

CLIMPING CREMATORIUM

Surface Water Management Plan

Prepared for: Southern Co-operative Group

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1.0 Introduction

SLR Consulting Limited has been appointed on behalf of the Southern Co-operative Group Limited to prepare this Surface Water Management Plan (SWMP) to support a planning application for a new crematorium on land near Climping ("the Site") in West Sussex.

This SWMP has been prepared under the direction of a Principal Hydrologist of SLR who specialises in surface water management and drainage design. Site Location

The Site is situated to the south of Grevatt's Lane to the southwest of the village of Climping and to the northeast of Ancton and Elmer. The Site is centred at National Grid Reference 498735 101407.

A Site Location Plan is provided as Figure 1-1.

Figure 1-1
Site Location Plan



The Site is located in an area which falls under the jurisdiction of Arun District Council and West Sussex County Council. The former is the local Planning Authority, and the latter is the Lead Local Flood Authority (LLFA).

1.1 Development Proposals

The proposal is for the development of land to create a crematorium with associated access, parking and landscaping at Grevatt's Lane, Climping, West Sussex, BN17 5RE. Details of the proposed development are enclosed at Appendix 01.

The development will comprise a detached, single storey crematorium building set back circa. 200m from Grevatt's Lane and will incorporate a vestibule and waiting areas, chapel, cremation equipment and ancillary office spaces. The development will be accessed via a new vehicular access from Grevatt's Lane. Sited in the northwest corner of the Site. To the front of the building there will be two parking areas. The main car park will

be hard-surfaced and provide for circa. 99 parking spaces. Around the outside of the car park, a driveway will be provided for the use of hearses etc. In addition to the main car park a second, smaller overflow car park, for circa. 60 cars, will be provided in the northeast corner of the Site.

The proposals also include the landscaping of the remainder of the Site.

2.0 Baseline Site Appraisal

2.1 Existing Site Features

The Site is an arable field which is bound to the north by Grevatt's Lane. A ditch flows in a southerly direction along the western Site boundary. This joins a larger watercourse called Ryebank Rife at the southwestern corner of the Site and this larger channel then forms the southern Site boundary.

Land use locally is all arable farmland and the closest buildings are associated with an area of light industry around 350m to the east

Access onto the Site is obtained from Grevatt's Lane at the northwest corner of the Site via a short track that crosses the ditch along the western Site boundary.

Figure 2-1
Aerial Plan of Site



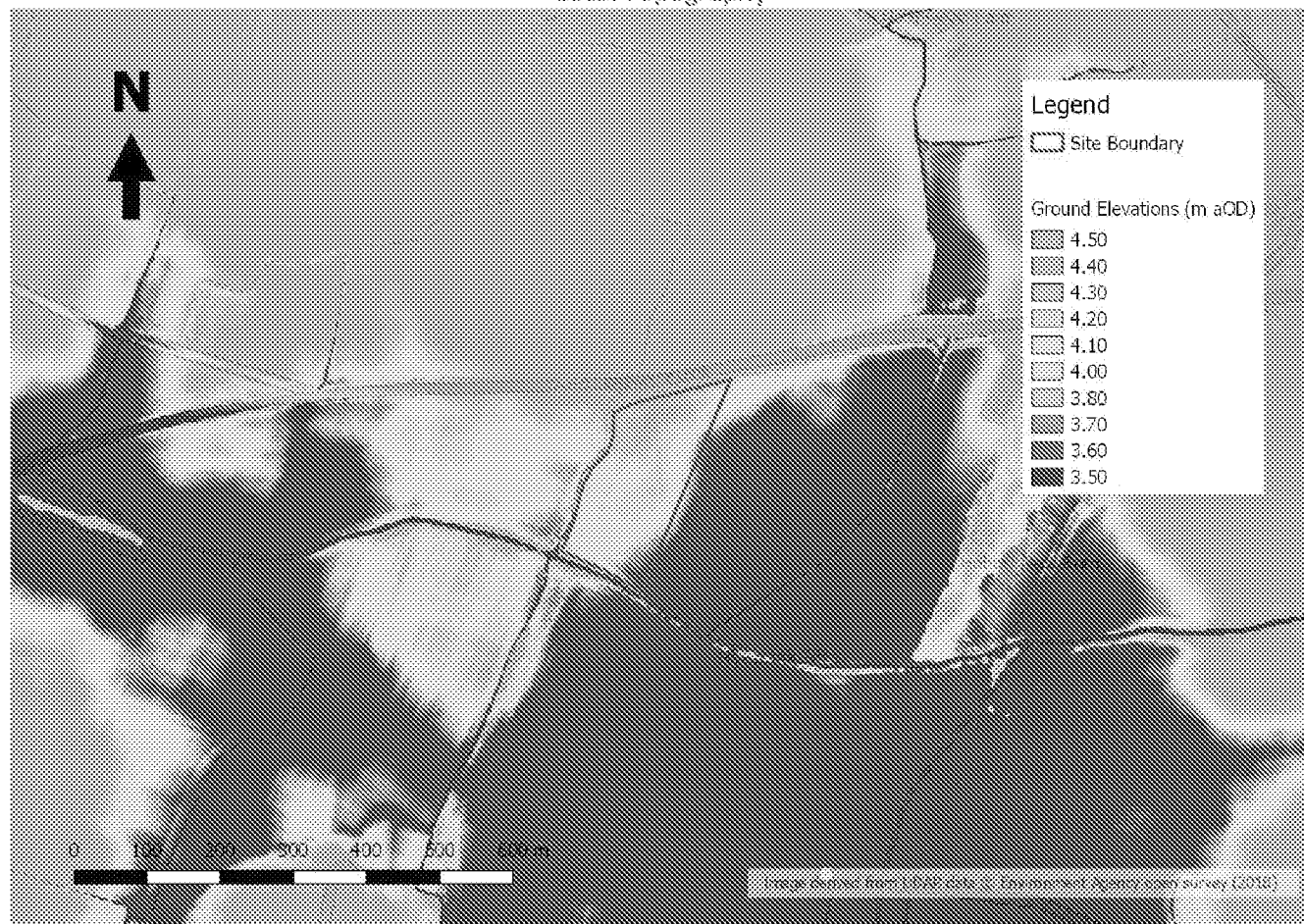
2.2 Topography

Topographic data for the Site and immediate locale, gathered using Light Detection and Ranging (LiDAR) aerial photogrammetric techniques, has been downloaded from the Environment Agency (EA) open data website¹ (refer to Figure 2-2). A topographic survey of the Site has also been undertaken and a copy of this is contained in Appendix 02.

¹ Environment Agency open data webSite, <http://environment.data.gov.uk>

Data indicates that the levels on the Site range between 3.5m above Ordnance Datum (aOD) and 4.5m aOD. The highest areas are to the north close to Grevatt's Lane with the lowest areas present to the southeast close to Ryebank Rife.

Figure 2-2
Local Topography



2.3 Hydrology and Drainage

A significant channel called Ryebank Rife forms the southern Site boundary. This channel, which flows from the west to the east, conveys runoff from the low-lying land between Yapton and Middleton-on-Sea into the tidal reaches of the River Arun. This channel is designated as Main River and the EA are therefore the statutory drainage authority with responsibility for approving any works to, or within 8m, of this channel.

A small ditch flows from the north to the south along the western Site boundary. The ditch drains land to the north of Grevatt's Lane, but, based on the topography, is only likely to receive flows from an area of around 10ha. The channel passes beneath Grevatt's Lane and the Site access within a 300mm culvert and then discharges into Ryebank Rife at the southwestern corner of the Site. The channel is an Ordinary Watercourse.

Following the dissolution of the South West Sussex Internal Drainage Board, Arun District Council are now the statutory drainage authority with responsibility for approving any works for Ordinary Watercourses. Arun District Council work in partnership with West Sussex County Council (who are the LLFA) in respect of Consenting and Enforcement on Ordinary Watercourses.

At the time of the Site walkover there were no flows in either the ditch or Ryebank Rife, although standing water was observed in Ryebank Rife just downstream (southeast) of the Site.

2.4 Potential Sources of Flood Risk

A full Flood Risk Assessment has been completed separately² however in summary the Site is situated across Flood Zone 1, 2 and 3 with development only extending into Flood Zone 2. The primary flood risk arises from the sea and the fact that current flood defences along the coast are unlikely to be retained. As a result of this, and projected changes in sea level associated with climate change, tidal flood could extend inland up to, and across, all of the Site with a design flood level of 4.94m aOD.

2.5 Geological and Hydrogeological Features

2.5.1 Geology

The National Soils Resources Institute, Soilsclapes website³ describes the soils across the Site as '*Loamy soils with naturally high groundwater*'.

British Geological Survey (BGS) mapping⁴ indicates that the local area is underlain by a solid geology which is comprised of Chalk. This is overlain by drift deposits that are described as River Terrace Deposits consisting of sand, silt and clay.

The Site is not located in a groundwater source protection zone. The River Terrace Deposits are however designated as a Secondary A aquifer while the Chalk is designated as a Principal Aquifer. The former designation suggest that this unit may be important for water resources at a local scale while the latter mean that the Chalk is important for water resources on a regional scale. On this basis it should be noted that a groundwater risk assessment will be required if burials are proposed at the Site.

2.5.2 Site Investigation

An intrusive investigation of the Site was undertaken in August 2018⁵. This recorded that the drift deposits predominantly comprised silts and clays. The Chalk was encountered at depths of between 3m and 5m below ground level and was observed to be weathered.

Soakaway testing was undertaken at three locations. During the tests water levels in the excavated pits only dropped by between 2 to 14cm in around 5 hours. The tests, which were set up in line with the requirements of BRE365, were abandoned after this as soakage rate were clearly too slow to support infiltration drainage. Full results from this testing are included in the Phase 1 and 2 Geoenvironmental Assessment⁵.

2 SLR Consulting, Climping Flood Risk Assessment, January 2019

3 Soilsclapes online soil map, Cranfield Soil and Agrifood Institute, <http://www.landis.org.uk/soilsclapes/>

4 BGS Geology of Britain Viewer, available at <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>.

5 Phase 1 & 2 Geoenvironmental Assessment, Grevatts Lane, Climping, Prepared for the Southern Co-operative Group, SLR, 2018

3.0 Climate Change

3.1 Anticipated lifetime of development

In line with PPG and best practice guidance (BS8533), a 100 year lifetime of development has been applied to this Crematorium development in line with other sites where elements of the proposed land use (including but not limited to, burial plots, etc.) are considered to remain in perpetuity.

3.2 Rainfall Intensity

The most recent advice on climate change is provided by the Environment Agency⁶. An extract of *Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)* is reproduced as Table 3-1.

Table 3-1
Peak Rainfall Intensity Allowance in Small and Urban Catchments

River Basin District	Allowance Category	Total potential change anticipated for 2015 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Applies across all of England	Upper End	10%	20%	40%
	Central	5%	10%	20%

In line with Table 3-1, the SWMP will be developed to take into account increases in rainfall intensity of 40% over the lifetime of the development.

⁶ Environment Agency, February 2016. Flood risk assessments: climate change allowances (Accessed on 5 March 2018 at <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>)

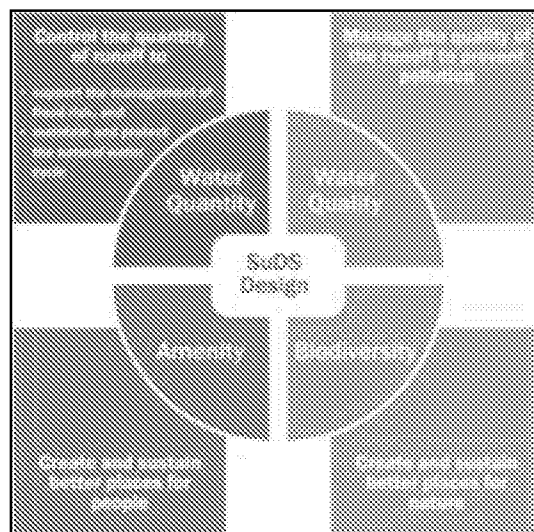
4.0 Surface Water Drainage Statement

4.1 Key Principles of Surface Water Management

4.1.1 Overview

Current best practice guidance document; The SuDS Manual (CIRIA Report C753)⁷, promotes sustainable water management through the use of sustainable drainage techniques (SuDS). There are four main categories of SuDS which are referred to as the ‘four pillars of SuDS design’ as depicted in Figure 4-1.

Figure 4-1 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).
- ❖ **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.

4.1.2 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.

4.1.3 Local Policy Context

Policy W DM3 (Sustainable Urban Drainage Systems) of the Arun Local Plan states;

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

“To increase the levels of water capture and storage and improve water quality, all development must identify opportunities to incorporate a range of Sustainable Urban Drainage Systems (SUDS), appropriate to the size of development, at an early stage of the design process.

Proposals for both major and minor development proposals must incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design. These features include:

- *Green roofs*
- *Permeable driveways and parking*
- *Soakaways*
- *Water harvesting and storage features including water butts.*

Proposals for major development must also integrate SUDS within public open spaces and roads, reflecting discussion with the appropriate bodies. SUDS must therefore be integrated into the overall design of a development and must:

- a. Contribute positively to the appearance of the area, integrating access to allow maintenance of existing watercourses and the system.*
- b. Effectively manage water (including its quality)*
- c. Accommodate and enhance biodiversity by making connections to existing Green Infrastructure assets and*
- d. Provide amenity for local residents (ensuring a safe environment)*
- e. Retain the existing drainage network of the site and the wider area,*
- f. Be maintained in perpetuity, supported through a Maintenance and Management Plan/Regime, including its financing, agreed with the Local Planning Authority.*

In order to ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction, developers must:

- g. Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA.*
- h. Undertake up to six months groundwater monitoring within the winter period.*
- i. Undertake winter percolation testing in accordance with BRE365.*
- j. The proposed drainage system must be designed to ensure that there is no flooding on a 1 in 30 year storm event.*
- k. The design must also take account of the 1 in 100 year storm event plus 30% allowance for climate change, on stored volumes, to ensure that there is no flooding of properties or the public highway or inundation of the foul sewerage system. Any excess flows must be contained within the site boundary, and within designated storage areas.”*

West Sussex County Council, in their role as LLFA also provide further guidance about incorporating SUDS in development⁸. Where appropriate both the local planning policy and this guidance should inform the broad nature and detailed design of the storm water drainage systems on this Site.

4.2 Existing Surface Water Drainage Regime

Most of the rain falling on the Site currently infiltrates into the shallow soils from where it is either evaporated, contributes to groundwater recharge or results in shallow sub surface flows to one of the local channels. Only in the event of intense rainfall or water logging of the ground would surface runoff occur.

⁸ Water. People. Places., A guide for master planning sustainable drainage into developments, Prepared by the Lead Local Flood Authorities of the South East of England, https://www.westsussex.gov.uk/media/2270/suds_design_guidance.pdf

4.3 Physical Influences and Constraints to the Use of SuDS

4.3.1 Discharge receptor

As detailed within Policy W DM3 (Sustainable Urban Drainage Systems) of the Arun Local Plan, developers should;

“Follow the hierarchy of preference for different types of surface water drainage disposal systems as set out in Approved Document H of the Building Regulations and the SUDS manual produced by CIRIA”

The drainage hierarchy requires that where possible storm water runoff should preferentially be directed to the ground. Where this is not possible runoff should be discharged to surface water receptors and only where no alternative exists should runoff be discharged to sewerage system.

As discussed in Section 2.5, the Site is underlain by River Terrace Deposits which are predominately comprised of clays and silts. Infiltration testing on the Site indicates that the use of infiltration drainage into this unit will not be feasible.

A ditch is present to the west of the Site and a larger drain (Ryebank Rife) is present to the south. As the elevation of the Site slopes to the southeast it is considered sensible to construct a new swale on the eastern boundary of the Site to convey runoff to Ryebank Rife.

From the data provided the owner of the Site is the riparian owner for the north bank of Ryebank Rife. As such discharge to this channel should not be hindered by third party land ownership issues which otherwise could present a ‘ransom’ situation.

4.3.2 Sustainable Drainage Features

As detailed within Policy W DM3 (Sustainable Urban Drainage Systems) of the Arun Local Plan, developers should;

“incorporate SUDS within the private areas of the development in order to provide source control features to the overall SUDS design”

There is also a requirement to;

“Contribute positively to the appearance of the area”

and,

“Effectively manage water (including its quality)”

In line with these statements the proposals for the Site seeks to;

- ❖ minimise the amount of hardstanding created on the Site through the use of green roofs, permeable paving or grass-crete. We note that permeable paving needs to be under-drained to prevent water logging (i.e. type C permeable paving), and
- ❖ accommodate excess storm flows within surface water features such as swales or ponds as opposed to hard engineered features such as tanks.

4.3.3 Flood Risk

As discussed within this assessment land to the south and east of the Site is designated as Flood Zones 2 and 3 indicating that flooding from tidal sources is more likely in this area. Guidance referenced by West Sussex County Council⁸ states;

“Floodplains should be used primarily to mitigate flood risk from rivers or tides. During storms and heavy rainfall these areas will naturally flood with river or coastal water, making them ineffective for storing surface water runoff.”

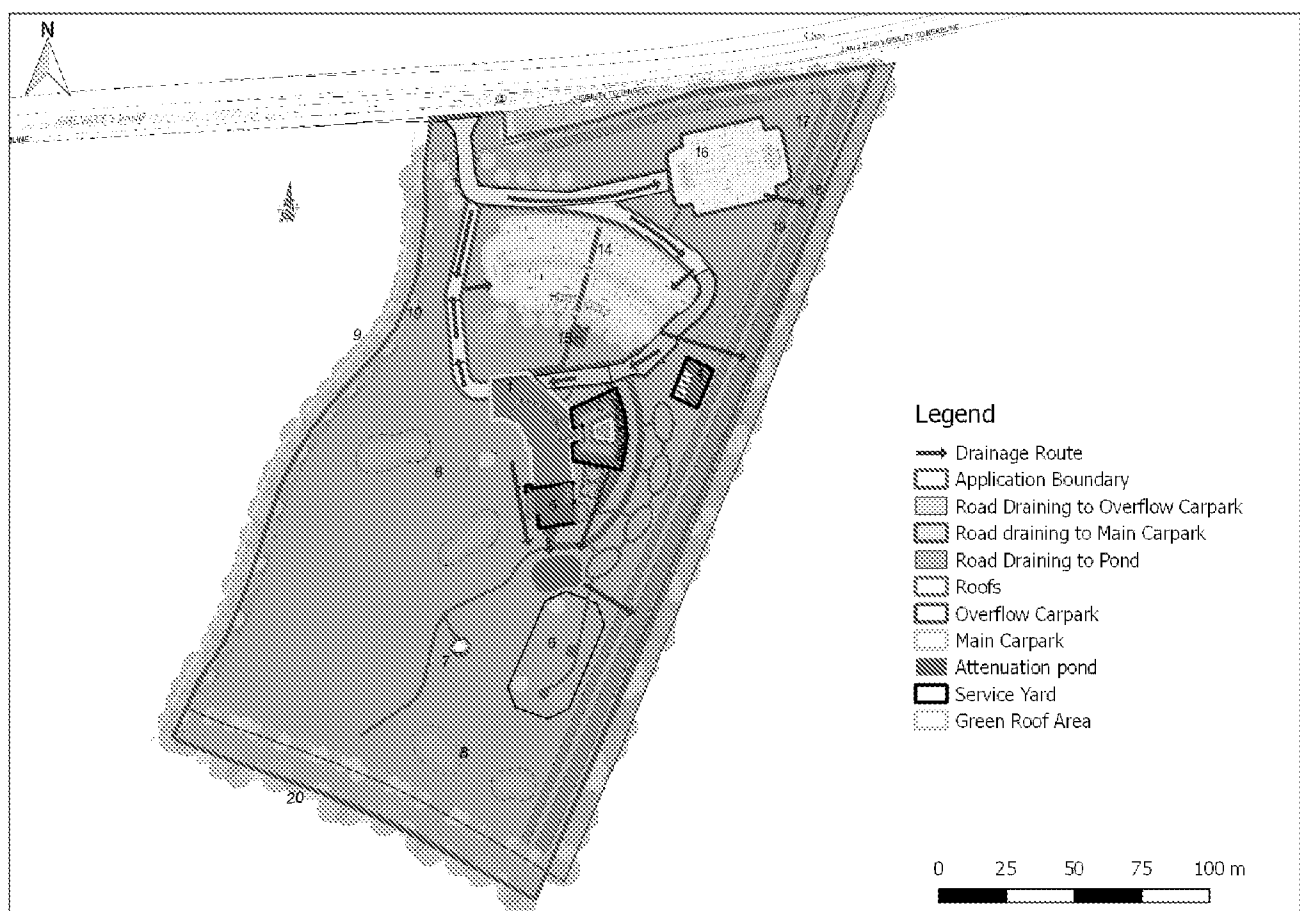
Based on this, storm attenuation features such as ponds should ideally be located away from the lower parts of the Site, although it is noted that this may be challenging to achieve given the scale of the flood risk constraints.

It should also be noted that the floodplain primarily relates to flooding from the sea. As such inundation of drainage features during very extreme events is of less concern as the impact of small storm water inputs (derived from the Site) on the severity of tidal flooding will be negligible.

4.4 Proposed Surface Water Drainage Regime

The proposed drainage system is split into three separate catchments based on the section of impermeable area draining to each SuDS feature. A drawing of the proposed drainage scheme is included as Figure 4-2 and Appendix 03.

Figure 4-2
 Proposed Surface Water Drainage Design



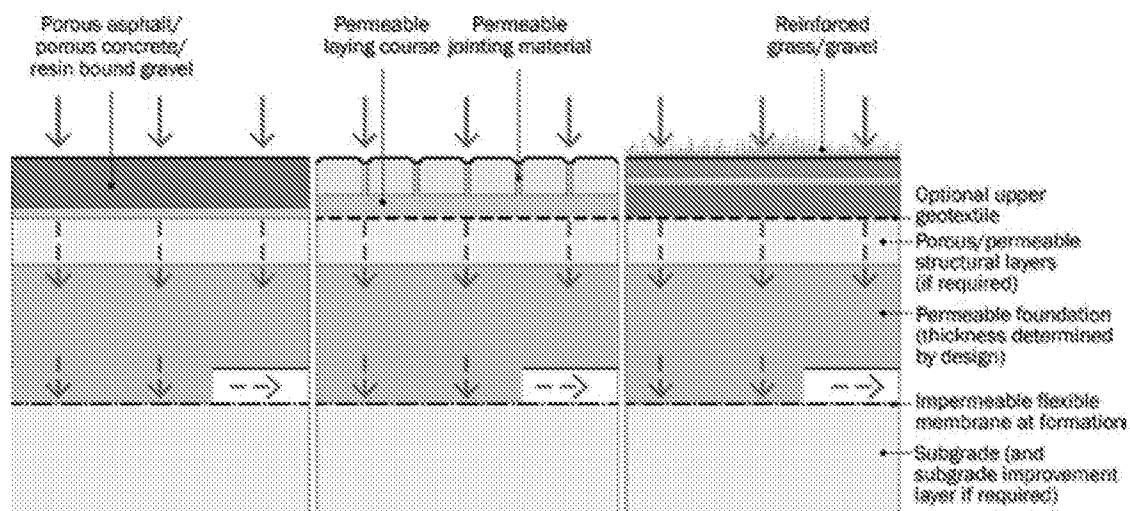
4.4.1 Main Carpark

The main carpark shown in the proposed Site layout (Appendix 01) will be surfaced with a pervious paving system to allow incident rainfall to percolate through the road construction. A typical arrangement for the pervious paving is shown by shown by Figure 4-3, although in this instance the impermeable membrane at the base of the permeable subbase would not be required. This area will however also receive surface water from an area of the northern section of the looped road and the western section of the looped road highlighted grey in Figure 4-2.

Rainfall falling on the northern section of the looped road and the western section of the looped road will drain via a highway drains to the main carpark and discharge into the permeable sub-base. This flow would then percolate through the sub-base along with the incident rainfall.

As the infiltration rate is low and insufficient to cater for large storm events, the pervious subbase to the carpark is to be drained via a perforated pipe network discharging to a swale along the eastern boundary of the Site. To limit the flow to the greenfield runoff rate and ensure the storage potential is fully mobilised, the discharge to the swale will be attenuated using a flow control device (orifice plate or Hydrobrake™).

Figure 4-3
 Type C Pervious Paving (Figure 20.13 SuDS Manual)



4.4.2 Overflow Carpark

The overflow carpark in the northeast corner of the Site will also be surfaced with a pervious paving system to allow incident rainfall to percolate through the road construction. A typical arrangement for the pervious paving is shown by shown by Figure 4-3, although in this instance the impermeable membrane at the base of the permeable subbase would not be required. This area will however also receive surface water from the northern section of the looped road highlighted blue in Figure 4-2.

Rainfall falling on the northern side of the looped road will drain via a highway drain to the overflow carpark and discharge into the permeable sub-base. This flow would then percolate through the sub-base along with incident rainfall.

As the infiltration rate is low and insufficient to cater for large storm events, the pervious subbase to the carpark is to be drained via a perforated pipe network discharging to a swale along the eastern boundary of the Site. To limit the flow to the greenfield runoff rate and ensure the storage potential is fully mobilised, the discharge to the swale will be attenuated using a flow control device (orifice plate or Hydrobrake™).

4.4.3 Remaining Areas

Surface water runoff resulting from the roofs of the buildings and adjacent hardstanding will be conveyed to an attenuation pond south of the crematorium. Runoff from the south- eastern section of the looped road will also be routed to the attenuation pond via a highway drainage system.

The roof of the main crematorium building will be built as a green roof which, when compared to a conventional roof design, can reduce runoff, as water is held in the plants and substrates and released back to the atmosphere.

The pond will be located outside of Flood Zone 3 as recommended by West Sussex County Council. Existing ground levels at the pond are approximately 4m aOD with a proposed invert level for the outfall (i.e. rest water level) of 2.75m aOD. The pond would have a small permanently wetted area with shallow (1 in 3) vegetated slopes to minimise health and safety risks, enhance ecology and provide an aesthetically pleasing feature.

Water will discharge from the pond via a pipe network to a swale on the eastern border of the Site. To limit the flow to the greenfield runoff rate and ensure the storage potential is fully mobilised, the discharge to the swale will be attenuated using a flow control device (orifice plate or Hydrobrake™).

Existing ground levels along the alignment of the proposed swale are approximately 3.5m aOD. Considering a swale depth of 1m the invert level of the swale will be approximately 2.5m aOD. This allows sufficient gradient to discharge from the pond to the swale via gravity.

The pond highlighted in Figure 4-2 is drawn approximately to scale and will be located near the scattering and seating area to add aesthetic value to the area.

4.4.4 Eastern Boundary Swale / Channel

All surface water runoff from the three areas will discharge to a swale constructed along the eastern boundary of the Site. The swale will be 1m deep to allow the conveyance of surface water runoff via gravity from the Site. The swale will also have a 1m wide base and be 5m wide to in total to achieve a 1 in 2 bank slope for safety. The swale will convey flows to Ryebank Rife adjacent the southeast corner of the Site. From here water will be routed east into the tidal reaches of the River Arun.

The swale will be vegetated with grass which (along with the pond) will assist in the removal sediment and trace oil derived from area of car parking.

4.5 Maximum Allowable Discharge to Surface Waters

As detailed within Policy W DM3 (Sustainable Urban Drainage Systems) of the Arun Local Plan, developers should;

“ensure that SUDS discharge water from the development at the same or lesser rate, as prior to construction”

In this instance this will mean that runoff post development should not exceed greenfield rates. This is in line with normal good practice, and the SuDS Manual⁷. Site drainage arrangements will seek to ensure that this is not exceeded for all storm events up to the 1 in 100 annual probability event, including a 40% uplift in peak rainfall depth to account for changes associated with climate change.

Calculation of greenfield runoff rates for the Site have been undertaken based on IH 124 methodology and the results are present in Table 4-1 with calculation sheets included in Appendix 04.

Table 4-1
Greenfield Runoff Rate Estimate

AEP (%)	Site Estimated Greenfield Runoff Rate (l/s)	Site Estimated Greenfield Runoff Rate (l/s/ha)
100	11.8	3.0
3.3	31.4	8.0
1	44.2	11.3

The total area of the Site that will be positively drained following development is approximately 2.1 hectares. This includes developed areas on Site and greenfield areas that are upgradient of proposed drainage system.

The greenfield 1 in 1 year [100% AEP] runoff rate for the contributing drainage area is 6.3l/s which is split between the sub catchments. The drainage systems design is intended to ensure that post development the three drainage systems, in combination, do not discharge more than this. The allowable discharge rates for the sub catchments used in the design process are presented in Table 4-2.

Table 4-2
 Sub Catchment Allowable Discharge Rates

Catchment	Allowable Discharge Rate (l/s)
Overflow Carpark	1
Main Carpark	1
Attenuation Pond	4.3

4.6 SuDS Performance

SuDS performance at the Site were assessed using the 'source control' tool within the MicroDrainage software. The Flood Estimation Handbook (FEH) rainfall model was used with a design standard return period of 1% AEP (1 in 100 year return period) plus an allowance for climate change as recommended within NPPF (applied as a 40% uplift in peak rainfall intensity).

Full results from the source control analysis are presented in Appendix 05.

4.6.1 SuDS Performance Runoff rates

The proposed surface water management plan will result in a reduction in post-development runoff rates. The improvement in peak surface water runoff rates from the Site is summarised in Table 4-3.

Table 4-3
 SuDS Performance Runoff Rates

Annual Probability Event (%)	Contributing Area* Pre-development Greenfield Runoff Rate (l/s)	Contributing Area* Post-Development Runoff Rate (l/s)	Reduction in Runoff Rate	
			(l/s)	(%)
100%	6.3	2.7	3.6	57.1
3.3%	16.9	4.7	12.2	72.2
1%	23.8	5.6	18.2	76.5
1% + 40% Climate Change	23.8*	6.3	17.5	73.5

*Compared with "Present Day" 1% AEP

*Contributing area is 2.1ha

4.6.2 SuDS Performance Water Levels and Volumes

Main Carpark and Overflow carpark

The results from the pervious paving analysis presented in Table 4-4 indicate that no flooding is predicted to occur at the Site from the 1 in 100 annual probability storm with a 40% allowance for climate change. The maximum depth for each pervious paving SuDS system is less than the proposed paving depth of 0.4m. Full results from the source control analysis are presented in Appendix 05.

Table 4-4
 SuDS Performance: Pervious Paving

SuDS Area	Attenuated Discharge (l/s)	Paving Depth (m)	Pervious Paving Area (ha)	Impermeable Area (ha)	Max Depth (m)	Flooded Volume (m ³)
Overflow Carpark	1.0	0.4	0.12	0.18	0.39	0.0
Main Carpark	1.0	0.4	0.21	0.28	0.37	0.0

Attenuation Pond

The results from the attenuation pond analysis, including the consideration of the green roof, are presented in Table 4-5 and indicate that no flooding is predicted to occur at the Site for a storm with a 1 in 100 annual probability of occurrence plus a 40% allowance for climate change. Full results from the source control analysis are presented in Appendix 05.

The dimensions of the pond modelled in MicroDrainage include a base area of 67m², which will be constantly wet. The maximum surface area of the pond when it is at maximum capacity is 202m². This will create a shallow slope on the banks of the pond which will benefit wildlife.

Table 4-5
 SuDS Performance: Attenuation Pond

Pond Depth* (m)	Attenuated Discharge (l/s)	Pond Surface Area (m ²)	Impermeable Area (ha)	Green Roof Area (ha)	Max Depth (m)	Flooded Volume (m ³)
1.0	4.3	202	0.27	0.08	0.99	0.0

* Excluding a 0.25m freeboard

4.7 Design Exceedance Arrangement

The outline drainage strategy has also considered residual risk associated with exceedance flood events (i.e. those that are in excess of the design event). Excess flows entering the drainage systems will back up upstream of the flow control devices. If the capacity of the storage provided was exceeded water would then flow overland toward the proposed swale on the eastern boundary of the Site. There is no proposed built infrastructure between the flow control structures and the swale.

The swale will provide a conveyance path for flows from exceedance events to discharge towards the low point at the northeast corner of the Site.

4.8 Principal Operation and Maintenance Requirements

Responsibility for management and maintenance of the Site drainage network will fall to a Site management company who will manage and maintain the long-term integrity and function of the proposed SuDS facilities. This can be secured by way of an appropriately worded planning condition, if required by the Local Planning Authority.

The proposed development layout (refer to Appendix 01) provides adequate maintenance access to key SuDS features.

The following sections outline recommended maintenance requirements for the various aspects of the drainage system serving the development. If necessary, these outline operation and maintenance plan can be refined when the Site is operational to suit specific conditions.

The anticipated lifetime of SuDS facilities, their frequency of replacement, and methods for their replacement, are largely dictated by the choice of installation, manufacturer, and the quality of workmanship during construction. Further details can be provided at the detailed infrastructure design stage.

4.8.1 Swale along the eastern boundary

A recommended operation and maintenance plan for the swale along the eastern boundary is summarised in Table 4-6.

Table 4-6
 Typical Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Typical 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
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect infiltration surface for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours.	Monthly, or as 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 silt removal frequencies.	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required.	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeded.	As required
	Relevel uneven surfaces and reinstate design levels.	As required

Maintenance Schedule	Required Action	Typical Frequency
	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

4.8.2 Pervious Pavement

The anticipated maintenance and management plan for the pervious pavements at the Site is outlined in Table 4-7.

Table 4-7
 Typical Pervious Pavement Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Minimum Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on Site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying.	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving.	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to uses, and replace lost joining material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action.	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers.	Annually

4.8.3 Attenuation Pond

The anticipated maintenance and management plan for the attenuation pond at the Site is outlined in Table 4-8.

Table 4-8
 Typical Pond Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Typical 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
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect infiltration surface for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours.	Monthly, or as 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 silt removal frequencies.	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required.	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeded.	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

5.0 Conclusions

SLR Consulting Limited has been appointed on behalf of the Southern Co-operative Group Limited to prepare this Surface Water Management Plan (SWMP) to support planning application for a new crematorium on land near Climping ("the Site"). Based on this assessment the following conclusions are made;

1. The Site is situated across Flood Zone 1, 2 and 3 however development will only extend into Flood Zone 2. The primary flood risk arises from the sea.
2. In accordance with the SuDS manual, runoff from the Site will be attenuated to the greenfield (100% (1 in 1) AEP) runoff rate.
3. The Site is underlain by River Terrace Deposits which are predominately comprised of clays and silts. Infiltration testing on the Site indicates that the use of infiltration drainage into this unit will not be feasible.
4. It is proposed that the surface water runoff arising from the proposed development is managed through three separate catchments. This includes two pervious carpark systems and an attenuation pond.
5. Outflow from all three SuDS systems is proposed to discharge to the swale at the eastern boundary of the Site. Subsequently water will drain to Rybeank Rife adjacent to the southern boundary of the Site and then east to the tidal reaches of the River Arun.
6. The surface water management strategy presented in this report demonstrates that adequate SuDS space provision is afforded within the development and that the proposed scheme is feasible and compliant to appropriate best practice and regulatory requirements.
7. The proposed SWMP will ensure that the proposed development will not increase the flood risk elsewhere.

APPENDIX 01

Details of Proposed Layout

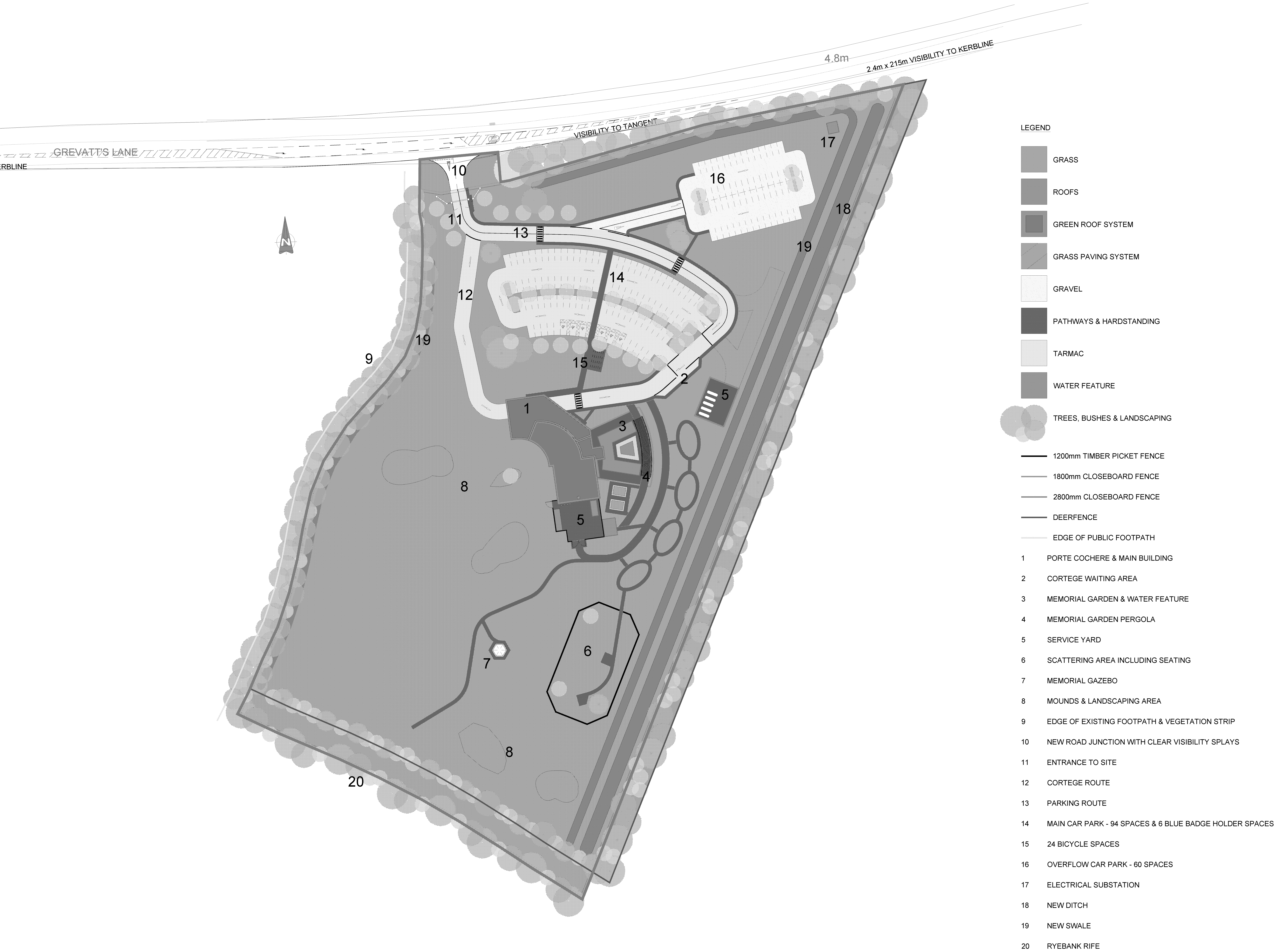
Notes:

THIS DRAWING IS THE COPYRIGHT OF THE SOUTHERN CO-OPERATIVE LIMITED AND MAY NOT BE COPIED, ALTERED OR REPRODUCED IN ANY FORM, OR PASSED TO A THIRD PARTY WITHOUT THE WRITTEN CONSENT OF THE SOUTHERN CO-OPERATIVE LIMITED.

DIMENSIONS SHOULD BE CHECKED AND VERIFIED ON SITE AND ANY DISCREPANCIES SHOULD BE REPORTED TO THE DESIGNER.

DO NOT SCALE FROM THIS DRAWING, EXCEPT FOR PLANNING PURPOSES. UNLESS OTHERWISE SPECIFIED.

IF IN DOUBT ASK FOR CONFIRMATION.



LEGEND

- GRASS
- ROOFS
- GREEN ROOF SYSTEM
- GRASS PAVING SYSTEM
- GRAVEL
- PATHWAYS & HARDSTANDING
- TARMAC
- WATER FEATURE
- TREES, BUSHES & LANDSCAPING

- 1200mm TIMBER PICKET FENCE
- 1800mm CLOSEBOARD FENCE
- 2800mm CLOSEBOARD FENCE
- DEERFENCE
- EDGE OF PUBLIC FOOTPATH

- 1 PORTE COCHERE & MAIN BUILDING
- 2 CORTEGE WAITING AREA
- 3 MEMORIAL GARDEN & WATER FEATURE
- 4 MEMORIAL GARDEN PERGOLA
- 5 SERVICE YARD
- 6 SCATTERING AREA INCLUDING SEATING
- 7 MEMORIAL GAZEBO
- 8 MOUNDS & LANDSCAPING AREA
- 9 EDGE OF EXISTING FOOTPATH & VEGETATION STRIP
- 10 NEW ROAD JUNCTION WITH CLEAR VISIBILITY SPLAYS
- 11 ENTRANCE TO SITE
- 12 CORTEGE ROUTE
- 13 PARKING ROUTE
- 14 MAIN CAR PARK - 94 SPACES & 6 BLUE BADGE HOLDER SPACES
- 15 24 BICYCLE SPACES
- 16 OVERFLOW CAR PARK - 60 SPACES
- 17 ELECTRICAL SUBSTATION
- 18 NEW DITCH
- 19 NEW SWALE
- 20 RYEBANK RIFE

STATUS

PLANNING

CLIENT: SOUTHERN CO-OP
END OF LIFE SERVICES

DESIGNER: SOUTHERN COOPERATIVE
1000 LAKESIDE, WESTERN ROAD
PORTSMOUTH, HAMPSHIRE
PO6 3FE

SITE: GREVATTS LANE
WEST SUSSEX, BN17 5RX
TITLE: CLIMPING CREMATORIUM

SCALE AT A3: 1:500

DATE: 04-12-2018

DRAWN: ML

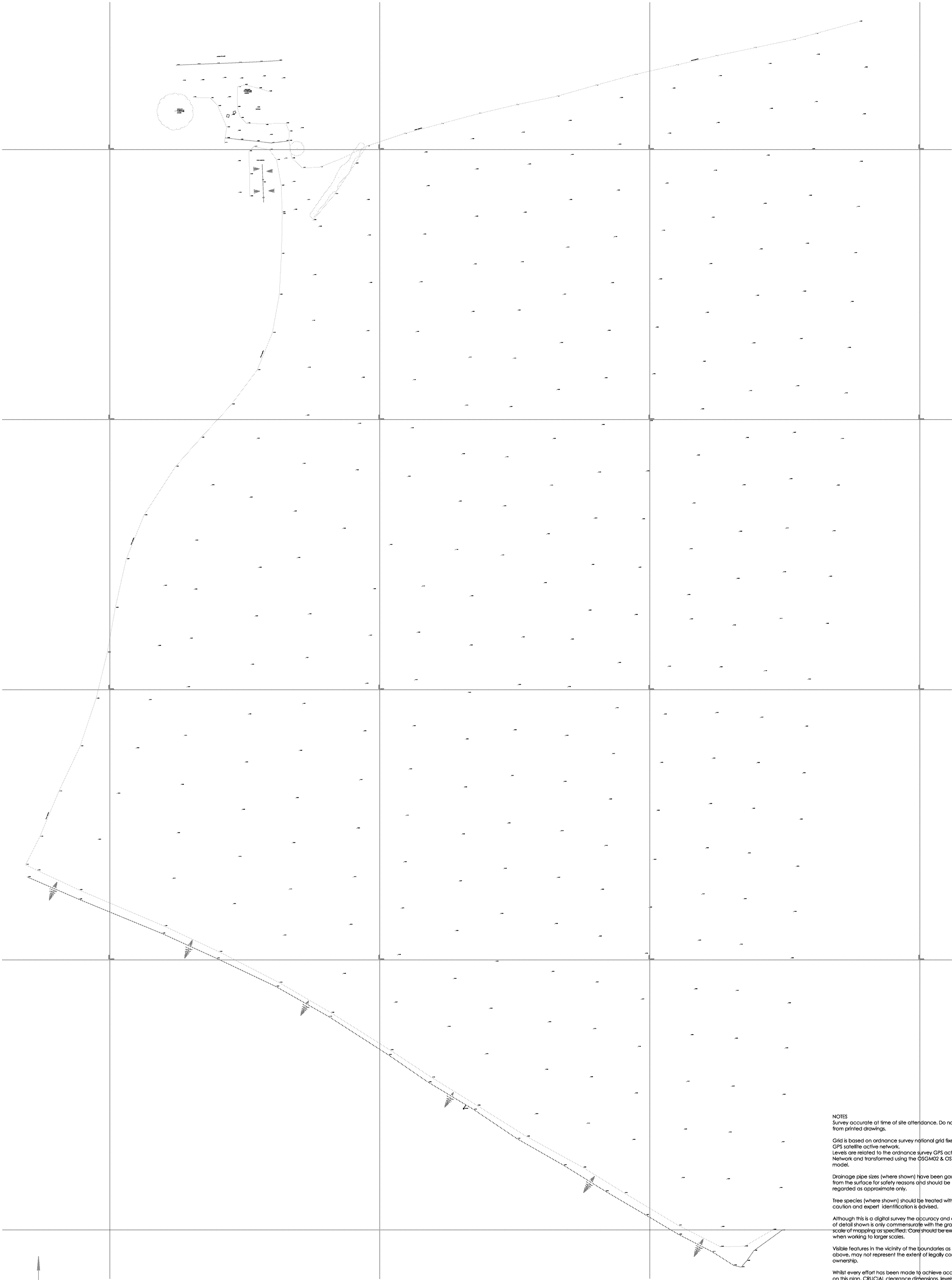
CHECKED:

DRAWING NO: IN PROGRESS - TBC

REVISION:

APPENDIX 02

Site Topographic Survey



NOTES

Survey accurate at time of site attendance. Do not scale from printed drawings.

Grid is based on Ordnance Survey national grid fixed by GPS satellite active network. Levels are related to the Ordnance Survey GPS active Network and transformed using the OSGM02 & OSTN02 model.

Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded as approximate only.

Tree species (where shown) should be treated with caution and expert identification is advised.

Although this is a digital survey the accuracy and amount of detail shown is only commensurate with the graphical scale of mapping as specified. Care should be exercised when working to larger scales.

Visible features in the vicinity of the boundaries as shown above, may not represent the extent of legally conveyed ownership.

Whilst every effort has been made to achieve accuracy on this plan, CRUCIAL clearance dimensions, levels and invert levels should be checked prior to design and construction.

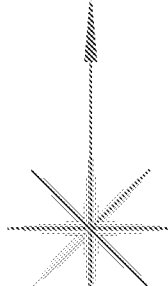
Areas of dense undergrowth cannot be surveyed in detail, these areas will be shown in outline only and marked as 'dense undergrowth' on the plan.

Kerb levels have been taken on the top of the channel.

medlams
surveys limited

www.medlams-surveys.co.uk
bmediam@medlams-surveys.co.uk
07717 205 388 01243 931482

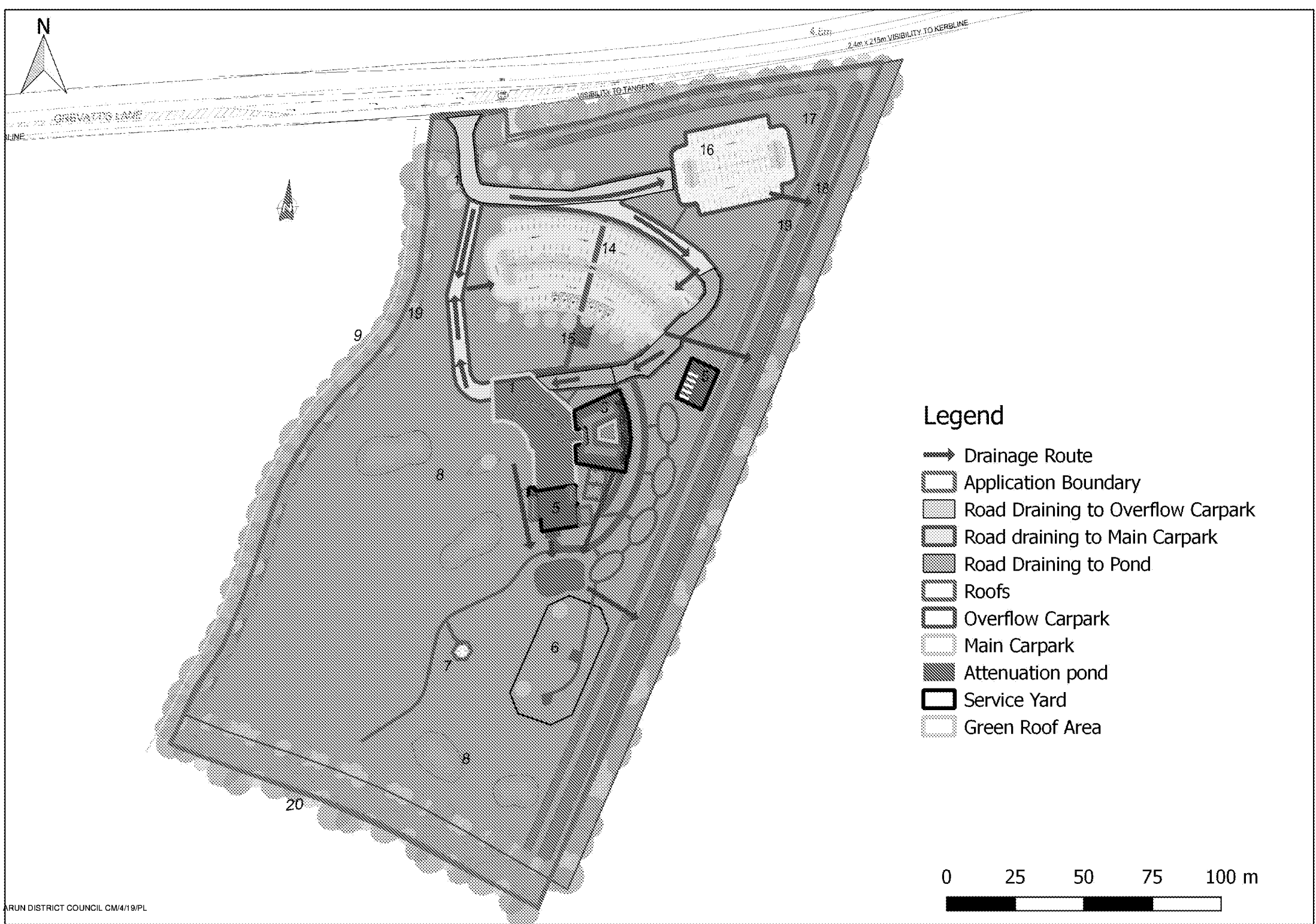
project: Grevatts Lane, Climping, West Sussex, BN17 5RX
client: Southern Co-Op job ref: S986
title: Topographic Survey scale 1:500 @A1
date 09.04.18 dwg no: EX 01 rev:



Site Plan 1:500

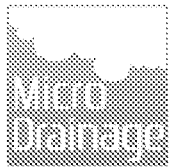
APPENDIX 03

Surface Water Drainage Design



APPENDIX 04

Greenfield Runoff Estimate

SLR Consulting Ltd		Page 1
Warnford Court 29 Throgmorton Street London, EC2N 2AT	Southern Co-operatives Grevatt's Lane, Climping Greenfield Runoff Estimate	
Date 01/03/2019 File Carpark Permeable Pavin...	Designed by SLR Checked by	
Innovyze	Source Control 2018.1	

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	50.000	Urban	0.000
SAAR (mm)	726	Region Number	Region 7

Results l/s

QBAR Rural 177.5
QBAR Urban 177.5

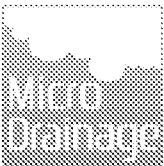
Q100 years 566.3

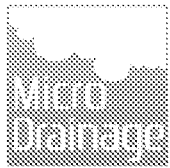
Q1 year 150.9
Q2 years 156.4
Q5 years 227.2
Q10 years 287.6
Q20 years 355.6
Q25 years 381.3
Q30 years 402.3
Q50 years 465.1
Q100 years 566.3
Q200 years 665.7
Q250 years 697.7
Q1000 years 916.1

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APPENDIX 05

Source Control Analysis

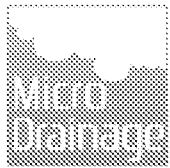
SLR Consulting Ltd					Page 1																																																																																																																																																																																																																																																																																		
Warnford Court 29 Throgmorton Street London, EC2N 2AT			Grevatts Lane, Climping Overflow Carpark Paving Calcs 100 Year RP + 40% CC																																																																																																																																																																																																																																																																																				
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 1415 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max E Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>3.734</td><td>0.134</td><td>0.0</td><td>0.6</td><td>0.6</td><td>48.9</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>3.764</td><td>0.164</td><td>0.0</td><td>0.6</td><td>0.6</td><td>59.7</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>3.799</td><td>0.199</td><td>0.0</td><td>0.7</td><td>0.7</td><td>72.4</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>3.839</td><td>0.239</td><td>0.0</td><td>0.8</td><td>0.8</td><td>86.8</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>3.864</td><td>0.264</td><td>0.0</td><td>0.8</td><td>0.8</td><td>95.9</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>3.882</td><td>0.282</td><td>0.0</td><td>0.8</td><td>0.8</td><td>102.4</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>3.906</td><td>0.306</td><td>0.0</td><td>0.9</td><td>0.9</td><td>111.3</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>3.923</td><td>0.323</td><td>0.0</td><td>0.9</td><td>0.9</td><td>117.2</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>3.934</td><td>0.334</td><td>0.0</td><td>0.9</td><td>0.9</td><td>121.2</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>3.941</td><td>0.341</td><td>0.0</td><td>0.9</td><td>0.9</td><td>124.0</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>3.935</td><td>0.335</td><td>0.0</td><td>0.9</td><td>0.9</td><td>121.7</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>3.924</td><td>0.324</td><td>0.0</td><td>0.9</td><td>0.9</td><td>117.7</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>3.909</td><td>0.309</td><td>0.0</td><td>0.9</td><td>0.9</td><td>112.4</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>3.895</td><td>0.295</td><td>0.0</td><td>0.9</td><td>0.9</td><td>107.2</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>3.889</td><td>0.289</td><td>0.0</td><td>0.9</td><td>0.9</td><td>104.8</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>3.877</td><td>0.277</td><td>0.0</td><td>0.8</td><td>0.8</td><td>100.8</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>3.865</td><td>0.265</td><td>0.0</td><td>0.8</td><td>0.8</td><td>96.2</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>3.852</td><td>0.252</td><td>0.0</td><td>0.8</td><td>0.8</td><td>91.7</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>3.840</td><td>0.240</td><td>0.0</td><td>0.8</td><td>0.8</td><td>87.3</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>3.753</td><td>0.153</td><td>0.0</td><td>0.6</td><td>0.6</td><td>55.5</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>164.105</td><td>0.0</td><td>35.4</td><td>23</td></tr><tr><td>30 min Summer</td><td>98.693</td><td>0.0</td><td>41.1</td><td>37</td></tr><tr><td>60 min Summer</td><td>59.354</td><td>0.0</td><td>66.9</td><td>66</td></tr><tr><td>120 min Summer</td><td>35.695</td><td>0.0</td><td>80.6</td><td>126</td></tr><tr><td>180 min Summer</td><td>26.511</td><td>0.0</td><td>88.9</td><td>184</td></tr><tr><td>240 min Summer</td><td>21.467</td><td>0.0</td><td>94.7</td><td>244</td></tr><tr><td>360 min Summer</td><td>15.944</td><td>0.0</td><td>102.4</td><td>364</td></tr><tr><td>480 min Summer</td><td>12.910</td><td>0.0</td><td>107.6</td><td>482</td></tr><tr><td>600 min Summer</td><td>10.961</td><td>0.0</td><td>111.2</td><td>602</td></tr><tr><td>720 min Summer</td><td>9.589</td><td>0.0</td><td>113.8</td><td>720</td></tr><tr><td>960 min Summer</td><td>7.479</td><td>0.0</td><td>113.7</td><td>914</td></tr><tr><td>1440 min Summer</td><td>5.270</td><td>0.0</td><td>110.5</td><td>1128</td></tr><tr><td>2160 min Summer</td><td>3.713</td><td>0.0</td><td>162.8</td><td>1512</td></tr><tr><td>2880 min Summer</td><td>2.896</td><td>0.0</td><td>166.0</td><td>1928</td></tr><tr><td>4320 min Summer</td><td>2.171</td><td>0.0</td><td>172.2</td><td>2732</td></tr><tr><td>5760 min Summer</td><td>1.770</td><td>0.0</td><td>207.0</td><td>3568</td></tr><tr><td>7200 min Summer</td><td>1.510</td><td>0.0</td><td>218.2</td><td>4328</td></tr><tr><td>8640 min Summer</td><td>1.327</td><td>0.0</td><td>227.1</td><td>5184</td></tr><tr><td>10080 min Summer</td><td>1.189</td><td>0.0</td><td>233.8</td><td>5944</td></tr><tr><td>15 min Winter</td><td>164.105</td><td>0.0</td><td>39.0</td><td>23</td></tr></table>							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	3.734	0.134	0.0	0.6	0.6	48.9	Flood Risk	30 min Summer	3.764	0.164	0.0	0.6	0.6	59.7	Flood Risk	60 min Summer	3.799	0.199	0.0	0.7	0.7	72.4	Flood Risk	120 min Summer	3.839	0.239	0.0	0.8	0.8	86.8	Flood Risk	180 min Summer	3.864	0.264	0.0	0.8	0.8	95.9	Flood Risk	240 min Summer	3.882	0.282	0.0	0.8	0.8	102.4	Flood Risk	360 min Summer	3.906	0.306	0.0	0.9	0.9	111.3	Flood Risk	480 min Summer	3.923	0.323	0.0	0.9	0.9	117.2	Flood Risk	600 min Summer	3.934	0.334	0.0	0.9	0.9	121.2	Flood Risk	720 min Summer	3.941	0.341	0.0	0.9	0.9	124.0	Flood Risk	960 min Summer	3.935	0.335	0.0	0.9	0.9	121.7	Flood Risk	1440 min Summer	3.924	0.324	0.0	0.9	0.9	117.7	Flood Risk	2160 min Summer	3.909	0.309	0.0	0.9	0.9	112.4	Flood Risk	2880 min Summer	3.895	0.295	0.0	0.9	0.9	107.2	Flood Risk	4320 min Summer	3.889	0.289	0.0	0.9	0.9	104.8	Flood Risk	5760 min Summer	3.877	0.277	0.0	0.8	0.8	100.8	Flood Risk	7200 min Summer	3.865	0.265	0.0	0.8	0.8	96.2	Flood Risk	8640 min Summer	3.852	0.252	0.0	0.8	0.8	91.7	Flood Risk	10080 min Summer	3.840	0.240	0.0	0.8	0.8	87.3	Flood Risk	15 min Winter	3.753	0.153	0.0	0.6	0.6	55.5	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	164.105	0.0	35.4	23	30 min Summer	98.693	0.0	41.1	37	60 min Summer	59.354	0.0	66.9	66	120 min Summer	35.695	0.0	80.6	126	180 min Summer	26.511	0.0	88.9	184	240 min Summer	21.467	0.0	94.7	244	360 min Summer	15.944	0.0	102.4	364	480 min Summer	12.910	0.0	107.6	482	600 min Summer	10.961	0.0	111.2	602	720 min Summer	9.589	0.0	113.8	720	960 min Summer	7.479	0.0	113.7	914	1440 min Summer	5.270	0.0	110.5	1128	2160 min Summer	3.713	0.0	162.8	1512	2880 min Summer	2.896	0.0	166.0	1928	4320 min Summer	2.171	0.0	172.2	2732	5760 min Summer	1.770	0.0	207.0	3568	7200 min Summer	1.510	0.0	218.2	4328	8640 min Summer	1.327	0.0	227.1	5184	10080 min Summer	1.189	0.0	233.8	5944	15 min Winter	164.105	0.0	39.0	23
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60 min Summer	3.799	0.199	0.0	0.7	0.7	72.4	Flood Risk																																																																																																																																																																																																																																																																																
120 min Summer	3.839	0.239	0.0	0.8	0.8	86.8	Flood Risk																																																																																																																																																																																																																																																																																
180 min Summer	3.864	0.264	0.0	0.8	0.8	95.9	Flood Risk																																																																																																																																																																																																																																																																																
240 min Summer	3.882	0.282	0.0	0.8	0.8	102.4	Flood Risk																																																																																																																																																																																																																																																																																
360 min Summer	3.906	0.306	0.0	0.9	0.9	111.3	Flood Risk																																																																																																																																																																																																																																																																																
480 min Summer	3.923	0.323	0.0	0.9	0.9	117.2	Flood Risk																																																																																																																																																																																																																																																																																
600 min Summer	3.934	0.334	0.0	0.9	0.9	121.2	Flood Risk																																																																																																																																																																																																																																																																																
720 min Summer	3.941	0.341	0.0	0.9	0.9	124.0	Flood Risk																																																																																																																																																																																																																																																																																
960 min Summer	3.935	0.335	0.0	0.9	0.9	121.7	Flood Risk																																																																																																																																																																																																																																																																																
1440 min Summer	3.924	0.324	0.0	0.9	0.9	117.7	Flood Risk																																																																																																																																																																																																																																																																																
2160 min Summer	3.909	0.309	0.0	0.9	0.9	112.4	Flood Risk																																																																																																																																																																																																																																																																																
2880 min Summer	3.895	0.295	0.0	0.9	0.9	107.2	Flood Risk																																																																																																																																																																																																																																																																																
4320 min Summer	3.889	0.289	0.0	0.9	0.9	104.8	Flood Risk																																																																																																																																																																																																																																																																																
5760 min Summer	3.877	0.277	0.0	0.8	0.8	100.8	Flood Risk																																																																																																																																																																																																																																																																																
7200 min Summer	3.865	0.265	0.0	0.8	0.8	96.2	Flood Risk																																																																																																																																																																																																																																																																																
8640 min Summer	3.852	0.252	0.0	0.8	0.8	91.7	Flood Risk																																																																																																																																																																																																																																																																																
10080 min Summer	3.840	0.240	0.0	0.8	0.8	87.3	Flood Risk																																																																																																																																																																																																																																																																																
15 min Winter	3.753	0.153	0.0	0.6	0.6	55.5	Flood Risk																																																																																																																																																																																																																																																																																
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																																			
15 min Summer	164.105	0.0	35.4	23																																																																																																																																																																																																																																																																																			
30 min Summer	98.693	0.0	41.1	37																																																																																																																																																																																																																																																																																			
60 min Summer	59.354	0.0	66.9	66																																																																																																																																																																																																																																																																																			
120 min Summer	35.695	0.0	80.6	126																																																																																																																																																																																																																																																																																			
180 min Summer	26.511	0.0	88.9	184																																																																																																																																																																																																																																																																																			
240 min Summer	21.467	0.0	94.7	244																																																																																																																																																																																																																																																																																			
360 min Summer	15.944	0.0	102.4	364																																																																																																																																																																																																																																																																																			
480 min Summer	12.910	0.0	107.6	482																																																																																																																																																																																																																																																																																			
600 min Summer	10.961	0.0	111.2	602																																																																																																																																																																																																																																																																																			
720 min Summer	9.589	0.0	113.8	720																																																																																																																																																																																																																																																																																			
960 min Summer	7.479	0.0	113.7	914																																																																																																																																																																																																																																																																																			
1440 min Summer	5.270	0.0	110.5	1128																																																																																																																																																																																																																																																																																			
2160 min Summer	3.713	0.0	162.8	1512																																																																																																																																																																																																																																																																																			
2880 min Summer	2.896	0.0	166.0	1928																																																																																																																																																																																																																																																																																			
4320 min Summer	2.171	0.0	172.2	2732																																																																																																																																																																																																																																																																																			
5760 min Summer	1.770	0.0	207.0	3568																																																																																																																																																																																																																																																																																			
7200 min Summer	1.510	0.0	218.2	4328																																																																																																																																																																																																																																																																																			
8640 min Summer	1.327	0.0	227.1	5184																																																																																																																																																																																																																																																																																			
10080 min Summer	1.189	0.0	233.8	5944																																																																																																																																																																																																																																																																																			
15 min Winter	164.105	0.0	39.0	23																																																																																																																																																																																																																																																																																			
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SLR Consulting Ltd		Page 2
Warnford Court 29 Throgmorton Street London, EC2N 2AT	Grevatts Lane, Climping Overflow Carpark Paving Calcs 100 Year RP + 40% CC	
Date 01/02/2019 File Carpark Permeable Pavin...	Designed by SLR Checked by	
Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

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
30 min Winter	3.786	0.186	0.0	0.7	0.7	67.7	Flood Risk
60 min Winter	3.825	0.225	0.0	0.8	0.8	81.9	Flood Risk
120 min Winter	3.870	0.270	0.0	0.8	0.8	98.2	Flood Risk
180 min Winter	3.899	0.299	0.0	0.9	0.9	108.5	Flood Risk
240 min Winter	3.919	0.319	0.0	0.9	0.9	115.9	Flood Risk
360 min Winter	3.947	0.347	0.0	0.9	0.9	126.2	Flood Risk
480 min Winter	3.966	0.366	0.0	1.0	1.0	133.0	Flood Risk
600 min Winter	3.979	0.379	0.0	1.0	1.0	137.9	Flood Risk
720 min Winter	3.989	0.389	0.0	1.0	1.0	141.3	Flood Risk
960 min Winter	3.984	0.384	0.0	1.0	1.0	139.5	Flood Risk
1440 min Winter	3.968	0.368	0.0	1.0	1.0	133.7	Flood Risk
2160 min Winter	3.949	0.349	0.0	0.9	0.9	126.7	Flood Risk
2880 min Winter	3.928	0.328	0.0	0.9	0.9	119.3	Flood Risk
4320 min Winter	3.913	0.313	0.0	0.9	0.9	113.8	Flood Risk
5760 min Winter	3.894	0.294	0.0	0.9	0.9	106.7	Flood Risk
7200 min Winter	3.873	0.273	0.0	0.8	0.8	99.4	Flood Risk
8640 min Winter	3.854	0.254	0.0	0.8	0.8	92.4	Flood Risk
10080 min Winter	3.836	0.236	0.0	0.8	0.8	85.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	98.693	0.0	44.9	37
60 min Winter	59.354	0.0	75.3	66
120 min Winter	35.695	0.0	89.8	124
180 min Winter	26.511	0.0	98.3	182
240 min Winter	21.467	0.0	104.2	240
360 min Winter	15.944	0.0	112.2	356
480 min Winter	12.910	0.0	117.6	472
600 min Winter	10.961	0.0	121.3	586
720 min Winter	9.588	0.0	124.0	700
960 min Winter	7.479	0.0	123.8	918
1440 min Winter	5.270	0.0	120.3	1182
2160 min Winter	3.713	0.0	183.0	1620
2880 min Winter	2.896	0.0	186.0	2076
4320 min Winter	2.171	0.0	190.4	2980
5760 min Winter	1.770	0.0	234.5	3808
7200 min Winter	1.510	0.0	247.6	4680
8640 min Winter	1.327	0.0	258.0	5448
10080 min Winter	1.189	0.0	265.8	6256

SLR Consulting Ltd		Page 4
Warnford Court 29 Throgmorton Street London, EC2N 2AT	Grevatts Lane, Climping Overflow Carpark Paving Calcs 100 Year RP + 40% CC	
Date 01/02/2019	Designed by SLR	
File Carpark Permeable Pavin...	Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 4.000

Porous Car Park Structure

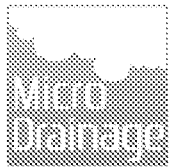
Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 34.8
Membrane Percolation (mm/hr) 1000	Length (m) 34.8
Max Percolation (l/s) 336.4	Slope (1:X) 0.0
Safety Factor 2.0	Depression Storage (mm) 5
Porosity 0.30	Evaporation (mm/day) 3
Invert Level (m) 3.600	Membrane Depth (m) 0

Orifice Outflow Control

Diameter (m) 0.028 Discharge Coefficient 0.600 Invert Level (m) 3.600

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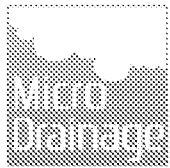
SLR Consulting Ltd					Page 1																																																																																																																																																																																																																																																																																		
Warnford Court 29 Throgmorton Street London, EC2N 2AT			Grevatts Lane, Climping Main Carpark Paving Calcs 100 Year RP + 40% CC																																																																																																																																																																																																																																																																																				
Date 01/02/2019 File Carpark Permeable Pavin...			Designed by SLR Checked by																																																																																																																																																																																																																																																																																				
Innovyze			Source Control 2018.1																																																																																																																																																																																																																																																																																				
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 2219 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max E Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>3.719</td><td>0.119</td><td>0.0</td><td>0.6</td><td>0.6</td><td>75.2</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>3.747</td><td>0.147</td><td>0.0</td><td>0.6</td><td>0.6</td><td>92.2</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>3.779</td><td>0.179</td><td>0.0</td><td>0.7</td><td>0.7</td><td>112.3</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>3.816</td><td>0.216</td><td>0.0</td><td>0.8</td><td>0.8</td><td>135.7</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>3.840</td><td>0.240</td><td>0.0</td><td>0.8</td><td>0.8</td><td>150.7</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>3.857</td><td>0.257</td><td>0.0</td><td>0.9</td><td>0.9</td><td>161.9</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>3.883</td><td>0.283</td><td>0.0</td><td>0.9</td><td>0.9</td><td>177.9</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>3.901</td><td>0.301</td><td>0.0</td><td>0.9</td><td>0.9</td><td>189.1</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>3.914</td><td>0.314</td><td>0.0</td><td>1.0</td><td>1.0</td><td>197.6</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>3.924</td><td>0.324</td><td>0.0</td><td>1.0</td><td>1.0</td><td>204.0</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>3.925</td><td>0.325</td><td>0.0</td><td>1.0</td><td>1.0</td><td>204.4</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>3.918</td><td>0.318</td><td>0.0</td><td>1.0</td><td>1.0</td><td>200.2</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>3.907</td><td>0.307</td><td>0.0</td><td>0.9</td><td>0.9</td><td>193.5</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>3.898</td><td>0.298</td><td>0.0</td><td>0.9</td><td>0.9</td><td>187.5</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>3.901</td><td>0.301</td><td>0.0</td><td>0.9</td><td>0.9</td><td>189.6</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>3.899</td><td>0.299</td><td>0.0</td><td>0.9</td><td>0.9</td><td>187.9</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>3.893</td><td>0.293</td><td>0.0</td><td>0.9</td><td>0.9</td><td>184.3</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>3.886</td><td>0.286</td><td>0.0</td><td>0.9</td><td>0.9</td><td>179.7</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>3.878</td><td>0.278</td><td>0.0</td><td>0.9</td><td>0.9</td><td>174.7</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>3.736</td><td>0.136</td><td>0.0</td><td>0.6</td><td>0.6</td><td>85.4</td><td>Flood Risk</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>164.105</td><td>0.0</td><td>39.9</td><td>23</td></tr><tr><td>30 min Summer</td><td>98.693</td><td>0.0</td><td>45.8</td><td>37</td></tr><tr><td>60 min Summer</td><td>59.354</td><td>0.0</td><td>86.7</td><td>66</td></tr><tr><td>120 min Summer</td><td>35.695</td><td>0.0</td><td>99.8</td><td>126</td></tr><tr><td>180 min Summer</td><td>26.511</td><td>0.0</td><td>107.6</td><td>186</td></tr><tr><td>240 min Summer</td><td>21.467</td><td>0.0</td><td>113.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>15.944</td><td>0.0</td><td>120.2</td><td>364</td></tr><tr><td>480 min Summer</td><td>12.910</td><td>0.0</td><td>124.8</td><td>484</td></tr><tr><td>600 min Summer</td><td>10.961</td><td>0.0</td><td>127.9</td><td>602</td></tr><tr><td>720 min Summer</td><td>9.589</td><td>0.0</td><td>129.9</td><td>722</td></tr><tr><td>960 min Summer</td><td>7.479</td><td>0.0</td><td>128.5</td><td>962</td></tr><tr><td>1440 min Summer</td><td>5.270</td><td>0.0</td><td>123.0</td><td>1398</td></tr><tr><td>2160 min Summer</td><td>3.713</td><td>0.0</td><td>217.7</td><td>1708</td></tr><tr><td>2880 min Summer</td><td>2.896</td><td>0.0</td><td>213.8</td><td>2076</td></tr><tr><td>4320 min Summer</td><td>2.171</td><td>0.0</td><td>207.2</td><td>2900</td></tr><tr><td>5760 min Summer</td><td>1.770</td><td>0.0</td><td>312.8</td><td>3744</td></tr><tr><td>7200 min Summer</td><td>1.510</td><td>0.0</td><td>326.8</td><td>4544</td></tr><tr><td>8640 min Summer</td><td>1.327</td><td>0.0</td><td>334.4</td><td>5360</td></tr><tr><td>10080 min Summer</td><td>1.189</td><td>0.0</td><td>332.4</td><td>6160</td></tr><tr><td>15 min Winter</td><td>164.105</td><td>0.0</td><td>43.6</td><td>23</td></tr></table>							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	3.719	0.119	0.0	0.6	0.6	75.2	Flood Risk	30 min Summer	3.747	0.147	0.0	0.6	0.6	92.2	Flood Risk	60 min Summer	3.779	0.179	0.0	0.7	0.7	112.3	Flood Risk	120 min Summer	3.816	0.216	0.0	0.8	0.8	135.7	Flood Risk	180 min Summer	3.840	0.240	0.0	0.8	0.8	150.7	Flood Risk	240 min Summer	3.857	0.257	0.0	0.9	0.9	161.9	Flood Risk	360 min Summer	3.883	0.283	0.0	0.9	0.9	177.9	Flood Risk	480 min Summer	3.901	0.301	0.0	0.9	0.9	189.1	Flood Risk	600 min Summer	3.914	0.314	0.0	1.0	1.0	197.6	Flood Risk	720 min Summer	3.924	0.324	0.0	1.0	1.0	204.0	Flood Risk	960 min Summer	3.925	0.325	0.0	1.0	1.0	204.4	Flood Risk	1440 min Summer	3.918	0.318	0.0	1.0	1.0	200.2	Flood Risk	2160 min Summer	3.907	0.307	0.0	0.9	0.9	193.5	Flood Risk	2880 min Summer	3.898	0.298	0.0	0.9	0.9	187.5	Flood Risk	4320 min Summer	3.901	0.301	0.0	0.9	0.9	189.6	Flood Risk	5760 min Summer	3.899	0.299	0.0	0.9	0.9	187.9	Flood Risk	7200 min Summer	3.893	0.293	0.0	0.9	0.9	184.3	Flood Risk	8640 min Summer	3.886	0.286	0.0	0.9	0.9	179.7	Flood Risk	10080 min Summer	3.878	0.278	0.0	0.9	0.9	174.7	Flood Risk	15 min Winter	3.736	0.136	0.0	0.6	0.6	85.4	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	164.105	0.0	39.9	23	30 min Summer	98.693	0.0	45.8	37	60 min Summer	59.354	0.0	86.7	66	120 min Summer	35.695	0.0	99.8	126	180 min Summer	26.511	0.0	107.6	186	240 min Summer	21.467	0.0	113.0	244	360 min Summer	15.944	0.0	120.2	364	480 min Summer	12.910	0.0	124.8	484	600 min Summer	10.961	0.0	127.9	602	720 min Summer	9.589	0.0	129.9	722	960 min Summer	7.479	0.0	128.5	962	1440 min Summer	5.270	0.0	123.0	1398	2160 min Summer	3.713	0.0	217.7	1708	2880 min Summer	2.896	0.0	213.8	2076	4320 min Summer	2.171	0.0	207.2	2900	5760 min Summer	1.770	0.0	312.8	3744	7200 min Summer	1.510	0.0	326.8	4544	8640 min Summer	1.327	0.0	334.4	5360	10080 min Summer	1.189	0.0	332.4	6160	15 min Winter	164.105	0.0	43.6	23
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																																																																																																																																																																																																																																																																																
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30 min Summer	3.747	0.147	0.0	0.6	0.6	92.2	Flood Risk																																																																																																																																																																																																																																																																																
60 min Summer	3.779	0.179	0.0	0.7	0.7	112.3	Flood Risk																																																																																																																																																																																																																																																																																
120 min Summer	3.816	0.216	0.0	0.8	0.8	135.7	Flood Risk																																																																																																																																																																																																																																																																																
180 min Summer	3.840	0.240	0.0	0.8	0.8	150.7	Flood Risk																																																																																																																																																																																																																																																																																
240 min Summer	3.857	0.257	0.0	0.9	0.9	161.9	Flood Risk																																																																																																																																																																																																																																																																																
360 min Summer	3.883	0.283	0.0	0.9	0.9	177.9	Flood Risk																																																																																																																																																																																																																																																																																
480 min Summer	3.901	0.301	0.0	0.9	0.9	189.1	Flood Risk																																																																																																																																																																																																																																																																																
600 min Summer	3.914	0.314	0.0	1.0	1.0	197.6	Flood Risk																																																																																																																																																																																																																																																																																
720 min Summer	3.924	0.324	0.0	1.0	1.0	204.0	Flood Risk																																																																																																																																																																																																																																																																																
960 min Summer	3.925	0.325	0.0	1.0	1.0	204.4	Flood Risk																																																																																																																																																																																																																																																																																
1440 min Summer	3.918	0.318	0.0	1.0	1.0	200.2	Flood Risk																																																																																																																																																																																																																																																																																
2160 min Summer	3.907	0.307	0.0	0.9	0.9	193.5	Flood Risk																																																																																																																																																																																																																																																																																
2880 min Summer	3.898	0.298	0.0	0.9	0.9	187.5	Flood Risk																																																																																																																																																																																																																																																																																
4320 min Summer	3.901	0.301	0.0	0.9	0.9	189.6	Flood Risk																																																																																																																																																																																																																																																																																
5760 min Summer	3.899	0.299	0.0	0.9	0.9	187.9	Flood Risk																																																																																																																																																																																																																																																																																
7200 min Summer	3.893	0.293	0.0	0.9	0.9	184.3	Flood Risk																																																																																																																																																																																																																																																																																
8640 min Summer	3.886	0.286	0.0	0.9	0.9	179.7	Flood Risk																																																																																																																																																																																																																																																																																
10080 min Summer	3.878	0.278	0.0	0.9	0.9	174.7	Flood Risk																																																																																																																																																																																																																																																																																
15 min Winter	3.736	0.136	0.0	0.6	0.6	85.4	Flood Risk																																																																																																																																																																																																																																																																																
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																																																																																			
15 min Summer	164.105	0.0	39.9	23																																																																																																																																																																																																																																																																																			
30 min Summer	98.693	0.0	45.8	37																																																																																																																																																																																																																																																																																			
60 min Summer	59.354	0.0	86.7	66																																																																																																																																																																																																																																																																																			
120 min Summer	35.695	0.0	99.8	126																																																																																																																																																																																																																																																																																			
180 min Summer	26.511	0.0	107.6	186																																																																																																																																																																																																																																																																																			
240 min Summer	21.467	0.0	113.0	244																																																																																																																																																																																																																																																																																			
360 min Summer	15.944	0.0	120.2	364																																																																																																																																																																																																																																																																																			
480 min Summer	12.910	0.0	124.8	484																																																																																																																																																																																																																																																																																			
600 min Summer	10.961	0.0	127.9	602																																																																																																																																																																																																																																																																																			
720 min Summer	9.589	0.0	129.9	722																																																																																																																																																																																																																																																																																			
960 min Summer	7.479	0.0	128.5	962																																																																																																																																																																																																																																																																																			
1440 min Summer	5.270	0.0	123.0	1398																																																																																																																																																																																																																																																																																			
2160 min Summer	3.713	0.0	217.7	1708																																																																																																																																																																																																																																																																																			
2880 min Summer	2.896	0.0	213.8	2076																																																																																																																																																																																																																																																																																			
4320 min Summer	2.171	0.0	207.2	2900																																																																																																																																																																																																																																																																																			
5760 min Summer	1.770	0.0	312.8	3744																																																																																																																																																																																																																																																																																			
7200 min Summer	1.510	0.0	326.8	4544																																																																																																																																																																																																																																																																																			
8640 min Summer	1.327	0.0	334.4	5360																																																																																																																																																																																																																																																																																			
10080 min Summer	1.189	0.0	332.4	6160																																																																																																																																																																																																																																																																																			
15 min Winter	164.105	0.0	43.6	23																																																																																																																																																																																																																																																																																			
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Warnford Court 29 Throgmorton Street London, EC2N 2AT	Grevatts Lane, Climping Main Carpark Paving Calcs 100 Year RP + 40% CC	
Date 01/02/2019 File Carpark Permeable Pavin...	Designed by SLR Checked by	
Innovyze	Source Control 2018.1	

Summary of Results for 100 year Return Period (+40%)

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
30 min Winter	3.766	0.166	0.0	0.7	0.7	104.6	Flood Risk
60 min Winter	3.802	0.202	0.0	0.8	0.8	127.2	Flood Risk
120 min Winter	3.844	0.244	0.0	0.8	0.8	153.5	Flood Risk
180 min Winter	3.871	0.271	0.0	0.9	0.9	170.5	Flood Risk
240 min Winter	3.891	0.291	0.0	0.9	0.9	183.0	Flood Risk
360 min Winter	3.920	0.320	0.0	1.0	1.0	201.3	Flood Risk
480 min Winter	3.940	0.340	0.0	1.0	1.0	214.2	Flood Risk
600 min Winter	3.956	0.356	0.0	1.0	1.0	223.9	Flood Risk
720 min Winter	3.968	0.368	0.0	1.0	1.0	231.5	Flood Risk
860 min Winter	3.979	0.379	0.0	1.0	1.0	232.6	Flood Risk
1440 min Winter	3.965	0.365	0.0	1.0	1.0	229.6	Flood Risk
2160 min Winter	3.950	0.350	0.0	1.0	1.0	220.0	Flood Risk
2880 min Winter	3.938	0.338	0.0	1.0	1.0	212.4	Flood Risk
4320 min Winter	3.937	0.337	0.0	1.0	1.0	212.0	Flood Risk
5760 min Winter	3.929	0.329	0.0	1.0	1.0	206.8	Flood Risk
7200 min Winter	3.917	0.317	0.0	1.0	1.0	199.6	Flood Risk
8640 min Winter	3.904	0.304	0.0	0.9	0.9	191.5	Flood Risk
10080 min Winter	3.891	0.291	0.0	0.9	0.9	183.2	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	98.693	0.0	49.7	37
60 min Winter	59.354	0.0	95.1	66
120 min Winter	35.695	0.0	108.9	124
180 min Winter	26.511	0.0	117.1	182
240 min Winter	21.467	0.0	122.8	242
360 min Winter	15.944	0.0	130.3	358
480 min Winter	12.910	0.0	135.1	476
600 min Winter	10.961	0.0	138.3	592
720 min Winter	9.589	0.0	140.4	708
860 min Winter	7.478	0.0	139.6	834
1440 min Winter	5.270	0.0	133.1	1376
2160 min Winter	3.713	0.0	239.1	1796
2880 min Winter	2.896	0.0	234.5	2216
4320 min Winter	2.171	0.0	227.0	3120
5760 min Winter	1.770	0.0	354.3	4040
7200 min Winter	1.510	0.0	369.6	4904
8640 min Winter	1.327	0.0	376.0	5792
10080 min Winter	1.189	0.0	371.4	6648

SLR Consulting Ltd		Page 4
Warnford Court 29 Throgmorton Street London, EC2N 2AT	Grevatts Lane, Climping Main Carpark Paving Calcs 100 Year RP + 40% CC	
Date 01/02/2019 File Carpark Permeable Pavin...	Designed by SLR Checked by	
Innovyze	Source Control 2018.1	

Model Details

Storage is Online Cover Level (m) 4.000

Porous Car Park Structure

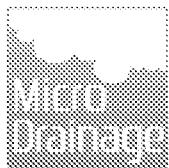
Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 45.8
Membrane Percolation (mm/hr) 1000	Length (m) 45.8
Max Percolation (l/s) 582.7	Slope (1:X) 0.0
Safety Factor 2.0	Depression Storage (mm) 5
Porosity 0.30	Evaporation (mm/day) 3
Invert Level (m) 3.600	Membrane Depth (m) 0

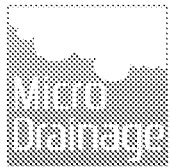
Orifice Outflow Control

Diameter (m) 0.029 Discharge Coefficient 0.600 Invert Level (m) 3.600

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Warnford Court 29 Throgmorton Street London, EC2N 2AT		Grevatts Lane, Climping Pond and Green Roof 100 Year + 40% CC			
Date 01/03/2019 File Pond attenuation.SRCX		Designed by SLR Checked by			
Innovyze		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	3.585	0.585	3.3	58.5	O K
30 min Summer	3.676	0.676	3.6	71.6	O K
60 min Summer	3.771	0.771	3.8	86.6	Flood Risk
120 min Summer	3.859	0.859	4.0	101.5	Flood Risk
180 min Summer	3.891	0.891	4.1	107.5	Flood Risk
240 min Summer	3.902	0.902	4.1	109.5	Flood Risk
360 min Summer	3.911	0.911	4.2	111.1	Flood Risk
480 min Summer	3.911	0.911	4.2	111.1	Flood Risk
600 min Summer	3.907	0.907	4.2	110.3	Flood Risk
720 min Summer	3.899	0.899	4.1	108.8	Flood Risk
960 min Summer	3.849	0.849	4.0	99.9	Flood Risk
1440 min Summer	3.760	0.760	3.8	84.7	Flood Risk
2160 min Summer	3.647	0.647	3.5	67.3	O K
2880 min Summer	3.556	0.556	3.2	54.6	O K
4320 min Summer	3.455	0.455	2.9	41.9	O K
5760 min Summer	3.379	0.379	2.6	33.1	O K
7200 min Summer	3.321	0.321	2.4	26.9	O K
8640 min Summer	3.275	0.275	2.2	22.5	O K
10080 min Summer	3.240	0.240	2.1	19.0	O K
15 min Winter	3.642	0.642	3.5	66.5	O K
30 min Winter	3.738	0.738	3.7	81.2	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	164.105	0.0	68.9	44	
30 min Summer	98.693	0.0	83.8	55	
60 min Summer	59.354	0.0	101.8	74	
120 min Summer	35.695	0.0	123.2	124	
180 min Summer	26.511	0.0	137.7	182	
240 min Summer	21.467	0.0	148.9	226	
360 min Summer	15.944	0.0	166.2	286	
480 min Summer	12.910	0.0	179.7	350	
600 min Summer	10.961	0.0	190.8	418	
720 min Summer	9.589	0.0	200.3	488	
960 min Summer	7.479	0.0	208.2	620	
1440 min Summer	5.270	0.0	219.5	884	
2160 min Summer	3.713	0.0	231.3	1272	
2880 min Summer	2.896	0.0	239.7	1644	
4320 min Summer	2.171	0.0	268.1	2376	
5760 min Summer	1.770	0.0	290.1	3080	
7200 min Summer	1.510	0.0	308.0	3816	
8640 min Summer	1.327	0.0	323.1	4504	
10080 min Summer	1.189	0.0	336.2	5240	
15 min Winter	164.105	0.0	77.7	46	
30 min Winter	98.693	0.0	94.4	56	
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Warnford Court 29 Throgmorton Street London, EC2N 2AT		Grevatts Lane, Climping Pond and Green Roof 100 Year + 40% CC			
Date 01/03/2019 File Pond attenuation.SRCX		Designed by SLR Checked by			
Innovyze		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	3.839	0.839	4.0	98.2	Flood Risk
120 min Winter	3.934	0.934	4.2	115.6	Flood Risk
180 min Winter	3.973	0.973	4.3	123.1	Flood Risk
240 min Winter	3.989	0.989	4.3	126.2	Flood Risk
360 min Winter	3.993	0.993	4.3	127.0	Flood Risk
480 min Winter	3.990	0.990	4.3	126.5	Flood Risk
600 min Winter	3.981	0.981	4.3	124.6	Flood Risk
720 min Winter	3.967	0.967	4.3	122.0	Flood Risk
960 min Winter	3.902	0.902	4.1	109.5	Flood Risk
1440 min Winter	3.781	0.781	3.8	88.2	Flood Risk
2160 min Winter	3.629	0.629	3.4	64.7	O K
2880 min Winter	3.509	0.509	3.1	48.5	O K
4320 min Winter	3.377	0.377	2.6	32.9	O K
5760 min Winter	3.288	0.288	2.3	23.7	O K
7200 min Winter	3.228	0.228	2.0	18.0	O K
8640 min Winter	3.186	0.186	1.8	14.3	O K
10080 min Winter	3.157	0.157	1.6	11.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	59.354	0.0	114.5	76	
120 min Winter	35.695	0.0	138.5	124	
180 min Winter	26.511	0.0	154.8	178	
240 min Winter	21.467	0.0	167.4	232	
360 min Winter	15.944	0.0	186.8	302	
480 min Winter	12.910	0.0	201.8	374	
600 min Winter	10.961	0.0	214.3	450	
720 min Winter	9.589	0.0	225.1	526	
960 min Winter	7.479	0.0	233.9	672	
1440 min Winter	5.270	0.0	246.7	950	
2160 min Winter	3.713	0.0	260.1	1340	
2880 min Winter	2.896	0.0	269.6	1704	
4320 min Winter	2.171	0.0	301.8	2424	
5760 min Winter	1.770	0.0	326.7	3120	
7200 min Winter	1.510	0.0	347.1	3824	
8640 min Winter	1.327	0.0	364.4	4504	
10080 min Winter	1.189	0.0	379.4	5240	
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Warnford Court 29 Throgmorton Street London, EC2N 2AT	Grevatts Lane, Climping Pond and Green Roof 100 Year + 40% CC	
Date 01/03/2019 File Pond attenuation.SRCX	Designed by SLR Checked by	
Innovyze Source Control 2018.1		

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 498800 101200 SU 98800 01200
C (1km)	-0.026
D1 (1km)	0.386
D2 (1km)	0.256
D3 (1km)	0.409
E (1km)	0.310
F (1km)	2.321
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Green Roof

Area (m ³)	805	Evaporation (mm/day)	3
Depression Storage (mm)	5	Decay Coefficient	0.050

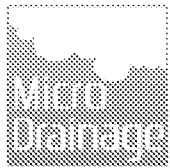
Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:	From:	To:	From:	To:
0	4 0.014628	32	36 0.002953	64	68 0.000596	96	100 0.000120
4	8 0.011977	36	40 0.002418	68	72 0.000488	100	104 0.000099
8	12 0.009806	40	44 0.001980	72	76 0.000400	104	108 0.000081
12	16 0.008028	44	48 0.001621	76	80 0.000327	108	112 0.000066
16	20 0.006573	48	52 0.001327	80	84 0.000268	112	116 0.000054
20	24 0.005382	52	56 0.001087	84	88 0.000219	116	120 0.000044
24	28 0.004406	56	60 0.000890	88	92 0.000180		
28	32 0.003607	60	64 0.000728	92	96 0.000147		

Time Area Diagram

Total Area (ha) 0.158

Time (mins)	Area	Time (mins)	Area
From:	To:	From:	To:
0	4 0.088	4	8 0.070

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Warnford Court 29 Throgmorton Street London, EC2N 2AT	Grevatts Lane, Climping Pond and Green Roof 100 Year + 40% CC	
Date 01/03/2019 File Pond attenuation.SRCX	Designed by SLR Checked by	
Innovyze Source Control 2018.1		

Model Details

Storage is Online Cover Level (m) 4.000

Tank or Pond Structure

Invert Level (m) 3.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	67.0	1.000	202.0

Orifice Outflow Control

Diameter (m) 0.046 Discharge Coefficient 0.600 Invert Level (m) 3.000

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