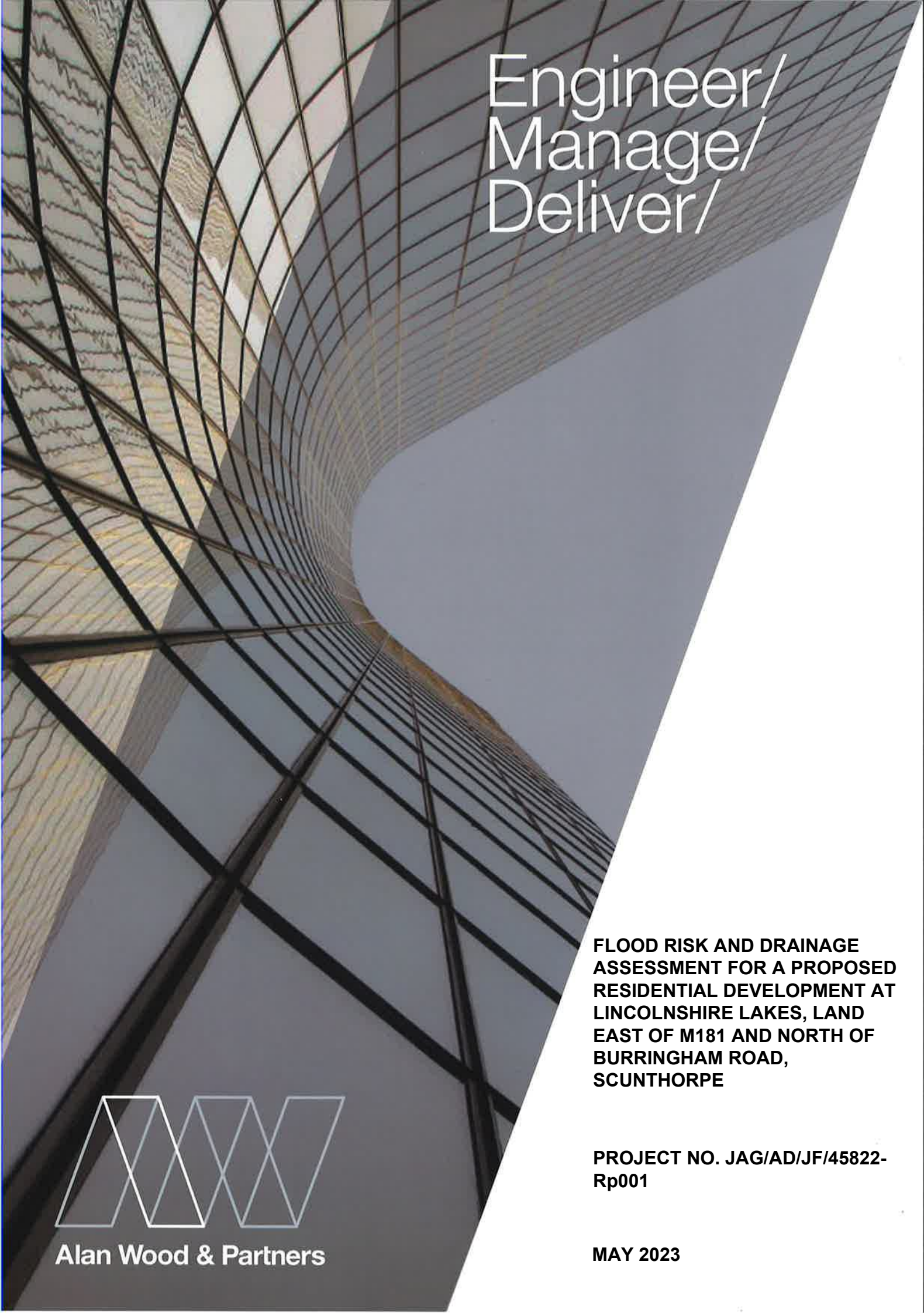

FLOOD RISK AND DRAINAGE ASSESSMENT FOR A PROPOSED RESIDENTIAL DEVELOPMENT AT LINCOLNSHIRE LAKES, LAND EAST OF M181 AND NORTH OF BURRINGHAM ROAD, SCUNTHORPE

PROJECT NO. JAG/AD/JF/45822-Rp001

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Prepared by: A Dunn

[redacted]

Signed: ……
Date: 26th May 2023

Approved by: J Gibson, MEng (Hons), CEng, CWEM MCIWEM
Director

[redacted]

Signed: … ……
Date: 26th May 2023

Issue	Revision	Revised by	Approved by	Revised Date

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APPENDICES

1.0 INTRODUCTION

1.1 Background

1.1.1 Alan Wood & Partners were commissioned by Keepmoat to prepare a Flood Risk and Drainage Assessment for a proposed residential development at Lincolnshire Lakes, land east of M181 and north of Burringham Road, Scunthorpe in support of an application for full planning consent.

1.1.2 The application is part of a wider development scheme (Lincolnshire Lakes Development) which has previously been granted outline planning consent (Planning Reference PA-2015-0396).

1.1.3 A Flood Risk and Drainage Assessment (FRDA) for the proposed development is required to assess the development's risk from flooding and the suitability of the site in terms of drainage.

1.2 Layout of Report

1.2.1 Section 1 provides an introduction to the FRDA, explains the layout of this FRA and provides an introduction to flood risk and the latest guidance on development and flood risk in England.

1.2.2 Section 2 provides an introduction to the site. The site description is based upon a desktop study and information provided by the developer. In order to obtain further information on flood risk, consultation was undertaken with the Environment Agency.

1.2.3 Section 3 of this report details the information gathered through the consultation.

1.2.4 Section 4 of this report details the development proposals and considers the development proposals in relation to the current planning policy on development and flood risk in England (and what type of development is considered appropriate in different flood risk zones). National Planning Policy Framework (NPPF): and its associated Technical Guidance (Communities and Local Government, March 2012) is the current planning policy on flood risk in England, and an introduction to NPPF is provided below.

1.2.5 Section 5 considers the foul drainage arrangements for the proposed development.

1.2.6 Section 6 considers the surface water drainage arrangements for the proposed development.

1.2.7 Section 7 includes the operation and maintenance requirements for the development.

1.2.8 Section 8 of this report considers the flood risk to site, and the potential for the development proposals to impact on flood risk. The assessment of flood risk is based on the latest planning policy and utilises all the information gathered in the preparation of the report.

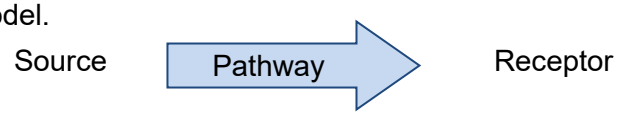
1.2.9 Section 9 of this report provides details of any recommendations for further work to mitigate against possible flooding.

1.2.10 Section 10 of this report provides a summary of the report.

1.3 Flood Risk

1.3.1 Flood risk takes account of both the probability and the consequences of flooding. Flood risk = probability of flooding x consequences of flooding

1.3.3 Probability is usually interpreted in terms of the return period, e.g. 1 in 100 and 1 in 200 year event, etc. In terms of probability, there is a 1 in 100 (1%) chance of one or more 1 in 100 year floods occurring in a given year. The consequence of flooding depends on how vulnerable a receptor is to flooding. The components of flood risk can be considered using a source-pathway-receptor model.



1.3.4 Sources constitute flood hazards, which are anything with the potential to cause harm through flooding (e.g. rainfall extreme sea levels, river flows and canals). Pathways represent the mechanism by which the flood hazard would cause harm to a receptor (e.g. overtopping and failure of embankments and flood defences, inadequate drainage and inundation of floodplains). Receptors comprise the people, property, infrastructure and ecosystems that could potentially be affected should a flood occur.

1.4 National Planning Policy Framework

1.4.1 General

1.4.1.1 NPPF and its associated Technical Guidance replaces Planning Policy Statement 25 and provides guidance on how to evaluate sites with respect to flood risk.

1.4.1.2 A summary of the requirements of the NPPF is provided below.

1.4.2 Sources of Flooding

1.4.2.1 The NPPF requires an assessment to flood risk to consider all forms of flooding and lists six forms of flooding that should be considered as part of a flood risk assessment. These forms of flooding are listed in Table 1, along with an explanation of each form of flooding.

Table 1: Forms of flooding

Flooding from Rivers (Fluvial Flooding)
Watercourses flood when the amount of water in them exceeds the flow capacity of the river channel. Flooding can either develop gradually or rapidly, depending on the characteristics of the catchment. Land use, topography and the development can have a strong influence on flooding from rivers.
Flooding from the Sea (Tidal Flooding)
Flooding to low-lying land from the sea and tidal estuaries is caused by storm surges and high tides. Where tidal defences exist, they can be overtopped or breached during a severe storm, which may be more likely with climate change.
Flooding from Land (Pluvial Flooding)
Intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems can run quickly off land and result in local flooding. In developed areas this flood water can be polluted with domestic sewage where foul sewers surcharge and overflow. Local topography and built form can have a strong influence on the direction and depth of flow. The design of development down to a micro-level can influence or exacerbate this. Overland flow paths should be taken into account in spatial planning for urban developments. Flooding can be exacerbated if development increases the percentage of impervious area.

Flooding from Groundwater
Groundwater flooding occurs when groundwater levels rise above ground levels (i.e. groundwater issues). Groundwater flooding is most likely to occur in low-lying areas underlain by permeable rocks (aquifers). Chalk is the most extensive source of groundwater flooding.
Flooding from Sewers
In urban areas, rainwater is frequently drained into sewers. Flooding can occur when sewers are overwhelmed by heavy rainfall and become blocked. Sewer flooding continues until the water drains away.
Flooding from Other Artificial Sources (i.e. reservoirs, canals, lakes and ponds)
Non-natural or artificial sources of flooding can include reservoirs, canals and lakes. Reservoir or canal flooding may occur as a result of the facility being overwhelmed and /or as a result of dam or bank failure.

1.4.3 Flood Zones

1.4.3.1 For river and sea flooding, the NPPF uses four Flood Zones to characterise flood risk. These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences, and are detailed in Table 2.

Table 2: Flood zones

Flood Zone	Definition
1	Low probability (less than 1 in 1,000 annual probability of river or sea flooding in any year (<0.1%).
2	Medium probability (between 1 in 100 and 1 in 1,000 annual probability of river flooding (1%-0.1%) or between 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5%-0.1%) in any year).
3a	High probability (1 in 100 or greater annual probability of river flooding (>1%) in any year or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
3b	This zone comprises land where water has to flow or be stored in times flood. Land which would flood with an annual probability of 1 in 20 (5%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

1.4.4 Vulnerability

1.4.4.1 NPPF classifies the vulnerability of developments to flooding into five categories. These categories are detailed in Table 3.

Table 3: Flood risk vulnerability classification

Flood Risk Vulnerability Classification	Examples of Development Types
Essential Infrastructure	- Essential utility infrastructure including electricity generating power stations and grid and primary substations - Wind turbines
Highly Vulnerable	- Police stations, ambulance stations, fire stations, command centres and telecommunications installations required to be operational during flooding. - Emergency dispersal points. - Basement dwellings. - Caravans, mobile homes and park homes intended for permanent residential use.
More Vulnerable	- Hospitals. - Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. - Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. - Non-residential uses for health services, nurseries and educational establishments. - Sites used for holiday or short-let caravans and camping.
Less Vulnerable	- Building used for shops, financial, professional and other services, restaurants and cafes, hot foot takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable" and assembly and leisure. - Land and buildings used for agriculture and forestry.
Water Compatible	- Docks, marinas and wharves. - Water based recreation (excluding sleeping accommodation). - Lifeguard and coastguard stations. - Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.

1.4.4.2 Based on the vulnerability of a development, NPPF states within what Flood Zones(s) the development is appropriate. The flood risk vulnerability and Flood Zone 'compatibility' of developments is summarised in Table 4.

Table 4: Flood risk vulnerability and flood zone compatibility

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	1	✓	✓	✓	✓	✓
	2	✓	✓	Exception Test	✓	✓
	3a	Exception Test	✓	x	Exception Test	✓
	3b	Exception Test	✓	x	x	x

1.4.5 The Sequential Test, Exception Test and Sequential Approach

1.4.5.1 The Sequential Test is a risk-based test that should be applied at all stages of development and aims to steer new development to areas with the lowest probability of flooding (Zone 1). This is applied by the Local Planning Authority by means of a Strategic Flood Assessment (SFRA).

1.4.5.2 The SFRA and NPPF may require the Exception Test to be applied to certain forms of new development. The test considers the vulnerability of the new development to flood risk and, to be passed, must demonstrate that:

- There are sustainability benefits that outweigh the flood risk and;
- The new development is safe and does not increase flood risk elsewhere.

1.4.5.3 The Sequential Approach is also a risk-based approach to development. In a development site located in several Flood Zones or with other flood risk, the sequential approach directs the most vulnerable types of development towards areas of least risk within the site.

1.4.6 Climate Change

1.4.6.1 There is a planning requirement to account for climate change in the proposed design. The recommended allowances should be based on the most relevant guidance from the Environment Agency and the Lead Local Flood Authority.

1.4.7 Sustainable Drainage

1.4.7.1 The key planning objectives in NPPF are to appraise, manage and where possible, reduce flood risk. Sustainable Drainage Systems (SuDS) provide an effective way of achieving some of these objectives, and NPPF and Part H of the Building Regulations (DTLR 2002) direct developers towards the use of SuDS wherever possible.

1.5 Development Plan

1.5.1 The relevant policies in respect of the proposed development comprise the Core Strategy (2011), the Housing and Employment Land Allocations DPD (2019), the saved policies of the Local Plan (2003) and the Lincolnshire Lakes Action Plan (2016).

1.6 EIA Screening

1.6.1 As part of the EIA Screening procedure the Flood Risk Assessment prepared by EWE Associates was revised in 2019 due to the time which had elapsed since the original application was submitted.

1.6.2 An updated Flood Risk Assessment and Drainage Strategy will be submitted with this application. The FRA submitted in support of the Outline Application proposed land raising to the critical flood level identified by the modelling works to appropriately mitigate against flood risk, and this approach is to be reflected in the updated strategy. The Drainage Strategy for the site incorporates a series of SuDS measures to support the overall flood management and biodiversity enhancement measures proposed across the site.

1.6.3 North Lincolnshire Council advised in May 2022 that the development would not compromise EIA development and consequently there was no requirement for an EIA to be undertaken and no requirement to submit an Environmental Statement with the planning application for the development.

2.0 EXISTING SITE DESCRIPTION

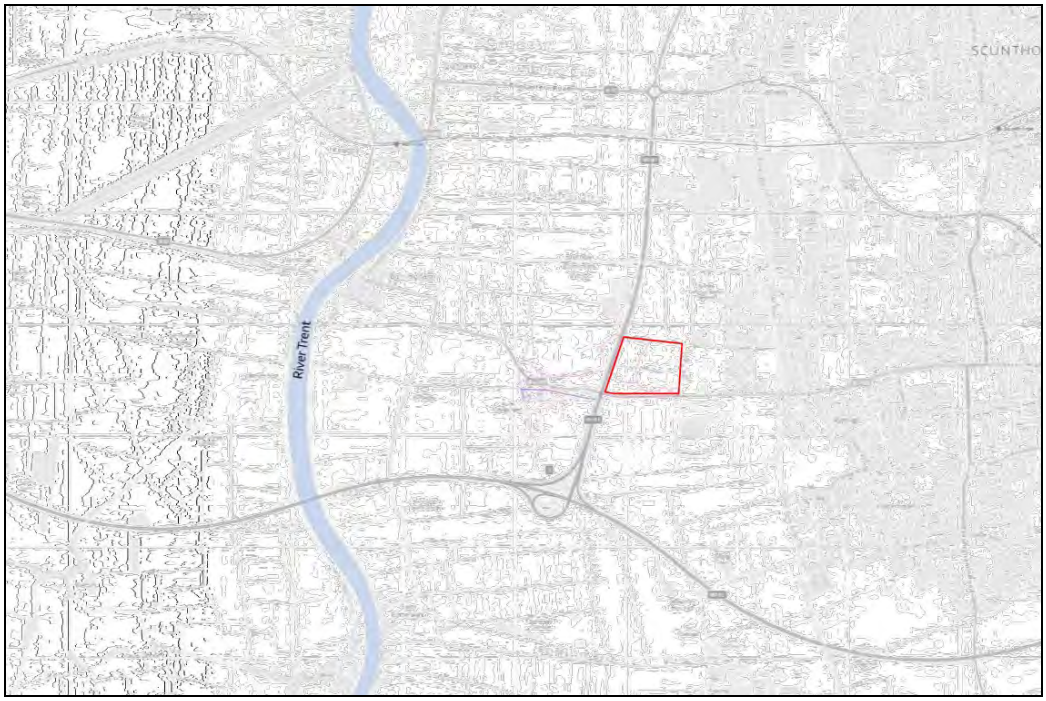
2.1 Location

2.1.1 The area of the proposed development occupies land to the north of Burringham Road and to the east of the M181 motorway on the western outskirts of Scunthorpe, North Lincolnshire

2.1.2 An aerial photograph and location plan are included in Figures 1 and 2 below, which identify the location of the site.

Figure 1: Aerial Photograph

Figure 2: Site Location Plan



2.1.3 The Ordnance Survey grid reference for the centre of the site development is approximately 486250, 408645.

2.2 Site Description

2.2.1 The area of the proposed development currently comprises agricultural land extending to approximately 24.95ha in area.

2.2.2 There are open agricultural ditches present along the northern and western site boundaries and central between the two agricultural fields.

2.3 Surrounding Features

2.3.1 To the north of the site lies an extensive area of agricultural land.

2.3.2 To the east of the site is Carisbrooke Manor Lane, with the Manor House and a Hospice building to the east, beyond which lies an extensive area of residential development.

2.3.3 Burringham Road bounds the site to the south, beyond which lies an area of agricultural land extending to the M180 motorway. There is a small area of woodland adjacent to the south west corner of the site.

2.3.4 The M181 motorway bounds the site to the west.

2.4 Topography

2.4.1 A topographic survey of the development site was undertaken in order to establish existing ground levels over the area of the site.

2.4.2 The survey has shown that the existing ground levels vary from approximately 1.33m OD(N) to approximately 3.14m OD(N).

2.4.3 Existing road levels along Burringham Road to the south of the site adjacent to the development vary from approximately 2.49m OD(N) to 3.61m OD(N), rising at the western end of the site to approximately 10.42m OD(N) at the junction of the M181.

2.4.4 Existing road levels along Carisbrooke Manor Lane along the eastern boundary of the site are shown to vary from approximately 3.19m OD(N) to approximately 3.41m OD(N).

2.4.5 Copies of the topographic survey drawings are included in Appendix A.

2.5 Ground Conditions

2.5.1 A ground investigation report has been prepared in respect of the proposed development site (see separate report).

2.5.2 A desktop study of the British Geological Survey map of the region shows the underlying geology to comprise superficial deposits of Alluvium – Clay, Silt and Sand overlaying bedrock comprising Mercia Mudstone Group – Mudstone.

2.5.3 The ground conditions are considered to be unsuitable for the disposal of surface water run-off from the development to soakaways/infiltration.

2.5.4 A study of the local groundwater maps shows that the site overlays a Secondary B Aquifer and lies within an area where the groundwater vulnerability classification is ‘Medium – High’.

2.6 Drainage Ditches

2.6.1 There are existing open ditches present along the northern site boundary, along the western site boundary adjacent to the M181 Motorway and central to the site between the two existing agricultural fields.

2.6.2 There is also a small open drainage ditch located in proximity to the south western site boundary that outfalls into the ditch along the western site boundary.

2.6.3 A study of the local mapping shows that these ditches lie within the jurisdiction of the local Internal Drainage Board (Scunthorpe & Gainsborough).

2.6.4 These ditches form part of the regional drainage network which drains the low-lying agricultural land towards the River Trent.

2.7 M181 / Burringham Road

2.7.1 Under previous successful planning applications as part of the wider Lincs Lakes development the M181 to the west of the site is to be de-trunked and a terminal roundabout constructed. This has recently achieved Technical Approval in Principle, as well as the two new roundabouts off the new M181 on the diverted Burringham Road. One of these roundabouts is to serve this proposed site.

2.7.2 The new roundabouts and diverted highways will be drained to SuDS and some existing ditches will be diverted and/or culverted. The proposed development will take the new highway drainage and SuDS into account but will be separate from it.

3.0 CONSULTATION

3.1 Consultation has taken place with the Design Team in order to obtain relevant details pertaining to the proposed development.

3.2 Consultation has taken place with the Environment Agency in order to obtain relevant information in respect of flood mapping, details of which are included within this report.

3.3 Consultation has taken place with Severn Trent Water (STW) in respect of the discharge of foul waste water from the development. Correspondence received from STW is appended to this report.

3.4 Consultation has taken place with North Lincolnshire Council in respect of the disposal of surface water run-off from the development (SuDS guidance) details of which are incorporated within this report.

3.5 Consultation has taken place with the landowner as part of ongoing support for the M181/Burringham Road highway works and outline application information, including the EWE FRA which was submitted and approved as part of the Lincs Lakes scheme.

3.6 Consultation has taken place with the Internal Drainage Board (Scunthorpe & Gainsborough Water Management Board) regarding the discharge of surface water flows to the greenfield rate of 1.4 l/s/ha.

4.0 PROPOSED DEVELOPMENT

4.1 The Development

4.1.1 The proposed development comprises the construction of a new residential development to include the following:-

- Construction of 599 residential dwellings
- Construction of new access roads
- Construction of driveways, parking areas and footpaths
- New service installation works to serve the development
- Residential gardens
- Areas of public open space
- Large permanently wet attenuation lake
- Sub-Station
- Pumping Stations
- Landscaping

4.1.2 A site layout drawing of the proposed development is included in Appendix B.

4.1.3 The development forms part of the wider Lincolnshire Lakes Development project and is accessed from the recently technically approved M181 terminal junction and Burringham Road roundabouts, covered under successful planning applications, which were supported by the EWE FRA (Ref No2014/1706 – Final Report Rev E – May 2019).

4.2 Flood Risk

4.2.1 In terms of flood risk vulnerability, construction associated with residential dwellings is classed as ‘More Vulnerable’ development (Table 3).

4.2.2 In terms of flood zone compatibility, ‘More Vulnerable’ development is considered to require a Sequential Test and an Exception Test in Flood Zone 3 (Table 4).

5.0 FOUL WATER DRAINAGE

5.1 It is proposed that foul water domestic waste from the development will be discharged to the public sewer network, for which formal approval will be required from Severn Trent Water.

5.2 Severn Trent Water have advised that foul water waste from the development can discharge to the existing 150mm diameter public sewer located on Main Avenue at a distance of approximately 150m to the east of the site.

5.3 A copy of Severn Trent Water's pre-planning response is included in Appendix C.

5.4 Based upon a development of approximately 599 dwellings and with a peak flow rate of 4000 litres per dwelling per day (includes a peak factor of 6 x Dry Weather Flow (DWF)), in accordance with Sewerage Sector Guidance Appendix C – March 2020, the peak foul water flow from the development site would be approximately 28 litres per second.

5.5 A separate foul sewer network will be designed and built to meet Building Regulations (private) and Sewers for Adoption (public) standards.

5.6 Preliminary design work has shown that a gravity discharge to the public sewer cannot be achieved and consequently a pumped discharge will need to be provided.

5.7 An adoptable pump station, rising main and outfall will therefore be required, which will need to be constructed to Severn Trent Water's adoptable standards for adoption under a Section 104 Agreement. This will be sized on 3 x DWF (approximately 14 l/s).

5.8 It is envisaged that foul sewer pipe sizes will range from 100mm to 300mm in diameter and the pipe gradients will range from 1/40 to 1/150 to meet the required standards.

5.9 An indicative foul water drainage layout is shown on the drawings included in Appendix D.

6.0 SURFACE WATER DRAINAGE

6.1 General

6.1.1 The surface water drainage has been designed in accordance with current CIRIA C753 SuDS Manual guidelines.

6.2 Existing Site

6.2.1 From the aerial photograph included in Figure 3 below, it can be seen that the development area currently comprises agricultural land, which will discharge at the greenfield run-off rate.

Figure 3: Aerial Photograph

6.3 Run-off Destination

6.3.1 Requirement H3 of the Building Regulations establishes a preferred hierarchy for disposal of surface water. Consideration should firstly be given to soakaway, infiltration, watercourse, surface water sewer and combined sewer in that priority order.

6.3.2 The existing ground conditions are considered to be unsuitable for the disposal of surface water run-off to soakaways/infiltration trenches (see section 2.5).

6.3.3 The second preferred option would be to discharge the surface water run-off from the development to a watercourse.

6.3.4 Investigations have revealed that there is an open drainage ditch located along the western boundary of the development site into which the surface water run-off could be discharged.

6.3.5 It is therefore proposed that the surface water run-off from the development is discharged into this watercourse.

6.4 Flood Risk

6.4.1 For new developments, the current design criteria required for the surface water drainage will need to be based upon a 1 in 100 year storm event, with an additional allowance to account for climate change resulting from global warming. There should be no above ground flooding for the 1 in 30 year return period and no property flooding or off site flooding from the critical 1 in 100 year storm event, with the additional allowance to account for climate change.

6.5 Climate Change

6.5.1 An additional 40% allowance will need to be included for the potential change to peak rainfall intensity resulting from climate change in accordance with North Lincolnshire Council SuDS guidelines.

6.6 Urban Creep

6.6.1 The project is a residential development and consequently there is a requirement to allow an additional 10% to the calculated impermeable areas for urban creep within the drainage design.

6.7 Peak Flow Control

6.7.1 North Lincolnshire Council SuDS guidance advises that the surface water discharge rate should be based on an equivalent greenfield run-off rate.

6.7.2 Based upon a greenfield run-off rate of 1.4 l/s per hectare and an assumed total development area of 26.4 hectares, the equivalent greenfield discharge rate would be approximately 37.0 l/s.

6.7.3 This design criteria has therefore been used to assess the volumes of surface water storage which need to be provided.

6.7.4 The required restriction to the discharge will be achieved by means of an appropriate vortex flow control valve incorporated in the final manhole chamber prior to the outfall.

6.7.5 In order to ensure the discharge of surface water from the development will not increase the risk of flooding to other properties, it will be necessary to attenuate the drainage by restricting the discharge to the agreed rate and providing storage as required.

6.7.6 Based upon the design criteria set out above, hydraulic model calculations have been undertaken in order to determine the pipe sizes and gradients and to assess the required volume of storage which will need to be provided.

6.7.7 A summary of storage volumes required is set out in Table 5 below.

Table 5: Volume of Surface Water Storage Required

Storm Event	1 Year Storm	30 Year Storm	100 Year Storm + 40%
Storage Volume Required	2758m^3	5017m^3	8996m^3
Additional Storage Volume Required	Nil	2259m^3	3979m^3

6.7.8 It is proposed that the total volume of storage required to accommodate the 100 year event plus climate change will be stored in an attenuation lake located in the westernmost area of the application site. It is proposed that this will be a wet basin to serve as a permanent water feature on the site.

6.7.9 The pipe sizes required are shown to vary from 150mm diameter to 750mm diameter.

6.7.10 A copy of the hydraulic model study calculations is included in Appendix E.

6.7.11 Indicative drainage layout drawings showing the surface water drainage strategy for the development are included in Appendix D.

6.8 Drain - Down Time

6.8.1 From the Hydraulic Calculation Results in Appendix E it can be seen that the half drain down time for the 30 year event is 18.8 hrs and 33.8 hrs for the 100 year plus climate change event. These are greater than the guidance limits, however the attenuation lake does have a large surplus capacity before overtopping.

6.9 Volume Control

6.9.1 SuDS guidelines advise that the run-off volume from the developed site for the 1 in 100 year 6-hour rainfall event should not exceed the greenfield run-off volume for the same event.

6.9.2 As the design is based upon the greenfield run-off rate, this requirement has been satisfied.

6.10 SuDS Features

6.10.1 Consideration will need to be given to incorporate SuDS features within the surface water drainage network.

6.10.2 The following SUDs features have been included in the preliminary design:-

- Permanent wet attenuation lake as a permanent water feature which is not only a storage facility but is also an amenity impacting on biodiversity, ecology and the water quality.
- Open swales to access road verges containing under drain filter trenches.
- The existing ditch bisecting the site will be deepened and widened to treat, convey and store water.

These are shown on the drainage layout drawing included in Appendix D.

6.11 Pollution Control

6.11.1 It is a requirement to ensure that the quality of any receiving body is not adversely affected by the development.

6.11.2 Investigations have revealed that the development site overlays a Secondary B Aquifer and lies within a Groundwater Vulnerability Zone classified as 'Medium – High'.

6.11.3 The risk of pollution is considered low as the proposed site is to be used for residential purposes only. Clean roof water drainage will be discharged into the below ground sewers via a closed system. Road drainage will be collected via trapped gullies and will also be discharged to a sealed below ground surface water sewer system.

6.11.4 On this basis the risk of pollutants being discharged to the receiving watercourse is extremely remote.

6.12 Designing for Exceedance

6.12.1 Overland flood risk from exceedance flows and from off-site sources will be mitigated to a large extent by the creation of the new surface water sewerage system as described above. Proposed ground levels will be set to channel flows away from the new dwellings.

6.12.2 In order to create the lake, the excavated material from this area will be used to raise the developable area 1 to 2 m higher than existing levels. This will help minimise overland flows encroaching onto the housing sites.

6.12.3 Furthermore, the ground floor construction levels for the dwellings will be raised by approximately 150mm above the adjacent external ground level, which will provide additional clearance above any likely flooding.

6.12.4 The existing overland flow routes should generally be maintained within the final layout of the development site without increasing the flood risk to off-site parties.

6.12.5 Any existing flood risk may reduce by the creation of a formal surface water drainage system but cannot be entirely removed.

6.12.6 Indicative drawings showing the existing and post-development overland surface water flood routing are included in Appendix F.

6.13 Highways Drainage

6.13.1 Highways drainage from the proposed adoptable roads on site will be collected by trapped gullies prior to discharge into the below ground drainage network. The highway drainage will be offered for adoption to the Local Authority, via a formal Section 38 Agreement.

6.14 Water Quality

6.14.1 The water quality from the development via the surface water drainage system has been assessed in accordance with the simple index approach set out in Chapter 26 of the CIRIA SuDS Manual C753.

6.14.2 The output shows that the water quality from the roof areas and roadways is of an acceptable standard without any further treatment.

6.14.3 A copy of the matrix output from the assessment is included in Appendix G.

7.0 OPERATION AND MAINTENANCE

7.1 The drainage pipework is designed with self-cleansing gradients and consequently the network should require little or no maintenance.

7.2 All road gullies or drainage channel systems serving areas of hardstanding will need to be regularly inspected to ensure the system remains operable. See Table 6 below.

7.3 The final inspection chambers prior to discharge to the storage tank and to the watercourse should be regularly inspected to ensure the system is free-flowing. See Table 6 below.

Table 6: Operation and Maintenance Requirements for Silt Traps/Trapped Gullies (Based on CIRIA C753 Table 14.2)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	6 monthly
	Inspect filter media and establish appropriate replacement frequencies	6 monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

7.4 The flow control valve should be regularly maintained as set out in Table 7 below.

Table 7: Operation and Maintenance Requirements for Hydro-Brake® Vortex Flow Control Device (Based on Manufacturer's recommendations)

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	6 monthly
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Monthly during the first three months, then every 6 months
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every 6 months

7.5 Operation and maintenance requirements for the attenuation lake are set out in Table 8 below.

Table 8: Operation and Maintenance Requirements for Attenuation Lake

Maintenance schedule	Required action	Typical frequency*
Routine maintenance	Remove litter and debris	6 monthly
	Vegetation management	As required
Occasional maintenance	Clean inlet/outlet pipe	As required
Remedial actions	Repair/re-construct damaged component/structure	As required
	Remove silt and debris	As required
Monitoring	Inspect for evidence of damage or erosion	6 monthly
	Inspect sediment accumulation	Yearly
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

7.6 Operation and maintenance requirements for the filter trenches are set out in Table 9 below.

Table 9: Operation and Maintenance Requirements for Filter Trenches

Maintenance schedule	Required action	Typical frequency*
Regular maintenance	None	
Occasional maintenance	Remove silt and debris from inspection chamber	As required
Remedial actions	Re-construct filter trench if evidence of heavy siltation or failure	As required
Monitoring	Inspect downstream PPIC for evidence of siltation and to ensure system is free-flowing	Yearly
*During the first year of operation, inspections should be carried out at least monthly (and after significant storm events) to ensure that the system is functioning as designed and that no damage is evident.		

7.7 Operation and maintenance requirements for the package pumping station are set out in Table 10 below.

Table 10: Operation and Maintenance Requirements for Package Pumping Station (based on CIRIA R182, Section 3) – to be used in conjunction with manufacturer's recommendations

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Basic adjustment to equipment	As recommended by manufacturer
	Lubricate systems	As recommended by manufacturer
	Changeover duty pump	As recommended by manufacturer
	Recording systems (where present) – recover data	As recommended by manufacturer/as required by database
	Standby generators (where present) – run off load	Weekly
	Standby generators (where present) – run on load	Monthly
Remedial actions	Clear blockages in pipework	As required
	Clean walls, floor, electrodes and floats	As required
	Replace malfunctioning or worn components	As required
Monitoring	Check operation of non-return valves	6 monthly
	Inspect pump and control equipment for evidence of poor operation or failure	Monthly during the first 6 months of operation, then every 3 months

	Inspect the sump for silt/grease accumulation rate and establish appropriate removal frequencies	Monthly during the first 6 months of operation, then 6 monthly
	Inspect for structural failure of pump chamber(s) and general condition of any ancillary equipment	6 monthly
	Check the pump and pipework seals for leaks	Monthly during the first 6 months of operation, then 6 monthly
Note:- Pump to be isolated from electrical supply prior to maintenance works being undertaken		

7.8 Operation and maintenance requirements for swales are set out in Table 11 below.

Table 11: Operation and Maintenance Requirements for Swales

Maintenance schedule	Required Action	Frequency
Regular Maintenance	Litter and debris removal	Monthly (or as required)
	Grass cutting – to retain grass height within specified design range.	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants.	Monthly (at start, then as required).
Occasional Maintenance	Check for poor vegetation growth due to lack of sunlight or dropping of leaf litter and cut back adjacent vegetation where possible.	Annually.
	Re-seed areas of poor vegetation growth. Alter plant types to better suit conditions, if required.	Annually, or if bare soil is exposed over 10% or more of the swale treatment area.
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding.	As required.
	Re-level uneven surfaces and reinstate design levels.	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface.	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip.	As required.
	Remove and dispose of oils or petrol residues using safe standard practices	As required.
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly.
	Inspect infiltration surfaces for ponding, compaction, and silt	Monthly, or when required.

	accumulation. Record areas where water is ponding for >48 hours.	
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Half yearly.

7.9 Operation and maintenance requirements of the drainage components, as listed above, should be undertaken in accordance with Chapter 32 of the CIRIA SuDS Manual, along with the relevant tables and any relevant manufacturer's recommendations. See also BS 8582:2013 Code of Practice for Surface Water Management for Development Sites Section 11 and Susdrain Fact Sheet on SuDS Maintenance and Adoption Options (England) dated September 2015.

7.10 The highway drainage will form part of the Section 38 Agreement with the Highway Authority who will be responsible for future maintenance works.

7.11 The domestic drainage will remain the responsibility of the individual householders.

7.12 On the basis that the main sewer network will be offered to Severn Trent Water for formal adoption under a Section 104 Agreement, Severn Trent Water will be responsible for the operation, management and maintenance of the network in line with standard requirements and obligations.

7.13 The personnel undertaking the maintenance should have appropriate experience of SuDS and drainage maintenance and should be capable of keeping sufficiently detailed records of any inspections. An example of a checklist for SuDS maintenance can be found within Appendix B of the CIRIA C753 SuDS Manual v2. If personnel do not have appropriate experience, then specific inspection visits may be necessary. During the first year of operations of SuDS, inspections should usually be carried out at monthly intervals (and after significant storm events).

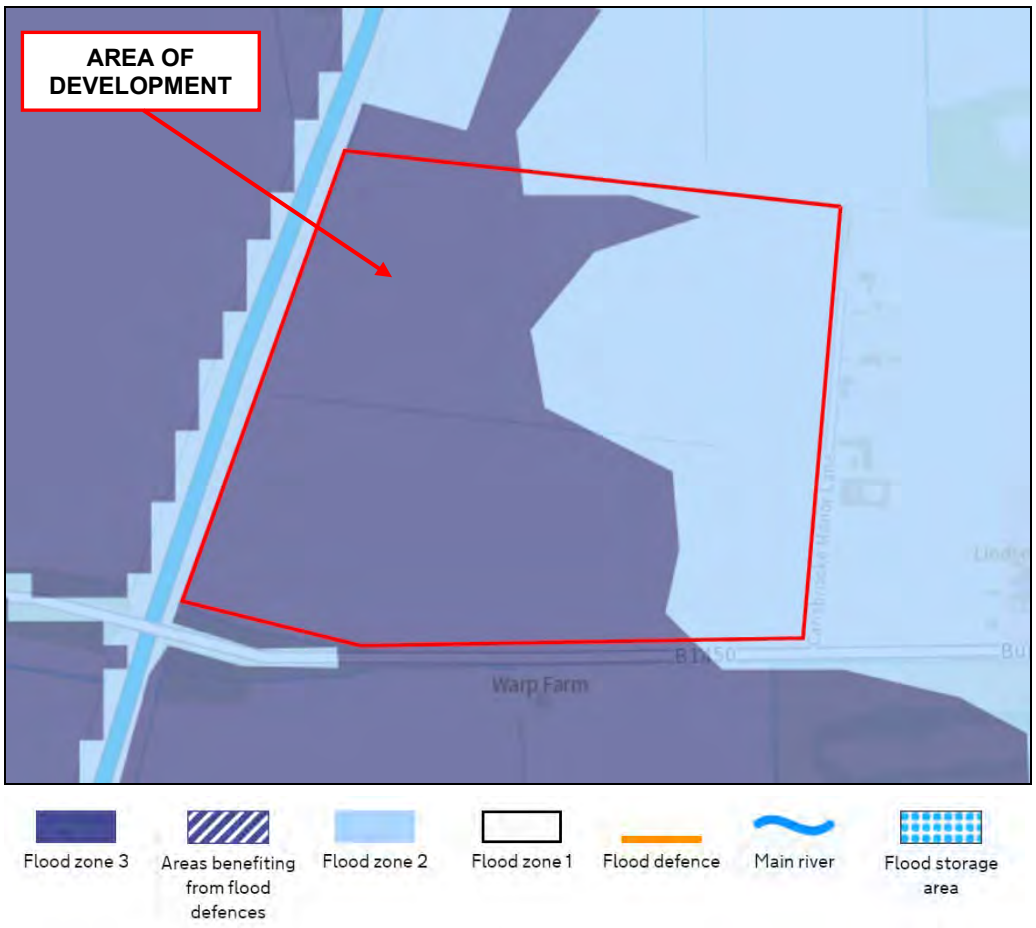
7.14 The responsibility for the operation and maintenance of the SuDS components will lie with Keepmoat Homes Ltd, or any subsequent landowner of the site.

8.0 FLOOD RISK ASSESSMENT

8.1 Flood Zone

8.1.1 A copy of the Environment Agency Flood Map for Planning is included in Figure 3 below, which identifies the western area of the development site to be located within an area designated as Flood Zone 3, (high probability of flooding), comprising land assessed as having a 1 in 100 or greater annual probability of river flooding or a 1 in 200 year or greater annual probability of flooding from the sea.

Figure 3: Environment Agency Flood map for planning dated February 2022



8.1.2 The eastern area of the development site is shown to be located within an area designated as Flood Zone 2, (medium probability of flooding), comprising land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding or between a 1 in 200 and 1 in 1000 annual probably of sea flooding in any year.

8.2 Tidal Flooding

8.2.1 The south bank of the River Humber is situated approximately 14km to the north of the development site.

8.2.2 At this distance from the site this watercourse is not considered to pose any direct risk of flooding to the development.

8.3 Fluvial Flooding

8.3.1 The River Ancholme is situated approximately 11km to the east of the site at its nearest location.

8.3.2 At this distance from the site this watercourse is not considered to pose any risk of flooding to the development.

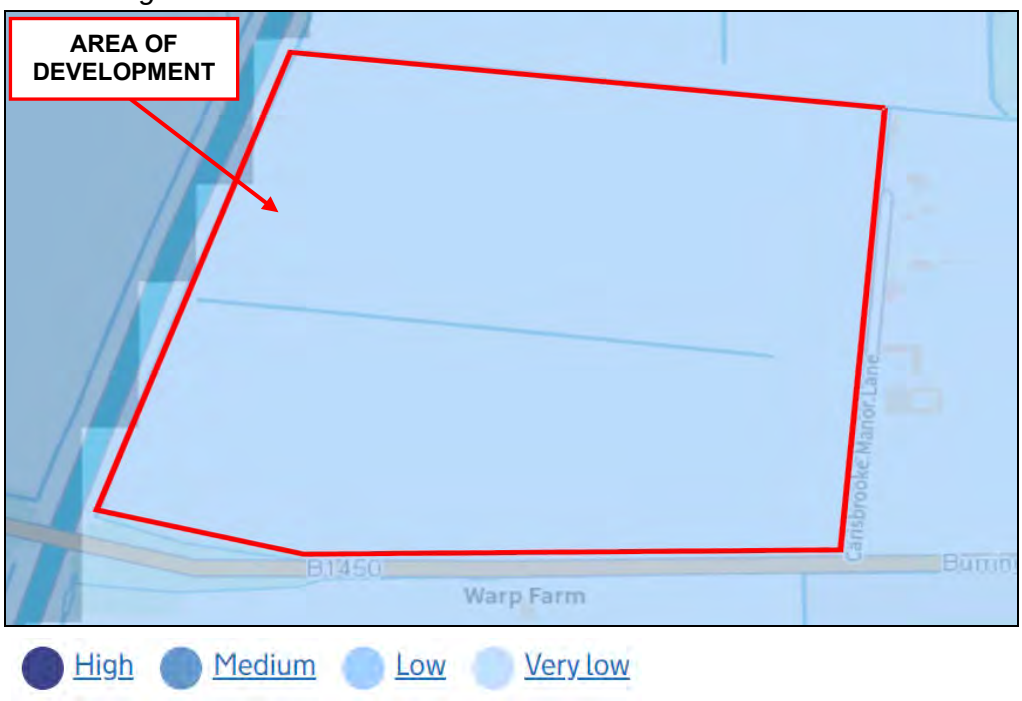
8.3.3 The River Trent is situated approximately 3km to the west of the site and is the main source of potential flooding in the region.

8.3.4 As the watercourse outfalls into the River Humber, it is tidally influenced, causing water levels to rise during periods of high tides in the estuary due to the tidal restriction to the outfall. Consequently, this results in a more severe flood situation arising.

8.3.5 The existing flood defences to the River Trent comprise earthen embankments with a defence level of approximately 6.477m OD(N) in proximity to the development.

8.3.6 A copy of the flood map produced from the Environment Agency showing the extent of flooding from rivers or the sea is included in Figure 4 below.

Figure 4: Environment Agency map dated February 2022 showing the extent of Flooding from Rivers or the Sea



8.3.7 The map shows that the area of the new development is considered to be at 'Low Risk' of flooding.

8.3.8 Flood data obtained from the Environment Agency in respect of the Lincolnshire Lakes Area Action Plan dated January 2018 gave consideration to a breach of the river defences for the 1 in 200 probability flood event including a 20% allowance for climate change and for the 1 in 1000 probability flood event including climate change.

8.3.9 The results of the flood modelling gave a predicted flood water level for the River Trent in proximity to the development site varying from 6.01m OD(N) to 6.03m OD(N) between Keadby Bridge and the M180 motorway for the 1 in 200 probability flood event including climate change.

8.3.10 Based upon this data, the Lincolnshire Lakes Action Plan modelling which was undertaken in January 2018 estimated that the flood water level over the area of the application site would be at approximately 3.03m OD(N) resulting from a 1 in 200 probability plus 20% climate change flood event.

8.3.11 The predicted flood water level for the 1 in 1000 probability flood event was estimated to be at 5.31m OD(N) over the area of the application site.

8.3.12 With existing ground levels over the area of the application site shown to vary from approximately 2.49m to 3.61m OD(N), it can be seen that areas of the development site would be prone to flooding should a major breach of the flood defences to the River Trent occur.

8.3.13 Flood mitigation measures will consequently need to be considered within the design of the new development in order to minimise the risk from flooding, should such an event occur.

8.3.14 Details of such measures are set out in Section 9 of this report.

8.4 Compensatory Flood Storage

8.4.1 The floor levels of the new dwellings will need to be suitably raised above the predicted flood level and consequently there will be a degree of displacement of flood waters within the flood plain resulting from the finalised design levels for the development.

8.4.2 For the wider Lincolnshire Lakes Development, the flood modelling which was undertaken by JBA Consulting in 2018 concluded that the displacement from the full development would result in a negligible 11mm increase in the predicted flood level over the extent of the flood plain.

8.4.3 The River Trent is defended and any risk of flooding is therefore residual.

8.4.4 On this basis, it is considered that there should be no requirement to provide any compensatory flood storage within the scope of this application site.

8.5 Flooding from Open Drainage Ditches

8.5.1 There are a large number of open agricultural drainage ditches in the local region, which drain the low-lying agricultural land towards the River Trent.

8.5.2 There is an open drainage ditch running centrally from east to west within the site.

8.5.3 There is an open drainage ditch along the northern boundary of the site.

8.5.4 There is an open drainage ditch along the western boundary of the site.

8.5.5 As the River Trent is tidal, the outfall from the drainage ditch network cannot discharge by gravity when levels in the river are high.

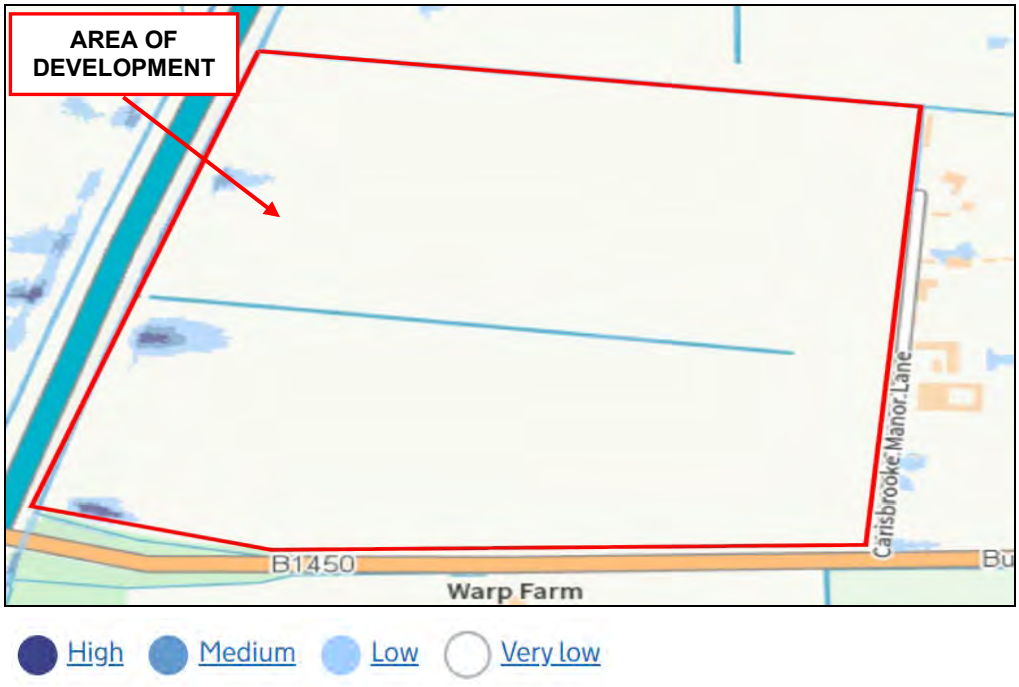
8.5.6 There is consequently a risk of the local ditches overtopping their banks in extreme rainfall events during periods of high tides.

8.5.7 This scenario is reflected on the maps produced by the Environment Agency considering flood risk from surface water flooding in Section 5.5 below.

8.6 Surface Water Flooding

8.6.1 A copy of the Environment Agency map showing the extent of flooding from surface water is included in Figure 5 below.

Figure 5: Environment Agency map dated February 2022 showing the extent of flooding from surface water



8.6.2 There are, however, three isolated pockets of land within the development in proximity to the western site boundary shown to be at risk from overland surface water flooding.

8.6.3 The maps produced by the Environment Agency showing the anticipated flood depths for low risk, medium risk and high risk flooding scenarios are included in Figures 6, 7 and 8 below.

Figure 6: Environment Agency map dated February 2022 showing the anticipated flood depth from surface water – low risk

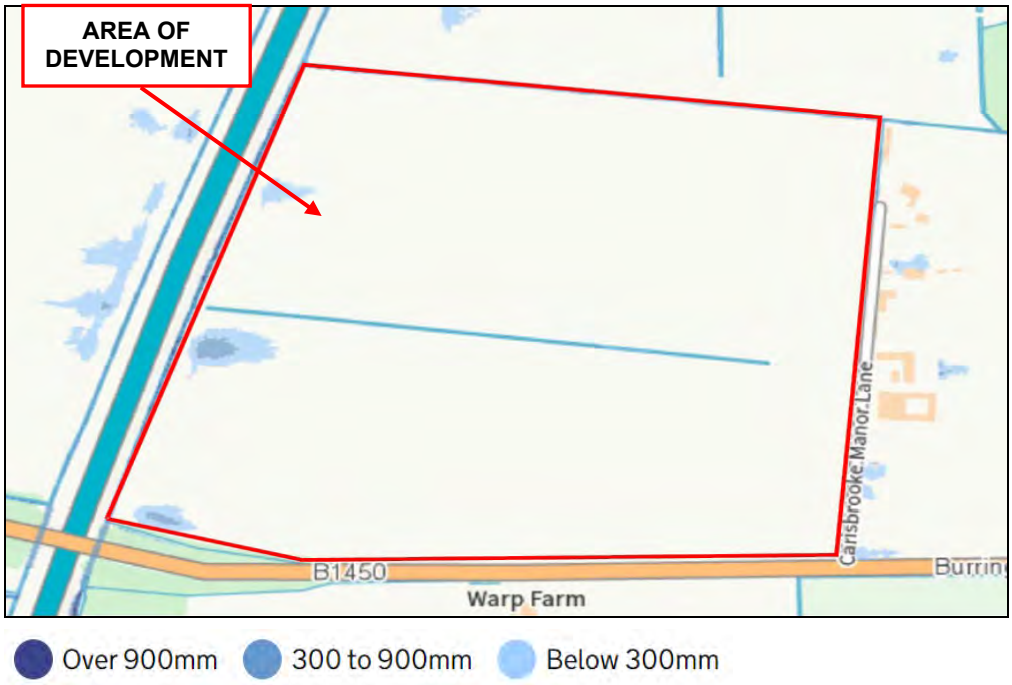


Figure 7: Environment Agency map dated February 2022 showing the anticipated flood depth from surface water – medium risk

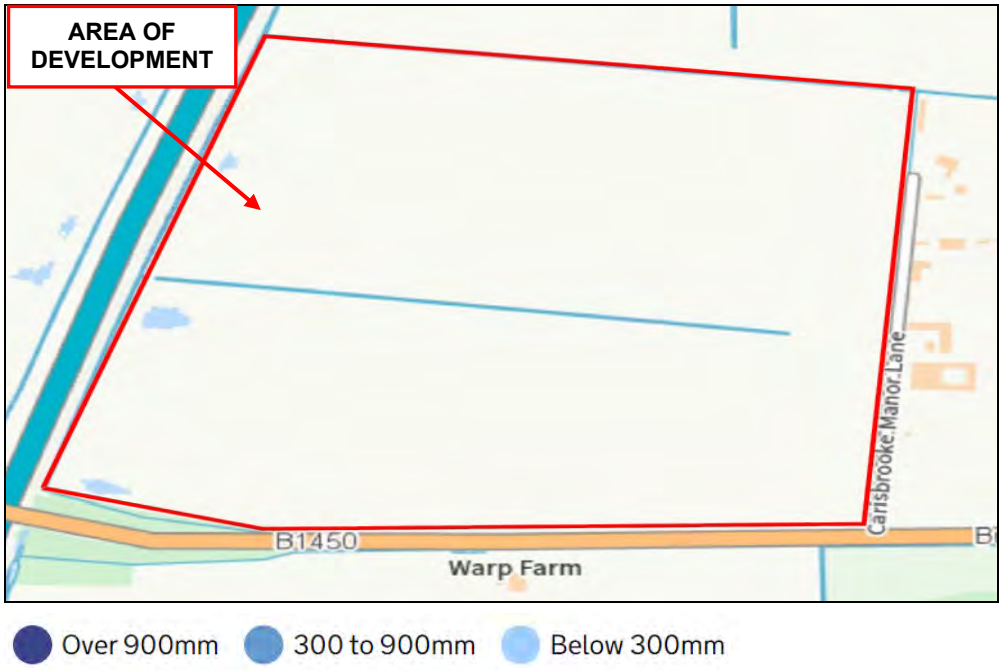
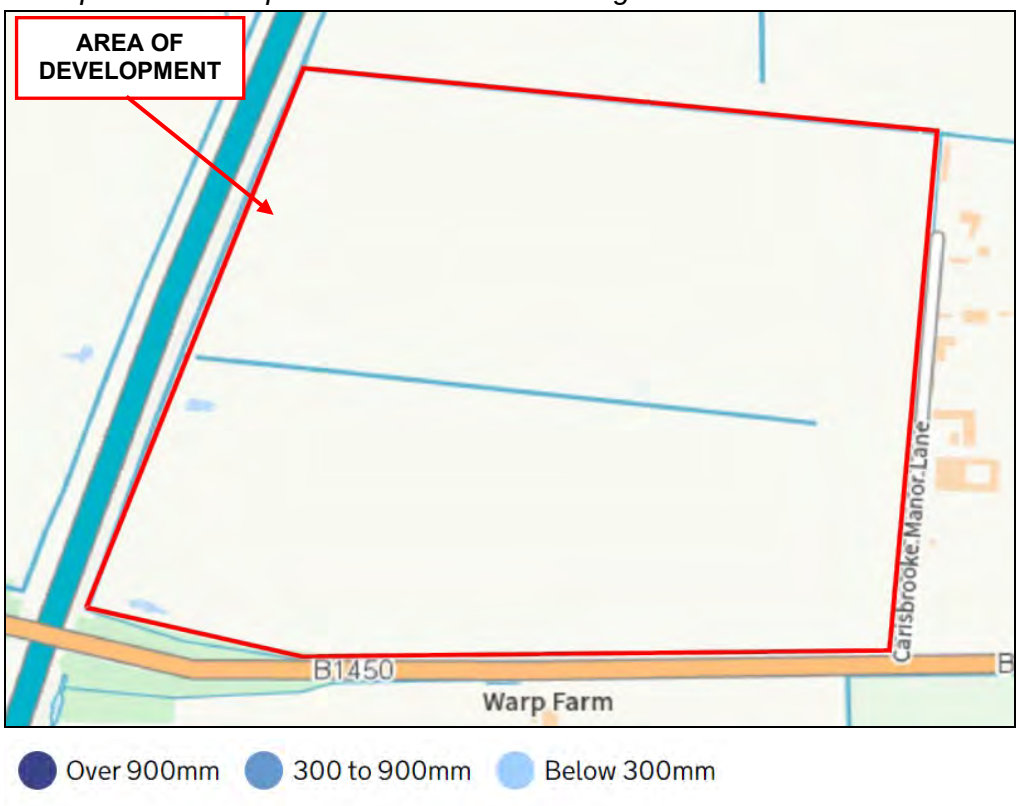


Figure 8: Environment Agency map dated February 2022 showing the anticipated flood depth from surface water – high risk



8.6.4 The maps show that for a 'low risk' scenario, the isolated area of the site in the north is prone to flooding to a depth below 300mm, whilst the isolated areas in the centre and in the south of the site are shown to potentially flood to a depth of 300 to 900mm.

8.6.5 For a 'medium risk' scenario, the area of the site shown to be at risk from overland surface water flooding is reduced, with a likely flood depth over the three affected areas shown to be below 300mm.

8.6.6 For a 'high risk' scenario, the area of the site shown to be at risk is further reduced, with the northern area not shown to be prone to flooding and the likely flood depth over the remaining affected areas shown to be below 300mm.

8.6.7 Mitigation measures to address the risk of surface water flooding to the development will therefore need to be considered. Details of such measures are set out in Section 9 of this report.

8.7 Groundwater Flooding

8.7.1 Groundwater flooding can occur when the sub-surface water levels are high and emerges above ground level.

8.7.2 The ground levels under the developable areas will be raised by between 1 and 2m above existing levels therefore the risk from groundwater flooding will be negligible.

8.7.3 There are no proposals to create any basements within the development.

8.7.4 It is not envisaged that the construction works will involve deep excavation works and consequently the risk to the development from this potential flood source is considered to be low and acceptable.

8.8 Flood Risk from Existing Water Mains

8.8.1 There are no existing water mains present within the area of the development site.

8.8.2 The risk of flooding to the development from this potential flood source is therefore considered to be low and acceptable.

8.9 Flood Risk from Existing Drainage Services

8.9.1 There are no existing water mains present within the area of the development site.

8.9.2 The risk of flooding to the development from this potential flood source is therefore considered to be low and acceptable.

8.10 Flood Risk from New Drainage Services

8.10.1 In order to ensure the development does not increase the risk of flooding to adjacent developments resulting from the creation of new impermeable areas within the development, adequate control measures will need to be provided in the design of the surface water drainage network.

8.10.2 The new drainage should be undertaken in accordance with Section 6 of this report to ensure that the development does not increase the risk of flooding to other parties resulting from the new drainage services.

8.10.3 On this basis the risk of flooding from this potential flood source will be adequately addressed.

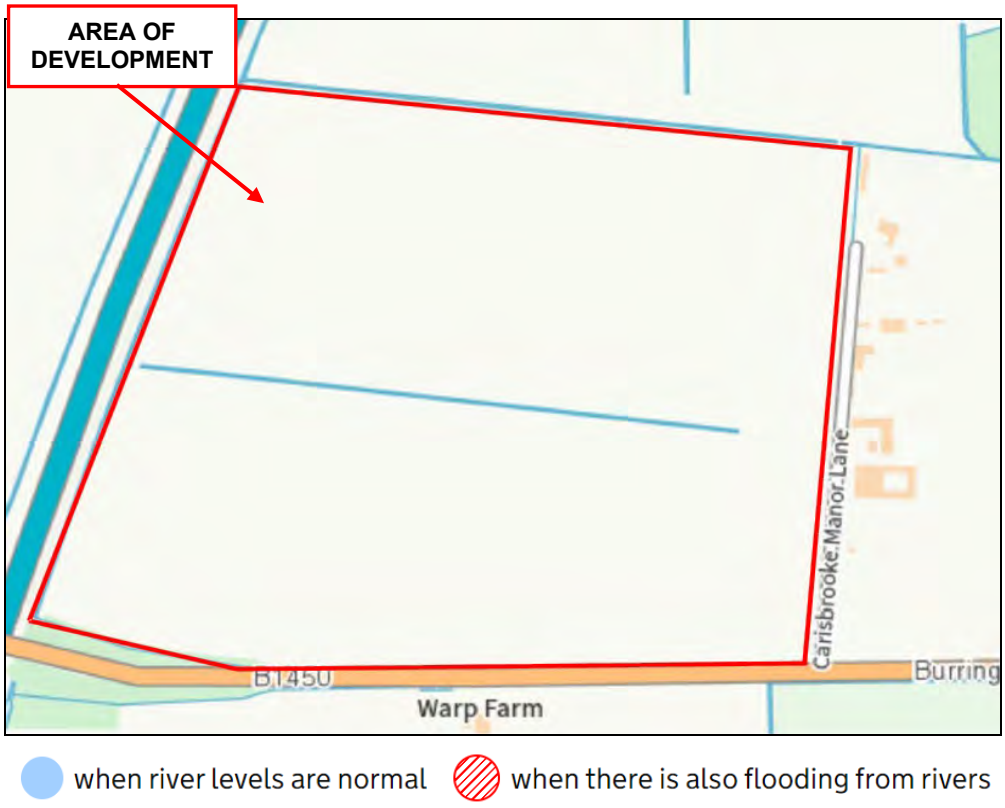
8.11 Flooding from Reservoirs, Canals and Other Artificial Sources

8.11.1 A study of the local area has shown that there are a number of small ponds and lakes in the local vicinity of the development.

8.11.2 However, due to their small scale and distance from the site they are not considered to pose any risk of flooding to the development should they overtop during an extreme rainfall event.

8.11.3 A copy of the map produced by the Environment Agency showing the extent of flooding from reservoirs is included in Figure 9 below.

Figure 9: Environment Agency map dated February 2022 showing the extent of flooding from reservoirs



8.11.4 The map shows that the development site is not considered to be at risk from reservoir flooding.

8.11.5 The risk to the development from any such potential flood source is considered to be low and acceptable.

9.0 FLOOD MITIGATION MEASURES

9.1 Passive Flood Protection Works

9.1.1 For new developments lying in the flood zone, the normal requirement is to elevate the ground floor above the predicted flood water level in order to minimise the risk of flood waters entering the buildings.

9.1.2 For the application site, the 1 in 200 probability event plus climate change flood level determined by the flood modelling undertaken in January 2018 was estimated at 3.03m OD(N).

9.1.3 In order to provide a degree of freeboard, it is considered that the minimum ground floor construction level should be raised by 300mm above the estimated flood level, which would result in a minimum floor construction level of 3.33m OD(N).

9.1.4 At this level of construction it is considered that the risk of flooding to the development has been adequately addressed.

9.1.5 External ground levels around the dwellings will be set to direct any overland surface water away from the buildings in order to minimise the risk of flood damage occurring.

9.2 Flood Resilience

9.2.1 For new developments which lie within the flood zone it is a requirement to provide an additional 300mm of flood resilience above the elevated ground floor construction level in order to minimise any flood damage and provide ease of reconstruction, should flood waters enter the building.

9.2.2 For this development, this would equate to a flood resilience level of 3.63m OD(N) (floor level of 3.33m + 0.3m).

9.2.3 The following measures should therefore be adopted within the new construction:-

- The ground floors should be of solid concrete or an appropriate precast concrete flooring system incorporating a waterproof membrane.
- The external walls should be of water-resistant construction up to 300mm above ground floor level.
- There should be no voids within the external walls, other than doorways within 300mm of finished floor level which could allow flood waters to enter the dwellings.
- All partition walls constructed at ground floor level should be of suitable robust construction or metal stud partitions fixed with plasterboard, with the lower boarding laid horizontally for ease of replacement.
- All electrical apparatus or other flood sensitive equipment should be elevated to a minimum of 300mm above finished floor level to prevent damage occurring should flood waters enter the buildings.
- All cables should be routed at high level with vertical drops to the fittings.

9.2.4 Alternatively, the ground floor construction level could be elevated by a further 300mm, resulting in an equivalent flood protection level of 3.63m OD(N).

9.2.5 This is in accordance with the previous EWE FRA report.

9.2.6 If this option were to be adopted, there would be no requirement for flood resilient construction methods to be incorporated in the design of the dwellings.

9.3 Safe Refuge

9.3.1 It is a requirement for safe refuge to be provided within new developments above the predicted flood level to ensure that there will be no requirement for evacuation measures by the emergency services.

9.3.2 The predicted 1 in 1000 probability flood event plus climate change flood level from the previous modelling undertaken was estimated at 5.31m OD(N). This is also in accordance with findings of the previous EWE FRA report.

9.3.3 It is therefore recommended that the development incorporates safe refuge within each building above this level.

9.3.4 The new dwellings are of two-storey construction.

9.3.5 A minimum first floor construction level of 5.40m OD(N) should be provided to ensure safe refuge is available. With a floor-to-floor height of approximately 2.7m, it can be seen that this required level of safety will be met.

9.3.6 On this basis, it is considered that the requirement to provide safe refuge has been satisfied.

9.4 Management

9.4.1 The development should be connected to the Environment Agency's early 'Flood Direct' warning service to ensure there is sufficient time available for ground floor accommodation to be vacated should the need arise.

9.4.2 Each dwelling within the development should have a Flood Risk Evacuation Plan in place to ensure all occupants understand the procedures in place in the event of a flood situation and where to escape to safety, should this prove necessary.

9.5 Access/Egress

9.5.1 Safe access or egress from the development could be restricted during the peak time of a major flood scenario, as the local road network is shown to lie in an area prone to flooding. However, adequate warning will be given and the timescale of the flood should be limited due to tidal conditions. Safe access and egress will therefore be predominantly available.

9.5.2 Safe refuge is provided and there should therefore be no requirements for evacuation of occupants of the development by the Emergency Services during a major flood situation.

10.0 SUMMARY

10.1 The report has been prepared to assess the flood risk implications for a proposed residential development at Lincolnshire Lakes, land east of M181 and north of Burringham Road, Scunthorpe, North Lincolnshire.

10.2 The site falls in both Flood Zone 2 (medium probability of flooding) and Flood Zone 3a (high probability of flooding) on the maps produced by the Environment Agency.

10.3 The proposals are considered to be 'More Vulnerable' development in terms of flood risk vulnerability.

10.4 The primary risk to the site is from tidal flooding from the River Humber resulting from the river defences being breached or overtopped during an extreme flood event.

10.5 The primary focus for flood risk assessment is to protect life, then consideration should be given to buildings, contents, operation and re-use. As the scheme is progressed the design should consider exceedance and routing of flows away from the buildings.

10.6 Mitigation works are proposed which we consider will reduce the risk to the development from flooding down to an acceptable level. These measures align with findings of the previous EWE FRA report.

10.7 This report has considered other potential sources of flooding to the site, including groundwater, surface water, existing sewers, water mains and other artificial sources.

10.8 Overall, this report demonstrates that the flood risk to the development is reasonable and acceptable providing the recommended mitigation measures set out in this report are adopted.

10.9 The report also demonstrates that the foul and surface water drainage networks for the new development can be designed and constructed to meet the requirements of local planning policies.

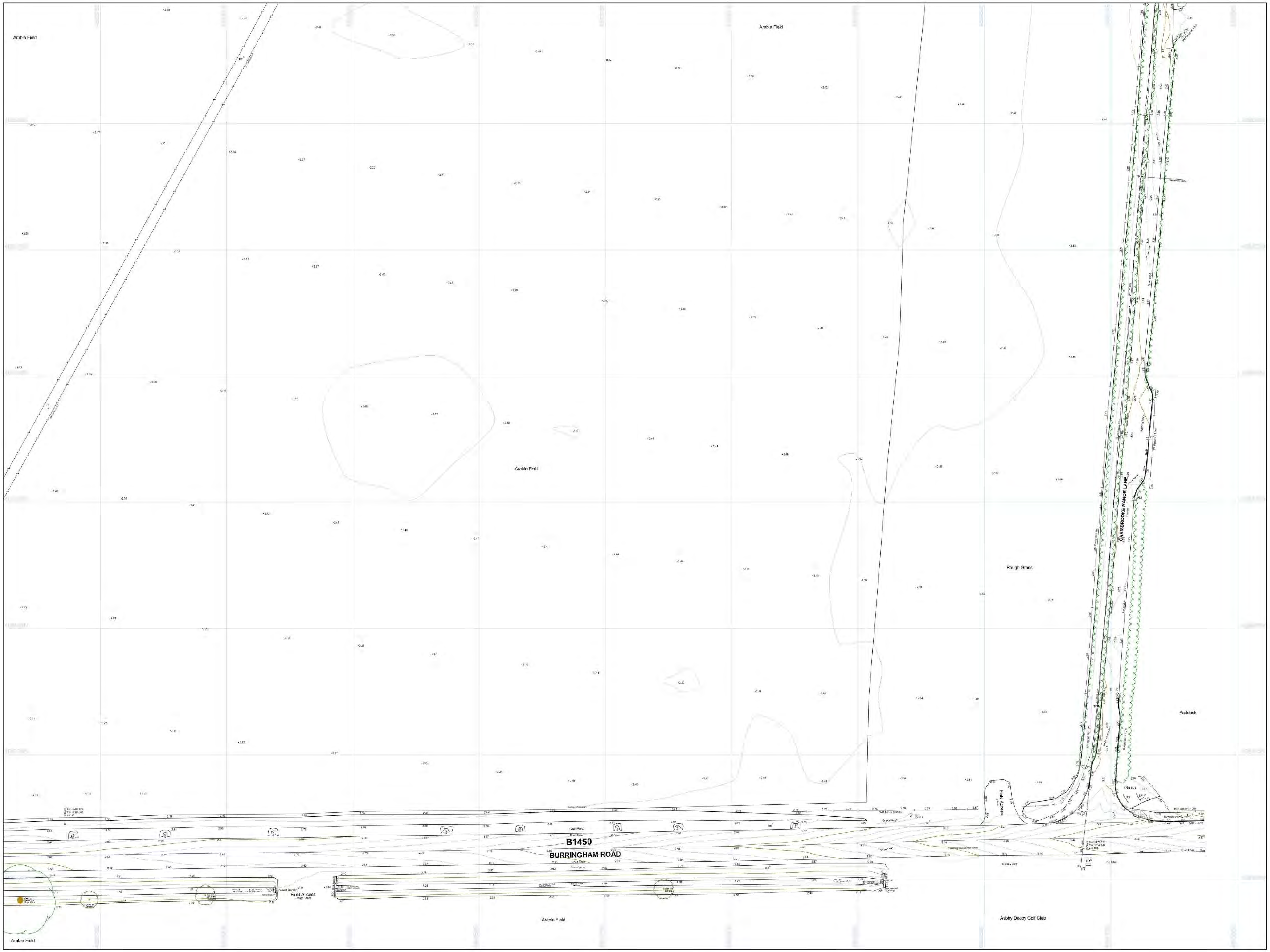
10.10 Surface water run-off from the development will be attenuated and discharged by gravity at the greenfield run-off rate to the watercourse along the western site boundary.

10.11 Foul water waste from the development will be discharged by means of a pumped outfall to the public foul water sewer located approximately 150m to the east of the site.

10.12 Suitably worded conditions can be applied to the grant of planning permission to control the delivery of the development in the usual manner.

APPENDIX A

Topographic Survey Drawings



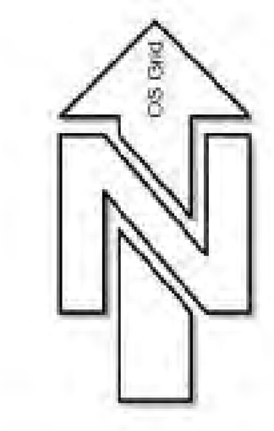
Notes

1. Surveyed January 2016.
2. Survey related to Ordnance Survey National Grid.
3. Levels related to GPS Orthometric height, converted to MSL (Newlyn) by OSGM02.
4. Check levels taken to compare with previous survey on the same wider scheme, all previous data has been greyscaled.
5. Road studs/markings along the B1450 Burringham Road have not been surveyed.

Control

STN	East	North	Level	Type
STN01	486471.033	408354.144	3.368	Peg
STN02	486267.979	408361.341	2.511	Peg
STN02A	486395.452	408569.167	2.790	Peg
STN02B	486461.789	408723.820	2.456	Peg
STN02C	486165.968	408859.045	1.966	Peg
STN03	486032.436	408356.387	2.512	Peg
STN03A	485829.863	408440.001	2.373	Peg
STN03B	485874.384	408392.198	2.148	Peg
STN03C	485919.551	408382.252	2.276	Peg
STN03D	485961.468	408376.591	2.329	Peg
STN04	485896.884	408347.986	6.303	Nail
STN05	485794.799	408372.174	10.356	Nail
STN06	485797.171	408347.176	2.388	Peg
STN07	485719.056	408406.633	9.833	Nail
STN07A	485722.531	408425.016	2.294	Peg
STN07B	485687.957	408430.290	2.179	Peg
STN07C	485754.401	408418.376	2.467	Peg
STN08	485580.972	408421.849	4.980	Nail
STN09	485485.347	408403.263	2.445	Nail
STN10	485563.103	408385.763	2.618	Nail
STN10A	485601.093	408392.418	2.270	Peg
STN11	485719.531	408351.961	2.319	Nail
STN11A	485717.211	408372.361	2.345	Peg
STN11B	485741.421	408366.522	2.911	Peg

Sheet Layout



0 2.5 5 7.5 10 12.5 15 20 25

METRES

General

- Every effort is made to identify all visible above ground features. However, it should be borne in mind that at the time of survey, some surface features may have been obscured.
- Visible features in the vicinity of the site extents, as detailed on this survey, may not represent the legally conveyed ownership boundaries.

Legend

Top / Bottom of Bank
Building / Overhead Canopy
Wall
Solid Surface Feature / Road Edge
Hard / Soft Surface Change
Kerb / Dropped Kerb
Combined Kerb & Drainage System
Drainage Channel
Road Traffic Sensors
Fence Line -
BW Barbed Wire, HR Hand Rail, PR Post & Rail, CB Close Boarded, IR Iron Railings, SB Safety Barrier, CHNL Chestnut, MP PR Metal Post & Rail, SF Security Fence, CL Chain Link, OB Open Boarded, TF Temporary Fence, CP Concrete Panel, PA Paling Fence, WM Wire Mesh, (D) Dilapidated, PC Post & Chain
Hedge Line, Bush
Tree / Scrub Canopy Line, Tree
O/H Telephone / Electric Cable(s), Conifer
Rock Face
Pipe Line (Above Ground)
TP/T Trial Pit (with level); Survey Station; Gate; Electric Pylon
BH Borehole (with level); Spot Level; Woodland Area (Deciduous); Level Datum; Woodland Area (Coniferous); Marsh Land

Feature Abbreviations

ACU Air Conditioning Unit, BB Belisha Beacon, BO Bollard, BO(L) Bollard (Lit), BP Boundary Post, BS Bus Stop, CATV Cable TV Cover, CCTV Close Circuit TV, COL Column, CP Concrete Post, DWB Dog Waste Bin, EL Electric Cover, EP Electricity Pole, ER Earth Rod, FH Fire Hydrant, FP Fence Post, FL Flood Light, G Gully (with Level), GP Gate Post, GAS Gas Cover, KO Kerb Offset, LB Lighting Beacon, LBIN Litter Bin, LP Lamp Post, ME Meter, MH Manhole, MP Marker Post, MEP Metal Post, NP Name Plate, PB Post Box, PM Parking Meter, RBB Rodent Bait Box, RE Rodding Eye, RS Road Sign, RS(L) Road Sign (Lit), RWP Rain Water Pipe, SNR Sensor, SP Sign Post, SP(L) Sign Post (Lit), SPDC Speed Camera, STAY Cable Stay, SV Stop Valve, SVP Soil Vent Pipe, TAP Stand Pipe, TCB Telephone Box, TEL Telecom's Cover, TL Traffic Light, TP Telephone Pole, TS Traffic Signal Cover, VP Vent Pipe, WM Water Meter, WO Wash Out, WV Water Valve, UC? Unknown Cover, UTL Unable to Lift, Ø Diameter

Description Abbreviations

Assmd Rt Assumed Route, BkDrp Back Drop, Bk Brick, BusStKb Bus Stop Kerb, Bldg Building, CDrnKbS Combined Drainage & Kerb System, Conc Concrete, CPit Catch Pit, DrpKb Drop Kerb, Drn Chnl Drainage Channel, Flw Bd Flower Bed, FW Foul Water, GTrp Grease Trap, Ht Height, Hg Hedge, Intcpr Interceptor, Lvl Level, m Metres, mm Millimetres, MSL Mean Sea Level, No. Number, O/H Overhead, OSBM Ordnance Survey Bench Mark, RetWal Retaining Wall, Rd Edg Road Edge, Spd Rbr Speed Retarder, St Stone, STN Station, SW Surface Water, Tac Tactile Paving, Tmc Tarmac

Level Prefix

AL Arch Level, CL Cover Level, DPC Damp Proof Course, EL Eaves Level, IL Invert Level, PL Parapet Level, RL Roof/Ridge Level, SL Soffit Level, SpL Springing Level, TL Threshold Level, ToC Top of Concrete Level, ToP Top of Pipe Level, ToS Top of Steel Level, ToW Top of Wall Level, WLL Sill Level, WL Water Level (inc date & Time), FFL Finished Floor Level, 1st FFL 1st Finished Floor Level

Digital File: 3944_10_3d.dwg | Original Size: A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed: AF/TS	Date: 01.02.16	Scale: 1:250
Drawn: AF	Sheet: 1 of 12	Approved: AJD

Client: **North Lincolnshire Council**

Title: Topographical Survey

Project: **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/001 | Rev. -

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Fax: 01724 748171
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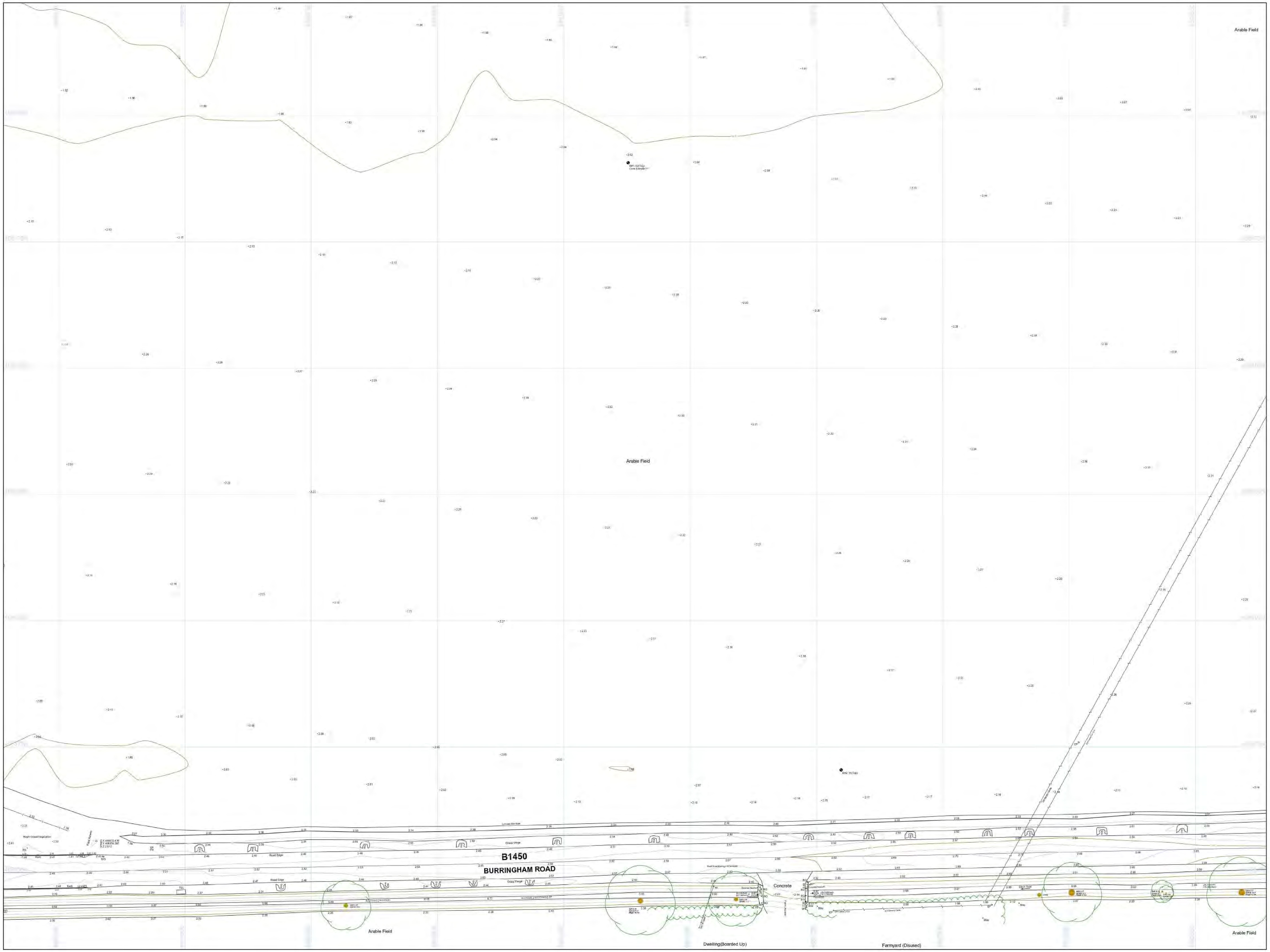
Regional Office in Leeds



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Control

STN	East	North	Level	Type
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STN04	485696.884	408347.986	6.303	Nail
STN05	485794.799	408372.174	10.356	Nail
STN06	485797.171	408347.176	2.388	Peg
STN07	485719.056	408406.633	9.833	Nail
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Sheet Layout

0 2.5 5 7.5 10 12.5 15 20 25

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Feature Abbreviations

Description Abbreviations

Level Prefix

Digital File	3944_10_3d.dwg	Original Size	A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 2 of 12	Approved AJD

Client **North Lincolnshire Council**

Title Topographical Survey

Project **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/002 Rev. -

Clugston

Clugston Survey Services
St Vincent House
Normanby Road
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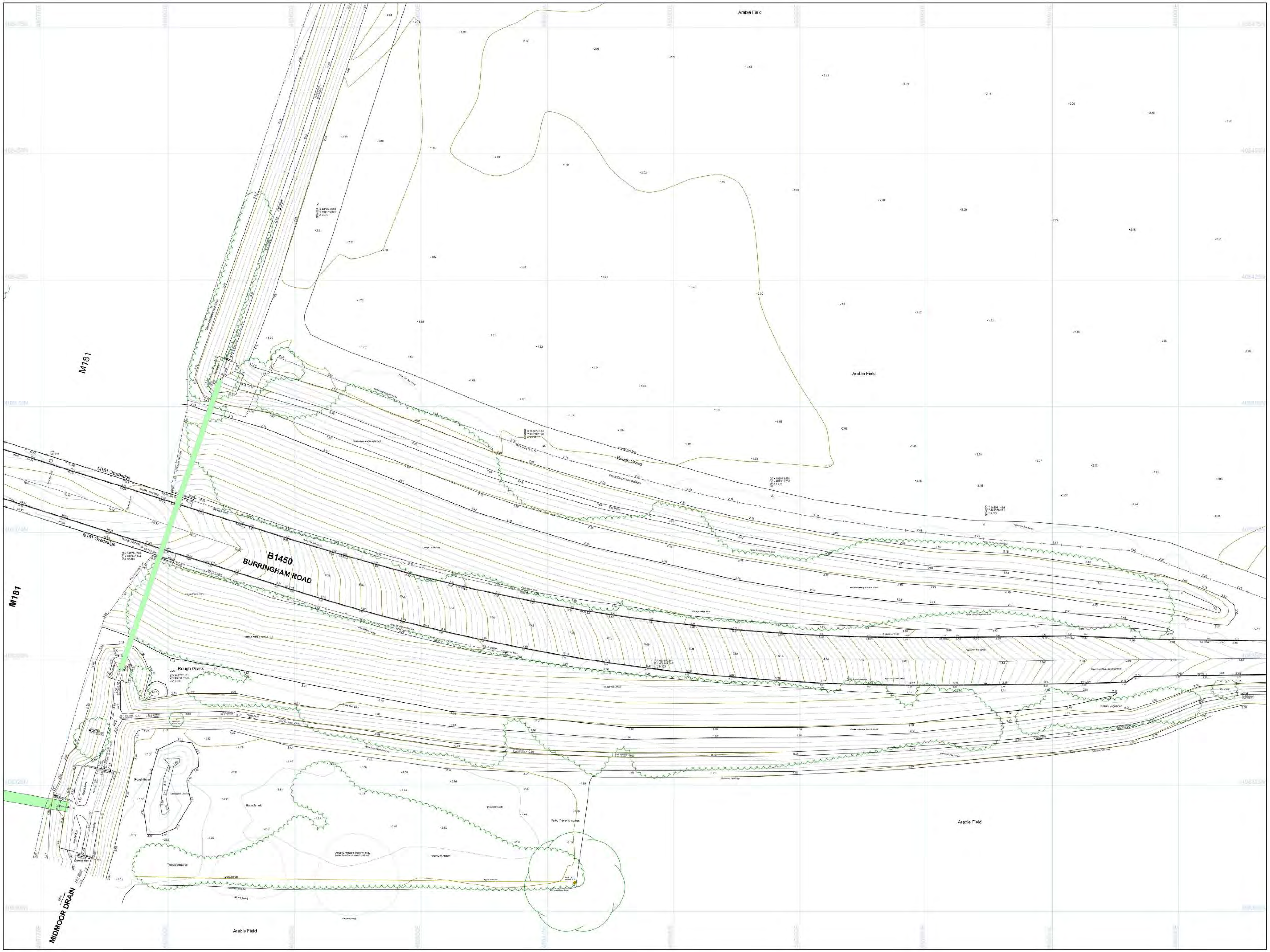

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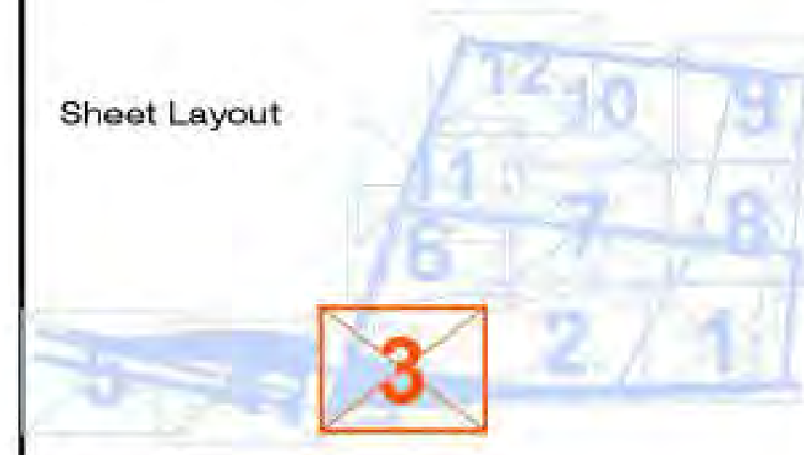

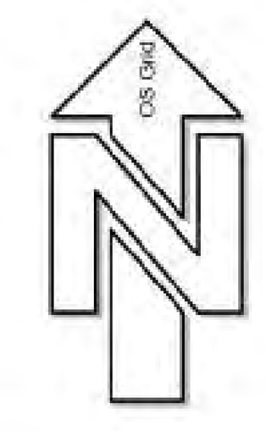

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Digital File 3944_10_3d.dwg | Original Size A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 3 of 12	Approved AJD

Client **North Lincolnshire Council**

Title Topographical Survey

Project **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/003 | Rev. -

Clugston

Clugston Survey Services
St Vincent House
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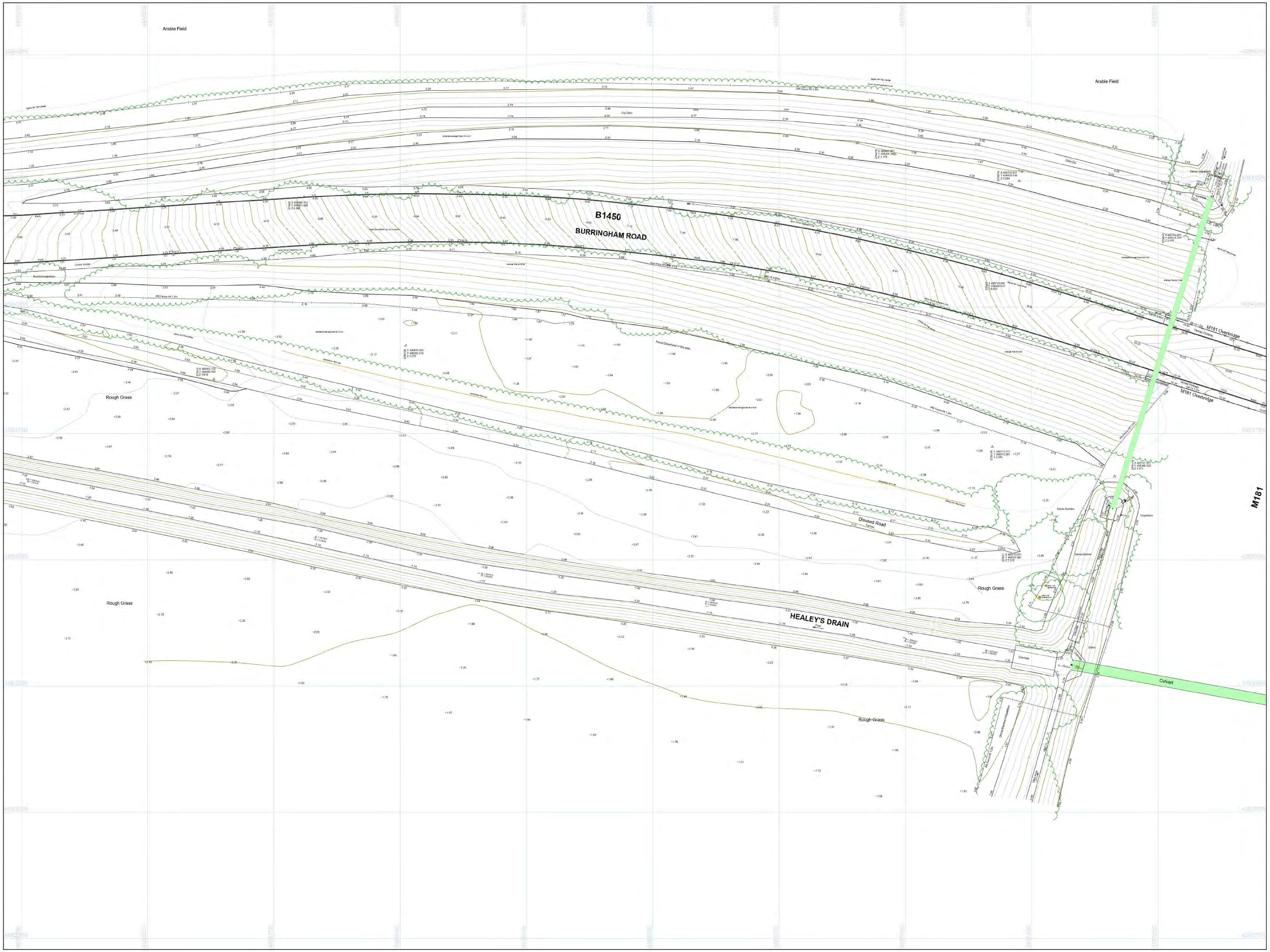

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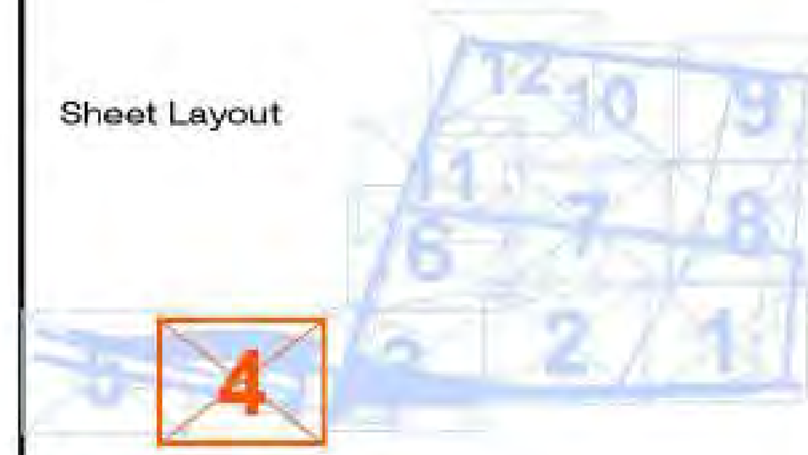

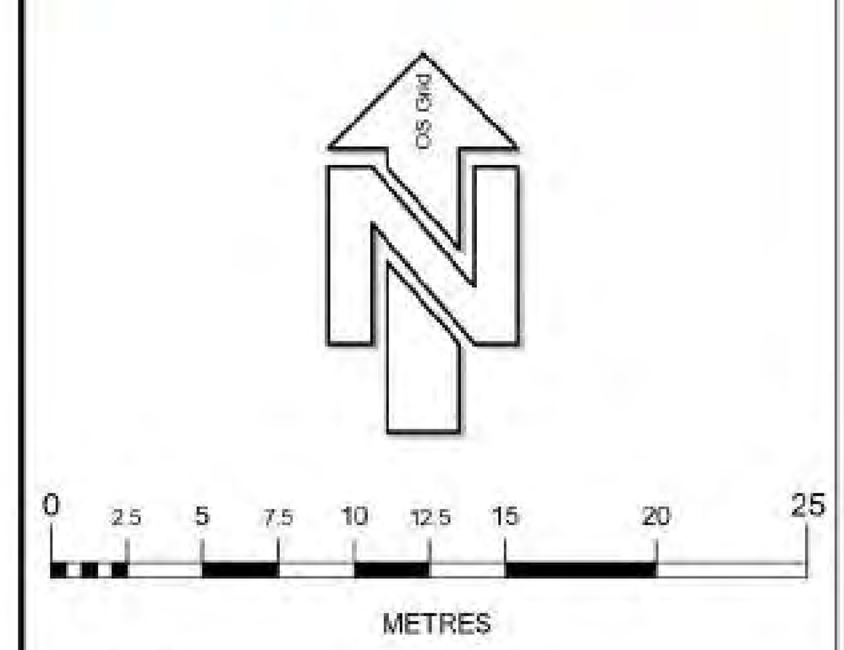

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Woodland Area (Deciduous) — Woodland Area (Coniferous)

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Digital File 3944_10_3d.dwg — Original Size A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 4 of 12	Approved AJD

Client North Lincolnshire Council

Title Topographical Survey

Project North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire

Drawing No. 3944/10/004 — Rev. -

Clugston

Clugston Survey Services
St Vincent House
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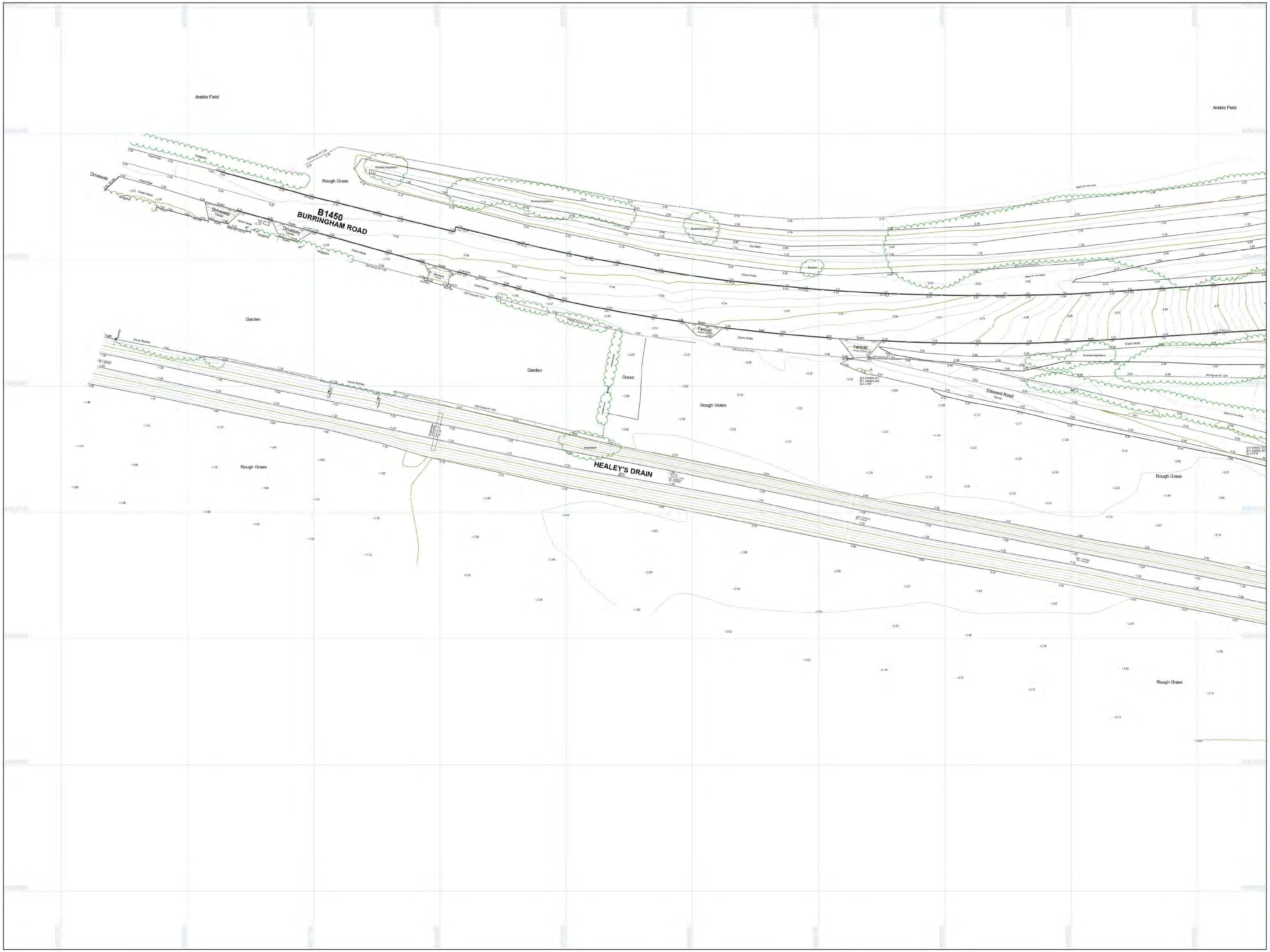

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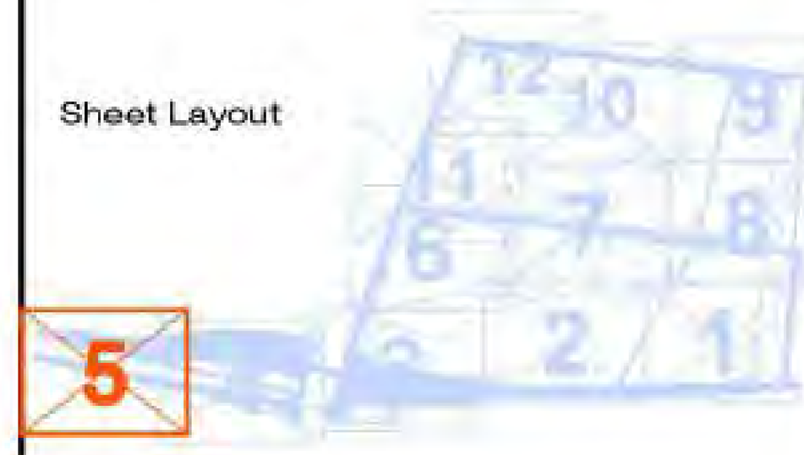

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Revisions

Drawing Status FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 5 of 12	Approved AJD

Client **North Lincolnshire Council**

Title Topographical Survey

Project **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/005 Rev. -

Clugston

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STN11A	485717.211	408372.381	2.345	Peg
STN11B	485741.421	408366.522	2.911	Peg

Sheet Layout

6

0 2.5 5 7.5 10 12.5 15 20 25

METRES

General

Legend

Feature Abbreviations

Description Abbreviations

Level Prefix

Digital File	3944_10_3d.dwg	Original Size	A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 6 of 12	Approved AJD

Client North Lincolnshire Council

Title Topographical Survey

Project North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire

Drawing No. 3944/10/006 **Rev.** -

Clugston

Clugston Survey Services
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survey@clugston.co.uk
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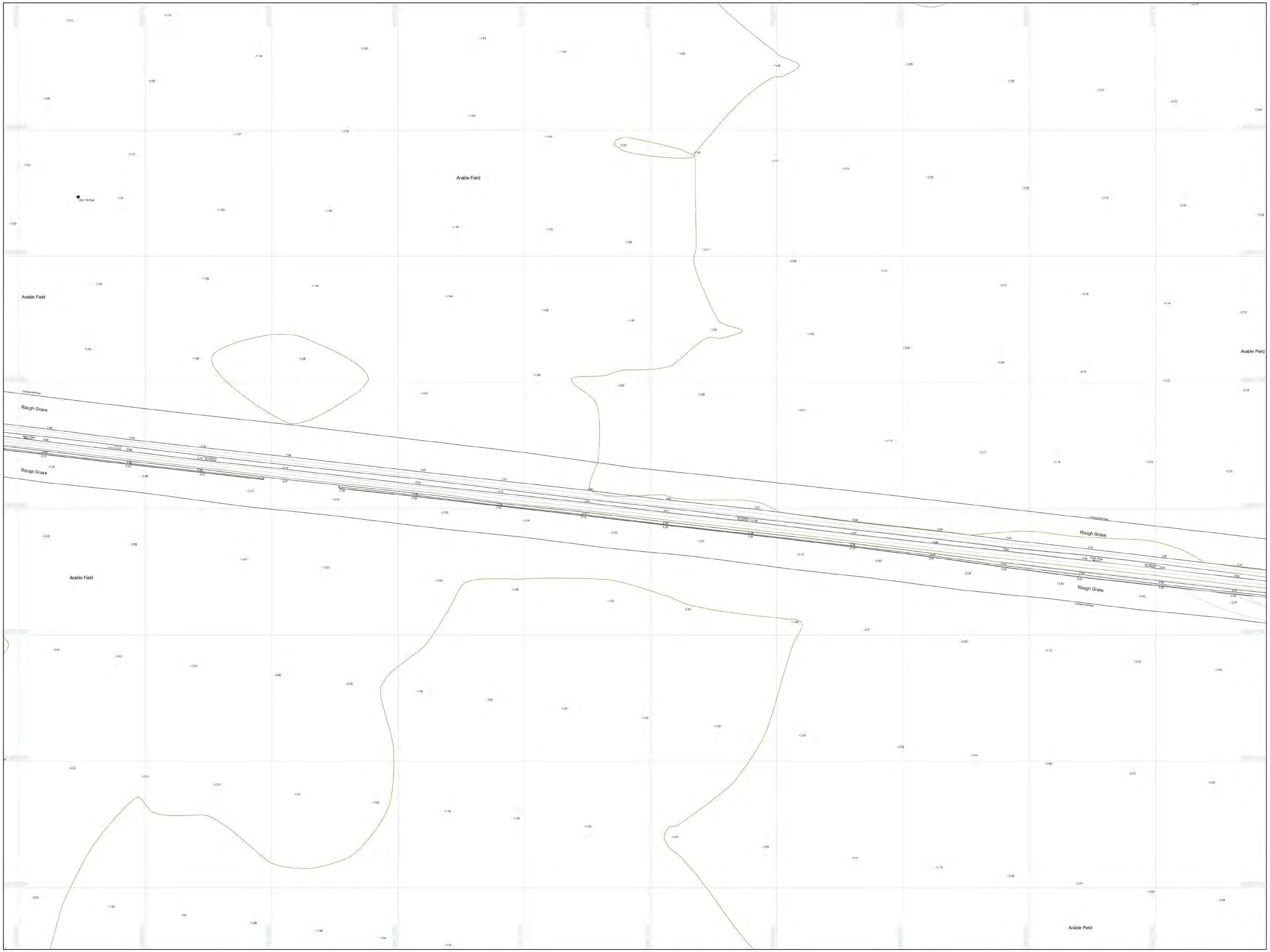

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STN02A	486395.452	408569.167	2.790	Peg
STN02B	486461.789	408723.820	2.456	Peg
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Building / Overhead Canopy
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Hard / Soft Surface Change
Kerb / Dropped Kerb
Combined Kerb & Drainage System
Drainage Channel
Road Traffic Sensors
Fence Line -

BW	Barbed Wire	HR	Hand Rail	PR	Post & Rail
CB	Close Boarded	IR	Iron Railings	SB	Safety Barrier
CNM	Chestnut	MI PR	Metal Post & Rail	SF	Security Fence
CL	Chain Link	OB	Open Boarded	TF	Temporary Fence
CP	Concrete Panel	PA	Paling Fence	WM	Wire Mesh
(D)	Dilapidated	PC	Post & Chain		

Hedge Line — Bush
Tree / Scrub Canopy Line — Tree
O/H Telephone / Electric Cable(s) — Conifer
Rock Face
Pipe Line (Above Ground)

TP/TT 22.5 Trial Pit (with level) — Survey Station — Gate — Electric Pylon
BH 26.5 Borehole (with level) — 10.1 Spot Level — Level Datum — Marsh Land
Woodland Area (Deciduous) — Woodland Area (Coniferous)

Feature Abbreviations

ACU	Air Conditioning Unit	FH	Fire Hydrant	NP	Name Plate	SVP	Soil Vent Pipe
BB	Belisha Beacon	FP	Fence Post	PB	Post Box	TAP	Stand Pipe
BO	Bollard	FL	Flood Light	PM	Parking Meter	TCB	Telephone Box
BO(L)	Bollard (Lit)	G	Gully (with Level)	RBB	Rodent Bait Box	TEL	Telecom's Cover
BP	Boundary Post	GP	Gate Post	RE	Rodding Eye	TL	Traffic Light
BS	Bus Stop	GAS	Gas Cover	RS	Road Sign	TP	Telephone Pole
CATV	Cable TV Cover	KO	Kerb Offset	RS(L)	Road Sign (Lit)	TS	Traffic Signal Cover
CCTV	Close Circuit TV	LB	Lighting Beacon	RWP	Rain Water Pipe	VP	Vent Pipe
COL	Column	LBN	Litter Bin	SNR	Sensor	WM	Water Meter
CP	Concrete Post	LP	Lamp Post	SP	Sign Post	WO	Wash Out
DWB	Dog Waste Bin	ME	Meter	SP(L)	Sign Post (Lit)	WV	Water Valve
EL	Electric Cover	MH	Manhole	SPDC	Speed Camera	UC?	Unknown Cover
EP	Electricity Pole	MP	Marker Post	STAY	Cable Stay	UTL	Unable to Lift
ER	Earth Rod	MEP	Metal Post	SV	Stop Valve	Ø	Diameter

Description Abbreviations

Asmd Rt	Assumed Route	Flw Bd	Flower Bed	O/H	Overhead
BkDrp	Back Drop	FW	Foul Water	OSBM	Ordnance Survey Bench Mark
Bk	Brick	GTrp	Grease Trap		
BusStKb	Bus Stop Kerb	Ht	Height	RetWall	Retaining Wall
Bldg	Building	Hg	Hedge	Rd Edg	Road Edge
CDrnKbS	Combined Drainage & Kerb System	Intcpr	Interceptor	Spd Rtr	Speed Retarder
		Lvl	Level	St	Stone
Conc	Concrete	m	Metres	STN	Station
CPit	Catch Pit	mm	Millimetres	SW	Surface Water
DrpKB	Drop Kerb	MSL	Mean Sea Level	Tac	Tactile Paving
Drn Chnl	Drainage Channel	No.	Number	Tmc	Tarmac

Level Prefix

AL	Arm Level	RL	Roof / Ridge Level	ToS	Top of Step Level	FFL	Finished Floor Level
CL	Cover Level	SL	Soffit Level	ToW	Top of Wall Level	1st FFL	1st Finished Floor Level
DPC	Damp Proof Course	Spring	Springing Level	SILL	Sill Level		
EL	Eaves Level	TL	Threshold Level	WL	Water Level (on date & Time)		
IL	Invert Level	ToC	Top of Concrete Level				
PL	Parapet Level	ToP	Top of Pile Level				

Digital File 3944_10_3d.dwg — Original Size A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 7 of 12	Approved AJD

Client **North Lincolnshire Council**

Title Topographical Survey

Project **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/007 — Rev. -

Clugston

Clugston Survey Services
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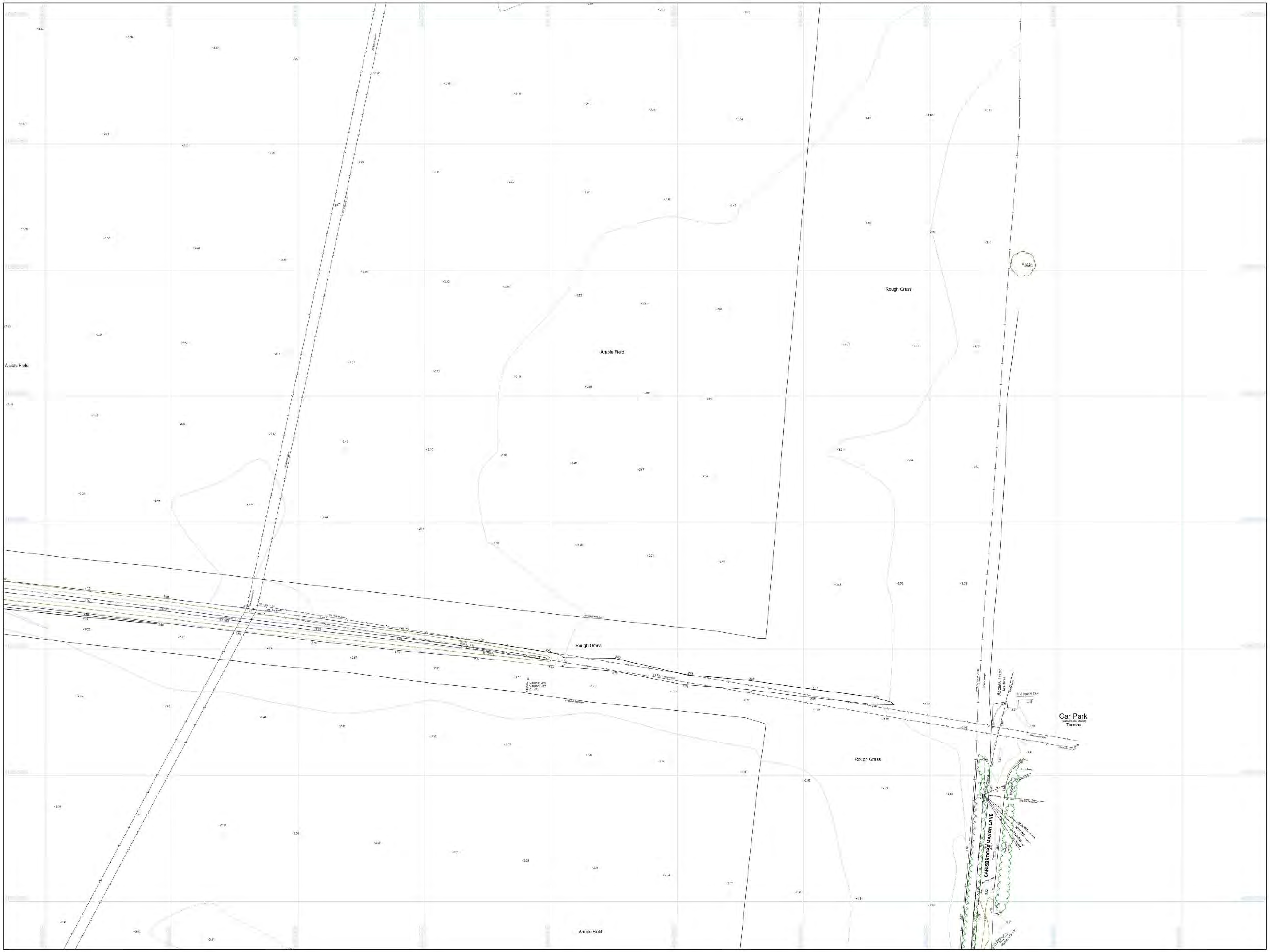

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Digital File 3944_10_3d.dwg Original Size A0

No.	Description	Date	Signed

Revisions

Drawing Status FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 8 of 12	Approved AJD

Client **North Lincolnshire Council**

Title Topographical Survey

Project **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/008 Rev. -

Clugston

Clugston Survey Services
St Vincent House
Normanby Road
Scunthorpe
North Lincolnshire
DN15 8QT

Tel: 01724 748170
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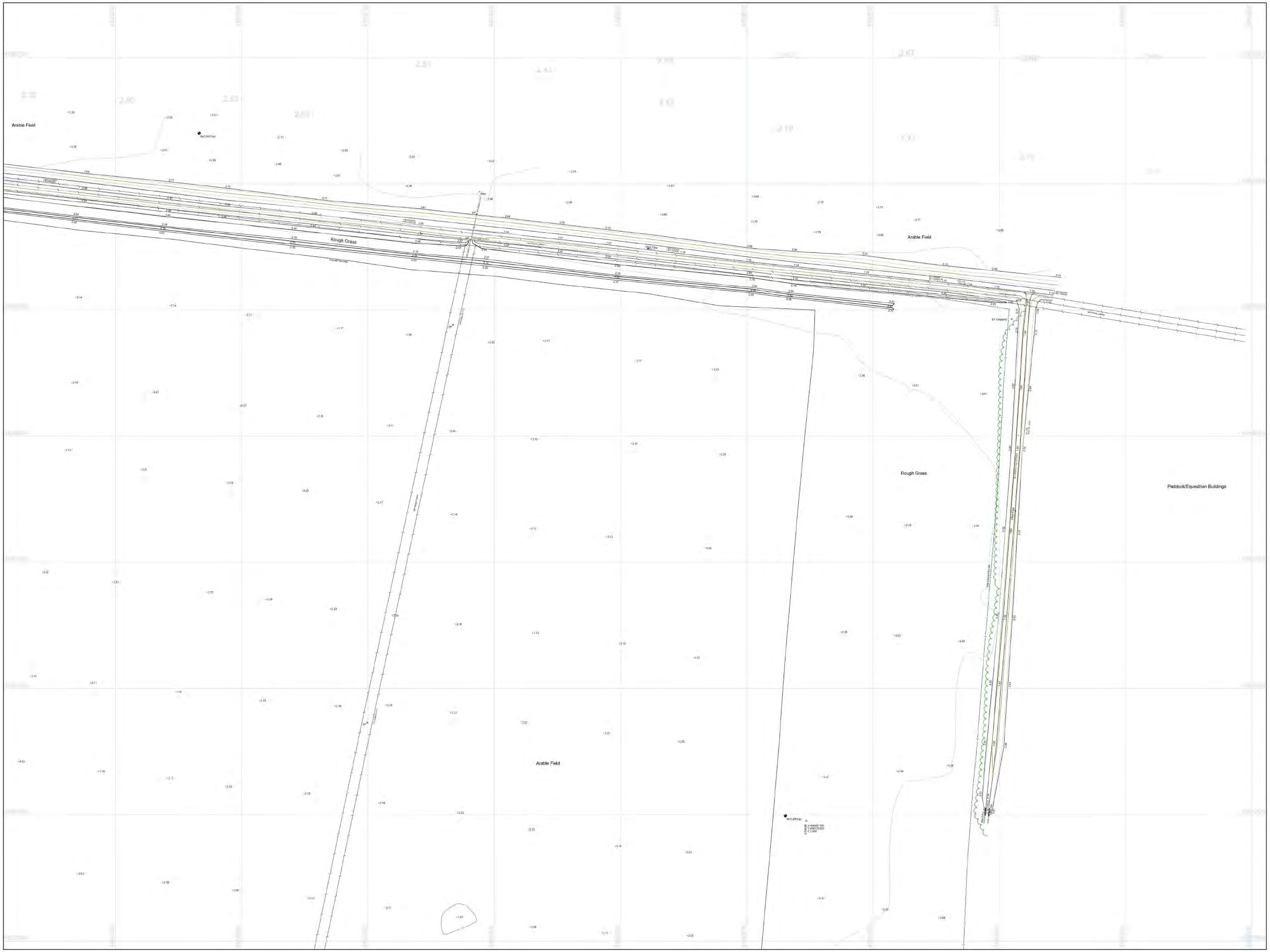

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Digital File: 3944_10_3d.dwg — Original Size: A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed: AF/TS	Date: 01.02.16	Scale: 1:250
Drawn: AF	Sheet: 9 of 12	Approved: AJD

Client: **North Lincolnshire Council**

Title: Topographical Survey

Project: **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/009 — Rev. -

Clugston Survey Services
St Vincent House
Normanby Road
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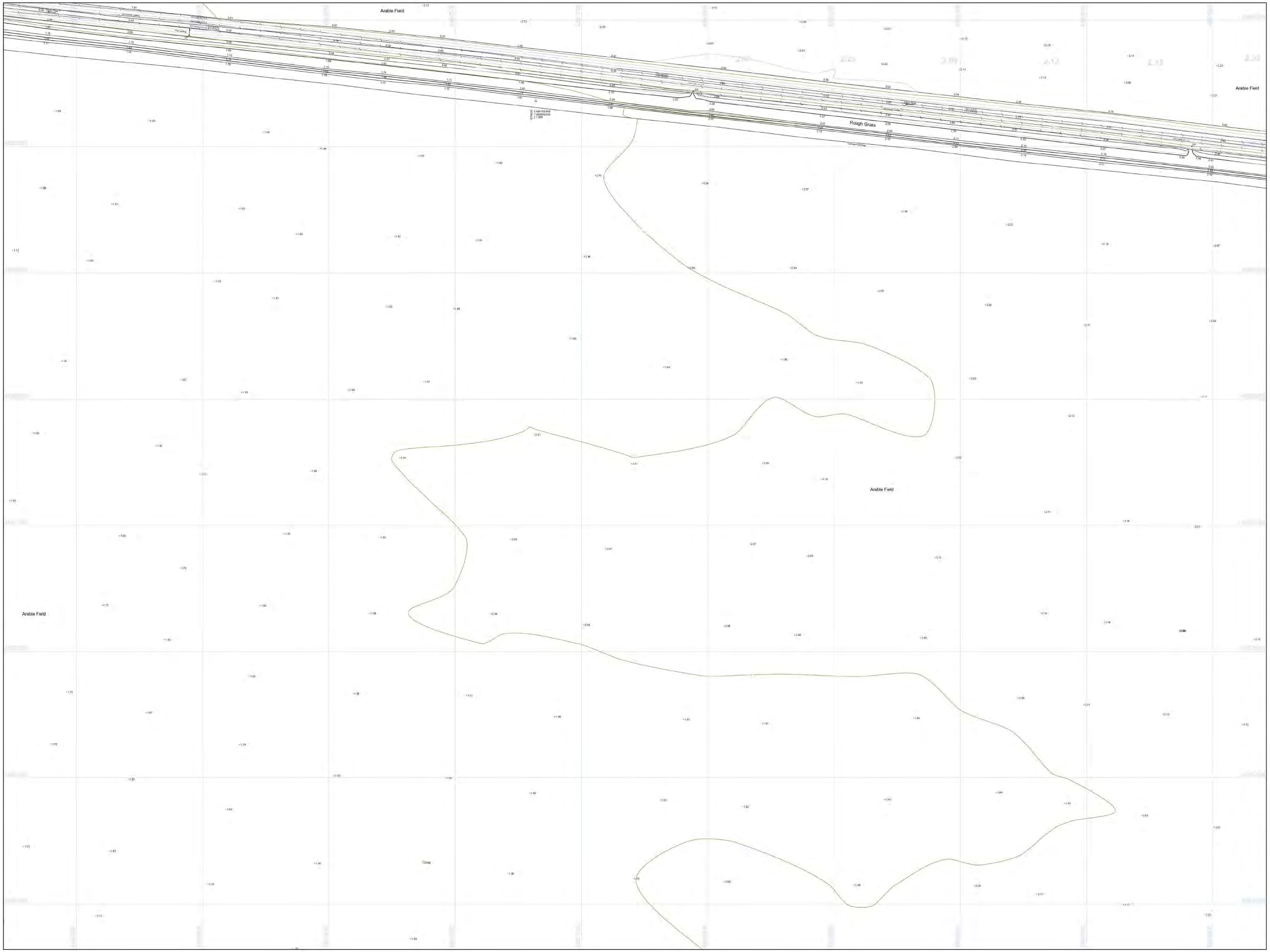

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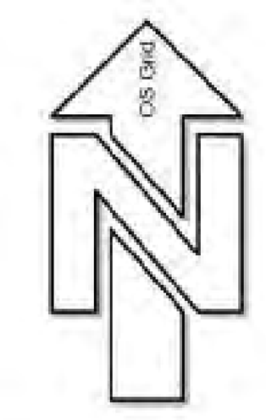

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No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 10 of 12	Approved AJD

Client: **North Lincolnshire Council**

Title: Topographical Survey

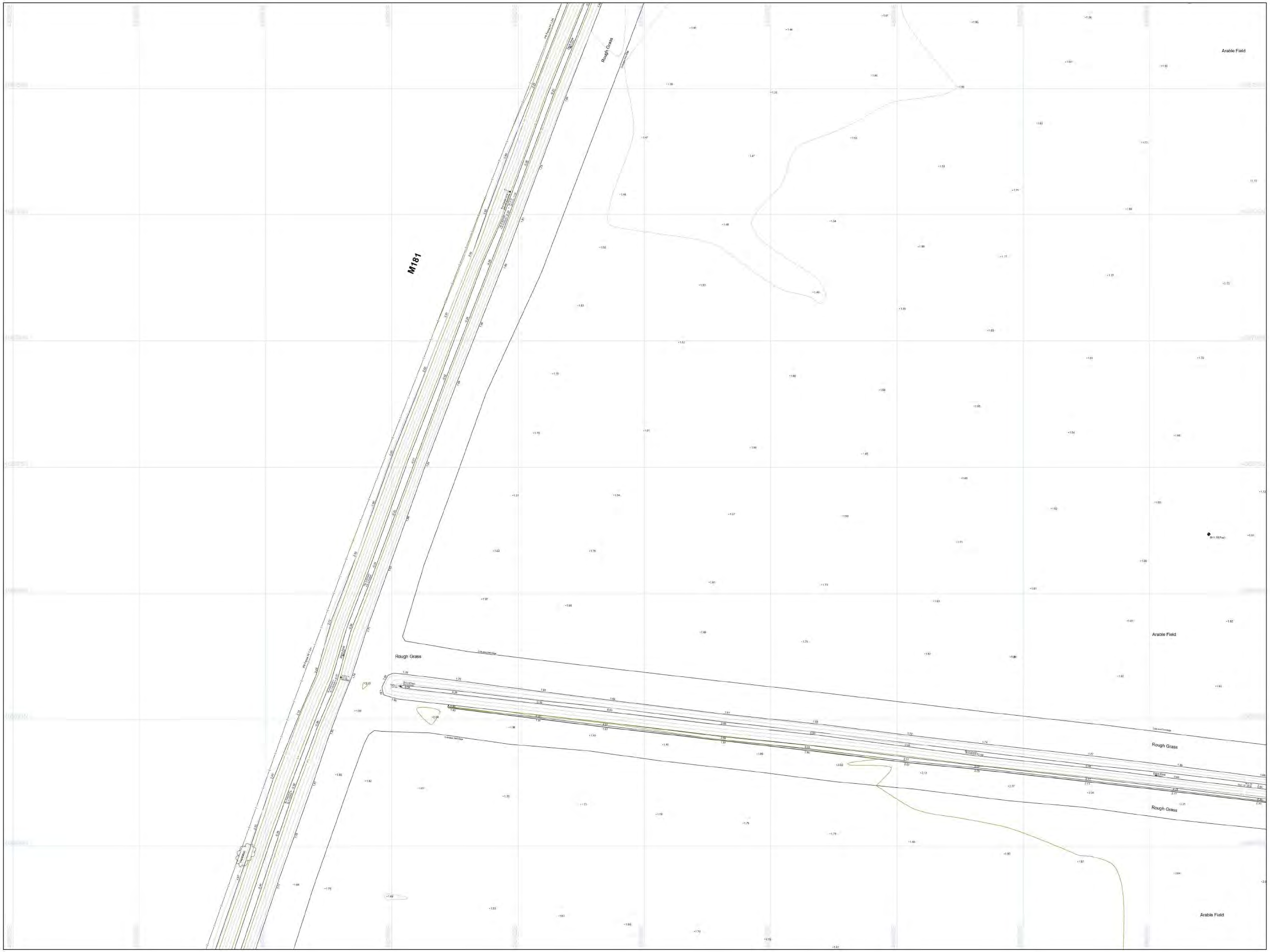
Project: **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/010 Rev. -

Clugston Survey Services
St Vincent House
Normanby Road
Scunthorpe
North Lincolnshire
DN15 8QT

Tel: 01724 748178
Fax: 01724 748178
survey@clugston.co.uk
www.clugstonsurvey.co.uk

Regional Office in Leeds



Notes

1. Surveyed January 2016.
2. Survey related to Ordnance Survey National Grid.
3. Levels related to GPS Orthometric height, converted to MSL (Newlyn) by OSGM02.
4. Check levels taken to compare with previous survey on the same wider scheme, all previous data has been greyscaled.
5. Road studs/markings along the B1450 Burringham Road have not been surveyed.

Control

STN	East	North	Level	Type
STN01	486471.033	408354.144	3.368	Peg
STN02	486267.979	408361.341	2.511	Peg
STN02A	486395.452	408569.167	2.790	Peg
STN02B	486461.789	408723.820	2.456	Peg
STN02C	486165.968	408859.045	1.966	Peg
STN03	486032.436	408356.387	2.512	Peg
STN03A	485829.883	408440.001	2.373	Peg
STN03B	485874.384	408392.196	2.148	Peg
STN03C	485919.551	408382.252	2.276	Peg
STN03D	485961.468	408376.591	2.329	Peg
STN04	485896.884	408347.986	6.303	Nail
STN05	485794.799	408372.174	10.356	Nail
STN06	485797.171	408347.176	2.388	Peg
STN07	485719.056	408406.633	9.833	Nail
STN07A	485722.531	408425.016	2.294	Peg
STN07B	485687.957	408430.290	2.179	Peg
STN07C	485754.401	408418.376	2.467	Peg
STN08	485580.972	408421.849	4.980	Nail
STN09	485485.347	408403.283	2.445	Nail
STN10	485563.103	408385.763	2.618	Nail
STN10A	485601.093	408392.418	2.270	Peg
STN11	485719.531	408351.961	2.319	Nail
STN11A	485717.211	408372.381	2.345	Peg
STN11B	485741.421	408366.522	2.911	Peg

Sheet Layout

11

0 2.5 5 7.5 10 12.5 15 20 25

METRES

General

- Every effort is made to identify all visible above ground features. However, it should be borne in mind that at the time of survey, some surface features may have been obscured.
- Visible features in the vicinity of the site extents, as detailed on this survey, may not represent the legally conveyed ownership boundaries.

Legend

Top / Bottom of Bank
Building / Overhead Canopy
Wall
Solid Surface Feature / Road Edge
Hard / Soft Surface Change
Kerb / Dropped Kerb
Combined Kerb & Drainage System
Drainage Channel
Road Traffic Sensors
Fence Line -

BW Barbed Wire, HR Hand Rail, PR Post & Rail, CB Close Boarded, IR Iron Railings, SB Safety Barrier, CNNut Chestnut, MPR Metal Post & Rail, SF Security Fence, CL Chain Link, OB Open Boarded, TF Temporary Fence, CP Concrete Panel, PA Paling Fence, WM Wire Mesh, (D) Dilapidated, PC Post & Chain

Hedge Line
Tree / Scrub Canopy Line
O/H Telephone / Electric Cable(s)
Rock Face
Pipe Line (Above Ground)
Bush
Tree
Conifer

Trial Pit (with level); Survey Station; Gate; Electric Pylon; Borehole (with level); Spot Level; Woodland Area (Deciduous); Level Datum; Woodland Area (Coniferous); Marsh Land

Feature Abbreviations

Description Abbreviations

Level Prefix

Digital File 3944_10_3d.dwg Original Size A0

No.	Description	Date	Signed

Revisions

Drawing Status FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 11 of 12	Approved AJD

Client **North Lincolnshire Council**

Title Topographical Survey

Project **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/011 Rev. -

Clugston

Clugston Survey Services
St Vincent House
Normanby Road
Scunthorpe
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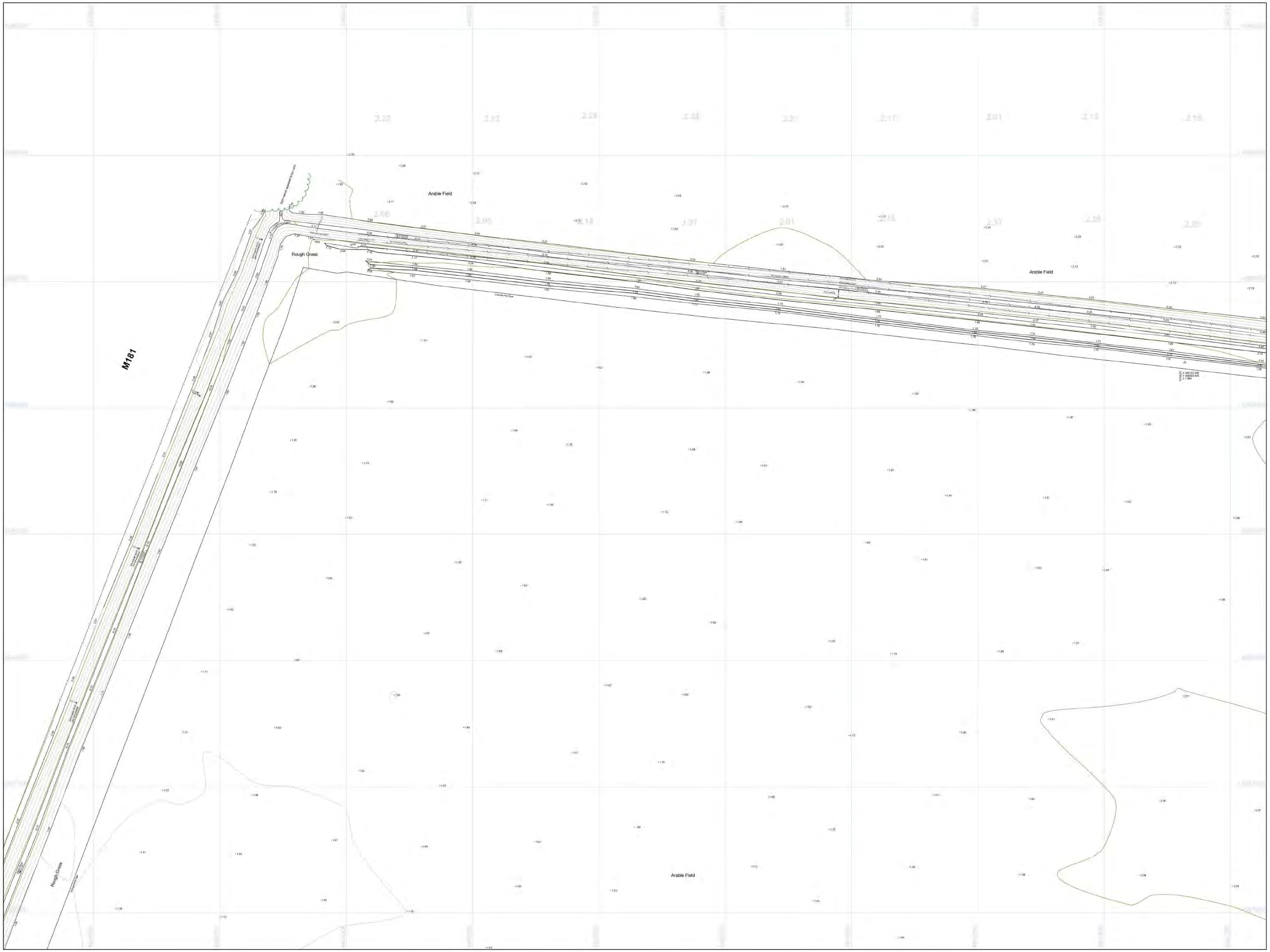

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Sheet Layout

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Legend

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Description Abbreviations

Level Prefix

Digital File 3944_10_3d.dwg Original Size A0

No.	Description	Date	Signed

Revisions

Drawing Status: FINAL

Surveyed AF/TS	Date 01.02.16	Scale 1:250
Drawn AF	Sheet 12 of 12	Approved AJD

Client **North Lincolnshire Council**

Title Topographical Survey

Project **North Lincolnshire Lakes Burringham Road (Lake 1) Scunthorpe, N.Lincolnshire**

Drawing No. 3944/10/012 Rev. -

Clugston

Clugston Survey Services
St Vincent House
Normanby Road
Scunthorpe
North Lincolnshire
DN15 8QT

APPENDIX B

Indicative Site Layout Drawing

2m

Proposed Lake

Drain

Secondary Street

The Lane

Primary Street A

Primary Street (Connecting)

Primary Street B

The Courtyard

Green Corridor

Play Area (LEAP)

Back Lane

Edge Lane

Shared Street

Pump Station

Arrival Green

Drain

3m

MANOR LANE

Key

- Application site boundary
- Existing (retained) trees & hedgerow
- Proposed planting
  Tree selection misleading for further details
- Open space
- Indicative surface water attenuation basin
- Proposed pedestrian/cycle link
- Potential for equipped play/LEAP
- Proposed buildings

Housing Schedule

House Type	Storey	Bed	Number	House Sq. (Sales)	Total Sq ft		
Watergrove	1	2	10	812	8,120		
Padbury	2	2	55	764	42,020		
Ashbrith	2	2	56	764	42,784		
Danecroft	2	2	32	859	27,488		
Cavenham	2	2	29	859	24,911	182	30%
Fewston	2	3	21	918	19,278		
Seacourt	2	3	26	918	23,868		
Eldwick	2	3	7	1004	7,028		
Killington	2	3	12	1012	12,144		
Westbourne	2	3	31	1019	31,558		
Holgate	2	3	46	1018	46,828		
Farley	2	3	67	1020	68,340		
Denton	2.5	3	40	1087	43,480		
Selset	2.5	3	49	1088	53,312	299	50%
Langford	2	4	31	1153	35,743		
Prenton	2	4	29	1153	33,437		
Didbury	2.5	4	9	1287	11,583		
Newham	2	4	15	1289	19,335		
Thirlmere	2	4	22	1299	28,578		
Devoke	3	4	12	1312	15,744	118	20%
Total			599		595,579		
Net Dev				37.96 acres			
Coverage				15,695 sq.ft/acre			
2.5 Storey Above			110				18.4%

0 10 50 m

nineteen47
CHARTERED TOWN PLANNERS & URBAN DESIGNERS

Project: Lincolnshire Lakes

Drawing Title: Planning Layout

Project Code	Drawing No	Rev
n1720	008	
Date: 31.05.2023	Drawing Scale: 1:1,000 @ A1	

APPENDIX C

Severn Trent Water Pre-Planning Response

WONDERFUL ON TAP

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

www.stwater.co.uk
Network.Solutions@severntrent.co.uk

Contact: Emma Nowak
Mob: 07970361864

Our ref: 1025200

Alan Wood & Partners,
Hallamshire House,
Hayland Street,
Sheffield,
S9 1BY.

FAO Jacob Padley

23rd November 2021

Dear Mr Padley,

Proposed Residential Development (599 Houses) at: Site off Burringham Road, Scunthorpe.

X: 486208 / Y: 408620

I refer to your Development Enquiry Request submitted in respect of the above site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

Public Sewers in Site – Required Protection

There are no public sewers crossing the proposed development site.

Due to a change in legislation on 1 October 2011 there may also be former private sewers on the site which have transferred to the responsibility of Severn Trent Water Ltd, which are not shown on the statutory sewer records, but are located in your client's land. These sewers would have protective strips that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

Foul Water Drainage

Sewer records show the closest point for a foul connection from the site is at MH1401 on the public 150mm FWS east of the site on Main Avenue. It is likely that a pumped connection would be needed. Please submit pumped proposals as soon as possible.

From the information you have provided and our desktop assessment, we feel that sewer modelling will be required following your FW pump proposals. As you may be aware, we no longer

charge developers for the hydraulic modelling service. All sites now go forward for prioritization against our risk matrix that takes into account such things as planning status and potential impact on the environment or our existing customers. Currently, we would like to progress this through to modelling once the site has achieved full planning permission.

We may contact you in due course for further information and will liaise with you over time with regard to the outcome of our investigations and any impact that may have on the planning status, occupation, or phasing of the site. However, while we can provide a brief summary of our findings if you need us to, we will no longer provide the full external SCA report. In the meantime, as you progress matters for your site, we would appreciate any updates you have regarding the development progression, as we will be reviewing the modelling requirements on a weekly basis. I would therefore be grateful if you would forward as soon as possible the following details:

- Proposed submission of your Planning Application including references
- Proposed planned start and completion date.
- Any phasing details of the proposed development
- Planned occupation dates
- Confirmation whether a pumped solution is required (please state proposed pumped rates if applicable)
- Proposed Point of Connection

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If this is not practical a connection to the watercourse south east of the site would be acceptable subject to LLFA approval. In addition, other sustainable drainage methods should also be explored before a discharge to the public sewerage system is considered.

If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test

results or by the submission of a statement from the SI consultant (extract or a supplementary letter).

The site drainage should be discussed with the Local Lead Flood Authority with a view to implement suitable SUDs techniques to land soakaways or other land drainage systems prior to any consideration of discharges to public sewers being accepted. Any discharge rate to a watercourse or drainage ditch will be determined by the LLFA.

Any flows exceeding the proposed rates would need to be appropriately attenuated on site and discharged at a controlled rate.

New Connections

For any new connections including the use, reuse and indirect to the public sewerage system, the developer will need to submit Section 106 application. Our Developer Services department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes

please call 0800 707 6600, email new.connections@severntrent.co.uk or download from www.stwater.co.uk

Please quote the above reference number in any future correspondence (including e-mails) with STW Limited. Please send **all correspondence** to the network.solutions@severntrent.co.uk email inbox address, a response will be made within 15 days.

If you require a VAT receipt for the application fee please email MISCINCOME.NC@SEVERNTRENT.CO.UK quoting the above Reference Number.

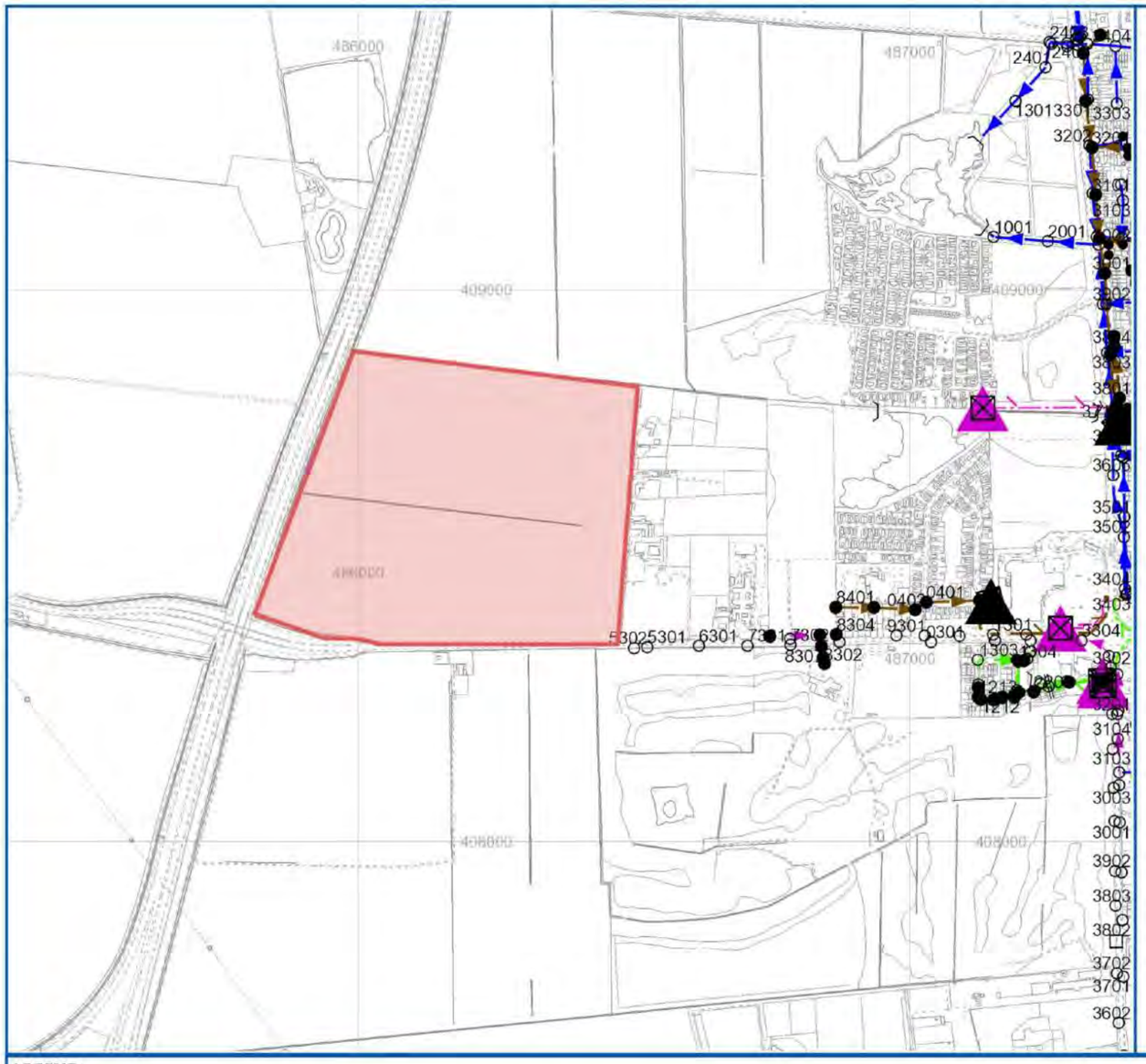
Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

Yours sincerely,

WONDERFUL ON TAP

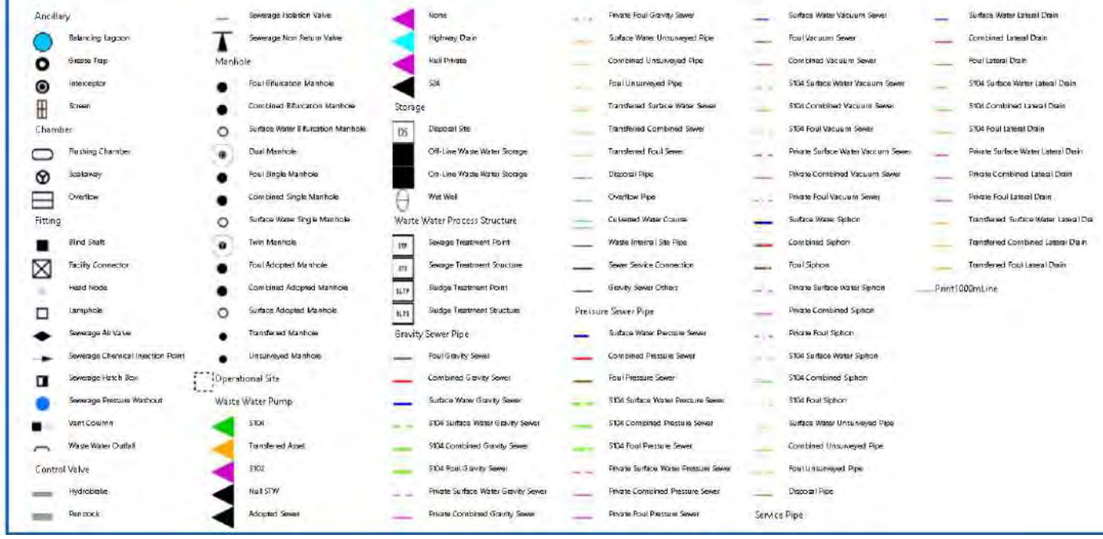
SEVERN TRENT

Emma Nowak.
Senior Evaluation Technician
Network Solutions
Developer Services



Reference	Cover Level	Invert Level Upstream	Invert Level Downstream	Purpose	Material	Pipe Shape	Max Size	Min Size	Gradient	Year Laid
SE87091001	2.973	<UNK>	0.73	S	VC	<UNK>	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87093402	4.32	2.598	2.5	S	CO	C	875	<UNK>	190.8	31/12/1899 00:00:00
SE87093406	4.5079	2.37	2.37	S	CO	C	600	<UNK>	0	31/12/1899 00:00:00
SE87093001	4.451	1.209	0.61	F	VC	C	225	<UNK>	246.87	31/12/1899 00:00:00
SE87083102	4.11	<UNK>	2.2	S	VC	C	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87093103	4.5479	<UNK>	3.08	S	VC	C	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87091301	<UNK>	<UNK>	<UNK>	S	CO	<UNK>	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87083701	<UNK>	<UNK>	0.09	F	VC	C	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87092001	3.9749	<UNK>	<UNK>	S	VC	<UNK>	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87092401	3.3129	<UNK>	<UNK>	S	VC	<UNK>	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87093405	4.589	2.439	2.38	S	CO	C	900	<UNK>	139.33	31/12/1899 00:00:00
SE87093401	<UNK>	<UNK>	2.38	F	VC	<UNK>	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE86088305	<UNK>	<UNK>	2.11	F	VC	C	150	<UNK>	0	31/12/1899 00:00:00
<UNK>	<UNK>	<UNK>	<UNK>	F	<UNK>	<UNK>	<UNK>	<UNK>	<UNK>	07/02/2012 00:00:00
SE87093004	4.486	2.537	2.41	S	CO	C	825	<UNK>	116.46	31/12/1899 00:00:00
SE86088301	<UNK>	<UNK>	<UNK>	F	CO	C	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE86088307	<UNK>	<UNK>	<UNK>	F	CO	C	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE86088302	<UNK>	<UNK>	<UNK>	F	CO	C	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE86087304	<UNK>	<UNK>	<UNK>	F	CO	C	<UNK>	<UNK>	0	31/12/1899 00:00:00
SE87083708	4.9019	0.21	0.21	F	VC	C	300	<UNK>	0	31/12/1899 00:00:00
SE87083702	4.61	0.02	<UNK>	F	VC	C	300	<UNK>	0	31/12/1899 00:00:00
SE87083802	4.4609	0.56	0.33	F	VC	C	225	<UNK>	417.22	31/12/1899 00:00:00
SE87083707	4.714	0.2	0.06	F	VC	C	225	<UNK>	145.07	31/12/1899 00:00:00
SE87083706	4.6389	3.15	3.1	S	VC	C	300	<UNK>	300.2	31/12/1899 00:00:00
SE87083903	4.471	2.59	2.41	S	CO	C	675	<UNK>	600.11	31/12/1899 00:00:00
SE87083704	4.8689	3.52	3.18	S	CO	C	900	670	37.76	31/12/1899 00:00:00
SE87083705	4.9699	3.07	2.77	S	VC	C	300	<UNK>	350.7	31/12/1899 00:00:00
SE87083801	4.476	3.05	2.39	F	VC	C	<UNK>	<UNK>	141.65	31/12/1899 00:00:00
SE87083901	4.3299	2.85	2.37	F	VC	C	<UNK>	<UNK>	38.71	31/12/1899 00:00:00

LEGEND



MATERIALS

-	- NONE
AC	- ASBESTOS CEME
BR	- BRICK
CC	- CONCRETE BOX CULVERT
CI	- CAST IRON
CO	- CONCRETE
CSB	CONCRETE SEGMENTS (BOLTED)
CSU	- CONCRETE SEGMENTS (UNBOLTED)
DI	- DUCTILE IRON
GRP	- GLASS REINFORCED PLASTIC
MAC	- MASONRY IN REGULAR COURSES
MAR	- MASONRY RANDOMLY COURSED
PE	- POLYETHLENE
PF	- PITCH
PP	- POLYPROPYLENE
PSC	- PLASTIC STEEL COMPOSITE
PVC	- POLYVINYL CHLORIDE
RPM	- REINFORCED PLASTIC MATRIX
SI	- SPUN (GREY) IRON
ST	- STEEL
U	- UNKNOWN
VC	- VITRIFIED CLAY
XXX	- OTHER

CATEGORIES

W	- WEIR
C	- CASCADE
DB	- DAMBOARD
SE	- SIDE ENTRY
FV	- FLAP VALVE
BD	- BACK DROP
S	- SIPHON
D	- HIGHWAY DRAIN
S104	- SECTION 104

SHAPE

C	- CIRCULAR
E	- EGG SHAPED
O	- OTHER
R	- RECTANGLE
S	- SQUARE
T	- TRAPEZOIDAL
U	- UNKNOWN

PURPOSE

C	- COMBINED
E	- FINAL EFFLUENT
F	- FOUL
L	- SLUDGE
S	- SURFACE WATER

SEVERN TRENT
Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0345 601 6616

SEWER RECORD (Tabular)

O/S Map Scale: 1:10,000

Date of Issue: 23-11-21

This map is centred upon:

X: 486382.84 **Y:** 408563.41

Disclaimer Statement:

1. Do not scale off this Map.
2. This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems.
3. On 1 October 2011 most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012. Private pumping stations, which form part of these sewers or lateral drains, will transfer to ownership of Severn Trent Water on or before 1 October 2016. Severn Trent Water does not possess complete records of these assets. These assets may not be displayed on the map.
4.
5. Ordnance Survey licence number: **100031673**
6. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright; therefore, no further copies should be made from it.

APPENDIX D

Strategic Drainage Layout Drawings

NOTES:

1. THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS. WHERE CONFLICT OF REQUIREMENTS EXIST THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION. OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS.
3. DRAWINGS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER AND FURTHER INSTRUCTIONS OBTAINED BEFORE WORK IS COMMENCED.
4. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE BUILDING IS FULLY COMPLETED. IT IS THE CONTRACTORS SOLE RESPONSIBILITY TO DETERMINE THE ERECTION PROCEDURE AND SEQUENCE AND ENSURE THAT THE BUILDING AND ITS COMPONENTS ARE SAFE DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE-DOWNS WHICH MAY BE NECESSARY, SUCH MATERIAL REMAINING THE THE PROPERTY OF THE CONTRACTOR ON COMPLETION, AND FOR ENSURING THAT THE WORKS AND ANY ADJACENT PROPERTIES ARE SAFE IN THE TEMPORARY CONDITION.

GENERAL NOTES:

G01. ALL WORKS SUBJECT TO SECTION 38, SECTION 62/278 AND SECTION 104 AGREEMENTS TO BE APPROVED BY THE RELEVANT AUTHORITY PRIOR TO COMMENCEMENT OF WORKS.

G02. ALL LEVELS ARE IN METRES AOD (ABOVE ORDNANCE DATUM) UNLESS NOTED OTHERWISE.

G03. ALL WORKS TO BE UNDERTAKEN IN COMPLIANCE WITH BS 8000 FOR WORKMANSHIP ON BUILDING SITES.

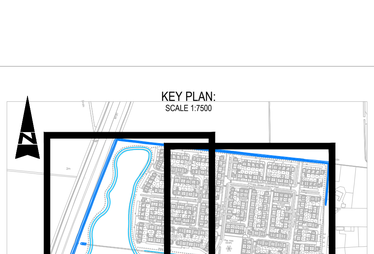
G04. ABBREVIATIONS:
MH = MANHOLE
CL = COVER LEVEL
IL = INVERT LEVEL
S / SW = SURFACE WATER
F / FW = FOUL WATER
FD = FLOW CONTROL CHAMBER

KEY:

- SURFACE WATER SEWER
- SWALE
- WETLAND AREA
- SITE BOUNDARY

100mm at A0

KEY PLAN:
SCALE 1:7500



Rev	Description	Date	By	Chk	App
P7	UPDATED TO LATEST SITE LAYOUT	26.05.23	JP	JAG	JAG
P6	REVISED DRAINAGE LAYOUT	26.05.23	ERD	JP	JAG
P5	REVISED SITE LAYOUT	18.04.23	ERD	JP	JAG
P4	REVISED SITE LAYOUT	02.02.23	LIR	JP	JAG
P3	REVISED SITE LAYOUT	09.02.22	JP	JMc	JAG
P2	REVISED SITE AND DRAINAGE LAYOUT	18.11.21	ERD	JP	JAG
P1	FIRST ISSUE	09.08.21	JP	JMc	JJS

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London T. 02071 860761
Scarborough T. 01723 865484
York T. 01904 611594
Leeds T. 01135 311098

Project: Proposed Residential Development at Lincolnshire Lakes, Burringham Road

Client: Keepmoat Homes

Drawing: Indicative Drainage Layout - Sheet 1

Role: CIVIL ENGINEER

Drawing Status: PRELIMINARY

Job. no. 45822 | Scale@ A0: 1:500 | Rev. P7

Project	Originator	Volume	Level	Type	Role	Number
KPLL	AWP	ZZ	XX	SK	C	0001

NOTES:

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100mm at A0

GENERAL NOTES:

G01. ALL WORKS SUBJECT TO SECTION 38, SECTION 62/278 AND SECTION 104 AGREEMENTS TO BE APPROVED BY THE RELEVANT AUTHORITY PRIOR TO COMMENCEMENT OF WORKS.

G02. ALL LEVELS ARE IN METRES AOD (ABOVE ORDNANCE DATUM) UNLESS NOTED OTHERWISE.

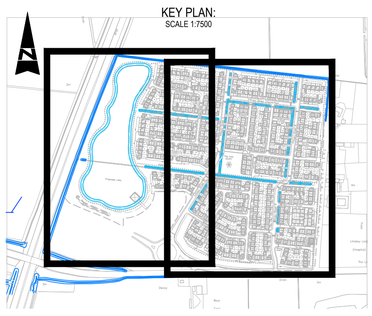
G03. ALL WORKS TO BE UNDERTAKEN IN COMPLIANCE WITH BS 8000 FOR WORKMANSHIP ON BUILDING SITES.

G04. ABBREVIATIONS:
MH = MANHOLE
CL = COVER LEVEL
IL = INVERT LEVEL
S / SW = SURFACE WATER
F / FW = FOUL WATER
FD = FLOW CONTROL CHAMBER

KEY:

- SURFACE WATER SEWER
- SWALE
- WETLAND AREA
- SITE BOUNDARY

KEY PLAN:
SCALE 1:7500



Rev	Description	Date	By	Chk	App
P7	UPDATED TO LATEST SITE LAYOUT	26.05.23	JP	JAG	JAG
P6	REVISED DRAINAGE LAYOUT	26.05.23	ERD	JP	JAG
P5	REVISED SITE LAYOUT	18.04.23	ERD	JP	JAG
P4	REVISED SITE LAYOUT	02.02.23	LIR	JP	JAG
P3	REVISED SITE LAYOUT	09.02.22	JP	JMc	JAG
P2	REVISED SITE AND DRAINAGE LAYOUT	18.11.21	ERD	JP	JAG
P1	FIRST ISSUE	09.08.21	JP	JMc	JJS

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Project: Proposed Residential Development at Lincolnshire Lakes, Burringham Road

Client: Keepmoat Homes

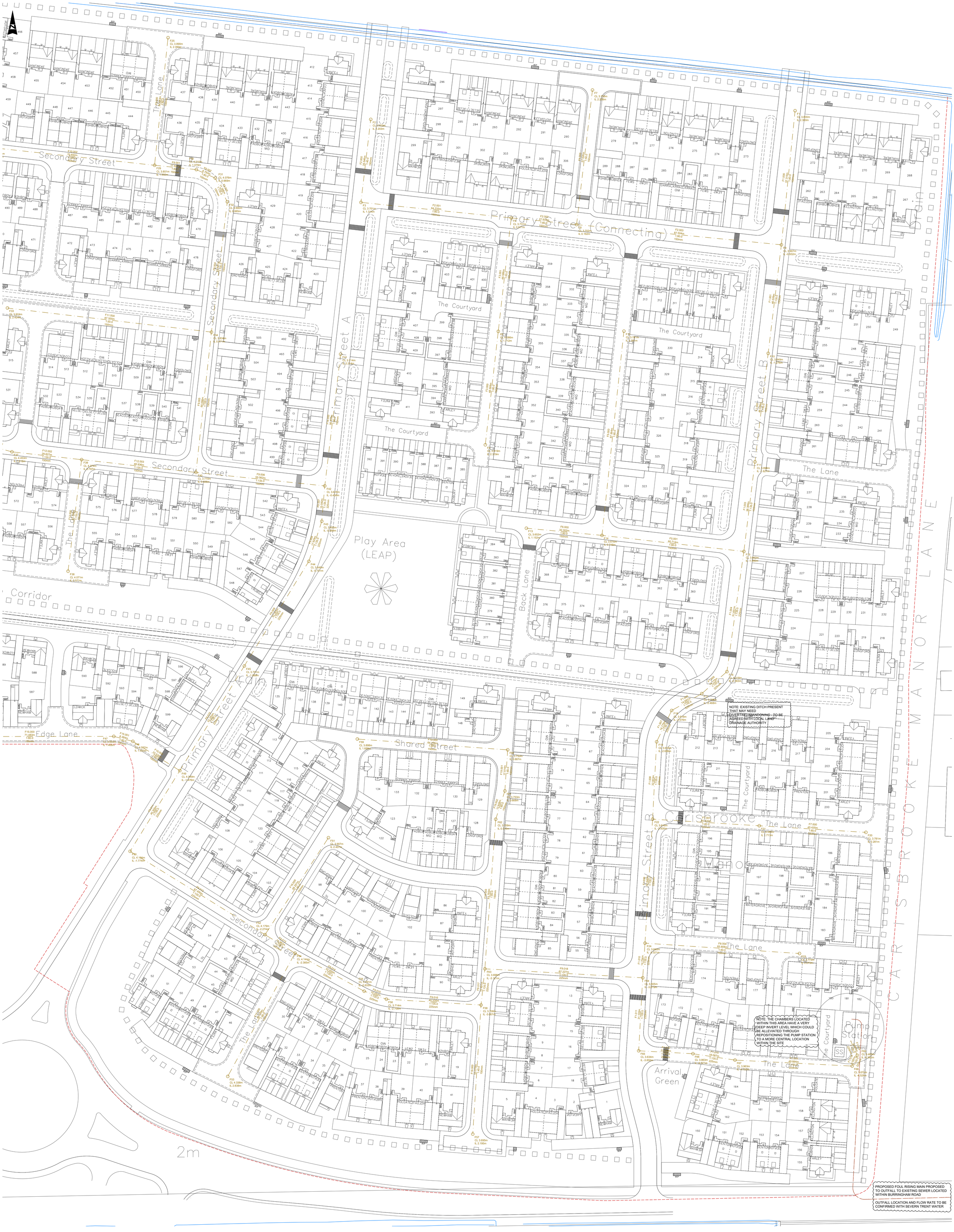
Drawing: Indicative Drainage Layout - Sheet 2

Role: CIVIL ENGINEER

Drawing Status: PRELIMINARY

Job. no. 45822 | Scale@ A0: 1:500 | Rev. P7

Project	Originator	Volume	Level	Type	Role	Number
KPLL	AWP	ZZ	XX	SK	C	0002



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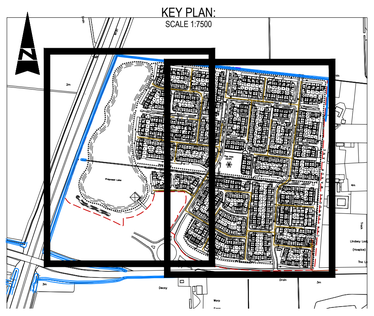
KEY:

- FOUL WATER SEWER
- FOUL WATER RISING MAIN
- SWALE
- WETLAND AREA
- SITE BOUNDARY

KEY PLAN:
SCALE 1:7500



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Rev	Description	Date	By	Chk	App
P5	REVISED TO SUIT LATEST SITE LAYOUT	26.05.23	JP	JAG	JAG
P4	REVISED TO SUIT LATEST SITE LAYOUT	26.05.23	JP	JAG	JAG
P3	REVISED SITE LAYOUT	09.02.22	JP	JMc	JAG
P2	REVISED SITE AND DRAINAGE LAYOUT	19.11.21	ERD	JP	JJS
P1	FIRST ISSUE	17.08.21	ERD	JP	JAG

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Project: Proposed Residential Development at Lincolnshire Lakes, Burringham Road

Client: Keepmoat Homes

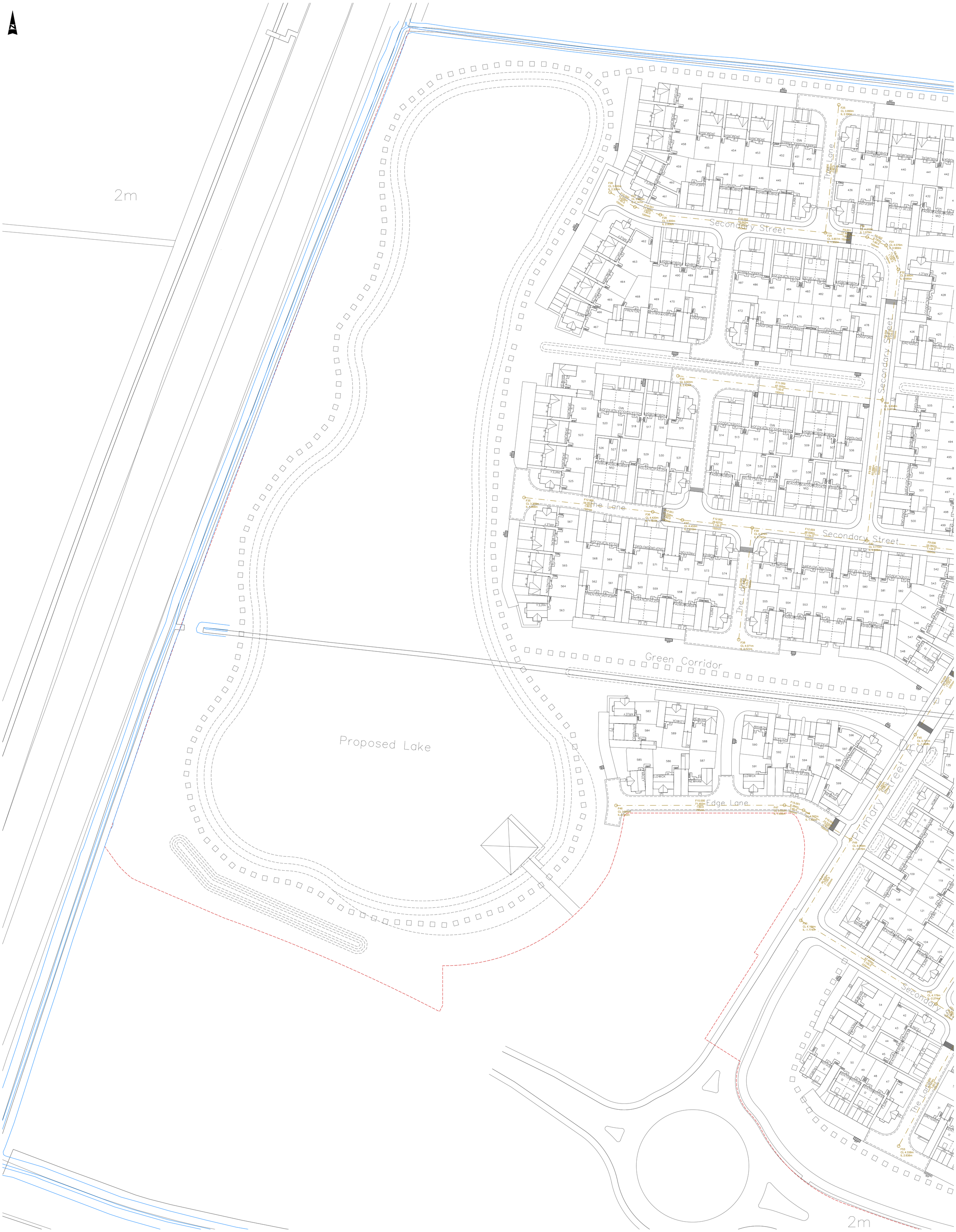
Drawing: Indicative Foul Drainage Layout - Sheet 1

Role: CIVIL ENGINEER

Drawing Status: PRELIMINARY

Job. no. 45822 | Scale@ A0: 1:500 | Rev. P5

Project	Originator	Volume	Level	Type	Role	Number
KPLL	AWP	ZZ	XX	SK	C	0004



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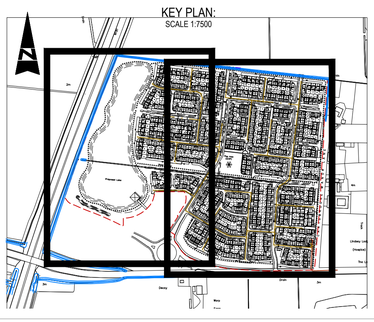
SCALE 1:7500



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Project: Proposed Residential Development at Lincolnshire Lakes, Burringham Road

Client: Keepmoat Homes

Drawing: Indicative Foul Drainage Layout - Sheet 2

Role: CIVIL ENGINEER

Drawing Status: PRELIMINARY

Job. no. 45822 | Scale@ A0: 1:500 | Rev. P5

Project	Originator	Volume	Level	Type	Role	Number
KPLL	AWP	ZZ	XX	SK	C	0005

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APPENDIX E

Hydraulic Model Calculations

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

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

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	55.846	0.256	218.1	0.196	5.00	0.0	0.600	o	525	Pipe/Conduit	
S1.001	28.142	0.129	218.2	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.000	41.707	0.245	170.0	0.077	5.00	0.0	0.600	o	300	Pipe/Conduit	
S2.001	61.077	0.188	325.0	0.244	0.00	0.0	0.600	o	450	Pipe/Conduit	
S2.002	5.524	0.017	325.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S2.003	43.175	0.086	500.0	0.102	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.002	11.093	0.027	410.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.000	46.955	0.276	170.0	0.098	5.00	0.0	0.600	o	375	Pipe/Conduit	
S3.001	80.726	0.312	258.8	0.287	0.00	0.0	0.600	o	450	Pipe/Conduit	
S3.002	8.357	0.032	258.8	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.003	51.553	0.103	500.0	0.122	0.00	0.0	0.600	o	600	Pipe/Conduit	
S4.000	7.225	0.014	500.0	0.061	5.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	7.586	0.312	24.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	10.00	5.62	1.907	0.196	0.0	0.0	0.0	1.51	327.4	5.3
S1.001	10.00	5.93	1.651	0.196	0.0	0.0	0.0	1.51	327.4	5.3
S2.000	10.00	5.58	2.283	0.077	0.0	0.0	0.0	1.20	85.0	2.1
S2.001	10.00	6.48	1.888	0.321	0.0	0.0	0.0	1.12	178.5	8.7
S2.002	10.00	6.56	1.625	0.321	0.0	0.0	0.0	1.24	267.8	8.7
S2.003	10.00	7.22	1.533	0.422	0.0	0.0	0.0	1.08	306.0	11.4
S1.002	10.00	7.38	1.446	0.619	0.0	0.0	0.0	1.20	338.3	16.8
S3.000	10.00	5.56	2.265	0.098	0.0	0.0	0.0	1.39	153.2	2.7
S3.001	10.00	6.63	1.914	0.384	0.0	0.0	0.0	1.26	200.2	10.4
S3.002	10.00	6.74	1.602	0.384	0.0	0.0	0.0	1.26	200.2	10.4
S1.003	10.00	8.17	1.419	1.125	0.0	0.0	0.0	1.08	306.0	30.5
S4.000	10.00	5.21	2.845	0.061	0.0	0.0	0.0	0.58	23.0	1.6
S4.001	10.00	5.26	2.831	0.061	0.0	0.0	0.0	2.67	106.0	1.6

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.002	12.174	0.024	500.0	0.078	0.00	0.0	0.600	o	375	Pipe/Conduit	
S4.003	4.484	0.185	24.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S4.004	22.902	0.046	500.0	0.022	0.00	0.0	0.600	o	450	Pipe/Conduit	
S4.005	13.945	0.574	24.3	0.017	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.004	32.025	0.078	410.0	0.144	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.005	7.912	0.019	410.0	0.009	0.00	0.0	0.600	o	600	Pipe/Conduit	
S5.000	13.580	0.834	16.3	0.045	5.00	0.0	0.600	o	225	Pipe/Conduit	
S1.006	18.115	0.044	410.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.007	41.953	0.084	500.0	0.122	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.008	5.652	0.011	495.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S6.000	53.376	0.218	245.0	0.243	5.00	0.0	0.600	o	300	Pipe/Conduit	
S6.001	24.524	0.075	325.0	0.087	0.00	0.0	0.600	o	375	Pipe/Conduit	
S6.002	11.529	0.028	410.0	0.054	0.00	0.0	0.600	o	450	Pipe/Conduit	
S6.003	49.088	0.828	59.3	0.056	0.00	0.0	0.600	o	525	Pipe/Conduit	
S7.000	38.527	0.227	170.0	0.057	5.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.002	10.00	5.51	2.368	0.139	0.0	0.0	0.0	0.80	88.7	3.8
S4.003	10.00	5.53	2.344	0.139	0.0	0.0	0.0	3.69	407.4	3.8
S4.004	10.00	5.95	2.084	0.161	0.0	0.0	0.0	0.90	143.5	4.3
S4.005	10.00	6.01	2.039	0.178	0.0	0.0	0.0	4.14	658.2	4.8
S1.004	10.00	8.62	1.315	1.446	0.0	0.0	0.0	1.20	338.3	39.2
S1.005	10.00	8.73	1.237	1.455	0.0	0.0	0.0	1.20	338.3	39.4
S5.000	10.00	5.07	2.426	0.045	0.0	0.0	0.0	3.26	129.6	1.2
S1.006	10.00	8.98	1.217	1.499	0.0	0.0	0.0	1.20	338.3	40.6
S1.007	10.00	9.63	1.173	1.621	0.0	0.0	0.0	1.08	306.0	43.9
S1.008	10.00	9.71	1.089	1.621	0.0	0.0	0.0	1.09	307.6	43.9
S6.000	10.00	5.89	2.526	0.243	0.0	0.0	0.0	1.00	70.7	6.6
S6.001	10.00	6.30	2.233	0.331	0.0	0.0	0.0	1.00	110.4	9.0
S6.002	10.00	6.49	2.083	0.384	0.0	0.0	0.0	1.00	158.7	10.4
S6.003	10.00	6.77	1.980	0.441	0.0	0.0	0.0	2.91	630.6	11.9
S7.000	10.00	5.64	2.219	0.057	0.0	0.0	0.0	1.00	39.8	1.5

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.000	32.850	0.710	46.3	0.109	5.00	0.0	0.600	o	300	Pipe/Conduit	
S7.001	65.676	0.540	121.6	0.108	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.009	5.376	0.011	495.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.010	76.929	0.077	1000.0	0.288	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S1.011	9.023	0.018	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.012	57.119	0.057	1000.0	0.246	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S9.000	58.042	0.237	245.0	0.185	5.00	0.0	0.600	o	300	Pipe/Conduit	
S9.001	21.894	0.568	38.5	0.100	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.002	49.380	0.152	325.0	0.041	0.00	0.0	0.600	o	375	Pipe/Conduit	
S9.003	20.609	0.052	396.3	0.092	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.013	17.356#	0.014	1239.7	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S10.000	5.519	0.011	500.0	0.013	5.00	0.0	0.600	o	225	Pipe/Conduit	
S10.001	7.452	0.044	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.002	62.304	0.125	500.0	0.103	0.00	0.0	0.600	o	300	Pipe/Conduit	
S10.003	10.252	0.787	13.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S10.004	37.178	0.074	500.0	0.163	0.00	0.0	0.600	\/	-1	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S8.000	10.00	5.24	2.627	0.109	0.0	0.0	0.0	2.32	163.8	2.9
S7.001	10.00	6.41	1.917	0.274	0.0	0.0	0.0	1.42	100.7	7.4
S1.009	10.00	9.80	1.077	2.336	0.0	0.0	0.0	1.09	307.5	63.3
S1.010	10.00	10.34	1.066	2.624	0.0	0.0	0.0	2.36	16352.1	71.1
S1.011	10.00	10.48	0.989	2.624	0.0	0.0	0.0	1.08	306.0	71.1
S1.012	10.00	10.88	0.971	2.870	0.0	0.0	0.0	2.36	16352.2	77.7
S9.000	10.00	5.97	2.223	0.185	0.0	0.0	0.0	1.00	70.7	5.0
S9.001	10.00	6.09	1.911	0.285	0.0	0.0	0.0	2.93	323.2	7.7
S9.002	10.00	6.92	1.343	0.326	0.0	0.0	0.0	1.00	110.4	8.8
S9.003	10.00	7.25	1.116	0.417	0.0	0.0	0.0	1.02	161.4	11.3
S1.013	10.00	11.30	0.914	3.287	0.0	0.0	0.0	0.68	193.1	89.0
S10.000	10.00	5.16	2.428	0.013	0.0	0.0	0.0	0.58	23.0	0.3
S10.001	10.00	5.28	2.417	0.013	0.0	0.0	0.0	1.00	39.8	0.3
S10.002	10.00	6.77	2.298	0.116	0.0	0.0	0.0	0.70	49.2	3.1
S10.003	10.00	6.81	2.174	0.116	0.0	0.0	0.0	4.38	309.5	3.1
S10.004	10.00	7.00	1.387	0.279	0.0	0.0	0.0	3.35	23162.3	7.6

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S11.000	25.092	0.148	170.0	0.069	5.00	0.0	0.600	o	225	Pipe/Conduit	
S11.001	20.903	0.085	245.0	0.050	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.002	21.379	0.087	245.0	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.000	38.850	0.727	53.4	0.048	5.00	0.0	0.600	o	225	Pipe/Conduit	
S11.003	18.418	0.075	245.0	0.032	0.00	0.0	0.600	o	300	Pipe/Conduit	
S11.004	27.275	0.088	310.0	0.094	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.005	31.849	0.462	68.9	0.073	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.000	26.182	0.186	140.4	0.125	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.001	46.712	0.333	140.4	0.132	0.00	0.0	0.600	o	375	Pipe/Conduit	
S14.000	26.418	0.155	170.4	0.188	5.00	0.0	0.600	o	375	Pipe/Conduit	
S14.001	23.230	0.095	244.5	0.084	0.00	0.0	0.600	o	375	Pipe/Conduit	
S14.002	8.124	0.033	245.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S13.002	17.918	0.073	245.0	0.009	0.00	0.0	0.600	o	450	Pipe/Conduit	
S15.000	25.088	0.278	90.1	0.098	5.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S11.000	10.00	5.42	2.358	0.069	0.0	0.0	0.0	1.00	39.8	1.9
S11.001	10.00	5.77	2.135	0.118	0.0	0.0	0.0	1.00	70.7	3.2
S11.002	10.00	6.12	2.050	0.127	0.0	0.0	0.0	1.00	70.7	3.4
S12.000	10.00	5.36	2.765	0.048	0.0	0.0	0.0	1.79	71.3	1.3
S11.003	10.00	6.43	1.963	0.208	0.0	0.0	0.0	1.00	70.7	5.6
S11.004	10.00	6.87	1.813	0.302	0.0	0.0	0.0	1.02	113.1	8.2
S11.005	10.00	7.12	1.725	0.375	0.0	0.0	0.0	2.18	241.3	10.2
S13.000	10.00	5.40	2.558	0.125	0.0	0.0	0.0	1.10	43.8	3.4
S13.001	10.00	5.91	2.222	0.257	0.0	0.0	0.0	1.53	168.7	7.0
S14.000	10.00	5.32	2.172	0.188	0.0	0.0	0.0	1.38	153.0	5.1
S14.001	10.00	5.65	2.017	0.272	0.0	0.0	0.0	1.15	127.5	7.4
S14.002	10.00	5.76	1.847	0.272	0.0	0.0	0.0	1.29	205.9	7.4
S13.002	10.00	6.14	1.814	0.538	0.0	0.0	0.0	1.29	205.9	14.6
S15.000	10.00	5.30	2.460	0.098	0.0	0.0	0.0	1.38	54.8	2.7

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S15.001	19.513	0.217	90.1	0.008	0.00	0.0	0.600	o	300	Pipe/Conduit	
S13.003	36.763	0.150	245.0	0.110	0.00	0.0	0.600	o	450	Pipe/Conduit	
S13.004	33.396	0.103	325.0	0.058	0.00	0.0	0.600	o	450	Pipe/Conduit	
S13.005	21.442	0.066	325.0	0.007	0.00	0.0	0.600	o	450	Pipe/Conduit	
S16.000	46.840	0.783	59.8	0.153	5.00	0.0	0.600	o	225	Pipe/Conduit	
S13.006	33.680	0.242	139.2	0.113	0.00	0.0	0.600	o	450	Pipe/Conduit	
S17.000	10.611	0.184	57.7	0.037	5.00	0.0	0.600	o	300	Pipe/Conduit	
S18.000	94.552	0.291	325.0	0.386	5.00	0.0	0.600	o	450	Pipe/Conduit	
S17.001	22.767	0.056	410.0	0.087	0.00	0.0	0.600	o	525	Pipe/Conduit	
S17.002	14.445	0.035	410.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S17.003	9.069	0.018	500.0	0.068	0.00	0.0	0.600	o	525	Pipe/Conduit	
S17.004	5.883	0.014	410.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S19.000	63.743	0.562	113.4	0.147	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S15.001	10.00	5.50	2.107	0.106	0.0	0.0	0.0	1.66	117.1	2.9
S13.003	10.00	6.61	1.740	0.754	0.0	0.0	0.0	1.29	205.9	20.4
S13.004	10.00	7.11	1.590	0.812	0.0	0.0	0.0	1.12	178.5	22.0
S13.005	10.00	7.42	1.487	0.820	0.0	0.0	0.0	1.12	178.5	22.2
S16.000	10.00	5.46	2.429	0.153	0.0	0.0	0.0	1.69	67.4	4.1
S13.006	10.00	7.75	1.421	1.086	0.0	0.0	0.0	1.72	273.8	29.4
S17.000	10.00	5.09	2.067	0.037	0.0	0.0	0.0	2.07	146.6	1.0
S18.000	10.00	6.40	2.024	0.386	0.0	0.0	0.0	1.12	178.5	10.5
S17.001	10.00	6.75	1.658	0.510	0.0	0.0	0.0	1.10	238.1	13.8
S17.002	10.00	6.97	1.602	0.510	0.0	0.0	0.0	1.10	238.1	13.8
S17.003	10.00	7.12	1.567	0.579	0.0	0.0	0.0	0.99	215.4	15.7
S17.004	10.00	7.21	1.549	0.579	0.0	0.0	0.0	1.10	238.1	15.7
S19.000	10.00	5.72	2.322	0.147	0.0	0.0	0.0	1.48	104.3	4.0

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S17.005	5.349	0.011	486.3	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S17.006	41.521	0.083	500.0	0.105	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.007	5.782	0.012	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S20.000	88.579	0.531	166.8	0.279	5.00	0.0	0.600	o	375	Pipe/Conduit	
S17.008	5.814	0.012	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.009	24.848	0.050	500.0	0.139	0.00	0.0	0.600	o	600	Pipe/Conduit	
S17.010	23.822	0.048	496.3	0.024	0.00	0.0	0.600	o	750	Pipe/Conduit	
S21.000	51.709	0.103	500.0	0.204	5.00	0.0	0.600	o	300	Pipe/Conduit	
S21.001	28.495	0.220	129.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S22.000	44.930	0.090	500.0	0.210	5.00	0.0	0.600	o	600	Pipe/Conduit	
S22.001	16.581	0.144	115.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S23.000	48.449	0.097	500.0	0.206	5.00	0.0	0.600	o	600	Pipe/Conduit	
S23.001	15.348	0.272	56.4	0.026	0.00	0.0	0.600	o	600	Pipe/Conduit	
S24.000	46.094	0.092	500.0	0.135	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S17.005	10.00	7.30	1.535	0.726	0.0	0.0	0.0	1.01	218.4	19.7
S17.006	10.00	7.94	1.449	0.831	0.0	0.0	0.0	1.08	306.0	22.5
S17.007	10.00	8.03	1.366	0.831	0.0	0.0	0.0	1.08	306.0	22.5
S20.000	10.00	6.05	2.110	0.279	0.0	0.0	0.0	1.40	154.6	7.6
S17.008	10.00	8.12	1.354	1.110	0.0	0.0	0.0	1.08	306.0	30.1
S17.009	10.00	8.50	1.342	1.249	0.0	0.0	0.0	1.08	306.0	33.8
S17.010	10.00	8.82	1.143	1.273	0.0	0.0	0.0	1.25	551.9	34.5
S21.000	10.00	6.24	2.568	0.204	0.0	0.0	0.0	0.70	49.2	5.5
S21.001	10.00	6.58	2.465	0.204	0.0	0.0	0.0	1.38	97.5	5.5
S22.000	10.00	5.69	2.074	0.210	0.0	0.0	0.0	1.08	306.0	5.7
S22.001	10.00	5.81	1.984	0.210	0.0	0.0	0.0	2.27	641.5	5.7
S23.000	10.00	5.75	2.284	0.206	0.0	0.0	0.0	1.08	306.0	5.6
S23.001	10.00	5.82	2.187	0.232	0.0	0.0	0.0	3.25	917.9	6.3
S24.000	10.00	6.10	2.232	0.135	0.0	0.0	0.0	0.70	49.2	3.6

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S22.002	44.095	0.088	500.0	0.125	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.003	7.750	0.024	325.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.004	16.291	0.033	500.0	0.092	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.005	8.089	0.069	117.2	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.006	11.506	0.023	500.0	0.028	0.00	0.0	0.600	o	600	Pipe/Conduit	
S25.000	54.988	0.224	245.5	0.186	5.00	0.0	0.600	o	525	Pipe/Conduit	
S25.001	17.565	0.072	244.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S22.007	8.139	0.016	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.008	19.022	0.038	500.0	0.072	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.009	11.577	0.122	94.9	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.010	18.045	0.036	500.0	0.154	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.011	5.193	0.010	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.012	19.690	0.039	500.0	0.089	0.00	0.0	0.600	o	600	Pipe/Conduit	
S22.013	21.200	0.096	220.8	0.014	0.00	0.0	0.600	o	750	Pipe/Conduit	
S17.011	5.538	0.055	100.7	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S17.012	60.554	0.061	1000.0	0.000	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S26.000	72.298	0.518	139.6	0.256	5.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S22.002	10.00	6.78	1.840	0.702	0.0	0.0	0.0	1.08	306.0	19.0
S22.003	10.00	6.88	1.752	0.702	0.0	0.0	0.0	1.35	380.4	19.0
S22.004	10.00	7.13	1.728	0.794	0.0	0.0	0.0	1.08	306.0	21.5
S22.005	10.00	7.19	1.695	0.794	0.0	0.0	0.0	2.25	635.7	21.5
S22.006	10.00	7.37	1.626	0.822	0.0	0.0	0.0	1.08	306.0	22.3
S25.000	10.00	5.64	1.975	0.186	0.0	0.0	0.0	1.43	308.5	5.0
S25.001	10.00	5.85	1.751	0.186	0.0	0.0	0.0	1.43	309.5	5.0
S22.007	10.00	7.49	1.603	1.008	0.0	0.0	0.0	1.08	306.0	27.3
S22.008	10.00	7.78	1.587	1.080	0.0	0.0	0.0	1.08	306.0	29.2
S22.009	10.00	7.86	1.549	1.080	0.0	0.0	0.0	2.50	707.0	29.2
S22.010	10.00	8.14	1.427	1.234	0.0	0.0	0.0	1.08	306.0	33.4
S22.011	10.00	8.22	1.391	1.234	0.0	0.0	0.0	1.08	306.0	33.4
S22.012	10.00	8.52	1.380	1.322	0.0	0.0	0.0	1.08	306.0	35.8
S22.013	10.00	8.71	1.191	1.337	0.0	0.0	0.0	1.88	830.2	36.2
S17.011	10.00	8.85	1.245	2.814	0.0	0.0	0.0	2.79	1232.2	76.2
S17.012	10.00	9.28	1.239	2.814	0.0	0.0	0.0	2.36	16352.1	76.2
S26.000	10.00	5.91	2.304	0.256	0.0	0.0	0.0	1.33	93.9	6.9

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S26.001	52.870	0.379	139.5	0.162	0.00	0.0	0.600	o	450	Pipe/Conduit	
S26.002	11.131	0.080	139.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S13.007	65.307	0.065	1000.0	0.000	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S11.006	14.743	0.015	1000.0	0.000	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S10.005	14.579	0.015	1000.0	0.000	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S10.006	11.200	0.022	500.0	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S27.000	59.977	0.245	245.0	0.235	5.00	0.0	0.600	o	300	Pipe/Conduit	
S27.001	65.543	0.202	325.0	0.122	0.00	0.0	0.600	o	375	Pipe/Conduit	
S27.002	10.608	0.033	325.0	0.013	0.00	0.0	0.600	o	375	Pipe/Conduit	
S27.003	24.633	0.049	500.0	0.089	0.00	0.0	0.600	o	450	Pipe/Conduit	
S27.004	7.391	0.018	410.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S27.005	8.834	0.018	500.0	0.051	0.00	0.0	0.600	o	450	Pipe/Conduit	
S27.006	7.508	0.018	410.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S27.007	22.575	0.046	495.0	0.107	0.00	0.0	0.600	o	525	Pipe/Conduit	
S27.008	26.993	0.693	39.0	0.000	0.00	0.0	0.600	o	525	Pipe/Conduit	
S10.007	11.607	0.023	500.0	0.026	0.00	0.0	0.600	o	750	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S26.001	10.00	6.42	1.636	0.418	0.0	0.0	0.0	1.72	273.5	11.3
S26.002	10.00	6.53	1.257	0.418	0.0	0.0	0.0	1.72	273.8	11.3
S13.007	10.00	9.74	1.179	4.318	0.0	0.0	0.0	2.36	16352.1	116.9
S11.006	10.00	9.84	1.113	4.693	0.0	0.0	0.0	2.36	16352.1	127.1
S10.005	10.00	9.94	1.313	4.971	0.0	0.0	0.0	2.36	16352.0	134.6
S10.006	10.00	10.09	1.298	4.971	0.0	0.0	0.0	1.24	549.9	134.6
S27.000	10.00	6.00	2.832	0.235	0.0	0.0	0.0	1.00	70.7	6.4
S27.001	10.00	7.09	2.512	0.356	0.0	0.0	0.0	1.00	110.4	9.7
S27.002	10.00	7.27	2.311	0.370	0.0	0.0	0.0	1.00	110.4	10.0
S27.003	10.00	7.72	2.203	0.458	0.0	0.0	0.0	0.90	143.5	12.4
S27.004	10.00	7.85	2.154	0.458	0.0	0.0	0.0	1.00	158.7	12.4
S27.005	10.00	8.01	2.136	0.509	0.0	0.0	0.0	0.90	143.5	13.8
S27.006	10.00	8.14	2.118	0.509	0.0	0.0	0.0	1.00	158.7	13.8
S27.007	10.00	8.51	2.025	0.616	0.0	0.0	0.0	1.00	216.5	16.7
S27.008	10.00	8.64	1.979	0.616	0.0	0.0	0.0	3.60	778.7	16.7
S10.007	10.00	10.25	1.276	5.614	0.0	0.0	0.0	1.24	549.9	152.0

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.008	75.293	0.075	1000.0	0.000	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S28.000	61.109	0.249	245.0	0.266	5.00	0.0	0.600	o	300	Pipe/Conduit	
S28.001	37.605	0.116	325.0	0.080	0.00	0.0	0.600	o	375	Pipe/Conduit	
S28.002	48.858	0.129	378.7	0.183	0.00	0.0	0.600	o	450	Pipe/Conduit	
S29.000	16.494	0.097	170.0	0.151	5.00	0.0	0.600	o	225	Pipe/Conduit	
S28.003	19.411	1.058	18.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S30.000	45.174	0.270	167.3	0.161	5.00	0.0	0.600	o	225	Pipe/Conduit	
S31.000	15.617	0.092	170.0	0.073	5.00	0.0	0.600	o	225	Pipe/Conduit	
S31.001	30.341	0.178	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S30.001	47.784	1.059	45.1	0.053	0.00	0.0	0.600	o	300	Pipe/Conduit	
S10.009	71.459	0.071	1000.0	0.000	0.00	0.0	0.600	\/	-1	Pipe/Conduit	
S10.010	29.876#	0.107	279.2	0.000	0.00	0.0	0.600	o	750	Pipe/Conduit	
S1.014	7.626	0.031	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S10.008	10.00	10.78	1.253	5.614	0.0	0.0	0.0	2.36	16352.1	152.0
S28.000	10.00	6.02	2.881	0.266	0.0	0.0	0.0	1.00	70.7	7.2
S28.001	10.00	6.65	2.557	0.346	0.0	0.0	0.0	1.00	110.4	9.4
S28.002	10.00	7.43	2.366	0.529	0.0	0.0	0.0	1.04	165.2	14.3
S29.000	10.00	5.27	2.559	0.151	0.0	0.0	0.0	1.00	39.8	4.1
S28.003	10.00	7.50	2.237	0.680	0.0	0.0	0.0	4.76	757.7	18.4
S30.000	10.00	5.75	2.583	0.161	0.0	0.0	0.0	1.01	40.1	4.3
S31.000	10.00	5.26	2.583	0.073	0.0	0.0	0.0	1.00	39.8	2.0
S31.001	10.00	5.77	2.491	0.073	0.0	0.0	0.0	1.00	39.8	2.0
S30.001	10.00	6.11	2.238	0.287	0.0	0.0	0.0	2.35	165.9	7.8
S10.009	10.00	11.28	1.179	6.581	0.0	0.0	0.0	2.36	16352.1	178.2
S10.010	10.00	11.58	1.107	6.581	0.0	0.0	0.0	1.67	737.7	178.2
S1.014	10.00	11.71	0.900	9.868	0.0	0.0	0.0	1.00	70.7«	267.3

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.015	8.065	0.033	245.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.015	10.00	11.84	0.869	9.868	0.0	0.0	0.0	1.00	70.7«	267.3

Conduit Sections for Storm

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \/ open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m²)
-1	\/	1000	2000	39.1		3.771	6.922

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S116, DS/PN: S1.015, Volume (m³): 3.8

Unit Reference	MD-SHE-0264-3700-0600-3700
Design Head (m)	0.600
Design Flow (l/s)	37.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	264
Invert Level (m)	0.869
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.600	37.0
Flush-Flo™	0.362	37.0
Kick-Flo®	0.528	34.8
Mean Flow over Head Range	-	27.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	8.4	1.200	51.6	3.000	80.5	7.000	120.8
0.200	27.2	1.400	55.6	3.500	86.8	7.500	125.1
0.300	36.6	1.600	59.3	4.000	92.6	8.000	129.3
0.400	36.9	1.800	62.8	4.500	98.1	8.500	133.3
0.500	35.5	2.000	66.1	5.000	103.3	9.000	137.3
0.600	37.0	2.200	69.2	5.500	108.2	9.500	141.1
0.800	42.5	2.400	72.2	6.000	112.9		
1.000	47.3	2.600	75.1	6.500	116.3		

Storage Structures for Storm

Tank or Pond Manhole: S115, DS/PN: S1.014

Invert Level (m) 0.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28597.0	1.800	33519.0

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S79	15 Winter	1	+0%	100/15 Summer	100/15 Winter		
S1.001	S80	15 Winter	1	+0%	100/15 Summer			
S2.000	S81	15 Winter	1	+0%	100/15 Summer			
S2.001	S82	15 Winter	1	+0%	100/15 Summer			
S2.002	S83	15 Winter	1	+0%	30/15 Summer			
S2.003	S84(SW)	15 Winter	1	+0%	30/15 Summer			
S1.002	S85	15 Winter	1	+0%	30/15 Summer			
S3.000	S86	15 Winter	1	+0%	100/15 Summer			
S3.001	S87	15 Winter	1	+0%	100/15 Summer			
S3.002	S88	15 Winter	1	+0%	30/15 Summer			
S1.003	S89(SW)	15 Winter	1	+0%	30/15 Summer			
S4.000	S90(SW)	15 Winter	1	+0%	100/15 Summer			
S4.001	S91	15 Winter	1	+0%	100/15 Summer			
S4.002	S92(SW)	15 Winter	1	+0%	100/15 Summer			
S4.003	S93	15 Winter	1	+0%	100/15 Summer			
S4.004	S94(SW)	15 Winter	1	+0%	100/15 Summer			
S4.005	S95	15 Winter	1	+0%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S79	2.010	-0.422	0.000	0.08			24.4	OK	2
S1.001	S80	1.769	-0.407	0.000	0.08			22.9	OK	
S2.000	S81	2.353	-0.230	0.000	0.12			9.7	OK	
S2.001	S82	2.030	-0.308	0.000	0.21			34.6	OK	
S2.002	S83	1.791	-0.359	0.000	0.22			34.8	OK	
S2.003	S84(SW)	1.768	-0.365	0.000	0.16			42.8	OK	
S1.002	S85	1.738	-0.308	0.000	0.30			56.8	OK	
S3.000	S86	2.340	-0.300	0.000	0.09			12.2	OK	
S3.001	S87	2.059	-0.304	0.000	0.22			40.8	OK	
S3.002	S88	1.772	-0.280	0.000	0.30			40.5	OK	
S1.003	S89(SW)	1.725	-0.294	0.000	0.38			102.8	OK	
S4.000	S90(SW)	2.944	-0.126	0.000	0.39			7.6	OK	
S4.001	S91	2.878	-0.178	0.000	0.10			7.6	OK	
S4.002	S92(SW)	2.510	-0.233	0.000	0.30			16.0	OK	
S4.003	S93	2.422	-0.297	0.000	0.10			16.1	OK	
S4.004	S94(SW)	2.205	-0.330	0.000	0.16			18.0	OK	
S4.005	S95	2.101	-0.388	0.000	0.05			19.8	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.004	S96	15 Winter	1	+0%	30/15 Summer			
S1.005	S97	15 Winter	1	+0%	30/15 Summer			
S5.000	S98	15 Winter	1	+0%	100/15 Summer			
S1.006	S99	15 Winter	1	+0%	30/15 Summer			
S1.007	S100(SW)	15 Winter	1	+0%	30/15 Summer			
S1.008	S101	15 Winter	1	+0%	30/15 Summer			
S6.000	S102	15 Winter	1	+0%	30/15 Summer			
S6.001	S105	15 Winter	1	+0%	100/15 Summer			
S6.002	S106	15 Winter	1	+0%	100/15 Summer			
S6.003	S107	15 Winter	1	+0%	100/15 Summer			
S7.000	S108	15 Winter	1	+0%	100/15 Summer			
S8.000	S109	15 Winter	1	+0%	100/15 Summer			
S7.001	S110	15 Winter	1	+0%	100/15 Summer			
S1.009	S111	15 Winter	1	+0%	30/15 Summer			
S1.010	S112(SW)	30 Winter	1	+0%				
S1.011	S113	30 Winter	1	+0%	30/15 Summer			
S1.012	S110(SW)	30 Winter	1	+0%				
S9.000	S111	15 Winter	1	+0%	100/15 Summer			
S9.001	S112	15 Winter	1	+0%				
S9.002	S113	15 Winter	1	+0%	30/15 Winter			
S9.003	S114	30 Winter	1	+0%	30/15 Summer			
S1.013	S111	30 Winter	1	+0%	30/15 Summer			
S10.000	S61(SW)	15 Winter	1	+0%	100/15 Summer			
S10.001	S62	15 Winter	1	+0%	100/15 Summer			
S10.002	S63(SW)	15 Winter	1	+0%	100/15 Summer			
S10.003	S64	15 Winter	1	+0%	100/15 Winter			
S10.004	S65(SW)	30 Winter	1	+0%				
S11.000	S54	15 Winter	1	+0%	100/15 Summer			
S11.001	S55	15 Winter	1	+0%	100/15 Summer			
S11.002	S56	15 Winter	1	+0%	100/15 Summer			
S12.000	S57	15 Winter	1	+0%				
S11.003	S58	15 Winter	1	+0%	30/30 Winter			
S11.004	S59	15 Winter	1	+0%	30/30 Summer			
S11.005	S60	15 Winter	1	+0%	30/15 Winter			
S13.000	S41	15 Winter	1	+0%	100/15 Summer	100/15 Winter		
S13.001	S42	15 Winter	1	+0%	30/30 Winter	100/15 Winter		
S14.000	S43	15 Winter	1	+0%	30/15 Winter	100/15 Winter		
S14.001	S44	15 Winter	1	+0%	30/15 Summer	100/15 Winter		
S14.002	S45	60 Winter	1	+0%	30/15 Summer			
S13.002	S46	60 Winter	1	+0%	30/15 Summer			
S15.000	S47	15 Winter	1	+0%	100/15 Summer			
S15.001	S48	15 Winter	1	+0%	30/15 Winter			
S13.003	S49	60 Winter	1	+0%	30/15 Summer			
S13.004	S50	60 Winter	1	+0%	30/15 Summer			
S13.005	S51	30 Winter	1	+0%	1/30 Winter			
S16.000	S52	15 Winter	1	+0%	100/15 Summer			
S13.006	S53	30 Winter	1	+0%	1/30 Winter			
S17.000	S1	15 Winter	1	+0%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.004	S96	1.659	-0.256	0.000	0.44			122.2	OK
S1.005	S97	1.610	-0.226	0.000	0.69			120.3	OK
S5.000	S98	2.458	-0.193	0.000	0.05			5.6	OK
S1.006	S99	1.585	-0.232	0.000	0.52			121.6	OK
S1.007	S100(SW)	1.551	-0.222	0.000	0.48			125.5	OK
S1.008	S101	1.492	-0.197	0.000	0.62			130.3	OK
S6.000	S102	2.670	-0.156	0.000	0.44			29.6	OK
S6.001	S105	2.399	-0.209	0.000	0.40			38.1	OK
S6.002	S106	2.293	-0.240	0.000	0.44			43.6	OK
S6.003	S107	2.083	-0.421	0.000	0.09			48.7	OK
S7.000	S108	2.286	-0.158	0.000	0.19			7.1	OK
S8.000	S109	2.688	-0.239	0.000	0.09			13.8	OK
S7.001	S110	2.038	-0.179	0.000	0.34			32.3	OK
S1.009	S111	1.480	-0.196	0.000	0.79			168.2	OK
S1.010	S112(SW)	1.467	-1.599	0.000	0.01			178.5	OK
S1.011	S113	1.447	-0.142	0.000	0.57			150.7	OK*
S1.012	S110(SW)	1.432	-1.539	0.000	0.01			159.9	OK
S9.000	S111	2.346	-0.177	0.000	0.35			23.5	OK
S9.001	S112	1.999	-0.287	0.000	0.12			33.8	OK
S9.002	S113	1.502	-0.216	0.000	0.36			37.0	OK
S9.003	S114	1.426	-0.140	0.000	0.27			34.9	OK
S1.013	S111	1.412	-0.102	0.000	1.12			163.3	OK*
S10.000	S61(SW)	2.468	-0.185	0.000	0.07			1.6	OK
S10.001	S62	2.450	-0.192	0.000	0.05			1.6	OK
S10.002	S63(SW)	2.404	-0.194	0.000	0.25			11.9	OK
S10.003	S64	2.218	-0.256	0.000	0.05			11.9	OK
S10.004	S65(SW)	1.752	-1.635	0.000	0.00			22.7	OK
S11.000	S54	2.433	-0.150	0.000	0.24			8.6	OK
S11.001	S55	2.232	-0.203	0.000	0.23			14.0	OK
S11.002	S56	2.151	-0.199	0.000	0.24			14.6	OK
S12.000	S57	2.811	-0.179	0.000	0.09			6.0	OK
S11.003	S58	2.093	-0.170	0.000	0.39			23.6	OK
S11.004	S59	1.962	-0.226	0.000	0.33			32.6	OK
S11.005	S60	1.833	-0.266	0.000	0.18			39.6	OK
S13.000	S41	2.656	-0.127	0.000	0.39			15.7	OK
S13.001	S42	2.334	-0.263	0.000	0.19			29.7	OK
S14.000	S43	2.279	-0.268	0.000	0.18			23.4	OK
S14.001	S44	2.157	-0.235	0.000	0.30			32.4	OK
S14.002	S45	2.070	-0.227	0.000	0.13			17.8	OK
S13.002	S46	2.068	-0.196	0.000	0.21			35.0	OK
S15.000	S47	2.536	-0.149	0.000	0.24			12.2	OK
S15.001	S48	2.179	-0.228	0.000	0.13			13.2	OK
S13.003	S49	2.056	-0.134	0.000	0.27			48.5	OK
S13.004	S50	2.018	-0.022	0.000	0.31			48.0	OK
S13.005	S51	1.938	0.000	0.000	0.44			63.9	SURCHARGED
S16.000	S52	2.514	-0.140	0.000	0.30			19.2	OK
S13.006	S53	1.875	0.004	0.000	0.33			78.9	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S17.000	S1	2.107	-0.260	0.000	0.04			4.7	OK

PN	US/MH Name	Level Exceeded
S1.004	S96	
S1.005	S97	
S5.000	S98	
S1.006	S99	
S1.007	S100(SW)	
S1.008	S101	
S6.000	S102	
S6.001	S105	
S6.002	S106	
S6.003	S107	
S7.000	S108	
S8.000	S109	
S7.001	S110	
S1.009	S111	
S1.010	S112(SW)	
S1.011	S113	
S1.012	S110(SW)	
S9.000	S111	
S9.001	S112	
S9.002	S113	
S9.003	S114	
S1.013	S111	
S10.000	S61(SW)	
S10.001	S62	
S10.002	S63(SW)	
S10.003	S64	
S10.004	S65(SW)	
S11.000	S54	
S11.001	S55	
S11.002	S56	
S12.000	S57	
S11.003	S58	
S11.004	S59	
S11.005	S60	
S13.000	S41	1
S13.001	S42	1
S14.000	S43	3
S14.001	S44	2
S14.002	S45	
S13.002	S46	
S15.000	S47	

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

PN	US/MH Name	Level Exceeded
S15.001	S48	
S13.003	S49	
S13.004	S50	
S13.005	S51	
S16.000	S52	
S13.006	S53	
S17.000	S1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S18.000	S2	15 Winter	1	+0%	100/15 Summer			
S17.001	S3	60 Winter	1	+0%	30/15 Summer			
S17.002	S4	60 Winter	1	+0%	30/15 Summer			
S17.003	S5(SW)	60 Winter	1	+0%	30/15 Summer			
S17.004	S6	60 Winter	1	+0%	30/15 Summer			
S19.000	S7	15 Winter	1	+0%	100/15 Summer			
S17.005	S8	60 Winter	1	+0%	30/15 Summer			
S17.006	S9(SW)	60 Winter	1	+0%	30/15 Summer			
S17.007	S10	30 Winter	1	+0%	30/15 Summer			
S20.000	S12	15 Winter	1	+0%	100/15 Summer			
S17.008	S13(SW)	30 Winter	1	+0%	30/15 Summer			
S17.009	S14	60 Winter	1	+0%	30/15 Summer			
S17.010	S15	60 Winter	1	+0%	30/15 Summer			
S21.000	S16(SW)	15 Winter	1	+0%	30/15 Summer			
S21.001	S17	15 Winter	1	+0%	100/15 Summer			
S22.000	S21(SW)	15 Winter	1	+0%	100/15 Summer	100/30 Winter		
S22.001	S22	15 Winter	1	+0%	100/15 Summer			
S23.000	S23(SW)	15 Winter	1	+0%	100/15 Summer			
S23.001	S24	15 Winter	1	+0%	100/15 Summer			
S24.000	S25(SW)	15 Winter	1	+0%	100/15 Summer			
S22.002	S26(SW)	15 Winter	1	+0%	30/30 Winter			
S22.003	S27	15 Winter	1	+0%	30/30 Summer			
S22.004	S28(SW)	30 Winter	1	+0%	30/15 Winter			
S22.005	S29	30 Winter	1	+0%	30/15 Winter			
S22.006	S30(SW)	30 Winter	1	+0%	30/15 Summer			
S25.000	S31	15 Winter	1	+0%	100/15 Summer			
S25.001	S32	30 Winter	1	+0%	30/30 Summer			
S22.007	S33	30 Winter	1	+0%	30/15 Summer			
S22.008	S34(SW)	30 Winter	1	+0%	30/15 Summer			
S22.009	S35	30 Winter	1	+0%	30/15 Summer			
S22.010	S36(SW)	30 Winter	1	+0%	30/15 Summer			
S22.011	S37	30 Winter	1	+0%	30/15 Summer			
S22.012	S38(SW)	30 Winter	1	+0%	30/15 Summer			
S22.013	S39	30 Winter	1	+0%	30/15 Summer			
S17.011	S40	30 Winter	1	+0%	30/15 Summer			
S17.012	S65	30 Winter	1	+0%				
S26.000	S102	15 Winter	1	+0%	100/15 Summer			
S26.001	S103	30 Winter	1	+0%	30/15 Summer			
S26.002	S104	30 Winter	1	+0%	1/15 Summer			
S13.007	S66	30 Winter	1	+0%				
S11.006	S67	30 Winter	1	+0%				
S10.005	S68	30 Winter	1	+0%				
S10.006	S66	30 Winter	1	+0%	30/15 Winter			
S27.000	S69	15 Winter	1	+0%	30/15 Winter			
S27.001	S70	15 Winter	1	+0%	100/15 Summer			
S27.002	S71	15 Winter	1	+0%	30/15 Summer			
S27.003	S72(SW)	15 Winter	1	+0%	30/15 Winter			
S27.004	S73	15 Winter	1	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S18.000	S2	2.190	-0.284	0.000	0.26			44.4	OK
S17.001	S3	2.069	-0.114	0.000	0.16			31.2	OK
S17.002	S4	2.059	-0.068	0.000	0.19			28.0	OK
S17.003	S5(SW)	2.051	-0.041	0.000	0.25			29.5	OK
S17.004	S6	2.045	-0.030	0.000	0.17			27.4	OK
S19.000	S7	2.410	-0.212	0.000	0.19			18.8	OK
S17.005	S8	2.036	-0.023	0.000	0.22			35.2	OK
S17.006	S9(SW)	2.024	-0.025	0.000	0.15			39.4	OK
S17.007	S10	1.966	0.000	0.000	0.22			46.3	OK
S20.000	S12	2.235	-0.250	0.000	0.24			35.0	OK
S17.008	S13(SW)	1.954	0.000	0.000	0.32			66.9	OK
S17.009	S14	1.942	0.000	0.000	0.20			48.4	OK
S17.010	S15	1.873	-0.020	0.000	0.11			43.5	OK
S21.000	S16(SW)	2.729	-0.139	0.000	0.52			24.0	OK
S21.001	S17	2.570	-0.194	0.000	0.27			24.0	OK
S22.000	S21(SW)	2.207	-0.467	0.000	0.10			25.6	OK
S22.001	S22	2.114	-0.470	0.000	0.06			23.2	OK
S23.000	S23(SW)	2.410	-0.474	0.000	0.09			25.2	OK
S23.001	S24	2.276	-0.511	0.000	0.05			27.9	OK
S24.000	S25(SW)	2.359	-0.173	0.000	0.37			17.1	OK
S22.002	S26(SW)	2.097	-0.342	0.000	0.29			76.0	OK
S22.003	S27	2.028	-0.323	0.000	0.35			73.3	OK
S22.004	S28(SW)	2.023	-0.305	0.000	0.39			69.5	OK
S22.005	S29	2.015	-0.280	0.000	0.20			68.2	OK
S22.006	S30(SW)	2.011	-0.216	0.000	0.45			69.4	OK
S25.000	S31	2.078	-0.422	0.000	0.08			23.0	OK
S25.001	S32	2.005	-0.271	0.000	0.06			15.2	OK
S22.007	S33	2.004	-0.199	0.000	0.47			81.2	OK
S22.008	S34(SW)	1.996	-0.191	0.000	0.42			84.0	OK
S22.009	S35	1.979	-0.170	0.000	0.22			77.9	OK
S22.010	S36(SW)	1.966	-0.061	0.000	0.44			83.7	OK
S22.011	S37	1.926	-0.064	0.000	0.36			76.3	OK
S22.012	S38(SW)	1.911	-0.070	0.000	0.39			79.6	OK
S22.013	S39	1.871	-0.070	0.000	0.12			72.7	OK
S17.011	S40	1.811	-0.184	0.000	0.24			134.6	OK
S17.012	S65	1.799	-1.440	0.000	0.01			130.5	OK
S26.000	S102	2.429	-0.175	0.000	0.36			32.6	OK
S26.001	S103	1.789	-0.297	0.000	0.16			39.7	OK
S26.002	S104	1.782	0.075	0.000	0.18			29.9	SURCHARGED
S13.007	S66	1.779	-1.400	0.000	0.01			169.8	OK
S11.006	S67	1.754	-1.359	0.000	0.01			141.1	OK
S10.005	S68	1.752	-1.561	0.000	0.01			144.9	OK
S10.006	S66	1.749	-0.299	0.000	0.34			146.9	OK*
S27.000	S69	2.973	-0.159	0.000	0.42			28.4	OK
S27.001	S70	2.676	-0.211	0.000	0.38			39.0	OK
S27.002	S71	2.499	-0.187	0.000	0.50			39.7	OK
S27.003	S72(SW)	2.439	-0.214	0.000	0.38			45.8	OK

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S27.004	S73	2.398	-0.205	0.000	0.47			45.4	OK

PN	US/MH Name	Level Exceeded
S18.000	S2	
S17.001	S3	
S17.002	S4	
S17.003	S5(SW)	
S17.004	S6	
S19.000	S7	
S17.005	S8	
S17.006	S9(SW)	
S17.007	S10	
S20.000	S12	
S17.008	S13(SW)	
S17.009	S14	
S17.010	S15	
S21.000	S16(SW)	
S21.001	S17	
S22.000	S21(SW)	1
S22.001	S22	
S23.000	S23(SW)	
S23.001	S24	
S24.000	S25(SW)	
S22.002	S26(SW)	
S22.003	S27	
S22.004	S28(SW)	
S22.005	S29	
S22.006	S30(SW)	
S25.000	S31	
S25.001	S32	
S22.007	S33	
S22.008	S34(SW)	
S22.009	S35	
S22.010	S36(SW)	
S22.011	S37	
S22.012	S38(SW)	
S22.013	S39	
S17.011	S40	
S17.012	S65	
S26.000	S102	
S26.001	S103	
S26.002	S104	
S13.007	S66	
S11.006	S67	

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

PN	US/MH Name	Level Exceeded
S10.005	S68	
S10.006	S66	
S27.000	S69	
S27.001	S70	
S27.002	S71	
S27.003	S72(SW)	
S27.004	S73	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S27.005	S74(SW)	15 Winter	1	+0%	30/15 Winter			
S27.006	S75	15 Winter	1	+0%	100/15 Summer			
S27.007	S76	15 Winter	1	+0%	100/15 Summer			
S27.008	S77	15 Winter	1	+0%	100/15 Winter			
S10.007	S78	30 Winter	1	+0%	30/15 Winter			
S10.008	S80	30 Winter	1	+0%				
S28.000	S117	15 Winter	1	+0%	30/15 Summer			
S28.001	S118	15 Winter	1	+0%	100/15 Summer			
S28.002	S119	15 Winter	1	+0%	100/15 Summer			
S29.000	S120	15 Winter	1	+0%	30/15 Summer			
S28.003	S121	15 Winter	1	+0%				
S30.000	S122	15 Winter	1	+0%	30/15 Summer			
S31.000	S123	15 Winter	1	+0%	100/15 Summer			
S31.001	S124	15 Winter	1	+0%	100/15 Winter			
S30.001	S123	15 Winter	1	+0%				
S10.009	S129	30 Winter	1	+0%				
S10.010	S121	30 Winter	1	+0%	100/15 Summer			
S1.014	S115	7200 Winter	1	+0%				
S1.015	S116	7200 Winter	1	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S27.005	S74(SW)	2.382	-0.204	0.000	0.58			48.8	OK
S27.006	S75	2.347	-0.221	0.000	0.51			49.0	OK
S27.007	S76	2.236	-0.314	0.000	0.34			55.7	OK
S27.008	S77	2.083	-0.421	0.000	0.09			55.6	OK
S10.007	S78	1.739	-0.287	0.000	0.69			179.0	OK
S10.008	S80	1.514	-1.739	0.000	0.01			178.9	OK
S28.000	S117	3.032	-0.149	0.000	0.48			32.0	OK
S28.001	S118	2.722	-0.209	0.000	0.40			39.7	OK
S28.002	S119	2.560	-0.256	0.000	0.37			55.8	OK
S29.000	S120	2.678	-0.106	0.000	0.53			18.9	OK
S28.003	S121	2.342	-0.345	0.000	0.12			72.4	OK
S30.000	S122	2.701	-0.107	0.000	0.53			20.5	OK
S31.000	S123	2.662	-0.146	0.000	0.26			9.1	OK
S31.001	S124	2.567	-0.149	0.000	0.25			9.3	OK
S30.001	S123	2.334	-0.204	0.000	0.22			34.9	OK
S10.009	S129	1.465	-1.714	0.000	0.01			219.2	OK
S10.010	S121	1.417	-0.440	0.000	0.36			217.6	OK*
S1.014	S115	0.984	-0.216	0.000	0.15			7.8	OK
S1.015	S116	0.965	-0.204	0.000	0.15			7.8	OK

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

PN	US/MH Name	Level Exceeded
S27.005	S74(SW)	
S27.006	S75	
S27.007	S76	
S27.008	S77	
S10.007	S78	
S10.008	S80	
S28.000	S117	
S28.001	S118	
S28.002	S119	
S29.000	S120	
S28.003	S121	
S30.000	S122	
S31.000	S123	
S31.001	S124	
S30.001	S123	
S10.009	S129	
S10.010	S121	
S1.014	S115	
S1.015	S116	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S79	15 Winter	30	+0%	100/15 Summer	100/15 Winter		
S1.001	S80	15 Winter	30	+0%	100/15 Summer			
S2.000	S81	15 Winter	30	+0%	100/15 Summer			
S2.001	S82	15 Winter	30	+0%	100/15 Summer			
S2.002	S83	30 Summer	30	+0%	30/15 Summer			
S2.003	S84(SW)	30 Summer	30	+0%	30/15 Summer			
S1.002	S85	15 Winter	30	+0%	30/15 Summer			
S3.000	S86	15 Winter	30	+0%	100/15 Summer			
S3.001	S87	15 Winter	30	+0%	100/15 Summer			
S3.002	S88	15 Winter	30	+0%	30/15 Summer			
S1.003	S89(SW)	30 Winter	30	+0%	30/15 Summer			
S4.000	S90(SW)	15 Winter	30	+0%	100/15 Summer			
S4.001	S91	15 Winter	30	+0%	100/15 Summer			
S4.002	S92(SW)	15 Winter	30	+0%	100/15 Summer			
S4.003	S93	15 Winter	30	+0%	100/15 Summer			
S4.004	S94(SW)	15 Winter	30	+0%	100/15 Summer			
S4.005	S95	15 Winter	30	+0%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S79	2.206	-0.226	0.000	0.20			58.4	OK
S1.001	S80	2.176	0.000	0.000	0.13			36.1	OK
S2.000	S81	2.396	-0.187	0.000	0.30			23.4	OK
S2.001	S82	2.254	-0.084	0.000	0.59			96.6	OK
S2.002	S83	2.177	0.027	0.000	0.43			68.1	SURCHARGED
S2.003	S84(SW)	2.144	0.011	0.000	0.30			78.2	SURCHARGED
S1.002	S85	2.101	0.055	0.000	0.57			106.2	SURCHARGED
S3.000	S86	2.383	-0.257	0.000	0.21			29.8	OK
S3.001	S87	2.182	-0.182	0.000	0.61			115.5	OK
S3.002	S88	2.112	0.060	0.000	0.74			98.0	SURCHARGED
S1.003	S89(SW)	2.089	0.069	0.000	0.76			204.0	SURCHARGED
S4.000	S90(SW)	3.022	-0.048	0.000	0.95			18.6	OK
S4.001	S91	2.905	-0.150	0.000	0.24			18.7	OK
S4.002	S92(SW)	2.634	-0.109	0.000	0.83			43.7	OK
S4.003	S93	2.475	-0.245	0.000	0.26			43.4	OK
S4.004	S94(SW)	2.296	-0.238	0.000	0.44			50.2	OK
S4.005	S95	2.146	-0.343	0.000	0.13			55.1	OK

PN	US/MH Name	Level Exceeded
S1.000	S79	2
S1.001	S80	
S2.000	S81	
S2.001	S82	
S2.002	S83	
S2.003	S84(SW)	
S1.002	S85	
S3.000	S86	
S3.001	S87	
S3.002	S88	
S1.003	S89(SW)	
S4.000	S90(SW)	
S4.001	S91	
S4.002	S92(SW)	
S4.003	S93	
S4.004	S94(SW)	
S4.005	S95	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.004	S96	30 Winter	30	+0%	30/15 Summer			
S1.005	S97	30 Winter	30	+0%	30/15 Summer			
S5.000	S98	15 Winter	30	+0%	100/15 Summer			
S1.006	S99	30 Winter	30	+0%	30/15 Summer			
S1.007	S100(SW)	30 Winter	30	+0%	30/15 Summer			
S1.008	S101	30 Winter	30	+0%	30/15 Summer			
S6.000	S102	15 Winter	30	+0%	30/15 Summer			
S6.001	S105	15 Winter	30	+0%	100/15 Summer			
S6.002	S106	15 Winter	30	+0%	100/15 Summer			
S6.003	S107	15 Winter	30	+0%	100/15 Summer			
S7.000	S108	15 Winter	30	+0%	100/15 Summer			
S8.000	S109	15 Winter	30	+0%	100/15 Summer			
S7.001	S110	15 Winter	30	+0%	100/15 Summer			
S1.009	S111	30 Winter	30	+0%	30/15 Summer			
S1.010	S112(SW)	30 Winter	30	+0%				
S1.011	S113	30 Winter	30	+0%	30/15 Summer			
S1.012	S110(SW)	30 Winter	30	+0%				
S9.000	S111	15 Winter	30	+0%	100/15 Summer			
S9.001	S112	15 Winter	30	+0%				
S9.002	S113	30 Winter	30	+0%	30/15 Winter			
S9.003	S114	30 Winter	30	+0%	30/15 Summer			
S1.013	S111	30 Winter	30	+0%	30/15 Summer			
S10.000	S61(SW)	15 Winter	30	+0%	100/15 Summer			
S10.001	S62	15 Winter	30	+0%	100/15 Summer			
S10.002	S63(SW)	15 Winter	30	+0%	100/15 Summer			
S10.003	S64	15 Winter	30	+0%	100/15 Winter			
S10.004	S65(SW)	30 Winter	30	+0%				
S11.000	S54	15 Winter	30	+0%	100/15 Summer			
S11.001	S55	30 Winter	30	+0%	100/15 Summer			
S11.002	S56	30 Winter	30	+0%	100/15 Summer			
S12.000	S57	15 Winter	30	+0%				
S11.003	S58	30 Winter	30	+0%	30/30 Winter			
S11.004	S59	30 Winter	30	+0%	30/30 Summer			
S11.005	S60	30 Winter	30	+0%	30/15 Winter			
S13.000	S41	15 Winter	30	+0%	100/15 Summer	100/15 Winter		
S13.001	S42	60 Winter	30	+0%	30/30 Winter	100/15 Winter		
S14.000	S43	60 Winter	30	+0%	30/15 Winter	100/15 Winter		
S14.001	S44	60 Winter	30	+0%	30/15 Summer	100/15 Winter		
S14.002	S45	30 Winter	30	+0%	30/15 Summer			
S13.002	S46	30 Winter	30	+0%	30/15 Summer			
S15.000	S47	15 Winter	30	+0%	100/15 Summer			
S15.001	S48	30 Winter	30	+0%	30/15 Winter			
S13.003	S49	30 Winter	30	+0%	30/15 Summer			
S13.004	S50	30 Winter	30	+0%	30/15 Summer			
S13.005	S51	30 Winter	30	+0%	1/30 Winter			
S16.000	S52	15 Winter	30	+0%	100/15 Summer			
S13.006	S53	30 Winter	30	+0%	1/30 Winter			
S17.000	S1	30 Winter	30	+0%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.004	S96	2.051	0.137	0.000	0.87			243.3	SURCHARGED
S1.005	S97	2.009	0.172	0.000	1.38			241.4	SURCHARGED
S5.000	S98	2.478	-0.173	0.000	0.12			13.9	OK
S1.006	S99	1.986	0.169	0.000	1.03			242.3	SURCHARGED
S1.007	S100(SW)	1.947	0.174	0.000	0.95			249.7	SURCHARGED
S1.008	S101	1.880	0.191	0.000	1.17			248.1	SURCHARGED
S6.000	S102	2.868	0.042	0.000	1.06			70.8	SURCHARGED
S6.001	S105	2.568	-0.040	0.000	0.93			88.3	OK
S6.002	S106	2.504	-0.029	0.000	1.00			98.0	OK
S6.003	S107	2.141	-0.364	0.000	0.20			113.8	OK
S7.000	S108	2.328	-0.116	0.000	0.46			17.4	OK
S8.000	S109	2.724	-0.203	0.000	0.23			33.9	OK
S7.001	S110	2.140	-0.077	0.000	0.87			83.4	OK
S1.009	S111	1.854	0.177	0.000	1.63			347.1	SURCHARGED
S1.010	S112(SW)	1.749	-1.317	0.000	0.02			392.3	OK
S1.011	S113	1.720	0.131	0.000	1.32			347.1	SURCHARGED*
S1.012	S110(SW)	1.666	-1.305	0.000	0.02			365.1	OK
S9.000	S111	2.439	-0.084	0.000	0.82			55.1	OK
S9.001	S112	2.056	-0.230	0.000	0.31			84.5	OK
S9.002	S113	1.743	0.025	0.000	0.73			74.5	SURCHARGED
S9.003	S114	1.657	0.090	0.000	0.71			93.1	SURCHARGED
S1.013	S111	1.639	0.125	0.000	2.81			412.0	SURCHARGED*
S10.000	S61(SW)	2.514	-0.139	0.000	0.17			4.0	OK
S10.001	S62	2.508	-0.134	0.000	0.15			4.4	OK
S10.002	S63(SW)	2.504	-0.094	0.000	0.74			34.5	OK
S10.003	S64	2.252	-0.222	0.000	0.15			34.3	OK
S10.004	S65(SW)	2.104	-1.283	0.000	0.00			62.7	OK
S11.000	S54	2.482	-0.101	0.000	0.57			21.0	OK
S11.001	S55	2.344	-0.091	0.000	0.46			28.6	OK
S11.002	S56	2.330	-0.021	0.000	0.49			30.3	OK
S12.000	S57	2.837	-0.153	0.000	0.22			14.8	OK
S11.003	S58	2.298	0.036	0.000	0.81			49.1	SURCHARGED
S11.004	S59	2.274	0.087	0.000	0.71			69.9	SURCHARGED
S11.005	S60	2.193	0.094	0.000	0.37			80.1	SURCHARGED
S13.000	S41	2.735	-0.048	0.000	0.95			38.3	OK
S13.001	S42	2.620	0.024	0.000	0.26			40.9	SURCHARGED
S14.000	S43	2.703	0.156	0.000	0.21			27.5	SURCHARGED
S14.001	S44	2.690	0.298	0.000	0.32			34.6	SURCHARGED
S14.002	S45	2.608	0.311	0.000	0.38			51.0	SURCHARGED
S13.002	S46	2.603	0.339	0.000	0.60			98.3	SURCHARGED
S15.000	S47	2.587	-0.098	0.000	0.59			30.0	OK
S15.001	S48	2.512	0.106	0.000	0.24			24.6	SURCHARGED
S13.003	S49	2.505	0.315	0.000	0.73			131.7	SURCHARGED
S13.004	S50	2.398	0.358	0.000	0.84			130.4	SURCHARGED
S13.005	S51	2.307	0.370	0.000	0.89			130.0	SURCHARGED
S16.000	S52	2.575	-0.079	0.000	0.72			46.6	OK
S13.006	S53	2.279	0.408	0.000	0.73			174.7	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S17.000	S1	2.349	-0.018	0.000	0.08			8.2	OK

PN	US/MH Name	Level Exceeded
S1.004	S96	
S1.005	S97	
S5.000	S98	
S1.006	S99	
S1.007	S100(SW)	
S1.008	S101	
S6.000	S102	
S6.001	S105	
S6.002	S106	
S6.003	S107	
S7.000	S108	
S8.000	S109	
S7.001	S110	
S1.009	S111	
S1.010	S112(SW)	
S1.011	S113	
S1.012	S110(SW)	
S9.000	S111	
S9.001	S112	
S9.002	S113	
S9.003	S114	
S1.013	S111	
S10.000	S61(SW)	
S10.001	S62	
S10.002	S63(SW)	
S10.003	S64	
S10.004	S65(SW)	
S11.000	S54	
S11.001	S55	
S11.002	S56	
S12.000	S57	
S11.003	S58	
S11.004	S59	
S11.005	S60	
S13.000	S41	1
S13.001	S42	1
S14.000	S43	3
S14.001	S44	2
S14.002	S45	
S13.002	S46	
S15.000	S47	

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

PN	US/MH Name	Level Exceeded
S15.001	S48	
S13.003	S49	
S13.004	S50	
S13.005	S51	
S16.000	S52	
S13.006	S53	
S17.000	S1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S18.000	S2	30 Winter	30	+0%	100/15 Summer			
S17.001	S3	30 Winter	30	+0%	30/15 Summer			
S17.002	S4	30 Winter	30	+0%	30/15 Summer			
S17.003	S5(SW)	30 Winter	30	+0%	30/15 Summer			
S17.004	S6	30 Winter	30	+0%	30/15 Summer			
S19.000	S7	15 Winter	30	+0%	100/15 Summer			
S17.005	S8	30 Winter	30	+0%	30/15 Summer			
S17.006	S9(SW)	30 Winter	30	+0%	30/15 Summer			
S17.007	S10	30 Winter	30	+0%	30/15 Summer			
S20.000	S12	15 Winter	30	+0%	100/15 Summer			
S17.008	S13(SW)	30 Winter	30	+0%	30/15 Summer			
S17.009	S14	30 Winter	30	+0%	30/15 Summer			
S17.010	S15	30 Winter	30	+0%	30/15 Summer			
S21.000	S16(SW)	15 Winter	30	+0%	30/15 Summer			
S21.001	S17	15 Winter	30	+0%	100/15 Summer			
S22.000	S21(SW)	30 Winter	30	+0%	100/15 Summer	100/30 Winter		
S22.001	S22	30 Winter	30	+0%	100/15 Summer			
S23.000	S23(SW)	30 Winter	30	+0%	100/15 Summer			
S23.001	S24	30 Winter	30	+0%	100/15 Summer			
S24.000	S25(SW)	30 Winter	30	+0%	100/15 Summer			
S22.002	S26(SW)	30 Winter	30	+0%	30/30 Winter			
S22.003	S27	30 Winter	30	+0%	30/30 Summer			
S22.004	S28(SW)	30 Winter	30	+0%	30/15 Winter			
S22.005	S29	30 Winter	30	+0%	30/15 Winter			
S22.006	S30(SW)	30 Winter	30	+0%	30/15 Summer			
S25.000	S31	60 Winter	30	+0%	100/15 Summer			
S25.001	S32	30 Winter	30	+0%	30/30 Summer			
S22.007	S33	30 Winter	30	+0%	30/15 Summer			
S22.008	S34(SW)	30 Winter	30	+0%	30/15 Summer			
S22.009	S35	30 Winter	30	+0%	30/15 Summer			
S22.010	S36(SW)	30 Winter	30	+0%	30/15 Summer			
S22.011	S37	30 Winter	30	+0%	30/15 Summer			
S22.012	S38(SW)	30 Winter	30	+0%	30/15 Summer			
S22.013	S39	30 Winter	30	+0%	30/15 Summer			
S17.011	S40	30 Winter	30	+0%	30/15 Summer			
S17.012	S65	30 Winter	30	+0%				
S26.000	S102	15 Winter	30	+0%	100/15 Summer			
S26.001	S103	60 Winter	30	+0%	30/15 Summer			
S26.002	S104	30 Winter	30	+0%	1/15 Summer			
S13.007	S66	30 Winter	30	+0%				
S11.006	S67	30 Winter	30	+0%				
S10.005	S68	30 Winter	30	+0%				
S10.006	S66	30 Winter	30	+0%	30/15 Winter			
S27.000	S69	15 Winter	30	+0%	30/15 Winter			
S27.001	S70	15 Winter	30	+0%	100/15 Summer			
S27.002	S71	15 Winter	30	+0%	30/15 Summer			
S27.003	S72(SW)	15 Winter	30	+0%	30/15 Winter			
S27.004	S73	15 Winter	30	+0%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S18.000	S2	2.452	-0.022	0.000	0.51			86.9	OK
S17.001	S3	2.346	0.163	0.000	0.53			101.7	SURCHARGED
S17.002	S4	2.328	0.200	0.000	0.61			90.7	SURCHARGED
S17.003	S5(SW)	2.312	0.219	0.000	0.85			101.0	SURCHARGED
S17.004	S6	2.299	0.225	0.000	0.65			101.6	SURCHARGED
S19.000	S7	2.466	-0.156	0.000	0.45			44.7	OK
S17.005	S8	2.290	0.230	0.000	0.78			124.0	SURCHARGED
S17.006	S9(SW)	2.279	0.230	0.000	0.52			135.0	SURCHARGED
S17.007	S10	2.255	0.289	0.000	0.63			132.2	SURCHARGED
S20.000	S12	2.318	-0.167	0.000	0.56			82.8	OK
S17.008	S13(SW)	2.246	0.292	0.000	0.81			171.7	SURCHARGED
S17.009	S14	2.234	0.292	0.000	0.79			189.9	SURCHARGED
S17.010	S15	2.205	0.312	0.000	0.48			190.6	SURCHARGED
S21.000	S16(SW)	2.941	0.073	0.000	1.26			58.5	SURCHARGED
S21.001	S17	2.642	-0.122	0.000	0.65			57.6	OK
S22.000	S21(SW)	2.594	-0.080	0.000	0.18			48.2	OK
S22.001	S22	2.528	-0.056	0.000	0.09			32.8	OK
S23.000	S23(SW)	2.535	-0.349	0.000	0.18			48.7	OK
S23.001	S24	2.507	-0.280	0.000	0.10			54.2	OK
S24.000	S25(SW)	2.532	0.000	0.000	0.69			31.8	OK
S22.002	S26(SW)	2.498	0.058	0.000	0.47			123.8	SURCHARGED
S22.003	S27	2.484	0.133	0.000	0.47			99.1	SURCHARGED
S22.004	S28(SW)	2.478	0.151	0.000	0.66			116.6	SURCHARGED
S22.005	S29	2.463	0.168	0.000	0.29			100.8	SURCHARGED
S22.006	S30(SW)	2.409	0.183	0.000	0.64			100.2	SURCHARGED
S25.000	S31	2.450	-0.050	0.000	0.10			27.4	OK
S25.001	S32	2.401	0.125	0.000	0.14			33.5	SURCHARGED
S22.007	S33	2.397	0.194	0.000	0.61			104.7	SURCHARGED
S22.008	S34(SW)	2.386	0.199	0.000	0.56			111.3	SURCHARGED
S22.009	S35	2.365	0.216	0.000	0.31			108.5	SURCHARGED
S22.010	S36(SW)	2.259	0.232	0.000	0.61			117.5	SURCHARGED
S22.011	S37	2.237	0.246	0.000	0.55			117.7	SURCHARGED
S22.012	S38(SW)	2.227	0.246	0.000	0.61			123.8	SURCHARGED
S22.013	S39	2.203	0.262	0.000	0.21			124.6	SURCHARGED
S17.011	S40	2.188	0.193	0.000	0.62			353.0	SURCHARGED
S17.012	S65	2.172	-1.067	0.000	0.02			350.4	OK
S26.000	S102	2.525	-0.079	0.000	0.85			76.5	OK
S26.001	S103	2.359	0.273	0.000	0.23			58.2	SURCHARGED
S26.002	S104	2.240	0.533	0.000	0.46			78.5	SURCHARGED
S13.007	S66	2.139	-1.040	0.000	0.03			487.0	OK
S11.006	S67	2.105	-1.008	0.000	0.04			493.1	OK
S10.005	S68	2.102	-1.211	0.000	0.04			515.7	OK
S10.006	S66	2.100	0.052	0.000	1.23			523.4	SURCHARGED*
S27.000	S69	3.152	0.020	0.000	1.01			67.9	SURCHARGED
S27.001	S70	2.874	-0.013	0.000	0.88			91.2	OK
S27.002	S71	2.730	0.045	0.000	1.17			92.5	SURCHARGED
S27.003	S72(SW)	2.660	0.007	0.000	0.87			103.4	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S27.004	S73	2.617	0.013	0.000	1.07			103.2	SURCHARGED

PN	US/MH Name	Level Exceeded
S18.000	S2	
S17.001	S3	
S17.002	S4	
S17.003	S5(SW)	
S17.004	S6	
S19.000	S7	
S17.005	S8	
S17.006	S9(SW)	
S17.007	S10	
S20.000	S12	
S17.008	S13(SW)	
S17.009	S14	
S17.010	S15	
S21.000	S16(SW)	
S21.001	S17	
S22.000	S21(SW)	1
S22.001	S22	
S23.000	S23(SW)	
S23.001	S24	
S24.000	S25(SW)	
S22.002	S26(SW)	
S22.003	S27	
S22.004	S28(SW)	
S22.005	S29	
S22.006	S30(SW)	
S25.000	S31	
S25.001	S32	
S22.007	S33	
S22.008	S34(SW)	
S22.009	S35	
S22.010	S36(SW)	
S22.011	S37	
S22.012	S38(SW)	
S22.013	S39	
S17.011	S40	
S17.012	S65	
S26.000	S102	
S26.001	S103	
S26.002	S104	
S13.007	S66	
S11.006	S67	

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

PN	US/MH Name	Level Exceeded
S10.005	S68	
S10.006	S66	
S27.000	S69	
S27.001	S70	
S27.002	S71	
S27.003	S72(SW)	
S27.004	S73	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S27.005	S74(SW)	15 Winter	30	+0%	30/15 Winter			
S27.006	S75	15 Winter	30	+0%	100/15 Summer			
S27.007	S76	15 Winter	30	+0%	100/15 Summer			
S27.008	S77	30 Winter	30	+0%	100/15 Winter			
S10.007	S78	30 Winter	30	+0%	30/15 Winter			
S10.008	S80	30 Winter	30	+0%				
S28.000	S117	15 Winter	30	+0%	30/15 Summer			
S28.001	S118	15 Winter	30	+0%	100/15 Summer			
S28.002	S119	15 Winter	30	+0%	100/15 Summer			
S29.000	S120	15 Winter	30	+0%	30/15 Summer			
S28.003	S121	15 Winter	30	+0%				
S30.000	S122	15 Winter	30	+0%	30/15 Summer			
S31.000	S123	15 Winter	30	+0%	100/15 Summer			
S31.001	S124	15 Winter	30	+0%	100/15 Winter			
S30.001	S123	15 Winter	30	+0%				
S10.009	S129	30 Winter	30	+0%				
S10.010	S121	60 Winter	30	+0%	100/15 Summer			
S1.014	S115	2880 Winter	30	+0%				
S1.015	S116	2880 Winter	30	+0%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S27.005	S74(SW)	2.595	0.009	0.000	1.28			108.8	SURCHARGED
S27.006	S75	2.568	0.000	0.000	1.14			109.1	OK
S27.007	S76	2.362	-0.188	0.000	0.72			119.2	OK
S27.008	S77	2.133	-0.371	0.000	0.17			108.1	OK
S10.007	S78	2.073	0.047	0.000	2.35			606.4	SURCHARGED
S10.008	S80	1.818	-1.435	0.000	0.04			604.9	OK
S28.000	S117	3.280	0.099	0.000	1.14			76.7	SURCHARGED
S28.001	S118	2.853	-0.078	0.000	0.96			95.8	OK
S28.002	S119	2.716	-0.100	0.000	0.93			138.9	OK
S29.000	S120	2.850	0.066	0.000	1.32			46.5	SURCHARGED
S28.003	S121	2.410	-0.277	0.000	0.32			182.6	OK
S30.000	S122	2.948	0.140	0.000	1.21			46.5	SURCHARGED
S31.000	S123	2.716	-0.092	0.000	0.64			22.4	OK
S31.001	S124	2.619	-0.097	0.000	0.60			22.3	OK
S30.001	S123	2.395	-0.143	0.000	0.53			82.5	OK
S10.009	S129	1.785	-1.394	0.000	0.04			643.8	OK
S10.010	S121	1.753	-0.104	0.000	1.00			606.4	OK*
S1.014	S115	1.049	-0.151	0.000	0.39			20.2	OK
S1.015	S116	1.034	-0.135	0.000	0.38			20.2	OK

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

PN	US/MH Name	Level Exceeded
S27.005	S74(SW)	
S27.006	S75	
S27.007	S76	
S27.008	S77	
S10.007	S78	
S10.008	S80	
S28.000	S117	
S28.001	S118	
S28.002	S119	
S29.000	S120	
S28.003	S121	
S30.000	S122	
S31.000	S123	
S31.001	S124	
S30.001	S123	
S10.009	S129	
S10.010	S121	
S1.014	S115	
S1.015	S116	

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

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.300	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.000	S79	30 Winter	100	+40%	100/15 Summer	100/15 Winter		
S1.001	S80	30 Winter	100	+40%	100/15 Summer			
S2.000	S81	30 Winter	100	+40%	100/15 Summer			
S2.001	S82	30 Winter	100	+40%	100/15 Summer			
S2.002	S83	15 Winter	100	+40%	30/15 Summer			
S2.003	S84(SW)	15 Winter	100	+40%	30/15 Summer			
S1.002	S85	30 Winter	100	+40%	30/15 Summer			
S3.000	S86	30 Winter	100	+40%	100/15 Summer			
S3.001	S87	30 Winter	100	+40%	100/15 Summer			
S3.002	S88	30 Winter	100	+40%	30/15 Summer			
S1.003	S89(SW)	30 Winter	100	+40%	30/15 Summer			
S4.000	S90(SW)	30 Winter	100	+40%	100/15 Summer			
S4.001	S91	30 Winter	100	+40%	100/15 Summer			
S4.002	S92(SW)	30 Winter	100	+40%	100/15 Summer			
S4.003	S93	30 Winter	100	+40%	100/15 Summer			
S4.004	S94(SW)	30 Winter	100	+40%	100/15 Summer			
S4.005	S95	30 Winter	100	+40%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.000	S79	3.632	1.200	0.525	0.23			68.7	FLOOD
S1.001	S80	3.587	1.411	0.000	0.20			54.4	FLOOD RISK
S2.000	S81	3.632	1.049	0.000	0.38			29.8	FLOOD RISK
S2.001	S82	3.604	1.266	0.000	0.64			105.9	FLOOD RISK
S2.002	S83	3.503	1.353	0.000	0.77			121.6	FLOOD RISK
S2.003	S84(SW)	3.494	1.361	0.000	0.55			145.0	FLOOD RISK
S1.002	S85	3.468	1.421	0.000	0.89			167.5	SURCHARGED
S3.000	S86	3.649	1.009	0.000	0.27			37.8	FLOOD RISK
S3.001	S87	3.584	1.220	0.000	0.67			125.5	FLOOD RISK
S3.002	S88	3.468	1.416	0.000	0.86			113.7	SURCHARGED
S1.003	S89(SW)	3.446	1.427	0.000	1.14			307.5	SURCHARGED
S4.000	S90(SW)	3.470	0.400	0.000	1.36			26.5	SURCHARGED
S4.001	S91	3.456	0.400	0.000	0.34			26.4	SURCHARGED
S4.002	S92(SW)	3.441	0.698	0.000	1.16			61.4	SURCHARGED
S4.003	S93	3.428	0.709	0.000	0.35			59.4	SURCHARGED
S4.004	S94(SW)	3.355	0.821	0.000	0.56			63.7	SURCHARGED
S4.005	S95	3.341	0.853	0.000	0.15			63.1	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.000	S79	2
S1.001	S80	
S2.000	S81	
S2.001	S82	
S2.002	S83	
S2.003	S84(SW)	
S1.002	S85	
S3.000	S86	
S3.001	S87	
S3.002	S88	
S1.003	S89(SW)	
S4.000	S90(SW)	
S4.001	S91	
S4.002	S92(SW)	
S4.003	S93	
S4.004	S94(SW)	
S4.005	S95	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.004	S96	30 Winter	100	+40%	30/15 Summer			
S1.005	S97	30 Winter	100	+40%	30/15 Summer			
S5.000	S98	30 Winter	100	+40%	100/15 Summer			
S1.006	S99	30 Winter	100	+40%	30/15 Summer			
S1.007	S100(SW)	30 Winter	100	+40%	30/15 Summer			
S1.008	S101	30 Winter	100	+40%	30/15 Summer			
S6.000	S102	15 Winter	100	+40%	30/15 Summer			
S6.001	S105	30 Winter	100	+40%	100/15 Summer			
S6.002	S106	30 Winter	100	+40%	100/15 Summer			
S6.003	S107	30 Winter	100	+40%	100/15 Summer			
S7.000	S108	15 Winter	100	+40%	100/15 Summer			
S8.000	S109	15 Winter	100	+40%	100/15 Summer			
S7.001	S110	15 Winter	100	+40%	100/15 Summer			
S1.009	S111	30 Winter	100	+40%	30/15 Summer			
S1.010	S112(SW)	30 Winter	100	+40%				
S1.011	S113	30 Winter	100	+40%	30/15 Summer			
S1.012	S110(SW)	30 Winter	100	+40%				
S9.000	S111	15 Winter	100	+40%	100/15 Summer			
S9.001	S112	15 Winter	100	+40%				
S9.002	S113	15 Winter	100	+40%	30/15 Winter			
S9.003	S114	30 Winter	100	+40%	30/15 Summer			
S1.013	S111	30 Winter	100	+40%	30/15 Summer			
S10.000	S61(SW)	15 Winter	100	+40%	100/15 Summer			
S10.001	S62	15 Winter	100	+40%	100/15 Summer			
S10.002	S63(SW)	15 Winter	100	+40%	100/15 Summer			
S10.003	S64	30 Winter	100	+40%	100/15 Winter			
S10.004	S65(SW)	30 Winter	100	+40%				
S11.000	S54	60 Winter	100	+40%	100/15 Summer			
S11.001	S55	60 Winter	100	+40%	100/15 Summer			
S11.002	S56	60 Winter	100	+40%	100/15 Summer			
S12.000	S57	60 Winter	100	+40%				
S11.003	S58	60 Winter	100	+40%	30/30 Winter			
S11.004	S59	60 Winter	100	+40%	30/30 Summer			
S11.005	S60	60 Winter	100	+40%	30/15 Winter			
S13.000	S41	15 Winter	100	+40%	100/15 Summer	100/15 Winter		
S13.001	S42	15 Winter	100	+40%	30/30 Winter	100/15 Winter		
S14.000	S43	30 Winter	100	+40%	30/15 Winter	100/15 Winter		
S14.001	S44	15 Winter	100	+40%	30/15 Summer	100/15 Winter		
S14.002	S45	15 Winter	100	+40%	30/15 Summer			
S13.002	S46	15 Winter	100	+40%	30/15 Summer			
S15.000	S47	15 Winter	100	+40%	100/15 Summer			
S15.001	S48	15 Winter	100	+40%	30/15 Winter			
S13.003	S49	15 Winter	100	+40%	30/15 Summer			
S13.004	S50	15 Winter	100	+40%	30/15 Summer			
S13.005	S51	30 Winter	100	+40%	1/30 Winter			
S16.000	S52	15 Winter	100	+40%	100/15 Summer			
S13.006	S53	30 Winter	100	+40%	1/30 Winter			
S17.000	S1	30 Winter	100	+40%	100/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.004	S96	3.329	1.414	0.000	1.36			378.7	SURCHARGED
S1.005	S97	3.194	1.357	0.000	2.16			377.9	SURCHARGED
S5.000	S98	3.076	0.425	0.000	0.17			19.7	SURCHARGED
S1.006	S99	3.056	1.239	0.000	1.65			387.2	SURCHARGED
S1.007	S100 (SW)	2.910	1.137	0.000	1.57			412.4	SURCHARGED
S1.008	S101	2.702	1.013	0.000	1.94			411.1	SURCHARGED
S6.000	S102	3.614	0.788	0.000	1.84			123.0	SURCHARGED
S6.001	S105	2.886	0.278	0.000	1.43			136.6	SURCHARGED
S6.002	S106	2.806	0.274	0.000	1.61			158.2	SURCHARGED
S6.003	S107	2.781	0.277	0.000	0.31			171.7	SURCHARGED
S7.000	S108	3.120	0.676	0.000	0.65			24.5	SURCHARGED
S8.000	S109	3.166	0.239	0.000	0.38			56.4	SURCHARGED
S7.001	S110	3.037	0.820	0.000	1.22			117.3	SURCHARGED
S1.009	S111	2.538	0.862	0.000	2.95			629.9	SURCHARGED
S1.010	S112 (SW)	2.242	-0.824	0.000	0.04			702.7	OK
S1.011	S113	2.196	0.607	0.000	2.06			541.1	SURCHARGED*
S1.012	S110 (SW)	1.905	-1.066	0.000	0.03			564.0	OK
S9.000	S111	2.828	0.305	0.000	1.45			97.0	SURCHARGED
S9.001	S112	2.270	-0.016	0.000	0.50			137.8	OK
S9.002	S113	2.100	0.382	0.000	1.44			146.7	SURCHARGED
S9.003	S114	1.902	0.336	0.000	1.23			161.6	SURCHARGED
S1.013	S111	1.873	0.359	0.000	4.34			635.7	SURCHARGED*
S10.000	S61 (SW)	2.733	0.080	0.000	0.34			7.8	SURCHARGED
S10.001	S62	2.727	0.085	0.000	0.33			9.9	SURCHARGED
S10.002	S63 (SW)	2.720	0.122	0.000	1.29			60.7	SURCHARGED
S10.003	S64	2.637	0.163	0.000	0.22			47.8	SURCHARGED
S10.004	S65 (SW)	2.630	-0.757	0.000	0.01			113.6	OK
S11.000	S54	3.017	0.434	0.000	0.51			18.8	SURCHARGED
S11.001	S55	2.989	0.553	0.000	0.52			32.0	SURCHARGED
S11.002	S56	2.963	0.613	0.000	0.54			33.7	SURCHARGED
S12.000	S57	2.960	-0.030	0.000	0.21			14.3	OK
S11.003	S58	2.943	0.680	0.000	0.90			54.6	SURCHARGED
S11.004	S59	2.865	0.677	0.000	0.80			79.0	SURCHARGED
S11.005	S60	2.783	0.683	0.000	0.46			98.1	SURCHARGED
S13.000	S41	3.984	1.201	0.566	1.32			53.6	FLOOD
S13.001	S42	3.777	1.180	0.262	0.64			100.1	FLOOD
S14.000	S43	3.750	1.203	2.823	0.48			64.6	FLOOD
S14.001	S44	3.702	1.310	2.726	0.94			102.4	FLOOD
S14.002	S45	3.670	1.373	0.000	0.69			93.6	FLOOD RISK
S13.002	S46	3.663	1.399	0.000	1.15			187.3	FLOOD RISK
S15.000	S47	3.874	1.189	0.000	0.89			44.8	FLOOD RISK
S15.001	S48	3.733	1.326	0.000	0.39			40.0	FLOOD RISK
S13.003	S49	3.599	1.409	0.000	1.42			256.8	FLOOD RISK
S13.004	S50	3.313	1.273	0.000	1.73			268.4	SURCHARGED
S13.005	S51	3.063	1.126	0.000	1.70			248.5	SURCHARGED
S16.000	S52	3.522	0.868	0.000	1.04			67.3	SURCHARGED
S13.006	S53	2.887	1.016	0.000	1.40			333.3	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S17.000	S1	3.269	0.902	0.000	0.12			13.0	FLOOD RISK

PN	US/MH Name	Level Exceeded
S1.004	S96	
S1.005	S97	
S5.000	S98	
S1.006	S99	
S1.007	S100(SW)	
S1.008	S101	
S6.000	S102	
S6.001	S105	
S6.002	S106	
S6.003	S107	
S7.000	S108	
S8.000	S109	
S7.001	S110	
S1.009	S111	
S1.010	S112(SW)	
S1.011	S113	
S1.012	S110(SW)	
S9.000	S111	
S9.001	S112	
S9.002	S113	
S9.003	S114	
S1.013	S111	
S10.000	S61(SW)	
S10.001	S62	
S10.002	S63(SW)	
S10.003	S64	
S10.004	S65(SW)	
S11.000	S54	
S11.001	S55	
S11.002	S56	
S12.000	S57	
S11.003	S58	
S11.004	S59	
S11.005	S60	
S13.000	S41	1
S13.001	S42	1
S14.000	S43	3
S14.001	S44	2
S14.002	S45	
S13.002	S46	
S15.000	S47	

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

PN	US/MH Name	Level Exceeded
S15.001	S48	
S13.003	S49	
S13.004	S50	
S13.005	S51	
S16.000	S52	
S13.006	S53	
S17.000	S1	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S18.000	S2	30 Winter	100	+40%	100/15 Summer			
S17.001	S3	30 Winter	100	+40%	30/15 Summer			
S17.002	S4	30 Winter	100	+40%	30/15 Summer			
S17.003	S5(SW)	30 Winter	100	+40%	30/15 Summer			
S17.004	S6	30 Winter	100	+40%	30/15 Summer			
S19.000	S7	30 Winter	100	+40%	100/15 Summer			
S17.005	S8	30 Winter	100	+40%	30/15 Summer			
S17.006	S9(SW)	30 Winter	100	+40%	30/15 Summer			
S17.007	S10	30 Winter	100	+40%	30/15 Summer			
S20.000	S12	30 Winter	100	+40%	100/15 Summer			
S17.008	S13(SW)	30 Winter	100	+40%	30/15 Summer			
S17.009	S14	30 Winter	100	+40%	30/15 Summer			
S17.010	S15	30 Winter	100	+40%	30/15 Summer			
S21.000	S16(SW)	15 Winter	100	+40%	30/15 Summer			
S21.001	S17	30 Winter	100	+40%	100/15 Summer			
S22.000	S21(SW)	30 Winter	100	+40%	100/15 Summer	100/30 Winter		
S22.001	S22	30 Winter	100	+40%	100/15 Summer			
S23.000	S23(SW)	30 Winter	100	+40%	100/15 Summer			
S23.001	S24	30 Winter	100	+40%	100/15 Summer			
S24.000	S25(SW)	30 Winter	100	+40%	100/15 Summer			
S22.002	S26(SW)	30 Winter	100	+40%	30/30 Winter			
S22.003	S27	30 Winter	100	+40%	30/30 Summer			
S22.004	S28(SW)	30 Winter	100	+40%	30/15 Winter			
S22.005	S29	30 Winter	100	+40%	30/15 Winter			
S22.006	S30(SW)	30 Winter	100	+40%	30/15 Summer			
S25.000	S31	30 Winter	100	+40%	100/15 Summer			
S25.001	S32	30 Winter	100	+40%	30/30 Summer			
S22.007	S33	30 Winter	100	+40%	30/15 Summer			
S22.008	S34(SW)	30 Winter	100	+40%	30/15 Summer			
S22.009	S35	30 Winter	100	+40%	30/15 Summer			
S22.010	S36(SW)	30 Winter	100	+40%	30/15 Summer			
S22.011	S37	30 Winter	100	+40%	30/15 Summer			
S22.012	S38(SW)	30 Winter	100	+40%	30/15 Summer			
S22.013	S39	30 Winter	100	+40%	30/15 Summer			
S17.011	S40	30 Winter	100	+40%	30/15 Summer			
S17.012	S65	30 Winter	100	+40%				
S26.000	S102	15 Winter	100	+40%	100/15 Summer			
S26.001	S103	60 Winter	100	+40%	30/15 Summer			
S26.002	S104	30 Winter	100	+40%	1/15 Summer			
S13.007	S66	30 Winter	100	+40%				
S11.006	S67	30 Winter	100	+40%				
S10.005	S68	30 Winter	100	+40%				
S10.006	S66	30 Winter	100	+40%	30/15 Winter			
S27.000	S69	15 Winter	100	+40%	30/15 Winter			
S27.001	S70	15 Winter	100	+40%	100/15 Summer			
S27.002	S71	15 Winter	100	+40%	30/15 Summer			
S27.003	S72(SW)	15 Winter	100	+40%	30/15 Winter			
S27.004	S73	15 Winter	100	+40%	30/15 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S18.000	S2	3.410	0.936	0.000	0.83			139.8	FLOOD RISK
S17.001	S3	3.261	1.078	0.000	0.92			175.6	SURCHARGED
S17.002	S4	3.215	1.088	0.000	1.15			169.8	SURCHARGED
S17.003	S5(SW)	3.176	1.084	0.000	1.59			187.9	SURCHARGED
S17.004	S6	3.148	1.074	0.000	1.17			183.7	SURCHARGED
S19.000	S7	3.253	0.631	0.000	0.60			59.3	SURCHARGED
S17.005	S8	3.125	1.065	0.000	1.44			229.2	SURCHARGED
S17.006	S9(SW)	3.090	1.042	0.000	0.98			256.8	SURCHARGED
S17.007	S10	3.021	1.056	0.000	1.21			255.1	SURCHARGED
S20.000	S12	3.149	0.664	0.000	0.72			106.2	SURCHARGED
S17.008	S13(SW)	2.994	1.040	0.000	1.64			347.1	SURCHARGED
S17.009	S14	2.949	1.007	0.000	1.61			386.2	SURCHARGED
S17.010	S15	2.871	0.979	0.000	0.98			389.5	SURCHARGED
S21.000	S16(SW)	3.334	0.466	0.000	2.24			104.0	FLOOD RISK
S21.001	S17	2.950	0.186	0.000	0.95			83.4	SURCHARGED
S22.000	S21(SW)	3.449	0.775	0.655	0.27			71.9	FLOOD
S22.001	S22	3.442	0.858	0.000	0.17			66.5	SURCHARGED
S23.000	S23(SW)	3.581	0.697	0.000	0.30			78.9	SURCHARGED
S23.001	S24	3.565	0.777	0.000	0.14			71.9	SURCHARGED
S24.000	S25(SW)	3.464	0.932	0.000	1.06			49.1	FLOOD RISK
S22.002	S26(SW)	3.389	0.949	0.000	0.79			209.3	SURCHARGED
S22.003	S27	3.336	0.984	0.000	0.98			207.5	SURCHARGED
S22.004	S28(SW)	3.314	0.986	0.000	1.29			230.0	SURCHARGED
S22.005	S29	3.274	0.979	0.000	0.66			230.2	SURCHARGED
S22.006	S30(SW)	3.249	1.023	0.000	1.52			235.6	SURCHARGED
S25.000	S31	3.304	0.804	0.000	0.26			71.6	FLOOD RISK
S25.001	S32	3.227	0.951	0.000	0.28			65.7	SURCHARGED
S22.007	S33	3.216	1.012	0.000	1.65			283.1	SURCHARGED
S22.008	S34(SW)	3.178	0.991	0.000	1.49			296.6	SURCHARGED
S22.009	S35	3.114	0.966	0.000	0.84			295.3	SURCHARGED
S22.010	S36(SW)	3.053	1.026	0.000	1.69			324.3	SURCHARGED
S22.011	S37	2.983	0.992	0.000	1.51			323.7	SURCHARGED
S22.012	S38(SW)	2.943	0.963	0.000	1.66			338.5	SURCHARGED
S22.013	S39	2.870	0.929	0.000	0.57			338.9	SURCHARGED
S17.011	S40	2.834	0.839	0.000	1.36			774.8	SURCHARGED
S17.012	S65	2.742	-0.497	0.000	0.05			772.7	OK
S26.000	S102	3.355	0.751	0.000	1.37			123.3	SURCHARGED
S26.001	S103	2.922	0.836	0.000	0.45			111.8	SURCHARGED
S26.002	S104	2.787	1.080	0.000	0.90			151.9	SURCHARGED
S13.007	S66	2.689	-0.490	0.000	0.06			961.0	OK
S11.006	S67	2.631	-0.482	0.000	0.07			804.1	OK
S10.005	S68	2.626	-0.687	0.000	0.06			719.7	OK
S10.006	S66	2.623	0.575	0.000	1.70			724.9	SURCHARGED*
S27.000	S69	4.262	1.130	0.000	1.58			105.9	FLOOD RISK
S27.001	S70	3.629	0.742	0.000	1.43			148.2	SURCHARGED
S27.002	S71	3.201	0.516	0.000	1.94			153.7	SURCHARGED
S27.003	S72(SW)	3.046	0.393	0.000	1.52			181.4	SURCHARGED

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S27.004	S73	2.928	0.324	0.000	1.89			182.8	SURCHARGED

PN	US/MH Name	Level Exceeded
S18.000	S2	
S17.001	S3	
S17.002	S4	
S17.003	S5(SW)	
S17.004	S6	
S19.000	S7	
S17.005	S8	
S17.006	S9(SW)	
S17.007	S10	
S20.000	S12	
S17.008	S13(SW)	
S17.009	S14	
S17.010	S15	
S21.000	S16(SW)	
S21.001	S17	
S22.000	S21(SW)	1
S22.001	S22	
S23.000	S23(SW)	
S23.001	S24	
S24.000	S25(SW)	
S22.002	S26(SW)	
S22.003	S27	
S22.004	S28(SW)	
S22.005	S29	
S22.006	S30(SW)	
S25.000	S31	
S25.001	S32	
S22.007	S33	
S22.008	S34(SW)	
S22.009	S35	
S22.010	S36(SW)	
S22.011	S37	
S22.012	S38(SW)	
S22.013	S39	
S17.011	S40	
S17.012	S65	
S26.000	S102	
S26.001	S103	
S26.002	S104	
S13.007	S66	
S11.006	S67	

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

PN	US/MH Name	Level Exceeded
S10.005	S68	
S10.006	S66	
S27.000	S69	
S27.001	S70	
S27.002	S71	
S27.003	S72(SW)	
S27.004	S73	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S27.005	S74(SW)	15 Winter	100	+40%	30/15 Winter			
S27.006	S75	30 Winter	100	+40%	100/15 Summer			
S27.007	S76	30 Winter	100	+40%	100/15 Summer			
S27.008	S77	30 Winter	100	+40%	100/15 Winter			
S10.007	S78	30 Winter	100	+40%	30/15 Winter			
S10.008	S80	30 Winter	100	+40%				
S28.000	S117	15 Winter	100	+40%	30/15 Summer			
S28.001	S118	15 Winter	100	+40%	100/15 Summer			
S28.002	S119	15 Winter	100	+40%	100/15 Summer			
S29.000	S120	15 Winter	100	+40%	30/15 Summer			
S28.003	S121	15 Winter	100	+40%				
S30.000	S122	15 Winter	100	+40%	30/15 Summer			
S31.000	S123	15 Winter	100	+40%	100/15 Summer			
S31.001	S124	15 Winter	100	+40%	100/15 Winter			
S30.001	S123	15 Winter	100	+40%				
S10.009	S129	30 Winter	100	+40%				
S10.010	S121	30 Winter	100	+40%	100/15 Summer			
S1.014	S115	2160 Winter	100	+40%				
S1.015	S116	2160 Winter	100	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S27.005	S74(SW)	2.821	0.236	0.000	2.33			197.8	SURCHARGED
S27.006	S75	2.721	0.153	0.000	1.91			182.0	SURCHARGED
S27.007	S76	2.702	0.153	0.000	1.30			214.9	SURCHARGED
S27.008	S77	2.678	0.174	0.000	0.32			205.6	SURCHARGED
S10.007	S78	2.411	0.385	0.000	3.17			817.0	SURCHARGED
S10.008	S80	2.143	-1.110	0.000	0.05			816.0	OK
S28.000	S117	4.303	1.122	0.000	1.90			127.8	FLOOD RISK
S28.001	S118	3.328	0.397	0.000	1.59			158.8	SURCHARGED
S28.002	S119	3.018	0.202	0.000	1.56			233.3	SURCHARGED
S29.000	S120	3.223	0.439	0.000	2.35			83.1	SURCHARGED
S28.003	S121	2.473	-0.214	0.000	0.54			313.8	OK
S30.000	S122	3.787	0.979	0.000	2.10			80.3	FLOOD RISK
S31.000	S123	2.842	0.034	0.000	1.14			40.2	SURCHARGED
S31.001	S124	2.726	0.010	0.000	1.04			38.8	SURCHARGED
S30.001	S123	2.485	-0.052	0.000	0.89			138.3	OK
S10.009	S129	2.108	-1.071	0.000	0.06			968.4	OK
S10.010	S121	2.073	0.216	0.000	1.55			939.9	SURCHARGED*
S1.014	S115	1.158	-0.042	0.000	0.64			33.6	OK
S1.015	S116	1.138	-0.031	0.000	0.64			33.6	OK

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

PN	US/MH Name	Level Exceeded
S27.005	S74(SW)	
S27.006	S75	
S27.007	S76	
S27.008	S77	
S10.007	S78	
S10.008	S80	
S28.000	S117	
S28.001	S118	
S28.002	S119	
S29.000	S120	
S28.003	S121	
S30.000	S122	
S31.000	S123	
S31.001	S124	
S30.001	S123	
S10.009	S129	
S10.010	S121	
S1.014	S115	
S1.015	S116	

APPENDIX F

Surface Water Exceedance Flood Routing Drawing

NOTES:

1. THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS. WHERE CONFLICT OF REQUIREMENTS EXIST THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION. OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS AND ARCHITECTS DRAWINGS.
3. DRAWINGS NOT TO BE SCALED. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR. ANY DISCREPANCIES TO BE NOTIFIED TO THE ENGINEER AND FURTHER INSTRUCTIONS OBTAINED BEFORE WORK IS COMMENCED.
4. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER THE BUILDING IS FULLY COMPLETED. IT IS THE CONTRACTORS SOLE RESPONSIBILITY TO DETERMINE THE ERECTION PROCEDURE AND SEQUENCE AND ENSURE THAT THE BUILDING AND ITS COMPONENTS ARE SAFE DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER TEMPORARY BRACING, GUYS OR TIE-DOWNS WHICH MAY BE NECESSARY, SUCH MATERIAL REMAINING THE THE PROPERTY OF THE CONTRACTOR ON COMPLETION, AND FOR ENSURING THAT THE WORKS AND ANY ADJACENT PROPERTIES ARE SAFE IN THE TEMPORARY CONDITION.

KEY

= EXISTING SURFACE WATER EXCEEDANCE FLOW PATH ROUTE.

Rev	Description	Date	By	Chk	App
P2	DRAWING REFERENCE AMENDED	26.05.23	ERD	JP	JAG
P1	FIRST ISSUE	10.02.22	HJD	AD	--

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York	T. 01904 611594

Project: Proposed Residential Development Site at Lincolnshire Lakes, Burringham Road

Client: Keepmoat Homes

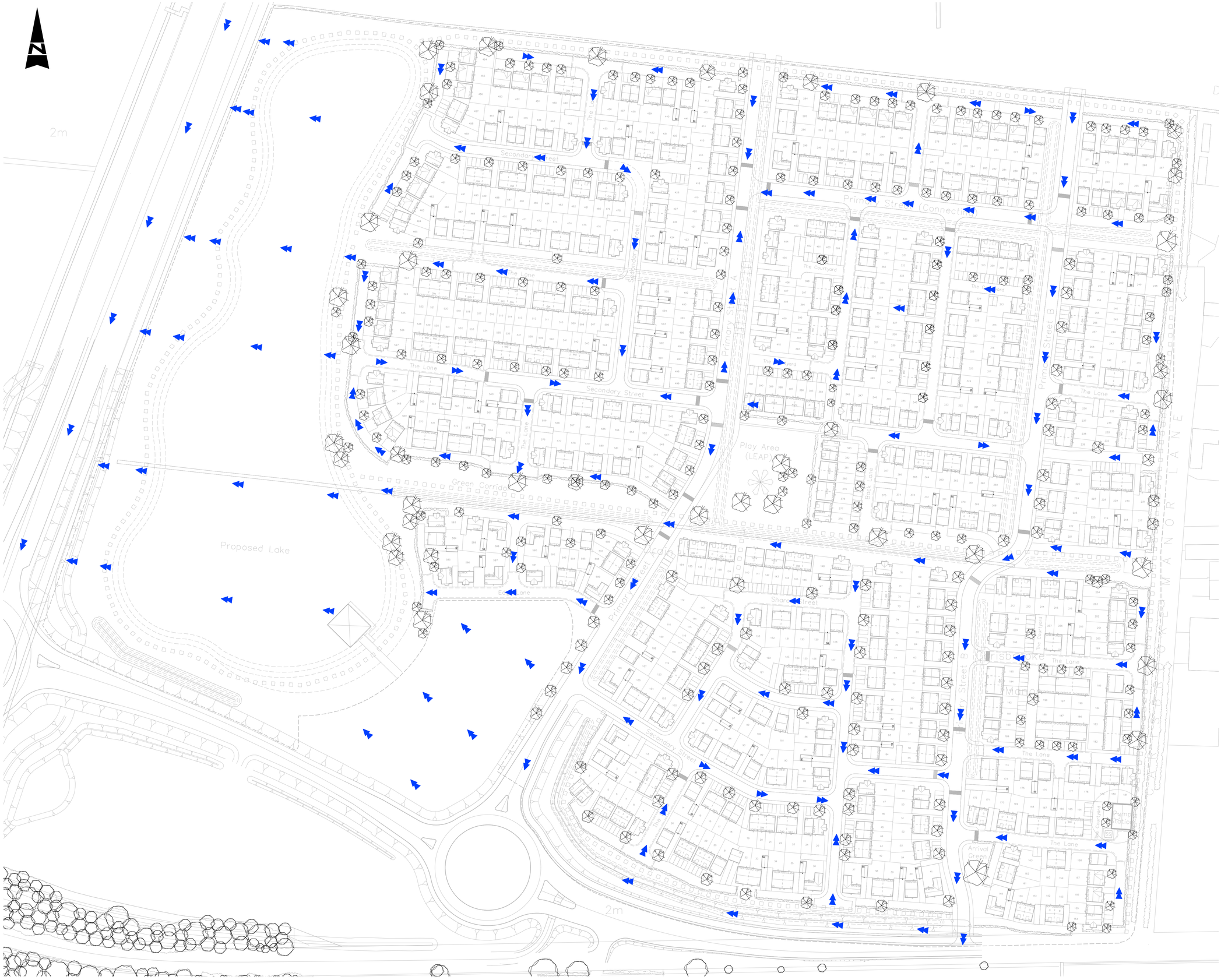
Drawing: Existing SW Exceedance Flood Routing

Role: Civils

Drawing Status: FOR INFORMATION

Job. no. 45822 | Scale@A1: 1:1000 | Rev. P2

Project	Originator	Volume	Level	Type	Role	Number
KPLL	AWP	ZZ	XX	D	C	3300



NOTES:

1. THESE NOTES ARE INTENDED TO AUGMENT DRAWINGS AND SPECIFICATIONS. WHERE CONFLICT OF REQUIREMENTS EXIST THE ORDER OF PRECEDENCE SHALL BE AS SHOWN IN THE SPECIFICATION. OTHERWISE THE STRICTEST PROVISION SHALL GOVERN.
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KEY

▲ = PROPOSED SURFACE WATER EXCEEDANCE FLOW PATH ROUTE

Rev	Description	Date	By	Chk	App
P3	REVISED TO SUIT UPDATED SITE LAYOUT	26.05.23	JP	JAG	JAG
P2	REVISED TO SUIT UPDATED SITE LAYOUT	26.05.23	ERD	JP	JAG
P1	FIRST ISSUE	10.02.22	HJD	AD	--

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Project: Proposed Residential Development Site at Lincolnshire Lakes, Burringham Road

Client: Keepmoat Homes

Drawing: Proposed SW Exceedance Flood Routing

Role: Civils

Drawing Status: FOR INFORMATION

Job. no. 45822 | Scale@ A1: 1:1000 | Rev. P3

Project	Originator	Volume	Level	Type	Role	Number
KPLL	AWP	ZZ	XX	D	C	3301

APPENDIX G

CIRIA SuDS Manual Water Quality Matrix Output

SIMPLE INDEX APPROACH: TOOL

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

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

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

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

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

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

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

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

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

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

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

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

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

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

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

	Runoff Area Land Use Description	*Hazard Level*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons
Select land use type from the drop down list (or 'Other' if none applicable): →	Residential/Industrial roofing; Inert materials	Very low	0.3	0.2	0.05
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:					
Landuse Pollution Hazard Index		**Very low**	**0.3**	**0.2**	**0.05**

DESIGN CONDITIONS: 1 | 2

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

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

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

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

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

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

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Detention basin	0.5	0.5	0.6
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	None	0	0	0
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None	0	0	0
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:				
Aggregated Surface Water Pollution Mitigation Index		**0.5**	**0.5**	**0.6**

DESIGN CONDITIONS: 1 | 2 | 3

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

Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events

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

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B

No ? Go to Step 2C

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

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

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

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

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

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

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

DESIGN CONDITIONS: 1 | 2 | 3 | 4

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

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

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

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

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

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

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

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

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

DESIGN CONDITIONS: 1

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

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but interception requires separate evaluation.

SIMPLE INDEX APPROACH: TOOL

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

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

3. The process that is automated in this tool is described in the SuDS Manual, Chapter 26 (Section 26.7)

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

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

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

6. Interception should be delivered for all upstream impermeable areas as part of the strategy for water quantity and quality control for the site. This is required in order to deliver both of the water quality criteria set out in Chapter 4 of the SuDS Manual

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

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

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

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

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

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

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

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

	Runoff Area Land Use Description	*Pollution Hazard*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2
Select land use type from the drop down list (or 'Other' if none applicable): →	Low traffic roads (e.g. residential roads and general access roads, < 300 traffic movements/day)	Low	0.5	0.4	0.4		
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:							
	Landuse Pollution Hazard Index	**Low**	**0.5**	**0.4**	**0.4**		

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

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

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

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

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

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

	SuDS Component Description		*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2	3
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Swale		0.5	0.6	0.6	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	User defined indices	Enter User Defined Indices in row below				Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below		
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None		0	0	0			
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:								
	Catchpit Manhole/Trapped Gullies	SuDS Component 2	0.4	0.2	0.2			
	Aggregated Surface Water Pollution Mitigation Index		**0.7**	**0.7**	**0.7**			

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

Is the runoff now discharged to an infiltration component?

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

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

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

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

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

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

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

		Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2	3	4
Select type of groundwater protection from the drop down list: →	None							
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:								
	Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**				

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

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

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

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

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

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

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

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

Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.

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

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