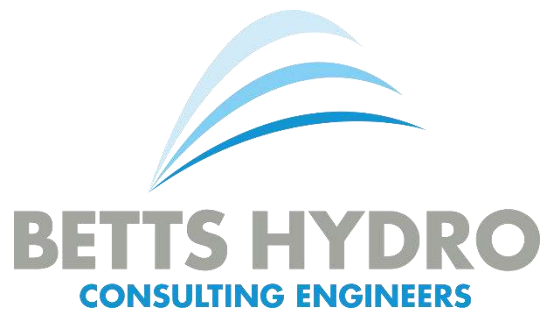


Land at Thomas Street, Lindley, Huddersfield

Flood Risk Assessment & Drainage Management Strategy

May 2023

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LAND OFF THOMAS STREET HUDDERSFIELD

FLOOD RISK ASSESSMENT AND DRAINAGE MANAGEMENT STRATEGY



For

Muller Property Group
The Point
Crewe Road
Alsager
Cheshire
ST7 2GP

MÜLLER
PROPERTY GROUP

MAY 2023

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**LAND OFF THOMAS STREET
HUDDERSFIELD**

**FLOOD RISK ASSESSMENT AND
DRAINAGE MANAGEMENT STRATEGY**

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EXECUTIVE SUMMARY

This Flood Risk Assessment and Drainage Management Strategy was commissioned by Muller Property Group referred to hereafter as 'the client'. This report has been prepared to support a planning application for the construction of a residential care home on land off Thomas Street in Huddersfield.

The proposals are residential in nature and are classified as 'more vulnerable' within Annex 3: Flood Risk Vulnerability Classification of the National Planning Policy Framework. The Planning Practice Guidance confirms that this type of development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk as a result.

Flood Risk

This report has reviewed all sources of flood risk both to and resulting from the proposed development. Consultation with the Environment Agency, Kirklees Council, and Yorkshire Water have not identified any historical flooding at the site or within the wider area.

The online flood risk datasets have also identified the site to be at low risk from fluvial/tidal flooding. The site is however shown to be at higher risk of surface water flooding due to its impermeable nature. This surface water flood risk to site will be reduced and sustainably managed post-development, following the implementation of a sustainable surface water management regime and where relevant appropriate levels design.

This assessment has been prepared in consultation with the relevant interested parties and the reports is commensurate with the scale and nature of the development proposals. The development proposals can therefore be considered appropriate in accordance with the Planning Practice Guidance.

Drainage Strategy

The key focus of this assessment is therefore on the sustainable management of surface water run-off to ensure no increased flood risk results from the development proposals. The surface water run-off management options have been assessed in accordance with the sustainable drainage hierarchy, which is to discharge to ground, followed by a waterbody or finally the public sewer.

As infiltration is not likely to be feasible based on ground conditions, further discussion with KC, and the previous drainage regime; this assessment also considers the alternative options. The next discharge option in the hierarchy should be to discharge to a watercourse/waterbody. There are however no watercourses suitable for outfall within proximity of the site. The alternative drainage method should infiltration and a connection into a watercourse not be feasible, is to discharge surface water into the nearest surface water compatible sewer network.

Yorkshire Water sewer records show that the site was previously served by formal surface water infrastructure, however, this length of sewer has been abandoned since the previous building was demolished in 2014. Further investigation of the existing drainage infrastructure serving the site has been undertaken by Invek Ltd in March 2022 and identified the exact location, routing, and condition of these existing drainage systems onsite. The proposals are to reuse the existing onsite sewers where feasible, to discharge to the public combined sewer within Thorncliffe Street as the site formerly did.

Based on the site area, the pre-development greenfield rate (Q_{Bar}) is calculated to be 1.8l/s. As a standard flow control device mechanism will be utilised to restrict the discharge rate and the lowest feasible discharge rate applied by the orifice plate diameter would be 5.0l/s. The proposed discharge rate will therefore be 5.0l/s. Restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. Detailed design will determine with accuracy the attenuation requirements.

As infiltration is unlikely to be feasible a connection into the main drainage systems is needed, however, the presence of the permeable surfaces will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753). Detailed design should confirm whether this site would be suitable for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation requirements.

The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with an allowance for climate change being contained onsite.

This Flood Risk Assessment and Drainage Management Strategy has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The report is commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance.

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Specialist Software

-  MicroDrainage WinDES (v.2020.1.3) – Calculation of Greenfield run-off volumes, rates of rainfall and stormwater storage estimates.

Abbreviations & Acronyms

AEP	Annual Exceedance Probability
BGS	British Geological Survey
CC	Climate Change
CSAI	Cranfield Soil and Agrifood Institute
EA	Environment Agency
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
KC	Kirklees Council
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
mAOD	Metres Above Ordnance Datum
NGR	National Grid Reference
NPPF	National Planning Policy Framework
OS	Ordnance Survey
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Practice Guidance
QSE	Quick Storage Estimate
QBAR	Mean Annual Flood
SfA	Sewers for Adoption
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Drainage Systems
TWL	Top Water Level
YW	Yorkshire Water

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1.0 INTRODUCTION

1.1 Planning Policy Context

- 1.1.1 All forms of flooding and their impact on the natural and built environment are material planning considerations. The revised National Planning Policy Framework (NPPF) sets out the Government's objectives for the planning system, and how planning should facilitate and promote sustainable patterns of development, avoiding flood risk and accommodating the impacts of climate change. Government policy with respect to development in flood risk areas is contained within the revised NPPF and the supporting Planning Practice Guidance (PPG) (refer to extracts in **Appendix A**).
- 1.1.2 A Flood Risk Assessment and Drainage Management Strategy (FRA&DMS) has been completed in accordance with the revised NPPF and the PPG to review all sources of flood risk both to and from the proposed development. The report also considers the most appropriate drainage management options including the implementation of Sustainable Drainage Systems (SuDS) in line with national policy.
- 1.1.3 The proposals are residential in nature and are classified as 'more vulnerable' within Annex 3: Flood Risk Vulnerability Classification of the National Planning Policy Framework (NPPF). The Planning Practice Guidance (PPG) confirms that this type of development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk as a result.

1.2 Site Context

- 1.2.1 This FRA&DMS has been prepared to support a planning application for the construction of a 60no. bed residential care home on land off Thomas Street in Huddersfield. The proposals will be complete with access, car parking, boundary fencing and drainage.

1.3 Consultation

- 1.3.1 The preparation of this report has been undertaken in consultation with the Environment Agency (EA), Yorkshire Water (YW), and Kirklees Council (KC). Consultation responses can be seen in **Appendix B, C, and D** respectively. The NPPF advises that Kirklees Council (KC) as the Local Planning Authority (LPA) should consult with the EA who will provide advice and guidance on flood issues at a strategic level and in relation to planning applications.

2.0 EXISTING SITE LOCATION

2.1 Location

- 2.1.1 The development site is located on land off Thomas Street in Huddersfield. The Ordnance Survey National Grid Reference for the site is E: 411643, N: 418272 and the nearest postcode is HD3 3JH (see Location Plan in **Appendix E**). The total site covers 0.255ha and is edged in red in **Figure 1**.
- 2.1.2 In terms of the surrounding land-use, located to the north, east and south of the site are Thomas Street, Thorncliffe Street, and Brian Street respectively. The site is surrounded by a mixture of residential and commercial development, as illustrated in **Figure 1**.



Figure 1: Existing Features Plan (Google Maps, 2022)

2.2 Existing and Historical Land Use

- 2.2.1 The site is currently undeveloped and comprises of some former hardstanding land associated with the previous development. Historically, the site was undeveloped until the late 1800's when it was developed into residential dwellings. Demolition and redevelopment of the site began around 2010, involving the construction of a council owned care home. This was demolished around 2013 (planning ref: 2013/N/92811/W) and has remained undeveloped since.

2.3 Topography

- 2.3.1 A topographic survey has been undertaken and included within **Appendix F**. The topographic survey has identified that the site falls from 212.2mAOD adjacent to the western boundary, down to 209.9mAOD in the south-eastern corner of site. The arrows shown on **Figure 1** give a general indication of the fall across the site.

3.0 DEVELOPMENT PROPOSALS

3.1 Nature of the development

- 3.1.1 This assessment is to support to a planning application for the construction of a 60no. bed residential care home on land located off Thomas Street in Huddersfield. The proposals will be complete with access, car parking, external works and lighting, landscaping, boundary walls and fencing, external services, and drainage. A full planning layout is included in **Appendix G**.



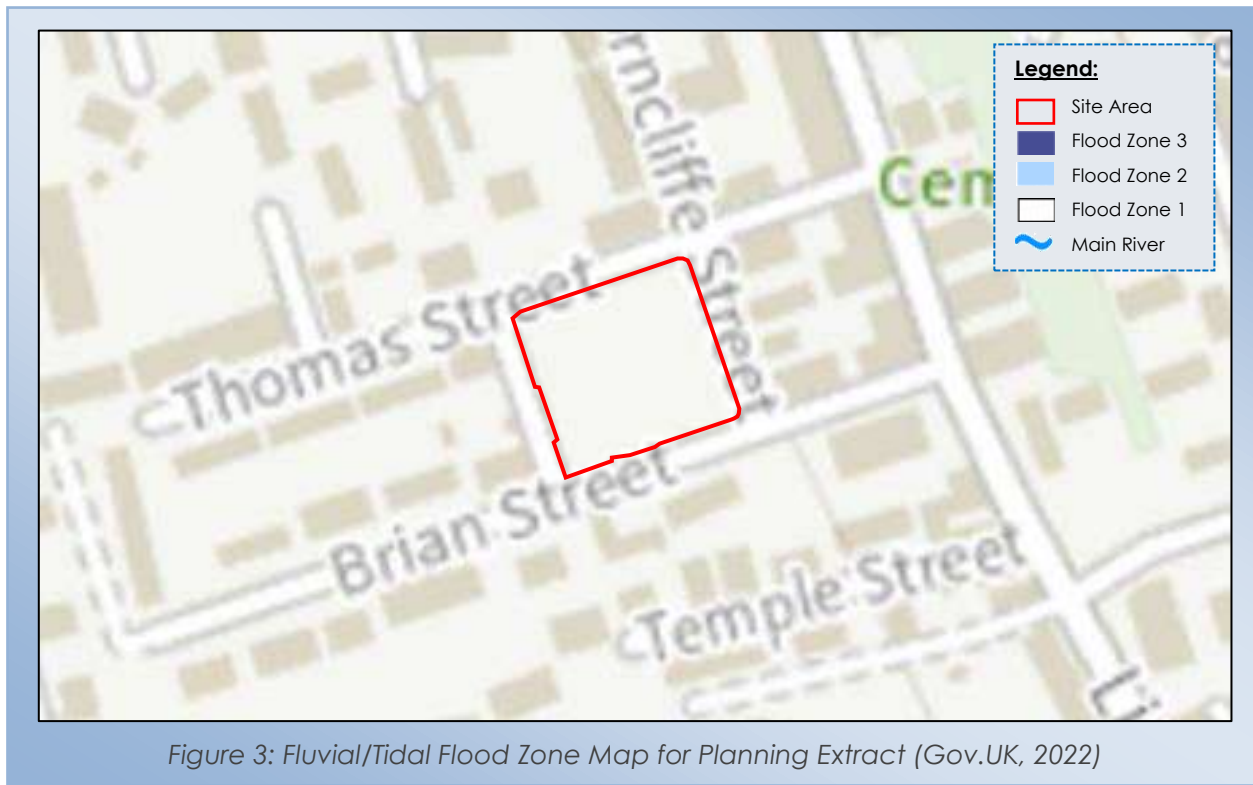
Figure 2: Proposed Site Plan (ADG Architects, 2023)

- 3.1.2 The total site covers 0.255ha and is assumed to be 100% permeable at present. Due to the nature of the development the impermeable areas of the site will likely increase to 72% post-development (which equates to 1826m²).
- 3.1.3 National and local policy identifies that Sustainable Drainage Systems (SuDS) should be incorporated into new development where at all feasible. It is highly recommended that permeable surfacing be utilised where at all feasible for proposed developed areas, to minimise the surface water run-off generated. Given the scale and nature of the proposals there is likely to be scope to incorporate SuDS features onsite such as rain gardens, water butts and permeable paving. Detailed design will be required to confirm, subject to ground investigations and detailed levels review.

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flood Risk

- 4.1.1 Information relating to flood risk at the site has been obtained from the Environment Agency and from the Gov.uk website. An extract of the EA's Flood Zone Map for Planning is shown in **Figure 3**, which illustrates that the site is located solely within Flood Zone 1. Flood Zone 1 is an area considered to be at little or no flood risk from rivers and/or the sea (as defined by the EA).



- 4.1.2 The nearest Main River to site is Grimescar Dike located 1.45km north-east. It is understood based on the proximity to site and the surrounding topography, the risk from this Main River is very low. This is reflected in the national flood mapping data sets (see full mapping in **Appendix B**).
- 4.1.3 Initial consultation with the EA, YW, and KC also failed to highlight any historical flooding directly to the site or the surrounding area because of fluvial sources (see correspondence in **Appendix B, C, and D**). This is further supported by the review of Kirklees Council Strategic Flood Risk Assessment, which does not identify the site to be at risk from fluvial sources.

4.2 Tidal Flood Risk

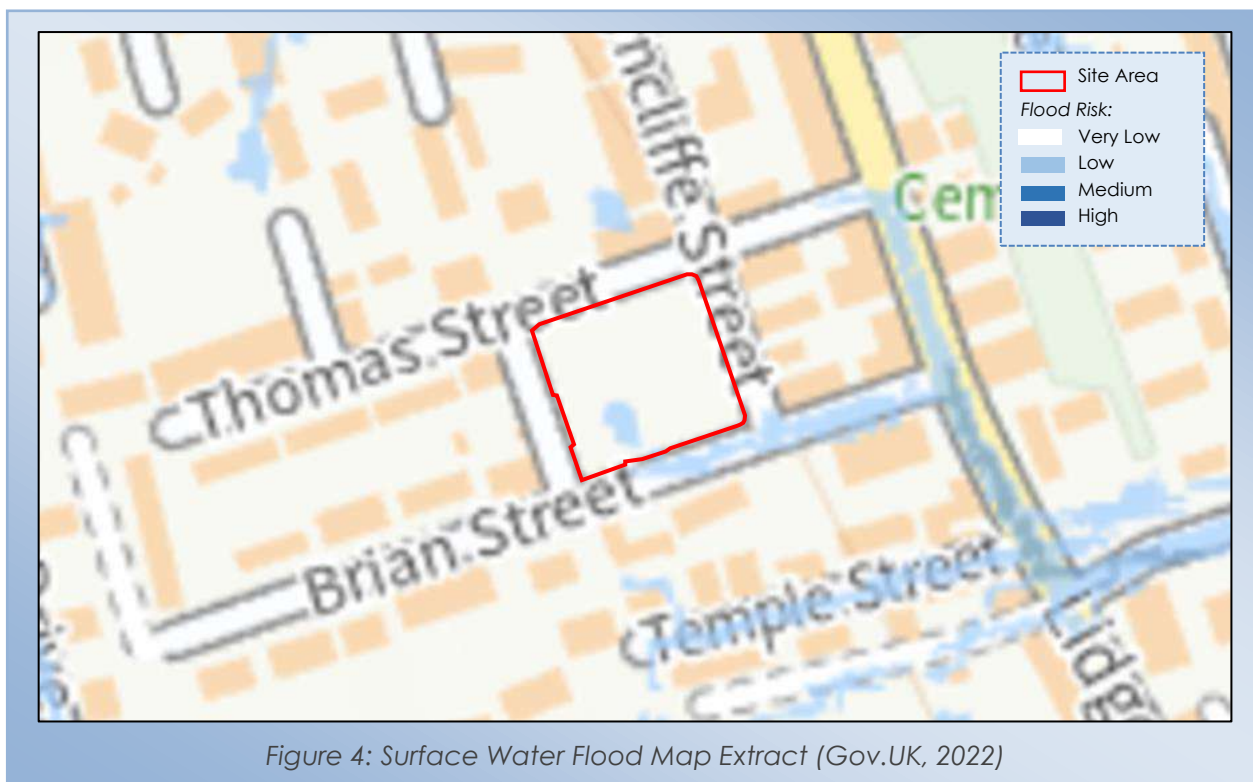
- 4.2.1 The Northwest Coastline is located over 70km west of the development site. Due to the distance from site, the tidal flood risk from these sources is 'low'. This is supported by the EA's Flood Zone Map for Planning also for the site being in Flood Zone 1.

4.3 Flood Risk Vulnerability Classification and Flood Zone Compatibility

- 4.3.1 The proposals are residential in nature and are classified as 'more vulnerable' within Annex 3: Flood Risk Vulnerability Classification of the NPPF. The PPG confirms that this type of development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk as a result.

4.4 Surface Water Flood Risk

- 4.4.1 Surface water flooding occurs when rainwater is unable to drain away through the normal drainage systems or soak into the ground but lies on or flows over the ground instead. The risk associated with surface water flooding is indicated by the long-term flood mapping (extract shown in **Figure 4**).
- 4.4.2 As indicated in **Figure 4**, the site is predominantly at 'very low' risk from surface water flooding. Generally, areas at higher risk of surface water flooding correspond with either existing watercourses, conveyance features, existing ponds, or natural low-lying depressions. In this case, the areas onsite at higher risk correspond with existing hardstanding areas of the site located adjacent to Brian Street, which is therefore susceptible to surface water ponding during extreme and prolonged rainfall events.



- 4.4.3 The risk to the proposals from surface water flooding will be managed and reduced, post-development through the design and implementation of a sustainable surface water management regime. To further mitigate for any residual risks, it is advised that (following any re-grade of the site) finished floor levels of the care home are elevated above the external levels to provide safe overland flood routes for any excess surface water run-off.

Pluvial (Overland run-off) Flood Risk

- 4.4.4 Intense rainfall that is unable to soak into the ground or enter drainage systems can run-off land and result in flooding. Local topography and the land-use can have a strong influence on the direction and depth of flow. The topography of the site and surrounding developed areas means it is unlikely the site will be impacted by overland pluvial flows, as these are typically generated in undeveloped/undrained areas.
- 4.4.5 The volume and rate of overland flow from land can be exacerbated, if development increases the percentage of impermeable area. Any overland flows generated by the development must be carefully controlled with safe avenues directing overland flow away from adjacent development being advised.

Sewer Flood Risk

- 4.4.6 In urban areas, rainwater is frequently drained into surface water sewers or sewers containing both surface and wastewater known as 'combined sewers'. Foul water flooding often occurs in areas prone to overland flow and can result when the sewer is overwhelmed by heavy rainfall and will continue until the water drains away.
- 4.4.7 Yorkshire Water sewer records have identified an abandoned sewer located onsite, which previously routed east into a public combined sewer within Thorncliffe Street. There are also public combined sewers within Thomas Street located adjacent to the northern boundary, and Brian Street located adjacent to the southern boundary of the site. Consultation with YW identified no recorded historical sewer flooding issues on or near to the site (see **Appendix C** for correspondence and sewer records).

4.5 Groundwater Flood Risk

- 4.5.1 High groundwater levels are usually the key source of groundwater flooding, which occurs when excess water emerges at the grounds surface (or within manmade underground structures such as basements). Groundwater flooding is often more insistent than surface water flooding and would typically last for weeks/months rather than days meaning the result to property is often more severe.
- 4.5.2 In general terms groundwater flooding can occur from three main sources:
- If groundwater levels are naturally close to the surface, then this can present a flood risk during times of intense rainfall.
 - Seepage and percolation occur where embankments above ground level hold water. In these cases, water travels through the embankment material and emerges on the opposite side of the embankment.
 - Groundwater recovery / rebound occurs where the water table has been artificially depressed by abstraction. When the abstraction stops the water, table makes a recovery to its original level. There is the potential for groundwater flooding in low lying areas where groundwater levels have been depressed below their pre-pumping conditions, where these were at or close to ground level.
- 4.5.3 The mapping data for groundwater shows that the site is underlain by a Secondary A Aquifer with Unproductive superficial deposits. The site is also located within a High Groundwater Vulnerability Zone. No historical flooding at or within close proximity to the site due to groundwater related sources has however been identified as part of this

assessment. Review of KC's Strategic Flood Risk Assessment (SFRA) identifies the site to be within an Area Susceptible to Ground Water Flooding, with < 25% Risk of Groundwater Emergence (see mapping extracts in **Appendix H**).

- 4.5.4 Irrespective, it is advised that the Finished Floor Levels of the proposed buildings be raised sufficiently above the external levels where possible to safeguard dwellings (this is typically 150mm). The external levels should fall away from the proposed dwellings where practical to provide safe avenues for overland flows around/away from any proposed more vulnerable development.

4.6 Artificial Sources of Flood Risk

- 4.6.1 National policy states that an FRA should consider the potential risks from a variety of other flood sources including artificial sources (such as risks from reservoirs and canals).

Reservoirs

- 4.6.2 The EA recognises reservoirs as bodies of water over 25,000cu.m and the long-term flood mapping is included in **Appendix B** which shows the extents of flooding associated with reservoirs does not impact on or near to the development site.

Canals

- 4.6.3 There are no canals located in proximity to site therefore the risk of flooding associated with canals is 'low'.
- 4.6.4 Irrespective, it is advised that external levels fall away from the proposed buildings, to minimise the flood risk from a variety of sources. By keeping the finished floor levels elevated relative to the externals, this should help create an overland flood flow route in the event of a breach or any other source of flooding that could lead to overland flows including reservoir or canal flooding.

4.7 Historical and Anecdotal Flooding Information

- 4.7.1 No historical flooding has been identified during our review of online sources, including review of the Kirklees Council's Strategic Flood Risk Assessment (see general mapping extracts in **Appendix H**).
- 4.7.2 Consultation with Kirklees Council, Yorkshire Water, and the Environment Agency has been has also failed to identify any historic flooding directly to site from the variety of sources reviewed (see **Appendix B, C, and D** for correspondence).

4.8 Flood Risk Mitigation Measures & Residual Risks

- 4.8.1 The development parcels are located wholly within Flood Zone 1 and are at little risk of fluvial/tidal flooding. To observe a conservative approach however, mitigation measures have been proposed below to safeguard against other potential residual sources of flood risk. The mitigation measures also consider the uncertainties of climate change in accordance with the revised NPPF and PPG.

Mitigation Measures

- 4.8.2 For 'more vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Levels (FFL) of the proposed buildings, a minimum of 150mm above the existing ground levels. By ensuring the FFLs are raised sufficiently above the external levels (following any re-grade) should mitigate any risk of flooding from a variety of sources, including groundwater and surface water risks.
- 4.8.3 Any overland flows generated by the development must be carefully controlled. Safe avenues directing overland flow way from any existing and proposed buildings are advised.
- 4.8.4 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).
- 4.8.5 The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with an allowance for climate change being contained onsite.
- 4.8.6 As with any drainage system blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either YW or KC then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.

Residual Risks

- 4.8.7 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the development site if the capacity of the drainage system is exceeded.

5.0 SURFACE WATER MANAGEMENT

- 5.0.1 The total site covers 0.255ha and is assumed to be 100% permeable at present. Due to the nature of the development the impermeable areas of the site will likely increase to 72% post-development (which equates to 0.183ha). It is understood that any run-off generated by the existing hardstanding areas onsite currently ponds within the low-lying depressions onsite and infiltrates over an extended period of time. It is understood that there is a sewer onsite that may still cater for some surface water flows.
- 5.0.2 Further investigation of the existing drainage infrastructure serving the site has been undertaken by Invek Ltd in March 2022. This identified the exact location, routing, and condition of the former existing drainage systems onsite. A connectivity survey has been included within **Appendix I** for completeness.

5.1 Pre-Development Surface Water Run-off

- 5.1.1 Further consultation with Yorkshire Water has identified that the site has not positively discharged to the public sewer network since 2015 and is served by limited surface water infrastructure (see correspondence in **Appendix C**). This assessment has therefore considered the site to be 100% permeable to calculate the existing run-off.
- 5.1.2 The peak rates and volumes of run-off generated by the development area have been calculated for the key storm events using the IH124 Statistical Method. Details of the pre-development rates and volumes are included in **Table 1** (full details can be found in **Appendix J**) based on the site area.

Development Area	Run-Off Rates				Run-Off Volumes	
	1 In 1 Year	1 In 30 Year	1 In 100 Year	QBar	1 In 1 Year	1 In 100 Year
0.255ha	1.6l/s	3.2l/s	3.8l/s	1.8l/s	21.7cu.m	57.7cu.m

Table 1: Pre-Development Surface Water Run-Off Rates (Betts Hydro, 2023)

5.2 Post Development Surface Water Run-Off

- 5.2.1 As previously discussed due to the nature of the development the impermeable areas of the site post-development will likely increase. It is understood that the site will increase to 72% impermeable post development which equates to 0.183ha. The unrestricted post-development run-off rates generated by this impermeable area have been detailed in **Table 2**.

Impermeable Areas	Run-Off Rates		
	1 In 1 Yr	1 In 30 Yr	1 In 100 Yr + CC
0.183ha	9.5l/s	17.0l/s	31.9l/s

Table 2: Post-Development Un-Restricted Run-Off Rates (Betts Hydro, 2023)

- 5.2.2 In accordance with national and local planning policies it is, however, necessary to restrict surface water run-off rates where at all practical to mimic a pre-development greenfield equivalent situation. The proposals will be to discharge surface water run-off

from the new development to mimic the pre-development greenfield equivalent situation (**Table 1**). Further details can be found in Section 5.7.

5.3 Sustainable Drainage Systems (SuDS)

- 5.3.1 In accordance with national and local planning policy, peak surface water discharge rates from new development should be appropriately managed and where possible reduced. To manage surface water run-off policy shows that preference should always be given to Sustainable Drainage Systems (SuDS) over the traditional methods of buried sewers wherever possible and practical.
- 5.3.2 SuDS can (if designed and situated appropriately) address the four key sustainability objectives embedded in planning policy including providing space for water (water quantity), improving water quality and biodiversity, along with providing valuable amenity/recreational space within new development sites. These benefits depend on the type of SuDS features being proposed, some examples are illustrated in **Figure 5**.



- 5.3.3 Opportunities should also be taken to provide soft landscaping where at all possible on site to assist in minimising surface water run-off. It would be recommended that permeable surfacing and bio-filtration be considered where at all feasible. By including measures such as these the surface water run-off is being dealt with at source and this will assist locally with surface water management (subject to optimum ground conditions).
- 5.3.4 If infiltration is not feasible then a connection into the main drainage systems is needed, but the presence of the permeable surfaces will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753). Detailed design should confirm whether this site would be suitable for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation requirements.

5.4 Methods of Surface Water Management

5.4.1 There are three methods that have been reviewed for the management and discharge of surface water. These may be applied individually or collectively to form a complete strategy and should be applied in the order of priority listed below:

-  Discharge via infiltration
-  Discharge to watercourse
-  Discharge to public sewerage system

5.5 Discharge via Infiltration

5.5.1 Any impermeable areas that can drain to soakaway or an alternative method of infiltration would significantly improve the sustainability of any surface water system onsite. The ground conditions have been identified based on the online datasets given there has been no onsite infiltration testing at this time to support this assessment.

5.5.2 The online Cranfield Soil and AgriFood Institute (CSAI), Soilscales viewer identifies Freely draining slightly acid loamy soils. The British Geology Survey (BGS) mapping data indicates that the bedrock geology consists of Sandstone, however, no superficial deposits have been recorded.

5.5.3 The underlying strata appears to suggest that permeability is low, however the FEH soil factor of 0.47 suggests a very low permeability for the area (based on the scale of 0.1 being very high permeability and 0.5 being very low).

5.5.4 Further discussion has also been undertaken with Kirklees Council, which identified that there are cellared properties within close proximity to the site. As these are usually for storage only, these are considered unlikely to be sufficiently tanked. It is therefore understood that infiltration is not a viable solution, as this may potentially increase flood risk to the cellared properties (see correspondence in **Appendix D**).

5.5.5 Based on the soil classification, further consultation with KC, and the previous drainage regime, it is understood that infiltration is unlikely to offer a possible means of managing all the surface water run-off generated by the development; other surface water discharge methods have therefore been reviewed.

5.6 Discharge to Watercourse/Waterbody

5.6.1 The next discharge option in the sustainable drainage hierarchy should be to discharge to the watercourse, there are however no watercourses suitable for outfall within proximity of the site. The alternative drainage method should infiltration and a connection into a watercourse not be feasible, is to discharge surface water run-off into the nearest surface water compatible sewer network.

5.7 Discharge to Public Sewer Network

5.7.1 As infiltration and a connection into a nearby watercourse are not likely to be feasible, the alternative proposal in accordance with policy would be to discharge surface water run-off from the proposed development into the nearest surface water compatible sewer.

- 5.7.2 YW sewer records have identified an abandoned sewer located onsite, which is shown to connect into a public combined sewer within Thorncliffe Street. There are also public combined sewers within Thomas Street located adjacent to the northern boundary, and Brian Street located adjacent to the southern boundary of the site. It is understood that the site was previously developed and was served by this now abandoned formal surface water infrastructure.
- 5.7.3 Further investigation of the existing drainage infrastructure serving the site has been undertaken by Invek Ltd in March 2022. This identified the exact location, routing, and condition of these existing drainage systems onsite; a connectivity survey has been included within **Appendix I** for completeness.

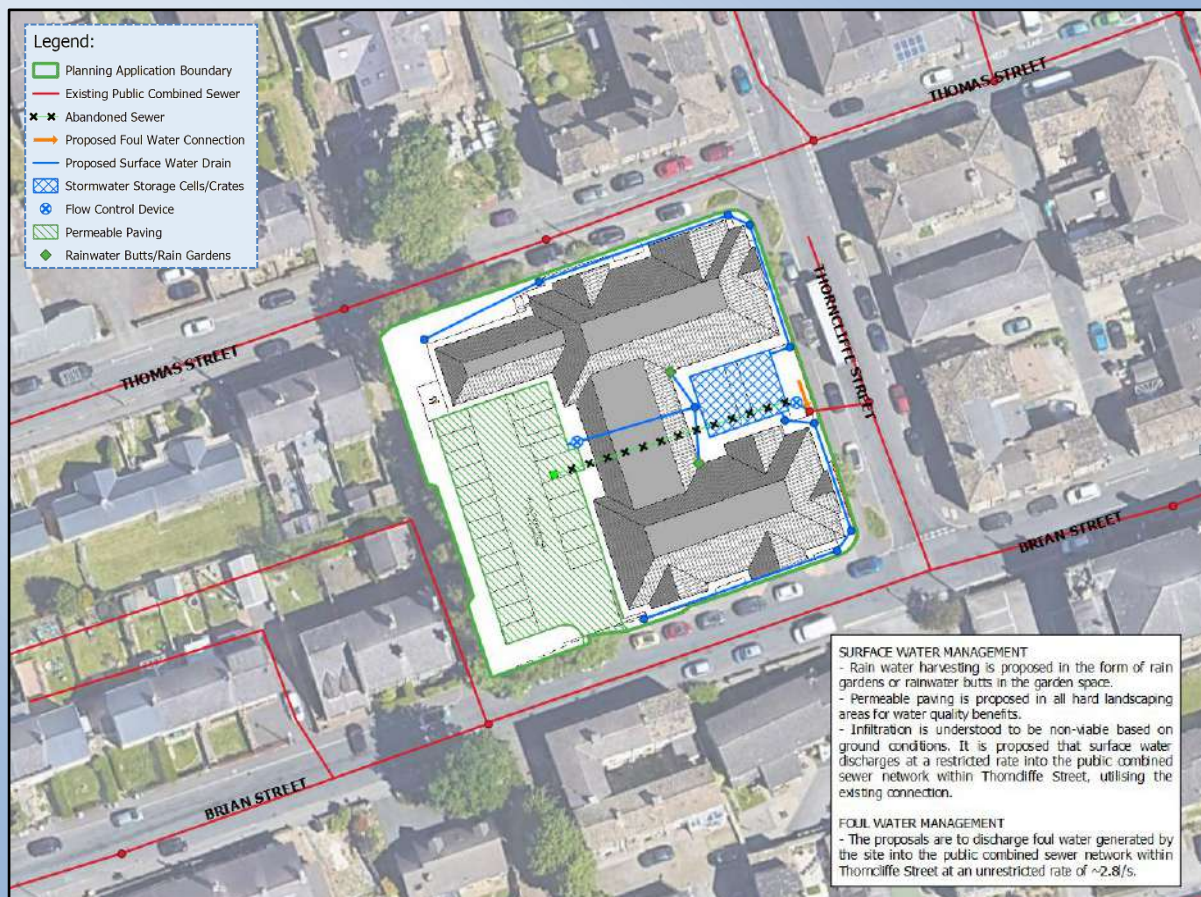


Figure 6: Preliminary Drainage Strategy Extract (Betts Hydro, 2023)

* This drawing is not a drainage 'design' it is a preliminary drainage plan.

- 5.7.4 The proposals are therefore to discharge surface water run-off from the new development into the public combined sewer network within Thorncliffe Street via the existing onsite connections identified during the intrusive investigations.
- 5.7.5 Detailed design will be required to confirm the feasibility of the strategy and consents for works to the public sewer network will be required from Yorkshire Water. Early discussion will be needed to identify any additional capacity constraints. Any offsite works are to be discussed with other relevant parties (Highways Authority) during the detailed design stage. A pre-development enquiry with Yorkshire Water has been

submitted, which identified that YW will consider a connection into the public combined sewer within Thorncliffe Street at a point to the east of the site, at a restricted rate of no greater than 5.0l/s.

Proposed Discharge Rates

- 5.7.6 In accordance with the SuDS Manual (CIRIA) and the Non-Technical Standards for SuDS (March 2015) all sites should endeavour to achieve as close to pre-development greenfield rates as is viable. Based on the site area, the pre-development greenfield rate (QBar) is calculated to be 1.8l/s. As a standard flow control device mechanism will be utilised to restrict the discharge rate and the lowest feasible discharge rate applied by the orifice plate diameter would be 5.0l/s. The proposed discharge rate will therefore be 5.0l/s.
- 5.7.7 Restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. The stormwater storage figures quoted in **Table 3 (Appendix L)** are estimates only. Detailed design will determine with accuracy the attenuation requirements.

Impermeable Area (0.183)	1 In 1 Year	1 In 30 Year	1 In 100 Year + 45% CC
Restricted Run-Off Rate	5.0l/s	5.0l/s	5.0l/s
Estimated Stormwater Storage Volume	7.5cu.m-19cu.m	33cu.m-52cu.m	80cu.m-121cu.m

Table 3: Estimated Stormwater Storage Requirements (Betts Hydro, 2023)

- 5.7.8 As discussed previously, restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. Given the scale and nature of the development this will be provided via underground storage. The surface water scheme for the development will be designed to cater for the surface water run-off generated in the events up to and including the 1 in 100yr return period event with allowance for climate change.

5.8 Climate Change

- 5.8.1 There are indications that the climate in the UK is changing significantly, and it is widely believed that the nature of climate change will vary greatly by region. Current opinion indicates the likelihood that future climate change would produce more frequent short duration and high intensity rainfall events with the addition of more frequent periods of long duration rainfall. It is believed that the impact of climate change means there is likely to be a long-term increase in the average sea levels, with an expectation that sea levels will rise gradually. An increase in flood water levels means that future flooding events will occur more frequently and will have a greater impact.
- 5.8.2 In light of the future uncertainties Climate Change should be accounted for within the design of all new developments. Climate change factors have been considered and any increase in the level of flood risk (to the site) from climate change is likely to be related to the increase in rainfall intensity and duration and its impact upon the surface water drainage system.

5.8.3 In accordance with the Aire and Calder Management Catchment peak rainfall allowances, the upper end allowance (**Table 4**) for the 2070's has been utilised.

PROJECTIONS	TOTAL POTENTIAL CHANGE ANTICIPATED FOR THE 2070'S
Upper End Allowance	45%
Central Allowance	30%

Table 4: Change to Peak Rainfall Compared to 1981-2000 Baseline (Environment Agency, 2022)

6.0 FOUL WATER MANAGEMENT

- 6.1 Review of the YW sewer records identify there to be public sewer infrastructure located to the north, east, and south of the site. The nearest foul water compatible public sewer is a public combined sewer (300mm dia.) located within Thorncliffe Street adjacent to the southern boundary of site (refer to sewer records within **Appendix C**).
- 6.2 Based on the proposals for the construction of a 60no. bed care home, the approximate peak foul water flows generated by the site have been calculated at 2.8l/s, based on 4000 litres per dwelling per 24 hours as per the guidance contained within Sewers for Adoption.
- 6.3 The proposals for foul water management will be to connect foul water flows into the nearest public combined sewer (300mm dia.) within Thorncliffe Street. In review of YW sewer records there is an existing onsite sewer that outfalls into the public combined sewer within Thorncliffe Street that can be re-used to serve the new proposals, to avoid forming new connections.
- 6.4 Further investigation of the existing drainage infrastructure serving the site has been undertaken by Invek Ltd in March 2022. This identified the exact location, routing, and condition of these existing drainage systems onsite. A connectivity survey has been included within **Appendix I** for completeness. The proposals are therefore to reuse the existing onsite sewer where feasible and continue to discharge foul water to the public combined sewer within Thorncliffe Street.
- 6.5 Detailed design will be required to confirm feasibility of the strategy and to confirm whether a full gravity connection can be achieved. Early consultation with YW is also recommended to identify any additional constraints and their preferred point(s) of connection. A pre-development enquiry has been sent to YW; which identified that YW would consider a connection into the public combined sewer located within Thorncliffe Street, at a point to the east of the site (see correspondence within **Appendix C**).

7.0 SUMMARY AND CONCLUSIONS

- 7.1 This report has been prepared to support a planning application for the construction of a 60no. bed residential care home on land off Thomas Street in Huddersfield. The proposals are residential in nature and are classified as 'more vulnerable' within Annex 3: Flood Risk Vulnerability Classification of the NPPF. The PPG confirms that this type of development is appropriate when located within Flood Zone 1, providing there is no increase in flood risk as a result.

Flood Risk

- 7.2 This report has reviewed all sources of flood risk both to and resulting from the proposed development. Consultation with the Environment Agency, Kirklees Council, and Yorkshire Water have not identified any historical flooding at the site or within the wider area.
- 7.3 The online flood risk datasets have also identified the site to be at low risk from fluvial/tidal flooding. The site is however shown to be at higher risk of surface water flooding due to its impermeable nature. This surface water flood risk to site will be reduced and sustainably managed post-development, following the implementation of a sustainable surface water management regime and where relevant appropriate levels design.
- 7.4 This assessment has been prepared in consultation with the relevant interested parties and the reports is commensurate with the scale and nature of the development proposals. The development proposals can therefore be considered appropriate in accordance with the Planning Practice Guidance.

Drainage Strategy

- 7.5 The key focus of this assessment is therefore on the sustainable management of surface water run-off to ensure no increased flood risk results from the development proposals. The surface water run-off management options have been assessed in accordance with the sustainable drainage hierarchy, which is to discharge to ground, followed by a waterbody or finally the public sewer.
- 7.6 As infiltration is not likely to be feasible based on ground conditions, further discussion with KC, and the previous drainage regime; this assessment also considers the alternative options. The next discharge option in the hierarchy should be to discharge to a watercourse/waterbody. There are however no watercourses suitable for outfall within proximity of the site. The alternative drainage method should infiltration and a connection into a watercourse not be feasible, is to discharge surface water into the nearest surface water compatible sewer network.
- 7.7 Yorkshire Water sewer records show that the site was previously served by formal surface water infrastructure, however, this length of sewer has been abandoned since the previous building was demolished in 2014. Further investigation of the existing drainage infrastructure serving the site has been undertaken by Invek Ltd in March 2022 and identified the exact location, routing, and condition of these existing drainage systems onsite. The proposals are to reuse the existing onsite sewers where feasible, to discharge to the public combined sewer within Thorncliffe Street as the site formerly did.

- 7.8 Based on the site area, the pre-development greenfield rate (QBar) is calculated to be 1.8l/s. As a standard flow control device mechanism will be utilised to restrict the discharge rate and the lowest feasible discharge rate applied by the orifice plate diameter would be 5.0l/s. The proposed discharge rate will therefore be 5.0l/s. Restricting the rate of discharge will generate a requirement to provide onsite stormwater storage for the extreme rainfall events. Detailed design will determine with accuracy the attenuation requirements.
- 7.9 As infiltration is unlikely to be feasible a connection into the main drainage systems is needed, however, the presence of the permeable surfaces will still allow the first 5mm of rainfall to be dealt with at source as identified in the SuDS Manual (CIRIA 753). Detailed design should confirm whether this site would be suitable for incorporation of SuDS following more detailed analysis of levels, ground conditions and attenuation requirements.
- 7.10 The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with an allowance for climate change being contained onsite.
- 7.11 This Flood Risk Assessment and Drainage Management Strategy has been prepared in consultation with the relevant interested parties and incorporates their comments where possible. The report is commensurate with the scale and nature of the development proposals and in summary, the development can be considered appropriate in accordance with the Planning Practice Guidance.

8.0 RECOMMENDATIONS

- 8.1 For 'more vulnerable' development located within Flood Zone 1, it is typical to set the Finished Floor Levels (FFL) of the proposed buildings, a minimum of 150mm above the existing ground levels. By ensuring the FFLs are raised sufficiently above the external levels (following any re-grade) should mitigate any risk of flooding from a variety of sources, including groundwater and surface water risks.
- 8.2 Any overland flows generated by the development must be carefully controlled. Safe avenues directing overland flow way from any existing and proposed buildings are advised.
- 8.3 To minimise the flood risk to the neighbouring properties it is recommended that the surface water run-off generated by the proposals be managed effectively with the peak rates of run-off being restricted to the equivalent of the pre-development situation (with betterment where required).
- 8.4 The proposed onsite surface water drainage system will need to be sized to contain the 1 in 30yr return period event below ground with exceedance from storm events up to and including the 1 in 100yr return period storm event with an allowance for climate change being contained onsite.
- 8.5 As with any drainage system blockages within either the foul or surface water system have the potential to cause flooding or disruption. It is important that should any drainage systems not be offered for adoption to either YW or KC then an appropriate maintenance regime should be scheduled with a suitably qualified management company for these private drainage systems.
- 8.6 If an extreme rainfall event exceeds the design criteria for the drainage system it is likely that there will be some overland flows that are unable to enter the system, it is important that these potential overland flows are catered for within the development site if the capacity of the drainage system is exceeded.

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APPENDIX A: NPPF & PPG EXTRACTS

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14. Meeting the challenge of climate change, flooding and coastal change

152. The planning system should support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change. It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience; encourage the reuse of existing resources, including the conversion of existing buildings; and support renewable and low carbon energy and associated infrastructure.

Planning for climate change

153. Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply, biodiversity and landscapes, and the risk of overheating from rising temperatures⁵³. Policies should support appropriate measures to ensure the future resilience of communities and infrastructure to climate change impacts, such as providing space for physical protection measures, or making provision for the possible future relocation of vulnerable development and infrastructure.
154. New development should be planned for in ways that:
- a) avoid increased vulnerability to the range of impacts arising from climate change. When new development is brought forward in areas which are vulnerable, care should be taken to ensure that risks can be managed through suitable adaptation measures, including through the planning of green infrastructure; and
 - b) can help to reduce greenhouse gas emissions, such as through its location, orientation and design. Any local requirements for the sustainability of buildings should reflect the Government's policy for national technical standards.
155. To help increase the use and supply of renewable and low carbon energy and heat, plans should:
- a) provide a positive strategy for energy from these sources, that maximises the potential for suitable development, while ensuring that adverse impacts are addressed satisfactorily (including cumulative landscape and visual impacts);
 - b) consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development; and

⁵³ In line with the objectives and provisions of the Climate Change Act 2008.

- c) identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers.
156. Local planning authorities should support community-led initiatives for renewable and low carbon energy, including developments outside areas identified in local plans or other strategic policies that are being taken forward through neighbourhood planning.
157. In determining planning applications, local planning authorities should expect new development to:
- a) comply with any development plan policies on local requirements for decentralised energy supply unless it can be demonstrated by the applicant, having regard to the type of development involved and its design, that this is not feasible or viable; and
 - b) take account of landform, layout, building orientation, massing and landscaping to minimise energy consumption.
158. When determining planning applications for renewable and low carbon development, local planning authorities should:
- a) not require applicants to demonstrate the overall need for renewable or low carbon energy, and recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and
 - b) approve the application if its impacts are (or can be made) acceptable⁵⁴. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas.

Planning and flood risk

159. Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere.
160. Strategic policies should be informed by a strategic flood risk assessment, and should manage flood risk from all sources. They should consider cumulative impacts in, or affecting, local areas susceptible to flooding, and take account of advice from the Environment Agency and other relevant flood risk management authorities, such as lead local flood authorities and internal drainage boards.

⁵⁴ Except for applications for the repowering of existing wind turbines, a proposed wind energy development involving one or more turbines should not be considered acceptable unless it is in an area identified as suitable for wind energy development in the development plan; and, following consultation, it can be demonstrated that the planning impacts identified by the affected local community have been fully addressed and the proposal has their backing.

161. All plans should apply a sequential, risk-based approach to the location of development – taking into account all sources of flood risk and the current and future impacts of climate change – so as to avoid, where possible, flood risk to people and property. They should do this, and manage any residual risk, by:
- a) applying the sequential test and then, if necessary, the exception test as set out below;
 - b) safeguarding land from development that is required, or likely to be required, for current or future flood management;
 - c) using opportunities provided by new development and improvements in green and other infrastructure to reduce the causes and impacts of flooding, (making as much use as possible of natural flood management techniques as part of an integrated approach to flood risk management); and
 - d) where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term, seeking opportunities to relocate development, including housing, to more sustainable locations.
162. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding from any source. 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 strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding.
163. If it is not possible for development to be located in areas 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 exception test will depend on the potential vulnerability of the site and of the development proposed, in line with the Flood Risk Vulnerability Classification set out in Annex 3.
164. The application of the exception test should be informed by a strategic or site-specific flood risk assessment, depending on whether it is being applied during plan production or at the application stage. To pass the exception test it should be demonstrated that:
- a) the development would provide wider sustainability benefits to the community that outweigh the flood risk; and
 - b) 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.
165. Both elements of the exception test should be satisfied for development to be allocated or permitted.
166. Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again. However, the exception test may need to be reapplied if relevant aspects of the proposal had not been considered when the test was applied at the plan-

making stage, or if more recent information about existing or potential flood risk should be taken into account.

167. When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment⁵⁵. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:
- a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
 - b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
 - c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
 - d) any residual risk can be safely managed; and
 - e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.
168. Applications for some minor development and changes of use⁵⁶ should not be subject to the sequential or exception tests but should still meet the requirements for site-specific flood risk assessments set out in footnote 55.
169. Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used 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.

Coastal change

⁵⁵ A site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use.

⁵⁶ This includes householder development, small non-residential extensions (with a footprint of less than 250m²) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

170. In coastal areas, planning policies and decisions should take account of the UK Marine Policy Statement and marine plans. Integrated Coastal Zone Management should be pursued across local authority and land/sea boundaries, to ensure effective alignment of the terrestrial and marine planning regimes.
171. Plans should reduce risk from coastal change by avoiding inappropriate development in vulnerable areas and not exacerbating the impacts of physical changes to the coast. They should identify as a Coastal Change Management Area any area likely to be affected by physical changes to the coast, and:
- a) be clear as to what development will be appropriate in such areas and in what circumstances; and
 - b) make provision for development and infrastructure that needs to be relocated away from Coastal Change Management Areas.
172. Development in a Coastal Change Management Area will be appropriate only where it is demonstrated that:
- a) it will be safe over its planned lifetime and not have an unacceptable impact on coastal change;
 - b) the character of the coast including designations is not compromised;
 - c) the development provides wider sustainability benefits; and
 - d) the development does not hinder the creation and maintenance of a continuous signed and managed route around the coast⁵⁷.
173. Local planning authorities should limit the planned lifetime of development in a Coastal Change Management Area through temporary permission and restoration conditions, where this is necessary to reduce a potentially unacceptable level of future risk to people and the development.

⁵⁷ As required by the Marine and Coastal Access Act 2009.

(<http://www.legislation.gov.uk/ukxi/2015/596/article/4/made>) to require planning permission to be sought in each case.

Paragraph: 075 Reference ID: 7-075-20220825

Revision date: 25 08 2022

How can neighbourhood plans and neighbourhood development/community right to build orders take account of coastal change?

In any instance where a Neighbourhood Area is proposed in a Coastal Change Management Area, careful attention should be paid to the guidance on [what development would be appropriate in such an area](#), including whether [time-limiting planning permissions](#) are needed. The local planning authority will need to be consulted about existing and anticipated levels of risk, and the types of development that may or may not be appropriate.

See related policy in [paragraphs 170 to 173 of the National Planning Policy Framework](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change>).

Paragraph: 076 Reference ID: 7-076-20220825

Revision date: 25 08 2022

Flood Zone and flood risk tables

- Table 1: Flood Zones
- [National Planning Policy Framework Annex 3 - Flood risk vulnerability classification](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification>)
- [Table 2: Flood risk vulnerability and flood zone 'incompatibility'](#)

Paragraph: 077 Reference ID: 7-077-20220825

Revision date: 25 08 2022

Table 1: Flood Zones

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 0.1% annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map for Planning – all land outside Zones 2, 3a and 3b)
Zone 2 Medium Probability	Land having between a 1% and 0.1% annual probability of river flooding; or land having between a 0.5% and 0.1% annual

Flood Zone	Definition
	probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1% or greater annual probability of river flooding; or Land having a 0.5% or greater annual probability of sea. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

Note: The Flood Zones shown on the Environment Agency's Flood Map for Planning (Rivers and Sea) do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding. Reference should therefore also be made to the [Strategic Flood Risk Assessment](https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment) (<https://www.gov.uk/guidance/local-planning-authorities-strategic-flood-risk-assessment>) when considering location and potential future flood risks to developments and land uses.

Paragraph: 078 Reference ID: 7-078-20220825

Revision date: 25 08 2022

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

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

Key:

✓ Exception test is not required

X Development should not be permitted

Notes to table 2:

- This table does not show the application of the [Sequential Test](#) which should be applied first to guide development to the lowest flood risk areas; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and [Exception Tests](#) do not need to be applied to those developments set out in [National Planning Policy Framework footnote 56](#) (<https://www.gov.uk/guidance/national-planning-policy-framework/14-meeting-the-challenge-of-climate-change-flooding-and-coastal-change>). The Sequential and Exception Tests should be applied to ‘major’ and ‘non major’ development;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

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

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

- remain operational and safe for users in times of flood;

- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

Paragraph: 079 Reference ID: 7-079-20220825

Revision date: 25 08 2022

Site-specific flood risk assessment: Checklist

1 - Development site and location

You can use this section to describe the site you are proposing to develop. It would be helpful to include, or make reference to, a location map which clearly indicates the development site.

- a. Where is the development site located? (e.g. postal address or national grid reference)
- b. What is the current use of the site? (e.g. undeveloped land, housing, shops, offices)
- c. Which Flood Zone (for river or sea flooding) is the site within? (i.e. Flood Zone 1, Flood Zone 2, Flood Zone 3). As a first step, you should check the [Flood Map for Planning \(https://flood-map-for-planning.service.gov.uk/\)](https://flood-map-for-planning.service.gov.uk/). Check the Strategic Flood Risk Assessment for the area available from the local planning authority to identify if the site is within Flood Zone 1 but at increased risk of flooding in future due to climate change
- d. Also check the Strategic Flood Risk Assessment to identify if there are any other sources of flooding that may affect the site now or in the future.

2 - Development proposals

You can use this section to provide a general summary of the development proposals. It would be helpful to include, or make reference to, an existing block plan and a proposed block plan, where appropriate.

- a. What are the development proposal(s) for this site? Will this involve a change of use of the site and, if so, what will that change be?
- b. In terms of vulnerability to flooding, what is the vulnerability classification of the proposed development? See [National Planning Policy Framework Annex 3 \(https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification\)](https://www.gov.uk/guidance/national-planning-policy-framework/annex-3-flood-risk-vulnerability-classification) for an explanation of the vulnerability classifications.
- c. What is the expected or estimated lifetime of the proposed development likely to be (e.g. 100 years or 75 years)? See [paragraph 006](#) of this guidance for further advice on how to assess the lifetime of developments for flood risk and coastal

APPENDIX B: EA INFORMATION & CORRESPONDENCE

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Hannah Buchanan

From: Reilly, Hilary <Hilary.Reilly@environment-agency.gov.uk>
Sent: 20 April 2022 09:30
To: Hannah Buchanan
Subject: Your Enquiry: RFI/2022/253856
Attachments: Planning advice for developers.pdf; Conditional Licence 253856.pdf; Supporting Information 253856.pdf

Our Ref: RFI/2022/253856

Your Ref:

Dear Hannah

**RE: Provision of Product 4, 5 6 and 7 for Thomas Street, Huddersfield. HD3 3JH
Request for information under the Freedom of Information Act 2000 (FOIA) / Environmental Information
Regulations 2004 (EIR)**

Thank you for your enquiry which was received on 2nd March 2022.

The requested data is attached. Please also find attached a 'Supporting Information' document which should be read in conjunction with this data.

Please note the Share file links within the attached documents will expire in 25 days so we strongly recommend downloading the files and saving these to your computer as soon as this email is received. Any request for a link to be remade after it has expired will be considered as a new enquiry and will be subject to a response within 20 working days

Product 4

The product 4 information is provided subject to the Open Government Licence ([here](#)). Please read for details of permitted use.

Products 5, 6 and 7

The Products 5 6 and 7 information is not available under the Open Government Licence but we may be able to license it to you under the Environment Agency Conditional Licence. Please see the attached Conditional License document which provides details of the Conditional License relevant to this data.

Planning Advice

If you are using our data to inform a development proposal, we encourage you to contact our Sustainable Places team for pre-planning application advice. Their advice can help you solve key environmental issues early, reduce the chance of an objection, and help you design a more sustainable development for proposed planning applications. If you would like to take advantage of this service, our advisers will be able to provide further information and estimated costs for any detailed advice. Please contact our Sustainable Places Team by e-mail at sp-yorkshire@environment-agency.gov.uk for further information.

For general enquiries relating to your development or our role within the planning system, please refer to the attached 'Planning advice for developers' document.

I hope that we have correctly interpreted your request. We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 (FOIA) and the associated Environmental Information Regulations 2004 (EIR).

If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

If you require any further help, please do not hesitate to contact me.

Yours sincerely

Hilary Reilly

Customers and Engagement Team

Environment Agency | Lateral, 8 City Walk, Leeds, LS11 9AT

hilary.reilly@environment-agency.gov.uk

External: 02084 747695 **Internal:** 27695

Enquiries Team Tel: 020 847 48174 | **Email:** neyorkshire@environment-agency.gov.uk

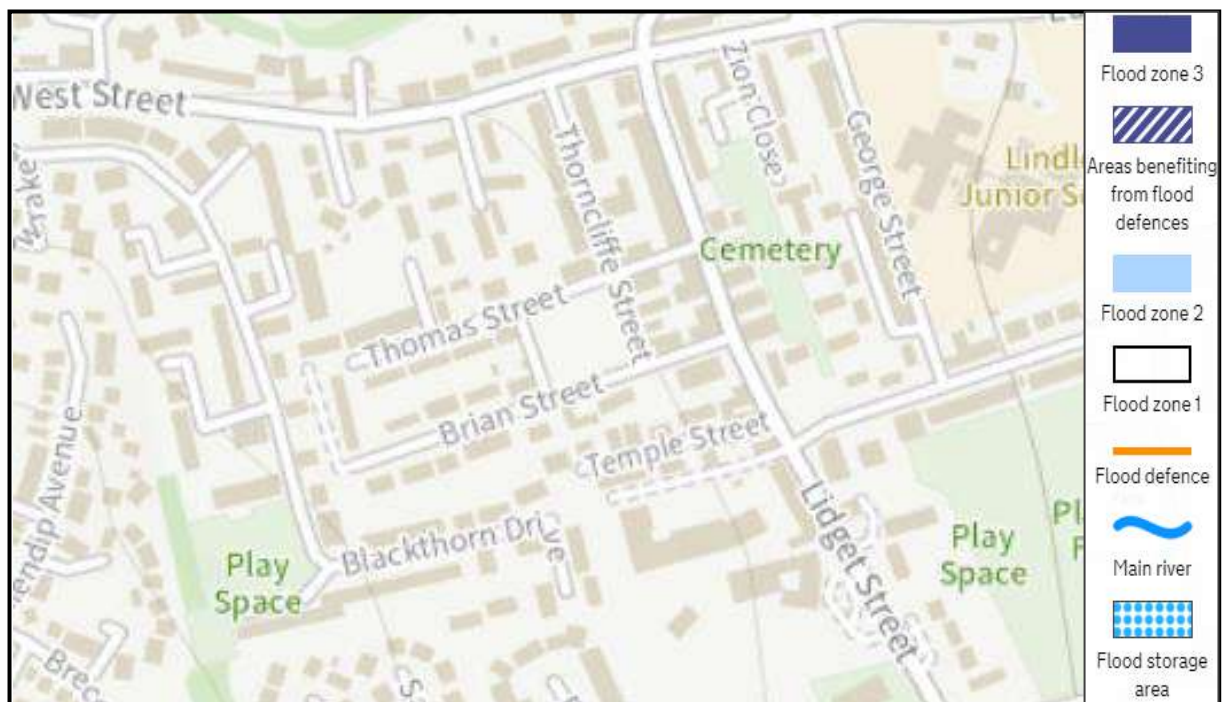
Working days: Monday to Friday



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NATIONAL FLOOD MAPPING

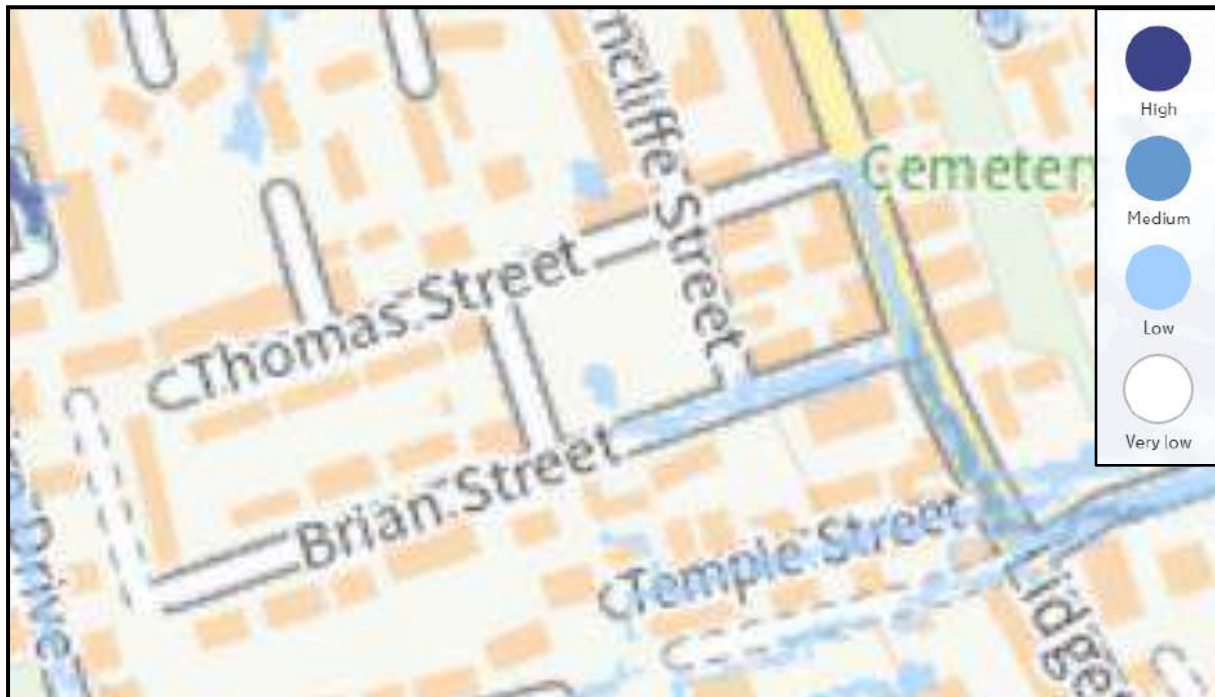
Flood Map for Planning



Long Term Flood Risk – Rivers or Sea



Long Term Flood Risk – Surface Water



Long Term Flood Risk - Reservoirs



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APPENDIX C: YW CORRESPONDENCE

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Hannah Buchanan

From: safemove-crm <safemove-crm@yorkshirewater.co.uk>
Sent: 03 March 2022 08:49
To: Hannah Buchanan
Subject: RE: Sewer Flood Risk Information Request CRM:0931362

Good morning

Thank you for your email. Our plans are a chargeable service so please can I direct you to our website safe-move.co.uk where you can order the plans. Online.

Please note that these plans will show Yorkshire Water assets and not any private assets.

Thank you.

----- Original Message -----

From: Hannah Buchanan <hannahbuchanan@betts-associates.co.uk>;
Received: Wed Mar 02 2022 16:34:40 GMT+0000 (Greenwich Mean Time)
To: safemove@yorkshirewater.com <safemove@yorkshirewater.com>;
Subject: Sewer Flood Risk Information Request

EXTERNAL SOURCE - THINK BEFORE YOU CLICK

To whom it may concern,

Thomas Street, Huddersfield, HD3 3JH

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Hannah Buchanan *BSc (Hons) MSc GradCIWEM*
Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

hannahbuchanan@betts-associates.co.uk
www.betts-associates.co.uk

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SUDS | STRUCTURAL SURVEYS | PARTY WALL DUTIES | INFILTRATION | GEOTECHNICAL

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Yorkshire Water customers can get in touch for free via live chat or by requesting a free call back at

<https://www.yorkshirewater.com>

Save money on your utility bills and help conserve water by requesting a free water saving pack

<https://www.yorkshirewater.com/savewater>

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Yorkshire Water Services Limited

Registered Office Western House, Halifax Road, Bradford, BD6 2SZ

Registered in England and Wales No 2366682

YORKSHIRE WATER PROTECTION OF MAINS AND SERVICES

1. The position of Yorkshire Water Services Ltd (YWS) apparatus shown on the existing mains record drawing(s) indicates the **general** position and nature of our apparatus and the accuracy of this information cannot be guaranteed. Any damage to YWS apparatus as a result of your works may have serious consequences and you will be held responsible for all costs incurred. Prior to commencing major works, the exact location of apparatus must be determined on site, if necessary by excavating trial holes. The actual position of such apparatus and that of service pipes which have not been indicated must be established on site by contacting the Customer Helpline on 0845 124 24 24 for both water and sewerage.
2. The public sewer and water network is lawfully retained in its existing position and the sewerage and water undertaker is entitled to have it remain so without any disturbance. The provisions of section 159 of the Water Industry Act 1991 provides that the undertaker may "inspect, maintain, adjust, repair or alter" the network. Those rights are given to enable the undertaker to perform its statutory duties. Any development of the land or any other action that unacceptably hindered the exercise of those rights would be unlawful. The provisions contained in Section 185 of the Water Industry Act 1991 state that where it is reasonable to do so, a person may require the water supply undertaker to alter or remove a pipe where it is necessary to enable that person to carry out a proposed change of use of the land. The provisions contained in Section 185 also require the person making the request to pay the full cost of carrying out the necessary works.
3. Ground levels over existing YWS apparatus are to be maintained. Sewers in highways will **generally** be laid to give 1200mm of cover from finished ground level working to kerb races, other permanent identification of the limits of the road or to an agreed line and level. Substantial increases or decreases to this 1200mm depth of cover will result in the sewer being re-laid at your expense. Water mains and services will **generally** be laid with a minimum of 750mm depth of cover however some mains and services usually those installed over 50 years ago may have less ground cover.
4. If surface levels are to be decreased / increased significantly the effects on existing water supply apparatus will be carefully considered and if any alterations are necessary, the costs of the alterations will be recharged to you in full. Outlets on fire hydrants must be no more than 300mm below the new levels and all surface boxes must be adjusted as part of the scheme.
5. To enable future repair works to be carried out without hindrance; any pipe, cable, duct, etc. installed parallel to a water main or service pipe should not be installed directly over or within 300mm of a water main or service pipe or 1000mm of a waste water asset. Where a pipe, cable, duct, etc. crosses a main or service it should preferably cross perpendicular or at an angle of no less than 45° and with a minimum clearance of 150mm. These requirements apply to activities within an existing highway and are relevant to the installation of pipes, cables, ducts, etc. up to and including 250mm in diameter (*see illustration below*). Necessary protection measures for installations greater than 250mm in diameter and/or in private land will need to be agreed on an individual basis. Installations within a new development site must comply with the National Joint Utilities Group publication Volume 2: NJUG Guidelines On The Positioning Of Underground Utilities Apparatus For New Development Sites.
6. All excavation works near to YW apparatus should be by hand digging only.
7. Backfilling with a suitable material to a minimum 300mm above YW apparatus is required.
8. Adequate support must be provided where any works pass under YW apparatus.
9. Jointing chambers, lighting columns and other structures must be installed in such a way that future repair or maintenance works to YW apparatus will not be hindered.
10. Apparatus such as; railings, sign posts, etc. must not be placed in such a way that they prevent access to or full operation of controlling valves, hydrants or similar apparatus. YWS surface boxes must not be covered or buried. Any adjustment, alteration or replacement of manhole covers must be agreed on site prior to the commencement of the works with a YWS Inspector who may be contacted via our Call Centre on 0845 124 24 24.
11. Explosives shall not be used within 100 metres of any Yorkshire Water Services apparatus or installations.
12. Vibrating plant should not be used directly over any apparatus. Movement or operation by vehicles or heavy plant is not to be permitted in the immediate vicinity of YWS plant or apparatus unless there has been prior consultation and, if necessary, adequate protection provided without cost to YWS.
13. **Under no circumstances** should thrust boring or similar trenchless techniques commence until the actual position of the Company's mains/services along the proposed route have been confirmed by trial holes.
14. Any alterations to the highway should be notified following the procedures outlined in the New Road and Street Works Act 1991 Code of Practice; Measures Necessary Where Apparatus Is Affected By Major Works (Diversiary Works).
15. You will be held responsible for any damage or loss to YWS apparatus during and after completion of work, caused by yourselves, your servant or agent. Any damage caused or observed to YWS plant or apparatus should be immediately reported to YWS. Should YW incur any costs as a result of non-compliance with the above, all costs will be rechargeable in full.
16. You should ensure that nothing is done on the site to prejudice the safety or operation of YWS employees, plant or apparatus.
17. In accordance with the New Roads and Street Works Act 1991, Chapter 22, Part 3, Section 80. The location of any identified YW asset "which is not marked, or is wrongly marked, on the records made available" should be communicated back to Yorkshire Water. The location of the apparatus should be identified on copies of the supplied plans which should be returned to Yorkshire Water (Asset Records Team) with photographic supporting evidence where possible.
18. The Government has decided that responsibility for private sewers serving two or more properties and lateral drains (the section of pipe beyond the boundary of a single property, connecting it to the public sewer) will be transferred to the water companies on Oct 1 2011.

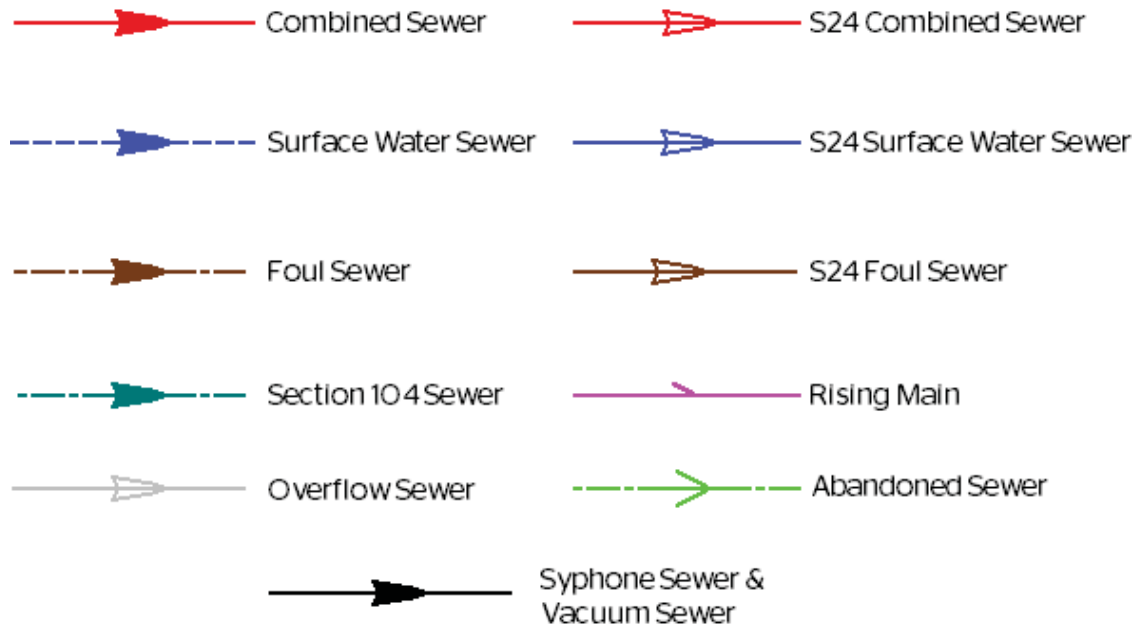
Private pumping stations will also transfer during the period 1 October 2011 – 1 Oct 2016. Records of these assets may not yet be shown on the existing mains record drawing(s). If you encounter any of these assets you must inform Yorkshire Water Services Ltd (YWS).

19. Please note that the information supplied on the enclosed plans is reproduced from Ordnance Survey material with the permission of the Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office, © Crown Copyright. Unauthorised reproduction infringes Crown Copyright and may lead to prosecution or civil proceedings. Licence Number 1000019559.
20. This information is for guidance only and the position and depth of any YW apparatus is approximate only. Likewise, the nature and condition of any YW apparatus cannot be guaranteed. YW has no responsibility for recording the locations of privately owned apparatus. As of 1 October 2011, there may be some lateral drains and/or public sewers which are not documented on YW records but may still be present. For the avoidance of doubt, this information is not a substitute for appropriate professional and/or legal advice. YW accepts no responsibility for any inaccuracy or omissions in this information. The actual position of YW apparatus must be determined on site by excavating trial holes by hand. YW requires a minimum of two working days' written notice of the intention to excavate any trial holes before any excavation can be undertaken. If there are any queries in this respect please contact Yorkshire Water on 0845 124 24 24.

Property Identifier



Sewer Legend

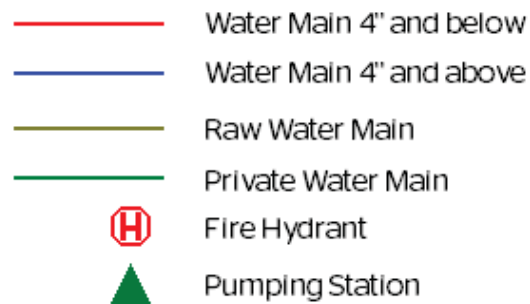


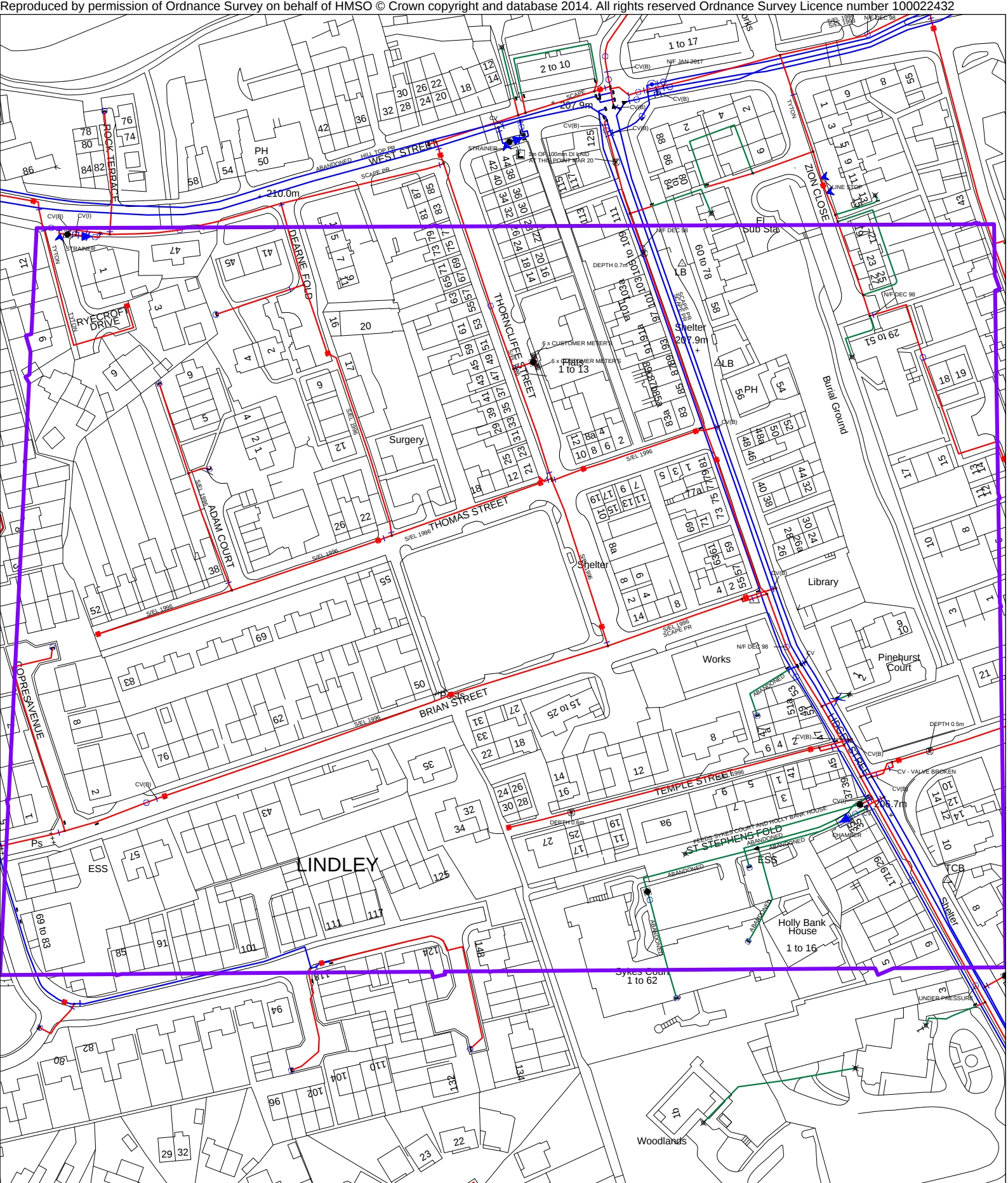
Pumping Station



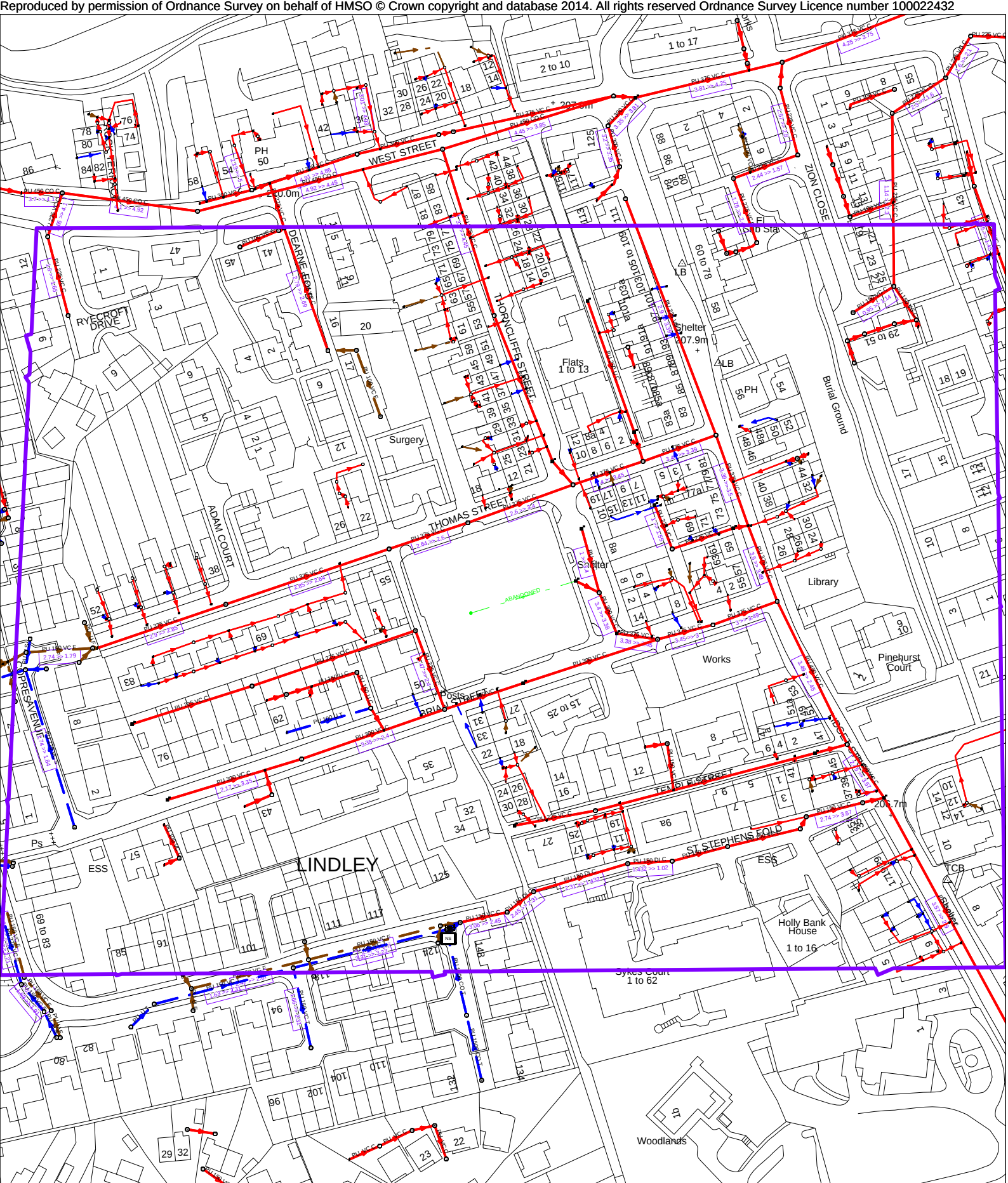
Public Sewer Treatment Works

Water Legend





Public Clean Water Network 14/03/2022 13:42:55 OS Grid Coordinates: 411477 : 418076 Map Name : SE1118SW svcGISSafeMovePD



Public Waste Water Network 14/03/2022 13:42:57 OS Grid Coordinates: 411477 : 418076 Map Name : SE1118SW svcGISSafeMovePD



YorkshireWater

**Ms H Buchanan
Betts Associates Ltd
Units 6-7 Old Marsh Farm Barns
Welsh Road
Deeside
CH5 2LY
hannahbuchanan@betts-
associates.co.uk**

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

Tel: 0345 120 8482

Fax:

Email:

**Your Ref:
Our Ref: Y005451**

**technical.sewerage@yorkshirewat
er.co.uk**

**For telephone enquiries ring:
Chris Roberts on 0345 120 8482**

18th April 2022

Dear Ms Buchanan,

**Land off Thomas Street, Huddersfield, HD3 3JH – Pre-Planning Sewerage
Enquiry U605383**

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:



Existing Infrastructure

There is an abandoned 225 mm diameter public combined sewer recorded on the site. In this instance, building-over may take place under the control of Part H4 Building Regulations 2010. No trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0345 120 84 82.

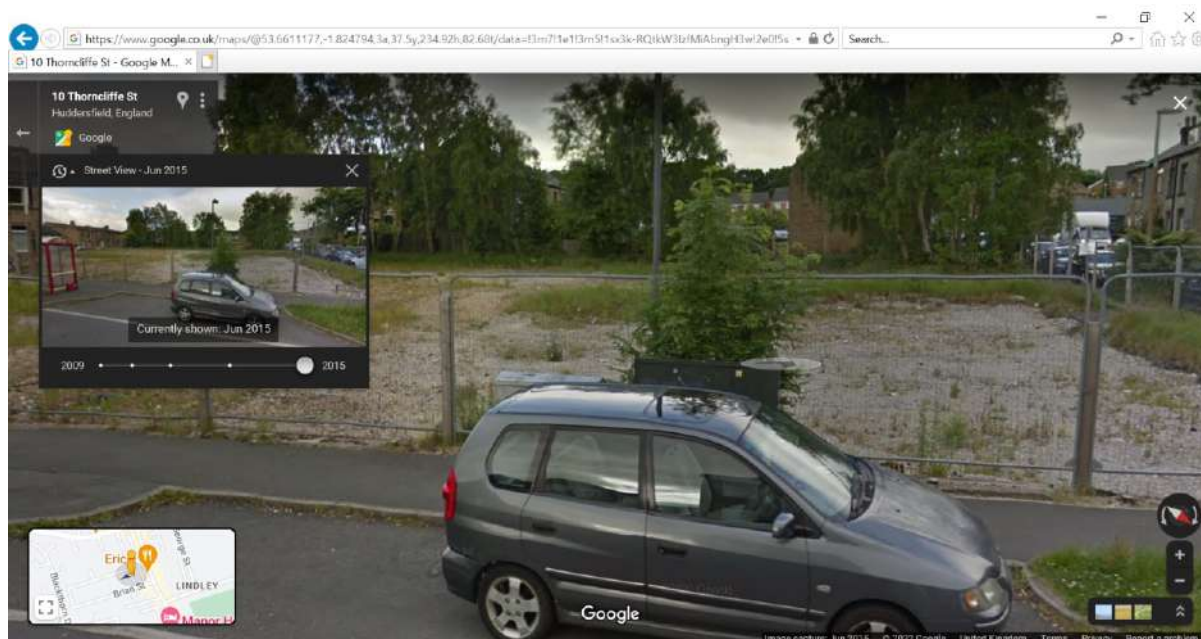
Foul Water

Development of the site should take place with separate systems for foul and surface water drainage on site, with a combined sewer off site.

Foul water domestic waste can discharge to the 225/300 mm diameter public combined sewer recorded in Thorncliffe Street, at a point to the east of the site.

Surface Water

It is noted the site is derelict and has not positively discharged to the public sewer network since 2015 and the existing drainage plan only shows one gully on the whole site and as such the proposed discharge is not acceptable, so curtilage surface water may discharge to the 225/300 mm diameter public combined sewer recorded in Thorncliffe Street, at a point to the east of the site. The surface water discharge from the site to be restricted to not greater than 5 (five) litres/second.



This permission is not an acceptance in respect to any planning conditions imposed under the Grant of Planning Permission.

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. 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.



YorkshireWater

We are happy to offer pre-development technical advice on any prospective sites that you would like to put forward 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.

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. 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 D: LLFA/LPA CORRESPONDENCE

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Hannah Buchanan

From: Paul Farndale <Paul.Farndale@kirklees.gov.uk>
Sent: 22 March 2022 21:50
To: Hannah Buchanan
Subject: FW: Historic Flood Risk Information Request Thomas Street HD3 3JH
Attachments: Location Plan.pdf

Follow Up Flag: Follow up
Flag Status: Completed

Hello Hannah,

Nothing on our records with regard to surface water flood risk incidents or risk mapping for the 1 in 100 return period.

Site shows that it could well be compatible for soakaways on British Geological Survey Maps. However in this area it looks like there are cellared properties adjacent and as these are usually for storage only, not being properly tanked out, we would rule out infiltration techniques as a risk to flooding property.

The site has an abandoned sewer noted. Please contact YW to see if it is still present even if grouted up and it will need removing. This looks like it served an old street line when back to back properties were on the site.

The site is shown as demolished in 2018 and therefore any brownfield discharge rates are likely not to apply as the site has, 'lost its place in the system'. A 3l/s discharge rate is likely, however an increase to this will be supported if Yorkshire Water are willing to accept one.

Kind regards,

Paul Farndale
Kirklees LLFA

From: Floodmanagement <Floodmanagement@kirklees.gov.uk>
Sent: 03 March 2022 06:48
To: Paul Farndale <Paul.Farndale@kirklees.gov.uk>
Subject: FW: Historic Flood Risk Information Request

From: Hannah Buchanan <hannahbuchanan@betts-associates.co.uk>
Sent: 02 March 2022 16:43
To: Floodmanagement <Floodmanagement@kirklees.gov.uk>; DCAdmin <DC.Admin@kirklees.gov.uk>
Subject: Historic Flood Risk Information Request

CAUTION: External email. Do not click links or open attachments unless you recognize the sender and know the content is safe.

To whom it may concern,

Thomas Street, Huddersfield, HD3 3JH

Please could you confirm whether you have any information that you feel would be valuable to a Flood Risk Assessment and Drainage Management Strategy for the above site (location plan attached), including details of historical flooding and any predicted flood water levels; this would be greatly appreciated. If there are any specific requirements that you require in a scope of works for this site, please can you advise at this stage so that it can be fully incorporated into the proposals at an early stage.

Please do not hesitate to contact me on the details below to discuss further should you require additional information or clarification.

Kind Regards,

Hannah Buchanan BSc (Hons) MSc GradCIWEM
Graduate Flood Risk Analyst

BETTS HYDRO

Consulting Engineers

Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Chester +44 (0)1244 289041

hannahbuchanan@betts-associates.co.uk
www.betts-associates.co.uk

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APPENDIX E: LOCATION PLAN

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LOCATION PLAN

Thomas Street, Huddersfield



OS X (Eastings)	411643
OS Y (Northings)	418272
Nat Grid	SE116182 / SE1164318272
Nearest Post Code	HD3 3JH
Lat (WGS84)	N53:39:39 (53.660808655910984)
Long (WGS84)	W1:49:31 (-1.8252884948644732)
Lat, Long (WGS84)	53.660808655910984,-1.8252884948644732
Lat (OSGB36)	N53:39:38 (53.66057561320457)
Long (OSGB36)	W1:49:26 (-1.8237917065101243)
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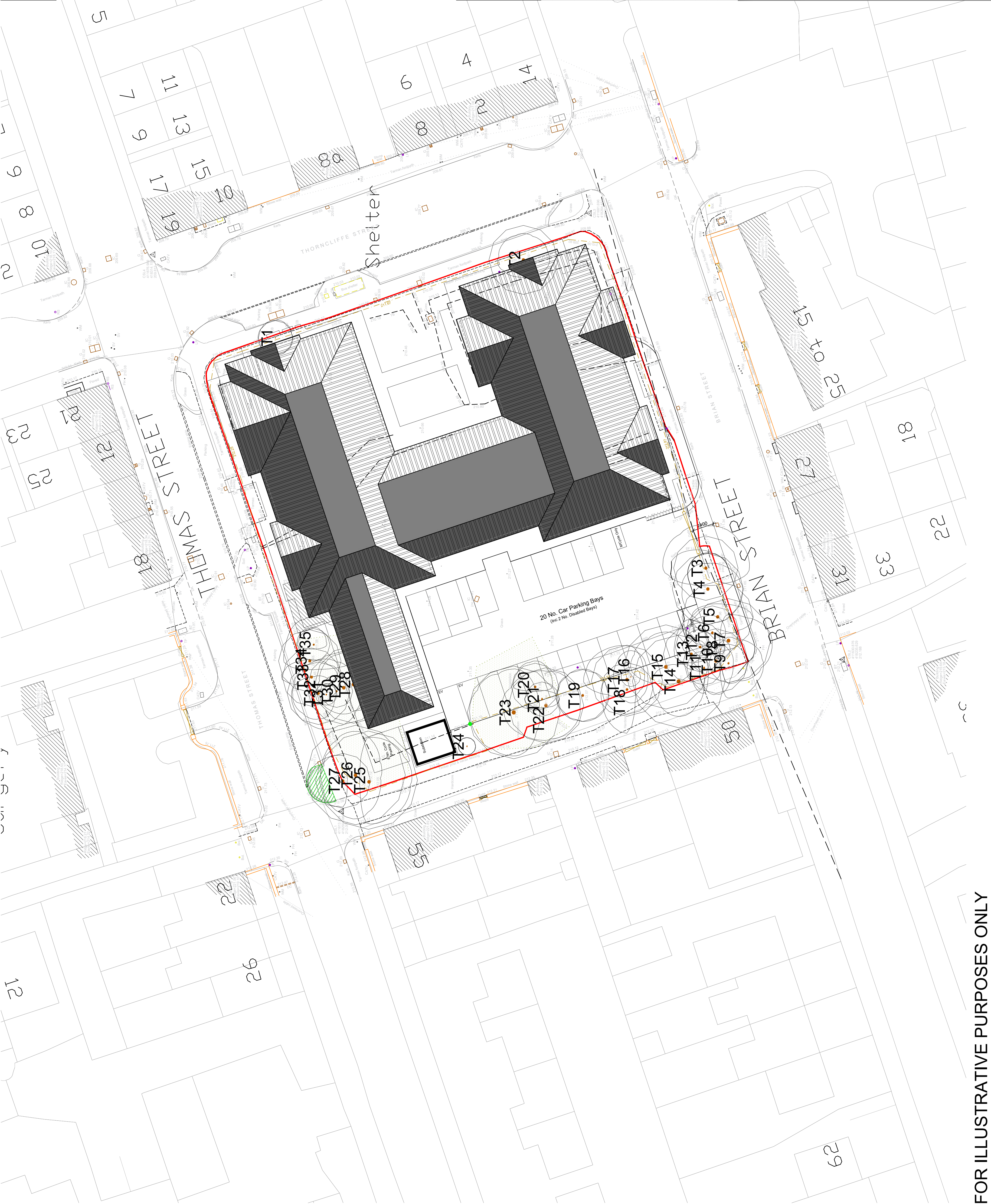
APPENDIX F: TOPOGRAPHIC SURVEY

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APPENDIX G: PROPOSED PLANNING LAYOUT

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Site Area -
2500m² (0.25 hectares)



P	02/05/23	Substation added to site	OFF	JB
O	26/04/23	Bin store has been relocated and parking reduced	CM	JB
N	25/04/23	Note has been removed	CM	JB
M	25/04/23	Bin store has been relocated	CM	JB
L	25/04/23	Layout has been amended to suit the highways comments	CM	JB
K	24/04/23	Building footprint has been adjusted to accommodate the Highway comments	CM	JB
J	11/04/23	Footpath has been widened to 1200mm as required for access	CM	JB
I	03/04/23	Footpath has been increased as agreed with the Highways Consultant	CM	JB
H	23/08/22	Bin store and cycle store have been amended to suit the Landscape Consultant	CM	JB
G	21/06/22	Title block has been amended	CM	JB
F	15/06/22	Road Plan added to layout	CM	JB
E	12/04/22	Layout has been revised to suit the Tree Consultants comments	CM	JB
D	30/03/22	Layout has been revised to suit the Transport Consultants comments	CM	JB
C	18/03/22	Detailed layout has been added	CM	JB
B	24/02/22	Title block has been updated	CM	JB
A	13/01/22	Layout has been revised to accommodate the TPO	JB	JB
-	01/01/21	Original Drawing	JB	JB
Rev	Date	Revision Description	Drawn By	Reviewed By

ADG ARCHITECTS
6 Phoenix Court, Darrington, D.L.1 4WD
t: 01325 464 111
e: studio@adgarchitects.co.uk
w: www.adgarchitects.co.uk

Client
Muller Property Group

Project Information
Proposed Care Home Development
21 Thomas Street, Lindley, Huddersfield HD3 3JJ

Drawing Title
Proposed Site Plan

A1 Scale
1:200

Job Number
H.21.81

Drawing Number
(9-) 2

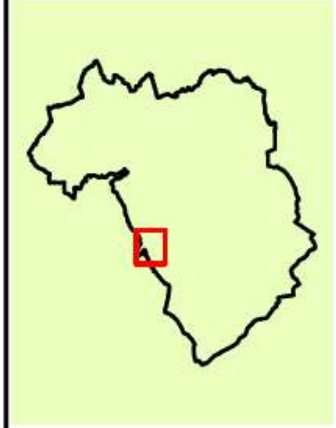
Revision
P

Drawing Issue
PLANNING

FOR ILLUSTRATIVE PURPOSES ONLY

APPENDIX H: PFRA/SFRA PLANNING EXTRACTS

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LEGEND

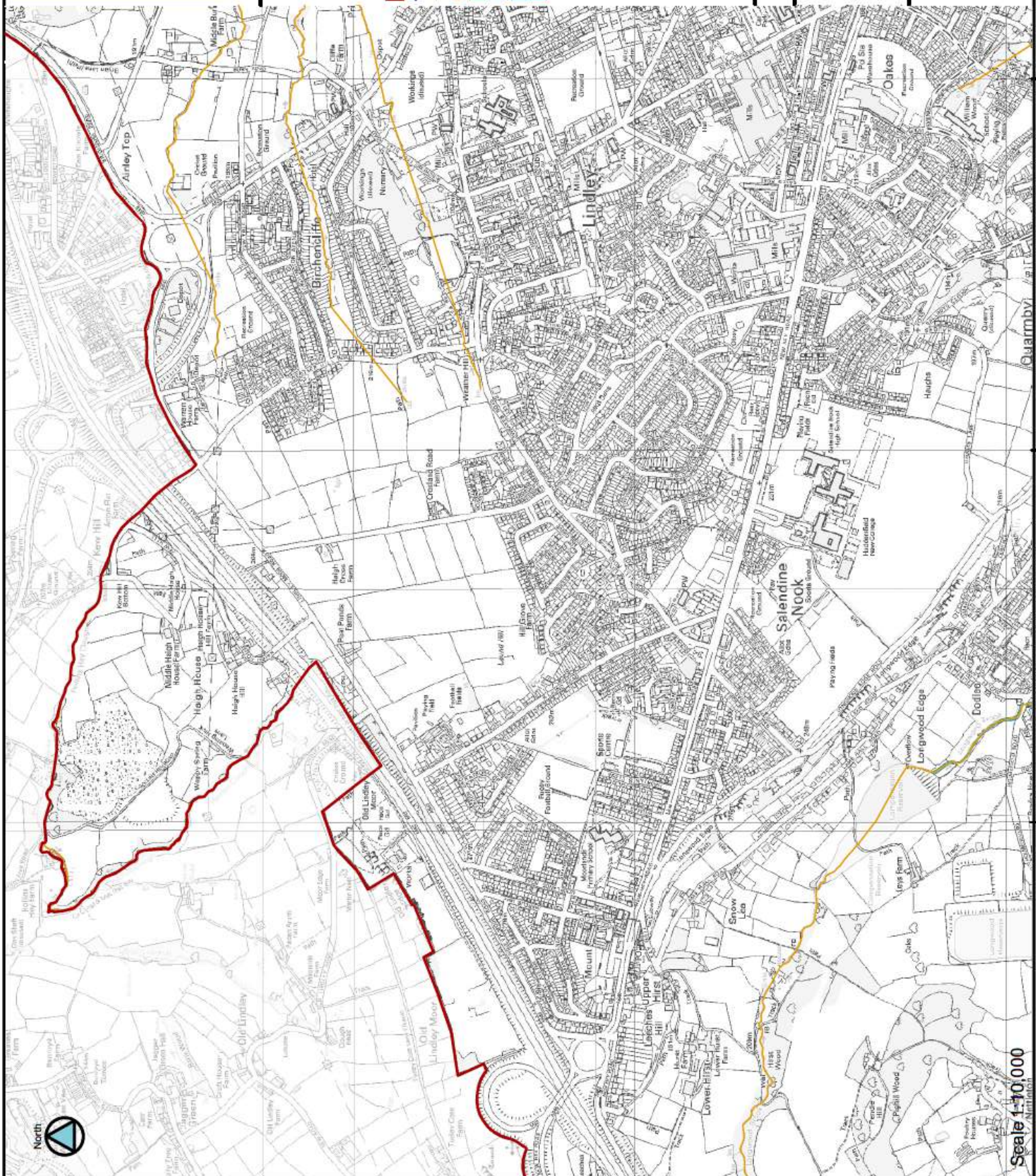
Choose Option Flood Zones

- Council boundary
- Main River
- Detailed River Network
- Flood Zones
 - Flood Zone 3b
 - Flood Zone 3ai
 - Flood Zone 3a
 - Flood Zone 2

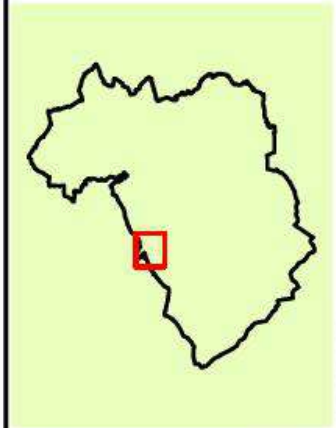
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STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL
MAP_E



Scale 1:10,000



LEGEND

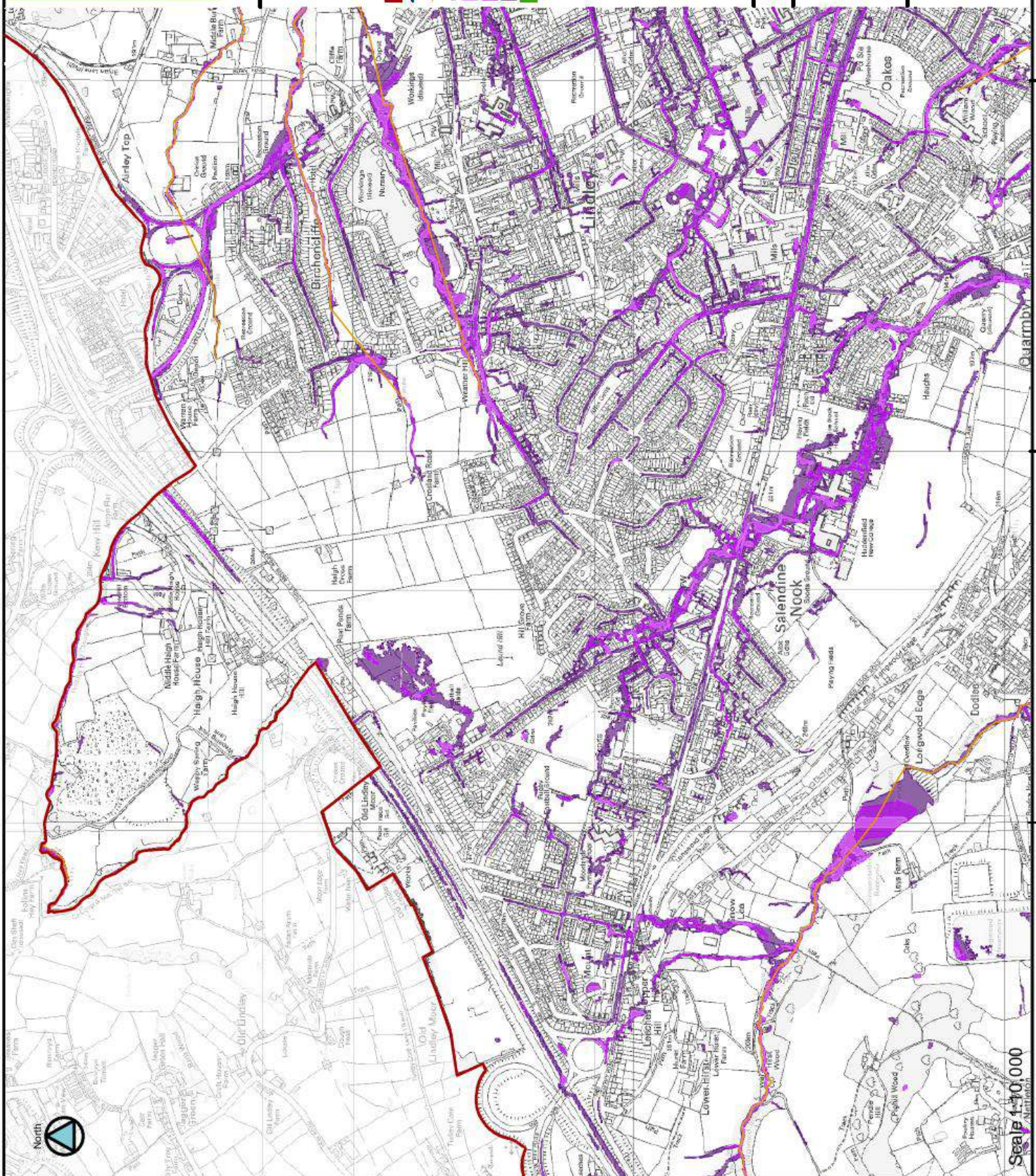
Choose Option Updated Flood Map for Surface Water

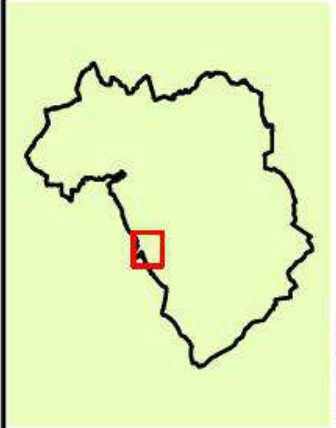
- Council boundary
- Main River
- Detailed River Network
- uFWSW
- 30 year event
- 100 year event
- 1000 year event
- CDA indicative

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STRATEGIC FLOOD RISK ASSESSMENT
For
KIRKLEES COUNCIL
MAP_E





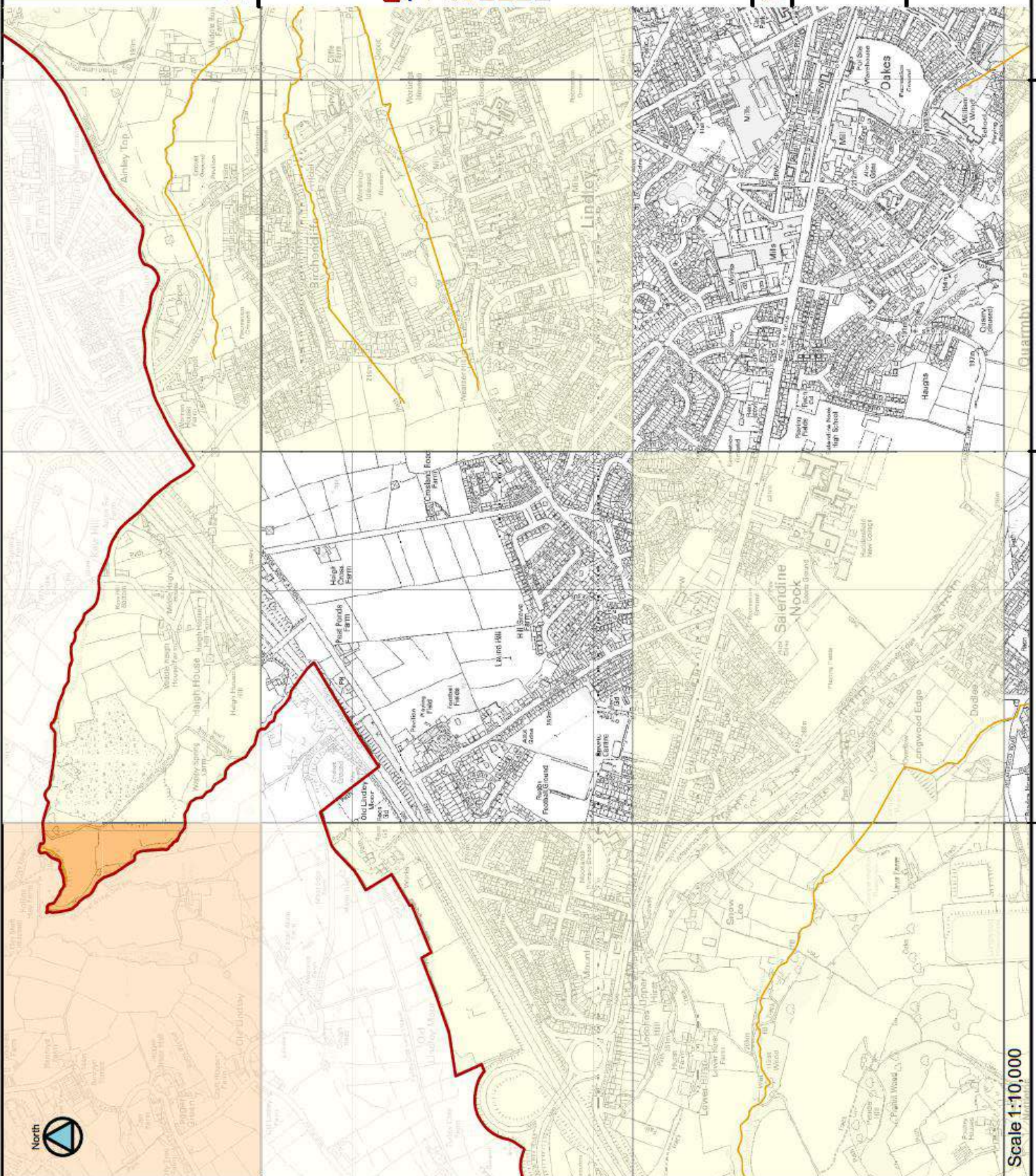
LEGEND

- Choose Option**
- Areas Susceptible to Ground water Flooding
- Choose Option**
- Countdown boundary
 - Main River
 - Detailed River Network
- Areas Susceptible to Ground Water Flooding**
- Risk of Groundwater Emergence**
- >= 75%
 - >= 50% < 75%
 - >= 25% < 50%
 - < 25%

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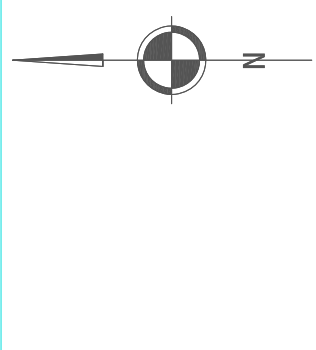
STRATEGIC FLOOD RISK ASSESSMENT For KIRKLEES COUNCIL MAP E



Scale 1:10,000

APPENDIX I: ONSITE DRAINAGE INVESTIGATIONS (INVEK)

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Legend/Notes:

- Combined Sewer
- Foul Sewer
- SW Sewer
- Assumed Sewer (Not Proven)
- Rising Main
- Highway Drainage
- Culvert Sewer
- Open Water Course
- Overflow Line
- Treated Line
- Rain Water Down Pipe
- Foul Down Pipe
- Combined Down Pipe
- Gray Water Down Pipe
- Highway Gully
- Septic Tanks
- Direction of overland flows

Public MHMH01MH02MH03MH04CCTV endGully 01

smas

CHAS

BUILDER'S PROFILE

INVEK

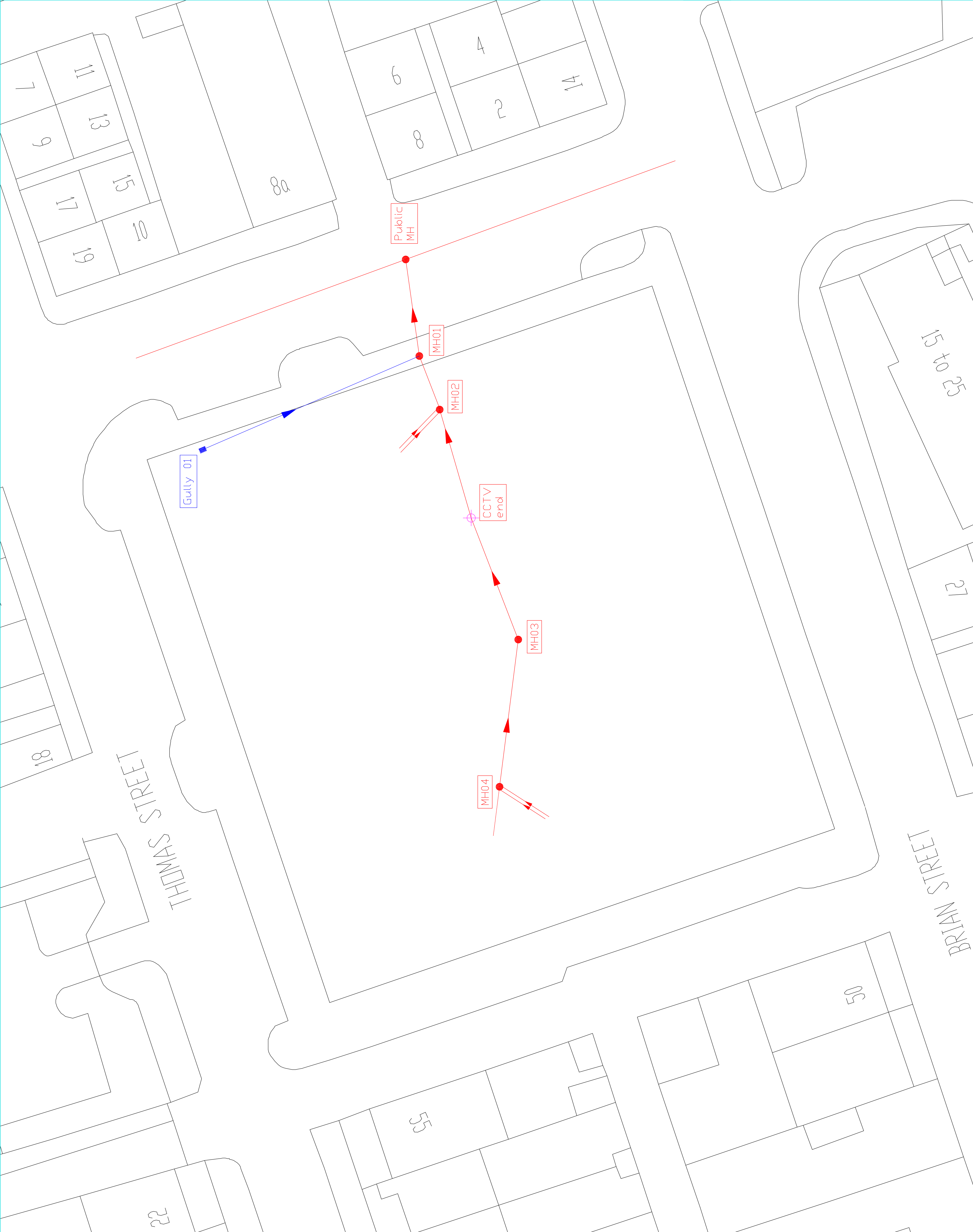
SURVEYS LTD.

Warrington Business Park, Long Lane, Warrington, Cheshire, WA2 8TX

Tel: 01925 244376 Fax: 01925 241517

Email: kevin@invek.com - www.invek.com

Client	Betts Hydro		
Drawing Title	Thomas Street, Huddersfield Drainage Layout		
Scale(s)	N.T.S	Drawn	PW
Date	18.03.22	Checked	RD
Job Number	1931	Approved	KN
Sheet Size, Drawing Number & Revision			
A1_1931/01_Rev_00			





Invek Surveys Ltd

Thomas Street, Huddersfield

18 March 2022



www.wincan.com

GRADE 3,4 & 5 Summary

STRUCTURAL DEFECTS

Structural defects			
Section	PLR	Grade	Fault description
4	MH02 X	4	Fracture, multiple at joint, from 9 to 5 o'clock, End

Grade 3; Best practice suggests consideration be given to repair in the medium term

Grade 4; Best practice suggests consideration be given to a repair to avoid potential collapse

Grade 5; Best practice suggests this pipe is at risk of collapse at any time; urgent consideration should be given to a repair to avoid collapse

SERVICE / OPERATIONAL DEFECTS

Service defects			
Section	PLR	Grade	Fault description
1	MH01 X	3	Settled deposits, fine, 10% cross-sectional area loss, End
2	Pipe B X	3	Settled deposits, fine, 10% cross-sectional area loss, End
3	MH02 X	3	Settled deposits, coarse, 15% cross-sectional area loss
4	MH02 X	3	Settled deposits, fine, 20% cross-sectional area loss, End
5	MH03 X	4	Multiple defects at 0.9m

Grade 3; Best practice suggests consideration be given to maintenance activities in the medium term

Grade 4; Best practice suggests consideration be given to maintenance activity to avoid potential blockage

Grade 5; Best practice suggests this pipe is at immediate risk of backing up / causing flooding

Abandoned Surveys

Camera no access		
Section	PLR	Fault description
3	MH02 X	Line deviates down

Information

These summaries are based on the SRM grading from the WRC

Structural Defects (SRM 4)

Project name :
Thomas Street, Huddersfield

Project Number :

Contact :

Date :
18/03/2022

No.	PLR	Dir.	Use	Shape / Size	Date	Mat.	Total Length	Insp. Length	Peak HWG	Peak Score	Grade	Mean Score	Total Score
1	MH01X	D	C	C 225	18/03/2022	VC	9.00	9.00	-	0	1	0	0
2	Pipe BX	U	C	C 150	18/03/2022	VC	14.75	14.75	1	1	1	0.14	2
3	MH02X	U	C	C 150	18/03/2022	VC	1.70	1.70	2	10	2	5.88	10
4	MH02X	D	C	C 150	18/03/2022	VC	3.40	3.40	4	121	4	36.17	123
5	MH03X	U	C	C 150	18/03/2022	VC	9.05	9.05	2	2	1	0.33	3

Inspection report

Date : 18/03/2022	Job number :	Weather : no rain or snow	Operator : Invek	Section number : 1	PLR SUFFIX: X
Weather no rain or snow	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : Invek

Place : Road : Location Inspection	Huddersfield Thomas Street Fields MH01 (D/S) Public	Location details: Catchment: Tape number : Pipe Length	U/S MH : U/S Depth : D/S MH : D/S Depth :	MH01 Public
Direction Use:	Combined	Pipe shape :	Circular	
Year laid :		Pipe size :	225 mm	
Purpose :	Sample survey to determine asset condition	Pipe material :	Vitrified clay	
Total length :	9.00 m	Lining :		

Comment :

1:75	Position	Code	Observation	MPEG	Photo	Grade			
	0.00	MH	Start node type, manhole, reference number : MH01	00:00:02		0			
	0.00	WL	Water level, 0% of the vertical dimension	00:00:02	1_2A	0			
	1.90	CN	Connection other than junction, at 1 o'clock, diameter 100mm	00:00:17	1_3A	0			
	2.70	CN	Connection other than junction, at 11 o'clock, diameter 100mm	00:00:25	1_4A	0			
	5.80	CN	Connection other than junction, at 12 o'clock, diameter 100mm	00:00:38	1_5A	0			
	6.60	LR	Line deviates right	00:00:44	1_6A	0			
	7.40	WLC	Clear water level, 20% of the vertical dimension	00:00:48	1_7A	0			
	7.70	S01	DES Settled deposits, fine, 10% cross-sectional area loss, Start	00:00:52	1_8A	3			
	9.00	F01	DES Settled deposits, fine, 10% cross-sectional area loss, End	00:01:12		3			
	9.00	MHF	Finish node type, manhole reference number: Public	00:01:12	1_10A	0			
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	0	0	0	1	1	2	0.29	2.6	3

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
1

PLR Suffix :
X



Photo: 1_2A
 0m, Water level, 0% of the vertical dimension



Photo: 1_3A
 1.9m, Connection other than junction, at 1 o'clock, diameter 100mm



Photo: 1_4A
 2.7m, Connection other than junction, at 11 o'clock, diameter 100mm



Photo: 1_5A
 5.8m, Connection other than junction, at 12 o'clock, diameter 100mm

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
1

PLR Suffix :
X



Photo: 1_6A
 6.6m, Line deviates right



Photo: 1_7A
 7.4m, Clear water level, 20% of the vertical dimension



Photo: 1_8A
 7.7m, Settled deposits, fine, 10% cross-sectional area loss, Start

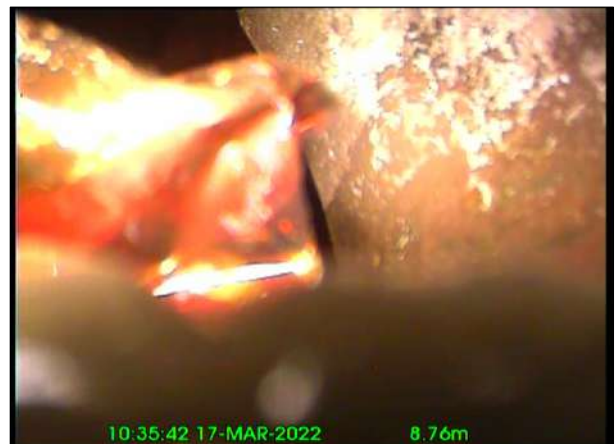


Photo: 1_10A
 9m, Finish node type, manhole reference number: Public

Inspection report

Date : 18/03/2022	Job number :	Weather : no rain or snow	Operator : Invek	Section number : 2	PLR SUFFIX: X
Weather no rain or snow	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : Invek

Place : Road : Location Inspection	Huddersfield Thomas Street Fields MH01 (U/S) Pipe B	Location details: Catchment: Tape number : Pipe Length	U/S MH : U/S Depth : D/S MH : D/S Depth :	Pipe B MH01
Direction Use:	Combined	Pipe shape :	Circular	
Year laid :		Pipe size :	150 mm	
Purpose :	Sample survey to determine asset condition	Pipe material :	Vitrified clay	
Total length :	14.75 m	Lining :		

Comment :

1:126	Position	Code	Observation	MPEG	Photo	Grade
	0.00	MH	Start node type, manhole, reference number : MH01	00:00:02		0
	0.00	WLT	Turbid water level, 10% of the vertical dimension	00:00:02	2_2A	0
	0.00	S01 DES	Settled deposits, fine, 10% cross-sectional area loss, Start	00:00:02	2_3A	3
	2.45	F01 DES	Settled deposits, fine, 10% cross-sectional area loss, End	00:00:21		3
	3.85	S02 DES	Settled deposits, fine, 15% cross-sectional area loss, Start	00:00:28	2_5A	3
	4.65	WLT	Turbid water level, 20% of the vertical dimension	00:00:31	2_6A	0
	5.00	WLT	Turbid water level, 20% of the vertical dimension	00:02:26	2_7A	0
	7.00	WL	Water level, 0% of the vertical dimension	00:02:12	2_8A	0
	7.20	LL	Line deviates left	00:02:13	2_9A	0
	7.20	JDM	Joint displaced, medium	00:02:14	2_10A	1
	8.80	JDM	Joint displaced, medium	00:02:07	2_11A	1
	12.90	CN	Connection other than junction, at 9 o'clock, diameter 100mm	00:01:35	2_12A	0
	13.30	LR	Line deviates right	00:01:32	2_13A	0
	14.75	F02 DES	Settled deposits, fine, 15% cross-sectional area loss, End	00:01:13		3

Inspection Report

Date : 18/03/2022	Job number :	Weather : no rain or snow	Operator : Invek	Section number : 2	PLR : X
Weather no rain or snow	Vehicle :	Camera :	Preset :	Cleaned : no	Grade:

</

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
2

PLR Suffix :
X



Photo: 2_2A
 0m, Turbid water level, 10% of the vertical dimension



Photo: 2_3A
 0m, Settled deposits, fine, 10% cross-sectional area loss, Start



Photo: 2_5A
 3.85m, Settled deposits, fine, 15% cross-sectional area loss, Start



Photo: 2_6A
 4.65m, Turbid water level, 20% of the vertical dimension

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
2

PLR Suffix :
X



Photo: 2_7A
5m, Turbid water level, 20% of the vertical dimension



Photo: 2_8A
7m, Water level, 0% of the vertical dimension



Photo: 2_9A
7.2m, Line deviates left



Photo: 2_10A
7.2m, Joint displaced, medium

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
2

PLR Suffix :
X



Photo: 2_11A
 8.8m, Joint displaced, medium



Photo: 2_12A
 12.9m, Connection other than junction, at 9 o'clock, diameter 100mm

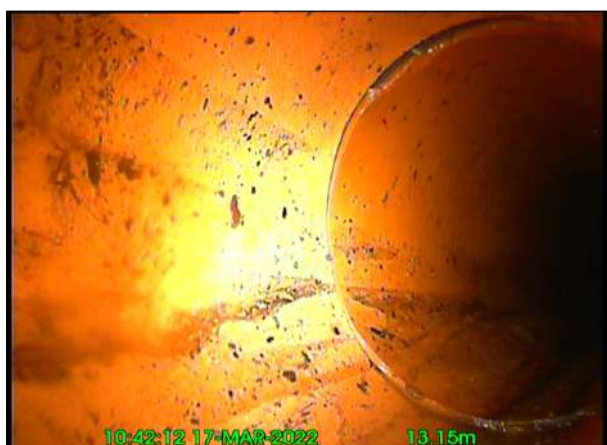


Photo: 2_13A
 13.3m, Line deviates right



Photo: 2_15A
 14.75m, Finish node type, gully reference number: Pipe B

Inspection report

Date : 18/03/2022	Job number :	Weather : no rain or snow	Operator : Invek	Section number : 3	PLR SUFFIX: X
Weather no rain or snow	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : Invek

Place :	Huddersfield	Location details:		U/S MH :	MH02
Road :	Thomas Street	Catchment:		U/S Depth :	
Location :	Fields	Tape number :		D/S MH :	MH01
Inspection :	MH01 (U/S) MH02	Pipe Length		D/S Depth :	
Direction Use:	Combined			Pipe shape :	Circular
Year laid :				Pipe size :	150 mm
Purpose :	Sample survey to determine asset condition			Pipe material :	Vitrified clay
Total length :	1.70 m			Lining :	

Comment :

1:50	Position	Code	Observation	MPEG	Photo	Grade
	0.00	MH	Start node type, manhole, reference number : MH01	00:00:02		0
	0.00	WL	Water level, 0% of the vertical dimension	00:00:02	3_2A	0
	0.20	DER	Settled deposits, coarse, 15% cross-sectional area loss	00:00:11	3_3A	3
	1.60	CCJ	Crack, circumferential at joint, from 12 to 3 o'clock	00:00:20	3_4A	2
	1.70	LD	Line deviates down	00:00:22	3_5A	0
	1.70	SA	Survey abandoned Remarks: Survey stopped here, unable to pass bend in line.	00:00:43	3_6A	0

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
1	10	5.88	10	2	1	2	1.18	2	3

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
3

PLR Suffix :
X



Photo: 3_2A
 0m, Water level, 0% of the vertical dimension



Photo: 3_3A
 0.2m, Settled deposits, coarse, 15% cross-sectional area loss



Photo: 3_4A
 1.6m, Crack, circumferential at joint, from 12 to 3 o'clock



Photo: 3_5A
 1.7m, Line deviates down

Place :

Invek Surveys Ltd
Long Lane
Warrington
Tel: 01925 244376
Fax: 01925241517
Email: kevin@invek.com

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
3

PLR Suffix :
X



Photo: 3_6A

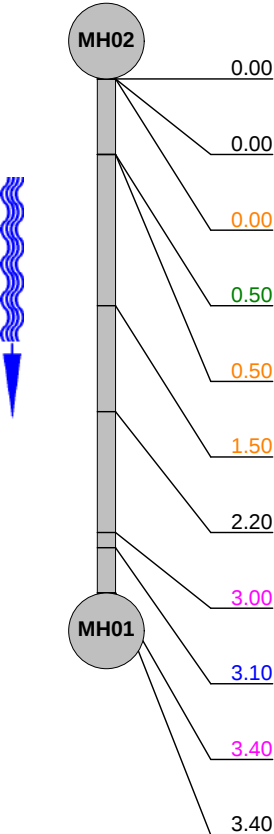
1.7m, Survey abandoned Remarks: Survey stopped here,
unable to pass bend in line.

Inspection report

Date : 18/03/2022	Job number :	Weather : no rain or snow	Operator : Invek	Section number : 4	PLR SUFFIX: X
Weather no rain or snow	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : Invek

Place : Road : Location Inspection	Huddersfield Thomas Street Fields MH02 (D/S) MH01	Location details: Catchment: Tape number : Pipe Length	U/S MH : U/S Depth : D/S MH : D/S Depth :	MH02 MH01
Direction Use:	Combined	Pipe shape :	Circular	
Year laid :		Pipe size :	150 mm	
Purpose :	Sample survey to determine asset condition	Pipe material :	Vitrified clay	
Total length :	3.40 m	Lining :		

Comment :

1:50	Position	Code	Observation	MPEG	Photo	Grade			
	0.00	MH	Start node type, manhole, reference number : MH02	00:00:01		0			
	0.00	WL	Water level, 0% of the vertical dimension	00:00:01	4_2A	0			
	0.00	S01	DES	Settled deposits, fine, 20% cross-sectional area loss, Start	00:00:11	4_3A	3		
	0.50	JDM	Joint displaced, medium	00:00:13	4_4A	1			
	0.50	FCJ	Fracture, circumferential at joint, from 10 to 11 o'clock	00:00:13	4_5A	3			
	1.50	F01	DES	Settled deposits, fine, 20% cross-sectional area loss, End	00:00:27		3		
	2.20	CN	Connection other than junction, at 6 o'clock, diameter 150mm Remarks: Dropshaft	00:00:30	4_7A	0			
	3.00	S02	FMJ	Fracture, multiple at joint, from 9 to 5 o'clock, Start	00:00:34	4_8A	4		
	3.10	JDL	Joint displaced, large	00:00:56	4_9A	2			
	3.40	F02	FMJ	Fracture, multiple at joint, from 9 to 5 o'clock, End	00:00:40		4		
	3.40	MHF	Finish node type, manhole reference number: MH01	00:00:40	4_10A	0			
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
4	121	36.17	123	4	1	2	1.12	3.8	3

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
4

PLR Suffix :
X



Photo: 4_2A
 0m, Water level, 0% of the vertical dimension



Photo: 4_3A
 0m, Settled deposits, fine, 20% cross-sectional area loss, Start



Photo: 4_4A
 0.5m, Joint displaced, medium



Photo: 4_5A
 0.5m, Fracture, circumferential at joint, from 10 to 11 o'clock

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
4

PLR Suffix :
X



Photo: 4_7A
 2.2m, Connection other than junction, at 6 o'clock, diameter 150mm Remarks: Dropshaft



Photo: 4_8A
 3m, Fracture, multiple at joint, from 9 to 5 o'clock, Start



Photo: 4_9A
 3.1m, Joint displaced, large



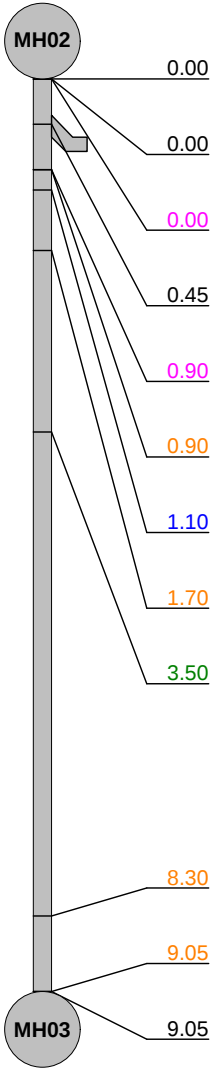
Photo: 4_10A
 3.4m, Finish node type, manhole reference number: MH01

Inspection report

Date : 18/03/2022	Job number :	Weather : no rain or snow	Operator : Invek	Section number : 5	PLR SUFFIX: X
Weather no rain or snow	Vehicle :	Camera :	Preset :	Cleaned : no	Operator : Invek

Place : Road : Location Inspection	Huddersfield Thomas Street Fields MH02 (U/S) MH03	Location details: Catchment: Tape number : Pipe Length	U/S MH : U/S Depth : D/S MH : D/S Depth :	MH03 MH02
Direction Use:	Combined	Pipe shape :	Circular	
Year laid :		Pipe size :	150 mm	
Purpose :	Sample survey to determine asset condition	Pipe material :	Vitrified clay	
Total length :	9.05 m	Lining :		

Comment :

1:75	Position	Code	Observation	MPEG	Photo	Grade			
	0.00	MH	Start node type, manhole, reference number : MH02	00:00:01		0			
	0.00	WL	Water level, 0% of the vertical dimension	00:00:01	5_2A	0			
	0.00	S01	DES Settled deposits, fine, 30% cross-sectional area loss, Start	00:00:10	5_3A	4			
	0.45	CN	Connection other than junction, at 9 o'clock, diameter 150mm	00:00:13	5_4A	0			
	0.90	F01	DES Settled deposits, fine, 30% cross-sectional area loss, End	00:00:16		4			
	0.90	S02	DES Settled deposits, fine, 15% cross-sectional area loss, Start	00:00:16	5_6A	3			
	1.10	JDL	Joint displaced, large	00:00:16	5_7A	2			
	1.70	F02	DES Settled deposits, fine, 15% cross-sectional area loss, End	00:00:31		3			
	3.50	JDM	Joint displaced, medium	00:00:39	5_9A	1			
	8.30	S03	DER Settled deposits, coarse, 10% cross-sectional area loss, Start	00:00:59	5_10A	3			
	9.05	F03	DER Settled deposits, coarse, 10% cross-sectional area loss, End	00:01:07		3			
	9.05	MHF	Finish node type, manhole reference number: MH03	00:01:07	5_12A	0			
STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
2	2	0.33	3	1	3	7.5	0.83	7.5	4

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
5

PLR Suffix :
X



Photo: 5_2A
 0m, Water level, 0% of the vertical dimension



Photo: 5_3A
 0m, Settled deposits, fine, 30% cross-sectional area loss, Start



Photo: 5_4A
 0.45m, Connection other than junction, at 9 o'clock, diameter 150mm



Photo: 5_6A
 0.9m, Settled deposits, fine, 15% cross-sectional area loss, Start

Inspection pictures

Place :
Huddersfield

Road :
Thomas Street

Date :
18/03/2022

Section number :
5

PLR Suffix :
X



Photo: 5_7A
 1.1m, Joint displaced, large



Photo: 5_9A
 3.5m, Joint displaced, medium



Photo: 5_10A
 8.3m, Settled deposits, coarse, 10% cross-sectional area loss, Start



Photo: 5_12A
 9.05m, Finish node type, manhole reference number: MH03

APPENDIX J: SURFACE WATER RUN-OFF CALCULATIONS

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Calculated by:

Site name:

Site location:

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

Site Details

Latitude:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	986	986
Hydrological region:	3	3
Growth curve factor 1 year:	0.86	0.86
Growth curve factor 30 years:	1.75	1.75
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	1.84	1.84
1 in 1 year (l/s):	1.58	1.58
1 in 30 years (l/s):	3.22	3.22
1 in 100 year (l/s):	3.82	3.82
1 in 200 years (l/s):	4.36	4.36

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

SURFACE WATER RUN-OFF CALCULATION SHEET



Development	Thomas Street, Huddersfield
Project No.	HYD710

Revision	C	Completed by	HB
Date	02/05/2023	Checked by	RDN

Areas			
Total Site	0.255	ha	
Development Area ¹	0.255	ha	
Existing Impermeable		ha	
Existing Impermeable ²		ha	
Existing Pervious	0.255	ha	
Existing Pervious ²	0.000	ha	
Proposed total impermeable	0.183	ha	72%

Catchment Characteristics			
SAAR	1011	mm	
SPR	0.47		
BFI	0.833		
i ₁	18.6	mm/hr	d ₁ 22.7 mm
i ₃₀	33.5	mm/hr	d ₃₀ 53.2 mm
i ₁₀₀	43.2	mm/hr	d ₁₀₀ 68.0 mm

Run-off Rates			
Pre-development			
Impermeable -----	1yr	0.0	l/s
	30yr	0.0	l/s
	100yr	0.0	l/s
	50mm/hr ³	0.0	l/s
Pervious ⁴ -----	1yr	1.6	l/s
	30yr	3.2	l/s
	100yr	3.8	l/s
	QBar ⁵	1.8	l/s
Total -----	1yr	1.6	l/s
	30yr	3.2	l/s
	100yr	3.8	l/s
Post-development (without control)			
Impermeable ⁶ -----	1yr	9.5	l/s
	30yr	17.0	l/s
	100yr+45%CC	31.9	l/s

Volumes			
Pre-development			
Impermeable -----	1yr	0.0	cu.m
	30yr	0.0	cu.m
	100yr	0.0	cu.m
Pervious ⁴ -----	1yr	21.7	cu.m
	30yr	42.1	cu.m
	100yr	57.7	cu.m
Total -----	1yr	21.7	cu.m
	30yr	42.1	cu.m
	100yr	57.7	cu.m
Post-development			
Impermeable ⁶ -----	1yr	41.6	cu.m
	30yr	97.4	cu.m
	100yr	124.5	cu.m

Stormwater Storage Estimates					
Restricted Rate to 5.0l/s					
Microdrainage Quick Storage Estimates			(using FEH catchment data)		
Return Period	Rate	lower	upper	mean	
1yr	5.0 l/s	7.5	19	13.25	cu.m
30yr	5.0 l/s	33	52	42.5	cu.m
100yr+45%CC	5.0 l/s	80	121	100.5	cu.m

1/ The 'development area' removes areas of POS and/or landscaped areas of the wider site that are to remain as existing.
 2/ On occasion the existing impermeable area cannot be evidenced to connect and a reduction is applied.
 3/ 50mm/hr is used for BRegs calculations and often used by Water Companies when considering allowable post-development rates of discharge. (Rational Method)
 4/ The Greenfield rates and of run-off have been calculated using the UK SUDS Calculator
 5/ QBar is the estimated flood flow for the 2.33yr return period event and is often used as a post-development rate restriction.
 6/ Post-development run-off is only considered from the impermeable area when the proposed post-development impermeable area >50% in accordance with the EA Guidance Preliminary rainfall runoff management for developments (WS-074/A/TR1/1 rev E (2012)).

NB. The catchment characteristics are from the FEH catchment, the UK SUDS Calculator and Microdrainage.
 NB. The rainfall intensities and depths are calculated for the 6hr duration rainfall event (peak summer intensity)

Betts Associates Ltd		Page 1
6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Thomas Street Huddersfield	
Date 14/03/2022	Designed by HB	
File	Checked by MB/RDN	
Innovyze	Network 2020.1.3	

Rainfall profile

Storm duration (mins) 360

FSR Data

Region England and Wales

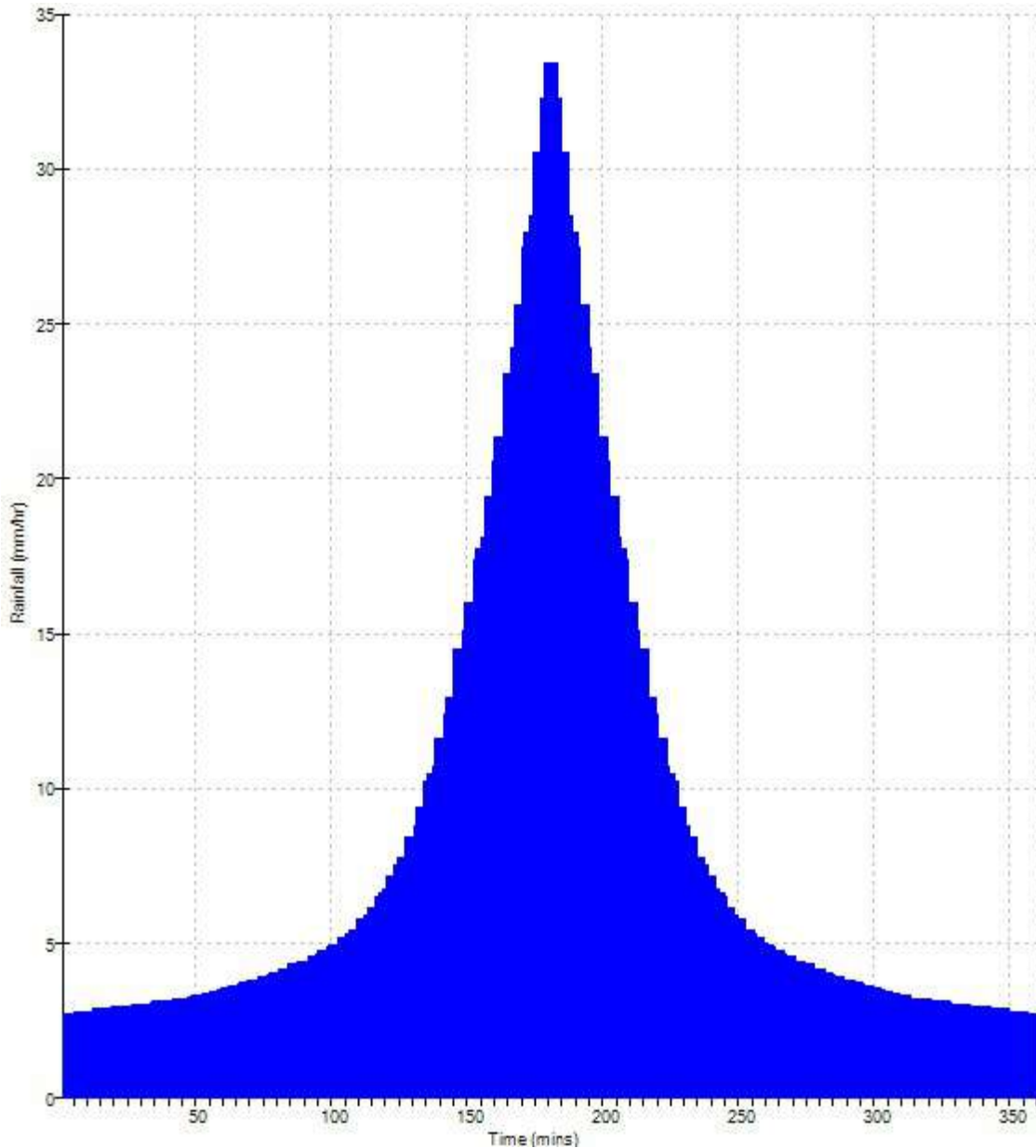
M5-60 (mm) 19.000

Ratio R 0.309

Peak Intensity (mm/hr) 33.463

Ave. Intensity (mm/hr) 8.536

Return Period (years) 30.0

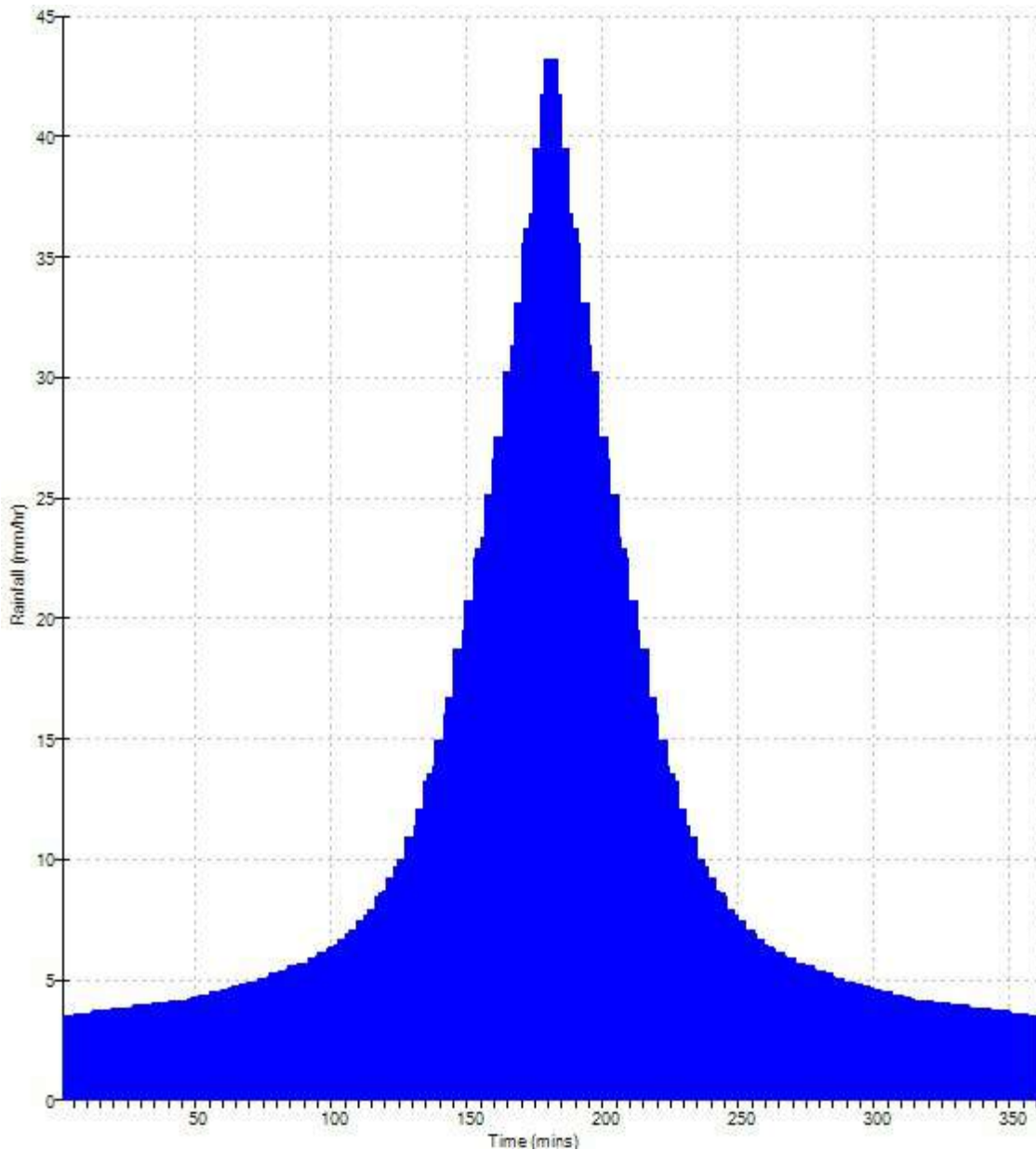


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6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Thomas Street Huddersfield	
Date 14/03/2022	Designed by HB	
File	Checked by MB/RDN	
Innovyze	Network 2020.1.3	

Rainfall profile

Storm duration (mins) 360

FSR Data
Region England and Wales
M5-60 (mm) 19.000
Ratio R 0.309
Peak Intensity (mm/hr) 43.228
Ave. Intensity (mm/hr) 11.028
Return Period (years) 100.0

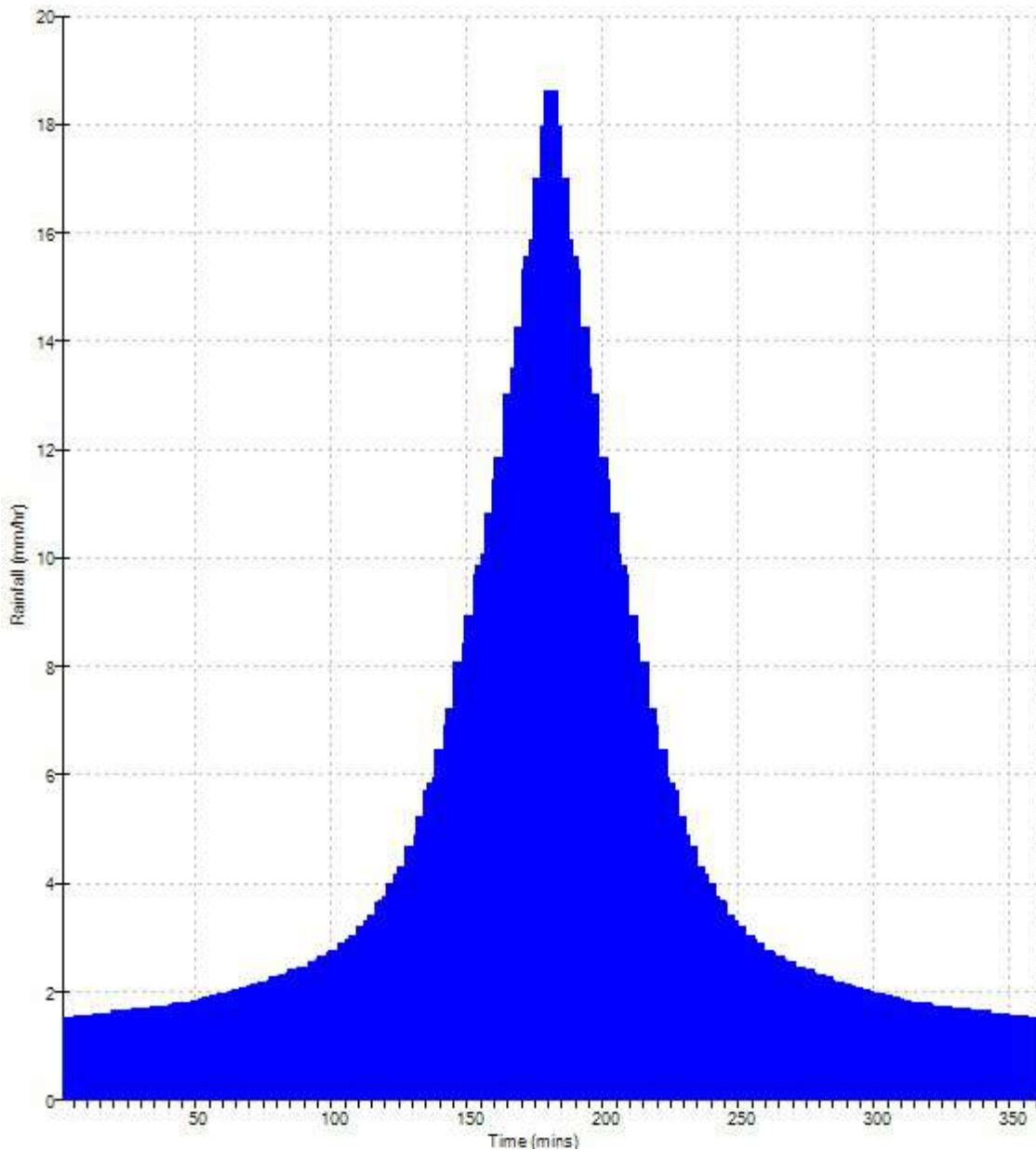


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6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Thomas Street Huddersfield	
Date 14/03/2022	Designed by HB	
File	Checked by MB/RDN	
Innovyze	Network 2020.1.3	

Rainfall profile

Storm duration (mins) 360

FSR Data
Region England and Wales
M5-60 (mm) 19.000
Ratio R 0.309
Peak Intensity (mm/hr) 18.631
Ave. Intensity (mm/hr) 4.753
Return Period (years) 2.0



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6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Thomas Street Huddersfield	
Date 14/03/2022 File	Designed by HB Checked by MB/RDN	
Innovyze Source Control 2020.1.3		

Greenfield Runoff Volume

FSR Data

Return Period (years)	2
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.000
Ratio R	0.307
Areal Reduction Factor	1.00
Area (ha)	0.255
SAAR (mm)	1175
CWI	123.757
Urban	0.000
SPR	30.000

Results

Percentage Runoff (%)	29.69
Greenfield Runoff Volume (m³)	21.656

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6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Thomas Street Huddersfield	
Date 14/03/2022 File	Designed by HB Checked by MB/RDN	
Innovyze Source Control 2020.1.3		

Greenfield Runoff Volume

FSR Data

Return Period (years)	30
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.000
Ratio R	0.307
Areal Reduction Factor	1.00
Area (ha)	0.255
SAAR (mm)	1175
CWI	123.757
Urban	0.000
SPR	30.000

Results

Percentage Runoff (%)	32.15
Greenfield Runoff Volume (m³)	42.110

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Betts Associates Ltd		Page 1																										
6 Old Marsh Farm Barns Welsh Road, Sealand Flintshire, CH5 2LY	Thomas Street Huddersfield																											
Date 14/03/2022 File	Designed by HB Checked by MB/RDN																											
Innovyze		Source Control 2020.1.3																										
<u>Greenfield Runoff Volume</u> FSR Data <table> <tr> <td>Return Period (years)</td> <td>100</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>360</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> </tr> <tr> <td>M5-60 (mm)</td> <td>19.000</td> </tr> <tr> <td>Ratio R</td> <td>0.307</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.00</td> </tr> <tr> <td>Area (ha)</td> <td>0.255</td> </tr> <tr> <td>SAAR (mm)</td> <td>1175</td> </tr> <tr> <td>CWI</td> <td>123.757</td> </tr> <tr> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SPR</td> <td>30.000</td> </tr> </table> Results <table> <tr> <td>Percentage Runoff (%)</td> <td>34.13</td> </tr> <tr> <td>Greenfield Runoff Volume (m³)</td> <td>57.732</td> </tr> </table>			Return Period (years)	100	Storm Duration (mins)	360	Region	England and Wales	M5-60 (mm)	19.000	Ratio R	0.307	Areal Reduction Factor	1.00	Area (ha)	0.255	SAAR (mm)	1175	CWI	123.757	Urban	0.000	SPR	30.000	Percentage Runoff (%)	34.13	Greenfield Runoff Volume (m³)	57.732
Return Period (years)	100																											
Storm Duration (mins)	360																											
Region	England and Wales																											
M5-60 (mm)	19.000																											
Ratio R	0.307																											
Areal Reduction Factor	1.00																											
Area (ha)	0.255																											
SAAR (mm)	1175																											
CWI	123.757																											
Urban	0.000																											
SPR	30.000																											
Percentage Runoff (%)	34.13																											
Greenfield Runoff Volume (m³)	57.732																											
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APPENDIX K: PRELIMINARY DRAINAGE STRATEGY

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APPENDIX L: STORMWATER STORAGE ESTIMATES

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1 YEAR RETURN PERIOD STORM EVENT

Variables	
FEH Rainfall	Cv (Summer) 0.750
Return Period (years) 2	Cv (Winter) 0.840
Version 2013	Impervious Area (ha) 0.183
Point	Maximum Allowable Discharge (l/s) 5.0
Site GB 411647 418271 SE 11647 18271	Infiltration Coefficient (m/hr) 0.00000
	Safety Factor 2.0
	Climate Change (%) 0

Results	
Global Variables require approximate storage of between 7.5 m ³ and 19 m ³ .	
These values are estimates only and should not be used for design purposes.	

30 YEAR RETURN PERIOD STORM EVENT

Variables	
FEH Rainfall	Cv (Summer) 0.750
Return Period (years) 30	Cv (Winter) 0.840
Version 2013	Impervious Area (ha) 0.183
Point	Maximum Allowable Discharge (l/s) 5.0
Site GB 411647 418271 SE 11647 18271	Infiltration Coefficient (m/hr) 0.00000
	Safety Factor 2.0
	Climate Change (%) 0

Results	
Global Variables require approximate storage of between 33 m ³ and 52 m ³ .	
These values are estimates only and should not be used for design purposes.	

Variables	
	FEH Rainfall Return Period (years) 100 Version 2013 Point ... Site GB 411647 418271 SE 11647 18271
Variables	Cv (Summer) 0.750 Cv (Winter) 0.840 Impemeable Area (ha) 0.183 Maximum Allowable Discharge (l/s) 5.0 Infiltration Coefficient (m/hr) 0.00000  Safety Factor 2.0 Climate Change (%) 45
Results	
Design	
Overview 2D	
Overview 3D	
Vt	

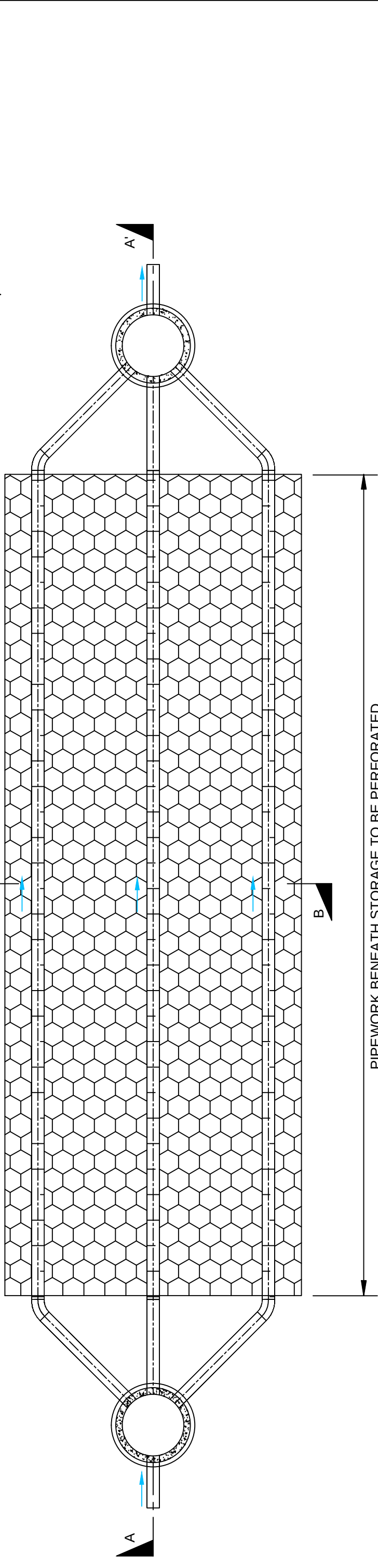
Results	
	Global Variables require approximate storage of between 80 m³ and 121 m³. These values are estimates only and should not be used for design purposes.
Variables	

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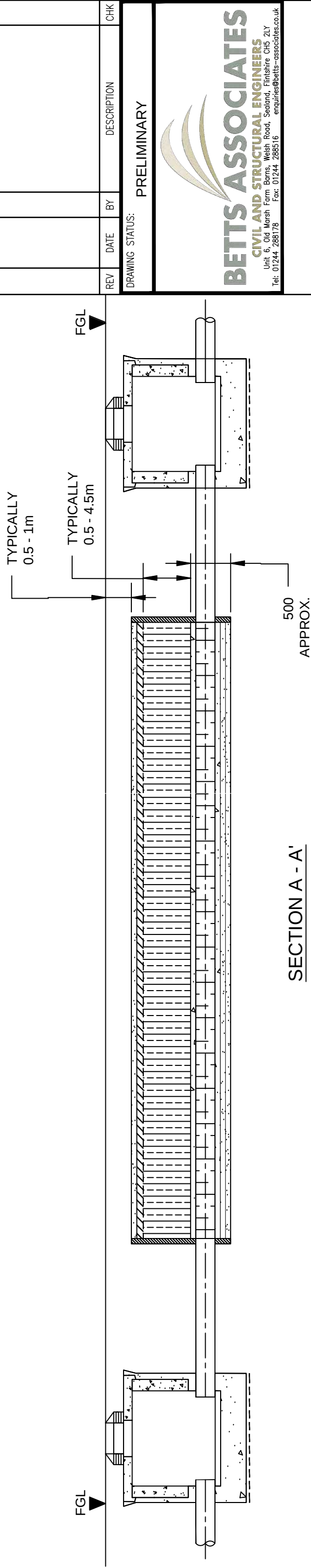
APPENDIX M: TYPICAL SUDS DETAILS

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 B'	DO NOT SCALE
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PLAN



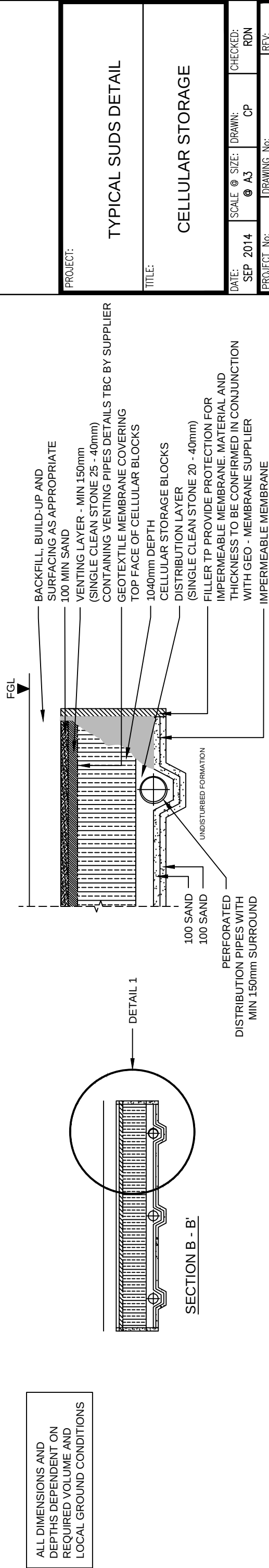
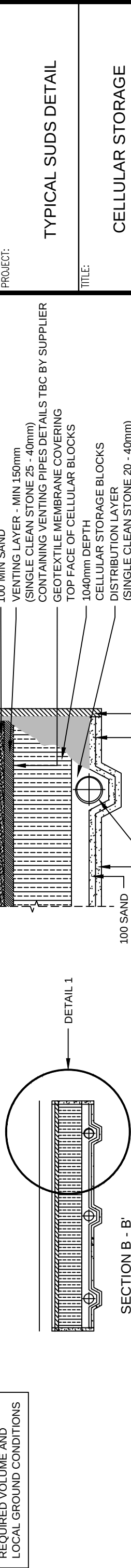
ALL DIMENSIONS AND DEPTHS DEPENDENT ON REQUIRED VOLUME AND LOCAL GROUND CONDITIONS

BACKFILL, BUILD-UP AND SURFACING AS APPROPRIATE

100 MIN SAND

VENTING LAYER - MIN 150mm

PROJECT:



DETAIL 1

BETTS

113

A

ALL DIMENSIONS AND DEPTHS DEPENDENT ON REQUIRED VOLUME AND LOCAL GROUND CONDITIONS

SECTION A - A'

SECTION B - B'

DETAIL 1

FGL

BACKFILL, BUILD-UP AND SURFACING AS APPROPRIATE

100 MIN SAND

VENTING LAYER - MIN 150mm (SINGLE CLEAN STONE 25 - 40mm)

CONTAINING VENTING PIPES DETAILS TBC BY SUPPLIER

GEOTEXTILE MEMBRANE COVERING TOP FACE OF CELLULAR BLOCKS

1040mm DEPTH

CELLULAR STORAGE BLOCKS

DISTRIBUTION LAYER (SINGLE CLEAN STONE 20 - 40mm)

FILLER TP PROVIDE PROTECTION FOR IMPERMEABLE MEMBRANE. MATERIAL AND THICKNESS TO BE CONFIRMED IN CONJUNCTION WITH GEO - MEMBRANE SUPPLIER

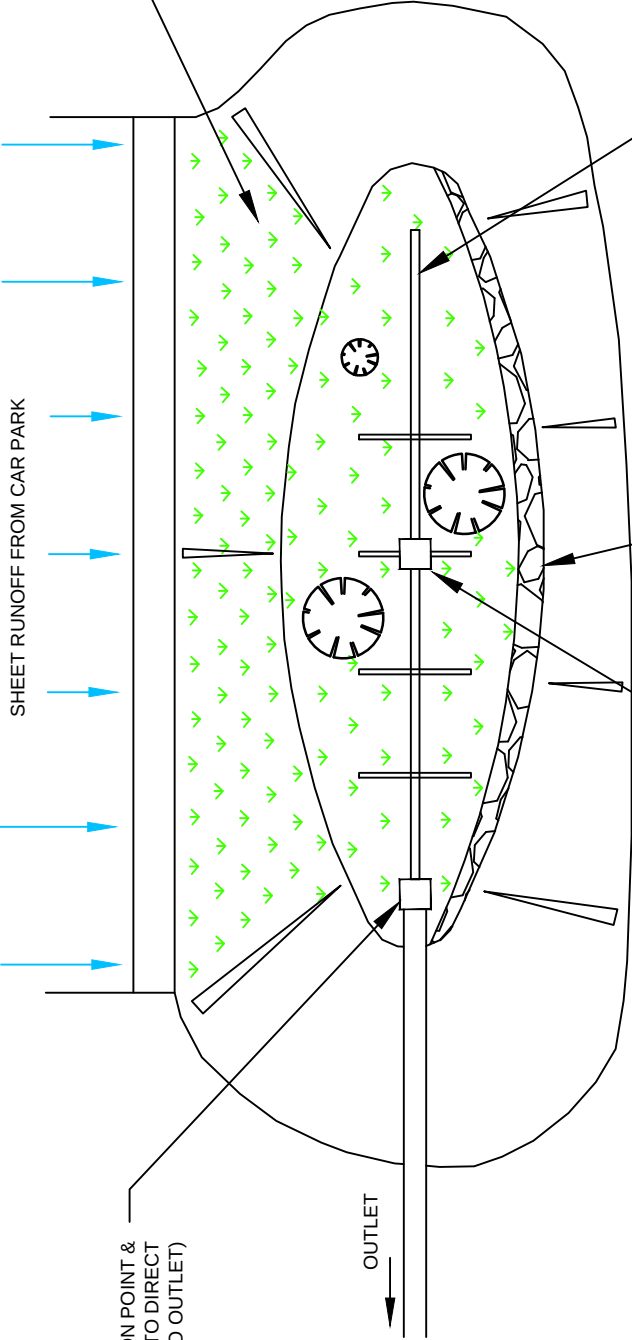
IMPERMEABLE MEMBRANE

PERFORATED DISTRIBUTION PIPES WITH MIN 150mm SURROUND

UNDISTURBED FORMATION

500 APPROX.

DO NOT SCALE



The diagram illustrates a cross-section of a geotextile filter fabric underdrain system. On the left, a horizontal line represents the 'SHEET FLOW FROM HARD SURFACE' with an arrow pointing right. Below this, a vertical line indicates the 'DESIGN LEVEL' with a triangle symbol. To the right of the design level, a vertical line marks the 'INSPECTION POINT & OVERFLOW'. The main body of the diagram shows a cross-section of the 'GEOTEXTILE FILTER FABRIC' with a woven pattern. Inside the fabric, there are blue arrows pointing right, representing flow. On the right side of the fabric, there are green arrows pointing left, representing flow. A label on the right side points to the fabric with the text 'PERFORATED UNDERDRAIN (SINGLE OR MULTIPLE ACROSS SECTION, DEPENDING ON WIDTH)'.

TYPICAL SECTION

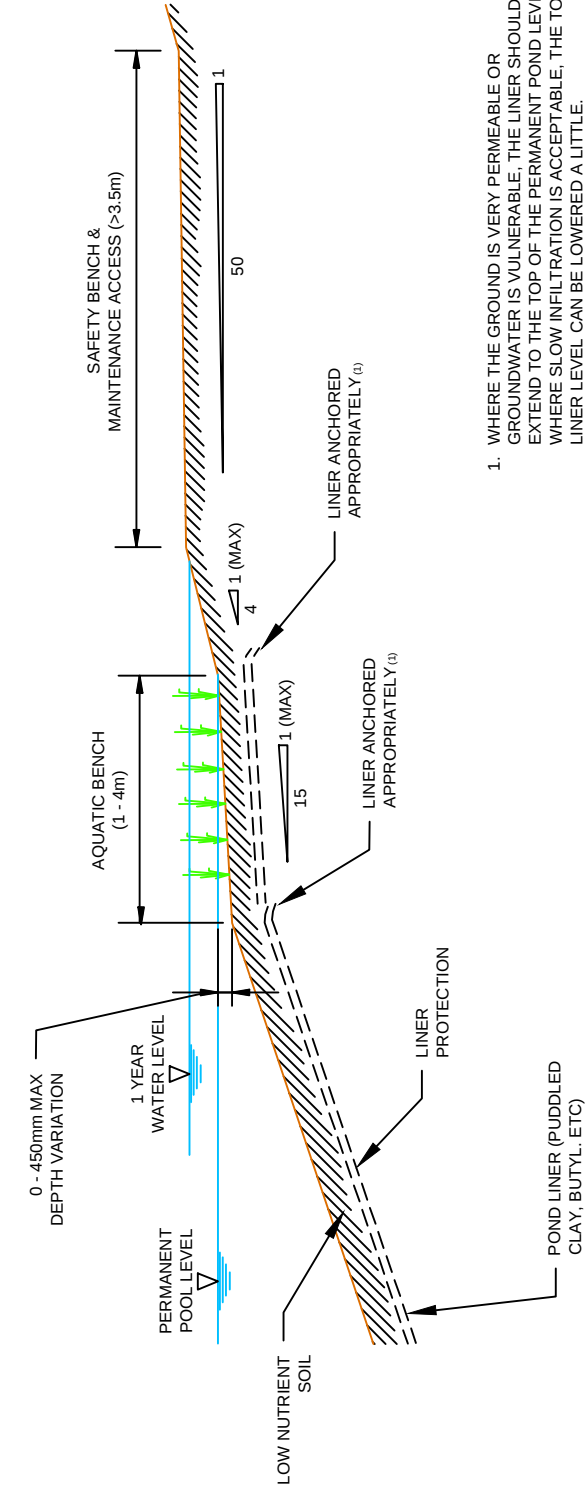
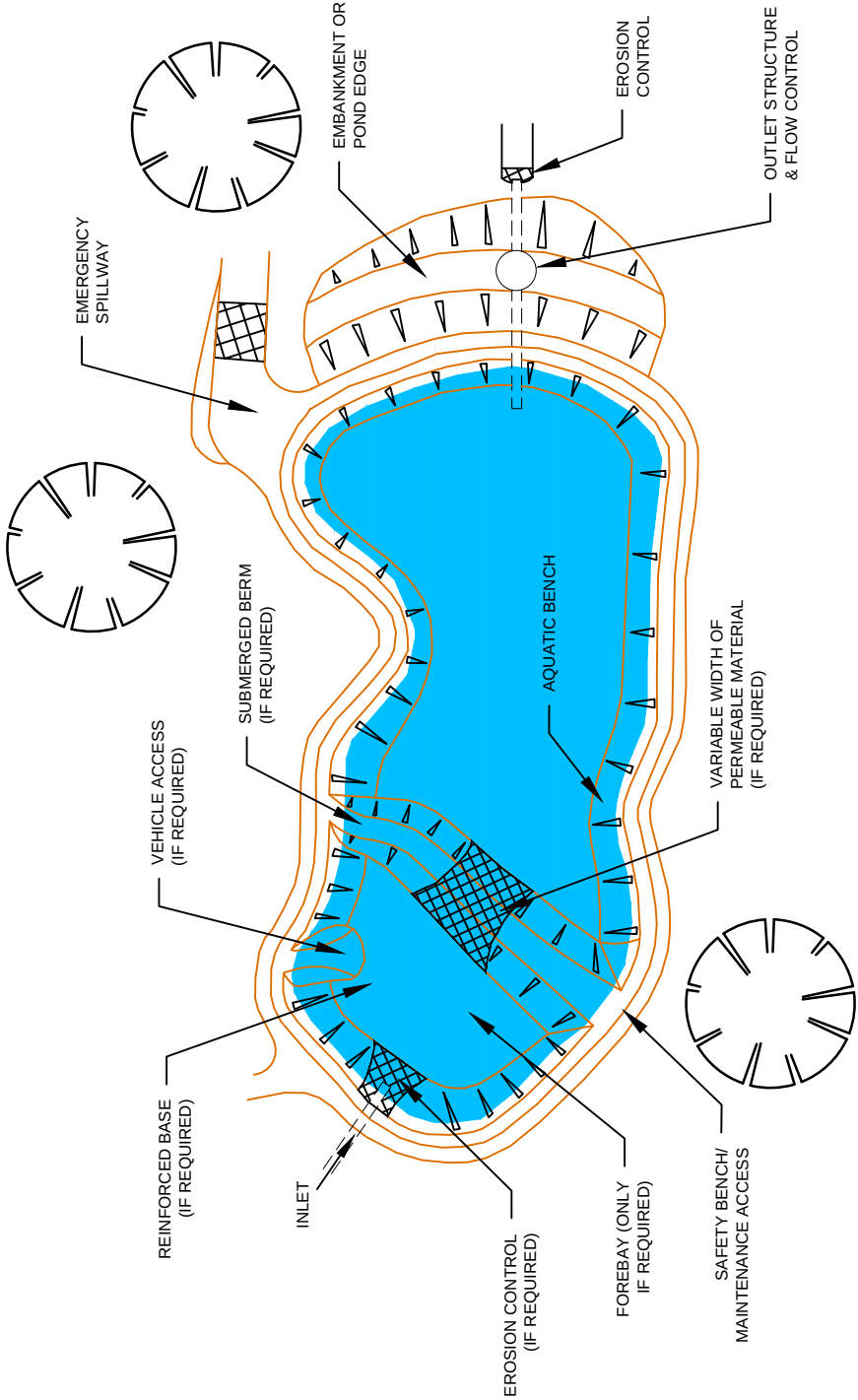
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TITLE:

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No: BETTS	DRAWING No: 112	REV: A
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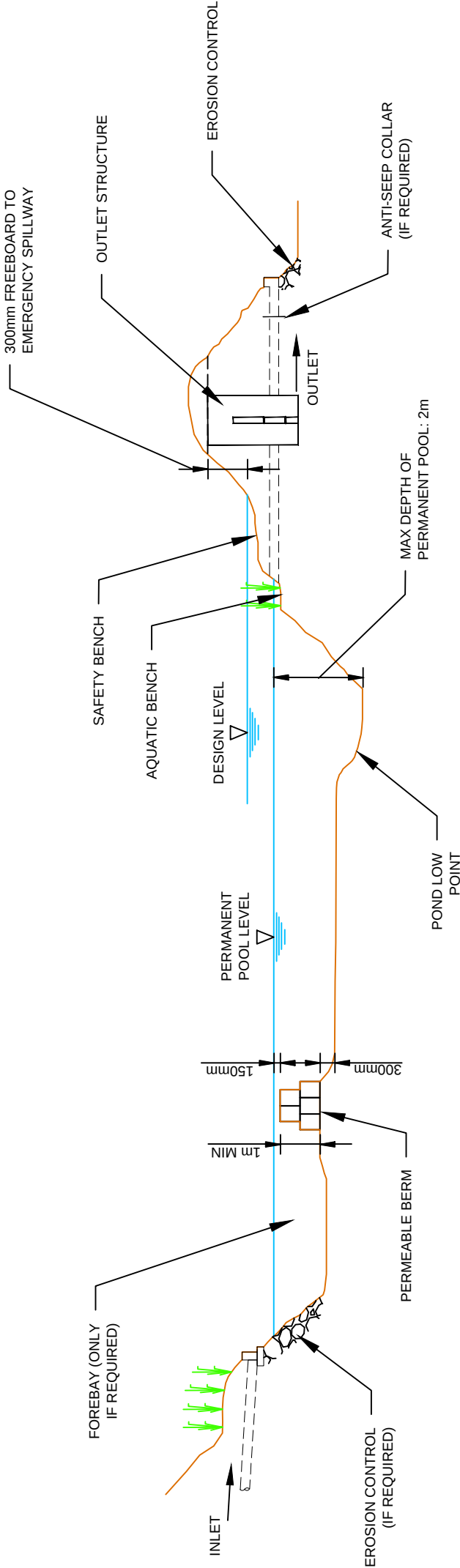
DO NOT SCALE



1. WHERE THE GROUND IS VERY PERMEABLE OR GROUNDWATER IS VULNERABLE, THE LINER SHOULD EXTEND TO THE TOP OF THE PERMANENT POND LEVEL. WHERE SLOW INFILTRATION IS ACCEPTABLE, THE TOP LINER LEVEL CAN BE LOWERED A LITTLE.

TYPICAL POND EDGE GEOMETRY

PLAN VIEW



PROFILE

REV	DATE	BY	DESCRIPTION	CHK
-----	------	----	-------------	-----

DRAWING STATUS:

PRELIMINARY



BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Berris, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT:

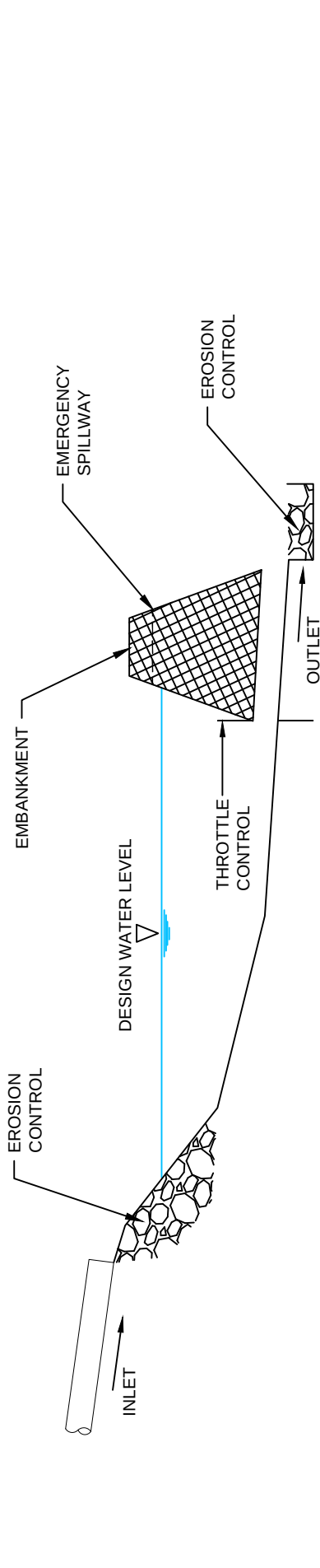
TYPICAL SUDS DETAIL

TITLE:

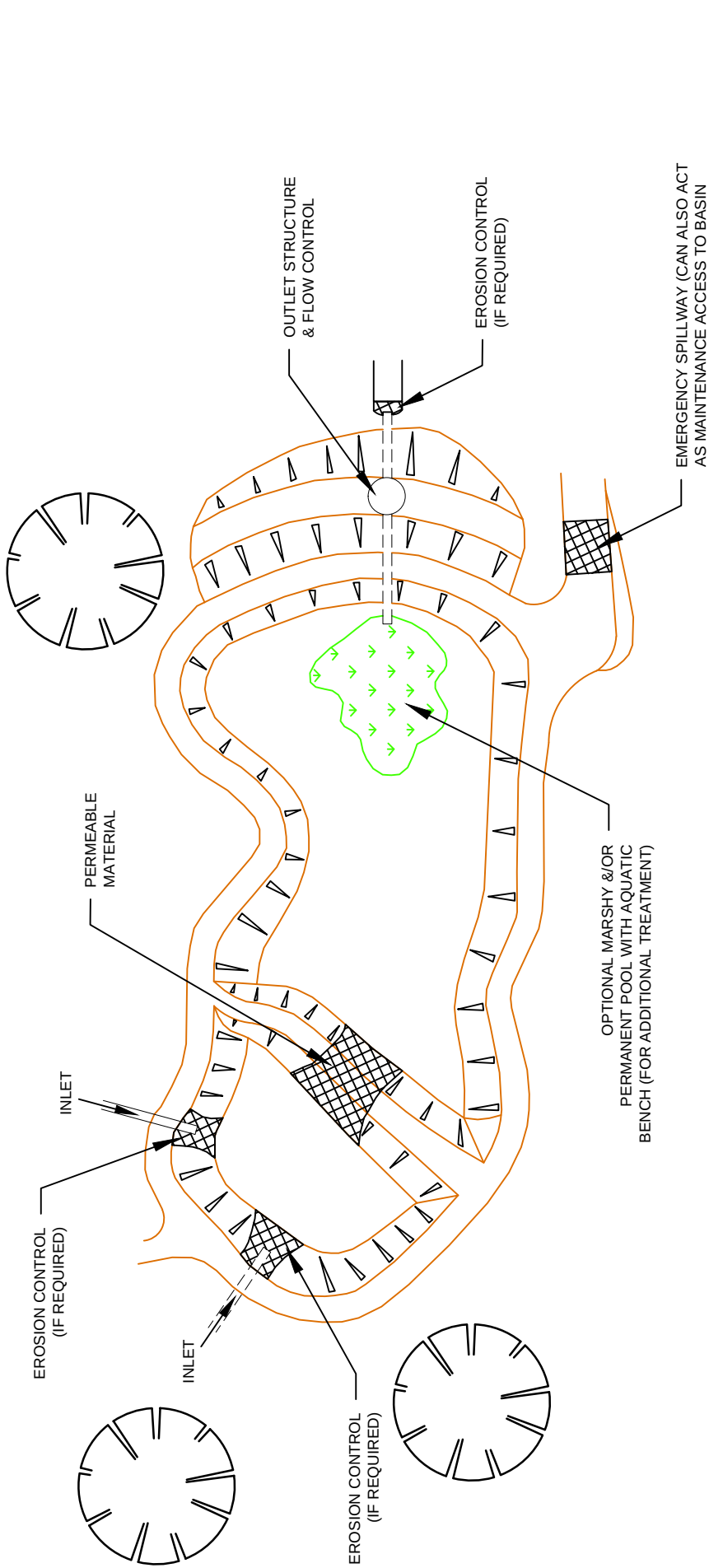
WET PONDS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 111	REV: A	

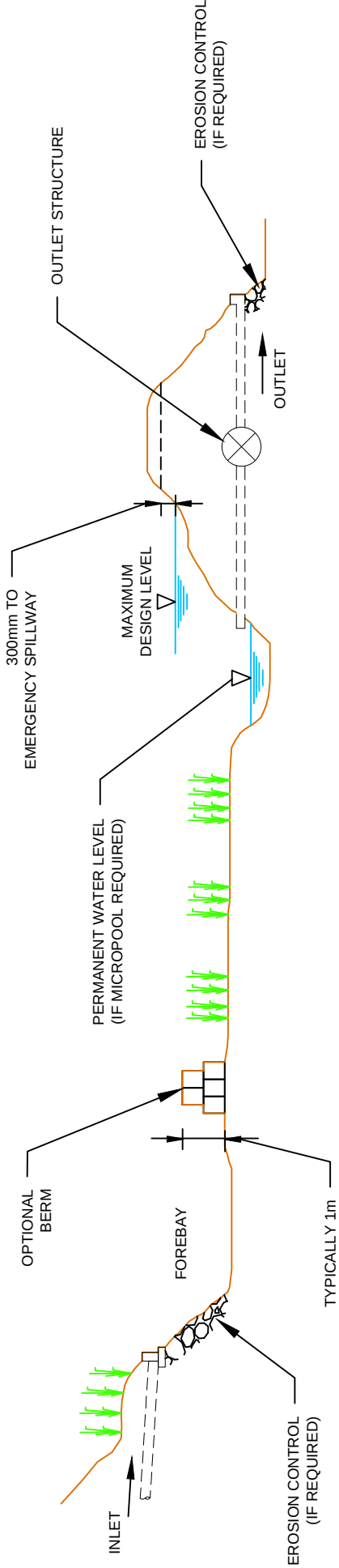
DO NOT SCALE



SCHEMATIC OF DETENTION
BASIN PROFILE



PLAN VIEW



ELEVATION

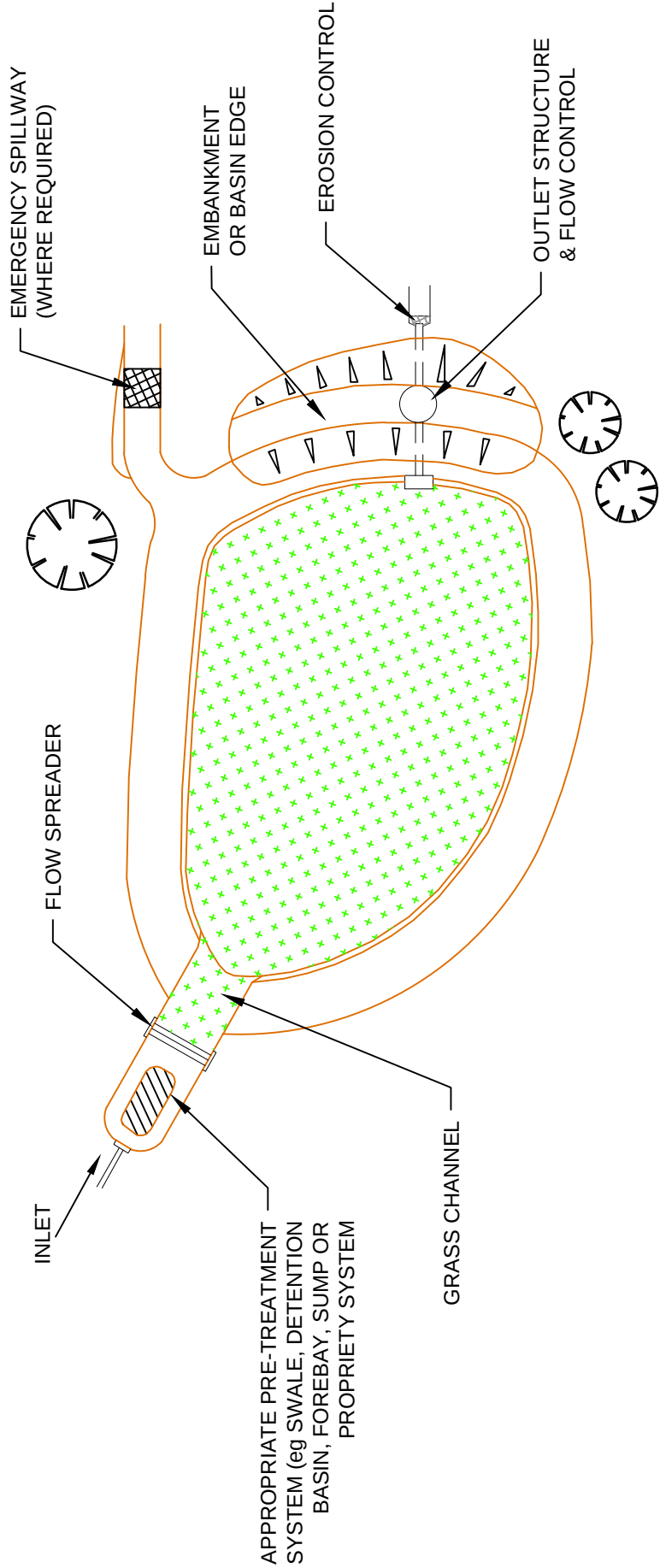
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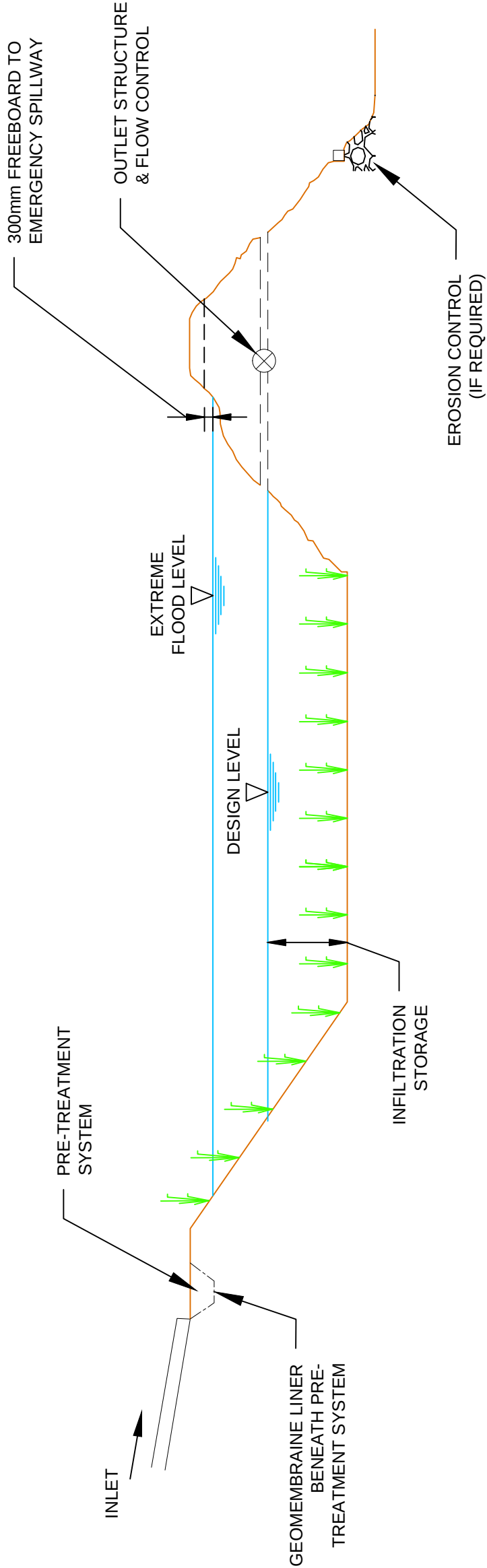
BETTS ASSOCIATES
CIVIL AND STRUCTURAL ENGINEERS
Unit 6, Old Marsh Farm Barns, Welsh Road, Sealand, Flintshire, CH5 2LY
Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk

PROJECT:				
TYPICAL SUDS DETAIL				
TITLE:				
DETENTION BASINS				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	REV: A
PROJECT No: BETTS		DRAWING No: 110		REV: A

DO NOT SCALE



PLAN VIEW



ELEVATION

REV	DATE	BY	DESCRIPTION	CHK

DRAWING STATUS: PRELIMINARY



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PROJECT:

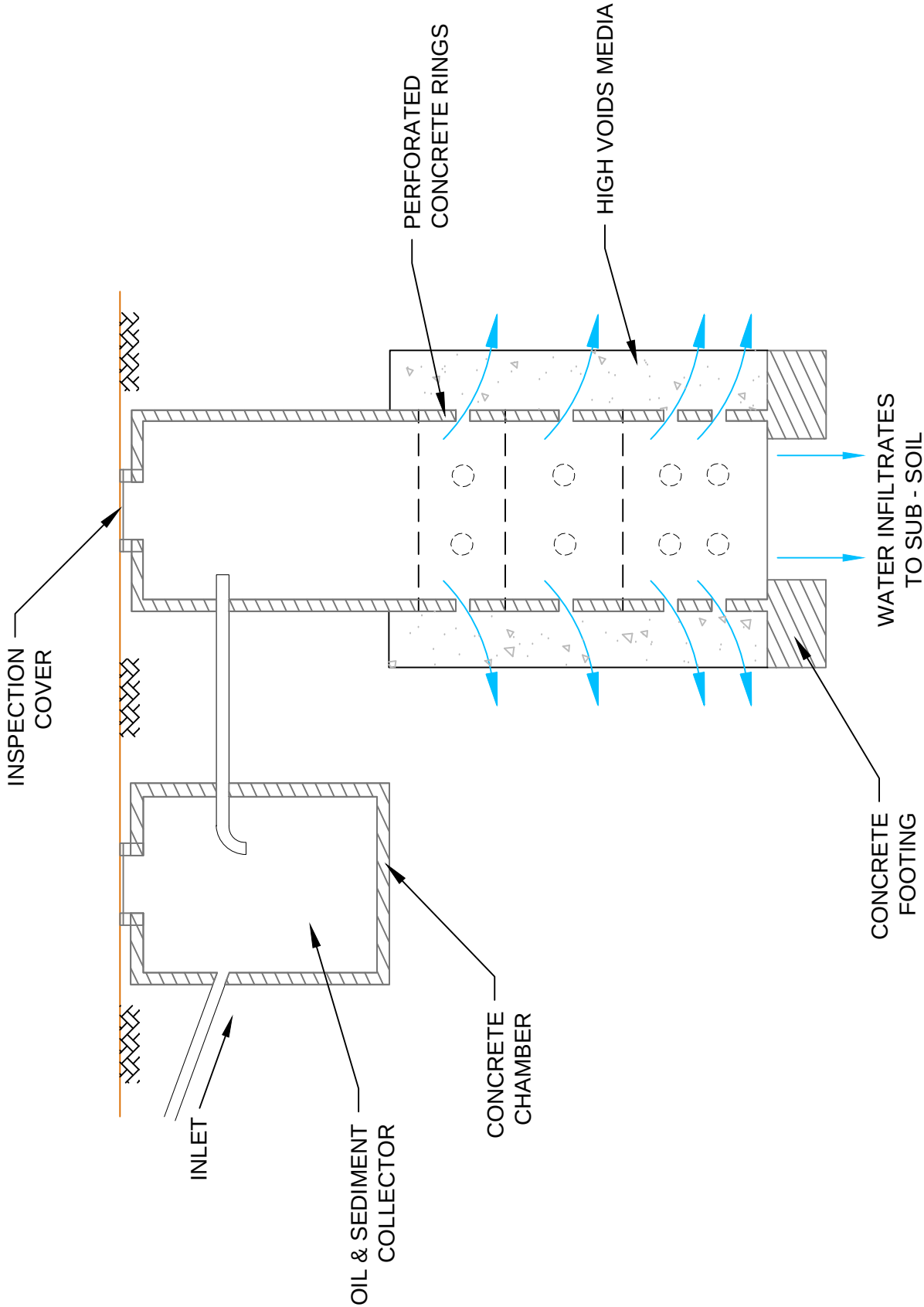
TYPICAL SUDS DETAIL

INFILTRATION BASINS

DATE:	SCALE @ SIZE:	DRAWN:	CHECKED:
SEP 2014	@ A3	CP	RDN

PROJECT No:	DRAWING No:	REV:
BETTS	109	A

DO NOT SCALE



SOAKAWAY DETAILS
(INCLUDING PRE-TREATMENT DEVICE)

REV	DATE	BY	DESCRIPTION	CHK			

DRAWING STATUS: PRELIMINARY



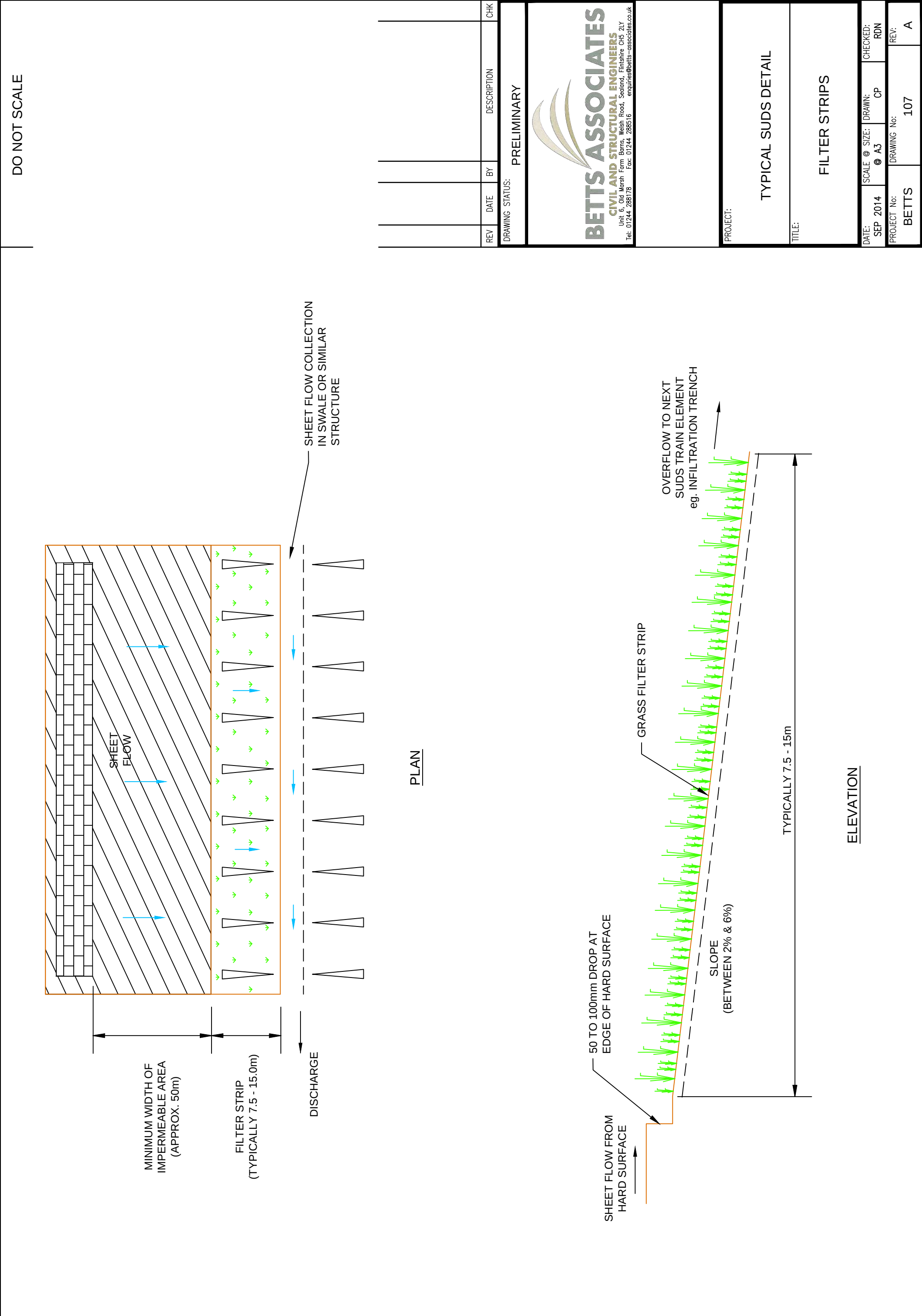
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PROJECT:

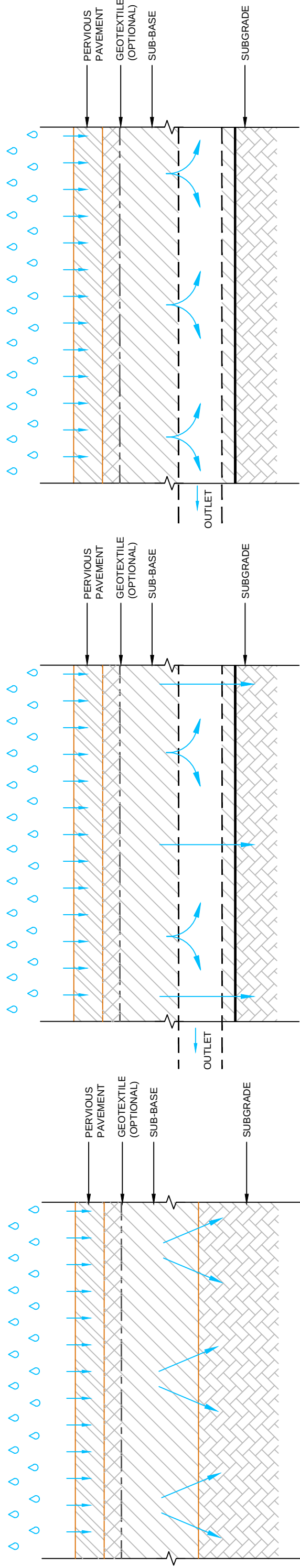
TYPICAL SUDS DETAIL

SOAKAWAYS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS	DRAWING No: 108	REV: A	



	DO NOT SCALE
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TYPE A: TOTAL INFILTRATION

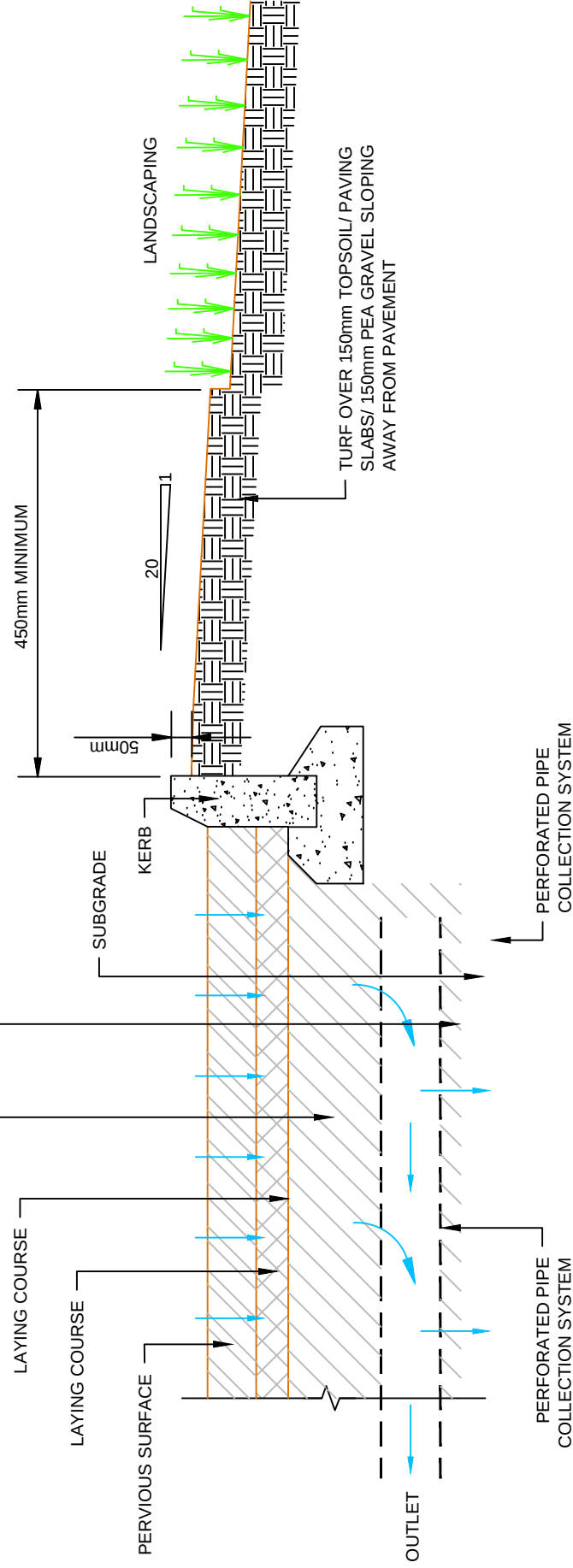
TYPE B: PARTIAL INFILTRATION

TYPE C: NO INFILTRATION

[illegible]

AGGREGATE SUB-BASE (MAY BE REPLACED WITH GEOCELLULAR BLOCKS)

— GEOTEXTILE (OPTIONAL - TYPES A & B) OR GEOMEMBRANE (TYPE C)



LANDSCAPING DETAIL

PRELIMINARY



PROJECT:

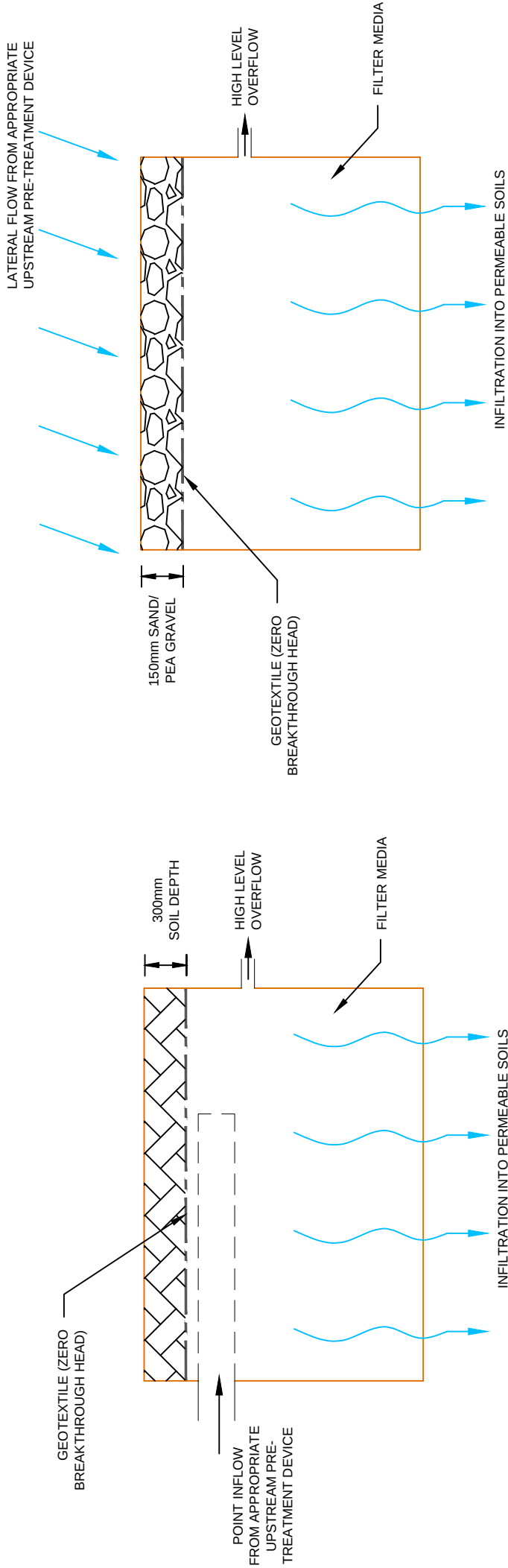
TYPICAL SUDS DETAIL

TITLE:

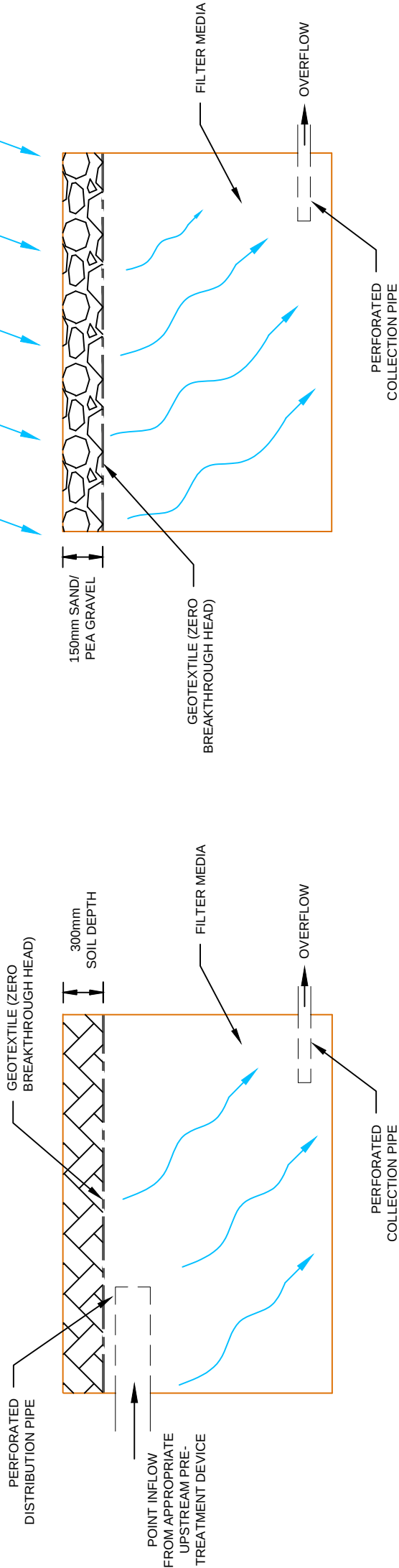
PERVIOUS PAVEMENTS

DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN
PROJECT No: BETTS		DRAWING No: 105	
		REV: A	

DO NOT SCALE



INFILTRATION TRENCH SCHEMATICS



FILTER TRENCH SCHEMATICS

REV	DATE	BY	DESCRIPTION	CHK

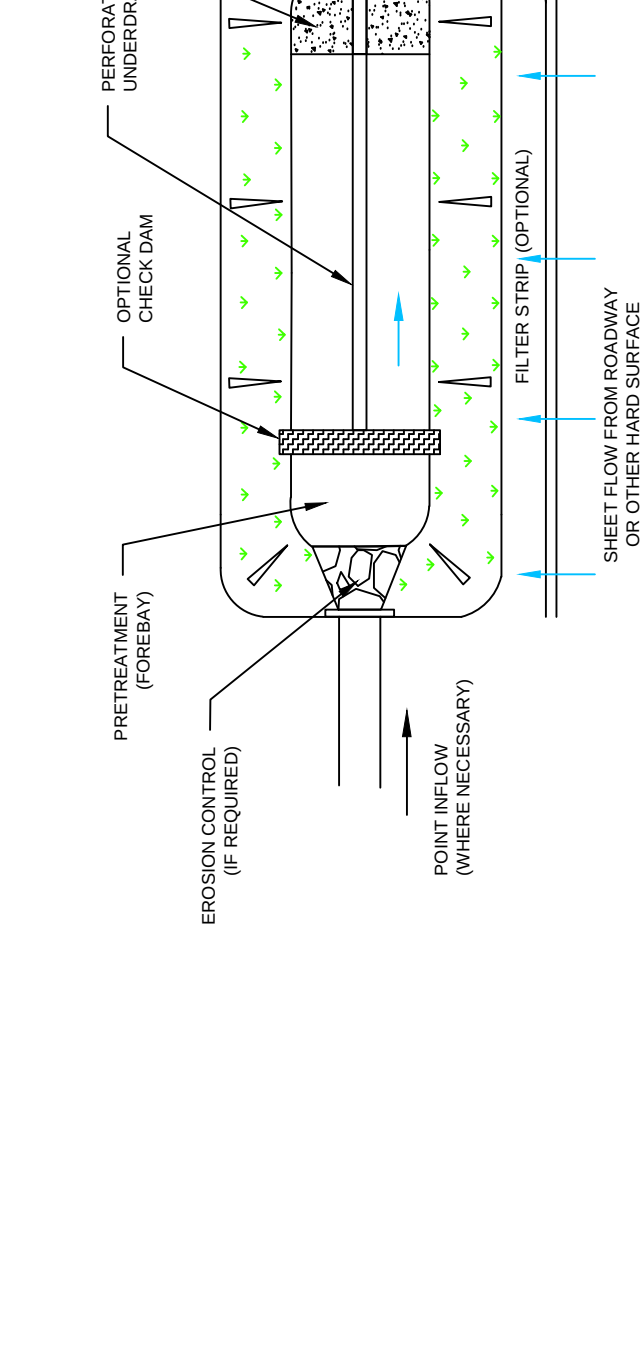
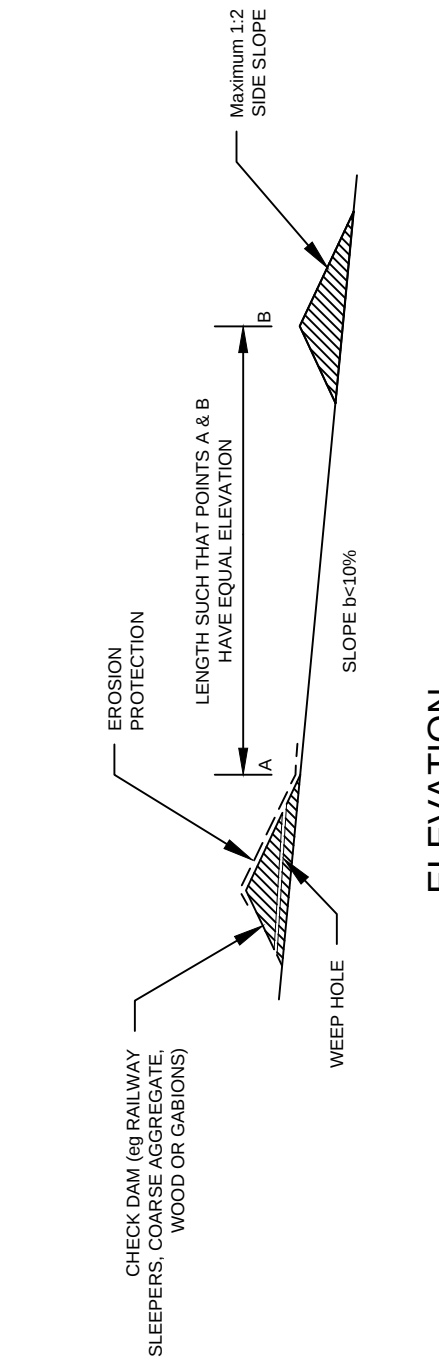
DRAWING STATUS: PRELIMINARY



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PROJECT:				
TYPICAL SUDS DETAIL				
TITLE:				
TRENCHES				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	REV: A
PROJECT No: BETTS		DRAWING No: 105		

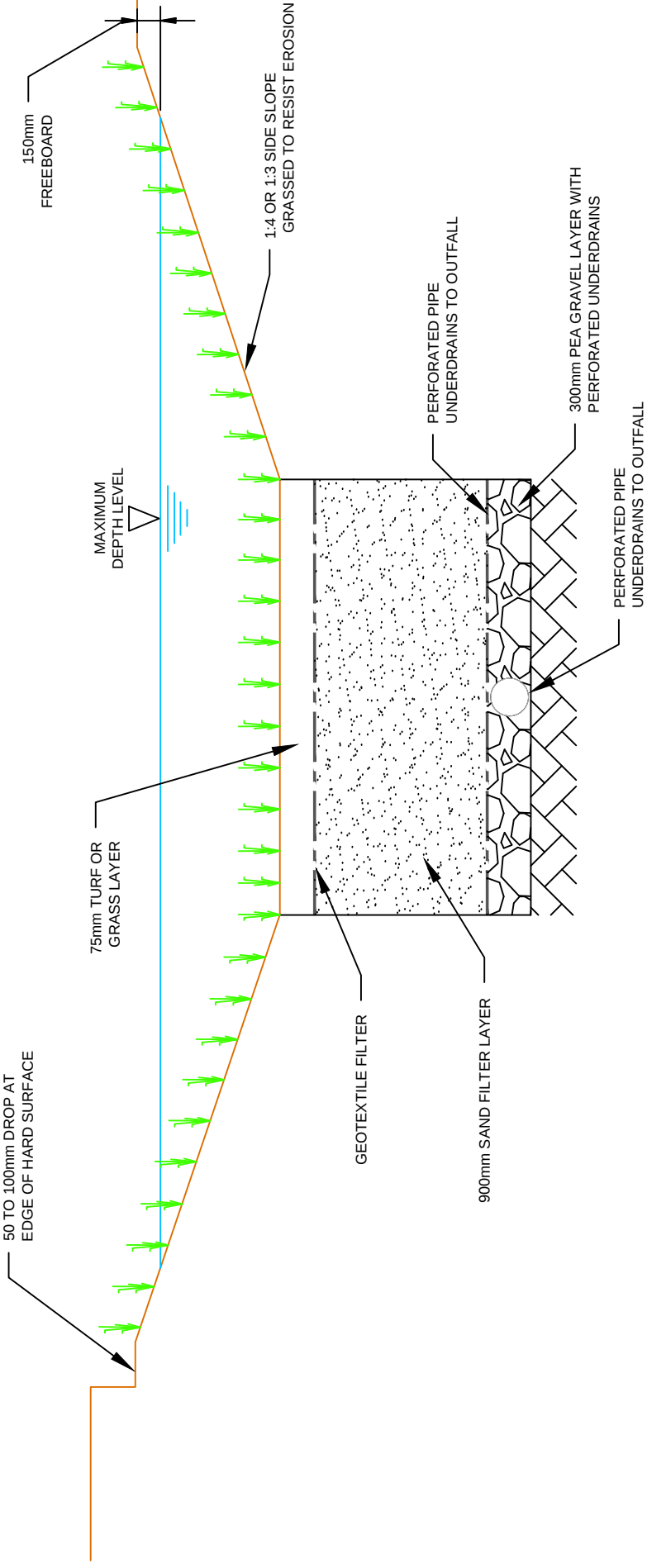
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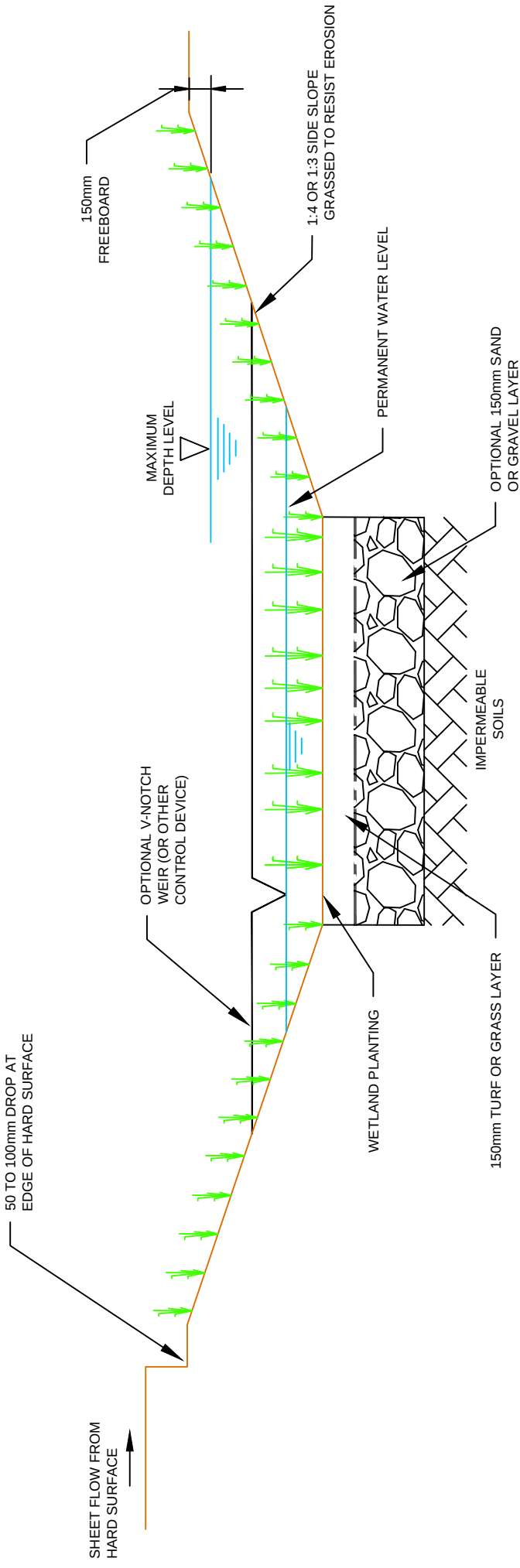
ENHANCED DRY SWALE

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DO NOT SCALE



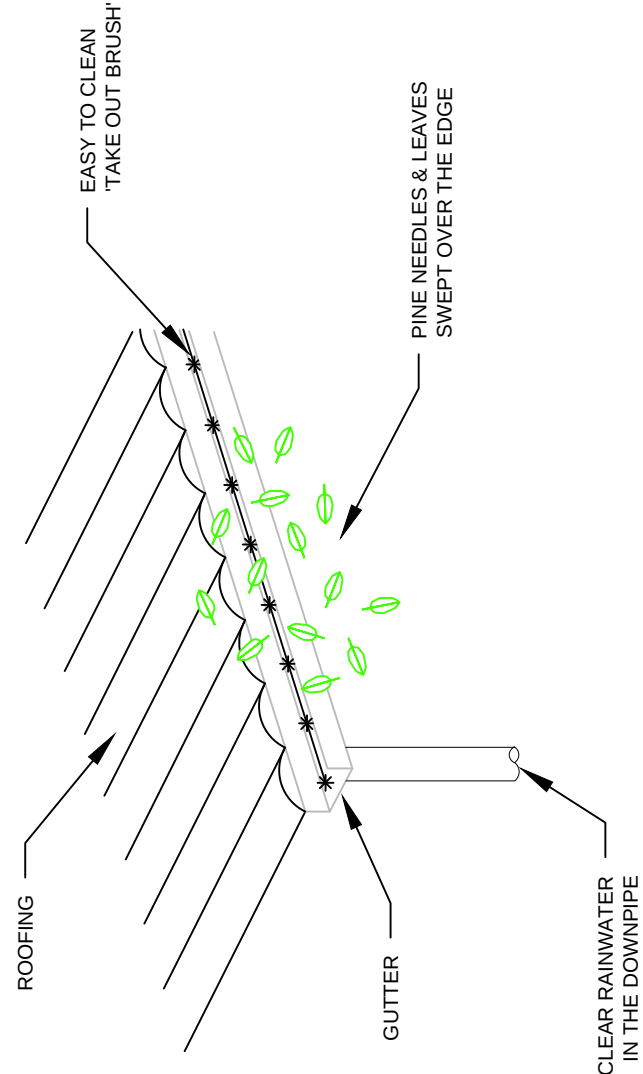
DRY SWALE



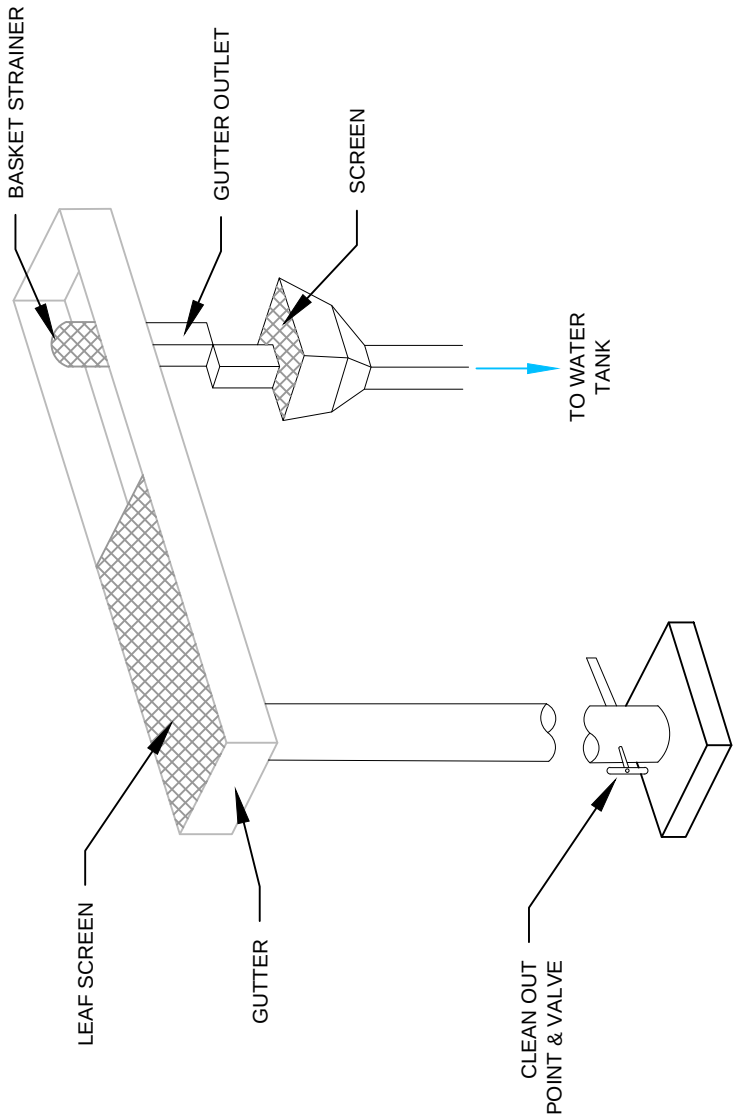
WET SWALE

[illegible]

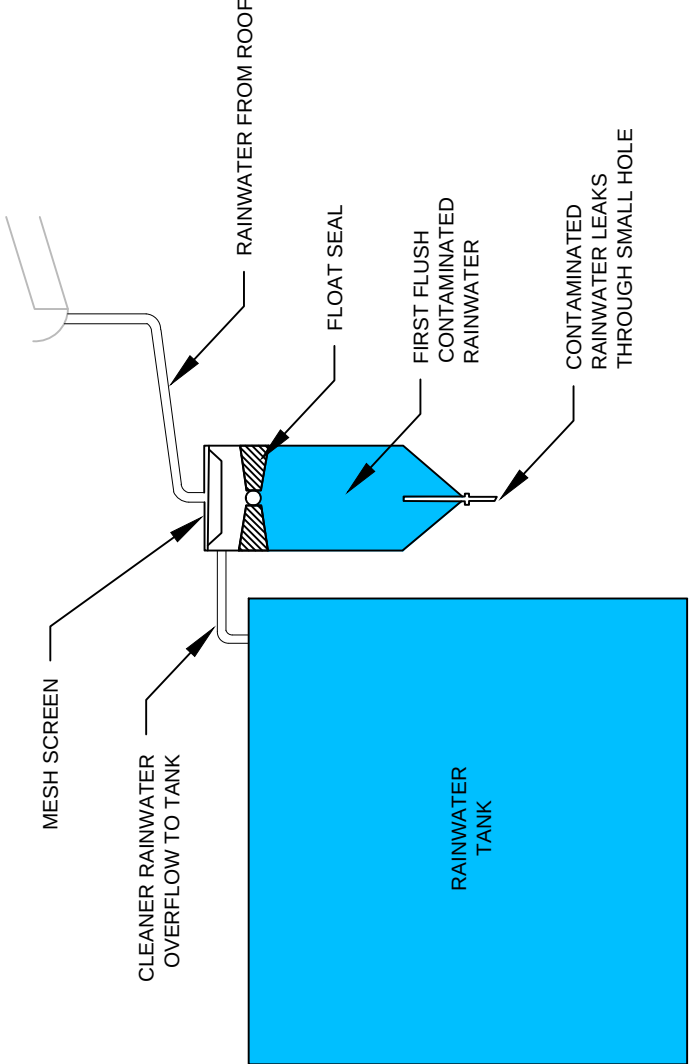
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RAINWATER HARVESTING



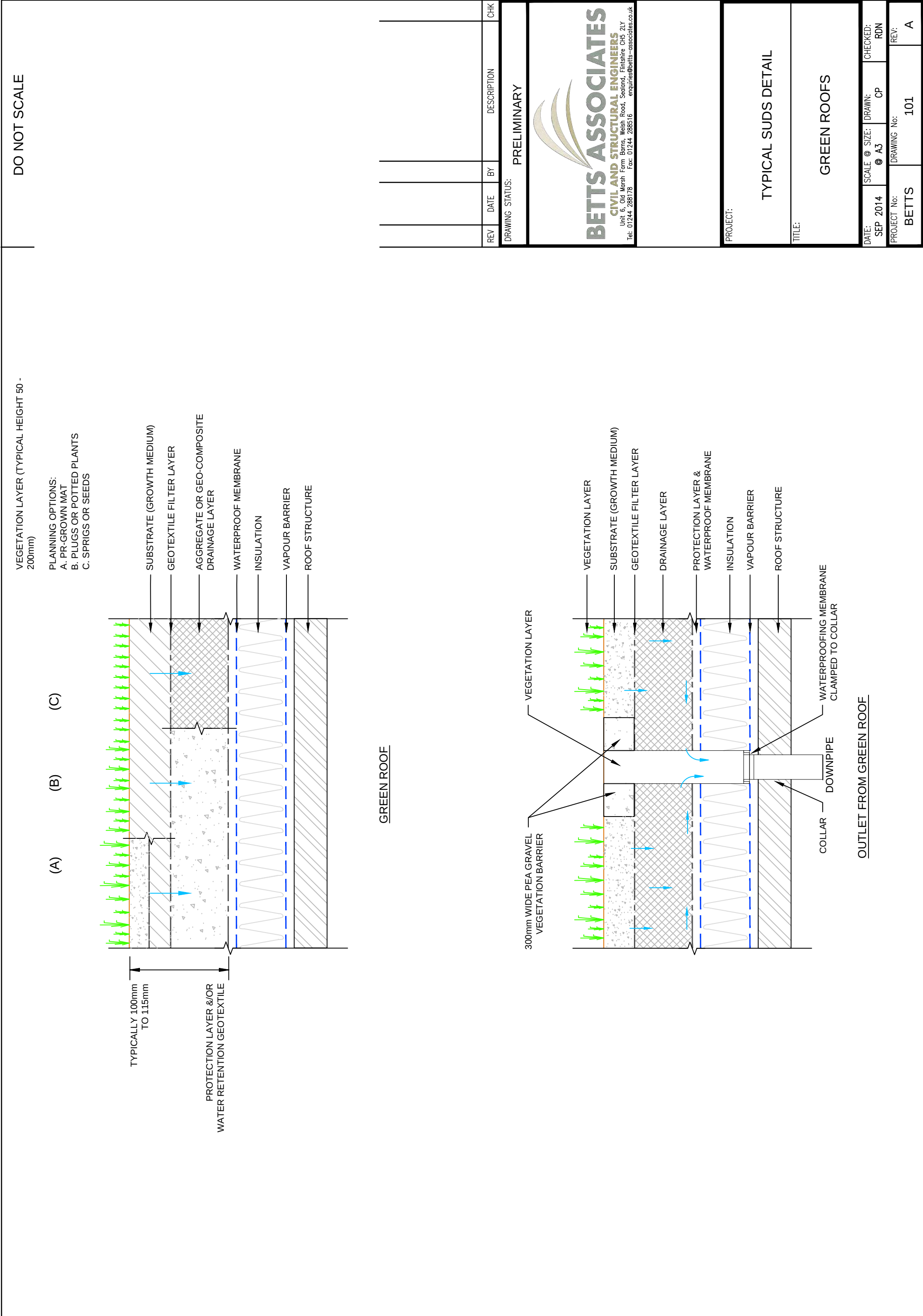
RAINWATER HARVESTING



RAINWATER HARVESTING

RAINWATER HARVESTING

REV	DATE	BY	DESCRIPTION	CHK
DRAWING STATUS: PRELIMINARY				
 BETTS ASSOCIATES CIVIL AND STRUCTURAL ENGINEERS Unit 6, Old Marsh Farm Berris, Welsh Road, Sealand, Flintshire, CH5 2LY Tel: 01244 288178 Fax: 01244 288516 enquiries@betts-associates.co.uk				
PROJECT:				
TYPICAL SUDS DETAIL				
TITLE:				
RAINWATER HARVESTING				
DATE: SEP 2014	SCALE @ SIZE: @ A3	DRAWN: CP	CHECKED: RDN	
PROJECT No: BETTS	DRAWING No: 102	REV: A		



APPENDIX N: NOTES OF LIMITATIONS

The data essentially comprised a study of available documented information from various sources together with discussions with relevant authorities and other interested parties. There may also be circumstances at the site that are not documented. The information reviewed is not exhaustive and has been accepted in good faith as providing representative and true data pertaining to site conditions. If additional information becomes available which might impact our conclusions, we request the opportunity to review the information, reassess the potential concerns and modify our opinion if warranted.

It should be noted that any risks identified in this report are perceived risks based on the available information.

This report was prepared by Betts Hydro Ltd for the sole and exclusive use of the titled client in response to particular instructions. Any other parties using the information contained in this report do so at their own risk and any duty of care to those parties is excluded.

This document has been prepared for the titled project only and should any third party wish to use or rely upon the contents of the report, written approval from Betts Hydro Ltd must be sought.

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MÜLLER