FCC ENVIRONMENT LIMITED

SPECIFICATION FOR CONSTRUCTION OF THE SURFACE WATER MANAGEMENT SCHEME AT MILTON LANDFILL SITE

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Project Quality Assurance

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Purpose

This document was prepared as a Specification for the construction of the Surface Water Management Scheme (SWMS) at Milton Landfill Site for FCC Environment (UK) Limited (FCC), to provide surface water control for the site. Sirius Environmental Limited (Sirius) accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

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1 GENERAL REQUIREMENTS

1.1 Introduction

FCC Environment (UK) Limited are seeking to construct a Surface Water Management Scheme (SWMS) at Milton Landfill Site. The site is address is:

Milton Landfill,
Butt Lane,
Milton,
Cambridgeshire
CB24 6DQ

Sirius Environmental Limited has prepared a detailed Specification for the construction of the Surface Water Management Scheme. FCC shall appoint a third party independent Construction Quality Assurance (CQA) consultant to provide supervision for the duration of the surface water management scheme on FCC's behalf. A representative of the CQA Manager, the CQA Inspector, shall supervise the construction works, and shall advise the Contractor with regard to the onsite and offsite testing requirements.

The Construction Quality Assurance (CQA) Plan and Engineering Specification for the proposed surface water management works has been prepared in accordance with the Environmental Permit.

This document, when read in conjunction with the CQA Plan **(Ref: WR7544/02)** details the requirements for the installation to be undertaken by the Contractor and the quality control procedures that shall be followed during the works by the CQA Inspector to demonstrate that the works have been undertaken in accordance with the Specification. This document also details requirements for each element of the construction which should be read in conjunction with the construction drawings.

1.2 Project Team

The project team shall comprise:

Waste Management Operator/Employer – FCC Environment (UK) Limited
Designer – Sirius Environmental Limited
Main Contractor (Contractor) – Jones Bros Civil Engineering Limited
CQA – Egniol Limited
Principal Designer – Sirius Environmental Limited

1.3 Facilities

1.3.1 Contractor's Compound

The location and layout of the Contractor's compound shall be agreed with FCC prior to commencement of any works on site. The Contractor shall submit his proposals to FCC for mess facilities, plant standing, and maintenance areas. The Contractor shall site his plant standing, maintenance and refuelling areas so that no pollution shall occur. 110% secondary containment bunding shall be used for fuel/oil storage tanks where appropriate. The Contractor shall also take into account the storage and mess requirements of his sub-contractors, if appropriate.

No lodgings or caravans shall be allowed on site.

The Contractor shall ensure that adequate provision is made within the compound area for parking of all the plant, equipment and any private vehicles owned by operatives/subcontractors and visitors. Parking shall be permitted in any other areas of the landfill site.

The Contractor shall be responsible for the security of the works, all the Contractor's offices, plant, materials, services, and machinery.

1.3.2 Contractor's Offices and Welfare Facilities

The Contractor shall be responsible for the provision and maintenance of welfare facilities for himself and any sub-contractors. These facilities shall be as prescribed in the Working Rule agreement published by the Civil Engineering Construction Conciliation Board for Great Britain. The sanitary accommodation and disposal arrangements shall comply with the requirements of the local Environmental Health Authority. The Contractor's personnel shall not be permitted access to FCC's mess, shower, and toilet facilities.

1.3.3 Fuel and Oil Installations

The Contractor's fuel and oil installations within the site shall only be provided at locations approved by FCC, such approval not to be unreasonably withheld or delayed.

All fuel and oil installations provided by the Contractor shall be contained within an impermeable bund capable of containing 110% of the tank capacity in the event of a spillage; 'self-bunded' items shall be permitted, subject to the Contractor being able to substantiate their efficacy.

The Contractor shall designate an area within his compound for carrying out plant maintenance and repairs. The Contractor shall ensure that all routine maintenance and repairs take place within this area. Any fuel or oil spillages shall be remediated and a safe and controlled manner by the Contractor and at his expense.

1.3.4 Facilities for CQA Inspector (If required)

Where required, the Contractor shall provide, service and maintain one high-security steel ISO container, or as otherwise provided for, for the sole use of the CQA Inspector within the agreed location of his compound, subject to the approval of the CQA Inspector, which shall not be unreasonably delayed or withheld. The Contractor shall ensure that the container is provided with power supply, sufficient electricity power sockets, electric lighting and space heating, such that it shall be ready for use by the CQA Inspector on the first day that CQA work is required. The Contractor shall be responsible for the maintenance of these facilities throughout the duration of the works.

All keys for the CQA Inspector's facilities shall be handed to the CQA Inspector.

1.4 Landfill Gas and Leachate Management Systems

FCC has installed landfill gas and leachate management systems across the Site, including areas within and adjacent to the works. FCC shall inform the Contractor which systems are to remain undisturbed during the period of the works, and which can be, or have been, decommissioned.

Should the Contractor subsequently damage or disturb any operational system, he shall immediately inform the CQA Inspector and FCC. Only if required by FCC, the Contractor shall carry out such reasonable remedial measures as are deemed necessary by FCC to reinstate any damaged or disturbed system to the same condition as immediately prior to commencement of the works, otherwise FCC shall provide for the remediation to be completed within a timescale to be agreed with the Contractor.

1.5 PPC Permit

The area of the works is encompassed by the existing Permit (PPC) for the current landfill operations. The Contractor shall not directly or indirectly compromise FCC's ability to carry out its operations in accordance with the PPC Permit, a copy of which shall be provided by FCC on request.

2 CONSTRUCTION REQUIREMENTS

2.1 Regulations and Site Safety

The works come under the Construction (Design and Management) Regulations of 2015 and the Main Contractor shall also be appointed as the Principal Contractor.

The Contractor shall comply with the safety requirements set out in the following documents:

- FCC - Health and Safety Policy;
- FCC - Site User Safety Instructions;
- FCC - General Policy Statement for Contractors Conditions of Contract and Safety Rules; and
- FCC - Health & Safety Site Plan.

A copy of these documents is available for inspection at the landfill site office.

The Contractor shall adhere to the site Health and Safety Rules and the DSEAR Regulations dated 2002. The Contractors performance with respect to these rules shall be reviewed at each progress meeting.

2.2 CDM Area

The extent and location of the CDM area shall be agreed with FCC prior to any works commencing on-site, and 'works' shall include the delivery of any plant, equipment, materials and/or accommodation.

The agreed area shall be demarcated on site and once demarcated, the Principal Contractor shall ensure that the requirements of the CDM Regulations 2015 are adhered to at all times within it.

2.3 Method Statements and Risk Assessments

The Sirius Design Risk Assessment is enclosed in Appendix 1.

The Contractor shall submit to FCC for the approval, prior to commencement of the works, method statements and risk assessments detailing the proposals for all the works to be undertaken.

2.4 Substances Hazardous to Health

A substance hazardous to health shall only be used or generated in or about the works where specified in the Contract or with the consent of the CQA Inspector.

Where any substance hazardous to health is so used or generated during the works the Contractor shall provide the CQA Inspector with:

- A copy of the assessment of the risks created by the use of that substance; and
- Details of the measures to be taken to prevent or adequately control the exposure of the persons working with or those who may be affected by the substance.

The information required in the above shall be provided to FCC at least 14 days prior to the use of or incorporation into the works of substances hazardous to health or where appropriate at the commencement of the works where this is less than 14 days.

The Contractor shall advise FCC of the information, instruction, training and supervision to be provided for the Contractor's personnel and any other person likely to enter the area in which the hazard exists. The Contractor is to ensure that provision is made for monitoring health.
Where the measures referred to necessitate the use of protective clothing or other safety apparatus the Contractor shall:

- Provide FCC and his staff with sufficient and suitable items of protective clothing and safety apparatus if not previously supplied;
- Arrange for the proper storage, maintenance and regular testing and replacement of the items provided to the Employer and his staff; and
- Arrange for appropriate training or instruction for FCC and his staff in the use of such items.

2.5 Noise

The Contractor shall comply with any site specific noise limits and the following specific requirements:

- No work other than the operation of plant and equipment for the control of the groundwater shall take place outside the permitted hours except in case of emergency. FCC shall be informed of any such emergency immediately.
- All mobile plant, equipment and vehicles under the control of the Contractor, his sub-Contractors and suppliers, and in use or calling at the site, shall be fitted with appropriate silencing equipment and shall be maintained to manufacturers' standards.

2.6 Naked Flames and Smoking

Naked flames are prohibited within the working area on site at all times. Smoking shall only be permitted in areas approved by FCC.

The Contractor shall obtain a permit to work from FCC for any 'hot works'. The works are to be carried out away from the landfill area and at a location agreed with FCC.

2.7 Mobile Plant

All Contractors vehicles and subcontractors vehicles (plant and operatives vehicles) shall be fitted with flashing amber beacons for vehicle awareness. Green flashing beacons to indicate that seat belts are in operation shall also be fitted to all construction plant. These beacons shall be located in a visually prominent position and shall be used whenever vehicles are on site. No Contractors vehicles shall be allowed on site without the use of a flashing amber beacon.

All mobile plant shall be assessed for restricted rear view vision and action agreed, dependent upon the outcome of this assessment, which may result in suitable equipment being fitted in order to minimise the potential risk to within acceptable limits.

2.8 Dust Nuisance

The Contractor shall take all necessary steps to eliminate the generation of dust nuisance during the works.

Existing highways, site and access roads used by the vehicles and plant of the Contractor or of his sub-contractors or suppliers of materials, shall be kept clean and clear of all dust and mud dropped by the vehicles in any form. All dust and mud from the works spreading onto highways, site and access roads shall be immediately cleared by the Contractor by use of mechanical plant to the approval of FCC.

Compliance with this clause shall not relieve the Contractor of any responsibility for complying with the requirements of any Highway Authority in respect of keeping roads clean.

2.9 Communication Systems

The Contractor shall obtain the approval of FCC prior to the commissioning of any communication equipment and, following approval, shall ensure that it does not interfere with any existing systems on the site.

2.10 Access

The general arrangement of the site is shown on the respective site layout drawings. The only entrances to the works for the use of the Contractor are via the main site entrance, no other site entrances are to be used unless stated in the Specification. Areas for site offices, welfare facilities and plant standing areas shall be arranged with FCC.

The main access road is to be kept clear at all times, as it shall be used primarily by FCC's operations traffic. The Contractor shall need to make provision for providing suitable access within the site, in particular between borrow areas, stockpile areas and the Contractors compound.

The Contractor must not use the access roads used by FCC for access into active cells unless given prior permission of FCC. Alternative access roads must be used or constructed, the locations of which shall be agreed with FCC prior to work commencing.

The Contractor shall carry out jointly with FCC a condition survey of the access roads made available under the Contract prior to the commencement of any works. The Contractor shall repair and make good any damage to FCC's landfill access roads which occur as a result of the Contractor's activities.

The Contractor's vehicles must give way to landfill traffic and not impede the movement of the traffic involved in landfill operations.

The specified speed limits within the landfill site shall be observed at all times. Non-compliance may result in the exclusion of any offender from the site.

Appropriate signage must be displayed to warn traffic of slow moving plant, particularly if the haul road access crosses the main access road.

All vehicles leaving the site must be free from mud and debris. The Contractor shall be responsible and shall pay for the removal of debris and any damages arising from mud and debris that leaves the site as a consequence of the works.

2.11 Permitted Hours of Working

The permitted hours of working are to be confirmed at the Pre Start Meeting.

Working on Sundays and Bank Holidays shall not be allowed unless approved before hand by FCC.

2.12 Control of Surface Water

The Contractor shall carry out all necessary operations for the control of standing water, or surface water run-off, within the CDM area to enable the construction of the works, and by doing so shall prevent damage to the works, the site, or adjoining properties. Where these actions include measures to prevent the in-flow of water from the landfill site, these works shall be approved by FCC before commencement.

Any water shall only be discharged outside the CDM area and/or off-site following the receipt of approval by FCC.

2.13 Control of Leachate

The Contractor shall carry out all necessary operations for the control of leachate, within the CDM area to enable the construction of the works, and by doing so shall prevent damage to the works, the site, or adjoining properties. Where these actions include measures to prevent the in-flow of leachate from the landfill site, these works shall be approved by FCC before commencement.

Any leachate collected shall only be discharged outside the CDM area and/or off-site following the receipt of approval by FCC.

2.14 Disposal of Exhumed Waste

In the event that it is necessary to excavate waste in order to achieve any element or elements of this Specification, the excavated waste shall be disposed of as directed by FCC.

2.15 Protection of Boreholes

The Contractor shall locate and adequately protect existing deep ground water, leachate and landfill gas monitoring boreholes within the works area from damage during the works. The location of the boreholes are to be confirmed with FCC.

2.16 Inclement Weather

No materials shall be placed or compacted during inclement weather conditions, if in the opinion of the CQA Inspector, trafficking over compacted or uncompacted material would prove detrimental to the construction. Any such trafficking damage caused by the Contractor shall be repaired in accordance with the Contract at the Contractor's expense. Inclement weather conditions may include, rain, snow, freezing conditions or excessive heat as indicated by the CQA Inspector.

Following wet weather conditions, any standing water on the surface of the construction must be removed at the Contractor's expense. If instructed by the CQA Inspector, the Contractor shall remove any material rendered unsuitable by wetting at the Contractor's expense. Earthworks placement operations following inclement weather conditions shall not proceed without the prior approval of the CQA Inspector.

Any frozen material shall be allowed to thaw before use. Previously compacted material that has become frozen shall be removed from the works and stockpiled until suitable for reuse.

2.17 Tolerance limits

Tolerance limits for the work shall be as follows:

i) Positions in plan shall be within 50mm of the true positions shown on or calculated from the drawings;

ii) Levels shall be $\pm$ 50mm of the required elevation shown on, or calculated from, the drawings; and

iii) All other survey control and tolerance information is available in the FCC Good Practice Guide 6.0.

2.18 Confidentiality

The whole of the Tender Documents and all information provided by FCC for the purpose of or in connection with the Contract shall be dealt with by the Contractor as confidential to him and not be disclosed by him other than to his employees, sub-contractors or agents as appropriate for the sole purpose of the Contract.

The Contractor shall not, except with the prior consent in writing of FCC:

i) Publish or advertise or permit to be published or advertised any photograph, drawing or written matter concerning the Contract or the works;

ii) Use or permit the use of the name of FCC in any publication or advertisement; or

iii) Place any advertisement on any part of the works.

The Contractor shall refer all press representatives to FCC. Photographs for publication shall not be made of any part of the works without the prior written authorisation of FCC. Such authorisation if granted shall be in the form of itemised approvals for each exposure concerned.

3 SCOPE OF THE CONSTRUCTION WORKS

3.1 General Description

Construction was designed to comply with the Permit for the site.

The general arrangement for the surface water scheme is shown on **Drawing WR7544/01/01**.

Construction of the surface water scheme generally involves:

- Construction of new surface water ditches around the site;
- Construction of a new attenuation lagoon in the north east of the site;
- Construction of a cap deflection bund;
- Installation of culverts;
- Installation of lagoon outfall pipework;
- Installation of isolation chamber and gate valve on the lagoon outfall pipework;
- Installation of sandbag headwalls on the lagoon inflow to culverts and the lagoon outfall pipework;
- Installation of pre cast concrete headwalls on the culverts and the lagoon outfall pipework;
- Installation of an orifice plate on the lagoon outfall headwall; and
- Installation of non-return valves on lagoon inflow pipework.

3.2 Design Overview

The design for this surface water management scheme at Milton Landfill Site is based where possible on utilising the existing surface water features that have been constructed during the lifetime of the site. The scheme shall control the surface water run off generated by collecting this within perimeter surface water ditches which subsequently discharge to the newly constructed attenuation lagoon on the eastern side of the site, where the surface water discharge is controlled via an orifice plate to restrict the outflow to the permitted outfall location.

The proposed surface water scheme for the site has been subject to hydraulic calculations which have been analysed in *Microdrainage 2019.1* which is the industry standard software for drainage design.

All calculations have been analysed using the 1 in 100 Year (1% probability) storm frequencies, with an additional 30% climate change allowance to model the long-term scenario for the site which is required by the Environment Agency on Landfill Sites.

The maximum gross area of the site is approximately 37 Ha. This area has been accounted for within the Microdrainage calculations undertaken. The 37 Ha has been split in 3 main catchments for each individual ditch. The catchment areas are shown on **Drawing WR7544/01/02**.

As part of this design greenfield runoff calculations were undertaken for the site to determine the runoff volumes predevelopment of the landfill site. The greenfield runoff rates are presented in Table below:

Table 1 – Greenfield Runoff Calculations	
Return Period	**Discharge Rate (l/s)**
Q_{bar}	122.6
1 in 1 Year	106.5
1 in 30 Year	294.5
1 in 100 Year	436.4

Modelling for this scheme has been undertaken using the Rainfall – Runoff method which utilises unit hydrographs for each pipe/ditch which are calculated by the software by inputting rainfall data for the site along with Standard Percentage Runoff (SPR) for the soil, area of sub catchment, length of sub catchment and levels at two points along the length of catchment are used to calculate the gradient.

The rainfall – runoff method has been chosen for this scheme over the Wallingford Rational Method as it takes into account the fact that the runoff generated will be slower entering the system than if was falling onto a paved surface compared with the Rational Method, meaning slower peak flows which are representative of site conditions. The rational method was not designed to be used where sites contained <20% paved area. The rainfall – runoff method has been designed for catchments which are sloped and are mainly containing undeveloped/rural environments where no urbanisation has occurred.

The values used within the Rainfall – Runoff method have been derived from site conditions. The soils that have been used as restoration material have been mainly clayey material. An SPR value of 47 has been chosen which correlates to a SOIL class of 0.45 to represent (as outlined in Wallingford/Flood Studies Report) a clayey material over an impermeable layer, which best reflects the restoration conditions (worst case) at Milton Landfill.

To keep the discharge rate within an acceptable limit the site needs attenuation volume to restrict the discharge. A new attenuation lagoon shall be constructed on the eastern boundary of the site to provide storage volume for the collected surface water runoff. The newly constructed attenuation lagoon shall provide an attenuation volume of approximately 11,150m^3.

An orifice plate shall be installed on the discharge from the attenuation lagoon to restrict the volume of surface water discharged from site to less than the Q_{bar} rate for the site specified in Table 1.

Microdrainage calculations are presented in **Appendix 3**.

3.3 Principal Quantities

The principal quantities for the works are given in **Appendix 2**.

3.4 Survey Information

The Contractor shall undertake an initial survey of the site in accordance with the FCC Good Practice Guide. This shall be compared to existing surveys, and once approved by FCC, the Contractor's survey shall form the 'original ground level survey' (OGL) from which the measurement of the works shall be undertaken. Further surveys shall be required as follows:

i) Completed ditch installation with top and bottom of bank levels;

ii) Invert levels of all existing and proposed pipework;

iii) Invert and cover levels of all headwalls;

iv) Invert and cover levels of all manhole chambers; and

v) Lagoon top and bottom of bank levels.

3.5 Daily Journal

The Contractor shall be required to keep a detailed daily journal recording the information detailed below. The Contractor shall give FCC reasonable access to the daily journal which shall, if necessary, be made available to FCC, Environment Agency (EA), or any other regulating authority, during and after, completion of the Works, if required. The Contractor shall forward copies of the daily journals, on a weekly basis, to the FCC.

This information shall be recorded in an acceptable form of daily journal which shall include the following:

- Date of shift;
- Names of personnel in attendance during the shift;
- Weather conditions, including ambient temperature;
- Type of plant used, plant breakdowns and hours;
- Approximate totals of earthworks carried out including identification of source and destination;
- Delays;
- Additional works, reasons and reference;
- Deliveries;
- Details of meetings and other correspondence;
- Details of remedial works; and
- Any other relevant information.

4 EXCAVATION AND ENGINEERED FILL

4.1 General

This section outlines the requirements for excavation and placing engineered fill materials to the required levels as shown on **Drawing WR7544/01/01**. As the material forms the proposed lagoon containment system, the material shall be cohesive (low permeability) to retain surface water.

The compaction of all engineered fill materials shall be carried out in accordance with the Highways Agency "*Manual of Contract Documents for Highway Works (MCDHW) – Volume 1 Specification for Highway Works*" 2016 Series 600 Earthworks, published by HMSO except as amended hereunder. The Contractor shall employ only that plant and those working methods that are suited to the materials to be handled and traversed. He shall be responsible for maintaining the nature of the suitable material so that when it is placed and compacted it remains in accordance with the Contract. Suitability shall be determined in accordance with the definitions below.

The Contractor shall submit his proposals to the CQA Inspector regarding the extent and management of the excavations, stockpiling and filling of materials before starting works. Excavations shall not proceed without the prior approval of the CQA Inspector.

The Contractor shall not remove any materials from the site unless approved by FCC.

After completion of the works, the Contractor is required to re-grade any stockpiles and surrounding areas where deemed necessary. This shall be carried out to the satisfaction of FCC.

4.2 Definitions

The following definitions shall apply to the Specification and CQA Plan wherever reference is made to the defined engineered fill material:

- 'Suitable material' shall comprise all that is acceptable in accordance with the Contract for use in the works and deemed by the CQA Inspector to be suitable;
- 'Unsuitable material' shall mean material other than suitable materials and shall include:
    - Peat, material from swamps marshes and bogs;
    - Logs stumps and perishable material;
    - Material in a frozen condition;
    - Material susceptible to spontaneous combustion; and
    - Any commercial or domestic waste.

- 'rock' shall be deemed to mean hard material which, in the opinion of the Project Manager, necessitates for its loosening or removal the use of special machinery designed for rock cutting, but shall exclude any material that can be removed by normal excavating machinery and which, in any case, has a volume not exceeding 1 cubic metre or 0.25 cubic metres where the net width of the excavation is less than 2 metres.

4.3 General Excavation

The final profile of excavations shall be defined by the levels and lines shown on **Drawing WR7544/01/01**.

The final profile shall be achieved by excavating *in situ* materials of varying consistency in accordance with this section.

The Contractor shall, unless otherwise agreed with FCC, carry out excavations in such a manner that the materials can be identified and placed in stockpiles for further use, without mixing of materials.

The engineering material shall not contain any unsuitable materials as defined in this section.

The sub-grade formation shall be assessed by the CQA Inspector prior to the placement of engineered fill. The assessment shall be based upon an inspection of the sub-grade for identification of unsuitable material. Where unsuitable material is encountered within the sub-grade it shall be removed and the resulting void shall then be filled in accordance with this section.

Where unsuitable material is encountered within the sub-grade to a depth below the excavation profiles provided, the CQA Inspector shall immediately inform the Designer to enable an assessment of the ground conditions to take place so that appropriate measure may be taken to investigate the presence and extent of unsuitable material and any impact this may have on the construction design.

Measures to provide an acceptable sub-grade whereby the presence of unsuitable material is encountered may include for the placement and compaction of a sacrificial engineered fill layer to provide a suitable sub-grade at the requisite minimum 50kN/m^2, or the placement of an aggregate layer to provide a suitable surface prior to placement of the engineered fill.

In the event of ground water entering into the engineering material, appropriate remedial action shall be discussed with the FCC, the Designer and the CQA Inspector, following which an agreed solution shall be established.

All remedial measures shall be completed and approved by the CQA Inspector prior to the placement of any fill material.

4.4 General Fill and Placement

Engineered fill material shall comprise only suitable material as defined in this section and may be excavated on-site material, imported material or a combination of both.

The materials shall be classified via Particle Size Distribution (PSD) Testing, then placed and compacted in accordance with the method specification contained within MCDHW, Clause 612, Compaction of Fills.

Haulage of materials to areas of placement shall only proceed when sufficient plant is available to compact the materials at the point of deposition.

Suitable engineered fill materials shall be placed and compacted in horizontal layers to a minimum specification in terms of layer thickness and number of passes as defined by Table 6/4 of MCDHW appropriate to the compaction requirements as listed in Table 6/1 for the class of materials being compacted. The interface between individual layers shall be scarified to allow keying in between the layers of the structure and allow the structure to be formed as a homogeneous mass. Any clods present in the material should be broken down during compaction to ensure homogeneity of the fill material.

Once trimmed, the surface shall be proof rolled using a smooth vibratory roller with a mass per unit width of the roller between 2,000kg/m and 5,000kg/m to provide an even and firm surface. The surface shall be sufficiently consolidated as to allow movement of vehicles without causing undue rutting or exhibiting other detrimental effects. Any soft spots or areas in which heave is observed during proof rolling shall be removed and the subsequent void filled in accordance with this Specification.

Where engineered fill material is to be left exposed overnight the surface of the fill is to be sealed and smoothed to prevent water ingress. The sealed surface shall be scarified prior to the placement of any future layers of fill material.

4.5 Engineered Fill Testing Requirements

The maximum particle size for cohesive engineered fill shall be 125 mm except for isolated particles with a maximum size of 300 mm in any dimension based upon a visual assessment at the point of placement in the Works and provided the isolated particles are dispersed within a finer matrix.

Testing shall be carried out on the engineered fill in accordance with Table 1.

The surface of the formation whereby engineered fill is not placed shall be subject to the hand shear vane (HSV) testing requirements detailed in Table 1 below.

Table 1. Engineered Fill Testing Requirements

Parameter	Test Method (BS 1377:1990:)	Acceptance Criteria	Testing Frequency
Classification Testing:			
Particle Size Distribution (Wet Sieve and Pipette Analysis)	Part 2 Clause 9.2 and 9.4	For classification to determine the class and compaction requirements of the material as per Highway Works Document	1 per 5,000m^2 or following visual change of material
Cohesive Fill:			
In-situ Shear Strength (Hand Shear Vane)	Part 9 Clause 4.4	>50 kPa	1 per 25m Grid Or at *least* one per layer

4.6 As-Built Drawings

A survey of the top of engineered fill levels shall be carried out. This drawing shall be supplied to the CQA Inspector.

5 SURFACE WATER DITCHES

5.1 Proposed Ditch Construction

The proposed surface-water collection ditches shall be constructed in accordance with the lines and levels shown on **Drawing WR7544/01/01** and the construction details shown on **Drawing WR7544/01/03**. All ditches shall be constructed with a minimum fall of 1 in 500, unless stated otherwise. Excavated material shall be used to construct bunds on the downslope side of the ditches, and surplus material shall be placed on the cap to create an even profile. All surface water ditches shall be excavated into cohesive soils.

5.2 Existing Ditches

Any existing ditches shall be cleared out.

5.3 Hydroseeding

All ditches are to be hydro-seeded once installed.

5.4 Setting Out

The exact alignment of the ditches is to be confirmed with the Contractor and the CQA Manager on site, to reflect the latest topography (due to the latent effects of waste consolidation on surface levels), but is to be closely in accordance with the positions shown on **Drawing WR7544/01/01**.

6 LAGOON CONSTRUCTION

6.1 Attenuation Lagoon

The new attenuation lagoon is required in the eastern part of the site in the location shown on **Drawing WR7544/01/01**, this lagoon collects the surface water from the entire landfill site.

The lagoon shall be constructed with 1 in 2 sides, shall give 11,150m^3 capacity and be 1.4m deep, with a freeboard of 0.3m. The lagoon shall have a top area of 11,035m^2 and shall have a basal area of 8,140m^2. In some areas a bund shall be required to be built to raise the level of the lagoon to provide the required storage volume (Depth of 1.4m to include height of the bund).

The engineered fill material used to raise the level of the lagoon shall be cohesive and low permeability, to limit any seepage of water into the substrate. This material shall be tested and conform with **Table 1** of this Specification.

The proposed lagoon shall be constructed to the lines and levels shown on Drawing **WR7544/01/01**.

Cross sections of the lagoon are presented on Drawing WR7544/01/06.

7 CAP DEFLECTION BUND

A cap deflection bund shall be required on the southern part of the site to prevent any surface water that is unable to be captured by the surface water ditches, running onto the A14/A10 slip road. This water shall be diverted in the existing ditch on the perimeter of site.

The cap deflection bund shall be 500mm wide at the crest and shall be 500mm high with 1 in 1 sides.

The cap deflection bund shall be constructed in accordance with the detail presented on **Drawing WR7544/01/03**.

8 CARRIER DRAIN CONSTRUCTION

8.1 Attenuation Lagoon Outfall Pipework

The surface water outfall from the attenuation lagoon shall be through a new 300mm HDPE twinwall pipe. The discharge pipe shall be jointed using twinwall collars, and shall be laid in accordance with the levels and locations shown on **Drawing WR7544/01/01**. The pipe shall be installed within a trench, with a 20mm gravel bed and surround. The outfall pipe shall be installed in accordance with the detail provided on **Drawing WR7544/01/03**. The outfall pipe shall originate from a pre-cast concrete headwall and shall discharge via a sandbag headwall into the surface water outfall ditch.

Table 2 - Lagoon Outfall Pipework Details	
Parameter	**Requirement**
Pipe Internal Diameter	300mm
Pipe Type	Twinwall HDPE
Joint Type	Twinwall Collars
Pipe System Fall	To suit identified falls and remain buried a minimum of 500mm to crown
Pipe Bedding	20mm Gravel bed and surround

8.2 Culverts

Culvert 1 shall discharge into the attenuation lagoon via a triple pipe 300mm culvert consisting of HDPE twinwall pipework. The culverts shall originate from a sandbag headwall and shall discharge via a precast concrete headwall into the attenuation lagoon. The pipes shall be installed within a trench, with a 20mm gravel bed and surround and a ST4 concrete bridging slab (in areas under the access road). The location of the culvert is shown on **Drawing WR7544/01/01**. The culvert shall be installed as per construction details are shown on **Drawing WR7544/01/03**. Details for the culvert are given in **Table 3** below.

Table 3 - Culvert 1 Details	
Parameter	**Requirement**
Pipe Internal Diameter	3 x 300mm
Pipe Type	Twinwall HDPE
Joint Type	Twinwall Collars
Pipe System Fall	To suit identified falls and remain buried a minimum of 250mm to crown
Pipe Bedding	20mm gravel bed and surround with concrete cover bridging slab
Pipe Spacing	Pipes to be spaced 100mm apart

8.3 Culvert 2

Culvert 2 shall discharge into the attenuation lagoon via a triple pipe 225mm culvert consisting of HDPE twinwall pipework. The culverts shall originate from a sandbag headwall and shall discharge via a precast concrete headwall into the attenuation lagoon. The pipework shall be installed within a trench, with a 20mm gravel bed and surround and an ST4 concrete bridging slab (in areas under the access road). The location of the culvert is shown on **Drawing WR7544/01/01**. The culvert shall be installed as per construction details are shown on **Drawing WR7544/01/03**. Details for the culvert are given in **Table 4** below.

Table 4 - Culvert 2 Details	
Parameter	**Requirement**
Pipe Internal Diameter	3 x 225 mm
Pipe Type	Twinwall HDPE
Joint Type	Twinwall Collars
Pipe System Fall	To suit identified falls and remain buried a minimum of 250mm to crown
Pipe Bedding	20mm gravel bed and surround with concrete cover bridging slab
Pipe Spacing	Pipes to be spaced 100mm apart

8.4 Culvert 3

Culvert 3 shall discharge into the attenuation lagoon via a double 225mm culvert consisting of HDPE twinwall pipework. The culverts shall originate from a sandbag headwall and shall discharge via a precast concrete headwall into the attenuation lagoon. The pipe shall be installed within a trench, with a 20mm gravel bed and surround and a ST4 concrete bridging slab (in areas under the access road). The location of the culvert is shown on **Drawing WR7544/01/01**. The culvert shall be installed as per construction details are shown on **Drawing WR7544/01/03**. Details for the culvert are given in **Table 5** below.

Table 5 - Culvert 3 Details	
Parameter	**Requirement**
Pipe Internal Diameter	2 x 225 mm
Pipe Type	Twinwall HDPE
Joint Type	Twinwall Collars
Pipe System Fall	To suit identified falls and remain buried a minimum of 250mm to crown
Pipe Bedding	20mm gravel bed and surround with concrete cover bridging slab
Pipe Spacing	Pipes to be spaced 100mm apart

8.5 Culvert Concrete Cover Slab

Where the cover to pipework is less than 1.2m (crown to surface) a 150mm thick ST4 concrete slab shall be constructed above the pipework with 1 layer of A393 mesh with a minimum cover to all reinforcement of 50mm as per the construction detail on **Drawing WR74544/01/02**.

Due to the levels of the road and proposed levels of the pipework it may be necessary to create a speed table in order to provide the required protection to the pipework. Where deemed necessary this shall be constructed in accordance with **Drawing WR7544/01/03**.

8.6 Headwalls

Headwalls shall be required at entry (inflow) and discharge (outfall) from the attenuation lagoon and culverts. Headwalls shall consist of either pre-cast concrete headwalls or concrete sandbag headwalls. The type, location and design level of each headwall is shown on **Drawing WR7544/01/01** and shall be installed as per the construction details on **Drawing WR7544/01/03**. The pre-cast concrete headwalls shall be bedded on the underlying soils. These soils shall be cohesive, and shall be firm prior to installation of headwall. The soils shall achieve a minimum undrained shear strength of 50 kN/m^2.

8.7 Orifice Plate

To restrict the outflow from the attenuation lagoon, an orifice plate shall be installed on the outfall headwall to restrict the flow. An orifice plate of **270mm** diameter is required to restrict the flow.

8.8 Non Return Valve

A non-return (flap) valve shall be bolted to the headwalls of all incoming pipework to the lagoon. The non-return valve shall be as per the construction detail on **Drawing WR7544/01/03**.

8.9 Isolation Valve and Chamber

The proposed outfall from the attenuation lagoon shall have a manually controlled shut-off system. The sluice valve shall be a suitable 450mm diameter type, to provide a water-tight seal, to prevent water egress.

The new valve shall need to be capable of operating fully submerged. The valve shall also have a manual operating handle accessible above ground level, so it can be operated when the lagoon is full. The new sluice valve shall be housed in a 1500 mm diameter pre-cast concrete chamber with step irons for emergency access or for servicing if required. The valve shall be controlled by a rod at the surface, which is used to lift the valve up when shut off is not required

and can be pushed down when lagoon isolation is needed. The valve is to consist of a plate which is to be flanged to the pipe.

All fittings shall be suitable for submersion and operation in water.

The location of the proposed isolation valve chamber is shown on **Drawing WR7544/01/01** with the construction detail for the chamber shown on **Drawing WR7440/01/03**.

9 ANCILLARY CONSTRUCTION DETAILS

9.1 Fencing to the lagoon

The completed lagoon shall be protected from accidental access by 2 wooden triple 'post and wire' style fence 800 mm apart with the top wire barbed with a high hedgerow planted in between. Fencing shall follow the ground profile with small adjustments in height, as necessary to obtain flowing alignment. Construction details of the proposed fencing are shown on **Drawing WR7544/01/05**.

Materials

1. All timber used shall be weather treated for use outdoors;
2. Posts to have a minimum length of 1.800m with a minimum profile of 75 mm by 100 mm;
3. 4 mm barbed wire;
4. 4 mm galvanised steel wire; and
5. Fencing staples shall be 4mm by 40mm galvanised.

Erection

1. Main posts shall be set at intervals not exceeding 1.8m;
2. Fence posts to be a minimum 1200m high above ground level with 0.600m driven below ground;
3. Posts where possible shall be secured in a 300 mm wide by 650 mm deep foundation. The foundation shall be backfilled with excavated arisings. The excavated arisings are to be compacted by hand tamping the material to ensure the post is sufficiently supported;
4. Posts shall be tanalised timber posts;
5. The wire is to be installed with a 0.325m gap between each wire, the top wire is to be barbed;
6. The wire shall be secured to the timber posts using galvanised fence staples which shall be a minimum of 40 mm long and shall have a diameter of 4 mm;
7. The fencing shall be spaced 800 mm apart with a hedge row planted in between the fences.

9.2 Metal Field Farm Gate

For the lagoon, the Contractor shall provide 1No. metal farm field gate. The gate shall provide a vehicle access minimum opening width of 3m and shall be hung on 2445 mm x 175 mm x 175 mm tanalised timber posts, or suitable galvanised steel hanging posts 2445 mm by 114 mm by 114 mm, set in a foundation 300 mm wide by 1250 mm deep. The foundation shall be filled with ST2 concrete from the base to 250 mm below the surface, where the excavated arising shall be compacted around the post and backfilled to the surface. The top and bottom hinges shall be inverted to prevent gate removal and reduce risk of theft. Bolts used within the gate are to be welded to prevent theft.

All vehicle gates shall be fitted with a sprung bolt system, or lever latch, to allow easy opening. The location of the field farm gate is shown on **Drawing WR7544/01/01** and the construction detail is shown on **Drawing WR7544/01/02**.

9.3 Metal Pedestrian Gate Detail

For the lagoons the Contractor shall provide 1 No. metal pedestrian gate. The gate shall have a minimum opening with of 1000 mm and shall be hung on 2445 mm x 175 mm x 175 mm tanalised timber posts, or suitable galvanised steel hanging posts 2445 mm by 114 mm by 114 mm, set in a foundation 300 mm wide by 1250 mm deep. The foundation shall be filled with ST2 concrete from the base to 250 mm below the surface, where the excavated arising shall be compacted around the post and backfilled to the surface. The top and bottom hinges shall be inverted to prevent gate removal and reduce risk of theft. Bolts used within the gate are to be welded to prevent theft.

All pedestrian gates shall be fitted with a sprung bolt system, or lever latch, to allow easy opening. The location of the pedestrian gate is shown on **Drawing WR7544/01/01** and the construction detail is shown on **Drawing WR7544/01/05**.

9.4 Lifebuoys

The Contractor shall provide 600 mm diameter orange or yellow polyethylene lifebuoys with reflective panels next to the proposed attenuation lagoon in the locations shown on **Drawing WR7544/01/01**. Lifebuoys shall be mounted to a single pole in an encapsulated housing and provided with a 30m minimum encapsulated line with graphical user instructions. Lifebuoy stations to be clearly visible around the lagoon at a maximum height of 1.7m above the ground.

9.5 Deep water and No Swimming Signage

The Contractor shall provide 450 mm by 350 mm plastic warning signs marked with approved graphical representations and the words '*Danger – Deep Water'* and '*No Swimming'*. The lagoon shall have 3 warning signs: 1 adjacent to the field gate, 1 adjacent to the lagoon outfall, and 1 elsewhere around the perimeter of the lagoon, fixed using plastic zip ties.

9.6 As-Built Drawings

A survey of the actual installed pipework routes and falls, and the locations and elevations of all other fabrications shall be produced, along with the as built position of the ditches and surface water attenuation lagoons. The survey of the attenuation lagoon shall include top and bottom of batters, invert levels of incoming ditches, invert levels of outgoing pipework and invert levels of headwalls and orifice plate.

The survey shall be used to check that the falls and the invert levels of the system are in accordance with design.

APPENDIX 1
DESIGNER'S RISK ASSESSMENT

FCC ENVIRONMENT LIMITED

DESIGNER RISK ASSESSMENT FOR THE CONSTRUCTION OF THE SURFACE WATER MANAGEMENT SCHEME AT MILTON LANDFILL SITE

Document Reference: WR7544/03
April 2020

SiriUS Environmental

Project Quality Assurance

Report Reference	**:**	WR7544/03
Report Date	**:**	April 2020
Prepared for	**:**	FCC Environment Limited
Issued by	**:**	Sirius Environmental Limited 4245 Park Approach Thorpe Park Leeds LS15 8GB

Rev	Date Issued	Amendment Details	Author	Reviewer
0	07/04/2020	Final Draft for Internal Review	JD	AC/AK

Purpose

This document was prepared as the Designer's Risk Assessment (DRA) for the construction of the Surface Water Management Scheme (SWMS) for Milton Landfill Site for FCC Environment Limited (FCC) to provide final surface water control solution for the site. Sirius Environmental Limited (Sirius) accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

Sirius has no liability regarding the use of this report except to FCC Environment Limited.

Contents

1. PROJECT DESCRIPTION

1.1.1 The proposed works and Construction Quality Assurance requirements are included with Documents Ref: **WR7544/01** (Engineering Specification) and **WR7544/02** (CQA Plan)

2. MAINTENANCE AND USAGE NOTES

2.1.1 The following notes are provided for the end-user, who should be aware of the following maintenance and hazard requires for maintaining the completed drainage system:

(i) Ditches are to be maintained and regular checks to ensure they are clear of debris that doesn't impede flow;

(ii) Ditches are to be maintained to ensure that if any settlement occurs the falls of the ditches are still maintained;

(iii) Lifebuoys are checked regualry to ensure it is not damaged;

(iv) Fencing to be checked regularly to ensure it is not damaged;

(v) Isolation Chamber needs to be lifted and checked regularly to ensure they are fully functionally and the gate valve does not become seized over time;

(vi) Lagoon need to be inspected regualry to ensure they do not sustain any damage and any remedial works are undertaken as soon possible;

(vii) Outlets and all piped sections need to be kept clean from debris to prevent back up In the lagoon; and

(viii) Orifice plates need to be checked regularly to ensure they do not become blocked.

The maintenance requirements summarised above are detailed in Table 1 and Table 2 below:

Table 1 – Maintenance Requirements for Ditches		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Remove litter and debris	As Required
	Cut Grass	As required to ensure flow is unimpeded
	Manage other vegetation or trees	Monthly at the start, then as required
	Inspect vegetation coverage	Monthly for 6 months, then quarterly for 2 years and then half yearly
	Inspect inlet and outlet location to culverts for blockages and silt accumulations	Monthly
Occasional Maintenance	Reseed areas of poor vegetation growth or alter vegetation to better suit conditions	As required or if bare soil is exposed over 10% of the ditch profile
Remedial Actions	Repair erosion damage by reseeding.	As required
	Repair uneven surface where settlement of the ditch has occurred over capped areas to ensure falls are as per design	As required
	Remove build up of silts that have accumulated with the ditch to ensure flow capacity	As required

Table 2 – Maintenance Requirements for Surface Water Lagoons		
Maintenance Schedule	**Required Action**	**Typical Frequency**
Regular Maintenance	Remove litter and debris	As Required
	Inspect inlet and outlet location to lagoons for blockages and silt accumulations	Monthly
	Inspect isolation valves to ensure they are working	Annually
	Inspect banksides, structures and pipework for evidence of physical damage	Monthly
	Remove sediment from inlet and outlet	Annually
Occasional Maintenance	Remove build-up of silts that have accumulated with the lagoon to ensure attenuation capacity	Every 5 years or as required
Remedial Actions	Repair erosion damage	As required
	Repair damaged outlet features	As required

3. DESIGN RISKS

3.1.1 Design risks, mitigation measures and residual risks are identified on the following risk assessments. The Contractor's attention is drawn in particular to the specific construction hazards identified for which residual risks are considered to be moderate or high. The Contractor is expected to undertake an assessment of risk and to develop specific method statements in order to reduce the risks to an acceptable level.

Design Risk Assessment	**Sheet Number:**	1 of 3
	Job Number:	WR7544/03
	Date:	April 2020

Subject	Hazards	Persons at Risk	Initial			Mitigation Measures	Residual			Action
			Severity	Likelihood	Risk		Severity	Likelihood	Risk	
General excavations, deep excavations and excavations from stockpiles	Risk to personnel and plant from excavation collapse Risk to personnel and plant from stockpile collapse	Construction Personnel	H	M	H	Regularly inspect excavations as work proceeds to identify potential failure areas	M	L	M	Contractor to provide details of working methods in construction phase health and safety plan, including assessment of ground stability for earthworks plant, and details of all restrictions to be imposed
						Excavated slopes to be battered back at appropriate angle/gradient	M	L	M	
						Organise excavation work such that plant is located on stable ground	M	L	M	
						Restrict access to excavations (both above and below the working face)	M	L	M	
Excavations within landfill waste	Risk to personnel from contact with waste, leachate, etc	Construction personnel	M	L	H	Check extent and location of excavations (with regard to existing cell works). Remove leachate from excavations on regular basis. Monitor for presence of landfill gas. Implement strict hygiene rules	L	L	L	Contractor to provide details in construction phase health and safety plan. Movements on and around waste to be restricted to absolute minimum. Maintain good personal hygiene. Wear gloves.
	Risk to personnel from landfill gas	Construction and landfill personnel	H	H	H		M	L	M	Refer to landfill safe working practices. Requirement for 'hot works' permit. No smoking on site. H_2S issues to be highlighted. All H_2S wells and chambers to be clearly marked by Employer prior to mobilisation of Contractor. Evacuation strategy to be included in construction phase health and safety plan.
Exposure of buried asbestos during regrade of capping areas/construction of cell tie-in	Risk of inhalation of airborne fibres	Construction personnel	H	L	M	Stop works and isolate area. Request inspection of excavation by FCC staff if any suspect materials are encountered. General restriction of access for non-essential personnel	H	L	M	Contractor to develop safe working methods to isolate any asbestos if encountered. If encountered, licensed specialist contractor to be appointed by contractor. ASB5 notification to be raised for HSE.
Working adjacent to excavations	Objects falling onto personnel and plant operating below	Construction personnel	H	M	M	Access to excavations, and edge of excavations, to be restricted	M	L	M	Contractor to provide details of restrictions
Water	Potential flooding of excavation due to intense rainfall combined with extensive catchment area	Construction personnel	L	M	M	Drainage ditches or sumps to be excavated to allow water to be diverted from, and removed from excavation	L	L	L	Weather reports to be monitored. Temporary drainage measures to be detailed in construction phase health and safety plan

Subject	Hazards	Persons at Risk	Initial			Mitigation Measures	Residual			Action
			Severity	Likelihood	Risk		Severity	Likelihood	Risk	
Groundwater	Instability/accumulation of groundwater/soft ground	Construction personnel	M	L	M	Pedestrian access to area to be restricted to essential personnel.	L	L	L	Contractor to provide details on managing groundwater if encountered during the works
Fire	Caused by oxygen drawn into waste mass	Construction and site personnel	H	L	M	Close liaison with LFG contractor (Infinis) during construction works with regard to disconnection/reconnection of gas wells, and relocation of collection pipework, to prevent oxygen being drawn in to the waste mass during the capping works.	L	L	L	Contractor to provide details in construction phase health and safety plan.
Working on or adjacent to soft ground	Subsidence of plant and machinery	Construction personnel	M	M	M	Review existing soils data. Monitor condition of soils as work proceeds	M	L	M	Contractor to develop working methods to cater for working over and adjacent to soft ground
Loading of excavation materials	Risk to personnel in vicinity of vehicles	Construction personnel	M	M	M	Drivers to position vehicles in safe locations	L	L	L	Contractor to provide details of loading arrangements in construction phase health and safety plan
						Access to loading area to be restricted	L	M	L	Contractor to provide details of restriction arrangements in construction phase health and safety plan
Working at heights	Fall into excavations	Construction personnel	H	M	H	Excavation depths and gradients to be minimised	M	L	M	Contractor to provide details of measures to be imposed, including barriers to be erected around excavations and restricted access provisions.
	Objects falling onto personnel below	Construction personnel	H	M	H	Access to excavations to be restricted	M	L	M	
Transportation of materials on site	Risk of vehicle collisions	Construction personnel	M	L	M	Access/egress arrangements to each works area to be self-explanatory	L	L	L	Contractor to provide details of access/egress arrangements, including signage, in construction phase health and safety plan
Working on steep slopes	Materials falling onto personnel and/or plant	Construction personnel	H	M	H	Materials to be placed at flat areas at the top of bottom of the slope	H	M	M	Contractor to develop safe working method for materials handling
	Vehicles overturning	Construction personnel	H	M	H	Contractor to avoid vehicular access routes at crests of slopes where possible. Edge protection to be provided as necessary.	M	L	M	Materials to be placed from base of slopes where possible. If placed from top of slopes, stop boards or other protective measures must be used.
	Personnel falling down slope	Construction personnel	H	M	H	Access to be restricted to essential personnel	L	L	L	Contractor to provide suitable edge protection, instruction, and if appropriate, fall arrest systems

Design Risk Assessment	**Sheet Number:**	3 of 3
	Job Number:	WR7544/03
	Date:	April 2020

Subject	Hazards	Persons at Risk	Initial			Mitigation Measures	Residual			Action
			Severity	Likelihood	Risk		Severity	Likelihood	Risk	
Site traffic/traffic management	Risk to personnel from moving plant and machinery	Construction and landfill personnel	M	L	M	Contractor to ensure that consideration has been given to vehicular and pedestrian traffic management	L	L	L	Separate pedestrian and vehicular access routes. Contractor to provide traffic management arrangements in construction phase health and safety plan. FCC site rules to be included within induction process, and enforced.
Deliveries	Risk of injury during unloading and handling	Construction personnel, delivery drivers	M	L	M	Contractor to ensure that all suppliers and subcontractor material deliveries are properly coordinated and due regard is given to the restriction of routes, programming and sizing of delivery vehicles.	M	L	L	Contractor to provide details in construction phase health and safety plan
Existing services	Risk to personnel from landfill gas mains, leachate pipes, compressed air lines and associated power cables	Construction personnel	M	M	H	Banksman to be employed when operating in close proximity to leachate and has wells or pipes. Contractor to ensure that all persons affected by existing services are aware of those services and take all necessary precautions to protect themselves and the services.	M	L	M	Contractor to identify services on site at commencement of construction works. Contractor to provide details of investigative procedures, e.g. CAT scanning Services drawing to be obtained from Employer on mobilisation to site.
	Risk to personnel from hidden services	Construction personnel	M	L	M	Contractor to ensure that all persons undertaking works likely to affect any hidden services are aware of their possible presence and take all necessary precautions to protect themselves and the services	M	L	L	Contractor to identify KNOWN services on site at commencement of construction works. Details of 'safe dig' procedures to be provided in construction phase health and safety plan.
	Risk of damage to services	Construction personnel	M	L	M	Contractor to ensure adequate support is provided to services exposed during excavations Contractor to check adequacy of goal posts with regard to overhead power cables and routing of plant and vehicles	L	L	L	Contractor to provide details in construction phase health and safety plan, and in traffic management plan

APPENDIX 2
PRINCIPAL QUANTITIES

FCC ENVIRONMENT

PROJECT ACTIVITY SCHEDULE

ACTIVITY	**LANDFILL**

SUB-ACTIVITY	**Surface Water Management**

CONTRACTOR	**TBC**
SITE NAME	**Milton Landfill Site**
SITE REF	
SIRIUS PROJECT REF.	**WR7544**
PROJECT NAME	**Milton Surface Water Scheme**
FCC PROJECT REF.	
ENGINEERING MANAGER	**Robert Ogden**
SITE START DATE	**TBC**
SITE WORKS DURATION	**TBC**

PROJECT DRIVER	**Surface Water Management**

NOTES:

Please note that this is the draft issue of quantities from the designer and the Contractor should verify these quantites before completing the Contractor Return Activity Schedule for agreement

Description of Works

General:-

Haul distances will be measured from the centre of the supply area to the centre of the final capped area.

Scope of Works:-

Construction of new surface water ditches around the site
Construction of a new attenuation lagoon in the north east of the site
Construction of cap deflection bund
Installation of culverts/lagoon inflow pipework
Installation of lagoon outfall pipework
Installation of isolation chamber and gate valve on lagoon outfall pipework
Installation of sandbag headwalls on lagoon inflow pipework and lagoon outfall pipework;
Installation of precast concrete headwalls on culverts and lagoon outfall pipework
Installation of orifice plate on lagoon outfall headwall
Installation of non-return valves on lagoon inflow pipework

Extra-ordinary Works

Milton Surface Water Scheme		
1.General Items		-
2.Drainage		-
3. Attenuation Lagoon		-
Project Total	£	-

FCC ENVIRONMENT

-

LANDFILL **Surface Water** **Milton Landfill Site**

	L3	L4	L5 L6	Quants 1	Meas Unit 1	Quants 2	Meas Unit 2	Unit Rate	Total Cost £
1	**General Items**								
	1	**Site Establishment & General Attendance**			Sum				-
	2	**Weekly Site Running Costs**			Weekly				-
	3	**Other works Outside the scope of Major Cost Centres**							
		1			Sum				-
		2			Sum				-
		3			Sum				-
		4			Sum				-
		5			Sum				-
								Total	-
2	**Drainage**								
	1								
			Pipework (100mm bedding, twice pipe dia cover, three times pipe dia width, stone backfill, all HDPE twinwall pipework)						
			150mm ID ne 3.5m average depth inc stone backfill		m				-
			225mm ditto		m				-
			2 x 225mm ID ne 750mm average depth inc stone bedding,surround and concrete cover slab with A393 Mesh	12	m				-
			2 x 225mm ID ne 750mm average depth inc stone bedding and surround	30	m				-
			3 x 225mm ID ne 750mm average depth inc stone bedding, surround and concrete cover slab with A393 Mesh	10	m				-
			3 x 300mm ID ne 750mm average depth inc stone bedding and surround	23	m				-
			3 x 300mm ID ne 750mm average depth inc stone bedding,surround and concrete cover slab with A393 Mesh	12	m				-
			300mm ID ne 1.7m average depth inc stone bedding and surround, 300mm cover and backfill arising	24	m				-
			375mm ditto		m				-
			400mm ditto		m				-
			450mm ditto		m				-
			600mm ditto		m				-
			750mm ditto		m				-
	2	Fittings							
		1	Bends		no.				-
		2	Junctions		no.				-
		3	Gate Valve (300mm)	1	no.				-
		4	Non Return Valve (225mm)	5	no.				-
		5	Non Return Valve (300mm)	3	no.				-
		6	Others		no.				-
	3	Manholes (pcc rings & cover slabs)							
			600mm dia ne 1.7m depth inc stone backfill & B125 covers & frames & concrete surround and A393 mesh		no.				-
			900mm ditto		no.				-
			1200mm ditto		no.				-
			1500mm ditto	1	no.				-
			1800mm ditto		no.				-
			EO for each additional 500mm depth inc stone backfill						
			600mm dia		no				-
			900mm dia		no				-
			1200mm dia		no		Mat Type		-
			1500mm dia		no				-
			1800mm dia		no				-
			EO for covers & frames						
			Type D250		no				-
			Type D400		no				-
	4	Headwall							
		1	Precast Concrete Headwall (6C A or Equailvalent) with 2 x 225mm pipe openings	1	no				-
		2	Precast Concrete Headwall (10C A or Equailvalent) with 3 x 225mm pipe openings	1	no				-
		3	Precast Concrete Headwall (10C A or Equailvalent) with 1 x 300mm pipe opening	1	no				-
		4	Precast Concrete Headwall (15C A or Equailvalent) with 3 x 300mm pipe opening	1	no				-
		5	Concrete Sandbag Headwall	4	no				-
	5	Geocomposite Layer			m2				-
	6	Ditches (x-section area)							
			ne 2m2/m	3216	m				-
			over 2m2 ne 4m2/m		m				-
			over 4m2 ne 6m2/m		m				-
			over 8m2 ne 10m2/m		m				-
			Clearance of exisitng ditches	1817	m				-
	7	Ditch Fill to Raise Cover Level of Exisiting Ditches							
		1	Import		m3				-
		2	Excavate From on site / Imported.						
			1 0 Haul		m3				-
			2 Not exceeding 250m Haul		m3				-
			3 More Than 250m Haul ne 500m haul		m3				-
			4 More Than 500m Haul ne 1000m haul		m3				-
			5 More than 1000m haul (per 500m)		m3				-
		3	Spread level & compact		m3				-
	8	Orifice Plates							
			270mm Orifice Plate	1	no				-
	9	Penstock Valve			no				-
	10	Erosion Matting			m2				-
	11	Reno Matress			m2				-
	12	Surface Water Deflection Bund - 500mm High x 500mm Wide with 1 in 1 sides		382	m				-
								Total	-
3	**Attenuation Lagoon**								
	1	Lagoon Excavate							
		1	Excavation to form lagoon						
			1 0 Haul		m3				-
			2 Not exceeding 250m Haul		m3				-
			3 More Than 250m Haul ne 500m haul		m3				-
			4 More Than 500m Haul ne 1000m haul	11264	m3				-
			5 More than 1000m haul (per 500m)		m3				-
			5 Export		m3				-
	2	Lagoon Fill							
		1	Import		m3				-
		2	Excavate From on site / Imported.						
			1 0 Haul		m3				-
			2 Not exceeding 250m Haul		m3				-
			3 More Than 250m Haul ne 500m haul		m3				-
			4 More Than 500m Haul ne 1000m haul		m3				-
			5 More than 1000m haul (per 500m)		m3				-
		3	Spread level & compact		m3				-
		4	Trim Surface	593	m2				-
		5	Form stockpile onsite inc sealing surface	10671	m3				-
	3	**Fencing and Gates**							
		1	Triple Post and Wire Fence with hedging	947	m				-
		2	Metal Field Farm Gate	1	no				-
		3	Pedestrian Gate	1	no				-
	4	**Other Items**							
		1	Lifebuoy	3	no				-
		2	Deep water and no swimming sign	5	no				-
								Total	-
		Grand Totals							-

Contract Risk Register

Site
Project Title
Project Number
Contractor **XXX**

		Date	Signature
Signed on behalf of the Contractor			
NEC Supervisor			
NEC Project Manager	**Stuart Mitchell**		

		Risk Owner	Likelihood	Severity	Provisional sum
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					

APPENDIX 3
MICRODRAINAGE CALCULATIONS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.450	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Time Area Diagram for Storm

Time (mins)	Area (ha)
0-4	0.000

Total Area Contributing (ha) = 0.000

Total Pipe Volume (m³) = 4859.394

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	62.000	0.900	68.9	0.000	5.00	0.0	0.030	\/	-2	Pipe/Conduit		
1.001	499.000	1.000	499.0	0.000	0.00	0.0	0.030	\/	-2	Pipe/Conduit		
1.002	462.000	1.000	462.0	0.000	0.00	0.0	0.030	\/	-2	Pipe/Conduit		
1.003	346.000	0.700	494.3	0.000	0.00	0.0	0.030	\/	-2	Pipe/Conduit		
1.004	504.000	1.000	504.0	0.000	0.00	0.0	0.030	\/	-2	Pipe/Conduit		
1.005	190.000	0.475	400.0	0.000	0.00	0.0	0.030	\/	-2	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)
1.000	50.00	5.63	16.000	0.000	0.0	0.0	0.0	1.64	820.6	0.0
1.001	27.56	19.27	15.100	0.000	0.0	0.0	0.0	0.61	304.9	0.0
1.002	20.66	30.00	14.100	0.000	0.0	0.0	0.0	0.63	316.9	0.0
1.003	20.66	30.00	13.100	0.000	0.0	0.0	0.0	0.61	306.3	0.0
1.004	20.66	30.00	12.400	0.000	0.0	0.0	0.0	0.61	303.4	0.0
1.005	20.66	30.00	11.400	0.000	0.0	0.0	0.0	0.68	340.5	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.006	50.000	0.125	400.0	0.000	0.00	0.0		0.030	\/	-2	Pipe/Conduit	
1.007	40.000	0.100	400.0	0.000	0.00	0.0	0.600		ooo	-14	Pipe/Conduit	
2.000	366.000	1.000	366.0	0.000	5.00	0.0		0.030	\/	-2	Pipe/Conduit	
2.001	55.000	0.900	61.1	0.000	0.00	0.0		0.030	\/	-2	Pipe/Conduit	
2.002	14.000	0.400	35.0	0.000	0.00	0.0	0.600		oo	-16	Pipe/Conduit	
3.000	333.000	3.400	97.9	0.000	5.00	0.0		0.030	\/	-2	Pipe/Conduit	
3.001	357.000	1.700	210.0	0.000	0.00	0.0		0.030	\/	-2	Pipe/Conduit	
3.002	48.000	0.400	120.0	0.000	0.00	0.0	0.600		ooo	-17	Pipe/Conduit	
1.008	25.000	0.100	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	
1.009	539.000	1.500	359.3	0.000	0.00	0.0		0.030	\/	-3	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)
1.006	20.66	30.00	10.925	0.000	0.0	0.0	0.0	0.68	340.5	0.0
1.007	20.66	30.00	10.700	0.000	0.0	0.0	0.0	0.78	165.4	0.0
2.000	34.24	13.57	12.900	0.000	0.0	0.0	0.0	0.71	356.0	0.0
2.001	33.47	14.09	11.900	0.000	0.0	0.0	0.0	1.74	871.2	0.0
2.002	33.32	14.20	11.000	0.000	0.0	0.0	0.0	2.22	176.4	0.0
3.000	43.09	9.03	16.100	0.000	0.0	0.0	0.0	1.38	688.2	0.0
3.001	31.76	15.36	12.700	0.000	0.0	0.0	0.0	0.94	470.0	0.0
3.002	30.94	16.03	11.000	0.000	0.0	0.0	0.0	1.19	142.2	0.0
1.008	20.66	30.00	9.900	0.000	0.0	0.0	0.0	0.99	70.0	0.0
1.009	20.66	30.00	9.800	0.000	0.0	0.0	0.0	1.49	8917.2	0.0

Conduit Sections for Storm

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

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m²)
-2	\/	500	500	45.0		1.045	0.500
-3	\/	1000	1500	26.6		3.113	5.993
-14	ooo	900	300			0.300	0.212
-16	oo	450	225			0.225	0.080

Conduit Sections for Storm

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m^2)
-17	ooo	675	225			0.225	0.119

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	\/	-2	1	16.500	16.000	0.000	Junction	
1.001	\/	-2	2	15.600	15.100	0.000	Junction	
1.002	\/	-2	3	14.600	14.100	0.000	Junction	
1.003	\/	-2	4	13.600	13.100	0.000	Junction	
1.004	\/	-2	5	12.900	12.400	0.000	Junction	
1.005	\/	-2	6	11.900	11.400	0.000	Junction	
1.006	\/	-2	7	11.425	10.925	0.000	Junction	
1.007	ooo	-14	7	11.300	10.700	0.100	Junction	
2.000	\/	-2	7	13.400	12.900	0.000	Junction	
2.001	\/	-2	8	12.400	11.900	0.000	Junction	
2.002	oo	-16	10	11.500	11.000	0.275	Open Manhole	10000
3.000	\/	-2	9	16.600	16.100	0.000	Junction	
3.001	\/	-2	10	13.200	12.700	0.000	Junction	
3.002	ooo	-17	13	11.500	11.000	0.275	Open Manhole	10000
1.008	o	300	11	11.200	9.900	1.000	Junction	
1.009	\/	-3	11	11.100	9.800	-0.200	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	62.000	68.9	2	15.600	15.100	0.000	Junction	
1.001	499.000	499.0	3	14.600	14.100	0.000	Junction	
1.002	462.000	462.0	4	13.600	13.100	0.000	Junction	
1.003	346.000	494.3	5	12.900	12.400	0.000	Junction	
1.004	504.000	504.0	6	11.900	11.400	0.000	Junction	
1.005	190.000	400.0	7	11.425	10.925	0.000	Junction	
1.006	50.000	400.0	7	11.300	10.800	0.000	Junction	
1.007	40.000	400.0	11	11.200	10.600	0.100	Junction	
2.000	366.000	366.0	8	12.400	11.900	0.000	Junction	
2.001	55.000	61.1	10	11.500	11.000	0.000	Open Manhole	10000
2.002	14.000	35.0	11	11.200	10.600	0.375	Junction	
3.000	333.000	97.9	10	13.200	12.700	0.000	Junction	
3.001	357.000	210.0	13	11.500	11.000	0.000	Open Manhole	10000
3.002	48.000	120.0	11	11.200	10.600	0.375	Junction	
1.008	25.000	250.0	11	11.100	9.800	1.000	Junction	
1.009	539.000	359.3		10.500	8.300	0.700	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.009		10.500	8.300	0.000	0	0

Online Controls for Storm

Orifice Manhole: 11, DS/PN: 1.008, Volume (m³): 14.3

Diameter (m) 0.270 Discharge Coefficient 0.600 Invert Level (m) 9.900

Storage Structures for Storm

Tank or Pond Manhole: 11, DS/PN: 1.008

Invert Level (m) 9.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	9783.0	1.200	12115.0

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

Simulation Criteria

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

Number of Input Hydrographs	10	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	240 Summer	1	+0%				
1.001	2	360 Summer	1	+0%				
1.002	3	360 Summer	1	+0%				
1.003	4	360 Summer	1	+0%				
1.004	5	360 Summer	1	+0%				
1.005	6	360 Summer	1	+0%				
1.006	7	360 Summer	1	+0%				
1.007	7	360 Summer	1	+0%	100/30 Summer			
2.000	7	240 Summer	1	+0%				
2.001	8	360 Summer	1	+0%				
2.002	10	360 Summer	1	+0%				
3.000	9	240 Summer	1	+0%				
3.001	10	360 Summer	1	+0%				
3.002	13	360 Summer	1	+0%	100/240 Summer			
1.008	11	1440 Summer	1	+0%	30/60 Summer			
1.009	11	1440 Summer	1	+0%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	16.005	-0.495	0.000	0.00		1.4	OK	
1.001	2	15.198	-0.402	0.000	0.05		16.7	OK	
1.002	3	14.247	-0.353	0.000	0.10		32.5	OK	
1.003	4	13.284	-0.316	0.000	0.16		48.0	OK	
1.004	5	12.627	-0.273	0.000	0.22		68.3	FLOOD RISK*	
1.005	6	11.619	-0.281	0.000	0.21		72.5	FLOOD RISK*	
1.006	7	11.144	-0.281	0.000	0.21		72.5	FLOOD RISK*	
1.007	7	10.838	-0.162	0.000	0.44		72.5	OK*	
2.000	7	13.033	-0.367	0.000	0.09		31.5	OK	
2.001	8	11.978	-0.422	0.000	0.04		32.7	OK	
2.002	10	11.068	-0.157	0.000	0.21		32.7	OK	
3.000	9	16.154	-0.446	0.000	0.02		13.2	OK	
3.001	10	12.818	-0.382	0.000	0.07		34.6	OK	
3.002	13	11.076	-0.149	0.000	0.25		34.6	OK	
1.008	11	10.137	-0.063	0.000	0.52		36.3	OK*	
1.009	11	9.866	-1.434	0.000	0.00		36.3	OK	

Input Hydrograph Manhole 1, DS/PN 1.000 (Storm)
240 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	0.221
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	62.000	SPR	47.000
H(85%) (m)	18.050	LAG (hrs)	0.000
H(10%) (m)	16.350	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	90	Q (l/s)	3.1	PR (%)	34.750
T (mins)	8	TB (mins)	238	S1085 (m/km)	36.559
TPt (mins)	94	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.0	16	0.0	28	0.0	40	0.0	52	0.1	64	0.1
8	0.0	20	0.0	32	0.0	44	0.0	56	0.1	68	0.1
12	0.0	24	0.0	36	0.0	48	0.0	60	0.1	72	0.1

Input Hydrograph Manhole 1, DS/PN 1.000 (Storm)
240 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
76	0.1	144	0.7	212	1.4	280	1.0	348	0.3	416	0.0
80	0.1	148	0.8	216	1.4	284	0.9	352	0.2	420	0.0
84	0.1	152	0.8	220	1.4	288	0.9	356	0.2	424	0.0
88	0.2	156	0.9	224	1.4	292	0.8	360	0.2	428	0.0
92	0.2	160	0.9	228	1.4	296	0.8	364	0.2	432	0.0
96	0.2	164	1.0	232	1.4	300	0.8	368	0.1	436	0.0
100	0.2	168	1.0	236	1.4	304	0.7	372	0.1	440	0.0
104	0.3	172	1.1	240	1.3	308	0.7	376	0.1	444	0.0
108	0.3	176	1.1	244	1.3	312	0.6	380	0.1	448	0.0
112	0.3	180	1.2	248	1.3	316	0.6	384	0.1	452	0.0
116	0.4	184	1.2	252	1.2	320	0.5	388	0.1	456	0.0
120	0.4	188	1.3	256	1.2	324	0.5	392	0.1	460	0.0
124	0.4	192	1.3	260	1.2	328	0.5	396	0.1	464	0.0
128	0.5	196	1.4	264	1.1	332	0.4	400	0.1	468	0.0
132	0.5	200	1.4	268	1.1	336	0.4	404	0.1	472	0.0
136	0.6	204	1.4	272	1.0	340	0.3	408	0.0	476	0.0
140	0.6	208	1.4	276	1.0	344	0.3	412	0.0	480	0.0

Input Hydrograph Manhole 2, DS/PN 1.001 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.549
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	490.000	SPR	47.000
H(85%) (m)	20.500	LAG (hrs)	0.000
H(10%) (m)	15.900	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	207	Q (l/s)	27.8	PR (%)	34.750
T (mins)	18	TB (mins)	545	S1085 (m/km)	12.517
TPt (mins)	216	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.0	12	0.0	18	0.1	24	0.1	30	0.1	36	0.1

Input Hydrograph Manhole 2, DS/PN 1.001 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
42	0.2	156	1.9	270	9.6	384	16.1	498	12.6	612	6.2
48	0.2	162	2.2	276	10.0	390	16.2	504	12.3	618	5.8
54	0.2	168	2.5	282	10.5	396	16.2	510	11.9	624	5.5
60	0.3	174	2.7	288	10.9	402	16.1	516	11.6	630	5.2
66	0.3	180	3.1	294	11.3	408	16.1	522	11.3	636	4.9
72	0.4	186	3.5	300	11.8	414	15.9	528	11.0	642	4.5
78	0.4	192	3.8	306	12.2	420	15.8	534	10.6	648	4.2
84	0.5	198	4.3	312	12.6	426	15.6	540	10.3	654	3.9
90	0.6	204	4.7	318	13.0	432	15.4	546	9.9	660	3.6
96	0.6	210	5.1	324	13.4	438	15.2	552	9.6	666	3.3
102	0.7	216	5.6	330	13.8	444	15.0	558	9.2	672	3.1
108	0.8	222	6.0	336	14.2	450	14.7	564	8.9	678	2.8
114	0.9	228	6.4	342	14.5	456	14.5	570	8.5	684	2.5
120	1.0	234	6.9	348	14.9	462	14.3	576	8.2	690	2.3
126	1.1	240	7.3	354	15.2	468	14.0	582	7.9	696	2.0
132	1.2	246	7.8	360	15.4	474	13.7	588	7.5	702	1.8
138	1.4	252	8.2	366	15.7	480	13.4	594	7.2	708	1.6
144	1.5	258	8.7	372	15.9	486	13.2	600	6.8	714	1.4
150	1.7	264	9.1	378	16.0	492	12.9	606	6.5	720	1.4

Input Hydrograph Manhole 3, DS/PN 1.002 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.391
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	456.000	SPR	47.000
H(85%) (m)	19.000	LAG (hrs)	0.000
H(10%) (m)	14.500	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	201	Q (l/s)	27.7	PR (%)	34.750
T (mins)	18	TB (mins)	528	S1085 (m/km)	13.158
TPt (mins)	210	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 3, DS/PN 1.002 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.0	126	1.1	246	8.0	366	15.7	486	12.5	606	5.7
12	0.0	132	1.3	252	8.4	372	15.9	492	12.2	612	5.4
18	0.1	138	1.4	258	8.9	378	15.9	498	11.9	618	5.1
24	0.1	144	1.6	264	9.3	384	16.0	504	11.6	624	4.7
30	0.1	150	1.8	270	9.8	390	16.0	510	11.3	630	4.4
36	0.1	156	2.0	276	10.2	396	15.9	516	10.9	636	4.1
42	0.2	162	2.2	282	10.7	402	15.8	522	10.6	642	3.8
48	0.2	168	2.5	288	11.1	408	15.7	528	10.2	648	3.5
54	0.2	174	2.8	294	11.5	414	15.5	534	9.9	654	3.2
60	0.3	180	3.2	300	12.0	420	15.4	540	9.6	660	2.9
66	0.3	186	3.6	306	12.4	426	15.2	546	9.2	666	2.6
72	0.4	192	3.9	312	12.8	432	15.0	552	8.8	672	2.4
78	0.4	198	4.4	318	13.2	438	14.7	558	8.5	678	2.1
84	0.5	204	4.8	324	13.6	444	14.5	564	8.1	684	1.9
90	0.6	210	5.2	330	13.9	450	14.2	570	7.8	690	1.7
96	0.6	216	5.7	336	14.3	456	14.0	576	7.4	696	1.5
102	0.7	222	6.1	342	14.6	462	13.7	582	7.1	702	1.3
108	0.8	228	6.6	348	15.0	468	13.4	588	6.7	708	1.2
114	0.9	234	7.0	354	15.3	474	13.1	594	6.4	714	1.1
120	1.0	240	7.5	360	15.5	480	12.9	600	6.1	720	1.1

Input Hydrograph Manhole 4, DS/PN 1.003 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.063
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	347.000	SPR	47.000
H(85%) (m)	19.900	LAG (hrs)	0.000
H(10%) (m)	14.000	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	157	Q (l/s)	32.2	PR (%)	34.750
T (mins)	18	TB (mins)	419	S1085 (m/km)	22.671
TPt (mins)	166	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 4, DS/PN 1.003 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	126	1.6	246	10.9	366	17.0	486	9.2	606	1.5
12	0.1	132	1.8	252	11.5	372	16.8	492	8.8	612	1.4
18	0.1	138	2.0	258	12.1	378	16.5	498	8.3	618	1.2
24	0.1	144	2.3	264	12.6	384	16.2	504	7.8	624	1.1
30	0.1	150	2.6	270	13.2	390	15.9	510	7.3	630	1.0
36	0.2	156	2.9	276	13.7	396	15.5	516	6.9	636	0.9
42	0.2	162	3.3	282	14.3	402	15.2	522	6.4	642	0.8
48	0.3	168	3.7	288	14.8	408	14.8	528	5.9	648	0.7
54	0.3	174	4.1	294	15.3	414	14.4	534	5.5	654	0.6
60	0.4	180	4.6	300	15.8	420	14.0	540	5.1	660	0.5
66	0.5	186	5.1	306	16.1	426	13.7	546	4.6	666	0.5
72	0.5	192	5.6	312	16.5	432	13.2	552	4.2	672	0.4
78	0.6	198	6.2	318	16.9	438	12.8	558	3.8	678	0.4
84	0.7	204	6.8	324	17.1	444	12.4	564	3.4	684	0.3
90	0.8	210	7.3	330	17.3	450	12.0	570	3.0	690	0.3
96	0.9	216	7.9	336	17.5	456	11.5	576	2.7	696	0.2
102	1.0	222	8.5	342	17.4	462	11.1	582	2.4	702	0.2
108	1.2	228	9.1	348	17.4	468	10.6	588	2.1	708	0.2
114	1.3	234	9.7	354	17.4	474	10.2	594	1.9	714	0.1
120	1.5	240	10.3	360	17.2	480	9.7	600	1.7	720	0.1

Input Hydrograph Manhole 5, DS/PN 1.004 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	5.429
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	504.000	SPR	47.000
H(85%) (m)	20.100	LAG (hrs)	0.000
H(10%) (m)	13.600	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	188	Q (l/s)	36.4	PR (%)	34.750
T (mins)	18	TB (mins)	496	S1085 (m/km)	17.196
TPt (mins)	197	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 5, DS/PN 1.004 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	126	1.6	246	11.0	366	20.7	486	15.0	606	5.6
12	0.1	132	1.8	252	11.6	372	20.8	492	14.5	612	5.2
18	0.1	138	1.9	258	12.2	378	20.7	498	14.1	618	4.8
24	0.1	144	2.2	264	12.8	384	20.6	504	13.6	624	4.3
30	0.1	150	2.5	270	13.4	390	20.5	510	13.1	630	4.0
36	0.2	156	2.7	276	14.0	396	20.3	516	12.7	636	3.6
42	0.2	162	3.1	282	14.6	402	20.1	522	12.2	642	3.2
48	0.3	168	3.5	288	15.2	408	19.9	528	11.7	648	2.9
54	0.3	174	3.9	294	15.8	414	19.5	534	11.2	654	2.6
60	0.4	180	4.5	300	16.4	420	19.2	540	10.7	660	2.3
66	0.5	186	5.0	306	16.9	426	18.9	546	10.2	666	2.0
72	0.5	192	5.5	312	17.5	432	18.6	552	9.8	672	1.8
78	0.6	198	6.1	318	18.0	438	18.2	558	9.3	678	1.6
84	0.7	204	6.7	324	18.5	444	17.9	564	8.8	684	1.4
90	0.8	210	7.3	330	18.9	450	17.5	570	8.3	690	1.3
96	0.9	216	7.9	336	19.4	456	17.1	576	7.9	696	1.1
102	1.0	222	8.5	342	19.7	462	16.7	582	7.4	702	1.0
108	1.1	228	9.1	348	20.1	468	16.3	588	6.9	708	0.9
114	1.3	234	9.7	354	20.4	474	15.8	594	6.5	714	0.8
120	1.4	240	10.4	360	20.5	480	15.4	600	6.0	720	0.8

Input Hydrograph Manhole 6, DS/PN 1.005 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	1.160
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	283.000	SPR	47.000
H(85%) (m)	20.200	LAG (hrs)	0.000
H(10%) (m)	13.400	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	134	Q (l/s)	10.9	PR (%)	34.750
T (mins)	12	TB (mins)	353	S1085 (m/km)	32.038
TPt (mins)	140	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 6, DS/PN 1.005 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.0	126	0.6	246	3.9	366	5.0	486	1.8	606	0.2
12	0.0	132	0.7	252	4.1	372	4.9	492	1.7	612	0.2
18	0.0	138	0.7	258	4.3	378	4.8	498	1.5	618	0.1
24	0.0	144	0.8	264	4.5	384	4.6	504	1.4	624	0.1
30	0.0	150	0.9	270	4.7	390	4.5	510	1.2	630	0.1
36	0.1	156	1.0	276	4.9	396	4.3	516	1.1	636	0.1
42	0.1	162	1.1	282	5.0	402	4.2	522	1.0	642	0.1
48	0.1	168	1.3	288	5.2	408	4.0	528	0.9	648	0.1
54	0.1	174	1.4	294	5.3	414	3.9	534	0.8	654	0.0
60	0.1	180	1.6	300	5.4	420	3.7	540	0.7	660	0.0
66	0.2	186	1.7	306	5.5	426	3.5	546	0.6	666	0.0
72	0.2	192	1.9	312	5.6	432	3.4	552	0.5	672	0.0
78	0.2	198	2.1	318	5.6	438	3.2	558	0.5	678	0.0
84	0.3	204	2.3	324	5.6	444	3.0	564	0.4	684	0.0
90	0.3	210	2.6	330	5.6	450	2.9	570	0.4	690	0.0
96	0.3	216	2.8	336	5.5	456	2.7	576	0.3	696	0.0
102	0.4	222	3.0	342	5.4	462	2.5	582	0.3	702	0.0
108	0.4	228	3.2	348	5.3	468	2.4	588	0.3	708	0.0
114	0.5	234	3.4	354	5.2	474	2.2	594	0.2	714	0.0
120	0.5	240	3.6	360	5.1	480	2.0	600	0.2	720	0.0

Input Hydrograph Manhole 7, DS/PN 2.000 (Storm)
240 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	7.341
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	346.000	SPR	47.000
H(85%) (m)	19.600	LAG (hrs)	0.000
H(10%) (m)	13.700	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	157	Q (l/s)	58.7	PR (%)	34.750
T (mins)	16	TB (mins)	416	S1085 (m/km)	22.736
TPt (mins)	165	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 7, DS/PN 2.000 (Storm)
240 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.1	84	2.1	164	14.0	244	28.8	324	28.6	404	17.9
8	0.1	88	2.3	168	14.8	248	29.4	328	28.2	408	17.3
12	0.1	92	2.5	172	15.6	252	29.9	332	27.7	412	16.7
16	0.2	96	2.9	176	16.3	256	30.3	336	27.3	416	16.1
20	0.2	100	3.2	180	17.1	260	30.7	340	26.8	420	15.5
24	0.3	104	3.6	184	17.9	264	31.1	344	26.3	424	14.9
28	0.3	108	4.1	188	18.7	268	31.4	348	25.8	428	14.3
32	0.4	112	4.6	192	19.5	272	31.5	352	25.3	432	13.8
36	0.5	116	5.2	196	20.3	276	31.5	356	24.8	436	13.2
40	0.5	120	5.8	200	21.0	280	31.6	360	24.3	440	12.6
44	0.6	124	6.4	204	21.8	284	31.6	364	23.7	444	12.0
48	0.7	128	7.1	208	22.5	288	31.4	368	23.2	448	11.5
52	0.8	132	7.8	212	23.3	292	31.2	372	22.6	452	10.9
56	0.9	136	8.5	216	24.0	296	31.1	376	22.1	456	10.4
60	1.0	140	9.3	220	24.8	300	30.8	380	21.5	460	9.8
64	1.2	144	10.0	224	25.5	304	30.5	384	20.9	464	9.3
68	1.3	148	10.8	228	26.2	308	30.1	388	20.3	468	8.7
72	1.5	152	11.6	232	26.9	312	29.8	392	19.7	472	8.2
76	1.6	156	12.4	236	27.5	316	29.4	396	19.1	476	7.7
80	1.8	160	13.2	240	28.2	320	29.0	400	18.5	480	7.2

Input Hydrograph Manhole 8, DS/PN 2.001 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	0.533
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	70.000	SPR	47.000
H(85%) (m)	19.600	LAG (hrs)	0.000
H(10%) (m)	13.350	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	63	Q (l/s)	10.7	PR (%)	34.750
T (mins)	6	TB (mins)	166	S1085 (m/km)	119.048
TPt (mins)	66	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 8, DS/PN 2.001 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.0	126	0.7	246	4.0	366	0.9	486	0.1	606	0.0
12	0.0	132	0.8	252	4.0	372	0.8	492	0.0	612	0.0
18	0.0	138	0.8	258	3.9	378	0.8	498	0.0	618	0.0
24	0.0	144	0.9	264	3.8	384	0.7	504	0.0	624	0.0
30	0.1	150	1.0	270	3.7	390	0.7	510	0.0	630	0.0
36	0.1	156	1.1	276	3.5	396	0.6	516	0.0	636	0.0
42	0.1	162	1.2	282	3.3	402	0.6	522	0.0	642	0.0
48	0.1	168	1.3	288	3.1	408	0.5	528	0.0	648	0.0
54	0.2	174	1.4	294	2.9	414	0.5	534	0.0	654	0.0
60	0.2	180	1.6	300	2.7	420	0.4	540	0.0	660	0.0
66	0.3	186	1.9	306	2.5	426	0.4	546	0.0	666	0.0
72	0.3	192	2.1	312	2.3	432	0.3	552	0.0	672	0.0
78	0.4	198	2.4	318	2.1	438	0.3	558	0.0	678	0.0
84	0.4	204	2.6	324	1.9	444	0.2	564	0.0	684	0.0
90	0.5	210	2.9	330	1.7	450	0.2	570	0.0	690	0.0
96	0.5	216	3.2	336	1.5	456	0.2	576	0.0	696	0.0
102	0.5	222	3.4	342	1.3	462	0.1	582	0.0	702	0.0
108	0.6	228	3.6	348	1.2	468	0.1	588	0.0	708	0.0
114	0.6	234	3.8	354	1.1	474	0.1	594	0.0	714	0.0
120	0.7	240	3.9	360	1.0	480	0.1	600	0.0	720	0.0

Input Hydrograph Manhole 9, DS/PN 3.000 (Storm)
240 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	3.107
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	350.000	SPR	47.000
H(85%) (m)	20.200	LAG (hrs)	0.000
H(10%) (m)	14.500	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	160	Q (l/s)	24.4	PR (%)	34.750
T (mins)	16	TB (mins)	423	S1085 (m/km)	21.714
TPt (mins)	168	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 9, DS/PN 3.000 (Storm)
240 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.0	84	0.8	164	5.7	244	11.9	324	12.1	404	7.8
8	0.0	88	0.9	168	6.1	248	12.1	328	11.9	408	7.5
12	0.1	92	1.0	172	6.4	252	12.3	332	11.7	412	7.3
16	0.1	96	1.2	176	6.7	256	12.5	336	11.6	416	7.0
20	0.1	100	1.3	180	7.0	260	12.7	340	11.4	420	6.8
24	0.1	104	1.5	184	7.4	264	12.9	344	11.2	424	6.5
28	0.1	108	1.7	188	7.7	268	13.0	348	11.0	428	6.3
32	0.2	112	1.9	192	8.0	272	13.1	352	10.8	432	6.1
36	0.2	116	2.1	196	8.3	276	13.1	356	10.6	436	5.8
40	0.2	120	2.4	200	8.6	280	13.2	360	10.3	440	5.6
44	0.2	124	2.6	204	9.0	284	13.2	364	10.1	444	5.3
48	0.3	128	2.9	208	9.3	288	13.2	368	9.9	448	5.1
52	0.3	132	3.2	212	9.6	292	13.1	372	9.7	452	4.9
56	0.4	136	3.5	216	9.9	296	13.0	376	9.5	456	4.6
60	0.4	140	3.8	220	10.2	300	12.9	380	9.2	460	4.4
64	0.5	144	4.1	224	10.5	304	12.8	384	9.0	464	4.2
68	0.5	148	4.4	228	10.8	308	12.7	388	8.7	468	4.0
72	0.6	152	4.7	232	11.1	312	12.6	392	8.5	472	3.7
76	0.7	156	5.1	236	11.3	316	12.4	396	8.3	476	3.5
80	0.8	160	5.4	240	11.6	320	12.3	400	8.0	480	3.3

Input Hydrograph Manhole 10, DS/PN 3.001 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	5.396
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	398.000	SPR	47.000
H(85%) (m)	18.900	LAG (hrs)	0.000
H(10%) (m)	13.600	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	176	Q (l/s)	38.5	PR (%)	34.750
T (mins)	18	TB (mins)	467	S1085 (m/km)	17.755
TPt (mins)	185	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 10, DS/PN 3.001 (Storm)
360 minute 1 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	126	1.8	246	12.1	366	21.5	486	14.1	606	4.0
12	0.1	132	2.0	252	12.8	372	21.4	492	13.6	612	3.6
18	0.1	138	2.2	258	13.5	378	21.2	498	13.1	618	3.2
24	0.1	144	2.5	264	14.1	384	21.0	504	12.6	624	2.8
30	0.2	150	2.8	270	14.8	390	20.8	510	12.0	630	2.6
36	0.2	156	3.1	276	15.4	396	20.5	516	11.5	636	2.3
42	0.3	162	3.5	282	16.1	402	20.2	522	11.0	642	2.0
48	0.3	168	4.0	288	16.7	408	19.9	528	10.4	648	1.8
54	0.4	174	4.4	294	17.3	414	19.5	534	9.9	654	1.6
60	0.4	180	5.0	300	17.9	420	19.1	540	9.4	660	1.4
66	0.5	186	5.6	306	18.5	426	18.8	546	8.9	666	1.3
72	0.6	192	6.2	312	19.0	432	18.3	552	8.3	672	1.1
78	0.7	198	6.8	318	19.6	438	17.9	558	7.8	678	1.0
84	0.8	204	7.4	324	20.0	444	17.5	564	7.3	684	0.9
90	0.9	210	8.1	330	20.4	450	17.0	570	6.8	690	0.8
96	1.0	216	8.8	336	20.8	456	16.5	576	6.3	696	0.7
102	1.1	222	9.4	342	21.1	462	16.1	582	5.8	702	0.6
108	1.3	228	10.1	348	21.3	468	15.6	588	5.3	708	0.6
114	1.4	234	10.8	354	21.5	474	15.1	594	4.9	714	0.5
120	1.6	240	11.5	360	21.5	480	14.6	600	4.4	720	0.5

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

Simulation Criteria

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

Number of Input Hydrographs	10	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	1	120 Summer	30	+0%				
1.001	2	360 Summer	30	+0%				
1.002	3	360 Summer	30	+0%				
1.003	4	360 Summer	30	+0%				
1.004	5	360 Summer	30	+0%				
1.005	6	360 Summer	30	+0%				
1.006	7	360 Summer	30	+0%				
1.007	7	360 Summer	30	+0%	100/30 Summer			
2.000	7	240 Summer	30	+0%				
2.001	8	360 Summer	30	+0%				
2.002	10	360 Summer	30	+0%				
3.000	9	240 Summer	30	+0%				
3.001	10	360 Summer	30	+0%				
3.002	13	360 Summer	30	+0%	100/240 Summer			
1.008	11	1440 Summer	30	+0%	30/60 Summer			
1.009	11	1440 Summer	30	+0%				

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	16.012	-0.488	0.000	0.00		3.3	OK	
1.001	2	15.265	-0.335	0.000	0.13		38.7	OK	
1.002	3	14.335	-0.265	0.000	0.24		75.4	FLOOD RISK*	
1.003	4	13.394	-0.206	0.000	0.36		111.5	FLOOD RISK*	
1.004	5	12.759	-0.141	0.000	0.52		158.4	FLOOD RISK*	
1.005	6	11.749	-0.151	0.000	0.49		168.2	FLOOD RISK*	
1.006	7	11.274	-0.151	0.000	0.49		168.1	FLOOD RISK*	
1.007	7	10.958	-0.042	0.000	1.02		168.1	OK*	
2.000	7	13.115	-0.285	0.000	0.21		73.3	FLOOD RISK*	
2.001	8	12.031	-0.369	0.000	0.09		75.9	OK	
2.002	10	11.111	-0.114	0.000	0.49		75.8	OK	
3.000	9	16.187	-0.413	0.000	0.04		30.7	OK	
3.001	10	12.893	-0.307	0.000	0.17		80.3	OK	
3.002	13	11.125	-0.100	0.000	0.59		80.3	OK	
1.008	11	10.420	0.220	0.000	1.06		74.3	SURCHARGED*	
1.009	11	9.936	-1.364	0.000	0.01		74.3	OK	

Input Hydrograph Manhole 1, DS/PN 1.000 (Storm)
120 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	0.221
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	62.000	SPR	47.000
H(85%) (m)	18.050	LAG (hrs)	0.000
H(10%) (m)	16.350	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	90	Q (l/s)	3.1	PR (%)	34.750
T (mins)	8	TB (mins)	238	S1085 (m/km)	36.559
TPt (mins)	94	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.0	16	0.0	28	0.1	40	0.2	52	0.3	64	0.6
8	0.0	20	0.0	32	0.1	44	0.2	56	0.4	68	0.7
12	0.0	24	0.1	36	0.1	48	0.2	60	0.5	72	0.9

Input Hydrograph Manhole 1, DS/PN 1.000 (Storm)
120 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
76	1.0	136	3.1	196	2.6	256	1.0	316	0.1	376	0.0
80	1.2	140	3.2	200	2.5	260	0.9	320	0.0	380	0.0
84	1.3	144	3.3	204	2.4	264	0.8	324	0.0	384	0.0
88	1.5	148	3.3	208	2.3	268	0.7	328	0.0	388	0.0
92	1.6	152	3.3	212	2.2	272	0.6	332	0.0	392	0.0
96	1.8	156	3.3	216	2.1	276	0.5	336	0.0	396	0.0
100	1.9	160	3.3	220	2.0	280	0.4	340	0.0	400	0.0
104	2.1	164	3.3	224	1.9	284	0.4	344	0.0	404	0.0
108	2.2	168	3.2	228	1.7	288	0.3	348	0.0	408	0.0
112	2.3	172	3.1	232	1.6	292	0.2	352	0.0	412	0.0
116	2.5	176	3.1	236	1.5	296	0.2	356	0.0	416	0.0
120	2.6	180	3.0	240	1.4	300	0.1	360	0.0		
124	2.8	184	2.9	244	1.3	304	0.1	364	0.0		
128	2.9	188	2.8	248	1.2	308	0.1	368	0.0		
132	3.0	192	2.7	252	1.1	312	0.1	372	0.0		

Input Hydrograph Manhole 2, DS/PN 1.001 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.549
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	490.000	SPR	47.000
H(85%) (m)	20.500	LAG (hrs)	0.000
H(10%) (m)	15.900	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	207	Q (l/s)	27.8	PR (%)	36.307
T (mins)	18	TB (mins)	545	S1085 (m/km)	12.517
TPt (mins)	216	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	24	0.2	42	0.4	60	0.6	78	1.0	96	1.4
12	0.1	30	0.2	48	0.4	66	0.7	84	1.1	102	1.6
18	0.1	36	0.3	54	0.5	72	0.8	90	1.3	108	1.8

Input Hydrograph Manhole 2, DS/PN 1.001 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
114	2.0	216	12.9	318	30.2	420	36.6	522	26.2	624	12.8
120	2.2	222	13.9	324	31.1	426	36.3	528	25.5	630	12.0
126	2.5	228	15.0	330	32.0	432	35.8	534	24.7	636	11.3
132	2.8	234	16.0	336	32.9	438	35.3	540	23.9	642	10.5
138	3.1	240	17.0	342	33.7	444	34.8	546	23.1	648	9.8
144	3.6	246	18.1	348	34.5	450	34.3	552	22.3	654	9.1
150	4.0	252	19.1	354	35.3	456	33.7	558	21.5	660	8.4
156	4.4	258	20.2	360	35.9	462	33.1	564	20.7	666	7.8
162	5.1	264	21.2	366	36.4	468	32.5	570	19.8	672	7.1
168	5.7	270	22.2	372	37.0	474	31.9	576	19.0	678	6.4
174	6.3	276	23.3	378	37.2	480	31.2	582	18.2	684	5.8
180	7.2	282	24.3	384	37.5	486	30.5	588	17.4	690	5.2
186	8.0	288	25.3	390	37.7	492	29.9	594	16.6	696	4.7
192	8.9	294	26.3	396	37.6	498	29.2	600	15.9	702	4.2
198	9.9	300	27.3	402	37.4	504	28.5	606	15.1	708	3.7
204	10.9	306	28.3	408	37.3	510	27.7	612	14.3	714	3.3
210	11.9	312	29.2	414	37.0	516	27.0	618	13.5	720	3.3

Input Hydrograph Manhole 3, DS/PN 1.002 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.391
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	456.000	SPR	47.000
H(85%) (m)	19.000	LAG (hrs)	0.000
H(10%) (m)	14.500	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	201	Q (l/s)	27.7	PR (%)	36.307
T (mins)	18	TB (mins)	528	S1085 (m/km)	13.158
TPt (mins)	210	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	12	0.1	18	0.1	24	0.2	30	0.2	36	0.3

Input Hydrograph Manhole 3, DS/PN 1.002 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
42	0.4	156	4.5	270	22.7	384	37.1	498	27.7	612	12.5
48	0.4	162	5.2	276	23.7	390	37.1	504	26.9	618	11.7
54	0.5	168	5.9	282	24.7	396	36.9	510	26.2	624	11.0
60	0.6	174	6.5	288	25.7	402	36.7	516	25.4	630	10.2
66	0.7	180	7.4	294	26.7	408	36.5	522	24.6	636	9.5
72	0.9	186	8.3	300	27.8	414	36.1	528	23.8	642	8.8
78	1.0	192	9.1	306	28.7	420	35.7	534	23.0	648	8.1
84	1.1	198	10.1	312	29.7	426	35.3	540	22.2	654	7.4
90	1.3	204	11.2	318	30.6	432	34.7	546	21.4	660	6.7
96	1.5	210	12.2	324	31.5	438	34.2	552	20.5	666	6.1
102	1.6	216	13.2	330	32.4	444	33.7	558	19.7	672	5.5
108	1.9	222	14.2	336	33.3	450	33.1	564	18.9	678	4.9
114	2.1	228	15.3	342	34.0	456	32.5	570	18.1	684	4.4
120	2.3	234	16.3	348	34.7	462	31.8	576	17.3	690	3.9
126	2.6	240	17.4	354	35.5	468	31.2	582	16.4	696	3.4
132	2.9	246	18.5	360	35.9	474	30.5	588	15.6	702	3.1
138	3.2	252	19.5	366	36.4	480	29.8	594	14.8	708	2.8
144	3.7	258	20.6	372	36.9	486	29.1	600	14.1	714	2.4
150	4.1	264	21.6	378	37.0	492	28.4	606	13.3	720	2.4

Input Hydrograph Manhole 4, DS/PN 1.003 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.063
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	347.000	SPR	47.000
H(85%) (m)	19.900	LAG (hrs)	0.000
H(10%) (m)	14.000	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	157	Q (l/s)	32.2	PR (%)	36.307
T (mins)	18	TB (mins)	419	S1085 (m/km)	22.671
TPt (mins)	166	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 4, DS/PN 1.003 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	126	3.8	246	25.3	366	39.4	486	21.4	606	3.5
12	0.1	132	4.3	252	26.7	372	39.0	492	20.4	612	3.2
18	0.2	138	4.7	258	28.0	378	38.3	498	19.3	618	2.8
24	0.2	144	5.4	264	29.4	384	37.6	504	18.2	624	2.5
30	0.3	150	6.0	270	30.6	390	36.9	510	17.1	630	2.2
36	0.4	156	6.6	276	31.9	396	36.1	516	16.0	636	2.0
42	0.5	162	7.6	282	33.2	402	35.3	522	14.9	642	1.8
48	0.6	168	8.5	288	34.3	408	34.5	528	13.8	648	1.6
54	0.8	174	9.4	294	35.5	414	33.5	534	12.7	654	1.4
60	0.9	180	10.6	300	36.6	420	32.6	540	11.7	660	1.2
66	1.1	186	11.8	306	37.5	426	31.7	546	10.7	666	1.1
72	1.3	192	13.0	312	38.4	432	30.7	552	9.7	672	1.0
78	1.4	198	14.3	318	39.3	438	29.8	558	8.8	678	0.8
84	1.6	204	15.7	324	39.7	444	28.8	564	7.9	684	0.7
90	1.9	210	17.0	330	40.1	450	27.8	570	7.1	690	0.6
96	2.1	216	18.4	336	40.6	456	26.7	576	6.4	696	0.5
102	2.4	222	19.8	342	40.5	462	25.7	582	5.7	702	0.4
108	2.7	228	21.2	348	40.4	468	24.7	588	5.0	708	0.3
114	3.0	234	22.5	354	40.3	474	23.6	594	4.5	714	0.3
120	3.4	240	23.9	360	39.9	480	22.5	600	4.0	720	0.3

Input Hydrograph Manhole 5, DS/PN 1.004 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	5.429
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	504.000	SPR	47.000
H(85%) (m)	20.100	LAG (hrs)	0.000
H(10%) (m)	13.600	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	188	Q (l/s)	36.4	PR (%)	36.307
T (mins)	18	TB (mins)	496	S1085 (m/km)	17.196
TPt (mins)	197	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 5, DS/PN 1.004 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	126	3.6	246	25.5	366	48.0	486	34.8	606	13.0
12	0.1	132	4.1	252	26.9	372	48.3	492	33.7	612	12.0
18	0.2	138	4.5	258	28.4	378	48.1	498	32.7	618	11.0
24	0.2	144	5.1	264	29.8	384	47.9	504	31.6	624	10.0
30	0.3	150	5.7	270	31.2	390	47.7	510	30.5	630	9.2
36	0.4	156	6.4	276	32.6	396	47.1	516	29.4	636	8.3
42	0.5	162	7.3	282	34.0	402	46.6	522	28.3	642	7.4
48	0.6	168	8.2	288	35.3	408	46.1	528	27.2	648	6.7
54	0.7	174	9.1	294	36.7	414	45.4	534	26.1	654	5.9
60	0.9	180	10.3	300	38.0	420	44.7	540	24.9	660	5.2
66	1.0	186	11.6	306	39.3	426	44.0	546	23.8	666	4.7
72	1.2	192	12.8	312	40.5	432	43.2	552	22.7	672	4.2
78	1.4	198	14.2	318	41.8	438	42.3	558	21.5	678	3.7
84	1.6	204	15.5	324	42.9	444	41.5	564	20.4	684	3.3
90	1.8	210	16.9	330	44.0	450	40.6	570	19.3	690	3.0
96	2.0	216	18.3	336	45.1	456	39.7	576	18.2	696	2.6
102	2.3	222	19.8	342	45.9	462	38.8	582	17.2	702	2.4
108	2.6	228	21.2	348	46.6	468	37.8	588	16.1	708	2.1
114	2.9	234	22.6	354	47.4	474	36.8	594	15.0	714	1.9
120	3.2	240	24.1	360	47.7	480	35.8	600	14.0	720	1.9

Input Hydrograph Manhole 6, DS/PN 1.005 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	1.160
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	283.000	SPR	47.000
H(85%) (m)	20.200	LAG (hrs)	0.000
H(10%) (m)	13.400	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	134	Q (l/s)	10.9	PR (%)	36.307
T (mins)	12	TB (mins)	353	S1085 (m/km)	32.038
TPt (mins)	140	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 6, DS/PN 1.005 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.0	126	1.4	246	9.0	366	11.7	486	4.3	606	0.4
12	0.0	132	1.5	252	9.5	372	11.4	492	3.9	612	0.4
18	0.0	138	1.7	258	9.9	378	11.1	498	3.5	618	0.3
24	0.1	144	1.9	264	10.4	384	10.7	504	3.2	624	0.3
30	0.1	150	2.1	270	10.9	390	10.4	510	2.8	630	0.2
36	0.1	156	2.3	276	11.3	396	10.1	516	2.5	636	0.2
42	0.2	162	2.6	282	11.7	402	9.7	522	2.2	642	0.2
48	0.2	168	2.9	288	12.0	408	9.3	528	2.0	648	0.1
54	0.3	174	3.3	294	12.4	414	9.0	534	1.8	654	0.1
60	0.3	180	3.6	300	12.6	420	8.6	540	1.6	660	0.1
66	0.4	186	4.0	306	12.8	426	8.2	546	1.4	666	0.1
72	0.4	192	4.5	312	12.9	432	7.8	552	1.2	672	0.0
78	0.5	198	5.0	318	13.0	438	7.5	558	1.1	678	0.0
84	0.6	204	5.4	324	13.0	444	7.1	564	1.0	684	0.0
90	0.7	210	5.9	330	12.9	450	6.7	570	0.9	690	0.0
96	0.8	216	6.4	336	12.8	456	6.3	576	0.8	696	0.0
102	0.9	222	6.9	342	12.6	462	5.9	582	0.7	702	0.0
108	1.0	228	7.5	348	12.4	468	5.5	588	0.6	708	0.0
114	1.1	234	8.0	354	12.2	474	5.1	594	0.6	714	0.0
120	1.2	240	8.5	360	11.9	480	4.7	600	0.5	720	0.0

Input Hydrograph Manhole 7, DS/PN 2.000 (Storm)
240 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	7.341
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	346.000	SPR	47.000
H(85%) (m)	19.600	LAG (hrs)	0.000
H(10%) (m)	13.700	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	157	Q (l/s)	58.7	PR (%)	35.571
T (mins)	16	TB (mins)	416	S1085 (m/km)	22.736
TPt (mins)	165	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 7, DS/PN 2.000 (Storm)
240 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.2	84	4.7	164	32.5	244	67.0	324	66.6	404	41.7
8	0.2	88	5.2	168	34.4	248	68.4	328	65.6	408	40.3
12	0.3	92	5.9	172	36.2	252	69.6	332	64.6	412	38.9
16	0.4	96	6.7	176	38.1	256	70.5	336	63.5	416	37.5
20	0.5	100	7.5	180	39.9	260	71.5	340	62.4	420	36.1
24	0.6	104	8.4	184	41.7	264	72.5	344	61.3	424	34.7
28	0.7	108	9.4	188	43.6	268	73.0	348	60.1	428	33.4
32	0.9	112	10.7	192	45.4	272	73.3	352	58.9	432	32.0
36	1.0	116	12.1	196	47.2	276	73.5	356	57.7	436	30.7
40	1.2	120	13.4	200	49.0	280	73.7	360	56.5	440	29.3
44	1.4	124	14.9	204	50.8	284	73.6	364	55.3	444	28.0
48	1.6	128	16.5	208	52.5	288	73.2	368	54.0	448	26.7
52	1.9	132	18.2	212	54.2	292	72.8	372	52.7	452	25.4
56	2.1	136	19.8	216	56.0	296	72.4	376	51.4	456	24.1
60	2.4	140	21.5	220	57.7	300	71.8	380	50.0	460	22.8
64	2.7	144	23.4	224	59.3	304	71.0	384	48.6	464	21.6
68	3.0	148	25.2	228	61.0	308	70.2	388	47.3	468	20.3
72	3.4	152	27.0	232	62.6	312	69.4	392	45.9	472	19.1
76	3.8	156	28.8	236	64.2	316	68.6	396	44.5	476	17.8
80	4.3	160	30.7	240	65.6	320	67.6	400	43.1	480	16.7

Input Hydrograph Manhole 8, DS/PN 2.001 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	0.533
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	70.000	SPR	47.000
H(85%) (m)	19.600	LAG (hrs)	0.000
H(10%) (m)	13.350	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	63	Q (l/s)	10.7	PR (%)	36.307
T (mins)	6	TB (mins)	166	S1085 (m/km)	119.048
TPt (mins)	66	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 8, DS/PN 2.001 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.0	126	1.7	246	9.2	366	2.1	486	0.1	606	0.0
12	0.0	132	1.8	252	9.2	372	2.0	492	0.1	612	0.0
18	0.1	138	1.9	258	9.1	378	1.8	498	0.1	618	0.0
24	0.1	144	2.1	264	8.9	384	1.7	504	0.0	624	0.0
30	0.1	150	2.2	270	8.5	390	1.6	510	0.0	630	0.0
36	0.2	156	2.4	276	8.2	396	1.5	516	0.0	636	0.0
42	0.3	162	2.7	282	7.7	402	1.3	522	0.0	642	0.0
48	0.3	168	3.0	288	7.3	408	1.2	528	0.0	648	0.0
54	0.4	174	3.4	294	6.8	414	1.1	534	0.0	654	0.0
60	0.5	180	3.8	300	6.3	420	1.0	540	0.0	660	0.0
66	0.6	186	4.3	306	5.8	426	0.9	546	0.0	666	0.0
72	0.7	192	4.9	312	5.3	432	0.8	552	0.0	672	0.0
78	0.8	198	5.5	318	4.8	438	0.7	558	0.0	678	0.0
84	0.9	204	6.1	324	4.3	444	0.6	564	0.0	684	0.0
90	1.0	210	6.7	330	3.9	450	0.5	570	0.0	690	0.0
96	1.1	216	7.3	336	3.4	456	0.4	576	0.0	696	0.0
102	1.2	222	7.9	342	3.1	462	0.3	582	0.0	702	0.0
108	1.3	228	8.4	348	2.8	468	0.3	588	0.0	708	0.0
114	1.4	234	8.8	354	2.5	474	0.2	594	0.0	714	0.0
120	1.5	240	9.1	360	2.3	480	0.2	600	0.0	720	0.0

Input Hydrograph Manhole 9, DS/PN 3.000 (Storm)
240 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	3.107
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	350.000	SPR	47.000
H(85%) (m)	20.200	LAG (hrs)	0.000
H(10%) (m)	14.500	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	160	Q (l/s)	24.4	PR (%)	35.571
T (mins)	16	TB (mins)	423	S1085 (m/km)	21.714
TPt (mins)	168	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 9, DS/PN 3.000 (Storm)
240 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.1	84	1.9	164	13.3	244	27.6	324	28.2	404	18.1
8	0.1	88	2.1	168	14.1	248	28.2	328	27.8	408	17.5
12	0.1	92	2.4	172	14.8	252	28.7	332	27.4	412	16.9
16	0.2	96	2.7	176	15.6	256	29.2	336	26.9	416	16.4
20	0.2	100	3.1	180	16.4	260	29.6	340	26.5	420	15.8
24	0.2	104	3.4	184	17.1	264	30.0	344	26.0	424	15.2
28	0.3	108	3.9	188	17.9	268	30.3	348	25.6	428	14.7
32	0.4	112	4.4	192	18.6	272	30.5	352	25.1	432	14.1
36	0.4	116	4.9	196	19.4	276	30.6	356	24.6	436	13.5
40	0.5	120	5.5	200	20.1	280	30.8	360	24.1	440	13.0
44	0.6	124	6.1	204	20.8	284	30.8	364	23.6	444	12.4
48	0.7	128	6.8	208	21.6	288	30.6	368	23.1	448	11.9
52	0.8	132	7.4	212	22.3	292	30.5	372	22.5	452	11.4
56	0.9	136	8.1	216	23.0	296	30.4	376	22.0	456	10.8
60	1.0	140	8.8	220	23.7	300	30.2	380	21.5	460	10.3
64	1.1	144	9.6	224	24.4	304	29.9	384	20.9	464	9.8
68	1.2	148	10.3	228	25.1	308	29.6	388	20.4	468	9.2
72	1.4	152	11.0	232	25.8	312	29.3	392	19.8	472	8.7
76	1.5	156	11.8	236	26.4	316	28.9	396	19.2	476	8.2
80	1.7	160	12.6	240	27.0	320	28.5	400	18.6	480	7.7

Input Hydrograph Manhole 10, DS/PN 3.001 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	5.396
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	398.000	SPR	47.000
H(85%) (m)	18.900	LAG (hrs)	0.000
H(10%) (m)	13.600	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	176	Q (l/s)	38.5	PR (%)	36.307
T (mins)	18	TB (mins)	467	S1085 (m/km)	17.755
TPt (mins)	185	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 10, DS/PN 3.001 (Storm)
360 minute 30 year Summer I+0%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	126	4.1	246	28.2	366	49.9	486	32.8	606	9.3
12	0.1	132	4.6	252	29.7	372	49.8	492	31.6	612	8.4
18	0.2	138	5.1	258	31.3	378	49.3	498	30.4	618	7.5
24	0.3	144	5.8	264	32.8	384	48.9	504	29.2	624	6.6
30	0.3	150	6.4	270	34.3	390	48.4	510	28.0	630	5.9
36	0.5	156	7.1	276	35.8	396	47.7	516	26.7	636	5.3
42	0.6	162	8.2	282	37.3	402	46.9	522	25.5	642	4.6
48	0.7	168	9.2	288	38.8	408	46.2	528	24.3	648	4.1
54	0.8	174	10.3	294	40.2	414	45.3	534	23.0	654	3.7
60	1.0	180	11.6	300	41.6	420	44.5	540	21.8	660	3.3
66	1.1	186	12.9	306	42.9	426	43.6	546	20.6	666	2.9
72	1.3	192	14.3	312	44.2	432	42.6	552	19.3	672	2.6
78	1.6	198	15.8	318	45.4	438	41.6	558	18.1	678	2.3
84	1.8	204	17.3	324	46.4	444	40.6	564	17.0	684	2.1
90	2.0	210	18.8	330	47.4	450	39.5	570	15.8	690	1.9
96	2.3	216	20.3	336	48.4	456	38.4	576	14.6	696	1.7
102	2.6	222	21.9	342	48.9	462	37.3	582	13.5	702	1.5
108	2.9	228	23.5	348	49.4	468	36.2	588	12.4	708	1.3
114	3.3	234	25.0	354	50.0	474	35.1	594	11.3	714	1.1
120	3.6	240	26.6	360	49.9	480	33.9	600	10.3	720	1.1

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

Simulation Criteria

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

Number of Input Hydrographs	10	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.450
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	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, 0, 30

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	120 Summer	100	+30%					16.024
1.001	2	360 Summer	100	+30%					15.335
1.002	3	360 Summer	100	+30%					14.430
1.003	4	360 Summer	100	+30%					13.511
1.004	5	360 Summer	100	+30%					12.896
1.005	6	360 Summer	100	+30%					11.882
1.006	7	360 Summer	100	+30%					11.407
1.007	7	360 Summer	100	+30%	100/30 Summer				11.251
2.000	7	240 Summer	100	+30%					13.207
2.001	8	240 Summer	100	+30%					12.089
2.002	10	240 Summer	100	+30%					11.183
3.000	9	240 Summer	100	+30%					16.229
3.001	10	240 Summer	100	+30%					12.977
3.002	13	240 Summer	100	+30%	100/240 Summer				11.303
1.008	11	960 Summer	100	+30%	30/60 Summer				10.859
1.009	11	960 Summer	100	+30%					9.970

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.476	0.000	0.01		6.4	OK	
1.001	2	-0.265	0.000	0.24		72.9	FLOOD RISK*	
1.002	3	-0.170	0.000	0.45		141.9	FLOOD RISK*	
1.003	4	-0.089	0.000	0.68		209.8	FLOOD RISK*	
1.004	5	-0.004	0.000	0.98		298.0	FLOOD RISK*	
1.005	6	-0.018	0.000	0.93		316.4	FLOOD RISK*	
1.006	7	-0.018	0.000	0.93		316.4	FLOOD RISK*	
1.007	7	0.251	0.000	1.91		316.3	FLOOD RISK*	
2.000	7	-0.193	0.000	0.39		139.5	FLOOD RISK*	
2.001	8	-0.311	0.000	0.17		144.1	OK	
2.002	10	-0.042	0.000	0.94		144.0	OK	
3.000	9	-0.371	0.000	0.08		58.5	OK	
3.001	10	-0.223	0.000	0.32		152.0	FLOOD RISK*	
3.002	13	0.078	0.000	1.11		150.6	FLOOD RISK	
1.008	11	0.659	0.000	1.59		111.6	SURCHARGED*	
1.009	11	-1.330	0.000	0.01		111.6	OK	

Input Hydrograph Manhole 1, DS/PN 1.000 (Storm)
120 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	0.221
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	62.000	SPR	47.000
H(85%) (m)	18.050	LAG (hrs)	0.000
H(10%) (m)	16.350	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	90	Q (l/s)	3.1	PR (%)	38.712
T (mins)	8	TB (mins)	238	S1085 (m/km)	36.559
TPt (mins)	94	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.0	16	0.1	28	0.1	40	0.3	52	0.6	64	1.2
8	0.0	20	0.1	32	0.2	44	0.4	56	0.7	68	1.4
12	0.0	24	0.1	36	0.2	48	0.5	60	0.9	72	1.7

Input Hydrograph Manhole 1, DS/PN 1.000 (Storm)
120 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
76	1.9	136	5.9	196	5.0	256	1.9	316	0.1	376	0.0
80	2.2	140	6.1	200	4.8	260	1.7	320	0.1	380	0.0
84	2.5	144	6.2	204	4.6	264	1.5	324	0.1	384	0.0
88	2.8	148	6.3	208	4.4	268	1.4	328	0.0	388	0.0
92	3.1	152	6.4	212	4.2	272	1.2	332	0.0	392	0.0
96	3.3	156	6.4	216	4.0	276	1.0	336	0.0	396	0.0
100	3.6	160	6.3	220	3.7	280	0.8	340	0.0	400	0.0
104	3.9	164	6.2	224	3.5	284	0.7	344	0.0	404	0.0
108	4.2	168	6.1	228	3.3	288	0.6	348	0.0	408	0.0
112	4.5	172	6.0	232	3.1	292	0.4	352	0.0	412	0.0
116	4.7	176	5.8	236	2.9	296	0.4	356	0.0	416	0.0
120	5.0	180	5.7	240	2.7	300	0.3	360	0.0		
124	5.3	184	5.5	244	2.5	304	0.2	364	0.0		
128	5.5	188	5.3	248	2.3	308	0.2	368	0.0		
132	5.7	192	5.1	252	2.1	312	0.1	372	0.0		

Input Hydrograph Manhole 2, DS/PN 1.001 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.549
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	490.000	SPR	47.000
H(85%) (m)	20.500	LAG (hrs)	0.000
H(10%) (m)	15.900	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	207	Q (l/s)	27.8	PR (%)	40.447
T (mins)	18	TB (mins)	545	S1085 (m/km)	12.517
TPt (mins)	216	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	24	0.3	42	0.6	60	1.1	78	1.8	96	2.7
12	0.1	30	0.4	48	0.8	66	1.3	84	2.0	102	3.0
18	0.2	36	0.5	54	1.0	72	1.6	90	2.4	108	3.4

Input Hydrograph Manhole 2, DS/PN 1.001 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
114	3.8	216	24.3	318	56.8	420	69.0	522	49.4	624	24.0
120	4.2	222	26.2	324	58.5	426	68.3	528	47.9	630	22.6
126	4.8	228	28.1	330	60.2	432	67.4	534	46.5	636	21.2
132	5.3	234	30.1	336	62.0	438	66.5	540	45.0	642	19.9
138	5.9	240	32.1	342	63.5	444	65.6	546	43.5	648	18.5
144	6.7	246	34.0	348	64.9	450	64.5	552	42.0	654	17.2
150	7.5	252	36.0	354	66.4	456	63.4	558	40.4	660	15.8
156	8.3	258	38.0	360	67.5	462	62.4	564	38.9	666	14.6
162	9.5	264	39.9	366	68.6	468	61.2	570	37.3	672	13.3
168	10.7	270	41.9	372	69.7	474	60.0	576	35.8	678	12.1
174	11.9	276	43.8	378	70.1	480	58.8	582	34.3	684	11.0
180	13.5	282	45.7	384	70.5	486	57.5	588	32.8	690	9.9
186	15.1	288	47.6	390	71.0	492	56.2	594	31.3	696	8.8
192	16.7	294	49.5	396	70.7	498	54.9	600	29.8	702	7.9
198	18.6	300	51.4	402	70.5	504	53.6	606	28.4	708	7.0
204	20.5	306	53.2	408	70.3	510	52.2	612	26.9	714	6.2
210	22.3	312	55.0	414	69.6	516	50.8	618	25.5	720	6.2

Input Hydrograph Manhole 3, DS/PN 1.002 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.391
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	456.000	SPR	47.000
H(85%) (m)	19.000	LAG (hrs)	0.000
H(10%) (m)	14.500	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	201	Q (l/s)	27.7	PR (%)	40.447
T (mins)	18	TB (mins)	528	S1085 (m/km)	13.158
TPt (mins)	210	Base Flow (l/s)	0.0		

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.1	12	0.1	18	0.2	24	0.3	30	0.4	36	0.5

Input Hydrograph Manhole 3, DS/PN 1.002 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
42	0.7	156	8.5	270	42.7	384	69.8	498	52.1	612	23.5
48	0.8	162	9.8	276	44.6	390	69.9	504	50.7	618	22.1
54	1.0	168	11.0	282	46.6	396	69.5	510	49.2	624	20.7
60	1.2	174	12.3	288	48.5	402	69.1	516	47.8	630	19.3
66	1.4	180	13.9	294	50.4	408	68.7	522	46.3	636	17.9
72	1.6	186	15.6	300	52.3	414	67.9	528	44.8	642	16.5
78	1.9	192	17.2	306	54.1	420	67.2	534	43.3	648	15.2
84	2.1	198	19.1	312	55.9	426	66.4	540	41.8	654	13.9
90	2.4	204	21.0	318	57.7	432	65.4	546	40.2	660	12.6
96	2.7	210	22.9	324	59.3	438	64.4	552	38.7	666	11.5
102	3.1	216	24.8	330	61.0	444	63.4	558	37.1	672	10.3
108	3.5	222	26.8	336	62.7	450	62.3	564	35.6	678	9.2
114	3.9	228	28.8	342	64.0	456	61.1	570	34.0	684	8.3
120	4.3	234	30.8	348	65.4	462	60.0	576	32.5	690	7.4
126	4.9	240	32.8	354	66.8	468	58.7	582	31.0	696	6.5
132	5.5	246	34.8	360	67.7	474	57.4	588	29.4	702	5.8
138	6.0	252	36.7	366	68.5	480	56.2	594	27.9	708	5.2
144	6.9	258	38.7	372	69.4	486	54.8	600	26.5	714	4.5
150	7.7	264	40.7	378	69.6	492	53.5	606	25.0	720	4.5

Input Hydrograph Manhole 4, DS/PN 1.003 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	4.063
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	347.000	SPR	47.000
H(85%) (m)	19.900	LAG (hrs)	0.000
H(10%) (m)	14.000	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	157	Q (l/s)	32.2	PR (%)	40.447
T (mins)	18	TB (mins)	419	S1085 (m/km)	22.671
TPt (mins)	166	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 4, DS/PN 1.003 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.2	126	7.2	246	47.7	366	74.3	486	40.4	606	6.6
12	0.2	132	8.0	252	50.2	372	73.4	492	38.3	612	5.9
18	0.3	138	8.8	258	52.7	378	72.1	498	36.3	618	5.3
24	0.4	144	10.1	264	55.3	384	70.8	504	34.2	624	4.7
30	0.6	150	11.3	270	57.7	390	69.6	510	32.1	630	4.2
36	0.8	156	12.5	276	60.1	396	68.0	516	30.0	636	3.8
42	1.0	162	14.3	282	62.5	402	66.4	522	28.0	642	3.3
48	1.2	168	16.0	288	64.7	408	64.9	528	26.0	648	3.0
54	1.4	174	17.7	294	66.8	414	63.2	534	24.0	654	2.6
60	1.7	180	20.0	300	69.0	420	61.4	540	22.1	660	2.3
66	2.0	186	22.2	306	70.6	426	59.7	546	20.2	666	2.0
72	2.3	192	24.5	312	72.3	432	57.9	552	18.3	672	1.8
78	2.7	198	27.0	318	73.9	438	56.0	558	16.6	678	1.5
84	3.1	204	29.5	324	74.7	444	54.2	564	14.9	684	1.3
90	3.5	210	32.0	330	75.5	450	52.3	570	13.3	690	1.1
96	4.0	216	34.6	336	76.4	456	50.3	576	12.0	696	0.9
102	4.5	222	37.2	342	76.2	462	48.4	582	10.6	702	0.8
108	5.1	228	39.8	348	76.1	468	46.4	588	9.3	708	0.6
114	5.7	234	42.4	354	76.0	474	44.4	594	8.4	714	0.5
120	6.3	240	45.0	360	75.1	480	42.4	600	7.5	720	0.5

Input Hydrograph Manhole 5, DS/PN 1.004 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	5.429
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	504.000	SPR	47.000
H(85%) (m)	20.100	LAG (hrs)	0.000
H(10%) (m)	13.600	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	188	Q (l/s)	36.4	PR (%)	40.447
T (mins)	18	TB (mins)	496	S1085 (m/km)	17.196
TPt (mins)	197	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 5, DS/PN 1.004 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.2	126	6.8	246	48.0	366	90.4	486	65.4	606	24.4
12	0.2	132	7.6	252	50.7	372	90.9	492	63.5	612	22.6
18	0.3	138	8.5	258	53.4	378	90.5	498	61.5	618	20.7
24	0.4	144	9.6	264	56.1	384	90.2	504	59.5	624	18.9
30	0.6	150	10.8	270	58.7	390	89.8	510	57.4	630	17.2
36	0.7	156	11.9	276	61.3	396	88.8	516	55.4	636	15.6
42	0.9	162	13.7	282	64.0	402	87.8	522	53.3	642	13.9
48	1.1	168	15.4	288	66.5	408	86.8	528	51.2	648	12.5
54	1.4	174	17.2	294	69.0	414	85.5	534	49.1	654	11.2
60	1.6	180	19.5	300	71.6	420	84.2	540	46.9	660	9.8
66	1.9	186	21.8	306	73.9	426	82.8	546	44.8	666	8.8
72	2.2	192	24.1	312	76.3	432	81.3	552	42.6	672	7.9
78	2.6	198	26.7	318	78.7	438	79.7	558	40.6	678	6.9
84	2.9	204	29.2	324	80.7	444	78.2	564	38.5	684	6.2
90	3.4	210	31.8	330	82.8	450	76.4	570	36.4	690	5.6
96	3.8	216	34.5	336	84.8	456	74.7	576	34.3	696	4.9
102	4.3	222	37.2	342	86.3	462	73.0	582	32.3	702	4.4
108	4.9	228	39.9	348	87.8	468	71.1	588	30.3	708	4.0
114	5.5	234	42.6	354	89.3	474	69.3	594	28.3	714	3.5
120	6.0	240	45.3	360	89.9	480	67.4	600	26.4	720	3.5

Input Hydrograph Manhole 6, DS/PN 1.005 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	1.160
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	283.000	SPR	47.000
H(85%) (m)	20.200	LAG (hrs)	0.000
H(10%) (m)	13.400	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	134	Q (l/s)	10.9	PR (%)	40.447
T (mins)	12	TB (mins)	353	S1085 (m/km)	32.038
TPt (mins)	140	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 6, DS/PN 1.005 (Storm)
360 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
6	0.0	126	2.6	246	16.9	366	22.0	486	8.0	606	0.8
12	0.1	132	2.9	252	17.8	372	21.4	492	7.3	612	0.7
18	0.1	138	3.2	258	18.7	378	20.8	498	6.6	618	0.6
24	0.1	144	3.6	264	19.6	384	20.2	504	5.9	624	0.5
30	0.2	150	4.0	270	20.5	390	19.6	510	5.3	630	0.4
36	0.2	156	4.4	276	21.3	396	18.9	516	4.7	636	0.4
42	0.3	162	4.9	282	22.0	402	18.3	522	4.2	642	0.3
48	0.4	168	5.5	288	22.7	408	17.6	528	3.7	648	0.2
54	0.5	174	6.1	294	23.3	414	16.9	534	3.3	654	0.2
60	0.6	180	6.8	300	23.7	420	16.2	540	2.9	660	0.2
66	0.7	186	7.6	306	24.1	426	15.5	546	2.6	666	0.1
72	0.8	192	8.4	312	24.4	432	14.8	552	2.3	672	0.1
78	0.9	198	9.3	318	24.5	438	14.0	558	2.1	678	0.1
84	1.1	204	10.2	324	24.4	444	13.3	564	1.9	684	0.0
90	1.3	210	11.2	330	24.3	450	12.5	570	1.7	690	0.0
96	1.4	216	12.1	336	24.1	456	11.8	576	1.5	696	0.0
102	1.6	222	13.1	342	23.8	462	11.0	582	1.3	702	0.0
108	1.8	228	14.0	348	23.4	468	10.3	588	1.2	708	0.0
114	2.0	234	15.0	354	23.0	474	9.5	594	1.0	714	0.0
120	2.3	240	15.9	360	22.5	480	8.8	600	0.9	720	0.0

Input Hydrograph Manhole 7, DS/PN 2.000 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	7.341
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	346.000	SPR	47.000
H(85%) (m)	19.600	LAG (hrs)	0.000
H(10%) (m)	13.700	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	157	Q (l/s)	58.7	PR (%)	39.843
T (mins)	16	TB (mins)	416	S1085 (m/km)	22.736
TPt (mins)	165	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 7, DS/PN 2.000 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.4	84	9.0	164	61.9	244	127.5	324	126.8	404	79.3
8	0.4	88	10.0	168	65.4	248	130.2	328	125.0	408	76.6
12	0.5	92	11.2	172	68.9	252	132.5	332	123.0	412	74.0
16	0.7	96	12.8	176	72.5	256	134.3	336	120.9	416	71.4
20	0.9	100	14.3	180	76.0	260	136.1	340	118.8	420	68.7
24	1.1	104	15.9	184	79.5	264	137.9	344	116.7	424	66.1
28	1.3	108	17.9	188	82.9	268	139.1	348	114.5	428	63.5
32	1.6	112	20.4	192	86.4	272	139.5	352	112.2	432	61.0
36	1.9	116	23.0	196	89.8	276	139.9	356	109.9	436	58.4
40	2.2	120	25.5	200	93.2	280	140.3	360	107.6	440	55.9
44	2.6	124	28.3	204	96.6	284	140.1	364	105.2	444	53.3
48	3.1	128	31.4	208	99.9	288	139.3	368	102.7	448	50.9
52	3.5	132	34.6	212	103.3	292	138.5	372	100.3	452	48.4
56	3.9	136	37.7	216	106.6	296	137.7	376	97.8	456	45.9
60	4.5	140	41.0	220	109.8	300	136.6	380	95.2	460	43.5
64	5.1	144	44.5	224	113.0	304	135.1	384	92.6	464	41.1
68	5.7	148	47.9	228	116.1	308	133.7	388	90.0	468	38.7
72	6.4	152	51.4	232	119.2	312	132.2	392	87.3	472	36.3
76	7.1	156	54.8	236	122.1	316	130.5	396	84.7	476	34.0
80	8.1	160	58.4	240	124.8	320	128.7	400	82.0	480	31.7

Input Hydrograph Manhole 8, DS/PN 2.001 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	0.533
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	70.000	SPR	47.000
H(85%) (m)	19.600	LAG (hrs)	0.000
H(10%) (m)	13.350	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	63	Q (l/s)	10.5	PR (%)	39.843
T (mins)	8	TB (mins)	169	S1085 (m/km)	119.048
TPt (mins)	67	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 8, DS/PN 2.001 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.0	84	2.9	164	16.7	244	11.3	324	1.5	404	0.0
8	0.1	88	3.1	168	17.3	248	10.5	328	1.3	408	0.0
12	0.1	92	3.4	172	17.9	252	9.8	332	1.2	412	0.0
16	0.2	96	3.7	176	18.3	256	9.1	336	1.0	416	0.0
20	0.2	100	4.1	180	18.6	260	8.4	340	0.9	420	0.0
24	0.3	104	4.5	184	18.8	264	7.7	344	0.8	424	0.0
28	0.4	108	5.0	188	18.8	268	7.0	348	0.7	428	0.0
32	0.5	112	5.6	192	18.7	272	6.3	352	0.6	432	0.0
36	0.6	116	6.2	196	18.4	276	5.7	356	0.5	436	0.0
40	0.7	120	6.9	200	18.0	280	5.1	360	0.4	440	0.0
44	0.8	124	7.7	204	17.6	284	4.6	364	0.3	444	0.0
48	1.0	128	8.6	208	17.1	288	4.1	368	0.3	448	0.0
52	1.1	132	9.5	212	16.6	292	3.7	372	0.2	452	0.0
56	1.3	136	10.4	216	16.0	296	3.3	376	0.2	456	0.0
60	1.5	140	11.4	220	15.3	300	3.0	380	0.1	460	0.0
64	1.7	144	12.3	224	14.7	304	2.7	384	0.1	464	0.0
68	1.9	148	13.3	228	14.0	308	2.4	388	0.0	468	0.0
72	2.2	152	14.2	232	13.4	312	2.1	392	0.0	472	0.0
76	2.4	156	15.1	236	12.7	316	1.9	396	0.0	476	0.0
80	2.6	160	15.9	240	12.0	320	1.7	400	0.0	480	0.0

Input Hydrograph Manhole 9, DS/PN 3.000 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	3.107
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	350.000	SPR	47.000
H(85%) (m)	20.200	LAG (hrs)	0.000
H(10%) (m)	14.500	Base Flow (l/s)	(Calculated)

Output Variables

TP(0) (mins)	160	Q (l/s)	24.4	PR (%)	39.843
T (mins)	16	TB (mins)	423	S1085 (m/km)	21.714
TPt (mins)	168	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 9, DS/PN 3.000 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.2	84	3.7	164	25.4	244	52.6	324	53.6	404	34.4
8	0.2	88	4.1	168	26.8	248	53.7	328	52.9	408	33.3
12	0.2	92	4.6	172	28.3	252	54.7	332	52.1	412	32.2
16	0.3	96	5.2	176	29.7	256	55.5	336	51.2	416	31.1
20	0.4	100	5.9	180	31.1	260	56.3	340	50.4	420	30.0
24	0.4	104	6.5	184	32.6	264	57.1	344	49.5	424	29.0
28	0.5	108	7.3	188	34.0	268	57.7	348	48.7	428	27.9
32	0.7	112	8.4	192	35.4	272	58.0	352	47.7	432	26.8
36	0.8	116	9.4	196	36.9	276	58.3	356	46.8	436	25.8
40	0.9	120	10.4	200	38.3	280	58.6	360	45.9	440	24.7
44	1.1	124	11.6	204	39.7	284	58.6	364	44.9	444	23.7
48	1.2	128	12.9	208	41.1	288	58.3	368	43.9	448	22.6
52	1.4	132	14.1	212	42.4	292	58.1	372	42.9	452	21.6
56	1.6	136	15.4	216	43.8	296	57.8	376	41.9	456	20.6
60	1.8	140	16.8	220	45.2	300	57.4	380	40.9	460	19.6
64	2.1	144	18.2	224	46.5	304	56.8	384	39.8	464	18.6
68	2.3	148	19.6	228	47.8	308	56.3	388	38.7	468	17.6
72	2.6	152	21.0	232	49.1	312	55.7	392	37.7	472	16.6
76	2.9	156	22.4	236	50.3	316	55.1	396	36.6	476	15.6
80	3.3	160	23.9	240	51.4	320	54.3	400	35.5	480	14.7

Input Hydrograph Manhole 10, DS/PN 3.001 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Input Variables

Region	England and Wales	Area (Ha)	5.396
M5-60 (mm)	20.000	SAAR (mm)	550
Ratio R	0.450	CWI	76.000
Areal Reduction Factor	1.000	Urban	0.000
Main Stream Length (m)	398.000	SPR	47.000
H(85%) (m)	18.900	LAG (hrs)	0.000
H(10%) (m)	13.600	Base Flow (l/s)	(Calculated)

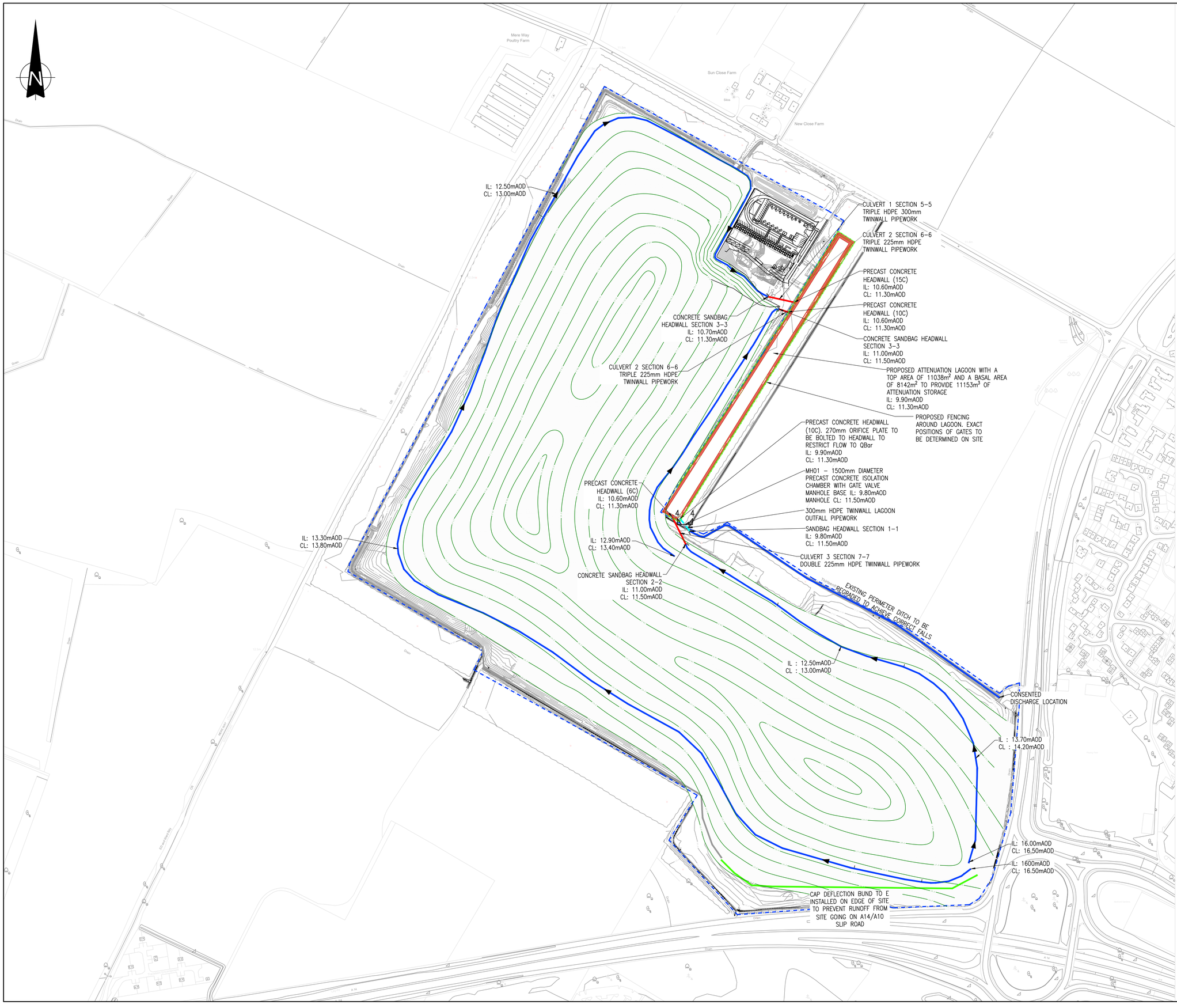
Output Variables

TP(0) (mins)	176	Q (l/s)	38.7	PR (%)	39.843
T (mins)	16	TB (mins)	464	S1085 (m/km)	17.755
TPt (mins)	184	Base Flow (l/s)	0.0		

Input Hydrograph Manhole 10, DS/PN 3.001 (Storm)
240 minute 100 year Summer I+30%
Input Hydrograph Type: FSR Dynamic

Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)	Time (mins)	Flow (l/s)
4	0.2	84	5.3	164	36.8	244	78.7	324	91.1	404	65.8
8	0.2	88	5.9	168	38.9	248	80.6	328	90.3	408	64.2
12	0.3	92	6.6	172	41.1	252	82.4	332	89.4	412	62.7
16	0.4	96	7.6	176	43.3	256	84.0	336	88.3	416	61.1
20	0.5	100	8.5	180	45.5	260	85.7	340	87.2	420	59.5
24	0.6	104	9.4	184	47.6	264	87.3	344	86.2	424	57.9
28	0.8	108	10.6	188	49.8	268	88.7	348	85.1	428	56.3
32	1.0	112	12.1	192	52.0	272	89.9	352	83.8	432	54.8
36	1.1	116	13.6	196	54.1	276	91.1	356	82.6	436	53.2
40	1.3	120	15.1	200	56.3	280	92.3	360	81.4	440	51.6
44	1.5	124	16.7	204	58.4	284	93.1	364	80.1	444	50.0
48	1.8	128	18.6	208	60.5	288	93.5	368	78.8	448	48.4
52	2.1	132	20.5	212	62.7	292	94.0	372	77.4	452	46.8
56	2.3	136	22.3	216	64.8	296	94.4	376	76.1	456	45.2
60	2.7	140	24.3	220	66.9	300	94.4	380	74.7	460	43.7
64	3.0	144	26.3	224	68.9	304	94.1	384	73.3	464	42.1
68	3.4	148	28.3	228	70.9	308	93.7	388	71.8	468	40.6
72	3.8	152	30.4	232	73.0	312	93.3	392	70.4	472	39.0
76	4.2	156	32.5	236	75.0	316	92.8	396	68.9	476	37.5
80	4.8	160	34.6	240	76.8	320	91.9	400	67.3	480	36.0

DRAWINGS



NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.

2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.

4. ALL INVERT LEVELS ARE TO BE CONFIRMED BY SIRIUS PRIOR TO CONSTRUCTION ONCE A FULL UP TO DATE SURVEY OF NORTHERN LAGOON AREA HAS BEEN UNDERTAKEN AND RECEIVED.

5. GATE POSITIONS TO BE CONFIRMED ON SITE WITH FCC DURING CONSTRUCTION WORKS.

KEY

- 18.5 — SITE SURVEY
- 19.0 — PROPOSED LAGOON CONTOURS
- 19.5 — FINAL RESTORATION CONTOURS
- OWNERSHIP BOUNDARY
- PROPOSED SURFACE WATER DITCH (500mm WIDE x 500mm DEEP)
- PROPOSED PIPEWORK
- PROPOSED ROAD CROSSING / CULVERT
- CAP DEFLECTION BUND
- FLOW DIRECTION
- EXISTING DITCHES
- PROPOSED MANHOLE CHAMBER
- PROPOSED PRECAST CONCRETE HEADWALL
- PROPOSED CONCRETE SANDBAG HEADWALL

REV	DESCRIPTION	DATE	BY

CLIENT

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

sirius Environmental

JOB TITLE

MILTON LANDFILL SITE
Surface Water Management

DRAWING TITLE

General Arrangement

DRAWN	DATE	APPROVED	DATE
M.C	03/02/2020	J.D	03/02/2020

SCALE	SHEET	DRAWING NUMBER	REVISION
1:2500	A1L	WR7544/01/01	0

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.

2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.

4. ALL INVERT LEVELS ARE TO BE CONFIRMED BY SIRIUS PRIOR TO CONSTRUCTION ONCE A FULL UP TO DATE SURVEY OF NORTHERN LAGOON AREA HAS BEEN UNDERTAKEN AND RECEIVED

KEY

18.5 SITE SURVEY

CATCHMENTS AREA 1

CATCHMENTS AREA 2

CATCHMENTS AREA 3

REV	DESCRIPTION	DATE	BY

CLIENT

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

Sirius Environmental

JOB TITLE

MILTON LANDFILL SITE
Surface Water Management

DRAWING TITLE

Catchments Areas

DRAWN	DATE	APPROVED	DATE
M.C	03/02/2020	J.D	03/02/2020

SCALE	SHEET	DRAWING NUMBER	REVISION
1:2500	A1L	WR7544/01/02	0

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.

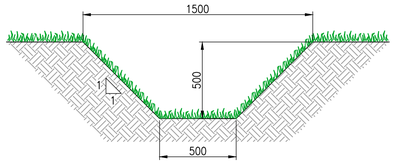
2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.

4. CONCRETE WORKS - ALL CONCRETE TO BE IN ACCORDANCE WITH BS 8500-1:2015 AND BS8500-2:2015.

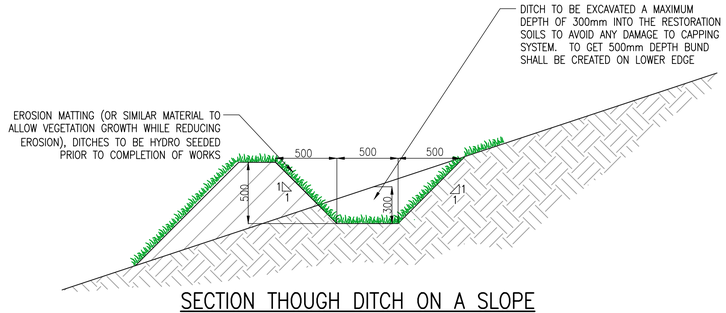
5. CONCRETE FOR BLINDING TO BE 'GEN1'. CONCRETE FOR DRAINAGE WORKS UNLESS STATED OTHERWISE SHALL BE 'ST1'.

KEY



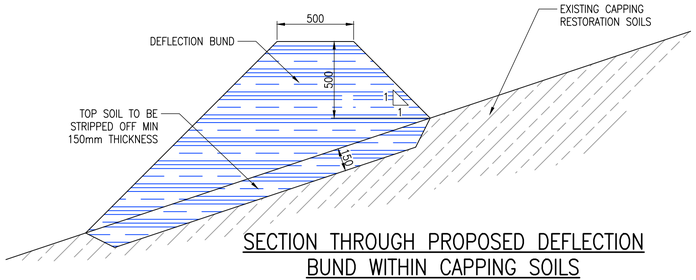
CROSS SECTION THROUGH PROPOSED DRAINAGE DITCH

(NTS)



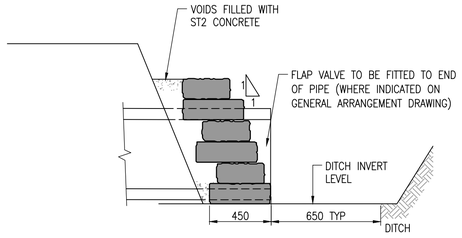
SECTION THOUGH DITCH ON A SLOPE

SCALE 1:25



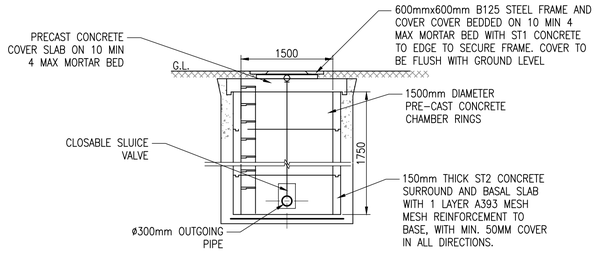
SECTION THROUGH PROPOSED DEFLECTION BUND WITHIN CAPPING SOILS

(NTS)



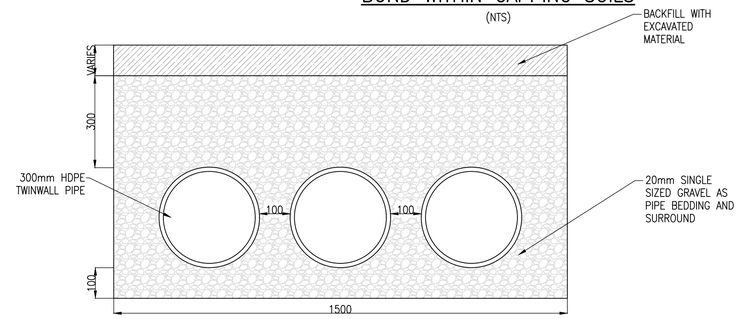
SECTION THROUGH CONCRETE SANDBAG HEADWALL

SCALE 1:20



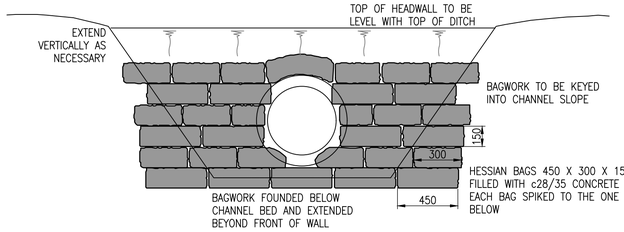
SECTION 4–4 CONSTRUCTION DETAILS OF PROPOSED SURFACE WATER ISOLATION CHAMBER

SCALE 1:50



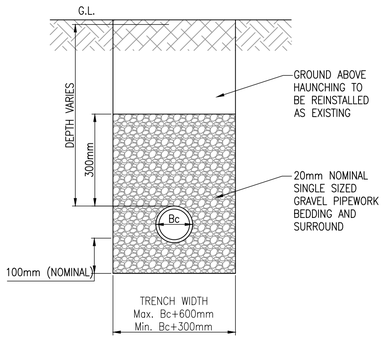
SECTION 5–5 TRIPLE 300mm PIPE CULVERT/PIPE TRENCH DETAIL

SCALE 1:10



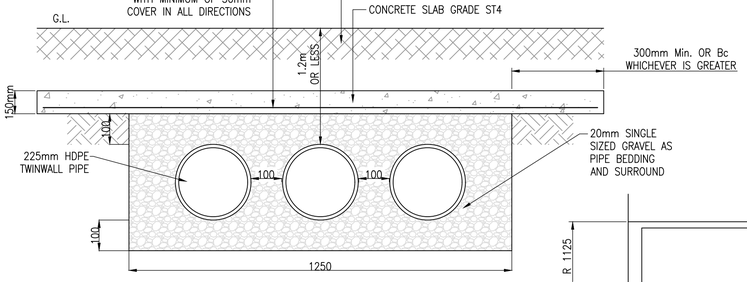
SECTION 1–1 CONCRETE SANDBAG HEADWALL

SCALE 1:20



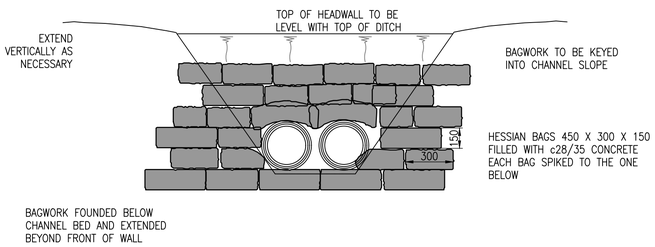
PIPEWORK DETAIL FOR SINGLE PIPES

SCALE 1:10



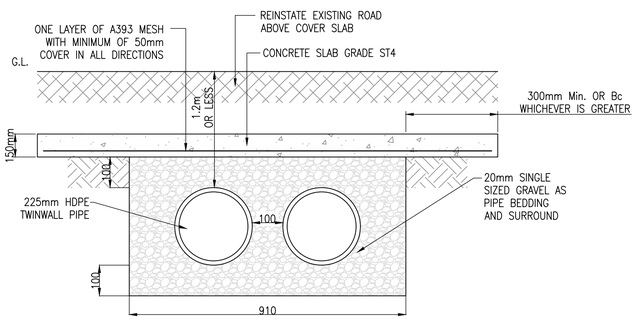
SECTION 6–6 TRIPLE 225mm PIPE CULVERT/PIPE TRENCH DETAIL

SCALE 1:10



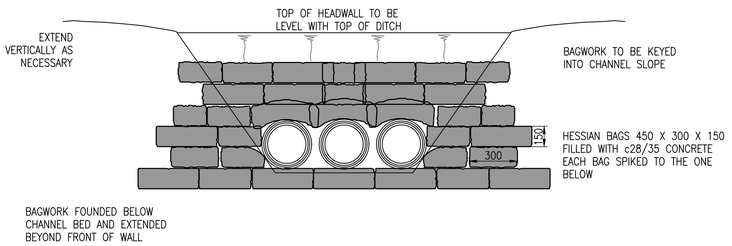
SECTION 2–2 CONCRETE SANDBAG HEADWALL DOUBLE PIPE

SCALE 1:20



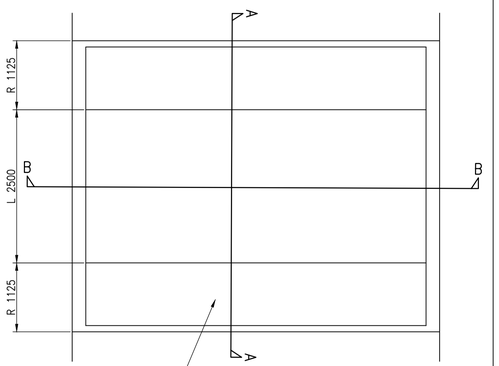
SECTION 7– 7 TRIPLE 225mm PIPE CULVERT/PIPE TRENCH WITH CONCRETE COVER SLAB DETAIL (FOR PIPEWORK UNDER ACCESS ROAD)

SCALE 1:10



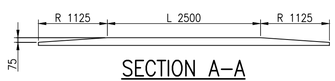
SECTION 3–3 CONCRETE SANDBAG HEADWALL TRIPLE PIPE

SCALE 1:20



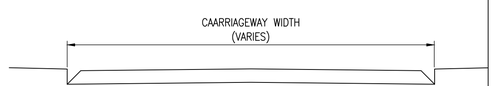
PLAN

SCALE 1:50



SECTION A–A

SCALE 1:50



SECTION B–B

SCALE 1:50

SPEED TABLE CONSTRUCTION

SCALE 1:50

REV	DESCRIPTION	DATE	BY

CLIENT

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

sirius Environmental
4245 Park Approach, Thorpe Park, Leeds. LS15 8GB. 0113 264 9960

JOB TITLE

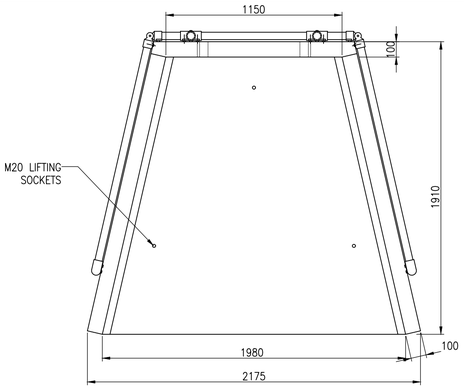
MILTON LANDFILL SITE
Surface Water Management

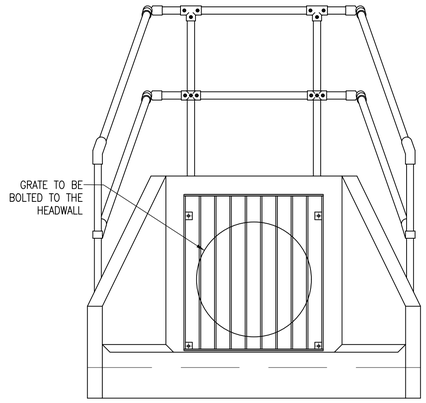
DRAWING TITLE

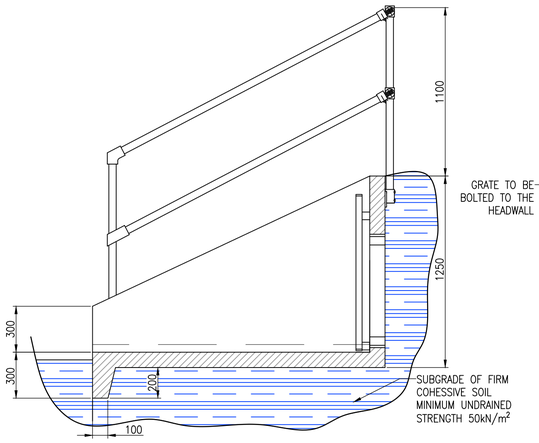
Construction Details - Sheet 1

DRAWN	DATE	APPROVED	DATE
M.C	02/04/2020	J.D	02/04/2020

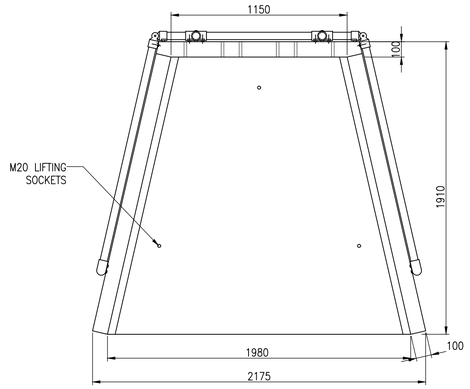
SCALE	SHEET	DRAWING NUMBER	REVISION
As Shown	A1L	WR7544/01/03	0

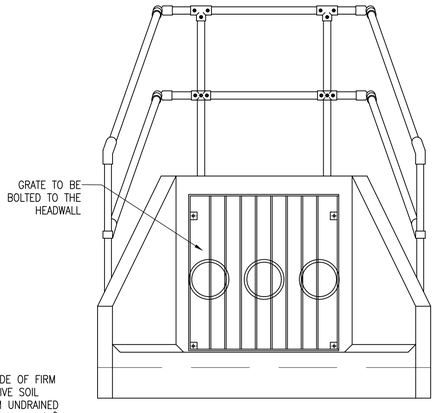




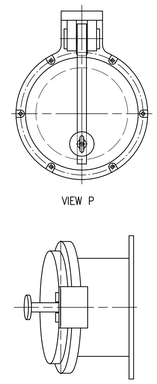


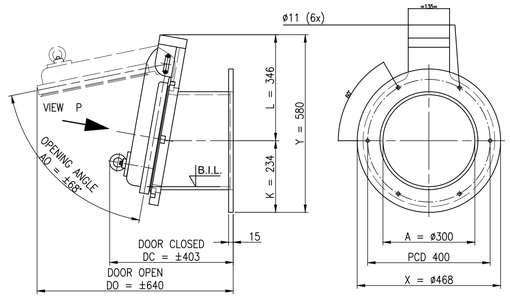
H10C A HEADWALL
(NTS)





H10C A HEADWALL
WITH TRIPLE 225mm PIPEWORK
(NTS)



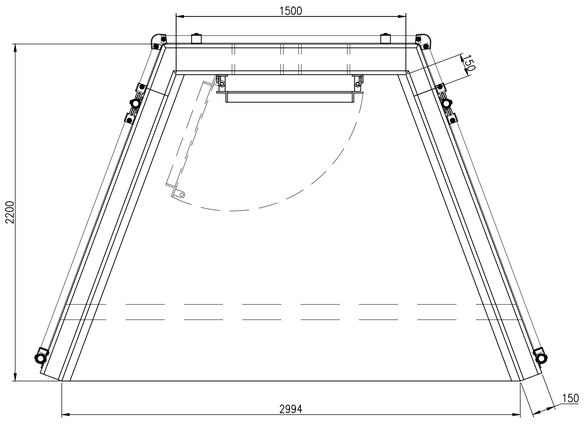


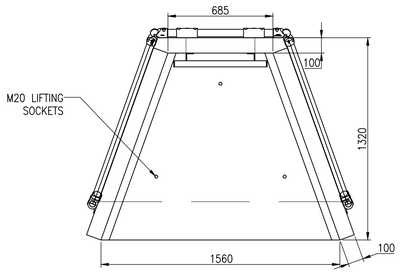
300mm HDPE/SS FLAP VALVE SPECIFICATION INFORMATION

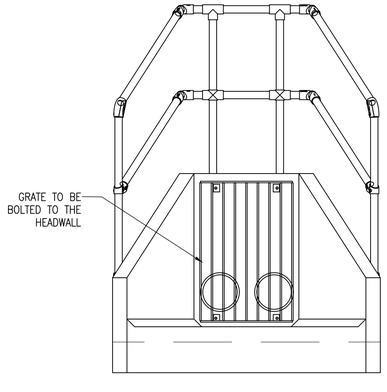
- THE VALVE PLATE AND THE BACK PLATE ARE PRODUCED USING HDPE/SS
- THE HINGE PIN AND BALLAST WEIGHT ARE PRODUCED IN SS316 AS STANDARD
- THE BALLAST WEIGHT CAN BE EASILY ADJUSTED IF REQUIRED
- THE SEALING ARRANGEMENT CONSISTS OF AN EPDM LIPS SEAL IN THE BACK PLATE
- THE VALVE PLATE IS ALSO INSTALLED ON AN ANGLE IN RELATION TO THE BACK PLATE TO ENSURE A GOOD SEAL

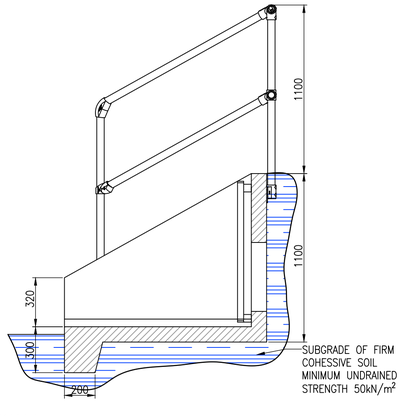
MATERIAL: HDPE, SS316, EPDM
OPENING: Ø300mm
MAX LOAD FROM BOTTOM INVERT LEVEL (B.I.L): 1.3MWC LONG PERIOD (=50 YEARS)
5MWC SHORT PERIOD (=72HOURS)
NUMBER OF CHEMICAL ANCHORS M8: 6 PIECES
ALL DIMENSIONS IN mm

NON RETURN VALVE
NTS

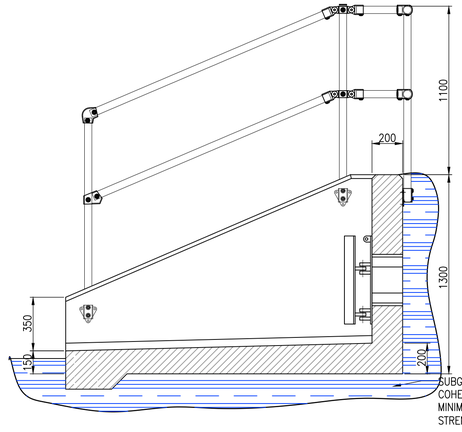


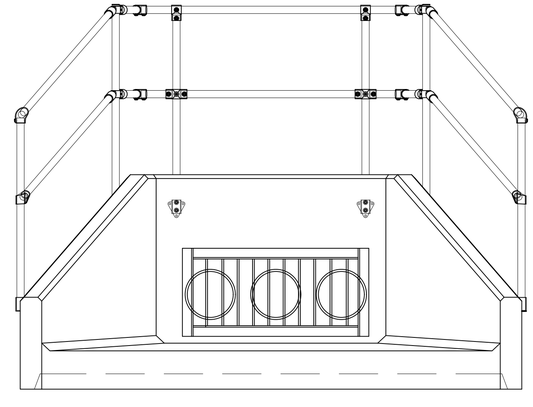






H6C A HEADWALL
WITH DOUBLE 225mm PIPEWORK
(NTS)





H15C A HEADWALL
WITH TRIPLE 300mm PIPEWORK
(NTS)

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.

2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.

4. CONCRETE WORKS - ALL CONCRETE TO BE IN ACCORDANCE WITH BS 8500-1:2015 AND BS8500-2:2015.

5. CONCRETE FOR BLINDING TO BE 'GEN1'. CONCRETE FOR DRAINAGE WORKS UNLESS STATED OTHERWISE SHALL BE 'ST1'.

KEY

REV	DESCRIPTION	DATE	BY

CLIENT

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

sirius Environmental
4245 Park Approach, Thorpe Park, Leeds. LS15 8GB. 0113 264 9960

JOB TITLE

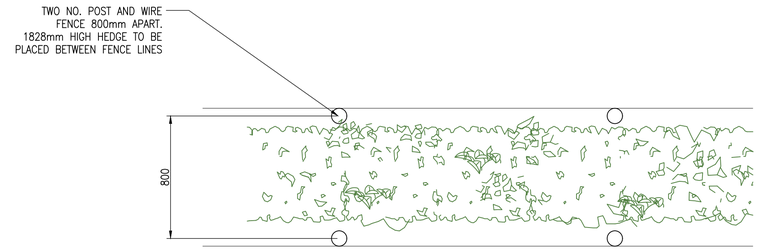
MILTON LANDFILL SITE
Surface Water Management

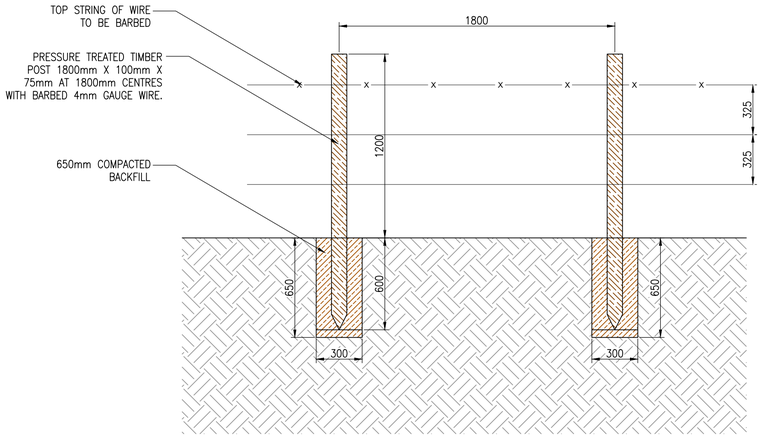
DRAWING TITLE

Construction Details - Sheet 2

DRAWN	DATE	APPROVED	DATE
M.C	02/04/2020	J.D	02/04/2020

SCALE	SHEET	DRAWING NUMBER	REVISION
As Shown	A1L	WR7544/01/04	0





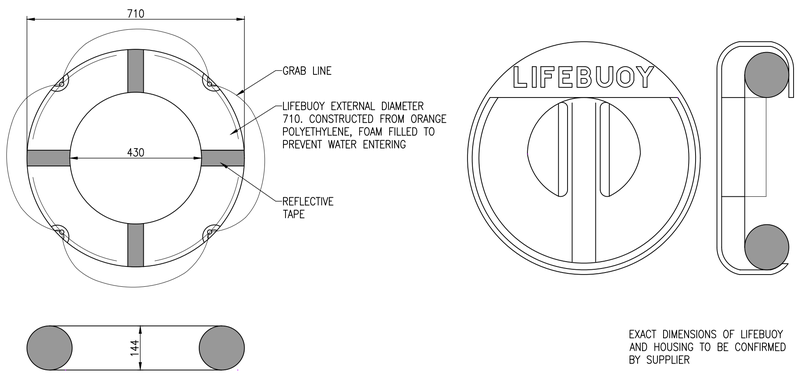
POST AND WIRE FENCE DETAIL

SCALE 1:20

SIGN TO BE PLACE AROUND LAGOON PERIMETER AT REGULAR INTERVALS

TYPICAL WARNING SIGN
DANGER DEEP WATER NO SWIMMING

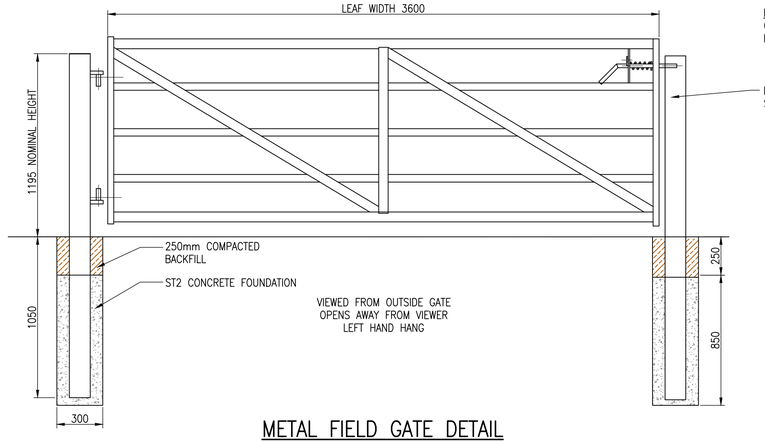
NTS



EXACT DIMENSIONS OF LIFEBUOY AND HOUSING TO BE CONFIRMED BY SUPPLIER

TYPICAL LIFEBOUY AND HOUSING DETAILS

SCALE 1:10



METAL FIELD GATE DETAIL

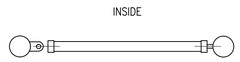
SCALE 1:20

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. GAPS UNDERNEATH GATES & FENCING ARE NOMINAL DUE TO GROUND LEVELS.

MATERIAL
HANG POSTS – ø88.9 CHS
HANG POSTS – ø114 CHS
SLAM POSTS – ø88.9 CHS
RAILS – ø40 CHS
– ø32 CHS
STILES – 50 x 25 RHS
BRACE – 40 x 6 M.S FLAT BAR

FINISH
GALVANISED TO BS EN ISO 1461:1999
POWDER COATED: IF REQUIRED

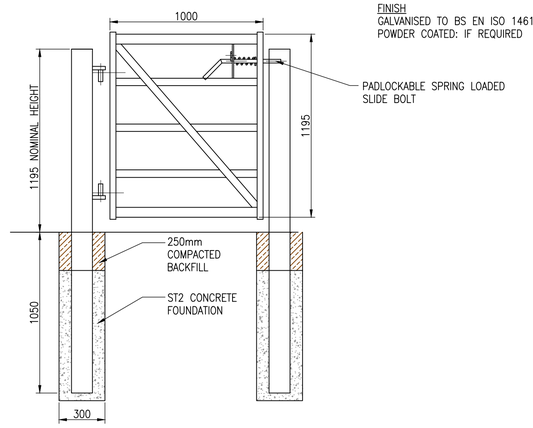


NOTES

1. ALL DIMENSIONS ARE IN mm.
2. GAPS UNDERNEATH GATES & FENCING ARE NOMINAL DUE TO GROUND LEVELS.

MATERIAL
HANG POSTS – ø88.9 CHS
HANG POSTS – ø114 CHS
SLAM POSTS – ø88.9 CHS
RAILS – ø40 CHS
– ø32 CHS
STILES – 50 x 25 RHS
BRACE – 40 x 6 M.S FLAT BAR

FINISH
GALVANISED TO BS EN ISO 1461:1999
POWDER COATED: IF REQUIRED



METAL PEDESTIRAN GATE DETAIL

SCALE 1:20

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.
2. DO NOT SCALE FROM THIS DRAWING.
3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.
4. **CONCRETE WORKS** - ALL CONCRETE TO BE IN ACCORDANCE WITH BS 8500-1:2015 AND BS8500-2:2015.
5. CONCRETE FOR BLINDING TO BE 'GEN1'. CONCRETE FOR DRAINAGE WORKS UNLESS STATED OTHERWISE SHALL BE 'ST1'.
6. LIFEBUOYS, MEETING EITHER OF THE STANDARDS SET OUT IN THE MERCHANT SHIPPING (LIFE SAVING APPLIANCES) REGULATIONS (SI 1986 NO 1066), WITH A SUITABLE BUOYANT LIFELINE OF ADEQUATE LENGTH ATTACHED, SHOULD BE AVAILABLE WITHIN 50m OF ANY WORKING POSITION WHERE A PERSON COULD FALL INTO THE WATER.

REV	DESCRIPTION	DATE	BY

CLIENT

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

sirius Environmental
4245 Park Approach, Thorpe Park, Leeds. LS15 8GB. 0113 264 9960

JOB TITLE

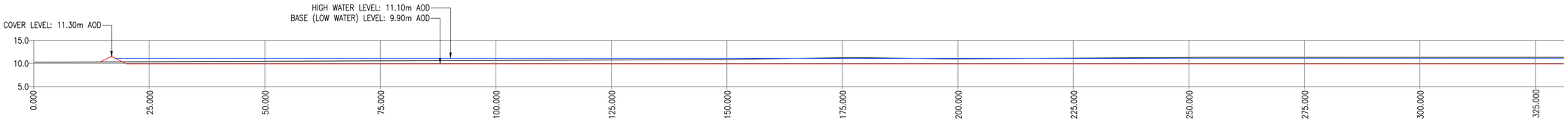
MILTON LANDFILL SITE
Surface Water Management

DRAWING TITLE

Lagoon Fencing Construction Details

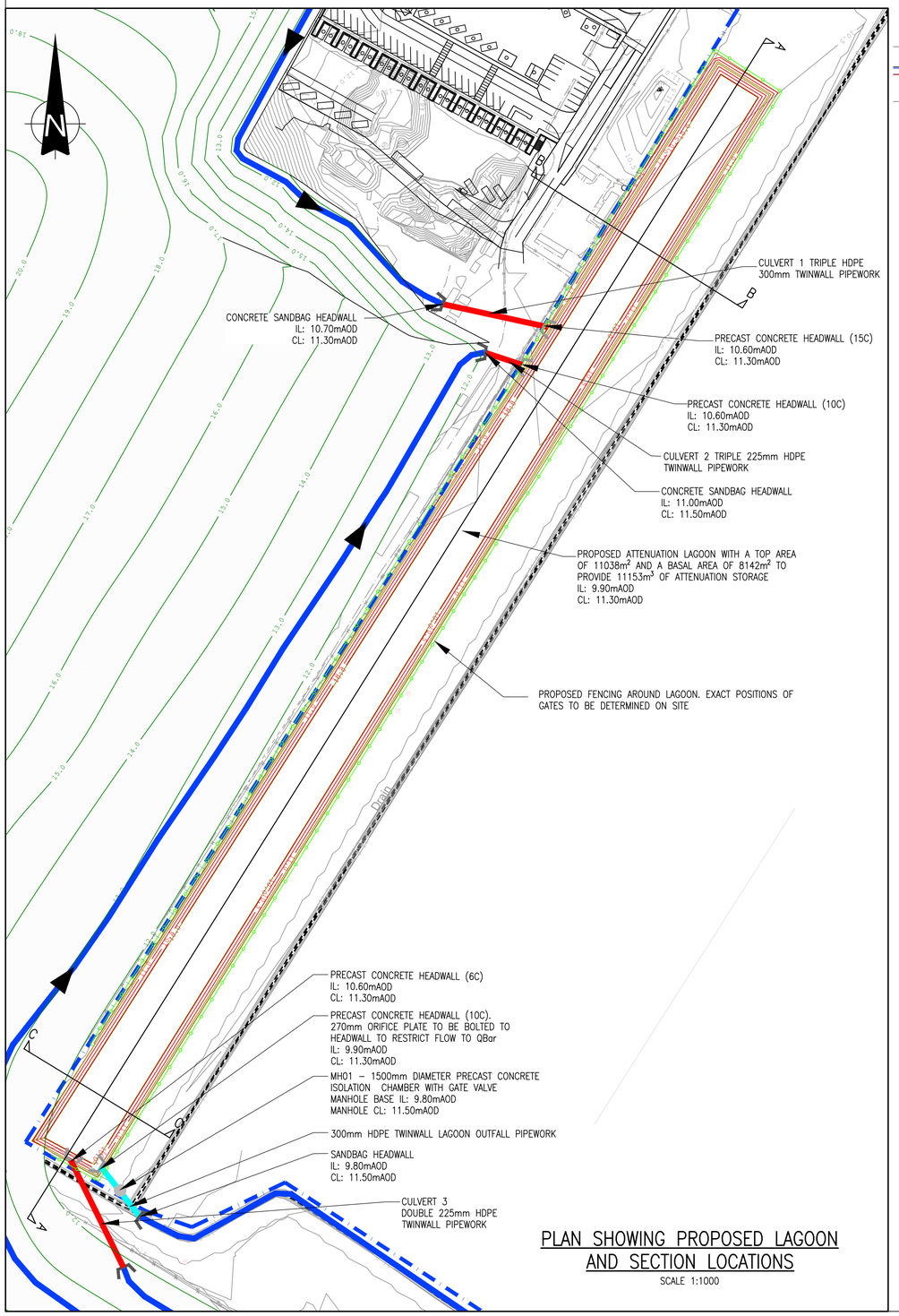
DRAWN	DATE	APPROVED	DATE
M.C	02/04/2020	J.D	02/04/2020

SCALE	SHEET	DRAWING NUMBER	REVISION
As Shown	A1L	WR7544/01/05	0



LONG SECTION A–A

SCALE 1:500

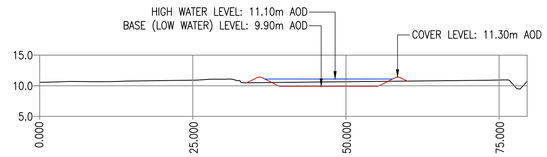


PLAN SHOWING PROPOSED LAGOON AND SECTION LOCATIONS

SCALE 1:1000

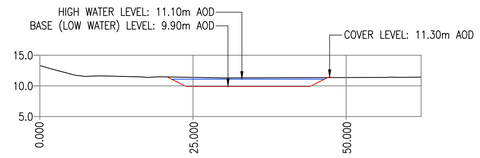
LONG SECTION A–A CONTINUED

SCALE 1:500



LONG SECTION B–B

SCALE 1:500



LONG SECTION C–C

SCALE 1:500

NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM.

2. DO NOT SCALE FROM THIS DRAWING.

3. ANY ANOMALIES IDENTIFIED WITH THE DETAILS SHOWN ON THIS DRAWING ARE TO BE BROUGHT TO THE ATTENTION OF SIRIUS ENVIRONMENTAL PRIOR TO CONSTRUCTION WORKS COMMENCING.

4. ALL INVERT LEVELS ARE TO BE CONFIRMED BY SIRIUS PRIOR TO CONSTRUCTION ONCE A FULL UP TO DATE SURVEY OF NORTHERN LAGOON AREA HAS BEEN UNDERTAKEN AND RECEIVED.

5. GATE POSITIONS TO BE CONFIRMED ON SITE WITH FCC DURING CONSTRUCTION WORKS.

KEY

- 18.5 — SITE SURVEY
- 19.0 — PROPOSED LAGOON CONTOURS
- 19.5 — FINAL RESTORATION CONTOURS
- OWNERSHIP BOUNDARY
- PROPOSED SURFACE WATER DITCH (500mm WIDE x 500mm DEEP)
- PROPOSED PIPEWORK
- PROPOSED ROAD CROSSING / CULVERT
- CAP DEFLECTION BUND
- FLOW DIRECTION
- EXISTING DITCHES
- PROPOSED MANHOLE CHAMBER
- PROPOSED PRECAST CONCRETE HEADWALL
- PROPOSED CONCRETE SANDBAG HEADWALL

SECTIONS KEY

- SITE SURVEY
- PROPOSED LAGOON CONTOURS
- PROPOSED MAXIMUM WATER LEVEL

REV	DESCRIPTION	DATE	BY

CLIENT

FCC Environment

FCC Environment (UK) Limited
Ground Floor West, 900 Pavilion Drive, Northampton Business Park, Northampton, NN4 7RG

Sirius Environmental

JOB TITLE

MILTON LANDFILL SITE
Surface Water Management

DRAWING TITLE

Lagoon Sections

DRAWN	DATE	APPROVED	DATE
M.C	20/08/2020	J.D	20/08/2020

SCALE	SHEET	DRAWING NUMBER	REVISION
As Shown	A1L	WR7544/01/06	0