2160 min Summer	262.988	0.388	0.0	3.0	3.0	55.3	O K
2880 min Summer	262.901	0.301	0.0	3.0	3.0	42.9	O K
4320 min Summer	262.788	0.188	0.0	2.9	2.9	26.8	O K
5760 min Summer	262.730	0.130	0.0	2.7	2.7	18.5	O K
7200 min Summer	262.702	0.102	0.0	2.5	2.5	14.6	O K
8640 min Summer	262.689	0.089	0.0	2.2	2.2	12.8	O K
10080 min Summer	262.680	0.080	0.0	2.0	2.0	11.4	O K
15 min Winter	262.936	0.336	0.0	3.0	3.0	47.9	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	119.716	0.0	44.1	18
30 min Summer	82.072	0.0	60.7	33
60 min Summer	53.779	0.0	80.0	62
120 min Summer	33.982	0.0	101.2	122
180 min Summer	25.541	0.0	114.1	182
240 min Summer	20.673	0.0	123.1	240
360 min Summer	15.381	0.0	137.4	314
480 min Summer	12.443	0.0	148.2	380
600 min Summer	10.546	0.0	157.0	444
720 min Summer	9.207	0.0	164.5	508
960 min Summer	7.423	0.0	176.9	636
1440 min Summer	5.467	0.0	195.4	896
2160 min Summer	4.015	0.0	215.6	1276
2880 min Summer	3.221	0.0	230.5	1640
4320 min Summer	2.355	0.0	252.7	2332
5760 min Summer	1.887	0.0	270.3	3000
7200 min Summer	1.590	0.0	284.7	3680
8640 min Summer	1.383	0.0	297.0	4408
10080 min Summer	1.229	0.0	307.8	5136
15 min Winter	119.716	0.0	49.5	18

Weetwood		Page 2
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit A SW Calculations	
Date 03/03/2022 11:29 File 2022-03-03 5474 R1 - A....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
30 min Winter	263.053	0.453	0.0	3.0	3.0	64.6	O K
60 min Winter	263.176	0.576	0.0	3.0	3.0	82.1	O K
120 min Winter	263.291	0.691	0.0	3.0	3.0	98.4	O K
180 min Winter	263.337	0.737	0.0	3.0	3.0	105.0	O K
240 min Winter	263.354	0.754	0.0	3.0	3.0	107.4	O K
360 min Winter	263.359	0.759	0.0	3.0	3.0	108.2	O K
480 min Winter	263.343	0.743	0.0	3.0	3.0	105.9	O K
600 min Winter	263.326	0.726	0.0	3.0	3.0	103.5	O K
720 min Winter	263.305	0.705	0.0	3.0	3.0	100.4	O K
960 min Winter	263.252	0.652	0.0	3.0	3.0	92.9	O K
1440 min Winter	263.118	0.518	0.0	3.0	3.0	73.8	O K
2160 min Winter	262.951	0.351	0.0	3.0	3.0	50.0	O K
2880 min Winter	262.833	0.233	0.0	3.0	3.0	33.3	O K
4320 min Winter	262.718	0.118	0.0	2.6	2.6	16.8	O K
5760 min Winter	262.689	0.089	0.0	2.2	2.2	12.7	O K
7200 min Winter	262.676	0.076	0.0	1.9	1.9	10.8	O K
8640 min Winter	262.668	0.068	0.0	1.6	1.6	9.6	O K
10080 min Winter	262.662	0.062	0.0	1.4	1.4	8.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.072	0.0	68.0	33
60 min Winter	53.779	0.0	89.6	62
120 min Winter	33.982	0.0	113.3	120
180 min Winter	25.541	0.0	127.8	178
240 min Winter	20.673	0.0	137.9	234
360 min Winter	15.381	0.0	153.9	342
480 min Winter	12.443	0.0	166.0	398
600 min Winter	10.546	0.0	175.9	468
720 min Winter	9.207	0.0	184.3	548
960 min Winter	7.423	0.0	198.1	704
1440 min Winter	5.467	0.0	218.8	980
2160 min Winter	4.015	0.0	241.5	1344
2880 min Winter	3.221	0.0	258.2	1676
4320 min Winter	2.355	0.0	283.1	2296
5760 min Winter	1.887	0.0	302.8	2952
7200 min Winter	1.590	0.0	318.9	3680
8640 min Winter	1.383	0.0	332.7	4408
10080 min Winter	1.229	0.0	344.8	5136

Weetwood		Page 3
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit A SW Calculations	
Date 03/03/2022 11:29 File 2022-03-03 5474 R1 - A....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.312	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.199

Time (mins)		Area
From:	To:	(ha)
0	4	0.199

Weetwood		Page 4
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit A SW Calculations	
Date 03/03/2022 11:29 File 2022-03-03 5474 R1 - A....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 264.600

Cellular Storage Structure

Invert Level (m) 262.600 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	150.0	0.0	0.801	0.0	0.0
0.800	150.0	0.0			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0082-3000-1000-3000
 Design Head (m) 1.000
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 82
 Invert Level (m) 262.600
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0
Flush-Flo™	0.297	3.0
Kick-Flo®	0.623	2.4
Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		


Weetwood		Page 1
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit B SW Calculations	
Date 03/03/2022 11:30 File 2022-03-03 5474 R1 - B....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 391 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	259.948	0.598	0.0	2.5	2.5	45.4	O K
30 min Summer	260.159	0.809	0.0	2.5	2.5	61.4	O K
60 min Summer	260.373	1.023	0.0	2.5	2.5	77.8	O K
120 min Summer	260.563	1.213	0.0	2.6	2.6	92.2	O K
180 min Summer	260.636	1.286	0.0	2.7	2.7	97.8	O K
240 min Summer	260.657	1.307	0.0	2.7	2.7	99.4	O K
360 min Summer	260.661	1.311	0.0	2.7	2.7	99.6	O K
480 min Summer	260.648	1.298	0.0	2.7	2.7	98.7	O K
600 min Summer	260.629	1.279	0.0	2.7	2.7	97.2	O K
720 min Summer	260.606	1.256	0.0	2.7	2.7	95.5	O K
960 min Summer	260.557	1.207	0.0	2.6	2.6	91.8	O K
1440 min Summer	260.455	1.105	0.0	2.5	2.5	83.9	O K
2160 min Summer	260.302	0.952	0.0	2.5	2.5	72.3	O K
2880 min Summer	260.156	0.806	0.0	2.5	2.5	61.2	O K
4320 min Summer	259.825	0.475	0.0	2.5	2.5	36.1	O K
5760 min Summer	259.638	0.288	0.0	2.5	2.5	21.9	O K
7200 min Summer	259.541	0.191	0.0	2.4	2.4	14.5	O K
8640 min Summer	259.487	0.137	0.0	2.2	2.2	10.4	O K
10080 min Summer	259.457	0.107	0.0	2.1	2.1	8.1	O K
15 min Winter	260.023	0.673	0.0	2.5	2.5	51.2	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	119.716	0.0	47.2	18
30 min Summer	82.072	0.0	64.8	33
60 min Summer	53.779	0.0	85.0	62
120 min Summer	33.982	0.0	107.5	122
180 min Summer	25.541	0.0	121.2	182
240 min Summer	20.673	0.0	130.8	240
360 min Summer	15.381	0.0	145.9	308
480 min Summer	12.443	0.0	157.4	372
600 min Summer	10.546	0.0	166.8	436
720 min Summer	9.207	0.0	174.7	506
960 min Summer	7.423	0.0	187.8	646
1440 min Summer	5.467	0.0	207.5	924
2160 min Summer	4.015	0.0	228.7	1340
2880 min Summer	3.221	0.0	244.6	1732
4320 min Summer	2.355	0.0	268.2	2424
5760 min Summer	1.887	0.0	286.7	3104
7200 min Summer	1.590	0.0	302.0	3752
8640 min Summer	1.383	0.0	315.1	4416
10080 min Summer	1.229	0.0	326.6	5144
15 min Winter	119.716	0.0	52.9	18

Weetwood		Page 2
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit B SW Calculations	
Date 03/03/2022 11:30 File 2022-03-03 5474 R1 - B....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	260.260	0.910	0.0	2.5	2.5	69.1	O K
60 min Winter	260.506	1.156	0.0	2.6	2.6	87.9	O K
120 min Winter	260.730	1.380	0.0	2.8	2.8	104.9	O K
180 min Winter	260.823	1.473	0.0	2.9	2.9	112.0	O K
240 min Winter	260.858	1.508	0.0	2.9	2.9	114.6	O K
360 min Winter	260.873	1.523	0.0	2.9	2.9	115.7	O K
480 min Winter	260.852	1.502	0.0	2.9	2.9	114.2	O K
600 min Winter	260.828	1.478	0.0	2.9	2.9	112.4	O K
720 min Winter	260.797	1.447	0.0	2.9	2.9	109.9	O K
960 min Winter	260.722	1.372	0.0	2.8	2.8	104.3	O K
1440 min Winter	260.562	1.212	0.0	2.6	2.6	92.1	O K
2160 min Winter	260.328	0.978	0.0	2.5	2.5	74.3	O K
2880 min Winter	260.096	0.746	0.0	2.5	2.5	56.7	O K
4320 min Winter	259.641	0.291	0.0	2.5	2.5	22.1	O K
5760 min Winter	259.496	0.146	0.0	2.2	2.2	11.1	O K
7200 min Winter	259.447	0.097	0.0	2.0	2.0	7.3	O K
8640 min Winter	259.432	0.082	0.0	1.7	1.7	6.3	O K
10080 min Winter	259.423	0.073	0.0	1.5	1.5	5.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.072	0.0	72.5	33
60 min Winter	53.779	0.0	95.2	62
120 min Winter	33.982	0.0	120.4	120
180 min Winter	25.541	0.0	135.7	176
240 min Winter	20.673	0.0	146.5	232
360 min Winter	15.381	0.0	163.5	340
480 min Winter	12.443	0.0	176.3	388
600 min Winter	10.546	0.0	186.8	464
720 min Winter	9.207	0.0	195.7	542
960 min Winter	7.423	0.0	210.4	694
1440 min Winter	5.467	0.0	232.4	996
2160 min Winter	4.015	0.0	256.2	1432
2880 min Winter	3.221	0.0	274.0	1876
4320 min Winter	2.355	0.0	300.4	2460
5760 min Winter	1.887	0.0	321.1	3056
7200 min Winter	1.590	0.0	338.2	3672
8640 min Winter	1.383	0.0	352.9	4408
10080 min Winter	1.229	0.0	365.8	5088

Weetwood		Page 3
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit B SW Calculations	
Date 03/03/2022 11:30 File 2022-03-03 5474 R1 - B....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.312	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.211

Time (mins)		Area
From:	To:	(ha)
0	4	0.211

Weetwood		Page 4
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit B SW Calculations	
Date 03/03/2022 11:30 File 2022-03-03 5474 R1 - B....	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 262.250

Cellular Storage Structure

Invert Level (m) 259.350 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	80.0	0.0	1.601	0.0	0.0
1.600	80.0	0.0			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0074-3000-1600-3000
 Design Head (m) 1.600
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 74
 Invert Level (m) 259.350
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	3.0
Flush-Flo™	0.323	2.5
Kick-Flo®	0.661	2.0
Mean Flow over Head Range	-	2.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	2.6	3.000	4.0	7.000	6.0
0.200	2.4	1.400	2.8	3.500	4.3	7.500	6.2
0.300	2.5	1.600	3.0	4.000	4.6	8.000	6.4
0.400	2.5	1.800	3.2	4.500	4.9	8.500	6.5
0.500	2.4	2.000	3.3	5.000	5.1	9.000	6.7
0.600	2.2	2.200	3.5	5.500	5.3	9.500	6.9
0.800	2.2	2.400	3.6	6.000	5.6		
1.000	2.4	2.600	3.8	6.500	5.8		


Weetwood		Page 1
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit C SW Calculations	
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XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1231 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	251.168	0.218	0.0	2.9	2.9	124.2	O K
30 min Summer	251.247	0.297	0.0	3.0	3.0	169.2	O K
60 min Summer	251.334	0.384	0.0	3.0	3.0	219.1	O K
120 min Summer	251.426	0.476	0.0	3.0	3.0	271.1	O K
180 min Summer	251.476	0.526	0.0	3.0	3.0	299.9	O K
240 min Summer	251.508	0.558	0.0	3.0	3.0	317.9	O K
360 min Summer	251.552	0.602	0.0	3.0	3.0	343.4	O K
480 min Summer	251.581	0.631	0.0	3.0	3.0	359.4	O K
600 min Summer	251.598	0.648	0.0	3.0	3.0	369.6	O K
720 min Summer	251.609	0.659	0.0	3.0	3.0	375.7	O K
960 min Summer	251.617	0.667	0.0	3.0	3.0	380.4	O K
1440 min Summer	251.609	0.659	0.0	3.0	3.0	375.8	O K
2160 min Summer	251.585	0.635	0.0	3.0	3.0	362.0	O K
2880 min Summer	251.553	0.603	0.0	3.0	3.0	343.4	O K
4320 min Summer	251.485	0.535	0.0	3.0	3.0	305.0	O K
5760 min Summer	251.424	0.474	0.0	3.0	3.0	269.9	O K
7200 min Summer	251.368	0.418	0.0	3.0	3.0	238.1	O K
8640 min Summer	251.317	0.367	0.0	3.0	3.0	209.3	O K
10080 min Summer	251.272	0.322	0.0	3.0	3.0	183.8	O K
15 min Winter	251.194	0.244	0.0	3.0	3.0	139.3	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	119.716	0.0	116.0	19
30 min Summer	82.072	0.0	159.5	34
60 min Summer	53.779	0.0	221.1	64
120 min Summer	33.982	0.0	279.6	124
180 min Summer	25.541	0.0	314.9	182
240 min Summer	20.673	0.0	339.3	242
360 min Summer	15.381	0.0	376.9	362
480 min Summer	12.443	0.0	403.6	482
600 min Summer	10.546	0.0	423.1	602
720 min Summer	9.207	0.0	436.2	722
960 min Summer	7.423	0.0	442.7	960
1440 min Summer	5.467	0.0	422.9	1254
2160 min Summer	4.015	0.0	603.8	1640
2880 min Summer	3.221	0.0	644.8	2016
4320 min Summer	2.355	0.0	702.3	2772
5760 min Summer	1.887	0.0	761.9	3576
7200 min Summer	1.590	0.0	802.2	4328
8640 min Summer	1.383	0.0	836.2	5096
10080 min Summer	1.229	0.0	864.9	5840
15 min Winter	119.716	0.0	130.3	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	251.283	0.333	0.0	3.0	3.0	189.8	O K
60 min Winter	251.382	0.432	0.0	3.0	3.0	246.1	O K
120 min Winter	251.486	0.536	0.0	3.0	3.0	305.3	O K
180 min Winter	251.544	0.594	0.0	3.0	3.0	338.7	O K
240 min Winter	251.582	0.632	0.0	3.0	3.0	360.1	O K
360 min Winter	251.635	0.685	0.0	3.0	3.0	390.3	O K
480 min Winter	251.667	0.717	0.0	3.0	3.0	408.9	O K
600 min Winter	251.689	0.739	0.0	3.0	3.0	421.1	O K
720 min Winter	251.703	0.753	0.0	3.0	3.0	429.1	O K
960 min Winter	251.716	0.766	0.0	3.0	3.0	436.9	O K
1440 min Winter	251.713	0.763	0.0	3.0	3.0	434.7	O K
2160 min Winter	251.680	0.730	0.0	3.0	3.0	416.1	O K
2880 min Winter	251.642	0.692	0.0	3.0	3.0	394.6	O K
4320 min Winter	251.542	0.592	0.0	3.0	3.0	337.7	O K
5760 min Winter	251.440	0.490	0.0	3.0	3.0	279.3	O K
7200 min Winter	251.352	0.402	0.0	3.0	3.0	229.3	O K
8640 min Winter	251.277	0.327	0.0	3.0	3.0	186.5	O K
10080 min Winter	251.216	0.266	0.0	3.0	3.0	151.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.072	0.0	178.2	33
60 min Winter	53.779	0.0	247.8	62
120 min Winter	33.982	0.0	312.9	122
180 min Winter	25.541	0.0	351.9	180
240 min Winter	20.673	0.0	378.4	240
360 min Winter	15.381	0.0	417.6	356
480 min Winter	12.443	0.0	442.1	472
600 min Winter	10.546	0.0	453.3	588
720 min Winter	9.207	0.0	453.5	702
960 min Winter	7.423	0.0	445.1	926
1440 min Winter	5.467	0.0	423.9	1356
2160 min Winter	4.015	0.0	675.6	1712
2880 min Winter	3.221	0.0	720.2	2188
4320 min Winter	2.355	0.0	778.4	3072
5760 min Winter	1.887	0.0	853.5	3864
7200 min Winter	1.590	0.0	898.7	4616
8640 min Winter	1.383	0.0	937.0	5360
10080 min Winter	1.229	0.0	969.6	6048

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.312	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.562

Time (mins)		Area
From:	To:	(ha)
0	4	0.562

Weetwood		Page 4
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Model Details

Storage is Online Cover Level (m) 253.000

Cellular Storage Structure

Invert Level (m) 250.950 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	600.0	0.0	0.801	0.0	0.0
0.800	600.0	0.0			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0082-3000-1000-3000
 Design Head (m) 1.000
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 82
 Invert Level (m) 250.950
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0
Flush-Flo™	0.297	3.0
Kick-Flo®	0.623	2.4
Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		


Weetwood		Page 1
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit D-E SW Calculations	
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XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1065 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	245.211	0.211	0.0	2.9	2.9	110.3	O K
30 min Summer	245.287	0.287	0.0	3.0	3.0	150.1	O K
60 min Summer	245.372	0.372	0.0	3.0	3.0	194.1	O K
120 min Summer	245.458	0.458	0.0	3.0	3.0	239.5	O K
180 min Summer	245.506	0.506	0.0	3.0	3.0	264.3	O K
240 min Summer	245.535	0.535	0.0	3.0	3.0	279.4	O K
360 min Summer	245.575	0.575	0.0	3.0	3.0	300.2	O K
480 min Summer	245.598	0.598	0.0	3.0	3.0	312.5	O K
600 min Summer	245.612	0.612	0.0	3.0	3.0	319.9	O K
720 min Summer	245.620	0.620	0.0	3.0	3.0	324.1	O K
960 min Summer	245.624	0.624	0.0	3.0	3.0	325.8	O K
1440 min Summer	245.610	0.610	0.0	3.0	3.0	318.6	O K
2160 min Summer	245.579	0.579	0.0	3.0	3.0	302.7	O K
2880 min Summer	245.545	0.545	0.0	3.0	3.0	284.8	O K
4320 min Summer	245.476	0.476	0.0	3.0	3.0	248.7	O K
5760 min Summer	245.413	0.413	0.0	3.0	3.0	215.9	O K
7200 min Summer	245.357	0.357	0.0	3.0	3.0	186.7	O K
8640 min Summer	245.308	0.308	0.0	3.0	3.0	161.1	O K
10080 min Summer	245.267	0.267	0.0	3.0	3.0	139.6	O K
15 min Winter	245.237	0.237	0.0	3.0	3.0	123.7	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	119.716	0.0	104.1	19
30 min Summer	82.072	0.0	143.5	34
60 min Summer	53.779	0.0	197.2	64
120 min Summer	33.982	0.0	249.6	122
180 min Summer	25.541	0.0	281.4	182
240 min Summer	20.673	0.0	303.5	242
360 min Summer	15.381	0.0	337.9	362
480 min Summer	12.443	0.0	363.4	482
600 min Summer	10.546	0.0	383.5	602
720 min Summer	9.207	0.0	399.6	720
960 min Summer	7.423	0.0	422.2	960
1440 min Summer	5.467	0.0	427.6	1182
2160 min Summer	4.015	0.0	538.3	1536
2880 min Summer	3.221	0.0	575.2	1932
4320 min Summer	2.355	0.0	628.7	2724
5760 min Summer	1.887	0.0	678.0	3512
7200 min Summer	1.590	0.0	713.8	4248
8640 min Summer	1.383	0.0	744.1	5008
10080 min Summer	1.229	0.0	769.7	5656
15 min Winter	119.716	0.0	116.9	19

Weetwood		Page 2
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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	245.322	0.322	0.0	3.0	3.0	168.5	O K
60 min Winter	245.417	0.417	0.0	3.0	3.0	218.1	O K
120 min Winter	245.517	0.517	0.0	3.0	3.0	270.0	O K
180 min Winter	245.572	0.572	0.0	3.0	3.0	298.8	O K
240 min Winter	245.606	0.606	0.0	3.0	3.0	316.8	O K
360 min Winter	245.655	0.655	0.0	3.0	3.0	342.4	O K
480 min Winter	245.685	0.685	0.0	3.0	3.0	357.7	O K
600 min Winter	245.703	0.703	0.0	3.0	3.0	367.1	O K
720 min Winter	245.714	0.714	0.0	3.0	3.0	372.8	O K
960 min Winter	245.722	0.722	0.0	3.0	3.0	377.1	O K
1440 min Winter	245.709	0.709	0.0	3.0	3.0	370.5	O K
2160 min Winter	245.671	0.671	0.0	3.0	3.0	350.6	O K
2880 min Winter	245.623	0.623	0.0	3.0	3.0	325.5	O K
4320 min Winter	245.508	0.508	0.0	3.0	3.0	265.5	O K
5760 min Winter	245.409	0.409	0.0	3.0	3.0	213.5	O K
7200 min Winter	245.324	0.324	0.0	3.0	3.0	169.5	O K
8640 min Winter	245.257	0.257	0.0	3.0	3.0	134.1	O K
10080 min Winter	245.205	0.205	0.0	2.9	2.9	106.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.072	0.0	160.7	33
60 min Winter	53.779	0.0	221.1	62
120 min Winter	33.982	0.0	279.6	122
180 min Winter	25.541	0.0	314.9	180
240 min Winter	20.673	0.0	339.3	240
360 min Winter	15.381	0.0	376.9	356
480 min Winter	12.443	0.0	403.8	472
600 min Winter	10.546	0.0	423.6	586
720 min Winter	9.207	0.0	437.2	700
960 min Winter	7.423	0.0	444.5	924
1440 min Winter	5.467	0.0	426.8	1342
2160 min Winter	4.015	0.0	602.6	1684
2880 min Winter	3.221	0.0	643.6	2160
4320 min Winter	2.355	0.0	702.9	2980
5760 min Winter	1.887	0.0	759.5	3752
7200 min Winter	1.590	0.0	799.7	4472
8640 min Winter	1.383	0.0	833.8	5184
10080 min Winter	1.229	0.0	862.9	5848

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XP Solutions	Source Control 2020.1	


Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.312	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.500

Time (mins)		Area
From:	To:	(ha)
0	4	0.500

Weetwood		Page 4
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XP Solutions	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 247.000

Cellular Storage Structure

Invert Level (m) 245.000 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	550.0	0.0	0.801	0.0	0.0
0.800	550.0	0.0			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0082-3000-1000-3000
 Design Head (m) 1.000
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 82
 Invert Level (m) 245.000
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0
Flush-Flo™	0.297	3.0
Kick-Flo®	0.623	2.4
Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		


Weetwood		Page 1
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XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1352 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	260.966	0.216	0.0	2.9	2.9	133.6	O K
30 min Summer	261.045	0.295	0.0	3.0	3.0	182.1	O K
60 min Summer	261.132	0.382	0.0	3.0	3.0	236.0	O K
120 min Summer	261.224	0.474	0.0	3.0	3.0	292.5	O K
180 min Summer	261.275	0.525	0.0	3.0	3.0	324.0	O K
240 min Summer	261.307	0.557	0.0	3.0	3.0	343.9	O K
360 min Summer	261.353	0.603	0.0	3.0	3.0	372.4	O K
480 min Summer	261.383	0.633	0.0	3.0	3.0	390.8	O K
600 min Summer	261.402	0.652	0.0	3.0	3.0	402.8	O K
720 min Summer	261.415	0.665	0.0	3.0	3.0	410.4	O K
960 min Summer	261.426	0.676	0.0	3.0	3.0	417.5	O K
1440 min Summer	261.422	0.672	0.0	3.0	3.0	414.8	O K
2160 min Summer	261.401	0.651	0.0	3.0	3.0	402.0	O K
2880 min Summer	261.374	0.624	0.0	3.0	3.0	385.2	O K
4320 min Summer	261.310	0.560	0.0	3.0	3.0	345.5	O K
5760 min Summer	261.251	0.501	0.0	3.0	3.0	309.4	O K
7200 min Summer	261.197	0.447	0.0	3.0	3.0	276.2	O K
8640 min Summer	261.148	0.398	0.0	3.0	3.0	245.7	O K
10080 min Summer	261.104	0.354	0.0	3.0	3.0	218.4	O K
15 min Winter	260.993	0.243	0.0	3.0	3.0	149.8	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	119.716	0.0	123.4	19
30 min Summer	82.072	0.0	169.4	34
60 min Summer	53.779	0.0	236.8	64
120 min Summer	33.982	0.0	299.3	124
180 min Summer	25.541	0.0	336.8	182
240 min Summer	20.673	0.0	362.6	242
360 min Summer	15.381	0.0	401.5	362
480 min Summer	12.443	0.0	427.5	482
600 min Summer	10.546	0.0	443.6	602
720 min Summer	9.207	0.0	450.0	722
960 min Summer	7.423	0.0	444.1	960
1440 min Summer	5.467	0.0	420.9	1312
2160 min Summer	4.015	0.0	647.5	1684
2880 min Summer	3.221	0.0	690.5	2076
4320 min Summer	2.355	0.0	747.5	2848
5760 min Summer	1.887	0.0	818.6	3632
7200 min Summer	1.590	0.0	861.9	4392
8640 min Summer	1.383	0.0	898.4	5184
10080 min Summer	1.229	0.0	929.0	5856
15 min Winter	119.716	0.0	138.5	19

Weetwood		Page 2
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit F SW Calculations	
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XP Solutions	Source Control 2020.1	

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ (1/s)	Max Outflow Volume (m³)	Status
30 min Winter	261.081	0.331	0.0	3.0	3.0	204.3	O K
60 min Winter	261.179	0.429	0.0	3.0	3.0	265.0	O K
120 min Winter	261.283	0.533	0.0	3.0	3.0	329.3	O K
180 min Winter	261.342	0.592	0.0	3.0	3.0	365.7	O K
240 min Winter	261.380	0.630	0.0	3.0	3.0	389.3	O K
360 min Winter	261.435	0.685	0.0	3.0	3.0	422.8	O K
480 min Winter	261.469	0.719	0.0	3.0	3.0	444.0	O K
600 min Winter	261.492	0.742	0.0	3.0	3.0	458.2	O K
720 min Winter	261.508	0.758	0.0	3.0	3.0	467.8	O K
960 min Winter	261.525	0.775	0.0	3.0	3.0	478.3	O K
1440 min Winter	261.527	0.777	0.0	3.0	3.0	479.8	O K
2160 min Winter	261.498	0.748	0.0	3.0	3.0	462.0	O K
2880 min Winter	261.466	0.716	0.0	3.0	3.0	441.8	O K
4320 min Winter	261.382	0.632	0.0	3.0	3.0	390.1	O K
5760 min Winter	261.282	0.532	0.0	3.0	3.0	328.3	O K
7200 min Winter	261.195	0.445	0.0	3.0	3.0	274.9	O K
8640 min Winter	261.120	0.370	0.0	3.0	3.0	228.4	O K
10080 min Winter	261.056	0.306	0.0	3.0	3.0	188.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.072	0.0	188.7	33
60 min Winter	53.779	0.0	265.4	62
120 min Winter	33.982	0.0	334.8	122
180 min Winter	25.541	0.0	375.8	180
240 min Winter	20.673	0.0	403.2	240
360 min Winter	15.381	0.0	440.7	358
480 min Winter	12.443	0.0	457.3	474
600 min Winter	10.546	0.0	457.8	590
720 min Winter	9.207	0.0	453.7	704
960 min Winter	7.423	0.0	443.0	932
1440 min Winter	5.467	0.0	421.6	1370
2160 min Winter	4.015	0.0	723.8	1752
2880 min Winter	3.221	0.0	769.6	2216
4320 min Winter	2.355	0.0	801.3	3156
5760 min Winter	1.887	0.0	916.9	3928
7200 min Winter	1.590	0.0	965.5	4688
8640 min Winter	1.383	0.0	1006.7	5448
10080 min Winter	1.229	0.0	1041.6	6152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.312	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.604

Time (mins)		Area
From:	To:	(ha)
0	4	0.604

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Model Details

Storage is Online Cover Level (m) 262.750

Cellular Storage Structure

Invert Level (m) 260.750 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	650.0	0.0	0.801	0.0	0.0
0.800	650.0	0.0			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0082-3000-1000-3000
 Design Head (m) 1.000
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 82
 Invert Level (m) 260.750
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0
Flush-Flo™	0.297	3.0
Kick-Flo®	0.623	2.4
Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		


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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1418 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	257.708	0.208	0.0	2.9	2.9	138.2	O K
30 min Summer	257.783	0.283	0.0	3.0	3.0	188.3	O K
60 min Summer	257.867	0.367	0.0	3.0	3.0	244.1	O K
120 min Summer	257.955	0.455	0.0	3.0	3.0	302.8	O K
180 min Summer	258.005	0.505	0.0	3.0	3.0	335.6	O K
240 min Summer	258.036	0.536	0.0	3.0	3.0	356.3	O K
360 min Summer	258.081	0.581	0.0	3.0	3.0	386.1	O K
480 min Summer	258.109	0.609	0.0	3.0	3.0	405.2	O K
600 min Summer	258.129	0.629	0.0	3.0	3.0	418.4	O K
720 min Summer	258.142	0.642	0.0	3.0	3.0	427.2	O K
960 min Summer	258.156	0.656	0.0	3.0	3.0	436.0	O K
1440 min Summer	258.154	0.654	0.0	3.0	3.0	435.0	O K
2160 min Summer	258.135	0.635	0.0	3.0	3.0	422.4	O K
2880 min Summer	258.108	0.608	0.0	3.0	3.0	404.5	O K
4320 min Summer	258.050	0.550	0.0	3.0	3.0	365.9	O K
5760 min Summer	257.996	0.496	0.0	3.0	3.0	329.9	O K
7200 min Summer	257.946	0.446	0.0	3.0	3.0	296.6	O K
8640 min Summer	257.900	0.400	0.0	3.0	3.0	265.8	O K
10080 min Summer	257.857	0.357	0.0	3.0	3.0	237.6	O K
15 min Winter	257.733	0.233	0.0	3.0	3.0	154.9	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	119.716	0.0	126.0	19
30 min Summer	82.072	0.0	172.8	34
60 min Summer	53.779	0.0	243.7	64
120 min Summer	33.982	0.0	307.9	124
180 min Summer	25.541	0.0	346.4	182
240 min Summer	20.673	0.0	372.6	242
360 min Summer	15.381	0.0	411.9	362
480 min Summer	12.443	0.0	437.3	482
600 min Summer	10.546	0.0	451.1	602
720 min Summer	9.207	0.0	454.1	722
960 min Summer	7.423	0.0	445.2	960
1440 min Summer	5.467	0.0	420.5	1368
2160 min Summer	4.015	0.0	667.5	1708
2880 min Summer	3.221	0.0	711.4	2076
4320 min Summer	2.355	0.0	765.7	2852
5760 min Summer	1.887	0.0	845.3	3632
7200 min Summer	1.590	0.0	890.0	4400
8640 min Summer	1.383	0.0	927.7	5184
10080 min Summer	1.229	0.0	959.1	5944
15 min Winter	119.716	0.0	141.5	19

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	257.818	0.318	0.0	3.0	3.0	211.2	O K
60 min Winter	257.912	0.412	0.0	3.0	3.0	274.1	O K
120 min Winter	258.012	0.512	0.0	3.0	3.0	340.8	O K
180 min Winter	258.069	0.569	0.0	3.0	3.0	378.5	O K
240 min Winter	258.106	0.606	0.0	3.0	3.0	402.9	O K
360 min Winter	258.159	0.659	0.0	3.0	3.0	438.5	O K
480 min Winter	258.193	0.693	0.0	3.0	3.0	461.2	O K
600 min Winter	258.217	0.717	0.0	3.0	3.0	476.6	O K
720 min Winter	258.233	0.733	0.0	3.0	3.0	487.2	O K
960 min Winter	258.251	0.751	0.0	3.0	3.0	499.3	O K
1440 min Winter	258.257	0.757	0.0	3.0	3.0	503.1	O K
2160 min Winter	258.231	0.731	0.0	3.0	3.0	486.0	O K
2880 min Winter	258.201	0.701	0.0	3.0	3.0	466.3	O K
4320 min Winter	258.123	0.623	0.0	3.0	3.0	414.2	O K
5760 min Winter	258.031	0.531	0.0	3.0	3.0	353.0	O K
7200 min Winter	257.950	0.450	0.0	3.0	3.0	299.2	O K
8640 min Winter	257.878	0.378	0.0	3.0	3.0	251.6	O K
10080 min Winter	257.816	0.316	0.0	3.0	3.0	210.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.072	0.0	192.4	33
60 min Winter	53.779	0.0	273.1	62
120 min Winter	33.982	0.0	344.3	122
180 min Winter	25.541	0.0	386.2	180
240 min Winter	20.673	0.0	413.7	240
360 min Winter	15.381	0.0	449.4	358
480 min Winter	12.443	0.0	461.2	474
600 min Winter	10.546	0.0	458.6	590
720 min Winter	9.207	0.0	453.4	706
960 min Winter	7.423	0.0	441.6	932
1440 min Winter	5.467	0.0	419.6	1372
2160 min Winter	4.015	0.0	745.4	1924
2880 min Winter	3.221	0.0	790.5	2220
4320 min Winter	2.355	0.0	805.7	3160
5760 min Winter	1.887	0.0	946.9	3976
7200 min Winter	1.590	0.0	997.1	4752
8640 min Winter	1.383	0.0	1039.6	5528
10080 min Winter	1.229	0.0	1075.4	6248

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.312	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.624

Time (mins)		Area
From:	To:	(ha)
0	4	0.624

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Model Details

Storage is Online Cover Level (m) 259.500

Cellular Storage Structure

Invert Level (m) 257.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	700.0	0.0	0.801	0.0	0.0
0.800	700.0	0.0			


Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0082-3000-1000-3000
 Design Head (m) 1.000
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 82
 Invert Level (m) 257.500
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0
Flush-Flo™	0.297	3.0
Kick-Flo®	0.623	2.4
Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		


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Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 2395 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	247.689	0.189	0.0	2.9	2.9	206.7	O K
30 min Summer	247.759	0.259	0.0	3.0	3.0	282.4	O K
60 min Summer	247.837	0.337	0.0	3.0	3.0	367.7	O K
120 min Summer	247.920	0.420	0.0	3.0	3.0	459.1	O K
180 min Summer	247.969	0.469	0.0	3.0	3.0	511.9	O K
240 min Summer	248.000	0.500	0.0	3.0	3.0	546.6	O K
360 min Summer	248.048	0.548	0.0	3.0	3.0	598.2	O K
480 min Summer	248.080	0.580	0.0	3.0	3.0	633.8	O K
600 min Summer	248.104	0.604	0.0	3.0	3.0	660.3	O K
720 min Summer	248.123	0.623	0.0	3.0	3.0	680.8	O K
960 min Summer	248.149	0.649	0.0	3.0	3.0	709.2	O K
1440 min Summer	248.173	0.673	0.0	3.0	3.0	735.6	O K
2160 min Summer	248.176	0.676	0.0	3.0	3.0	738.0	O K
2880 min Summer	248.164	0.664	0.0	3.0	3.0	725.8	O K
4320 min Summer	248.135	0.635	0.0	3.0	3.0	693.4	O K
5760 min Summer	248.100	0.600	0.0	3.0	3.0	655.1	O K
7200 min Summer	248.065	0.565	0.0	3.0	3.0	617.0	O K
8640 min Summer	248.031	0.531	0.0	3.0	3.0	580.6	O K
10080 min Summer	247.999	0.499	0.0	3.0	3.0	545.6	O K
15 min Winter	247.712	0.212	0.0	2.9	2.9	231.7	O K


Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	119.716	0.0	168.0	23
30 min Summer	82.072	0.0	220.4	38
60 min Summer	53.779	0.0	347.6	68
120 min Summer	33.982	0.0	430.3	126
180 min Summer	25.541	0.0	468.8	186
240 min Summer	20.673	0.0	483.8	246
360 min Summer	15.381	0.0	485.5	366
480 min Summer	12.443	0.0	477.9	486
600 min Summer	10.546	0.0	467.6	604
720 min Summer	9.207	0.0	456.3	724
960 min Summer	7.423	0.0	436.4	964
1440 min Summer	5.467	0.0	407.7	1442
2160 min Summer	4.015	0.0	877.0	2144
2880 min Summer	3.221	0.0	846.6	2476
4320 min Summer	2.355	0.0	774.7	3244
5760 min Summer	1.887	0.0	1253.3	3984
7200 min Summer	1.590	0.0	1317.5	4760
8640 min Summer	1.383	0.0	1369.8	5536
10080 min Summer	1.229	0.0	1409.0	6352
15 min Winter	119.716	0.0	187.1	23

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	247.790	0.290	0.0	3.0	3.0	316.7	O K
60 min Winter	247.878	0.378	0.0	3.0	3.0	412.6	O K
120 min Winter	247.972	0.472	0.0	3.0	3.0	515.8	O K
180 min Winter	248.027	0.527	0.0	3.0	3.0	575.9	O K
240 min Winter	248.064	0.564	0.0	3.0	3.0	615.8	O K
360 min Winter	248.119	0.619	0.0	3.0	3.0	676.0	O K
480 min Winter	248.157	0.657	0.0	3.0	3.0	718.1	O K
600 min Winter	248.186	0.686	0.0	3.0	3.0	749.0	O K
720 min Winter	248.207	0.707	0.0	3.0	3.0	772.7	O K
960 min Winter	248.238	0.738	0.0	3.0	3.0	806.0	O K
1440 min Winter	248.269	0.769	0.0	3.0	3.0	840.0	O K
2160 min Winter	248.279	0.779	0.0	3.0	3.0	850.9	O K
2880 min Winter	248.268	0.768	0.0	3.0	3.0	839.1	O K
4320 min Winter	248.229	0.729	0.0	3.0	3.0	796.8	O K
5760 min Winter	248.188	0.688	0.0	3.0	3.0	751.8	O K
7200 min Winter	248.141	0.641	0.0	3.0	3.0	700.4	O K
8640 min Winter	248.084	0.584	0.0	3.0	3.0	638.4	O K
10080 min Winter	248.030	0.530	0.0	3.0	3.0	579.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	82.072	0.0	236.0	37
60 min Winter	53.779	0.0	387.2	66
120 min Winter	33.982	0.0	468.4	126
180 min Winter	25.541	0.0	490.3	184
240 min Winter	20.673	0.0	490.1	242
360 min Winter	15.381	0.0	477.3	360
480 min Winter	12.443	0.0	461.7	478
600 min Winter	10.546	0.0	449.7	596
720 min Winter	9.207	0.0	440.2	712
960 min Winter	7.423	0.0	425.8	946
1440 min Winter	5.467	0.0	408.3	1402
2160 min Winter	4.015	0.0	881.8	2076
2880 min Winter	3.221	0.0	850.1	2712
4320 min Winter	2.355	0.0	787.9	3412
5760 min Winter	1.887	0.0	1400.9	4328
7200 min Winter	1.590	0.0	1469.4	5264
8640 min Winter	1.383	0.0	1524.0	6136
10080 min Winter	1.229	0.0	1554.3	6864

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.312	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.931

Time (mins)		Area	Time (mins)		Area
From:	To:	(ha)	From:	To:	(ha)
0	4	0.500	4	8	0.431

Weetwood		Page 4
Joseph's Well Hanover Walk Leeds, LS3 1AB	5474 Lindley Moor Road, Lindley Unit H-N SW Calculations	
Date 03/03/2022 11:33 File 2022-03-03 5474 R1 - H-...	Designed by TB Checked by	
XP Solutions	Source Control 2020.1	

Model Details

Storage is Online Cover Level (m) 249.500

Cellular Storage Structure

Invert Level (m) 247.500 Safety Factor 2.0
 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
 Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	1150.0	0.0	0.801	0.0	0.0
0.800	1150.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0082-3000-1000-3000
 Design Head (m) 1.000
 Design Flow (l/s) 3.0
 Flush-Flo™ Calculated
 Objective Minimise upstream storage
 Application Surface
 Sump Available Yes
 Diameter (mm) 82
 Invert Level (m) 247.500
 Minimum Outlet Pipe Diameter (mm) 100
 Suggested Manhole Diameter (mm) 1200

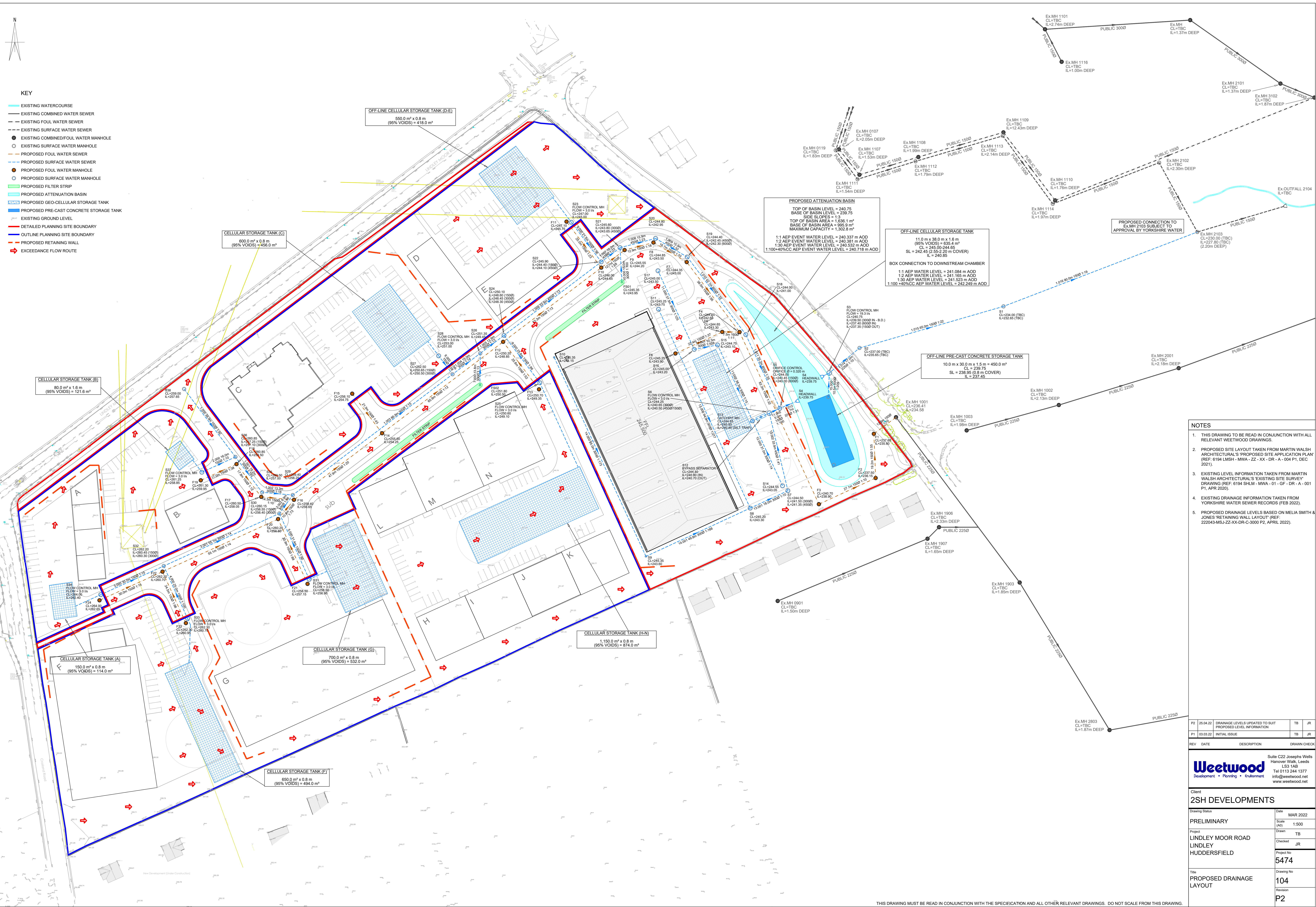
Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0
Flush-Flo™	0.297	3.0
Kick-Flo®	0.623	2.4
Mean Flow over Head Range	-	2.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		

APPENDIX J

Preliminary Drainage Layout



- KEY**
- EXISTING WATERCOURSE
 - EXISTING COMBINED WATER SEWER
 - EXISTING FOUL WATER SEWER
 - EXISTING SURFACE WATER SEWER
 - EXISTING COMBINED/FOUL WATER MANHOLE
 - EXISTING SURFACE WATER MANHOLE
 - PROPOSED FOUL WATER SEWER
 - PROPOSED SURFACE WATER SEWER
 - PROPOSED FOUL WATER MANHOLE
 - PROPOSED SURFACE WATER MANHOLE
 - PROPOSED FILTER STRIP
 - PROPOSED ATTENUATION BASIN
 - PROPOSED GEO-CELLULAR STORAGE TANK
 - PROPOSED PRE-CAST CONCRETE STORAGE TANK
 - EXISTING GROUND LEVEL
 - DETAILED PLANNING SITE BOUNDARY
 - OUTLINE PLANNING SITE BOUNDARY
 - PROPOSED RETAINING WALL
 - EXCEEDANCE FLOW ROUTE

PROPOSED ATTENUATION BASIN
 TOP OF BASIN LEVEL = 240.75
 BASE OF BASIN LEVEL = 239.75
 SIDE SLOPES = 1:3
 TOP OF BASIN AREA = 1,838.1 m²
 BASE OF BASIN AREA = 995.9 m²
 MAXIMUM CAPACITY = 1,302.8 m³
 1:1 AEP EVENT WATER LEVEL = 240.337 m AOD
 1:2 AEP EVENT WATER LEVEL = 240.381 m AOD
 1:30 AEP EVENT WATER LEVEL = 240.532 m AOD
 1:100+40%CC AEP EVENT WATER LEVEL = 240.718 m AOD

OFF-LINE CELLULAR STORAGE TANK
 11.0 m x 38.0 m x 1.6 m
 (95% VOIDS) = 835.4 m³
 CL = 245.00-244.65
 SL = 242.45 (2.55-2.28 m COVER)
 IL = 240.85
BOX CONNECTION TO DOWNSTREAM CHAMBER
 1:1 AEP WATER LEVEL = 241.084 m AOD
 1:2 AEP WATER LEVEL = 241.165 m AOD
 1:30 AEP WATER LEVEL = 241.523 m AOD
 1:100+40%CC AEP WATER LEVEL = 242.249 m AOD

OFF-LINE PRE-CAST CONCRETE STORAGE TANK
 10.0 m x 30.0 m x 1.5 m = 450.0 m³
 CL = 238.75
 SL = 238.95 (0.8 m COVER)
 IL = 237.45

CELLULAR STORAGE TANK (B)
 80.0 m x 1.6 m
 (95% VOIDS) = 121.6 m³

CELLULAR STORAGE TANK (C)
 600.0 m x 0.8 m
 (95% VOIDS) = 456.0 m³

CELLULAR STORAGE TANK (H,N)
 1,150.0 m x 0.8 m
 (95% VOIDS) = 874.0 m³

CELLULAR STORAGE TANK (G)
 700.0 m x 0.8 m
 (95% VOIDS) = 532.0 m³

CELLULAR STORAGE TANK (A)
 150.0 m x 0.8 m
 (95% VOIDS) = 114.0 m³

CELLULAR STORAGE TANK (F)
 650.0 m x 0.8 m
 (95% VOIDS) = 494.0 m³

- NOTES**
- THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT WEETWOOD DRAWINGS.
 - PROPOSED SITE LAYOUT TAKEN FROM MARTIN WALSH ARCHITECTURAL'S PROPOSED SITE APPLICATION PLAN (REF: 6194 LM5H - MWA - ZZ - XX - DR - A - 004 P1, DEC 2021).
 - EXISTING LEVEL INFORMATION TAKEN FROM MARTIN WALSH ARCHITECTURAL'S EXISTING SITE SURVEY DRAWING (REF: 6194 SHLM - MWA - 01 - GF - DR - A - 001 P1, APR 2020).
 - EXISTING DRAINAGE INFORMATION TAKEN FROM YORKSHIRE WATER SEWER RECORDS (FEB 2022).
 - PROPOSED DRAINAGE LEVELS BASED ON MELIA SMITH & JONES RETAINING WALL LAYOUT (REF: 222043-MSJ-ZZ-XX-DR-C-3000 P2, APR 2022).

REV	DATE	DESCRIPTION	DRAWN	CHECK
P2	25.04.22	DRAINAGE LEVELS UPDATED TO SUIT PROPOSED LEVEL INFORMATION	TB	JR
P1	03.03.22	INITIAL ISSUE	TB	JR

Client
25H DEVELOPMENTS

Project
 LINDLEY MOOR ROAD
 LINDLEY
 HUDDERSFIELD

Project No
 5474

Title
 PROPOSED DRAINAGE LAYOUT

Revision
 P2

Date
 MAR 2022

Scale (A0)
 1:500

Drawn
 TB

Checked
 JR

Drawing No
 104

Revision
 P2

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