



Saxon Pit Southern Buttress Environmental Permit Application

Environmental Setting and Site Design

East Midlands Waste Management Ltd

Saxon Works, Peterborough Road, Whittlesey, PE7 1PJ

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1.0 Introduction

1.1 Report Context

SLR Consulting Ltd (SLR) has been instructed by East Midlands Waste Management Limited (EMWM) to prepare an application for an Environmental Permit (EP) for the construction of a buttress to stabilise the southern face of Saxon Pit, located at Peterborough Road, Whittlesey, PE7 1PJ (the Site).

This Environment Setting and Site Design (ESSD) report supports the EP application and sets out the conceptual model and the environmental setting and site design. It is supported by the risk assessments submitted in the EP application, which include the:

- Environmental Risk Assessment (ERA);
- Stability Risk Assessment (SRA); and
- Hydrogeological Risk Assessment (HRA).

1.2 Site Details

1.2.1 Site Location and Access

Saxon Pit is an inactive quarry located immediately to the west of the town of Whittlesey in Cambridgeshire at National Grid Reference 525754E, 297057N. Saxon Pit comprises an excavation in the Oxford Clay which is between 18m and 27m deep and lies between the A605/Peterborough Road to the north and the Peterborough to March railway line to the south. The Site is located within part of the Saxon Pit quarry and is accessed via a shared unnamed access road from the A605 / Peterborough Road.

The eastern boundary of the wider Saxon Pit site is adjacent to a housing estate. To the southeast, the canalised Kings Dyke flows beneath the Peterborough to March railway line. The original Saxon Brickworks and associated infrastructure which were located in the pit have now been demolished and/or repurposed/de-commissioned and the general site is now operated as a waste management and plant hire facility by EMWM.

The Site location, EP boundary, layout and environmental setting is shown on the following drawings:

- Site Location Plan, Drawing No. 001
- Environmental Permit Boundary and Site Layout Plan
- Site Setting Plan, Drawing No. 003Site Classification

The Site will be regulated as a bespoke EP comprising deposit for recovery and waste screening activities.

The following specified waste management activities will be listed in the EP:

- **R3:** Recycling or reclamation of organic substances which are not used as solvents.
- **R5:** Recycling / reclamation of inorganic compounds – use of waste for the purpose of restoration of land.
- **R13:** Storage of wastes pending any of the operations number R3 or R5.

A total of 216,700m³ of waste is proposed to be deposited at the Site to construct a buttress to stabilise the southern face of Saxon Pit.



1.2.2 Application Boundaries and Site Security

The Site layout and proposed EP boundary is illustrated in Drawing 002 Environmental Permit Boundary and Site Layout Plan.

The Site will benefit from the following to keep the Site secure, and prevent unauthorised access:

- Visitor Sign in/Sign out book;
- Regular inspection to ensure continual monitoring of security provisions; and
- Perimeter fencing/hedging and lockable gates.

1.2.3 Adjacent Waste Management Activities

The exhausted clay pit has historically suffered from several minor failures of the quarry face along its eastern and southern boundaries. The eastern slope of the wider Saxon Pit site has been stabilised by regrading works under a separate deposit for recovery EP (EPR/FB3406KC) which involved cutting back the slope crest combined with limited buttressing installed to the lower parts, using imported waste materials. The EP EPR/FB3406KC is operated by EMWM and was originally issued on 30 January 2012.

To the northwest of the Site, Johnson’s Aggregates and Recycling Ltd operates a non-hazardous waste physical treatment facility dealing with the treatment of incinerator bottom ash (IBA) under the EP EPR/DP3131NM. In addition, Forterra Buildings Products Ltd manufacture house bricks at Kings Dyke works under EPR/GP3435WX, where clay material is supplied by adjacent quarries.

It is noted that the proposed EP will share facilities with the existing waste management activities undertaken within the wider Saxon Pit site, including highway access, internal haulage route and infrastructure such as welfare, parking, wheel wash and weighbridge.

1.2.4 Immediate Site Surrounding

The Site, prior to development, currently consists of open land in the base of a former clay quarry, approximately 22-25 metre below surrounding ground levels and adjacent to the southern face of the former quarry.

The immediate surrounding land uses are identified in Table 1-1.

Table 1-1 Immediate Surrounding Land Uses

Boundary	Description
North	Open land within the wider Saxon Pit site. Commercial and industrial premises including waste operations undertaken by Johnsons Aggregates and Recycling and plant hire facilities among others. The A605/Peterborough Road lies approximately 465m to the north of the proposed EP boundary.
East	Open land including the existing deposit for recovery EP operated by EMWM for the stabilisation the eastern face of Saxon Pit, beyond which lies a large residential area within the town of Whittlesey, the centre of which is located circa 1km from the Site.
South	Peterborough to March railway line runs parallel to the southern boundary of the Site, beyond which lies King’s Dyke. Open / agricultural land is located further to the south.
West	Commercial and industrial land and open land within the wider Saxon Pit site.



The receptors located in the vicinity of the Site are detailed further in Section 3.0 of this ESDD Report. Surrounding land-use and receptors are identified on Drawing No. 003 Site Setting Plan.



2.0 Source Term Characterisation

2.1 Site Development

2.1.1 Historical Development

Saxon Pit was historically quarried for clay and was also the location for a former brickworks. Post-brickmaking Saxon Pit has been, and continues to be, used for a wide range of commercial enterprises by different legal entities involving waste and non-waste related activities.

The exhausted clay pit has historically suffered from several minor failures of the quarry face along its eastern and southern boundaries.

The eastern slope of the wider Saxon Pit site has been stabilised by regrading works which involved cutting back the slope crest combined with limited buttressing installed to the lower parts, using imported waste materials. Following site investigations in 1997 and 1998 it was recommended that Hanson (the site owner at the time) undertake a slope face stabilisation scheme based on buttressing of these slopes using imported inert waste material. This was initially undertaken under a waste exemption, until a change in the Regulations required the activity to secure an EP, which was granted originally to Glazewing Ltd in 2012. The EP was subsequently transferred to EMWM, which has operated the site under the current waste recovery EP (Ref EPR/BB3038Y) since October 2017.

Multiple shallow failures have been observed in the south/south-western slope along the slope adjacent to the Peterborough to March railway line. As a consequence, it is now proposed to carry out a buttressing exercise on the southern quarry wall.

2.1.2 Proposed Development

The southern wall of Saxon Pit is proposed to be stabilised by the construction of a buttress comprising circa 216,700m³ of material. The buttress has been designed with a 1V:3H gradient for the main and south-western section to achieve an acceptable factor of safety for the slope gradient. It is proposed for the buttress to be constructed under an EP containing a deposit for recovery activity.

The design of the buttress takes into account the constraints posed by presence of existing buildings at the toe of the buttress, which are under third party ownership. To address this, it is proposed to install a retaining structure, such as a gabion wall at the toe of the slope.

All material will need to be imported for the construction of the buttress as a cut-and-fill approach is not an option for the stabilisation works. This is due to the proximity of the crest of the former quarry slope to the adjacent railway and surface water feature behind the crest of the slope meaning that it is not possible to cut the existing slope back to a suitably stable profile. In addition, all excess material which remained following closure of the quarry has been incorporated into the previous stabilisation phase on the eastern quarry face. The material used for the buttress will be imported inert clays and soils, likely to be sourced from local construction, demolition and excavation (CD&E) projects and will conform to inert Waste Acceptance Criteria (iWAC) as set out in the 2003/33/EC: Council Decision of 19 December 2002¹.

The buttress-forming material will be placed to an earthworks specification² and will follow placement methods similar to those in the existing eastern recovery EP to achieve the

¹ 2003/33/EC: Council Decision of 19 December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC

² Manual of Contract Documents for Highway Work Volume 1 Specification for highway works, national highways.



proposed profile and cross-sections presented in Drawing 002. In general terms this comprises:

- The former quarry floor and faces will be cleared and trimmed to remove any loose debris
- The imported material will be placed in layers and be notionally compacted by the bulldozer.
- The profile of the buttress will be controlled through topographic surveying and the use of survey boards where required.

Following completion of the engineered buttress, the slope will be finished with a comprehensive landscaping and ecological enhancement scheme designed to integrate with the existing restoration/planting scheme to the east of the Site. It is estimated that buttress engineering work and restoration would take seven years to complete.

Surface water run-off will be managed via a swale at the base of the buttress which will direct flow to the existing drainage scheme and attenuation lagoon to the north of the proposed EP boundary.

There is an area of the Site that will not undergo the permanent deposit of waste. A waste processing and storage area is included within the proposed EP boundary, as shown on Drawing No. 002 Environmental Permit Boundary and Site Layout Plan. It is noted that a Site Condition Report for the area that is not undergoing the permanent deposit of waste has been prepared and is included as Section 12 of the EP application.

2.2 Source

2.2.1 Proposed Waste Activities

The EP application is for deposit of waste for recovery and physical treatment. Waste will be physically treated through a screener where necessary before being deposited into the buttress.

The waste management activities that will be carried out at the Site, as specified in Annex I of the Waste Framework Directive, are:

- **R3:** Recycling or reclamation of organic substances which are not used as solvents.
- **R5:** Recycling / reclamation of inorganic compounds – use of waste for the purpose of restoration of land.
- **R13:** Storage of wastes pending any of the operations number R3 or R5.

2.2.2 Quantity of Waste Required

A total of 216,700m³ (between 325,500 and 390,600 tonnes assuming a density of between 1.5 and 1.8 tonnes per m³) of waste is required for the construction of the buttress.

It is proposed that the Site will accept up to 50,000 tonnes per annum of inert waste only. A maximum of 20,000 tonnes of waste will be stored on the Site at any one time prior to deposit into the recovery operations.

2.2.3 Permitted Waste Types

The buttress will be progressively constructed using suitable cohesive waste sourced locally from construction and development projects.

The waste types which will be used for the development are detailed in Table 2-1 List of Wastes to be Accepted Table 2-1 with their associated European Waste Catalogue (EWC)



code. These EWC codes and descriptions are included in the Waste Recovery Plan (WRP) approved by the EA on 17 December 2024. A copy of the WRP is included as Section 4 of the EP application.

Table 2-1 List of Wastes to be Accepted

EWC Code	Description
01	WASTES RESULTING FROM EXPLORATION, MINING, QUARRYING, AND PHYSICAL AND CHEMICAL TREATMENT OF MINERALS
01 01	wastes from mineral excavation
01 01 02	Waste from non metalliferous excavation excluding silt and tailings
01 04	wastes from physical and chemical processing of non-metalliferous minerals
01 04 08	Waste gravel and crushed rocks other than those containing dangerous substances
01 04 09	Waste sand and clays
17	CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)
17 01	concrete, bricks, tiles and ceramics
17 01 01	concrete
17 01 02	bricks
17 01 03	tiles & ceramics
17 01 07	mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06
17 05	Soils Stones and Dredging Soil
17 05 04	Soil and Stones
19	WASTES FROM WASTE MANAGEMENT FACILITIES, OFF-SITE WASTE WATER TREATMENT PLANTS AND THE PREPARATION OF WATER INTENDED FOR HUMAN CONSUMPTION AND WATER FOR INDUSTRIAL USE
19 12	wastes from the mechanical treatment of waste (for example sorting, crushing, compacting, pelletising) not otherwise specified
19 12 09	Minerals (for example sand, stones)
20	MUNICIPAL WASTE (HOUSEHOLD WASTE AND SIMILAR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL WASTES) INCLUDING SEPARATELY COLLECTED FRACTIONS
20 02	Garden and Park Wastes
20 02 02	Soil and Stones

Waste inputs will be limited to those that meet inert Waste Acceptance Criteria (iWAC) limits as outlined within section 2.1.2 of the Landfill Directive 2003/33/EC and reproduced in Table 2-2 and Table 2-3.

Any wastes that do not meet the criteria will not be accepted at the Site.

Strict waste acceptance procedures will be in place at the Site to ensure that non-conforming waste is not accepted, as described in the Operating Techniques in Section 5 of the EP application. Documentation will accompany all waste material accepted, which will be



reviewed in accordance with the Site's waste pre-acceptance and acceptance procedures to ensure any materials used are suitable for use in the restoration operations.

Table 2-2 Limit values for waste acceptable for Inert Waste

Component	L/S = 2 l/kg (mg/kg dry substance)	L/S = 10 l/kg (mg/kg dry substance)
Arsenic	0.1	0.5
Barium	7	20
Cadmium	0.03	0.04
Chromium (Total)	0.2	0.5
Copper	0.9	2.0
Mercury	0.003	0.01
Molybdenum	0.3	0.5
Nickel	0.2	0.4
Lead	0.2	0.5
Antimony	0.02	0.06
Selenium	0.06	0.1
Zinc	2	4
Chloride	550	800
Fluoride	4	10
Sulphate	560*	1000*
Phenol	0.5	1
DOC**	240	500
TDS***	2500	4000
Notes	<p>* If the waste does not meet these values for sulphate, it may still be considered as complying with the acceptance criteria if the leaching does not exceed either of the following values: 1,500mg/l as C₀ at L/S = 0.1l/kg and 6000mg/kg at L/S = 10l/kg.</p> <p>** If the waste does not meet these values for DOC at its own pH value, it may alternatively be tested at L/S = 10 l/kg and a pH between 7,5 and 8,0. The waste may be considered as complying with the acceptance criteria for DOC, if the result of this determination does not exceed 500 mg/kg.</p> <p>*** The values for total dissolved solids (TDS) can be used alternatively to the values for sulphate and chloride.</p>	

Table 2-3 Limits for Total Content of Organic Contaminants

Parameter	Value (mg/kg)
TOC (total organic carbon)	30,000 (*)
BTEX (benzene, toluene, ethylbenzene and xylenes)	6.0
PCBs (polychlorinated biphenyls, 7 congeners)	1.0
Mineral oil (C10 to C40)	500



Parameter	Value (mg/kg)
PAHs (polycyclic aromatic hydrocarbons)	100
* In the case of soils, a higher limit value may be admitted by the competent authority, provided the DOC value of 500 mg/kg is achieved at L/S = 10 l/kg, either at the soil's own pH or at a pH value between 7,5 and 8,0.	

Environment Agency guidance 'Testing for Disposal to Landfill'³ clarifies: "While limits are set for these tests in the Council Decision annex, the Environmental Permitting Regulations, schedule 10 state that the L:S 10 l/kg test must be used." It is therefore proposed that the L:S 10l/kg WAC limits will be used for determining priority contaminants.

³ Environment Agency (March 2013). *Waste Sampling and Testing for Disposal to Landfill*. Ref. EBPRI 11507B Final



3.0 Pathway & Receptors

3.1 Geology

A summary of the regional geological sequence relevant to the Site is provided in Table 3-1. It should be noted that given the historic quarrying the superficial deposits have been excavated and are not present across the Site.

Table 3-1 Geological Sequence and Lithological Descriptions

Parent Group	Geological Strata	Lithological Description	Est. Typical Thickness (m)
Quaternary Superficial	Topsoil	Loamy Soils	3m
	Made Ground	Coarse gravel, cobbles of brick. Fine to coarse sand.	
	March Gravel Member	Sandy flint gravel to clayey silty pebbly sand. (Only in small parts at the north and west the site)	Unknown
Jurassic	Oxford Clay	Silicate-mudstone, grey, generally smooth to slightly silty, with sporadic beds of argillaceous limestone nodules.	c.20m
	Kellaways Formation	Mudstone, grey, commonly silici-silty or silici-sandy, with (predominantly in the upper part) beds of generally calcareous siltstone and sandstone.	Unknown

Soils

The Cranfield Soilscales online soil map viewer indicates that the site is underlain by freely draining slightly acid loamy soils, although these will have been removed during historic quarrying.

Superficial and Bedrock

According to BGS online mapping⁴, the bedrock across the Site comprises of:

- Oxford Clay Formation – covering the whole site. Sedimentary bedrock formed between 166.1 and 157.3 million years ago during the Jurassic period.
- Kellaways Sand Formation – underlying the Oxford Clay Formation, the Kellaways Formation mainly consists of low permeability mudstones, however there is a thin sandstone horizon that has the potential for some flow but is not likely to be able to be used as a resource due to the quality.

The 2019 HRA⁵ for the eastern buttress reported that the Oxford Clay Formation is shallowest to the east of the Site, at c. 15 m, and dips towards the west of the site where it is c. 30 m thick.

⁴ <http://mapapps2.bgs.ac.uk/geoindex/home.html>

⁵ SLR Consulting Ltd (2019) *Saxon Pit: Hydrogeological Risk Assessment*, Ref: 403-07764-00001



3.2 Hydrology

The Flood Map for Planning⁶ identifies that the Site is located within a Flood Zone 3 for surface water and small watercourses, defined as having “high probability of flooding from rivers and the sea”.

The Site falls within the catchment of the King’s Dyke to the east of the Site, a tributary of the River Nene. The Kings Dyke is culverted beneath the railway line to the south of the Site flowing in a north-easterly direction. At its closest point, the channel is located c.40m south east of the Site and drains an upstream catchment area⁵ of 23.75km². Kings Dyke flows ultimately into the old course of the River Nene c.10km downstream of the site, via Briggate River, Twenty Foot River and Whittlesey Dyke. A significant length of these watercourses is canalised along their reaches. The Kings Dyke is formed via an offtake from the River Nene (Stanground Lock). Water levels are controlled by the St Germans Pumping Station and the lock gates at Stanground Lock, to sustain a level of c.1.5m aOD which can be managed as required.

The new course of the River Nene is designated as Environment Agency Main River⁶ which, at its closest point, flows eastwards 1km north of the Site draining an approximate upstream catchment area⁵ of 1,642km². The River Nene rises to the north of Northampton and flows towards Peterborough. The Dog-in-a-Double sluice is located approximately 8km downstream of Peterborough, to the north of Whittlesey, at which point the fluvial Nene meets the tidal reaches of the River Nene. Approximately 40km downstream of the sluice, the River outfalls into the Wash. The tidal reaches of the River Nene are defended by a series of raised earth embankments, with the exception of Wisbech Reach.

The local topography is flat and low lying, with large areas of fenland where the landscape is dominated by drainage channels managed by Internal Drainage Boards. These channels are crucial to maintain the agricultural land use and manage flood risk.

3.2.1 Site Drainage

The current and proposed site drainage is outlined within the Surface Water Drainage Strategy (Appendix A), and is summarised as follows:

- The drainage for the buttress of the southern slope is proposed to mimic the previous designs for the existing eastern buttress.
- Flow is routed overland, into the existing lagoon on the Saxon Pit site, located to the north of the proposed EP boundary. This lagoon has a capacity of 10,040 m³ and is approximately 3.5 m deep. Water levels are kept around 2 – 2.5 m. Flows are then pumped from the lagoon into a reed bed that feeds into the King’s Dyke at a rate up to 52.8l/s. The new site drainage plan will control the flows shedding off the buttress in order to stop the flooding of the low-lying areas.
- A swale will also be installed to intercept, attenuate and convey any flows shed from the slope face of the proposed buttress towards the lagoon.

3.3 Hydrogeology

3.3.1 Aquifer Classification and Vulnerability

The DEFRA online mapping service ‘Magic Map’⁷ classifies the Oxford Clay as an Unproductive Aquifer, described as:

⁶ <https://flood-map-for-planning.service.gov.uk/>

⁷ <https://magic.defra.gov.uk/MagicMap.html>



‘rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow’.

The underlying Kellaways Formation is classified as a ‘Secondary A Aquifer’ which are described as:

‘Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers’

The superficial March gravels are also classified as a ‘Secondary A aquifer’, although given that these deposits are not present across the Site there is considered to be no potential pathway for any contaminants generated by the Site.

Site investigations conducted in 2017 had minor groundwater seepage in one of the four boreholes drilled, however it was commented that no permanent groundwater body was encountered.

The site investigations in the site directly to the west, Victory Works, indicated that most the boreholes drilled experienced very low or no recharge.

Oxford Clay has been characterised as having a very low permeability, usually recorded at less $1 \times 10^{-9} \text{m/s}$.

3.3.2 Source Protection Zones

The Site is not located within a groundwater Source Protection Zone (SPZ). The nearest SPZ is a Zone II which is located approximately 16 km north-west of the site.

3.3.3 Abstractions

Licensed abstractions within a 2 km radius of the site are recorded below in Table 3-2. There are no groundwater abstractions within 2 km radius of the Site.

Table 3-2 Licensed Abstractions within 2 km of the site.

Licence ID & Owner	Distance from Site (km)	Abstraction purpose	Max. Daily Quantity (m3)	Source
AN/033/0053/050 Chapelbridge Farms	South - west 1.22	Spray Irrigation - Direct	2000	SW
6/33/53/*S/0811 Star Pit Partners	South-west 1.46	Spray Irrigation – Direct	18,000	SW

3.3.4 Groundwater Levels and Flow

There is no site-specific information about the groundwater flows or levels, however investigations carried out directly to the west indicated that the water level across three boreholes sits at around 0.7 - 2.3m.

These logs confirm that the boreholes have little to no recharge taking place. This suggests that the flow is either very slow or stagnant.

No information is available on groundwater levels in the underlying Kellaways Sands.



3.3.5 Groundwater Vulnerability

The DEFRA online mapping service ‘Magic Map’ confirms that the Site lies in an area of “unproductive” groundwater vulnerability.

3.4 Human Population, Culture and Nature

Local receptors within 500m of the Site’s proposed EP boundary are identified in Table 3-3, along with cultural and ecological receptors within 2km. The Site’s environmental setting is shown on the Site Setting Plan, Drawing No. 003.

Table 3-3 Receptors

Receptor Name	Receptor Type	Direction	Approximate Distance from proposed EP Boundary
Local receptors within 500m of the EP Boundary			
Open Land	Open Land	East	Adjacent
Peterborough to March railway line	Local Transport Network	South	50m
King’s Dyke	Surface Water Feature	South	70m
Eco Plant Hire And Sales Ltd	Commercial/ Industrial Premises	Northwest	50m
Deciduous woodland	Habitat	South	80m
Deciduous woodland	Habitat	South	140m
Surface Water Feature	Surface Water Feature	South	125m
Residential	Residential	Northeast	210m
Johnsons Aggregates & Recycling Ltd	Commercial/ Industrial Premises	North	235m
Aster Cars	Commercial/ Industrial Premises	North	435m
A605 / Peterborough Road	Local Transport Network	North	465m
Residential	Residential	North	480m
Browns Removal and Storage	Commercial/ Industrial Premises	Northwest	595m
Cultural and ecological receptors within 2km of the Environmental Permit Boundary			
Listed Building*	Grade II Listed Building	Northeast	570m
Kings Dyke Nature Reserve	Nature Reserve	Northwest	600m
Bassenhally Pit	SSSI	North	980m
Whittlesey Butter Cross	Scheduled Monument	East	1km



Receptor Name	Receptor Type	Direction	Approximate Distance from proposed EP Boundary
Nene Washes	SSSI, SPA, Ramsar, SAC	North	1.2km

* Various other listed buildings are located within 2km of the Site, as shown on the Site Setting Plan, Drawing 003.

3.4.1 Residential

The town on Whittlesey lies to the east of the Site. The closest residential properties within Whittlesey are located 210m from the northeastern boundary of the Site. Additional residential properties are located 280m southeast and circa 480m to the north of the Site along the A605 / Peterborough Road.

3.4.2 Agricultural/ Open Land

There are several agricultural fields and open land within the vicinity of the Site, the nearest open areas of land are adjacent to the Site's eastern boundary, comprising the base of the Saxon Pit site. This area is associated with the deposit for recovery EP to stabilise the eastern face of the Saxon Pit wider site.

3.4.3 Commercial and Industrial

There is an area of commercial and industrial receptors to the immediate north of the EP boundary, comprising Eco Plant Hire and Sales Ltd, Tag Industries and Johnsons Aggregates & Recycling Ltd amongst other industries.

3.4.4 Local Transport Network

There are several roads within a 500m radius of the Site, the closest of which is the A605 Peterborough Road 465m to the north of the Site. The Peterborough to March railway line runs parallel to the southern boundary of the Site, approximately 50m from the proposed EP boundary.

3.4.5 Listed Buildings

There are several listed buildings within 2km of the Site, the closest of which is located approximately 570m northeast of the Site within Whittlesey. The locations of other listed buildings are shown on the Site Setting Plan, Drawing No. 003.

3.4.6 Scheduled Monuments

The Scheduled Monument "Whittlesey Butter Cross" is located 1km east of the Site. There are no other Scheduled Monuments identified within 2km of the Site.

3.4.7 Designated Habitat Sites

A 2km radius was used for identifying European and International Designated Habitat Sites and for other designated habitat sites using Defra's MAGIC map application.

The following European and Internationally Designated Habitat Sites are situated within 2km of the Site:

- Nene Washes (Special Areas of Conservation (SAC) and Ramsar)– 1.2km north;

None of the following types of designated habitat sites were identified as situated within 2km of the Site:



- National Nature Reserve (NNR);
- Ancient Woodland; and
- Areas of Outstanding Natural Beauty (AONB).

3.4.7.1 Site of Special Scientific Interest (SSSI)

The following Sites of Special Scientific Interest are situated within 2km of the Site:

- Bassenhally Pit – 980m north
- Nene Washes–1.2km north

3.4.7.2 Special Protection Areas (SPAs)

Nene Washes SPA is located 1.2km north of the Site.

3.4.7.3 Protected Species

A Nature and Heritage Conservation (N&H) Screen was requested for the Site to determine whether there were any other protected habitats or protected species within 500m of the proposed EP boundary. A copy of the N&H screen from the EA is included as Appendix B of this ESSD Report.

The screen identified the following protected species within 500m of the Site:

- European Eel
- European Eel migratory route
- European Water Vole

The mapping within the N&H screen suggests that these receptors are associated with the Kings Dyke located to the south of the proposed EP boundary.

The N&H screen also confirmed that the following were not found to be located within 500m of the Site: *“Special Areas of Conservation (cSAC or SAC), Special Protection Area (pSPA or SPA), Marine Conservation Zone (MCZ), Ramsar, Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserve (LNR), Local Wildlife Sites (LWS), Ancient Woodland, relevant species and habitats”*.

3.5 Compliance Points

3.5.1 Groundwater

The Hydrogeological Risk Assessment (HRA) completed as part of the EP application considers that there is no groundwater pathway beneath the Site. Therefore, it considers that *“Hazardous Substances will not be discernible in the groundwater or surface water at the compliance points and Non-Hazardous Pollutants will not be present at the compliance points above a level that may constitute pollution.”*

3.5.2 Surface Water

For the purposes of defining receptors, the compliance points for water are taken to be the discharge points into the surface water receptors in the existing lagoon on the wider Saxon Pit site and at the reed bed before discharging into the Kings Dyke.



3.5.3 Amenity (Nuisance and Health issues)

All sensitive receptors within 500m of the Site which have the potential to be impacted by the proposed activities have been outlined in Table 3-3. The risks that require further consideration include:

- Noise and Vibration;
- Fugitive Surface Emissions (including dust, mud); and
- Incidents and Accidents.

These risks are considered in depth in the Environmental Risk Assessment (ERA) (Ref: 416.065341.00001/ERA) included in Section 7 of the EP application.

The ERA concludes that, with the implementation of the risk management measures proposed within this application, potential hazards from the activities are not likely to be significant and no further assessment of the risks is required.



4.0 Pollution Control Measures

4.1 Site Infrastructure

The proposed layout of the Site is shown on Drawing 002, Environmental Permit Boundary and Site Layout Plan.

The Site is accessed via an established HGV access to the A605 / Peterborough Road to the north. This existing access serves the Site and several other commercial developments, waste processing and recycling facilities all operating on adjacent areas of Saxon Pit, including the stabilisation scheme for the eastern part of the buttress. Entrance to the Site from the access road is via an intercom and password-operated gate, to minimise unauthorised entrance.

A wheel wash, weighbridge, welfare office, parking area and existing lagoon and pumping station are located outside of the proposed EP boundary to the north. The access road, welfare office, parking area and weighbridge which lie outside the permit boundary are shared with the existing waste management operations in the vicinity of the Site.

Surfacing across the Site consists of soil only. There are no concreted areas with the EP boundary.

There is no proposed fuel storage within the proposed EP boundary. The only fuels present on the Site will be fuels within operational mobile plant and vehicles.

A swale will be installed at the base of the buttress which will intercept, attenuate and convey any surface water flows shed from the slope face to the lagoon to the north of the proposed EP boundary.

4.2 Basal and Side Slope Engineering

4.2.1 Buttress Design

The construction of the buttress will be carried out and implemented in strict accordance with the planning permission (Ref No. CCC/24/078/FUL) granted by Cambridgeshire County Council.

The buttress has been designed with a 1V:3H gradient for the main and south-western section to achieve an acceptable factor of safety for the slope gradient.

The design also takes into account the constraints posed by presence of existing buildings at the toe of the buttress, which are under third party ownership. To address this, it is proposed to install a retaining structure, such as a gabion wall at the toe of the slope.

Based on an isopachyte of the existing topography and the proposed buttress design, approximately 216,700m³ of material will be required for the construction (between 325,500 and 390,600 tonnes assuming a density between 1.5 and 1.8 tonnes/m³). Strict waste acceptance procedures would ensure that only suitable materials are accepted at the Site.

Construction operations will be conducted in accordance with an approved method statement and risk assessment, to ensure that the work is carried out to an appropriate recognised standard such as Series 600 Specification for Highways. An earthworks methodology will be set out in detail in an engineering specification that will be completed prior to undertaking any works. This will set out requirements for:

- Material acceptance testing and classification;
- Requirements for placement trials;



- Material placement and compaction requirements (method or end-product placement);
- Requirements for in-situ testing during and following placement of materials;
- Procedures to be followed where materials or compaction are deemed not to have met the specification; and
- Requirements for any monitoring of the compaction / engineering works.

Placement methods similar to those in the existing eastern recovery EP operated by EMWM will be implemented to achieve the proposed profile and cross-sections presented on Drawing 002 (Construction and Cross Sections) of the approved Waste Recovery Plan, as provided in Section 4 of the EP application. In general terms, placement methods comprise:

- The former quarry floor and faces will be cleared and trimmed to remove any loose debris
- The imported material will be placed in layers and be notionally compacted by the bulldozer.
- The profile of the buttress will be controlled through topographic surveying and the use of survey boards where required.

The finished re-profiling layer will be engineered to ensure that it integrates with the existing stabilisation buttressing and approved restoration scheme for the eastern slope and suitable for the landscaping and ecological enhancement scheme required under the gained planning permission.

The finished scheme will be designed and operated to ensure that it does not result in any environmental problems such as soil erosion, pollution or increase the risk of flooding in the surrounding area.

4.2.2 Artificially Engineered Geological Barrier

Although the pit has been excavated for clay, there are estimated to be a minimum of 1.5m of Oxford Clay remaining beneath the base of the Site, likely to be in excess of 4m thickness. Oxford Clay is characterised by having a very low permeability; regularly recorded as less than 1×10^{-9} m/s.

The natural containment and attenuation provided by the geological setting is considered likely to mitigate any potential impact in the event of contamination being generated from the deposit of waste in the construction of the buttress. As such, there is not considered to be a requirement to construct an artificially established geological barrier (AEGB) at the Site.

4.3 Capping

As the permitted wastes under the EP will comprise inert waste only, no capping is proposed nor required.

4.4 Surface Water Management

The current and proposed site drainage is outlined within the Surface Water Drainage Strategy produced for the Site, provided as Appendix A to this ESSD Report. The drainage is summarised as follows:

- The Site drainage for the buttress of the southern slope is proposed to mimic the previous designs for the existing eastern buttress;
- Surface water at the base of the pit will be managed via an existing lagoon, located to the north of the proposed EP boundary, which houses a pumping station. The



pumping station consists of a submersible pump that transfers water from the lagoon / pumping station to a discharge point direct into an existing dyke that is attached to the main Kings Dyke. Discharges of water from the silt lagoon to the Kings Dyke will be controlled by a discharge consent (EPR/YB3895AC/A001) that is pending issued from the EA to EMWM.

- Surface water flow is routed overland, into the existing lagoon. This lagoon has a capacity of 10,040 m³ and is approximately 3.5 m deep. Water levels are kept around 2 – 2.5 m. Flows are then pumped from the lagoon into a reed bed that feeds into the Kings Dyke at a rate up to 52.8l/s. The new site drainage plan will control the flows shedding off the buttress in order to stop the flooding of the low-lying areas;
- A swale will also be installed to intercept, attenuate and convey any flows shed from the slope face of the proposed buttress towards the lagoon.

There is no proposed surface water monitoring under the EP application. It is anticipated that the pending discharge consent for discharges of water from the silt lagoon to the Kings Dyke would provide the appropriate safeguards to protect the receiving water course, inclusive of the contribution from rainfall derived run-off from the proposed activities within this EP application.

4.5 Amenity

The proposed operations under the EP at the Site could have the potential to impact nearby receptor amenity. An ERA has been prepared as part of the EP application to assess the risks from the proposed operations. The risks that require further consideration include:

- Noise and Vibration;
- Fugitive Surface Emissions (including dust, mud); and
- Accidents and Incidents.

The Site will be operated in accordance with an Environmental Management System (EMS) and activities at the Site will occur in accordance with the Operating Techniques (OT) document prepared as part of the EP application. The OT provides a high-level overview of the infrastructure and procedures to be implemented at the Site.

To address noise and vibration risk, a Noise Assessment and Noise Monitoring Plan has been prepared as part of the EP application and lists the preventative and remedial mitigation measures to be implemented at the Site to reduce the risk of noise emissions affecting nearby receptors. The Noise Assessment and Noise Monitoring Plan is provided as Section 11 of the EP application. Mitigation measures include, but are not limited to, the following:

- Ensuring all plant is kept well maintained;
- Ensuring silencers on plant are effective;
- Turning off plant when not in use; and
- Use of non-tonal reversing signals on mobile plant operating on the Site.

Periodic noise monitoring will be undertaken at nearby residential properties.

To address dust emission risk, a Dust & Emissions Management Plan (DEMP) has been prepared to support the EP application which sets out the preventative and remedial mitigation measures to be implemented at the Site to control dust. Mitigation measures include, but are not limited to, the following:

- Cessation of deposition of dusty waste during particularly dry or windy weather conditions;



- Adequate water supply will be provided for effective dust mitigation;
- Screening of dusty material will be avoided during particularly dry and windy conditions;
- Screening will take place within the quarry void with the quarry walls providing natural dust attenuation;
- Temporary waste stockpiles will be located in a clearly designated area within the permitted site boundary (i.e. within the base of the disused quarry);
- All plant and equipment will be maintained to a high standard;
- Drop heights will be minimised when depositing inert material;
- Monitoring of weather forecasts to choose appropriate mitigation measures;
- Vehicle exhausts to be angled upwards;
- Vehicles will be evenly loaded to avoid spillages;
- Vehicles entering and leaving the site will be covered to prevent escape of materials during transport;
- All vehicles will adhere to the site speed limit of 10mph;
- Temporary haul roads will benefit from regular maintenance. Necessary repairs to the surface will be carried out as soon as reasonably practicable;
- Good housekeeping of roads and surfaces;
- Monitoring of weather forecasts;
- Haul roads will be swept and sprayed with water regularly to prevent the build of dust generating material;
- A wheel wash is implemented near the Site access and all vehicles leaving the site will do so via the wheel wash; and
- Use of bowsers or sprays in dry conditions.

The risks from accidents and incidents is addressed within the ERA and OT documents. The Site will be kept secure to prevent unauthorised access.

4.6 Post-Closure Controls (Aftercare)

The Site will be restored in accordance with the contours shown on Drawing 002 (Construction and Cross Sections) of the WRP, provided in Section 4 of this EP. Following completion of the deposit of material, the Site will be restored in accordance with the detailed restoration plan to be submitted to satisfy condition 26 of Planning Permission CCC/24/078/FUL.

A Closure Plan has not been provided as part of this ESSD report or the wider EP application. The construction of the buttress will be completed in accordance with the plans included within the gained planning permission. Following completion of the deposit for recovery activity, a topographical survey of the buttress will be undertaken to demonstrate the required profile has been achieved. The topographical survey will be provided as part of the application to surrender the EP at the end of the works.

It is considered highly unlikely that there will be differential settlements and structural failure of the Site due to the waste types being used in the buttress construction. As discussed in previous sections of this ESSD report, the waste types are not biodegradable and therefore it is anticipated that there will be no significant settlement.



5.0 Monitoring

5.1 Weather

5.1.1 Obtaining Meteorological Information

Meteorological information will be obtained from the local Met Office reports.

5.1.2 Rainfall

Relevant rainfall data applicable to the Site have been obtained from the Met Office website of UK mapped climate averages for 1991-2020. The average annual rainfall $\geq 1\text{mm/day}$ for the area of the Site is 113.12 days per year, comprising approximately 30% of the year. It is therefore considered that on those days the natural suppression afforded by the rain would eliminate all sources of dust across the Site.

Rainfall is typically lower in the summer months, combined with higher temperatures to increase the drying time of material. The potential for dust generation and subsequent transfer of airborne dust emissions beyond the Site boundary is therefore higher during the summer months.

Table 5-1 Rainfall Statistics

Month	Average Precipitation (mm)	
	Heathrow	Oxford
January 2021	91.6	114.1
February 2021	32.4	55.2
March 2021	24.6	29.5
April 2021	7.2	27.1
May 2021	84.6	94.5
June 2021	88.2	67.3
July 2021	61.2	67.0
August 2021	42.2	34.8
September 2021	52.4	42.1
October 2021	87.6	88.6
November 2021	10.2	15.9
December 2021	71.2	41.4
Annual Total	653.4	677.5
Annual Average	665.45	

The ongoing monitoring of rainfall is not considered to be applicable to operations on the Site. It is noted however that weather conditions will be checked via Met Office forecasts by Site staff to ensure appropriate mitigation measures are enacted to minimise dust emissions from operations e.g. by reducing/ceasing operation in periods of significantly dry weather.



5.1.3 Prevailing Wind Direction and Strength

Wind speed and direction data from the meteorological observation station at Wittering located 22km west of the Site, is considered to be broadly representative of the local Site conditions. A wind rose for Wittering is presented in Figure 5-1.

Figure 5-1 indicates that the prevailing wind direction is from the south-west, with almost 50% of the winds observed from this direction. Approximately only 30% of the wind occurs from the north, east and south collectively. Approximately 25% of the winds were observed from the north-west.

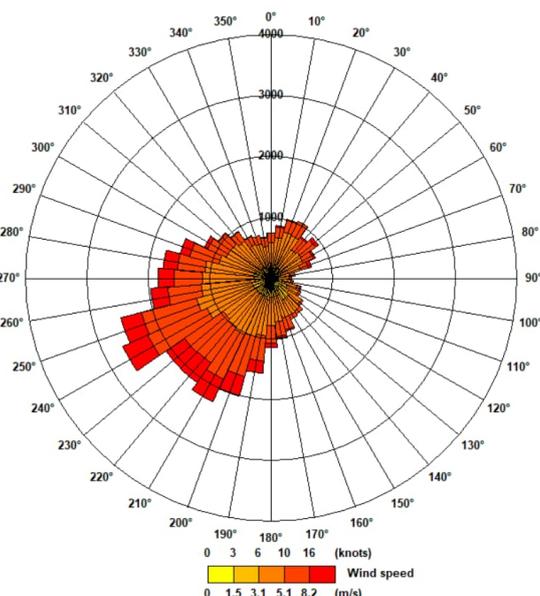


Figure 5-1 Windrose from Wittering Meteorological Station (2015-2019)

Ongoing monitoring of wind speed and direction will be carried out in accordance with the Dust & Emissions Management Plan (DEMP) included in Section 10 of the EP application.

5.2 Leachate Monitoring

Leachate is generated by rainfall infiltrating through deposited waste. Due to the inert nature of the materials that will be accepted at the Site, leachate generated will not contain any hazardous substances or non-hazardous pollutants throughout the lifecycle of the Site. As such, no leachate management or monitoring is proposed.

Strict waste acceptance criteria will be implemented on the Site to ensure that only appropriate waste is accepted on to the Site.

5.3 Gas Monitoring

Gas monitoring is not proposed to be undertaken during the operations, due to the inert nature of the materials being deposited and their lack of biological content and gassing potential. It is considered therefore that gas monitoring infrastructure is not required.

It will be confirmed that no biodegradable waste will be present in the Site through the implementation of strict waste acceptance procedures.



5.4 Groundwater Monitoring

Given the lack of a groundwater pathway or receptor as demonstrated by the HRA, no groundwater monitoring is proposed and as such no groundwater monitoring infrastructure is required.

5.5 Surface Water Monitoring

There is no proposed surface water monitoring under the EP application. It is anticipated that the pending discharge consent for discharges of water from the silt lagoon to the Kings Dyke would provide the appropriate safeguards to protect the receiving water course, inclusive of the contribution from rainfall derived run-off from the proposed activities within this EP application.

5.6 Amenity Monitoring

Amenity monitoring at the Site will consist of daily checks to confirm control measures implemented at the Site are effective. Findings of amenity monitoring will be recorded within the Site Diary. Monitoring will consist of:

- Daily checks of the Site and its boundaries for evidence of windblown litter.
- Continuous visual monitoring by Site operatives to ensure that dust emissions are not leaving the Site boundary
- Continuous audial monitoring by Site operatives to ensure that noise emissions are not excessive by mitigation measures failing. Periodic noise monitoring at nearby residential properties will be undertaken in accordance with the Noise Monitoring Plan.

There are no specific amenity monitoring points defined at the Site for dust and litter. Monitoring can be undertaken at any area of the Site within the EP boundary.

5.7 Topographical Survey

A topographical survey of the buttress will be undertaken once the deposit for recovery activities have been completed to demonstrate the required profile has been achieved. The topographical survey will be provided as part of the application to surrender the EP at the end of the works.

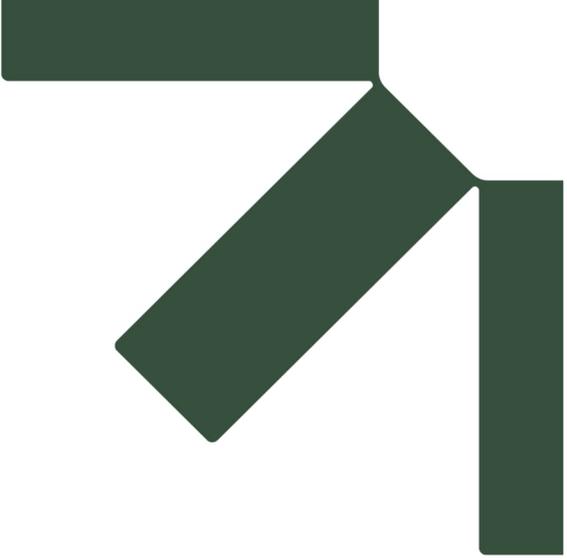


6.0 Conclusion

The overall conclusion from the technical and environmental risk assessments undertaken as part of this EP application is that there is unlikely to be a significant environmental impact as a result of the proposed construction of the stabilisation buttress using imported inert waste.

The Site will operate in accordance with its environmental management system which will continue to ensure that risks are assessed and appropriate control measures are in place.





Appendix A Surface Water Drainage Strategy

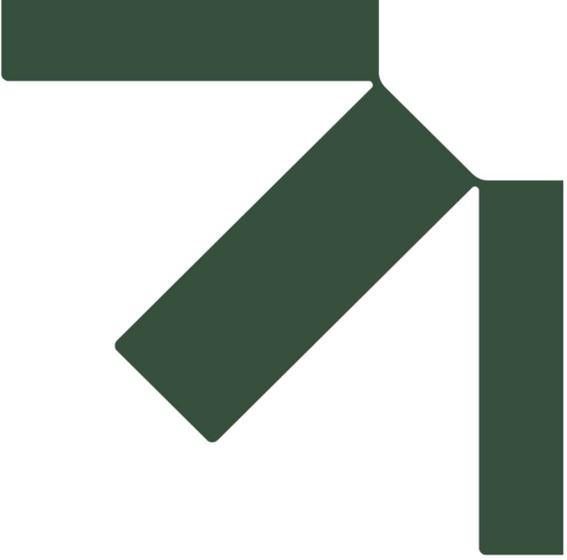
Saxon Pit Southern Buttress Environmental Permit Application

Environmental Setting and Site Design

East Midlands Waste Management Ltd

SLR Project No.: 416.065341.00001

8 May 2025



Appendix B Nature and Heritage Conservation Screen

Saxon Pit Southern Buttress Environmental Permit Application

Environmental Setting and Site Design

East Midlands Waste Management Ltd

SLR Project No.: 416.065341.00001

8 May 2025

Nature and Heritage Conservation

Screening Report: Bespoke Waste

Reference	EPR/FB3406KC/P001
NGR	TL 25781 96976
Buffer (m)	138
Date report produced	14/02/2025
Number of maps enclosed	1

This nature and heritage conservation report

The nature and heritage conservation sites, protected species and habitats, and other features identified in the table below **must be considered in your application**.

In the further information column, there are links which give more information about the site or feature type and indicate where you are able to self-serve to get the most accurate site boundaries or feature locations.

Most designated site boundaries are available on [Magic map](#). Using Magic map allows you to zoom in and see the site boundary or feature location in detail, Magic map also allows you to measure the distance from these sites and features to your proposed boundary. [Help videos](#) are available on Magic map to guide you through.

Where information is not publicly available, or is only available to those with GIS access, we have provided a map at the end of this report.

Protected Species within screening distance

European Eel
European Eel migratory route
European Water Vole

Screening distance (m)

up to 500m

Further Information

[Natural England](#)
[Appropriate Local Record Centre \(LRC\)](#)

Where protected species are present, a licence may be required from [Natural England](#) to handle the species or undertake the proposed works.

The following nature and heritage conservation sites, protected species and habitats, and other features have been checked for, where they are relevant for the permit type requested, but have not been found within screening distance of your site unless included in the list above.

Special Areas of Conservation (cSAC or SAC), Special Protection Area (pSPA or SPA), Marine Conservation Zone (MCZ), Ramsar, Sites of Special Scientific Interest (SSSI), National Nature Reserve (NNR), Local Nature Reserve (LNR), Local Wildlife Sites (LWS), Ancient Woodland, relevant species and habitats.

Please note we have screened this application for features for which we have information. It is however your responsibility to comply with all environmental and planning legislation, this information does not imply that no other checks or permissions will be required.

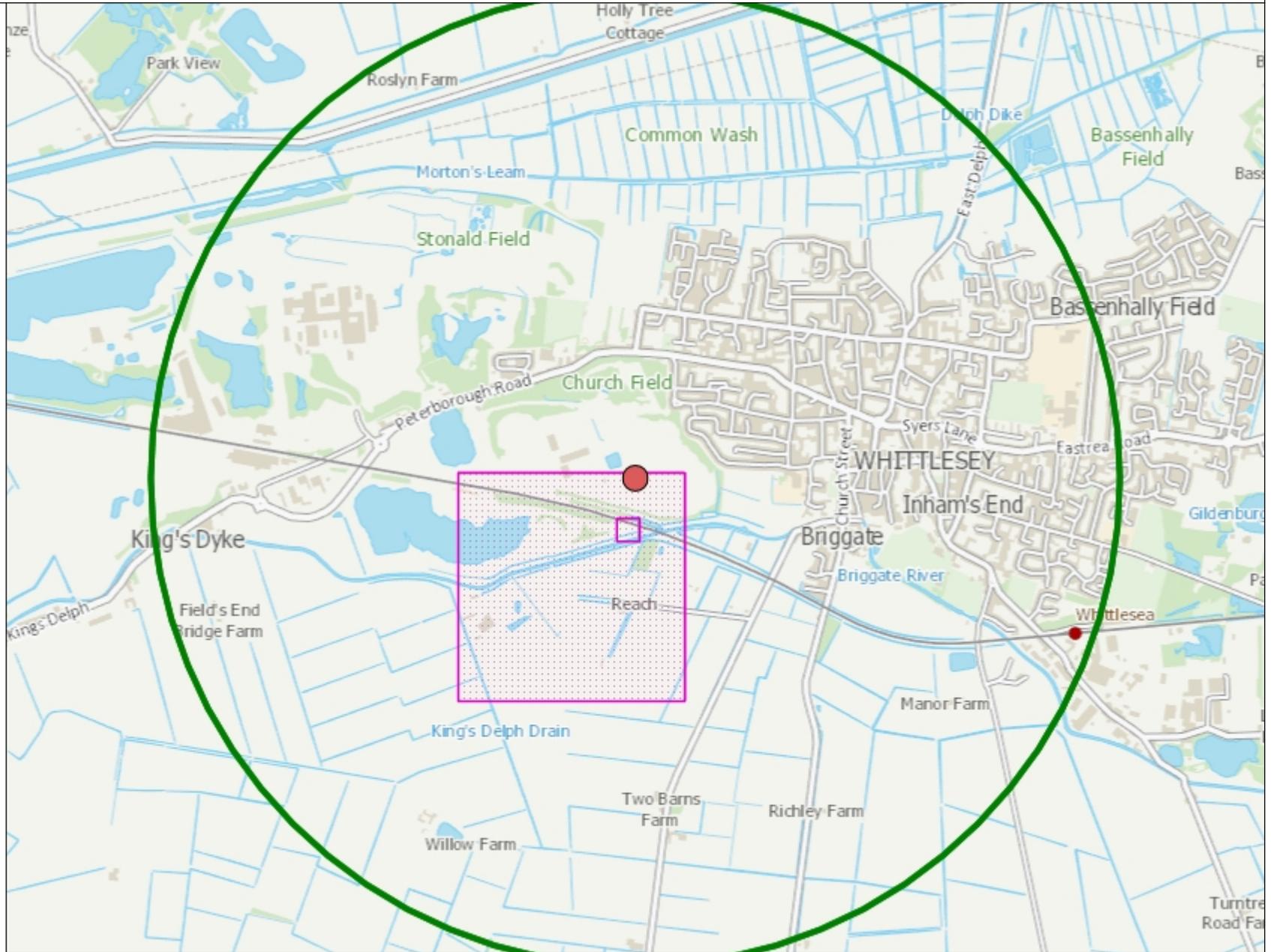
The nature and heritage screening we have conducted as part of this report is subject to change as it is based on data we hold at the time it is generated. We cannot guarantee there will be no changes to our screening data between the date of this report and the submission of the permit application, which could result in the return of an application or requesting further information

Protected Species

Legend

Protected species screened for Env Permits - complete set

-  Protected species, non fish
-  Protected fish
-  Protected fish migratory route
-  Coded



1: 25,000

0 625

Metres





Making Sustainability Happen



Saxon Pit Southern Buttress Stabilisation Works

Surface Water Drainage Strategy

East Midlands Waste Management

Bank House, Broad Street, Spalding, Lincs, PE11 1TB

Prepared by:

SLR Consulting Limited

The Cursitor, 38 Chancery Lane, London, WC2A 1EN

SLR Project No.: 422.064744.00001

Client Reference No: 07764

27 June 2024

Revision: 02

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
01	5 July 2023	Chloe Nelson	Martin Baines	Stephen Muggeridge
02	27 June 2024	Chloe Nelson	Simon Bond	Simon Bond

Basis of Report

This document has been prepared by SLR Consulting Limited (SLR) with reasonable skill, care and diligence, and taking account of the timescales and resources devoted to it by agreement with East Midlands Waste Management (the Client) as part or all of the services it has been appointed by the Client to carry out. It is subject to the terms and conditions of that appointment.

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Appendix B	Greenfield Runoff Rates
Appendix C	Conceptual Surface Water Drainage Strategy
Appendix D	Post Development Runoff Modelling Calculations
Appendix E	Pump Failure Modelling Calculations



Acronyms and Abbreviations

AEP	Annual Exceedance Probability. The probability of a flood occurring in any year expressed as a percentage, or chance, i.e. 1% (1 in 100). This is commonly referred to as a 'Return Period' expressed in years, i.e. a 1% AEP event would be referred to as a 1 in 100 year event.
EMWM	East Midlands Waste Management Limited
FRA	Flood Risk Assessment
IDB	Internal Drainage Board
m aOD	metres above Ordnance Datum. A ground or flood level expressed as a height above the Ordnance Datum located in Newlyn, Cornwall.
MLC	Middle Level Commissioners
NGR	National Grid Reference
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
SWDS	Surface Water Drainage Strategy



1.0 Introduction

SLR Consulting Limited (SLR) has been appointed by East Midland Waste Management Limited (“the client”) to prepare a Flood Risk Assessment for proposed stabilisation works to the Southern Buttress at Saxon Pit, Peterborough Road, Whittlesey (“the site”).

The existing buttress is a predominantly bare face with some vegetated areas at the tip and base of the slope. Anecdotal evidence from the site walkover identified several areas of slippage and failure along the slope. Stabilisation works are critical due to the presence of the existing railway line on the tip of the buttress.

A site layout plan of the development proposals is included in **Appendix A**.

This Surface Water Drainage Strategy (SWDS) has been prepared under the direction of a Technical Director of SLR who specialises in flood risk, drainage and associated planning matters. Reporting has been completed in accordance with guidance presented within the National Planning Policy Framework¹ (NPPF) and its associated Planning Practice Guidance² (PPG), taking due account of current best practice documents published by the British Standards Institution BS8533³ and local planning policies.

1.1 Site Location

The site is centred around NGR TL 25754 97057 and the nearest post code is PE7 1NP. Immediately to the east of the site is the town of Whittlesey. The King’s Dyke flows north east beneath the Ely to Peterborough railway line present to the south to remerge adjacent to the south east extent of the site. The site sits adjacent to a wider waste / aggregate processing plant at the former Hanson Brick Works site.

A location plan of the site is provided below in Figure 1-1.

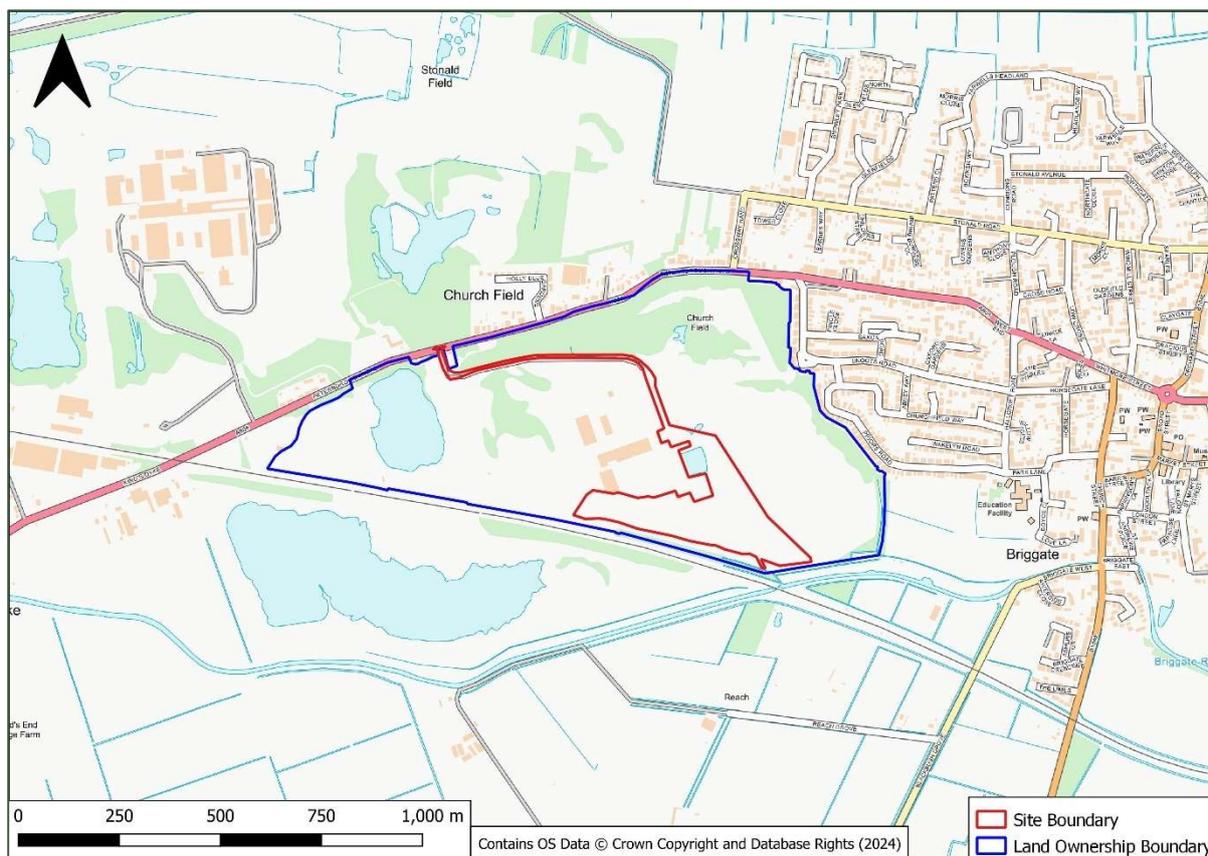
1 Revised National Planning Policy Framework: Communities and Local Government (December 2023)

2 Planning Practice Guidance, Flood Risk and Coastal Change: Communities and Local Government (August 2022)

3 BS8533:2017, Assessing and managing flood risk in development: Code of Practice (2nd Edition, December 2017)



Figure 1-1: Site Location Plan



SLR has been involved in historical stabilisation works at the site since 2008 in which the existing buttress was designed and monitored in order to stabilise the northern and north eastern slopes on site.

Additional stabilisation is now required for the southern buttress due to multiple shallow failures recorded along the slope adjacent to the railway.

1.2 Administrative Context

The proposed development falls within the jurisdiction of both Fenland District Council and Cambridgeshire County Council. The former is the planning authority responsible for determining the outcome of this application, while the latter is the Lead Local Flood Authority (LLFA) which deal with matters relating to localised flood risk and drainage.

The site also falls within the Whittlesey and District IDB district who is supported by the Middle Level Commissioners (MLC), a land drainage authority that is responsible for the maintenance of major watercourses within their catchment. The MLC also provide a planning consultancy service to the IDBs in their district.



2.0 Baseline Site Appraisal

Saxon Pit is an 18m to 27m deep excavation into the Oxford Clay to the south of Peterborough Road (A605). The site is bound to the north by a mixture of scrub and woodland vegetation, residential properties in Whittlesey to the east, the railway line and King's Dyke to the south and operational commercial and storage areas to the west.

Saxon Pit was worked using a shale planing device that extracted the clay in a continuous operation. This left sub-vertical clay faces at the edges of extraction. Generally, these faces are stable in the medium to long term however, the face of Saxon Pit has degraded considerably since clay extraction ceased. It is considered that this is also due to poor drainage in the ground immediately to the east of the pit, as well as unfavourable orientations of joint planes in the Oxford Clay with respect to the face orientation.

Without stabilisation works, the crest of the slope could migrate. Clay and overlying soils could slump down the face to leave a broken, poorly drained landform. Anecdotal evidence from the site walkover noted clear areas of migration / slipping on the southern buttress which has occurred through the previous winter (2022-2023).

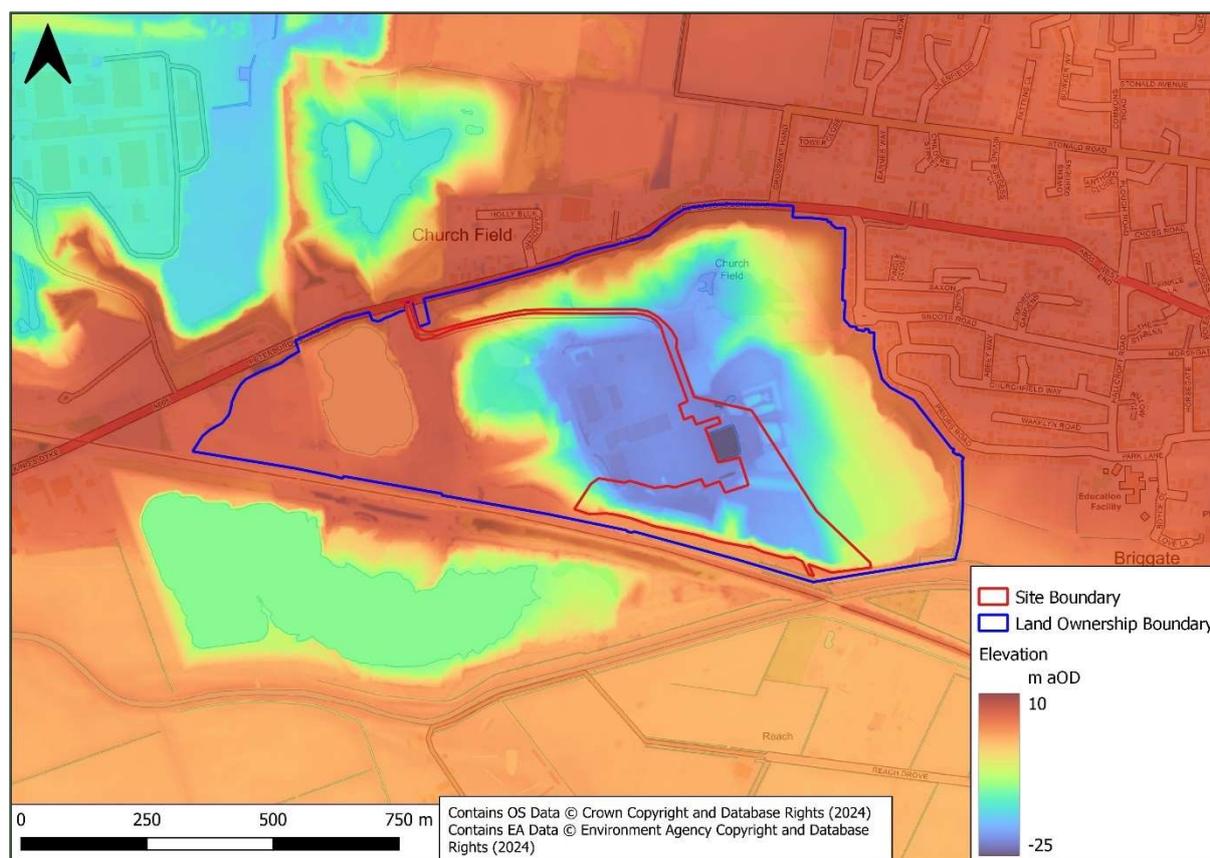
2.1 Topography

Topographic data from on and around the site, gathered using Light Detection and Ranging (LiDAR) aerial photogrammetric techniques, has been downloaded from the Environment Agency open data website⁴ and is included as Figure 2-1. The elevation datum is extrapolated using a Digital Terrain Model (DTM) which is a bare earth model and thus excludes features such as built development and vegetation.

4 Environment Agency open data website <http://environment.data.gov.uk>



Figure 2-1: 1m DTM LiDAR Plot



The LiDAR data presented in Figure 2-1 above indicates that the site is sunken below the surrounding area. Ground levels on the site slope towards the existing lagoon at around -24.7m aOD from 8m aOD at the site access along Peterborough Road.

The railway line to the south is elevated to around 4m aOD which is below the elevation of Peterborough Road at 8m aOD. Water levels in the Kings Dyke on the date of the survey are estimated at around 1.4m aOD.

Low lying land is also present to the south of the railway adjacent to the Kings Dyke, within the Star Pit, to -9.8m aOD. The wider agricultural area is generally low lying, between 0 and 1m aOD, however where residential development is located (i.e., Peterborough (c.11m aOD to the west of the site), Whittlesey (c.7m aOD east of the site) ground levels are markedly raised.

Raised land is present along the southern boundary of the site, adjacent to the reach of the Kings Dike to a minimum elevation of 2.15m aOD.

2.2 Hydrology

The Kings Dyke is culverted beneath the railway line to the south of the site flowing in a north easterly direction. At its closest point, the channel is located c.40m south east of the site and drains an upstream catchment area⁵ of 23.75km². Kings Dyke flows ultimately into the old course of the River Nene c.10km downstream of the site, via Briggate River, Twenty Foot River and Whittlesey Dyke. A significant length of these watercourses are canalised along their reaches. The Kings Dyke is formed via an offtake from the River Nene

5 Flood Estimation Handbook Web Service, UK Centre for Ecology and Hydrology, <https://fehweb.ceh.ac.uk/Map>



(Stanground Lock). Water levels are controlled by the St Germans Pumping Station and the lock gates at Stanground Lock, to sustain a level of c.1.5m aOD which can be managed as required.

The new course of the River Nene is designated as Environment Agency Main River⁶ which, at its closest point, flow eastwards 1km north of the site draining an approximate upstream catchment area^{Error! Bookmark not defined.} of 1,642km². The River Nene rises to the north of Northampton and flows towards Peterborough. The Dog-in-a-Double sluice is located approximately 8km downstream of Peterborough, to the north of Whittlesey, at which point the fluvial Nene meets the tidal reaches of the River Nene. Approximately 40km downstream of the sluice, the River outfalls into the Wash. The tidal reaches of the River Nene are defended by a series of raised earth embankments, with the exception of Wisbech Reach.

The local topography is flat and low lying, with large areas of fenland where the landscape is dominated by drainage channels managed by Internal Drainage Boards. These channels are crucial to maintain the agricultural land use and manage flood risk.

2.3 Geology and Hydrogeology

British Geological Survey Mapping indicates that the bedrock geology at the site comprises of the Oxford Clay formation, which was mined as part of the initial quarry operation at the former Brickworks site. Superficial deposits of the March Gravel Member are noted along the southern buttress and at the site access road entrance off Peterborough Road (A605). Further south and in the south eastern extent of the site, the superficial geology mapping records Peat deposits.

The Environment Agency have designated the Oxford Clay Formation and Peat deposits as an unproductive aquifer, defined as geology with negligible significance for water supply or baseflow to rivers, lakes and wetlands. The March Gravel Member is designated as a Secondary A aquifer, defined as permeable layers which can support water supplies on a local scale and may form an important source of baseflow to rivers.

2.4 Flood Risk

A flood risk assessment for the site to support the planning application has been produced by SLR Consulting.

The flood risk assessment suggests that the site is at risk of flooding from fluvial sources however all other potential sources are considered very low risk.

Assessment of the fluvial flood risk indicates that there are a number of low probability scenarios by which fluvial flooding could occur at the site. None of these scenarios have a qualitative probability assigned to them and instead are deemed a credible worst-case scenario. On this basis, it is not possible to challenge the flood designation on the site. The likelihood of fluvial flooding occurring is however considered low.

In terms of planning, the site is still designated as Flood Zone 3 however the proposed development does not alter the prevailing flood risk or flood vulnerability of the site. Once stabilisation works are complete, any flooding at the site would not impact the proposed development.

6 Statutory Main River Map, including Main River Map changes, Environment Agency, <https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a563>
86



3.0 Surface Water Drainage Strategy

This surface water drainage strategy sets out high level principles for managing storm water on the site in line with best practice and the requirements of Cambridgeshire County Council, the LLFA for the area. The strategy has been produced in support of the planning application and is in accordance with the pre-application letter provided by Cambridgeshire County Council in relation to drainage, document reference PREFR/23-000002 dated 17/03/2023.

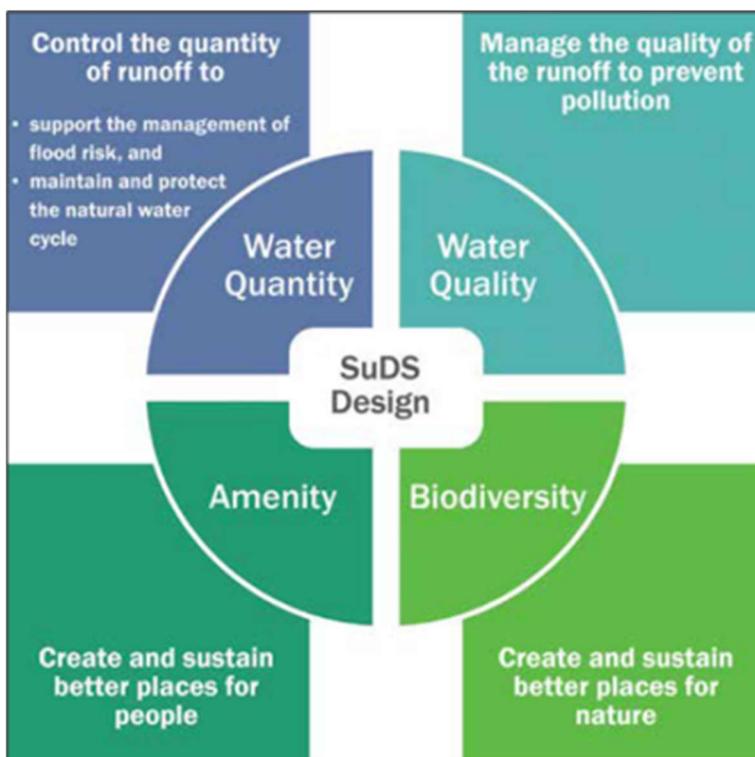
This strategy is intended to demonstrate that, given the nature and quantum of development proposed, it will be feasible to drain the site in line with planning requirements.

3.1 Key Principals of Surface Water Management

3.1.1 Overview

Current best practice guidance document; The Sustainable Drainage System (SuDS) Manual (CIRIA Report C753)⁷, promotes sustainable water management through the use of SuDS. There are four main categories of SuDS which are referred to as the ‘four pillars of SuDS design’ as depicted in **Error! Reference source not found.**

Figure 3-1: Four Pillars of SuDS (extract from CIRIA Report C753)



The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a ‘management train’. The hierarchy of techniques is identified as:

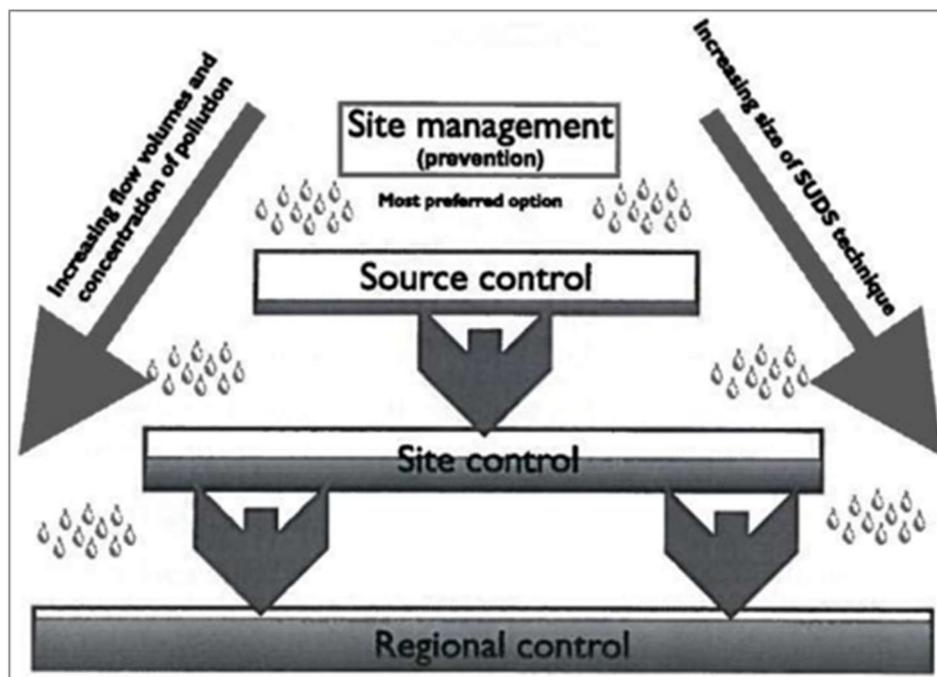
- **Prevention** – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
- **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting).

7 Report C753, The SuDS Manual; CIRIA (2015). Report C753, November 2015.



- **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site).
- **Regional Control** – management of runoff from several sites, typically in a retention pond or wetland.

Figure 3-2: SuDS Management Train



It is generally accepted that the implementation of SuDS, as opposed to conventional drainage systems, provides a number of benefits by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- Reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- Reducing potable water demand through rainwater harvesting;
- Improving amenity through the provision of public open spaces and wildlife habitat; and replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

3.1.2 National Policy Context

Current national planning policy guidance and best practice, namely NPPF and PPG, require development proposals in all Flood Zones to seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of SuDS.



3.1.3 Local Policy and Guidance

The Fenland Local Plan⁸ contains the policies and broad locations for the growth and regeneration of Fenland, setting out the strategic vision for the district over the next 20 years.

Relevant policy from the Local Plan is reproduced below.

Policy LP14 – Responding to Climate Change and Managing the Risk of Flooding in Fenland

Part (A) Resource Use, Renewable Energy and Allowable Solutions

Resource Use:

In order to address the following:

- (a) the urgent need to combat the causes of, and adaptation to, climate change;*
- (b) the chronic levels of fuel poverty in selected parts of the district;*
- (c) the need to compensate for the embodied energy of new buildings;*
- (d) the need to create local jobs in Fenland;*
- (e) the increasing need to use water more efficiently;*
- (f) the desire to develop skills and experience in the ‘green economy’;*
- (g) the desire to minimise, as a result of new development, the need for costly and resource intensive upgrades and capacity increases to the wider power infrastructure network, and*
- (h) the need, generally, to upgrade existing dwellings to better energy performance (acknowledging the fact that 85% of today’s existing, mostly energy inefficient, homes in the UK will likely still be in existence in 2050),*

The Council will expect all developments of one dwelling or more, or 100 sq m or more for non-dwellings, to explicitly demonstrate what reasonable contribution the development will make towards minimising resource consumption above and beyond what is required by Building Regulations and/or other standard planning policies.

To meet this policy requirement will be a matter for negotiation. However, in order to assist developers in meeting the ‘reasonable contribution’ test, the Council will prepare and maintain a Resource Use based SPD which will set out a cost-effective and viable set of options for the developer.

All developments (dwellings and non-dwellings) are encouraged to incorporate on site renewable and/or decentralised renewable or low carbon energy sources, water saving measures and measures to help the development withstand the longer term impacts of climate change.

Renewable Energy:

Renewable energy proposals will be supported and considered in the context of sustainable development and climate change. Proposals for renewable energy technology, associated infrastructure and integration of renewable technology on existing or proposed structures will be assessed both individually and cumulatively on their merits taking account of the following factors;

- *The surrounding landscape, townscape and heritage assets*
- *Residential and visual amenity*
- *Noise impact*
- *Specific highway safety, designated nature conservation or biodiversity considerations*
- *Aircraft movements and associated activities*
- *High quality agricultural land*

8 Fenland Local Plan, Fenland District Council, Adopted May 2014



The granting or refusal of planning permission for wind turbines will be informed by up-to date local evidence and, if produced as anticipated, a Resource Use Supplementary Planning Document.

Renewable energy proposals which will directly benefit a local community in the medium and long term and/or are targeted at residents experiencing fuel poverty will be particularly supported.

Allowable Solutions:

Development proposals will, through Building Regulations or other regulations, need to meet all or the majority of their required reduction of carbon emissions on-site. Where these cannot be fully met on-site, and where a lawful mechanism exists to do so, the Council will be prepared to accept, as an 'allowable solution', a financial contribution to make up the difference. To implement this policy the Council intends to participate in a local offset fund, such as a Community Energy Fund. The contribution will be used to finance renewable energy projects within the local area identified through the Cambridgeshire Carbon Reduction Infrastructure Framework (CRIF) or subsequent updates or similar approaches.

Part (B) Flood Risk and Drainage

The granting or refusal of planning permission on sites will be informed by:

- *Fenland Detailed Stage 2a Water Cycle Study [2011]*
- *Fenland Level 1 SFRA (District Wide) [2011]*
- *Fenland Level 2 SFRA (Wisbech) [2012]*
- *Cambridgeshire Surface Water Management Plan [2011]*
- *Middle Level Strategic Study [2004]*
- *Any subsequent additional or updated SFRAs, Surface Water Management Plans,*
- *Catchment Studies, and Water Cycle Studies*
- *Any national advice in force at the time*

All development proposals should adopt a sequential approach to flood risk from all forms of flooding. Development in areas known to be at risk from any form of flooding will only be permitted following:

- (a) *the successful completion of a sequential test (if necessary), having regard to actual and residual flood risks*
- (b) *an exception test (if necessary),*
- (c) *the suitable demonstration of meeting an identified need, and*
- (d) *through the submission of a site specific flood risk assessment, demonstrating appropriate flood risk management and safety measures and a positive approach to reducing flood risk overall, and without reliance on emergency services.*

In addition to the requirements of the NPPF and associated technical guide, all applications for relevant developments must include a drainage strategy to demonstrate that:

- (a) *suitable consideration has been given to surface water drainage;*
- (b) *appropriate arrangements for attenuating surface water run-off can be accommodated within the site; and*
- (c) *issues of ownership and maintenance are addressed. For foul drainage private infrastructure managed by residents groups or management companies should be avoided.*

The use of Sustainable Drainage Systems (SuDs) will be required to ensure that runoff from the site (post development) is to Greenfield runoff rates for all previously undeveloped sites and for developed sites (where feasible). This should include sufficient area within the site to accommodate SuDS for the short term management of surface water drainage and where appropriate link to green / blue infrastructure to exploit opportunities for biodiversity, environmental, heritage, social and recreational



enhancement and value. Schemes should complement the aims of the Cambridgeshire Green Infrastructure Strategy but should be retained and maintained primarily for the purpose for which they were designed, whilst being sensitive to the multi-functional benefits they can provide.

The most appropriate SuDS techniques should be used depending on the particular circumstances of the site and area. Consideration should be given to the facility to be used, what is trying to be achieved, and the nature of water level management in the area.

The discharge of surface water from developments should be designed to contribute to an improvement in water quality in the receiving water course or aquifer in accordance with the objectives of the Water Framework Directive.

All proposals should have regard to the guidance and byelaws of the relevant Internal Drainage Board, including, where appropriate the Middle Level Strategic Study and should help achieve the flood management goals from the River Nene and Great Ouse Catchment Flood Management Plans.

A Supplementary Planning Document informed by up-to-date national and local evidence and to be adopted in 2014 will be used to further assess planning applications on flood risk and drainage matters.

Cambridgeshire County Council in their role as the LLFA have produced a Surface Water Planning Guidance⁹ document to support developers and consultants in the preparation of surface water drainage documents for planning applications.

Discharging to Watercourse

If it is proposed to discharge into a watercourse within the site boundary this should be shown on a plan. We will require evidence that the watercourse itself has an outfall and is in a suitable condition to receive surface water:

- Photographs at appropriate intervals along the watercourse should be provided to determine the condition of the watercourse.
- An approximate assessment of channel capacity based on its dimensions could be undertaken to determine the capacity of the watercourse. As a worst-case scenario, the smallest part of the watercourse should be assessed.
- Evidence of a final effective outfall can include desktop traces to show the physical presence of the watercourse.

The lack of detailed information on these grounds may increase the level of uncertainty we have about the effectiveness of a drainage strategy. If this degree of uncertainty is great then as LLFA we would have grounds to object to the drainage proposal.

If the site discharges into a third-party asset such as an IDB drain under non-standard conditions (e.g. a higher rate of discharge), agreements outlining this should be provided before we are able to approve the proposal.

Appendix B provides a list of information sources relating to potential ownership/management of watercourses.

Existing Runoff Rates

We require calculations of the existing peak runoff rates (l/s/ha) for the following storm events:

- 100% Annual Exceedance Probability (AEP) (1 in 1)
- 3.3% AEP (1 in 30)
- 1% AEP (1 in 100)

⁹ Surface Water Planning Guidance, Cambridgeshire County Council, April 2024, <https://www.cambridgeshire.gov.uk/asset-library/Surface-Water-Planning-Guidance.pdf>



Consideration should be given to sub-catchments that may exist on site and individual calculations should be provided per sub-catchment where appropriate.

Proposed Runoff Rates

We require the rate of runoff from a development to be restricted in line with the SuDS Non-Statutory Technical Standards.

Brownfield (previously developed land) sites must reduce the existing runoff from the site as part of the redevelopment. In order to provide betterment, redevelopments should look to reinstate greenfield runoff rates.

Existing Runoff Volumes

We require calculations of the existing peak runoff volumes (m^3/ha) for the following storm events using FEH rainfall data:

- 100% Annual Exceedance Probability (AEP) (1 in 1)
- 3.3% AEP (1 in 30)
- 1% AEP (1 in 100)

Proposed Runoff Volumes

Runoff volumes from the developed site will usually increase in comparison to the site in its natural condition; this may increase flood risk in natural receiving systems. Controlling the volume of runoff from the site is therefore vital to prevent flood risk in natural systems.

The volume should, where reasonably practicable be controlled, in accordance with the following.

Greenfield Sites: The runoff volume from the development site to any surface water body or sewer in the 1% AEP (1 in 100), 6 hour rainfall event should not exceed the greenfield runoff volume for the same event.

Previously Developed Sites: The runoff volume from the development site to any surface water body or sewer in the 1% AEP (1 in 100), 6 hour rainfall event must be constrained to a value as close to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the existing site. Where it is not reasonably practicable to constrain the volume of runoff, the runoff volume must be discharged at a rate that does not adversely affect flood risk.

Required Volume of Attenuation

An assessment of the volume of attenuation storage on site is required. This should be based on the 1% AEP plus climate change storm event and allowable discharge rate for the site. The method and volumes of attenuation should be identified and located on a plan of the proposed development.

Hydraulic Calculations

Calculations to show the performance of the system for a range of summer and winter storm durations from 15 minutes up to the 10080 minute (7 day) should be undertaken. For storm durations less than 1 hour, Flood Studies Report (FSR) rainfall data should be used. For storm durations greater than 1 hour, Flood Estimation Handbook (FEH) rainfall data should be used. FEH data must be used in these longer duration storms as it uses more up to data rainfall data and is more accurate for the purpose of modelling the future storm events over other data sources such as FSR for the larger duration storms. The FEH22 rainfall model supersede the FEH99 and FEH13 models. FEH22 is a major update of the previous FEH13, which now incorporates revised data, methods, and software. Whilst FEH13 is acceptable, FEH22 is preferred.



Full network hydraulic calculations are required for a suitable review of the proposed system. These should show the full pipe network and results for the 100%, 3.3% and 1% Annual Exceedance Probability (AEP) storm events.

For the critical 100% and 50% AEP rainfall events there should be no surcharging of the system, with the exception of any proposed flow control device/s.

For the critical 3.3% AEP rainfall event including an allowance for climate change, there should be no above ground flooding.

For the 1% AEP rainfall event including an allowance for climate change some short term above ground flooding may be permitted. It should be demonstrated that flood water is below 300 mm from the buildings finished floor levels and does not disrupt emergency access routes.

In line with best practice self-cleansing pipe velocities should be 1.0m/s with a minimum acceptable self-cleansing velocity of 0.75m/s to avoid the risk of blockages.

The MADD Factor should be set to 0 to avoid underestimating volumes entering the drainage network. Default settings assume that surface water is lost or stored elsewhere on site before entering the drainage network. A conservative approach should be taken to ensure that the proposed development provides the maximum level of storage for all rainfall events.

As hydraulic modelling is for the proposed impermeable areas across the site, Cv values should be set to 1 to account for the total runoff during storm events. Cv values of 0.84 and 0.75 for winter and summer storms respectively were justified in a paper in the 1990s based on the original runoff model in the Wallingford Procedure which was issued in 1983. This has since shown to under-predict runoff for large rainfall events and has therefore been rendered obsolete

Water Quality

Surface water discharging from the site must be treated appropriately (in accordance with the Simple Index Approach) to ensure there is little risk to polluting of surrounding groundwater, watercourses, water bodies or sewer systems. A treatment train should be formed to provide a range of different phases of surface water treatment. Chapter 26 of the CIRIA SuDS Manual (C753) outlines the pollution hazard indices. Surface water should meet these indices through the use of SuDS before discharge from the site.

Consideration should be given to surface water drainage from the highway and surface water treatment of these surfaces should also be in line with the principles set out in the CIRIA SuDS Manual. For most residential developments this will be classed as a lightly trafficked road and therefore surface water treatment must meet the corresponding pollution hazard indices.

It should be noted that features such as offline basins do not provide treatment for the longer return period storms before controls are exceeded directing surface water into these features. Therefore, systems which include features such as offline basins must meet the surface water treatment within the system for runoff from these lower return period storms.

Pumping

If it can be demonstrated that a partial or completely pumped drainage system is the only viable option we would require that the residual risk of flooding due to the failure of the pumps be investigated. We would require that the flood level be determined under the following conditions:

- The pumps were to fail; and
- The attenuation storage was 50% full; and



- The 1 % AEP +40% climate change event occurred

The pump failure modelling should be supported by an exceedance flow plan based on the topographic levels of the site to demonstrate the volume, depth and flow direction of flood water. The floor levels of the affected properties must be raised above this level and all flooding must be safely stored onsite.

3.2 Climate Change

In February 2016, the Environment Agency issued updated guidance on the impacts of climate change on flood risk in the UK to support NPPF¹⁰. This advice, which was most recently updated in May 2022, sets out that peak rainfall intensity, sea level, peak river flow; offshore wind speed and extreme wave heights are all expected to increase in the future as a result of climate change. Consideration of the changes to these parameters should use the allowances outlined below based on the anticipated lifetime of the development.

The guidance acknowledges that there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, the document provides estimates of possible changes that reflect a range of different emission scenarios. Updates issued in December 2019 brought the advice in line with the finding of UK Climate Projections 2018 (UKCP18).

Only changes to peak rainfall as a result of climate change are appropriate in this drainage assessment.

3.2.1 Anticipated Lifetime of Development

This application proposes a 100-year operational lifetime.

3.2.2 Peak Rainfall Intensity

For peak rainfall intensity the PPG guidance states that flood risk assessments should assess both the ‘central’ and ‘upper end’ allowances to understand the range of impacts. As detailed in Table 3-1, and assuming a development lifetime of 100-years, this equates to uplifts of 35% and 40% respectively.

Table 3-1: Old Bedford and Middle Level Management Catchment Peak Rainfall Allowances

River Basin Management Catchment	Allowance Category	AEP (%)	Total potential change anticipated for 2050s	Total potential change anticipated for 2070s
Old Bedford and Middle Level	Upper End	3.3	35%	35%
	Central		20%	25%
	Upper End	1	40%	40%
	Central		20%	25%

3.3 Existing Surface Water Drainage Regime

The site is an existing buttress and any rainfall onto the landform flows overland to the north in line with the prevailing topography. Due to the slope on the buttress and limited vegetation

¹⁰ Environment Agency, Flood Risk Assessments: Climate change allowances. February 2016, Updated July 2021



cover (see Photograph 3-1), the percentage of rainfall which runs off the slope is assumed to be high, with little interception provided by vegetation. Runoff from the buttress is assumed to eventually end up in the existing lagoon at the low point within Saxon Pit.

Photograph 3-1: Existing Buttress Landform



3.3.1 Greenfield Runoff Rates

Greenfield runoff rates for the southern buttress area of the site have been estimated through application of the Revitalised Flood Hydrograph Model (ReFH2). ReFH2 is recommended by the Environment Agency as the methodology for estimating flood peaks and hydrographs for small catchments¹¹.

The ReFH2 method is applied using software 'The Revitalised Flood Hydrograph' modelling tool.

In addition to the FEH parameters (obtained from FEH webservice for 1km grid) the following parameters were incorporated:

- Southern Buttress Area: 3.41ha

These parameters have been reviewed with understanding of the local geological context and are considered suitable for the pre-development drained area (i.e., when the buttress was flat land).

The greenfield runoff results are summarised in Table 3-2 and full results are included as Appendix B.

¹¹ Environment Agency, Estimating flood peaks and hydrographs for small catchments: Phase 1, Project: SC090031, May 2012



Table 3-2: Greenfield Runoff Rates

Annual Probability	Greenfield Runoff Rate (l/s/ha)	Southern Buttress Area Runoff Rate (l/s/3.41ha)
100%	0.9	3.1
50%	1.0	3.4
3.3%	2.4	8.2
1%	3.4	11.6

3.3.2 Existing Runoff Rates

The existing site is a buttress slope which has undergone a series of stabilisation works. Following each stabilisation process, the slope of the buttress has changed and vegetation has been allowed to rewild to enhance slope stabilisation.

Pre-development of Saxon Pit, the buttress would have been a relatively flat landform, equivalent to the local area. The existing site is therefore a restored formation and greenfield runoff rates will effectively underestimate the rates of runoff discharging from the slope.

The National Coal Board Nomogram can be used to determine runoff co-efficient based on soil type, ground slope and vegetation cover.

Assuming a ground slope of 0.49 (taken using LiDAR data), Clay soil and short grass / grass tip cover, a runoff coefficient of 0.9 is derived for the site, generating an effective impermeable area of 3.07ha.

The simplified rational method has been used to estimate the brownfield runoff rate from the buttress using the effective impermeable area of 3.07ha.

$$Q = ciA$$

Where Q is the runoff rate; c is the runoff coefficient¹², i is the rainfall intensity¹³ and A is the effective impermeable area¹⁴.

The estimated existing runoff rates from the buttress area are summarised in Table 3-3.

Table 3-3: Existing Runoff Rates

Annual Probability	Rainfall Depth (mm)	Runoff Rate (l/s)
100%	19.77	28.1
50%	25.85	36.7
3.3%	52.00	73.9
1%	67.80	96.4

3.3.3 Lagoon Drainage Regime

It is understood that at present, all flows shed from the site discharge overland into the existing lagoon within Saxon Pit. The lagoon has capacity for 10,040m³ of water and is

12 Runoff coefficient 0.9 as derived using the National Coal Board Nomogram

13 For a 6-hour storm duration using the flood estimation handbook web service, FEH 2022 DDF modelling

14 Effective Impermeable Area: 3.07ha



approximately 3.5m in depth. Water depths in the pit are maintained at around 2.0m-2.5m to ensure 1.5m freeboard within the lagoon.

Flows from the existing lagoon are pumped to King's Dyke to the south east of the site, discharging through a reedbed before diffusely entering the watercourse. The pump used is a Sulzer J405HD, with a head value of c.25m (which is the height it must pump from the lagoon into the reedbed and King's Dyke from the crest of Saxon Pit), the pump flow rate is approximately 52.8/s or 190m³/hour. It is understood that there are back up pumps across the site used in times of flood.

The applicant is currently undergoing a permitting process for the continued use of the pump and discharge into King's Dyke. The current situation works (and has for a number of years) with no issues and the pump and outfall are clearly in a suitable condition to discharge and receive surface water. The diffuse discharge of water through the reed bed system ensures a consistent supply of water to aquatic habitat whilst providing improvement to water quality.

3.4 Constraints on the Use of SuDS

3.4.1 Topography

Due to the nature of the site development and its topography (steeply sloping), drainage can only be provided at the base of the formation. It is not possible to intercept flow along the slope other than through the use of vegetation.

3.4.2 Spatial Constraints

There is limited available space at the base of the slope due to the presence of industrial facilities within Saxon Pit. Open SuDS features with a large surface area would therefore not be appropriate at the site.

3.4.3 Geology

The site was formerly used for clay quarrying meaning that the permeability of the soils is generally very low. This is supported by a continuous body of water present in the existing lagoon which does not benefit from infiltration to ground, nor does this receive groundwater inflow.

Due to low permeability geology, the potential for discharging surface water runoff to ground is very low.

3.4.4 Hydrology

The King's Dyke is present to the south of the site and currently receives site flows via a pump from the existing lagoon which outfalls into a reed bed by which flows dissipate into the watercourse. This lagoon is currently the receptor for current flows from the southern buttress.

The King's Dyke is elevated above the site and therefore drainage into this network is only possible through the use of pumps. At present, there is one discharge point in the southeast of the site which pumps into the King's Dyke from the lagoon. It is thought that retaining this discharge mechanism without the need for a new outfall and extra permitting is most preferable.

3.5 Proposed Catchment Area Schedule

For purposes of the drainage calculations, the proposed areas contributing to runoff have been extracted from the development masterplan (Appendix A). The proposed contributing



area also includes the surface area of any open SuDS features which may be required for the proposed development drainage and are summarised in Table 3-4 below.

Previous drainage investigations have been undertaken on Saxon Pit with regards to stabilisation works on the eastern buttress. This reporting is contained within a letter to the client dated 05 July 2022, SLR Ref: 422.V07764.00001. The contributing catchment area from the eastern buttress from this report is 10.2ha. A runoff coefficient of 1.0 will be applied to this area as the value of 10.2 was used in the original modelling.

As the southern buttress itself is not entirely impermeable (restoration of a landform with planting), an effective impermeable area of 0.9 is applied as per Section 3.3.2. Whilst changes to vegetation cover and shallowing of slope may occur through the redevelopment process, these changes have not been confirmed and therefore this drainage strategy will conservatively use the current higher 0.9 runoff coefficient figure. A runoff coefficient of 1.0 is applied for all opens SuDS as this accounts for direct rainfall into the feature with no interception.

There will be no alterations to the existing catchments through the site redevelopment. All site derived flows will still discharge into the lagoon.

Table 3-4: Catchment Area Schedule

Land Use	Area (ha)	Effective Impermeable Area (ha)
Eastern Buttress	10.20	10.20
Southern Buttress	3.41	3.07
Swale	0.50	0.50
Lagoon	0.40	0.40
Total	14.51	14.17

3.6 Conceptual Surface Water Drainage Strategy

The proposed drainage strategy will manage surface water runoff as close to the source as possible within the confines of the site for the 1% AEP event, plus a 40% accommodation for climate change.

It is proposed that runoff from the southern buttress will utilise the existing on-site drainage scheme whereby all flows from the lagoon are pumped into a reedbed which diffusely outfalls into the King's Dyke. At present, flows which are shed from the existing southern slope face eventually end up into the lagoon however runoff is unrestricted and when flowing overland can result in shallow ponding. The proposed drainage strategy utilises a swale at the base of the proposed slope to intercept, attenuate and convey flows which are shed from the southern buttress into the lagoon. This provides two tiers of treatment in line with the Simple Index Method.

In accordance with the requirements of Cambridgeshire County Council, modelling must be undertaken to demonstrate flood depths for coincidental events of pump failure, when the site drainage is at 50% capacity followed by a 1 in 100 year plus 40% climate change event. Analysis of this events predicts 308mm of shallow flooding across the base of Saxon Pit. This would be standing water which has very low velocity. This residual risk of flooding is also very low due to regular maintenance and servicing of the existing pumps and availability of back up pumps available elsewhere on the site. We would however recommend that a duty/standby set up pump is provided at the site.

The drainage strategy proposed allows for a more controlled solution within the confines of the site without increasing discharge rates into the King's Dyke. The strategy presented



here will be subject to detailed design and relevant approvals before construction commences.

A conceptual surface water drainage drawing, which also identifies the pump outflow route, is provided as Appendix C.

3.7 SuDS Assessment of Drainage

3.7.1 Attenuation Storage

Temporary storage volumes required within the drainage system have been estimated using the Source Control function in the WinDes software¹⁵. These are considered an appropriate methodology for planning and master planning purposes.

It is envisaged that a new length of swale will be placed at the base of the southern buttress which will convey flows into the lagoon. The inflow to the lagoon will therefore consider the runoff from both the southern and eastern buttresses.

The modelling has been undertaken using the cascade function in Source Control whereby the outflow from the swale flows into the lagoon.

The following parameters have been incorporated into the modelling:

Swale

Impermeable Area: 3.57ha (3.07ha buttress effective impermeable area; 0.50ha swale surface area)

- Cover Level: -21.0m aOD
- Invert Level: -22.5m aOD
- Base Width: 2.0m
- Side Slope: 1:3
- Length: 450m

Orifice Outflow Control

- Invert Level: -22.5m aOD
- Diameter: 0.10m
- Coefficient of Discharge: 0.6

It should be noted that the dimensions of a swale put forward by Cambridgeshire County Council (Section 3.1.3) have been considered however would not provide sufficient attenuation from the site. This swale is under private control and is not accessible to the public and therefore its size and side slope are considered acceptable.

Lagoon

Impermeable Area: 10.6ha (10.2ha Eastern Buttress, 0.4ha lagoon surface area)

- Cover Level: -21.0m aOD
- Invert Level: -24.5m aOD
- Surface Area: 4000m²

¹⁵ Innovyze, Inc. MicroDrainage, Version 2020.1



Pump Outflow Control

- Invert Level -24.5m aOD
- Pump Rate: 52.8/s

We would note that the modelling of the lagoon has effectively decreased the standing water level in the lagoon to -24.5m aOD. It is understood that at present, the standing water level is above this (c.-22.5m aOD) however modelling of this scenario with inflows from the southern buttress drainage predicts flooding from Saxon Pit. Standing water levels within Saxon Pit therefore need to be reduced by 2m in line with the drainage modelling.

3.7.2 Performance

The lagoon and swale will provide attenuation of stormwater from the southern buttress for the critical 1% AEP event plus a 40% climate change uplift.

Results from the modelling are provided as Appendix D and summarised in Table 3-5 below. The modelling demonstrates sufficient capacity within the drainage network to attenuate flows from the proposed development.

Table 3-5: SuDS Performance – Attenuation Volumes

SuDS Feature	Annual Probability (%)	Critical Event	Peak Water Depth (m)	Maximum Discharge Rate (l/s)
Swale	1 + 40% CC	720 min Winter	1.492	25.1
Lagoon	1 + 40% CC	960 min Winter	3.423	52.8

The volume of runoff will mimic the existing regime using the same pumped rate of 52.8l/s. Runoff rates and volumes from the site as a result of the proposed development therefore will not increase. Attenuation is provided for all events up to and including the 1% AEP plus 40% climate change.

3.8 Pump Failure

Cambridgeshire County Council require modelling of the following coincidental events:

- The pumps were to fail;
- The attenuation storage was 50% full; and
- The 1 % AEP +40% climate change event occurred

We would note that the likelihood of pump failure on the site is very low given that back up pumps are available (Section 3.3.3) and regular maintenance and servicing of the pump is complied with.

In order to derive actual flood levels on the site, we have assumed that the wider low-lying area around the lagoon below -20m aOD (assuming maximum flood depth of 1m) is approximately 70,000m².

The outputs of the pump failure modelling are provided as Appendix E and summarised in Table 3-6 below. The model outputs summarised in Table 3-6 are for the 24-hour storm. This is considered more than sufficient time for back up pumps to be mobilised on site.

The swale has been modelled to effectively form the inflow and overflow into the lagoon. The pump failure modelling predicts a combined flood volume of 15,802.5m³. It is envisaged that the flood volume would be dissipated across the surface area at the base of the void which



is approximately 70,000m²; equating to an approximate flood depth of 0.226m of ponded water with low velocity (i.e., it is not freely flowing).

Table 3-6: 24-hour Pump Failure Scenario

SuDS Feature	Annual Probability (%)	Flooded Volume (m ³)
Swale	1 + 40% CC	2306.8
Lagoon	1 + 40% CC	13495.7

3.9 SuDS Assessment of Water Quality

SuDS provide a number of water quality benefits, and the proposed surface water management system uses a swale for conveyance, attenuation and settlement/filtration of stormwater flows. A lagoon (pond) is also used for attenuation and settlement/filtration purposes.

The simple index method, as outlined within the SuDS Manual, provides a way of quantifying the benefit to water quality of the SuDS Management Train. The pollution hazard from the proposed development and the mitigation from the SUDS component are each assigned an index. The total mitigation index must be greater than the pollution hazard index for adequate treatment to be delivered.

$$\text{Total SuDS mitigation index} \geq \text{pollution hazard index}$$

(for each contaminant type) (for each containment type)

The total SUDS mitigation is the summation of the first components mitigation index and half the mitigation index of any subsequent component in the treatment train.

With reference to the SuDS Manual, post-development surface water runoff generated from the southern buttress is considered to have a 'Low' *Pollution Hazard Level* as presented in Table 3-7.

Table 3-7: Pollution Hazard Potential of the Proposed Development

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Buttress (i.e., infilled ground / vegetated earth)	Very Low	0.2	0.2	0.05

The proposed drainage system is required to demonstrate sufficient treatment capability to manage the specified Pollution Hazard Indices. Flows from the southern buttress will be routed through a swale and lagoon (pond) prior to discharge into the King's Dyke.

The SuDS mitigation indices for the Proposed Development is provided in Table 3-8.



Table 3-8: SuDS Mitigation Indices for the Proposed Development

SuDS Component	Mitigation Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Swale	0.7	0.6	0.7
Pond	0.4	0.4	0.4

Table 3-9 compares the SuDS Mitigation Indices, provided by the proposed ‘Source Control’, ‘Conveyance’ and ‘Site Control’ measures against the Pollution Hazard Indices.

Table 3-9: SuDS Performance: Water Quality Indices

Land Use	Pollution Hazard Level	Pollution Hazard and SuDS Mitigation Indices Comparison					
		Total Suspended Solids (TSS)		Metals		Hydrocarbons	
		Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index	Pollution Index	SuDS Mitigation Index
Buttress (i.e. infilled ground / vegetated earth)	Very Low	0.2	0.9	0.2	0.8	0.05	0.9

SuDS Mitigation Index = Swale + 0.5 Pond

As the SuDS Mitigation Index provided by the proposed SuDS measures are \geq Pollution Hazard Index the water quality assessment criteria are satisfied for the site.

3.10 SuDS Operation and Maintenance

A full SuDS maintenance plan would be produced as part of the detailed drainage design post-development and the precise requirement would depend on manufacture specification of the final design. The maintenance of the drainage network would be the responsibility of the site owners and / or operators. This could be secured as an appropriately worded planning condition.

An outline of the typical maintenance requirements of the swale is provided below in Table 3-10. The lagoon and pimp will remain as existing, and all associated maintenance and management protocols will be complied with.

Table 3-10: Typical Swale Maintenance Requirements

Maintenance Schedule	Required Action	Minimum Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass- to retain grass height within specified design range	Monthly (during growing season), or as required.
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required



Maintenance Schedule	Required Action	Minimum Frequency
	Inspect inlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly.
	Inspect inlets and facility surface for silt accumulation, establish appropriate slit removal frequencies.	As required or if bare soil is exposed over 10% or more of the swale treatment area
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plan types to better suit conditions, if required	Annually
Remedial Actions	Repair erosion or other damage by re-turfing or reseedling	As required.
	Relevel uneven surfaces and reinstate design levels	As required.
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required.
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required.
	Remove and dispose of oils or petrol residues using safe standard practices.	As required.

3.11 Exceedance

In the low probability event of exceedance of the proposed site drainage strategy, flows from the lagoon (pond) and swale would overtop into the base of Saxon Pit, causing flooding across the low-lying area. This is however mimicking the existing regime and the provision of extra storage in the swale will reduce the prevailing flood risk. Flows will eventually discharge off site via the pump into the King’s Dyke.



4.0 Conclusions

SLR Consulting Limited (SLR) has been appointed by East Midland Waste Management Limited (“the client”) to prepare a Flood Risk Assessment for proposed stabilisation works to the Southern Buttress at Saxon Pit, Peterborough Road, Whittlesey (“the site”). The existing buttress is a predominantly bare face with some vegetated areas at the top and base of the slope. Anecdotal evidence from the site walkover identified several areas of slippage and failure along the slope. Stabilisation works are critical due to the presence of the existing railway line close to the top of the buttress.

Under existing conditions, rainfall onto the existing buttress face sheds off the slope and is eventually routed overland, resulting in shallow flooding, into the existing lagoon in Saxon Pit at unrestricted rates. Flows from the existing lagoon are then pumped up at 52.8/s into a reed bed which diffusely outfalls into the King’s Dyke.

It is envisaged that the proposed drainage for works on the southern buttress will seek to mimic the existing regime but will also control flows shedding off the face of the buttress rather than flooding out the lower lying areas.

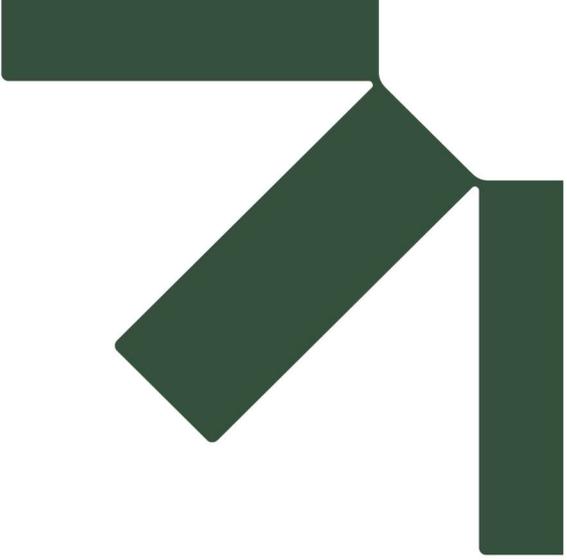
A swale will be installed at the base of the buttress which will intercept, attenuate and convey any flows shed from the slope face towards the lagoon. Flows into the lagoon will then be pumped under the existing rate of 52.8l/s to ensure that discharge into the King’s Dyke does not increase as a result of the proposed development.

Modelling has been undertaken for the critical 100-year event plus a 40% uplift in peak rainfall intensity to account for climate change. Drainage modelling of the lagoon has considered flows from the swale but also flows from the Eastern Buttress. No flooding is predicted from the swale or lagoon during the critical event.

Exceedance of the site drainage strategy would mimic the existing regime with flows overtopping the swale and lagoon to pond within the base / low lying area of Saxon Pit. Gradually, water levels decrease through pumping into the King’s Dyke.

This surface water drainage strategy demonstrates a suitable surface water drainage strategy for the site using SuDS features which ensure no flooding for a 1 in 100-year event plus 40% climate change ensuring runoff rates from the site do not exceed existing whilst satisfying the requirements of the simple index method.

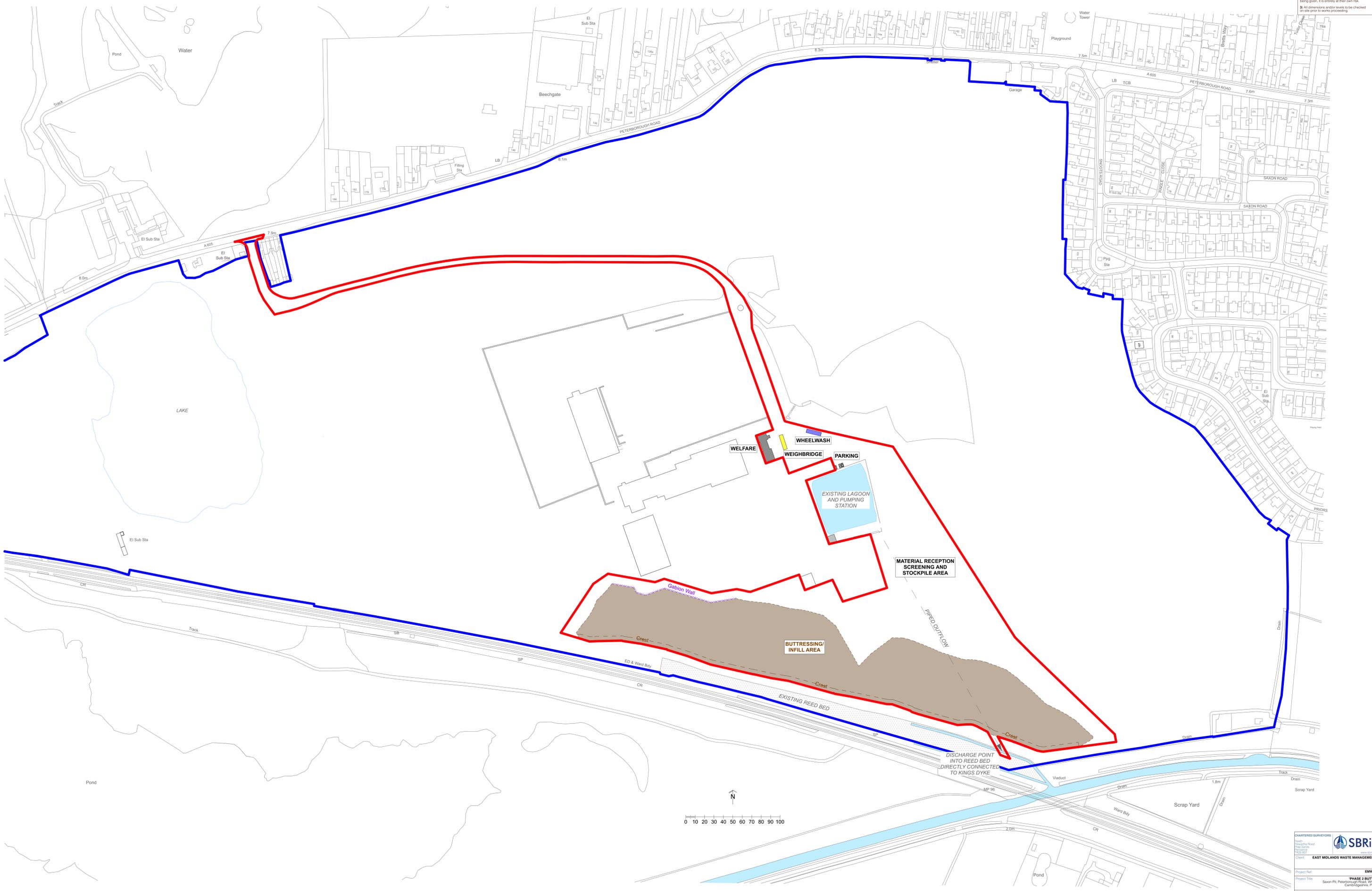




Appendix A **Proposed
Development
Masterplan**

NOTES

- 1) This drawing has been produced/issued for the specific use as stated in the drawing status below. The drawing should only be used therefore for matters concerning the identified use.
- 2) Until technical approval, consent and/or licensing has been obtained from the relevant authority, it should be understood that all drawings issued are preliminary and NOT for construction. Should the contractor commence site work prior to such approval being given, it is entered at their own risk.
- 3) All dimensions and/or levels to be checked on site prior to works proceeding.



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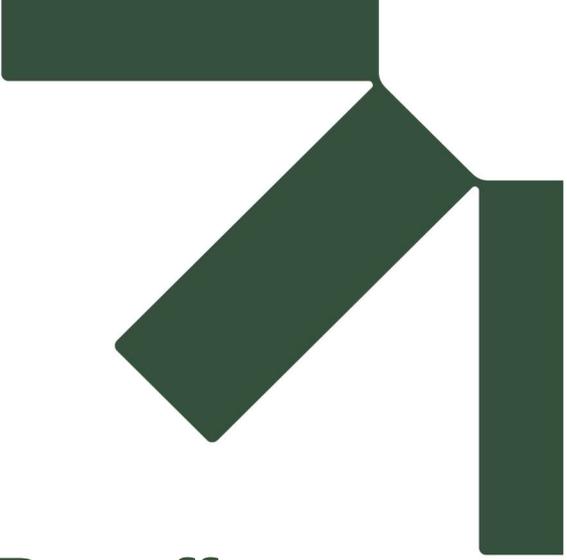
Project Ref: **ENWM P2B**
 Project Title: **PHASE 2 BUTTRESS**
 Location: **Saxon Rd, Peterborough Road, Wintborough, Cambridgeshire, CB1 1U**

Drawn by: **DJJ** Drawn No: **ENWM P2B-1-1-001**
 Date: **14.03.2023** Scale: **1:1250 A0** Rev: **G**

Drawn Title: **BUTTRESSING SITE PLAN**

Drawn Status: **PLANNING**

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Appendix B Greenfield Runoff Rates

UK Design Flood Estimation

Generated on 05 July 2023 16:08:24 by chloenelson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D7BE-E56D

Site name: FEH_Catchment_Descriptors_525900_296800_v5_0_1

Easting: 525900

Northing: 296800

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [23.4]*

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH13 (mm):	29.92	Total runoff (ML):	0.07
Total Rainfall (mm):	19.56	Total flow (ML):	0.20
Peak Rainfall (mm):	3.81	Peak flow (m ³ /s):	0.00

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH13)

Name	Value	User-defined?
Duration (hh:mm:ss)	26:00:00	No
Timestep (hh:mm:ss)	02:00:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [1]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	114.78	No
Cmax (mm)	402.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	16.18	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	63.37	No
BR	2.23	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Urbext 2000	0.1	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.348	0.000	0.109	0.000	0.000	0.000
02:00:00	0.539	0.000	0.171	0.000	0.000	0.000
04:00:00	0.832	0.000	0.267	0.000	0.000	0.000
06:00:00	1.278	0.000	0.413	0.000	0.000	0.000
08:00:00	1.949	0.000	0.637	0.000	0.000	0.000
10:00:00	2.929	0.000	0.974	0.000	0.000	0.000
12:00:00	3.814	0.000	1.299	0.000	0.000	0.000
14:00:00	2.929	0.000	1.021	0.000	0.000	0.000
16:00:00	1.949	0.000	0.691	0.000	0.000	0.000
18:00:00	1.278	0.000	0.458	0.000	0.000	0.000
20:00:00	0.832	0.000	0.300	0.000	0.000	0.001
22:00:00	0.539	0.000	0.195	0.000	0.000	0.001
24:00:00	0.348	0.000	0.127	0.001	0.000	0.001
26:00:00	0.000	0.000	0.000	0.001	0.000	0.001
28:00:00	0.000	0.000	0.000	0.001	0.000	0.001
30:00:00	0.000	0.000	0.000	0.001	0.000	0.001
32:00:00	0.000	0.000	0.000	0.001	0.000	0.001
34:00:00	0.000	0.000	0.000	0.001	0.000	0.001
36:00:00	0.000	0.000	0.000	0.001	0.000	0.001
38:00:00	0.000	0.000	0.000	0.000	0.000	0.001
40:00:00	0.000	0.000	0.000	0.000	0.000	0.001
42:00:00	0.000	0.000	0.000	0.000	0.000	0.001
44:00:00	0.000	0.000	0.000	0.000	0.000	0.001
46:00:00	0.000	0.000	0.000	0.000	0.000	0.001
48:00:00	0.000	0.000	0.000	0.000	0.000	0.001
50:00:00	0.000	0.000	0.000	0.000	0.000	0.001
52:00:00	0.000	0.000	0.000	0.000	0.000	0.001
54:00:00	0.000	0.000	0.000	0.000	0.000	0.001
56:00:00	0.000	0.000	0.000	0.000	0.000	0.001
58:00:00	0.000	0.000	0.000	0.000	0.000	0.001
60:00:00	0.000	0.000	0.000	0.000	0.000	0.001
62:00:00	0.000	0.000	0.000	0.000	0.000	0.001
64:00:00	0.000	0.000	0.000	0.000	0.000	0.001
66:00:00	0.000	0.000	0.000	0.000	0.000	0.000
68:00:00	0.000	0.000	0.000	0.000	0.000	0.000

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
70:00:00	0.000	0.000	0.000	0.000	0.000	0.000
72:00:00	0.000	0.000	0.000	0.000	0.000	0.000
74:00:00	0.000	0.000	0.000	0.000	0.000	0.000
76:00:00	0.000	0.000	0.000	0.000	0.000	0.000
78:00:00	0.000	0.000	0.000	0.000	0.000	0.000
80:00:00	0.000	0.000	0.000	0.000	0.000	0.000
82:00:00	0.000	0.000	0.000	0.000	0.000	0.000
84:00:00	0.000	0.000	0.000	0.000	0.000	0.000
86:00:00	0.000	0.000	0.000	0.000	0.000	0.000
88:00:00	0.000	0.000	0.000	0.000	0.000	0.000
90:00:00	0.000	0.000	0.000	0.000	0.000	0.000
92:00:00	0.000	0.000	0.000	0.000	0.000	0.000
94:00:00	0.000	0.000	0.000	0.000	0.000	0.000
96:00:00	0.000	0.000	0.000	0.000	0.000	0.000
98:00:00	0.000	0.000	0.000	0.000	0.000	0.000
100:00:00	0.000	0.000	0.000	0.000	0.000	0.000
102:00:00	0.000	0.000	0.000	0.000	0.000	0.000

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km ²)	0.01 [23.4]	Yes
ALTBAR	11	No
ASPBAR	99	No
ASPVAR	0.29	No
BFIHOST	0.5	No
BFIHOST19	0.46	No
DPLBAR (km)	9.03	No
DPSBAR (mkm ⁻¹)	17.2	No
FARL	0	No
LDP	17.87	No
PROPWET	0.21	No
RMED1H	11.4	No
RMED1D	29.1	No
RMED2D	35	No
SAAR (mm)	545	No
SAAR4170 (mm)	578	No
SPRHOST	40.45	No
Urbext2000	0.1	No
Urbext1990	0.06	No
URBCONC	0.87	No
URBLOC	1.16	No
DDF parameter C	-0.02	No
DDF parameter D1	0.34	No
DDF parameter D2	0.25	No
DDF parameter D3	0.23	No
DDF parameter E	0.31	No
DDF parameter F	2.46	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.34	No
DDF parameter D2 (1km grid value)	0.24	No
DDF parameter D3 (1km grid value)	0.23	No
DDF parameter E (1km grid value)	0.31	No
DDF parameter F (1km grid value)	2.44	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 05 July 2023 16:09:14 by chloenelson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D7BE-E56D

Site name: FEH_Catchment_Descriptors_525900_296800_v5_0_1

Easting: 525900

Northing: 296800

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [23.4]*

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH13 (mm):	33.62	Total runoff (ML):	0.08
Total Rainfall (mm):	21.98	Total flow (ML):	0.22
Peak Rainfall (mm):	4.29	Peak flow (m ³ /s):	0.00

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH13)

Name	Value	User-defined?
Duration (hh:mm:ss)	26:00:00	No
Timestep (hh:mm:ss)	02:00:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [1]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	114.78	No
Cmax (mm)	402.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	16.18	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	63.37	No
BR	2.2	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Urbext 2000	0.1	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.391	0.000	0.122	0.000	0.000	0.000
02:00:00	0.606	0.000	0.193	0.000	0.000	0.000
04:00:00	0.935	0.000	0.300	0.000	0.000	0.000
06:00:00	1.436	0.000	0.465	0.000	0.000	0.000
08:00:00	2.190	0.000	0.718	0.000	0.000	0.000
10:00:00	3.291	0.000	1.101	0.000	0.000	0.000
12:00:00	4.286	0.000	1.472	0.000	0.000	0.000
14:00:00	3.291	0.000	1.160	0.000	0.000	0.000
16:00:00	2.190	0.000	0.786	0.000	0.000	0.000
18:00:00	1.436	0.000	0.522	0.000	0.000	0.001
20:00:00	0.935	0.000	0.342	0.000	0.000	0.001
22:00:00	0.606	0.000	0.223	0.001	0.000	0.001
24:00:00	0.391	0.000	0.144	0.001	0.000	0.001
26:00:00	0.000	0.000	0.000	0.001	0.000	0.001
28:00:00	0.000	0.000	0.000	0.001	0.000	0.001
30:00:00	0.000	0.000	0.000	0.001	0.000	0.001
32:00:00	0.000	0.000	0.000	0.001	0.000	0.001
34:00:00	0.000	0.000	0.000	0.001	0.000	0.001
36:00:00	0.000	0.000	0.000	0.001	0.000	0.001
38:00:00	0.000	0.000	0.000	0.001	0.000	0.001
40:00:00	0.000	0.000	0.000	0.001	0.000	0.001
42:00:00	0.000	0.000	0.000	0.000	0.000	0.001
44:00:00	0.000	0.000	0.000	0.000	0.001	0.001
46:00:00	0.000	0.000	0.000	0.000	0.001	0.001
48:00:00	0.000	0.000	0.000	0.000	0.001	0.001
50:00:00	0.000	0.000	0.000	0.000	0.001	0.001
52:00:00	0.000	0.000	0.000	0.000	0.001	0.001
54:00:00	0.000	0.000	0.000	0.000	0.001	0.001
56:00:00	0.000	0.000	0.000	0.000	0.001	0.001
58:00:00	0.000	0.000	0.000	0.000	0.001	0.001
60:00:00	0.000	0.000	0.000	0.000	0.001	0.001
62:00:00	0.000	0.000	0.000	0.000	0.000	0.001
64:00:00	0.000	0.000	0.000	0.000	0.000	0.001
66:00:00	0.000	0.000	0.000	0.000	0.000	0.001
68:00:00	0.000	0.000	0.000	0.000	0.000	0.001

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
70:00:00	0.000	0.000	0.000	0.000	0.000	0.000
72:00:00	0.000	0.000	0.000	0.000	0.000	0.000
74:00:00	0.000	0.000	0.000	0.000	0.000	0.000
76:00:00	0.000	0.000	0.000	0.000	0.000	0.000
78:00:00	0.000	0.000	0.000	0.000	0.000	0.000
80:00:00	0.000	0.000	0.000	0.000	0.000	0.000
82:00:00	0.000	0.000	0.000	0.000	0.000	0.000
84:00:00	0.000	0.000	0.000	0.000	0.000	0.000
86:00:00	0.000	0.000	0.000	0.000	0.000	0.000
88:00:00	0.000	0.000	0.000	0.000	0.000	0.000
90:00:00	0.000	0.000	0.000	0.000	0.000	0.000
92:00:00	0.000	0.000	0.000	0.000	0.000	0.000
94:00:00	0.000	0.000	0.000	0.000	0.000	0.000
96:00:00	0.000	0.000	0.000	0.000	0.000	0.000
98:00:00	0.000	0.000	0.000	0.000	0.000	0.000
100:00:00	0.000	0.000	0.000	0.000	0.000	0.000
102:00:00	0.000	0.000	0.000	0.000	0.000	0.000
104:00:00	0.000	0.000	0.000	0.000	0.000	0.000
106:00:00	0.000	0.000	0.000	0.000	0.000	0.000
108:00:00	0.000	0.000	0.000	0.000	0.000	0.000

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km ²)	0.01 [23.4]	Yes
ALTBAR	11	No
ASPBAR	99	No
ASPVAR	0.29	No
BFIHOST	0.5	No
BFIHOST19	0.46	No
DPLBAR (km)	9.03	No
DPSBAR (mkm ⁻¹)	17.2	No
FARL	0	No
LDP	17.87	No
PROPWET	0.21	No
RMED1H	11.4	No
RMED1D	29.1	No
RMED2D	35	No
SAAR (mm)	545	No
SAAR4170 (mm)	578	No
SPRHOST	40.45	No
Urbext2000	0.1	No
Urbext1990	0.06	No
URBCONC	0.87	No
URBLOC	1.16	No
DDF parameter C	-0.02	No
DDF parameter D1	0.34	No
DDF parameter D2	0.25	No
DDF parameter D3	0.23	No
DDF parameter E	0.31	No
DDF parameter F	2.46	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.34	No
DDF parameter D2 (1km grid value)	0.24	No
DDF parameter D3 (1km grid value)	0.23	No
DDF parameter E (1km grid value)	0.31	No
DDF parameter F (1km grid value)	2.44	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 05 July 2023 16:09:32 by chloenelson
Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D7BE-E56D

Site name: FEH_Catchment_Descriptors_525900_296800_v5_0_1

Easting: 525900

Northing: 296800

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [23.4]*

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH13 (mm):	79.82	Total runoff (ML):	0.20
Total Rainfall (mm):	52.19	Total flow (ML):	0.52
Peak Rainfall (mm):	10.18	Peak flow (m ³ /s):	0.00

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH13)

Name	Value	User-defined?
Duration (hh:mm:ss)	26:00:00	No
Timestep (hh:mm:ss)	02:00:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [1]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	114.78	No
Cmax (mm)	402.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	16.18	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	63.37	No
BR	1.86	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Urbext 2000	0.1	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	0.929	0.000	0.293	0.000	0.000	0.000
02:00:00	1.438	0.000	0.462	0.000	0.000	0.000
04:00:00	2.220	0.000	0.723	0.000	0.000	0.000
06:00:00	3.409	0.000	1.133	0.000	0.000	0.000
08:00:00	5.199	0.000	1.781	0.000	0.000	0.000
10:00:00	7.813	0.000	2.797	0.000	0.000	0.000
12:00:00	10.176	0.000	3.860	0.000	0.000	0.000
14:00:00	7.813	0.000	3.131	0.000	0.000	0.001
16:00:00	5.199	0.000	2.164	0.001	0.000	0.001
18:00:00	3.409	0.000	1.454	0.001	0.000	0.001
20:00:00	2.220	0.000	0.961	0.001	0.000	0.001
22:00:00	1.438	0.000	0.629	0.001	0.000	0.002
24:00:00	0.929	0.000	0.409	0.002	0.000	0.002
26:00:00	0.000	0.000	0.000	0.002	0.000	0.002
28:00:00	0.000	0.000	0.000	0.002	0.001	0.002
30:00:00	0.000	0.000	0.000	0.002	0.001	0.002
32:00:00	0.000	0.000	0.000	0.002	0.001	0.002
34:00:00	0.000	0.000	0.000	0.002	0.001	0.002
36:00:00	0.000	0.000	0.000	0.002	0.001	0.002
38:00:00	0.000	0.000	0.000	0.001	0.001	0.002
40:00:00	0.000	0.000	0.000	0.001	0.001	0.002
42:00:00	0.000	0.000	0.000	0.001	0.001	0.002
44:00:00	0.000	0.000	0.000	0.001	0.001	0.002
46:00:00	0.000	0.000	0.000	0.001	0.001	0.002
48:00:00	0.000	0.000	0.000	0.001	0.001	0.002
50:00:00	0.000	0.000	0.000	0.001	0.001	0.002
52:00:00	0.000	0.000	0.000	0.001	0.001	0.002
54:00:00	0.000	0.000	0.000	0.001	0.001	0.002
56:00:00	0.000	0.000	0.000	0.000	0.001	0.001
58:00:00	0.000	0.000	0.000	0.000	0.001	0.001
60:00:00	0.000	0.000	0.000	0.000	0.001	0.001
62:00:00	0.000	0.000	0.000	0.000	0.001	0.001
64:00:00	0.000	0.000	0.000	0.000	0.001	0.001
66:00:00	0.000	0.000	0.000	0.000	0.001	0.001
68:00:00	0.000	0.000	0.000	0.000	0.001	0.001

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
70:00:00	0.000	0.000	0.000	0.000	0.001	0.001
72:00:00	0.000	0.000	0.000	0.000	0.001	0.001
74:00:00	0.000	0.000	0.000	0.000	0.001	0.001
76:00:00	0.000	0.000	0.000	0.000	0.001	0.001
78:00:00	0.000	0.000	0.000	0.000	0.001	0.001
80:00:00	0.000	0.000	0.000	0.000	0.001	0.001
82:00:00	0.000	0.000	0.000	0.000	0.001	0.001
84:00:00	0.000	0.000	0.000	0.000	0.001	0.001
86:00:00	0.000	0.000	0.000	0.000	0.001	0.001
88:00:00	0.000	0.000	0.000	0.000	0.001	0.001
90:00:00	0.000	0.000	0.000	0.000	0.001	0.001
92:00:00	0.000	0.000	0.000	0.000	0.001	0.001
94:00:00	0.000	0.000	0.000	0.000	0.001	0.001
96:00:00	0.000	0.000	0.000	0.000	0.001	0.001
98:00:00	0.000	0.000	0.000	0.000	0.001	0.001
100:00:00	0.000	0.000	0.000	0.000	0.001	0.001
102:00:00	0.000	0.000	0.000	0.000	0.001	0.001
104:00:00	0.000	0.000	0.000	0.000	0.001	0.001
106:00:00	0.000	0.000	0.000	0.000	0.001	0.001
108:00:00	0.000	0.000	0.000	0.000	0.001	0.001
110:00:00	0.000	0.000	0.000	0.000	0.000	0.000
112:00:00	0.000	0.000	0.000	0.000	0.000	0.000
114:00:00	0.000	0.000	0.000	0.000	0.000	0.000
116:00:00	0.000	0.000	0.000	0.000	0.000	0.000
118:00:00	0.000	0.000	0.000	0.000	0.000	0.000
120:00:00	0.000	0.000	0.000	0.000	0.000	0.000
122:00:00	0.000	0.000	0.000	0.000	0.000	0.000
124:00:00	0.000	0.000	0.000	0.000	0.000	0.000
126:00:00	0.000	0.000	0.000	0.000	0.000	0.000
128:00:00	0.000	0.000	0.000	0.000	0.000	0.000
130:00:00	0.000	0.000	0.000	0.000	0.000	0.000
132:00:00	0.000	0.000	0.000	0.000	0.000	0.000
134:00:00	0.000	0.000	0.000	0.000	0.000	0.000
136:00:00	0.000	0.000	0.000	0.000	0.000	0.000
138:00:00	0.000	0.000	0.000	0.000	0.000	0.000
140:00:00	0.000	0.000	0.000	0.000	0.000	0.000

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
142:00:00	0.000	0.000	0.000	0.000	0.000	0.000
144:00:00	0.000	0.000	0.000	0.000	0.000	0.000
146:00:00	0.000	0.000	0.000	0.000	0.000	0.000
148:00:00	0.000	0.000	0.000	0.000	0.000	0.000
150:00:00	0.000	0.000	0.000	0.000	0.000	0.000
152:00:00	0.000	0.000	0.000	0.000	0.000	0.000
154:00:00	0.000	0.000	0.000	0.000	0.000	0.000

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km ²)	0.01 [23.4]	Yes
ALTBAR	11	No
ASPBAR	99	No
ASPVAR	0.29	No
BFIHOST	0.5	No
BFIHOST19	0.46	No
DPLBAR (km)	9.03	No
DPSBAR (mkm ⁻¹)	17.2	No
FARL	0	No
LDP	17.87	No
PROPWET	0.21	No
RMED1H	11.4	No
RMED1D	29.1	No
RMED2D	35	No
SAAR (mm)	545	No
SAAR4170 (mm)	578	No
SPRHOST	40.45	No
Urbext2000	0.1	No
Urbext1990	0.06	No
URBCONC	0.87	No
URBLOC	1.16	No
DDF parameter C	-0.02	No
DDF parameter D1	0.34	No
DDF parameter D2	0.25	No
DDF parameter D3	0.23	No
DDF parameter E	0.31	No
DDF parameter F	2.46	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.34	No
DDF parameter D2 (1km grid value)	0.24	No
DDF parameter D3 (1km grid value)	0.23	No
DDF parameter E (1km grid value)	0.31	No
DDF parameter F (1km grid value)	2.44	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on 05 July 2023 16:09:48 by chloenelson

Printed from the ReFH2 Flood Modelling software package, version 4.0.8560.23190

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: D7BE-E56D

Site name: FEH_Catchment_Descriptors_525900_296800_v5_0_1

Easting: 525900

Northing: 296800

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [23.4]*

Using plot scale calculations: No

Model: 2.3

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH13 (mm):	110.73	Total runoff (ML):	0.29
Total Rainfall (mm):	72.41	Total flow (ML):	0.72
Peak Rainfall (mm):	14.12	Peak flow (m ³ /s):	0.00

Parameters

Where the user has overridden a system-generated value, this original value is shown in square brackets after the value used.

** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH13)

Name	Value	User-defined?
Duration (hh:mm:ss)	26:00:00	No
Timestep (hh:mm:ss)	02:00:00	No
SCF (Seasonal correction factor)	0.65	No
ARF (Areal reduction factor)	1 [1]	Yes
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	114.78	No
Cmax (mm)	402.26	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	16.18	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BFO (m ³ /s)	0	No
BL (hr)	63.37	No
BR	1.66	No

Urbanisation parameters

Name	Value	User-defined?
Sewer capacity (m ³ /s)	0	No
Exporting drained area (km ²)	0	No
Urban area (km ²)	0	No
Urbext 2000	0.1	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
00:00:00	1.289	0.000	0.408	0.000	0.000	0.000
02:00:00	1.995	0.000	0.644	0.000	0.000	0.000
04:00:00	3.079	0.000	1.012	0.000	0.000	0.000
06:00:00	4.730	0.000	1.599	0.000	0.000	0.000
08:00:00	7.213	0.000	2.541	0.000	0.000	0.000
10:00:00	10.840	0.000	4.051	0.000	0.000	0.000
12:00:00	14.118	0.000	5.694	0.000	0.000	0.001
14:00:00	10.840	0.000	4.693	0.001	0.000	0.001
16:00:00	7.213	0.000	3.278	0.001	0.000	0.001
18:00:00	4.730	0.000	2.216	0.001	0.000	0.001
20:00:00	3.079	0.000	1.471	0.002	0.000	0.002
22:00:00	1.995	0.000	0.966	0.002	0.000	0.002
24:00:00	1.289	0.000	0.629	0.002	0.000	0.003
26:00:00	0.000	0.000	0.000	0.002	0.001	0.003
28:00:00	0.000	0.000	0.000	0.003	0.001	0.003
30:00:00	0.000	0.000	0.000	0.003	0.001	0.003
32:00:00	0.000	0.000	0.000	0.003	0.001	0.004
34:00:00	0.000	0.000	0.000	0.003	0.001	0.004
36:00:00	0.000	0.000	0.000	0.002	0.001	0.003
38:00:00	0.000	0.000	0.000	0.002	0.001	0.003
40:00:00	0.000	0.000	0.000	0.002	0.001	0.003
42:00:00	0.000	0.000	0.000	0.002	0.001	0.003
44:00:00	0.000	0.000	0.000	0.002	0.001	0.003
46:00:00	0.000	0.000	0.000	0.001	0.001	0.003
48:00:00	0.000	0.000	0.000	0.001	0.001	0.003
50:00:00	0.000	0.000	0.000	0.001	0.001	0.002
52:00:00	0.000	0.000	0.000	0.001	0.001	0.002
54:00:00	0.000	0.000	0.000	0.001	0.001	0.002
56:00:00	0.000	0.000	0.000	0.001	0.001	0.002
58:00:00	0.000	0.000	0.000	0.001	0.001	0.002
60:00:00	0.000	0.000	0.000	0.001	0.001	0.002
62:00:00	0.000	0.000	0.000	0.000	0.001	0.002
64:00:00	0.000	0.000	0.000	0.000	0.001	0.002
66:00:00	0.000	0.000	0.000	0.000	0.001	0.002
68:00:00	0.000	0.000	0.000	0.000	0.001	0.001

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
70:00:00	0.000	0.000	0.000	0.000	0.001	0.001
72:00:00	0.000	0.000	0.000	0.000	0.001	0.001
74:00:00	0.000	0.000	0.000	0.000	0.001	0.001
76:00:00	0.000	0.000	0.000	0.000	0.001	0.001
78:00:00	0.000	0.000	0.000	0.000	0.001	0.001
80:00:00	0.000	0.000	0.000	0.000	0.001	0.001
82:00:00	0.000	0.000	0.000	0.000	0.001	0.001
84:00:00	0.000	0.000	0.000	0.000	0.001	0.001
86:00:00	0.000	0.000	0.000	0.000	0.001	0.001
88:00:00	0.000	0.000	0.000	0.000	0.001	0.001
90:00:00	0.000	0.000	0.000	0.000	0.001	0.001
92:00:00	0.000	0.000	0.000	0.000	0.001	0.001
94:00:00	0.000	0.000	0.000	0.000	0.001	0.001
96:00:00	0.000	0.000	0.000	0.000	0.001	0.001
98:00:00	0.000	0.000	0.000	0.000	0.001	0.001
100:00:00	0.000	0.000	0.000	0.000	0.001	0.001
102:00:00	0.000	0.000	0.000	0.000	0.001	0.001
104:00:00	0.000	0.000	0.000	0.000	0.001	0.001
106:00:00	0.000	0.000	0.000	0.000	0.001	0.001
108:00:00	0.000	0.000	0.000	0.000	0.001	0.001
110:00:00	0.000	0.000	0.000	0.000	0.001	0.001
112:00:00	0.000	0.000	0.000	0.000	0.001	0.001
114:00:00	0.000	0.000	0.000	0.000	0.001	0.001
116:00:00	0.000	0.000	0.000	0.000	0.001	0.001
118:00:00	0.000	0.000	0.000	0.000	0.001	0.001
120:00:00	0.000	0.000	0.000	0.000	0.001	0.001
122:00:00	0.000	0.000	0.000	0.000	0.001	0.001
124:00:00	0.000	0.000	0.000	0.000	0.001	0.001
126:00:00	0.000	0.000	0.000	0.000	0.001	0.001
128:00:00	0.000	0.000	0.000	0.000	0.000	0.000
130:00:00	0.000	0.000	0.000	0.000	0.000	0.000
132:00:00	0.000	0.000	0.000	0.000	0.000	0.000
134:00:00	0.000	0.000	0.000	0.000	0.000	0.000
136:00:00	0.000	0.000	0.000	0.000	0.000	0.000
138:00:00	0.000	0.000	0.000	0.000	0.000	0.000
140:00:00	0.000	0.000	0.000	0.000	0.000	0.000

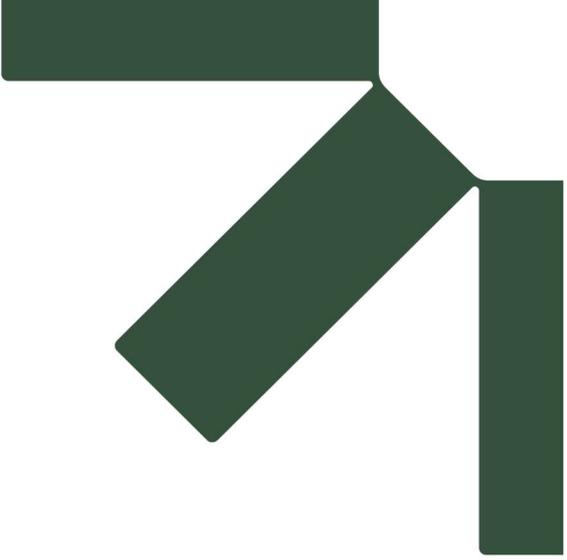
Time (hh:mm:ss)	Rain (mm)	Sewer Loss (m ³ /s)	Net Rain (mm)	Runoff (m ³ /s)	Baseflow (m ³ /s)	Total Flow (m ³ /s)
142:00:00	0.000	0.000	0.000	0.000	0.000	0.000
144:00:00	0.000	0.000	0.000	0.000	0.000	0.000
146:00:00	0.000	0.000	0.000	0.000	0.000	0.000
148:00:00	0.000	0.000	0.000	0.000	0.000	0.000
150:00:00	0.000	0.000	0.000	0.000	0.000	0.000
152:00:00	0.000	0.000	0.000	0.000	0.000	0.000
154:00:00	0.000	0.000	0.000	0.000	0.000	0.000
156:00:00	0.000	0.000	0.000	0.000	0.000	0.000
158:00:00	0.000	0.000	0.000	0.000	0.000	0.000
160:00:00	0.000	0.000	0.000	0.000	0.000	0.000
162:00:00	0.000	0.000	0.000	0.000	0.000	0.000
164:00:00	0.000	0.000	0.000	0.000	0.000	0.000
166:00:00	0.000	0.000	0.000	0.000	0.000	0.000
168:00:00	0.000	0.000	0.000	0.000	0.000	0.000
170:00:00	0.000	0.000	0.000	0.000	0.000	0.000

Appendix

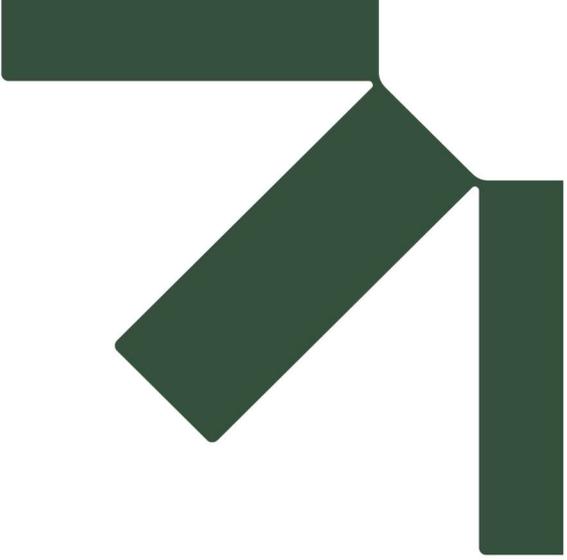
Catchment descriptors *

Name	Value	User-defined value used?
Area (km ²)	0.01 [23.4]	Yes
ALTBAR	11	No
ASPBAR	99	No
ASPVAR	0.29	No
BFIHOST	0.5	No
BFIHOST19	0.46	No
DPLBAR (km)	9.03	No
DPSBAR (mkm ⁻¹)	17.2	No
FARL	0	No
LDP	17.87	No
PROPWET	0.21	No
RMED1H	11.4	No
RMED1D	29.1	No
RMED2D	35	No
SAAR (mm)	545	No
SAAR4170 (mm)	578	No
SPRHOST	40.45	No
Urbext2000	0.1	No
Urbext1990	0.06	No
URBCONC	0.87	No
URBLOC	1.16	No
DDF parameter C	-0.02	No
DDF parameter D1	0.34	No
DDF parameter D2	0.25	No
DDF parameter D3	0.23	No
DDF parameter E	0.31	No
DDF parameter F	2.46	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.34	No
DDF parameter D2 (1km grid value)	0.24	No
DDF parameter D3 (1km grid value)	0.23	No
DDF parameter E (1km grid value)	0.31	No
DDF parameter F (1km grid value)	2.44	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM



Appendix C Conceptual Surface Water Drainage Strategy



Appendix D Post Development Runoff Modelling Calculations

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Cascade Summary of Results for Swale.SRCX

Upstream Outflow To Overflow To
Structures

(None) Saxon Pit.SRCX (None)

Half Drain Time : 558 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control E (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-22.245	0.255	0.0	9.4	9.4	317.2	O K
30 min Summer	-22.197	0.303	0.0	10.5	10.5	395.9	O K
60 min Summer	-22.156	0.344	0.0	11.3	11.3	469.7	O K
120 min Summer	-22.075	0.425	0.0	12.8	12.8	626.6	O K
180 min Summer	-22.037	0.463	0.0	13.4	13.4	707.0	O K
240 min Summer	-22.015	0.485	0.0	13.8	13.8	753.2	O K
360 min Summer	-21.997	0.503	0.0	14.0	14.0	794.1	O K
480 min Summer	-21.994	0.506	0.0	14.1	14.1	801.2	O K
600 min Summer	-21.994	0.506	0.0	14.1	14.1	800.4	O K
720 min Summer	-21.997	0.503	0.0	14.1	14.1	795.3	O K
960 min Summer	-22.004	0.496	0.0	13.9	13.9	779.3	O K
1440 min Summer	-22.023	0.477	0.0	13.6	13.6	737.0	O K
2160 min Summer	-22.052	0.448	0.0	13.2	13.2	674.1	O K
2880 min Summer	-22.078	0.422	0.0	12.7	12.7	619.8	O K
4320 min Summer	-22.120	0.380	0.0	12.0	12.0	536.9	O K
5760 min Summer	-22.152	0.348	0.0	11.4	11.4	476.8	O K
7200 min Summer	-22.177	0.323	0.0	10.9	10.9	432.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	36.342	0.0	296.4	21
30 min Summer	22.893	0.0	376.5	34
60 min Summer	13.855	0.0	481.3	64
120 min Summer	9.560	0.0	667.2	122
180 min Summer	7.429	0.0	778.9	182
240 min Summer	6.131	0.0	857.5	242
360 min Summer	4.594	0.0	964.0	360
480 min Summer	3.690	0.0	1032.1	420
600 min Summer	3.098	0.0	1082.2	480
720 min Summer	2.678	0.0	1121.8	542
960 min Summer	2.122	0.0	1182.9	674
1440 min Summer	1.524	0.0	1265.2	950
2160 min Summer	1.098	0.0	1402.1	1360
2880 min Summer	0.875	0.0	1489.2	1756
4320 min Summer	0.646	0.0	1642.7	2548
5760 min Summer	0.527	0.0	1803.0	3288
7200 min Summer	0.455	0.0	1944.3	4032

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Edinburgh Park
Edinburgh, EH12 9DH



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Cascade Summary of Results for Swale.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640 min Summer	-22.196	0.304	0.0	10.5	10.5	397.9	O K
10080 min Summer	-22.213	0.287	0.0	10.2	10.2	369.8	O K
15 min Winter	-22.245	0.255	0.0	9.4	9.4	317.3	O K
30 min Winter	-22.197	0.303	0.0	10.5	10.5	396.1	O K
60 min Winter	-22.156	0.344	0.0	11.3	11.3	469.9	O K
120 min Winter	-22.074	0.426	0.0	12.8	12.8	627.4	O K
180 min Winter	-22.036	0.464	0.0	13.4	13.4	708.3	O K
240 min Winter	-22.014	0.486	0.0	13.8	13.8	755.2	O K
360 min Winter	-21.995	0.505	0.0	14.1	14.1	798.3	O K
480 min Winter	-21.992	0.508	0.0	14.1	14.1	804.9	O K
600 min Winter	-21.995	0.505	0.0	14.1	14.1	798.2	O K
720 min Winter	-21.998	0.502	0.0	14.0	14.0	791.0	O K
960 min Winter	-22.009	0.491	0.0	13.9	13.9	768.0	O K
1440 min Winter	-22.036	0.464	0.0	13.4	13.4	708.7	O K
2160 min Winter	-22.077	0.423	0.0	12.8	12.8	622.3	O K
2880 min Winter	-22.114	0.386	0.0	12.1	12.1	549.2	O K
4320 min Winter	-22.172	0.328	0.0	11.0	11.0	441.3	O K
5760 min Winter	-22.215	0.285	0.0	10.1	10.1	366.9	O K
7200 min Winter	-22.247	0.253	0.0	9.4	9.4	314.7	O K
8640 min Winter	-22.271	0.229	0.0	8.8	8.8	276.4	O K
10080 min Winter	-22.291	0.209	0.0	8.3	8.3	247.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.406	0.0	2080.0	4760
10080 min Summer	0.371	0.0	2208.8	5456
15 min Winter	36.342	0.0	296.4	21
30 min Winter	22.893	0.0	376.5	34
60 min Winter	13.855	0.0	481.3	62
120 min Winter	9.560	0.0	667.2	120
180 min Winter	7.429	0.0	778.9	178
240 min Winter	6.131	0.0	857.5	236
360 min Winter	4.594	0.0	964.0	348
480 min Winter	3.690	0.0	1032.1	452
600 min Winter	3.098	0.0	1082.3	494
720 min Winter	2.678	0.0	1121.9	562
960 min Winter	2.122	0.0	1183.1	714
1440 min Winter	1.524	0.0	1265.6	1014
2160 min Winter	1.098	0.0	1402.2	1448
2880 min Winter	0.875	0.0	1489.3	1848
4320 min Winter	0.646	0.0	1643.1	2640
5760 min Winter	0.527	0.0	1803.0	3400
7200 min Winter	0.455	0.0	1944.4	4112
8640 min Winter	0.406	0.0	2080.3	4848
10080 min Winter	0.371	0.0	2209.9	5552

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Cascade Rainfall Details for Swale.SRCX

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.570

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 3.070	4	8 0.500

4/5 Lockside View
Edinburgh Park
Edinburgh, EH12 9DH



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Cascade Model Details for Swale.SRCX

Storage is Online Cover Level (m) -21.000

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	450.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	-22.500	Cap Infiltration Depth (m)	0.000
Base Width (m)	2.0		

Orifice Outflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) -22.500

Cascade Summary of Results for Saxon Pit.SRCX

Upstream Outflow To Overflow To Structures

Swale.SRCX (None) (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	-24.279	0.221	52.8	883.3	O K
30 min Summer	-24.226	0.274	52.8	1097.3	O K
60 min Summer	-24.180	0.320	52.8	1278.6	O K
120 min Summer	-24.078	0.422	52.8	1686.6	O K
180 min Summer	-24.032	0.468	52.8	1871.8	O K
240 min Summer	-24.010	0.490	52.8	1959.9	O K
360 min Summer	-24.002	0.498	52.8	1991.1	O K
480 min Summer	-24.015	0.485	52.8	1941.8	O K
600 min Summer	-24.029	0.471	52.8	1883.2	O K
720 min Summer	-24.044	0.456	52.8	1824.3	O K
960 min Summer	-24.073	0.427	52.8	1709.9	O K
1440 min Summer	-24.127	0.373	52.8	1490.7	O K
2160 min Summer	-24.201	0.299	52.8	1196.2	O K
2880 min Summer	-24.263	0.237	52.8	946.9	O K
4320 min Summer	-24.360	0.140	52.8	560.3	O K
5760 min Summer	-24.424	0.076	52.8	304.4	O K
7200 min Summer	-24.466	0.034	52.8	136.7	O K
8640 min Summer	-24.489	0.011	52.8	44.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	36.342	0.0	1258.2	30
30 min Summer	22.893	0.0	1587.3	44
60 min Summer	13.855	0.0	1950.0	72
120 min Summer	9.560	0.0	2692.0	130
180 min Summer	7.429	0.0	3140.6	188
240 min Summer	6.131	0.0	3455.2	246
360 min Summer	4.594	0.0	3883.4	362
480 min Summer	3.690	0.0	4158.8	454
600 min Summer	3.098	0.0	4362.7	506
720 min Summer	2.678	0.0	4527.7	568
960 min Summer	2.122	0.0	4780.2	692
1440 min Summer	1.524	0.0	5139.7	960
2160 min Summer	1.098	0.0	5612.5	1360
2880 min Summer	0.875	0.0	5999.0	1740
4320 min Summer	0.646	0.0	6637.7	2472
5760 min Summer	0.527	0.0	7116.3	3176
7200 min Summer	0.455	0.0	7688.6	3824
8640 min Summer	0.406	0.0	8232.9	4488

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Cascade Summary of Results for Saxon Pit.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	-24.498	0.002	52.8	9.8	O K
15 min Winter	-24.279	0.221	52.8	883.4	O K
30 min Winter	-24.225	0.275	52.8	1099.7	O K
60 min Winter	-24.179	0.321	52.8	1283.3	O K
120 min Winter	-24.075	0.425	52.8	1698.6	O K
180 min Winter	-24.027	0.473	52.8	1892.1	O K
240 min Winter	-24.004	0.496	52.8	1985.2	O K
360 min Winter	-23.994	0.506	52.8	2025.2	O K
480 min Winter	-24.008	0.492	52.8	1967.2	O K
600 min Winter	-24.028	0.472	52.8	1889.6	O K
720 min Winter	-24.047	0.453	52.8	1812.7	O K
960 min Winter	-24.085	0.415	52.8	1661.0	O K
1440 min Winter	-24.164	0.336	52.8	1343.8	O K
2160 min Winter	-24.273	0.227	52.8	909.5	O K
2880 min Winter	-24.361	0.139	52.8	555.6	O K
4320 min Winter	-24.477	0.023	52.8	92.5	O K
5760 min Winter	-24.498	0.002	52.8	8.2	O K
7200 min Winter	-24.499	0.001	52.8	7.0	O K
8640 min Winter	-24.499	0.001	52.8	7.0	O K
10080 min Winter	-24.499	0.001	52.8	7.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.371	0.0	8751.7	5016
15 min Winter	36.342	0.0	1258.2	30
30 min Winter	22.893	0.0	1588.8	43
60 min Winter	13.855	0.0	1947.4	70
120 min Winter	9.560	0.0	2692.4	128
180 min Winter	7.429	0.0	3139.3	184
240 min Winter	6.131	0.0	3455.1	242
360 min Winter	4.594	0.0	3885.4	354
480 min Winter	3.690	0.0	4160.5	462
600 min Winter	3.098	0.0	4363.8	558
720 min Winter	2.678	0.0	4525.5	580
960 min Winter	2.122	0.0	4782.1	730
1440 min Winter	1.524	0.0	5140.4	1024
2160 min Winter	1.098	0.0	5612.9	1436
2880 min Winter	0.875	0.0	5980.7	1812
4320 min Winter	0.646	0.0	6636.3	2424
5760 min Winter	0.527	0.0	7153.8	2896
7200 min Winter	0.455	0.0	7685.7	4376
8640 min Winter	0.406	0.0	8199.2	5048
10080 min Winter	0.371	0.0	8720.7	4480

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Cascade Rainfall Details for Saxon Pit.SRCX

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 10.600

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 2.550	8	12 2.550	16	20 0.400
4	8 2.550	12	16 2.550		

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Cascade Model Details for Saxon Pit.SRCX

Storage is Online Cover Level (m) -21.000

Tank or Pond Structure

Invert Level (m) -24.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	4000.0	3.500	4000.0

Pump Outflow Control

Invert Level (m) -24.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	52.8000	3.500	52.8000

3.3% AEP

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Cascade Summary of Results for Swale.SRCX

Upstream Outflow To Overflow To
Structures

(None) Saxon Pit.SRCX (None)

Half Drain Time : 976 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control E (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-21.987	0.513	0.0	14.2	14.2	816.0	O K
30 min Summer	-21.896	0.604	0.0	15.5	15.5	1036.4	O K
60 min Summer	-21.814	0.686	0.0	16.6	16.6	1253.2	O K
120 min Summer	-21.705	0.795	0.0	18.0	18.0	1568.1	O K
180 min Summer	-21.646	0.854	0.0	18.7	18.7	1754.6	O K
240 min Summer	-21.609	0.891	0.0	19.1	19.1	1872.8	O K
360 min Summer	-21.574	0.926	0.0	19.5	19.5	1992.6	O K
480 min Summer	-21.561	0.939	0.0	19.7	19.7	2033.9	O K
600 min Summer	-21.561	0.939	0.0	19.7	19.7	2035.8	O K
720 min Summer	-21.567	0.933	0.0	19.6	19.6	2015.2	O K
960 min Summer	-21.584	0.916	0.0	19.4	19.4	1957.8	O K
1440 min Summer	-21.621	0.879	0.0	19.0	19.0	1835.1	O K
2160 min Summer	-21.674	0.826	0.0	18.4	18.4	1664.3	O K
2880 min Summer	-21.722	0.778	0.0	17.8	17.8	1517.6	O K
4320 min Summer	-21.802	0.698	0.0	16.8	16.8	1285.5	O K
5760 min Summer	-21.866	0.634	0.0	15.9	15.9	1112.4	O K
7200 min Summer	-21.918	0.582	0.0	15.2	15.2	982.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	92.774	0.0	759.5	22
30 min Summer	59.264	0.0	941.6	36
60 min Summer	36.262	0.0	1271.4	64
120 min Summer	23.176	0.0	1623.1	124
180 min Summer	17.643	0.0	1848.6	184
240 min Summer	14.402	0.0	2005.6	242
360 min Summer	10.621	0.0	2199.8	362
480 min Summer	8.455	0.0	2312.0	482
600 min Summer	7.042	0.0	2378.5	600
720 min Summer	6.044	0.0	2416.0	714
960 min Summer	4.722	0.0	2445.8	808
1440 min Summer	3.299	0.0	2413.3	1044
2160 min Summer	2.290	0.0	2928.3	1448
2880 min Summer	1.769	0.0	3012.0	1848
4320 min Summer	1.234	0.0	3137.3	2640
5760 min Summer	0.962	0.0	3292.5	3456
7200 min Summer	0.799	0.0	3416.5	4184

4/5 Lockside View
Edinburgh Park
Edinburgh, EH12 9DH



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Cascade Summary of Results for Swale.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640 min Summer	-21.960	0.540	0.0	14.6	14.6	878.9	O K
10080 min Summer	-21.996	0.504	0.0	14.1	14.1	795.9	O K
15 min Winter	-21.987	0.513	0.0	14.2	14.2	816.0	O K
30 min Winter	-21.896	0.604	0.0	15.5	15.5	1036.7	O K
60 min Winter	-21.814	0.686	0.0	16.6	16.6	1253.8	O K
120 min Winter	-21.705	0.795	0.0	18.0	18.0	1569.6	O K
180 min Winter	-21.645	0.855	0.0	18.7	18.7	1757.1	O K
240 min Winter	-21.608	0.892	0.0	19.2	19.2	1875.8	O K
360 min Winter	-21.572	0.928	0.0	19.6	19.6	1997.4	O K
480 min Winter	-21.559	0.941	0.0	19.7	19.7	2041.4	O K
600 min Winter	-21.558	0.942	0.0	19.7	19.7	2046.7	O K
720 min Winter	-21.562	0.938	0.0	19.7	19.7	2030.3	O K
960 min Winter	-21.582	0.918	0.0	19.4	19.4	1963.8	O K
1440 min Winter	-21.625	0.875	0.0	19.0	19.0	1822.4	O K
2160 min Winter	-21.689	0.811	0.0	18.2	18.2	1617.7	O K
2880 min Winter	-21.749	0.751	0.0	17.5	17.5	1436.4	O K
4320 min Winter	-21.853	0.647	0.0	16.1	16.1	1147.7	O K
5760 min Winter	-21.937	0.563	0.0	15.0	15.0	935.5	O K
7200 min Winter	-22.003	0.497	0.0	14.0	14.0	780.3	O K
8640 min Winter	-22.057	0.443	0.0	13.1	13.1	662.7	O K
10080 min Winter	-22.102	0.398	0.0	12.3	12.3	572.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.690	0.0	3537.0	4936
10080 min Summer	0.612	0.0	3652.9	5656
15 min Winter	92.774	0.0	759.5	22
30 min Winter	59.264	0.0	941.7	35
60 min Winter	36.262	0.0	1271.4	64
120 min Winter	23.176	0.0	1623.1	122
180 min Winter	17.643	0.0	1848.6	180
240 min Winter	14.402	0.0	2005.7	238
360 min Winter	10.621	0.0	2199.9	354
480 min Winter	8.455	0.0	2312.2	468
600 min Winter	7.042	0.0	2379.0	580
720 min Winter	6.044	0.0	2416.8	688
960 min Winter	4.722	0.0	2447.1	890
1440 min Winter	3.299	0.0	2416.5	1098
2160 min Winter	2.290	0.0	2928.4	1556
2880 min Winter	1.769	0.0	3012.2	1988
4320 min Winter	1.234	0.0	3138.2	2812
5760 min Winter	0.962	0.0	3292.5	3624
7200 min Winter	0.799	0.0	3416.6	4392
8640 min Winter	0.690	0.0	3537.5	5104
10080 min Winter	0.612	0.0	3654.2	5848

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 Edinburgh Park
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Cascade Rainfall Details for Swale.SRCX

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.570

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 3.070	4	8 0.500

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Edinburgh Park
Edinburgh, EH12 9DH



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Cascade Model Details for Swale.SRCX

Storage is Online Cover Level (m) -21.000

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	450.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	-22.500	Cap Infiltration Depth (m)	0.000
Base Width (m)	2.0		

Orifice Outflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) -22.500

Cascade Summary of Results for Saxon Pit.SRCX

Upstream Outflow To Overflow To Structures

Swale.SRCX (None) (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	-23.905	0.595	52.8	2379.0	O K
30 min Summer	-23.743	0.757	52.8	3027.2	O K
60 min Summer	-23.585	0.915	52.8	3660.8	O K
120 min Summer	-23.352	1.148	52.8	4591.0	O K
180 min Summer	-23.212	1.288	52.8	5150.8	O K
240 min Summer	-23.123	1.377	52.8	5509.1	O K
360 min Summer	-23.029	1.471	52.8	5883.7	O K
480 min Summer	-22.994	1.506	52.8	6022.3	O K
600 min Summer	-22.990	1.510	52.8	6039.0	O K
720 min Summer	-23.004	1.496	52.8	5983.3	O K
960 min Summer	-23.061	1.439	52.8	5757.5	O K
1440 min Summer	-23.201	1.299	52.8	5196.6	O K
2160 min Summer	-23.367	1.133	52.8	4530.4	O K
2880 min Summer	-23.493	1.007	52.8	4028.6	O K
4320 min Summer	-23.694	0.806	52.8	3224.3	O K
5760 min Summer	-23.858	0.642	52.8	2566.2	O K
7200 min Summer	-23.992	0.508	52.8	2032.8	O K
8640 min Summer	-24.104	0.396	52.8	1583.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	92.774	0.0	3216.2	31
30 min Summer	59.264	0.0	4081.9	46
60 min Summer	36.262	0.0	5112.5	74
120 min Summer	23.176	0.0	6536.5	134
180 min Summer	17.643	0.0	7459.0	194
240 min Summer	14.402	0.0	8111.7	252
360 min Summer	10.621	0.0	8955.4	372
480 min Summer	8.455	0.0	9104.4	490
600 min Summer	7.042	0.0	9101.0	608
720 min Summer	6.044	0.0	9097.7	728
960 min Summer	4.722	0.0	9075.1	964
1440 min Summer	3.299	0.0	8866.8	1354
2160 min Summer	2.290	0.0	11668.3	1652
2880 min Summer	1.769	0.0	12023.9	2020
4320 min Summer	1.234	0.0	12608.2	2784
5760 min Summer	0.962	0.0	13028.3	3576
7200 min Summer	0.799	0.0	13492.2	4328
8640 min Summer	0.690	0.0	13959.2	5032

Cascade Summary of Results for Saxon Pit.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	-24.197	0.303	52.8	1211.2	O K
15 min Winter	-23.905	0.595	52.8	2380.0	O K
30 min Winter	-23.742	0.758	52.8	3030.6	O K
60 min Winter	-23.584	0.916	52.8	3664.9	O K
120 min Winter	-23.349	1.151	52.8	4602.5	O K
180 min Winter	-23.208	1.292	52.8	5166.7	O K
240 min Winter	-23.117	1.383	52.8	5530.5	O K
360 min Winter	-23.021	1.479	52.8	5914.6	O K
480 min Winter	-22.984	1.516	52.8	6062.4	O K
600 min Winter	-22.977	1.523	52.8	6092.1	O K
720 min Winter	-22.988	1.512	52.8	6049.6	O K
960 min Winter	-23.039	1.461	52.8	5845.8	O K
1440 min Winter	-23.184	1.316	52.8	5264.6	O K
2160 min Winter	-23.380	1.120	52.8	4481.1	O K
2880 min Winter	-23.539	0.961	52.8	3845.7	O K
4320 min Winter	-23.817	0.683	52.8	2734.0	O K
5760 min Winter	-24.046	0.454	52.8	1814.4	O K
7200 min Winter	-24.230	0.270	52.8	1080.8	O K
8640 min Winter	-24.368	0.132	52.8	529.0	O K
10080 min Winter	-24.463	0.037	52.8	149.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.612	0.0	14431.2	5760
15 min Winter	92.774	0.0	3217.3	31
30 min Winter	59.264	0.0	4080.3	45
60 min Winter	36.262	0.0	5114.9	74
120 min Winter	23.176	0.0	6536.1	132
180 min Winter	17.643	0.0	7459.3	190
240 min Winter	14.402	0.0	8112.3	248
360 min Winter	10.621	0.0	8954.5	364
480 min Winter	8.455	0.0	9079.8	480
600 min Winter	7.042	0.0	9067.4	596
720 min Winter	6.044	0.0	9055.2	712
960 min Winter	4.722	0.0	9021.2	940
1440 min Winter	3.299	0.0	8862.0	1372
2160 min Winter	2.290	0.0	11669.1	1696
2880 min Winter	1.769	0.0	12020.2	2136
4320 min Winter	1.234	0.0	12603.5	2984
5760 min Winter	0.962	0.0	13008.7	3752
7200 min Winter	0.799	0.0	13503.4	4472
8640 min Winter	0.690	0.0	13980.1	5104
10080 min Winter	0.612	0.0	14519.9	5560

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Cascade Rainfall Details for Saxon Pit.SRCX

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 10.600

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From:	To:	From:	To:	From:	To:
0	4 2.550	8	12 2.550	16	20 0.400
4	8 2.550	12	16 2.550		

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Cascade Model Details for Saxon Pit.SRCX

Storage is Online Cover Level (m) -21.000

Tank or Pond Structure

Invert Level (m) -24.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	4000.0	3.500	4000.0

Pump Outflow Control

Invert Level (m) -24.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	52.8000	3.500	52.8000

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Cascade Summary of Results for Swale.SRCX

Upstream Outflow To Overflow To
Structures

(None) Saxon Pit.SRCX (None)

Half Drain Time : 1260 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control E (l/s)	Max Outflow (l/s)	Max Volume (m ³)	Status
15 min Summer	-21.867	0.633	0.0	15.9	15.9	1110.7	O K
30 min Summer	-21.752	0.748	0.0	17.4	17.4	1428.1	O K
60 min Summer	-21.652	0.848	0.0	18.6	18.6	1733.4	O K
120 min Summer	-21.510	0.990	0.0	20.2	20.2	2213.2	O K
180 min Summer	-21.432	1.068	0.0	21.1	21.1	2501.5	O K
240 min Summer	-21.384	1.116	0.0	21.6	21.6	2686.7	O K
360 min Summer	-21.334	1.166	0.0	22.0	22.0	2883.8	O K
480 min Summer	-21.315	1.185	0.0	22.2	22.2	2963.9	O K
600 min Summer	-21.310	1.190	0.0	22.3	22.3	2984.6	O K
720 min Summer	-21.313	1.187	0.0	22.3	22.3	2972.0	O K
960 min Summer	-21.332	1.168	0.0	22.1	22.1	2891.7	O K
1440 min Summer	-21.378	1.122	0.0	21.6	21.6	2708.2	O K
2160 min Summer	-21.442	1.058	0.0	21.0	21.0	2463.2	O K
2880 min Summer	-21.499	1.001	0.0	20.4	20.4	2253.5	O K
4320 min Summer	-21.597	0.903	0.0	19.3	19.3	1914.2	O K
5760 min Summer	-21.677	0.823	0.0	18.3	18.3	1654.3	O K
7200 min Summer	-21.744	0.756	0.0	17.5	17.5	1452.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	126.000	0.0	989.6	22
30 min Summer	81.400	0.0	1172.3	36
60 min Summer	49.900	0.0	1746.6	64
120 min Summer	32.400	0.0	2245.1	124
180 min Summer	24.809	0.0	2532.9	184
240 min Summer	20.300	0.0	2697.8	244
360 min Summer	14.983	0.0	2868.4	362
480 min Summer	11.914	0.0	2948.6	482
600 min Summer	9.904	0.0	2987.3	602
720 min Summer	8.483	0.0	3003.3	720
960 min Summer	6.600	0.0	2996.3	932
1440 min Summer	4.583	0.0	2905.3	1138
2160 min Summer	3.155	0.0	4030.1	1512
2880 min Summer	2.417	0.0	4108.0	1908
4320 min Summer	1.661	0.0	4165.3	2724
5760 min Summer	1.276	0.0	4368.0	3520
7200 min Summer	1.044	0.0	4467.4	4320

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Edinburgh Park
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Cascade Summary of Results for Swale.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Control (1/s)	Max Σ Outflow (1/s)	Max Volume (m³)	Status
8640 min Summer	-21.801	0.699	0.0	16.8	16.8	1289.9	O K
10080 min Summer	-21.850	0.650	0.0	16.2	16.2	1155.9	O K
15 min Winter	-21.867	0.633	0.0	15.9	15.9	1110.8	O K
30 min Winter	-21.752	0.748	0.0	17.4	17.4	1428.5	O K
60 min Winter	-21.652	0.848	0.0	18.6	18.6	1734.4	O K
120 min Winter	-21.510	0.990	0.0	20.2	20.2	2215.0	O K
180 min Winter	-21.431	1.069	0.0	21.1	21.1	2504.1	O K
240 min Winter	-21.383	1.117	0.0	21.6	21.6	2690.4	O K
360 min Winter	-21.333	1.167	0.0	22.1	22.1	2889.2	O K
480 min Winter	-21.313	1.187	0.0	22.3	22.3	2971.7	O K
600 min Winter	-21.307	1.193	0.0	22.3	22.3	2995.5	O K
720 min Winter	-21.309	1.191	0.0	22.3	22.3	2986.8	O K
960 min Winter	-21.326	1.174	0.0	22.1	22.1	2915.7	O K
1440 min Winter	-21.379	1.121	0.0	21.6	21.6	2704.5	O K
2160 min Winter	-21.451	1.049	0.0	20.9	20.9	2429.4	O K
2880 min Winter	-21.520	0.980	0.0	20.1	20.1	2179.8	O K
4320 min Winter	-21.642	0.858	0.0	18.8	18.8	1765.7	O K
5760 min Winter	-21.745	0.755	0.0	17.5	17.5	1449.2	O K
7200 min Winter	-21.830	0.670	0.0	16.4	16.4	1208.5	O K
8640 min Winter	-21.902	0.598	0.0	15.4	15.4	1020.5	O K
10080 min Winter	-21.964	0.536	0.0	14.6	14.6	871.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	0.889	0.0	4561.0	5024
10080 min Summer	0.778	0.0	4647.3	5760
15 min Winter	126.000	0.0	989.6	22
30 min Winter	81.400	0.0	1172.4	36
60 min Winter	49.900	0.0	1746.6	64
120 min Winter	32.400	0.0	2245.2	122
180 min Winter	24.809	0.0	2532.9	180
240 min Winter	20.300	0.0	2697.9	240
360 min Winter	14.983	0.0	2868.6	356
480 min Winter	11.914	0.0	2949.0	472
600 min Winter	9.904	0.0	2987.9	586
720 min Winter	8.483	0.0	3004.0	698
960 min Winter	6.600	0.0	2997.6	914
1440 min Winter	4.583	0.0	2908.5	1156
2160 min Winter	3.155	0.0	4030.2	1600
2880 min Winter	2.417	0.0	4108.4	2048
4320 min Winter	1.661	0.0	4170.1	2900
5760 min Winter	1.276	0.0	4368.0	3744
7200 min Winter	1.044	0.0	4467.5	4472
8640 min Winter	0.889	0.0	4561.4	5272
10080 min Winter	0.778	0.0	4648.9	5960

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Cascade Rainfall Details for Swale.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 3.570

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	3.070	4	8	0.500

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Cascade Model Details for Swale.SRCX

Storage is Online Cover Level (m) -21.000

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	450.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	-22.500	Cap Infiltration Depth (m)	0.000
Base Width (m)	2.0		

Orifice Outflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) -22.500

Cascade Summary of Results for Saxon Pit.SRCX

Upstream Outflow To Overflow To Structures

Swale.SRCX (None) (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	-23.685	0.815	52.8	3261.2	O K
30 min Summer	-23.449	1.051	52.8	4203.7	O K
60 min Summer	-23.222	1.278	52.8	5113.0	O K
120 min Summer	-22.861	1.639	52.8	6557.6	O K
180 min Summer	-22.638	1.862	52.8	7447.1	O K
240 min Summer	-22.491	2.009	52.8	8034.5	O K
360 min Summer	-22.326	2.174	52.8	8695.2	O K
480 min Summer	-22.249	2.251	52.8	9005.7	O K
600 min Summer	-22.216	2.284	52.8	9137.7	O K
720 min Summer	-22.209	2.291	52.8	9165.6	O K
960 min Summer	-22.242	2.258	52.8	9033.7	O K
1440 min Summer	-22.390	2.110	52.8	8438.6	O K
2160 min Summer	-22.638	1.862	52.8	7447.6	O K
2880 min Summer	-22.829	1.671	52.8	6684.1	O K
4320 min Summer	-23.108	1.392	52.8	5568.8	O K
5760 min Summer	-23.328	1.172	52.8	4689.7	O K
7200 min Summer	-23.511	0.989	52.8	3955.4	O K
8640 min Summer	-23.672	0.828	52.8	3310.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	126.000	0.0	4327.7	32
30 min Summer	81.400	0.0	4558.8	46
60 min Summer	49.900	0.0	7035.4	76
120 min Summer	32.400	0.0	9112.8	134
180 min Summer	24.809	0.0	9117.5	194
240 min Summer	20.300	0.0	9115.9	254
360 min Summer	14.983	0.0	9112.8	374
480 min Summer	11.914	0.0	9111.2	492
600 min Summer	9.904	0.0	9107.8	612
720 min Summer	8.483	0.0	9104.4	730
960 min Summer	6.600	0.0	9099.4	968
1440 min Summer	4.583	0.0	9059.2	1444
2160 min Summer	3.155	0.0	16069.5	2052
2880 min Summer	2.417	0.0	16403.3	2292
4320 min Summer	1.661	0.0	16052.0	2992
5760 min Summer	1.276	0.0	17317.0	3760
7200 min Summer	1.044	0.0	17667.7	4544
8640 min Summer	0.889	0.0	18010.5	5288

Cascade Summary of Results for Saxon Pit.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	-23.814	0.686	52.8	2743.8	O K
15 min Winter	-23.685	0.815	52.8	3261.5	O K
30 min Winter	-23.448	1.052	52.8	4206.2	O K
60 min Winter	-23.221	1.279	52.8	5116.3	O K
120 min Winter	-22.858	1.642	52.8	6568.3	O K
180 min Winter	-22.634	1.866	52.8	7462.8	O K
240 min Winter	-22.487	2.013	52.8	8053.8	O K
360 min Winter	-22.319	2.181	52.8	8723.2	O K
480 min Winter	-22.239	2.261	52.8	9042.2	O K
600 min Winter	-22.204	2.296	52.8	9182.8	O K
720 min Winter	-22.195	2.305	52.8	9219.1	O K
960 min Winter	-22.222	2.278	52.8	9111.9	O K
1440 min Winter	-22.359	2.141	52.8	8564.9	O K
2160 min Winter	-22.613	1.887	52.8	7547.8	O K
2880 min Winter	-22.837	1.663	52.8	6652.1	O K
4320 min Winter	-23.181	1.319	52.8	5274.5	O K
5760 min Winter	-23.480	1.020	52.8	4079.6	O K
7200 min Winter	-23.737	0.763	52.8	3052.9	O K
8640 min Winter	-23.959	0.541	52.8	2162.4	O K
10080 min Winter	-24.147	0.353	52.8	1413.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	0.778	0.0	18394.3	6056
15 min Winter	126.000	0.0	4327.7	32
30 min Winter	81.400	0.0	4557.2	46
60 min Winter	49.900	0.0	7035.9	74
120 min Winter	32.400	0.0	9112.1	132
180 min Winter	24.809	0.0	9106.9	192
240 min Winter	20.300	0.0	9103.2	250
360 min Winter	14.983	0.0	9094.3	366
480 min Winter	11.914	0.0	9087.0	484
600 min Winter	9.904	0.0	9078.0	600
720 min Winter	8.483	0.0	9069.2	718
960 min Winter	6.600	0.0	9046.6	950
1440 min Winter	4.583	0.0	8978.8	1408
2160 min Winter	3.155	0.0	16072.0	2056
2880 min Winter	2.417	0.0	16407.7	2344
4320 min Winter	1.661	0.0	16254.5	3172
5760 min Winter	1.276	0.0	17293.5	4032
7200 min Winter	1.044	0.0	17688.3	4824
8640 min Winter	0.889	0.0	18026.9	5536
10080 min Winter	0.778	0.0	18393.6	6248

4/5 Lockside View
 Edinburgh Park
 Edinburgh, EH12 9DH

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Cascade Rainfall Details for Saxon Pit.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+0

Time Area Diagram

Total Area (ha) 10.600

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:	From: To:	From: To:	From: To:	From: To:	From: To:
0 4	2.550	8 12	2.550	16 20	0.400
4 8	2.550	12 16	2.550		

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Cascade Model Details for Saxon Pit.SRCX

Storage is Online Cover Level (m) -21.000

Tank or Pond Structure

Invert Level (m) -24.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	4000.0	3.500	4000.0

Pump Outflow Control

Invert Level (m) -24.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	52.8000	3.500	52.8000

1% AEP + 40% Climate Change

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Cascade Summary of Results for Swale.SRCX

Upstream Outflow To Overflow To
Structures

(None) Saxon Pit.SRCX (None)

Half Drain Time : 1609 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-21.708	0.792	0.0	18.0	18.0	1558.3	O K
30 min Summer	-21.570	0.930	0.0	19.6	19.6	2005.3	O K
60 min Summer	-21.449	1.051	0.0	20.9	20.9	2438.6	O K
120 min Summer	-21.276	1.224	0.0	22.6	22.6	3124.0	O K
180 min Summer	-21.180	1.320	0.0	23.5	23.5	3542.4	O K
240 min Summer	-21.119	1.381	0.0	24.1	24.1	3816.8	O K
360 min Summer	-21.054	1.446	0.0	24.7	24.7	4122.2	O K
480 min Summer	-21.025	1.475	0.0	24.9	24.9	4264.0	O K
600 min Summer	-21.013	1.487	0.0	25.0	25.0	4322.0	O K
720 min Summer	-21.011	1.489	0.0	25.0	25.0	4332.5	O K
960 min Summer	-21.023	1.477	0.0	24.9	24.9	4272.1	O K
1440 min Summer	-21.074	1.426	0.0	24.5	24.5	4030.1	O K
2160 min Summer	-21.144	1.356	0.0	23.9	23.9	3704.0	O K
2880 min Summer	-21.204	1.296	0.0	23.3	23.3	3432.8	O K
4320 min Summer	-21.309	1.191	0.0	22.3	22.3	2985.8	O K
5760 min Summer	-21.397	1.103	0.0	21.4	21.4	2634.6	O K
7200 min Summer	-21.470	1.030	0.0	20.7	20.7	2357.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	176.400	0.0	1233.2	22
30 min Summer	113.960	0.0	1413.8	37
60 min Summer	69.860	0.0	2407.7	66
120 min Summer	45.360	0.0	2931.5	124
180 min Summer	34.732	0.0	3180.3	184
240 min Summer	28.420	0.0	3325.0	244
360 min Summer	20.977	0.0	3472.9	362
480 min Summer	16.680	0.0	3537.5	482
600 min Summer	13.866	0.0	3563.3	602
720 min Summer	11.877	0.0	3567.8	722
960 min Summer	9.241	0.0	3540.0	960
1440 min Summer	6.417	0.0	3412.1	1256
2160 min Summer	4.416	0.0	5587.3	1604
2880 min Summer	3.383	0.0	5601.1	1992
4320 min Summer	2.325	0.0	5346.8	2808
5760 min Summer	1.786	0.0	6116.1	3624
7200 min Summer	1.462	0.0	6255.0	4400

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Edinburgh Park
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Cascade Summary of Results for Swale.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	-21.534	0.966	0.0	20.0	20.0	2130.6	O K
10080 min Summer	-21.589	0.911	0.0	19.4	19.4	1939.9	O K
15 min Winter	-21.708	0.792	0.0	18.0	18.0	1558.4	O K
30 min Winter	-21.570	0.930	0.0	19.6	19.6	2005.9	O K
60 min Winter	-21.448	1.052	0.0	20.9	20.9	2439.8	O K
120 min Winter	-21.276	1.224	0.0	22.6	22.6	3126.0	O K
180 min Winter	-21.179	1.321	0.0	23.5	23.5	3545.5	O K
240 min Winter	-21.118	1.382	0.0	24.1	24.1	3821.0	O K
360 min Winter	-21.053	1.447	0.0	24.7	24.7	4128.5	O K
480 min Winter	-21.023	1.477	0.0	24.9	24.9	4272.4	O K
600 min Winter	-21.011	1.489	0.0	25.0	25.0	4333.3	O K
720 min Winter	-21.008	1.492	0.0	25.1	25.1	4347.1	O K
960 min Winter	-21.019	1.481	0.0	25.0	25.0	4295.7	O K
1440 min Winter	-21.068	1.432	0.0	24.5	24.5	4058.6	O K
2160 min Winter	-21.147	1.353	0.0	23.8	23.8	3689.5	O K
2880 min Winter	-21.217	1.283	0.0	23.2	23.2	3378.4	O K
4320 min Winter	-21.345	1.155	0.0	21.9	21.9	2840.9	O K
5760 min Winter	-21.456	1.044	0.0	20.8	20.8	2409.3	O K
7200 min Winter	-21.552	0.948	0.0	19.8	19.8	2067.6	O K
8640 min Winter	-21.634	0.866	0.0	18.9	18.9	1791.6	O K
10080 min Winter	-21.706	0.794	0.0	18.0	18.0	1564.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.245	0.0	6386.7	5184
10080 min Summer	1.089	0.0	6510.8	5952
15 min Winter	176.400	0.0	1233.2	22
30 min Winter	113.960	0.0	1413.9	36
60 min Winter	69.860	0.0	2407.7	64
120 min Winter	45.360	0.0	2931.5	122
180 min Winter	34.732	0.0	3180.3	182
240 min Winter	28.420	0.0	3325.0	240
360 min Winter	20.977	0.0	3472.9	358
480 min Winter	16.680	0.0	3537.5	474
600 min Winter	13.866	0.0	3563.4	590
720 min Winter	11.877	0.0	3568.0	704
960 min Winter	9.241	0.0	3540.5	930
1440 min Winter	6.417	0.0	3414.2	1354
2160 min Winter	4.416	0.0	5588.2	1668
2880 min Winter	3.383	0.0	5605.1	2132
4320 min Winter	2.325	0.0	5361.9	3024
5760 min Winter	1.786	0.0	6116.2	3864
7200 min Winter	1.462	0.0	6255.1	4680
8640 min Winter	1.245	0.0	6386.9	5448
10080 min Winter	1.089	0.0	6511.9	6248

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 Edinburgh Park
 Edinburgh, EH12 9DH



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Cascade Rainfall Details for Swale.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.570

Time (mins)	Area	Time (mins)	Area
From:	To: (ha)	From:	To: (ha)
0	4 3.070	4	8 0.500

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Cascade Model Details for Swale.SRCX

Storage is Online Cover Level (m) -21.000

Swale Structure

Infiltration Coefficient Base (m/hr)	0.00000	Length (m)	450.0
Infiltration Coefficient Side (m/hr)	0.00000	Side Slope (1:X)	3.0
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	1.00	Cap Volume Depth (m)	0.000
Invert Level (m)	-22.500	Cap Infiltration Depth (m)	0.000
Base Width (m)	2.0		

Orifice Outflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) -22.500

Cascade Summary of Results for Saxon Pit.SRCX

Upstream Outflow To Overflow To Structures

Swale.SRCX (None) (None)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	-23.351	1.149	52.8	4597.7	O K
30 min Summer	-23.017	1.483	52.8	5932.3	O K
60 min Summer	-22.692	1.808	52.8	7233.0	O K
120 min Summer	-22.170	2.330	52.8	9319.9	O K
180 min Summer	-21.844	2.656	52.8	10622.8	O K
240 min Summer	-21.624	2.876	52.8	11505.0	O K
360 min Summer	-21.363	3.137	52.8	12549.0	O K
480 min Summer	-21.223	3.277	52.8	13106.0	O K
600 min Summer	-21.148	3.352	52.8	13408.5	O K
720 min Summer	-21.108	3.392	52.8	13567.5	O K
960 min Summer	-21.093	3.407	52.8	13629.7	O K
1440 min Summer	-21.186	3.314	52.8	13254.8	O K
2160 min Summer	-21.436	3.064	52.8	12256.5	O K
2880 min Summer	-21.686	2.814	52.8	11256.8	O K
4320 min Summer	-22.083	2.417	52.8	9667.9	O K
5760 min Summer	-22.360	2.140	52.8	8561.5	O K
7200 min Summer	-22.579	1.921	52.8	7683.5	O K
8640 min Summer	-22.770	1.730	52.8	6921.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	176.400	0.0	4561.1	33
30 min Summer	113.960	0.0	4559.5	47
60 min Summer	69.860	0.0	9122.3	76
120 min Summer	45.360	0.0	9119.1	136
180 min Summer	34.732	0.0	9119.1	196
240 min Summer	28.420	0.0	9117.5	254
360 min Summer	20.977	0.0	9115.9	374
480 min Summer	16.680	0.0	9112.8	494
600 min Summer	13.866	0.0	9112.8	614
720 min Summer	11.877	0.0	9111.2	732
960 min Summer	9.241	0.0	9106.1	972
1440 min Summer	6.417	0.0	9099.4	1448
2160 min Summer	4.416	0.0	18158.2	2164
2880 min Summer	3.383	0.0	17872.5	2880
4320 min Summer	2.325	0.0	16872.4	3460
5760 min Summer	1.786	0.0	24255.1	4144
7200 min Summer	1.462	0.0	24777.2	4904
8640 min Summer	1.245	0.0	25293.2	5696

Cascade Summary of Results for Saxon Pit.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
10080 min Summer	-22.939	1.561	52.8	6244.4	O K
15 min Winter	-23.350	1.150	52.8	4599.7	O K
30 min Winter	-23.016	1.484	52.8	5934.0	O K
60 min Winter	-22.691	1.809	52.8	7237.6	O K
120 min Winter	-22.168	2.332	52.8	9328.1	O K
180 min Winter	-21.841	2.659	52.8	10634.7	O K
240 min Winter	-21.620	2.880	52.8	11521.1	O K
360 min Winter	-21.357	3.143	52.8	12572.4	O K
480 min Winter	-21.216	3.284	52.8	13135.6	O K
600 min Winter	-21.138	3.362	52.8	13446.1	O K
720 min Winter	-21.096	3.404	52.8	13614.2	O K
960 min Winter	-21.077	3.423	52.8	13692.2	O K
1440 min Winter	-21.158	3.342	52.8	13366.5	O K
2160 min Winter	-21.391	3.109	52.8	12437.8	O K
2880 min Winter	-21.651	2.849	52.8	11395.8	O K
4320 min Winter	-22.095	2.405	52.8	9621.0	O K
5760 min Winter	-22.432	2.068	52.8	8272.4	O K
7200 min Winter	-22.728	1.772	52.8	7089.3	O K
8640 min Winter	-22.998	1.502	52.8	6008.7	O K
10080 min Winter	-23.240	1.260	52.8	5038.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
10080 min Summer	1.089	0.0	25756.3	6456
15 min Winter	176.400	0.0	4559.5	33
30 min Winter	113.960	0.0	4558.8	47
60 min Winter	69.860	0.0	9119.1	76
120 min Winter	45.360	0.0	9114.1	134
180 min Winter	34.732	0.0	9111.8	192
240 min Winter	28.420	0.0	9106.8	252
360 min Winter	20.977	0.0	9099.5	368
480 min Winter	16.680	0.0	9092.4	486
600 min Winter	13.866	0.0	9086.7	604
720 min Winter	11.877	0.0	9078.1	722
960 min Winter	9.241	0.0	9062.1	956
1440 min Winter	6.417	0.0	9019.1	1424
2160 min Winter	4.416	0.0	18039.1	2108
2880 min Winter	3.383	0.0	17846.7	2772
4320 min Winter	2.325	0.0	16955.1	3544
5760 min Winter	1.786	0.0	24266.8	4336
7200 min Winter	1.462	0.0	24848.9	5192
8640 min Winter	1.245	0.0	25246.3	6048
10080 min Winter	1.089	0.0	25927.7	6856

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 Edinburgh Park
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Cascade Rainfall Details for Saxon Pit.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 10.600

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:	From: To:	From: To:	From: To:	From: To:	From: To:
0 4	2.550	8 12	2.550	16 20	0.400
4 8	2.550	12 16	2.550		

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Cascade Model Details for Saxon Pit.SRCX

Storage is Online Cover Level (m) -21.000

Tank or Pond Structure

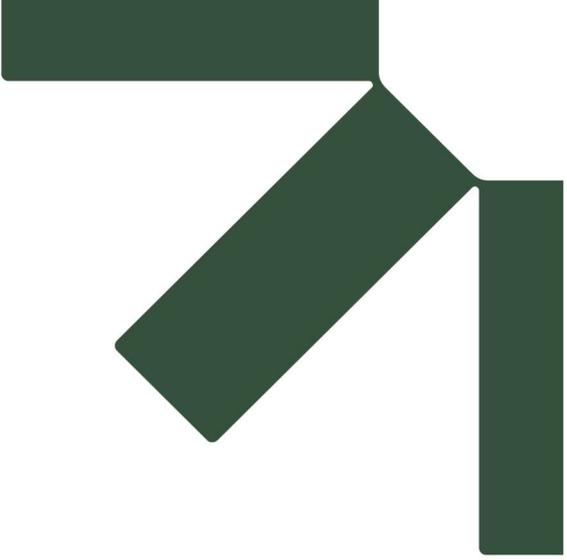
Invert Level (m) -24.500

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	4000.0	3.500	4000.0

Pump Outflow Control

Invert Level (m) -24.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	52.8000	3.500	52.8000



Appendix E Pump Failure Modelling Calculations

Cascade Summary of Results for Swale.SRCX

Upstream Outflow To Overflow To
Structures

(None) Saxon Pit.SRCX (None)

Half Drain Time : 1123 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control E (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	-20.876	0.874	0.0	18.9	18.9	1557.9	FLOOD
30 min Summer	-20.432	1.318	0.0	23.5	23.5	2002.5	FLOOD
60 min Summer	-20.005	1.745	0.0	27.2	27.2	2429.6	FLOOD
120 min Summer	-19.339	2.411	0.0	32.1	32.1	3095.8	FLOOD
180 min Summer	-18.943	2.807	0.0	34.7	34.7	3490.9	FLOOD
240 min Summer	-18.693	3.057	0.0	36.2	36.2	3740.9	FLOOD
360 min Summer	-18.437	3.313	0.0	37.7	37.7	3997.0	FLOOD
480 min Summer	-18.345	3.405	0.0	38.2	38.2	4089.4	FLOOD
600 min Summer	-18.334	3.416	0.0	38.3	38.3	4100.3	FLOOD
720 min Summer	-18.368	3.382	0.0	38.1	38.1	4066.2	FLOOD
960 min Summer	-18.472	3.278	0.0	37.5	37.5	3962.2	FLOOD
1440 min Summer	-18.687	3.063	0.0	36.2	36.2	3747.4	FLOOD
2160 min Summer	-18.989	2.761	0.0	34.4	34.4	3444.9	FLOOD
2880 min Summer	-19.252	2.498	0.0	32.7	32.7	3182.0	FLOOD
4320 min Summer	-19.677	2.073	0.0	29.7	29.7	2757.5	FLOOD
5760 min Summer	-19.997	1.753	0.0	27.2	27.2	2437.3	FLOOD
7200 min Summer	-20.240	1.510	0.0	25.2	25.2	2194.8	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	176.400	123.6	1235.2	22
30 min Summer	113.960	568.1	1452.3	36
60 min Summer	69.860	995.3	2426.2	64
120 min Summer	45.360	1661.4	3065.8	124
180 min Summer	34.732	2056.5	3423.7	184
240 min Summer	28.420	2306.5	3657.5	242
360 min Summer	20.977	2562.6	3931.7	362
480 min Summer	16.680	2655.0	4079.9	482
600 min Summer	13.866	2666.0	4164.6	600
720 min Summer	11.877	2631.9	4212.7	716
960 min Summer	9.241	2527.9	4243.5	816
1440 min Summer	6.417	2313.0	4174.5	1054
2160 min Summer	4.416	2010.5	5642.9	1452
2880 min Summer	3.383	1747.6	5742.7	1872
4320 min Summer	2.325	1323.1	5668.7	2680
5760 min Summer	1.786	1002.9	6116.6	3464
7200 min Summer	1.462	760.5	6255.7	4256

Cascade Summary of Results for Swale.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
8640 min Summer	-20.432	1.318	0.0	23.5	23.5	2002.7	FLOOD
10080 min Summer	-20.587	1.163	0.0	22.0	22.0	1847.1	FLOOD
15 min Winter	-20.876	0.874	0.0	18.9	18.9	1558.1	FLOOD
30 min Winter	-20.431	1.319	0.0	23.5	23.5	2003.1	FLOOD
60 min Winter	-20.003	1.747	0.0	27.2	27.2	2431.5	FLOOD
120 min Winter	-19.335	2.415	0.0	32.1	32.1	3099.7	FLOOD
180 min Winter	-18.937	2.813	0.0	34.7	34.7	3497.1	FLOOD
240 min Winter	-18.685	3.065	0.0	36.2	36.2	3748.9	FLOOD
360 min Winter	-18.425	3.325	0.0	37.8	37.8	4009.5	FLOOD
480 min Winter	-18.326	3.424	0.0	38.3	38.3	4108.0	FLOOD
600 min Winter	-18.308	3.442	0.0	38.4	38.4	4126.7	FLOOD
720 min Winter	-18.332	3.418	0.0	38.3	38.3	4101.9	FLOOD
960 min Winter	-18.449	3.301	0.0	37.6	37.6	3985.8	FLOOD
1440 min Winter	-18.693	3.057	0.0	36.2	36.2	3741.1	FLOOD
2160 min Winter	-19.044	2.706	0.0	34.0	34.0	3390.1	FLOOD
2880 min Winter	-19.356	2.394	0.0	32.0	32.0	3078.5	FLOOD
4320 min Winter	-19.855	1.895	0.0	28.4	28.4	2579.5	FLOOD
5760 min Winter	-20.224	1.526	0.0	25.4	25.4	2210.3	FLOOD
7200 min Winter	-20.500	1.250	0.0	22.9	22.9	1934.6	FLOOD
8640 min Winter	-20.714	1.036	0.0	20.7	20.7	1720.0	FLOOD
10080 min Winter	-20.890	0.860	0.0	18.8	18.8	1544.7	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
8640 min Summer	1.245	568.3	6387.4	5024
10080 min Summer	1.089	412.7	6511.3	5848
15 min Winter	176.400	123.7	1235.2	22
30 min Winter	113.960	568.8	1452.3	36
60 min Winter	69.860	997.1	2426.2	64
120 min Winter	45.360	1665.3	3065.7	122
180 min Winter	34.732	2062.8	3423.5	180
240 min Winter	28.420	2314.5	3657.2	238
360 min Winter	20.977	2575.1	3931.2	354
480 min Winter	16.680	2673.7	4079.3	468
600 min Winter	13.866	2692.3	4163.9	580
720 min Winter	11.877	2667.6	4211.8	690
960 min Winter	9.241	2551.4	4242.4	894
1440 min Winter	6.417	2306.8	4172.8	1102
2160 min Winter	4.416	1955.7	5642.8	1560
2880 min Winter	3.383	1644.1	5742.4	2016
4320 min Winter	2.325	1145.1	5666.7	2856
5760 min Winter	1.786	776.0	6116.6	3688
7200 min Winter	1.462	500.2	6255.6	4536
8640 min Winter	1.245	285.6	6387.3	5352
10080 min Winter	1.089	110.3	6512.1	6152

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Cascade Rainfall Details for Swale.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 3.570

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	3.070	4	8	0.500

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Edinburgh Park
Edinburgh, EH12 9DH



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Cascade Model Details for Swale.SRCX

Storage is Online Cover Level (m) -21.000

Swale Structure

Infiltration Coefficient Base (m/hr) 0.00000	Length (m) 450.0
Infiltration Coefficient Side (m/hr) 0.00000	Side Slope (1:X) 3.0
Safety Factor 2.0	Slope (1:X) 0.0
Porosity 1.00	Cap Volume Depth (m) 0.000
Invert Level (m) -21.750	Cap Infiltration Depth (m) 0.000
Base Width (m) 2.0	

Orifice Outflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) -21.750

Cascade Summary of Results for Saxon Pit.SRCX

**Upstream Outflow To Overflow To
Structures**

Swale.SRCX (None) (None)

Outflow is too low. Design is unsatisfactory.

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
15 min Summer	-21.273	1.477	0.0	5909.5	O K
30 min Summer	-20.877	1.873	0.0	7491.8	FLOOD
60 min Summer	-20.292	2.458	0.0	9831.2	FLOOD
120 min Summer	-19.580	3.170	0.0	12681.8	FLOOD
180 min Summer	-19.133	3.617	0.0	14468.0	FLOOD
240 min Summer	-18.823	3.927	0.0	15706.9	FLOOD
360 min Summer	-18.432	4.318	0.0	17272.1	FLOOD
480 min Summer	-18.194	4.556	0.0	18223.8	FLOOD
600 min Summer	-18.035	4.715	0.0	18861.7	FLOOD
720 min Summer	-17.920	4.830	0.0	19318.9	FLOOD
960 min Summer	-17.771	4.979	0.0	19914.8	FLOOD
1440 min Summer	-17.626	5.124	0.0	20497.5	FLOOD
2160 min Summer	-17.126	5.624	0.0	22495.7	FLOOD
2880 min Summer	-17.011	5.739	0.0	22956.9	FLOOD
4320 min Summer	-16.896	5.854	0.0	23414.4	FLOOD
5760 min Summer	-16.676	6.074	0.0	24295.6	FLOOD
7200 min Summer	-16.537	6.213	0.0	24852.4	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
15 min Summer	176.400	0.0	0.0	1440
30 min Summer	113.960	491.8	0.0	1440
60 min Summer	69.860	2831.2	0.0	2880
120 min Summer	45.360	5681.8	0.0	2880
180 min Summer	34.732	7468.0	0.0	2880
240 min Summer	28.420	8706.9	0.0	2880
360 min Summer	20.977	10272.1	0.0	2880
480 min Summer	16.680	11223.8	0.0	2880
600 min Summer	13.866	11861.7	0.0	2880
720 min Summer	11.877	12318.9	0.0	2880
960 min Summer	9.241	12914.8	0.0	2880
1440 min Summer	6.417	13497.5	0.0	2880
2160 min Summer	4.416	15495.7	0.0	5760
2880 min Summer	3.383	15956.9	0.0	5760
4320 min Summer	2.325	16414.4	0.0	5760
5760 min Summer	1.786	17295.6	0.0	11520
7200 min Summer	1.462	17852.4	0.0	11520

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Cascade Summary of Results for Saxon Pit.SRCX

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m ³)	Status
8640 min Summer	-16.404	6.346	0.0	25385.1	FLOOD
10080 min Summer	-16.275	6.475	0.0	25901.9	FLOOD
15 min Winter	-21.273	1.477	0.0	5909.5	O K
30 min Winter	-20.877	1.873	0.0	7491.8	FLOOD
60 min Winter	-20.292	2.458	0.0	9831.2	FLOOD
120 min Winter	-19.580	3.170	0.0	12681.6	FLOOD
180 min Winter	-19.133	3.617	0.0	14467.8	FLOOD
240 min Winter	-18.823	3.927	0.0	15706.6	FLOOD
360 min Winter	-18.432	4.318	0.0	17271.6	FLOOD
480 min Winter	-18.194	4.556	0.0	18223.2	FLOOD
600 min Winter	-18.035	4.715	0.0	18861.0	FLOOD
720 min Winter	-17.920	4.830	0.0	19318.0	FLOOD
960 min Winter	-17.772	4.978	0.0	19913.6	FLOOD
1440 min Winter	-17.626	5.124	0.0	20495.7	FLOOD
2160 min Winter	-17.126	5.624	0.0	22495.6	FLOOD
2880 min Winter	-17.011	5.739	0.0	22956.6	FLOOD
4320 min Winter	-16.897	5.853	0.0	23412.4	FLOOD
5760 min Winter	-16.676	6.074	0.0	24295.6	FLOOD
7200 min Winter	-16.537	6.213	0.0	24852.4	FLOOD
8640 min Winter	-16.404	6.346	0.0	25385.0	FLOOD
10080 min Winter	-16.274	6.476	0.0	25902.7	FLOOD

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
8640 min Summer	1.245	18385.1	0.0	11520
10080 min Summer	1.089	18901.9	0.0	11520
15 min Winter	176.400	0.0	0.0	1440
30 min Winter	113.960	491.8	0.0	1440
60 min Winter	69.860	2831.2	0.0	2880
120 min Winter	45.360	5681.6	0.0	2880
180 min Winter	34.732	7467.8	0.0	2880
240 min Winter	28.420	8706.6	0.0	2880
360 min Winter	20.977	10271.6	0.0	2880
480 min Winter	16.680	11223.2	0.0	2880
600 min Winter	13.866	11861.0	0.0	2880
720 min Winter	11.877	12318.0	0.0	2880
960 min Winter	9.241	12913.6	0.0	2880
1440 min Winter	6.417	13495.7	0.0	2880
2160 min Winter	4.416	15495.6	0.0	5760
2880 min Winter	3.383	15956.6	0.0	5760
4320 min Winter	2.325	16412.4	0.0	5760
5760 min Winter	1.786	17295.6	0.0	11520
7200 min Winter	1.462	17852.4	0.0	11520
8640 min Winter	1.245	18385.0	0.0	11520
10080 min Winter	1.089	18902.7	0.0	11520

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Cascade Rainfall Details for Saxon Pit.SRCX

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 525900 296800 TL 25900 96800
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	1.000
Cv (Winter)	1.000
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 10.600

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
From: To:	From: To:	From: To:	From: To:	From: To:	From: To:
0 4	2.550	8 12	2.550	16 20	0.400
4 8	2.550	12 16	2.550		

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Cascade Model Details for Saxon Pit.SRCX

Storage is Online Cover Level (m) -21.000

Tank or Pond Structure

Invert Level (m) -22.750

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	4000.0	1.750	4000.0

Pump Outflow Control

Invert Level (m) -22.750

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.001	0.0000	3.000	0.0000



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