ARUP

Global Infrastructure UK Ltd

Data Center at Maxwells Farm West, Cheshunt

Environmental Permit Application - Summary Technical Report

Reference: 1A-RP-EHS-0010

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1. Introduction

1.1 Overview

This report has been produced by Ove Arup & Partners Ltd (Arup) on behalf of Global Infrastructure UK Ltd (GIUK), to accompany a bespoke application for an Environmental Permit (EP) for a Data Center on Land at Maxwells Farm West, Great Cambridge Road, Cheshunt, Broxbourne (hereafter referred to as 'the site').

A Reserved Matters application is seeking the approval for appearance, landscaping and layout of Phase 3 of outline planning permission ref. 07/21/0447/F, (which varied the original permission ref. 07/18/1181/O) for the construction of a Data Center and associated works.

Global Infrastructure UK Ltd seek to gain a bespoke environmental permit for the operation of standby generators required in the event of loss of power from the grid to power the Data Center. The EP for the site comprises the emergency back-up generation facility and the directly associated activities only, and therefore the EP is not for the whole of the Data Center.

The application is made by Global Infrastructure UK Ltd (GIUK) which is the legal entity that will be responsible for operating the generating installation.

1.2 The Operator

The parent company of GIUK owns and operates Data Centers within Europe and are familiar with European legislation but are yet to develop a Data Center of this sort in the UK.

The proposed Data Center at Maxwells Farm West will be the first Data Center operated by GIUK.

1.3 The Site

The site is located at Maxwells Farm West, Cheshunt, Waltham Cross, Broxbourne, EN8 8XH and is Centerd at approximate National Grid Reference TL 35013 01461. The site is located between the villages of Cheshunt which is approximately 2km north east of the site and Goff's Oak which is approximately 5km north west. The primary access to the site is gained via the northbound carriageway of the Great Cambridge Road, A10. A secondary access has now been created as part of the Phase 1 infrastructure works from the south of the site via Lieutenant Ellis Way and runs through the Center of the site connecting to the A10 to the east.

The site is screened by mature trees and hedgerows along its northern boundary which abuts the Maxwells West industrial estate / business park to the immediate north east. Beyond this, the area is predominantly residential in nature with playing fields which form part of the Goffs Churchgate secondary school.

The western boundary of the site is delineated by timber fencing parallel to the New River. St Mary's School and Sixth Form is located further west of this. The eastern boundary of the site contains minimal screening and is delineated by the A10 Great Cambridge Road carriageway which provides travel northwards towards Cheshunt and Broxbourne and southwards towards the M25 motorway.

The southern flyover known as the 'Paul Cully Bridge', which provides a pedestrian / cycle route eastward over the A10 towards Cheshunt Football Club and Cedars Park. The south of the site is bound by Theobalds Lane and the B198 / Lieutenant Ellis Way.

The whole Data Center site is currently an open green field and measures approximately 12 ha.

The Data Center will be manned on a 24-hour basis.

The location of the site is shown on Figure 1 below.

Figure 1: Site Location and Permit Boundary

2. Legislative framework

The following regulations and guidance are relevant to the assessment and have been taken into consideration in developing the approach to the assessment.

- The Environmental Permitting (England and Wales) Regulations 2016, SI2016/1154.
- EU, 2010 Directive 2010/75/EU of the European Parliament and the Council on industrial emissions.
- EU, 2015. Directive (EU) 2015/2193 on the limitation of emissions of certain pollutants into the air from medium combustion plant.
- The Control of Pollution (Oil Storage) (England) Regulations 2001.
- Best available techniques: environmental permits[1].
- Risk assessments for specific activities: environmental permits[2].
- Environment Agency Data Center FAQ Headline Approach[3].
- Reference Document - Best Available Techniques on Emissions from Storage 2016[4].
- CIRIA, 2014. Containment systems for the prevention of pollution (C736F)[5].

The site will emergency generators to provide power to the facility in the event of an interruption to the power supply to the facility.

The generators located closest to the sensitive receptors (generators A-a to A-h) will have a stack height of 15m, all other generators will have a stack height of 13m. The location of the generators is shown on Drawing Number 1A-C-1400-DCH-DR-EP-001 Site Layout and Emissions Points.

For both of the electrical yard and mechanical yard generators, refuelling will take place within a dedicated refuelling layby spanning the length of the generator areas. The fill points serving the electrical yard generators will be located on the western side of the electrical yard. The fill point serving the mechanical yard generators will be located on the eastern side of the mechanical yard. The fuel lines to the storage tanks will be integrally bunded and have leak detection. Each generator will have 22,000L bulk storage tanks (integrally bunded) which will be fitted with leak detection.

Each storage tank is enclosed and bunded to contain 110% of the storage capacity of the tank. All tanks will comply with the Oil Storage Regulation (SI 2001/2954, The Control of Pollution (Oil Storage) (England) Regulations 2001).

Combustion activities are regulated under The Environmental Permitting (England and Wales) Regulations 2016 (EPR). The regulations enact both the Industrial Emission Directive (IED) and the Medium Combustion Plant Directive (MCPD) in England and operators undertaking any of the activities identified under these regulations require an environmental permit to carry out these activities.

The Data Center will be operated on power from the national grid however, in the event of a grid failure power will be provided by standby diesel generators. The generators will be operated to provide power at a

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[1] Best available techniques: environmental permits - GOV.UK (www.gov.uk) [Accessed 15/12/2022]

[2] Risk assessments for specific activities: environmental permits - GOV.UK (www.gov.uk) [Accessed 15/12/2022]

[3] EA, 2022. Data Center FAQ Headline Approach– Release to Industry DRAFT version 21.0 to TechUK for Discussion 15/11/22

[4] EC, 2016. Reference Document – Best Available techniques on Emissions from Storage Available at: efs_bref_0706_0.pdf (europa.eu) [Accessed 15/12/2022

[5] CIRIA, 2014. Containment systems for the prevention of pollution. Secondary, tertiary and other measures for industrial and commercial premises. Available at https://www.ciria.org/ItemDetail?iProductCode=C736F&Category=FREEPUBS [Accessed 15/12/2022]

site during an emergency only, as well as routine testing in-line with the manufacturer's maintenance requirements.

They will not be used to provide a balancing service or for demand side response operations such as triad avoidance or fast frequency response. No electricity generated from the site will be exported off-site or fed back into the National Grid.

Combustion plants that have an aggregated capacity of greater than 50 MWth are listed in Annex I of the IED and must therefore be permitted to operate in line with Chapter II of the IED. However, the capacity of the individual units are all below 15 MWth so the plant does not fall under the scope of Chapter III of the Directive and therefore are not required to meet the requirements of the EU BAT Conclusions document for Large Combustion Plant (LCP), including the Emission Limit Values (ELVs) set in the Best Available Technique (BAT) conclusions. To cover this gap in the EU guidance the MCPD will inform site specific BAT for certain IED Chapter II activities, including gas engines generating electricity with a capacity of more than 50 MWth, operated as the primary activity on the site.

On this basis, the Environment Agency (EA) will include MCPD requirements in the permit, as the minimum standards. These are influenced by the type and frequency of the generator's operation. As the planned operation of the generators is for the purpose of maintenance and testing only and for less than 50 hours the operation of the generators is unlikely will not to be subject to any Emission Limit Values (ELVs) or testing restrictions, provided it can be demonstrated that no adverse environmental impacts are predicted, for example to local air quality.

As the aggregated combustion capacity is greater than 20 MWth, the site will be required to obtain a Greenhouse gas emission permit as part of the Emissions Trading System. Conditions will be set out within the Permit detailing the requirements to monitor and report on emissions from the site, including specifying the frequency of monitoring and methods used. Annual monitoring reports will also be required to be submitted.

2.1 Permitting regime - IED or MCPD

The standby generators will be permitted under the Environmental Permitting (England and Wales) Regulations 2016. The total aggregated capacity of the generators is above 50 MWth and will therefore be permitted under IED. However, because the individual combustion is below 15 MWth the installation will be permitted as an IED Chapter II installation but not a Chapter III (LCP) installation. This means the installation will not be required to meet the BAT Conclusions for the LCP. The permit will therefore follow the guidelines set out under the MCPD.

Under the EPR a permit is required to operate the plant, including the commissioning. The permit application process has therefore been programmed to achieve a permit prior to the commissioning phase in the project programme.

2.2 Scheduled Activities

The proposed combustion activity is defined in the EPR under Section 1.1 Part A(1)(a) 'burning fuel in an appliance with a rated thermal of 50 or more megawatts'. The EPR states *"...where two or more appliances with an aggregate rated thermal input of 50 or more megawatts are operated on the same site by the same operator, those appliances must be treated as a single appliance with a rated thermal input of 50 or more megawatts."*

2.3 Directly Associated Activities

Schedule 1, Part 1 Regulation 2(1) of the EP Regulations provides that a Directly Associated Activity (DAA) is an operation that, in relation to any other activity:

- Has a technical connection with the activity;
- Is carried out on the same site as the activity; and
- Could have an effect on pollution.

The following activities are therefore considered to be DAAs as they meet all three criteria:

- Generators refuelling laybys;
- Fuel storage; and
- Drainage system for the permitted activity and DAAs up to the point the drainage system connects to the wider drainage system serving the wider site which are not considered to be permitted activities or DAAs.

3. Data Center Description

3.1 Installed Engines

In response to Part B3 question 7a

The diesel generators which will be installed for emergency purposes will be located within the electrical yars and the mechanical yard. All generators will be serving the Data Center in an emergency scenario however 3 will be kept as back-up redundancy in the event one of the generators fails. All the generators will be fitted with Selective Catalytic Reduction (SCR) and have a individual combustion of below 15 MWth and a total thermal output of greater than 50 MWth.

3.2 Size of units needed

The number and configuration of the generators has been selected in order to ensure that the service requirements of the Data Center and associated servers / critical infrastructure in the event of any temporary grid interruptions / failures can always be met, whilst providing the necessary redundancy / resilience to cover any generator failure / maintenance.

Based on the power requirements for the site, the generators in the range between 1.5 and 8 MWth were considered to provide the best solution because:

- Units are readily available for this back up purpose (i.e. Hospitals, London Stock Exchange, banks, etc);
- They can be modularised (containerised);
- Components are "off the shelf" and easily changeable; and
- Each unit / module is self-sufficient.

This proposed solution ensures that the standby generators are operated at their optimal design capacity should they be required, which maximises the fuel efficiency/combustion and therefore emissions to air. Operating a smaller number of diesel generator with greater rated electrical outputs at sub-optimal low loads can have an adverse impact on engine operations and ultimately their longevity, if repeatedly used over long periods. For further information on generator why the selective generators are considered BAT see Section 5.

The electrical supply arrangement for the site is shown on Appendix B of this report.

3.3 Operating regime

The planned maintenance and testing regime of the generators is set out in Table 1 below. The generator is expected to be used purely for a stand-by emergency role as stated in the EA Data Center FAQ (2022).

Table 1: Generator Use

Scenarios	Operating profile	Description
Scenario 1: Annual Test	One hour run per month = 12 hours per year per generator	All generators to be tested, one at a time (daytime only). Generators will be tested at 100% load.
Scenario 2: 3 yearly test	A single event of 9 generators running for 12 hours, and 30 generators run for an additional 12 hours.	9* generators run for 12 hours, and 30 generators run for an additional 12 hours. Generators will be tested at 100% load.
Scenario 3: 6 yearly test	A single event of 9 generators running for an additional 12 hours, and 30 generators run for an additional 24 hours.	9* generators run for an additional 12 hours, and 30 generators run for an additional 24 hours. Generators will be tested at 100% load.
Scenario 4: Emergency scenario	A single unlikely event of 30 hours continuous operation due to grid failure	A single unlikely event where all generators will operate at 100% load for up to 30 hours.
Note: * For more information see 1A-RP-EHS-0013. The 9 worst case generators have been modelled in this scenario as these are the generators closest to receptors, giving a more conservative assessment. It has been assumed that the 3 yearly test only occurs every other 3 years, with the 6 yearly test occurring in between, meaning the 3 yearly and 6 yearly tests would not take place in the same year.		

3.4 Network Reliability

In the event of a loss of power supply, i.e. temporary grid blackout, the diesel-powered standby generators will be utilised to maintain the required power supply.

These generators are designed to automatically activate and provide the required power to the plant pending restoration of mains power, at which time they shall automatically ramp down and switch back to utility supply. The automatic controls are installed for each of the emergency (back-up) generators and each electrical line up is supported by a dedicated back-up generator.

Therefore, the specific number of back-up generators in use (and the relevant loads required) will always be reflective of, and proportionate to, the power demands at the time, to maintain operations until the supply is restored.

Every effort will be made to ensure that the emergency generators would not be required in practice, as described below.

Power for the Data Center will be supplied from/by the National Grid which operates its transmission system in accordance with the Security and Quality of Supply Standard which is a requirement of its Transmission Licence. In accordance with this standard, a level of redundancy is also built into the transmission system.

National Grid National Electrical Transmission System Performance Report 2021/22 states that the overall reliability of supply during 2021-22 was: 99.999612%[6]. The total estimated unsupplied energy for these 11 incidents during 2021–22 was 142.40 MWh. The longest loss of supply incident lasted 300 mins (7.5 hours) in Elstree, Watford, with a total of 25.7 MWh not supplied.

The power distribution system, on-site, starting from the High Voltage (HV) (132kV) intake substation (referred to as PERUN) down to the Low Voltage distribution, is designed to be safe, reliable, robust, and

[6] Available at <https://www.nationalgrideso.com/industry-information/industry-Data-and-reports/system-performance-reports> Accessed 04/01/2023

efficient and have in-built redundancy. The Operator designs and builds systems with in-built redundancy, based on High Voltage power supply connections from an electricity grid, being the primary power source to the site. The dual redundant circuit provides security of supply in the event of a fault or loss of supply from one source, the other circuit is capable of supplying full load to the site. To achieve this redundancy, the operator is proposing for the full supply to be split 50%/50% (dual-feeds) from alternative supply sources, each capable of supplying the 100%, if required.

Essentially, the Data Center will be supplied from the Grid by an adjacent 132/22kV substation with two separate circuits from two separate feeders from the Brimsdown 400/132kV upstream substation; therefore, in the event of a loss of supply from a single source, 50% of the development is still on the alternative source, while the remaining 50% is on standby emergency generators temporarily until the site's own distribution system can be rearranged to resume supply from the available source.

This arrangement stays in place until the failed source has restored supply, at which point power returns to the two supply sources. This arrangement is subject to connection agreement and compliance with transmission and distribution regulations (and providers).

The on-site infrastructure is designed as a minimum on N+1[3] reliability and concurrently maintainable design. This means that there is redundancy built into the system, so that any one component, or any one distribution path can be out of service without affecting operations. Similarly, for the grid connection to the Data Center to fail, it would require a number of failures to the upstream distribution network to occur simultaneously. The requirement to run standby generators is therefore minimised.

The Operator also undertakes a regular and robust infrastructure inspection, preventive maintenance and testing programme and has an integrated Building Management System (BMS) and Power Monitoring System (PMS): these are additional control tools which are used to monitor physical assets and equipment status and performance.

The measures above will minimise the potential for emergency operation of the diesel generators, reducing the overall environmental impact from the installation, in the rare event that they are triggered.

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[3] N+1 redundancy is a form of resilience that ensures system availability in the event of component failure. Components (N) have at least one independent backup component (+1). The level of resilience is referred to as active/passive or standby as backup components do not actively participate within the system during normal operation

4. Potential Emissions

A summary of the potential emissions from the site are detailed in the Environmental Risk Assessment provided as part of the EP Application (see Document Reference 1A-RP-EHS-0012).

4.1 Emissions to air

Detailed atmospheric dispersion modelling has been undertaken to consider and assess the potential impact of the use of the standby diesel generators during routine testing and maintenance regime as set out in in the different scenarios in Table 1.

Furthermore, an additional scenario was also considered to assess the potential impact in the unlikely event of an emergency power outage. This scenario considered a single event where all generators will operate at 100% load for up to 30 hours.

The Air Quality Assessment (1A-RP-EHS-0013) has been produced as part of the application, Table 2 and Table 3, provide a summary of significance for the testing and emergency scenarios.

Table 2: Human receptor assessment summary of significance for testing and emergency scenarios

Scenario	NO_2 annual mean	PM_{10} annual mean	NO_2 hourly mean	PM_{10} daily mean	SO_2 15-minute mean	SO_2 hourly mean	SO_2 daily mean	CO 8-hour rolling mean
Scenario 1 (annual test)	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Scenario 2 (3 yearly test)	-	-	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Scenario 3 (6 yearly test)	-	-	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
Scenario 4 emergency	-	-	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant	Insignificant
"-"denotes that as this scenario would only run for a limited period and is not a regularly scheduled test, no annual averages have been calculated.								

Table 3: Ecological assessment summary of significance for testing and emergency scenarios

Scenario	SO_2 annual mean	NO_X annual mean	NO_X daily mean
Scenario 1 (annual test)	Insignificant	Insignificant	Insignificant
Scenario 2 (3 yearly test)	-	-	Insignificant
Scenario 3 (6 yearly test)	-	-	Potentially significant
Scenario 4 Emergency	-	-	Potentially significant
"-"denotes that as this scenario would only run for a limited period and is not a regularly scheduled test, no annual averages have been calculated.			

Further information on generator emissions can be found in Section 5.5.1 of this report or The Air Quality Assessment (1A-RP-EHS-0013) accompanying the EP Application.

4.2 Emissions to water

There are no point source emissions to and from the generators or associated fuel storage.

4.3 Emission to land

There are no point source emissions to and from the generators or associated fuel storage. Discharges of surface water will be restricted to run off from the roof, hardstanding and paved areas.

4.4 Fugitive Emissions

The potential fugitive emissions from the site have been considered in the Environmental Risk Assessment (ERA) which also details the measures to manage any potential significant releases. The assessment is included with the application as Document Reference 1A-RP-EHS-0012.

4.5 Noise and Vibration

A Noise and Vibration Assessment has been completed for the site. In summary for ‘normal’ and ‘generator testing’ operational scenarios, the results show that predicted plant noise would not exceed the noise limits during the day and night-time periods at the nearest sensitive receptors. Routine testing and maintenance would also only occur during the day-time hours.

During a ‘full site blackout’ the predicted noise levels marginally exceed the noise emissions limits at two of the receptor locations. However, given the small magnitude of the exceedance, the rarity of this event and assumed short term duration of such an emergency event, this is not expected to cause an adverse effect at the nearest sensitive receptors. Further details are provided in the ERA which is included with the application.

5. BAT Assessment

In response to Application Form Part B3 question 3a.

This section provides a review and assessment of the site against BAT, in-line with the relevant applicable guidance.

5.1 Generator type

The EA's Data Center FAQ guidance note states that "*We accept that oil fired diesel generators are presently the default technology for standby generators in Data Centers."* Details into the BAT discussion justifying the choice of engine, the particular configuration and plant sizing meeting the standby arrangement are set out in Section 3.1 and 3.2.

Regarding the determination of engine type, diesel engines are considered to be BAT on the basis that:

- diesel fuelled engine has been chosen due to the ability to store the required volumes of diesel on site and therefore maximise energy security in the system;
- instantaneous supply of electricity is required in the event of power loss to the site, which diesel engines provide;
- the technology is well established, replacement parts are readily available, and the maintenance costs are low; and
- the size of the engines has been selected in order to ensure fast start up and shut down can be achieved as this is a fundamental requirement of the emergency back-up nature of the generators.

To determine the BAT for the site, various generators were considered. It was determined that renewable energy sources were not considered feasible for the purpose of emergency standby generators at this site because of the intermittent nature of their energy supply through the reliance on weather conditions. This makes it challenging to maintain a consistent and reliable energy supply. In the event of an electricity failure, it is important that the standby energy supply is able to provide consistent energy supply to meet the demand. The use of batteries to provide a means of storing the electricity generated from renewable energy could resolve the problem of intermittency, however due to the energy demands in the event of a grid failure, a large number of batteries would need to be stored on site. There is insufficient land available to install a network of high capacity batteries within the site boundary.

The following section outlines the initial model setup prior to understanding the alterations that would be required to achieve BAT, and subsequently outlines the various scenarios that have been assessed to improve air quality concentrations.

In order to determine the BAT for the Proposed Development, the following steps were taken:

- the model inputs were refined through discussions with the generator supplier, to ensure accurate Data to input to the models;
- the project team compared initial results from the predicted air quality concentrations from the array of generators available, to identify the most acceptable generators that could be taken forward;
- the model inputs were then further refined by comparing parameters with the Computational Fluid Dynamics (CFD) and noise teams to ensure consistency across the project and agree a generator specification suitable for air quality, CFD and noise;
- the air quality team discussed the potential use of Hydrogenated Vegetable Oil (HVO) fuel with the generator, and found this was not considered to be a viable option for the project (further details are provided below);

- the air quality team then liaised with the generator about possible mitigation through the use of Selective Catalytic Reduction (SCR), and compared results for alternative generators using SCR;
- once the specific generator had been selected, to improve predicted concentrations from operation, a stack height assessment was undertaken.

5.2 Review of alternative generator specifications

5.2.1 Generator 1

This generator was considered to be a good alternative to some of the standard generators, however it was found that the low NO_x generators are not able to provide sufficient power for the Proposed Development, and therefore could not be taken forward for operational reasons.

5.2.2 Generator 2

Generator 2 was then considered, however it was found that the NO_x emission rate was too high (>2000 mg/m^3) and therefore this specification was not suitable for the Proposed Development. Other generators were then considered at this point.

5.2.3 Generator 3

Generator 3 generator had lower emission rates than Generator 2, however it was considered that other generators or options may still be able to improve upon this.

5.2.4 Generator 4

Generator 4 was suggested to be used with SCR and it had the lowest emission rate. However, for the annual test, the SCR would only be in operation for the latter half hour due to the lead time in the SCR taking effect. When weighting the original Generator 4 emission rate with the Generator 4 SCR emission rate, the final emission rate was higher than the standard Generator 2 emission rate (further details on calculating SCR emission rates are provided below).

5.2.5 Generator 2 with open loop SCR generator

Due to the outcomes of the Generator 4 with SCR, Generator 2 was tested with SCR using the same methodology and it was found that this generator specification provided the best possible outcome of all generators tested, particularly as it was also suitable for the CFD and noise teams.

5.3 Consideration of SCR mitigation

Due to the consideration that the predicted concentrations of the original generators could be improved upon, SCR was investigated as an emissions abatement technique. The generator supplier confirmed that SCR would require 20 to 30 minutes to warm up before being effective. For a 1-hour test, this would mean that for the first half hour, the SCR would not be effective, and the original generator emission rate would be in effect. The second half hour would then emit pollutants at the lower SCR emission rate. In order to take this into account for the modelling, a weighted emission rate was calculated, using the standard emission rate for the initial half hour and the SCR emission rate for the second half hour.

5.4 Consideration of Hydrogenate Vegetable Oil (HVO)

The possibility of HVO fuel as an alternative fuel source to diesel was discussed with the generator supplier. The generator supplier indicated that there was a lack of empirical evidence supporting the use of HVO fuel to achieve a sufficient reduction in Nitrogen Oxides (NO_X) and Particulate Matter (PM) PM_{10} and $PM_{2.5}$ emissions. The use of HVO fuel was therefore discounted for the purposes of this application.

5.5 Emissions to air

The following sections are set out in-line with those topics contained within the Pre-application Guidance for the Combustion Sector[7] and Data Center FAQ Headline Approach provided by the EA, which require responses to demonstrate that the engines are specified to be BAT. This is for emergency standby diesel generators with a net rated thermal input above 1 MW, which are exempted from MCPD emission limits because they operate for less than 500 hours per year.

5.5.1 Generator emissions

The guidance specifies that BAT emissions specification for new diesel-fired reciprocating engines as 2g TA-Luft or US EPA Tier II (or equivalent) with NO_X emission levels in the range of 2000 mg/Nm^3 at 5% oxygen and reference conditions.

All of the back-up generators are to be of the same type and specification and fitted with SCR. The NOx emissions when SCR is effective are quoted as <190mg/Nm^3 @ 5% O_2.

For testing scenario 1 (annual test) no significant effects are predicted for human and ecological receptors for all pollutants.

No significant effects are predicted for human and ecological receptor for scenario 2 (3 yearly test) for all pollutants.

For testing scenario 3 (6 yearly test) no significant effects were identified for human receptors from all pollutants. However, the modelling did identify an exceedance of the air quality standard of 200µg/m^3 for the NO_2 hourly mean concentration. As such the exceedance was further assessed using statistical analysis (hypergeometric distribution). This assumes 48 hours (3 yearly test) and 96 hours (6 yearly test) of operation, to assess the probability of exceeding the NO_2 hourly mean objective. This showed that an exceedance would be highly unlikely (<1% probability) for the 3 yearly test and unlikely (<5% probability) for the 6 yearly test. These impacts are therefore considered as insignificant.

For testing scenario 3, potential exceedances of the NO_X daily mean critical level are predicted and this is considered to be potentially significant. However, this scenario would only occur once every 6 years so it is not considered to be significant and therefore no additional mitigation measures are considered necessary.

An emergency scenario (scenario 4), assuming all generators would be operating continuously for 30 hours was also assessed, with predicted exceedances of the NO_2 hourly mean objective, and NO_X daily mean critical level. These are considered to be potentially significant. Statistical analysis using the hypergeometric distribution was used to assess the probability of exceeding the NO_2 hourly mean objective and this indicated that an exceedance would be highly unlikely (<1% probability).

The emergency scenario was also compared against the US Acute Exposure Guideline Levels (AEGLs) for NO_2. Exceedances of the lower AEGL 1 limit were predicted under the emergency scenario at a small number of modelled receptors immediately adjacent to the western boundary. The AEGLs guidance states that effects of exposure to AEGL 1 are *"not disabling and are transient and reversible upon cessation of exposure".* The predicted concentrations at all receptors however were well below the AEGL 2 and 3 limits and this is therefore not considered to be significant.

The risk of this scenario occurring is however very unlikely. This is based on the sites inbuilt electrical resilience as the site will draw on power from a 132/22KV substation with two separate circuits from two separate feeders from the Brimsdown 400/132kV upstream substation; therefore, in the event of a loss of supply from a single source, 50% of the development is still on the alternative source, while the remaining 50% is on standby emergency generators temporarily until the site's own distribution system can be rearranged to resume supply from the available source.

[7] Environment Agency. Supplementary combustion sector (Part A installations) basic pre-application advice (Version 1.0) (2021)

5.5.2 Stack Height Assessment

A stack height assessment was undertaken to determine a suitable height for the proposed generator. Emissions of short-term NO_2 for Scenario 3 (6 yearly test) were identified early in the design development as likely to be the worst case and therefore this stack height assessment focusses on the predicted short term NO_2 concentrations for Scenario 3 only.

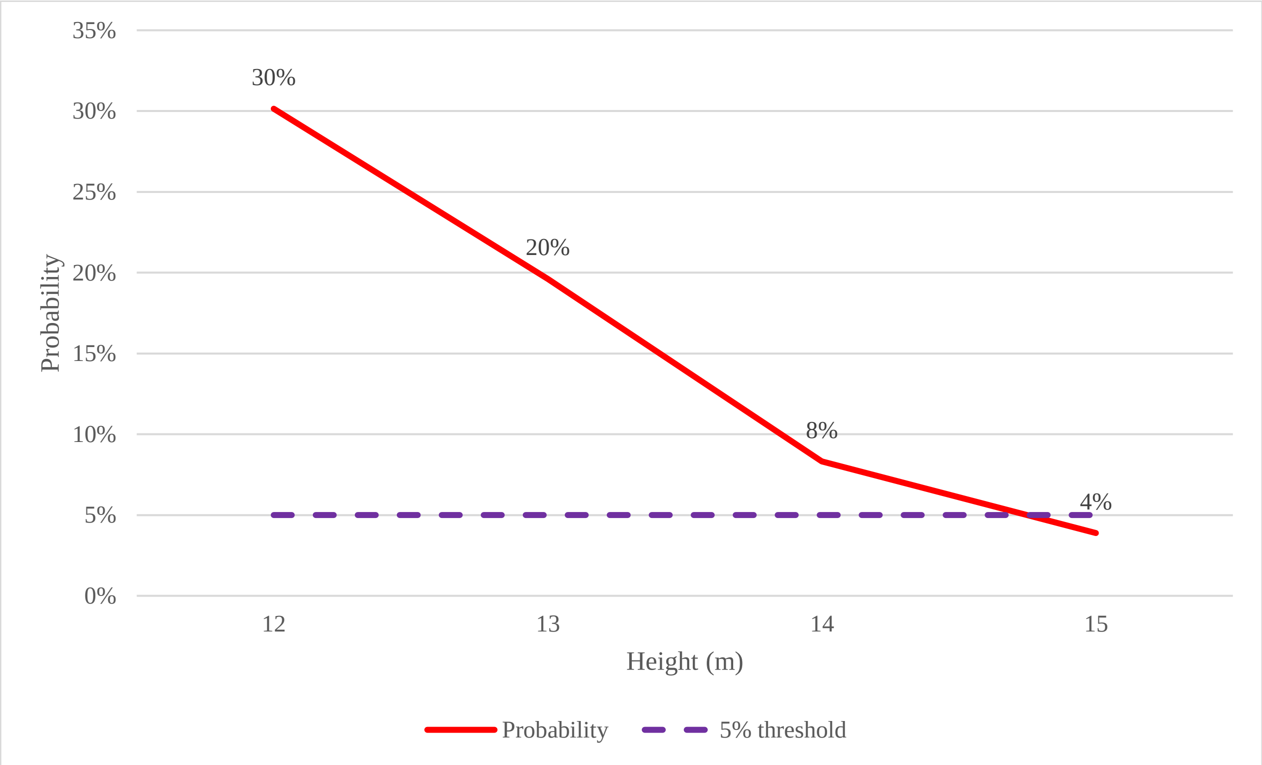
An operating window of 96 hours must be achieved to allow for Scenario 3 (based on four sets of 24 continuous tests). Stack heights were tested in 1m increments between 12m and 15m, based on known design parameters.

5.5.2.1 Stack heights for a 96-hour operating window

When considering stack heights from 12m-14m using the EA's hypergeometric distribution analysis, it was predicted there would be a high likelihood (greater than or equal to 5%) of exceeding the NO_2 hourly mean standard.

For a stack height of 15m however, this falls below 5%, which indicates an 'unlikely' probability of exceeding the NO_2 hourly mean standard.

Figure 2: Probability of exceeding hourly mean NO_2 standard



In order to reduce stack heights wherever possible due to planning constraints, and following discussions with the wider project team, a further stack height assessment was undertaken with generators A-a to A-h using a stack height of 15m and the remaining generators at 13m. Generators A-a to A-h are the closest to the sensitive residential receptors in the north-west and were therefore modelled at a greater stack height to improve dispersion.

It was predicted that the probability of exceeding the hourly NO_2 mean standard was 4.8%, which indicates an exceedance is 'unlikely'.

Therefore, the final assessment and design has considered stack heights of 15m for generators A-a to A-h and a stack height of 13m for all other generators. Results are outlined in detail in Section 7 of the Air Quality Assessment (1A-RP-EHS-0013).

5.8.1 Flue gas monitoring

The guidance specifies the BAT is also the provision of flue gases sampling ports to allow for monitoring of NO_X and Carbon Monoxide in line with web guidance 'Monitoring stack emissions: low risk MCPs and specified generators'.

Sampling ports will be installed within each of the flues which comply with the EA's MCERTS (monitoring certification scheme). Monitoring is expected to be required within four months of permit granting and when three times the number of maximum average annual operating hours have elapsed.

Further details on the monitoring strategy reset out in Section 7.

5.9 Emissions to water / land

No process waters will be generated by operation of the installation, hence there will be no associated process water discharge to ground or groundwater. Discharges of surface water will be restricted to run -off from the roof hardstanding and paved areas.

5.10 Fugitive emissions / leaks

5.10.1 Fuel storage and distribution

Management system will be in place at the facility to ensure that the risk from fugitive emissions are minimised, for example through regular inspection and maintenance of the plant. Scheduled maintenance of the diesel tanks will be incorporated into the Environmental Management System (EMS), to minimise the risk of fugitive emissions of diesel fumes to air.

The standby generator fuel storage, fuel delivery and engine lubrication oil systems have been designed to consider the potential impact of leaks / spillages on the site.

The principal guidance for the design of the oil storage and associated infrastructure is the Control of Pollution (Oil Storage) (England) Regulations 2001. Additionally, the requirement for the safe environmental storage of fuel on-site (including transport of fuel) is covered within the EPR.

Best Available Technique (BAT) Reference (BREF) document 'Emissions from storage' for sites regulated under the IED has also been considered as part of the design.

A road tanker will fill up the diesel storage tanks in a dedicated refuelling laybys spanning the length of the generator areas. The fill points serving the electrical yard generators will be located on the western side of the electrical yard. The fill point serving the mechanical yard generators will be located on the eastern side of the mechanical yard. The tanker will move along the layby to each generator fill point as shown in Figure 3 for the Electrical Yard Generators. The same procedure will be carried out for the generators in the mechanical yard.

Figure 3: Indicative Fuel Tanker Fill Points for Electrical Yard Generators

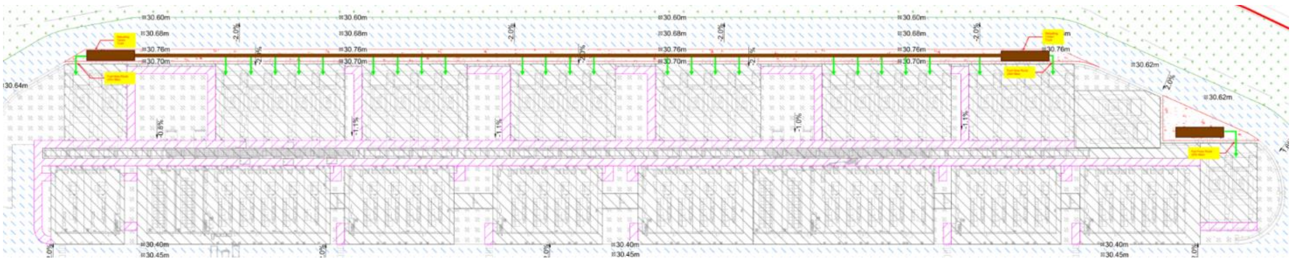
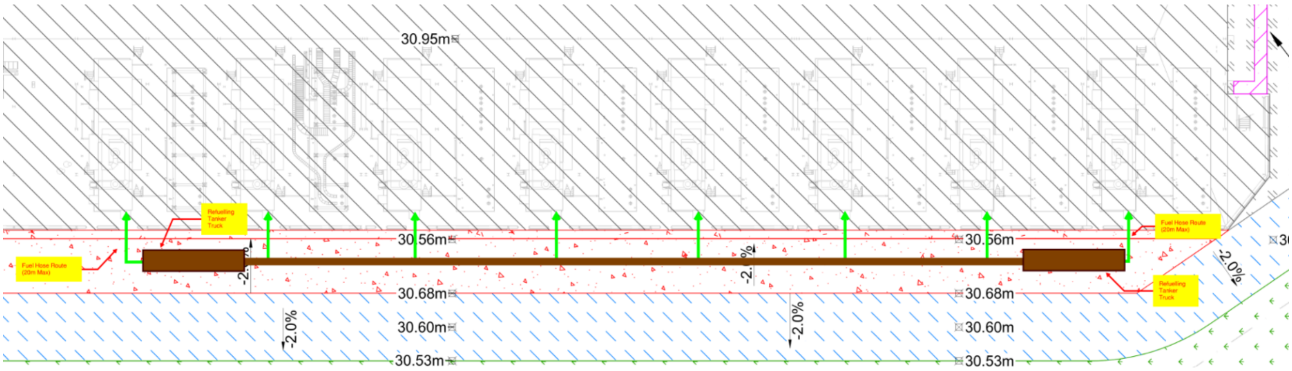


Figure 4: Indicative Fuel Tanker Fill Points for Mechanical Yard Generators



These laybys will have a treated concrete surface, with run off directed into drainage that routes via forecourt oil separators. These separators are specified such that they have a capacity of 10,000 litres, i.e. are capable of retaining the full loss of the contents of one compartment of a road tanker (up to 7,600 litres). Once the oil has been removed via the oil separator, the remaining surface water will pass into the site wide surface water drainage which will be directed through to two connecting attenuation ponds. See Appendix A for the Drainage Strategy.

Diesel will be transported from the refuelling point via above ground fuel lines which will be double lined through to the individual generator storage tanks (each with a volume of 22,000L bulk storage tanks). The generators located in the electrical yard will have their integrally bunded storage tanks (belly tanks) within the generator unit. For the generators located on the mechanical yard their respective storage tanks will be located approximated 10m from the generators and will be connected to the generator by double lined above ground fuel lines which will be fitted with leak detection and alarms. All storage tanks will be integrally bunded to a capacity of 110% of the tank volume and will be fitted with leak detection and alarm.

The double lining of fuel lines which will be fitted with leak detection and alarms provide primary and secondary containment of the fuel. The fuel lines will have no outlets with the exception of tanker connections. If there is a leak from the primary container, staff will be notified by the alarm system and will be able to act accordingly. Fuel lines will be inspected once a week to ensure they have not been compromised.

As the fuel will be stored within integrally bunded tanks capable of holding 110% of the tank volume and will be fitted with leak detection and alarms, this provides primary and secondary containment. If there is a leak from the primary container, staff will be notified by the alarm system and will be able to act accordingly. Fuel tanks will be inspected once a week to ensure they have not been compromised. See Appendix C for Fuel Schematics.

Fuel tank filling will be carried out by an approved third party specialist contractor. This reduces any significant risk of spillages and leaks. Spill kits will also be available to deal with any leaks. Relevant spill response equipment will be situated at various locations around the site, designed for the particular hazard characteristics of the materials (fuel) present.

The EMS will require all spillages will be logged, investigated and corrective action will be taken.

In order to retain the integrity of the diesel it will be polished. If the diesel fuel is left unpolished for extended periods of time it can cause clogging of the fuel lines and damage to the engines. Diesel fuel polishing is the process or removing contaminants and impurities from the fuel. It will involve the filtration of the diesel fuel using a 50-micron filter to remove contaminants. The mobile fuel polisher will be towed along the length of the electrical and mechanical yard connecting directly to the fuel lines.

Fuel polishing for the fuel stored in the electrical yard will tank place within the refuelling laybys which will have a treated concrete surface, with run off directed into drainage that routes via forecourt oil separators. These separators are specified such that they have a capacity of 10,000 litres, i.e. are capable of retaining the full loss of the contents of one compartment of a road tanker (up to 7,600 litres).

The fuel polishing for the generators within the mechanical yard will take place within the mechanical yard along adjacent to the storage tanks.

Figure 5 and Figure 6 shows the indicative location and route of the fuel polisher for the electrical yard generators and mechanical yard generators.

Figure 5: Indicative Mobile Fuel Polishing for Electrical Yard Generators

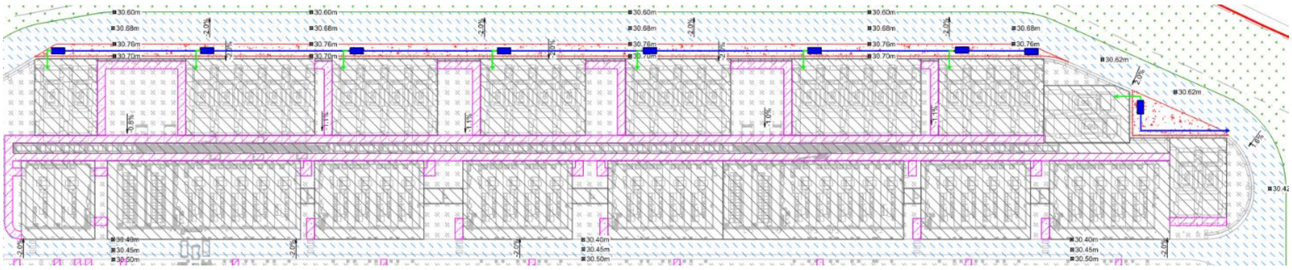
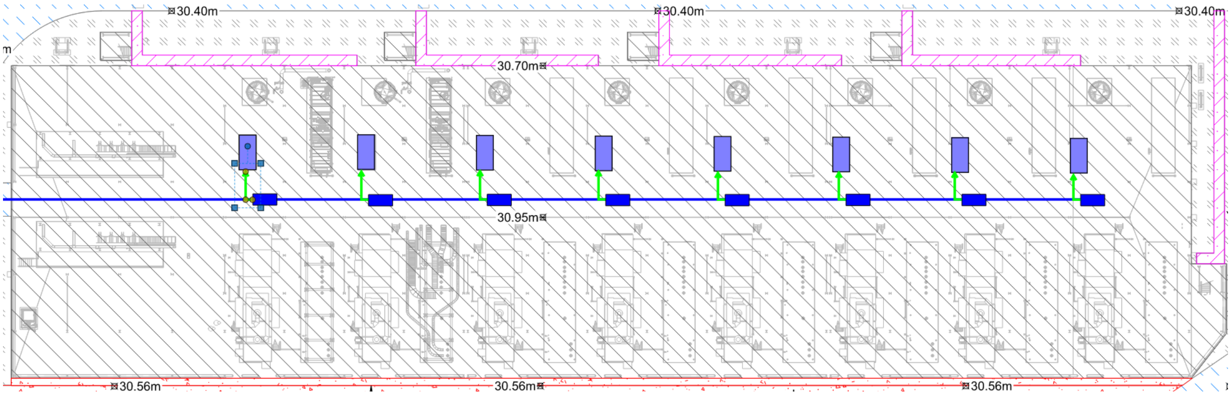


Figure 6: Indicative Mobile Fuel Polishing for Mechanical Yard Generators



The mobile unit will be fixed to a trailer base and will either be fitted with a hinged insulated double door or an insulated roller shutter door, and bunded flooring fitted with leak detection.

Best Available Techniques (BAT) Reference Document for the Refining of Mineral Oil and Gas Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control) under 4.21.13 Other good storage practices outlines the BAT for :

- Installation of self-sealing hose connections or implementation of line draining procedures.
- Installation of barriers and/or interlocking systems to prevent damage to equipment from the accidental movement or driving away of vehicles (road or rail tank cars) during loading operations.

In accordance with the BAT, a pipe will be used which has been manufactured with a safety breakaway coupling on one end which has safety pins which break on a pull away force and seal the pipe and contents and has Hi-Flow Dry Release Coupling (HDC) on the generator container for non-drop.

Each hose will be 5m long in total with 2.5m from the front to the back of the mobile unit and then 2.5m to the front again, which allows for 2.5 minimum to be pulled from the trailer across to the generator mobile polisher connections. The hose will have a volume of 2 L per meter. Using the safety breakaway coupling the hose will be sealed in the event of damage impact or drive off and also manual ball valve for manual isolation when the polisher is not in use.

All pipeline connections will be placed over drip trays with a rain cover and will be fitted with leak detection. It is anticipated that fugitive emissions of odour will not be significant for the facility. Diesel will be contained within either fuel lines which will be double piped or within storage tanks which will be integrally bunded with a capacity of 110% of the tank volumes. Both the fuel lines and the storage tanks will be fitted with leak detection and alarms. A spillage is therefore unlikely to occur within the generator areas. The refuelling points for the generators will take place on a treated surface which will drain into oil separators before passing into the wider drainage system. In the event a spill occurs, this could be a potential source of odour. Procedures will be incorporated within the EMS to ensure the potential for spills is minimised and they are dealt with swiftly should they occur.

No powders or other dry materials will be used or stored at the installation and therefore fugitive emissions of dust are unlikely to occur.

6. Resource Use and Efficiency

6.1 Raw materials

In response to Application Form Part B3 question 3c.

In response to Application Form Part B3 question 6d.

The raw materials to be used at the site are as follows:

Diesel fuel oil: each generator tank volume for 24 hour run time with 18,050 litre usable volume (22,000 L gross).

Lubricating oil and anti-freeze: to be used in the engines and other mechanical equipment. Occasional top up or replacement will be required during scheduled or forced maintenance periods only.

The lubricating oil and anti-freeze for the generators will be stored within the engines and manually topped up during servicing by an appointed service contractor.

Transformer oil: Occasional top up or replacement will be required.

No lubricating oil/anti-freeze or transformer oil will be stored on site by the operator; all oils will be brought to site and topped up/replaced during planned or forced maintenance periods only.

The BAT objective with regard to raw materials is achieved by the appropriate design, operation and maintenance of the generators to ensure the lowest possible consumption rate of fuel; by the selection of least hazardous materials; and by the provision of appropriate storage methods.

The generator engines are designed for the combustion of diesel fuel oil, this being the fuel recommended/specified by the engine manufacturers. The diesel fuel will have a low sulphur content.

Diesel has been selected due to the ability to store sufficient volumes on site to ensure security of supply. Other fuels have been considered but do not currently provide the same level of security of supply. Natural gas could not be stored in sufficient volumes and would be reliant on the National Transmission System; a contract for uninterruptible supply would be excessively costly given the infrequency of use. Due to the limited hours of operation, any potential benefits from the lower impacts associated with emissions from natural gas are reduced.

The engines will utilise a closed-circuit cooling water (CCCW) system. The cooling system, including coolers and CCCW circulating pumps will be fully within the container for each engine. There will be no need to routinely top up coolant and any spillages or leaks will be quickly identified and dealt with.

The lubricating and transformer oils may have other alternatives, however the type of fluids used are limited to those recommended/specified by the engine manufacturers and site engineers.

6.2 F-gases

In response to Application Form Part B3 question 6d.

F-gases will be used within the wider Data Center however will not be used as part of the Scheduled Activities or Directly Associated Activities listed; namely the combustion of fuels with a rating >50MWth for the standby diesel generators, together with the storage of associated fuels.

The Data Center will use the refrigerants R410a, R134a and R32 within the AHU Outdoor Units, HVRF and CRAC units. These refrigerants will be used in accordance with the F Gas regulations applicable to England.

Regular maintenance will be undertaken by an approved specialist contractor to ensure the units are all operating correctly and to prevent any leaks. Records will also be maintained of any refrigerant top-ups needed.

6.3 Energy Efficiency

In response to Application Form Part B3 question 6a and 6b.

The Energy Efficiency Directive (EED) exempts *"those peak load and back-up electricity generating installations which are planned to operate under 1,500 operating hours per year as a rolling average over a period of five years".*

As the total installed planned maintenance and testing schedule falls below the 1500 hour threshold, the Data Center is therefore exempt from the EED requirements and an assessment of energy efficiency is not required.

The standby generators will be subject to regular maintenance and inspection that will include ensuring the engines are optimised to minimise the heat rate (energy consumption) whilst maintaining relevant emissions standards.

The standby generators are designed for use in the event of an emergency. The efficiency of the selected generator is 40%.

The provision/implementation of combined heat and power (CHP) is not applicable as the standby generators will each operate for substantially less than 500 hours per annum for the provision of emergency power generation.

Energy recovery is also not reasonably practicable for engines of this emergency nature with such small anticipated operational hours. However, as part of the operator's EMS, energy use will form one of the key environmental indicator and regular assessments of the site's energy usage will be undertaken with a view to identifying measures to improve energy efficiency, where possible.

Energy efficiency will form part of on-site training.

6.3.1 Climate Change Agreement

In response to Application Form Part B3 question 6c.

The operator will not be a participant to a Climate Change Agreement (CCA) for the Data Center sector for the Data Center sector, however the operator will assess the site at a corporate level against the European Commission lead Code of Conduct for Energy Efficiency for Data Centers, in-line with the most recently published Best Practice Guidelines.[8]

6.4 Water Minimisation

In response to Application Form Part B3 question 6d.

There will be no consumption of water associated with the standby generators / combustion activities and use/storage of diesel at the site. A CCCW system will be installed which has no associated process discharge under normal operation. No process waters will be generated by the plant, hence there will be no associated process water releases to surface water or sewer from the installation.

The area containing the coolers and CCCW circulating pumps will be within the engine containers so the risk of accidental discharge of process waters to controlled waters is minimised.

6.5 Waste Minimisation

In response to Application Form Part B3 question 6e.

The site will not produce significant amounts of waste due to the nature of its operations. Any waste oil generated during testing/ maintenance will be removed from site by the appointed third-party contractor and managed by a suitably regulated waste management contractor.

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[8] 1 EC, 2022. Best Practice Guidelines for the EU, Code of Conduct on Data Center Energy Efficiency. Available at <https://e3p.jrc.ec.europa.eu/publications/2022-best-practice-guidelines-eu-code-conduct-Data-Center-energy-efficiency>

Each main engine holds 647 litres (0.647 m^3) of lubricating oil which is changed at 500 run hours or 3 year intervals, whichever is shorter.

The Site comprises containerised standby back-up generators (SBGs) for emergency. It is estimated that waste oils from the SBGs at the Site will be approximately 8.6m^3 / 7.7 tonnes per annum.

The same applies to any Waste Electric and Electronic Equipment generated on-site (not related to the Scheduled Activity or DAA, but wider site operations).

7. Monitoring

In response to Application Form Part B3 question 4

7.1 Emissions to Air

Each of the standby generators will each operate for less than 500 hours per annum and will not be subject to emissions limit values (ELV).

As the generators will also not be used for the elective generation of electricity, they will not be considered specified generators in accordance with EPR 2018 and hence will not be subject to the ELV.

In-line with BAT guidance received during engagement with the EA, it is expected that the operator will need to demonstrate that the engines are BAT by including the provision of flue gas sampling ports to allow for NO_X and CO monitoring, designed to meet BS EN 15259[9].

Any testing will be undertaken by an organisation with the EA's MCERTS accreditation for these measurements, so that the Data meets the requirements of the MCERTS certification for emissions monitoring systems.

In-line with the MCPD requirements captured by the EPR 2018, it is expected that periodic measurements shall be required at least when three times the number of maximum average annual operating hours have elapsed for medium combustion plants with a rated thermal input >1MWth and less than <20 MWth. This is for plant which operate <500 hours and have no ELVs associated with their operation.

The first measurements shall be carried out within four months of the grant of a permit to, or registration of, the plant, or of the date of the start of the operation, whichever is the latest.

In addition, the operator will also record:

- the operating hours of each engine for planned maintenance;
- the operating hours of each engine for emergency operation; and
- the amount of fuel used on an annual basis.

As previously detailed, one of the reasons for the decision to choose diesel standby generators on-site is in relation to their minimal start-up or shut-down times.

Operational hours will be counted from the first fuel ignition. This will include the shorter periods of plant 'overlap' when redundant plant is started as a precautionary measure before final load is reached with the optimum/minimum number of generators in use.

7.2 Emissions to Water

7.2.1 Surface Water

There are no point source emissions to and from the generators or associated fuel storage.

The surface water drainage system has been designed in accordance with the recommendations set out in:

- BS EN 752:2017 - Drain and sewer systems outside buildings - Sewer system management, and
- The Building Regulations 2010, Approved Document H – Drainage and waste disposal.

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[9] BSI, 2007. Air Quality. Measurement of stationary source emissions. Requirements for measurement sections and sites for the measurement objective, plan and report. BS EN 15259:2007

The Drainage Scheme and Drawings 1A-C-1400-X and 1A-C-1401-X, included in Appendix A, show the proposed surface water strategy for the development.

The drainage system for the refuelling laybys for the generators in the electrical yard and mechanical yard are separate from the rest of the site wide drainage. The laybys will have a treated concrete surface with run-off directed into drainage that routes via forecourt separators. These separators are specified such that they have the capacity of 10,000 L and are therefore capable of retaining the full loss of the contents of one compartment of a road tanker (up to 7,600 L).

Uncontaminated surface water runoff from the generator areas connects to the wider drainage system for the entire site. Monitoring of the surface water discharge from the Data Center is not considered necessary.

For the purpose of the environmental permit, in relation to the surface water discharge from the permitted installation there will be two point source emissions to water, referred to as S.8.8 and S.1.10, the location of which is indicated on the Site Layout and Emissions Point Plan and 1A-C-1401-DCH-X as the points at which the discharge leaves the permit boundary.

7.2.2 Foul Water

There are no point source emissions to and from the generators or associated fuel storage.

The foul water drainage system has been designed in accordance with the recommendations set out in:

- BS EN 752:2017 - Drain and sewer systems outside buildings - Sewer system management, and
- The Building Regulations 2010, Approved document H - Drainage and waste disposal

The wider Data Center, not the permitted installation, will be connected to the municipal combined sewer system for discharges of domestic grey water / sanitary effluent (sinks, toilets, cleaning water, etc.).

Based on the above information, monitoring of the foul water discharge from the Data Center is not considered necessary.

8. Environmental Management Systems

In response to Application Form b2 question 3d.

8.1 Overview

The Operator will develop an EMS in line with the requirements of the international standard ISO14001:2015.

The EMS will include the policies, management principles, organisational structure, responsibilities, standards/procedures, process controls and resources in place to manage environmental protection across all aspects of the business.

- Environmental aspects and impacts
- Objectives and targets
- Training and competence
- Reporting
- Legislation
- Auditing

The Operator currently has their own corporate EMS however this is not site specific. The Operator plans to have an EMS which will be accredited to ISO14001 in place within 12 months of the operation start date. The Operator is currently preparing for the registration to the accredited body. The EMS will include the policies, management principles, organisational structures, responsibilities, standards, procedures, process controls and resources in place to manage environmental protection across all aspects of the business.

The EMS will place particular importance on:

- Reducing risks to the environment to a level that is as low as reasonably practicable using best available techniques;
- Integrating EMS responsibilities within line management;
- A commitment to personnel environmental awareness and competence;
- The ongoing monitoring and review of environmental performance; and
- A commitment to working to achieve continuous improvement in environmental performance.

8.2 Policy

The EMS will include an Environmental Policy which clearly defines the operator’s commitment to continual improvement and to developing objectives and targets aimed at preventing pollution and improving environmental performance. The Policy will be reviewed annually by top management and communicated to all employees.

8.3 Organisation

The operator will establish and maintain documented procedures for identifying and recording environmental aspects for all its activities, products and services. Where significant, the environmental aspects will be considered in the development, implementation and maintenance of the EMS. These will be considered when introducing new or modified activities and services. The operator will also document in the EMS the process for the setting, managing and reviewing environmental objectives and targets.

The operator will document in the EMS the structure and responsibility within the organisation. Senior management will have overall responsibility for the provision and maintenance of an effective EMS Policy and improvement programme and will ensure that the requirements of the EMS are addressed in all management and business decisions.

The operator will maintain an internal audit programme for periodic internal audits of environmental documents, procedures, implementation and compliance status to determine whether the EMS conforms to planned arrangements, and to determine whether it has been appropriately implemented and maintained in accordance with its Environmental Policy.

8.4 Environmental Aspects Evaluation

The environmental significance of the site activities will be determined by means of environmental aspects evaluation. The operator will identify the aspects and impacts (direct and indirect) relevant to its activities, highlighting which substances, activities or incidents related to the aspects that could potentially have a harmful effect on the environment. Any substance, activity or incident that has the potential to cause harm, or under the worst case scenario has a high-risk of potential to harm will be identified as being ‘significant‘.

The operator’s main activities will be identified and recorded, for example in an aspect and impact register; evaluation of these aspects and impacts and the associated implications will be recorded. Environmental aspects will be considered under the following conditions:

- Normal operation (i.e. standard operating procedures and conditions);
- Abnormal operation (i.e. standard operating procedures but non-standard conditions); and
- Emergency conditions.

Aspects which are identified as being ‘significant’ will be managed by establishing operational controls, process, procedures, training and monitoring activities such audits. The operator’s management team will be responsible for reviewing aspects and impacts defined as being significant. All staff will be responsible for working in accordance with procedures relating to environmental compliance.

8.5 Environmental Risk Assessment

Environmental risk assessments, together with the environmental aspect evaluation, will allow routine management system procedures to manage risks under normal circumstances, and emergency plans to mitigate impacts under abnormal circumstances. Such assessments will cover the implications of material storage, oil transfer, drainage and site security.

Environmental risk assessments will be carried out:

- Under normal operating conditions;
- Under potential abnormal/emergency conditions;
- For existing equipment;
- For existing material storage;
- Before a new substance is introduced;
- Before the installation of new plant on-site; and
- Before existing plant is modified.

All significant risks will be recorded, for example in an aspect and impact register.

The operator will require and will encourage full and open reporting of all environmental incidents, including near misses. Staff will be encouraged to report environmental incidents and problems which may result from (inter alia) the following factors:

- Pollution incidents;
- Potential incidents;

- Breaches of legislation;
- Supplier non-compliances;
- Contractor non-compliances;
- Non-compliances identified during audits; and
- Management systems non-compliances.

Additionally, contractor personnel will be informed of the need to report incidents.

8.6 Monitoring, Control and Change Management

The primary mechanism that will ensure operational control to minimise adverse environmental risks will be the aspect and impacts register. Processes and procedures will address each significant aspect and generate the information and Data necessary to monitor adequately the environmental performance of the Data Center and develop an understanding of performance so as to identify faults, opportunities for improvement and to optimise maintenance routines.

The EMS will provide for the controlled implementation of changes which may have environmental implications, to ensure any environmental risks posed by a proposed change will be adequately managed.

Change control will include consideration of the proposed change requirement, identification of the potential environmental implications, measures required to minimise the potential environmental impacts and the responsibility for resolution and a timescale. Change control will include consideration of (inter alia):

- Legal obligations;
- Results of routine monitoring activities;
- Changing commercial circumstances;
- Improvement targets;
- Review of the environmental aspects, which will include risks from climate change;
- Complaints or suggestions from the public;
- Staff suggestions; and
- Non-compliances.

8.7 Accident Prevention and Management

The operator will develop systems for managing accidents or incidents. Risks as a result of activities undertaken, or proposed to be undertaken, at the Data Center will be considered and documented, for example in an environmental aspect and impact register and via risk assessments. The environmental aspect and impact register will be updated to include requirements of the Environmental Permit.

An Incident Management Response Plan will also be developed for the EMS which will set out the procedures for management and response in the event of an incident.

8.8 Climate Change Adaptation Plan

Adaptation to climate change must now be integrated into the management system for permitted activities. The operator will consider the risks to the site from climate change, the risks the site creates due to climate change and how to embed controls throughout the EMS. Based on climate projections over the coming decades the following risks are identified as potential risks:

- Summer daily maximum temperature may be around 7°C warmer which could resulting in increased use of standby generator on-site in the event the summer temperatures affect the electricity grid.

- Winter daily maximum temperature could be 4°C more than the current average, with the potential for more extreme temperatures, both warmer and colder than present resulting in potential impacts on the site.
- Daily rainfall intensity could increase by up to 20% on today's values resulting in flooding on the site.
- Average winter rainfall may increase by over 40% on today's averages resulting in potential increased risk of site surface flooding and could impact site wide drainage capacity.
- Sea level rise resulting in flooding events.
- Drier summers could see potentially up to 40% less rain than now.
- Generation of CO_2e emissions from generator use.

The Environmental Risk Assessment (1A-RP-EHS-0012) submitted as part of the application assesses the above risks.

As part of the EMS the operator will develop a Climate Change Adaptation Plan which will be compliant with the EAs guidance on risk assessment and adaptation planning in your management system[10]. The climate change adaptation plan will be monitored on an annual basis by the operator to determine if the plan is achieving its original objectives, managing priority risks, if the plan is still effective and if the plan needs updating.

8.9 Training

Environmental training will be provided; this will be for both general awareness and job-specific training. The site will be managed by a sufficient number of staff, who have the competencies to operate the site. In accordance with the EMS:

- All staff will have clearly defined roles and responsibilities;
- Records will be maintained of the knowledge and skills required for each post;
- Records will be maintained of the training undertaken and relevant qualifications obtained by staff to meet the competence requirement of each post; and
- Operations will be governed by standard operating instructions.

Each individual's knowledge and skills will be assessed and matched against the needs of the job position. Additional experience and/or training requirements necessary to enable an individual to undertake their assigned role will be identified, prioritised and planned.

Training records will be maintained and training needs regularly reviewed.

All contractors will be given appropriate training prior to the commencement of any works or services.

8.10 Review and Audit

The operator recognises that continuous improvement requires the ongoing appraisal of EMS and Environmental Policy in order to ensure that they remain effective, in line with developing best practice and relevant to the business as a whole. An annual management review of the EMS will be undertaken to ensure that it remains appropriate and effective at controlling environmental performance and to identify any areas where opportunities exist for improvement.

The EMS and site activities will be internally audited at least annually, either by site staff with suitable audit experience and / or training or by a suitably qualified and experienced third party.

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[10] EA, Guidance on climate change: risk assessment and adaptation planning in your management system. Available at https://www.gov.uk/guidance/climate-change-risk-assessment-and-adaptation-planning-in-your-management-system.

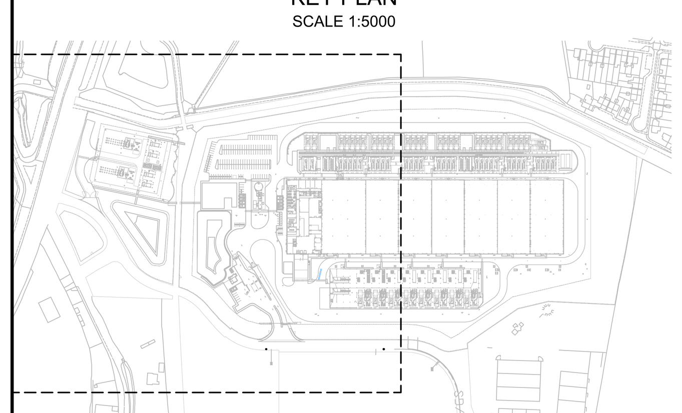
Where corrective action is identified as being required, through audit (or otherwise), which for example involves modifications to plant and equipment, the implementation of such changes will be managed via the EMS change management process.

Appendix A

Drainage Strategy

KEY PLAN

SCALE 1:5000



NOTES

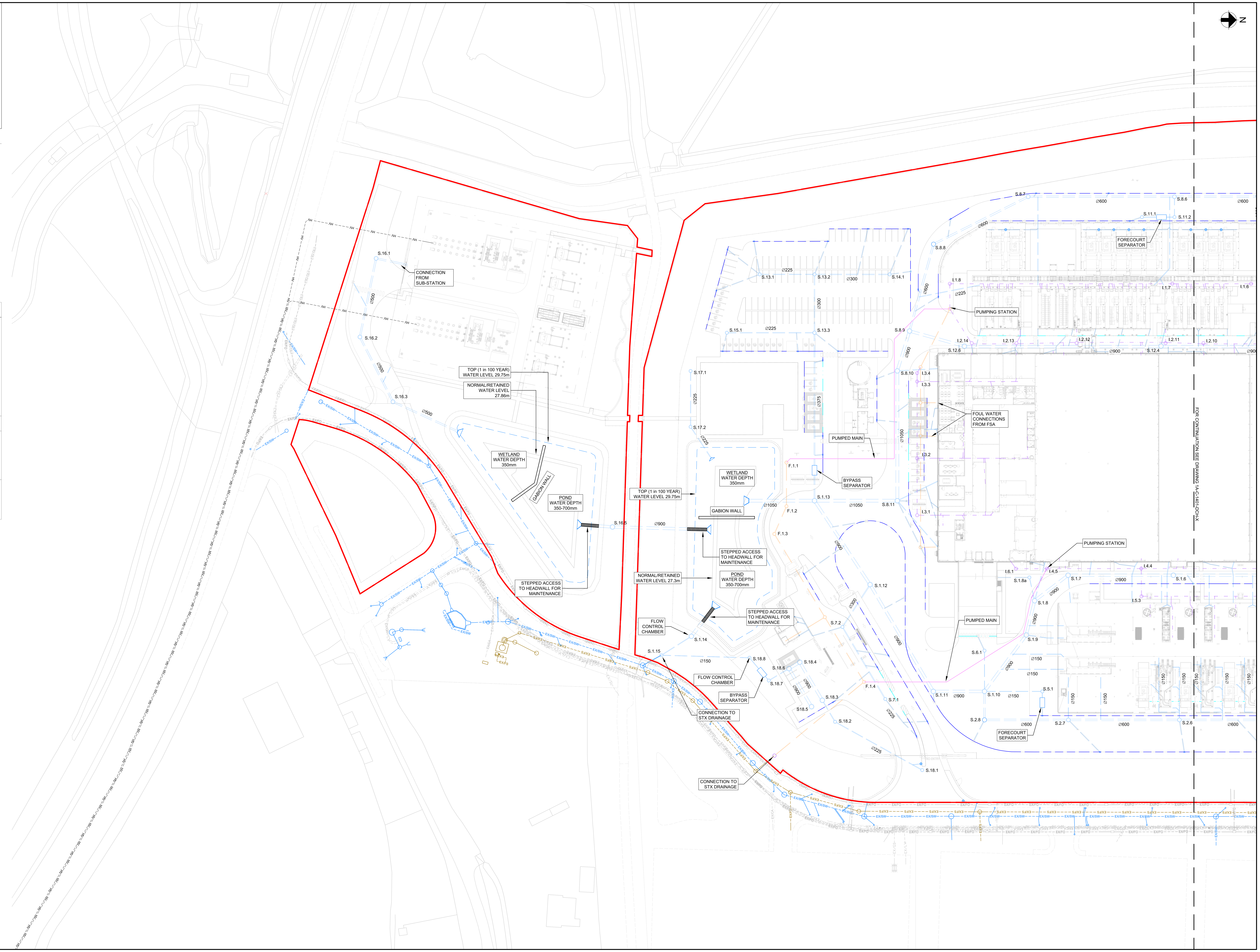
1. CONNECTION DETAILS TO OFFSITE UTILITIES ARE TO BE CONFIRMED WITH THE RELEVANT AUTHORITY / ASSET OWNER.
2. PIPE / MANHOLE QUANTITIES, SIZES, LOCATIONS AND CONNECTION POINTS ARE INDICATIVE AND SUBJECT TO DEVELOPMENT IN FUTURE DESIGN STAGES.
3. ALL FOUL DRAINAGE AND INDUSTRIAL FOUL DRAINAGE IS TO BE 150MM DIAMETER UNLESS NOTED OTHERWISE. RISING MAIN SIZE IS TO BE CONFIRMED IN FUTURE DESIGN STAGES.

LEGEND

(red line)	OWNER'S BOUNDARY
EX/GS	EXISTING GAS NETWORK
EX/LV	EXISTING LV ELECTRIC SUPPLY
EX/SL	EXISTING LV STREET LIGHTING SUPPLY
EX/WM	EXISTING WATER MAIN
EX/CA	EXISTING COMMUNICATIONS APPARATUS
EX/FS	EXISTING FOUL SEWER
EX/SW	EXISTING SURFACE WATER SEWER
EX/FO	EXISTING FIBRE OPTIC APPARATUS

LEGEND

	PROPOSED SURFACE WATER SEWER
	PROPOSED SANITARY SEWER Ø150mm (UNLESS NOTED OTHERWISE)
	PROPOSED INDUSTRIAL WATER SEWER Ø150mm (UNLESS NOTED OTHERWISE)
	PROPOSED INDUSTRIAL PUMPED MAIN
	PROPOSED ROAD GULLY
	PROPOSED KERB DRAIN
	PROPOSED CHANNEL DRAIN
	PROPOSED HEADWALL



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DRAFT PLANNING ISSUE
NOT FOR CONSTRUCTION
31/03/2023

N

REVISIONS

NO.	DATE	DESCRIPTION
0.1	31/03/2023	DRAFT PLANNING ISSUE

Drawn By: SM

Approved By: MM

Design Team: Arup

1A-CIVIL

Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH

Project Number: 288809

DRAINAGE LAYOUT
SHEET 1 OF 2

Discipline: Civil

Scale: 1:500 Sheet Size: A0

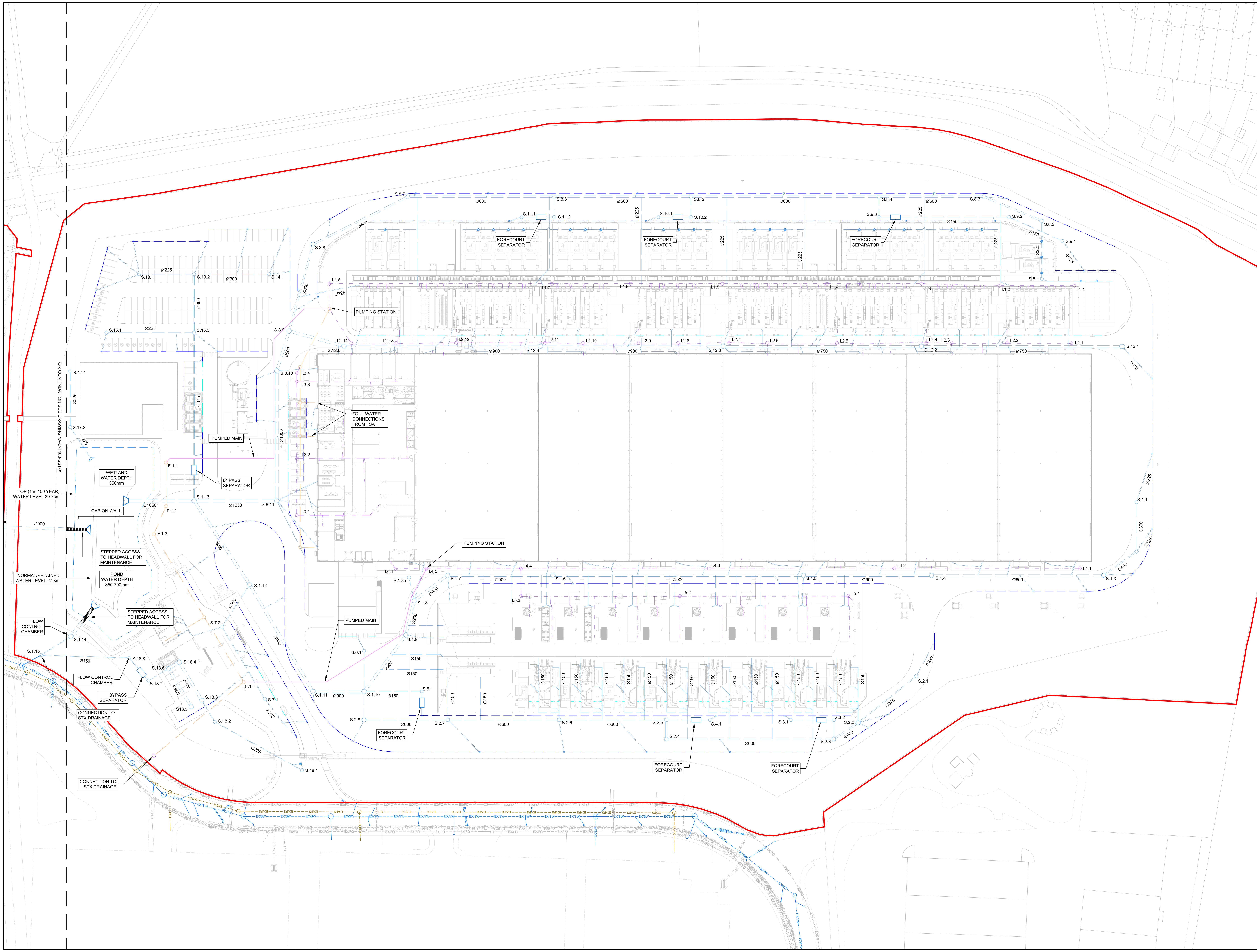
Sheet Number: **1A-C-1400-SST-X**

Current Rev: 0.1

Phase: PLANNING ISSUE

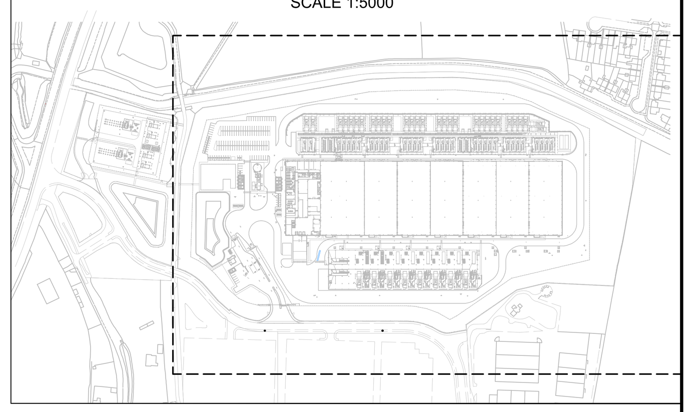
Model Name: N/A

Native File Format: Civil 3D 2023



KEY PLAN

SCALE 1:5000



NOTES

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- EX/FS — EXISTING FOUL SEWER
- EX/SW — EXISTING SURFACE WATER SEWER
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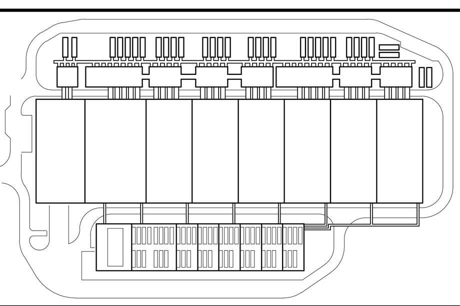

REVISIONS

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Approved By: MM
Design Team: Arup

1A-CIVIL
Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH
Project Number: 288809

DRAINAGE LAYOUT
SHEET 2 OF 2
Discipline: Civil
Scale: 1:500 Sheet Size: A0

Sheet Number:
1A-C-1401-DCH-X
Current Rev: 0.1
Phase: PLANNING ISSUE
Model Name: N/A
Native File Format: Civil 3D 2023

ARUP

Global Infrastructure UK Ltd

Data Centre and Electricity Substation at Maxwells Farm West, Cheshunt

Drainage Strategy

Reference: 1A-RP-C-0002

0.1 | 31 March 2023

Job number 288809

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Contents

Tables

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1. Introduction

This report has been produced by Arup on behalf of Global Infrastructure UK Ltd ('GIUK'), to support a reserved matters application for the development of Phases 2 and 3 of outline permission ref. 07/21/0447/F for an Electricity Substation and a Data Centre on Land at Maxwells Farm West, Great Cambridge Road, Cheshunt, Broxbourne (hereafter referred to as 'the site').

The proposed development would provide a state-of-the-art data centre and high-tech industry to Broxbourne comprising:

- 62,000m^2 data centre (employment space) across four buildings;
- 2,400m^2 for substation

A summary of the application and how this report fits into the suite of documents can be found in the Planning Statement.

This report will outline the proposed development's surface water and foul drainage systems.

2. Site Location and Description

The site is located at Maxwells Farm West, Cheshunt, Waltham Cross, Broxbourne, BN8 8XH and falls within the administrative boundary of Broxbourne Borough Council. The site comprises agricultural land and measures approximately 19 hectares (ha).

The site is located between the villages of Cheshunt which is approximately 2km north east of the site and Goff's Oak which is approximately 5km north west. The primary access to the site is gained via the northbound carriageway of the Great Cambridge Road, A10. A secondary access has now been provided as part of the Phase 1 infrastructure works from the south of the site via Lieutenant Ellis Way and runs through the centre of the site connecting to the A10 to the east.

The site is screened by mature trees and hedgerows along its northern boundary which abuts the Maxwells West industrial estate / business park to the immediate north east. Beyond this, the area is predominantly residential in nature with playing fields which form part of the Goffs Churchgate secondary school.

The western boundary of the site is delineated by timber fencing parallel to the New River. St Mary's School and Sixth Form is located further west of this. The eastern boundary of the site contains minimal screening and is delineated by the A10 Great Cambridge Road carriageway, which provides travel northwards towards Cheshunt and Broxbourne and southwards towards the M25 motorway. The southern portion of the site is bisected by a public right of way and connects to a flyover known as the 'Paul Cully Bridge,' which provides a pedestrian / cycle route eastward over the A10 towards Cheshunt Football Club and Cedars Park. The south of the site is bound by Theobalds Lane and the B198 / Lieutenant Ellis Way.

Phasing

As part of the outline planning permission, a site-wide phasing plan (drawing number: 3143-ARC-ZZ-ZZ-DR-A-0010, Rev: J) was approved under planning application reference: 07/20/0908/DRC for five phases of development.

Phase 2 is located in the southernmost extent of the site, south of the public right of way. Moving northward through the site the western portion of the site north of the public right of way comprises Phase 3 for the Data Centre and to the east are Phases 4 and 5. Phase 1 as outlined above, has already been built out and connects Lieutenant Ellis Way from the south in Phase 2 to the A10 through the centre of the site at Phase 4. An extract of the approved phasing plan is provided overleaf for reference.

Figure 2-1: Extract of Phasing Plan

Phase 2 – Electricity Substation

Phase 2 is located in the southernmost extent of the wider Maxwells Farm West site and comprises a largely rectangular parcel of open field measuring approximately 1.8ha. The western boundary is bound by timber fencing beyond which runs the New River. Further west of this is an attenuation pond and the designated Broom Hills local wildlife site.

The northern boundary of the site is bound by a public right of way which provides a cycle / walking route (The Paul Cully Bridge) eastward over the A10 / Great Cambridge Road flyover bridge to Cheshunt Football Ground and the Cedars Park / Theobalds Palace which is a designated scheduled monument. The eastern boundary of the site is well screened by mature trees and hedgerows. Beyond this lies a privately-owned parcel of land. A group of trees along the site's southern boundary are protected by a tree preservation order.

Theobalds Grove train station is located approximately 1.5km east. It is part of the Transport for London network and provides regular services into London. Waltham Cross station is approximately 2km south east of the site and provides links between London and the rest of Hertfordshire.

Phase 3 – Data Centre

The Phase 3 site is located immediately north of the public right of way that separates the site from Phase 2 as shown in purple on the extract above and comprises the majority of the wider Maxwells Farm site.

The site is currently an open green field and measures approximately 12ha. The eastern boundary of Phase 3 is bound by the Phase 1 Spine Road beyond which is Phase 4 and Phase 5. Further east of this is the A10 carriageway. The New River runs beyond the western boundary of Phase 3 whilst Maxwells West industrial estate is located to the immediate north east.

3. Proposed Development

Reserved Matters approval is sought for appearance, landscaping and layout, of Phases 2 and 3 of outline planning permission ref. 07/21/0447/F (which varied the original permission ref.07/18/1181/O) for the construction of an electricity substation and associated works.

Phase 2 – Electricity Substation

The proposed development consists of an electricity substation, measuring approximately 60 by 71.5 metres, located on hardstanding. The buildings and equipment on-site range between 3.9 and 6.7 metres in height. To the east of the substation there is an attenuation pond with a low-level fence. The electricity substation will have a landscaped buffer and security fence.

The site would be accessed via the Spine Road consented in Phase 1 (ref. 07/20/0907/RM as amended by 07/21/0722/NMA and 07/22/1066/F) with an access leading from the Spine Road to the core substation.

Phase 3 – Data Centre

The proposed development consists of a data centre hall building, located centrally within the site. This building is 83 by 308 metres in size and 11.4 metres in height. To the east of the data centre hall, there will be a mechanical yard containing all mechanical cooling plant as well as future proofing for district heating. To the west of the data centre hall, there will be an electrical yard, which will include external generators to provide power. The proposed generators would be up to 15 metres in height.

Phase 3 would include supporting infrastructure including an access to the east from the Spine Road consented in Phase 1 (ref. 07/20/0907/RM as amended by 07/21/0722/NMA and 07/22/1066/F), a security guardhouse, attenuation pond, a sprinkler tank and pump room, a single storey office building and a car park. All of these elements of the proposals would be located to the south of the data centre hall.

A tarmac perimeter access would be located around the mechanical yard, the electrical yard and the data centre hall.

4. Surface Water Management

4.1 Introduction

A Flood Risk Assessment (FRA) was prepared by RPS Consulting Service Ltd (reference RCEF61771-002R) in support of the original outline application for the full Maxwells Farm West development site (i.e. all five phases).

The FRA established restricted flow rates to be applied to future development.

The FRA also established water quality mitigation measures that would be incorporated.

4.2 Surface Water Outfalls and Flow Rates

4.2.1 Original FRA

For the original FRA, the Maxwells Farm West development site was split into four catchments, with a restricted flow rate applied to each catchment. A catchment plan is included in the original FRA.

The northern half of Phase 3 was defined as Catchment 1 and the southern half of Phase 3 was defined as catchment 2.

Phases 4, 5 and Phase 1 as far south as the public right of way crossing were defined as catchment 3.

The remainder of the development site, comprising Phase 2 and southern extent of Phase 1 was defined as Catchment 4.

Restricted flow rates were applied to each catchment are as follows:

Catchment 1 – 10.1 l/s

Catchment 2 – 15.7 l/s

Catchment 3 – 8.9 l/s

Catchment 4 – 2.1 l/s

The overall flow rate from the Maxwells Farm West development site is therefore restricted to 36.8 l/s.

4.2.2 Phase 1 Drainage

The spine road, constructed under Phase 1, includes surface water drainage connection points for future development phases. Restricted flow rates have been applied to each future development phase connection point.

A connection point has been provided for Phase 2, limited to 1.2 l/s. Phase 2 comprises part of catchment 4, and as such it is assumed that the catchment 4 flow rate has been applied to Phase 2 on a pro-rata basis.

A single connection point has been provided for Phase 3, limited to 25.8 l/s. Phase 3 comprises all of catchments 1 and 2, which have a combined restricted flow rate of 25.8 l/s in the FRA.

4.2.3 Proposed Development

For Phases 2 and 3, a single outfall is proposed so that surface water storage can be split across both phases. The outfall for Phase 3 has been utilised, with flow restricted to a maximum of 27 l/s, the combined flow rate for both Phases 2 and 3.

4.3 Allowance for climate change

The EA has produced guidance, available on the gov.uk website, relating to allowances that should be made for climate change. Climate change allowances relating to increased peak rainfalls intensity are outlined in Table 1 below.

London Management Catchment peak rainfall allowances	Total potential change anticipated for the ‘2050s’ (Development lifetime up to 2060)	Total potential change anticipated for the ‘2070s’ (Development lifetime 2061 to 2125)
Central allowance, 3.3% annual exceedance rainfall event	20%	20%
Upper end allowance, 3.3% annual exceedance rainfall event	35%	35%
Central allowance, 1% annual exceedance rainfall event	20%	25%
Upper end allowance, 1% annual exceedance rainfall event	40%	40%

Table 1 - Peak rainfall intensity allowance, London Management Catchment

EA guidance is to assess both the central and upper end allowances to understand the range of impact.

4.4 Surface water strategy

4.4.1 General

The surface water drainage system has been designed in accordance with the recommendations set out in:

- *BS EN 752:2017 - Drain and sewer systems outside buildings - Sewer system management*, and
- *The Building Regulations 2010, Approved Document H – Drainage and waste disposal*.

External surfaces are drained to linear drainage features, such as kerb drains or linear drainage channels, or to gullies.

A piped drainage system has been provided to convey flows from building roofs and external surfaces to the outfall.

The drainage system comprises two main networks:

- A network serving Phase 2, which passes through a pond located within Phase 2 and outfalls to the pond within Phase 3; and
- A network serving Phase 3, which passes through a pond located within Phase 3 and connects into the spine road drainage via a flow control device.

A small separate network serves the Data Centre site entrance, as levels in this area are too low to connect to the outfall via the Phase 3 pond by gravity. This network has a separate flow control device and surface water storage.

Drawings 1A-C-1400-X and 1A-C-1401-X, included in Appendix A, show the proposed surface water strategy for the development.

4.4.2 Water Quality Mitigation

As outlined in the FRA, water quality mitigation has been assessed against potential pollution hazards using the simple index approach defined within chapter 26 of CIRIA C753, *The SuDS Manual*.

For areas of medium risk, ponds provide sufficient water quality mitigation for suspended solids and metals, but insufficient mitigation for hydrocarbons.

As such the following SuDS systems have been provided:

- An area of heavily planted wetland with shallow retained water has been provided at the inlets to the SuDS systems; and
- A pond area with pools of deeper water and marginal planting has been provided prior to the outlet of the SuDS systems.

A simple index approach, in accordance with Chapter 26 of the SuDS Manual, has been adopted to assess the pollution hazard level of the various land uses within the development, and the mitigation effects of the SuDS measures incorporated.

Land uses, their pollution hazard levels and pollution hazard indices are summarised in Table 2 below.

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total suspended solids (TSS)	Metals	Hydro-carbons
Building Roofs	Low	0.3	0.2	0.05
Pedestrian areas and footways	Low	0.5	0.4	0.4
Car Parks and circulatory trafficked areas	Medium	0.7	0.6	0.7

Table 2 - Pollution Hazard Indices

For each land use the SuDS measures incorporated, and their mitigation indices are summarised in Table 3 below.

In accordance with the simple index approach, where two components (or more) in series have been incorporated, the total SuDS mitigation index has been calculated as follows:

$$\text{Total SuDS mitigation index} = \text{mitigation index}_1 + 0.5\,(\text{mitigation index}_2)$$

where:

$$\text{mitigation Index}_n = \text{mitigation index for component n}$$

Land Use	SuDS Measure	Mitigation Indices		
		Total suspended solids (TSS)	Metals	Hydro-carbons
All areas	Wetland	0.8	0.8	0.8
	Pond	0.7	0.7	0.5
	Total	**1.15**	**1.15**	**1.05**

Table 3 – SuDS Mitigation Indices

Table 4 below summarises pollution hazard levels and total SuDS mitigation for the various land uses.

Land Use	Pollution Hazard/Mitigation	Mitigation Indices		
		Total suspended solids (TSS)	Metals	Hydro-carbons
Building Roofs	Pollution Hazard Level	0.3	0.2	0.05
	Total SuDS Mitigation	1.15	1.15	1.08
Pedestrian areas and footways	Pollution Hazard Level	0.5	0.4	0.4
	Total SuDS Mitigation	1.15	1.15	1.08
Car Parks and circulatory trafficked areas	Pollution Hazard Level	0.7	0.6	0.7
	Total SuDS Mitigation	1.15	1.15	1.08

Table 4 – SuDS Mitigation Summary

To further safeguard water quality and reduce the risk of contamination entering the SuDS features, a Class 1 bypass hydrocarbon separators have been provided to the main car park.

Forecourt separators have been provided to drainage networks serving plant refuelling areas.

Beyond the connection from the proposed development into the spine road drainage, an additional pond is located at the end of the Phase 1 network, prior to the ultimate outfall from the Maxwells Farm West development site. This pond provides additional water quality mitigation prior to the ultimate outfall to watercourse from the Maxwells Farm West development site,

4.4.3 Maintenance and Management of Ponds

The following outlines the maintenance and management regime for the ponds at the proposed development.

During Construction

Ponds should not receive any runoff until vegetation is fully established and construction at the site has reached a state where sediment loads will not cause rapid siltation of the ponds.

This can be achieved by:

- Diverting flows from the ponds until vegetation is well rooted.
- Placing an erosion control blanket (e.g. jute straw or geosynthetic mats) over the freshly applied seed mix.

Care should be taken to ensure that the impermeable liner is not damaged during installation and is installed and lapped in accordance with the manufacturer's requirements.

Operation and Maintenance

Regular inspection and maintenance are important for the effective operation of the ponds.

Litter and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All litter should be removed from site.

Grass clippings from grass cutting within the ponds should be disposed of either off site or outside the area of the ponds, to remove nutrients and pollutants.

Occasionally, sediment may need to be removed (e.g. once deposits exceed 25 mm in depth). Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods.

Any damage due to sediment removal or erosion should be repaired and immediately reseeded or planted.

Table 5 below provides operational and maintenance requirements for the ponds at the proposed development.

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – in and round the ponds	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and outlets for silt accumulation, establish appropriate silt removal frequencies	Half yearly
	Check flow control devices	Annually
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required
	Prune and trim any trees and remove cuttings	Every 2 years or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years or as required.
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Repair and/or realign erosion protection	As required
	Re-level uneven surfaces and reinstate design levels	As required
	Remove and dispose of silt and sediment	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table 5 – Operation and Maintenance Requirements for SuDS Ponds

4.5 Drainage network modelling

Proposed drainage has been modelling using MicroDrainage software.

The following constraints have been applied:

- Paved external surfaces and the building roofs have been modelled as 100% impermeable.

- Storms up to and including the 1 in 100 year storm have been modelled.
- The flow rate to the spine road drainage network has been limited to a maximum of 27 l/s.
- An additional 40% in rainfall intensity to account for potential climate change has been included.
- The system has been designed for no flooding during the 1 in 100 year storm.

HydroBrake flow control devices have been provided to the network, limiting flow to the spine road drainage to 27 l/s for all events up to and including the 1 in 100 years storm, inclusive of climate change allowances.

Ponds have been provided to provide surface water storage. Approximately 5,860m^3 of storage has been provided within the ponds, with additional storage provided in the pipe networks.

Model results are included in Appendix B.

5. Foul water management

The foul water drainage system has been designed in accordance with the recommendations set out in:

- *BS EN 752:2017 - Drain and sewer systems outside buildings - Sewer system management*, and
- *The Building Regulations 2010, Approved Document H – Drainage and waste disposal*.

A foul water drainage system has been provided to intercept foul flows from the proposed buildings and convey flows to the foul water network provided within the spine road.

As with surface water, a connection point was provided as part of the Phase 1 drainage.

Flow from mechanical plant connects to separate industrial waste water networks, which connect to the foul water network at strategic points. Pumping stations have been provided to limit network depth and where required to allow the industrial waste water networks to connect to the gravity foul network.

6. Summary and Conclusions

A surface water drainage system has been designed that is in accordance with the parameters set out in the RPS Consulting Service Ltd FRA.

During Phase 1, connection points were provided into the spine road surface water drainage system for Phases 2 and 3. The connection point provided for Phase 2 has been limited to 1.2 l/s. The connection point provided for Phase 3 has been limited to 25.8 l/s.

A single surface water outfall has been used for the proposed development so that surface water storage can be split across both phases. The outfall for Phase 3 has been utilised, with flow restricted to the combined flow rate for both Phases 2 and 3 of 27 l/s.

Surface water storage has been provided in open water SuDS features. The SuDS features comprise areas of wetland and pond, providing adequate water quality mitigation for run-off from the proposed development.

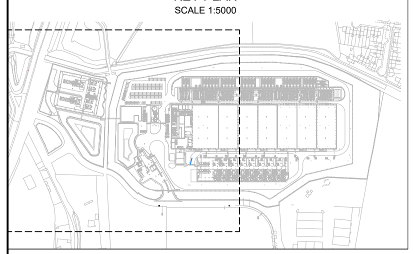
Separate foul and industrial waste water systems have bene provided that connect into the foul water drainage system located in the spine road, provided as part of Phase 1.

Appendix A

Drawings

KEY PLAN

SCALE 1:5000



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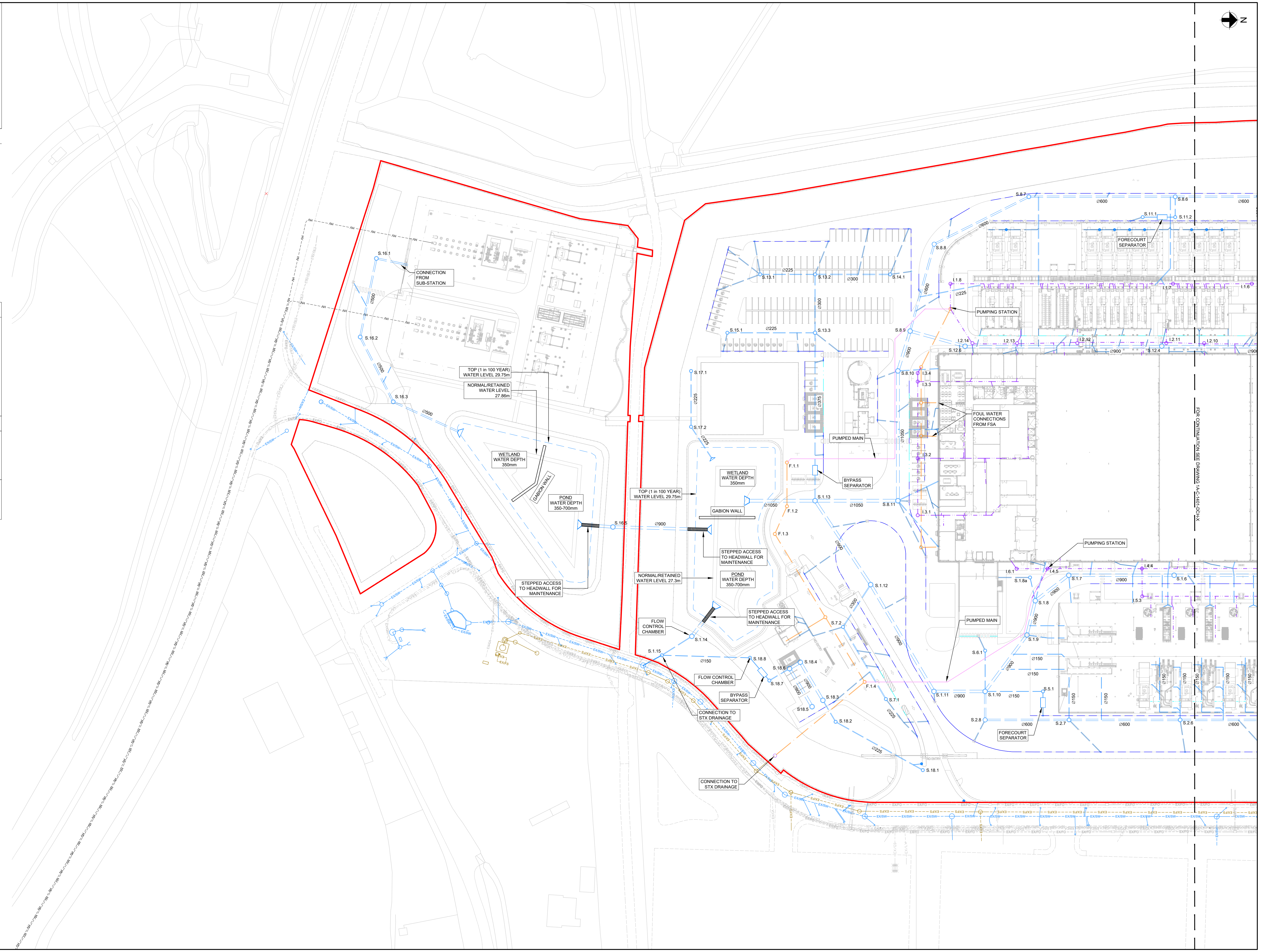

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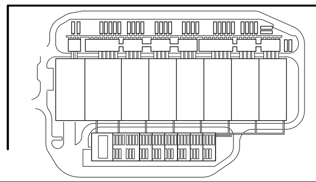

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DRAINAGE LAYOUT
SHEET 1 OF 2

Discipline: Civil

Scale: 1:500 Sheet Size: A0

Sheet Number: **1A-C-1400-SST-X**

Current Rev: 0.1

Phase: PLANNING ISSUE

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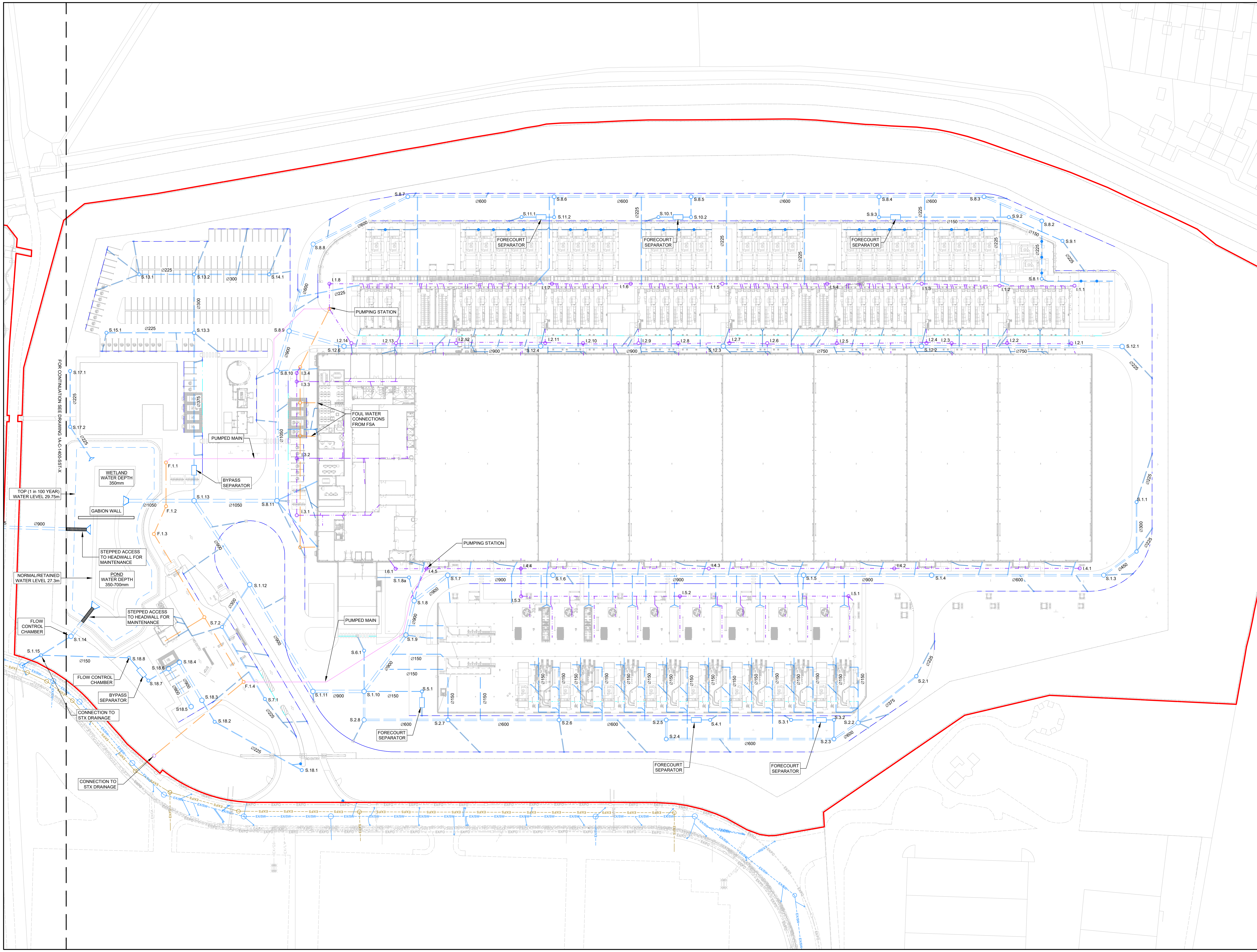

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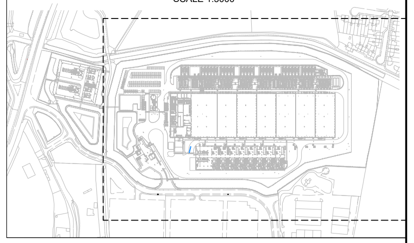

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Project Number: 288809

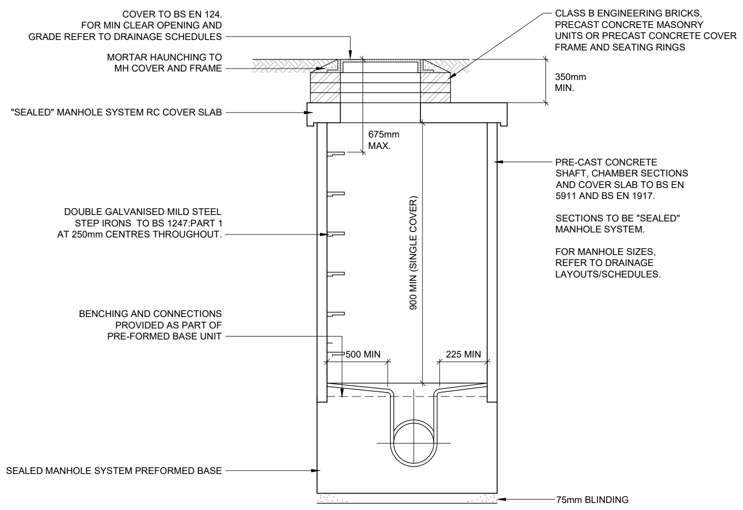
DRAINAGE LAYOUT
SHEET 2 OF 2

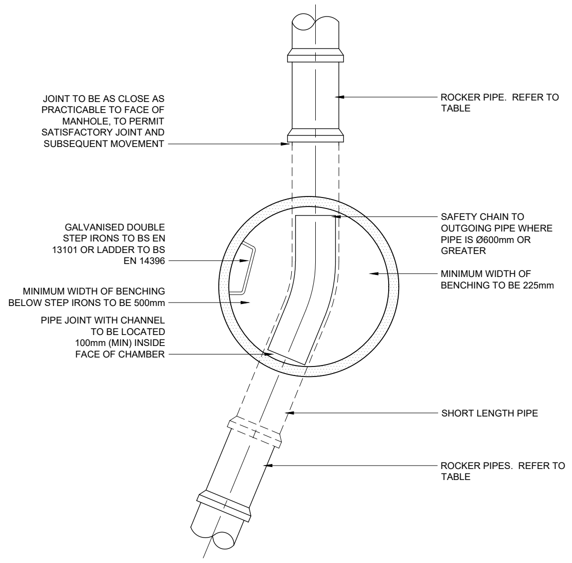
Discipline: Civil

Scale: 1:500 Sheet Size: A0

Sheet Number:
1A-C-1401-DCH-X

Current Rev: 0.1
Phase: PLANNING ISSUE
Model Name: N/A
Native File Format: Civil 3D 2023





DIAMETER OF PIPE (mm)	LENGTH OF ROCKER PIPE (mm)
150 - 600	600
600 - 750	1000
> 750	1250

ROCKER PIPE LENGTHS

NOTE:
CBR TESTING TO BE CARRIED OUT TO UNDERSIDE OF ALL FIBRE CHAMBERS AND FOR ALL MANHOLES DEEPER THAN 2m. MINIMUM CBR REQUIRED 5%%%, WHERE CBR IS LESS THAN 5%%% ADDITIONAL FOUNDATION SUPPORT MAY BE REQUIRED. ALL CBR's TO BE SUBMITTED TO THE ENGINEER PRIOR TO CONSTRUCTION OF VAULTS AND MANHOLES.

TYPICAL PCC MANHOLE - MAXIMUM DEPTH FROM TO SOFFIT FROM COVER 3m

DETAIL 1
SCALE 1:20
-

TRENCH WIDTHS-RIGID PIPES

NOMINAL PIPE DIAMETER (mm)	100	150	225	300	375	450	525	600	750	900	1050	1200	1350
TRENCH WIDTH MIN (mm) (W)	450	500	600	700	950	1050	1150	1250	1400	1950	2100	2300	2450
TRENCH WIDTH MAX (mm) (W)	650	700	800	900	1150	1250	1350	1450	1600	2150	2300	2500	2650

TRENCH WIDTHS-FLEXIBLE PIPES

NOMINAL PIPE DIAMETER (mm)	100	150	200	250	300
TRENCH WIDTH MIN (mm) (W)	450	450	600	600	700
TRENCH WIDTH MAX (mm) (W)	600	600	700	700	850

DIMENSION-"bc"

NOMINAL PIPE DIAMETER (mm)	100-450 incl.	525-600 incl.	750	900	1050	1200
bc (mm)	100	150	200	225	250	300

DIMENSION-"b"	PIPES UP TO AND INC. 600mm DIA.	PIPES GREATER THAN 600mm DIA.
UNIFORM SOIL	100mm	200mm
ROCK	200mm	300mm

TYPE "A" MATERIAL :

BROKEN STONE OR GRAVEL, GRADING AS FOLLOWS:-

1) RIGID PIPES - PIPE DIAMETER UP TO AND INCLUDING 600mm
:SIEVE SIZE GREATER THAN 5mm AND LESS THAN 12mm
- PIPE DIAMETER GREATER THAN 600mm DIA
: SIEVE SIZE GREATER THAN 5mm AND LESS THAN 19mm

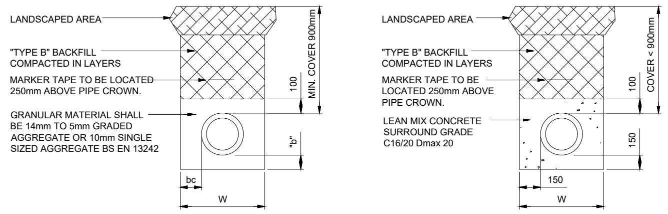
2) FLEXIBLE PIPES : SIEVE SIZE GREATER THAN 5mm AND LESS THAN 10mm

TYPE "B" MATERIAL :

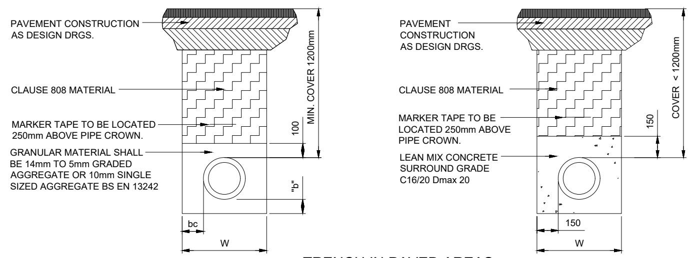
SELECTED FILL UNIFORM READILY COMPACTABLE MATERIAL FREE FROM :
- CLAY LUMPS RETAINED ON 75mm SIEVE,
- STONES RETAINED ON 25mm.SIEVE,
- TREE ROOTS, VEGETABLE MATTER,
- BUILDING RUBBISH AND FROZEN SOIL.

HARDCORE MATERIAL :

CRUSHED ROCK AS PER LOCAL A/E SPECIFICATIONS.



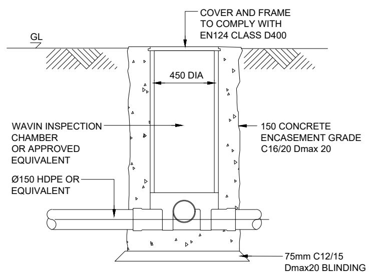
TRENCH IN UNPAVED AREAS



TRENCH IN PAVED AREAS

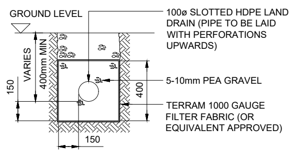
TYPICAL PIPE TRENCH DETAILS

DETAIL 2
SCALE 1:20
-



Ø450 I.C. TYPICAL DETAIL

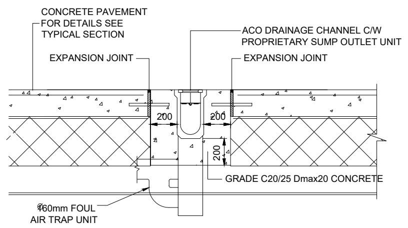
DETAIL 3
SCALE 1:20
-



TYPICAL LAND DRAIN UNPAVED AREAS

DETAIL 4
SCALE 1:20
-

NOTE:
ACO M200D DRAINAGE CHANNEL - HEAVY DUTY LEVEL INVERT WITH HEELGUARD SLOTTED DUCTILE IRON LOCKABLE GRATINGS TO LOAD CLASS D400 TO EN 124



TYPICAL SECTION THROUGH ACO CHANNEL

DETAIL 5
SCALE 1:20
-

NOTES

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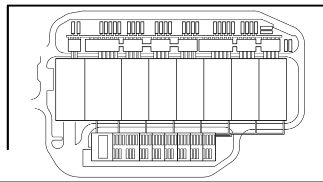
31/03/2023



N

REVISIONS

NO.	DATE	DESCRIPTION
0.1	31/03/2023	DRAFT PLANNING ISSUE

Drawn By: CDH
Approved By: MM
Design Team: Arup

1A-CIVIL
Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH
Project Number: 288809

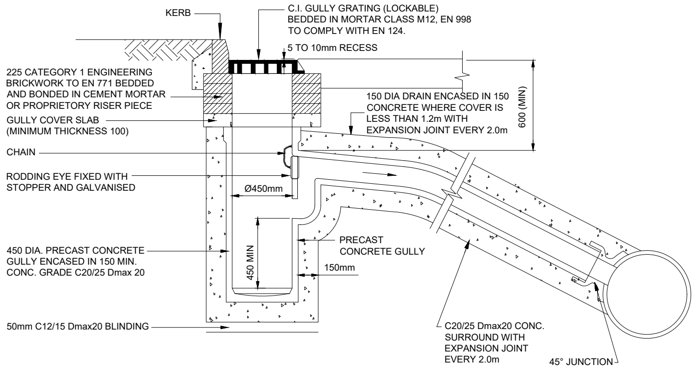
DRAINAGE DETAILS
SHEET 1 OF 4

Discipline:
Civil

Scale: AS SHOWN Sheet Size: A0

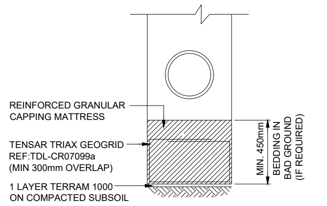
Sheet Number:
1A-C-8401-SDT-X

Current Rev: 0.1
Phase: PLANNING ISSUE
Model Name: N/A
Native File Format: Civil 3D 2023



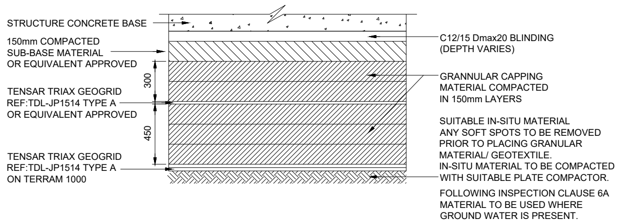
TYPICAL PRECAST ROAD GULLY

DETAIL 6
SCALE 1:20



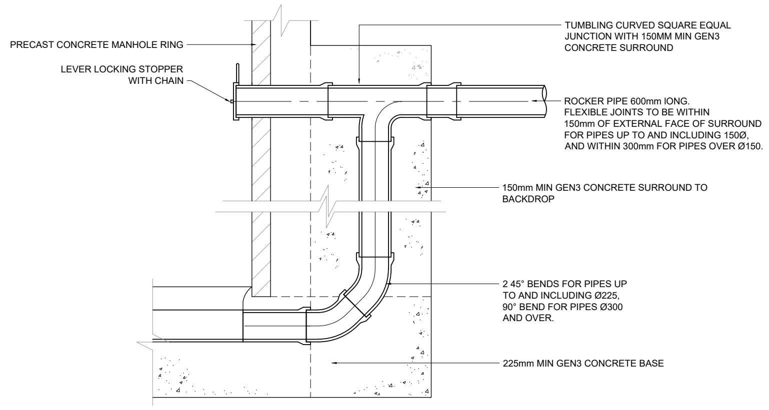
TYPICAL FOUNDATION DETAIL TO SERVICES TRENCH IN POOR GROUND (CBR <3%)

DETAIL 7
SCALE 1:20



TYPICAL BEDDING DETAIL IN POOR GROUND (CBR<3%)

DETAIL 8
SCALE 1:20



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CBR TESTING TO BE CARRIED OUT TO UNDERSIDE OF ALL FIBRE CHAMBERS AND FOR ALL MANHOLES DEEPER THAN 2m. MINIMUM CBR REQUIRED 5%, WHERE CBR IS LESS THAN 5% ADDITIONAL FOUNDATION SUPPORT MAY BE REQUIRED. ALL CBR's TO BE SUBMITTED TO THE ENGINEER PRIOR TO CONSTRUCTION OF VAULTS AND MANHOLES.

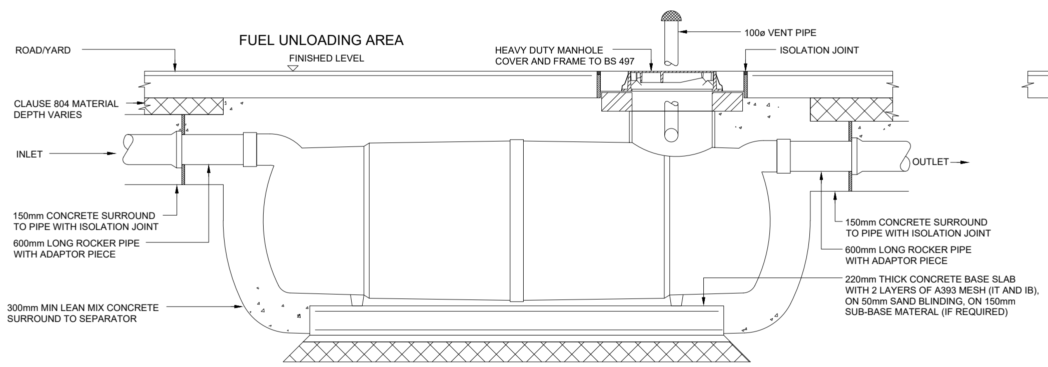
EXTERNAL BACKDROP MANHOLE
SCALE 1:20

DETAIL 10

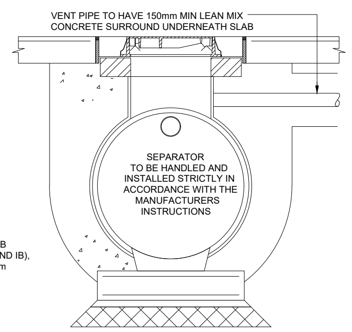
REFERENCE	WORKING CAPACITY (l)	DRAINAGE AREA (M2)	NORMAL FLOW RATE (l/s)	MAIN DIMENSIONS (mm)						
				LENGTH	DIAMETER	ACCESS SHAFT DIAMETER	BASE TO INVERT LEVEL	BASE TO OUTLET INVERT	STANDARD FALL ACROSS INVERT (mm)	MINIMUM INVERT
ENVIROCEPTOR CLASS 1	10000	555	10	3963	1920	600	2110	2060	50	400

NOTE: UNIT TO BE FITTED WITH AN OIL ALARM SYSTEM

INTERCEPTORS REQUIRE DUCTS CONNECTING TO SMALL POWER NETWORK AND TO CONTROL PANEL WITHIN KIOSK NEARBY. KIOSK TO BE POSITIONED TO SUIT SITE SPECIFIC DESIGN. VENT PIPE REQUIRED IN LANDSCAPED AREA NEAR TO INTERCEPTOR.



ELEVATION



END ELEVATION

TYPICAL DETAIL OF GRP CLASS 1 (10,000 L) FORECOURT SEPARATOR (AQUAOIL OR SIMILAR)

DETAIL 9
SCALE 1:20

NOTES

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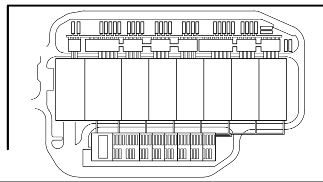

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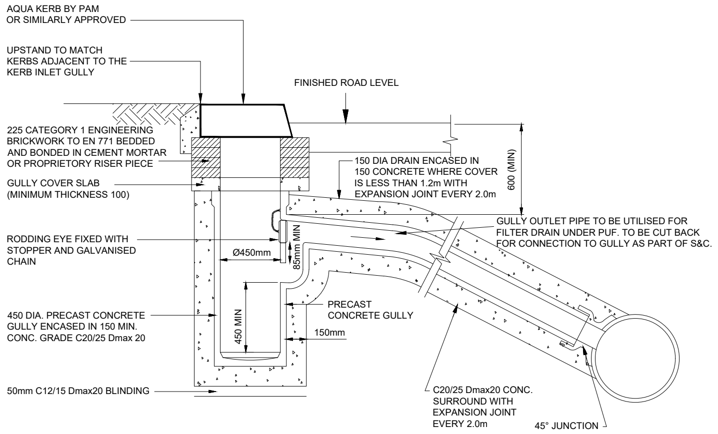
Drawn By: CDH
Approved By: MM
Design Team: Arup

1A-CIVIL
Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH
Project Number: 288809

DRAINAGE DETAILS
SHEET 2 OF 4
Discipline: Civil
Scale: AS SHOWN Sheet Size: A0

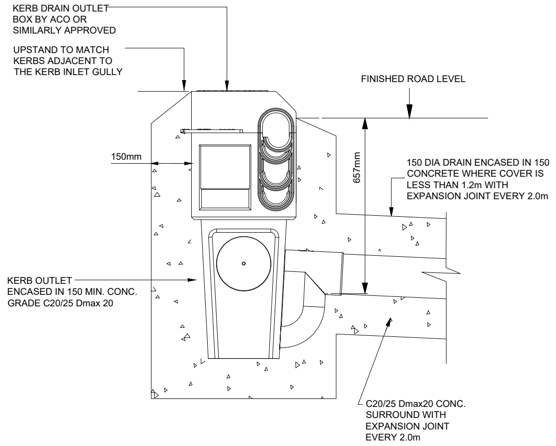
Sheet Number:
1A-C-8402-SDT-X
Current Rev: 0.1
Phase: PLANNING ISSUE
Model Name: N/A
Native File Format: Civil 3D 2023



UNDER S&C SCOPE PREVIOUSLY INSTALLED LAND DRAINS TO OUTER EDGES OF ROADS TO BE REMOVED AND REPLACED WITH KERB INLET GULLIES WHERE SHOWN ON THE PLANS. CONTRACTOR SHOULD CUT BACK THE MINIMUM AMOUNT OF ASPHALT TO ENABLE GULLY CONNECTION TO OUTLETS PREVIOUSLY CONSTRUCTED UNDER PUF.

TYPICAL KERB INLET GULLY

DETAIL 11 -
SCALE 1:20



TYPICAL KERB DRAIN OUTLET DETAIL

DETAIL 12 -
SCALE 1:10

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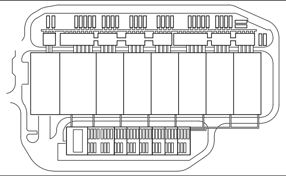

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Approved By: MM
Design Team: Arup

1A-CIVIL
Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH
Project Number: 288809

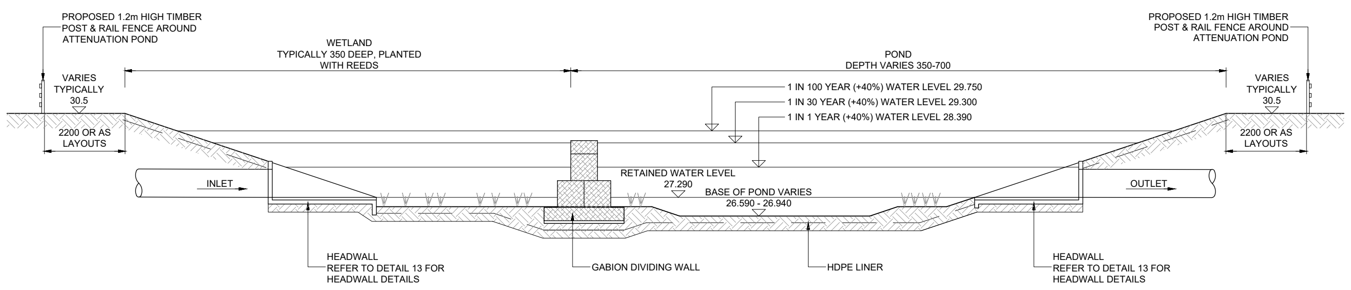
DRAINAGE DETAILS
SHEET 3 OF 4
Discipline: Civil
Scale: AS SHOWN Sheet Size: A0

Sheet Number:
1A-C-8403-SDT-X
Current Rev: 0.1
Phase: PLANNING ISSUE
Model Name: N/A
Native File Format: Civil 3D 2023

FOR POND, INLET AND OUTLET INVERT LEVELS, REFER TO LAYOUTS AND SCHEDULES.
LEVELS SHOWN BELOW ARE FOR DATA CENTRE POND.

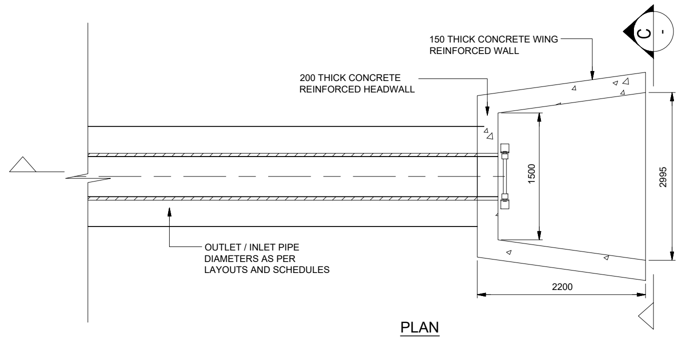
ATTENUATION POND SIZED TO HOLD 100-YEAR RETURN PERIOD STORM TO RATES SPECIFIED BY STX AT CONNECTION POINTS WITH 600mm MINIMUM FREEBOARD.

POND AND PIPES SIZED TO AVOID FLOODING IN THE 100-YEAR RETURN PERIOD +40% CLIMATE CHANGE ALLOWANCE.

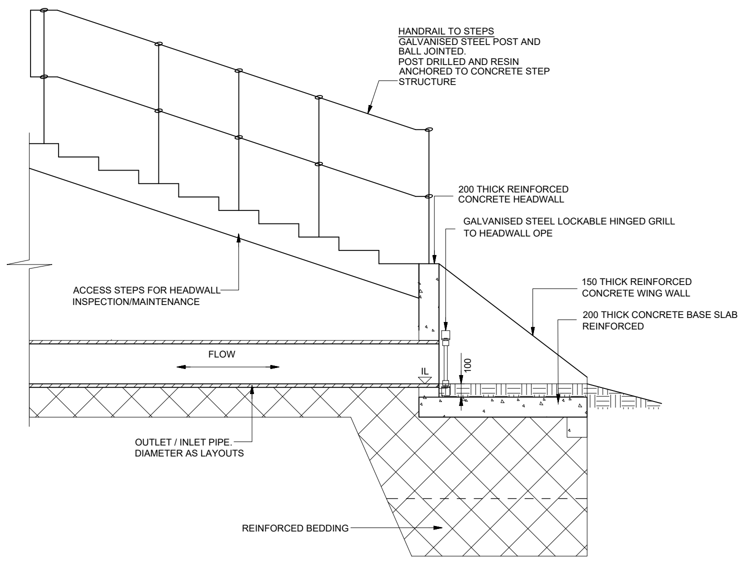


TYPICAL SECTION THROUGH ATTENUATION POND

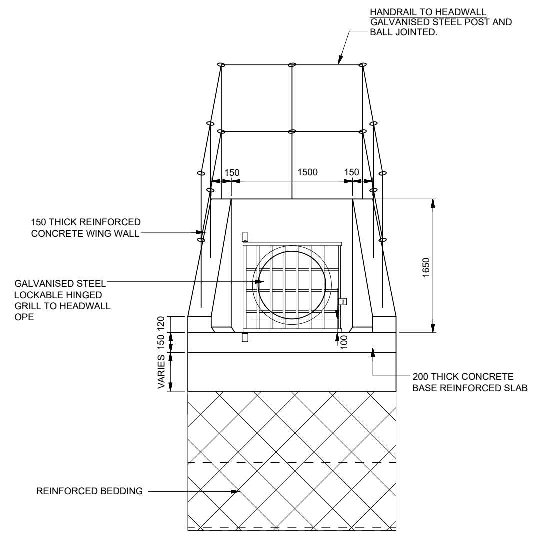
DETAIL 12 -
NTS



PLAN



SECTION B -
SCALE 1:25



SECTION C -
SCALE 1:25

NOTE:
CONCRETE STEEL REINFORCEMENT 100kg/m³

NOTE:
HEADWALL TO CONTRACTOR DESIGN DETAILS TO BE SUBMITTED TO ENGINEER FOR APPROVAL

NOTE:
HDPE HEADWALL ALTERNATIVES MAY BE CONSIDERED WHERE LOCALISATION AND GROUND CONDITIONS ALLOW

NOTE:
ALL CONCRETE BELOW GROUND BE XA1 IN ACCORDANCE WITH TO EN206.

TYPICAL DETAILS OF HEADWALL AT ATTENUATION POND

DETAIL 13 -
NTS

NOTES

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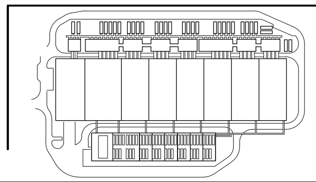

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DRAINAGE DETAILS
SHEET 4 OF 4
Discipline: Civil
Scale: AS SHOWN Sheet Size: A0

Sheet Number:
1A-C-8404-SDT-X
Current Rev: 0.1
Phase: PLANNING ISSUE
Model Name: N/A
Native File Format: Civil 3D 2023

Appendix B

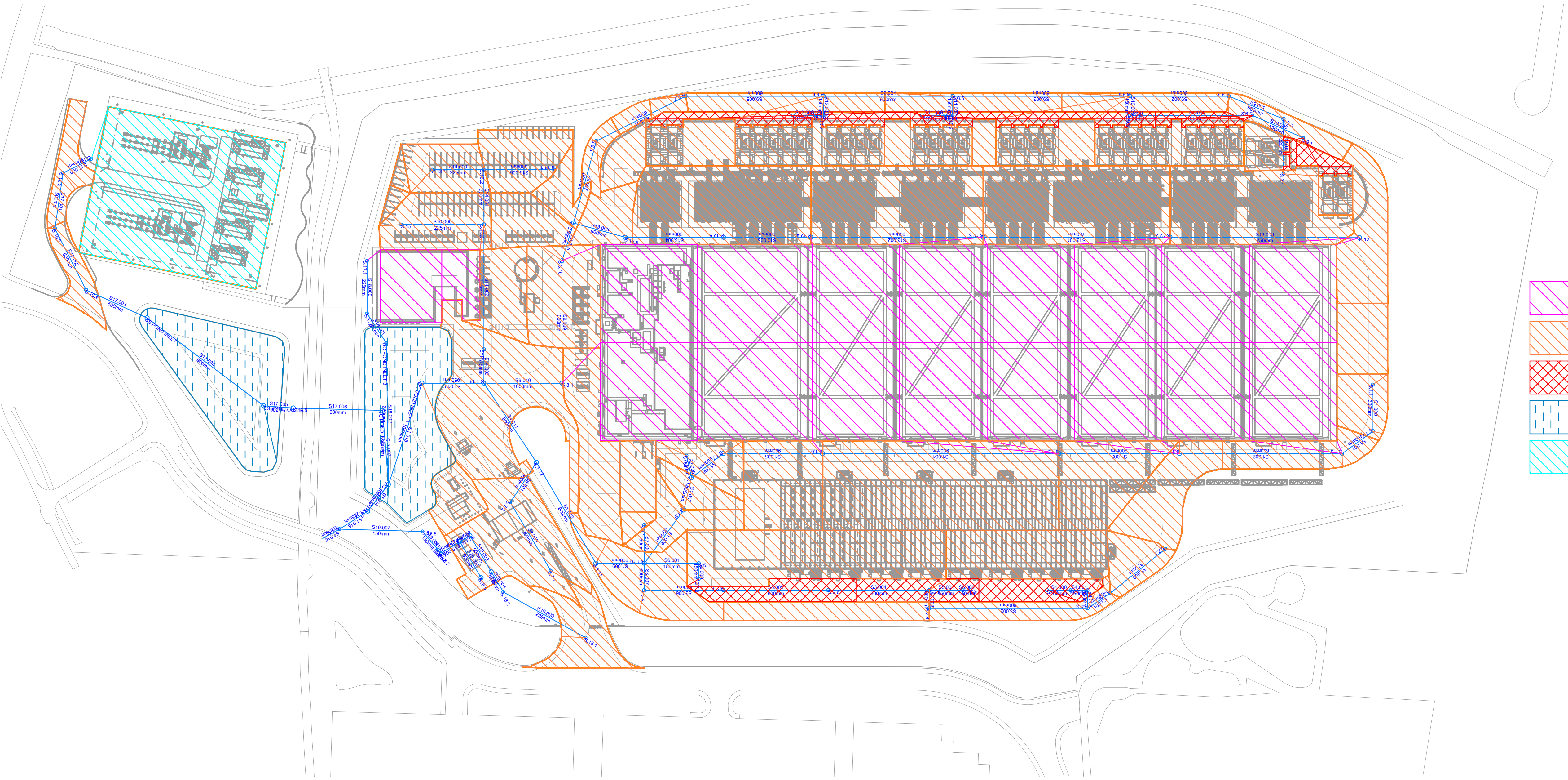
Calculations

Draft Planning Issue

STORM WATER DRAINAGE MODEL OUTPUT

1A-CC-C-0002 REV 0.1

31/03/23



	PIMP (%)
BUILDING	100
EXTERNAL AREA	100
CONTAMINATED RUNOFF	100
POND	100
PERUN	40

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for -Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	2	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	200	Maximum Backdrop Height (m)	0.000
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 Soffits

Network Design Table for '-Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	19.743	0.082	240.8	0.064	5.00	0.0	0.600	o	300	Pipe/Conduit	
S1.001	16.142	0.054	298.9	0.053	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.002	68.717	0.138	497.9	0.383	0.00	0.0	0.600	o	600	Pipe/Conduit	
S1.003	51.087	0.102	500.9	0.441	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.004	100.000	0.200	500.0	0.686	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.005	42.037	0.084	500.4	0.328	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.006	16.805	0.034	494.3	0.060	0.00	0.0	0.600	o	900	Pipe/Conduit	
S2.000	9.529	0.095	100.0	0.046	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	14.051	0.029	484.5	0.038	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.008	28.044	0.056	500.8	0.061	0.00	0.0	0.600	o	900	Pipe/Conduit	
S3.000	29.761	0.149	199.7	0.153	5.00	0.0	0.600	o	375	Pipe/Conduit	
S3.001	11.607	0.024	483.6	0.064	0.00	0.0	0.600	o	600	Pipe/Conduit	
S4.000	9.919	0.099	100.2	0.048	5.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	68.38	5.33	29.188	0.064	0.0	0.0	0.0	1.01	71.3	11.9
S1.001	67.13	5.56	28.956	0.117	0.0	0.0	0.0	1.17	186.2	21.3
S1.002	61.98	6.61	28.752	0.500	0.0	0.0	0.0	1.08	306.6	84.0
S1.003	59.40	7.22	28.314	0.941	0.0	0.0	0.0	1.39	886.3	151.4
S1.004	55.00	8.42	28.212	1.627	0.0	0.0	0.0	1.39	887.1	242.3
S1.005	53.37	8.92	28.012	1.955	0.0	0.0	0.0	1.39	886.7	282.5
S1.006	52.76	9.12	27.928	2.014	0.0	0.0	0.0	1.40	892.2	287.9
S2.000	69.33	5.16	28.745	0.046	0.0	0.0	0.0	1.00	17.8	8.5
S1.007	52.27	9.29	27.894	2.098	0.0	0.0	0.0	1.42	901.3	297.1
S1.008	51.31	9.62	27.865	2.159	0.0	0.0	0.0	1.39	886.4	300.0
S3.000	68.04	5.39	28.921	0.153	0.0	0.0	0.0	1.28	141.2	28.2
S3.001	67.08	5.56	28.547	0.217	0.0	0.0	0.0	1.10	311.2	39.4
S4.000	69.30	5.16	29.270	0.048	0.0	0.0	0.0	1.00	17.7	9.0

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)	HYD SECT	DIA (mm)	Section Type	Auto Design
S4.001	7.196	0.072	99.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.002	7.636	0.076	100.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.002	66.963	0.134	499.7	0.140	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.003	7.636	0.015	509.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S5.000	3.397	0.034	99.9	0.051	5.00	0.0	0.600	o	150	Pipe/Conduit	
S5.001	14.150	0.142	99.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.004	42.769	0.086	497.3	0.305	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.005	44.331	0.089	498.1	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.006	33.472	0.067	499.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S3.007	11.376	0.023	494.6	0.129	0.00	0.0	0.600	o	600	Pipe/Conduit	
S6.000	6.630	0.066	100.5	0.055	5.00	0.0	0.600	o	150	Pipe/Conduit	
S6.001	23.074	0.231	99.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	16.279	0.163	99.9	0.013	5.00	0.0	0.600	o	150	Pipe/Conduit	
S1.009	20.431	0.041	498.3	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S1.010	49.537	0.099	500.4	0.125	0.00	0.0	0.600	o	900	Pipe/Conduit	
S8.000	33.479	0.167	200.5	0.188	5.00	0.0	0.600	o	300	Pipe/Conduit	
S8.001	20.189	0.101	199.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.011	40.179	0.081	496.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S4.001	68.62	5.28	29.121	0.048	0.0	0.0	0.0	1.01	17.8	9.0
S4.002	67.91	5.41	29.049	0.048	0.0	0.0	0.0	1.00	17.7	9.0
S3.002	62.06	6.59	28.523	0.405	0.0	0.0	0.0	1.08	306.1	68.0
S3.003	61.54	6.71	28.389	0.405	0.0	0.0	0.0	1.07	303.2	68.0
S5.000	69.93	5.06	29.124	0.051	0.0	0.0	0.0	1.01	17.8	9.6
S5.001	68.58	5.29	29.040	0.051	0.0	0.0	0.0	1.01	17.8	9.6
S3.004	58.81	7.37	28.374	0.760	0.0	0.0	0.0	1.09	306.8	121.0
S3.005	56.26	8.05	28.288	0.760	0.0	0.0	0.0	1.08	306.6	121.0
S3.006	54.50	8.57	28.199	0.760	0.0	0.0	0.0	1.08	306.1	121.0
S3.007	53.93	8.74	28.132	0.888	0.0	0.0	0.0	1.09	307.7	129.8
S6.000	69.61	5.11	29.188	0.055	0.0	0.0	0.0	1.00	17.7	10.5
S6.001	67.47	5.49	29.122	0.055	0.0	0.0	0.0	1.01	17.8	10.5
S7.000	68.70	5.27	28.722	0.013	0.0	0.0	0.0	1.01	17.8	2.4
S1.009	50.64	9.87	27.809	3.116	0.0	0.0	0.0	1.40	888.6	427.3
S1.010	49.09	10.46	27.768	3.241	0.0	0.0	0.0	1.39	886.7	430.9
S8.000	67.40	5.50	29.184	0.188	0.0	0.0	0.0	1.11	78.2	34.4
S8.001	65.81	5.81	29.017	0.188	0.0	0.0	0.0	1.11	78.3	34.4
S1.011	47.92	10.94	27.669	3.429	0.0	0.0	0.0	1.40	890.6	445.0

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)	HYD SECT	DIA (mm)	Section Type	Auto Design
S9.000	23.108	0.136	169.9	0.058	5.00	0.0	0.600	o	225	Pipe/Conduit	
S9.001	25.018	0.050	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
S9.002	41.895	0.084	500.0	0.213	0.00	0.0	0.600	o	600	Pipe/Conduit	
S10.000	23.394	0.156	150.0	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit	
S10.001	47.220	0.315	150.0	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	
S10.002	4.619	0.031	149.0	0.007	0.00	0.0	0.600	o	150	Pipe/Conduit	
S10.003	8.149	0.054	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S9.003	75.027	0.150	500.0	0.155	0.00	0.0	0.600	o	600	Pipe/Conduit	
S11.000	9.780	0.098	99.8	0.046	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.001	3.206	0.032	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S11.002	8.149	0.081	100.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S9.004	54.640	0.109	500.0	0.134	0.00	0.0	0.600	o	600	Pipe/Conduit	
S12.000	9.780	0.098	99.8	0.053	5.00	0.0	0.600	o	150	Pipe/Conduit	
S12.001	3.206	0.032	100.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S12.002	8.149	0.081	100.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S9.005	58.406	0.117	500.0	0.180	0.00	0.0	0.600	o	600	Pipe/Conduit	
S9.006	42.246	0.084	500.0	0.024	0.00	0.0	0.600	o	600	Pipe/Conduit	
S9.007	35.979	0.072	499.7	0.117	0.00	0.0	0.600	o	600	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)
S9.000	68.05	5.39	29.269	0.058	0.0	0.0	0.0	1.00	39.8	10.7
S9.001	66.00	5.77	28.758	0.058	0.0	0.0	0.0	1.08	306.0	10.7
S9.002	62.87	6.42	28.708	0.271	0.0	0.0	0.0	1.08	306.0	46.2
S10.000	67.55	5.48	29.681	0.023	0.0	0.0	0.0	0.82	14.5	4.3
S10.001	62.76	6.44	29.525	0.043	0.0	0.0	0.0	0.82	14.5	7.3
S10.002	62.34	6.53	29.160	0.050	0.0	0.0	0.0	0.82	14.5	8.4
S10.003	61.60	6.70	29.129	0.050	0.0	0.0	0.0	0.82	14.5	8.4
S9.003	56.98	7.85	28.624	0.476	0.0	0.0	0.0	1.08	306.0	73.5
S11.000	69.31	5.16	29.378	0.046	0.0	0.0	0.0	1.01	17.8	8.6
S11.001	69.01	5.22	29.230	0.046	0.0	0.0	0.0	1.00	17.7	8.6
S11.002	68.24	5.35	29.198	0.046	0.0	0.0	0.0	1.00	17.7	8.6
S9.004	54.08	8.70	28.474	0.655	0.0	0.0	0.0	1.08	306.0	96.0
S12.000	69.31	5.16	29.381	0.053	0.0	0.0	0.0	1.01	17.8	9.9
S12.001	69.01	5.22	29.233	0.053	0.0	0.0	0.0	1.00	17.7	9.9
S12.002	68.24	5.35	29.201	0.053	0.0	0.0	0.0	1.00	17.7	9.9
S9.005	51.39	9.59	28.365	0.888	0.0	0.0	0.0	1.08	306.0	123.5
S9.006	49.63	10.25	28.248	0.912	0.0	0.0	0.0	1.08	306.0	123.5
S9.007	48.25	10.80	28.164	1.029	0.0	0.0	0.0	1.08	306.1	134.4

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S13.000	80.086	0.160	500.5	0.639	5.00	0.0	0.600	o	750	Pipe/Conduit	
S13.001	79.077	0.158	500.5	0.569	0.00	0.0	0.600	o	750	Pipe/Conduit	
S13.002	72.907	0.146	499.4	0.549	0.00	0.0	0.600	o	900	Pipe/Conduit	
S13.003	36.907	0.074	498.7	0.447	0.00	0.0	0.600	o	900	Pipe/Conduit	
S13.004	41.571	0.083	500.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S13.005	22.729	0.045	500.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S9.008	16.636	0.033	500.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S9.009	51.821	0.104	498.3	0.304	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S9.010	33.065	0.066	501.0	0.438	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S14.000	21.870	0.149	146.8	0.085	5.00	0.0	0.600	o	225	Pipe/Conduit	
S15.000	29.958	0.136	220.3	0.121	5.00	0.0	0.600	o	300	Pipe/Conduit	
S14.001	23.302	0.113	206.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S16.000	34.981	0.206	169.8	0.104	5.00	0.0	0.600	o	225	Pipe/Conduit	
S14.002	52.756	0.176	299.8	0.181	0.00	0.0	0.600	o	375	Pipe/Conduit	
S14.003	14.290	0.049	291.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.012	26.207	0.052	500.0	0.000	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S1.013	45.057	0.096	469.3	0.047	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S17.000	13.345	0.027	500.0	0.193	5.00	0.0	0.600	o	500	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)
S13.000	64.49	6.07	28.608	0.639	0.0	0.0	0.0	1.24	549.6	111.7
S13.001	59.77	7.13	28.448	1.209	0.0	0.0	0.0	1.24	549.6	195.6
S13.002	56.44	8.00	28.140	1.757	0.0	0.0	0.0	1.40	887.6	268.6
S13.003	54.91	8.44	27.994	2.205	0.0	0.0	0.0	1.40	888.2	327.9
S13.004	53.31	8.94	27.920	2.205	0.0	0.0	0.0	1.39	887.1	327.9
S13.005	52.49	9.21	27.837	2.205	0.0	0.0	0.0	1.39	887.1	327.9
S9.008	47.77	11.00	27.791	3.233	0.0	0.0	0.0	1.39	887.1	418.3
S9.009	46.48	11.56	27.608	3.537	0.0	0.0	0.0	1.54	1330.8	445.3
S9.010	45.70	11.92	27.504	3.975	0.0	0.0	0.0	1.53	1327.2	491.9
S14.000	68.31	5.34	29.104	0.085	0.0	0.0	0.0	1.08	42.8	15.8
S15.000	67.57	5.47	28.909	0.121	0.0	0.0	0.0	1.06	74.6	22.2
S14.001	65.70	5.83	28.773	0.207	0.0	0.0	0.0	1.09	77.1	36.8
S16.000	66.98	5.58	29.048	0.104	0.0	0.0	0.0	1.00	39.8	18.9
S14.002	61.71	6.67	28.585	0.492	0.0	0.0	0.0	1.04	115.0	82.2
S14.003	60.74	6.90	28.309	0.492	0.0	0.0	0.0	1.06	116.6	82.2
S1.012	45.10	12.20	27.438	7.896	0.0	0.0	0.0	1.53	1328.5	964.4
S1.013	44.14	12.68	27.386	7.943	0.0	0.0	0.0	1.58	1371.6	964.4
S17.000	68.92	5.23	28.619	0.193	0.0	0.0	0.0	0.96	189.4	36.0

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)	HYD SECT	DIA (mm)	Section Type	Auto Design
S17.001	23.788	0.048	500.0	0.048	0.00	0.0	0.600	o	500	Pipe/Conduit	
S17.002	29.027	0.062	468.2	0.043	0.00	0.0	0.600	o	500	Pipe/Conduit	
S17.003	28.416	0.061	465.8	0.000	0.00	0.0	0.600	o	500	Pipe/Conduit	
S17.004	61.820	0.124	500.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S17.005	12.498	0.025	499.9	0.235	0.00	0.0	0.600	o	900	Pipe/Conduit	
S17.006	37.735	0.076	496.5	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S17.007	31.392	0.063	498.3	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S18.000	22.269	0.131	170.0	0.080	5.00	0.0	0.600	o	225	Pipe/Conduit	
S18.001	14.926	0.088	169.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S18.002	59.819	0.352	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.014	14.355	0.030	478.5	0.256	0.00	0.0	0.600	o	1050	Pipe/Conduit	
S1.015	14.158	0.083	170.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.000	39.774	0.234	170.0	0.079	5.00	0.0	0.600	o	225	Pipe/Conduit	
S19.001	9.974	0.059	170.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.002	17.672	0.035	504.9	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S19.003	5.000	0.010	500.0	0.000	0.00	0.0	0.600	o	900	Pipe/Conduit	
S20.000	17.672	0.035	504.9	0.000	5.00	0.0	0.600	o	900	Pipe/Conduit	
S19.004	9.364	0.042	223.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.005	1.890	0.019	99.5	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S19.006	10.038	0.100	100.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S19.007	35.176	0.352	99.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S17.001	66.67	5.64	28.592	0.241	0.0	0.0	0.0	0.96	189.4	43.5
S17.002	64.23	6.13	28.545	0.284	0.0	0.0	0.0	1.00	195.8	49.4
S17.003	62.03	6.60	28.483	0.284	0.0	0.0	0.0	1.00	196.3	49.4
S17.004	58.93	7.34	28.022	0.284	0.0	0.0	0.0	1.39	887.1	49.4
S17.005	58.35	7.49	27.860	0.519	0.0	0.0	0.0	1.39	887.1	82.0
S17.006	56.67	7.94	27.835	0.519	0.0	0.0	0.0	1.40	890.2	82.0
S17.007	55.36	8.31	27.759	0.519	0.0	0.0	0.0	1.40	888.6	82.0
S18.000	68.13	5.37	29.536	0.080	0.0	0.0	0.0	1.00	39.8	14.8
S18.001	66.79	5.62	29.405	0.080	0.0	0.0	0.0	1.00	39.8	14.8
S18.002	61.96	6.62	29.317	0.080	0.0	0.0	0.0	1.00	39.8	14.8
S1.014	43.84	12.83	27.290	8.797	0.0	0.0	0.0	1.57	1358.3	1044.5
S1.015	68.89	5.24	27.260	0.000	25.0	0.0	0.0	1.00	39.7	25.0
S19.000	66.56	5.66	28.239	0.079	0.0	0.0	0.0	1.00	39.8	14.3
S19.001	65.70	5.83	28.005	0.079	0.0	0.0	0.0	1.00	39.8	14.3
S19.002	64.64	6.04	27.946	0.079	0.0	0.0	0.0	1.39	882.7	14.3
S19.003	64.35	6.10	27.911	0.079	0.0	0.0	0.0	1.39	887.1	14.3
S20.000	69.02	5.21	27.936	0.000	0.0	0.0	0.0	1.39	882.7	0.0
S19.004	63.50	6.28	27.901	0.079	0.0	0.0	0.0	0.87	34.7	14.3
S19.005	70.07	5.03	27.859	0.000	3.0	0.0	0.0	1.01	17.8	3.0
S19.006	69.10	5.20	27.709	0.000	3.0	0.0	0.0	1.00	17.7	3.0
S19.007	65.95	5.78	27.609	0.000	3.0	0.0	0.0	1.01	17.8	3.0

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)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.016	8.481	0.057	148.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.016	65.28	5.91	27.177	0.000	28.0	0.0	0.0	1.07	42.5	28.0

Manhole Schedules for -Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S.1.1	30.464	1.276	Open Manhole	1200	S1.000	29.188	300				
S.1.2	30.421	1.465	Open Manhole	1350	S1.001	28.956	450	S1.000	29.106	300	
S.1.3	30.451	1.699	Open Manhole	1500	S1.002	28.752	600	S1.001	28.902	450	
S.1.4	30.496	2.182	Open Manhole	1800	S1.003	28.314	900	S1.002	28.614	600	
S.1.5	30.468	2.256	Open Manhole	1800	S1.004	28.212	900	S1.003	28.212	900	
S.1.6	30.468	2.456	Open Manhole	1800	S1.005	28.012	900	S1.004	28.012	900	
S.1.7	30.492	2.564	Open Manhole	1800	S1.006	27.928	900	S1.005	27.928	900	
S.1.8a	30.517	1.772	Open Manhole	1200	S2.000	28.745	150				
S.1.8	30.510	2.616	Open Manhole	1800	S1.007	27.894	900	S1.006	27.894	900	
								S2.000	28.650	150	6
S.1.9	30.498	2.633	Open Manhole	1800	S1.008	27.865	900	S1.007	27.865	900	
S.2.1	30.317	1.396	Open Manhole	1350	S3.000	28.921	375				
S.2.2	30.500	1.953	Open Manhole	1500	S3.001	28.547	600	S3.000	28.772	375	
S.3.1	30.474	1.204	Open Manhole	1200	S4.000	29.270	150				
FCT 1	30.474	1.353	Open Manhole	1200	S4.001	29.121	150	S4.000	29.171	150	50
S.3.2	30.512	1.463	Open Manhole	1200	S4.002	29.049	150	S4.001	29.049	150	
S.2.3	30.494	1.971	Open Manhole	1500	S3.002	28.523	600	S3.001	28.523	600	
								S4.002	28.973	150	
S.2.4	30.527	2.138	Open Manhole	1500	S3.003	28.389	600	S3.002	28.389	600	
S.4.1	30.474	1.350	Open Manhole	1200	S5.000	29.124	150				
FCT 2	30.474	1.434	Open Manhole	1200	S5.001	29.040	150	S5.000	29.090	150	50
S.2.5	30.474	2.100	Open Manhole	1500	S3.004	28.374	600	S3.003	28.374	600	
								S5.001	28.898	150	74
S.2.6	30.474	2.186	Open Manhole	1500	S3.005	28.288	600	S3.004	28.288	600	
S.2.7	30.474	2.275	Open Manhole	1500	S3.006	28.199	600	S3.005	28.199	600	
S.2.8	30.408	2.276	Open Manhole	1500	S3.007	28.132	600	S3.006	28.132	600	
FCT 3	30.538	1.350	Open Manhole	1200	S6.000	29.188	150				
S.5.1	30.579	1.457	Open Manhole	1200	S6.001	29.122	150	S6.000	29.122	150	
S.6.1	30.350	1.628	Open Manhole	1200	S7.000	28.722	150				
S.1.10	30.363	2.554	Open Manhole	1800	S1.009	27.809	900	S1.008	27.809	900	
								S3.007	28.109	600	
								S6.001	28.891	150	332
								S7.000	28.559	150	
S.1.11	30.141	2.373	Open Manhole	1800	S1.010	27.768	900	S1.009	27.768	900	
S.7.1	30.684	1.500	Open Manhole	1200	S8.000	29.184	300				
S.7.2	30.617	1.600	Open Manhole	1200	S8.001	29.017	300	S8.000	29.017	300	
S.1.12	30.519	2.850	Open Manhole	1800	S1.011	27.669	900	S1.010	27.669	900	
								S8.001	28.916	300	647
S.8.1	30.700	1.431	Open Manhole	1200	S9.000	29.269	225				
S.8.2	30.608	1.850	Open Manhole	1500	S9.001	28.758	600	S9.000	29.133	225	
S.8.3	30.625	1.917	Open Manhole	1500	S9.002	28.708	600	S9.001	28.708	600	
S.9.1	30.665	0.984	Open Manhole	1200	S10.000	29.681	150				
S.9.2	30.677	1.152	Open Manhole	1200	S10.001	29.525	150	S10.000	29.525	150	
FCT4	30.724	1.564	Open Manhole	1200	S10.002	29.160	150	S10.001	29.210	150	50

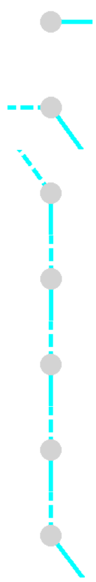
Manhole Schedules for -Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S.9.3	30.724	1.595	Open Manhole	1200	S10.003	29.129	150	S10.002	29.129	150	
S.8.4	30.626	2.002	Open Manhole	1500	S9.003	28.624	600	S9.002	28.624	600	
								S10.003	29.075	150	
S.10.1	30.728	1.350	Open Manhole	1200	S11.000	29.378	150				
FCT5	30.727	1.497	Open Manhole	1200	S11.001	29.230	150	S11.000	29.280	150	50
S.10.2	30.727	1.529	Open Manhole	1200	S11.002	29.198	150	S11.001	29.198	150	
S.8.5	30.626	2.152	Open Manhole	1500	S9.004	28.474	600	S9.003	28.474	600	
								S11.002	29.117	150	193
S.11.1	30.731	1.350	Open Manhole	1200	S12.000	29.381	150				
FCT6	30.731	1.498	Open Manhole	1200	S12.001	29.233	150	S12.000	29.283	150	50
S.11.2	30.731	1.530	Open Manhole	1200	S12.002	29.201	150	S12.001	29.201	150	
S.8.6	30.626	2.261	Open Manhole	1500	S9.005	28.365	600	S9.004	28.365	600	
								S12.002	29.120	150	305
S.8.7	30.623	2.375	Open Manhole	1500	S9.006	28.248	600	S9.005	28.248	600	
S.8.8	30.496	2.333	Open Manhole	1500	S9.007	28.164	600	S9.006	28.164	600	
S.12.1	30.449	1.841	Open Manhole	1800	S13.000	28.608	750				
S.12.2	30.482	2.034	Open Manhole	1800	S13.001	28.448	750	S13.000	28.448	750	
S.12.3	30.482	2.342	Open Manhole	1800	S13.002	28.140	900	S13.001	28.290	750	
S.12.4	30.482	2.488	Open Manhole	1800	S13.003	27.994	900	S13.002	27.994	900	
S.12.5	30.482	2.562	Open Manhole	1800	S13.004	27.920	900	S13.003	27.920	900	
S.12.6	30.484	2.647	Open Manhole	1800	S13.005	27.837	900	S13.004	27.837	900	
S.8.9	30.459	2.667	Open Manhole	1800	S9.008	27.791	900	S9.007	28.092	600	
								S13.005	27.791	900	
S.8.10	30.567	2.959	Open Manhole	1800	S9.009	27.608	1050	S9.008	27.758	900	
S.8.11	30.526	3.021	Open Manhole	1800	S9.010	27.504	1050	S9.009	27.504	1050	
S.13.1	30.524	1.420	Open Manhole	1200	S14.000	29.104	225				
S.14.1	30.473	1.564	Open Manhole	1200	S15.000	28.909	300				
S.13.2	30.537	1.764	Open Manhole	1200	S14.001	28.773	300	S14.000	28.955	225	107
								S15.000	28.773	300	
S.15.1	30.495	1.447	Open Manhole	1200	S16.000	29.048	225				
S.13.3	30.540	1.955	Open Manhole	1350	S14.002	28.585	375	S14.001	28.660	300	
								S16.000	28.842	225	107
BYP 1	30.543	2.234	Open Manhole	1350	S14.003	28.309	375	S14.002	28.409	375	100
S.1.13	30.431	2.993	Open Manhole	1800	S1.012	27.438	1050	S1.011	27.588	900	
								S9.010	27.438	1050	
								S14.003	28.260	375	147
DC POND INLET 1	30.500	3.114	Open Manhole	1800	S1.013	27.386	1050	S1.012	27.386	1050	
S.16.1	30.757	2.138	Open Manhole	1500	S17.000	28.619	500				
S.16.2	30.505	1.913	Open Manhole	1500	S17.001	28.592	500	S17.000	28.592	500	
S.16.3	30.634	2.090	Open Manhole	1500	S17.002	28.545	500	S17.001	28.545	500	
S.16.4	31.122	2.639	Open Manhole	1500	S17.003	28.483	500	S17.002	28.483	500	
SS POND INLET	30.700	2.678	Open Manhole	1800	S17.004	28.022	900	S17.003	28.422	500	
SS POND OUTLET	30.700	2.840	Open Manhole	1800	S17.005	27.860	900	S17.004	27.898	900	38
S.16.5	30.445	2.610	Open Manhole	1800	S17.006	27.835	900	S17.005	27.835	900	

Manhole Schedules for -Storm

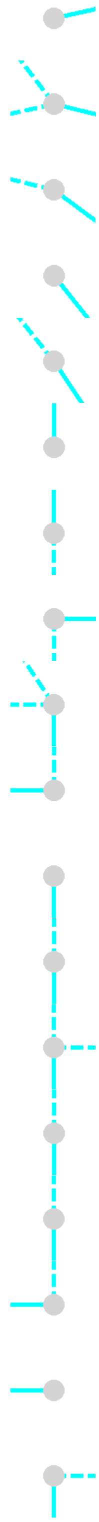
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN (Pipe Out)	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	PN (Pipes In)	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
DC POND INLET 2	30.500	2.741	Open Manhole	1800	S17.007	27.759	900	S17.006	27.759	900	
S.17.1	30.639	1.103	Open Manhole	1200	S18.000	29.536	225				
S.17.2	30.606	1.201	Open Manhole	1200	S18.001	29.405	225	S18.000	29.405	225	
DC POND INLET 3	30.500	1.183	Open Manhole	1200	S18.002	29.317	225	S18.001	29.317	225	
DC POND OUTLET	30.500	3.210	Open Manhole	1800	S1.014	27.290	1050	S1.013	27.290	1050	
								S17.007	27.696	900	256
								S18.002	28.965	225	851
S.1.14	30.700	3.440	Open Manhole	1800	S1.015	27.260	225	S1.014	27.260	1050	
S.18.1	29.540	1.301	Open Manhole	1200	S19.000	28.239	225				
S.18.2	31.272	3.267	Open Manhole	1200	S19.001	28.005	225	S19.000	28.005	225	
S.18.3	30.877	2.931	Open Manhole	1800	S19.002	27.946	900	S19.001	27.946	225	
S.18.4	30.746	2.835	Open Manhole	1800	S19.003	27.911	900	S19.002	27.911	900	
S18.5	30.832	2.896	Open Manhole	1800	S20.000	27.936	900				
S.18.6	30.696	2.795	Open Manhole	1800	S19.004	27.901	225	S19.003	27.901	900	
								S20.000	27.901	900	
S.18.7	31.198	3.339	Open Manhole	1200	S19.005	27.859	150	S19.004	27.859	225	
BYP 2	31.168	3.459	Open Manhole	1200	S19.006	27.709	150	S19.005	27.840	150	131
S.18.8	30.930	3.321	Open Manhole	1200	S19.007	27.609	150	S19.006	27.609	150	
S.1.15	29.724	2.547	Open Manhole	1200	S1.016	27.177	225	S1.015	27.177	225	
								S19.007	27.257	150	5
	29.825	2.705	Open Manhole	0		OUTFALL		S1.016	27.120	225	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S.1.1	534956.391	201705.534	534956.391	201705.534	Required	
S.1.2	534976.134	201705.534	534976.134	201705.534	Required	
S.1.3	534985.588	201692.450	534985.588	201692.450	Required	
S.1.4	534985.588	201623.733	534985.588	201623.733	Required	
S.1.5	534985.588	201572.645	534985.588	201572.645	Required	
S.1.6	534985.588	201472.645	534985.588	201472.645	Required	
S.1.7	534985.588	201430.608	534985.588	201430.608	Required	



Manhole Schedules for -Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S.1.8a	534986.489	201415.166	534986.489	201415.166	Required	
S.1.8	534995.787	201417.253	534995.787	201417.253	Required	
S.1.9	535009.442	201413.942	535009.442	201413.942	Required	
S.2.1	535025.914	201617.643	535025.914	201617.643	Required	
S.2.2	535044.509	201594.407	535044.509	201594.407	Required	
S.3.1	535043.350	201567.660	535043.350	201567.660	Required	
FCT 1	535043.350	201577.579	535043.350	201577.579	Required	
S.3.2	535043.350	201584.775	535043.350	201584.775	Required	
S.2.3	535050.986	201584.775	535050.986	201584.775	Required	
S.2.4	535050.986	201517.812	535050.986	201517.812	Required	
S.4.1	535043.350	201535.363	535043.350	201535.363	Required	
FCT 2	535043.350	201531.966	535043.350	201531.966	Required	
S.2.5	535043.350	201517.817	535043.350	201517.817	Required	
S.2.6	535043.350	201475.047	535043.350	201475.047	Required	
S.2.7	535043.349	201430.716	535043.349	201430.716	Required	
S.2.8	535043.349	201397.244	535043.349	201397.244	Required	
FCT 3	535038.604	201420.318	535038.604	201420.318	Required	
S.5.1	535031.973	201420.318	535031.973	201420.318	Required	



Manhole Schedules for -Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S.6.1	535015.695	201397.243	535015.695	201397.243	Required	
S.1.10	535031.973	201397.244	535031.973	201397.244	Required	
S.1.11	535031.973	201376.813	535031.973	201376.813	Required	
S.7.1	535035.023	201357.651	535035.023	201357.651	Required	
S.7.2	535006.247	201340.539	535006.247	201340.539	Required	
S.1.12	534989.345	201351.580	534989.345	201351.580	Required	
S.8.1	534867.278	201667.710	534867.278	201667.710	Required	
S.8.2	534844.170	201667.710	534844.170	201667.710	Required	
S.8.3	534834.500	201644.637	534834.500	201644.637	Required	
S.9.1	534852.126	201675.970	534852.126	201675.970	Required	
S.9.2	534842.648	201654.582	534842.648	201654.582	Required	
FCT4	534842.648	201607.362	534842.648	201607.362	Required	
S.9.3	534842.648	201602.742	534842.648	201602.742	Required	
S.8.4	534834.500	201602.742	534834.500	201602.742	Required	
S.10.1	534842.648	201514.730	534842.648	201514.730	Required	
FCT5	534842.648	201524.510	534842.648	201524.510	Required	
S.10.2	534842.648	201527.716	534842.648	201527.716	Required	
S.8.5	534834.500	201527.716	534834.500	201527.716	Required	

Manhole Schedules for -Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S.11.1	534842.648	201460.090	534842.648	201460.090	Required	
FCT6	534842.648	201469.869	534842.648	201469.869	Required	
S.11.2	534842.648	201473.075	534842.648	201473.075	Required	
S.8.6	534834.499	201473.075	534834.499	201473.075	Required	
S.8.7	534834.500	201414.670	534834.500	201414.670	Required	
S.8.8	534853.449	201376.913	534853.449	201376.913	Required	
S.12.1	534894.290	201699.780	534894.290	201699.780	Required	
S.12.2	534894.122	201619.694	534894.122	201619.694	Required	
S.12.3	534894.122	201540.618	534894.122	201540.618	Required	
S.12.4	534894.122	201467.710	534894.122	201467.710	Required	
S.12.5	534894.122	201430.803	534894.122	201430.803	Required	
S.12.6	534894.189	201389.232	534894.189	201389.232	Required	
S.8.9	534888.128	201367.326	534888.128	201367.326	Required	
S.8.10	534904.033	201362.448	534904.033	201362.448	Required	
S.8.11	534955.853	201362.448	534955.853	201362.448	Required	
S.13.1	534865.505	201307.514	534865.505	201307.514	Required	
S.14.1	534865.505	201359.342	534865.505	201359.342	Required	
S.13.2	534865.505	201329.383	534865.505	201329.383	Required	

Manhole Schedules for -Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S.15.1	534888.807	201294.403	534888.807	201294.403	Required	
S.13.3	534888.807	201329.383	534888.807	201329.383	Required	
BYP 1	534941.563	201329.383	534941.563	201329.383	Required	
S.1.13	534955.853	201329.383	534955.853	201329.383	Required	
DC POND INLET 1	534955.853	201303.176	534955.853	201303.176	Required	
S.16.1	534860.965	201163.271	534860.965	201163.271	Required	
S.16.2	534866.949	201151.344	534866.949	201151.344	Required	
S.16.3	534890.489	201147.921	534890.489	201147.921	Required	
S.16.4	534916.351	201161.102	534916.351	201161.102	Required	
SS POND INLET	534928.187	201186.936	534928.187	201186.936	Required	
SS POND OUTLET	534965.435	201236.275	534965.435	201236.275	Required	
S.16.5	534966.333	201248.741	534966.333	201248.741	Required	
DC POND INLET 2	534967.347	201286.463	534967.347	201286.463	Required	
S.17.1	534904.080	201279.921	534904.080	201279.921	Required	
S.17.2	534926.350	201279.921	534926.350	201279.921	Required	
DC POND INLET 3	534938.822	201288.121	534938.822	201288.121	Required	
DC POND OUTLET	534998.634	201289.036	534998.634	201289.036	Required	
S.1.14	535009.973	201280.232	535009.973	201280.232	Required	

Manhole Schedules for -Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
S.18.1	535063.385	201372.378	535063.385	201372.378	Required	
S.18.2	535044.105	201337.590	535044.105	201337.590	Required	
S.18.3	535035.522	201332.510	535035.522	201332.510	Required	
S.18.4	535020.315	201323.508	535020.315	201323.508	Required	
S18.5	535038.069	201328.207	535038.069	201328.207	Required	
S.18.6	535022.862	201319.206	535022.862	201319.206	Required	
S.18.7	535027.632	201311.147	535027.632	201311.147	Required	
BYP 2	535026.191	201309.924	535026.191	201309.924	Required	
S.18.8	535018.541	201303.425	535018.541	201303.425	Required	
S.1.15	535017.535	201268.263	535017.535	201268.263	Required	
	535021.596	201260.818			No Entry	

PIPELINE SCHEDULES for -Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	300	S.1.1	30.464	29.188	0.976	Open Manhole	1200
S1.001	o	450	S.1.2	30.421	28.956	1.015	Open Manhole	1350
S1.002	o	600	S.1.3	30.451	28.752	1.099	Open Manhole	1500
S1.003	o	900	S.1.4	30.496	28.314	1.282	Open Manhole	1800
S1.004	o	900	S.1.5	30.468	28.212	1.356	Open Manhole	1800
S1.005	o	900	S.1.6	30.468	28.012	1.556	Open Manhole	1800
S1.006	o	900	S.1.7	30.492	27.928	1.664	Open Manhole	1800
S2.000	o	150	S.1.8a	30.517	28.745	1.622	Open Manhole	1200
S1.007	o	900	S.1.8	30.510	27.894	1.716	Open Manhole	1800
S1.008	o	900	S.1.9	30.498	27.865	1.733	Open Manhole	1800
S3.000	o	375	S.2.1	30.317	28.921	1.021	Open Manhole	1350
S3.001	o	600	S.2.2	30.500	28.547	1.353	Open Manhole	1500
S4.000	o	150	S.3.1	30.474	29.270	1.054	Open Manhole	1200
S4.001	o	150	FCT 1	30.474	29.121	1.203	Open Manhole	1200
S4.002	o	150	S.3.2	30.512	29.049	1.313	Open Manhole	1200
S3.002	o	600	S.2.3	30.494	28.523	1.371	Open Manhole	1500
S3.003	o	600	S.2.4	30.527	28.389	1.538	Open Manhole	1500
S5.000	o	150	S.4.1	30.474	29.124	1.200	Open Manhole	1200
S5.001	o	150	FCT 2	30.474	29.040	1.284	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	19.743	240.8	S.1.2	30.421	29.106	1.015	Open Manhole	1350
S1.001	16.142	298.9	S.1.3	30.451	28.902	1.099	Open Manhole	1500
S1.002	68.717	497.9	S.1.4	30.496	28.614	1.282	Open Manhole	1800
S1.003	51.087	500.9	S.1.5	30.468	28.212	1.356	Open Manhole	1800
S1.004	100.000	500.0	S.1.6	30.468	28.012	1.556	Open Manhole	1800
S1.005	42.037	500.4	S.1.7	30.492	27.928	1.664	Open Manhole	1800
S1.006	16.805	494.3	S.1.8	30.510	27.894	1.716	Open Manhole	1800
S2.000	9.529	100.0	S.1.8	30.510	28.650	1.710	Open Manhole	1800
S1.007	14.051	484.5	S.1.9	30.498	27.865	1.733	Open Manhole	1800
S1.008	28.044	500.8	S.1.10	30.363	27.809	1.654	Open Manhole	1800
S3.000	29.761	199.7	S.2.2	30.500	28.772	1.353	Open Manhole	1500
S3.001	11.607	483.6	S.2.3	30.494	28.523	1.371	Open Manhole	1500
S4.000	9.919	100.2	FCT 1	30.474	29.171	1.153	Open Manhole	1200
S4.001	7.196	99.9	S.3.2	30.512	29.049	1.313	Open Manhole	1200
S4.002	7.636	100.5	S.2.3	30.494	28.973	1.371	Open Manhole	1500
S3.002	66.963	499.7	S.2.4	30.527	28.389	1.538	Open Manhole	1500
S3.003	7.636	509.1	S.2.5	30.474	28.374	1.500	Open Manhole	1500
S5.000	3.397	99.9	FCT 2	30.474	29.090	1.234	Open Manhole	1200
S5.001	14.150	99.6	S.2.5	30.474	28.898	1.426	Open Manhole	1500

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)
S3.004	o	600	S.2.5	30.474	28.374	1.500	Open Manhole	1500
S3.005	o	600	S.2.6	30.474	28.288	1.586	Open Manhole	1500
S3.006	o	600	S.2.7	30.474	28.199	1.675	Open Manhole	1500
S3.007	o	600	S.2.8	30.408	28.132	1.676	Open Manhole	1500
S6.000	o	150	FCT 3	30.538	29.188	1.200	Open Manhole	1200
S6.001	o	150	S.5.1	30.579	29.122	1.307	Open Manhole	1200
S7.000	o	150	S.6.1	30.350	28.722	1.478	Open Manhole	1200
S1.009	o	900	S.1.10	30.363	27.809	1.654	Open Manhole	1800
S1.010	o	900	S.1.11	30.141	27.768	1.473	Open Manhole	1800
S8.000	o	300	S.7.1	30.684	29.184	1.200	Open Manhole	1200
S8.001	o	300	S.7.2	30.617	29.017	1.300	Open Manhole	1200
S1.011	o	900	S.1.12	30.519	27.669	1.950	Open Manhole	1800
S9.000	o	225	S.8.1	30.700	29.269	1.206	Open Manhole	1200
S9.001	o	600	S.8.2	30.608	28.758	1.250	Open Manhole	1500
S9.002	o	600	S.8.3	30.625	28.708	1.317	Open Manhole	1500
S10.000	o	150	S.9.1	30.665	29.681	0.834	Open Manhole	1200
S10.001	o	150	S.9.2	30.677	29.525	1.002	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S3.004	42.769	497.3	S.2.6	30.474	28.288	1.586	Open Manhole	1500
S3.005	44.331	498.1	S.2.7	30.474	28.199	1.675	Open Manhole	1500
S3.006	33.472	499.6	S.2.8	30.408	28.132	1.676	Open Manhole	1500
S3.007	11.376	494.6	S.1.10	30.363	28.109	1.654	Open Manhole	1800
S6.000	6.630	100.5	S.5.1	30.579	29.122	1.307	Open Manhole	1200
S6.001	23.074	99.9	S.1.10	30.363	28.891	1.322	Open Manhole	1800
S7.000	16.279	99.9	S.1.10	30.363	28.559	1.654	Open Manhole	1800
S1.009	20.431	498.3	S.1.11	30.141	27.768	1.473	Open Manhole	1800
S1.010	49.537	500.4	S.1.12	30.519	27.669	1.950	Open Manhole	1800
S8.000	33.479	200.5	S.7.2	30.617	29.017	1.300	Open Manhole	1200
S8.001	20.189	199.9	S.1.12	30.519	28.916	1.303	Open Manhole	1800
S1.011	40.179	496.0	S.1.13	30.431	27.588	1.943	Open Manhole	1800
S9.000	23.108	169.9	S.8.2	30.608	29.133	1.250	Open Manhole	1500
S9.001	25.018	500.0	S.8.3	30.625	28.708	1.317	Open Manhole	1500
S9.002	41.895	500.0	S.8.4	30.626	28.624	1.402	Open Manhole	1500
S10.000	23.394	150.0	S.9.2	30.677	29.525	1.002	Open Manhole	1200
S10.001	47.220	150.0	FCT4	30.724	29.210	1.364	Open Manhole	1200

PIPELINE SCHEDULES for -Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.002	o	150	FCT4	30.724	29.160	1.414	Open Manhole	1200
S10.003	o	150	S.9.3	30.724	29.129	1.445	Open Manhole	1200
S9.003	o	600	S.8.4	30.626	28.624	1.402	Open Manhole	1500
S11.000	o	150	S.10.1	30.728	29.378	1.200	Open Manhole	1200
S11.001	o	150	FCT5	30.727	29.230	1.347	Open Manhole	1200
S11.002	o	150	S.10.2	30.727	29.198	1.379	Open Manhole	1200
S9.004	o	600	S.8.5	30.626	28.474	1.552	Open Manhole	1500
S12.000	o	150	S.11.1	30.731	29.381	1.200	Open Manhole	1200
S12.001	o	150	FCT6	30.731	29.233	1.348	Open Manhole	1200
S12.002	o	150	S.11.2	30.731	29.201	1.380	Open Manhole	1200
S9.005	o	600	S.8.6	30.626	28.365	1.661	Open Manhole	1500
S9.006	o	600	S.8.7	30.623	28.248	1.775	Open Manhole	1500
S9.007	o	600	S.8.8	30.496	28.164	1.733	Open Manhole	1500
S13.000	o	750	S.12.1	30.449	28.608	1.091	Open Manhole	1800
S13.001	o	750	S.12.2	30.482	28.448	1.284	Open Manhole	1800
S13.002	o	900	S.12.3	30.482	28.140	1.442	Open Manhole	1800
S13.003	o	900	S.12.4	30.482	27.994	1.588	Open Manhole	1800
S13.004	o	900	S.12.5	30.482	27.920	1.662	Open Manhole	1800
S13.005	o	900	S.12.6	30.484	27.837	1.747	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.002	4.619	149.0	S.9.3	30.724	29.129	1.445	Open Manhole	1200
S10.003	8.149	150.0	S.8.4	30.626	29.075	1.402	Open Manhole	1500
S9.003	75.027	500.0	S.8.5	30.626	28.474	1.552	Open Manhole	1500
S11.000	9.780	99.8	FCT5	30.727	29.280	1.297	Open Manhole	1200
S11.001	3.206	100.2	S.10.2	30.727	29.198	1.379	Open Manhole	1200
S11.002	8.149	100.6	S.8.5	30.626	29.117	1.359	Open Manhole	1500
S9.004	54.640	500.0	S.8.6	30.626	28.365	1.661	Open Manhole	1500
S12.000	9.780	99.8	FCT6	30.731	29.283	1.298	Open Manhole	1200
S12.001	3.206	100.2	S.11.2	30.731	29.201	1.380	Open Manhole	1200
S12.002	8.149	100.6	S.8.6	30.626	29.120	1.356	Open Manhole	1500
S9.005	58.406	500.0	S.8.7	30.623	28.248	1.775	Open Manhole	1500
S9.006	42.246	500.0	S.8.8	30.496	28.164	1.733	Open Manhole	1500
S9.007	35.979	499.7	S.8.9	30.459	28.092	1.767	Open Manhole	1800
S13.000	80.086	500.5	S.12.2	30.482	28.448	1.284	Open Manhole	1800
S13.001	79.077	500.5	S.12.3	30.482	28.290	1.442	Open Manhole	1800
S13.002	72.907	499.4	S.12.4	30.482	27.994	1.588	Open Manhole	1800
S13.003	36.907	498.7	S.12.5	30.482	27.920	1.662	Open Manhole	1800
S13.004	41.571	500.0	S.12.6	30.484	27.837	1.747	Open Manhole	1800
S13.005	22.729	500.0	S.8.9	30.459	27.791	1.767	Open Manhole	1800

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)
S9.008	o	900	S.8.9	30.459	27.791	1.767	Open Manhole	1800
S9.009	o	1050	S.8.10	30.567	27.608	1.909	Open Manhole	1800
S9.010	o	1050	S.8.11	30.526	27.504	1.971	Open Manhole	1800
S14.000	o	225	S.13.1	30.524	29.104	1.195	Open Manhole	1200
S15.000	o	300	S.14.1	30.473	28.909	1.264	Open Manhole	1200
S14.001	o	300	S.13.2	30.537	28.773	1.464	Open Manhole	1200
S16.000	o	225	S.15.1	30.495	29.048	1.222	Open Manhole	1200
S14.002	o	375	S.13.3	30.540	28.585	1.580	Open Manhole	1350
S14.003	o	375	BYP 1	30.543	28.309	1.859	Open Manhole	1350
S1.012	o	1050	S.1.13	30.431	27.438	1.943	Open Manhole	1800
S1.013	o	1050	DC POND INLET 1	30.500	27.386	2.064	Open Manhole	1800
S17.000	o	500	S.16.1	30.757	28.619	1.638	Open Manhole	1500
S17.001	o	500	S.16.2	30.505	28.592	1.413	Open Manhole	1500
S17.002	o	500	S.16.3	30.634	28.545	1.590	Open Manhole	1500
S17.003	o	500	S.16.4	31.122	28.483	2.139	Open Manhole	1500
S17.004	o	900	SS POND INLET	30.700	28.022	1.778	Open Manhole	1800
S17.005	o	900	SS POND OUTLET	30.700	27.860	1.940	Open Manhole	1800

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)
S9.008	16.636	500.0	S.8.10	30.567	27.758	1.909	Open Manhole	1800
S9.009	51.821	498.3	S.8.11	30.526	27.504	1.971	Open Manhole	1800
S9.010	33.065	501.0	S.1.13	30.431	27.438	1.943	Open Manhole	1800
S14.000	21.870	146.8	S.13.2	30.537	28.955	1.357	Open Manhole	1200
S15.000	29.958	220.3	S.13.2	30.537	28.773	1.464	Open Manhole	1200
S14.001	23.302	206.2	S.13.3	30.540	28.660	1.580	Open Manhole	1350
S16.000	34.981	169.8	S.13.3	30.540	28.842	1.473	Open Manhole	1350
S14.002	52.756	299.8	BYP 1	30.543	28.409	1.759	Open Manhole	1350
S14.003	14.290	291.6	S.1.13	30.431	28.260	1.796	Open Manhole	1800
S1.012	26.207	500.0	DC POND INLET 1	30.500	27.386	2.064	Open Manhole	1800
S1.013	45.057	469.3	DC POND OUTLET	30.500	27.290	2.160	Open Manhole	1800
S17.000	13.345	500.0	S.16.2	30.505	28.592	1.413	Open Manhole	1500
S17.001	23.788	500.0	S.16.3	30.634	28.545	1.590	Open Manhole	1500
S17.002	29.027	468.2	S.16.4	31.122	28.483	2.139	Open Manhole	1500
S17.003	28.416	465.8	SS POND INLET	30.700	28.422	1.778	Open Manhole	1800
S17.004	61.820	500.0	SS POND OUTLET	30.700	27.898	1.902	Open Manhole	1800
S17.005	12.498	499.9	S.16.5	30.445	27.835	1.710	Open Manhole	1800

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)
S17.006	o	900	S.16.5	30.445	27.835	1.710	Open Manhole	1800
S17.007	o	900	DC POND INLET 2	30.500	27.759	1.841	Open Manhole	1800
S18.000	o	225	S.17.1	30.639	29.536	0.878	Open Manhole	1200
S18.001	o	225	S.17.2	30.606	29.405	0.976	Open Manhole	1200
S18.002	o	225	DC POND INLET 3	30.500	29.317	0.958	Open Manhole	1200
S1.014	o	1050	DC POND OUTLET	30.500	27.290	2.160	Open Manhole	1800
S1.015	o	225	S.1.14	30.700	27.260	3.215	Open Manhole	1800
S19.000	o	225	S.18.1	29.540	28.239	1.076	Open Manhole	1200
S19.001	o	225	S.18.2	31.272	28.005	3.042	Open Manhole	1200
S19.002	o	900	S.18.3	30.877	27.946	2.031	Open Manhole	1800
S19.003	o	900	S.18.4	30.746	27.911	1.935	Open Manhole	1800
S20.000	o	900	S18.5	30.832	27.936	1.996	Open Manhole	1800
S19.004	o	225	S.18.6	30.696	27.901	2.570	Open Manhole	1800
S19.005	o	150	S.18.7	31.198	27.859	3.189	Open Manhole	1200
S19.006	o	150	BYP 2	31.168	27.709	3.309	Open Manhole	1200
S19.007	o	150	S.18.8	30.930	27.609	3.171	Open Manhole	1200
S1.016	o	225	S.1.15	29.724	27.177	2.322	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S17.006	37.735	496.5	DC POND INLET 2	30.500	27.759	1.841	Open Manhole	1800
S17.007	31.392	498.3	DC POND OUTLET	30.500	27.696	1.904	Open Manhole	1800
S18.000	22.269	170.0	S.17.2	30.606	29.405	0.976	Open Manhole	1200
S18.001	14.926	169.6	DC POND INLET 3	30.500	29.317	0.958	Open Manhole	1200
S18.002	59.819	170.0	DC POND OUTLET	30.500	28.965	1.310	Open Manhole	1800
S1.014	14.355	478.5	S.1.14	30.700	27.260	2.390	Open Manhole	1800
S1.015	14.158	170.6	S.1.15	29.724	27.177	2.322	Open Manhole	1200
S19.000	39.774	170.0	S.18.2	31.272	28.005	3.042	Open Manhole	1200
S19.001	9.974	170.0	S.18.3	30.877	27.946	2.706	Open Manhole	1800
S19.002	17.672	504.9	S.18.4	30.746	27.911	1.935	Open Manhole	1800
S19.003	5.000	500.0	S.18.6	30.696	27.901	1.895	Open Manhole	1800
S20.000	17.672	504.9	S.18.6	30.696	27.901	1.895	Open Manhole	1800
S19.004	9.364	223.0	S.18.7	31.198	27.859	3.114	Open Manhole	1200
S19.005	1.890	99.5	BYP 2	31.168	27.840	3.178	Open Manhole	1200
S19.006	10.038	100.4	S.18.8	30.930	27.609	3.171	Open Manhole	1200
S19.007	35.176	99.9	S.1.15	29.724	27.257	2.317	Open Manhole	1200
S1.016	8.481	148.8		29.825	27.120	2.480	Open Manhole	0

Simulation Criteria for -Storm

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	2	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.400		

Online Controls for -Storm

Hydro-Brake® Optimum Manhole: S.1.14, DS/PN: S1.015, Volume (m³): 19.6

Unit Reference	MD-SHE-0192-2370-2500-2370
Design Head (m)	2.500
Design Flow (l/s)	23.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	192
Invert Level (m)	27.260
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1800

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	2.500	23.7	Kick-Flo®	1.520	18.7
Flush-Flo™	0.734	23.7	Mean Flow over Head Range	-	20.7

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	6.7	0.800	23.6	2.000	21.3	4.000	29.7	7.000	38.8
0.200	17.7	1.000	23.2	2.200	22.3	4.500	31.4	7.500	40.2
0.300	20.8	1.200	22.3	2.400	23.2	5.000	33.0	8.000	41.4
0.400	22.2	1.400	20.5	2.600	24.1	5.500	34.6	8.500	42.7
0.500	23.1	1.600	19.1	3.000	25.8	6.000	36.1	9.000	43.9
0.600	23.5	1.800	20.2	3.500	27.8	6.500	37.5	9.500	45.0

Hydro-Brake® Optimum Manhole: S.18.7, DS/PN: S19.005, Volume (m³): 4.1

Unit Reference	MD-SHE-0075-2400-0900-2400
Design Head (m)	0.900
Design Flow (l/s)	2.4
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	27.859
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**	**Control Points**	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.900	2.4	Kick-Flo®	0.565	1.9
Flush-Flo™	0.269	2.4	Mean Flow over Head Range	-	2.1

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	2.1	0.400	2.3	0.800	2.3	1.400	2.9	2.000	3.5
0.200	2.4	0.500	2.2	1.000	2.5	1.600	3.1	2.200	3.6
0.300	2.4	0.600	2.0	1.200	2.7	1.800	3.3	2.400	3.8

Hydro-Brake® Optimum Manhole: S.18.7, DS/PN: S19.005, Volume (m³): 4.1

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
2.600	3.9	4.000	4.8	5.500	5.6	7.000	6.2	8.500	6.8
3.000	4.2	4.500	5.1	6.000	5.8	7.500	6.4	9.000	7.0
3.500	4.5	5.000	5.3	6.500	6.0	8.000	6.6	9.500	7.2

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S.1.1	15 Winter	1	+40%	100/15 Summer				29.280	-0.208	0.000
S1.001	S.1.2	15 Winter	1	+40%	30/30 Winter				29.071	-0.335	0.000
S1.002	S.1.3	15 Winter	1	+40%	30/30 Winter				28.978	-0.374	0.000
S1.003	S.1.4	15 Winter	1	+40%	30/15 Winter				28.652	-0.562	0.000
S1.004	S.1.5	15 Winter	1	+40%	30/15 Winter				28.585	-0.527	0.000
S1.005	S.1.6	30 Winter	1	+40%	30/15 Summer				28.482	-0.430	0.000
S1.006	S.1.7	30 Winter	1	+40%	30/15 Summer				28.444	-0.384	0.000
S2.000	S.1.8a	15 Winter	1	+40%	30/15 Summer				28.826	-0.069	0.000
S1.007	S.1.8	30 Winter	1	+40%	30/15 Summer				28.419	-0.375	0.000
S1.008	S.1.9	600 Winter	1	+40%	30/15 Summer				28.405	-0.360	0.000
S3.000	S.2.1	15 Winter	1	+40%	30/15 Winter				29.045	-0.251	0.000
S3.001	S.2.2	15 Winter	1	+40%	30/15 Winter				28.778	-0.369	0.000
S4.000	S.3.1	15 Winter	1	+40%	30/15 Summer				29.354	-0.066	0.000
S4.001	FCT 1	15 Winter	1	+40%	30/15 Summer				29.207	-0.064	0.000
S4.002	S.3.2	15 Winter	1	+40%	30/15 Summer				29.134	-0.065	0.000
S3.002	S.2.3	15 Winter	1	+40%	30/15 Winter				28.757	-0.366	0.000
S3.003	S.2.4	15 Winter	1	+40%	30/15 Summer				28.685	-0.304	0.000
S5.000	S.4.1	15 Winter	1	+40%	30/15 Summer				29.232	-0.042	0.000
S5.001	FCT 2	15 Winter	1	+40%	30/15 Summer				29.125	-0.065	0.000
S3.004	S.2.5	15 Winter	1	+40%	30/15 Summer				28.673	-0.301	0.000
S3.005	S.2.6	15 Winter	1	+40%	30/15 Summer				28.596	-0.292	0.000
S3.006	S.2.7	15 Winter	1	+40%	30/15 Summer				28.535	-0.264	0.000
S3.007	S.2.8	15 Winter	1	+40%	30/15 Summer				28.491	-0.241	0.000
S6.000	FCT 3	15 Winter	1	+40%	30/15 Summer				29.284	-0.054	0.000
S6.001	S.5.1	15 Winter	1	+40%	30/15 Summer				29.210	-0.062	0.000
S7.000	S.6.1	15 Winter	1	+40%	30/15 Summer				28.761	-0.111	0.000
S1.009	S.1.10	600 Winter	1	+40%	30/15 Summer				28.404	-0.305	0.000
S1.010	S.1.11	600 Winter	1	+40%	30/15 Summer				28.403	-0.265	0.000
S8.000	S.7.1	15 Winter	1	+40%	30/15 Summer				29.337	-0.147	0.000
S8.001	S.7.2	15 Winter	1	+40%	30/15 Summer				29.171	-0.146	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S.1.1	0.20			12.3	OK	
S1.001	S.1.2	0.15			21.2	OK	
S1.002	S.1.3	0.30			84.0	OK	
S1.003	S.1.4	0.20			147.9	OK	
S1.004	S.1.5	0.29			230.1	OK	
S1.005	S.1.6	0.31			218.7	OK	
S1.006	S.1.7	0.46			214.9	OK	
S2.000	S.1.8a	0.56			8.8	OK	
S1.007	S.1.8	0.51			217.1	OK	
S1.008	S.1.9	0.06			41.0	OK	
S3.000	S.2.1	0.24			29.4	OK	
S3.001	S.2.2	0.25			39.8	OK	
S4.000	S.3.1	0.59			9.3	OK	
S4.001	FCT 1	0.61			9.3	OK	
S4.002	S.3.2	0.61			9.4	OK	
S3.002	S.2.3	0.24			67.3	OK	
S3.003	S.2.4	0.35			62.4	OK	
S5.000	S.4.1	0.85			9.8	OK	
S5.001	FCT 2	0.60			9.8	OK	
S3.004	S.2.5	0.41			108.9	OK	
S3.005	S.2.6	0.38			101.2	OK	
S3.006	S.2.7	0.38			95.9	OK	
S3.007	S.2.8	0.67			104.4	OK	
S6.000	FCT 3	0.72			10.7	OK	
S6.001	S.5.1	0.64			10.8	OK	
S7.000	S.6.1	0.15			2.5	OK	
S1.009	S.1.10	0.11			59.0	OK	
S1.010	S.1.11	0.08			60.3	OK	
S8.000	S.7.1	0.50			36.0	OK	
S8.001	S.7.2	0.52			35.7	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.011	S.1.12	600 Winter	1	+40%	30/15 Summer				28.402	-0.167
S9.000	S.8.1	15 Winter	1	+40%	100/15 Summer				29.355	-0.139
S9.001	S.8.2	15 Winter	1	+40%	30/30 Winter				28.913	-0.445
S9.002	S.8.3	15 Winter	1	+40%	30/30 Winter				28.906	-0.402
S10.000	S.9.1	15 Winter	1	+40%	30/15 Summer				29.741	-0.090
S10.001	S.9.2	15 Winter	1	+40%	30/15 Summer				29.604	-0.071
S10.002	FCT4	15 Winter	1	+40%	30/15 Summer				29.259	-0.051
S10.003	S.9.3	15 Winter	1	+40%	30/15 Summer				29.219	-0.060
S9.003	S.8.4	15 Winter	1	+40%	30/15 Winter				28.845	-0.379
S11.000	S.10.1	15 Winter	1	+40%	30/15 Summer				29.459	-0.069
S11.001	FCT5	15 Winter	1	+40%	30/15 Summer				29.333	-0.047
S11.002	S.10.2	15 Winter	1	+40%	30/15 Summer				29.280	-0.068
S9.004	S.8.5	15 Winter	1	+40%	30/15 Winter				28.735	-0.339
S12.000	S.11.1	15 Winter	1	+40%	30/15 Summer				29.470	-0.061
S12.001	FCT6	15 Winter	1	+40%	30/15 Summer				29.346	-0.037
S12.002	S.11.2	15 Winter	1	+40%	30/15 Summer				29.290	-0.061
S9.005	S.8.6	15 Winter	1	+40%	30/15 Summer				28.645	-0.320
S9.006	S.8.7	15 Winter	1	+40%	30/15 Summer				28.542	-0.306
S9.007	S.8.8	15 Winter	1	+40%	30/15 Summer				28.461	-0.303
S13.000	S.12.1	15 Winter	1	+40%	30/30 Winter				28.888	-0.470
S13.001	S.12.2	15 Winter	1	+40%	30/15 Winter				28.777	-0.421
S13.002	S.12.3	15 Winter	1	+40%	30/15 Winter				28.563	-0.477
S13.003	S.12.4	15 Winter	1	+40%	30/15 Summer				28.482	-0.412
S13.004	S.12.5	15 Winter	1	+40%	30/15 Summer				28.438	-0.382
S13.005	S.12.6	600 Winter	1	+40%	30/15 Summer				28.404	-0.333
S9.008	S.8.9	600 Winter	1	+40%	30/15 Summer				28.404	-0.288
S9.009	S.8.10	600 Winter	1	+40%	30/15 Summer				28.403	-0.255
S9.010	S.8.11	600 Winter	1	+40%	30/15 Summer				28.402	-0.152
S14.000	S.13.1	15 Winter	1	+40%	30/15 Summer				29.207	-0.122
S15.000	S.14.1	15 Winter	1	+40%	30/15 Summer				29.032	-0.177
S14.001	S.13.2	15 Winter	1	+40%	30/15 Summer				28.937	-0.136
S16.000	S.15.1	15 Winter	1	+40%	30/15 Summer				29.167	-0.106
S14.002	S.13.3	15 Winter	1	+40%	30/15 Summer				28.847	-0.113
S14.003	BYP 1	15 Winter	1	+40%	30/15 Summer				28.591	-0.093
S1.012	S.1.13	600 Winter	1	+40%	30/15 Summer				28.401	-0.087
S1.013	DC POND INLET 1	600 Winter	1	+40%	30/15 Summer				28.396	-0.039
S17.000	S.16.1	15 Winter	1	+40%	30/360 Winter				28.832	-0.287
S17.001	S.16.2	15 Winter	1	+40%	30/360 Winter				28.796	-0.296
S17.002	S.16.3	15 Winter	1	+40%	30/240 Winter				28.743	-0.302
S17.003	S.16.4	15 Winter	1	+40%	30/180 Winter				28.668	-0.315
S17.004	SS POND INLET	720 Winter	1	+40%	30/180 Winter				28.384	-0.538
S17.005	SS POND OUTLET	720 Winter	1	+40%	30/120 Summer				28.384	-0.376
S17.006	S.16.5	720 Winter	1	+40%	30/120 Summer				28.384	-0.351
S17.007	DC POND INLET 2	720 Winter	1	+40%	30/60 Summer				28.384	-0.275
S18.000	S.17.1	15 Winter	1	+40%	30/15 Winter				29.639	-0.122
S18.001	S.17.2	15 Winter	1	+40%	100/15 Summer				29.510	-0.120
S18.002	DC POND INLET 3	15 Winter	1	+40%	100/15 Summer				29.416	-0.126
S1.014	DC POND OUTLET	720 Winter	1	+40%	1/360 Winter				28.385	0.045
S1.015	S.1.14	720 Winter	1	+40%	1/15 Summer				28.383	0.899
S19.000	S.18.1	15 Winter	1	+40%	30/60 Winter				28.340	-0.124
S19.001	S.18.2	30 Winter	1	+40%	30/15 Summer				28.151	-0.079
S19.002	S.18.3	30 Winter	1	+40%					28.148	-0.698
S19.003	S.18.4	30 Winter	1	+40%					28.148	-0.663
S20.000	S18.5	30 Winter	1	+40%					28.148	-0.688
S19.004	S.18.6	30 Winter	1	+40%	1/15 Winter				28.148	0.022
S19.005	S.18.7	30 Winter	1	+40%	1/15 Summer				28.145	0.136
S19.006	BYP 2	60 Winter	1	+40%					27.748	-0.111

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.011	S.1.12	0.000	0.09			60.7	OK	
S9.000	S.8.1	0.000	0.31			11.1	OK	
S9.001	S.8.2	0.000	0.05			11.0	OK	
S9.002	S.8.3	0.000	0.16			43.2	OK	
S10.000	S.9.1	0.000	0.33			4.5	OK	
S10.001	S.9.2	0.000	0.52			7.3	OK	
S10.002	FCT4	0.000	0.77			8.4	OK	
S10.003	S.9.3	0.000	0.67			8.4	OK	
S9.003	S.8.4	0.000	0.25			69.6	OK	
S11.000	S.10.1	0.000	0.56			8.9	OK	
S11.001	FCT5	0.000	0.79			8.9	OK	
S11.002	S.10.2	0.000	0.58			8.9	OK	
S9.004	S.8.5	0.000	0.32			87.5	OK	
S12.000	S.11.1	0.000	0.64			10.2	OK	
S12.001	FCT6	0.000	0.91			10.2	OK	
S12.002	S.11.2	0.000	0.66			10.2	OK	
S9.005	S.8.6	0.000	0.40			108.6	OK	
S9.006	S.8.7	0.000	0.40			105.4	OK	
S9.007	S.8.8	0.000	0.42			107.5	OK	
S13.000	S.12.1	0.000	0.23			114.9	OK	
S13.001	S.12.2	0.000	0.38			187.4	OK	
S13.002	S.12.3	0.000	0.32			246.6	OK	
S13.003	S.12.4	0.000	0.39			267.4	OK	
S13.004	S.12.5	0.000	0.36			251.8	OK	
S13.005	S.12.6	0.000	0.07			41.2	OK	
S9.008	S.8.9	0.000	0.13			60.5	OK	
S9.009	S.8.10	0.000	0.06			65.4	OK	
S9.010	S.8.11	0.000	0.07			69.7	OK	
S14.000	S.13.1	0.000	0.42			16.3	OK	
S15.000	S.14.1	0.000	0.34			23.2	OK	
S14.001	S.13.2	0.000	0.58			39.3	OK	
S16.000	S.15.1	0.000	0.54			20.3	OK	
S14.002	S.13.3	0.000	0.80			85.8	OK	
S14.003	BYP 1	0.000	0.92			84.7	OK	
S1.012	S.1.13	0.000	0.15			135.2	OK	
S1.013	DC POND INLET 1	0.000	0.13			134.1	OK	
S17.000	S.16.1	0.000	0.34			36.6	OK	
S17.001	S.16.2	0.000	0.29			43.6	OK	
S17.002	S.16.3	0.000	0.30			48.9	OK	
S17.003	S.16.4	0.000	0.29			48.4	OK	
S17.004	SS POND INLET	0.000	0.01			5.1	OK	
S17.005	SS POND OUTLET	0.000	0.05			17.9	OK	
S17.006	S.16.5	0.000	0.02			13.4	OK	
S17.007	DC POND INLET 2	0.000	0.02			11.2	OK	
S18.000	S.17.1	0.000	0.42			15.3	OK	
S18.001	S.17.2	0.000	0.44			15.4	OK	
S18.002	DC POND INLET 3	0.000	0.40			15.4	OK	
S1.014	DC POND OUTLET	0.000	0.17			104.3	SURCHARGED	
S1.015	S.1.14	0.000	0.68			23.6	SURCHARGED	
S19.000	S.18.1	0.000	0.40			15.1	OK	
S19.001	S.18.2	0.000	0.35			11.7	OK	
S19.002	S.18.3	0.000	0.02			10.7	OK	
S19.003	S.18.4	0.000	0.02			7.7	OK	
S20.000	S18.5	0.000	0.00			0.2	OK	
S19.004	S.18.6	0.000	0.12			3.3	SURCHARGED	
S19.005	S.18.7	0.000	0.22			2.4	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S19.006	BYP 2	0.000	0.15			2.4	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S19.007	S.18.8	60 Winter	1	+40%					27.646	-0.113	0.000	0.14
S1.016	S.1.15	120 Winter	1	+40%					27.326	-0.076	0.000	0.77

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S19.007	S.18.8			2.4	OK	
S1.016	S.1.15			26.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S.1.1	30 Winter	30	+40%	100/15 Summer				29.465	-0.023	0.000
S1.001	S.1.2	30 Winter	30	+40%	30/30 Winter				29.453	0.047	0.000
S1.002	S.1.3	30 Winter	30	+40%	30/30 Winter				29.447	0.095	0.000
S1.003	S.1.4	30 Winter	30	+40%	30/15 Winter				29.425	0.211	0.000
S1.004	S.1.5	30 Winter	30	+40%	30/15 Winter				29.411	0.299	0.000
S1.005	S.1.6	30 Winter	30	+40%	30/15 Summer				29.373	0.461	0.000
S1.006	S.1.7	30 Winter	30	+40%	30/15 Summer				29.340	0.512	0.000
S2.000	S.1.8a	30 Winter	30	+40%	30/15 Summer				29.342	0.447	0.000
S1.007	S.1.8	30 Winter	30	+40%	30/15 Summer				29.312	0.518	0.000
S1.008	S.1.9	1440 Winter	30	+40%	30/15 Summer				29.301	0.536	0.000
S3.000	S.2.1	30 Winter	30	+40%	30/15 Winter				29.414	0.118	0.000
S3.001	S.2.2	30 Winter	30	+40%	30/15 Winter				29.395	0.248	0.000
S4.000	S.3.1	15 Winter	30	+40%	30/15 Summer				29.574	0.154	0.000
S4.001	FCT 1	30 Winter	30	+40%	30/15 Summer				29.423	0.152	0.000
S4.002	S.3.2	30 Winter	30	+40%	30/15 Summer				29.406	0.207	0.000
S3.002	S.2.3	30 Winter	30	+40%	30/15 Winter				29.390	0.267	0.000
S3.003	S.2.4	30 Winter	30	+40%	30/15 Summer				29.372	0.383	0.000
S5.000	S.4.1	15 Winter	30	+40%	30/15 Summer				29.454	0.180	0.000
S5.001	FCT 2	30 Winter	30	+40%	30/15 Summer				29.396	0.206	0.000
S3.004	S.2.5	30 Winter	30	+40%	30/15 Summer				29.365	0.391	0.000
S3.005	S.2.6	30 Winter	30	+40%	30/15 Summer				29.336	0.448	0.000
S3.006	S.2.7	30 Winter	30	+40%	30/15 Summer				29.305	0.506	0.000
S3.007	S.2.8	1440 Winter	30	+40%	30/15 Summer				29.301	0.569	0.000
S6.000	FCT 3	15 Winter	30	+40%	30/15 Summer				29.654	0.316	0.000
S6.001	S.5.1	15 Winter	30	+40%	30/15 Summer				29.483	0.211	0.000
S7.000	S.6.1	1440 Winter	30	+40%	30/15 Summer				29.300	0.428	0.000
S1.009	S.1.10	1440 Winter	30	+40%	30/15 Summer				29.301	0.592	0.000
S1.010	S.1.11	1440 Winter	30	+40%	30/15 Summer				29.300	0.632	0.000
S8.000	S.7.1	15 Winter	30	+40%	30/15 Summer				29.596	0.112	0.000
S8.001	S.7.2	15 Winter	30	+40%	30/15 Summer				29.359	0.042	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S.1.1	0.38			23.9	OK	
S1.001	S.1.2	0.30			43.8	SURCHARGED	
S1.002	S.1.3	0.66			182.0	SURCHARGED	
S1.003	S.1.4	0.43			308.6	SURCHARGED	
S1.004	S.1.5	0.58			462.5	SURCHARGED	
S1.005	S.1.6	0.68			474.1	SURCHARGED	
S1.006	S.1.7	0.98			457.5	SURCHARGED	
S2.000	S.1.8a	1.07			16.9	SURCHARGED	
S1.007	S.1.8	1.09			463.1	SURCHARGED	
S1.008	S.1.9	0.07			46.5	SURCHARGED	
S3.000	S.2.1	0.45			56.7	SURCHARGED	
S3.001	S.2.2	0.46			74.4	SURCHARGED	
S4.000	S.3.1	1.35			21.3	SURCHARGED	
S4.001	FCT 1	1.14			17.4	SURCHARGED	
S4.002	S.3.2	1.13			17.3	SURCHARGED	
S3.002	S.2.3	0.48			133.5	SURCHARGED	
S3.003	S.2.4	0.65			115.9	SURCHARGED	
S5.000	S.4.1	1.98			22.9	SURCHARGED	
S5.001	FCT 2	1.14			18.7	SURCHARGED	
S3.004	S.2.5	0.84			221.3	SURCHARGED	
S3.005	S.2.6	0.76			202.3	SURCHARGED	
S3.006	S.2.7	0.74			188.1	SURCHARGED	
S3.007	S.2.8	0.12			18.3	SURCHARGED	
S6.000	FCT 3	1.59			23.8	SURCHARGED	
S6.001	S.5.1	1.39			23.5	SURCHARGED	
S7.000	S.6.1	0.02			0.3	SURCHARGED	
S1.009	S.1.10	0.12			65.5	SURCHARGED	
S1.010	S.1.11	0.09			66.6	SURCHARGED	
S8.000	S.7.1	1.20			85.8	SURCHARGED	
S8.001	S.7.2	1.24			85.0	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.011	S.1.12	1440 Winter	30	+40%	30/15 Summer				29.299	0.730
S9.000	S.8.1	15 Winter	30	+40%	100/15 Summer				29.418	-0.076
S9.001	S.8.2	30 Winter	30	+40%	30/30 Winter				29.363	0.005
S9.002	S.8.3	30 Winter	30	+40%	30/30 Winter				29.362	0.054
S10.000	S.9.1	15 Winter	30	+40%	30/15 Summer				29.924	0.093
S10.001	S.9.2	15 Winter	30	+40%	30/15 Summer				29.850	0.175
S10.002	FCT4	15 Winter	30	+40%	30/15 Summer				29.414	0.104
S10.003	S.9.3	30 Winter	30	+40%	30/15 Summer				29.380	0.101
S9.003	S.8.4	30 Winter	30	+40%	30/15 Winter				29.352	0.128
S11.000	S.10.1	15 Winter	30	+40%	30/15 Summer				29.668	0.140
S11.001	FCT5	15 Winter	30	+40%	30/15 Summer				29.503	0.123
S11.002	S.10.2	15 Winter	30	+40%	30/15 Summer				29.399	0.051
S9.004	S.8.5	30 Winter	30	+40%	30/15 Winter				29.334	0.260
S12.000	S.11.1	15 Winter	30	+40%	30/15 Summer				29.780	0.249
S12.001	FCT6	15 Winter	30	+40%	30/15 Summer				29.570	0.187
S12.002	S.11.2	15 Winter	30	+40%	30/15 Summer				29.437	0.086
S9.005	S.8.6	30 Winter	30	+40%	30/15 Summer				29.310	0.345
S9.006	S.8.7	960 Winter	30	+40%	30/15 Summer				29.300	0.451
S9.007	S.8.8	1440 Winter	30	+40%	30/15 Summer				29.299	0.536
S13.000	S.12.1	30 Winter	30	+40%	30/30 Winter				29.413	0.055
S13.001	S.12.2	30 Winter	30	+40%	30/15 Winter				29.392	0.194
S13.002	S.12.3	30 Winter	30	+40%	30/15 Winter				29.348	0.308
S13.003	S.12.4	30 Winter	30	+40%	30/15 Summer				29.308	0.414
S13.004	S.12.5	1440 Winter	30	+40%	30/15 Summer				29.300	0.480
S13.005	S.12.6	1440 Winter	30	+40%	30/15 Summer				29.300	0.563
S9.008	S.8.9	1440 Winter	30	+40%	30/15 Summer				29.299	0.608
S9.009	S.8.10	1440 Winter	30	+40%	30/15 Summer				29.299	0.640
S9.010	S.8.11	1440 Winter	30	+40%	30/15 Summer				29.299	0.745
S14.000	S.13.1	15 Winter	30	+40%	30/15 Summer				29.739	0.410
S15.000	S.14.1	15 Winter	30	+40%	30/15 Summer				29.697	0.488
S14.001	S.13.2	15 Winter	30	+40%	30/15 Summer				29.622	0.549
S16.000	S.15.1	15 Winter	30	+40%	30/15 Summer				29.731	0.458
S14.002	S.13.3	15 Winter	30	+40%	30/15 Summer				29.454	0.494
S14.003	BYP 1	1440 Winter	30	+40%	30/15 Summer				29.299	0.615
S1.012	S.1.13	1440 Winter	30	+40%	30/15 Summer				29.298	0.810
S1.013	DC POND INLET 1	1440 Winter	30	+40%	30/15 Summer				29.297	0.861
S17.000	S.16.1	1440 Winter	30	+40%	30/360 Winter				29.294	0.175
S17.001	S.16.2	1440 Winter	30	+40%	30/360 Winter				29.295	0.202
S17.002	S.16.3	1440 Winter	30	+40%	30/240 Winter				29.295	0.250
S17.003	S.16.4	1440 Winter	30	+40%	30/180 Winter				29.295	0.312
S17.004	SS POND INLET	1440 Winter	30	+40%	30/180 Winter				29.295	0.373
S17.005	SS POND OUTLET	1440 Winter	30	+40%	30/120 Summer				29.295	0.535
S17.006	S.16.5	1440 Winter	30	+40%	30/120 Summer				29.295	0.560
S17.007	DC POND INLET 2	1440 Winter	30	+40%	30/60 Summer				29.295	0.636
S18.000	S.17.1	15 Winter	30	+40%	30/15 Winter				29.763	0.002
S18.001	S.17.2	15 Winter	30	+40%	100/15 Summer				29.616	-0.014
S18.002	DC POND INLET 3	15 Winter	30	+40%	100/15 Summer				29.485	-0.057
S1.014	DC POND OUTLET	1440 Winter	30	+40%	1/360 Winter				29.295	0.956
S1.015	S.1.14	1440 Winter	30	+40%	1/15 Summer				29.294	1.810
S19.000	S.18.1	60 Winter	30	+40%	30/60 Winter				28.490	0.026
S19.001	S.18.2	60 Winter	30	+40%	30/15 Summer				28.483	0.253
S19.002	S.18.3	60 Winter	30	+40%					28.480	-0.366
S19.003	S.18.4	60 Winter	30	+40%					28.480	-0.331
S20.000	S18.5	60 Winter	30	+40%					28.480	-0.356
S19.004	S.18.6	60 Winter	30	+40%	1/15 Winter				28.480	0.354
S19.005	S.18.7	60 Winter	30	+40%	1/15 Summer				28.477	0.468
S19.006	BYP 2	720 Summer	30	+40%					27.748	-0.111

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.011	S.1.12	0.000	0.10			69.3	SURCHARGED	
S9.000	S.8.1	0.000	0.75			27.3	OK	
S9.001	S.8.2	0.000	0.09			21.1	SURCHARGED	
S9.002	S.8.3	0.000	0.36			94.9	SURCHARGED	
S10.000	S.9.1	0.000	0.70			9.6	SURCHARGED	
S10.001	S.9.2	0.000	1.15			16.2	SURCHARGED	
S10.002	FCT4	0.000	1.63			18.0	SURCHARGED	
S10.003	S.9.3	0.000	1.30			16.4	SURCHARGED	
S9.003	S.8.4	0.000	0.55			152.9	SURCHARGED	
S11.000	S.10.1	0.000	1.30			20.5	SURCHARGED	
S11.001	FCT5	0.000	1.78			20.0	SURCHARGED	
S11.002	S.10.2	0.000	1.31			20.2	SURCHARGED	
S9.004	S.8.5	0.000	0.68			183.0	SURCHARGED	
S12.000	S.11.1	0.000	1.46			23.0	SURCHARGED	
S12.001	FCT6	0.000	2.01			22.5	SURCHARGED	
S12.002	S.11.2	0.000	1.47			22.6	SURCHARGED	
S9.005	S.8.6	0.000	0.83			225.0	SURCHARGED	
S9.006	S.8.7	0.000	0.10			25.9	SURCHARGED	
S9.007	S.8.8	0.000	0.09			22.2	SURCHARGED	
S13.000	S.12.1	0.000	0.46			226.3	SURCHARGED	
S13.001	S.12.2	0.000	0.75			368.1	SURCHARGED	
S13.002	S.12.3	0.000	0.59			452.5	SURCHARGED	
S13.003	S.12.4	0.000	0.75			516.1	SURCHARGED	
S13.004	S.12.5	0.000	0.07			48.8	SURCHARGED	
S13.005	S.12.6	0.000	0.08			48.7	SURCHARGED	
S9.008	S.8.9	0.000	0.16			70.8	SURCHARGED	
S9.009	S.8.10	0.000	0.07			76.7	SURCHARGED	
S9.010	S.8.11	0.000	0.09			84.5	SURCHARGED	
S14.000	S.13.1	0.000	0.90			35.1	SURCHARGED	
S15.000	S.14.1	0.000	0.74			50.1	SURCHARGED	
S14.001	S.13.2	0.000	1.25			85.2	SURCHARGED	
S16.000	S.15.1	0.000	1.17			43.7	SURCHARGED	
S14.002	S.13.3	0.000	1.79			191.7	SURCHARGED	
S14.003	BYP 1	0.000	0.12			10.7	SURCHARGED	
S1.012	S.1.13	0.000	0.17			157.2	SURCHARGED	
S1.013	DC POND INLET 1	0.000	0.15			157.4	SURCHARGED	
S17.000	S.16.1	0.000	0.04			4.3	SURCHARGED	
S17.001	S.16.2	0.000	0.04			5.4	SURCHARGED	
S17.002	S.16.3	0.000	0.04			6.4	SURCHARGED	
S17.003	S.16.4	0.000	0.04			6.3	SURCHARGED	
S17.004	SS POND INLET	0.000	0.01			6.0	SURCHARGED	
S17.005	SS POND OUTLET	0.000	0.04			14.5	SURCHARGED	
S17.006	S.16.5	0.000	0.02			11.7	SURCHARGED	
S17.007	DC POND INLET 2	0.000	0.02			11.5	SURCHARGED	
S18.000	S.17.1	0.000	1.01			36.6	SURCHARGED	
S18.001	S.17.2	0.000	1.00			35.0	OK	
S18.002	DC POND INLET 3	0.000	0.91			35.0	OK	
S1.014	DC POND OUTLET	0.000	0.19			116.9	SURCHARGED	
S1.015	S.1.14	0.000	0.68			23.6	SURCHARGED	
S19.000	S.18.1	0.000	0.52			19.5	SURCHARGED	
S19.001	S.18.2	0.000	0.51			16.9	SURCHARGED	
S19.002	S.18.3	0.000	0.03			15.8	OK	
S19.003	S.18.4	0.000	0.02			10.2	OK	
S20.000	S18.5	0.000	0.00			0.1	OK	
S19.004	S.18.6	0.000	0.10			3.0	SURCHARGED	
S19.005	S.18.7	0.000	0.22			2.4	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S19.006	BYP 2	0.000	0.15			2.4	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S19.007	S.18.8	600 Winter	30	+40%					27.646	-0.113	0.000	0.14
S1.016	S.1.15	180 Winter	30	+40%					27.326	-0.076	0.000	0.77

PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S19.007	S.18.8			2.4	OK	
S1.016	S.1.15			26.0	OK	

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

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

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
S1.000	S.1.1	30 Winter	100	+40%	100/15 Summer				30.419	0.931	0.000
S1.001	S.1.2	30 Winter	100	+40%	30/30 Winter				30.402	0.996	0.000
S1.002	S.1.3	30 Winter	100	+40%	30/30 Winter				30.392	1.040	0.000
S1.003	S.1.4	30 Winter	100	+40%	30/15 Winter				30.356	1.142	0.000
S1.004	S.1.5	30 Winter	100	+40%	30/15 Winter				30.334	1.222	0.000
S1.005	S.1.6	30 Winter	100	+40%	30/15 Summer				30.268	1.356	0.000
S1.006	S.1.7	30 Winter	100	+40%	30/15 Summer				30.214	1.386	0.000
S2.000	S.1.8a	30 Winter	100	+40%	30/15 Summer				30.220	1.325	0.000
S1.007	S.1.8	30 Winter	100	+40%	30/15 Summer				30.171	1.377	0.000
S1.008	S.1.9	30 Winter	100	+40%	30/15 Summer				30.131	1.366	0.000
S3.000	S.2.1	30 Winter	100	+40%	30/15 Winter				30.306	1.010	0.000
S3.001	S.2.2	30 Winter	100	+40%	30/15 Winter				30.278	1.131	0.000
S4.000	S.3.1	30 Winter	100	+40%	30/15 Summer				30.389	0.969	0.000
S4.001	FCT 1	30 Winter	100	+40%	30/15 Summer				30.342	1.071	0.000
S4.002	S.3.2	30 Winter	100	+40%	30/15 Summer				30.307	1.108	0.000
S3.002	S.2.3	30 Winter	100	+40%	30/15 Winter				30.270	1.147	0.000
S3.003	S.2.4	30 Winter	100	+40%	30/15 Summer				30.243	1.254	0.000
S5.000	S.4.1	30 Winter	100	+40%	30/15 Summer				30.340	1.066	0.000
S5.001	FCT 2	30 Winter	100	+40%	30/15 Summer				30.305	1.115	0.000
S3.004	S.2.5	30 Winter	100	+40%	30/15 Summer				30.233	1.259	0.000
S3.005	S.2.6	30 Winter	100	+40%	30/15 Summer				30.192	1.304	0.000
S3.006	S.2.7	30 Winter	100	+40%	30/15 Summer				30.150	1.351	0.000
S3.007	S.2.8	30 Winter	100	+40%	30/15 Summer				30.111	1.379	0.000
S6.000	FCT 3	30 Winter	100	+40%	30/15 Summer				30.243	0.905	0.000
S6.001	S.5.1	30 Winter	100	+40%	30/15 Summer				30.198	0.926	0.000
S7.000	S.6.1	30 Winter	100	+40%	30/15 Summer				30.096	1.224	0.000
S1.009	S.1.10	30 Winter	100	+40%	30/15 Summer				30.081	1.372	0.000
S1.010	S.1.11	30 Winter	100	+40%	30/15 Summer				29.998	1.330	0.000
S8.000	S.7.1	30 Winter	100	+40%	30/15 Summer				29.961	0.477	0.000
S8.001	S.7.2	30 Winter	100	+40%	30/15 Summer				29.898	0.581	0.000

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

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S.1.1	0.50			31.2	FLOOD RISK	
S1.001	S.1.2	0.38			54.8	FLOOD RISK	
S1.002	S.1.3	0.83			230.5	FLOOD RISK	
S1.003	S.1.4	0.50			362.1	FLOOD RISK	
S1.004	S.1.5	0.67			531.8	FLOOD RISK	
S1.005	S.1.6	0.88			618.7	FLOOD RISK	
S1.006	S.1.7	1.34			623.8	FLOOD RISK	
S2.000	S.1.8a	1.36			21.4	FLOOD RISK	
S1.007	S.1.8	1.49			633.4	SURCHARGED	
S1.008	S.1.9	1.00			641.9	SURCHARGED	
S3.000	S.2.1	0.57			71.4	FLOOD RISK	
S3.001	S.2.2	0.53			84.9	FLOOD RISK	
S4.000	S.3.1	1.39			21.9	FLOOD RISK	
S4.001	FCT 1	1.36			20.7	FLOOD RISK	
S4.002	S.3.2	1.25			19.2	FLOOD RISK	
S3.002	S.2.3	0.56			155.9	FLOOD RISK	
S3.003	S.2.4	0.75			135.2	FLOOD RISK	
S5.000	S.4.1	2.01			23.2	FLOOD RISK	
S5.001	FCT 2	1.34			21.9	FLOOD RISK	
S3.004	S.2.5	1.06			279.7	FLOOD RISK	
S3.005	S.2.6	0.95			252.2	FLOOD RISK	
S3.006	S.2.7	0.92			233.5	SURCHARGED	
S3.007	S.2.8	1.69			264.9	FLOOD RISK	
S6.000	FCT 3	1.65			24.8	FLOOD RISK	
S6.001	S.5.1	1.39			23.4	SURCHARGED	
S7.000	S.6.1	0.37			6.1	FLOOD RISK	
S1.009	S.1.10	1.64			882.2	FLOOD RISK	
S1.010	S.1.11	1.25			902.2	FLOOD RISK	
S8.000	S.7.1	1.24			89.1	SURCHARGED	
S8.001	S.7.2	1.30			88.8	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
S1.011	S.1.12	30 Winter	100	+40%	30/15 Summer				29.851	1.282
S9.000	S.8.1	30 Winter	100	+40%	100/15 Summer				30.262	0.768
S9.001	S.8.2	30 Winter	100	+40%	30/30 Winter				30.229	0.871
S9.002	S.8.3	30 Winter	100	+40%	30/30 Winter				30.227	0.919
S10.000	S.9.1	30 Winter	100	+40%	30/15 Summer				30.388	0.557
S10.001	S.9.2	30 Winter	100	+40%	30/15 Summer				30.363	0.688
S10.002	FCT4	30 Winter	100	+40%	30/15 Summer				30.259	0.949
S10.003	S.9.3	30 Winter	100	+40%	30/15 Summer				30.239	0.960
S9.003	S.8.4	30 Winter	100	+40%	30/15 Winter				30.212	0.988
S11.000	S.10.1	30 Winter	100	+40%	30/15 Summer				30.277	0.749
S11.001	FCT5	30 Winter	100	+40%	30/15 Summer				30.234	0.854
S11.002	S.10.2	30 Winter	100	+40%	30/15 Summer				30.214	0.866
S9.004	S.8.5	30 Winter	100	+40%	30/15 Winter				30.180	1.106
S12.000	S.11.1	30 Winter	100	+40%	30/15 Summer				30.273	0.742
S12.001	FCT6	30 Winter	100	+40%	30/15 Summer				30.219	0.836
S12.002	S.11.2	30 Winter	100	+40%	30/15 Summer				30.185	0.834
S9.005	S.8.6	30 Winter	100	+40%	30/15 Summer				30.141	1.176
S9.006	S.8.7	30 Winter	100	+40%	30/15 Summer				30.082	1.234
S9.007	S.8.8	30 Winter	100	+40%	30/15 Summer				30.032	1.268
S13.000	S.12.1	30 Winter	100	+40%	30/30 Winter				30.364	1.006
S13.001	S.12.2	30 Winter	100	+40%	30/15 Winter				30.333	1.135
S13.002	S.12.3	30 Winter	100	+40%	30/15 Winter				30.245	1.205
S13.003	S.12.4	30 Winter	100	+40%	30/15 Summer				30.168	1.274
S13.004	S.12.5	30 Winter	100	+40%	30/15 Summer				30.099	1.279
S13.005	S.12.6	30 Winter	100	+40%	30/15 Summer				30.027	1.290
S9.008	S.8.9	30 Winter	100	+40%	30/15 Summer				29.972	1.281
S9.009	S.8.10	30 Winter	100	+40%	30/15 Summer				29.882	1.224
S9.010	S.8.11	30 Winter	100	+40%	30/15 Summer				29.790	1.236
S14.000	S.13.1	15 Winter	100	+40%	30/15 Summer				30.362	1.033
S15.000	S.14.1	15 Winter	100	+40%	30/15 Summer				30.300	1.091
S14.001	S.13.2	30 Winter	100	+40%	30/15 Summer				30.198	1.125
S16.000	S.15.1	15 Winter	100	+40%	30/15 Summer				30.361	1.088
S14.002	S.13.3	30 Winter	100	+40%	30/15 Summer				30.112	1.152
S14.003	BYP 1	30 Winter	100	+40%	30/15 Summer				29.823	1.139
S1.012	S.1.13	1440 Winter	100	+40%	30/15 Summer				29.759	1.271
S1.013	DC POND INLET 1	1440 Winter	100	+40%	30/15 Summer				29.757	1.322
S17.000	S.16.1	1440 Winter	100	+40%	30/360 Winter				29.755	0.636
S17.001	S.16.2	1440 Winter	100	+40%	30/360 Winter				29.755	0.663
S17.002	S.16.3	1440 Winter	100	+40%	30/240 Winter				29.755	0.711
S17.003	S.16.4	1440 Winter	100	+40%	30/180 Winter				29.755	0.772
S17.004	SS POND INLET	1440 Winter	100	+40%	30/180 Winter				29.755	0.833
S17.005	SS POND OUTLET	1440 Winter	100	+40%	30/120 Summer				29.755	0.995
S17.006	S.16.5	1440 Winter	100	+40%	30/120 Summer				29.757	1.022
S17.007	DC POND INLET 2	1440 Winter	100	+40%	30/60 Summer				29.756	1.097
S18.000	S.17.1	15 Winter	100	+40%	30/15 Winter				29.946	0.185
S18.001	S.17.2	1440 Winter	100	+40%	100/15 Summer				29.756	0.126
S18.002	DC POND INLET 3	1440 Winter	100	+40%	100/15 Summer				29.756	0.214
S1.014	DC POND OUTLET	1440 Winter	100	+40%	1/360 Winter				29.756	1.416
S1.015	S.1.14	1440 Winter	100	+40%	1/15 Summer				29.755	2.270
S19.000	S.18.1	120 Winter	100	+40%	30/60 Winter				28.697	0.233
S19.001	S.18.2	120 Winter	100	+40%	30/15 Summer				28.690	0.460
S19.002	S.18.3	120 Winter	100	+40%					28.687	-0.159
S19.003	S.18.4	120 Winter	100	+40%					28.687	-0.124
S20.000	S18.5	120 Winter	100	+40%					28.687	-0.149
S19.004	S.18.6	120 Winter	100	+40%	1/15 Winter				28.687	0.561
S19.005	S.18.7	120 Winter	100	+40%	1/15 Summer				28.689	0.680
S19.006	BYP 2	960 Winter	100	+40%					27.748	-0.111

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

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.011	S.1.12	0.000	1.36			948.1	SURCHARGED	
S9.000	S.8.1	0.000	0.77			28.2	SURCHARGED	
S9.001	S.8.2	0.000	0.11			26.2	SURCHARGED	
S9.002	S.8.3	0.000	0.45			117.0	SURCHARGED	
S10.000	S.9.1	0.000	0.70			9.6	FLOOD RISK	
S10.001	S.9.2	0.000	1.19			16.7	SURCHARGED	
S10.002	FCT4	0.000	1.64			18.1	SURCHARGED	
S10.003	S.9.3	0.000	1.41			17.7	SURCHARGED	
S9.003	S.8.4	0.000	0.64			178.1	SURCHARGED	
S11.000	S.10.1	0.000	1.34			21.2	SURCHARGED	
S11.001	FCT5	0.000	1.83			20.4	SURCHARGED	
S11.002	S.10.2	0.000	1.30			20.0	SURCHARGED	
S9.004	S.8.5	0.000	0.71			193.3	SURCHARGED	
S12.000	S.11.1	0.000	1.51			23.8	SURCHARGED	
S12.001	FCT6	0.000	2.05			23.0	SURCHARGED	
S12.002	S.11.2	0.000	1.45			22.4	SURCHARGED	
S9.005	S.8.6	0.000	0.93			253.0	SURCHARGED	
S9.006	S.8.7	0.000	0.94			245.6	SURCHARGED	
S9.007	S.8.8	0.000	1.06			271.3	SURCHARGED	
S13.000	S.12.1	0.000	0.58			286.2	FLOOD RISK	
S13.001	S.12.2	0.000	0.86			420.5	FLOOD RISK	
S13.002	S.12.3	0.000	0.77			589.9	FLOOD RISK	
S13.003	S.12.4	0.000	1.03			707.9	SURCHARGED	
S13.004	S.12.5	0.000	0.99			694.6	SURCHARGED	
S13.005	S.12.6	0.000	1.18			686.4	SURCHARGED	
S9.008	S.8.9	0.000	2.06			938.7	SURCHARGED	
S9.009	S.8.10	0.000	0.95			1001.2	SURCHARGED	
S9.010	S.8.11	0.000	1.14			1088.9	SURCHARGED	
S14.000	S.13.1	0.000	1.12			43.7	FLOOD RISK	
S15.000	S.14.1	0.000	0.93			63.1	FLOOD RISK	
S14.001	S.13.2	0.000	1.20			81.9	SURCHARGED	
S16.000	S.15.1	0.000	1.45			54.5	FLOOD RISK	
S14.002	S.13.3	0.000	1.85			197.2	SURCHARGED	
S14.003	BYP 1	0.000	2.01			185.8	SURCHARGED	
S1.012	S.1.13	0.000	0.21			191.2	SURCHARGED	
S1.013	DC POND INLET 1	0.000	0.18			192.1	SURCHARGED	
S17.000	S.16.1	0.000	0.05			5.3	SURCHARGED	
S17.001	S.16.2	0.000	0.04			6.6	SURCHARGED	
S17.002	S.16.3	0.000	0.05			7.5	SURCHARGED	
S17.003	S.16.4	0.000	0.04			7.2	SURCHARGED	
S17.004	SS POND INLET	0.000	0.01			6.8	SURCHARGED	
S17.005	SS POND OUTLET	0.000	0.05			20.3	SURCHARGED	
S17.006	S.16.5	0.000	0.02			14.8	SURCHARGED	
S17.007	DC POND INLET 2	0.000	0.02			13.4	SURCHARGED	
S18.000	S.17.1	0.000	1.28			46.5	SURCHARGED	
S18.001	S.17.2	0.000	0.07			2.3	SURCHARGED	
S18.002	DC POND INLET 3	0.000	0.06			2.3	SURCHARGED	
S1.014	DC POND OUTLET	0.000	0.22			135.2	SURCHARGED	
S1.015	S.1.14	0.000	0.68			23.7	SURCHARGED	
S19.000	S.18.1	0.000	0.40			15.1	SURCHARGED	
S19.001	S.18.2	0.000	0.42			14.0	SURCHARGED	
S19.002	S.18.3	0.000	0.03			13.3	OK	
S19.003	S.18.4	0.000	0.02			8.6	OK	
S20.000	S18.5	0.000	0.00			0.2	OK	
S19.004	S.18.6	0.000	0.11			3.2	SURCHARGED	
S19.005	S.18.7	0.000	0.22			2.4	SURCHARGED	

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

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S19.006	BYP 2	0.000	0.15			2.4	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S19.007	S.18.8	960 Winter	100	+40%					27.646	-0.113	0.000	0.14
S1.016	S.1.15	180 Summer	100	+40%					27.326	-0.076	0.000	0.77

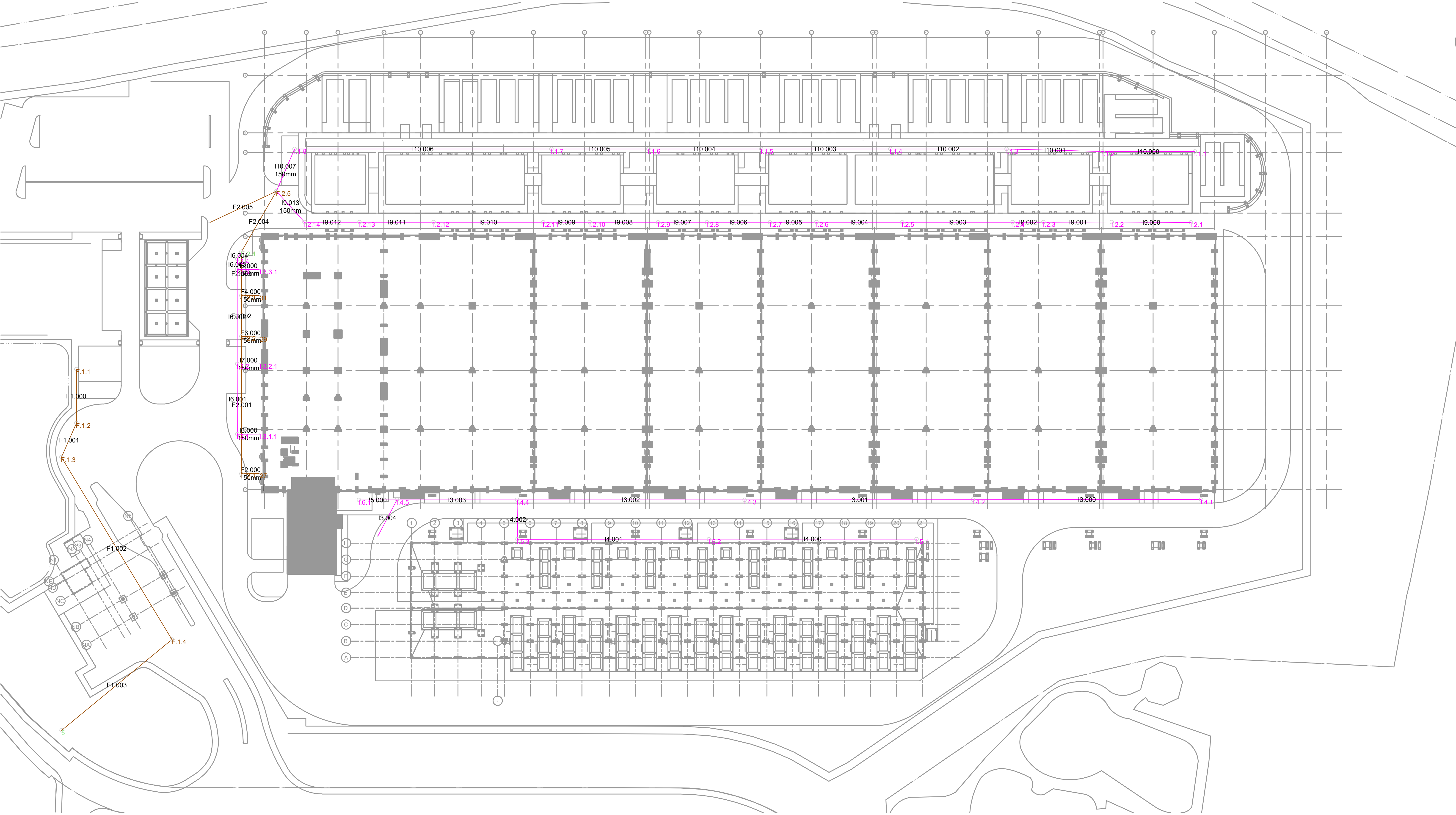
PN	US/MH Name	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S19.007	S.18.8			2.4	OK	
S1.016	S.1.15			26.0	OK	

Draft Planning Issue

FOUL AND INDUSTRIAL WATER DRAINAGE
MODEL OUTPUT

1A-CC-C-0003 REV 0.1

31/03/23



I10.006
I10.005
I10.004
I10.003
I10.002
I10.001
I10.000
I10.007
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F.2.5
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150mm
F2.005
F2.004
I9.012
I9.011
I9.010
I9.009
I9.008
I9.007
I9.006
I9.005
I9.004
I9.003
I9.002
I9.001
I9.000
I6.004
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150mm
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150mm
I7.000
150mm
I6.001
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F.1.2
F1.001
F.1.3
F1.002
F.1.4
F1.003
I5.000
I3.003
I3.004
I4.002
I3.002
I3.001
I3.000
I4.001
I4.000

FOUL SEWERAGE DESIGN

Network Design Table for '-Foul

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
F1.000	17.478	0.117	149.4	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F1.001	12.065	0.080	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F1.002	69.094	0.461	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F1.003	46.335	0.309	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F2.000	6.000	0.075	80.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F2.001	44.518	0.297	149.9	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F3.000	6.034	0.075	80.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F2.002	13.216	0.088	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F4.000	6.033	0.075	80.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F2.003	14.204	0.095	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F2.004	22.658	0.151	150.1	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
F2.005	24.069	0.160	150.4	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F1.000	29.264	0.000	0.0	0.0	0.0	0	0.00	0.72	12.6	0.0
F1.001	29.147	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
F1.002	29.067	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
F1.003	28.606	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
F2.000	29.445	0.000	0.0	0.0	0.0	0	0.00	0.98	17.3	0.0
F2.001	29.370	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
F3.000	28.950	0.000	0.0	0.0	0.0	0	0.00	0.98	17.3	0.0
F2.002	28.875	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
F4.000	29.410	0.000	0.0	0.0	0.0	0	0.00	0.98	17.3	0.0
F2.003	28.786	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
F2.004	27.530	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
F2.005	27.379	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0

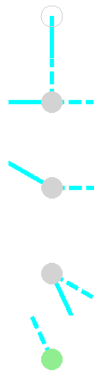
Manhole Schedules for -Foul

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
F.1.1	30.581	1.317	Open Manhole	1200	F1.000	29.264	150				
F.1.2	30.535	1.388	Open Manhole	1200	F1.001	29.147	150	F1.000	29.147	150	
F.1.3	30.548	1.481	Open Manhole	1200	F1.002	29.067	150	F1.001	29.067	150	
F.1.4	30.841	2.235	Open Manhole	1200	F1.003	28.606	150	F1.002	28.606	150	
5	30.400	2.103	Open Manhole	1200		OUTFALL		F1.003	28.297	150	
27	30.649	1.204	Junction		F2.000	29.445	150				
F.2.1	30.258	0.888	Open Manhole	1200	F2.001	29.370	150	F2.000	29.370	150	
29	30.650	1.700	Junction		F3.000	28.950	150				
F.2.2	30.409	1.535	Open Manhole	1200	F2.002	28.875	150	F2.001	29.073	150	198
								F3.000	28.875	150	
31	30.650	1.240	Junction		F4.000	29.410	150				
F.2.3	30.403	1.617	Open Manhole	1200	F2.003	28.786	150	F2.002	28.786	150	
								F4.000	29.335	150	548
F.2.4	30.599	3.069	Open Manhole	1200	F2.004	27.530	150	F2.003	28.692	150	1162
F.2.5	30.489	3.110	Open Manhole	1200	F2.005	27.379	150	F2.004	27.379	150	
	30.517	3.298	Open Manhole	0		OUTFALL		F2.005	27.219	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F.1.1	534940.591	201318.187	534940.591	201318.187	Required	
F.1.2	534958.069	201318.187	534958.069	201318.187	Required	
F.1.3	534969.122	201313.352	534969.122	201313.352	Required	
F.1.4	535028.200	201349.182	535028.200	201349.182	Required	
5	535057.640	201313.402			No Entry	
27	534974.359	201377.725			No Entry	
F.2.1	534974.464	201371.726	534974.464	201371.726	Required	
29	534930.172	201377.745			No Entry	
F.2.2	534929.946	201371.715	534929.946	201371.715	Required	

Manhole Schedules for -Foul

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
31	534916.735	201377.745			No Entry	
F.2.3	534916.730	201371.712	534916.730	201371.712	Required	
F.2.4	534902.527	201371.708	534902.527	201371.708	Required	
F.2.5	534882.904	201383.037	534882.904	201383.037	Required	
	534893.133	201361.250			No Entry	



PIPELINE SCHEDULES for -Foul

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)
F1.000	o	150	F.1.1	30.581	29.264	1.167	Open Manhole	1200
F1.001	o	150	F.1.2	30.535	29.147	1.238	Open Manhole	1200
F1.002	o	150	F.1.3	30.548	29.067	1.331	Open Manhole	1200
F1.003	o	150	F.1.4	30.841	28.606	2.085	Open Manhole	1200
F2.000	o	150	27	30.649	29.445	1.054	Junction	
F2.001	o	150	F.2.1	30.258	29.370	0.738	Open Manhole	1200
F3.000	o	150	29	30.650	28.950	1.550	Junction	
F2.002	o	150	F.2.2	30.409	28.875	1.385	Open Manhole	1200
F4.000	o	150	31	30.650	29.410	1.090	Junction	
F2.003	o	150	F.2.3	30.403	28.786	1.467	Open Manhole	1200
F2.004	o	150	F.2.4	30.599	27.530	2.919	Open Manhole	1200
F2.005	o	150	F.2.5	30.489	27.379	2.960	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F1.000	17.478	149.4	F.1.2	30.535	29.147	1.238	Open Manhole	1200
F1.001	12.065	150.0	F.1.3	30.548	29.067	1.331	Open Manhole	1200
F1.002	69.094	150.0	F.1.4	30.841	28.606	2.085	Open Manhole	1200
F1.003	46.335	150.0	5	30.400	28.297	1.953	Open Manhole	1200
F2.000	6.000	80.0	F.2.1	30.258	29.370	0.738	Open Manhole	1200
F2.001	44.518	149.9	F.2.2	30.409	29.073	1.186	Open Manhole	1200
F3.000	6.034	80.0	F.2.2	30.409	28.875	1.385	Open Manhole	1200
F2.002	13.216	150.0	F.2.3	30.403	28.786	1.467	Open Manhole	1200
F4.000	6.033	80.0	F.2.3	30.403	29.335	0.919	Open Manhole	1200
F2.003	14.204	150.0	F.2.4	30.599	28.692	1.757	Open Manhole	1200
F2.004	22.658	150.1	F.2.5	30.489	27.379	2.960	Open Manhole	1200
F2.005	24.069	150.4		30.517	27.219	3.148	Open Manhole	0

FOUL SEWERAGE DESIGN

Network Design Table for -Industrial

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
I3.000	74.000	0.493	150.1	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I3.001	74.000	0.493	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I3.002	73.764	0.492	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I4.000	67.283	0.449	149.9	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I4.001	62.089	0.414	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I4.002	12.776	0.085	150.3	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I3.003	38.942	0.260	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I5.000	12.340	0.082	150.5	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I3.004	13.275	0.089	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I6.000	7.326	0.183	40.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I6.001	22.738	0.152	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I7.000	7.392	0.185	40.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I6.002	30.626	0.204	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I8.000	7.398	0.002	4133.9	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I6.003	3.397	0.023	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I6.004	2.728	0.018	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
I3.000	29.253	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I3.001	28.760	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I3.002	28.267	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I4.000	29.153	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I4.001	28.704	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I4.002	27.757	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I3.003	27.672	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I5.000	29.215	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I3.004	27.412	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I6.000	28.795	0.000	0.0	0.0	0.0	0	0.00	1.39	24.5	0.0
I6.001	28.612	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I7.000	28.730	0.000	0.0	0.0	0.0	0	0.00	1.39	24.5	0.0
I6.002	28.460	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I8.000	29.125	0.000	0.0	0.0	0.0	0	0.00	0.13	2.3	0.0
I6.003	28.256	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I6.004	28.233	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0

FOUL SEWERAGE DESIGN

Network Design Table for -Industrial

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Units	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
I9.000	25.631	0.171	149.9	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.001	22.162	0.148	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.002	10.024	0.067	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.003	35.797	0.239	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.004	27.769	0.185	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.005	15.074	0.100	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.006	20.461	0.136	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.007	15.821	0.105	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.008	22.148	0.148	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.009	15.103	0.101	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.010	35.503	0.237	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.011	24.035	0.160	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.012	17.819	0.119	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I9.013	13.569	0.090	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.000	29.895	0.199	150.2	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.001	31.094	0.207	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.002	37.749	0.252	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.003	41.829	0.279	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.004	36.564	0.244	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.005	31.428	0.210	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.006	83.301	0.555	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	
I10.007	14.870	0.099	150.0	0.000	0.0	0.0	1.500	o	150	Pipe/Conduit	

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Units	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
I9.000	29.117	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.001	28.946	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.002	28.798	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.003	28.731	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.004	28.493	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.005	28.308	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.006	28.207	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.007	28.071	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.008	27.965	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.009	27.818	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.010	27.717	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.011	27.480	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.012	27.320	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I9.013	27.201	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.000	29.423	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.001	29.224	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.002	29.017	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.003	28.765	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.004	28.486	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.005	28.242	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.006	28.033	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0
I10.007	27.478	0.000	0.0	0.0	0.0	0	0.00	0.71	12.6	0.0

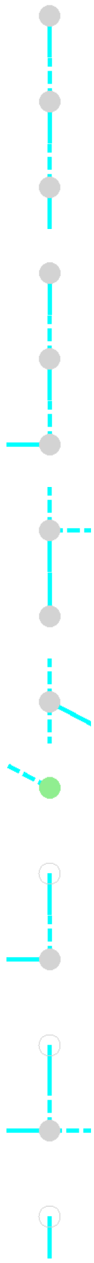
Manhole Schedules for -Industrial

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
I.4.1	30.519	1.266	Open Manhole	1200	I3.000	29.253	150				
I.4.2	30.518	1.758	Open Manhole	1200	I3.001	28.760	150	I3.000	28.760	150	
I.4.3	30.518	2.251	Open Manhole	1200	I3.002	28.267	150	I3.001	28.267	150	
I.5.1	30.487	1.334	Open Manhole	1200	I4.000	29.153	150				
I.5.2	30.488	1.784	Open Manhole	1200	I4.001	28.704	150	I4.000	28.704	150	
I.5.3	30.488	2.731	Open Manhole	1200	I4.002	27.757	150	I4.001	28.290	150	533
I.4.4	30.518	2.846	Open Manhole	1200	I3.003	27.672	150	I3.002	27.775	150	103
								I4.002	27.672	150	
I.6.1	30.540	1.325	Open Manhole	1200	I5.000	29.215	150				
I.4.5	30.528	3.115	Open Manhole	1200	I3.004	27.412	150	I3.003	27.412	150	
								I5.000	29.133	150	1721
	30.496	3.172	Open Manhole	0		OUTFALL		I3.004	27.324	150	
I.3.1.1	30.647	1.852	Junction		I6.000	28.795	150				
I.3.1	30.506	1.894	Open Manhole	1200	I6.001	28.612	150	I6.000	28.612	150	
I.3.2.1	30.550	1.820	Junction		I7.000	28.730	150				
I.3.2	30.391	1.930	Open Manhole	1200	I6.002	28.460	150	I6.001	28.460	150	
								I7.000	28.545	150	85
I.3.3.1	30.550	1.425	Junction		I8.000	29.125	150				
I.3.3	30.587	2.331	Open Manhole	1200	I6.003	28.256	150	I6.002	28.256	150	
								I8.000	29.123	150	867
I.3.4	30.604	2.371	Open Manhole	1200	I6.004	28.233	150	I6.003	28.233	150	
F.2.4	30.599	2.384	Open Manhole	0		OUTFALL		I6.004	28.215	150	
I.2.1	30.460	1.343	Open Manhole	1200	I9.000	29.117	150				
I.2.2	30.458	1.512	Open Manhole	1200	I9.001	28.946	150	I9.000	28.946	150	
I.2.3	30.459	1.660	Open Manhole	1200	I9.002	28.798	150	I9.001	28.798	150	
I.2.4	30.459	1.727	Open Manhole	1200	I9.003	28.731	150	I9.002	28.731	150	
I.2.5	30.459	1.966	Open Manhole	1200	I9.004	28.493	150	I9.003	28.493	150	
I.2.6	30.459	2.151	Open Manhole	1200	I9.005	28.308	150	I9.004	28.308	150	
I.2.7	30.459	2.251	Open Manhole	1200	I9.006	28.207	150	I9.005	28.207	150	
I.2.8	30.459	2.388	Open Manhole	1200	I9.007	28.071	150	I9.006	28.071	150	
I.2.9	30.459	2.493	Open Manhole	1200	I9.008	27.965	150	I9.007	27.965	150	
I.2.10	30.459	2.641	Open Manhole	1200	I9.009	27.818	150	I9.008	27.818	150	
I.2.11	30.459	2.742	Open Manhole	1200	I9.010	27.717	150	I9.009	27.717	150	
I.2.12	30.459	2.978	Open Manhole	1200	I9.011	27.480	150	I9.010	27.480	150	
I.2.13	30.459	3.139	Open Manhole	1200	I9.012	27.320	150	I9.011	27.320	150	
I.2.14	30.459	3.257	Open Manhole	1200	I9.013	27.201	150	I9.012	27.201	150	
	30.489	3.378	Open Manhole	0		OUTFALL		I9.013	27.111	150	
I.1.1	30.663	1.240	Open Manhole	1200	I10.000	29.423	150				
I.1.2	30.658	1.434	Open Manhole	1200	I10.001	29.224	150	I10.000	29.224	150	
I.1.3	30.679	1.662	Open Manhole	1200	I10.002	29.017	150	I10.001	29.017	150	
I.1.4	30.679	1.914	Open Manhole	1200	I10.003	28.765	150	I10.002	28.765	150	
I.1.5	30.679	2.193	Open Manhole	1200	I10.004	28.486	150	I10.003	28.486	150	
I.1.6	30.679	2.437	Open Manhole	1200	I10.005	28.242	150	I10.004	28.242	150	
I.1.7	30.679	2.646	Open Manhole	1200	I10.006	28.033	150	I10.005	28.033	150	

Manhole Schedules for -Industrial

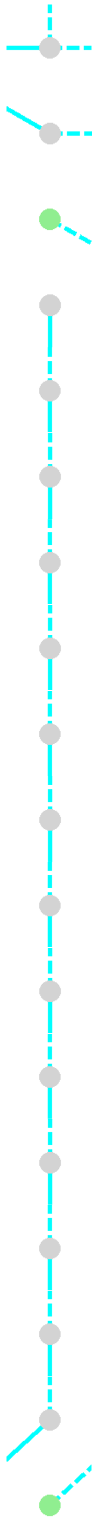
MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
I.1.8	30.634	3.157	Open Manhole	1200	I10.007	27.478	150	I10.006	27.478	150	
	30.489	3.110	Open Manhole	0		OUTFALL		I10.007	27.378	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
I.4.1	534982.854	201682.847	534982.854	201682.847	Required	
I.4.2	534982.882	201608.847	534982.882	201608.847	Required	
I.4.3	534982.911	201534.847	534982.911	201534.847	Required	
I.5.1	534995.659	201590.562	534995.659	201590.562	Required	
I.5.2	534995.688	201523.279	534995.688	201523.279	Required	
I.5.3	534995.716	201461.190	534995.716	201461.190	Required	
I.4.4	534982.940	201461.082	534982.940	201461.082	Required	
I.6.1	534982.986	201409.800	534982.986	201409.800	Required	
I.4.5	534982.950	201422.140	534982.950	201422.140	Required	
	534994.695	201415.952			No Entry	
I.3.1.1	534961.651	201377.683			No Entry	
I.3.1	534961.652	201370.357	534961.652	201370.357	Required	
I.3.2.1	534938.912	201377.745			No Entry	
I.3.2	534938.914	201370.353	534938.914	201370.353	Required	
I.3.3.1	534908.287	201377.745			No Entry	



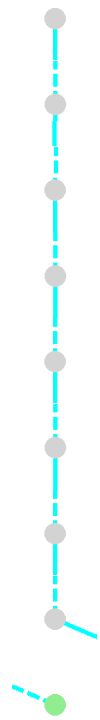
Manhole Schedules for -Industrial

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
I.3.3	534908.288	201370.347	534908.288	201370.347	Required	
I.3.4	534904.891	201370.347	534904.891	201370.347	Required	
F.2.4	534902.527	201371.708			No Entry	
I.2.1	534893.025	201679.514	534893.025	201679.514	Required	
I.2.2	534892.896	201653.884	534892.896	201653.884	Required	
I.2.3	534892.941	201631.722	534892.941	201631.722	Required	
I.2.4	534892.941	201621.698	534892.941	201621.698	Required	
I.2.5	534892.942	201585.901	534892.942	201585.901	Required	
I.2.6	534892.942	201558.132	534892.942	201558.132	Required	
I.2.7	534892.942	201543.058	534892.942	201543.058	Required	
I.2.8	534892.942	201522.597	534892.942	201522.597	Required	
I.2.9	534892.942	201506.775	534892.942	201506.775	Required	
I.2.10	534892.941	201484.627	534892.941	201484.627	Required	
I.2.11	534892.942	201469.524	534892.942	201469.524	Required	
I.2.12	534892.942	201434.022	534892.942	201434.022	Required	
I.2.13	534892.942	201409.987	534892.942	201409.987	Required	
I.2.14	534892.942	201392.168	534892.942	201392.168	Required	
	534882.904	201383.037			No Entry	



Manhole Schedules for -Industrial

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
I.1.1	534870.042	201680.764	534870.042	201680.764	Required	
I.1.2	534870.042	201650.869	534870.042	201650.869	Required	
I.1.3	534869.245	201619.785	534869.245	201619.785	Required	
I.1.4	534869.245	201582.036	534869.245	201582.036	Required	
I.1.5	534869.245	201540.207	534869.245	201540.207	Required	
I.1.6	534869.245	201503.643	534869.245	201503.643	Required	
I.1.7	534869.245	201472.215	534869.245	201472.215	Required	
I.1.8	534869.245	201388.914	534869.245	201388.914	Required	
	534882.904	201383.037			No Entry	



PIPELINE SCHEDULES for -Industrial

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)
I3.000	o	150	I.4.1	30.519	29.253	1.116	Open Manhole	1200
I3.001	o	150	I.4.2	30.518	28.760	1.608	Open Manhole	1200
I3.002	o	150	I.4.3	30.518	28.267	2.101	Open Manhole	1200
I4.000	o	150	I.5.1	30.487	29.153	1.184	Open Manhole	1200
I4.001	o	150	I.5.2	30.488	28.704	1.634	Open Manhole	1200
I4.002	o	150	I.5.3	30.488	27.757	2.581	Open Manhole	1200
I3.003	o	150	I.4.4	30.518	27.672	2.696	Open Manhole	1200
I5.000	o	150	I.6.1	30.540	29.215	1.175	Open Manhole	1200
I3.004	o	150	I.4.5	30.528	27.412	2.965	Open Manhole	1200
I6.000	o	150	I.3.1.1	30.647	28.795	1.702	Junction	
I6.001	o	150	I.3.1	30.506	28.612	1.744	Open Manhole	1200
I7.000	o	150	I.3.2.1	30.550	28.730	1.670	Junction	
I6.002	o	150	I.3.2	30.391	28.460	1.780	Open Manhole	1200
I8.000	o	150	I.3.3.1	30.550	29.125	1.275	Junction	
I6.003	o	150	I.3.3	30.587	28.256	2.181	Open Manhole	1200
I6.004	o	150	I.3.4	30.604	28.233	2.221	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
I3.000	74.000	150.1	I.4.2	30.518	28.760	1.608	Open Manhole	1200
I3.001	74.000	150.0	I.4.3	30.518	28.267	2.101	Open Manhole	1200
I3.002	73.764	150.0	I.4.4	30.518	27.775	2.593	Open Manhole	1200
I4.000	67.283	149.9	I.5.2	30.488	28.704	1.634	Open Manhole	1200
I4.001	62.089	150.0	I.5.3	30.488	28.290	2.048	Open Manhole	1200
I4.002	12.776	150.3	I.4.4	30.518	27.672	2.696	Open Manhole	1200
I3.003	38.942	150.0	I.4.5	30.528	27.412	2.965	Open Manhole	1200
I5.000	12.340	150.5	I.4.5	30.528	29.133	1.245	Open Manhole	1200
I3.004	13.275	150.0		30.496	27.324	3.022	Open Manhole	0
I6.000	7.326	40.0	I.3.1	30.506	28.612	1.744	Open Manhole	1200
I6.001	22.738	150.0	I.3.2	30.391	28.460	1.780	Open Manhole	1200
I7.000	7.392	40.0	I.3.2	30.391	28.545	1.695	Open Manhole	1200
I6.002	30.626	150.0	I.3.3	30.587	28.256	2.181	Open Manhole	1200
I8.000	7.398	4133.9	I.3.3	30.587	29.123	1.314	Open Manhole	1200
I6.003	3.397	150.0	I.3.4	30.604	28.233	2.221	Open Manhole	1200
I6.004	2.728	150.0	F.2.4	30.599	28.215	2.234	Open Manhole	0

PIPELINE SCHEDULES for -Industrial

Upstream Manhole

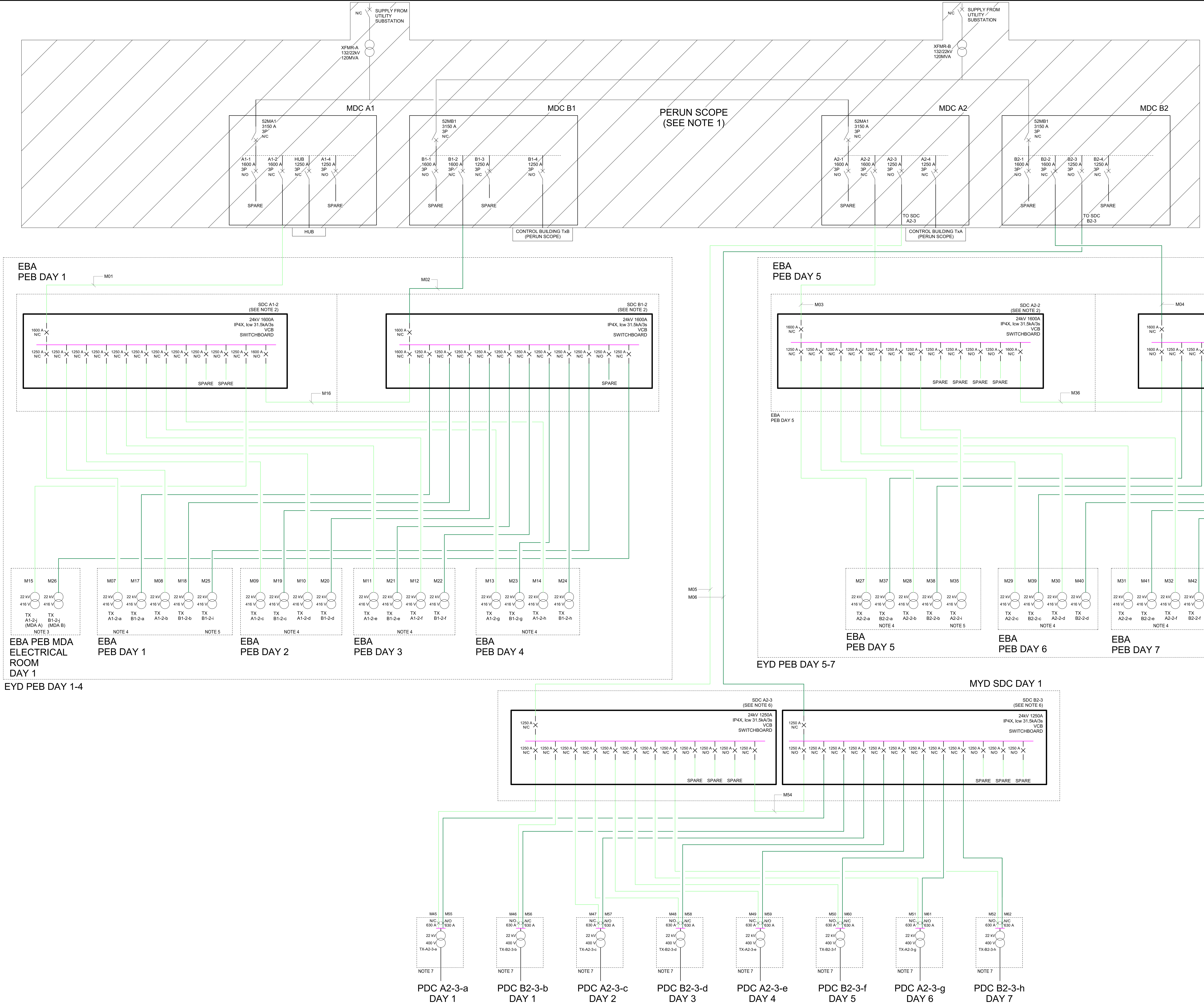
PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
I9.000	o	150	I.2.1	30.460	29.117	1.193	Open Manhole	1200
I9.001	o	150	I.2.2	30.458	28.946	1.362	Open Manhole	1200
I9.002	o	150	I.2.3	30.459	28.798	1.510	Open Manhole	1200
I9.003	o	150	I.2.4	30.459	28.731	1.577	Open Manhole	1200
I9.004	o	150	I.2.5	30.459	28.493	1.816	Open Manhole	1200
I9.005	o	150	I.2.6	30.459	28.308	2.001	Open Manhole	1200
I9.006	o	150	I.2.7	30.459	28.207	2.101	Open Manhole	1200
I9.007	o	150	I.2.8	30.459	28.071	2.238	Open Manhole	1200
I9.008	o	150	I.2.9	30.459	27.965	2.343	Open Manhole	1200
I9.009	o	150	I.2.10	30.459	27.818	2.491	Open Manhole	1200
I9.010	o	150	I.2.11	30.459	27.717	2.592	Open Manhole	1200
I9.011	o	150	I.2.12	30.459	27.480	2.828	Open Manhole	1200
I9.012	o	150	I.2.13	30.459	27.320	2.989	Open Manhole	1200
I9.013	o	150	I.2.14	30.459	27.201	3.107	Open Manhole	1200
I10.000	o	150	I.1.1	30.663	29.423	1.090	Open Manhole	1200
I10.001	o	150	I.1.2	30.658	29.224	1.284	Open Manhole	1200
I10.002	o	150	I.1.3	30.679	29.017	1.512	Open Manhole	1200
I10.003	o	150	I.1.4	30.679	28.765	1.764	Open Manhole	1200
I10.004	o	150	I.1.5	30.679	28.486	2.043	Open Manhole	1200
I10.005	o	150	I.1.6	30.679	28.242	2.287	Open Manhole	1200
I10.006	o	150	I.1.7	30.679	28.033	2.496	Open Manhole	1200
I10.007	o	150	I.1.8	30.634	27.478	3.007	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
I9.000	25.631	149.9	I.2.2	30.458	28.946	1.362	Open Manhole	1200
I9.001	22.162	150.0	I.2.3	30.459	28.798	1.510	Open Manhole	1200
I9.002	10.024	150.0	I.2.4	30.459	28.731	1.577	Open Manhole	1200
I9.003	35.797	150.0	I.2.5	30.459	28.493	1.816	Open Manhole	1200
I9.004	27.769	150.0	I.2.6	30.459	28.308	2.001	Open Manhole	1200
I9.005	15.074	150.0	I.2.7	30.459	28.207	2.101	Open Manhole	1200
I9.006	20.461	150.0	I.2.8	30.459	28.071	2.238	Open Manhole	1200
I9.007	15.821	150.0	I.2.9	30.459	27.965	2.343	Open Manhole	1200
I9.008	22.148	150.0	I.2.10	30.459	27.818	2.491	Open Manhole	1200
I9.009	15.103	150.0	I.2.11	30.459	27.717	2.592	Open Manhole	1200
I9.010	35.503	150.0	I.2.12	30.459	27.480	2.828	Open Manhole	1200
I9.011	24.035	150.0	I.2.13	30.459	27.320	2.989	Open Manhole	1200
I9.012	17.819	150.0	I.2.14	30.459	27.201	3.107	Open Manhole	1200
I9.013	13.569	150.0		30.489	27.111	3.228	Open Manhole	0
I10.000	29.895	150.2	I.1.2	30.658	29.224	1.284	Open Manhole	1200
I10.001	31.094	150.0	I.1.3	30.679	29.017	1.512	Open Manhole	1200
I10.002	37.749	150.0	I.1.4	30.679	28.765	1.764	Open Manhole	1200
I10.003	41.829	150.0	I.1.5	30.679	28.486	2.043	Open Manhole	1200
I10.004	36.564	150.0	I.1.6	30.679	28.242	2.287	Open Manhole	1200
I10.005	31.428	150.0	I.1.7	30.679	28.033	2.496	Open Manhole	1200
I10.006	83.301	150.0	I.1.8	30.634	27.478	3.007	Open Manhole	1200
I10.007	14.870	150.0		30.489	27.378	2.960	Open Manhole	0

Appendix B

Electrical Supply Arrangement



LEGEND

(transformer symbol)	TRANSFORMER
(circuit breaker symbol)	CIRCUIT BREAKER
(green line)	MV CABLE
(magenta line)	BUSBAR

DRAWING SPECIFIC NOTES:

1. EQUIPMENT SHOWN FOR REFERENCE ONLY. REFER TO PERUN 2.1 DESIGN DRAWINGS FOR SPECIFIC ARRANGEMENT AND EQUIPMENT RATINGS.
2. REFER TO 'OBERLIN 3.2, SDC-EMEA-JEG-24kV-44MW, UID 17203' FOR LATEST PRODUCT INFORMATION. SEE DRAWING 1A-E-5010-EBA-X FOR EBA SDC CONNECTION DETAILS AND INTERTRIP SIGNALS.
3. SEE DRAWING 1A-E-5012-EBA0-X FOR MDA PMDC CONNECTION DETAILS AND INTERTRIP SIGNALS.
4. SEE DRAWING 1A-E-5011-EBA-X FOR CRITICAL PMDC CONNECTION DETAILS AND INTERTRIP SIGNALS.
5. SEE DRAWING 1A.1-E-5013-EBA-X AND 1A.2-E-5014-EBA-X FOR IR PMDC CONNECTION DETAILS AND INTERTRIP SIGNALS.
6. REFER TO 'OBERLIN 3.2, SDC-EMEA-JEG-24kV-44MW, UID 17203' FOR LATEST PRODUCT INFORMATION. SEE DRAWING 1A-E-5011-MYD0-X FOR MYD SDC CONNECTION DETAILS AND INTERTRIP SIGNALS.
7. SEE DRAWING 1A-E-5003-MYD-X TO 1A-E-5010-MYD-X FOR PDC CONNECTION DETAILS AND INTERTRIP SIGNALS.

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24/03/2023

REVISIONS

NO.	DATE	DESCRIPTION
0.1	06/01/2023	BOD DRAFT ISSUE
0.2	25/01/2023	BOD ISSUE
0.3	10/03/2023	REVISED BOD DRAFT ISSUE
0.4	24.03.2023	REVISED BOD ISSUE

Drawn By: SL
Approved By: LW
Design Team: Arup

1A-MEP
Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH
Project Number: 288809

OVERALL HV/MV SCHEMATIC

Discipline: ELECTRICAL
Scale: NTS
Sheet Size: A0

Sheet Number: **1A-E-5000-SDT-X**
Current Rev: 0.4
Phase: REVISED BOD ISSUE
Model Name: 1A-MEP
Native File Format: Revit V. 2023.1

Appendix C

Fuel Schematics

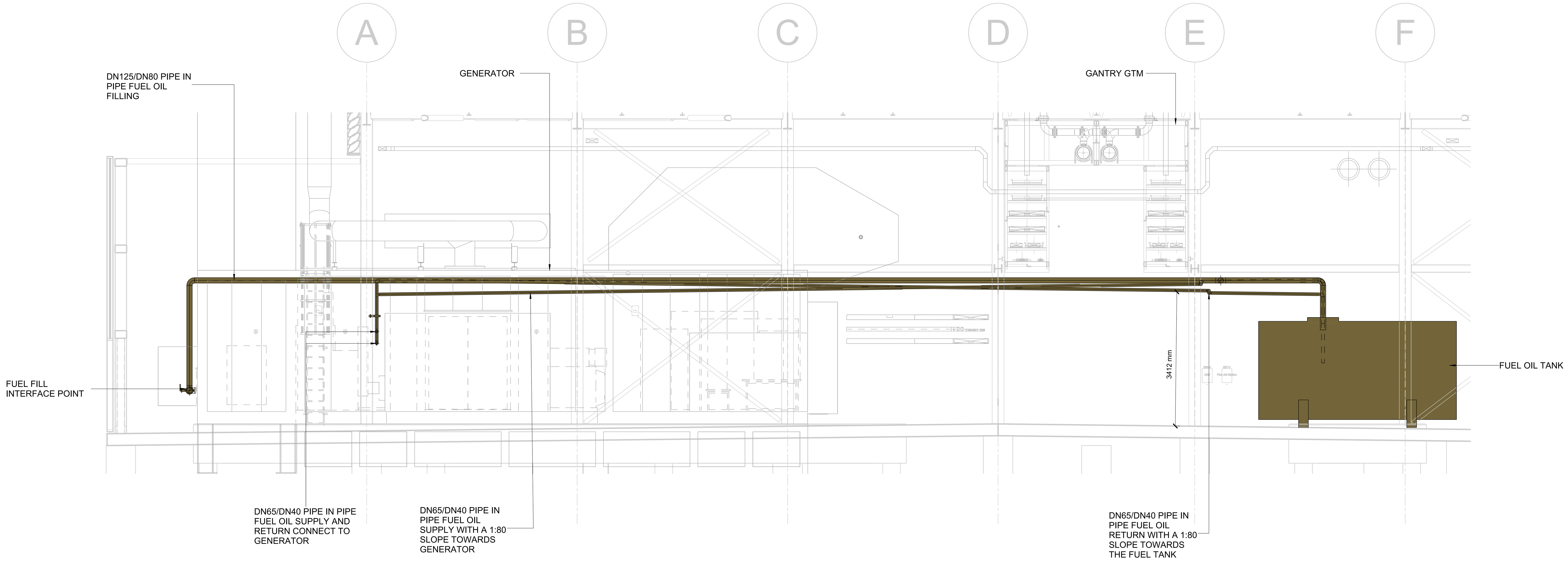
Title Fuel Tank Sizing
Number 1A-CC-P-0001

ARUP

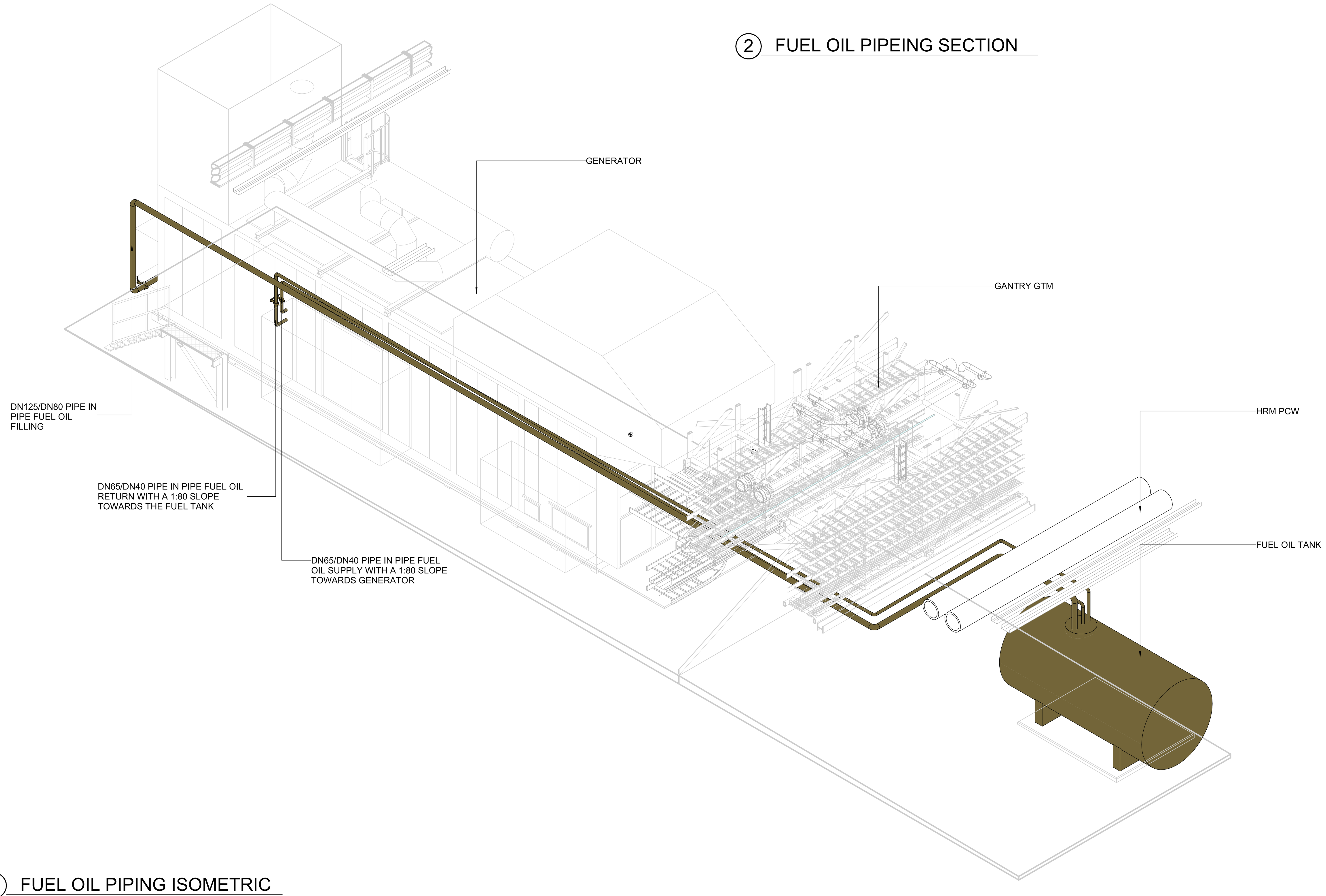
Revision	Created by	Checked by	Approved by	Design Stage	Date
0.1	Brendan Faulke	Michael Harrison	Natalie Chamberlain	BOD Draft Issue	06/01/2023
0.2	Brendan Faulke	Michael Harrison	Natalie Chamberlain	BOD Final Issue	25/01/2023
0.3	Brendan Faulke	Michael Harrison	Natalie Chamberlain	Revised BOD Draft Issue	10/03/2023
0.4	Brendan Faulke	Michael Harrison	Natalie Chamberlain	Revised BOD Final Issue	24/03/2023

Notes
Calculation to determine Fuel Tank Size
Fuel used at Max load from generator engine model set out in Annex 1
Density of EN 590 diesel fuel is defined as 0.820 to 0.845 kg/m3, average taken for calculation

Storage Required	Belly Tank Volume	Volume in Tank	Tank Capapcity Used	Total Fuel Storage	Fuel Density	Fuel Weight
hours	m³	m³	%	m³	kg/m³	tonnes
24	22	16.3	74.2%	653.2	0.832	0.54



2 FUEL OIL PIPEING SECTION



1 FUEL OIL PIPING ISOMETRIC

GENERAL NOTES

• THE SITE DISTRIBUTION CENTRE (SDC), POWER DISTRIBUTION CENTRE (PDC), AIR COOLED PLANTROOM (ACP), FREE COOLING AIR COOLED CHILLER (FCACC) AND GENERATOR (GEN) ARE PREFABRICATED MODULES DESIGNED AND CONSTRUCTED BY APPROPRIATE VENDORS.
• REFERENCE SHALL BE MADE TO THE CLIENTS STANDARD SPECIFICATIONS.
• ANY DISCREPANCIES BETWEEN THE INFORMATION GIVEN BY THE EOR AND THAT PROVIDED BY OTHERS MUST BE REFERRED TO THE ARCHITECT AND ENGINEER BEFORE WORK PROCEEDS.
• CONTRACTOR TO REFER TO 1A DESIGN RISK ASSESSMENT DOCUMENTATION AND MEET LOCAL HEALTH AND SAFETY REQUIREMENTS.
• THIS IS NOT AN INSTALLATION DRAWING.
• THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ARCHITECTURAL DRAWINGS, MECHANICAL, ELECTRICAL AND PUBLIC HEALTH DRAWINGS, STRUCTURAL AND CIVIL ENGINEERING DRAWINGS, AND ALL SPECIFICATION DOCUMENTS.
• DO NOT SCALE FROM THIS DRAWING. REFER TO ARCHITECTURAL DRAWINGS FOR BUILDING DIMENSION INFORMATION.
• ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED.
• ACP IS BASED ON: "GCUB4.0 ACP LOW RES.RFA" AND "GCUB4.0 ACP LOW RES PLUS.RFA" RECEIVED ON 20TH SEPTEMBER 2022.
• TRANE CHILLER SHOWN IS BASED ON "350XPG_GFC_XLN_A_Lower_Weight.RFA" RECEIVED ON 20TH SEPTEMBER 2022.
• THE PCW PIPEWORK IS TO BE CARBON STEEL UNLESS OTHERWISE STATED.
• THE PCW PIPEWORK SHALL BE BUTT-WELDED THROUGHOUT, EXCEPT WHERE IT CONNECTS TO ANY PLANT OR EQUIPMENT WHICH NEEDS TO BE MAINTAINED OR REMOVED. IN THIS INSTANCE IT SHALL BE WELD NECK FLANGED.
• ALL EXTERNAL PCW PIPEWORK SHALL BE INSULATED AND TRACE HEATED.
• REFRIGERANT LEAK DETECTION SHALL BE PROVIDED WITHIN BLANKING ENCLOSURES.
• THE ABOVE GROUND DOMESTIC PIPEWORK SHALL BE EN ISO 15494 GRADE HDPE PE100 / SDR17 THROUGHOUT UNLESS OTHERWISE STATED.
• ALL EXTERNAL ABOVE GROUND DOMESTIC PIPEWORK SHALL BE INSULATED AND TRACE HEATED TO COMPLY WITH CLIENT REQUIREMENTS, WITH EXCEPTION OF FINAL CONNECTION TO SERVE L01 BIB-TAPS. L01 BIB-TAP BRANCH PIPEWORK TO BE INSTALLED WITH A GRADIENT OF AT LEAST 1:100 TO FACILITATE DRAINING OF WATER DURING PERIODS OF EXTREME LOW TEMPERATURE.
• ALL VALVES LOCATED 2m OR HIGHER FROM GROUND TO INCLUDE CHAIN WHEELS.
• DASHED PIPE OUTLINE INDICATES DISTRICT HEATING PIPEWORK THAT CAN BE RETROSPECTIVELY INSTALLED

23/03/2023 22:32:46 Autodesk Docs://Project- 1-A/ A-MYD-MEP.rvt

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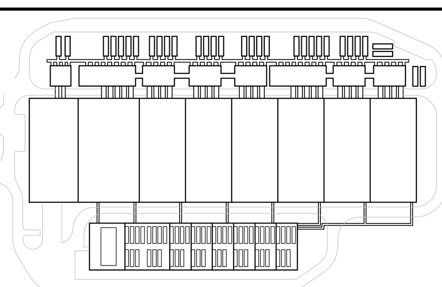

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REVISIONS

NO.	DATE	DESCRIPTION
0.1	10.03.2023	REVISED BOD DRAFT ISSUE
0.2	24.03.2023	REVISED BOD ISSUE

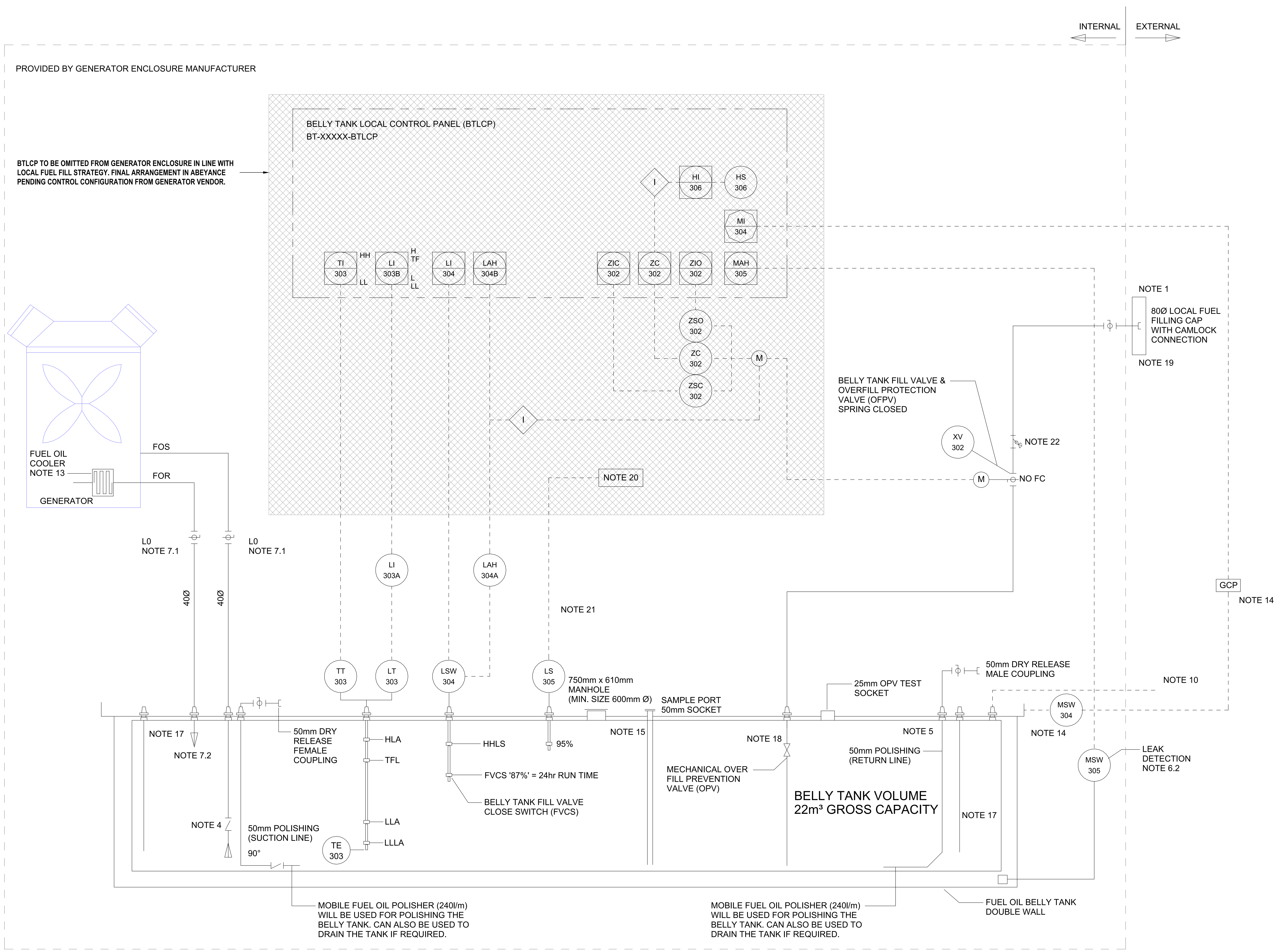
Drawn By: TS
Approved By: NC
Design Team: Arup

1A MYD MEP
Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH
Project Number: 288809

MYD Fuel Oil Piping Isometric
Discipline: HVAC
Scale: As indicated Sheet Size: A0

Sheet Number:
1A-M-4001-MYD-X
Current Rev: 0.2
Phase: REVISED BOD ISSUE
Model Name: 1A-MYD-MEP
Native File Format: Revit v.2023.1

DETAIL 1 - FUEL OIL BELLY TANK DIAGRAM (TYPICAL FOR ALL GENERATORS)



GENERAL NOTES:

1. FUEL FILL POINTS TO BE HOUSED IN LOCKABLE CABINET WITH DRIP TRAY AND LEAK DETECTION. FUEL FILL CABINET SHALL ALSO BE PROVIDED WITH 2-PIN CONNECTION (IF REQUIRED), WARNING LIGHT, LOCAL READ OUT OF FUEL LEVEL, MOTORISED OVERFILL PROTECTION VALVE POSITION & AUDIBLE ALARM.
2. VENT PIPES TO BE SINGLE WALL. NO INSULATION, CLADDING OR TRACE HEATING.
3. VALVE ARRANGEMENTS LOCATED INSIDE OF BUNDED AREAS WITH LEAK MONITORED DIP TRAY.
4. REMOVABLE NON-RETURN VALVE FOR EASIER PRIMING AND MAINTENANCE.
5. ANTI-SIPHON HOLE TO BE INSTALLED ON ALL PIPE LINES ABOVE LIQUID LEVEL INSIDE THE BELLY TANK EXCLUDING SUCTION LINES.
6. LEAK DETECTION TYPES:
   6.1 ANY-LIQUID
   6.2 BELLY TANK VACUUM LEAK DETECTION.
   6.3 DISCRIMINATIVE (HYDROCARBON/WATER)
7. GENERATOR FOS AND FOR PIPES INSIDE THE ENCLOSURE TO BE DESIGNED, SUPPLIED AND FITTED BY GENERATOR MANUFACTURER:
   7.1 GENERATOR FOS AND FOR VALVES MUST REMAIN LOCKED OPENED.
   7.2 FOR SHALL BE ROUTED TO THE OPPOSITE END OF THE TANK TO AVOID SUCTION OF THE WARMER FUEL OIL.
8. COUNTRY SPECIFIC CODES SHALL BE FOLLOWED.
9. ALL PACKAGED PLANT AND EQUIPMENT IS TO INCLUDE INTEGRAL DRAIN COCKS AT LOWEST POINT AND AIR VENTS AT HIGH POINTS TO ALL EQUIPMENT TO BE VENTED AND DRAINED.
10. SINGLE 80Ø AIR VENT, WITH VENT TIP AS PER THE ZONE CLASSIFICATION STATED IN THE ATEX REPORT.
11. NB80 FILL LINE WITHIN FILL CABINET TO SUIT LARGEST ROAD TANKER CONNECTION.
12. NB15 CONNECTION TO BIOCIDE INJECTION. BIOCIDE INJECTION ALSO AVAILABLE VIA THE MOBILE POLISHING UNIT.
13. FUEL OIL COOLER PROVIDED BY GENERATOR MANUFACTURER. RETURN FUEL OIL TEMPERATURE SHALL NOT EXCEED 50°C.
14. GENERATOR ROOM FLOOR CONTAINMENT WITH LEAK DETECTION WIRED TO THE GENERATOR CONTROLLER. LEAK DETECTION TYPE: ANY LIQUID.
15. THE FUEL OIL SYSTEM SHALL COMPLY WITH THE ATEX REPORT (SEE HAZARDOUS AREA CLASSIFICATION STUDY).
16. TANK VOLUMES FOR 24 hr RUN TIME: 2.75 MW GENERATOR: 18,050 LITRE USABLE VOLUME (22,000 LITRES GROSS)
17. DIP STICK/DRAIN TUBE TO BOTTOM OF TANK. DIP STICKS TO BE PLACED EITHER SIDE OF SLOPE AS PER KIWA REQUIREMENTS.
18. PIPE ABOVE THE LIQUID LEVEL, APPROXIMATELY 50mm BELOW THE TANK CEILING.
19. EARTH REELS WHERE FILLING TRUCK CAN CONNECT FOR GROUNDING BEFORE FUEL TRANSFER TO BE PROVIDED.
20. CONNECTION TO 2-PIN AT FILL POINT TO DISABLE PUMP ON TANKER.
21. 2-PIN CONNECTION ONLY APPLICABLE WHERE REQUIRED BY REGIONAL & NATIONAL REGULATIONS.
22. 50 MICRON STRAINER/FILTER ON FUEL LINE.

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0.4	24.03.2023	REVISED BOD ISSUE

Drawn By: TS
Approved By: NC
Design Team: Arup

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Maxwells Farm West
Great Cambridge Road
Cheshunt
Broxbourne
EN8 8XH
Project Number: 288809

GENERATOR FUEL OIL FLOW DIAGRAM
Discipline: HVAC
Scale: NTS Sheet Size: A0

Sheet Number: **1A-M-5003-MYD-X**
Current Rev: 0.4
Phase: REVISED BOD ISSUE
Model Name: 1A-MYD-MEP
Native File Format: Revit v.2023.1