NORTH LINCOLNSHIRE GREEN ENERGY PARK

Planning Act 2008

Infrastructure Planning (Applications Prescribed Forms and Procedure) Regulations 2009

APFP Regulation 5(2)(a)

North Lincolnshire Green Energy Park

Volume 6

Environmental Statement

6.3.5 Annex 5: Indicative Drainage Strategy

PINS reference: EN010116

February 2023

Revision number: 1

North Lincolnshire Green Energy Park

Indicative Drainage Strategy

0046658-DS-REP-01

0046658

17 February 2023

Revision P1

Contents

Table of Tables

Table of Figures

1 Introduction

1.1 Background

1.1.1 This report has been prepared by Buro Happold on behalf of The North Lincolnshire Green Energy Park Ltd. ('the Applicant'). Identified as a Nationally Significant Infrastructure Project (NSIP), the North Lincolnshire Green Energy Park (NLGEP) ('the Project') is being brought forward for planning under a Development Consent Order (DCO).

1.1.2 This drainage strategy should be read as supplementary information to the Flood Risk Assessment (**Document Reference 6.3.3**) for the Project.

1.2 Project Description

1.2.1 The North Lincolnshire Green Energy Park (NLGEP) ('the Project'), located at Flixborough, North Lincolnshire, is a Nationally Significant Infrastructure Project (NSIP) with an Energy Recovery Facility (ERF) capable of converting up to 760,000 tonnes of non-recyclable waste into 95 MW of electricity at its heart and a carbon capture, utilisation and storage (CCUS) facility which will treat the excess gasses released from the ERF to remove and store carbon dioxide (CO_2) prior to emission into the atmosphere.

1.2.2 The NSIP incorporates a switchyard, to ensure that the power created can be exported to the National Grid or to local businesses, and a water treatment facility, to take water from the mains supply or recycled process water to remove impurities and make it suitable for use in the boilers, the CCUS facility, concrete block manufacture, hydrogen production and the maintenance of the water levels in the wetland area.

1.2.3 The Project will include the following Associated Development to support the operation of the NSIP:

- a bottom ash and flue gas residue handling and treatment facility (RHTF)
- a concrete block manufacturing facility (CBMF)
- a plastic recycling facility (PRF)
- a hydrogen production and storage facility
- an electric vehicle (EV) and hydrogen (H2) refuelling station
- battery storage
- a hydrogen and natural gas above ground installations (AGI)
- a new access road and parking
- a gatehouse and visitor centre with elevated walkway

- railway reinstatement works including, sidings at Dragonby, reinstatement and safety improvements to the 6km private railway spur, and the construction of a new railhead with sidings south of Flixborough Wharf
- a northern and southern district heating and private wire network (DHPWN)
- habitat creation, landscaping and ecological mitigation, including green infrastructure and 65 acre wetland area
- new public rights of way and cycle ways including footbridges
- Sustainable Drainage Systems (SuDS) and flood defence; and
- utility constructions and diversions.

1.2.4 Refer to Appendix B for a figure showing an overview of the Project.

1.2.5 The Project will also include development in connection with the above works such as security gates, fencing, boundary treatment, lighting, hard and soft landscaping, surface and foul water treatment and drainage systems and CCTV.

1.2.6 The Project also includes temporary facilities required during the course of construction, including site establishment and preparation works, temporary construction laydown areas, contractor facilities, materials and plant storage, generators, concrete batching facilities, vehicle and cycle parking facilities, offices, staff welfare facilities, security fencing and gates, external lighting, roadways and haul routes, wheel wash facilities, and signage.

1.2.7 The Application land encompasses an area within and adjacent to Flixborough Port (RMS Trent Ports) on the east bank of the River Trent. The Flixborough Port and Flixborough Industrial Estate together form an industrial complex that has supported a range of businesses and industrial activities since the early 1900s. Existing infrastructure at the site includes roads, a rail spur, a 155m long wharf, weigh bridge, cranes, warehousing and stock sheds, workshops and portable offices.

1.2.8 The Project will have transport connectivity by road, rail, and river to sea via the River Trent and River Humber, with the latter two used for freight transport only. Land adjacent to the Flixborough Industrial Estate included within the Application Land is currently a mix of both brownfield land and areas used for arable agriculture, comprising a number of fields separated by hedgerows and well established drainage ditches which are maintained by the internal drainage board.

1.2.9 The Order Limits and indicative location of the proposed Energy Park buildings are shown on Figure 1-1.

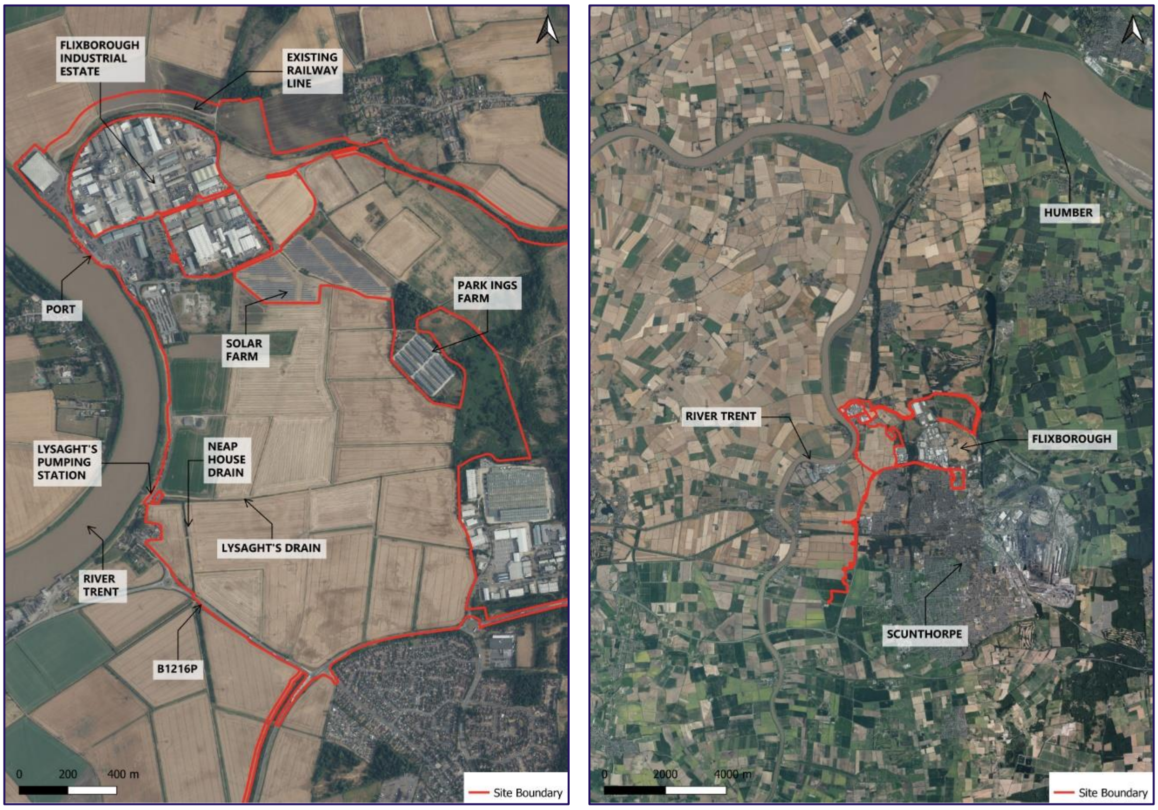


Figure 1-1 – the Project Location.

2 Site Context: Statutory & Non-Statutory Policies and Guidance

National Policy

2.1.1 The National Planning Policy Framework (NPPF 2021) provides planning policy from central government. The document states that "…local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where, informed by a site-specific flood risk assessment…".

2.1.2 Non-Statutory Technical Standards for Sustainable Drainage Systems (TSSuDS) (Department for Environment, Food and Rural Affairs, March 2015) provides guidance for the hydraulic performance of Sustainable Drainage Systems (SuDS) systems to reduce flood risk and improve water quality of water discharging from a development site. The document provides guidance on best practice and is not a statutory requirement for approval.

Planning Policy

2.1.3 In accordance with the North Lincolnshire Local Development Framework consideration of sustainable drainage systems and surface water attenuation methodologies are required. The SuDS and Flood Risk Guidance Document (April 2017) describes the requirements that must be met by the developers to avoid increasing the risk of flooding to the site and the surrounding areas.

3 Site Description

3.1 Existing Site

3.1.1 The existing site primarily comprises of five main areas, they include:

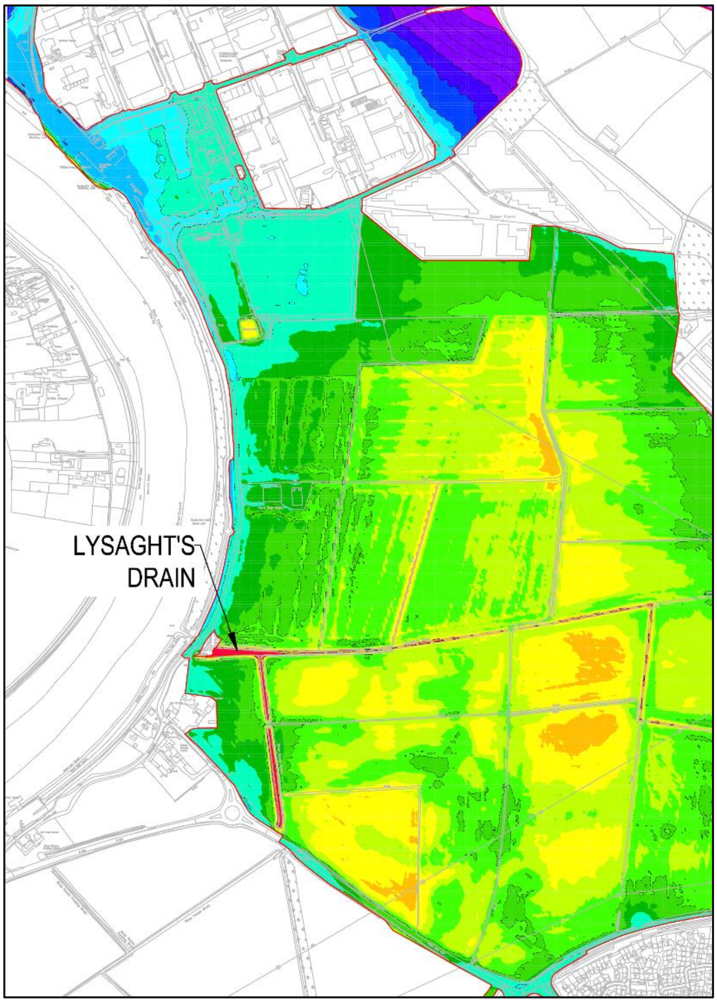
- The port area and adjacent steel sheds.
- Agricultural fields between Stather Road, Phoenix Parkway and Ferry Road West.
- The disused railway line between Flixborough Port and Drangonby Sidings.
- Highway link between Phoenix Parkway and Scunthorpe, for district heating and and private wire network (DHPWN) installation only.
- Highway link between Phoenix Parkway and Lincolnshire lakes scheme, along A1077 and M181, for DHPWN installation.

3.2 Existing Topography

3.2.1 Levels across the Energy Park Land containing the core elements of the project (ERF; carbon capture, utilisation and storage facility; bottom ash and flue gas residue handling and treatment facility; concrete block manufacturing facility; plastic recycling facility; hydrogen production and storage facility; electric vehicle (EV) and hydrogen (H2) refuelling station; battery storage and hydrogen and natural gas above ground installations), between Stather Road and Ferry Road West, vary from approximately +5.5 m AOD at the north-eastern corner, to +0.3 m AOD at the southern boundary.

3.2.2 Lysaght's Drain provides the lowest point of the Application Land at approximately -1.7 m AOD at the western end where it connects to a pumping station adjacent to the River Trent.

3.2.3 Levels to the east of Flixborough Industrial Estate vary from approximately +34 m AOD, in the north-eastern corner, to +4.5 m AOD in the area where the unknown road and Stather Road meets to the west of where the proposed AGI will be located.



Existing Ground Level Table			
Number	Range From [m AOD]	Range To [m AOD]	Colour
1	-1.700	-1.000	
2	-1.000	-0.500	
3	-0.500	0.000	
4	0.000	0.500	
5	0.500	1.000	
6	1.000	1.500	
7	1.500	2.000	
8	2.000	2.500	
9	2.500	3.000	
10	3.000	4.000	
11	4.000	5.000	
12	5.000	6.000	
13	6.000	8.000	
14	8.000	10.000	
15	10.000	20.000	
16	20.000	35.000	

Figure 3-1 Existing Topography.

3.2.4 The average elevation across the whole Application Land is approximately +2.3 m AOD.

3.2.5 Due to the Application Land's large area 10 different catchment areas are identified for the drainage strategy.

3.3 Existing Waterbodies

3.3.1 The River Trent runs adjacent to the western edge of the Application Land and will ultimately be the receiving body for the surface water discharge. There are a number of existing ditches across the Application Land, explained in the following section, and these will be used to convey surface water to the River Trent.

3.4 Existing Drainage

3.4.1 Existing drainage across the agricultural areas of the Application Land predominantly consists of land drains. Stather Road drains to either the existing agricultural fields or to adjacent ditches along its length. Whereas a piped drainage system exists within the Flixborough Industrial Estate.

3.4.2 The agricultural ditches eventually drain to Lysaght's Drain, which runs east-west through the centre of the Energy Park Land and in turn discharges to the River Trent, via a pumping Station.

3.4.3 The existing ditches are shown on plan in Figure 3-2, where the main ditches are numbered for reference. Table 3-1 summarises the length, top width, and flow direction of each ditch. Majority of the ditches have similar cross-sections, however, ditch 4 and 5 has a sheet pile wall on the southern side seen in Figure 3-3.

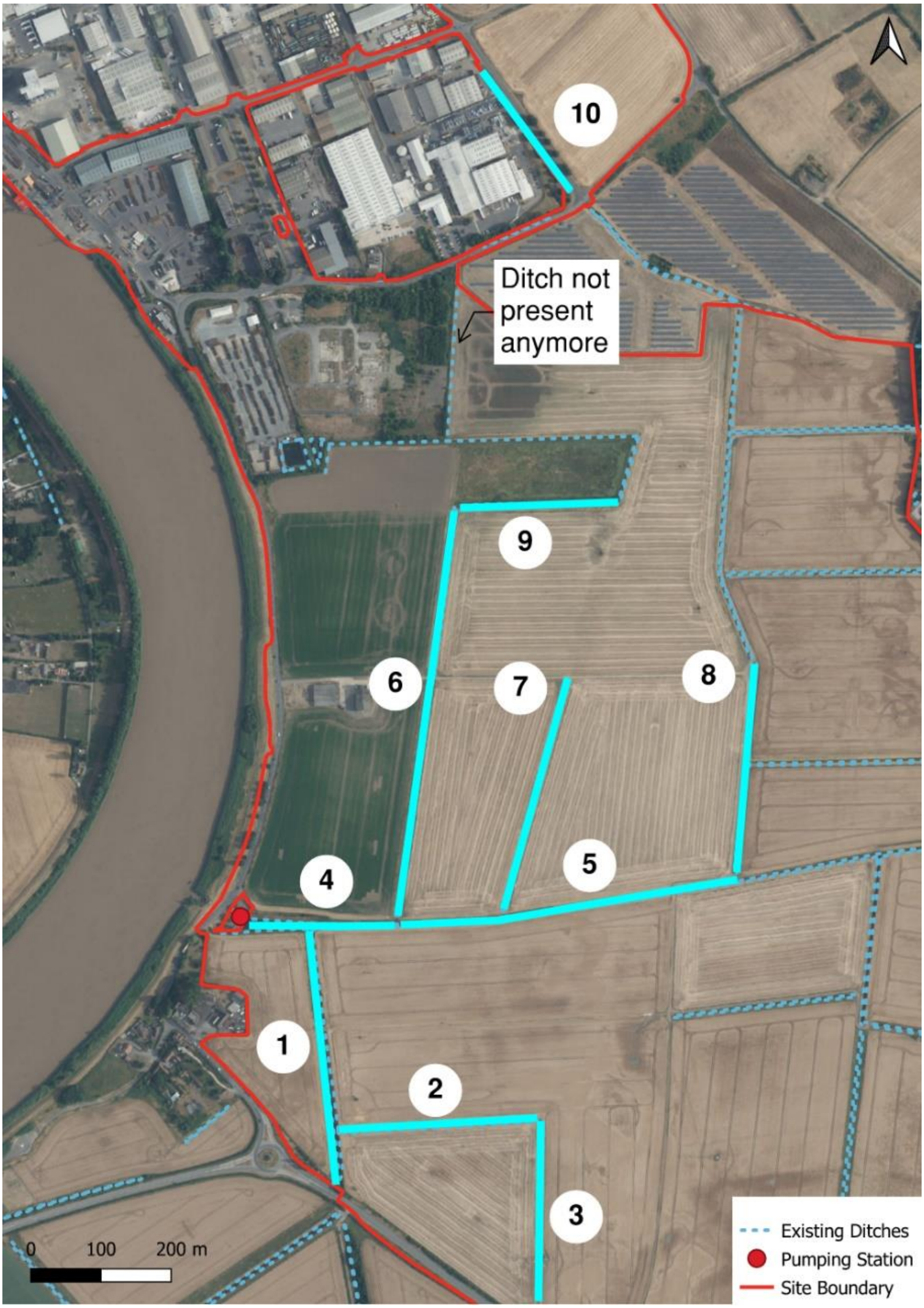


Figure 3-2: Plan of existing ditches on the Energy Park Land.

Table 3-1: Ditch properties.

Ditch Number	Length (m)	Top Width (m)	Flow Direction
1	348	15.5	S-N
2	278	5.0	E-W
3	282	5.0	S-N
4	222	35.0	E-W
5	692	6.0-7.7	E-W
6	590	5.0	N-S
7	340	6.0	N-S
8	298	5.0	N-S
9	230	4.0	E-W
10	208	2.0	N-S

Ditch 1

Ditch 2

Ditch 3


Ditch 4 (Lysaght's Drain)


Ditch 5 (Lysaght's Drain)


Ditch 6


Ditch 7

Ditch 8

Ditch 9

Ditch 10

Figure 3-3: Existing Ditches

3.4.4 In order to prove that the existing ditches can accommodate the proposed flows, an estimated capacity check has been undertaken and the following assumptions have been made:

- Geometry of the ditches have been determined from a walk over dated April 2021.
- Longitudinal slope to be 1:1000
- Side slopes to be 1:1 except ditch 10 which is 1:2.
- Manning’s n to be 0.035.

Using the Manning formula: $V = \frac{1}{n} R_h^{2/3} S^{1/2}$, the estimated existing capacity of the ditches are shown in Table 3-2:

Table 3-2 Existing ditches capacity check

Ditch Number	Height (m)	Base Width (m)	Velocity (m/s)	Capacity (l/s)
1	6.00	3.0	1.75	94,695
2	2.25	0.5	0.84	5,217
3	2.25	0.5	0.84	5,217
4	8.00	19.0	2.71	584,927
5	2.25	2.5	1.02	10,939
6	2.20	0.6	0.84	5,199
7	2.75	0.5	0.95	8,498
8	2.00	1.0	0.84	5,058
9	2.00	0.5	0.79	3,932
10	0.50	0.5	0.37	185

3.4.5 Looking at the proposed discharge rates shown on Table 4-5, it can be determined that the existing ditches have enough capacity to accommodate the proposed flows.

4 Proposed Surface Water Drainage Strategy

4.1 General

4.1.1 The surface water strategy and report have been developed in consultation with North Lincolnshire Council Lead Local Flood Authority and Scunthorpe & Gainsborough WMB.

4.1.2 This drainage strategy should be read as supplementary information to the Flood Risk Assessment (**Document Reference 6.3.3**) for the Project.

4.2 Surface Water Disposal

4.2.1 Surface water disposal should be in accordance with the drainage hierarchy in Building Regulations Part H 2015. This hierarchy is briefly described below:

- Step 1. Disposal on Site - via infiltration SuDS (Sustainable Drainage Systems)

  Infiltration tests are planned to be completed as part of a geotechnical investigation. A desktop study has indicated that potential for infiltration is low and has been considered as zero in the current calculations. The rates will be confirmed by investigation and the design updated as required.

- Step 2. Disposal to a Watercourse

  The nearest watercourses are the existing ditches across the Application Land, including Lysaght’s Drain, which runs east-west across the agricultural fields between Stather Road and Ferry Road West. Lysaght’s drain discharges into the River Trent via a pumping station located adjacent to Stather Road. The strategy for surface water will be to discharge to the existing ditches across the Application Land.

- Step 3. Disposal to a Public Sewer

  Not required for this development.

4.3 Watershed

4.3.1 As noted in Section 3.2, the Application Land is divided into 10 catchments. The land is generally flat but stormwater from the north-western and south-eastern boundaries slope towards ditches that connect to the central Lysaght's Drain. The proposed drainage strategy is to reflect these catchments, to mimic the existing drainage.

4.3.2 As all the catchments are discharging to a water course, the existing greenfield runoff rate has been calculated to comply with requirements set by Scunthorpe & Gainsborough Water Management Board (SGWMB). This flow rate of 1.4 l/s/ha will be used for the Project.

4.4 Consultation

4.4.1 North Lincolnshire Council – The NLC flood team have been consulted regarding the surface water strategy to include their requirement in the proposed design. Also, a meeting with the Lead Local Flood Authority and the SGWMB was held in May 2021 where the proposed strategy was presented for initial comments. It was confirmed that there are no records of historic flooding in the Order Limits. Refer to Appendix C and D for correspondence and meeting minutes.

4.4.2 Scunthorpe & Gainsborough Water Management Board (SGWMB)- A meeting with the SGWMB team was held in October 2020 where it was explained the project and the proposed surface water strategy. SGWMB stated that the proposed discharge rate has to be restricted to the greenfield runoff rate and not exceed 1.4l/s/ha. Refer to Appendix D for meeting minutes with SGWMB.

4.5 Sustainable Drainage Systems (SuDS)

4.5.1 Sustainable Urban Drainage Systems are used to reduce the impact of surface water from storm events on the existing environment mimicking the natural run-off characteristics of the site and removing pollutants from the urban run-off at source. There are various solutions which are described in the SuDS Manual (CIRIA C753) and include ground level features including swales and ponds, below ground systems (such as tanks, and infiltration techniques like soakaways). In addition, there are above ground solutions such as green roofs.

4.5.2 The Project considers the use of sustainable drainage techniques in accordance with local policy. The CIRIA SuDS Manual contains a hierarchy of sustainable methods of capturing and storing rainwater in a descending order: from drainage into the ground to recharging water resources. Since infiltration is not possible, surface water will be stored on site in open water features and then released at a controlled rate.

4.5.3 Non-infiltration SuDS features will not reduce the amount of surface water discharged; however, it will significantly delay and mitigate the peak flood flows from the Application Land. The hierarchy of SuDS techniques is shown below:

4.5.4 The SuDS features included in the design for the Project are listed below.

Table 4-1 SuDS Techniques.

	SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Suitability for the Project	Comments
Most Sustainable	**Living roofs**	√	√	√	**No**	Not considered for the infrastructure areas
	Basins & ponds	√	√	√	**Yes**	Detention basins and swales are considered as the main elements to convey and attenuate the surface water generated for the proposed impermeable areas.
	Constructed Wetlands				**No**	
	Balancing ponds				**No**	
	Detention basins				**Yes**	
	Retention ponds				**No**	
	Filter strips & swales	√	√	√	**Yes**	

	SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Suitability for the Project	Comments
Least Sustainable	**Rain Gardens**	√	√	√	**Yes**	
	Infiltration devices	√	√	√	**No**	Not considered as this stage. Results from ground investigation will determine if this option is available
	Soakaways					
	Infiltration trenches & basins					
	Permeable surfaces	√	√		**Yes**	To not be considered in the infrastructure areas, as not to adoptable requirements, but to be considered when building infrastructure is developed.
	Gravelled areas				**Yes**	Subject to landscape design
	Solid paving blocks				**Yes**	Subject to landscape design
	Porous pavers				**Yes**	Subject to landscape design

	SUDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Suitability for the Project	Comments
	Tanked systems	√			**Yes**	
	Over-sized pipes/tanks				**Yes**	
	Attenuation cells				**Yes**	

Detention Basins

4.5.5 The detention basins are proposed to be landscaped depressions that are normally dry except during and immediately following storm events. An allowance for topsoil/planting medium will be provided similar to a bio-retention system. The potential amenity/ecological use of the detention basin system allows this space to be flexible and provide multiple benefits to the Application Land.

4.5.6 Detention basins allow sedimentation and pollutant removal of the run-off. They will also provide the main source of attenuation across deliver a reduction in discharge volumes due to evapotranspiration.

Figure 4-1 Example Detention Basin.

Swales

4.5.7 Swales are shallow, flat bottomed, potentially vegetated channels designed to convey, treat and attenuate surface water runoff. They are designed to encourage evapotranspiration as well as infiltration to the ground. When incorporated into site design swales can be used to enhance the natural landscape and provide visual and biodiversity benefits. The swales across the Application Land are proposed to be wet swales that convey the surface water runoff to the detention basins where it will be attenuated and to the existing ditches where it will be discharged with restricted flow.

Figure 4-2 Example Swale.

4.6 Climate Change

4.6.1 The climate change allowances are based on the Table 2 Peak Rainfall Intensity Allowance in Small and Urban Catchments (use 1961 to 1990 baseline), produced by the Environment Agency (EA).

4.6.2 For the Project, it is considered at the upper end and the design life of the buildings is 40 years. From the table, the potential change in the peak rainfall intensity allowance anticipated is 20% however, after consultation with the LLFA , 40% has been used for the calculations.

Table 4-2-Peak rainfall intensity allowance in small and urban catchments (based on a 1961 to 1990 baseline).

Applies across all of England	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2069	Total potential change anticipated for 2070 to 2115
Upper End	+10%	+20%	+40%
Central	+5%	+10%	+20%

4.7 Pollution Control

4.7.1 The appropriateness of proposed SuDS for the Application Land has been evaluated based on the CIRIA Report C753 Simple Index Approach. This is based on a simple index system, in which SuDS components and types of sites are assigned an index value for pollutant mitigation/hazard levels. To deliver adequate treatment, the SuDS component should have a total pollution mitigation index equal to or larger than the pollution hazard index. The following table summarises the mitigation indices of the proposed SuDS.

4.7.2 Due to the multiple levels of treatment the proposed the SuDS are deemed sufficient for treating the various land use types.

Table 4-3 Mitigation indices of proposed SuDS components.

Mitigation indices			
Type of SuDS	**TSS**	**Metals**	**Hydrocarbons**
Swale	0.5	0.6	0.6
Detention basin	0.5	0.5	0.6
Filter Strips	0.4	0.4	0.5

4.7.3 These values are then compared to the pollution hazard levels of each type of area within the Application Land to evaluate the adequacy of proposed SuDS.

Table 4-4 Pollution hazard indices of areas within the Application Land.

Land use	Pollution hazard level	Total suspended solids	Metals	Hydrocarbons	Proposed mitigation measure	Adequacy
Low traffic roads, residential car parks	Low	0.5	0.4	0.4	Swales and basins	√

Land use	Pollution hazard level	Total suspended solids	Metals	Hydrocarbons	Proposed mitigation measure	Adequacy
Main access road	Medium	0.7	0.6	0.7	Swales, filter trenches and basins	√
Sites with Heavy Pollution	High	0.8	0.8	0.8	Swales, filter trenches and basins	√

4.8 Proposed Strategy

4.8.1 As noted, the Application Land is divided into 10 catchments, shown in Figure 4-3. These were divided due to the large area and several existing ditches crossing the Application Land. There are 10 detention basins and 1 storage tank used to promote biodiversity, treat water quality and attenuate stormwater before being discharged into the existing ditches. Where possible, swales will be used to convey runoff instead of pipes and basins will be used for storage instead of tanks. An orifice is used to control discharge rates from the basins. The proposed SuDS features included in the design are shown on the plan indicated in Figure 4-4 and Appendix F.

4.8.2 A hydraulic model has been created in MicroDrainage to design these systems to store the 1 in 100-year (plus 40% climate change) storm event prior to discharge into the existing ditches. Results are shown in Appendix I.

4.8.3 As part of the Project, the disused railway line between Flixborough Port and Drangonby Sidings will be reinstated. The LLFA confirmed during a meeting held in May 2021 that the no further restriction for the reinstated railway catchment will be required and it will maintain the existing strategy repairing or replacing the drainage that is not in acceptable condition.

4.8.4 The total area, effective impermeable area, and allowed discharge for each catchment is summarised in Table 4-5, which were calculated using the Percentage Impermeable proportions assumptions shown in Table 4-6.

4.8.5 The SuDS storage designs and attenuation volumes required are presented in Table 4-7. Areas that contribute runoff into each system is also identified. A short description of the drainage strategy for each catchment is included below, and the calculations and detail follow in the subsequent sections.

Table 4-5: Areas and allowed discharge for each catchment.

Catchment	Total Area (ha)	Impermeable Area (ha)	Allowed Discharge (l/s)
1	1.7	1.0	2.4
2	0.9	0.7	1.2
3	0.9	0.6	1.3
4	0.9	0.4	1.3
5	0.7	0.5	1.0
6	1.8	0.9	2.6
7	16.7	11.1	23.4
8	3.3	2.1	4.6
9	1.0	0.5	1.4
10	2.6	1.4	3.6

Table 4-6: Percentage Impermeable proportion assumptions.

Area	Percentage Impermeable Proportion (%)
Roof	90
Road	75
Grass	30
Detention Basin	100

Table 4-7: Summary of SuDS storage designs.

Catchment	Type	Base Area (m^2)	Top Area (m^2)	Depth (m)	Total Storage (m^3)	Areas Drained
1	Detention Basin 1	550	925	1.3	950	Southern hydrogen and natural gas above ground installations (AGI)
2	Storage Tank 1	756	756	0.914	670	Western hydrogen production and storage facility and electric vehicle (EV) and hydrogen (H2) refuelling station
3	Detention Basin 2	300	640	1.5	685	Eastern hydrogen production and storage facility and electric vehicle (EV) and hydrogen (H2) refuelling station
4	Detention Basin 3	405	600	0.8	400	Southern Access Road
5	Detention Basin 4	165	435	1.5	435	Railway
6	Detention Basin 5	265	585	1.3	535	Central Access Road
7	Detention Basin 6	6400	7460	0.95	6500	North-western ERF and northern concrete block manufacturing facility & plastic recycling facility
7	Detention Basin 7	1490	2215	1.5	2745	North-western ERF and northern concrete block manufacturing facility & plastic recycling facility
8	Detention Basin 8	1045	1625	1.5	1985	Southern concrete block manufacturing

Catchment	Type	Base Area (m^2)	Top Area (m^2)	Depth (m)	Total Storage (m^3)	Areas Drained
						facility & plastic recycling facility
9	Detention Basin 9	520	730	0.8	500	Northern Access Road
10	Storage Tank 2	2335	2335	0.61	1350	Northern hydrogen and natural gas above ground installations

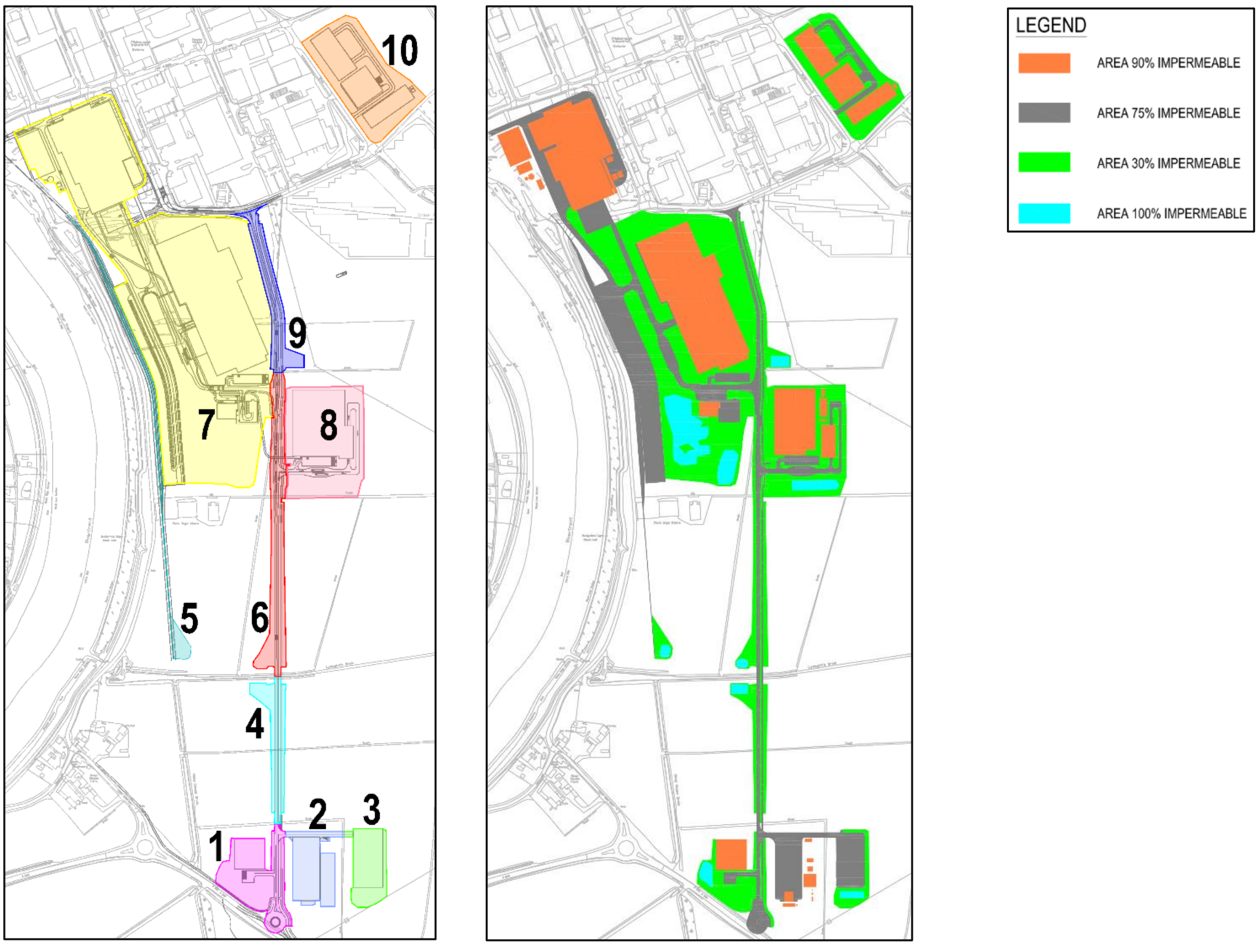


Figure 4-3: Catchment Plan.

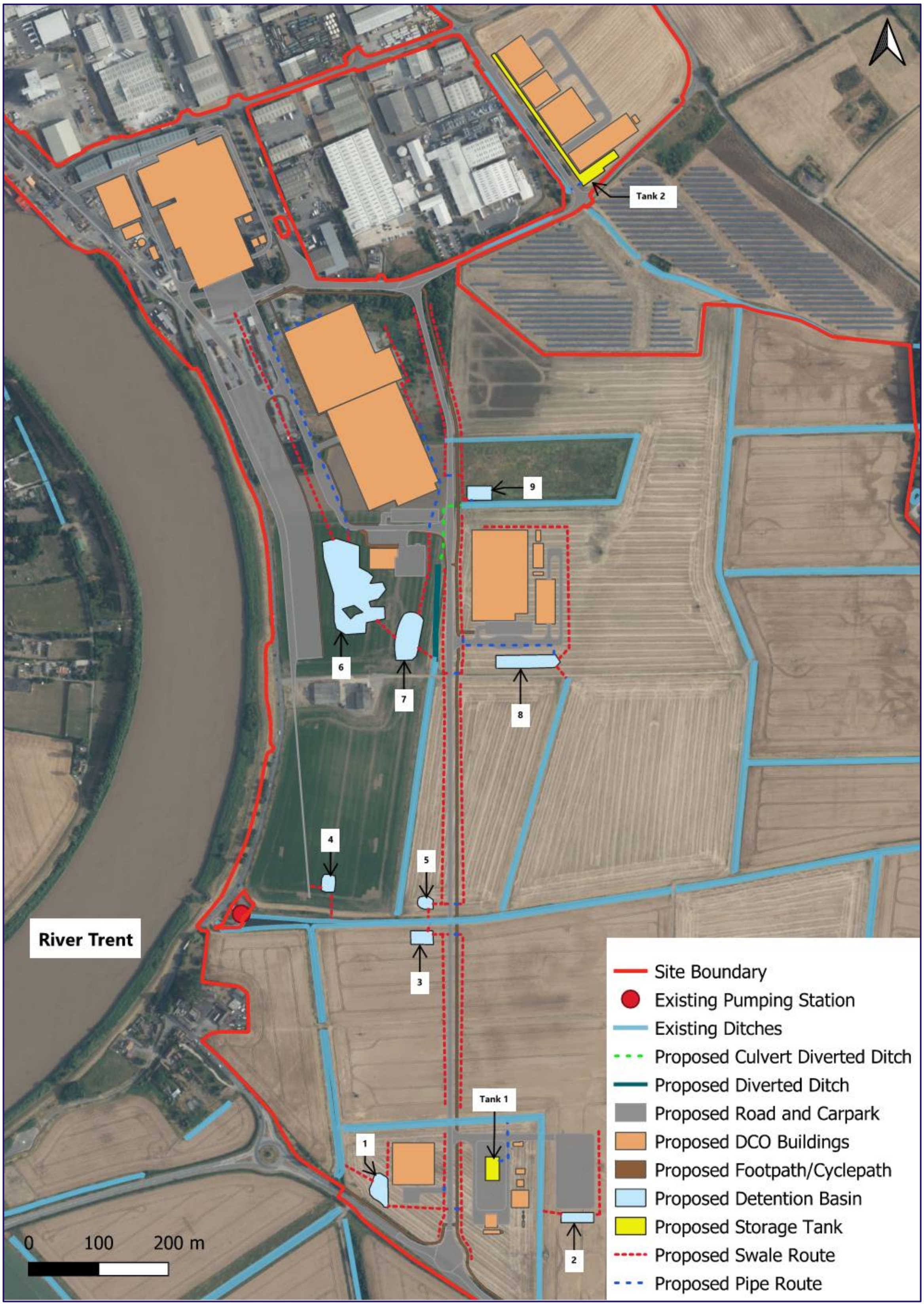


Figure 4-4: Proposed SuDS Features.

Catchment 1

4.8.6 Catchment 1 will discharge runoff from the southern hydrogen and natural gas above ground installations and access road to existing ditch 1 in the south-western area at a discharge rate of 2.4 l/s. Stormwater will be conveyed using swales. Attenuation will be provided in detention basin 1 located adjacent to Ferry Road West. The storage will comprise of a 1.3 m deep basin providing the attenuation volume of 950 m^3.

Catchment 2

4.8.7 Catchment 2 will discharge runoff from the western hydrogen production and storage facility and electric vehicle (EV) and hydrogen (H2) refuelling station to existing ditch 2 in the southern area at a discharge rate of 1.2 l/s. Stormwater will be conveyed using pipes. Attenuation will be provided in storage tank 1 located under the carpark due to the space constraint in this area. The storage will comprise of a 0.914 m deep ACO StormBrixx SD tank providing the attenuation volume of 670 m^3.

Catchment 3

4.8.8 Catchment 3 will discharge runoff from the eastern hydrogen production and storage facility and electric vehicle (EV) and hydrogen (H2) refuelling station to existing ditch 3 in the southern area at a discharge rate of 1.3 l/s. Stormwater will be conveyed using swales. Attenuation will be provided in detention basin 2. The storage will comprise of a 1.5 m deep basin providing the attenuation volume of 685 m^3.

Catchment 4

4.8.9 Catchment 4 will discharge runoff from the proposed central access road to existing ditch 5 in the central area at a discharge rate of 1.3 l/s. Stormwater will be conveyed using swales adjacent to the roads. Attenuation will be provided in detention basin 3. The storage will comprise of a 0.8 m deep basin providing the attenuation volume of 400 m^3. The outfall into the ditch will be above the existing sheet pile wall seen in Figure 3-3e.

Catchment 5

4.8.10 Catchment 5 will discharge runoff from the railway to existing ditch 4 in the western area at a discharge rate of 1.0 l/s. Stormwater will be conveyed using swales. Attenuation will be provided in detention basin 4. The storage will comprise of a 1.5 m deep basin providing the attenuation volume of 435 m^3.

Catchment 6

4.8.11 Catchment 6 will discharge runoff from the proposed central access road to existing ditch 5 in the central area at a discharge rate of 2.6 l/s. Stormwater will be conveyed using swales adjacent to the roads. Attenuation will be provided in detention basin 5. The storage will comprise of a 1.3 m deep basin providing the attenuation volume of 535 m^3.

Catchment 7

4.8.12 Catchment 7 will discharge runoff from the North-western ERF and northern concrete block manufacturing facility (CBMF) & plastic recycling facility (PRF) to existing ditch 6 in the central area at a discharge rate of 23.4 l/s. Stormwater will be conveyed using swales where possible. However, the western and eastern side of the northern CBMF and PRF will require some piped systems due to the space constraint. Attenuation will be provided in detention basin 6 and 7. The storage will comprise of a 0.95 and 1.5 m deep basin providing the attenuation volume of 6,500 m^3 and 2,745 m^3, respectively.

Catchment 8

4.8.13 Catchment 8 will discharge runoff from the southern CBMF and PRF to existing ditch 7 in the central area at a discharge rate of 4.6 l/s. Stormwater will be conveyed using swales. Attenuation will be provided in detention basin 8. The storage will comprise of a 1.5 m deep basin providing the attenuation volume of 1,985 m^3.

Catchment 9

4.8.14 Catchment 9 will discharge runoff from the proposed northern access road to existing ditch 9 at a discharge rate of 1.4 l/s. Stormwater will be conveyed using swales adjacent to the roads. Attenuation will be provided in detention basin 9. The storage will comprise of a 0.8 m deep basin providing the attenuation volume of 500 m^3.

Catchment 10

4.8.15 Catchment 10 will discharge runoff from the hydrogen and natural gas above ground installations and substations to existing ditch 10 in western side of the road at a discharge rate of 3.6 l/s. Stormwater will be conveyed using pipes adjacent to the buildings. Attenuation will be provided in storage tank 2. The storage will comprise of a 0.61m deep ACO StormBrixx HD tank providing the attenuation volume of 1350 m^3. It should be noted that, due to the constraints of the site and the levels, a pump solution may be required for this area, subject to detailed design.

4.9 Diverted Ditch

4.9.1 Existing Ditch 6 will be diverted due to the location of the proposed access road. The proposed diversion route is shown in Figure 4-6.

4.9.2 Calculations for the networks can be found in Appendix I.

Figure 4-5: Image of ditch to be diverted.

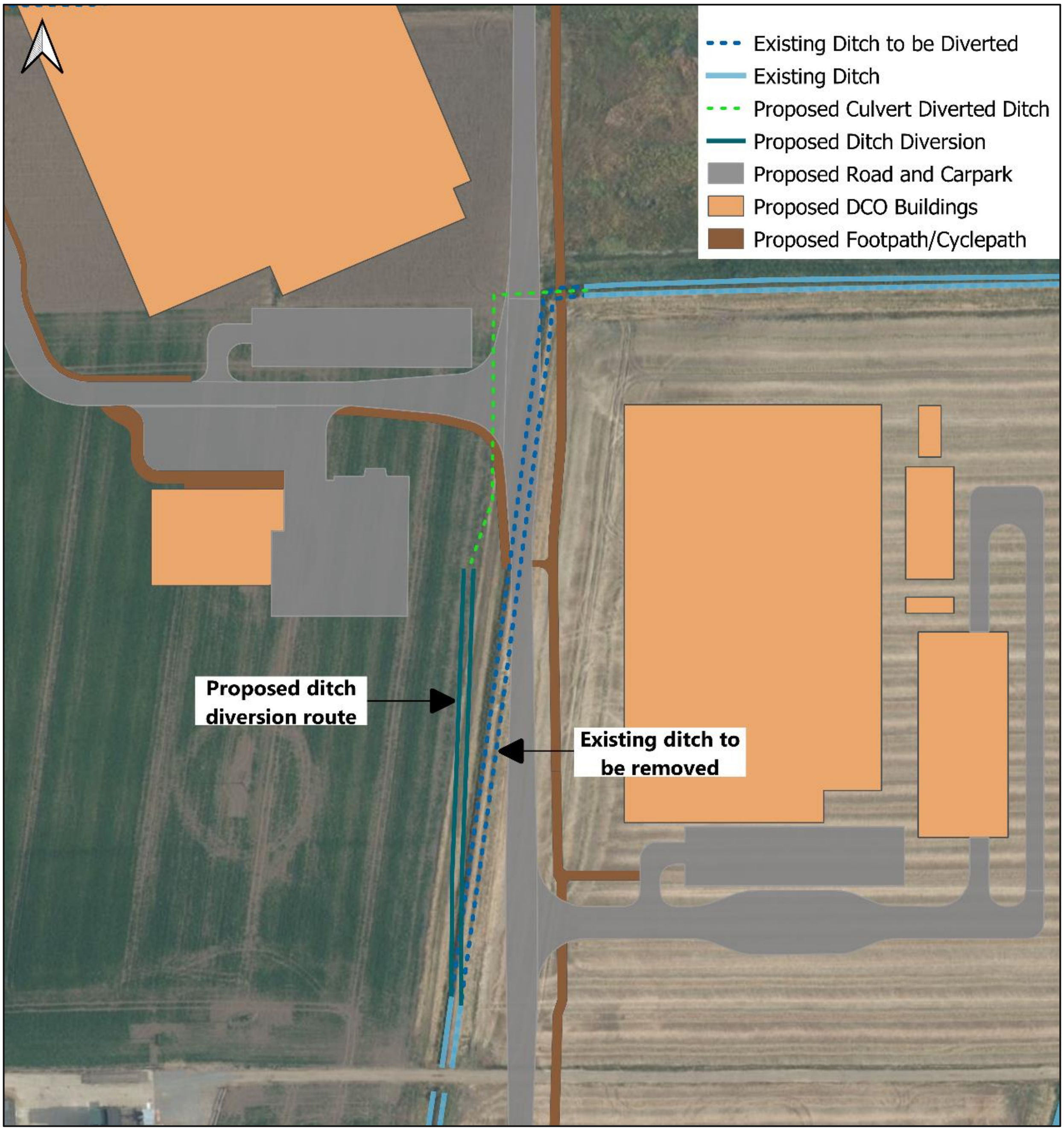


Figure 4-6: Proposed ditch diversion route.

4.10 Designing for Exceedance

4.10.1 The Energy Park buildings will be constructed on platforms raised above the existing levels, to raise the buildings out of the River Trent flood areas. Overland flow paths around these platforms will be maintained such that any exceedance events will follow the existing flow paths to the existing points of discharge. The exceedance flow routes are shown in Figure 4-7, where runoff will be diverted to the existing ditches.

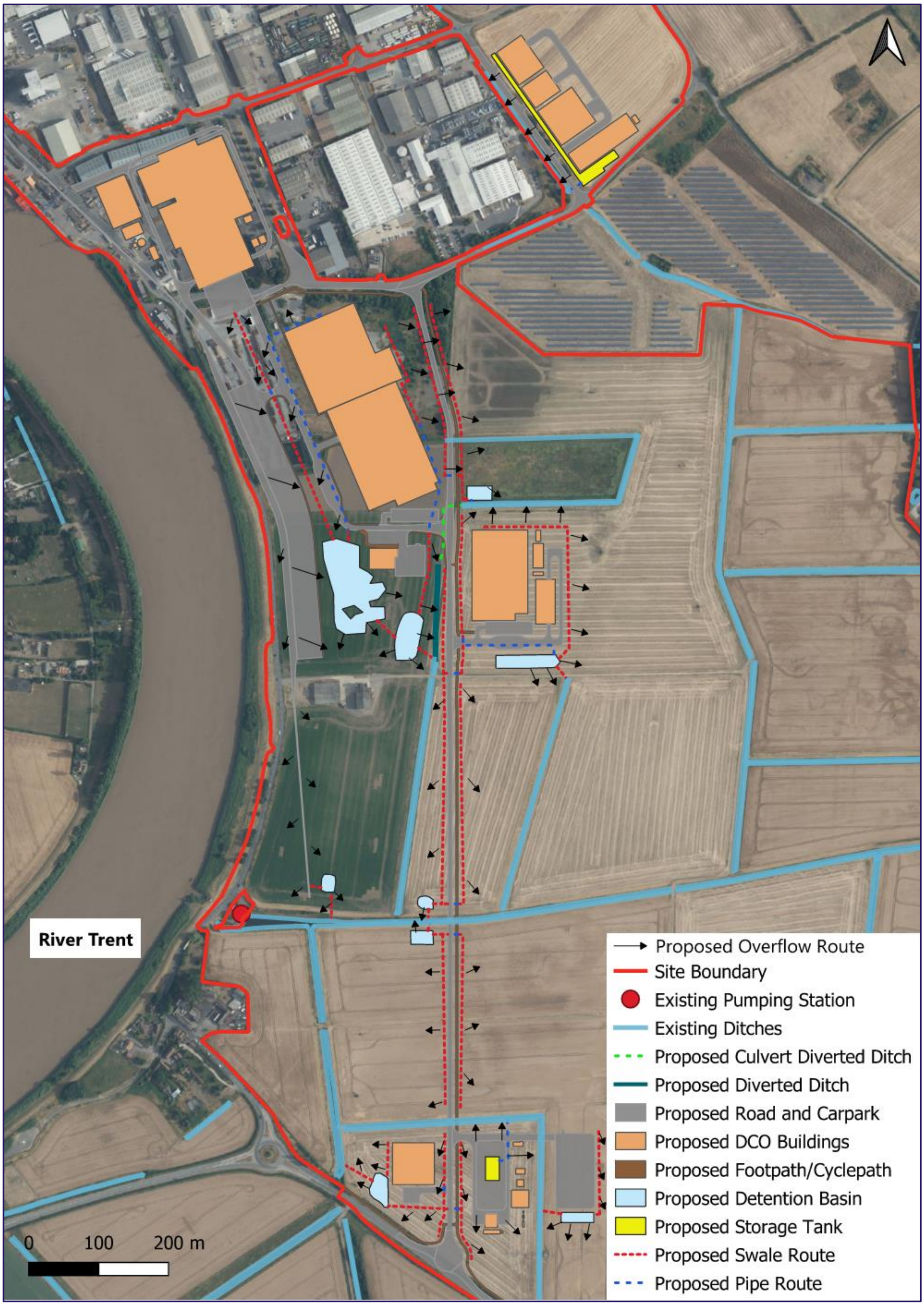


Figure 4-7: Exceedance Flow Routes.

4.11 Easements

4.11.1 SGWMB stated that there is a 9m easement from top of the bank for the existing ditches that can be reduced to 6m after applying for a consent.

4.12 Maintenance

4.12.1 Regular maintenance of the sustainable drainage system is essential to maintain its performance and avoid failure of the mechanical/electrical components.

4.12.2 Discussions with Severn Trent are ongoing to confirm the adoptability of the various SuDS features.

4.12.3 An agreed maintenance programme will be prepared in accordance with CIRIA guidance and supervised by the adopting authority. This will be included within the Building Manual for the development on completion. An outline maintenance plan is shown in Appendix G.

4.12.4 Table 4-8 shows the proposed responsible party for the maintenance of the SuDS features for the different catchments:

Table 4-8 Maintenance and ownership

Catchment	Maintenance and ownership	Catchment Type
1	North Lincolnshire Council (Public)	Public Highway
2	Landowner (Private)	Development Land
3	Landowner (Private)	Development Land
4	North Lincolnshire Council (Public)	Public Highway
5	Landowner (Private)	Development Land
6	North Lincolnshire Council (Public)	Public Highway
7	Landowner (Private)	Development Land
8	Landowner (Private)	Development Land
9	North Lincolnshire Council (Public)	Public Highway
10	Landowner (Private)	Development Land

5 Proposed Foul Water Drainage Strategy

5.1 General

5.1.1 The foul water strategy has been developed in accordance with the Severn Trent Water (STW) requirements and Building regulations. The proposed layout can be found in Appendix H.

5.2 Severn Trent Consultation

5.2.1 A Pre-development enquiry was submitted to STW in February 2021.

5.2.2 STW suggested that sewer modelling was required to check the available capacity in the existing network and connection locations. A summary of the results was received in January 2022 where it was highlighted that the existing network will need to be upgraded to take the proposed flows.

5.2.3 A meeting to clarify the results from the sewer modelling was held in February 2022 where Severn Trent highlighted that the existing modelling shows that the existing network is already under capacity and that any additional flow would require upgrades to the network.

5.2.4 Further meetings with STW took place in August and November of 2022 to understand the upgrade requirements and timelines for delivery. The split of flow between domestic and trade effluent was also confirmed. Additionally, it was agreed that STW would include in their assessment the flow which is removed from the network due to the demolition of several properties as part of the scheme.

5.2.5 In February 2023 STW confirmed that the domestic effluent proposed to be discharged from the scheme would be less than the flow removed from the network due to the demolition of the existing buildings. On this basis STW confirmed that "further modelling will not be going ahead as the domestic flow does not exceed the previously discharged trade flow of 0.35 l/s that has been removed." And that STW "can confirm that we can accept the domestic flows proposed in the email from Alan Corner dated 25/01/23."

5.2.6 On this basis the domestic effluent will discharge direct to the STW sewer and the trade effluent will be treated and reused on site.

5.2.7 Refer to Appendix A for asset records and Appendix E for correspondence.

5.3 Proposed Strategy

5.3.1 The network has been designed to split up trade effluent and domestic effluent.

5.3.2 The trade effluent will be treated and reused in the various processes on site. An effluent treatment plant facility will be located in the ERF building. This will mean that there is no trade effluent discharge to the public sewer or to the wetland areas.

5.3.3 The domestic effluent will discharge to the public sewer as agreed with STW.

5.3.4 Due to the geography of the development the areas have been split up into three areas.

5.3.5 Network 1 has been designed to take any domestic foul effluent from the southern hydrogen and natural gas above ground installations (AGI) and the electric vehicle (EV) and hydrogen (H2) refuelling station, plastic recycling facility (PRF), visitor's centre and the concrete block manufacturing facility (CBMF), and discharge to the existing public sewer located in Bellwin Drive. Due to topography and proposed levels, a gravity connection to the existing public sewer cannot be achieved and a pumping solution will be required. The strategy will be to collect foul water from the gas AGI and the facilities located on the electric vehicle (EV) and hydrogen (H2) refuelling station and discharge by a gravity system to a pumping station, which will pump to another pumping station located to the north of the PRF. This will in turn, pump to the public sewer.

5.3.6 The trade effluent in this area will be pumped via a separate system to the treatment plant located in the ERF facility.

5.3.7 Network 2 has been designed to take any domestic foul effluent from the Energy Recovery Facility and adjacent facilities and discharge, via gravity, to the existing public sewer located on Bellwin Drive.

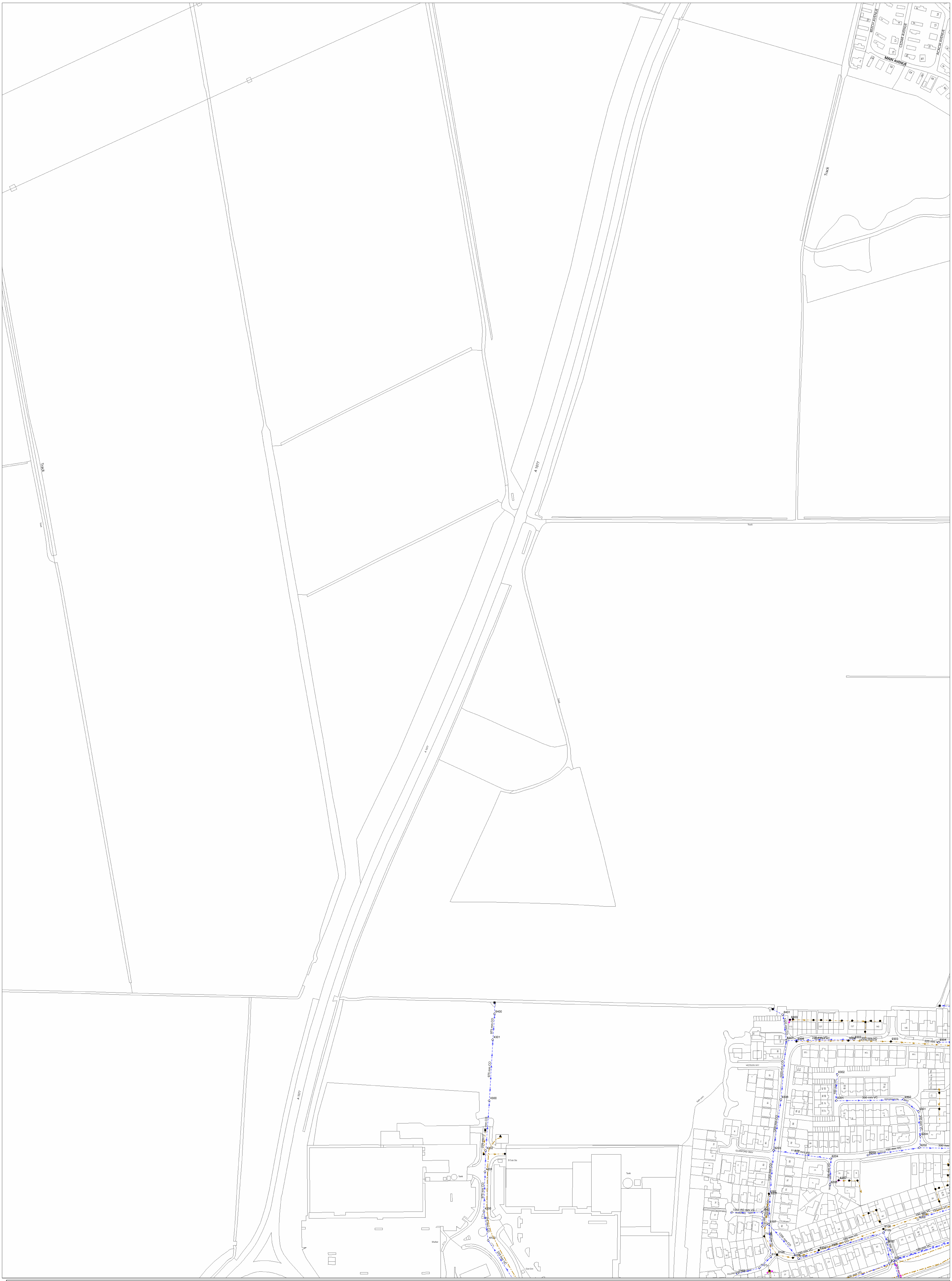
5.3.8 The trade effluent in this area will discharge direct to the treatment plant located in the ERF facility.

5.3.9 Network 3 has been designed to take any domestic foul effluent from the hydrogen and natural gas above ground installations (AGI) located to the north eastern part of the Project. Buildings will be drained by gravity to a pumping station that will pump the flow to the existing public sewer located on Bellwin Drive.

5.3.10 The trade effluent in this area will be pumped via a separate system to the treatment plant located in the ERF facility.

5.3.11 The pumping stations will be designed to adoptable standards. At this stage it is anticipated that emergency storage will be required and will be designed in accordance with Sewers for Adoption. Proprietary tank systems are proposed to provide this storage.

Appendix A Severn Trent Asset Records



Data updated: 14/06/20

Scale: 1:1250
Map Centre: 486484,411827
Date: 30/06/20
Our Ref: 410779 - 8
Wastewater Plan A0
Powered by digdat

mail@groundwise.com

26419

SEVERN TRENT

(c) Crown copyright and database rights 2020 Ordnance Survey 100031673 | Date: 30/06/20 | Scale: 1:1250 | Map Centre: 486056,414786 | Data updated: 14/06/20 | Our Ref: 410779 - 10 | Wastewater Plan A0

mail@groundwise.com

26419

SEVERN TRENT

Data updated: 14/06/20

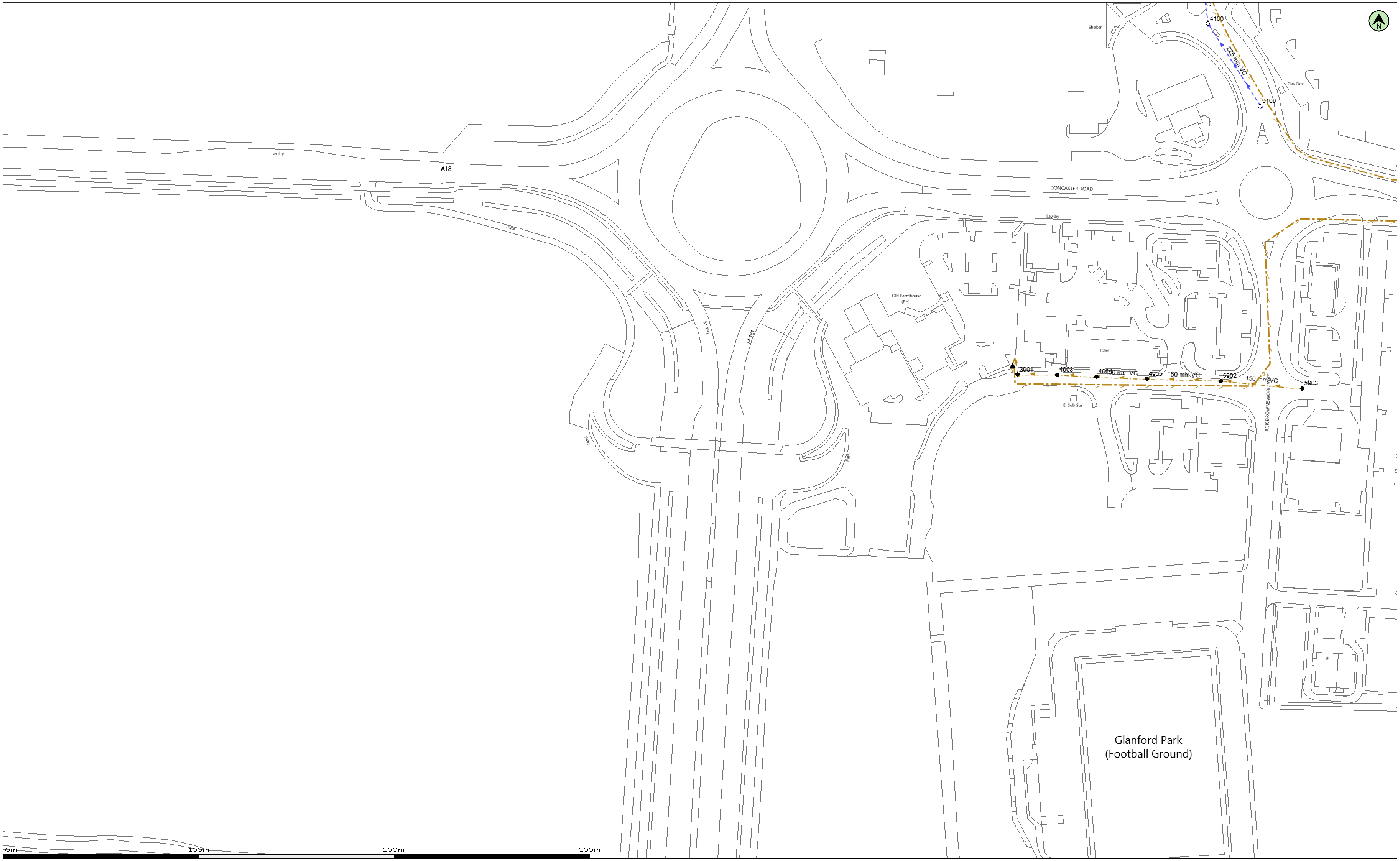
Scale: 1:1250
Map Centre: 487951,413952
Date: 30/06/20
Our Ref: 410779 - 16
Wastewater Plan A0
Powered by digdat

Public Foul Gravity/Lateral Drain	Highway Drain	Manhole Foul
Public Combined Gravity/Lateral Drain	Overflow Pipe	Manhole Surface
Public Surface Water Gravity/Lateral Drain	Disposal Pipe	Abandoned Pipe
Pressure Foul	Culverted Water Course	Section 104 sewers are shown in green
Pressure Combined	Pumping Station	Private sewers are shown in magenta
Pressure Surface Water	Fitting	

mail@groundwise.com

26419

SEVERN TRENT



 | Date: 30/06/20 | Scale: 1:1250 | Map Centre: 486238,410970 | Data updated: 14/06/20 | Our Ref: 410779 - 14 | Wastewater Plan A2

Public Foul Gravity/Lateral Drain
Public Combined Gravity/Lateral Drain
Public Surface Water Gravity/Lateral Drain
Pressure Foul
Pressure Combined
Pressure Surface Water
Highway Drain
Overflow Pipe
Disposal Pipe
Culverted Water Course
Pumping Station
Fitting
Manhole Foul
Manhole Surface
Abandoned Pipe
Section 104 sewers are shown in green
Private sewers are shown in magenta

mail@groundwise.com

26419

SEVERN
TRENT

Date: 30/06/20

Scale: 1:1250

Map Centre: 486500,412939

Data updated: 14/06/20

Our Ref: 410779 - 2

Wastewater Plan A0

mail@groundwise.com

26419

SEVERN TRENT

Date: 30/06/20

Scale: 1:1250

Map Centre: 486731,413905

Data updated: 14/06/20

Our Ref: 410779 - 12

Wastewater Plan A0

mail@groundwise.com

26419

SEVERN TRENT

Data updated: 14/06/20

Scale: 1:1250
Map Centre: 487395,413134

Date: 30/06/20
Our Ref: 410779 - 3

Wastewater Plan A2
Powered by digdat

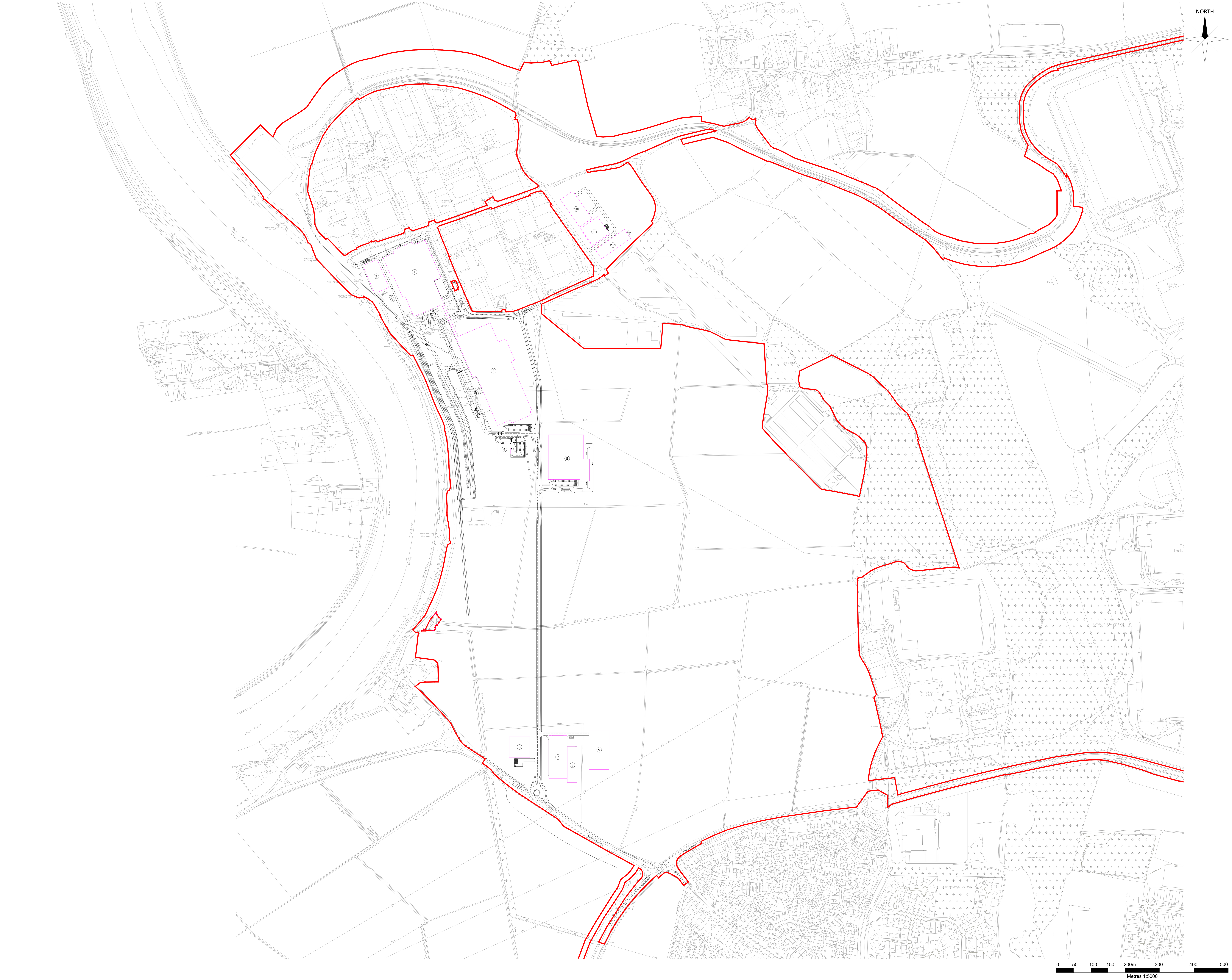
Public Foul Gravity/Lateral Drain	Highway Drain	Manhole Foul
Public Combined Gravity/Lateral Drain	Overflow Pipe	Manhole Surface
Public Surface Water Gravity/Lateral Drain	Disposal Pipe	Abandoned Pipe
Pressure Foul	Culverted Water Course	Section 104 sewers are shown in green
Pressure Combined	Pumping Station	Private sewers are shown in magenta
Pressure Surface Water	Fitting	

mail@groundwise.com

26419

SEVERN TRENT

Appendix B Proposed Masterplan



FOR PLANNING EXAMINATION PURPOSES ONLY

LEGEND

- ORDER LIMITS
- (1) ERF
- (2) CARBON CAPTURE
- (3) ASH, FGTr REPROSSESSING AND CONCRETE BLOCK MANUFACTURING
- (4) VISITORS CENTRE
- (5) PLASTICS RECYCLING FACILITY
- (6) AGI
- (7) VEHICLE REFUELLING STATION
- (8) HYDROGEN PRODUCTION
- (9) BATTERY STORAGE
- (10) ERF SUBSTATIONS
- (11) AGI
- (12) HYDROGEN PRODUCTION

Rev	Description	Date	Iss'd	Rev'd	App'd
2.0	Issued for client sign off	03.12.21	AO1	CAB	CAB
1.0	Issued for client sign off	11.11.21	AO1	CAB	CAB

DCO SUBMISSION

Project Stage

PRELIMINARY

Status of Drawing

Client

Level 33, Euston Tower, 286 Euston Rad, London, NW1 3DP

Client: NORTH LINCOLNSHIRE GREEN ENERGY PARK LTD

Consultant: FICHTNER CONSULTING ENGINEERS

Project: **NORTH LINCOLNSHIRE GREEN ENERGY PARK**

Drg Title: INDICATIVE SITE LAYOUT

Planning Inspectorate No.	Scale@A1	
0046658	1:5000	
Drawn/Designed By. DTW	Checked By. CAB	Approved By. CAB
Drawing No. NLGEP-FCE-XX-XX-DR-Y-5001		Revision 2.0

Angela Ogden X:\Solar 21\3154 - Flixborough EfW Development Support\8000 - Drawings\Drawings For Client Review\S3154-8000-0020AO1 NLGEP Indicative Site Layout R2.0.dwg

Appendix C Correspondence with LLFA

Francisco Rodriguez

From: Billy Green [redacted] >
Sent: 19 March 2021 12:28
To: Francisco Rodriguez
Cc: 046658 North Lincs Green Energy Park; Colin Byrne; Nathan George; LLFAdrainageteam
Subject: RE: North Lincs Green Energy Park- DN15 8UE. LLFA advice

****External Email. This email originated from outside Buro Happold.****

Hi Francis

Not that I know of...

We just require a fully compliant FRA and Drainage Strategy...

Kind Regards

Billy Green on behalf of the LLFA Drainage Team
Flood Risk Team
Asset & Infrastructure Services
North Lincolnshire Council

From: Francisco Rodriguez <[redacted]>
Sent: 19 March 2021 10:35
To: Billy Green <[redacted]>
Cc: 046658 North Lincs Green Energy Park <[redacted]>; Colin Byrne <[redacted]>; Nathan George <[redacted]>; LLFAdrainageteam <LLFAdrainageteam@northlincs.gov.uk>
Subject: RE: North Lincs Green Energy Park- DN15 8UE. LLFA advice

Good Morning Billy,

Thank you very much for your prompt response.

Could you please confirm if we need any specific documents that we have to complete for the DCO planning application?

Kind Regards
Francis
Francisco Rodriguez (Francis)
Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds
T:+44 (0)1132 042200

www.burohappold.com | Twitter | Instagram

[redacted]

BURO HAPPOLD

From: Billy Green <[redacted]>
Sent: 19 March 2021 09:56
To: Francisco Rodriguez [redacted]>
Cc: 046658 North Lincs Green Energy Park [redacted]>; Colin Byrne [redacted]>; Nathan George <[redacted]; LLFAdrainageteam <LLFAdrainageteam@northlincs.gov.uk>
Subject: RE: North Lincs Green Energy Park- DN15 8UE. LLFA advice

****External Email. This email originated from outside Buro Happold.****

Good morning Francisco

Your proposed surface water drainage strategy concept is acceptable in principle. The detail will obviously be confirmed at a later date.

There is not a lot more I can say at this stage.

Kind Regards

Billy Green on behalf of the LLFA Drainage Team
Flood Risk Team
Asset & Infrastructure Services
North Lincolnshire Council

From: Francisco Rodriguez <[redacted]>
Sent: 18 March 2021 09:08
To: Billy Green <[redacted]>
Cc: 046658 North Lincs Green Energy Park <[redacted]; Colin Byrne [redacted]>; Nathan George <[redacted]>
Subject: RE: North Lincs Green Energy Park- DN15 8UE. LLFA advice

Good Morning Billy,

Hope you are well,

Could you please assist with the below email?

Please let me know if you require further information

Kind Regards
Francis

Francisco Rodriguez (Francis)
Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds

T:+44 (0)1132 042200

www.burohappold.com | Twitter | Instagram
[redacted]

BURO HAPPOLD

From: Francisco Rodriguez
Sent: 18 February 2021 14:56
To: LLFAdrainageteam@northlincs.gov.uk
Cc: 046658 North Lincs Green Energy Park [redacted]; Colin Byrne [redacted]>; Nathan George <[redacted]>
Subject: North Lincs Green Energy Park- DN15 8UE. LLFA advice

Good Afternoon,

Hope you are keeping well,

We are working on a new development in Flixborough to the south of the Flixborough Industrial Estate, DN15 8UE. The scheme is called The North Lincs Green Energy Park and it is composed of various buildings which includes a new facility where energy will be recovered/produced from burning the waste left overs. Also, there is a concrete plant next to it which will use the ash produce by the Energy Park and also a polymer plant where the plastic from the waste will be melted and recycled. There will be a gas station to the north and an electrical charge point car park to the south. In addition, some vertical farming and glasshouses buildings are also part of the scheme.

The Waste left overs will be brough to the Energy Park via a new access road, a refurbished railway that will include a new stop and from the river using the existing port.

It should be noted that part of the project will go through the DCO (development consent order) scheme due to it meets national needs : reduce amount of waste and generate low carbon energy.

With regards to flooding and based on the Flood map for planning website ,the site is in Flood Zone 3 however, it is within the areas benefiting from flood defences.

Our Water team is working on the impact of introducing this new facility in the current site. It is envisaged that the new buildings and the access road will be protected from flooding raising up the levels in that area whereas the rest of the site will be for flood compensation and biodiversity benefits.

With regards to the surface water strategy, a meeting with the Scunthorpe & Gainsborough Water Management Board (SGWMB) was held 21/10/2020 where it was discussed how the existing drainage surface water strategy works and what restrictions/constraints are presented for the new scheme. SGWMB highlighted that the proposed discharge rate has to match the existing greenfield runoff which it has been assumed as 1.4l/s/ha as they stated.

Our proposed strategy will be to collect the surface water for the new impermeable areas and convey the water via swales to an attenuation pond where the water will be restricted and discharge to an existing ditch at the agreed discharge rate. The aim of the proposed surface water strategy is to use as much SuDS as possible which will be designed in accordance with Ciria C753 and the SuDS manual.

It is envisaged to submit information for DCO by September and we would like to know if the LLFA have any requirement that needs to be incorporated in our drainage strategy such as flow restriction or any specific documents that we have to complete for the planning application.

Please don't hesitate to contact me if further information is required,

Kind Regards

Francis

Francisco Rodriguez (Francis)
Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds
[redacted]

[redacted]

BURO HAPPOLD

This e-mail expresses the opinion of the author and is not necessarily the view of the Council. Please be aware that anything included in an e-mail may have to be disclosed under the Freedom of Information Act and cannot be regarded as confidential. This communication is intended for the address(es) only. Please notify the sender if received in error. All Email is monitored and recorded. Please think before you print- North Lincolnshire Council greening the workplace.

Meeting: Surface water drainage strategy- Meeting with LLFA and SGWMB to share the strategy and get their initial thoughts about it **Date:** 10/05/2021 14:00-15:00 **Attendees:** Billy Green – BG (LLFA) Paul Jones – PJ (SGWMB) Colin Byrne – CB (BH) Francisco Rodriguez – FR (BH) Stefan Gandler – SG (BH)	NORTH LINCOLNSHIRE GREEN ENERGY PARK

Items discussed:

- All parties introduce themselves
- FR gave a brief project description of the project and the proposed surface water strategy including discharge rate criteria and proposed sustainable drainage features considered.
- PJ agreed with the discharge rate criteria which is the same than the pumping station located in Lysaght's drain.
- PJ explained that the SGWMB is working with the Council to produce a flood model of the area to include hypothetic situation of a failure in the pumping station.
- PJ explained that any alteration within the 9m from top of the bank of any watercourse in the area (either they oversee them or not) have to go through a Consent Application that can be done post planning.
- BG stated that any highway drainage (swales and detention basin) or any structure that goes under it, have to be adopted by Highways and therefore design in accordance to meet their criteria.
- PJ and BG stated that there are no records of historic flooding on the proposed development.
- PJ stated that a capacity check of the existing drains is required to make sure the proposed flows can be accommodated in the existing drains.
- SGWMB don't adopt any drainage.
- BG confirmed that a 40% climate change is suitable for this area as the development is in a floodable area.
- PJ confirmed that there is no specific detail for the proposed connections to the existing drains.
- CB mentioned that the existing railway will be reinstated and BG confirmed that the railway drainage to be repaired or replaced if require but will not require further restriction on the discharge rate.
- The northern pumping station pumps water to River Trent, where it follows the route of the railway in the northern area of the site.
- PJ said that proposed bridges on the highways will require a consent order. A vehicle must be able to fit underneath bridge or there must be access to either side of the ditch.
- PJ mentioned that the existing ditches have a 1m freeboard but can fill up during extreme events.

• The ditch connection level should be as close as possible to existing ground level/ the top of bank to avoid a submerge connection during extreme events.
Summary of actions: BH to include the above information on the surface water drainage strategy.
Changes to the DCO:

Appendix D Correspondence with SGWMB

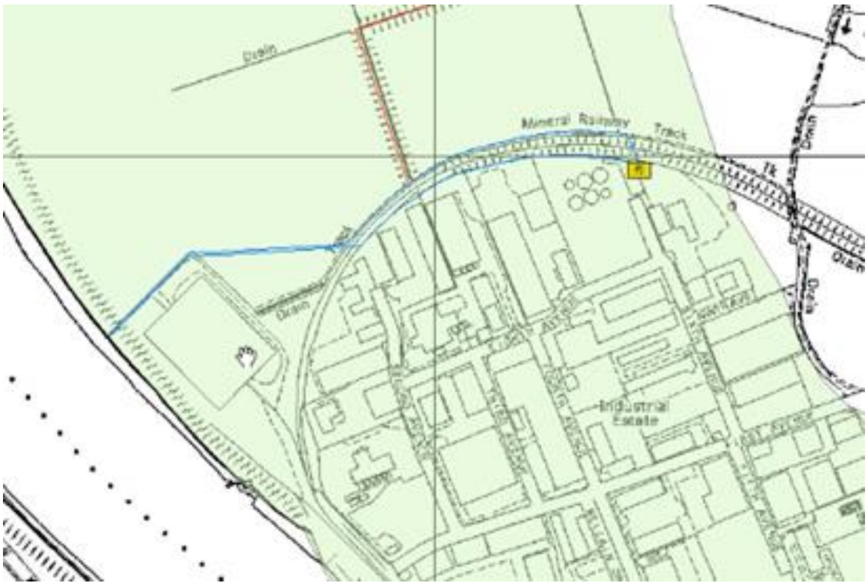
BURO HAPPOLD

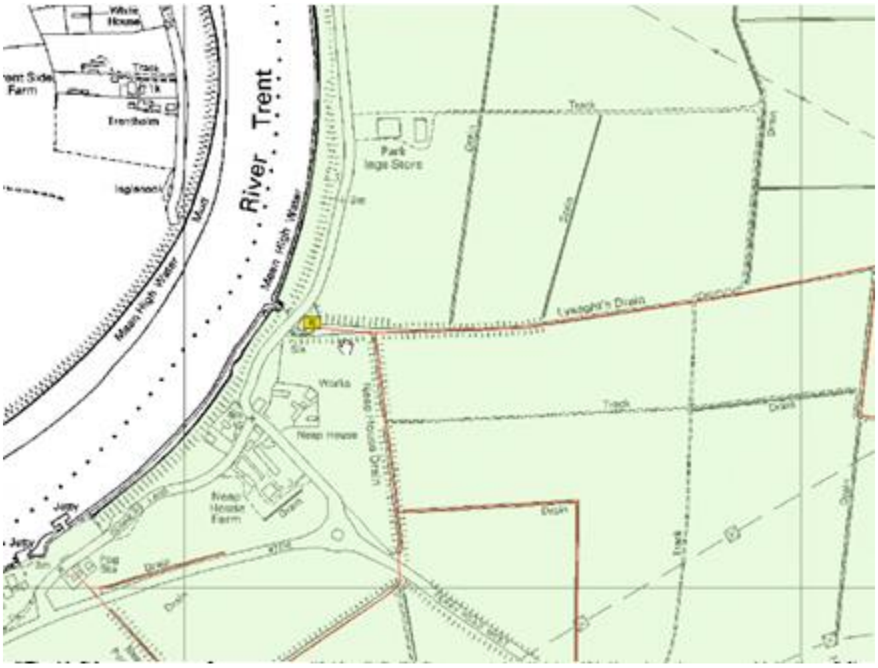
Minutes

Subject	NLGEP -MEETING WITH SCUNTHORPE & GAINSBOROUGH WATER MANAGEMENT BOARD	Job no	046658
Place	TEAM CALL	Date	21 October 2020
Present	Craig Benson (CB)- SGWMB Benjamin Jackson (BJ)- SGWMB Paul Thomson(PT)-BH Francisco Rodriguez(FR)-BH	Apologies	Paul Jones (PJ)-SGWMB Colin Byrne (CBy)-BH
Distribution	As above		

Objective of meeting: Introductory meeting for the North Lincolnshire Green Energy Park project regarding existing surface water drainage

Item	Action
1.0 Introduciton	
1.1 FR gave a brief project description covering the following points • Project site located in Flixborough. • Proposals include a main site for a new energy park and some glasshouses with vertical farming. • The different access to the energy park (new road, refurbished railway and new port). • The intention is to submit the main energy park through a DCO application in approximately one years' time and the other plots a few months later as part of two separate local planning applications.	
2.0 Existing Drainage	
2.1 CB explained that the existing land is drained by a series of main watercourses and small water bodies that discharge to the river Trent. There are 2 pumping stations and outfalls. One to the north of the Industrial Estate and one to the north of Neap House and south of the proposed site. See images for clarity.	





2.2	CB will send the watercourses, pump stations and catchment areas for the pumping station in **shape format** to include it in our design.	SGWMB(CB)
2.3	CB will try to find if there is any geometry of the watercourses that can be sent to us.	SGWMB(CB)
2.4	CB specified that any surface water that discharge to the watercourses has to be restricted to the greenfield runoff rate and don’t exceed **1.4l/s/ha.**	
2.5	FR mentioned that the site is split in three areas and it was asked if the required applications/consents have to be sent separately or one in conjunction (one for everything). CB explained the best approach is to speak to PJ and agree the way to proceed in each case.	
2.6	CB confirmed that Paul Jones (PJ) is the best contact to send the applications/consents and any question.	

Minutes taken by: Francisco Rodriguez

2.7 CB confirmed the timescale for a response is **2months** for any consent/application.

2.8 CB stated that there is a 9m easement from the top of the watercourse bank (it could be reduced to 6m).

2.9 CB stated that there are no issues building over the watercourses and they can be culverted or diverted if necessary, but this has to be consulted via the consent process.

2.10 CB stated that not all the consents may have a fee associated. This will need to be discussed with PJ when we have more details.

2.11 CB stated that anything within the region (small watercourses, ditches,etc) requires approval from the Board.

2.12 CB mentioned the watercourses are maintained annually about this time.

Appendix E Correspondence with Severn Trent

Francisco Rodriguez

From: Mussa, Asif <[redacted]>
Sent: 15 February 2023 14:15
To: Francisco Rodriguez; Colin Hammond; Meecham, Dave; Susie Byrne; David Bell; Colin Byrne; Alan Corner
Cc: Andrew Bradley; Nathan George; Laura Tinker
Subject: RE: NLGEP-Severn Trent SOCG follow up

Follow Up Flag: Follow up
Flag Status: Completed

****External Email. This email originated from outside Buro Happold.****

ST Classification: OFFICIAL PERSONAL

Hi Francisco

Thank you for your email below.

The further modelling will not be going ahead as the domestic flow does not exceed the previously discharged trade flow of 0.35 l/s that has been removed.

I can confirm that we can accept the domestic flows proposed in the email from Alan Corner dated 25/01/23.

Kind regards

Asif Mussa

Senior Evaluation Technician
Asset Protection
Asset Strategy & Planning
Chief Engineer, Severn Trent Water

☎ [redacted]
✉

WONDERFUL ON TAP

SEVERN TRENT

Institute of Water

From: Francisco Rodriguez <Francisco.Rodriguez@BuroHappold.com>
Sent: 09 February 2023 11:15
To: Mussa, Asif <[redacted]>; Colin Hammond [redacted]>; Meecham, Dave <[redacted]; Susie Byrne <[redacted]>; David Bell [redacted] Colin Byrne <[redacted]>; Alan Corner [redacted]>
Cc: Andrew Bradley <[redacted]>; Nathan George <[redacted]; Laura Tinker [redacted]>
Subject: RE: NLGEP-Severn Trent SOCG follow up

Hi All,

Francisco Rodriguez

From: Mussa, Asif <[redacted]
Sent: 02 February 2023 09:15
To: Alan Corner
Cc: Francisco Rodriguez; Colin Byrne; Nathan George
Subject: RE: DE-8462592 Energy Green Park, Stather Road, Flixborough, Lincs SCA-0749

****External Email. This email originated from outside Buro Happold.****

ST Classification: OFFICIAL PERSONAL

Hi Alan

Thank you for your email below.

I have passed this on to our consultants to confirm if this would need to be modelled again.

Kind regards

Asif Mussa

Senior Evaluation Technician
Asset Protection
Asset Strategy & Planning
Chief Engineer, Severn Trent Water

☎ [redacted]
✉

WONDERFUL ON TAP SEVERN TRENT Institute of Water

From: Alan Corner <[redacted]>
Sent: 25 January 2023 16:48
To: Mussa, Asif [redacted]>
Cc: Francisco Rodriguez <[redacted]>; Colin Byrne [redacted]>; Nathan George <[redacted]>
Subject: DE-8462592 Energy Green Park, Stather Road, Flixborough, Lincs SCA-0749

Hi Asif,

Thank you for confirming that Severn Trent have removed a flow of 0.35 l/s from the model as representing the flows from the buildings to be demolished.

The proposed NLGEP has:
150 staff per 8-hour shift each assumed to each produce 50 litres/shift. There will be 3 shifts per day and work occurs 7 days per week.
50 visitors each weekday – assumed over an 8-hour daytime period. Assumed to produce 50 litres each.
So as average values we have estimated:

- 8-hours period during a working day we have 200 persons on site generating 10,000 litres of foul flows or 0.347 l/sec average.
- Over a 24-hour period we have 500 persons each using 50 litres so 25,000 litres of foul flow or 0.289 l/sec average.

Can we please ask if you and the team at Severn Trent can assess what average domestic foul flows the staff plus visitors will generate and therefore how many of these up to 200 persons can be accommodated in the public sewers, based on the fact that we have removed 0.35l/s flows. So effectively a like for like replacement. The EA have written suggesting that they would prefer for all domestic foul flows to be connected to the public sewers.

We can then consider in more detail if the design needs to propose a foul strategy to deal with the visitor centre foul flows on the site and differently to the staff.

Best Regards Alan

Alan Corner
Director
Corner Water Consulting Ltd
Telephone: [redacted]

From: Mussa, Asif [redacted]>
Sent: 29 November 2022 10:45
To: Alan Corner [redacted]>
Cc: Francisco Rodriguez <[redacted]; Colin Byrne <[redacted]>; 'Nathan George' [redacted]>
Subject: RE: DE-8462592 Energy Green Park, Stather Road, Flixborough, Lincs SCA-0749

ST Classification: OFFICIAL PERSONAL

Hi Alan

Please see comments below:

The 'existing' area within the hydraulic model that was removed as land to be developed is indicated in the screenshot below.

To clarify, the buildings coloured purple are those that were removed. These were assessed as representing the highlighted developed areas of the drawing NLGEP-BHE-XX-XX-SK-100, shaded green, red and brown if I recall correctly.

The flows within the model associated to these trade dischargers amounted to 0.35 l/s as previously stated. This is represented in the model as trade flow, not domestic flow. Trade flows should account for all flow from these sites.

Francisco Rodriguez

From:	Net Dev East <Net.Dev.East@severntrent.co.uk>
Sent:	10 May 2021 15:49
To:	Francisco Rodriguez
Subject:	RE: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592
Follow Up Flag:	Follow up
Flag Status:	Completed

****External Email. This email originated from outside Buro Happold.****

ST Classification: OFFICIAL PERSONAL

Hi Francisco

Thank you for your email below and apologies for the delay in response, I have been off work for a few weeks.

We will require sewer modelling as the flows are pumped and there are two sewage pumping stations that will be affected so we will need to know if they have the capacity for the extra flows.

Please also be aware that as there will be trade effluent you will need to contact our business services team.

Would you like me to progress with requesting a quote for sewer modelling? The process can take a minimum of 2 months.

Kind regards

Asif Mussa

Senior Evaluation Technician
Asset Protection (Wholesale Operations) East

WONDERFUL ON TAP

From: Francisco Rodriguez [redacted]>
Sent: 30 April 2021 13:51
To: Net Dev East <Net.Dev.East@severntrent.co.uk>
Cc: 046658 North Lincs Green Energy Park [redacted]; Colin Byrne <[redacted]>
Subject: RE: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592

Hi Asif,

Could you please provide us with an update of my previous email?

Thanks

Francis
Francisco Rodriguez (Francis)
Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds
[redacted]

BURO HAPPOLD

From: Francisco Rodriguez
Sent: 06 April 2021 16:38
To: Net Dev East <Net.Dev.East@severntrent.co.uk>
Cc: 046658 North Lincs Green Energy Park <[redacted]; Colin Byrne <[redacted]
Subject: RE: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592

Hi Asif,

We have estimated that approximately 2l/s has been removed from the network that is located in Bellwin Drive/First Avenue as part of the buildings that will be demolished and we are adding 5.5 l/s to the network for the new buildings, which means that we are adding 3.5 l/s extra to the existing network in Bellwin Drive/ First Avenue as specified in the attached sketch.

Is it required a modelling exercise to assess if the additional 3.5l/s can be accommodated within the existing network or could we have an answer without it?

Also, can you please let us know a contact number or email address to contact you directly? It has been two months since we applied for the pre development enquiry and we would like to speed things up. It is a bit frustrating we have to wait two weeks to receive an answer for something that can be sorted with a 5min conversation.

Kind Regards

Francisco Rodriguez (Francis)
Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds
[redacted]

BURO HAPPOLD

From: Net Dev East <Net.Dev.East@severntrent.co.uk>
Sent: 06 April 2021 15:34
To: Francisco Rodriguez <[redacted]com>
Cc: 046658 North Lincs Green Energy Park <[redacted]>; Colin Byrne
[redacted]
Subject: RE: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592

****External Email. This email originated from outside Buro Happold.****

ST Classification: OFFICIAL PERSONAL

Hi Francis

Thank you for your email below.

Sewer modelling will be required and as it is a commercial development, we would not fund the exercise.

Would you like me to request a quote for sewer modelling?

Kind regards

Asif Mussa

Senior Evaluation Technician
Asset Protection (Wholesale Operations) East

WONDERFUL ON TAP SEVERN TRENT Institute of Water

From: Francisco Rodriguez <[redacted]>
Sent: 19 March 2021 13:21
To: Net Dev East <Net.Dev.East@severntrent.co.uk>
Cc: 046658 North Lincs Green Energy Park <046658@burohappold.onmicrosoft.com>; Colin Byrne [redacted]
Subject: RE: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592

Hi Asif,

Thanks for the email.

I have attached a sketch with the buildings and flows that are expecting to be pumped or discharged by gravity.

Due to levels, we envisage that only the Green Energy Park (green building) will discharged by gravity to the public sewer located in Bellwin drive/First Avenue.

Please let me know if you require further information.

Kind Regards
Francis

Francisco Rodriguez (Francis)
Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds
[redacted]

www.burohappold.com | Twitter | Instagram
[redacted]

BURO HAPPOLD

From: Net Dev East <Net.Dev.East@severntrent.co.uk>
Sent: 19 March 2021 11:07
To: Francisco Rodriguez [redacted]
Cc: 046658 North Lincs Green Energy Park <046658@burohappold.onmicrosoft.com>
Subject: RE: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592

****External Email. This email originated from outside Buro Happold.****

ST Classification: OFFICIAL PERSONAL

Hi Francis

Thank you for your email below.

Are the flows going to be pumped or discharged by gravity?

Kind regards

Asif Mussa

Senior Evaluation Technician
Asset Protection (Wholesale Operations) East

WONDERFUL ON TAP   SEVERN TRENT   Institute of Water

From: Francisco Rodriguez <[redacted]
Sent: 08 March 2021 10:06
To: Net Dev East <Net.Dev.East@severntrent.co.uk>
Cc: 046658 North Lincs Green Energy Park <046658@burohappold.onmicrosoft.com>
Subject: RE: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592

Hi,

Thanks for your email,

We have calculated an estimated flow rate for each of the buildings as it is intended to re-use the 51.5l/s incoming flow on other processed of the facility to reduce the water that leaves the facilities.

Please see attached sketch. Could you please confirm if:

- An estimated flow of 4l/s could be accommodated within the existing 225mm foul water pipe that is located in Bellwin Drive?

- An estimated flow of 0.5l/s could be accommodated within the existing foul water network located in Ferry Road West?
- An estimated flow of 0.5l/s could be accommodated within the existing foul water network located in First Avenue?
- We can connect surface water from the Electrolyser building and Gas AGI (yellow buildings) to the existing surface water sewer located within First Avenue at a restricted discharge rate in case infiltration is not suitable on site?

Please let me know if you require further information

Kind Regards

Francis
Francisco Rodriguez (Francis)
Infrastructure Engineer
Buro Happold | Cities Infrastructure Leeds
[redacted]

BURO HAPPOLD

From: Net Dev East <Net.Dev.East@severntrent.co.uk>
Sent: 24 February 2021 15:02
To: Francisco Rodriguez <[redacted]
Subject: Developer Enquiry Response: Stather Road, Flixborough Our Ref: 8462592

****External Email. This email originated from outside Buro Happold.****

ST Classification: UNMARKED

Dear Francisco

Please find attached below our Developer Enquiry response letter, along with a sewer record extract and supplementary guidance notes with regard to the above site.

If you have any further queries with regard to our response, please do not hesitate to contact us on the number / email address mentioned below. Please refrain from sending responses to a certain individual directly. Our email address below will ensure that your response is logged and tracked for a response. When responding, please quote our reference number above in all return correspondence.

Regards,

Asset Protection Waste Water
Tel [redacted]

(reply to net.dev.east@severntrent.co.uk)

WONDERFUL ON TAP SEVERN TRENT

Did you know? You can now make full applications online for a variety of our Developer Service offerings including Development Enquiries. Take a look here for more details: [redacted]

Severn Trent Plc (registered number 2366619) and Severn Trent Water Limited (registered number 2366686) (together the "Companies") are both limited companies registered in England & Wales with their registered office at Severn Trent Centre, 2 St John's Street, Coventry, CV1 2LZ This email (which includes any files attached to it) is not contractually binding on its own, is intended solely for the named recipient and may contain CONFIDENTIAL, legally privileged or trade secret information protected by law. If you have received this message in error please delete it and notify us immediately by telephoning +44 2477715000. If you are not the intended recipient you must not use, disclose, distribute, reproduce, retransmit, retain or rely on any information contained in this email. Please note the Companies reserve the right to monitor email communicationsin accordance with applicable law and regulations. To the extent permitted by law, neither the Companies or any of their subsidiaries, nor any employee, director or officer thereof, accepts any liability whatsoever in relation to this email including liability arising from any external breach of security or confidentiality or for virus infection or for statements made by the sender as these are not necessarily made on behalf of the Companies. Reduce waste! Please consider the environment before printing this email
Severn Trent Plc (registered number 2366619) and Severn Trent Water Limited (registered number 2366686) (together the "Companies") are both limited companies registered in England & Wales with their registered office at Severn Trent Centre, 2 St John's Street, Coventry, CV1 2LZ This email (which includes any files attached to it) is not contractually binding on its own, is intended solely for the named recipient and may contain CONFIDENTIAL, legally privileged or trade secret information protected by law. If you have received this message in error please delete it and notify us immediately by telephoning +44 2477715000. If you are not the intended recipient you must not use, disclose, distribute, reproduce, retransmit, retain or rely on any information contained in this email. Please note the Companies reserve the right to monitor email communicationsin accordance with applicable law and regulations. To the extent permitted by law, neither the Companies or any of their subsidiaries, nor any employee, director or officer thereof, accepts any liability whatsoever in relation to this email including liability arising from any external breach of security or confidentiality or for virus infection or for statements made by the sender as these are not necessarily made on behalf of the Companies. Reduce waste! Please consider the environment before printing this email
Severn Trent Plc (registered number 2366619) and Severn Trent Water Limited (registered number 2366686) (together the "Companies") are both limited companies registered in England & Wales with their registered office at Severn Trent Centre, 2 St John's Street, Coventry, CV1 2LZ This email (which includes any files attached to it) is not contractually binding on its own, is intended solely for the named recipient and may contain CONFIDENTIAL, legally

SEVERN TRENT WATER LIMITED

SCA Sewer Modelling Report - Summary of results

Date: 19/01/22

SCA Ref: SCA-0749

Dev Enq Ref: 8462592

Site Address: Land at Energy Green Park, Stather Road, Flixborough

Sewer modelling of the above confirms the following impacts on the public sewerage network:

Flooding Impact – High

Pollution Impact – Very High

Operational Impact – Very High

Further Notes:

Capacity upgrades will be required to accommodate the proposed development.

The flooding impact has been triggered as a result of sewer surcharge during dry weather flow as a result of the proposed development flows

The pollution impact has been triggered as a result of operation of increased spills of an Emergency Overflow

The Operational risk is triggered due to exacerbating storage volume requirements of several SPS in the flow route

This has been referred to our upgrades team for the domestic element to add to our promotions list. The works will be carried out depending on the priority of the schemes on the list. We are not obliged to carry out upgrades for trade effluent.

Senior Evaluation Technician: Asif Mussa

Meeting:
Drainage- Meeting with Severn Trent regarding the results of the sewer modelling exercise

Date:
08/02/2022 13:00-14:00

Attendees:
Asif Mussa – AM (STW)
Alan Corner – AC (CWC)
Francisco Rodriguez – FR (BH)
Nathan George – NG (BH)
Colin Byrne – CB (BH)

NORTH LINCOLNSHIRE GREEN ENERGY PARK

- BH gave an overview of the scheme and discharge locations for FW from the development to the proposed STW network.

- STW confirmed that the flows from existing buildings have been removed from the model.

- STWL noted that they have used 3.8l/s where flows are pumped from NLGEP. This is an assumed pump rate based on the minimum requirements for adoption. Since NLGEP has 2no. pumped connections and 1no. gravity connection, the actual flow rate modelled by STWL is 10.6l/s.

- STW would need to re-run the model. Noted that this would be outside of the usual 14-day period to request updates/re-runs, so likely to incur additional modelling costs. BH requested STWL to review based on timescales for response and availability to meet to discuss modelling output.

- STW highlighted the areas of the model/network where the issues are being reported:
- ➢ Emergency CSO at Hollyrood Drive SPS (this was the most significant impact).
    - Very high pollution impact (overflow into ditch)
    - Storage issue
    - Pumping capacity issue
- ➢ Burn Road CSO (medium impact)
- ➢ Moors Road pumping station (medium impact)
    - Pumping capacity issue

- STW noted that the modelling shows that it is currently spilling at the Hollyrood Drive SPS, so any new flows are likely to result in an impact.

- Discussion if an alternative location to connect to the STWL FW network could be found to avoid discharging through the Hollyrood Drive SPS. Noted that this will be difficult.

- Noted that reinforcement/upgrade works is confirmed by a separate (promotions) team in order of priority. STW noted there could be up to 5-year wait to get to project/site based on current upgrade requirements across the network.

• Discussion about the trade effluent. STWL noted that this will need to be confirmed with their promotions team
Summary of actions: • STWL to confirm the flow rate removed from the modelling. • BH to review and confirm with Solar 21 if the FW network will remain private upstream of connection to the STW sewer. If so, lower pump rates can be confirmed and included in the STW modelling.
Changes to the DCO:

Appendix F Proposed Stormwater Drainage Layout

N

1000 500 0 1000

1 : 20000

SCALE BEFORE REDUCTION

Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

SW EX — EXISTING SURFACE WATER (SEVERN TRENT)

EXISTING DITCH

PROPOSED

SITE BOUNDARY

PROPOSED SURFACE WATER PIPE

PROPOSED SWALE

PROPOSED CULVERT

PROPOSED DITCH DIVERSION ROUTE

PROPOSED DETENTION BASIN (POND)

ATTENUATION TANK

Rev	Description	Date	Iss'd	Rev'd	App'd
P1	UPDATED RED LINE BOUNDARY	09.01.2023	FR	CB	CB
P0	ISSUED FOR DCO SUBMISSION	25.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

Client

NORTH LINCOLNSHIRE GREEN ENERGY PARK

Level 33, Euston Tower, 286 Euston Road, London, NW1 3DP

LDA DESIGN GSDA ERM FICHTNER

BURO HAPPOLD northern planners bowland ecology ardent

Client: NORTH LINCOLNSHIRE GREEN ENERGY PARK LTD

Consultant: BURO HAPPOLD

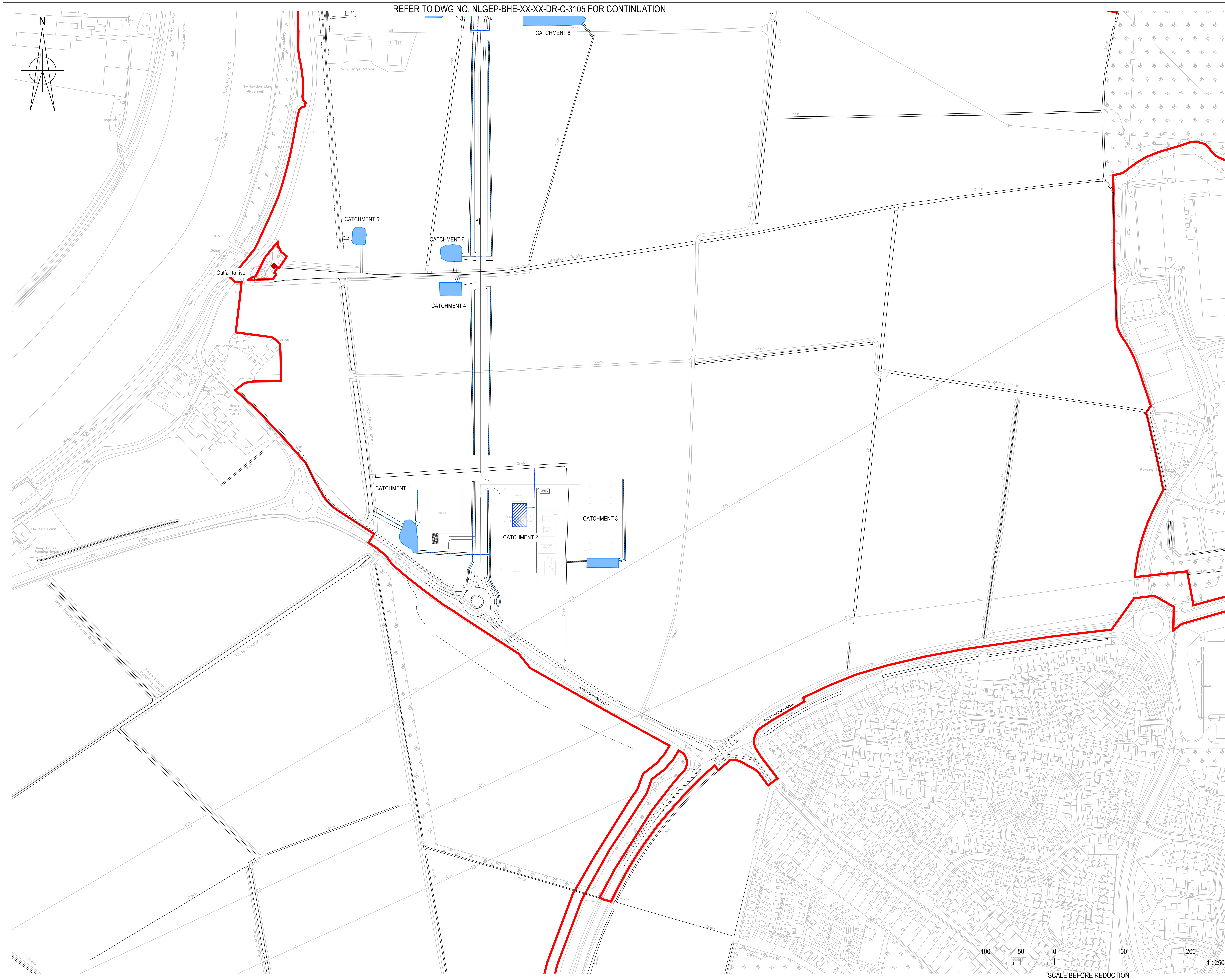
Project: **NORTH LINCOLNSHIRE GREEN ENERGY PARK**

Drg Title: INDICATIVE SURFACE WATER DRAINAGE PLAN
OVERALL SHEET

Planning Inspectorate No.	Scale@A1	
EN010116	1:20000	
Drawn/Designed By	Checked By	Approved By
J.SLEEMAN	C.BYRNE	C.BYRNE

Drawing No.: NLGEP-BHE-XX-XX-DR-C-3100

Revision: P1



Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

SW EX — EXISTING SURFACE WATER (SEVERN TRENT)

EXISTING DITCH

PROPOSED

SITE BOUNDARY

PROPOSED SURFACE WATER PIPE

PROPOSED SWALE

PROPOSED CULVERT

PROPOSED DITCH DIVERSION ROUTE

PROPOSED DETENTION BASIN (POND)

ATTENUATION TANK

Rev	Description	Date	Iss'd	Rev'd	App'd
P0	ISSUED FOR DCO SUBMISSION	18.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

Client

Level 33, Euston Tower, 286 Euston Rad, London, NW1 3DP

Client: *NORTH LINCOLNSHIRE GREEN ENERGY PARK*

Consultant: *BURO HAPPOLD*

Project: **NORTH LINCOLNSHIRE GREEN ENERGY PARK**

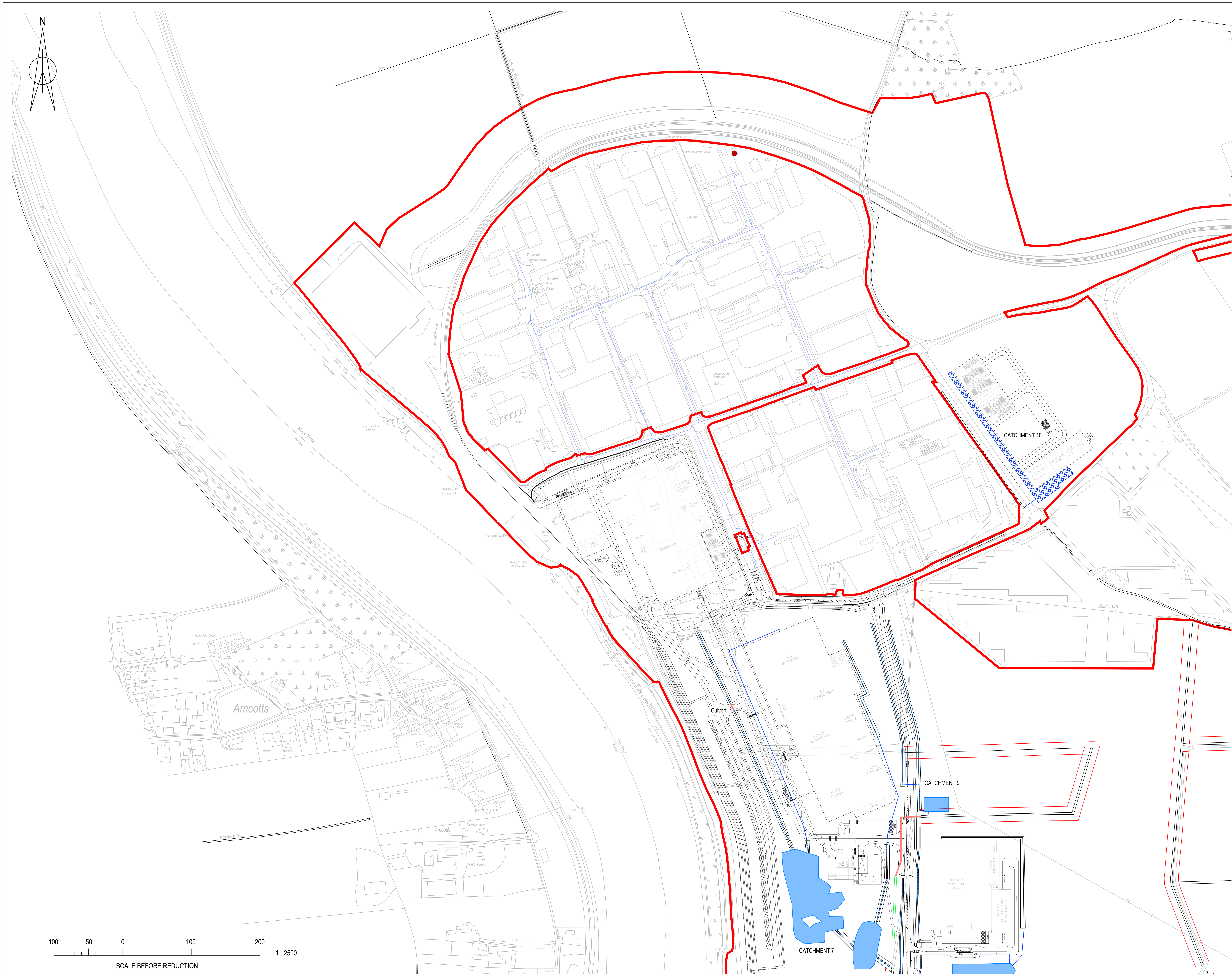
Drg Title: INDICATIVE SURFACE WATER DRAINAGE PLAN SHEET 4

Planning Inspectorate No.	Scale@A1	
EN010116	1:2500	
Drawn/Designed By.	Checked By.	Approved By.
J.SLEEMAN	C.BYRNE	C.BYRNE

Drawing No.: NLGEP-BHE-XX-XX-DR-C-3104

Revision: P0

Stefan Gandler \\Srv-leeds04\project cad\0046658 North Lincs Green Energy Park\F08 Civils - Infrastructure\Sheet\NLGEP-BHE-XX-XX-DR-C-3100 SERIES_SW_PLA.dwg



REFER TO DWG NO. NLGEP-BHE-XX-XX-DR-C-3104 FOR CONTINUATION

Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

- EXISTING SURFACE WATER (SEVERN TRENT)
- EXISTING DITCH

PROPOSED

- SITE BOUNDARY
- PROPOSED SURFACE WATER PIPE
- PROPOSED SWALE
- PROPOSED CULVERT
- PROPOSED DITCH DIVERSION ROUTE
- PROPOSED DETENTION BASIN (POND)
- ATTENUATION TANK

Rev	Description	Date	Iss'd	Rev'd	App'd
P1	UPDATED RED LINE BOUNDARY	09.01.2023	FR	CB	CB
P0	ISSUED FOR DCO SUBMISSION	25.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

Client

Level 33, Euston Tower, 286 Euston Rad, London, NW1 3DP

Client: NORTH LINCOLNSHIRE GREEN ENERGY PARK LTD

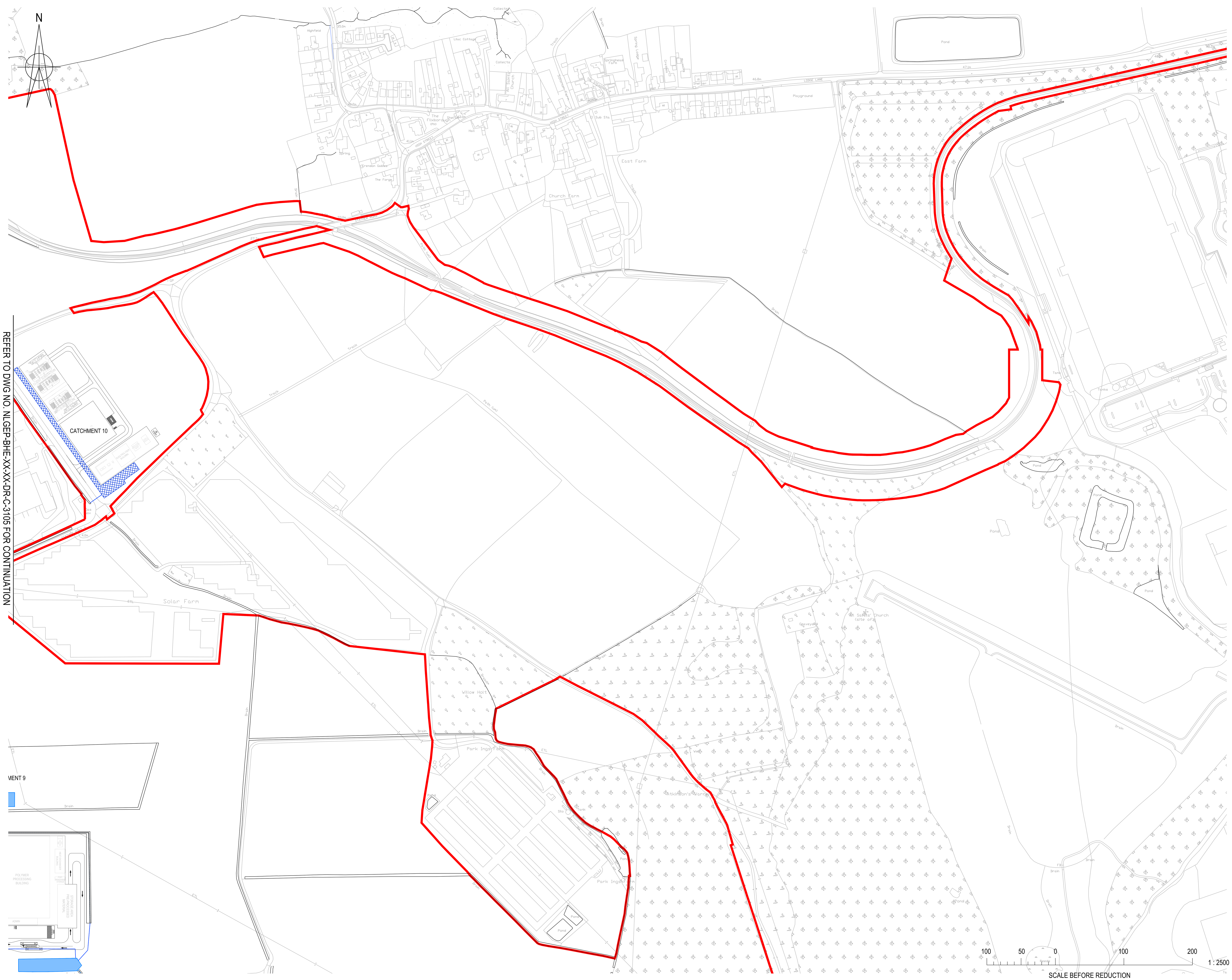
Consultant: BURO HAPPOLD

Project: NORTH LINCOLNSHIRE GREEN ENERGY PARK

Drg Title: INDICATIVE SURFACE WATER DRAINAGE PLAN SHEET 5

Planning Inspectorate No.	Scale@A1	
EN010116	1:2500	
Drawn/Designed By	Checked By	Approved By
J.SLEEMAN	C.BYRNE	C.BYRNE

Drawing No.	Revision
NLGEP-BHE-XX-XX-DR-C-3105	P1



Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

- SW EX — EXISTING SURFACE WATER (SEVERN TRENT)
- EXISTING DITCH

PROPOSED

- SITE BOUNDARY
- PROPOSED SURFACE WATER PIPE
- PROPOSED SWALE
- PROPOSED CULVERT
- PROPOSED DITCH DIVERSION ROUTE
- PROPOSED DETENTION BASIN (POND)
- ATTENUATION TANK

Rev	Description	Date	Iss'd	Rev'd	App'd
P0	ISSUED FOR DCO SUBMISSION	18.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

Client

Level 33, Euston Tower, 286 Euston Road, London, NW1 3DP

Client: *NORTH LINCOLNSHIRE GREEN ENERGY PARK*

Consultant: *BURO HAPPOLD*

Project: **NORTH LINCOLNSHIRE GREEN ENERGY PARK**

Drg Title: INDICATIVE SURFACE WATER DRAINAGE PLAN
SHEET 6

Planning Inspectorate No.	Scale@A1
EN010116	1:2500

Drawn/Designed By.	Checked By.	Approved By.
J.SLEEMAN	C.BYRNE	C.BYRNE

Drawing No.	Revision
NLGEP-BHE-XX-XX-DR-C-3106	P0

Stefan Gandler \\Srv-leeds04\project cad\0046658 North Lincs Green Energy Park\F08 Civils - Infrastructure\Sheet\NLGEP-BHE-XX-XX-DR-C-3

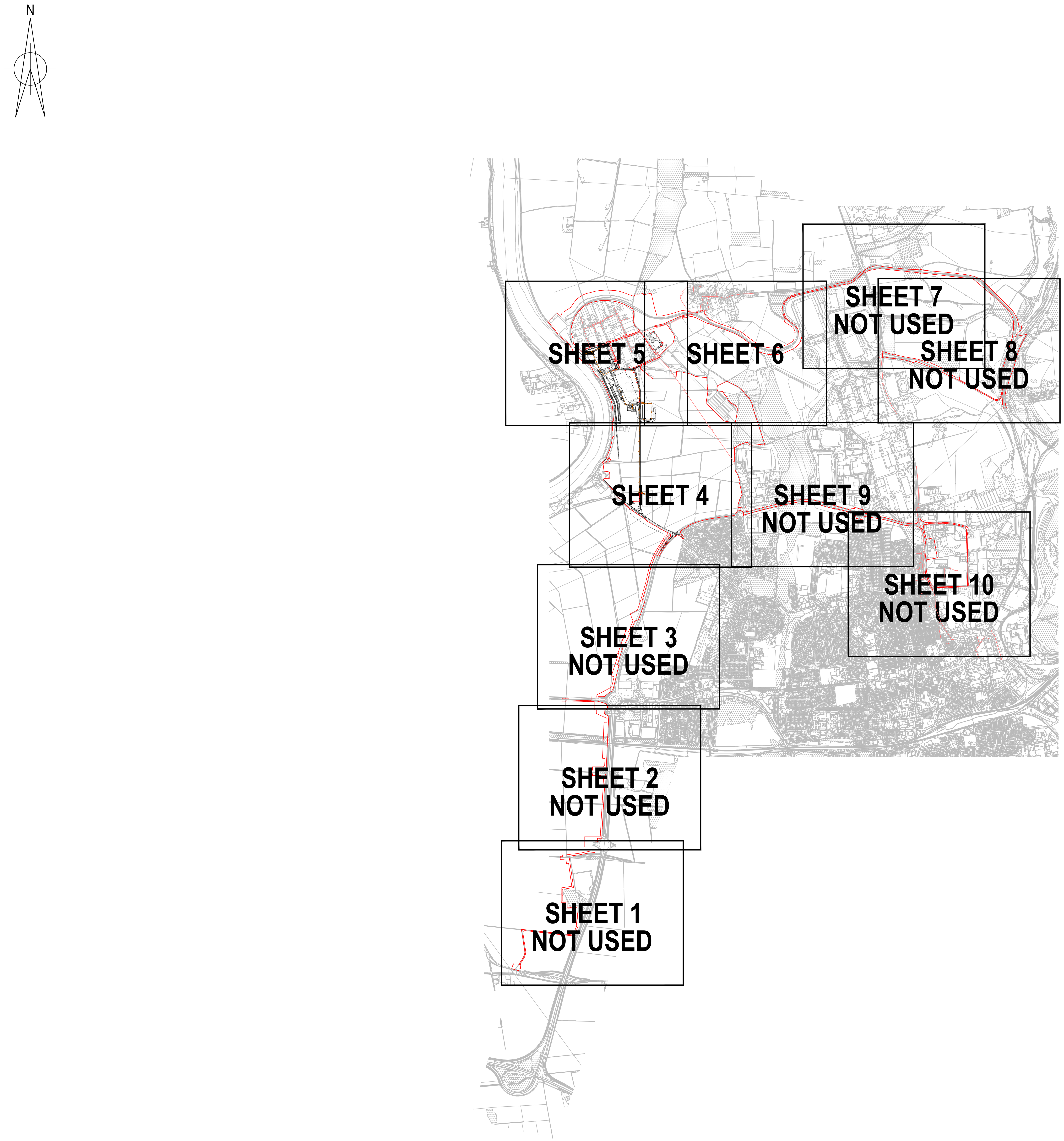
Appendix G SuDS Maintenance Plan

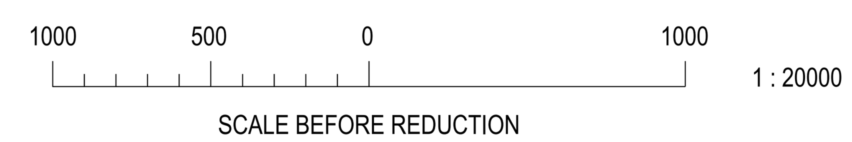
The table below is based on the CIRIA C753 SuDs Manual, 2015.

SUDS COMPONENTS MAINTENANCE REQUIREMENTS		
SUDS COMPONENT	**Swale**	
MAINTENANCE	**ACTION**	**FREQUENCY**
Regular maintenance	Litter and debris removal	Monthly
	Amenity grass cutting at 35-50mm	As required
	Grass cut to ditch access and overflows 75-100mm not to exceed 150mm	Monthly or as required
	Inspect and clear ditch where required, inlets, outlets and overflows	Monthly
Occasional tasks	Remove leaf accumulation	As required
	Cut back overhanging branches to allow dense vegetation growth	As required
Remedial work	Repair erosion, level uneven surfaces or damage by re-turfing or seeding	As required
	Repair or replace inlets, outlets or check dams to design detail	As required
	Remove silt and spread locally, reinstate surface	As required
SUDS COMPONENT	**Detention basins**	
MAINTENANCE	**ACTION**	**FREQUENCY**
Regular maintenance	Remove litter and debris	Monthly
	Cut grass for spillways and access routes	Monthly or as required
	Cut grass – meadow grass in and around basin	Six monthly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly at start then as required
	Inspect inlets, outlets and overflows for blockages and clear if required	Monthly
	Inspect banksides, structures, pipework etc. for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Monthly during first year, then annually or as required
	Check any penstocks or other mechanical devices	Annually

SUDS COMPONENTS MAINTENANCE REQUIREMENTS		
SUDS COMPONENT	**Swale**	
MAINTENANCE	**ACTION**	**FREQUENCY**
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually or as required
	Manage wetland plants in outlet pool where provided	Annually
Occasional tasks	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every two years or as required
	Remove sediments from inlets, outlet, forebay and main basin when required	Every 5 years or as required
Remedial work	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitate inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required
SUDS COMPONENT	**Key design standards for adoption inlets, outlets and connections**	
MAINTENANCE	**ACTION**	**FREQUENCY**
Regular maintenance	Litter and debris removal	Monthly
	Grass cut 1m around structure at 50mm where necessary	Monthly
	Remove silt from forebays, aprons or other structures if present	Monthly or as required
	Inspect and clear inlets, outlets, control structures and overflows	Monthly or as required
Occasional tasks	Removal of tree or shrub growth within 5m	As required

Appendix H Proposed Foul Water Drainage Layout





Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

FW EX — EXISTING FOUL WATER (SEVERN TRENT)

PROPOSED

SITE BOUNDARY

PROPOSED FOUL WATER CORRIDOR (DOMESTIC FLOW + TRADE EFFLUENT NETWORK)

PROPOSED FOUL WATER CORRIDOR RISING MAIN

PROPOSED FOUL WATER PUMPING STATION CORRIDOR (1 PUMPING STATION FOR DOMESTIC FLOWS + 1 PUMPING STATION FOR TRADE EFFLUENT)

PROPOSED FOUL WATER DOMESTIC FLOW NETWORK

PROPOSED FOUL WATER TRADE EFFLUENT NETWORK

PROPOSED FOUL WATER DOMESTIC FLOW RISING MAIN

PROPOSED FOUL WATER TRADE EFFLUENT RISING MAIN

PROPOSED TRADE EFFLUENT PUMPING STATION

Rev	Description	Date	Iss'd	Rev'd	App'd
P2	UPDATED FOUL WATER NETWORK	17.02.2023	FR	CB	CB
P1	UPDATED RED LINE BOUNDARY	09.01.2023	FR	CB	CB
P0	ISSUED FOR DCO SUBMISSION	25.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

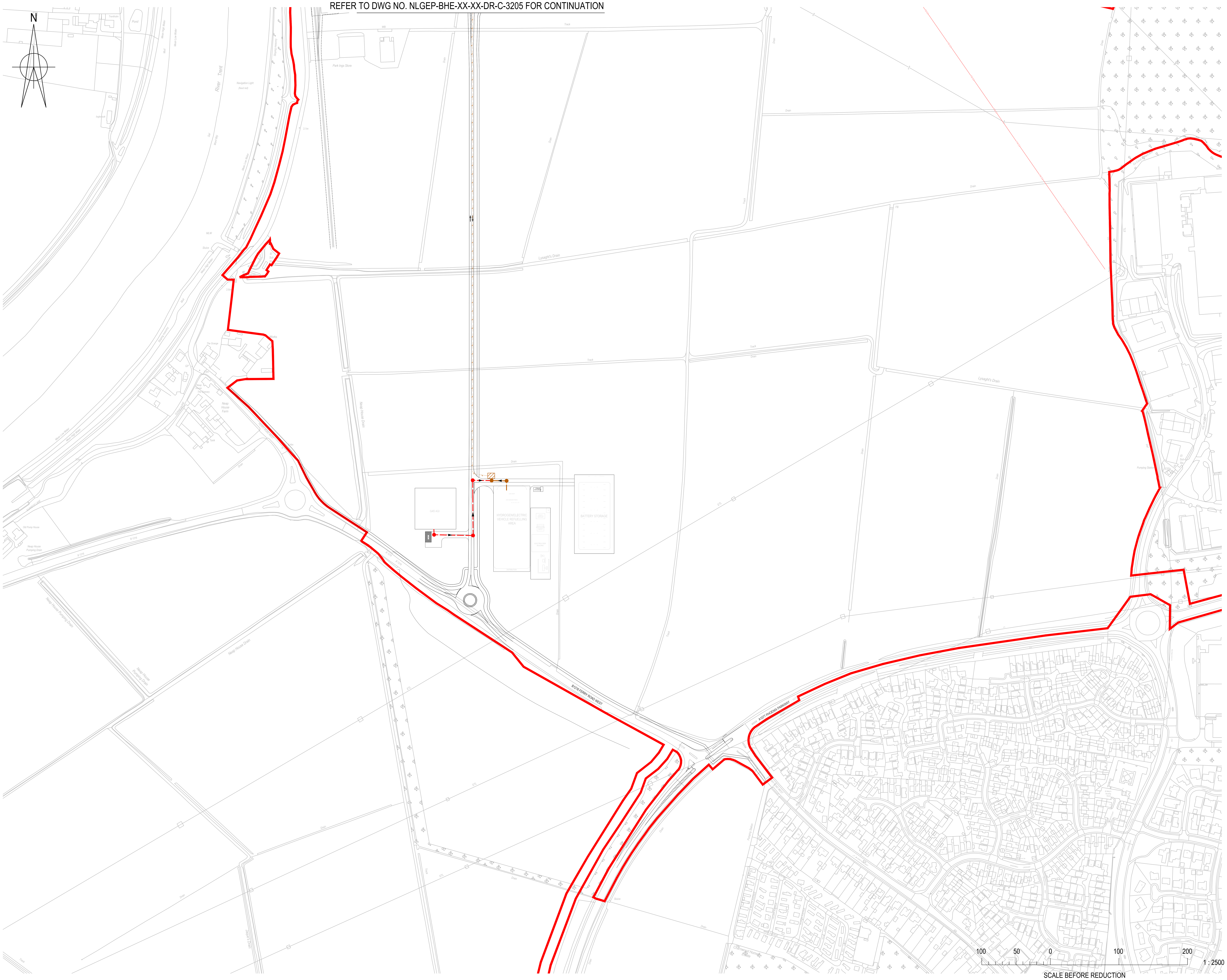
Client

Level 33, Euston Tower, 286 Euston Road, London, NW1 3DP

Client: NORTH LINCOLNSHIRE GREEN ENERGY PARK LTD
Consultant: BURO HAPPOLD
Project: NORTH LINCOLNSHIRE GREEN ENERGY PARK
Drg Title: INDICATIVE CONNECTION PLANS FOUL WATER DRAINAGE OVERALL SHEET

Planning Inspectorate No.	Scale@A1	
EN010116	1:20000	
Drawn/Designed By. J.SLEEMAN	Checked By. C.BYRNE	Approved By. C.BYRNE
Drawing No. NLGEP-BHE-XX-XX-DR-C-3200		Revision P2

REFER TO DWG NO. NLGEP-BHE-XX-XX-DR-C-3205 FOR CONTINUATION



Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

- EXISTING FOUL WATER (SEVERN TRENT)

PROPOSED

- SITE BOUNDARY
- PROPOSED FOUL WATER CORRIDOR (DOMESTIC FLOW + TRADE EFFLUENT NETWORK)
- PROPOSED FOUL WATER CORRIDOR RISING MAIN
- PROPOSED FOUL WATER PUMPING STATION CORRIDOR (1 PUMPING STATION FOR DOMESTIC FLOWS + 1 PUMPING STATION FOR TRADE EFFLUENT)
- PROPOSED FOUL WATER DOMESTIC FLOW NETWORK
- PROPOSED FOUL WATER TRADE EFFLUENT NETWORK
- PROPOSED FOUL WATER DOMESTIC FLOW RISING MAIN
- PROPOSED FOUL WATER TRADE EFFLUENT RISING MAIN
- PROPOSED TRADE EFFLUENT PUMPING STATION

Rev	Description	Date	Iss'd	Rev'd	App'd
P1	UPDATED FOUL WATER NETWORK	17.02.2023	FR	CB	CB
P0	ISSUED FOR DCO SUBMISSION	25.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

Client

NORTH LINCOLNSHIRE GREEN ENERGY PARK

Level 33, Euston Tower, 286 Euston Road, London, NW1 3DP

LDĀDESIGN GSDA ERM FICHTNER

BURO HAPPOLD northern planners bowland ecology ardent

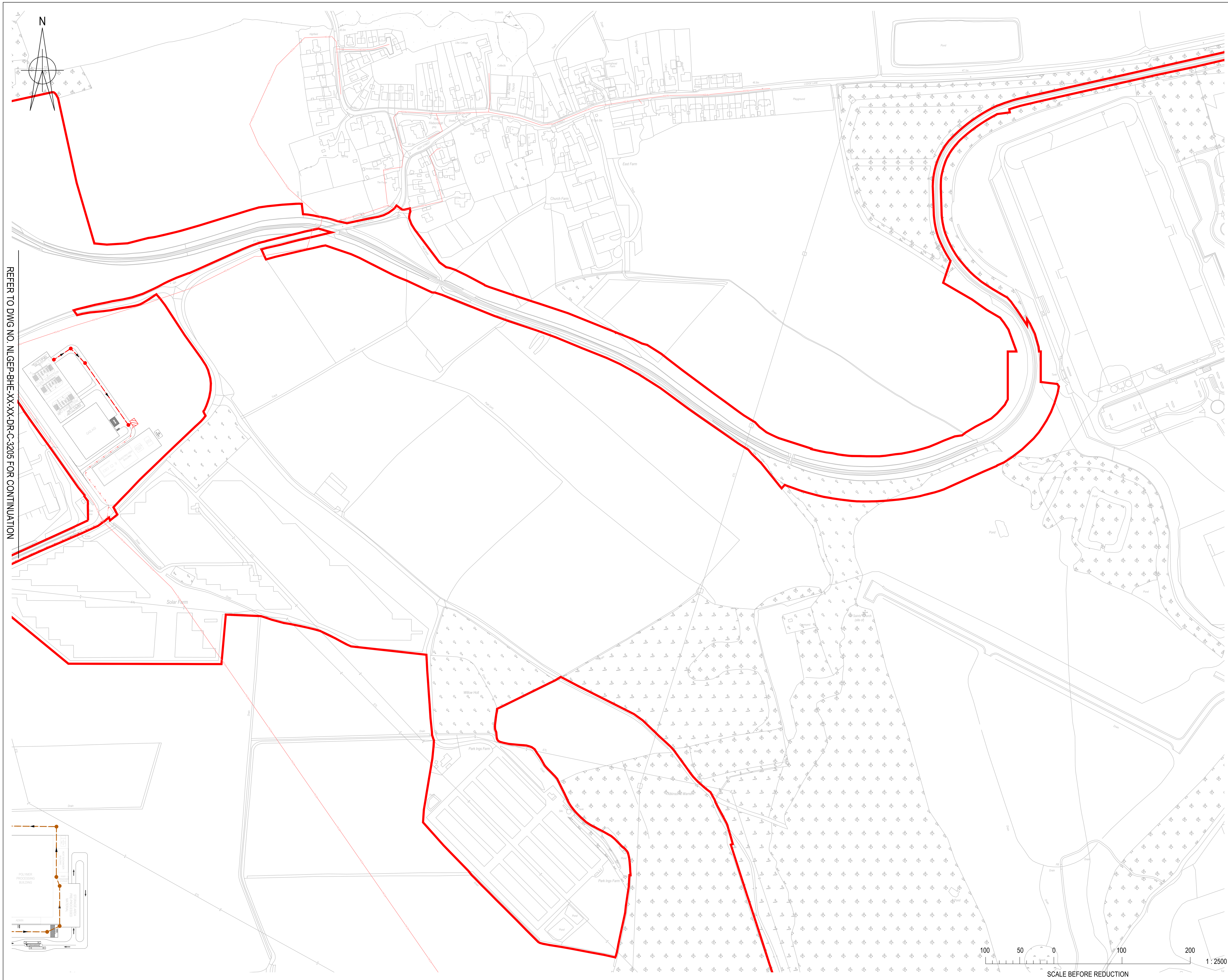
Client: NORTH LINCOLNSHIRE GREEN ENERGY PARK LTD

Consultant: BURO HAPPOLD

Project: NORTH LINCOLNSHIRE GREEN ENERGY PARK

Drg Title: INDICATIVE CONNECTION PLANS
FOUL WATER DRAINAGE
SHEET 4

Planning Inspectorate No.	Scale@A1	
EN010116	1:2500	
Drawn/Designed By. J.SLEEMAN	Checked By. C.BYRNE	Approved By. C.BYRNE
Drawing No. NLGEP-BHE-XX-XX-DR-C-3204		Revision P1



Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

FW EX — EXISTING FOUL WATER (SEVERN TRENT)

PROPOSED

- SITE BOUNDARY
- PROPOSED FOUL WATER CORRIDOR (DOMESTIC FLOW + TRADE EFFLUENT NETWORK)
- PROPOSED FOUL WATER CORRIDOR RISING MAIN
- PROPOSED FOUL WATER PUMPING STATION CORRIDOR (1 PUMPING STATION FOR DOMESTIC FLOWS + 1 PUMPING STATION FOR TRADE EFFLUENT)
- PROPOSED FOUL WATER DOMESTIC FLOW NETWORK
- PROPOSED FOUL WATER TRADE EFFLUENT NETWORK
- PROPOSED FOUL WATER DOMESTIC FLOW RISING MAIN
- PROPOSED FOUL WATER TRADE EFFLUENT RISING MAIN
- PROPOSED TRADE EFFLUENT PUMPING STATION

Rev	Description	Date	Iss'd	Rev'd	App'd
P1	UPDATED FOUL WATER NETWORK	17.02.2023	FR	CB	CB
P0	ISSUED FOR DCO SUBMISSION	25.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

Client

NORTH LINCOLNSHIRE GREEN ENERGY PARK

Level 33, Euston Tower, 286 Euston Rad, London, NW1 3DP

Client: *NORTH LINCOLNSHIRE GREEN ENERGY PARK LTD*

Consultant: *BURO HAPPOLD*

Project: **NORTH LINCOLNSHIRE GREEN ENERGY PARK**

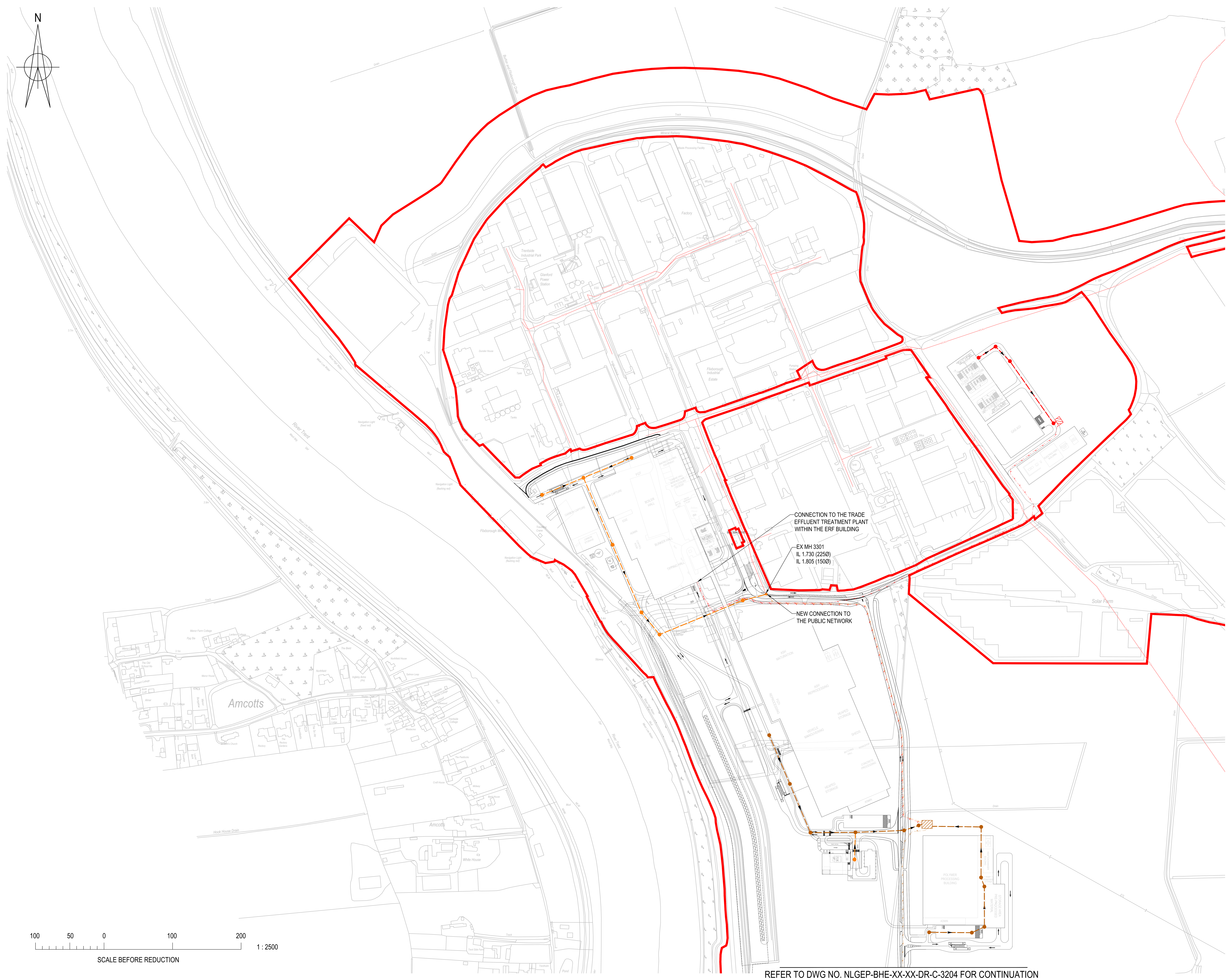
Drg Title: INDICATIVE CONNECTION PLANS
FOUL WATER DRAINAGE
SHEET 6

Planning Inspectorate No.	Scale@A1	
EN010116	1:2500	
Drawn/Designed By. J.SLEEMAN	Checked By. C.BYRNE	Approved By. C.BYRNE

Drawing No. NLGEP-BHE-XX-XX-DR-C-3206

Revision P1

Francisco Rodriguez \\SRV-LEEDS04\Project CAD\0046658 North Lincs Green Energy Park\F08 Civils - Infrastructure\Sheet\NLGEP-BHE-XX-XX-DR-C-3200 SERIES_FW_PLA.dwg



Planning Act 2008
The Infrastructure Planning (Applications: Prescribed forms and Procedure) Regulations 2009
Regulation: 5(2)(o)

NOTES:

1. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. DRAWINGS BASED ON THE FOLLOWING BACKGROUND INFORMATION:
   - ORDNANCE SURVEY MAPS RECEIVED © CROWN COPYRIGHT AND DATABASE RIGHTS 2021 OS LICENCE 100035409
3. THE COMPLETENESS OF THE UNDERGROUND SERVICE INFORMATION CANNOT BE GUARANTEED AND THEREFORE OTHER SERVICES MAY EXIST.

LEGEND

EXISTING

FW EX — EXISTING FOUL WATER (SEVERN TRENT)

PROPOSED

- SITE BOUNDARY
- PROPOSED FOUL WATER CORRIDOR (DOMESTIC FLOW + TRADE EFFLUENT NETWORK)
- PROPOSED FOUL WATER CORRIDOR RISING MAIN
- PROPOSED FOUL WATER PUMPING STATION CORRIDOR (1 PUMPING STATION FOR DOMESTIC FLOWS + 1 PUMPING STATION FOR TRADE EFFLUENT)
- PROPOSED FOUL WATER DOMESTIC FLOW NETWORK
- PROPOSED FOUL WATER TRADE EFFLUENT NETWORK
- PROPOSED FOUL WATER DOMESTIC FLOW RISING MAIN
- PROPOSED FOUL WATER TRADE EFFLUENT RISING MAIN
- PROPOSED TRADE EFFLUENT PUMPING STATION

Rev	Description	Date	Iss'd	Rev'd	App'd
P2	UPDATED FOUL WATER NETWORK	17.02.2023	FR	CB	CB
P1	UPDATED RED LINE BOUNDARY	09.01.2023	FR	CB	CB
P0	ISSUED FOR DCO SUBMISSION	25.02.2022	FR	CB	CB

DCO SUBMISSION

Project Stage

INFORMATION

Status of Drawing

Client

Level 33, Euston Tower, 286 Euston Rad, London, NW1 3DP

Client: NORTH LINCOLNSHIRE GREEN ENERGY PARK LTD

Consultant: BURO HAPPOLD

Project: **NORTH LINCOLNSHIRE GREEN ENERGY PARK**

Drg Title: INDICATIVE CONNECTION PLANS
FOUL WATER DRAINAGE
SHEET 5

Planning Inspectorate No.	Scale@A1	
EN010116	1:2500	
Drawn/Designed By.	Checked By.	Approved By.
J.SLEEMAN	C.BYRNE	C.BYRNE

Drawing No.: NLGEP-BHE-XX-XX-DR-C-3205

Revision: P2

Francisco Rodriguez \\SRV-LEEDS04\Project CAD\0046658 North Lincs Green Energy Park\F08 Civils - Infrastructure\Sheet\NLGEP-BHE-XX-XX-DR-C-3200 SERIES_FW_PLA.dwg

Appendix I MicroDrainage Results

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	17.007	0.207	82.0	0.073	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.001	13.508	0.165	81.9	0.015	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.002	12.530	0.153	81.9	0.008	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.000	31.723	0.159	199.5	0.017	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.001	44.329	0.222	199.7	0.008	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.002	9.113	0.046	198.1	0.015	0.00	0.0	0.600		o	150	Pipe/Conduit	
S2.003	19.660	0.098	200.6	0.022	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.000	18.666	0.104	179.5	0.056	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.001	28.457	0.158	180.1	0.031	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.002	33.517	0.186	180.2	0.040	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S4.000	44.745	0.224	199.8	0.081	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S4.001	44.745	0.224	199.8	0.033	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.003	23.091	0.077	299.9	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.003	38.148	0.254	150.2	0.061	0.00	0.0		0.035	3 \=/	500	1:3 Swale	

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	50.00	5.42	2.200	0.073	0.0	0.0	0.0	0.67	95.8	9.8
S1.001	50.00	5.76	1.993	0.087	0.0	0.0	0.0	0.67	95.9	11.8
S1.002	50.00	6.07	1.828	0.095	0.0	0.0	0.0	0.67	95.9	12.9
S2.000	50.00	6.23	2.200	0.017	0.0	0.0	0.0	0.43	61.4	2.3
S2.001	50.00	7.94	2.041	0.025	0.0	0.0	0.0	0.43	61.4	3.3
S2.002	50.00	8.16	1.819	0.039	0.0	0.0	0.0	0.71	12.6	5.3
S2.003	50.00	8.92	1.773	0.062	0.0	0.0	0.0	0.43	61.3	8.4
S3.000	50.00	5.68	2.200	0.056	0.0	0.0	0.0	0.45	64.8	7.6
S3.001	50.00	6.73	2.096	0.087	0.0	0.0	0.0	0.45	64.6	11.8
S3.002	50.00	7.96	1.938	0.127	0.0	0.0	0.0	0.45	64.6	17.1
S4.000	50.00	6.73	2.200	0.081	0.0	0.0	0.0	0.43	61.4	11.0
S4.001	50.00	8.46	1.976	0.114	0.0	0.0	0.0	0.43	61.4	15.4
S3.003	50.00	8.89	1.752	0.241	0.0	0.0	0.0	0.90	63.8	32.6
S1.003	50.00	10.20	1.675	0.458	0.0	0.0	0.0	0.50	70.8	62.1

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.004	38.148	0.254	150.2	0.054	0.00	0.0		0.035	3 \=/	500	1:3 Swale	🔒
S1.005	43.914	1.300	33.8	0.000	0.00	0.0		0.035	3 \=/	500	1:3 Swale	🔒
S5.000	30.364	0.214	141.9	0.169	5.00	0.0		0.035	3 \=/	500	1:3 Swale	🔒
S5.001	25.653	0.181	141.7	0.168	0.00	0.0		0.035	3 \=/	500	1:3 Swale	🔒
S5.002	19.998	1.300	15.4	0.000	0.00	0.0		0.035	3 \=/	500	1:3 Swale	🔒
S1.006	52.554	0.263	199.8	0.204	0.00	0.0		0.035	3 \=/	500	1:3 Swale	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.004	50.00	11.48	1.421	0.513	0.0	0.0	0.0	0.50	70.8	69.4
S1.005	50.00	12.18	1.166	0.513	0.0	0.0	0.0	1.05	149.3	69.4
S5.000	50.00	5.99	1.560	0.169	0.0	0.0	0.0	0.51	72.8	22.9
S5.001	50.00	6.83	1.346	0.337	0.0	0.0	0.0	0.51	72.9	45.6
S5.002	50.00	7.04	1.166	0.337	0.0	0.0	0.0	1.55	221.2	45.6
S1.006	50.00	14.21	-0.134	1.053	0.0	0.0	0.0	0.43	61.4«	142.6

Area Summary for Catchment 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Road	75	0.094	0.071	0.071
	Classification	Grass	30	0.007	0.002	0.073
1.001	Classification	Road	75	0.015	0.012	0.012
	Classification	Grass	30	0.010	0.003	0.015
1.002	Classification	Road	75	0.007	0.005	0.005
	Classification	Grass	30	0.008	0.002	0.008
2.000	Classification	Road	75	0.016	0.012	0.012
	Classification	Grass	30	0.017	0.005	0.017
2.001	Classification	Grass	30	0.025	0.008	0.008
2.002	Classification	Road	75	0.020	0.015	0.015
2.003	Classification	Grass	30	0.011	0.003	0.003
	Classification	Road	75	0.025	0.019	0.022
3.000	Classification	Road	75	0.071	0.053	0.053
	Classification	Grass	30	0.010	0.003	0.056
3.001	Classification	Road	75	0.034	0.026	0.026
	Classification	Grass	30	0.016	0.005	0.031
3.002	Classification	Road	75	0.023	0.017	0.017
	Classification	Road	75	0.009	0.007	0.024
	Classification	Road	75	0.007	0.006	0.030
	Classification	Grass	30	0.012	0.003	0.033
	Classification	Grass	30	0.021	0.006	0.040
4.000	Classification	Road	75	0.074	0.056	0.056
	Classification	Road	75	0.014	0.010	0.066
	Classification	Grass	30	0.023	0.007	0.073
	Classification	Grass	30	0.027	0.008	0.081
4.001	Classification	Road	75	0.014	0.010	0.010
	Classification	Grass	30	0.027	0.008	0.019
	Classification	Grass	30	0.017	0.005	0.023
	Classification	Road	75	0.013	0.010	0.033
3.003	-	-	100	0.000	0.000	0.000
1.003	Classification	Grass	30	0.017	0.005	0.005
	User	-	100	0.056	0.056	0.061
1.004	Classification	Road	75	0.060	0.045	0.045
	Classification	Grass	30	0.023	0.007	0.052
	Classification	Grass	30	0.007	0.002	0.054
1.005	-	-	100	0.000	0.000	0.000
5.000	Classification	Roof	90	0.181	0.163	0.163
	Classification	Grass	30	0.021	0.006	0.169
5.001	Classification	Roof	90	0.179	0.161	0.161
	Classification	Grass	30	0.022	0.007	0.168
5.002	-	-	100	0.000	0.000	0.000
1.006	Classification	Detention Basin	100	0.092	0.092	0.092
	Classification	Grass	30	0.079	0.024	0.116
	Classification	Grass	30	0.284	0.085	0.201
	Classification	Grass	30	0.010	0.003	0.204
				Total	Total	Total
				1.699	1.053	1.053

Simulation Criteria for Catchment 1

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 1

Orifice Manhole: S8, DS/PN: S1.006, Volume (m^3): 63.9

Diameter (m) 0.032 Discharge Coefficient 0.600 Invert Level (m) -0.134

Storage Structures for Catchment 1

Infiltration Basin Manhole: S8, DS/PN: S1.006

Invert Level (m) -0.134 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	552.1	1.300	924.8

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

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S3	15 Winter	1	+0%					2.244
S1.001	S4	15 Winter	1	+0%					2.041
S1.002	S5	15 Winter	1	+0%					1.878
S2.000	S5	15 Winter	1	+0%					2.225
S2.001	S5	15 Winter	1	+0%					2.070
S2.002	S6	15 Winter	1	+0%	30/15 Summer				1.879
S2.003	S7	15 Winter	1	+0%					1.826
S3.000	S6	15 Winter	1	+0%					2.248

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S3	-0.456	0.000	0.01			9.5	OK	
S1.001	S4	-0.511	0.000	0.01			11.2	OK	
S1.002	S5	-0.557	0.000	0.01			12.1	OK	
S2.000	S5	-0.475	0.000	0.00			2.3	OK	
S2.001	S5	-0.630	0.000	0.00			3.0	OK	
S2.002	S6	-0.090	0.000	0.34			4.2	OK*	
S2.003	S7	-0.874	0.000	0.00			6.2	OK	
S3.000	S6	-0.452	0.000	0.01			7.3	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S3.001	S7	15 Winter	1	+0%					2.155
S3.002	S8	15 Winter	1	+0%					2.008
S4.000	S10	15 Winter	1	+0%					2.259
S4.001	S12	15 Winter	1	+0%					2.045
S3.003	S10	15 Winter	1	+0%	30/15 Summer				1.880
S1.003	S7	15 Winter	1	+0%					1.792
S1.004	S15	15 Winter	1	+0%					1.542
S1.005	S7	15 Winter	1	+0%					1.247
S5.000	S14	15 Winter	1	+0%					1.639
S5.001	S15	15 Winter	1	+0%					1.456
S5.002	S15	15 Winter	1	+0%					1.226
S1.006	S8	1440 Winter	1	+0%					0.229

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.001	S7	-0.545	0.000	0.01			10.6	OK	
S3.002	S8	-0.692	0.000	0.01			14.7	OK	
S4.000	S10	-0.441	0.000	0.01			10.3	OK	
S4.001	S12	-0.655	0.000	0.01			13.6	OK	
S3.003	S10	-0.172	0.000	0.38			24.2	OK*	
S1.003	S7	-0.383	0.000	0.04			43.8	OK	
S1.004	S15	-0.379	0.000	0.05			47.3	OK	
S1.005	S7	-0.419	0.000	0.02			47.2	OK	
S5.000	S14	-0.521	0.000	0.01			21.9	OK	
S5.001	S15	-0.407	0.000	0.04			39.8	OK	
S5.002	S15	-0.440	0.000	0.01			39.8	OK	
S1.006	S8	-0.937	0.000	0.00			1.3	OK	

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

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S3	15 Winter	30	+40%					2.299
S1.001	S4	15 Winter	30	+40%					2.102
S1.002	S5	15 Winter	30	+40%					1.940
S2.000	S5	15 Winter	30	+40%					2.257
S2.001	S5	15 Winter	30	+40%					2.110
S2.002	S6	15 Winter	30	+40%	30/15 Summer				1.987
S2.003	S7	15 Winter	30	+40%					1.915
S3.000	S6	15 Winter	30	+40%					2.305

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S3	-0.401	0.000	0.03			41.6	OK	
S1.001	S4	-0.450	0.000	0.03			49.7	OK	
S1.002	S5	-0.495	0.000	0.03			54.0	OK	
S2.000	S5	-0.443	0.000	0.01			9.7	OK	
S2.001	S5	-0.590	0.000	0.01			13.5	OK	
S2.002	S6	0.018	0.000	1.23			15.5	SURCHARGED*	
S2.003	S7	-0.785	0.000	0.01			25.0	OK	
S3.000	S6	-0.395	0.000	0.04			31.8	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S3.001	S7	15 Winter	30	+40%					2.227
S3.002	S8	15 Winter	30	+40%					2.106
S4.000	S10	15 Winter	30	+40%					2.330
S4.001	S12	15 Winter	30	+40%					2.135
S3.003	S10	15 Winter	30	+40%	30/15 Summer				2.074
S1.003	S7	15 Winter	30	+40%					1.904
S1.004	S15	15 Winter	30	+40%					1.661
S1.005	S7	15 Winter	30	+40%					1.332
S5.000	S14	15 Winter	30	+40%					1.733
S5.001	S15	15 Winter	30	+40%					1.586
S5.002	S15	15 Winter	30	+40%					1.304
S1.006	S8	1440 Winter	30	+40%					0.878

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.001	S7	-0.473	0.000	0.04			49.2	OK	
S3.002	S8	-0.594	0.000	0.03			66.2	OK	
S4.000	S10	-0.370	0.000	0.05			44.9	OK	
S4.001	S12	-0.565	0.000	0.03			56.9	OK	
S3.003	S10	0.022	0.000	1.21			77.1	SURCHARGED*	
S1.003	S7	-0.271	0.000	0.17			168.1	FLOOD RISK*	
S1.004	S15	-0.260	0.000	0.19			185.6	FLOOD RISK*	
S1.005	S7	-0.334	0.000	0.09			186.0	OK	
S5.000	S14	-0.427	0.000	0.06			95.0	OK	
S5.001	S15	-0.277	0.000	0.18			191.3	FLOOD RISK*	
S5.002	S15	-0.362	0.000	0.06			191.7	OK	
S1.006	S8	-0.288	0.000	0.00			2.1	FLOOD RISK*	

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

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 Coefficient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of 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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S3	15 Winter	100	+40%					2.320
S1.001	S4	15 Winter	100	+40%					2.126
S1.002	S5	15 Winter	100	+40%					1.972
S2.000	S5	15 Winter	100	+40%					2.270
S2.001	S5	15 Winter	100	+40%					2.132
S2.002	S6	15 Winter	100	+40%	30/15 Summer				2.052
S2.003	S7	15 Winter	100	+40%					1.951
S3.000	S6	15 Winter	100	+40%					2.329

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S3	-0.380	0.000	0.05			62.5	OK	
S1.001	S4	-0.426	0.000	0.04			75.0	OK	
S1.002	S5	-0.463	0.000	0.04			81.0	OK	
S2.000	S5	-0.430	0.000	0.02			14.5	OK	
S2.001	S5	-0.568	0.000	0.01			19.9	OK	
S2.002	S6	0.083	0.000	1.64			20.6	SURCHARGED*	
S2.003	S7	-0.749	0.000	0.01			33.5	OK	
S3.000	S6	-0.371	0.000	0.05			47.9	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S3.001	S7	15 Winter	100	+40%					2.257
S3.002	S8	15 Winter	100	+40%					2.176
S4.000	S10	15 Winter	100	+40%					2.360
S4.001	S12	15 Winter	100	+40%					2.187
S3.003	S10	15 Winter	100	+40%	30/15 Summer				2.159
S1.003	S7	15 Winter	100	+40%					1.941
S1.004	S15	15 Winter	100	+40%					1.702
S1.005	S7	15 Winter	100	+40%					1.363
S5.000	S14	15 Winter	100	+40%					1.769
S5.001	S15	15 Winter	100	+40%					1.637
S5.002	S15	15 Winter	100	+40%					1.336
S1.006	S8	1440 Winter	100	+40%					1.144

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.001	S7	-0.443	0.000	0.05			74.2	OK	
S3.002	S8	-0.524	0.000	0.04			96.9	OK	
S4.000	S10	-0.340	0.000	0.08			67.4	OK	
S4.001	S12	-0.513	0.000	0.04			84.5	OK	
S3.003	S10	0.107	0.000	1.60			102.2	SURCHARGED*	
S1.003	S7	-0.234	0.000	0.24			232.0	FLOOD RISK*	
S1.004	S15	-0.219	0.000	0.26			260.0	FLOOD RISK*	
S1.005	S7	-0.303	0.000	0.13			261.0	OK	
S5.000	S14	-0.391	0.000	0.09			142.5	OK	
S5.001	S15	-0.226	0.000	0.26			288.3	FLOOD RISK*	
S5.002	S15	-0.330	0.000	0.09			290.0	OK	
S1.006	S8	-0.022	0.000	0.00			2.4	FLOOD RISK*	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 2

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	25.281	0.169	150.0	0.000	5.00	0.0	0.035	o	100	Pipe/Conduit	🔒
S1.001	18.759	0.131	143.2	0.000	0.00	0.0	0.035	o	100	Pipe/Conduit	🔒
S1.002	38.143	0.127	300.3	0.688	0.00	0.0	0.035	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)
S1.000	50.00	7.11	2.100	0.000	0.0	0.0	0.0	0.20	1.6	0.0
S1.001	50.00	8.64	1.931	0.000	0.0	0.0	0.0	0.20	1.6	0.0
S1.002	50.00	10.81	0.912	0.688	0.0	0.0	0.0	0.29	20.7«	93.1

Area Summary for Catchment 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.000	0.000	0.000
1.002	Classification	Roof	90	0.010	0.009	0.009
	Classification	Roof	90	0.010	0.009	0.018
	Classification	Roof	90	0.063	0.056	0.075
	Classification	Roof	90	0.000	0.000	0.075
	Classification	Roof	90	0.001	0.001	0.076
	Classification	Roof	90	0.002	0.002	0.078
	Classification	Roof	90	0.036	0.032	0.111
	Classification	Roof	90	0.014	0.013	0.123
	Classification	Roof	90	0.001	0.001	0.124
	Classification	Road	75	0.741	0.555	0.680
	Classification	Roof	90	0.009	0.008	0.688
				Total	Total	Total
				0.888	0.688	0.688

Simulation Criteria for Catchment 2

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 2

Hydro-Brake® Optimum Manhole: S14, DS/PN: S1.002, Volume (m^3): 2.2

Unit Reference	MD-SHE-0052-1200-0910-1200
Design Head (m)	0.910
Design Flow (l/s)	1.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	52
Invert Level (m)	0.912
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.910	1.2
Flush-Flo™	0.230	1.1
Kick-Flo®	0.468	0.9
Mean Flow over Head Range	-	1.0

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	1.0	1.200	1.4	3.000	2.1	7.000	3.0
0.200	1.1	1.400	1.5	3.500	2.2	7.500	3.1
0.300	1.1	1.600	1.5	4.000	2.4	8.000	3.2
0.400	1.0	1.800	1.6	4.500	2.5	8.500	3.3
0.500	0.9	2.000	1.7	5.000	2.6	9.000	3.4
0.600	1.0	2.200	1.8	5.500	2.7	9.500	3.5
0.800	1.1	2.400	1.9	6.000	2.8		
1.000	1.3	2.600	1.9	6.500	2.9		

Storage Structures for Catchment 2

Cellular Storage Manhole: S14, DS/PN: S1.002

Invert Level (m) 0.912 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.97
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	756.0	0.0	0.911	0.0	0.0
0.910	756.0	0.0			

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

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S12	15 Summer	1	+0%					2.100
S1.001	S13	15 Summer	1	+0%					1.931
S1.002	S14	1440 Winter	1	+0%	30/60 Summer				1.090

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S12	-0.100	0.000	0.00			0.0	OK	
S1.001	S13	-0.100	0.000	0.00			0.0	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S14	-0.122	0.000	0.05		1307	1.1	OK	

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

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S12	15 Summer	30	+40%					2.100
S1.001	S13	15 Summer	30	+40%					1.931
S1.002	S14	1440 Winter	30	+40%	30/60 Summer				1.566

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S12	-0.100	0.000	0.00			0.0	OK	
S1.001	S13	-0.100	0.000	0.00			0.0	OK	
S1.002	S14	0.354	0.000	0.05			1.1	SURCHARGED	

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

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S12	15 Summer	100	+40%					2.100
S1.001	S13	15 Summer	100	+40%					1.931
S1.002	S14	1440 Winter	100	+40%	30/60 Summer				1.787

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S12	-0.100	0.000	0.00			0.0	OK	
S1.001	S13	-0.100	0.000	0.00			0.0	OK	
S1.002	S14	0.575	0.000	0.06			1.2	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 3

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	22.917	0.115	199.3	0.130	5.00	0.0	0.035	3 \=/	500	1:3 Swale	🔒
S1.001	32.543	0.163	199.7	0.144	0.00	0.0	0.035	3 \=/	500	1:3 Swale	🔒
S1.002	31.620	0.158	200.1	0.141	0.00	0.0	0.035	3 \=/	500	1:3 Swale	🔒
S1.003	26.399	0.132	200.0	0.088	0.00	0.0	0.035	3 \=/	500	1:3 Swale	🔒
S1.004	64.043	0.532	120.4	0.000	0.00	0.0	0.035	3 \=/	500	1:3 Swale	🔒
S1.005	20.865	0.100	208.7	0.091	0.00	0.0	0.035	3 \=/	500	1:3 Swale	🔒

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	50.00	5.89	2.300	0.130	0.0	0.0	0.0	0.43	61.5	17.6
S1.001	50.00	7.14	2.185	0.275	0.0	0.0	0.0	0.43	61.4	37.2
S1.002	50.00	8.37	2.022	0.415	0.0	0.0	0.0	0.43	61.3	56.2
S1.003	50.00	9.39	1.864	0.503	0.0	0.0	0.0	0.43	61.3«	68.2
S1.004	50.00	11.31	1.732	0.503	0.0	0.0	0.0	0.55	79.1	68.2
S1.005	50.00	12.14	1.200	0.595	0.0	0.0	0.0	0.42	60.1«	80.5

Area Summary for Catchment 3

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Road	75	0.154	0.116	0.116
	Classification	Grass	30	0.049	0.015	0.130
1.001	Classification	Road	75	0.182	0.136	0.136
	Classification	Grass	30	0.026	0.008	0.144
1.002	Classification	Road	75	0.177	0.133	0.133
	Classification	Grass	30	0.027	0.008	0.141
1.003	Classification	Grass	30	0.023	0.007	0.007
	Classification	Road	75	0.108	0.081	0.088
1.004	-	-	100	0.000	0.000	0.000
1.005	Classification	Grass	30	0.049	0.015	0.015
	Classification	Detention Basin	100	0.064	0.064	0.079
	Classification	Grass	30	0.040	0.012	0.091
				Total	Total	Total
				0.900	0.595	0.595

Simulation Criteria for Catchment 3

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 3

Orifice Manhole: S4, DS/PN: S1.005, Volume (m^3): 88.4

Diameter (m) 0.023 Discharge Coefficient 0.600 Invert Level (m) 1.200

Storage Structures for Catchment 3

Infiltration Basin Manhole: S4, DS/PN: S1.005

Invert Level (m) 1.200 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	297.3	1.500	636.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 3

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					2.378
S1.001	S2	15 Winter	1	+0%					2.293
S1.002	S2	15 Winter	1	+0%					2.149
S1.003	S4	15 Winter	1	+0%					2.001
S1.004	S2	15 Winter	1	+0%					1.852
S1.005	S4	1440 Winter	1	+0%					1.576

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 3

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.322	0.000	0.03			16.9	OK	
S1.001	S2	-0.392	0.000	0.04			31.8	OK	
S1.002	S2	-0.373	0.000	0.05			44.7	OK	
S1.003	S4	-0.363	0.000	0.06			51.4	OK	
S1.004	S2	-0.480	0.000	0.03			50.7	OK	
S1.005	S4	-1.124	0.000	0.00			0.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 3

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+40%					2.477
S1.001	S2	15 Winter	30	+40%					2.421
S1.002	S2	15 Winter	30	+40%					2.300
S1.003	S4	15 Winter	30	+40%					2.163
S1.004	S2	1440 Winter	30	+40%					2.080
S1.005	S4	1440 Winter	30	+40%					2.080

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 3

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.223	0.000	0.14			73.1	FLOOD RISK*	
S1.001	S2	-0.264	0.000	0.18			152.8	FLOOD RISK*	
S1.002	S2	-0.222	0.000	0.26			220.1	FLOOD RISK*	
S1.003	S4	-0.201	0.000	0.30			256.8	FLOOD RISK*	
S1.004	S2	-0.252	0.000	0.01			11.9	FLOOD RISK*	
S1.005	S4	-0.620	0.000	0.00			1.0	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 3

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					2.522
S1.001	S2	15 Winter	100	+40%					2.471
S1.002	S2	15 Winter	100	+40%					2.357
S1.003	S4	1440 Winter	100	+40%					2.271
S1.004	S2	1440 Winter	100	+40%					2.270
S1.005	S4	1440 Winter	100	+40%					2.270

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 3

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.178	0.000	0.22			109.9	FLOOD RISK*	
S1.001	S2	-0.214	0.000	0.27			231.4	FLOOD RISK*	
S1.002	S2	-0.165	0.000	0.39			332.5	FLOOD RISK*	
S1.003	S4	-0.093	0.000	0.02			15.6	FLOOD RISK*	
S1.004	S2	-0.062	0.000	0.01			14.9	FLOOD RISK*	
S1.005	S4	-0.430	0.000	0.00			1.1	OK	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 4

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	48.949	0.245	199.8	0.023	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.001	66.776	0.334	199.9	0.026	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.002	67.044	0.335	200.1	0.033	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.003	64.503	0.321	200.9	0.032	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.000	49.688	0.248	200.4	0.047	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.001	66.782	0.334	199.9	0.050	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.002	66.782	0.334	199.9	0.060	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.003	64.366	0.322	199.9	0.056	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.004	14.030	0.047	298.5	0.018	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.004	9.119	0.046	198.2	0.010	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.005	11.015	0.662	16.6	0.000	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.006	13.331	0.067	199.0	0.083	0.00	0.0		0.035	3 \=/	500	1:3 Swale	

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	50.00	6.89	2.300	0.023	0.0	0.0	0.0	0.43	61.4	3.2
S1.001	50.00	9.48	2.055	0.050	0.0	0.0	0.0	0.43	61.4	6.7
S1.002	50.00	12.08	1.721	0.083	0.0	0.0	0.0	0.43	61.3	11.2
S1.003	50.00	14.58	1.386	0.115	0.0	0.0	0.0	0.43	61.2	15.6
S2.000	50.00	6.93	2.350	0.047	0.0	0.0	0.0	0.43	61.3	6.3
S2.001	50.00	9.51	2.102	0.096	0.0	0.0	0.0	0.43	61.4	13.1
S2.002	50.00	12.10	1.768	0.157	0.0	0.0	0.0	0.43	61.4	21.2
S2.003	50.00	14.59	1.434	0.212	0.0	0.0	0.0	0.43	61.4	28.8
S2.004	50.00	14.85	1.112	0.231	0.0	0.0	0.0	0.90	64.0	31.3
S1.004	50.00	15.20	1.065	0.356	0.0	0.0	0.0	0.43	61.6	48.2
S1.005	50.00	15.32	1.019	0.356	0.0	0.0	0.0	1.49	212.7	48.2
S1.006	50.00	15.83	0.357	0.439	0.0	0.0	0.0	0.43	61.5	59.5

Area Summary for Catchment 4

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Road	75	0.022	0.016	0.016
	Classification	Grass	30	0.024	0.007	0.023
1.001	Classification	Road	75	0.020	0.015	0.015
	Classification	Grass	30	0.038	0.011	0.026
1.002	Classification	Road	75	0.023	0.018	0.018
	Classification	Grass	30	0.052	0.016	0.033
1.003	Classification	Road	75	0.021	0.015	0.015
	Classification	Grass	30	0.055	0.017	0.032
2.000	Classification	Road	75	0.021	0.016	0.016
	Classification	Grass	30	0.031	0.009	0.025
	Classification	Road	75	0.019	0.014	0.039
	Classification	Grass	30	0.025	0.007	0.047
2.001	Classification	Road	75	0.020	0.015	0.015
	Classification	Grass	30	0.031	0.009	0.024
	Classification	Road	75	0.018	0.014	0.038
	Classification	Grass	30	0.040	0.012	0.050
2.002	Classification	Road	75	0.023	0.018	0.018
	Classification	Grass	30	0.035	0.011	0.028
	Classification	Road	75	0.021	0.016	0.044
	Classification	Grass	30	0.053	0.016	0.060
2.003	Classification	Road	75	0.020	0.015	0.015
	Classification	Grass	30	0.031	0.009	0.025
	Classification	Road	75	0.019	0.014	0.039
	Classification	Grass	30	0.056	0.017	0.056
2.004	Classification	Road	75	0.009	0.007	0.007
	Classification	Grass	30	0.013	0.004	0.010
	Classification	Road	75	0.008	0.006	0.016
	Classification	Grass	30	0.006	0.002	0.018
1.004	Classification	Road	75	0.009	0.007	0.007
	Classification	Grass	30	0.011	0.003	0.010
1.005	-	-	100	0.000	0.000	0.000
1.006	Classification	Detention Basin	100	0.059	0.059	0.059
	Classification	Grass	30	0.071	0.021	0.080
	Classification	Grass	30	0.011	0.003	0.083
				Total	Total	Total
				0.916	0.439	0.439

Simulation Criteria for Catchment 4

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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

Simulation Criteria for Catchment 4

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 4

Orifice Manhole: S4, DS/PN: S1.006, Volume (m^3): 11.0

Diameter (m) 0.027 Discharge Coefficient 0.600 Invert Level (m) 0.357

Storage Structures for Catchment 4

Infiltration Basin Manhole: S4, DS/PN: S1.006

Invert Level (m) 0.357 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	404.1	0.500	523.7	0.800	600.9

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					2.330
S1.001	S2	15 Winter	1	+0%					2.098
S1.002	S2	15 Winter	1	+0%					1.775
S1.003	S4	15 Winter	1	+0%					1.446
S2.000	S2	15 Winter	1	+0%					2.394
S2.001	S5	15 Winter	1	+0%					2.162
S2.002	S4	15 Winter	1	+0%					1.842
S2.003	S8	15 Winter	1	+0%					1.517

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.370	0.000	0.01			3.0	OK	
S1.001	S2	-0.457	0.000	0.01			5.6	OK	
S1.002	S2	-0.446	0.000	0.01			8.3	OK	
S1.003	S4	-0.440	0.000	0.01			10.6	OK	
S2.000	S2	-0.306	0.000	0.02			5.8	OK	
S2.001	S5	-0.440	0.000	0.01			10.4	OK	
S2.002	S4	-0.426	0.000	0.02			15.5	OK	
S2.003	S8	-0.417	0.000	0.02			19.4	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.004	S3	15 Winter	1	+0%	30/15 Summer				1.229
S1.004	S2	15 Winter	1	+0%					1.170
S1.005	S3	15 Winter	1	+0%					1.073
S1.006	S4	1440 Winter	1	+0%					0.576

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.004	S3	-0.183	0.000	0.32			19.9	OK*	
S1.004	S2	-1.441	0.000	0.00			30.8	OK	
S1.005	S3	-0.446	0.000	0.01			30.8	OK	
S1.006	S4	-0.581	0.000	0.00			0.7	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+40%					2.367
S1.001	S2	15 Winter	30	+40%					2.156
S1.002	S2	15 Winter	30	+40%					1.844
S1.003	S4	15 Winter	30	+40%					1.524
S2.000	S2	15 Winter	30	+40%					2.448
S2.001	S5	15 Winter	30	+40%					2.239
S2.002	S4	15 Winter	30	+40%					1.936
S2.003	S8	15 Winter	30	+40%					1.619

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.333	0.000	0.03			12.7	OK	
S1.001	S2	-0.399	0.000	0.03			25.5	OK	
S1.002	S2	-0.377	0.000	0.05			39.4	OK	
S1.003	S4	-0.362	0.000	0.06			49.9	OK	
S2.000	S2	-0.252	0.000	0.07			25.3	FLOOD RISK*	
S2.001	S5	-0.363	0.000	0.06			48.8	OK	
S2.002	S4	-0.332	0.000	0.08			71.9	OK	
S2.003	S8	-0.315	0.000	0.11			89.5	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.004	S3	15 Winter	30	+40%	30/15 Summer				1.439
S1.004	S2	15 Winter	30	+40%					1.260
S1.005	S3	15 Winter	30	+40%					1.129
S1.006	S4	1440 Winter	30	+40%					0.969

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.004	S3	0.027	0.000	1.21			74.2	SURCHARGED*	
S1.004	S2	-1.351	0.000	0.01			116.9	OK	
S1.005	S3	-0.390	0.000	0.04			117.1	OK	
S1.006	S4	-0.188	0.000	0.00			1.2	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					2.385
S1.001	S2	15 Winter	100	+40%					2.176
S1.002	S2	15 Winter	100	+40%					1.873
S1.003	S4	15 Winter	100	+40%					1.555
S2.000	S2	15 Winter	100	+40%					2.471
S2.001	S5	15 Winter	100	+40%					2.272
S2.002	S4	15 Winter	100	+40%					1.974
S2.003	S8	15 Winter	100	+40%					1.657

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.315	0.000	0.04			19.1	OK	
S1.001	S2	-0.379	0.000	0.04			38.2	OK	
S1.002	S2	-0.348	0.000	0.07			58.1	OK	
S1.003	S4	-0.331	0.000	0.09			74.1	OK	
S2.000	S2	-0.229	0.000	0.10			38.0	FLOOD RISK*	
S2.001	S5	-0.330	0.000	0.09			73.6	OK	
S2.002	S4	-0.294	0.000	0.13			109.0	FLOOD RISK*	
S2.003	S8	-0.277	0.000	0.16			134.7	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 4

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.004	S3	15 Winter	100	+40%	30/15 Summer				1.533
S1.004	S2	15 Winter	100	+40%					1.299
S1.005	S3	15 Winter	100	+40%					1.152
S1.006	S4	1440 Winter	100	+40%					1.136

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.004	S3	0.121	0.000	1.74			106.9	SURCHARGED*	
S1.004	S2	-1.312	0.000	0.01			171.3	OK	
S1.005	S3	-0.367	0.000	0.06			171.6	OK	
S1.006	S4	-0.021	0.000	0.00			1.3	FLOOD RISK*	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 5

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	6.415	0.043	149.2	0.415	10.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.001	19.862	1.000	19.9	0.000	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.002	39.928	0.683	58.5	0.079	0.00	0.0	0.035	3 \=/	500	1:3 Swale	

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	50.00	10.21	1.835	0.415	0.0	0.0	0.0	0.50	71.0	56.2
S1.001	50.00	10.46	1.792	0.415	0.0	0.0	0.0	1.37	194.7	56.2
S1.002	50.00	11.29	0.792	0.494	0.0	0.0	0.0	0.80	113.5	66.9

Area Summary for Catchment 5

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Road	75	0.543	0.407	0.407
	Classification	Grass	30	0.025	0.007	0.415
1.001	-	-	100	0.000	0.000	0.000
1.002	Classification	Detention Basin	100	0.043	0.043	0.043
	Classification	Grass	30	0.120	0.036	0.079
				Total	Total	Total
				0.731	0.494	0.494

Simulation Criteria for Catchment 5

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 5

Orifice Manhole: S3, DS/PN: S1.002, Volume (m^3): 23.0

Diameter (m) 0.020 Discharge Coefficient 0.600 Invert Level (m) 0.792

Storage Structures for Catchment 5

Tank or Pond Manhole: S3, DS/PN: S1.002

Invert Level (m) 0.792

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	165.5	1.500	434.4

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 5

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					1.943
S1.001	S2	15 Winter	1	+0%					1.854
S1.002	S3	1440 Winter	1	+0%					1.284

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.392	0.000	0.04			37.5	OK	
S1.001	S2	-0.481	0.000	0.01			37.5	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 5

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-1.009	0.000	0.00			0.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 5

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+40%					2.058
S1.001	S2	1440 Winter	30	+40%					2.011
S1.002	S3	1440 Winter	30	+40%					2.011

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.277	0.000	0.17			163.0	FLOOD RISK*	
S1.001	S2	-0.324	0.000	0.00			9.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 5

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.282	0.000	0.00			0.9	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 5

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	1440 Winter	100	+40%					2.269
S1.001	S2	1440 Winter	100	+40%					2.269
S1.002	S3	1440 Winter	100	+40%					2.269

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.066	0.000	0.01			12.9	FLOOD RISK*	
S1.001	S2	-0.066	0.000	0.00			12.9	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 5

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.002	S3	-0.024	0.000	0.00			1.0	FLOOD RISK*	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 6

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	30.336	0.248	122.5	0.075	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.001	30.707	0.251	122.3	0.011	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.002	30.736	0.251	122.5	0.016	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.003	30.809	0.252	122.3	0.021	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.004	24.723	0.198	124.9	0.032	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.000	32.933	0.165	200.0	0.034	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.001	32.625	0.163	200.2	0.026	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.002	76.607	0.383	200.0	0.052	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.003	21.225	0.106	200.2	0.055	0.00	0.0		0.035	3 \=/	300	1:3 Swale	
S2.004	25.918	0.130	199.4	0.001	0.00	0.0	0.600		o	300	Pipe/Conduit	
S2.005	32.342	0.162	199.6	0.037	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S2.006	18.186	0.091	199.8	0.009	0.00	0.0	0.600		o	300	Pipe/Conduit	
S1.005	36.845	0.184	200.2	0.006	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.006	61.433	0.307	200.1	0.025	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.007	61.302	0.307	199.7	0.028	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.008	61.644	0.308	200.1	0.030	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.009	61.344	0.307	199.8	0.033	0.00	0.0		0.035	3 \=/	500	1:3 Swale	

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	50.00	5.92	3.500	0.075	0.0	0.0	0.0	0.55	78.4	10.1
S1.001	50.00	6.85	3.252	0.085	0.0	0.0	0.0	0.55	78.4	11.5
S1.002	50.00	7.78	3.001	0.101	0.0	0.0	0.0	0.55	78.4	13.7
S1.003	50.00	8.71	2.750	0.122	0.0	0.0	0.0	0.55	78.5	16.6
S1.004	50.00	9.47	2.498	0.154	0.0	0.0	0.0	0.54	77.6	20.8
S2.000	50.00	6.27	3.500	0.034	0.0	0.0	0.0	0.43	61.3	4.6
S2.001	50.00	7.54	3.335	0.060	0.0	0.0	0.0	0.43	61.3	8.1
S2.002	50.00	10.50	3.172	0.111	0.0	0.0	0.0	0.43	61.3	15.1
S2.003	50.00	11.38	2.789	0.166	0.0	0.0	0.0	0.41	45.7	22.5
S2.004	50.00	11.77	2.683	0.168	0.0	0.0	0.0	1.11	78.5	22.7
S2.005	50.00	13.02	2.553	0.205	0.0	0.0	0.0	0.43	61.4	27.8
S2.006	50.00	13.29	2.391	0.214	0.0	0.0	0.0	1.11	78.4	28.9
S1.005	50.00	14.72	2.300	0.373	0.0	0.0	0.0	0.43	61.3	50.6
S1.006	50.00	17.10	2.116	0.398	0.0	0.0	0.0	0.43	61.3	53.9
S1.007	50.00	19.47	1.809	0.427	0.0	0.0	0.0	0.43	61.4	57.8
S1.008	50.00	21.85	1.502	0.456	0.0	0.0	0.0	0.43	61.3«	61.8
S1.009	50.00	24.23	1.194	0.489	0.0	0.0	0.0	0.43	61.4«	66.2

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 6

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.010	51.146	0.256	199.8	0.029	0.00	0.0		0.035	3 \=/	600	1:3 Swale	
S3.000	39.412	0.252	156.3	0.025	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.001	71.591	0.458	156.3	0.035	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.002	71.633	0.458	156.4	0.046	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.003	71.602	0.458	156.3	0.058	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S3.004	61.444	0.393	156.3	0.053	0.00	0.0		0.035	3 \=/	600	1:3 Swale	
S3.005	15.682	0.100	156.8	0.061	0.00	0.0	0.600		o	400	Pipe/Conduit	
S1.011	16.518	0.083	199.0	0.023	0.00	0.0		0.035	3 \=/	600	1:3 Swale	
S1.012	9.667	0.415	23.3	0.000	0.00	0.0		0.035	3 \=/	600	1:3 Swale	
S1.013	14.326	0.072	199.0	0.075	0.00	0.0		0.035	3 \=/	500	1:3 Swale	

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)
S1.010	50.00	26.16	0.887	0.519	0.0	0.0	0.0	0.44	69.4«	70.2
S3.000	50.00	6.35	2.750	0.025	0.0	0.0	0.0	0.49	69.4	3.3
S3.001	50.00	8.80	2.498	0.060	0.0	0.0	0.0	0.49	69.4	8.1
S3.002	50.00	11.25	2.040	0.106	0.0	0.0	0.0	0.49	69.4	14.4
S3.003	50.00	13.70	1.582	0.165	0.0	0.0	0.0	0.49	69.4	22.3
S3.004	50.00	15.76	1.124	0.217	0.0	0.0	0.0	0.50	78.4	29.4
S3.005	50.00	15.93	0.731	0.278	0.0	0.0	0.0	1.50	189.1	37.7
S1.011	50.00	26.79	0.631	0.820	0.0	0.0	0.0	0.44	69.5«	111.0
S1.012	50.00	26.91	0.548	0.820	0.0	0.0	0.0	1.29	203.1	111.0
S1.013	50.00	27.47	0.133	0.895	0.0	0.0	0.0	0.43	61.5«	121.1

Area Summary for Catchment 6

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Road	75	0.093	0.070	0.070
	Classification	Grass	30	0.017	0.005	0.075
1.001	Classification	Road	75	0.008	0.006	0.006
	Classification	Grass	30	0.017	0.005	0.011
1.002	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.018	0.005	0.016
1.003	Classification	Road	75	0.021	0.015	0.015
	Classification	Grass	30	0.019	0.006	0.021
1.004	Classification	Road	75	0.034	0.026	0.026
	Classification	Grass	30	0.020	0.006	0.032
2.000	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.022	0.007	0.017
	Classification	Road	75	0.013	0.010	0.027
	Classification	Grass	30	0.022	0.007	0.034
2.001	Classification	Grass	30	0.016	0.005	0.005
	Classification	Road	75	0.010	0.007	0.012
	Classification	Road	75	0.010	0.008	0.020
	Classification	Grass	30	0.020	0.006	0.026
2.002	Classification	Road	75	0.020	0.015	0.015
	Classification	Grass	30	0.028	0.008	0.024
	Classification	Grass	30	0.003	0.001	0.025
	Classification	Road	75	0.020	0.015	0.040
	Classification	Grass	30	0.040	0.012	0.052
2.003	Classification	Road	75	0.018	0.013	0.013
	Classification	Grass	30	0.021	0.006	0.020
	Classification	Road	75	0.038	0.028	0.048
	Classification	Grass	30	0.023	0.007	0.055
2.004	Classification	Grass	30	0.004	0.001	0.001
2.005	Classification	Road	75	0.026	0.020	0.020
	Classification	Road	75	0.017	0.013	0.032
	Classification	Grass	30	0.017	0.005	0.037
2.006	Classification	Grass	30	0.029	0.009	0.009
1.005	Classification	Grass	30	0.019	0.006	0.006
1.006	Classification	Road	75	0.017	0.012	0.012
	Classification	Grass	30	0.041	0.012	0.025
1.007	Classification	Road	75	0.021	0.015	0.015
	Classification	Grass	30	0.044	0.013	0.028
1.008	Classification	Road	75	0.020	0.015	0.015
	Classification	Grass	30	0.050	0.015	0.030
1.009	Classification	Road	75	0.021	0.016	0.016
	Classification	Grass	30	0.058	0.017	0.033
1.010	Classification	Road	75	0.020	0.015	0.015
	Classification	Grass	30	0.049	0.015	0.029
3.000	Classification	Road	75	0.015	0.012	0.012
	Classification	Grass	30	0.024	0.007	0.019
	Classification	Grass	30	0.019	0.006	0.025
3.001	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.022	0.007	0.017
	Classification	Road	75	0.014	0.011	0.028
	Classification	Grass	30	0.025	0.008	0.035
3.002	Classification	Road	75	0.019	0.014	0.014

Area Summary for Catchment 6

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	Classification	Grass	30	0.028	0.008	0.023
	Classification	Road	75	0.018	0.013	0.036
	Classification	Grass	30	0.036	0.011	0.046
3.003	Classification	Road	75	0.022	0.017	0.017
	Classification	Grass	30	0.035	0.010	0.027
	Classification	Road	75	0.021	0.016	0.043
	Classification	Grass	30	0.051	0.015	0.058
3.004	Classification	Road	75	0.020	0.015	0.015
	Classification	Grass	30	0.030	0.009	0.024
	Classification	Road	75	0.018	0.013	0.037
	Classification	Grass	30	0.052	0.015	0.053
3.005	Classification	Road	75	0.022	0.017	0.017
	Classification	Road	75	0.024	0.018	0.034
	Classification	Grass	30	0.036	0.011	0.045
	Classification	Grass	30	0.052	0.016	0.061
1.011	Classification	Road	75	0.024	0.018	0.018
	Classification	Grass	30	0.018	0.005	0.023
1.012	-	-	100	0.000	0.000	0.000
1.013	Classification	Detention Basin	100	0.058	0.058	0.058
	Classification	Grass	30	0.057	0.017	0.075
				Total	Total	Total
				1.822	0.895	0.895

Simulation Criteria for Catchment 6

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes

Synthetic Rainfall Details

Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 6

Orifice Manhole: S6, DS/PN: S1.013, Volume (m^3): 62.4

Diameter (m) 0.034 Discharge Coefficient 0.600 Invert Level (m) 0.133

Storage Structures for Catchment 6

Infiltration Basin Manhole: S6, DS/PN: S1.013

Invert Level (m) 0.133 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	262.3	0.350	336.1	1.300	582.6

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					3.549
S1.001	S2	15 Winter	1	+0%					3.304
S1.002	S2	15 Winter	1	+0%					3.057
S1.003	S4	15 Winter	1	+0%					2.810
S1.004	S2	15 Winter	1	+0%					2.565
S2.000	S2	15 Winter	1	+0%					3.537
S2.001	S7	15 Winter	1	+0%					3.383
S2.002	S7	15 Winter	1	+0%					3.235
S2.003	S7	15 Winter	1	+0%					2.879
S2.004	S10	15 Winter	1	+0%	100/15 Summer				2.775
S2.005	S9	15 Winter	1	+0%					2.634

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.351	0.000	0.01			9.7	OK	
S1.001	S2	-0.448	0.000	0.01			10.7	OK	
S1.002	S2	-0.444	0.000	0.01			12.4	OK	
S1.003	S4	-0.440	0.000	0.01			14.2	OK	
S1.004	S2	-0.433	0.000	0.02			17.2	OK	
S2.000	S2	-0.363	0.000	0.01			4.4	OK	
S2.001	S7	-0.452	0.000	0.01			7.0	OK	
S2.002	S7	-0.437	0.000	0.01			11.4	OK	
S2.003	S7	-0.410	0.000	0.02			16.1	OK	
S2.004	S10	-0.208	0.000	0.21			16.2	OK*	
S2.005	S9	-0.419	0.000	0.02			19.1	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.006	S10	15 Winter	1	+0%	100/15 Summer				2.494
S1.005	S6	15 Winter	1	+0%					2.413
S1.006	S4	15 Winter	1	+0%					2.230
S1.007	S2	15 Winter	1	+0%					1.922
S1.008	S6	15 Winter	1	+0%					1.615
S1.009	S3	15 Winter	1	+0%					1.306
S1.010	S8	30 Winter	1	+0%					0.988
S3.000	S15	15 Winter	1	+0%					2.779
S3.001	S4	15 Winter	1	+0%					2.543
S3.002	S11	15 Winter	1	+0%					2.098
S3.003	S6	15 Winter	1	+0%					1.651
S3.004	S13	15 Winter	1	+0%					1.195
S3.005	S3	15 Winter	1	+0%	30/360 Winter				0.842
S1.011	S2	30 Winter	1	+0%					0.756
S1.012	S5	1440 Winter	1	+0%					0.661
S1.013	S6	1440 Winter	1	+0%					0.661

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.006	S10	-0.197	0.000	0.26			19.5	OK*	
S1.005	S6	-0.387	0.000	0.04			35.4	OK	
S1.006	S4	-0.386	0.000	0.04			35.4	OK	
S1.007	S2	-0.387	0.000	0.04			35.4	OK	
S1.008	S6	-0.387	0.000	0.04			34.8	OK	
S1.009	S3	-0.388	0.000	0.04			34.4	OK	
S1.010	S8	-0.599	0.000	0.02			34.3	OK	
S3.000	S15	-0.471	0.000	0.00			3.3	OK	
S3.001	S4	-0.455	0.000	0.01			6.8	OK	
S3.002	S11	-0.442	0.000	0.01			11.0	OK	
S3.003	S6	-0.431	0.000	0.02			15.7	OK	
S3.004	S13	-0.529	0.000	0.01			19.7	OK	
S3.005	S3	-0.289	0.000	0.17			24.2	OK*	
S1.011	S2	-1.863	0.000	0.00			49.9	OK	
S1.012	S5	-1.257	0.000	0.00			6.6	OK	
S1.013	S6	-0.772	0.000	0.00		1290	1.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+40%					3.610
S1.001	S2	15 Winter	30	+40%					3.368
S1.002	S2	15 Winter	30	+40%					3.126
S1.003	S4	15 Winter	30	+40%					2.885
S1.004	S2	15 Winter	30	+40%					2.649
S2.000	S2	15 Winter	30	+40%					3.583
S2.001	S7	15 Winter	30	+40%					3.445
S2.002	S7	15 Winter	30	+40%					3.320

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.290	0.000	0.06			41.9	FLOOD RISK*	
S1.001	S2	-0.384	0.000	0.04			47.4	OK	
S1.002	S2	-0.375	0.000	0.05			54.8	OK	
S1.003	S4	-0.365	0.000	0.06			63.9	OK	
S1.004	S2	-0.349	0.000	0.07			76.8	OK	
S2.000	S2	-0.317	0.000	0.04			18.9	OK	
S2.001	S7	-0.390	0.000	0.04			32.9	OK	
S2.002	S7	-0.352	0.000	0.06			55.1	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.003	S7	15 Winter	30	+40%					2.981
S2.004	S10	15 Winter	30	+40%	100/15 Summer				2.917
S2.005	S9	15 Winter	30	+40%					2.735
S2.006	S10	15 Winter	30	+40%	100/15 Summer				2.662
S1.005	S6	15 Winter	30	+40%					2.530
S1.006	S4	15 Winter	30	+40%					2.347
S1.007	S2	15 Winter	30	+40%					2.037
S1.008	S6	15 Winter	30	+40%					1.728
S1.009	S3	15 Winter	30	+40%					1.417
S1.010	S8	1440 Winter	30	+40%					1.254
S3.000	S15	15 Winter	30	+40%					2.814
S3.001	S4	15 Winter	30	+40%					2.604
S3.002	S11	15 Winter	30	+40%					2.175
S3.003	S6	15 Winter	30	+40%					1.744
S3.004	S13	15 Winter	30	+40%					1.291
S3.005	S3	1440 Winter	30	+40%	30/360 Winter				1.254
S1.011	S2	1440 Winter	30	+40%					1.254
S1.012	S5	1440 Winter	30	+40%					1.254
S1.013	S6	1440 Winter	30	+40%					1.254

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.003	S7	-0.308	0.000	0.10			77.2	OK	
S2.004	S10	-0.066	0.000	0.96			75.3	OK*	
S2.005	S9	-0.318	0.000	0.10			85.3	OK	
S2.006	S10	-0.029	0.000	1.00			75.6	OK*	
S1.005	S6	-0.270	0.000	0.17			148.3	FLOOD RISK*	
S1.006	S4	-0.269	0.000	0.17			146.6	FLOOD RISK*	
S1.007	S2	-0.272	0.000	0.17			145.2	FLOOD RISK*	
S1.008	S6	-0.274	0.000	0.17			142.5	FLOOD RISK*	
S1.009	S3	-0.277	0.000	0.16			139.3	FLOOD RISK*	
S1.010	S8	-0.333	0.000	0.01			12.2	OK	
S3.000	S15	-0.436	0.000	0.01			13.8	OK	
S3.001	S4	-0.394	0.000	0.03			32.2	OK	
S3.002	S11	-0.365	0.000	0.06			53.5	OK	
S3.003	S6	-0.338	0.000	0.08			76.1	OK	
S3.004	S13	-0.433	0.000	0.06			94.4	OK	
S3.005	S3	0.123	0.000	0.04			5.8	SURCHARGED*	
S1.011	S2	-1.365	0.000	0.00			16.7	OK	
S1.012	S5	-0.664	0.000	0.00			15.7	OK	
S1.013	S6	-0.179	0.000	0.00			2.5	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					3.636
S1.001	S2	15 Winter	100	+40%					3.396
S1.002	S2	15 Winter	100	+40%					3.156
S1.003	S4	15 Winter	100	+40%					2.917
S1.004	S2	15 Winter	100	+40%					2.681
S2.000	S2	15 Winter	100	+40%					3.602
S2.001	S7	15 Winter	100	+40%					3.469
S2.002	S7	15 Winter	100	+40%					3.352

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.264	0.000	0.10			62.9	FLOOD RISK*	
S1.001	S2	-0.356	0.000	0.07			71.3	OK	
S1.002	S2	-0.345	0.000	0.08			82.1	OK	
S1.003	S4	-0.333	0.000	0.09			96.2	OK	
S1.004	S2	-0.317	0.000	0.11			115.8	OK	
S2.000	S2	-0.298	0.000	0.06			28.4	FLOOD RISK*	
S2.001	S7	-0.366	0.000	0.06			48.4	OK	
S2.002	S7	-0.320	0.000	0.10			82.3	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 6

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.003	S7	15 Winter	100	+40%					3.051
S2.004	S10	15 Winter	100	+40%	100/15 Summer				3.025
S2.005	S9	15 Winter	100	+40%					2.786
S2.006	S10	15 Winter	100	+40%	100/15 Summer				2.743
S1.005	S6	15 Winter	100	+40%					2.564
S1.006	S4	15 Winter	100	+40%					2.383
S1.007	S2	15 Winter	100	+40%					2.075
S1.008	S6	15 Winter	100	+40%					1.766
S1.009	S3	15 Winter	100	+40%					1.455
S1.010	S8	1440 Winter	100	+40%					1.421
S3.000	S15	15 Winter	100	+40%					2.830
S3.001	S4	15 Winter	100	+40%					2.627
S3.002	S11	15 Winter	100	+40%					2.206
S3.003	S6	15 Winter	100	+40%					1.780
S3.004	S13	1440 Winter	100	+40%					1.421
S3.005	S3	1440 Winter	100	+40%	30/360 Winter				1.421
S1.011	S2	1440 Winter	100	+40%					1.421
S1.012	S5	1440 Winter	100	+40%					1.421
S1.013	S6	1440 Winter	100	+40%					1.421

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.003	S7	-0.238	0.000	0.14			100.0	FLOOD RISK*	
S2.004	S10	0.042	0.000	1.20			93.9	SURCHARGED*	
S2.005	S9	-0.267	0.000	0.12			105.9	FLOOD RISK*	
S2.006	S10	0.052	0.000	1.32			99.5	SURCHARGED*	
S1.005	S6	-0.236	0.000	0.24			200.7	FLOOD RISK*	
S1.006	S4	-0.233	0.000	0.24			201.4	FLOOD RISK*	
S1.007	S2	-0.234	0.000	0.24			200.3	FLOOD RISK*	
S1.008	S6	-0.236	0.000	0.23			196.8	FLOOD RISK*	
S1.009	S3	-0.239	0.000	0.23			193.5	FLOOD RISK*	
S1.010	S8	-0.166	0.000	0.01			15.0	FLOOD RISK*	
S3.000	S15	-0.420	0.000	0.02			20.7	OK	
S3.001	S4	-0.371	0.000	0.05			47.6	OK	
S3.002	S11	-0.334	0.000	0.08			79.6	OK	
S3.003	S6	-0.302	0.000	0.12			114.2	OK	
S3.004	S13	-0.303	0.000	0.00			6.7	OK	
S3.005	S3	0.290	0.000	0.06			8.5	SURCHARGED*	
S1.011	S2	-1.198	0.000	0.00			19.6	OK	
S1.012	S5	-0.497	0.000	0.00			18.0	OK	
S1.013	S6	-0.012	0.000	0.00			2.6	FLOOD RISK*	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 7

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	59.310	0.204	290.7	3.395	10.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S1.001	60.167	0.204	294.9	0.182	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S1.002	12.275	0.033	372.0	0.162	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S1.003	48.419	0.169	286.5	0.049	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S1.004	60.079	0.202	297.4	0.282	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S1.005	63.394	0.202	313.8	0.292	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S1.006	26.566	0.087	305.4	0.336	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S1.007	153.785	0.450	341.7	0.000	0.00	0.0		0.035	3 \=/	3900	1:3 Swale	
S2.000	74.962	0.360	208.0	0.257	10.00	0.0	0.600		o	700	Pipe/Conduit	
S2.001	72.614	0.349	208.1	0.292	0.00	0.0	0.600		o	700	Pipe/Conduit	
S2.002	63.573	0.306	207.8	0.230	0.00	0.0	0.600		o	700	Pipe/Conduit	
S2.003	26.334	0.127	207.4	0.173	0.00	0.0	0.600		o	700	Pipe/Conduit	
S2.004	22.276	0.107	208.2	0.040	0.00	0.0	0.600		o	700	Pipe/Conduit	
S2.005	58.142	0.280	207.7	0.040	0.00	0.0	0.600		o	700	Pipe/Conduit	
S2.006	42.541	0.205	207.5	0.052	0.00	0.0	0.600		o	700	Pipe/Conduit	
S2.007	12.562	0.062	202.6	0.063	0.00	0.0	0.600		o	700	Pipe/Conduit	
S2.008	11.908	0.060	198.5	0.031	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	
S2.009	126.296	0.245	515.5	0.000	0.00	0.0		0.035	3 \=/	2100	1:3 Swale	

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	50.00	12.36	3.150	3.395	0.0	0.0	0.0	0.42	153.6«	459.8
S1.001	50.00	14.78	2.946	3.577	0.0	0.0	0.0	0.42	152.5«	484.4
S1.002	50.00	15.33	2.742	3.740	0.0	0.0	0.0	0.37	135.8«	506.4
S1.003	50.00	17.25	2.709	3.789	0.0	0.0	0.0	0.42	154.8«	513.0
S1.004	50.00	19.67	2.540	4.071	0.0	0.0	0.0	0.41	151.9«	551.3
S1.005	50.00	22.30	2.338	4.363	0.0	0.0	0.0	0.40	147.9«	590.8
S1.006	50.00	23.38	2.136	4.699	0.0	0.0	0.0	0.41	149.9«	636.3
S1.007	50.00	29.70	2.049	4.699	0.0	0.0	0.0	0.41	264.8«	636.3
S2.000	50.00	10.67	3.700	0.257	0.0	0.0	0.0	1.86	713.9	34.8
S2.001	50.00	11.33	3.340	0.550	0.0	0.0	0.0	1.85	713.8	74.4
S2.002	50.00	11.90	2.991	0.780	0.0	0.0	0.0	1.86	714.4	105.6
S2.003	50.00	12.13	2.685	0.953	0.0	0.0	0.0	1.86	715.1	129.0
S2.004	50.00	12.33	2.558	0.993	0.0	0.0	0.0	1.85	713.6	134.4
S2.005	50.00	12.86	2.451	1.032	0.0	0.0	0.0	1.86	714.5	139.8
S2.006	50.00	13.24	2.171	1.084	0.0	0.0	0.0	1.86	714.8	146.8
S2.007	50.00	13.35	1.966	1.147	0.0	0.0	0.0	1.88	723.4	155.4
S2.008	50.00	13.74	1.904	1.179	0.0	0.0	0.0	0.51	186.0	159.6
S2.009	50.00	20.41	1.844	1.179	0.0	0.0	0.0	0.32	120.6«	159.6

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 7

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.008	26.413	0.132	200.0	1.681	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	🔒
S1.009	48.972	0.757	64.7	0.000	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	🔒
S3.000	76.350	0.382	199.9	0.363	10.00	0.0		0.035	3 \=/	600	1:3 Swale	🔒
S3.001	76.350	0.382	199.9	0.955	0.00	0.0		0.035	3 \=/	600	1:3 Swale	🔒
S3.002	36.179	0.181	199.9	0.353	0.00	0.0		0.035	3 \=/	600	1:3 Swale	🔒
S3.003	51.340	0.257	199.8	0.407	0.00	0.0	0.600		o	600	Pipe/Conduit	🔒
S3.004	59.200	0.296	200.0	0.540	0.00	0.0	0.600		o	600	Pipe/Conduit	🔒
S3.005	11.855	0.059	200.9	0.158	0.00	0.0	0.600		o	600	Pipe/Conduit	🔒
S3.006	45.685	0.228	200.4	0.112	0.00	0.0		0.035	3 \=/	1000	1:3 Swale	🔒
S3.007	72.239	0.361	200.0	0.228	0.00	0.0		0.035	3 \=/	2000	1:3 Swale	🔒
S3.008	61.021	0.644	94.8	0.000	0.00	0.0		0.035	3 \=/	3000	1:3 Swale	🔒
S1.010	25.293	0.126	200.0	0.466	0.00	0.0		0.035	3 \=/	500	1:3 Swale	🔒

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)
S1.008	50.00	30.00	1.599	7.559	0.0	0.0	0.0	0.50	185.2«	1023.6
S1.009	50.00	30.00	1.467	7.559	0.0	0.0	0.0	0.89	325.7«	1023.6
S3.000	50.00	12.89	4.200	0.363	0.0	0.0	0.0	0.44	69.4	49.2
S3.001	50.00	15.78	3.818	1.318	0.0	0.0	0.0	0.44	69.4«	178.4
S3.002	50.00	17.15	3.436	1.671	0.0	0.0	0.0	0.44	69.3«	226.3
S3.003	50.00	17.65	3.255	2.077	0.0	0.0	0.0	1.72	486.1	281.3
S3.004	50.00	18.22	2.998	2.618	0.0	0.0	0.0	1.72	485.8	354.5
S3.005	50.00	18.34	2.702	2.776	0.0	0.0	0.0	1.71	484.7	375.9
S3.006	50.00	19.96	1.943	2.887	0.0	0.0	0.0	0.47	101.8«	391.0
S3.007	50.00	22.35	1.715	3.115	0.0	0.0	0.0	0.50	185.2«	421.8
S3.008	50.00	23.70	1.354	3.115	0.0	0.0	0.0	0.76	391.9«	421.8
S1.010	50.00	30.00	0.710	11.140	0.0	0.0	0.0	0.43	61.3«	1508.5

Area Summary for Catchment 7

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Roof	90	0.300	0.270	0.270
	Classification	Roof	90	0.050	0.045	0.315
	Classification	Roof	90	2.007	1.806	2.121
	Classification	Roof	90	0.012	0.011	2.132
	Classification	Grass	30	0.107	0.032	2.164
	Classification	Road	75	0.293	0.220	2.384
	Classification	Road	75	0.548	0.411	2.795
	Classification	Road	75	0.247	0.185	2.980
	Classification	Roof	90	0.012	0.011	2.991
	Classification	Road	75	0.032	0.024	3.015
	Classification	Roof	90	0.012	0.011	3.026
	Classification	Roof	90	0.200	0.180	3.206
	Classification	Roof	90	0.020	0.018	3.224
	Classification	Roof	90	0.004	0.003	3.227
	Classification	Roof	90	0.011	0.010	3.237
	Classification	Road	75	0.150	0.112	3.350
	Classification	Roof	90	0.046	0.041	3.391
	Classification	Road	75	0.006	0.005	3.395
1.001	Classification	Grass	30	0.304	0.091	0.091
	Classification	Road	75	0.062	0.046	0.138
	Classification	Road	75	0.059	0.044	0.182
1.002	Classification	Grass	30	0.210	0.063	0.063
	Classification	Road	75	0.132	0.099	0.162
1.003	Classification	Road	75	0.065	0.049	0.049
1.004	Classification	Grass	30	0.141	0.042	0.042
	Classification	Road	75	0.063	0.047	0.089
	Classification	Road	75	0.257	0.193	0.282
1.005	Classification	Road	75	0.056	0.042	0.042
	Classification	Grass	30	0.192	0.057	0.099
	Classification	Road	75	0.257	0.193	0.292
1.006	Classification	Grass	30	0.146	0.044	0.044
	Classification	Road	75	0.148	0.111	0.154
	Classification	Road	75	0.242	0.182	0.336
1.007	-	-	100	0.000	0.000	0.000
2.000	Classification	Roof	90	0.229	0.206	0.206
	Classification	Grass	30	0.169	0.051	0.257
2.001	Classification	Roof	90	0.203	0.183	0.183
	Classification	Grass	30	0.366	0.110	0.292
2.002	Classification	Roof	90	0.197	0.178	0.178
	Classification	Grass	30	0.141	0.042	0.220
	Classification	Road	75	0.014	0.010	0.230
2.003	Classification	Roof	90	0.141	0.126	0.126
	Classification	Grass	30	0.127	0.038	0.164
	Classification	Road	75	0.011	0.009	0.173
2.004	Classification	Grass	30	0.107	0.032	0.032
	Classification	Road	75	0.010	0.007	0.040
2.005	Classification	Road	75	0.053	0.040	0.040
2.006	Classification	Grass	30	0.173	0.052	0.052
2.007	Classification	Grass	30	0.210	0.063	0.063
2.008	Classification	Road	75	0.042	0.031	0.031
2.009	-	-	100	0.000	0.000	0.000

Area Summary for Catchment 7

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.008	Classification	Grass	30	0.100	0.030	0.030
	Classification	Detention Basin	100	0.745	0.745	0.775
	Classification	Grass	30	0.111	0.033	0.808
	Classification	Roof	90	0.090	0.081	0.889
	Classification	Road	75	0.036	0.027	0.917
	Classification	Grass	30	0.147	0.044	0.961
	Classification	Grass	30	0.287	0.086	1.047
	Classification	Road	75	0.846	0.634	1.681
1.009	-	-	100	0.000	0.000	0.000
3.000	Classification	Grass	30	0.551	0.165	0.165
	Classification	Roof	90	0.220	0.198	0.363
3.001	Classification	Grass	30	0.216	0.065	0.065
	Classification	Roof	90	0.485	0.437	0.501
	Classification	Roof	90	0.504	0.453	0.955
3.002	Classification	Grass	30	0.322	0.096	0.096
	Classification	Roof	90	0.285	0.257	0.353
3.003	Classification	Roof	90	0.452	0.407	0.407
3.004	Classification	Grass	30	0.204	0.061	0.061
	Classification	Roof	90	0.532	0.479	0.540
3.005	Classification	Grass	30	0.052	0.016	0.016
	Classification	Road	75	0.149	0.112	0.127
	Classification	Grass	30	0.102	0.031	0.158
3.006	Classification	Road	75	0.126	0.095	0.095
	Classification	Road	75	0.013	0.009	0.104
	Classification	Grass	30	0.025	0.007	0.112
3.007	Classification	Grass	30	0.157	0.047	0.047
	Classification	Grass	30	0.186	0.056	0.103
	Classification	Road	75	0.166	0.124	0.228
3.008	-	-	100	0.000	0.000	0.000
1.010	Classification	Grass	30	0.435	0.131	0.131
	Classification	Detention Basin	100	0.222	0.222	0.352
	Classification	Grass	30	0.353	0.106	0.458
	Classification	Grass	30	0.012	0.004	0.462
	Classification	Grass	30	0.015	0.004	0.466
				Total	Total	Total
				16.731	11.140	11.140

Simulation Criteria for Catchment 7

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Simulation Criteria for Catchment 7

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 7

Orifice Manhole: S5, DS/PN: S1.008, Volume (m^3): 1101.4

Diameter (m) 0.091 Discharge Coefficient 0.600 Invert Level (m) 1.599

Orifice Manhole: S6, DS/PN: S1.010, Volume (m^3): 579.5

Diameter (m) 0.099 Discharge Coefficient 0.600 Invert Level (m) 0.710

Storage Structures for Catchment 7

Infiltration Basin Manhole: S5, DS/PN: S1.008

Invert Level (m) 1.599 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	6397.7	0.700	7007.0	0.950	7459.1

Infiltration Basin Manhole: S6, DS/PN: S1.010

Invert Level (m) 0.710 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1486.6	0.600	1742.8	1.500	2215.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

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	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					3.369
S1.001	S2	15 Winter	1	+0%					3.170
S1.002	S2	15 Winter	1	+0%					2.979
S1.003	S4	15 Winter	1	+0%					2.929
S1.004	S4	15 Winter	1	+0%					2.762
S1.005	S4	15 Winter	1	+0%					2.562
S1.006	S6	30 Winter	1	+0%					2.356
S1.007	S3	30 Winter	1	+0%					2.210

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.631	0.000	0.07			303.5	OK	
S1.001	S2	-0.820	0.000	0.05			307.2	OK	
S1.002	S2	-0.521	0.000	0.12			309.2	OK	
S1.003	S4	-0.571	0.000	0.08			307.9	OK	
S1.004	S4	-0.738	0.000	0.06			307.2	OK	
S1.005	S4	-0.438	0.000	0.12			300.4	OK	
S1.006	S6	-0.728	0.000	0.06			300.0	OK	
S1.007	S3	-0.539	0.000	0.07			299.7	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S4	15 Winter	1	+0%					3.786
S2.001	S5	15 Winter	1	+0%					3.475
S2.002	S10	15 Winter	1	+0%					3.152
S2.003	S6	15 Winter	1	+0%	100/15 Summer				2.883
S2.004	S13	15 Winter	1	+0%	100/15 Summer				2.760
S2.005	S12	15 Winter	1	+0%	100/15 Winter				2.635
S2.006	S15	15 Winter	1	+0%	100/15 Summer				2.362
S2.007	S7	15 Winter	1	+0%	100/15 Summer				2.191
S2.008	S17	15 Winter	1	+0%					2.017
S2.009	S8	15 Winter	1	+0%					1.982
S1.008	S5	1440 Winter	1	+0%					1.848
S1.009	S20	1440 Winter	1	+0%					1.480
S3.000	S11	15 Winter	1	+0%					4.300
S3.001	S18	15 Winter	1	+0%					4.014
S3.002	S12	15 Winter	1	+0%					3.650
S3.003	S23	15 Winter	1	+0%	30/15 Summer				3.515
S3.004	S13	15 Winter	1	+0%	30/15 Summer				3.317
S3.005	S14	15 Winter	1	+0%	30/15 Summer				3.100
S3.006	S25	15 Winter	1	+0%					2.179
S3.007	S22	15 Winter	1	+0%					1.899
S3.008	S15	15 Winter	1	+0%					1.471
S1.010	S6	1440 Winter	1	+0%					1.149

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.000	S4	-0.614	0.000	0.04			23.2	OK	
S2.001	S5	-0.565	0.000	0.08			52.1	OK	
S2.002	S10	-0.539	0.000	0.12			74.0	OK	
S2.003	S6	-0.502	0.000	0.18			90.4	OK	
S2.004	S13	-0.498	0.000	0.18			93.8	OK	
S2.005	S12	-0.516	0.000	0.15			96.5	OK	
S2.006	S15	-0.509	0.000	0.17			99.4	OK	
S2.007	S7	-0.475	0.000	0.23			104.1	OK	
S2.008	S17	-0.883	0.000	0.02			105.9	OK	
S2.009	S8	-0.663	0.000	0.04			105.7	OK	
S1.008	S5	-0.701	0.000	0.00			7.8	OK	
S1.009	S20	-0.904	0.000	0.00			7.8	OK	
S3.000	S11	-0.800	0.000	0.01			32.5	OK	
S3.001	S18	-1.086	0.000	0.01			126.8	OK	
S3.002	S12	-1.450	0.000	0.01			156.1	OK	
S3.003	S23	-0.340	0.000	0.39			188.9	OK*	
S3.004	S13	-0.281	0.000	0.55			237.2	OK	
S3.005	S14	-0.202	0.000	0.77			247.5	OK	
S3.006	S25	-1.721	0.000	0.01			254.2	OK	
S3.007	S22	-0.402	0.000	0.11			260.7	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.008	S15	-0.883	0.000	0.02			260.7	OK	
S1.010	S6	-1.061	0.000	0.00			12.4	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

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	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+40%					3.632
S1.001	S2	15 Winter	30	+40%					3.440
S1.002	S2	15 Winter	30	+40%					3.258
S1.003	S4	15 Winter	30	+40%					3.192
S1.004	S4	15 Winter	30	+40%					3.028
S1.005	S4	15 Winter	30	+40%					2.830
S1.006	S6	15 Winter	30	+40%					2.617
S1.007	S3	15 Winter	30	+40%					2.420

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.368	0.000	0.31			1325.8	OK	
S1.001	S2	-0.550	0.000	0.20			1331.3	OK	
S1.002	S2	-0.242	0.000	0.51			1342.0	FLOOD RISK*	
S1.003	S4	-0.308	0.000	0.37			1336.9	OK	
S1.004	S4	-0.472	0.000	0.25			1334.9	OK	
S1.005	S4	-0.170	0.000	0.54			1302.3	FLOOD RISK*	
S1.006	S6	-0.467	0.000	0.25			1289.2	OK	
S1.007	S3	-0.329	0.000	0.29			1199.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S4	15 Winter	30	+40%					3.885
S2.001	S5	15 Winter	30	+40%					3.653
S2.002	S10	15 Winter	30	+40%					3.382
S2.003	S6	15 Winter	30	+40%	100/15 Summer				3.196
S2.004	S13	15 Winter	30	+40%	100/15 Summer				3.074
S2.005	S12	15 Winter	30	+40%	100/15 Winter				2.910
S2.006	S15	15 Winter	30	+40%	100/15 Summer				2.677
S2.007	S7	15 Winter	30	+40%	100/15 Summer				2.567
S2.008	S17	1440 Winter	30	+40%					2.303
S2.009	S8	1440 Winter	30	+40%					2.303
S1.008	S5	1440 Winter	30	+40%					2.303
S1.009	S20	1440 Winter	30	+40%					1.828
S3.000	S11	15 Winter	30	+40%					4.430
S3.001	S18	15 Winter	30	+40%					4.294
S3.002	S12	15 Winter	30	+40%					4.253
S3.003	S23	15 Winter	30	+40%	30/15 Summer				4.232
S3.004	S13	15 Winter	30	+40%	30/15 Summer				4.066
S3.005	S14	15 Winter	30	+40%	30/15 Summer				3.572
S3.006	S25	15 Winter	30	+40%					2.333
S3.007	S22	15 Winter	30	+40%					2.038
S3.008	S15	1440 Winter	30	+40%					1.827
S1.010	S6	1440 Winter	30	+40%					1.825

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.000	S4	-0.515	0.000	0.16			100.6	OK	
S2.001	S5	-0.387	0.000	0.40			252.4	OK	
S2.002	S10	-0.309	0.000	0.58			364.0	OK	
S2.003	S6	-0.189	0.000	0.87			443.9	OK	
S2.004	S13	-0.184	0.000	0.89			455.9	OK	
S2.005	S12	-0.241	0.000	0.75			465.5	OK	
S2.006	S15	-0.194	0.000	0.77			457.6	OK	
S2.007	S7	-0.099	0.000	1.00			460.2	OK	
S2.008	S17	-0.597	0.000	0.01			27.9	OK	
S2.009	S8	-0.342	0.000	0.01			27.5	OK	
S1.008	S5	-0.246	0.000	0.00			12.7	FLOOD RISK*	
S1.009	S20	-0.556	0.000	0.00			12.8	OK	
S3.000	S11	-0.670	0.000	0.04			140.7	OK	
S3.001	S18	-0.806	0.000	0.06			506.1	OK	
S3.002	S12	-0.847	0.000	0.02			400.7	OK	
S3.003	S23	0.377	0.000	0.97			472.8	SURCHARGED*	
S3.004	S13	0.468	0.000	1.28			556.4	SURCHARGED	
S3.005	S14	0.270	0.000	1.84			588.4	SURCHARGED	
S3.006	S25	-1.567	0.000	0.03			633.3	OK	
S3.007	S22	-0.263	0.000	0.30			709.9	FLOOD RISK*	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.008	S15	-0.527	0.000	0.01			73.6	OK	
S1.010	S6	-0.385	0.000	0.00			20.9	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

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	2
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					3.743
S1.001	S2	15 Winter	100	+40%					3.556
S1.002	S2	15 Winter	100	+40%					3.375
S1.003	S4	15 Winter	100	+40%					3.303
S1.004	S4	15 Winter	100	+40%					3.142
S1.005	S4	15 Winter	100	+40%					2.944
S1.006	S6	15 Winter	100	+40%					2.730
S1.007	S3	1440 Winter	100	+40%					2.551

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.257	0.000	0.47			1991.5	FLOOD RISK*	
S1.001	S2	-0.434	0.000	0.31			2004.2	OK	
S1.002	S2	-0.125	0.000	0.77			2023.5	FLOOD RISK*	
S1.003	S4	-0.197	0.000	0.55			2016.0	FLOOD RISK*	
S1.004	S4	-0.358	0.000	0.37			2014.4	OK	
S1.005	S4	-0.056	0.000	0.82			1980.1	FLOOD RISK*	
S1.006	S6	-0.354	0.000	0.38			1963.1	OK	
S1.007	S3	-0.198	0.000	0.04			145.3	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.000	S4	15 Winter	100	+40%					3.930
S2.001	S5	15 Winter	100	+40%					3.768
S2.002	S10	15 Winter	100	+40%					3.674
S2.003	S6	15 Winter	100	+40%	100/15 Summer				3.537
S2.004	S13	15 Winter	100	+40%	100/15 Summer				3.374
S2.005	S12	15 Winter	100	+40%	100/15 Winter				3.199
S2.006	S15	15 Winter	100	+40%	100/15 Summer				2.976
S2.007	S7	15 Winter	100	+40%	100/15 Summer				2.775
S2.008	S17	1440 Winter	100	+40%					2.504
S2.009	S8	1440 Winter	100	+40%					2.504
S1.008	S5	1440 Winter	100	+40%					2.504
S1.009	S20	1440 Winter	100	+40%					2.078
S3.000	S11	15 Winter	100	+40%					4.633
S3.001	S18	15 Winter	100	+40%					4.587
S3.002	S12	15 Winter	100	+40%					4.539
S3.003	S23	15 Winter	100	+40%	30/15 Summer				4.506
S3.004	S13	15 Winter	100	+40%	30/15 Summer				4.354
S3.005	S14	15 Winter	100	+40%	30/15 Summer				3.724
S3.006	S25	15 Winter	100	+40%					2.368
S3.007	S22	1440 Winter	100	+40%					2.101
S3.008	S15	1440 Winter	100	+40%					2.082
S1.010	S6	1440 Winter	100	+40%					2.074

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.000	S4	-0.470	0.000	0.24			151.2	OK	
S2.001	S5	-0.272	0.000	0.57			364.6	OK	
S2.002	S10	-0.017	0.000	0.75			472.1	OK	
S2.003	S6	0.152	0.000	1.11			563.9	SURCHARGED	
S2.004	S13	0.116	0.000	1.14			581.7	SURCHARGED	
S2.005	S12	0.048	0.000	0.93			578.6	SURCHARGED	
S2.006	S15	0.105	0.000	0.98			587.7	SURCHARGED	
S2.007	S7	0.109	0.000	1.32			608.3	SURCHARGED	
S2.008	S17	-0.396	0.000	0.01			35.9	OK	
S2.009	S8	-0.141	0.000	0.01			34.8	FLOOD RISK*	
S1.008	S5	-0.045	0.000	0.00			12.9	FLOOD RISK*	
S1.009	S20	-0.306	0.000	0.00			13.2	OK	
S3.000	S11	-0.467	0.000	0.06			207.3	OK	
S3.001	S18	-0.513	0.000	0.07			631.2	OK	
S3.002	S12	-0.561	0.000	0.03			519.0	OK	
S3.003	S23	0.651	0.000	1.12			546.1	SURCHARGED*	
S3.004	S13	0.756	0.000	1.47			635.5	SURCHARGED	
S3.005	S14	0.422	0.000	2.16			693.9	SURCHARGED	
S3.006	S25	-1.532	0.000	0.03			770.9	OK	
S3.007	S22	-0.200	0.000	0.04			96.7	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 7

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S3.008	S15	-0.272	0.000	0.01			91.1	FLOOD RISK*	
S1.010	S6	-0.136	0.000	0.00			23.3	FLOOD RISK*	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 8

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	62.656	0.313	200.0	0.519	5.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.001	58.320	0.292	199.7	0.452	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.002	74.232	0.371	200.1	0.200	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.003	50.857	0.254	200.2	0.244	0.00	0.0		0.035	3 \=/	500	1:3 Swale	
S1.004	50.857	0.203	250.0	0.000	0.00	0.0	0.600		o	750	Pipe/Conduit	
S1.005	19.021	0.076	250.0	0.079	0.00	0.0	0.600		o	750	Pipe/Conduit	
S1.006	18.844	0.941	20.0	0.000	0.00	0.0	0.600		o	750	Pipe/Conduit	
S1.007	19.847	0.136	145.9	0.570	0.00	0.0		0.035	3 \=/	500	1:3 Swale	

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	50.00	7.43	3.400	0.519	0.0	0.0	0.0	0.43	61.3«	70.3
S1.001	50.00	9.68	3.087	0.971	0.0	0.0	0.0	0.43	61.4«	131.4
S1.002	50.00	12.56	2.795	1.171	0.0	0.0	0.0	0.43	61.3«	158.5
S1.003	50.00	14.53	2.424	1.414	0.0	0.0	0.0	0.43	61.3«	191.5
S1.004	50.00	15.01	2.170	1.414	0.0	0.0	0.0	1.77	779.9	191.5
S1.005	50.00	15.19	1.967	1.494	0.0	0.0	0.0	1.77	779.9	202.3
S1.006	50.00	15.24	1.891	1.494	0.0	0.0	0.0	6.27	2770.1	202.3
S1.007	50.00	15.89	0.950	2.063	0.0	0.0	0.0	0.50	71.8«	279.4

Area Summary for Catchment 8

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Grass	30	0.037	0.011	0.011
	Classification	Roof	90	0.534	0.480	0.491
	Classification	Grass	30	0.092	0.028	0.519
1.001	Classification	Grass	30	0.041	0.012	0.012
	Classification	Roof	90	0.488	0.439	0.452
1.002	Classification	Roof	90	0.053	0.047	0.047
	Classification	Roof	90	0.008	0.007	0.054
	Classification	Road	75	0.066	0.050	0.104
	Classification	Grass	30	0.037	0.011	0.115
	Classification	Grass	30	0.180	0.054	0.169
	Classification	Roof	90	0.011	0.010	0.179
	Classification	Grass	30	0.071	0.021	0.200
1.003	Classification	Roof	90	0.179	0.161	0.161
	Classification	Road	75	0.036	0.027	0.188
	Classification	Grass	30	0.035	0.011	0.199
	Classification	Grass	30	0.060	0.018	0.217
	Classification	Grass	30	0.089	0.027	0.244
1.004	-	-	100	0.000	0.000	0.000
1.005	Classification	Road	75	0.066	0.050	0.050
	Classification	Grass	30	0.023	0.007	0.057
	Classification	Grass	30	0.032	0.010	0.066
	Classification	Grass	30	0.042	0.013	0.079
1.006	-	-	100	0.000	0.000	0.000
1.007	Classification	Detention Basin	100	0.161	0.161	0.161
	Classification	Road	75	0.291	0.219	0.380
	Classification	Grass	30	0.146	0.044	0.423
	Classification	Grass	30	0.041	0.012	0.436
	Classification	Grass	30	0.446	0.134	0.570
				Total	Total	Total
				3.267	2.063	2.063

Simulation Criteria for Catchment 8

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999

Synthetic Rainfall Details

Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 8

Orifice Manhole: S5, DS/PN: S1.007, Volume (m³): 7.9

Diameter (m) 0.042 Discharge Coefficient 0.600 Invert Level (m) 0.950

Storage Structures for Catchment 8

Infiltration Basin Manhole: S5, DS/PN: S1.007

Invert Level (m) 0.950 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1043.8	1.500	1622.8

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 8

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S2	15 Winter	1	+0%					3.558
S1.001	S4	15 Winter	1	+0%					3.283
S1.002	S3	15 Winter	1	+0%					3.001
S1.003	S4	15 Winter	1	+0%					2.636
S1.004	S5	15 Winter	1	+0%					2.379
S1.005	S2	15 Winter	1	+0%	100/15 Winter				2.200
S1.006	S3	15 Winter	1	+0%					2.027
S1.007	S5	1440 Winter	1	+0%					1.360

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 8

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2	-0.342	0.000	0.07			62.7	OK	
S1.001	S4	-0.304	0.000	0.12			102.5	OK	
S1.002	S3	-0.294	0.000	0.13			111.7	FLOOD RISK*	
S1.003	S4	-0.488	0.000	0.07			123.8	OK	
S1.004	S5	-0.541	0.000	0.17			114.2	OK	
S1.005	S2	-0.517	0.000	0.21			114.9	OK	
S1.006	S3	-0.614	0.000	0.08			115.1	OK	
S1.007	S5	-1.090	0.000	0.00			2.3	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 8

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S2	15 Winter	30	+40%					3.717
S1.001	S4	15 Winter	30	+40%					3.489
S1.002	S3	15 Winter	30	+40%					3.211
S1.003	S4	15 Winter	30	+40%					2.843
S1.004	S5	15 Winter	30	+40%					2.678
S1.005	S2	15 Winter	30	+40%	100/15 Winter				2.532
S1.006	S3	15 Winter	30	+40%					2.187
S1.007	S5	1440 Winter	30	+40%					2.105

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 8

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2	-0.183	0.000	0.33			277.7	FLOOD RISK*	
S1.001	S4	-0.098	0.000	0.57			482.9	FLOOD RISK*	
S1.002	S3	-0.084	0.000	0.60			513.8	FLOOD RISK*	
S1.003	S4	-0.281	0.000	0.29			553.9	FLOOD RISK*	
S1.004	S5	-0.242	0.000	0.75			497.0	OK	
S1.005	S2	-0.185	0.000	0.92			501.7	OK	
S1.006	S3	-0.454	0.000	0.33			500.6	OK	
S1.007	S5	-0.345	0.000	0.00			3.9	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 8

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S2	15 Winter	100	+40%					3.780
S1.001	S4	15 Winter	100	+40%					3.567
S1.002	S3	15 Winter	100	+40%					3.293
S1.003	S4	15 Winter	100	+40%					2.986
S1.004	S5	15 Winter	100	+40%					2.916
S1.005	S2	15 Winter	100	+40%	100/15 Winter				2.753
S1.006	S3	1440 Winter	100	+40%					2.396
S1.007	S5	1440 Winter	100	+40%					2.395

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 8

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2	-0.120	0.000	0.49			418.4	FLOOD RISK*	
S1.001	S4	-0.020	0.000	0.86			730.0	FLOOD RISK*	
S1.002	S3	-0.002	0.000	0.91			776.1	FLOOD RISK*	
S1.003	S4	-0.138	0.000	0.44			829.6	FLOOD RISK*	
S1.004	S5	-0.004	0.000	0.91			604.1	OK	
S1.005	S2	0.036	0.000	1.12			606.4	SURCHARGED	
S1.006	S3	-0.245	0.000	0.03			46.4	OK	
S1.007	S5	-0.055	0.000	0.00			4.4	FLOOD RISK*	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 9

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	44.474	0.148	300.5	0.034	5.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.001	44.474	0.148	300.5	0.019	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.002	44.474	0.148	300.5	0.018	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.003	44.474	0.148	300.5	0.018	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.004	51.377	0.171	300.5	0.020	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.005	51.377	0.171	300.5	0.023	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.006	15.196	0.051	298.0	0.022	0.00	0.0	0.035	o	300	Pipe/Conduit	
S2.000	44.886	0.156	287.7	0.044	5.00	0.0	0.035	3 \=/	500	1:3 Swale	
S2.001	44.886	0.156	287.7	0.037	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S2.002	44.886	0.156	287.7	0.035	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S2.003	44.886	0.156	287.7	0.036	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S2.004	51.511	0.179	287.8	0.039	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S2.005	51.511	0.181	284.6	0.045	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.007	8.597	0.043	200.0	0.037	0.00	0.0	0.035	3 \=/	500	1:3 Swale	
S1.008	6.842	0.034	201.2	0.085	0.00	0.0	0.035	3 \=/	500	1:3 Swale	

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	50.00	7.11	2.886	0.034	0.0	0.0	0.0	0.35	50.0	4.6
S1.001	50.00	9.22	2.738	0.054	0.0	0.0	0.0	0.35	50.0	7.3
S1.002	50.00	11.33	2.590	0.072	0.0	0.0	0.0	0.35	50.0	9.7
S1.003	50.00	13.44	2.441	0.090	0.0	0.0	0.0	0.35	50.0	12.2
S1.004	50.00	15.88	2.293	0.110	0.0	0.0	0.0	0.35	50.1	14.9
S1.005	50.00	18.32	2.122	0.134	0.0	0.0	0.0	0.35	50.1	18.1
S1.006	50.00	19.18	1.951	0.156	0.0	0.0	0.0	0.29	20.8«	21.1
S2.000	50.00	7.08	2.886	0.044	0.0	0.0	0.0	0.36	51.1	5.9
S2.001	50.00	9.17	2.730	0.080	0.0	0.0	0.0	0.36	51.1	10.9
S2.002	50.00	11.25	2.573	0.116	0.0	0.0	0.0	0.36	51.1	15.7
S2.003	50.00	13.34	2.417	0.152	0.0	0.0	0.0	0.36	51.1	20.6
S2.004	50.00	15.73	2.260	0.191	0.0	0.0	0.0	0.36	51.1	25.8
S2.005	50.00	18.11	2.081	0.236	0.0	0.0	0.0	0.36	51.4	32.0
S1.007	50.00	19.51	1.900	0.429	0.0	0.0	0.0	0.43	61.3	58.1
S1.008	50.00	19.78	1.057	0.513	0.0	0.0	0.0	0.43	61.2«	69.5

Area Summary for Catchment 9

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Road	75	0.034	0.025	0.025
	Classification	Grass	30	0.029	0.009	0.034
1.001	Classification	Road	75	0.015	0.012	0.012
	Classification	Grass	30	0.027	0.008	0.019
1.002	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.026	0.008	0.018
1.003	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.025	0.008	0.018
1.004	Classification	Road	75	0.014	0.010	0.010
	Classification	Grass	30	0.033	0.010	0.020
1.005	Classification	Road	75	0.017	0.013	0.013
	Classification	Grass	30	0.035	0.011	0.023
1.006	Classification	Road	75	0.029	0.022	0.022
2.000	Classification	Road	75	0.032	0.024	0.024
	Classification	Grass	30	0.013	0.004	0.028
	Classification	Road	75	0.010	0.007	0.035
	Classification	Grass	30	0.029	0.009	0.044
2.001	Classification	Road	75	0.015	0.011	0.011
	Classification	Grass	30	0.022	0.007	0.017
	Classification	Road	75	0.013	0.010	0.027
	Classification	Grass	30	0.031	0.009	0.037
2.002	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.021	0.006	0.017
	Classification	Road	75	0.013	0.010	0.027
	Classification	Grass	30	0.029	0.009	0.035
2.003	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.021	0.006	0.017
	Classification	Road	75	0.013	0.010	0.027
	Classification	Grass	30	0.031	0.009	0.036
2.004	Classification	Road	75	0.014	0.011	0.011
	Classification	Grass	30	0.022	0.006	0.017
	Classification	Road	75	0.013	0.010	0.027
	Classification	Grass	30	0.039	0.012	0.039
2.005	Classification	Road	75	0.017	0.013	0.013
	Classification	Grass	30	0.026	0.008	0.021
	Classification	Road	75	0.016	0.012	0.032
	Classification	Grass	30	0.044	0.013	0.045
1.007	Classification	Road	75	0.019	0.015	0.015
	Classification	Grass	30	0.030	0.009	0.023
	Classification	Road	75	0.018	0.013	0.037
1.008	Classification	Detention Basin	100	0.073	0.073	0.073
	Classification	Grass	30	0.039	0.012	0.085
				Total	Total	Total
				1.003	0.513	0.513

Simulation Criteria for Catchment 9

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 9

Orifice Manhole: S15, DS/PN: S1.008, Volume (m^3): 55.6

Diameter (m) 0.029 Discharge Coefficient 0.600 Invert Level (m) 1.057

Storage Structures for Catchment 9

Tank or Pond Manhole: S15, DS/PN: S1.008

Invert Level (m) 1.057

Depth (m)	**Area (m²)**	**Depth (m)**	**Area (m²)**
0.000	519.0	0.800	730.9

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					2.927
S1.001	S2	15 Winter	1	+0%					2.788
S1.002	S2	15 Winter	1	+0%					2.646
S1.003	S4	15 Winter	1	+0%					2.502
S1.004	S2	15 Winter	1	+0%					2.358
S1.005	S4	15 Winter	1	+0%					2.197
S1.006	S3	30 Winter	1	+0%	30/15 Summer				2.095
S2.000	S4	15 Winter	1	+0%					2.932
S2.001	S8	15 Winter	1	+0%					2.790
S2.002	S6	15 Winter	1	+0%					2.642
S2.003	S11	15 Winter	1	+0%					2.494

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.309	0.000	0.01			4.3	OK	
S1.001	S2	-0.514	0.000	0.01			6.2	OK	
S1.002	S2	-0.698	0.000	0.00			7.6	OK	
S1.003	S4	-0.837	0.000	0.00			8.8	OK	
S1.004	S2	-0.856	0.000	0.00			9.8	OK	
S1.005	S4	-1.063	0.000	0.00			10.5	OK	
S1.006	S3	-0.156	0.000	0.47			9.7	OK*	
S2.000	S4	-0.304	0.000	0.02			5.5	OK	
S2.001	S8	-0.435	0.000	0.01			8.9	OK	
S2.002	S6	-0.491	0.000	0.01			11.8	OK	
S2.003	S11	-0.541	0.000	0.01			14.3	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.004	S5	15 Winter	1	+0%					2.343
S2.005	S9	15 Winter	1	+0%					2.171
S1.007	S4	15 Winter	1	+0%					2.002
S1.008	S15	1440 Winter	1	+0%					1.276

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.004	S5	-0.605	0.000	0.01			16.5	OK	
S2.005	S9	-0.892	0.000	0.01			18.9	OK	
S1.007	S4	-1.285	0.000	0.00			28.5	OK	
S1.008	S15	-0.581	0.000	0.00			0.6	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	30	+40%					2.979
S1.001	S2	15 Winter	30	+40%					2.850
S1.002	S2	15 Winter	30	+40%					2.711
S1.003	S4	15 Winter	30	+40%					2.569
S1.004	S2	15 Winter	30	+40%					2.434
S1.005	S4	15 Winter	30	+40%					2.319
S1.006	S3	15 Winter	30	+40%	30/15 Summer				2.299
S2.000	S4	15 Winter	30	+40%					2.991
S2.001	S8	15 Winter	30	+40%					2.865
S2.002	S6	15 Winter	30	+40%					2.726
S2.003	S11	15 Winter	30	+40%					2.582

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.257	0.000	0.06			18.7	FLOOD RISK*	
S1.001	S2	-0.452	0.000	0.03			27.3	OK	
S1.002	S2	-0.633	0.000	0.02			33.1	OK	
S1.003	S4	-0.770	0.000	0.01			37.6	OK	
S1.004	S2	-0.780	0.000	0.01			41.2	OK	
S1.005	S4	-0.941	0.000	0.01			41.0	OK	
S1.006	S3	0.048	0.000	1.49			31.0	SURCHARGED*	
S2.000	S4	-0.245	0.000	0.08			24.1	FLOOD RISK*	
S2.001	S8	-0.360	0.000	0.06			40.4	OK	
S2.002	S6	-0.407	0.000	0.06			52.5	OK	
S2.003	S11	-0.453	0.000	0.05			61.8	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.004	S5	15 Winter	30	+40%					2.434
S2.005	S9	15 Winter	30	+40%					2.264
S1.007	S4	15 Winter	30	+40%					2.089
S1.008	S15	1440 Winter	30	+40%					1.653

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.004	S5	-0.514	0.000	0.05			69.9	OK	
S2.005	S9	-0.799	0.000	0.02			78.1	OK	
S1.007	S4	-1.198	0.000	0.01			109.6	OK	
S1.008	S15	-0.204	0.000	0.00			1.3	FLOOD RISK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
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, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	100	+40%					3.001
S1.001	S2	15 Winter	100	+40%					2.874
S1.002	S2	15 Winter	100	+40%					2.740
S1.003	S4	15 Winter	100	+40%					2.599
S1.004	S2	15 Winter	100	+40%					2.471
S1.005	S4	15 Winter	100	+40%					2.382
S1.006	S3	15 Winter	100	+40%	30/15 Summer				2.370
S2.000	S4	15 Winter	100	+40%					3.015
S2.001	S8	15 Winter	100	+40%					2.897
S2.002	S6	15 Winter	100	+40%					2.762
S2.003	S11	15 Winter	100	+40%					2.621

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.235	0.000	0.09			28.1	FLOOD RISK*	
S1.001	S2	-0.428	0.000	0.04			40.3	OK	
S1.002	S2	-0.604	0.000	0.03			48.1	OK	
S1.003	S4	-0.740	0.000	0.02			54.0	OK	
S1.004	S2	-0.743	0.000	0.02			58.6	OK	
S1.005	S4	-0.878	0.000	0.01			53.9	OK	
S1.006	S3	0.119	0.000	1.90			39.6	SURCHARGED*	
S2.000	S4	-0.221	0.000	0.12			36.2	FLOOD RISK*	
S2.001	S8	-0.328	0.000	0.09			61.5	OK	
S2.002	S6	-0.371	0.000	0.09			80.0	OK	
S2.003	S11	-0.414	0.000	0.08			94.2	OK	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 9

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S2.004	S5	15 Winter	100	+40%					2.475
S2.005	S9	15 Winter	100	+40%					2.303
S1.007	S4	15 Winter	100	+40%					2.130
S1.008	S15	1440 Winter	100	+40%					1.820

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S2.004	S5	-0.473	0.000	0.07			106.3	OK	
S2.005	S9	-0.760	0.000	0.03			118.3	OK	
S1.007	S4	-1.157	0.000	0.02			160.7	OK	
S1.008	S15	-0.037	0.000	0.00			1.5	FLOOD RISK*	

STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Catchment 10

« - 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	94.136	0.314	299.8	0.495	5.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S1.001	71.828	0.239	300.5	0.537	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S1.002	19.652	0.066	297.8	0.250	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
S1.003	11.322	0.023	492.3	0.152	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
S1.004	2.112	0.004	528.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	6.34	4.130	0.495	0.0	0.0	0.0	1.17	185.9	67.0
S1.001	50.00	7.37	3.816	1.033	0.0	0.0	0.0	1.17	185.7	139.8
S1.002	50.00	7.65	3.577	1.282	0.0	0.0	0.0	1.17	186.6	173.6
S1.003	50.00	8.07	3.290	1.434	0.0	0.0	0.0	0.45	7.9«	194.1
S1.004	50.00	8.15	3.267	1.434	0.0	0.0	0.0	0.43	7.6«	194.1

Area Summary for Catchment 10

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	Classification	Roof	90	0.426	0.384	0.384
	Classification	Grass	30	0.091	0.027	0.411
	Classification	Grass	30	0.054	0.016	0.427
	Classification	Grass	30	0.086	0.026	0.453
	Classification	Road	75	0.056	0.042	0.495
1.001	Classification	Roof	90	0.360	0.324	0.324
	Classification	Grass	30	0.080	0.024	0.348
	Classification	Grass	30	0.116	0.035	0.383
	Classification	Grass	30	0.076	0.023	0.405
	Classification	Grass	30	0.193	0.058	0.463
	Classification	Road	75	0.099	0.074	0.537
1.002	Classification	Roof	90	0.063	0.056	0.056
	Classification	Roof	90	0.000	0.000	0.057
	Classification	Roof	90	0.001	0.001	0.058
	Classification	Roof	90	0.002	0.002	0.060
	Classification	Roof	90	0.010	0.009	0.069
	Classification	Roof	90	0.010	0.009	0.078
	Classification	Road	75	0.153	0.115	0.193
	Classification	Grass	30	0.027	0.008	0.201
	Classification	Grass	30	0.161	0.048	0.250
1.003	Classification	Roof	90	0.008	0.008	0.008
	Classification	Grass	30	0.169	0.051	0.058
	Classification	Grass	30	0.231	0.069	0.127
	Classification	Grass	30	0.035	0.010	0.138
	Classification	Grass	30	0.046	0.014	0.152
1.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				2.553	1.434	1.434

Simulation Criteria for Catchment 10

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of 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	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025

Synthetic Rainfall Details

D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Catchment 10

Orifice Manhole: S2, DS/PN: S1.003, Volume (m^3): 3.1

Diameter (m) 0.047 Discharge Coefficient 0.600 Invert Level (m) 3.290

Storage Structures for Catchment 10

Cellular Storage Manhole: S2, DS/PN: S1.003

Invert Level (m) 3.290 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	2334.0	0.0	0.611	0.0	0.0
0.610	2334.0	0.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 10

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Winter	1	+0%					4.311
S1.001	S2	15 Winter	1	+0%					4.066
S1.002	S3	15 Winter	1	+0%					3.866
S1.003	S2	1440 Winter	1	+0%	1/1440 Winter				3.449
S1.004	S5	1440 Winter	1	+0%					3.299

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 10

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.269	0.000	0.32			58.7	FLOOD RISK*	
S1.001	S2	-0.200	0.000	0.58			107.3	OK*	
S1.002	S3	-0.161	0.000	0.73			124.1	OK*	
S1.003	S2	0.009	0.000	0.14			1.0	SURCHARGED*	
S1.004	S5	-0.118	0.000	0.09			1.0	OK*	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 10

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	30	+40%					4.580
S1.001	S2	15 Summer	30	+40%					4.266
S1.002	S3	15 Summer	30	+40%					4.027
S1.003	S2	1440 Winter	30	+40%	1/1440 Winter				3.755
S1.004	S5	1440 Winter	30	+40%					3.318

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 10

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.000	0.84			156.5	FLOOD RISK*	
S1.001	S2	0.000	0.000	1.78			331.2	SURCHARGED*	
S1.002	S3	0.000	0.000	2.27			383.2	SURCHARGED*	
S1.003	S2	0.315	0.000	0.40			2.7	SURCHARGED*	
S1.004	S5	-0.099	0.000	0.25			2.7	OK*	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 10

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	FEH
FEH Rainfall Version	1999
Site Location	GB 486200 413400 SE 86200 13400
C (1km)	-0.025
D1 (1km)	0.330
D2 (1km)	0.312
D3 (1km)	0.298
E (1km)	0.300
F (1km)	2.451
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	15 Summer	100	+40%					4.580
S1.001	S2	15 Summer	100	+40%					4.266
S1.002	S3	15 Summer	100	+40%					4.027
S1.003	S2	1440 Winter	100	+40%	1/1440 Winter				3.900
S1.004	S5	1440 Winter	100	+40%					3.323

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Catchment 10

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.000	0.000	1.11			206.9	FLOOD RISK*	
S1.001	S2	0.000	0.000	2.45			454.2	SURCHARGED*	
S1.002	S3	0.000	0.000	3.12			528.3	SURCHARGED*	
S1.003	S2	0.460	0.000	0.47			3.2	SURCHARGED*	
S1.004	S5	-0.094	0.000	0.30			3.2	OK*	

Francisco Rodriguez
Buro Happold Limited
3 Wellington Place
Leeds
LS1 4AP
UK

[redacted]