NEILSTON BATTERY STORAGE SITE, RENFREWSHIRE COUNCIL

Detailed Drainage Strategy

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Client Name: Statkraft UK Ltd

Client Address: 19th Floor, 22 Bishopsgate, London EC2N 4BQ, United Kingdom

Site Address: Gleniffer Road, Foxbar, Elderslie, Renfrewshire, Scotland, G78 3AW, United Kingdom

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Control Sheet

Vazquez Besada Consulting accepts responsibility for this document only to the commissioning party and not to any other.

Rev	Description	Issued by	Checked	Date
00	DRAFT	CVB	-	01/02/2023
01	Final Issue	CVB	-	09/02/2023
02	Amended to reflect the latest layout and impermeable areas amended. NPF4 reference added	CVB	-	23/03/2023
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Author	Signature	Date
Carlos Vázquez Besada, MICE, CEng Ingeniero de Caminos, Canales y Puertos		09/02/2023

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1.0 Introduction

1.1 Project Background

1.1.1 Vazquez Besada Consulting has been appointed by Statkraft UK Ltd via KAYA Consulting Limited to prepare this Detailed Drainage Strategy for a site at Gleniffer Road, Neilston, Renfrewshire, Scotland, G78 3AW (Nearest). The report provides information on drainage constraints at the site and follows government guidance with regards to development and surface water management.

1.1.2 The report is based on currently available information and preliminary discussions.

1.1.3 Proposals contained or forming part of this report represent the design intent and maybe subject to alteration or adjustment in completing the detailed design for this project. Where such adjustments are undertaken as part of the detailed design and are deemed a material deviation from the intent contained in this document, prior approval shall be obtained from the relevant authority in advance of commencing such works.

1.1.4 Where the proposed works to which this report refers are undertaken more than twelve months following the issue of this report, Vazquez Besada Consulting shall reserve the right to re-validate the findings and conclusions by undertaking appropriate further investigations at no cost to Vazquez Besada Consulting.

1.2 Scope of Assessment

1.2.1 This Detailed Drainage Strategy (DDS) will be undertaken in line with the ARCUS Outline Sustainable Drainage System (SuDS), undertaken in September 2021, following the below Renfrewshire Council advise:

'Prior to the commencement of development on site, the developer shall submit a detailed drainage assessment for the written approval of the planning authority. The detailed assessment shall take cognisance of the approved outline drainage strategy with respect to the management of surface water. The drainage strategy, as approved in writing by the planning authority, shall thereafter be implemented on site, and shall be maintained in accordance with the measures set out in the approved outline drainage strategy.'

1.2.2 This DDS is to be undertaken in accordance with the standing advice and requirements of the Scottish Environment Protection Agency (SEPA), National Planning Framework 4, Renfrewshire Council's planning guidance and Sewer for Scotland 4rd Edition.

1.2.3 The report will:

- Make reference to the potential risks of flooding to the site;
- Prepare outline design proposals for foul and surface water drainage of the site;

- Present the requirements of the drainage design, including relevant legislation and feedback from Scottish Water and Renfrewshire Council;
- Identify constraints and opportunities for the drainage design and how it may impact the overall site plan;
- Present a Detailed Drainage Strategy assessment to support a planning application for the proposed development.

1.2.4 The report reviews the following information:

- The SEPA flood maps for river, coastal and surface water flooding likelihood;
- The ARCUS Outline Sustainable Drainage System (SuDS), undertaken in September 2021.
- Renfrewshire local development plan and guidance: *"Renfrewshire Council, Drainage Assessment: Notes for Guidance"*
- Scottish Water Public Sewer Records;
- Sewers for Scotland 4rd Edition;
- National Planning Framework 4 (NPF4) (Februry 2023).

1.3 Proposed Development

1.3.1 The proposed development comprises the installation of a battery storage facility with the associated permeable access roads.

1.3.2 Proposed site plans drawings are included in Appendix A.

2.0 Existing site Details

2.1 History and Current Use

2.1.1 The development site is an existing greenfield empty site at Gleniffer Road, Foxbar, Elderslie, Renfrewshire Council, Scotland, G78 3AW (nearest) and covers a total area of approximately 13.9 ha. The approximate OS coordinates are 245033, 659821. The site location is shown in Figure 2-1.

2.1.2 The site is bounded by the B775 (Gleniffer Road) to the north-western boundary, by the existing greenfield lands to the north and south-eastern boundaries, and by an existing protected wetland (Sergeantlaw Moss Peatland) at the south-western boundary.

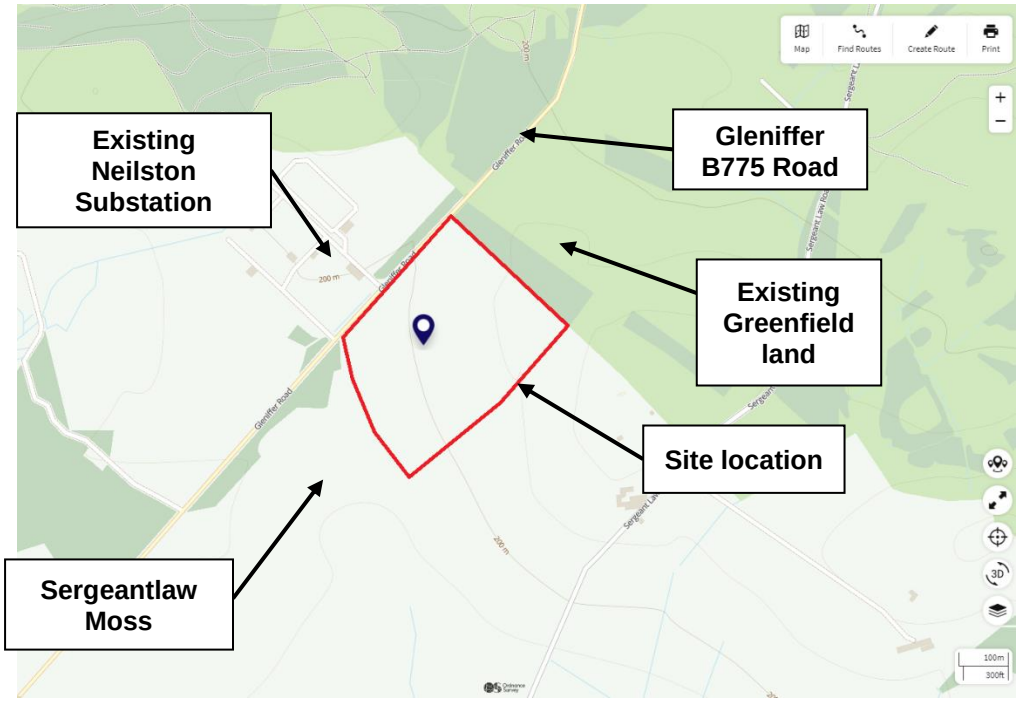

Figure 2-1. Site location (source: OS Open Data).

2.2 Existing Watercourses

2.2.1 A series of existing land drainage/ditches are present at the site surrounds to both sides of the Gleniffer Road. A review of the SEPA mapping, the FEH Webservice and the available OS mapping appear to show the ditches to the north of Gleniffer Road to run in a north-westerly direction up to discharge into the Old Patrick Water, approximately 1,165m to the east of the site. The existing land drains/ditches to the south of Gleniffer Road appear to run following a south-easterly direction up to discharging into the Killoch Water, approximately 970m to the south-east of the site.

2.2.2 The available information seems to indicate the presence of an existing low-lying area to the south of the site and to the south of Gleniffer Road, around contour 190mAOD that may be consistent with the existing Sergeantlaw Moss wetland area to the south of the site.

2.3 Existing Drainage

2.3.1 The existing public sewer plans have been obtained from Scottish Water. The plans show a just a 90mm MDPE 2006 water main to the north-west of the site, along the northern side of Gleniffer Road that appear to feed the existing Neilston Substation. No existing public sewers are identified within the Scottish Water GIS system.

2.3.2 The surface water and foul sewer plans are inserted as Appendix B.

2.4 Topography

2.4.1 A Topographical Survey has been undertaken by ORC Geomatics in August 2020 and it shows the site contours, generally, falling in a south-westerly direction. The highest site level is shown at the north-east corner, approximately at contour 215.5mAOD and the lowest part of the site at the south-east corner at approximately 189.5mAOD.

2.5 Ground Conditions

2.5.1 A review has been made of the new GeoIndex website by BGS. No boreholes records are shown at the site area, however, the nearest boreholes show consistent layers of CLAY. Therefore, infiltration is expected to be non-significant within the site.

3.0 Development and Flood Risk

3.1 National Planning Framework 4

3.1.1 The National Planning Framework 4 (NPF4) is a long term plan looking to 2045 that guides spatial development, sets out national planning policies, designate national developments and highlight regional spatial priorities. It is part of the development plan, and so influences planning decisions across Scotland. The NPF4 was published in February 2023 and incorporates updated Scottish Planning Policy, containing detailed national policy on a number of planning topics. For the first time, spatial and thematic planning policies are addressed in one place. This document is intended to be used in conjunction with Local Development Plans (LDPs), Planning Advice Notes (PANs), and Design Advice Guidance (DAG).

3.1.2 The guidance relating to flooding (NPF4) is summarised in terms of the flood risk to a proposed development in the following extracts.

3.2 Risk Framework

3.2.1 *"For planning purposes, at risk of flooding or in a flood risk area means land or built form with an annual probability of being flooded of greater than 0.5% which must include an appropriate allowance for future climate change. This risk of flooding is indicated on SEPA's future flood maps or may need to be assessed in a flood risk assessment. An appropriate allowance for climate change should be taken from the latest available guidance and evidence available for application in Scotland. The calculated risk of flooding can take account of any existing, formal flood protection schemes in determining the risk to the site. Where the risk of flooding is less than this threshold, areas will not be considered 'at risk of flooding' for planning purposes, but this does not mean there is no risk at all, just that the risk is sufficiently low to be acceptable for the purpose of planning. This includes areas where the risk of flooding is reduced below this threshold due to a formal flood protection scheme. "*

3.2.2 This includes flooding to be assessed from all sources*:*

"Watercourse /Fluvial Flooding – caused by excessive rainfall or snow melt within a limited period, which overwhelms the capacity of the watercourse or river channel, particularly when the ground is already saturated. It can also arise as a result of the blockage of a channel and/or associated structures such as small bridges and culverts;

Pluvial Flooding – occurs when rainwater ponds or flows over the ground (overland flow) before it enters a natural or man-made drainage systems (e.g. a river or sewer/drain). It can also occur when drainage systems are at full capacity. It is often combined with sewer flooding and groundwater flooding;

Sewer Flooding – occurs when the sewerage infrastructure has to deal with loads beyond its design capacity. This occurs most often as a result of high intensity rainfall events;

Groundwater Flooding – occurs when the water table rises above ground level. In Scotland this is most commonly associated with the movement of water through sands and gravels, often connected to the rise and fall of river levels; and

Coastal Flooding – occurs as a result of high tide, storm surge and wave activity raising the level of the sea above adjoining land.

3.2.3 Policy 2 Climate Mitigation and Adaptation states that *"Development proposals will be sited and designed to adapt to current and future risks from climate change".*

3.2.4 Policy 3 Biodiversity states that *"Development proposals will contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats and building and strengthening nature networks and the connections between them. Proposals should also integrate nature-based solutions, where possible." and "Any potential adverse impacts, including cumulative impacts, of development proposals on biodiversity, nature networks and the natural environment will be minimised through careful planning and design. This will take into account the need to reverse biodiversity loss, safeguard the ecosystem services that the natural environment provides, and build resilience by enhancing nature networks and maximising the potential for restoration."*

3.2.5 Coastal Development defines the following principles in Policy 10:

3.2.6 *"a) Development proposals in developed coastal areas will only be supported where the proposal:*

i. does not result in the need for further coastal protection measures taking into account future sea level change; or increase the risk to people of coastal flooding or coastal erosion, including through the loss of natural coastal defences including dune systems; and

ii. is anticipated to be supportable in the long-term, taking into account projected climate change.

3.2.7 *b) Development proposals in undeveloped coastal areas will only be supported where they:*

i. are necessary to support the blue economy, net zero emissions or to contribute to th economy or wellbeing of communities whose livelihood depend on marine or coastal activities, or is for essential infrastructure, where there is a specific locational need and no other suitable site;

ii. do not result in the need for further coastal protection measures taking into account future sea level change; or increase the risk to people of coastal flooding or coastal erosion, including through the loss of natural coastal defences including dune systems; and

iii. are anticipated to be supportable in the long-term, taking into account projected climate change; or

iii. are designed to have a very short lifespan.

3.2.8 *Development proposals for coastal defence measures will be supported if:*

i. they are consistent with relevant coastal or marine plans;

ii. nature-based solutions are utilised and allow for managed future coastal change wherever practical; and

iii. any in-perpetuity hard defense measures can be demonstrated to be necessary to protect essential assets.

3.2.9 *d) Where a design statement is submitted with any planning application that may impact on the coast it will take into account, as appropriate, long-term coastal vulnerability and resilience."*

3.2.10 Under Flood Risk and Water Management, Policy 22 sets out the following principles:

3.2.11 *" a) Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:*

i. essential infrastructure where the location is required for operational reasons;

ii. water compatible uses;

iii. redevelopment of an existing building or site for an equal or less vulnerable use; or.

iv. redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and where proposals demonstrate that long-term safety and resilience can be secured in accordance with relevant SEPA advice.

The protection offered by an existing formal flood protection scheme or one under construction can be taken into account when determining flood risk. In such cases, it will be demonstrated by the applicant that:

- *all risks of flooding are understood and addressed;*
- *there is no reduction in floodplain capacity, increased risk for others, or a need for future flood protection schemes;*
- *the development remains safe and operational during floods;*
- *flood resistant and resilient materials and construction methods are used; and*
- *future adaptations can be made to accommodate the effects of climate change.*

Additionally, for development proposals meeting criteria part iv), where flood risk is managed at the site rather than avoided these will also require:

- *the first occupied/utilised floor, and the underside of the development if relevant, to be above the flood risk level and have an additional allowance for freeboard; and*
- *that the proposal does not create an island of development and that safe access/egress can be achieved.*

3.2.12 *b) Small scale extensions and alterations to existing buildings will only be supported where they will not significantly increase flood risk.*

3.2.13 *c) Development proposals will:*

i. not increase the risk of surface water flooding to others, or itself be at risk.

ii. manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue-green infrastructure. All proposals should presume no surface water connection to the combined sewer;

iii. seek to minimise the area of impermeable surface.

3.2.14 *d) Development proposals will be supported if they can be connected to the public water mains. If connection is not feasible, the applicant will need to demonstrate that water for drinking water purposes will be sourced from a sustainable water source that is resilient to periods of water scarcity.*

3.2.15 *e) Development proposals which create, expand or enhance opportunities for natural flood risk management, including blue and green infrastructure, will be supported."*

3.3 SEPA Guidance

3.3.1 In their Climate Change Allowances for Flood Risk Assessment in Land Use Planning, SEPA recommends a 41% uplift for peak rainfall intensity for the Clyde Catchment.

4.0 Flood Risk

4.1.1 The Flood Risk Assessment is not part of this commission and will be assessed by others in a separate document.

5.0 Drainage Strategy

5.1 National Policy Framework 4 Requirements

5.1.1 The NPF4 National Spatial Strategy states that *Scotland's future places will be net zero, nature-positive places that are designed to reduce emissions and adapt to the impacts of climate change, whilst protecting, recovering and restoring our environment*. Within the six national developments the framework supports the delivery of sustainable places through *Urban Sustainable, Blue and Green Surface Water Management Solutions as an exemplar of a nature based, infrastructure first approach to catchment wide surface water flood risk management to help our two largest cities adapt to the future impacts of climate change.*

5.1.2 NP4 requires under Policy 22 that:

5.1.3 *" a) Development proposals at risk of flooding or in a flood risk area will only be supported if they are for:*

i. essential infrastructure where the location is required for operational reasons;

ii. water compatible uses;

iii. redevelopment of an existing building or site for an equal or less vulnerable use; or.

iv. redevelopment of previously used sites in built up areas where the LDP has identified a need to bring these into positive use and where proposals demonstrate that long-term safety and resilience can be secured in accordance with relevant SEPA advice.

5.1.4 And that:

"c) Development proposals will:

i. not increase the risk of surface water flooding to others, or itself be at risk.

ii. manage all rain and surface water through sustainable urban drainage systems (SUDS), which should form part of and integrate with proposed and existing blue-green infrastructure. All proposals should presume no surface water connection to the combined sewer;

iii. seek to minimise the area of impermeable surface."

5.1.5 This provides a general requirement that new developments do not increase the risk of surface water flooding, above the existing level of risk.

5.1.6 Under the Water Environment Controlled Activity (Scotland) Regulations 2011, SUDS are a statutory requirement for almost all development and must be considered during the site design to ensure adequate space will be available.

5.2 Renfrewshire Council Drainage Assessment Notes for Guidance

5.2.1 The Renfrewshire Council Notes for Guidance includes a Drainage Assessment Detailed Planning Requirements that makes reference to:

- Examination of current and historic drainage patterns including culverts traversing the site and their potential functions open watercourses;
- Confirmation from the water authority of the sewer network to accommodate waste water drainage, statutory and non-statutory surface water drainage from the development or statement on sewerage system constraints and alternative drainage arrangements;
- A detailed drawing of the development proposal;
- Summary statement of how drainage design provides waste and sustainable surface water drainage;
- Pre and post-development run-off calculations used to determine surface water drainage requirements and flood mitigatory surface water storage;
- Soil classification of the site.
- Calculation of pollution treatment volume for SuDS both individually and combined if necessary. Demonstration that the level of treatment and available treatment volume for SuDS are adequate;
- Plan identifying SuDS devices, land requirements and final discharge points where relevant i.e. existing surface water drainage system/roads drainage network or watercourses;
- SuDS measures in relation to the roads drainage network design;
- Subsoil porosity test including the location of any sustainable drainage infiltration devices;
- Assessment of flood risk if required in terms of flooding policies within Renfrewshire Local Plan;
- Maintenance arrangements;
- Design of safety measures for SuDS accompanied by health and safety risk assessment for areas of open water;
- A method statement dealing with contaminated water run-off from construction works;
- Proposals for integrating drainage with landscape and open space;
- Survey of existing habitats and species;
- And demonstration of good ecological practice including habitat enhancement.

5.3 Allowable Discharge Rate

5.3.1 The greenfield runoff rate, or QBAR rural, is the mean annual surface water flood flow from a rural (i.e. undeveloped) catchment. It is roughly equivalent to a 1 in 2.3 year return period and represents the surface water discharge from the site in an undeveloped state. This greenfield runoff rate is typically used as a basis for determining the allowable surface water discharge

rates from new developments, as it encourages a shift towards sustainable development and helping to mitigate the risk of surface water floods.

5.3.2 In accordance with the approved outline "Drainage Design for the Construction and Operation of Neilston Greener Grid Park at Land off Gleniffer Road, Renfrewshire" undertaken by ARCUS in September 2021, the existing QBAR rural discharge was calculated, in accordance with the FEH rainfall method, as:

QBAR rural = 136.4 l/s

5.3.3 As advised by Renfrewshire Council: "*The drainage strategy, as approved in writing by the planning authority, shall thereafter be implemented on site, and shall be maintained in accordance with the measures set out in the approved outline drainage strategy."* Therefore, the proposal shows a proposed surface water discharge, treated and attenuated, into the existing wetland area (Sergeantlaw Moss) to the south of the site.

5.3.4 The proposed site surface water discharge IL at the wetland area should be set to a min. level of 189.180mAOD via a new proposed swale with erosion control mattress and discharging into a land drain at the wetland area to ensure an adequate discharge into the Killoch Burn. A relevant method of work should be provided during the construction works.

5.3.5 Please find the ARCUS Outlined Drainage Design document for reference within Appendix F.

5.4 Surface Water Treatment Levels

5.4.1 SEPA highlights the legal requirement for the treatment of surface water by sustainable drainage systems (SuDS) for most types of development and encourage surface water runoff from developments to be treated in line with Scottish Planning Policy.

5.4.2 Consideration of SuDS requirements early in the planning process allows for greater flexibility and means the layout can be adopted to accommodate SuDS features, avoiding potential expenses to the developer at a later stage.

5.4.3 CIRIA report C753 'The SuDS Manual' (2015) provides guidance on assessing pollution hazard indices for various land uses and the type of SuDS solutions required to mitigate those hazards. Each activity or land use has pollution indices, whilst each SUDS component has corresponding mitigation indices, for total suspended solids, metals and hydrocarbons. Sufficient treatment measures should be provided, such that the mitigation indices are greater than or equal to the pollution indices.

5.4.4 According to the manual, commercial/industrial roofing: Inert materials have a pollution hazard level of 'very low'. The hazard index for total suspended solids (TSS) is 0.3, for metals is 0.2 and for hydrocarbons is 0.05. These are low enough to be addressed by any SUDS component; all of which have greater mitigation indices. For the proposed scheme the roof runoff will be treated via a filter drains and the downstream SuDS basin.

5.4.5 Individual Driveways/Low Traffic Roads have a pollution hazard level of 'low'. The hazard index for total suspended solids (TSS) is 0.5, for metals is 0.4 and for hydrocarbons is 0.4. The proposed tracks/roads will be formed by permeable materials, however, as a conservatory approach, the proposed scheme allows for any residual surface water treatment for the road runoff that will be treated via filter drains and the downstream SuDS Basin.

Pollution Hazard Indices				
Land Use Type	**Hazard Level**	**Suspended Solids**	**Metals**	**Hydrocarbons**
Commercial roofing: Inert materials	Very Low	0.3	0.2	0.05
Low Traffic Roads	Low	0.5	0.4	0.4
Pollution Mitigation Indices				
SuDS Component Description		**Suspended Solids**	**Metals**	**Hydrocarbons**
Filter Drain		0.4	0.4	0.4
Detention Basin		0.5	0.5	0.6

Table 5-1. Simple Index Approach (SIA).

5.4.6 As shown in the table, all the pollution mitigation indices exceed the pollution hazard indices for the all land use types.

5.5 Proposed Surface Water Drainage

5.5.1 At the time of writing there has been no infiltration test carried out. Based on the GeoIndex website review, the infiltration potential of the site is expected to be non-significant. Therefore, as agreed in the Outline ARCUS Strategy stage with Renfrewshire Council, the proposal allows for surface water discharge into the adjacent wetland.

5.5.2 Any new development site drainage has been designed to provide enough capacity, with no flooding, up to and including the 1 in 30 year event plus 41% allowance for climate change (latest SEPA climate change allowances for the Clyde catchment) and in accordance with current best practice and Renfrewshire Council the network has been checked for the 1 in 200 year rainfall event plus 41% allowance for CC.

5.5.3 Flow control is provided at the SuDS basin downstream control manhole just via a 300mm DIA pipe, that allows the system, from CP-41, to limit the discharge to a maximum rate of 125.4 l/s up to and including the 1 in 30yr plus 41% CC, 11.0 l/s lower than the max. discharge rate agreed with Renfrewshire Council.

5.5.4 The total site impermeable area has been remeasured from the approved Outline ARCUS Strategy based on the amended site layout. It has been calculated to be 1.83ha based on:

5.5.4 8No batteries x 38 groups = 0.98ha

5.5.4 1No Inverter x 38 groups = 0.056ha

5.5.4 1No Switchgear Container x 38 groups = 0.11ha

5.5.4 22No battery containers = 0.13ha

5.5.4 14No groups of energy management systems = 0.55ha

5.5.5 To restrict the surface water discharge, sufficient storage volume will be required in the drainage system to attenuate the flow without surcharging the system and causing flooding. The total attenuation volume provided for the new impermeable areas, measured to be 1.83ha, has been calculated as 486m3, to be achieved via a SuDS basin. This provides enough capacity to store with no flooding the 1 in 200 year event + 41% climate change (CC) and, as a good practice, allowing 300mm of freeboard at the 1 in 30yr plus 41% CC event.

5.5.6 For the 1 in 200yr event plus 41% CC, the proposed drainage system calculations show 16.9m^3 flooding at the proposed manhole CP-09, 0.7m^3 at CP-16, 0.02 m^3 at CP-21, 45.9m^3 at CP-30 and 22.5m^3 at CP-33 please refer to Appendix E for the drainage layout information. However, this flooding is expected to run south following the existing/proposed contours and will be picked by the next downstream filter drains, as the system is shown to be no full at downstream areas. Therefore, it is demonstrated that any potential surface water flooding will be constrained within the site area and not causing damage to buildings, essential services or adjoining developments and providing safe egress and access to the site at all times.

5.5.7 As a conservative scenario, the proposed filter drains have been modelled as 450mm DIA pipework to represent equivalent sectional area for a filter drain based on a min. 1m high x 0.5m wide x 0.33 void structure, in reality the proposed filter drain structures will be wider and higher, so the predicted 1 in 200yr + CC flooding reflected above might represent an overestimation.

5.5.8 In addition to the above. Any run-off coming from the above impermeable areas, that have been included in the surface water model, will cross proposed/existing permeable areas across the site. As a conservatory approach, the scheme assumes the proposed/existing permeable areas will have no infiltration capacity, however, in reality some runoff will be infiltrated to ground before being collected by the proposed drainage system. Please refer to Appendix C for the surface water drainage calculations.

5.5.9 It is also recommended that any proposed site levels are designed maintaining the existing topographical levels as much as possible so the surface water runoff from the proposed road will be picked by the proposed filter drains proposed across the site area to then discharge into the proposed SuDS basin before discharging, attenuated and treated, into the adjacent wetland.

5.6 Proposed Foul Water Drainage

5.6.1 No proposed foul water will be required at the proposed development.

5.7 Maintenance Requirements

5.7.1 The proposed drainage systems including the SuDS elements will be private and maintained by the developer. Any potential runoff from the impermeable areas will be incorporated into the proposed drainage system via filter drains, which will be also maintained by the developer.

5.7.2 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

5.7.3 A maintenance schedule as per the CIRIA SUDS Manual 2015 is included in Appendix G.

6.0 Conclusions and Recommendations

6.1 Conclusions

6.1.1 This report provides information on drainage constraints at the site and follows government guidance with regards to development and surface water management and advised by Renfrewshire Council it follows the measures set out in the approved outlined drainage strategy undertaken by ARCUS in September 2021.

6.1.2 The proposed development comprises the installation of a battery storage facility with the associated permeable access roads.

6.1.3 In accordance with the approved outline “Drainage Design for the Construction and Operation of Neilston Greener Grid Park at Land off Gleniffer Road, Renfrewshire” undertaken by ARCUS in September 2021, the existing QBAR rural discharge was calculated to be QBAR rural = 136.4 l/s.

6.1.4 Surface water treatment will be provided via filter drains and a new proposed SuDS basin.

6.1.5 Any new development site drainage has been designed to provide enough capacity, with no flooding, up to and including the 1 in 30 year event plus 41% allowance for climate change (latest SEPA climate change allowances for the Clyde area) and in accordance with current best practice and Renfrewshire Council the network has been checked for the 1 in 200 year rainfall event plus 41% allowance for CC.

6.1.6 Flow control is provided at the SuDS basin downstream control manhole just via a 300mm DIA pipe, that allows the system, from CP-41, to limit the discharge to a maximum rate of 125.4 l/s up to and including the 1 in 30yr plus 41% CC, 11.0 l/s lower than the max. discharge rate agreed with Renfrewshire Council.

6.1.7 To restrict the surface water discharge, sufficient storage volume will be required in the drainage system to attenuate the flow without surcharging the system and causing flooding. The total attenuation volume provided for the new impermeable areas, measured to be 1.83ha, has been calculated as 486m3, to be achieved via a SuDS basin. This provides enough capacity to store with no flooding the 1 in 200 year event + 41% climate change (CC) and, as a good practice, allowing 300mm of freeboard at the 1 in 30yr plus 41% CC event.

6.1.8 The proposed drainage system calculations show 16.9m^3 flooding at the proposed manhole CP-09, 0.7m^3 at CP-16, 0.02 m^3 at CP-21, 45.9m^3 at CP-30 and 22.5m^3 at CP-33 please refer to Appendix E for the drainage layout information, however, this flooding is expected to run south following the existing/proposed contours and will be picked by the next downstream filter drains, as the system is shown to be no full at downstream areas of the system. Therefore, it is demonstrated that any potential surface water flooding will be constrained within areas within

the site and not causing damage to buildings, essential services or adjoining developments and providing safe egress and access to the site at all times.

6.1.9 No proposed foul water will be required at the proposed development.

6.2 Recommendations

6.2.1 It is recommended that any proposed site levels are designed maintaining the existing topographical levels as much as possible so the surface water runoff from the proposed road will be picked by the proposed filter drains proposed across the site area to then discharge into the proposed SuDS basin before discharging, attenuated and treated, into the adjacent wetland.

6.2.2 SUDS features shall be designed considering the Site Investigation and any FRA conclusions and recommendations.

6.2.3 The proposed drainage system shall be maintained in line with the drainage maintenance schedule provided in Appendix G.

6.2.4 The Contractor shall discuss with SEPA to ascertain if any CAR license or registration is required for the surface water discharge into the adjacent wetland.

6.2.5 The proposed site surface water discharge IL at the wetland area should be set to a min. level of 189.180mAOD via a new proposed swale with erosion control mattress and discharging into a land drain at the wetland area to ensure an adequate discharge into the Killoch Burn. A relevant method of work should be provided during the construction works.

Appendix A – Proposed Development

Appendix B – Topographical Survey

Appendix C – Public Sewer Plans

Appendix D – Causeway Flow Drainage Calculations

Appendix E – Proposed Drainage Layout

Appendix F – ARCUS Outline Sustainable Drainage System (SuDS)

Appendix F – Drainage Maintenance Schedule

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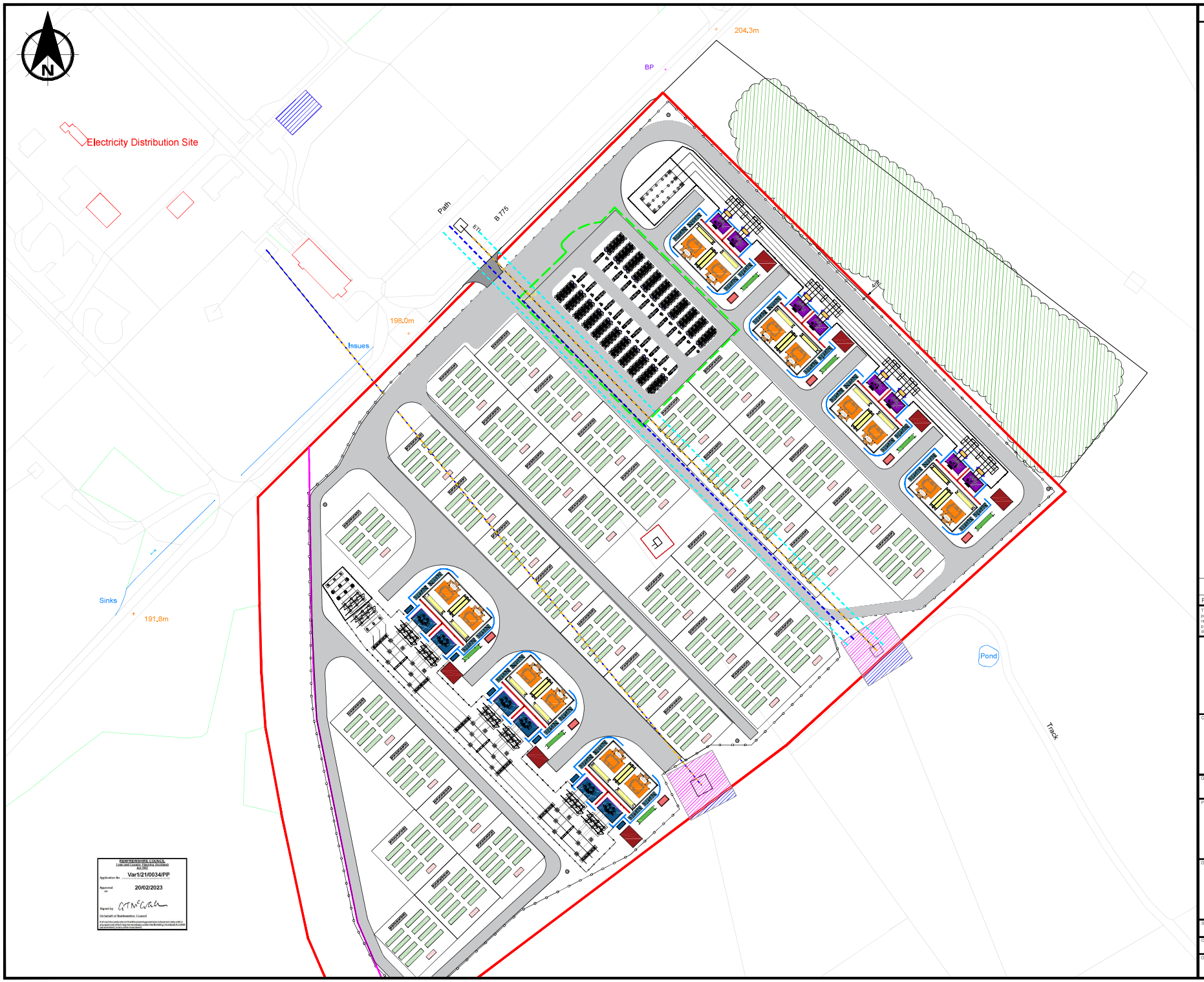

RENFREWSHIRE COUNCIL
Town and Country Planning (Scotland) Act 1997
Application No. Var1/21/0034/PP
Approved on 20/02/2023
Signed by
On behalf of Renfrewshire Council

SCALE 1 : 1000
10m 0 100m

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0100031673

NOTES

NMV PLAN KEY:

- NON-MATERIAL VARIATION SITE BOUNDARY
- BATTERY CONTAINER
- GATE (11.4m WIDE BY 3.4m HIGH)
- 3.4m HIGH PALISADE FENCE

APPEAL COMPOSITE PLAN KEY:

- SITE BOUNDARY
- 2.4m HIGH PALISADE FENCE
- 3.4m HIGH PALISADE FENCE
- OVERHEAD CABLE
- BATTERY (12.9m x 2.44m x 2.59m)
- INVERTER (6.1m x 2.44m x 2.59m)
- TRANSFORMERS WITH 7.0M HIGH CONNECTING BUS BARS
- LV SWITCH HOUSE (9.5m x 7.5m x 3.5m)
- RS BUILDING (20.7m x 36.7m x 6.0m TO ROOF PITCH)
- E-HOUSE (ENCLOSED IN BUILDING 20.7m x 38.8m x 6.0m TO ROOF PITCH)
- ENERGY MANAGEMENT SYSTEM (ENCLOSED IN BUILDING 20.7m x 36.7m x 6.0m TO ROOF PITCH)
- COOLER (9.6m x 2.4m x 2.5m)
- PROPOSED ROADS
- SWITCHGEAR CONTAINER (12.2m x 2.44m x 3.0m)
- EMERGENCY BACK UP DIESEL GENERATOR (6.1m x 3.6m x 2.9m)
- COMMS HOUSE (12.19m x 2.44m x 2.59m)
- DISCONNECTOR (2.2m x 4.5m)
- 6m SECURITY COLUMN
- 4m HIGH WALL
- WW2 BUILDING 5m BUFFER
- ATTENUATION BASIN
- Proposed Native Species Hedgerow Approx. Total Length: 0.83km Native Species Hedgerow Mix, 5/m
- Proposed Native Species Trees
- Proposed Native Species Shrub Mix Approx. Total Area: 0.43Ha Native Species Shrub Mix, 0.3/m2
- Proposed Native Species Grassland and Wildflower Mix Approx. Total Area: 1.03Ha EMTF, Wild Flowers for Hedgerows, Emorsgate, 1.5g/m2

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS AND SPECIFICATIONS ASSOCIATED WITH THIS PROJECT

Rev.	Date	Amendment Details	Drw'n	Chk'd	App'd
01	11/01/23	FOR INFORMATION	SH	JMB	JMB

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tnei

Client: Statkraft

Drawing Status: FOR INFORMATION

Project Title: NEILSTON NMV

Drawing Title: NEILSTON NMV SITE LAYOUT SCALE 1:1000

Scale	Designed	Drawn	Checked	Approved
1:1000	SH	SH	JMB	JMB
Original Size	Date	Date	Date	Date
A1	11/01/23	11/01/23	11/01/23	11/01/23

Drawing Number: 15628-014

Revision: 1

660250mN

660200mN

660150mN

660100mN

660050mN

660000mN

659950mN

659900mN

Note: All coordinates and levels are relative to OS Active Grid and Datum (OSTN15 and OSGM15)

Pentagon 2

Revision | Description | Date | Initials

ORC GEOMATICS

Client

ARCUS CONSULTANCY SERVICES LTD
7th Floor
144 West George Street
Glasgow
G2 2HG
0141 221 9997

Project

Neilston
Battery Storage Site

Plot

Topographic Survey

Surveyed By	Drawn By	Job No.	Date
GC	GC	ORC2008-0041	August 2020

Drawing No.	Scale	Paper Size	Revision
ORC2008-0041_3d	1:500	A0	

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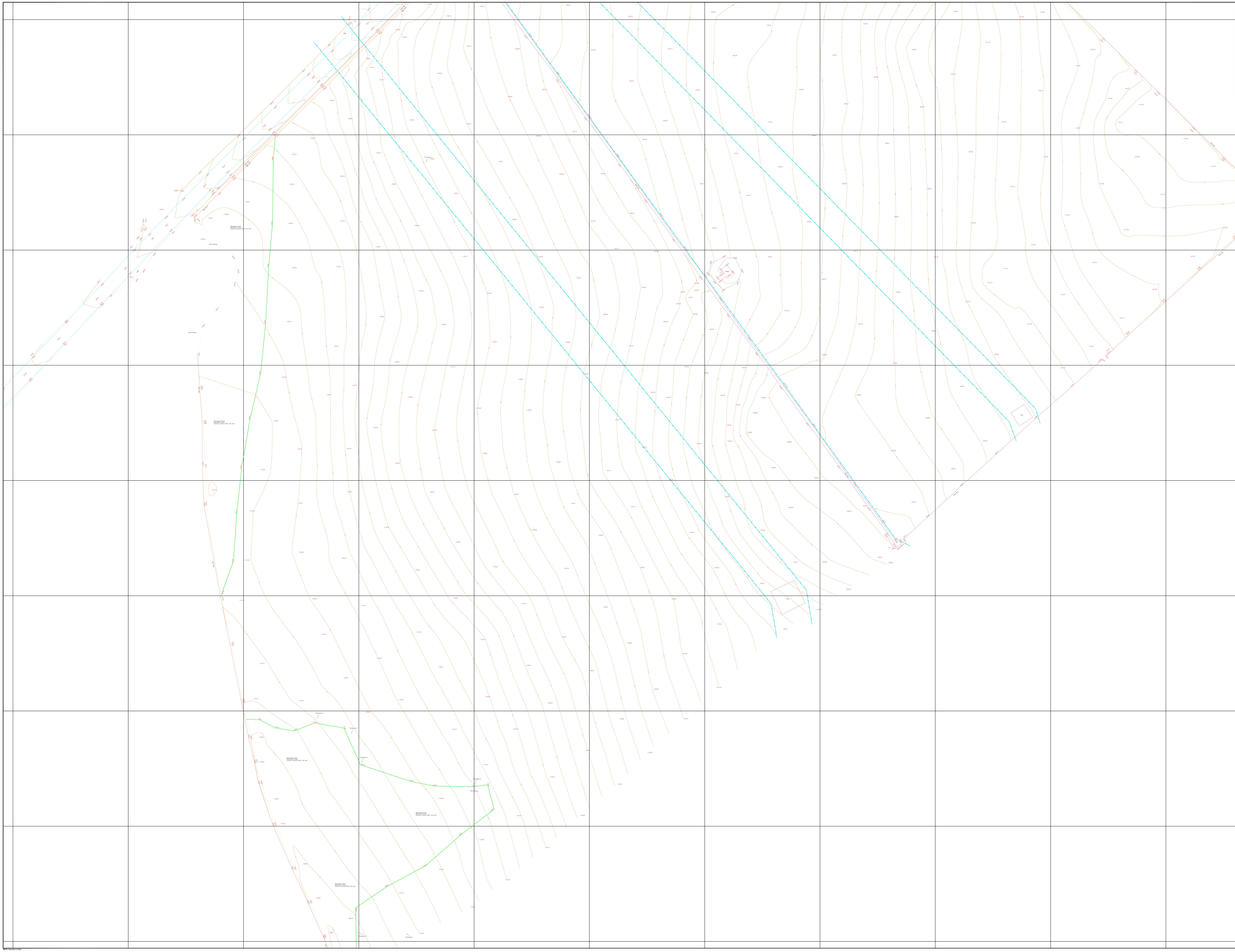

Revision	Description	Date	Initials

Client

ARCUS CONSULTANCY SERVICES LTD
7th Floor
144 West George Street
Glasgow
G2 2HG
0141 221 9997

Project

Neilston
Battery Storage Site

Plot

Topographic
Survey

Surveyed By	Drawn By	Job No.	Date	
GC	GC	ORC2008-0041	August 2020	
Drawing No.		Scale	Paper Size	Revision
ORC2008-0041_3d		1:500	A0	

Warning! Damaging a large diameter trunk main (12"/300mm and above) can result in loss of life and major water supply and water quality problems. If you're planning any extension work in the vicinity of any large diameter mains shown on our maps, you must contact Scottish Water to arrange a site visit 08000 778 778 WELL IN ADVANCE OF THE WORKS

Plotted By: carlosvbesada@gmail.com

N

The representation of physical assets and the boundaries of areas in which Scottish Water and others have an interest does not necessarily imply their true positions. For further details contact the appropriate District office.

Date: 30/01/2023

Neilston

0 25 50 100 Meters

SCALE: 1:5,291

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Scottish Water
Trusted to serve Scotland
The Bridge
6 Buchanan Gate
Stepps
Glasgow
G33 6FB
Tel No: 08000 778 778

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.242	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.046	5.00	214.800	1200	245320.055	659876.209	1.000
2	0.046	5.00	212.750	1200	245250.069	659947.637	0.999
3	0.046	5.00	207.250	1200	245198.046	660000.732	1.005
4	0.046	5.00	213.150	1200	245274.642	659835.067	1.000
5	0.046	5.00	210.250	1200	245204.598	659906.438	0.999
6	0.046	5.00	206.400	1200	245151.656	659960.388	1.005
7	0.046	5.00	206.000	1350	245145.454	659966.197	1.013
8	0.046	5.00	202.750	1200	245087.945	660024.083	1.001
9	0.046	5.00	202.000	1200	245047.495	659983.497	0.683
10	0.046	5.00	212.800	1200	245274.252	659821.103	1.000
11	0.046	5.00	209.900	1200	245213.555	659801.537	0.999
12	0.046	5.00	209.400	1200	245202.752	659797.600	0.999
13	0.046	5.00	205.650	1200	245132.708	659868.971	0.994
14	0.046	5.00	203.200	1200	245062.574	659940.253	0.995
15	0.046	5.00	201.650	1200	245030.664	659972.634	1.015
16	0.046	5.00	198.800	1200	244979.803	659936.476	0.996
17	0.046	5.00	206.600	1200	245164.533	659725.824	1.000
18	0.046	5.00	203.600	1200	245094.469	659797.175	1.003
19	0.045	5.00	199.800	1200	245024.404	659868.526	0.991
20	0.046	5.00	198.250	1200	244971.640	659920.738	1.000
21	0.046	5.00	196.500	1200	244954.940	659892.536	2.035
22	0.046	5.00	203.200	1200	245114.131	659707.733	1.100
23	0.046	5.00	202.750	1200	245099.309	659722.904	1.000
24	0.046	5.00	199.250	1200	245048.281	659714.868	1.000
25	0.046	5.00	201.400	1200	245068.083	659744.055	3.333
26	0.046	5.00	200.650	1200	245049.752	659772.873	2.760
27	0.046	5.00	197.750	1200	244999.409	659764.498	1.000
28	0.046	5.00	198.810	1200	245019.211	659793.685	2.244
29	0.046	5.00	197.600	1200	245000.880	659822.503	1.211
30	0.046	5.00	194.250	1200	244948.981	659812.364	0.850
31	0.046	5.00	195.750	1200	244968.833	659834.744	2.508
32	0.046	5.00	194.900	1200	244944.581	659879.831	2.075
33	0.046	5.00	192.750	1350	244916.951	659802.759	1.500
34	0.046	5.00	197.600	1200	245043.259	659660.355	1.000
35	0.046	5.00	195.750	1200	244973.353	659731.862	1.002
36	0.046	5.00	192.600	1350	244924.412	659772.969	1.504
37	0.046	5.00	192.600	1200	245042.867	659646.414	1.254
38	0.046	5.00	191.500	1200	244953.702	659599.525	1.076
39	0.046	5.00	192.550	1350	244925.060	659712.541	2.595
40			192.750	1350	244931.441	659713.825	2.821
SuDS Basin			190.800	1350	244945.956	659688.478	0.988

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Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Control - 41			192.250	1350	244942.127	659659.145	2.556
42			191.800	1350	244931.265	659657.306	2.150
43_OUT			191.000		244887.798	659649.804	1.526

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	100.000	0.600	213.800	211.751	2.049	48.8	450	5.57	46.0
1.001	2	3	74.334	0.600	211.751	206.245	5.506	13.5	450	5.79	45.4
1.002	3	7	62.917	0.600	206.245	204.987	1.258	50.0	225	6.36	43.8
2.000	4	5	100.000	0.600	212.150	209.251	2.899	34.5	450	5.48	46.3
2.001	5	6	75.587	0.600	209.251	205.395	3.856	19.6	450	5.75	45.5
2.002	6	7	8.498	0.600	205.395	204.996	0.399	21.3	450	5.79	45.4
1.003	7	8	81.597	0.600	205.000	201.749	3.251	25.1	450	6.69	42.9
1.004	8	9	57.301	0.600	201.750	201.320	0.430	133.3	450	7.24	41.6
1.005	9	15	20.032	0.600	201.317	200.636	0.681	29.4	225	7.38	41.3
3.000	10	11	66.100	0.600	211.800	208.901	2.899	22.8	450	5.26	47.0
3.001	11	12	11.498	0.600	208.901	208.401	0.500	23.0	225	5.33	46.8
3.002	12	13	100.000	0.600	208.401	204.656	3.745	26.7	450	5.75	45.5
3.003	13	14	100.000	0.600	204.656	202.205	2.451	40.8	450	6.27	44.0
3.004	14	15	45.462	0.600	202.205	200.637	1.568	29.0	450	6.47	43.5
1.006	15	16	68.800	0.600	200.635	197.804	2.831	24.3	450	7.65	40.7
1.007	16	20	17.729	0.600	197.804	197.257	0.547	32.4	300	7.76	40.4
4.000	17	18	100.000	0.600	205.600	202.597	3.003	33.3	450	5.47	46.3
4.001	18	19	100.000	0.600	202.597	198.809	3.788	26.4	450	5.89	45.1
4.002	19	20	74.231	0.600	198.809	197.259	1.550	47.9	450	6.31	43.9
1.008	20	21	38.900	0.600	197.250	195.498	1.752	22.2	450	7.91	40.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	2.915	463.7	5.7	0.550	0.549	0.046	0.0
1.001	5.555	883.4	11.3	0.549	0.555	0.092	0.0
1.002	1.854	73.7	16.4	0.780	0.788	0.138	0.0
2.000	3.470	551.9	5.8	0.550	0.549	0.046	0.0
2.001	4.608	732.8	11.3	0.549	0.555	0.092	0.0
2.002	4.420	702.9	17.0	0.555	0.554	0.138	0.0
1.003	4.070	647.4	37.5	0.550	0.551	0.322	0.0
1.004	1.759	279.8	41.5	0.550	0.230	0.368	0.0
1.005	2.421	96.3	46.3	0.458	0.789	0.414	0.0
3.000	4.271	679.3	5.9	0.550	0.549	0.046	0.0
3.001	2.740	108.9	11.7	0.774	0.774	0.092	0.0
3.002	3.946	627.6	17.0	0.549	0.544	0.138	0.0
3.003	3.190	507.3	22.0	0.544	0.545	0.184	0.0
3.004	3.786	602.2	27.1	0.545	0.563	0.230	0.0
1.006	4.137	657.9	76.1	0.565	0.546	0.690	0.0
1.007	2.771	195.9	80.7	0.696	0.693	0.736	0.0
4.000	3.532	561.7	5.8	0.550	0.553	0.046	0.0
4.001	3.969	631.2	11.2	0.553	0.541	0.092	0.0
4.002	2.943	468.1	16.3	0.541	0.541	0.137	0.0
1.008	4.329	688.4	99.9	0.550	0.552	0.919	0.0

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.009	21	32	16.393	0.600	194.465	192.826	1.639	10.0	300	7.96	40.0
5.000	22	23	21.209	0.600	202.100	201.750	0.350	60.6	450	5.14	47.4
5.001	23	25	37.715	0.600	201.750	198.088	3.662	10.3	225	5.29	46.9
6.000	24	25	36.500	0.600	198.250	198.067	0.183	199.5	450	5.42	46.5
5.002	25	26	35.400	0.600	198.067	197.890	0.177	200.0	450	5.84	45.3
5.003	26	28	36.958	0.600	197.891	196.566	1.325	27.9	225	6.08	44.6
7.000	27	28	36.500	0.600	196.750	196.567	0.183	199.5	450	5.42	46.5
5.004	28	29	35.400	0.600	196.567	196.390	0.177	200.0	450	6.49	43.4
5.005	29	31	34.305	0.600	196.389	193.242	3.147	10.9	225	6.64	43.1
8.000	30	31	30.200	0.600	193.400	193.249	0.151	200.0	450	5.35	46.7
5.006	31	32	54.900	0.600	193.250	192.825	0.425	129.2	450	7.15	41.8
1.010	32	33	98.400	0.600	192.825	191.251	1.574	62.5	450	8.60	38.7
1.011	33	36	30.709	0.600	191.250	191.096	0.154	199.4	450	8.96	38.1
9.000	34	35	100.000	0.600	196.600	194.748	1.852	54.0	450	5.60	45.9
9.001	35	36	66.200	0.600	194.750	191.355	3.395	19.5	450	5.84	45.2
1.012	36	39	63.300	0.600	191.346	189.955	1.391	45.5	450	9.31	37.4
10.000	37	38	118.300	0.600	191.346	190.424	0.922	128.3	450	6.10	44.5
10.001	38	39	117.200	0.600	190.424	189.955	0.469	249.9	450	7.62	40.7
1.013	39	40	6.509	0.600	189.955	189.929	0.026	250.3	450	9.39	37.3
1.014	40	SuDS Basin	29.209	0.600	189.929	189.812	0.117	249.6	450	9.77	36.6
1.015	SuDS Basin	Control - 41	29.582	0.600	189.812	189.694	0.118	250.7	450	10.16	36.0
1.016	Control - 41	42	11.016	0.600	189.694	189.650	0.044	250.4	450	10.30	35.8
1.017	42	43_OUT	44.110	0.600	189.650	189.474	0.176	250.6	300	11.04	34.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.009	4.998	353.3	104.6	1.735	1.774	0.965	0.0
5.000	2.615	415.9	5.9	0.650	0.550	0.046	0.0
5.001	4.100	163.0	11.7	0.775	3.087	0.092	0.0
6.000	1.436	228.3	5.8	0.550	2.883	0.046	0.0
5.002	1.434	228.0	22.6	2.883	2.310	0.184	0.0
5.003	2.486	98.9	27.8	2.534	2.019	0.230	0.0
7.000	1.436	228.3	5.8	0.550	1.793	0.046	0.0
5.004	1.434	228.0	37.9	1.793	0.760	0.322	0.0
5.005	3.985	158.5	43.0	0.986	2.283	0.368	0.0
8.000	1.434	228.0	5.8	0.400	2.051	0.046	0.0
5.006	1.787	284.2	52.1	2.050	1.625	0.460	0.0
1.010	2.574	409.4	154.4	1.625	1.049	1.471	0.0
1.011	1.436	228.4	156.5	1.050	1.054	1.517	0.0
9.000	2.771	440.7	5.7	0.550	0.552	0.046	0.0
9.001	4.620	734.7	11.3	0.550	0.795	0.092	0.0
1.012	3.020	480.2	167.9	0.804	2.145	1.655	0.0
10.000	1.793	285.2	5.5	0.804	0.626	0.046	0.0
10.001	1.281	203.8	10.2	0.626	2.145	0.092	0.0
1.013	1.280	203.6	181.1	2.145	2.371	1.793	0.0
1.014	1.282	203.9	178.0	2.371	0.538	1.793	0.0
1.015	1.279	203.4	174.9	0.538	2.106	1.793	0.0
1.016	1.280	203.6	173.8	2.106	1.700	1.793	0.0
1.017	0.988	69.9	168.4	1.850	1.226	1.793	0.0

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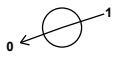
Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections
1	214.800	1.000	1200	 0
2	212.750	0.999	1200	 1 0
3	207.250	1.005	1200	 1 0
4	213.150	1.000	1200	 0
5	210.250	0.999	1200	 1 0
6	206.400	1.005	1200	 1 0
7	206.000	1.013	1350	 1 2 0
8	202.750	1.001	1200	 1 0
9	202.000	0.683	1200	 1 0
10	212.800	1.000	1200	 0
11	209.900	0.999	1200	 1 0
12	209.400	0.999	1200	 1 0
13	205.650	0.994	1200	 1 0

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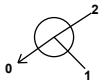
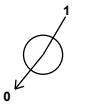
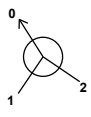
Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	
14	203.200	0.995	1200		1 0
15	201.650	1.015	1200		1 2 0
16	198.800	0.996	1200		1 0
17	206.600	1.000	1200		 0
18	203.600	1.003	1200		1 0
19	199.800	0.991	1200		1 0
20	198.250	1.000	1200		1 2 0
21	196.500	2.035	1200		1 0
22	203.200	1.100	1200		 0
23	202.750	1.000	1200		1 0
24	199.250	1.000	1200		 0
25	201.400	3.333	1200		1 2 0
26	200.650	2.760	1200		1 0

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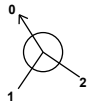
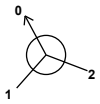
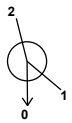
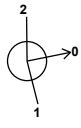
Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections
27	197.750	1.000	1200	 0
28	198.810	2.244	1200	 1 2 0
29	197.600	1.211	1200	 1 0
30	194.250	0.850	1200	 0
31	195.750	2.508	1200	 1 2 0
32	194.900	2.075	1200	 1 2 0
33	192.750	1.500	1350	 1 0
34	197.600	1.000	1200	 0
35	195.750	1.002	1200	 1 0
36	192.600	1.504	1350	 1 2 0
37	192.600	1.254	1200	 0
38	191.500	1.076	1200	 1 0
39	192.550	2.595	1350	 1 2 0

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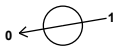
Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections
40	192.750	2.821	1350	1  0
SuDS Basin	190.800	0.988	1350	1  0
Control - 41	192.250	2.556	1350	1  0
42	191.800	2.150	1350	1  0
43_OUT	191.000	1.526		1 

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	Scotland and Ireland	Skip Steady State	x
M5-60 (mm)	17.000	Drain Down Time (mins)	240
Ratio-R	0.242	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	41	0	0
2	41	0	0
30	41	0	0
100	41	0	0
200	41	0	0

Node SuDS Basin Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	189.812
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	64

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	305.9	0.0	0.500	482.4	0.0	1.000	684.2	0.0

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
1 year +41% CC 15 minute summer	123.285	34.885
1 year +41% CC 15 minute winter	86.516	34.885
1 year +41% CC 30 minute summer	86.401	24.449
1 year +41% CC 30 minute winter	60.633	24.449
1 year +41% CC 60 minute summer	62.948	16.635
1 year +41% CC 60 minute winter	41.821	16.635
1 year +41% CC 120 minute summer	42.183	11.148
1 year +41% CC 120 minute winter	28.025	11.148
1 year +41% CC 180 minute summer	34.168	8.793
1 year +41% CC 180 minute winter	22.210	8.793
1 year +41% CC 240 minute summer	28.101	7.426
1 year +41% CC 240 minute winter	18.670	7.426
1 year +41% CC 360 minute summer	22.681	5.837
1 year +41% CC 360 minute winter	14.743	5.837
1 year +41% CC 480 minute summer	18.613	4.919
1 year +41% CC 480 minute winter	12.366	4.919
1 year +41% CC 600 minute summer	15.844	4.334
1 year +41% CC 600 minute winter	10.826	4.334
1 year +41% CC 720 minute summer	14.486	3.882
1 year +41% CC 720 minute winter	9.735	3.882
1 year +41% CC 960 minute summer	12.398	3.265
1 year +41% CC 960 minute winter	8.213	3.265
1 year +41% CC 1440 minute summer	9.532	2.555
1 year +41% CC 1440 minute winter	6.406	2.555
2 year +41% CC 15 minute summer	149.053	42.177
2 year +41% CC 15 minute winter	104.599	42.177
2 year +41% CC 30 minute summer	104.052	29.443
2 year +41% CC 30 minute winter	73.019	29.443
2 year +41% CC 60 minute summer	75.646	19.991
2 year +41% CC 60 minute winter	50.257	19.991
2 year +41% CC 120 minute summer	50.270	13.285
2 year +41% CC 120 minute winter	33.398	13.285
2 year +41% CC 180 minute summer	40.402	10.397
2 year +41% CC 180 minute winter	26.262	10.397
2 year +41% CC 240 minute summer	33.184	8.770
2 year +41% CC 240 minute winter	22.047	8.770
2 year +41% CC 360 minute summer	26.675	6.864
2 year +41% CC 360 minute winter	17.340	6.864
2 year +41% CC 480 minute summer	21.815	5.765
2 year +41% CC 480 minute winter	14.493	5.765
2 year +41% CC 600 minute summer	18.408	5.035
2 year +41% CC 600 minute winter	12.578	5.035
2 year +41% CC 720 minute summer	16.821	4.508
2 year +41% CC 720 minute winter	11.305	4.508
2 year +41% CC 960 minute summer	14.384	3.788
2 year +41% CC 960 minute winter	9.528	3.788
2 year +41% CC 1440 minute summer	11.007	2.950
2 year +41% CC 1440 minute winter	7.397	2.950
30 year +41% CC 15 minute summer	273.778	77.470
30 year +41% CC 15 minute winter	192.125	77.470
30 year +41% CC 30 minute summer	192.069	54.349
30 year +41% CC 30 minute winter	134.785	54.349
30 year +41% CC 60 minute summer	136.972	36.198
30 year +41% CC 60 minute winter	91.001	36.198
30 year +41% CC 120 minute summer	89.030	23.528
30 year +41% CC 120 minute winter	59.149	23.528
30 year +41% CC 180 minute summer	70.566	18.159
30 year +41% CC 180 minute winter	45.870	18.159
30 year +41% CC 240 minute summer	57.063	15.080
30 year +41% CC 240 minute winter	37.911	15.080
30 year +41% CC 360 minute summer	45.009	11.582
30 year +41% CC 360 minute winter	29.257	11.582
30 year +41% CC 480 minute summer	36.305	9.594
30 year +41% CC 480 minute winter	24.120	9.594
30 year +41% CC 600 minute summer	30.297	8.287
30 year +41% CC 600 minute winter	20.700	8.287
30 year +41% CC 720 minute summer	27.426	7.351
30 year +41% CC 720 minute winter	18.432	7.351
30 year +41% CC 960 minute summer	23.100	6.083
30 year +41% CC 960 minute winter	15.302	6.083
30 year +41% CC 1440 minute summer	17.371	4.656
30 year +41% CC 1440 minute winter	11.675	4.656
100 year +41% CC 15 minute summer	354.846	100.409
100 year +41% CC 15 minute winter	249.015	100.409
100 year +41% CC 30 minute summer	250.744	70.952
100 year +41% CC 30 minute winter	175.961	70.952
100 year +41% CC 60 minute summer	177.827	46.994
100 year +41% CC 60 minute winter	118.144	46.994
100 year +41% CC 120 minute summer	114.492	30.257
100 year +41% CC 120 minute winter	76.066	30.257
100 year +41% CC 180 minute summer	90.123	23.192
100 year +41% CC 180 minute winter	58.583	23.192
100 year +41% CC 240 minute summer	72.494	19.158
100 year +41% CC 240 minute winter	48.163	19.158
100 year +41% CC 360 minute summer	56.733	14.599
100 year +41% CC 360 minute winter	36.878	14.599
100 year +41% CC 480 minute summer	45.496	12.023
100 year +41% CC 480 minute winter	30.226	12.023
100 year +41% CC 600 minute summer	37.792	10.337
100 year +41% CC 600 minute winter	25.822	10.337
100 year +41% CC 720 minute summer	34.083	9.135
100 year +41% CC 720 minute winter	22.906	9.135
100 year +41% CC 960 minute summer	28.538	7.515
100 year +41% CC 960 minute winter	18.904	7.515
100 year +41% CC 1440 minute summer	21.280	5.703
100 year +41% CC 1440 minute winter	14.302	5.703
200 year +41% CC 15 minute summer	411.993	116.580
200 year +41% CC 15 minute winter	289.118	116.580
200 year +41% CC 30 minute summer	292.337	82.721
200 year +41% CC 30 minute winter	205.149	82.721
200 year +41% CC 60 minute summer	206.663	54.615
200 year +41% CC 60 minute winter	137.302	54.615
200 year +41% CC 120 minute summer	132.333	34.972
200 year +41% CC 120 minute winter	87.919	34.972

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Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
200 year +41% CC 180 minute summer	103.754	26.699	200 year +41% CC 600 minute summer	42.922	11.740
200 year +41% CC 180 minute winter	67.443	26.699	200 year +41% CC 600 minute winter	29.327	11.740
200 year +41% CC 240 minute summer	83.205	21.989	200 year +41% CC 720 minute summer	38.625	10.352
200 year +41% CC 240 minute winter	55.279	21.989	200 year +41% CC 720 minute winter	25.959	10.352
200 year +41% CC 360 minute summer	64.820	16.680	200 year +41% CC 960 minute summer	32.231	8.487
200 year +41% CC 360 minute winter	42.135	16.680	200 year +41% CC 960 minute winter	21.351	8.487
200 year +41% CC 480 minute summer	51.808	13.691	200 year +41% CC 1440 minute summer	23.918	6.410
200 year +41% CC 480 minute winter	34.420	13.691	200 year +41% CC 1440 minute winter	16.074	6.410

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Results for 1 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	213.839	0.038	7.3	0.0789	0.0000	OK
15 minute winter	2	11	211.790	0.039	14.3	0.0806	0.0000	OK
15 minute winter	3	11	206.326	0.080	20.9	0.1646	0.0000	OK
15 minute winter	4	11	212.185	0.035	7.3	0.0726	0.0000	OK
15 minute winter	5	11	209.294	0.043	14.3	0.0878	0.0000	OK
15 minute winter	6	11	205.448	0.053	20.9	0.1081	0.0000	OK
15 minute winter	7	11	205.082	0.095	48.2	0.2215	0.0000	OK
15 minute winter	8	12	201.885	0.136	54.6	0.2791	0.0000	OK
15 minute winter	9	12	201.455	0.138	59.4	0.3419	0.0000	OK
15 minute winter	10	10	211.833	0.032	7.3	0.0666	0.0000	OK
15 minute winter	11	11	208.958	0.057	14.4	0.1176	0.0000	OK
15 minute winter	12	11	208.457	0.056	21.2	0.1150	0.0000	OK
15 minute winter	13	11	204.727	0.071	28.1	0.1458	0.0000	OK
15 minute winter	14	12	202.276	0.071	34.4	0.1463	0.0000	OK
15 minute winter	15	12	200.751	0.116	98.2	0.2360	0.0000	OK
15 minute winter	16	12	197.976	0.172	103.9	0.3539	0.0000	OK
15 minute winter	17	11	205.635	0.035	7.3	0.0720	0.0000	OK
15 minute winter	18	11	202.643	0.046	14.3	0.0936	0.0000	OK
15 minute winter	19	11	198.871	0.062	20.5	0.1271	0.0000	OK
15 minute winter	20	12	197.386	0.136	128.1	0.2784	0.0000	OK
15 minute winter	21	12	194.591	0.126	132.5	0.1996	0.0000	OK
15 minute winter	22	10	202.141	0.041	7.3	0.0808	0.0000	OK
15 minute winter	23	10	201.795	0.045	14.5	0.0923	0.0000	OK
15 minute winter	24	10	198.304	0.054	7.3	0.1101	0.0000	OK
15 minute winter	25	11	198.177	0.110	28.7	0.1548	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	7.1	1.074	0.015	0.6578	
15 minute winter	2	1.001	3	14.0	1.141	0.016	0.9600	
15 minute winter	3	1.002	7	20.4	1.428	0.277	0.8992	
15 minute winter	4	2.000	5	7.0	1.073	0.013	0.6678	
15 minute winter	5	2.001	6	14.0	1.565	0.019	0.6797	
15 minute winter	6	2.002	7	21.0	1.366	0.030	0.1332	
15 minute winter	7	1.003	8	47.7	1.676	0.074	2.4302	
15 minute winter	8	1.004	9	53.7	1.345	0.192	2.2899	
15 minute winter	9	1.005	15	59.0	2.433	0.613	0.4856	
15 minute winter	10	3.000	11	7.1	0.878	0.011	0.5512	
15 minute winter	11	3.001	12	14.2	1.812	0.130	0.0899	
15 minute winter	12	3.002	13	21.2	1.578	0.034	1.3630	
15 minute winter	13	3.003	14	27.5	1.721	0.054	1.5981	
15 minute winter	14	3.004	15	33.5	1.465	0.056	1.0793	
15 minute winter	15	1.006	16	98.2	2.247	0.149	3.0270	
15 minute winter	16	1.007	20	102.7	2.638	0.524	0.6903	
15 minute winter	17	4.000	18	7.0	1.032	0.013	0.7031	
15 minute winter	18	4.001	19	13.9	1.291	0.022	1.0811	
15 minute winter	19	4.002	20	19.8	0.879	0.042	1.8455	
15 minute winter	20	1.008	21	126.8	3.266	0.184	1.5109	
15 minute winter	21	1.009	32	132.4	3.156	0.375	0.6824	
15 minute winter	22	5.000	23	7.2	0.941	0.017	0.1627	
15 minute winter	23	5.001	25	14.3	1.551	0.088	0.3798	
15 minute winter	24	6.000	25	7.1	0.363	0.031	0.7399	
15 minute winter	25	5.002	26	28.5	1.063	0.125	0.9524	

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Results for 1 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	11	197.984	0.094	35.4	0.1372	0.0000	OK
15 minute winter	27	10	196.804	0.054	7.3	0.1100	0.0000	OK
15 minute winter	28	11	196.712	0.146	49.4	0.2253	0.0000	OK
15 minute winter	29	11	196.480	0.091	54.8	0.1714	0.0000	OK
15 minute winter	30	10	193.454	0.054	7.3	0.1191	0.0000	OK
15 minute winter	31	11	193.398	0.156	68.5	0.2343	0.0000	OK
15 minute winter	32	12	193.045	0.220	206.0	0.3465	0.0000	OK
15 minute winter	33	13	191.719	0.469	209.2	0.9585	0.0000	SURCHARGED
15 minute winter	34	11	196.639	0.039	7.3	0.0806	0.0000	OK
15 minute winter	35	11	194.793	0.045	14.2	0.0915	0.0000	OK
15 minute winter	36	13	191.555	0.459	220.5	0.9381	0.0000	OK
15 minute winter	37	11	191.394	0.048	7.3	0.0888	0.0000	OK
15 minute winter	38	14	190.651	0.227	74.5	0.4501	0.0000	OK
15 minute winter	39	12	190.710	0.755	260.1	1.3489	0.0000	SURCHARGED
15 minute winter	40	12	190.666	0.737	263.1	1.0547	0.0000	SURCHARGED
60 minute winter	SuDS Basin	47	190.090	0.278	162.4	99.0866	0.0000	OK
60 minute winter	Control - 41	47	190.062	0.368	92.5	0.5270	0.0000	OK
60 minute winter	42	47	190.046	0.396	92.3	0.5673	0.0000	SURCHARGED
60 minute winter	43_OUT	47	189.710	0.236	92.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.003	28	35.5	1.666	0.359	0.7892	
15 minute winter	27	7.000	28	7.1	0.302	0.031	0.9995	
15 minute winter	28	5.004	29	48.0	1.136	0.210	1.5074	
15 minute winter	29	5.005	31	54.5	2.444	0.344	0.7618	
15 minute winter	30	8.000	31	7.1	0.304	0.031	0.8538	
15 minute winter	31	5.006	32	67.9	1.141	0.239	3.3501	
15 minute winter	32	1.010	33	203.5	1.711	0.497	11.5328	
15 minute winter	33	1.011	36	205.2	1.295	0.899	4.8656	
15 minute winter	34	9.000	35	7.0	0.956	0.016	0.7393	
15 minute winter	35	9.001	36	13.9	1.316	0.019	2.4666	
15 minute winter	36	1.012	39	218.3	1.962	0.455	7.2980	
15 minute winter	37	10.000	38	6.8	0.602	0.024	5.1195	
15 minute winter	38	10.001	39	65.4	0.521	0.321	13.9709	
15 minute winter	39	1.013	40	263.1	1.661	1.292	1.0313	
15 minute winter	40	1.014	SuDS Basin	263.2	2.444	1.291	2.8910	
60 minute winter	SuDS Basin	1.015	Control - 41	92.5	0.973	0.454	3.5744	
60 minute winter	Control - 41	1.016	42	92.3	0.825	0.453	1.5794	
60 minute winter	42	1.017	43_OUT	92.2	1.339	1.320	2.8667	243.7

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Results for 2 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	213.842	0.042	8.8	0.0862	0.0000	OK
15 minute winter	2	11	211.794	0.043	17.2	0.0880	0.0000	OK
15 minute winter	3	11	206.334	0.089	25.3	0.1828	0.0000	OK
15 minute winter	4	11	212.189	0.039	8.8	0.0792	0.0000	OK
15 minute winter	5	11	209.298	0.047	17.2	0.0960	0.0000	OK
15 minute winter	6	11	205.453	0.058	25.2	0.1181	0.0000	OK
15 minute winter	7	11	205.090	0.103	58.3	0.2404	0.0000	OK
15 minute winter	8	11	201.899	0.150	66.2	0.3081	0.0000	OK
15 minute winter	9	12	201.478	0.161	72.3	0.3982	0.0000	OK
15 minute winter	10	10	211.835	0.035	8.8	0.0725	0.0000	OK
15 minute winter	11	11	208.964	0.063	17.4	0.1300	0.0000	OK
15 minute winter	12	11	208.462	0.061	25.6	0.1257	0.0000	OK
15 minute winter	13	11	204.734	0.078	33.9	0.1603	0.0000	OK
15 minute winter	14	11	202.283	0.078	41.7	0.1611	0.0000	OK
15 minute winter	15	12	200.763	0.128	120.0	0.2615	0.0000	OK
15 minute winter	16	12	198.003	0.199	127.2	0.4091	0.0000	OK
15 minute winter	17	11	205.638	0.038	8.8	0.0786	0.0000	OK
15 minute winter	18	11	202.647	0.050	17.3	0.1025	0.0000	OK
15 minute winter	19	11	198.878	0.069	24.9	0.1399	0.0000	OK
15 minute winter	20	12	197.402	0.152	156.8	0.3115	0.0000	OK
15 minute winter	21	12	194.609	0.144	162.6	0.2276	0.0000	OK
15 minute winter	22	10	202.145	0.045	8.8	0.0885	0.0000	OK
15 minute winter	23	10	201.799	0.049	17.5	0.1012	0.0000	OK
15 minute winter	24	10	198.309	0.059	8.8	0.1204	0.0000	OK
15 minute winter	25	11	198.188	0.121	34.6	0.1702	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	8.5	1.136	0.018	0.7506	
15 minute winter	2	1.001	3	17.0	1.196	0.019	1.1108	
15 minute winter	3	1.002	7	24.8	1.533	0.336	1.0164	
15 minute winter	4	2.000	5	8.5	1.131	0.015	0.7599	
15 minute winter	5	2.001	6	16.9	1.655	0.023	0.7748	
15 minute winter	6	2.002	7	25.3	1.449	0.036	0.1516	
15 minute winter	7	1.003	8	57.9	1.723	0.089	2.8047	
15 minute winter	8	1.004	9	65.4	1.378	0.234	2.7304	
15 minute winter	9	1.005	15	72.6	2.529	0.754	0.5743	
15 minute winter	10	3.000	11	8.6	0.922	0.013	0.6361	
15 minute winter	11	3.001	12	17.1	1.909	0.157	0.1028	
15 minute winter	12	3.002	13	25.6	1.664	0.041	1.5589	
15 minute winter	13	3.003	14	33.4	1.818	0.066	1.8357	
15 minute winter	14	3.004	15	40.7	1.539	0.068	1.2445	
15 minute winter	15	1.006	16	120.3	2.328	0.183	3.6071	
15 minute winter	16	1.007	20	126.2	2.748	0.644	0.8138	
15 minute winter	17	4.000	18	8.5	1.084	0.015	0.8007	
15 minute winter	18	4.001	19	16.8	1.363	0.027	1.2383	
15 minute winter	19	4.002	20	24.1	0.916	0.052	2.1602	
15 minute winter	20	1.008	21	155.7	3.445	0.226	1.7581	
15 minute winter	21	1.009	32	162.4	3.336	0.460	0.7834	
15 minute winter	22	5.000	23	8.7	0.991	0.021	0.1861	
15 minute winter	23	5.001	25	17.3	1.555	0.106	0.4401	
15 minute winter	24	6.000	25	8.5	0.382	0.037	0.8447	
15 minute winter	25	5.002	26	34.4	1.113	0.151	1.0957	

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Results for 2 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	11	197.994	0.104	42.7	0.1522	0.0000	OK
15 minute winter	27	10	196.809	0.059	8.8	0.1204	0.0000	OK
15 minute winter	28	11	196.729	0.162	59.6	0.2504	0.0000	OK
15 minute winter	29	11	196.490	0.101	66.6	0.1911	0.0000	OK
15 minute winter	30	10	193.459	0.059	8.8	0.1302	0.0000	OK
15 minute winter	31	11	193.416	0.174	83.1	0.2606	0.0000	OK
15 minute winter	32	12	193.074	0.249	251.4	0.3915	0.0000	OK
15 minute winter	33	13	191.850	0.600	256.3	1.2268	0.0000	SURCHARGED
15 minute winter	34	11	196.643	0.043	8.8	0.0879	0.0000	OK
15 minute winter	35	11	194.797	0.049	17.2	0.0997	0.0000	OK
15 minute winter	36	13	191.595	0.499	271.9	1.0185	0.0000	OK
15 minute winter	37	11	191.398	0.052	8.8	0.0972	0.0000	OK
15 minute winter	38	14	190.733	0.309	102.3	0.6139	0.0000	OK
15 minute winter	39	12	190.781	0.826	296.3	1.4750	0.0000	SURCHARGED
15 minute summer	40	12	190.720	0.791	279.3	1.1314	0.0000	SURCHARGED
60 minute winter	SuDS Basin	47	190.151	0.339	196.3	124.6231	0.0000	OK
60 minute winter	Control - 41	48	190.124	0.430	99.7	0.6150	0.0000	OK
60 minute winter	42	48	190.105	0.455	99.6	0.6516	0.0000	SURCHARGED
60 minute winter	43_OUT	48	189.719	0.245	99.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.003	28	42.8	1.765	0.433	0.8943	
15 minute winter	27	7.000	28	8.5	0.313	0.037	1.1525	
15 minute winter	28	5.004	29	58.3	1.194	0.256	1.7407	
15 minute winter	29	5.005	31	66.4	2.616	0.419	0.8615	
15 minute winter	30	8.000	31	8.6	0.314	0.038	0.9895	
15 minute winter	31	5.006	32	82.1	1.199	0.289	3.8820	
15 minute winter	32	1.010	33	249.4	1.781	0.609	12.2164	
15 minute winter	33	1.011	36	253.6	1.601	1.110	4.8656	
15 minute winter	34	9.000	35	8.5	1.015	0.019	0.8402	
15 minute winter	35	9.001	36	16.8	1.376	0.023	3.0787	
15 minute winter	36	1.012	39	276.7	1.976	0.576	7.8563	
15 minute winter	37	10.000	38	8.3	0.631	0.029	7.3106	
15 minute winter	38	10.001	39	-87.6	-0.706	-0.430	16.0874	
15 minute winter	39	1.013	40	297.4	1.877	1.461	1.0313	
15 minute summer	40	1.014	SuDS Basin	278.2	2.437	1.364	3.1841	
60 minute winter	SuDS Basin	1.015	Control - 41	99.7	0.981	0.490	4.2037	
60 minute winter	Control - 41	1.016	42	99.6	0.829	0.489	1.7317	
60 minute winter	42	1.017	43_OUT	99.6	1.435	1.426	2.9103	294.3

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Results for 30 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	213.857	0.056	16.2	0.1158	0.0000	OK
15 minute winter	2	11	211.808	0.057	31.9	0.1177	0.0000	OK
15 minute winter	3	11	206.376	0.131	47.0	0.2673	0.0000	OK
15 minute winter	4	10	212.202	0.052	16.2	0.1062	0.0000	OK
15 minute winter	5	11	209.314	0.063	31.9	0.1286	0.0000	OK
15 minute winter	6	11	205.476	0.081	46.8	0.1655	0.0000	OK
15 minute winter	7	11	205.123	0.136	108.5	0.3175	0.0000	OK
15 minute winter	8	13	201.986	0.237	123.5	0.4856	0.0000	OK
15 minute winter	9	12	201.966	0.649	137.8	1.6082	0.0000	FLOOD RISK
15 minute winter	10	10	211.847	0.047	16.2	0.0968	0.0000	OK
15 minute winter	11	10	208.991	0.090	32.1	0.1841	0.0000	OK
15 minute winter	12	11	208.483	0.082	47.4	0.1690	0.0000	OK
15 minute winter	13	11	204.762	0.106	62.5	0.2189	0.0000	OK
15 minute winter	14	11	202.312	0.107	77.8	0.2204	0.0000	OK
15 minute winter	15	12	200.802	0.167	198.3	0.3401	0.0000	OK
15 minute winter	16	13	198.316	0.512	211.6	1.0522	0.0000	SURCHARGED
15 minute winter	17	10	205.651	0.051	16.2	0.1053	0.0000	OK
15 minute winter	18	11	202.664	0.067	31.9	0.1376	0.0000	OK
15 minute winter	19	11	198.903	0.094	46.1	0.1909	0.0000	OK
15 minute winter	20	13	197.447	0.197	245.8	0.4033	0.0000	OK
15 minute winter	21	14	195.141	0.676	256.3	1.0697	0.0000	SURCHARGED
15 minute winter	22	10	202.161	0.061	16.2	0.1193	0.0000	OK
15 minute winter	23	10	201.817	0.067	32.2	0.1380	0.0000	OK
15 minute winter	24	10	198.329	0.079	16.2	0.1623	0.0000	OK
15 minute winter	25	10	198.235	0.168	64.0	0.2358	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	15.7	1.365	0.034	1.1525	
15 minute winter	2	1.001	3	31.4	1.350	0.036	1.8535	
15 minute winter	3	1.002	7	46.2	1.888	0.627	1.5387	
15 minute winter	4	2.000	5	15.7	1.359	0.029	1.1664	
15 minute winter	5	2.001	6	31.3	1.928	0.043	1.2336	
15 minute winter	6	2.002	7	47.0	1.712	0.067	0.2373	
15 minute winter	7	1.003	8	108.2	2.073	0.167	4.6752	
15 minute winter	8	1.004	9	122.5	1.395	0.438	6.9496	
15 minute winter	9	1.005	15	111.0	2.792	1.153	0.7967	
15 minute winter	10	3.000	11	15.9	1.052	0.023	1.0309	
15 minute winter	11	3.001	12	31.4	2.255	0.288	0.1603	
15 minute winter	12	3.002	13	47.1	1.974	0.075	2.4203	
15 minute winter	13	3.003	14	62.5	2.175	0.123	2.8730	
15 minute winter	14	3.004	15	77.0	1.946	0.128	1.8370	
15 minute winter	15	1.006	16	198.9	2.454	0.302	7.2839	
15 minute winter	16	1.007	20	196.4	2.878	1.003	1.2484	
15 minute winter	17	4.000	18	15.7	1.300	0.028	1.2315	
15 minute winter	18	4.001	19	31.2	1.636	0.049	1.9293	
15 minute winter	19	4.002	20	45.7	1.104	0.098	3.1732	
15 minute winter	20	1.008	21	245.4	3.869	0.356	2.4677	
15 minute winter	21	1.009	32	253.8	3.655	0.718	1.1544	
15 minute winter	22	5.000	23	16.1	1.169	0.039	0.2914	
15 minute winter	23	5.001	25	32.0	1.719	0.196	0.7041	
15 minute winter	24	6.000	25	15.8	0.450	0.069	1.3221	
15 minute winter	25	5.002	26	63.3	1.260	0.278	1.7805	

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Results for 30 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	11	198.042	0.152	78.6	0.2226	0.0000	OK
15 minute winter	27	10	196.829	0.079	16.2	0.1623	0.0000	OK
15 minute winter	28	11	196.799	0.233	110.0	0.3592	0.0000	OK
15 minute winter	29	11	196.538	0.149	125.0	0.2825	0.0000	OK
15 minute winter	30	14	194.092	0.692	31.5	1.5310	0.0000	FLOOD RISK
15 minute winter	31	14	194.078	0.836	153.5	1.2527	0.0000	SURCHARGED
15 minute winter	32	14	194.031	1.206	401.3	1.8981	0.0000	SURCHARGED
15 minute winter	33	14	192.711	1.461	362.5	2.9869	0.0000	FLOOD RISK
15 minute winter	34	10	196.657	0.057	16.2	0.1176	0.0000	OK
15 minute winter	35	11	194.813	0.065	31.8	0.1322	0.0000	OK
15 minute winter	36	14	192.197	1.101	396.2	2.2491	0.0000	SURCHARGED
15 minute winter	37	11	191.416	0.070	16.2	0.1308	0.0000	OK
15 minute winter	38	13	191.159	0.735	174.6	1.4598	0.0000	SURCHARGED
15 minute winter	39	13	191.152	1.197	408.9	2.1384	0.0000	SURCHARGED
15 minute winter	40	10	190.917	0.988	409.9	1.4132	0.0000	SURCHARGED
60 minute winter	SuDS Basin	51	190.450	0.638	318.6	268.4532	0.0000	SURCHARGED
60 minute winter	Control - 41	51	190.389	0.695	125.4	0.9944	0.0000	SURCHARGED
60 minute winter	42	51	190.356	0.706	125.4	1.0104	0.0000	SURCHARGED
60 minute winter	43_OUT	51	189.742	0.268	125.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.003	28	79.2	2.192	0.801	1.2584	
15 minute winter	27	7.000	28	15.8	0.352	0.069	1.8410	
15 minute winter	28	5.004	29	109.8	1.396	0.481	2.7859	
15 minute winter	29	5.005	31	124.9	3.364	0.788	1.1622	
15 minute winter	30	8.000	31	37.6	0.347	0.165	4.7850	
15 minute winter	31	5.006	32	145.6	1.325	0.512	8.6985	
15 minute winter	32	1.010	33	353.2	2.230	0.863	15.5908	
15 minute winter	33	1.011	36	358.9	2.265	1.572	4.8656	
15 minute winter	34	9.000	35	15.6	1.232	0.035	1.2804	
15 minute winter	35	9.001	36	31.3	1.424	0.043	5.6845	
15 minute winter	36	1.012	39	382.9	2.417	0.797	10.0295	
15 minute winter	37	10.000	38	15.5	0.738	0.054	10.2522	
15 minute winter	38	10.001	39	-143.9	-0.922	-0.706	18.5696	
15 minute winter	39	1.013	40	409.9	2.587	2.013	1.0313	
15 minute winter	40	1.014	SuDS Basin	412.3	3.194	2.022	4.6280	
60 minute winter	SuDS Basin	1.015	Control - 41	125.4	0.989	0.617	4.6871	
60 minute winter	Control - 41	1.016	42	125.4	0.830	0.616	1.7454	
60 minute winter	42	1.017	43_OUT	125.4	1.783	1.795	3.0180	537.3

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Results for 100 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	213.864	0.064	21.0	0.1314	0.0000	OK
15 minute winter	2	11	211.816	0.065	41.4	0.1332	0.0000	OK
15 minute winter	3	11	206.403	0.158	61.1	0.3235	0.0000	OK
15 minute winter	4	10	212.209	0.059	21.0	0.1202	0.0000	OK
15 minute winter	5	11	209.322	0.071	41.4	0.1457	0.0000	OK
15 minute winter	6	11	205.489	0.094	60.9	0.1923	0.0000	OK
15 minute winter	7	11	205.140	0.153	140.4	0.3584	0.0000	OK
15 minute winter	8	12	202.126	0.377	160.0	0.7737	0.0000	OK
15 minute winter	9	11	202.000	0.683	164.1	1.6925	7.4980	FLOOD
15 minute winter	10	10	211.853	0.053	21.0	0.1095	0.0000	OK
15 minute winter	11	10	209.006	0.105	41.7	0.2157	0.0000	OK
15 minute winter	12	11	208.495	0.093	61.5	0.1918	0.0000	OK
15 minute winter	13	11	204.778	0.122	81.1	0.2503	0.0000	OK
15 minute winter	14	11	202.328	0.123	101.0	0.2519	0.0000	OK
15 minute winter	15	11	200.817	0.182	232.9	0.3703	0.0000	OK
15 minute winter	16	12	198.639	0.835	252.4	1.7150	0.0000	FLOOD RISK
15 minute winter	17	10	205.658	0.058	21.0	0.1192	0.0000	OK
15 minute winter	18	11	202.673	0.076	41.4	0.1562	0.0000	OK
15 minute winter	19	11	198.916	0.107	59.9	0.2181	0.0000	OK
15 minute winter	20	11	197.469	0.219	308.8	0.4499	0.0000	OK
15 minute winter	21	13	196.152	1.687	325.6	2.6712	0.0000	SURCHARGED
15 minute winter	22	10	202.169	0.069	21.0	0.1358	0.0000	OK
15 minute winter	23	10	201.827	0.077	41.8	0.1580	0.0000	OK
15 minute winter	24	10	198.340	0.090	21.0	0.1843	0.0000	OK
15 minute winter	25	11	198.263	0.196	83.0	0.2756	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	20.4	1.475	0.044	1.3847	
15 minute winter	2	1.001	3	40.7	1.407	0.046	2.3679	
15 minute winter	3	1.002	7	59.7	2.038	0.809	1.8434	
15 minute winter	4	2.000	5	20.4	1.468	0.037	1.3970	
15 minute winter	5	2.001	6	40.6	2.044	0.055	1.5092	
15 minute winter	6	2.002	7	60.9	1.830	0.087	0.2876	
15 minute winter	7	1.003	8	140.2	2.212	0.217	7.4404	
15 minute winter	8	1.004	9	147.6	1.398	0.527	8.5978	
15 minute winter	9	1.005	15	112.7	2.835	1.171	0.7967	
15 minute winter	10	3.000	11	20.7	1.105	0.030	1.2772	
15 minute winter	11	3.001	12	40.7	2.415	0.374	0.1938	
15 minute winter	12	3.002	13	61.1	2.121	0.097	2.9162	
15 minute winter	13	3.003	14	81.2	2.341	0.160	3.4717	
15 minute winter	14	3.004	15	100.4	2.150	0.167	2.1361	
15 minute winter	15	1.006	16	232.6	2.447	0.354	7.5134	
15 minute winter	16	1.007	20	235.8	3.349	1.204	1.2483	
15 minute winter	17	4.000	18	20.5	1.401	0.036	1.4776	
15 minute winter	18	4.001	19	40.5	1.763	0.064	2.3264	
15 minute winter	19	4.002	20	59.6	1.232	0.127	3.7629	
15 minute winter	20	1.008	21	309.2	3.970	0.449	4.4721	
15 minute winter	21	1.009	32	315.5	4.481	0.893	1.1544	
15 minute winter	22	5.000	23	20.8	1.250	0.050	0.3534	
15 minute winter	23	5.001	25	41.4	1.827	0.254	0.8456	
15 minute winter	24	6.000	25	20.6	0.480	0.090	1.6118	
15 minute winter	25	5.002	26	82.0	1.268	0.359	2.8233	

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Results for 100 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	12	198.163	0.273	101.7	0.4001	0.0000	SURCHARGED
15 minute winter	27	13	196.853	0.102	21.0	0.2102	0.0000	OK
15 minute winter	28	13	196.843	0.277	137.8	0.4267	0.0000	OK
15 minute winter	29	12	196.821	0.432	154.7	0.8165	0.0000	SURCHARGED
15 minute winter	30	11	194.250	0.850	106.0	1.8811	25.5146	FLOOD
15 minute winter	31	12	194.294	1.052	172.2	1.5761	0.0000	SURCHARGED
15 minute winter	32	11	194.364	1.539	414.8	2.4226	0.0000	SURCHARGED
15 minute winter	33	12	192.750	1.500	398.8	3.0675	12.4641	FLOOD
15 minute winter	34	10	196.665	0.065	21.0	0.1333	0.0000	OK
15 minute winter	35	11	194.821	0.073	41.3	0.1494	0.0000	OK
15 minute winter	36	12	192.319	1.223	437.3	2.4987	0.0000	FLOOD RISK
15 minute winter	37	11	191.426	0.080	21.0	0.1486	0.0000	OK
15 minute winter	38	12	191.356	0.932	207.1	1.8504	0.0000	FLOOD RISK
15 minute winter	39	12	191.302	1.346	433.2	2.4048	0.0000	SURCHARGED
60 minute winter	40	43	191.025	1.096	384.4	1.5690	0.0000	SURCHARGED
60 minute winter	SuDS Basin	52	190.639	0.827	383.8	377.6868	0.0000	FLOOD RISK
60 minute winter	Control - 41	52	190.565	0.871	138.3	1.2460	0.0000	SURCHARGED
60 minute winter	42	52	190.525	0.875	138.3	1.2518	0.0000	SURCHARGED
60 minute winter	43_OUT	52	189.750	0.276	138.3	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.003	28	96.2	2.441	0.973	1.4699	
15 minute winter	27	7.000	28	20.6	0.369	0.090	2.3534	
15 minute winter	28	5.004	29	134.9	1.440	0.592	4.5225	
15 minute winter	29	5.005	31	148.0	3.800	0.934	1.3643	
15 minute winter	30	8.000	31	-92.5	-0.584	-0.406	4.7850	
15 minute winter	31	5.006	32	151.6	1.357	0.534	8.6985	
15 minute winter	32	1.010	33	380.3	2.400	0.929	15.5908	
15 minute winter	33	1.011	36	376.9	2.379	1.651	4.8656	
15 minute winter	34	9.000	35	20.3	1.337	0.046	1.5303	
15 minute winter	35	9.001	36	40.5	1.408	0.055	5.7722	
15 minute winter	36	1.012	39	395.5	2.496	0.824	10.0295	
15 minute winter	37	10.000	38	20.1	0.761	0.070	10.4886	
15 minute winter	38	10.001	39	-166.6	-1.121	-0.818	18.5696	
15 minute winter	39	1.013	40	434.7	2.744	2.135	1.0313	
60 minute winter	40	1.014	SuDS Basin	383.8	2.422	1.882	4.6280	
60 minute winter	SuDS Basin	1.015	Control - 41	138.3	0.989	0.680	4.6871	
60 minute winter	Control - 41	1.016	42	138.3	0.873	0.679	1.7454	
60 minute winter	42	1.017	43_OUT	138.3	1.964	1.980	3.0503	705.4

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Results for 200 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	213.869	0.069	24.4	0.1415	0.0000	OK
15 minute winter	2	11	211.821	0.070	48.1	0.1433	0.0000	OK
15 minute winter	3	11	206.425	0.180	71.1	0.3689	0.0000	OK
15 minute winter	4	10	212.213	0.063	24.4	0.1292	0.0000	OK
15 minute winter	5	11	209.327	0.076	48.2	0.1568	0.0000	OK
15 minute winter	6	11	205.498	0.103	70.9	0.2102	0.0000	OK
15 minute winter	7	11	205.151	0.164	162.5	0.3845	0.0000	OK
15 minute winter	8	12	202.209	0.460	185.4	0.9433	0.0000	SURCHARGED
15 minute winter	9	10	202.000	0.683	198.3	1.6925	16.9840	FLOOD
15 minute winter	10	10	211.857	0.057	24.4	0.1176	0.0000	OK
15 minute winter	11	10	209.017	0.116	48.4	0.2374	0.0000	OK
15 minute winter	12	11	208.502	0.101	71.5	0.2067	0.0000	OK
15 minute winter	13	11	204.788	0.132	94.4	0.2708	0.0000	OK
15 minute winter	14	11	202.338	0.132	117.5	0.2724	0.0000	OK
15 minute winter	15	11	200.825	0.190	252.7	0.3874	0.0000	OK
15 minute winter	16	12	198.800	0.996	275.4	2.0468	0.6970	FLOOD
15 minute winter	17	10	205.662	0.062	24.4	0.1281	0.0000	OK
15 minute winter	18	11	202.679	0.082	48.2	0.1682	0.0000	OK
15 minute winter	19	11	198.925	0.116	69.8	0.2355	0.0000	OK
15 minute winter	20	12	197.495	0.245	338.0	0.5026	0.0000	OK
15 minute winter	21	13	196.500	2.035	350.9	3.2214	0.0192	FLOOD
15 minute winter	22	10	202.175	0.075	24.4	0.1466	0.0000	OK
15 minute winter	23	10	201.833	0.083	48.6	0.1711	0.0000	OK
15 minute winter	24	10	198.347	0.097	24.4	0.1986	0.0000	OK
15 minute winter	25	12	198.331	0.264	96.5	0.3721	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	23.8	1.544	0.051	1.5399	
15 minute winter	2	1.001	3	47.2	1.432	0.053	2.7831	
15 minute winter	3	1.002	7	68.7	2.119	0.931	2.0504	
15 minute winter	4	2.000	5	23.8	1.538	0.043	1.5540	
15 minute winter	5	2.001	6	47.2	2.111	0.064	1.6999	
15 minute winter	6	2.002	7	70.8	1.900	0.101	0.3215	
15 minute winter	7	1.003	8	162.4	2.180	0.251	8.2974	
15 minute winter	8	1.004	9	179.2	1.350	0.640	9.0790	
15 minute winter	9	1.005	15	112.7	2.835	1.171	0.7967	
15 minute winter	10	3.000	11	24.1	1.133	0.035	1.4504	
15 minute winter	11	3.001	12	47.3	2.509	0.434	0.2167	
15 minute winter	12	3.002	13	70.9	2.209	0.113	3.2497	
15 minute winter	13	3.003	14	94.5	2.441	0.186	3.8737	
15 minute winter	14	3.004	15	117.0	2.312	0.194	2.3116	
15 minute winter	15	1.006	16	252.5	2.492	0.384	7.6409	
15 minute winter	16	1.007	20	253.0	3.592	1.291	1.2450	
15 minute winter	17	4.000	18	23.8	1.465	0.042	1.6419	
15 minute winter	18	4.001	19	47.1	1.841	0.075	2.5918	
15 minute winter	19	4.002	20	69.5	1.345	0.149	4.2649	
15 minute winter	20	1.008	21	331.8	3.970	0.482	4.7977	
15 minute winter	21	1.009	32	340.6	4.837	0.964	1.1544	
15 minute winter	22	5.000	23	24.2	1.298	0.058	0.3960	
15 minute winter	23	5.001	25	48.2	1.899	0.295	0.9845	
15 minute winter	24	6.000	25	23.9	0.497	0.105	2.1723	
15 minute winter	25	5.002	26	96.8	1.254	0.425	4.5185	

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Results for 200 year +41% CC Critical Storm Duration. Lowest mass balance: 98.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	26	12	198.371	0.481	121.2	0.7040	0.0000	SURCHARGED
15 minute winter	27	12	196.958	0.208	24.4	0.4270	0.0000	OK
15 minute winter	28	13	196.966	0.400	140.1	0.6164	0.0000	OK
15 minute winter	29	13	196.904	0.515	162.0	0.9737	0.0000	SURCHARGED
30 minute winter	30	18	194.250	0.850	130.6	1.8811	45.9512	FLOOD
30 minute summer	31	18	194.330	1.088	174.9	1.6299	0.0000	SURCHARGED
30 minute summer	32	18	194.320	1.495	430.9	2.3529	0.0000	SURCHARGED
30 minute winter	33	18	192.750	1.500	401.7	3.0675	22.5353	FLOOD
15 minute winter	34	10	196.670	0.070	24.4	0.1435	0.0000	OK
15 minute winter	35	11	194.826	0.078	48.0	0.1604	0.0000	OK
15 minute winter	36	12	192.369	1.273	423.7	2.6008	0.0000	FLOOD RISK
15 minute winter	37	11	191.432	0.086	24.4	0.1600	0.0000	OK
15 minute winter	38	12	191.433	1.009	203.2	2.0030	0.0000	FLOOD RISK
15 minute winter	39	12	191.384	1.429	442.7	2.5522	0.0000	SURCHARGED
60 minute winter	40	44	191.127	1.198	408.5	1.7137	0.0000	SURCHARGED
120 minute winter	SuDS Basin	90	190.740	0.928	343.8	441.5181	0.0000	FLOOD RISK
120 minute winter	Control - 41	90	190.657	0.963	145.5	1.3783	0.0000	SURCHARGED
120 minute winter	42	90	190.613	0.963	145.5	1.3781	0.0000	SURCHARGED
120 minute winter	43_OUT	90	189.753	0.279	145.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	26	5.003	28	95.5	2.424	0.966	1.4699	
15 minute winter	27	7.000	28	24.9	0.394	0.109	3.9142	
15 minute winter	28	5.004	29	137.6	1.411	0.603	5.4344	
15 minute winter	29	5.005	31	143.5	3.734	0.906	1.3643	
30 minute winter	30	8.000	31	-113.3	-0.715	-0.497	4.7850	
30 minute summer	31	5.006	32	156.6	1.322	0.551	8.6985	
30 minute summer	32	1.010	33	393.0	2.481	0.960	15.5908	
30 minute winter	33	1.011	36	370.9	2.341	1.624	4.8656	
15 minute winter	34	9.000	35	23.7	1.397	0.054	1.6968	
15 minute winter	35	9.001	36	47.1	1.488	0.064	5.8316	
15 minute winter	36	1.012	39	392.8	2.479	0.818	10.0295	
15 minute winter	37	10.000	38	23.4	0.789	0.082	10.6146	
15 minute winter	38	10.001	39	-156.1	-0.985	-0.766	18.5696	
15 minute winter	39	1.013	40	444.7	2.807	2.184	1.0313	
60 minute winter	40	1.014	SuDS Basin	407.7	2.573	2.000	4.6280	
120 minute winter	SuDS Basin	1.015	Control - 41	145.5	0.953	0.715	4.6871	
120 minute winter	Control - 41	1.016	42	145.5	0.918	0.715	1.7454	
120 minute winter	42	1.017	43_OUT	145.5	2.066	2.082	3.0599	1047.6

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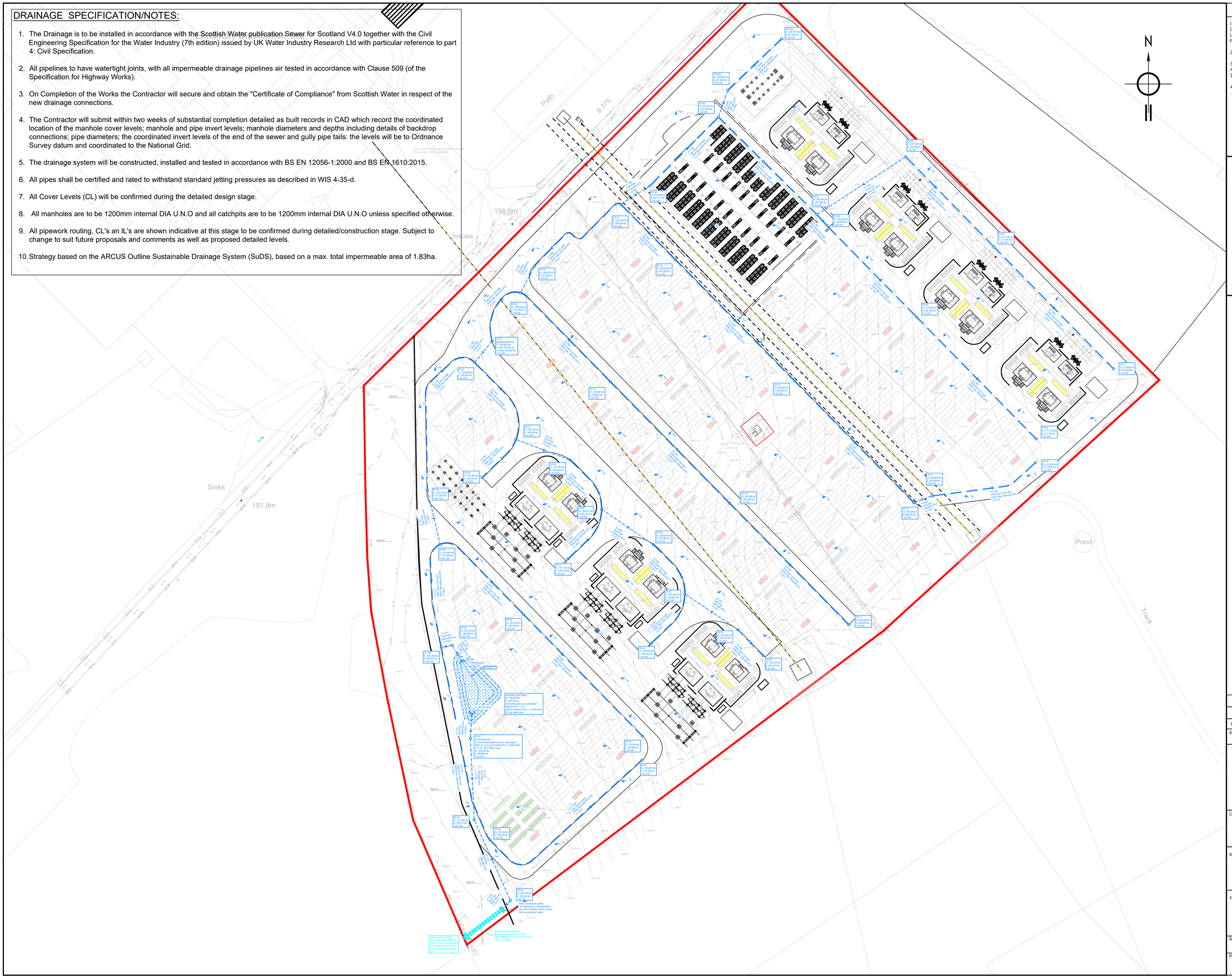
DRAINAGE SPECIFICATION/NOTES:

1. The Drainage is to be installed in accordance with the Scottish Water publication Sewer for Scotland V4.0 together with the Civil Engineering Specification for the Water Industry (7th edition) issued by UK Water Industry Research Ltd with particular reference to part 4: Civil Specification.
2. All pipelines to have watertight joints, with all impermeable drainage pipelines air tested in accordance with Clause 509 (of the Specification for Highway Works).
3. On Completion of the Works the Contractor will secure and obtain the "Certificate of Compliance" from Scottish Water in respect of the new drainage connections.
4. The Contractor will submit within two weeks of substantial completion detailed as built records in CAD which record the coordinated location of the manhole cover levels; manhole and pipe invert levels; manhole diameters and depths including details of backdrop connections; pipe diameters; the coordinated invert levels of the end of the sewer and gully pipe tails: the levels will be to Ordnance Survey datum and coordinated to the National Grid.
5. The drainage system will be constructed, installed and tested in accordance with BS EN 12056-1:2000 and BS EN 1610:2015.
6. All pipes shall be certified and rated to withstand standard jetting pressures as described in WIS 4-35-d.
7. All Cover Levels (CL) will be confirmed during the detailed design stage.
8. All manholes are to be 1200mm internal DIA U.N.O and all catchpits are to be 1200mm internal DIA U.N.O unless specified otherwise.
9. All pipework routing, CL's an IL's are shown indicative at this stage to be confirmed during detailed/construction stage. Subject to change to suit future proposals and comments as well as proposed detailed levels.
10. Strategy based on the ARCUS Outline Sustainable Drainage System (SuDS), based on a max. total impermeable area of 1.83ha.



Notes:

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4. ALL DIMENSIONS AND SIZES TO BE VERIFIED ON SITE.

Legend:

- Application site boundary
- Proposed Indicative Private Surface Water Catchpit
- Proposed Indicative Private Surface Water Pipework
- Proposed Private Filter Drain
- Proposed Private SuDS Basin

REV.	DESCRIPTION:	BY:	DATE:
B	Amended following discussions with Council	CVB	06/09/23
A	Proposed site layout revised	CVB	22/03/23

STATUS: PLANNING

VAZQUEZ BESADA CONSULTING
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CLIENT: Statkraft UK Ltd

SITE: Neilston Battery Storage Site
Refrenwshire Council

TITLE: Proposed Drainage Strategy

SCALE AT A1:	DATE:	DRAWN:	CHECKED:
1:1,000	01/02/23	CVB	-

PROJECT NO:	DRAWING NO:	REVISION:
23001	101	B

FAO James Weir
Planning Department
Renfrewshire Council
Renfrewshire House
Cotton Street
Paisley
PA1 1AN

By email: james.weir@Renfrewshire.gov.uk

30th September 2021

Your Reference: 21/0034/PP
Our Reference: 3547/SuDS

Dear Mr Weir,

Drainage Design for the construction and operation of Neilston Greener Grid Park at Land off Gleniffer Road, Renfrewshire

In accordance with Renfrewshire Council, Drainage Assessment: Notes for Guidance[1] an outline Sustainable Drainage System (SuDS) has been designed to serve the proposed Greener Grid Park on land off Gleniffer Road, Renfrewshire.

As outlined in the application the Development involves the installation of a battery storage facility which includes the impermeable elements totalling 0.95 ha and the initial design utilised attenuation structures which infiltrated to ground.

The greenfield run-off rate (Q_{BAR}) was calculated at 136.4 l/s using the Flood Estimation Handbook (FEH) rainfall data and ICP SuDS method using Micro Drainage software.

Following consultation, it has been suggested that the SuDS should discharge to the adjacent wetlands to the west of the Site rather than utilise infiltration.

The wetland to the west is a designated Site of Importance for Nature conservation (SINC) and will require a 30 m buffer from development infrastructure as advised during consultation. As such no development infrastructure, including the SuDS infrastructure, is to be located within 30 m of the SINC wetland (see Figure 1).

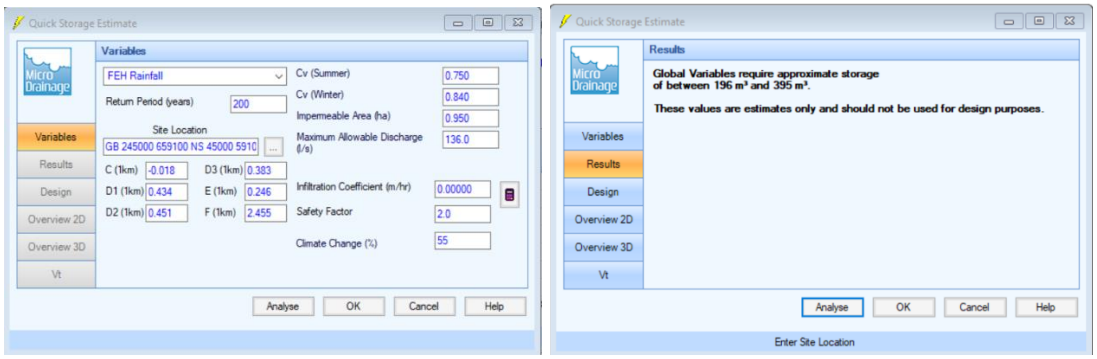
Disposal via Attenuated Release to Wetlands

Adequately sized structures are considered practicable within the proposed construction phase to attenuate surface water run-off for the 1:200 year event, plus a 55 % allowance for climate change.

The overall storage volume required to attenuate surface water flows for the 1:200 year (+55 %) event are shown in Plate 1, based on the areas of hardstanding outlined in Table 1 of the Outline Sustainable Drainage Strategy (Arcus 2021).

[1] Renfrewshire Council, Drainage Assessment: Notes for Guidance. [Online]. Available at: http://www.renfrewshire.gov.uk/media/1097/Drainage-assessment-guidance/pdf/Drainage_assessment_guidance.pdf?m=1455808042243

Plate 1: Micro Drainage Storage Calculations



As such, a detention basin will be used to attenuate flows and discharge at greenfield rates via an orifice plate or similar flow restriction device, with a depth of 0.5 m and an area of 585 m² as shown in Plate 2. Further details are provided in the Micro Drainage outputs in Appendix 2.

Plate 2: Attenuation Basin Dimensions

Estimation Pond Area / Volume Calculation (based on rectangular pond)

Base width	12	m	
Base length	36	m	
Ratio (L to W)	3		SuDS for Road 1.5:1 to 4:1, Sewers for Scotland Minimum 3:5
Side slope (1 in)	3		
Increment	0.1	m	

Depth	Area	Volume	Length	Width	
0	432	0	36	12	Invert Level of Oriface In Outlet Chamber
0.1	461.16	44.658	36.6	12.6	
0.2	491.04	92.268	37.2	13.2	
0.3	521.64	142.902	37.8	13.8	
0.4	552.96	196.632	38.4	14.4	
0.5	585	253.53	39	15	

The detention basin will be located in the south western section of the Site and will be served by filter drains and standard catch pits.

The Simple Index Approach (SIA) Tool

The Site will not be occupied by personnel and it is anticipated that occasional maintenance visits will be required, which will limit vehicle movements. This will involve significantly less than 300 traffic movements per day. Table 26.2 *Pollution hazard indices for different land use classifications* of the SuDS Manual identifies that the Development has a Pollution Hazard Level of Low, taken from the 'Low Traffic Roads *e.g. residential roads and general access roads, < 300 traffic movements/day'* scenario.

A SIA has been developed on behalf of Construction Indsutry Research and Information Association (CIRIA) to support the implementation of the water quality management design methods set out in the SuDS Manual, with appropriate cross referencing to the relevant 'Design Conditions' in the tool.

The SIA outputs are shown in Appendix 2 and as shown in Table 1, demonstrate that the combined Pollution Mitigation Indices for the run-off area are adequately met by the installation of permeable hardcore layer and a pond.

Table 1: SIA Outputs for Low Pollution Hazard Level Scenario

	Total Suspended Solids	**Metals**	**Hydrocarbons**
Pollution Hazard Indices	0.5	0.4	0.4

Pond / basin treatment indices	0.7	0.7	0.5

As such, the treatment of the surface water run-off, in the absence of significant spillages of hydrocarbons or other pollutants, will adequately meet the minimum requirements of the pollution mitigation indices outlined in the SIA Tool.

Responsibilities and Long-Term Management

It will be the responsibility of the site operator to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person will also have responsibility for reporting on the functionality of drainage measures.

Where impermeable areas remain through the lifetime of the Development, the SuDS measures serving these areas will be checked on a regular basis. Should drainage measures require dredging or unblocking, this will be undertaken as soon as practicable by a local contractor engaged by the site operator.

It is not anticipated that the Council will adopt the new drainage network. Therefore, it will be the responsibility of the site operator to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person from a management company will also have responsibility for reporting on the functionality of drainage measures. This should be secured through an appropriately worded planning condition.

An outline management / maintenance plan is provided in Table 1 and is based on the SuDS Manual.

Long-term Maintenance Schedule for the Detention Basin (based on Table 22.1 - Operation and maintenance requirements for detention basins of the SuDS Manual)

Maintenance Schedule	**Required Action**	**Frequency**
Regular Maintenance	Litter removal	A required
	Cut grass – for spillways and access routes (within the approved Applicant ownership agreement extents)	Monthly (during growing season), or as required
	Grass cutting – meadow grass in and around basin	Half yearly (spring, before nesting season, and autumn)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc. for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional	Reseed areas of poor vegetation growth	As required

Maintenance	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

An outline management / maintenance plan for the filter drains is provided in Table 2 and is based on Table 16.1 of the SuDS Manual.

Table 2: Outline maintenance plan for filter drains

Maintenance schedule	**Required Action**	**Typical Frequency**
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly, or as required
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Sergeantlaw Moss Peatland Restoration

In September 2021, NatureScot published the Peatland Restoration Feasibility Assessment Report for the Sergeantlaw Moss, which includes an assessment of the potential impacts of the Development.

Notably within this report was a recommendation that *"a minimum 30m hydrological protection / buffer zone is established between the edge of Sergeantlaw Moss and any development"*, as shown in figure 1 below.

Figure 1: Sergeantlaw Moss and Development

The Applicant has incorporated the 30m buffer prescribed in the NatureScot Report, and this is demonstrated in the revised layout within Appendix 1.

Timescales

Drainage measures outlined within this report should be implemented as soon as practical by the Developer's Contractor but in any event before the construction of any impermeable surfaces which are proposed to drain into the approved drainage system. Measures such as drainage pipes should be installed at the same time as the excavations, or as soon as practicable thereafter.

I trust that the above design provides sufficient information to condition the drainage scheme to serve the Development. Should you require any further information please contact me on the details below.

Yours sincerely,

[redacted]

Liam Nevins BSc (hons) MCIWEM C.WEM

Associate Director

Encs
Appendix 1 - Drainage Drawing 3547-DR-HYDR-0001
Appendix 2 - Micro Drainage outputs and drainage schematic

APPENDIX 1

KEY:

- SITE BOUNDARY
- 2.4m HIGH PALISADE FENCE
- 3.4m HIGH PALISADE FENCE
- BATTERY (12.9m x 2.44m x 2.59m)
- INVERTER (6.1m x 2.44m x 2.59m)
- TRANSFORMERS WITH 7.0M HIGH CONNECTING BUS BARS
- LV SWITCH HOUSE (7.5m x 9.1m)
- FIRE WALL (46.7m x 0.5m x 14.0m)
- BUILDING (20.7m x 36.7m x 10.0m TO ROOF PITCH)
- E-HOUSE (ENCLOSED IN BUILDING 20.7m x 38.6m x 10.0m TO ROOF PITCH)
- ENERGY MANAGEMENT SYSTEM (ENCLOSED IN BUILDING 20.7m x 36.7m x 10.0m TO ROOF PITCH)
- COOLER (11.3m x 2.4m x 2.5m)
- PROPOSED ROADS
- SWITCHGEAR CONTAINER (12.2m x 2.44m x 3.0m)
- EMERGENCY BACK UP DIESEL GENERATOR (6.1m x 3.6m x 2.9m)
- COMMS HOUSE (12.19m x 2.44m x 2.59m)
- DISCONNECTOR (2.2m x 4.5m)
- 6m SECURITY COLUMN
- 4m HIGH WALL
- WW2 BUILDING 5m BUFFER
- ATTENUATION BASIN

Project Title: NEILSTON BATTERY STORAGE SITE

Client: Statkraft

Drawing Title: PROPOSED OUTLINE DRAINAGE LAYOUT

Purpose of issue: PLANNING

Designed	Drawn	Checked	Approved
LN	RD	MG	MG

Arcus Internal Project No.: 3547

Scale @ A3: 1:2500

Date: 29/09/21

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Drawing Number: 3547-DR-HYDR-0001

Rev: 1

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Plot Date : 29 September 2021 16:25:27
File Name P:\PROJECTS\3547 NEILSTON, EAST RENFREWSHIRE\CAD\01-WORKING\01_01-DRAWINGS\3547-DR-HYDR-0001

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APPENDIX 2

Summary of Results for 200 year Return Period (+55%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	1.077	0.377	122.4	184.0	Flood Risk
30 min Summer	1.118	0.418	126.9	206.4	Flood Risk
60 min Summer	1.117	0.417	126.8	205.8	Flood Risk
120 min Summer	1.083	0.383	123.0	187.2	Flood Risk
180 min Summer	1.042	0.342	118.3	165.1	Flood Risk
240 min Summer	1.002	0.302	113.4	143.7	Flood Risk
360 min Summer	0.933	0.233	104.6	108.5	Flood Risk
480 min Summer	0.879	0.179	97.1	81.8	O K
600 min Summer	0.837	0.137	90.9	61.9	O K
720 min Summer	0.806	0.106	85.9	47.3	O K
960 min Summer	0.768	0.068	75.1	29.8	O K
1440 min Summer	0.720	0.020	61.1	8.6	O K
2160 min Summer	0.700	0.000	49.1	0.0	O K
2880 min Summer	0.700	0.000	40.8	0.0	O K
4320 min Summer	0.700	0.000	30.6	0.0	O K
5760 min Summer	0.700	0.000	24.9	0.0	O K
7200 min Summer	0.700	0.000	21.2	0.0	O K
8640 min Summer	0.700	0.000	18.6	0.0	O K
10080 min Summer	0.700	0.000	16.7	0.0	O K
15 min Winter	1.129	0.429	128.1	212.6	Flood Risk
30 min Winter	1.175	0.475	133.1	238.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	166.137	0.0	294.6	21
30 min Summer	105.048	0.0	374.6	30
60 min Summer	66.422	0.0	473.9	46
120 min Summer	41.998	0.0	597.2	80
180 min Summer	32.120	0.0	684.6	112
240 min Summer	26.555	0.0	758.1	144
360 min Summer	20.310	0.0	867.6	204
480 min Summer	16.791	0.0	957.8	264
600 min Summer	14.487	0.0	1031.9	324
720 min Summer	12.842	0.0	1097.8	382
960 min Summer	10.669	0.0	1215.7	502
1440 min Summer	8.216	0.0	1404.8	740
2160 min Summer	6.327	0.0	1622.9	0
2880 min Summer	5.257	0.0	1797.7	0
4320 min Summer	3.938	0.0	2020.1	0
5760 min Summer	3.208	0.0	2194.4	0
7200 min Summer	2.737	0.0	2339.9	0
8640 min Summer	2.403	0.0	2465.9	0
10080 min Summer	2.154	0.0	2577.7	0
15 min Winter	166.137	0.0	330.1	21
30 min Winter	105.048	0.0	417.3	31

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Summary of Results for 200 year Return Period (+55%)

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	1.165	0.465	132.0	233.3	Flood Risk
120 min Winter	1.100	0.400	124.9	196.4	Flood Risk
180 min Winter	1.031	0.331	116.9	158.8	Flood Risk
240 min Winter	0.969	0.269	109.3	126.8	Flood Risk
360 min Winter	0.874	0.174	96.4	79.4	O K
480 min Winter	0.810	0.110	86.7	49.3	O K
600 min Winter	0.774	0.074	77.0	32.9	O K
720 min Winter	0.748	0.048	69.2	21.0	O K
960 min Winter	0.711	0.011	58.6	5.0	O K
1440 min Winter	0.700	0.000	46.1	0.0	O K
2160 min Winter	0.700	0.000	35.5	0.0	O K
2880 min Winter	0.700	0.000	29.5	0.0	O K
4320 min Winter	0.700	0.000	22.1	0.0	O K
5760 min Winter	0.700	0.000	18.0	0.0	O K
7200 min Winter	0.700	0.000	15.3	0.0	O K
8640 min Winter	0.700	0.000	13.5	0.0	O K
10080 min Winter	0.700	0.000	12.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	66.422	0.0	526.8	50
120 min Winter	41.998	0.0	672.6	84
180 min Winter	32.120	0.0	767.2	118
240 min Winter	26.555	0.0	846.3	150
360 min Winter	20.310	0.0	971.7	210
480 min Winter	16.791	0.0	1072.4	266
600 min Winter	14.487	0.0	1155.8	326
720 min Winter	12.842	0.0	1229.4	386
960 min Winter	10.669	0.0	1362.2	504
1440 min Winter	8.216	0.0	1573.5	0
2160 min Winter	6.327	0.0	1817.6	0
2880 min Winter	5.257	0.0	2013.5	0
4320 min Winter	3.938	0.0	2262.6	0
5760 min Winter	3.208	0.0	2457.8	0
7200 min Winter	2.737	0.0	2620.7	0
8640 min Winter	2.403	0.0	2761.8	0
10080 min Winter	2.154	0.0	2887.1	0

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	200
Site Location	GB 245000 659100 NS 45000 59100
C (1km)	-0.018
D1 (1km)	0.434
D2 (1km)	0.451
D3 (1km)	0.383
E (1km)	0.246
F (1km)	2.455
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+55

Time Area Diagram

Total Area (ha) 0.950

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.317	4	8	0.317	8	12	0.317

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Model Details

Storage is Online Cover Level (m) 1.200

Tank or Pond Structure

Invert Level (m) 0.700

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	432.0	0.500	585.0

Orifice Outflow Control

Diameter (m) 0.283 Discharge Coefficient 0.600 Invert Level (m) 0.400

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Source Control - [3547_Pond_v1.SRCX] - [3D Animation]

File Edit View Analyse Cascade Window Help

Design Guide

Quick Storage Estimate

Quick Design: Infiltration

Detailed Design

Cascade

Total Vol (m³) = 173.4

60 min Winter

Max Water Level 1.147m

INFLOW 147.2 l/s

OUTFLOW 129.9 l/s

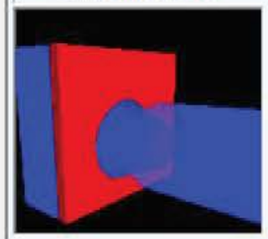
Video Controls

48 minutes

1x

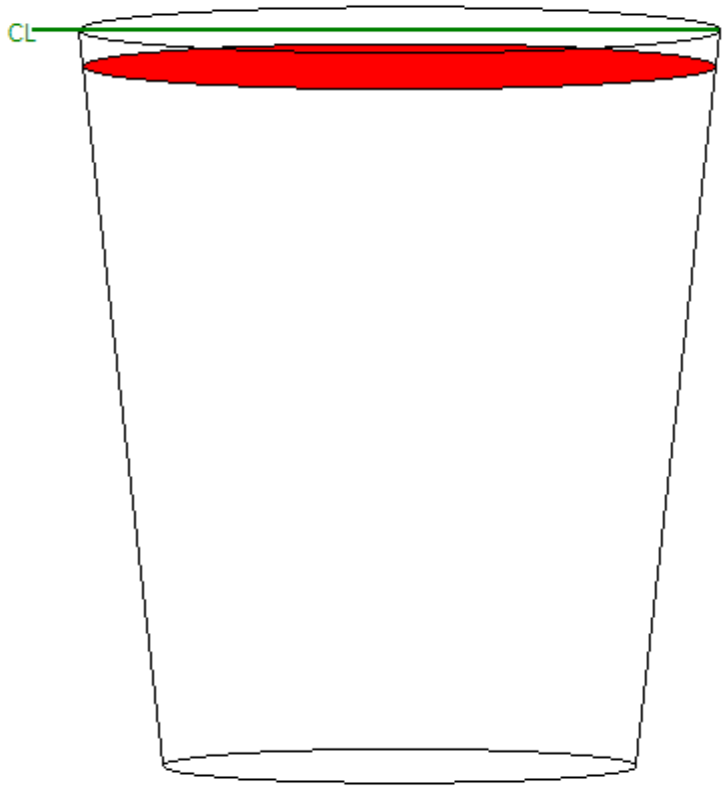
19

Outflow Water Level



Source Control A.P.T. 2015.1

Arcus Consulting		Page 1
1C Swinegate Ct East 3 Swinegate York YO1 8AJ		
Date 09/09/2021 11:52 File 3547_Pond_v1.SRCX	Designed by LiamN Checked by	
XP Solutions	Source Control 2015.1	



Invert Level of Structure (m): 0.700

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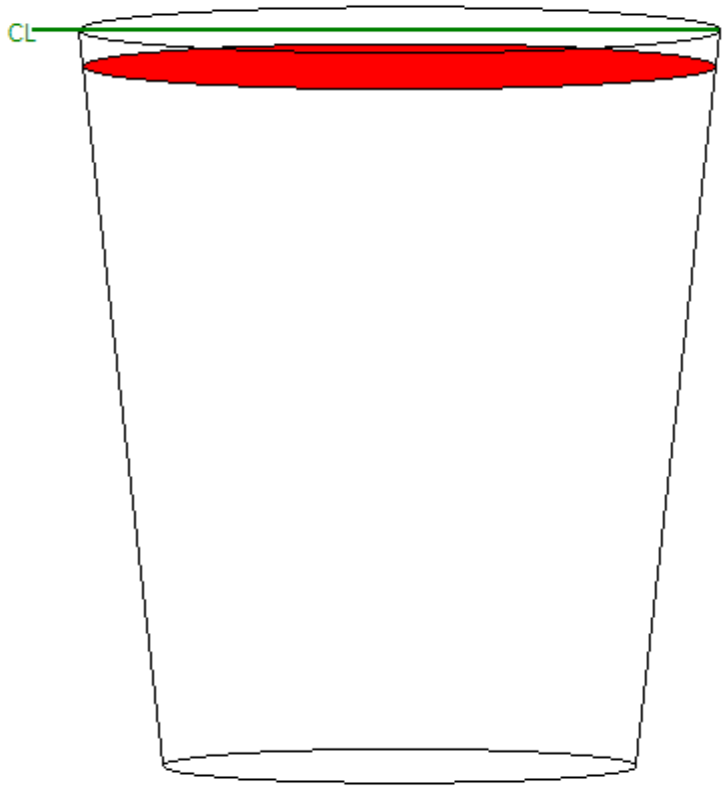
Arcus Consulting		Page 1
1C Swinegate Ct East 3 Swinegate York YO1 8AJ		
Date 09/09/2021 11:52 File 3547_Pond_v1.SRCX	Designed by LiamN Checked by	
XP Solutions	Source Control 2015.1	



Invert Level of Structure (m): 0.700

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SIMPLE INDEX APPROACH: SUMMARY TABLE

HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tools, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Other	Where indices are approved by the environmental regulator as part of the required risk assessment process, these should be entered in the 'User Defined Indices' row below. If indices are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment.		
Pollution Hazard Level					
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed		SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Ponds/wetlands should be preceded by an upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events		
Component 1	Pond or wetland				
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.7				
Metals	0.7				
Hydrocarbons	0.5				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.7				
Metals	0.7	**Note: In order to meet both Water Quality criteria set out in the SuDS Manual (Chapter 4), Interception should be delivered for all impermeable areas wherever possible. Interception delivery and treatment may be met by the same components, but Interception requires separate evaluation.**	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England		
Hydrocarbons	0.5				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

23001 - Drainage Maintenance Schedule

A sustainable drainage system with attenuation is to be installed at the site, in accordance with local authority requirements.

This has necessitated the installation of SuDS filter drains and a detention basin which will be maintained by the developer, Zenobe.

Areas of weed growth should be removed or managed safely using an appropriate herbicide applied into the weeds rather than sprayed, as required. Any areas of soft landscaping which, through vegetation maintenance or soil slip, have been raised to within 50mm of the paving level should be remediated, as required.

The general operation and maintenance requirements for filer drains as reflected in the CiRIA C753 Manual are shown below:

TABLE 16.1 Operation and maintenance requirements for filter drains

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Similarly, the recommendations for operation and maintenance requirements for detention basins in accordance with the CiRIA C753 Manual are shown below:

TABLE 22.1 Operation and maintenance requirements for detention basins

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

It is recommended that following installation a monitoring regime is carried out to establish if any more frequent maintenance is required, than has been described above.

Then once every three months after installation or within 48 hours after any large storms within the first six months following installation, inspect for evidence of poor operation. If required, take remedial action as noted above.

Annually, inspect silt accumulation rates to establish appropriate brushing frequencies and monitor the inspection chambers.

Manholes and catchpits including all inlets, outlets and overflows should be inspected every 6 months to ensure that they are in good condition and operating as designed and cleaned or unblocked if necessary.

Any debris on the surface of the catchment should be removed monthly, or as required, to avoid causing risks to performance. Similarly, any sediment seen to be within pre-treatment structures should be removed, annually or as required.

Entry into any manholes, underground drawpits, etc, should only be undertaken by persons fully trained by a recognised company, and hold the relevant certification with regard to being able to work in confined spaces.

Cleaning chemicals or compounds should be used in line with the manufacturer's instructions and then only by operatives trained to use such products. Method statements should be provided by any companies or persons intending to carry out such maintenance works as described above.

The developer (Zenobe) will be the Maintenance Organisation responsible for maintaining the non-adopted SUDS apparatus on site.

The contact details for Zenobe UK are:

Zenobē London Headquarters
First Floor, Burdett House
Buckingham St.
WC2N 6DU
United Kingdom
+44 (0)20 3912 7853

Renfrewshire Council will be responsible for maintenance of all other, external, drainage which is not under private ownership.

Renfrewshire Council contact details are:

Tel: Roads Maintenance Team – 0300 300 0380