# NEILSTON GREENER GRID PARK S36 APPLICATION

## 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, Paisley, 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.

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| 00 | DRAFT | CVB | - | 10/06/24 |
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# Table of Contents

# Appendices

| | |
|---|---|
| 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 G | Approved VB DDS |
| Appendix H | Drainage Maintenance Schedule |

# 1.0 Introduction

## 1.1 Project Background

1.1.1 Vazquez Besada Consulting has been appointed by Statkraft UK Ltd via TNEI Group to prepare this Detailed Drainage Strategy for a Section 36 Application for a site at Gleniffer Road, Neilston, Renfrewshire, Scotland, G78 3AW. 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 condition (21/0034/PP):

*'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 And also, in line with the approved Vazquez Besada Consulting Detailed Drainage Strategy undertaken in September 2023 that has been prepared to address the above planning condition.

1.2.3 This DDS is to be undertaken for a Section 36 Application 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.

1.2.4 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.

1.2.5 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;
- The VB Detailed Drainage Strategy (DDS), undertaken in September 2023;
- 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 Formation of an up to 750MW Battery Storage Facility, comprising up to 88 battery storage container blocks and associated infrastructure, storage containers, welfare, diesel generators, CCTV and lighting columns and associated access, internal access roads, hard and soft landscaping, SuDS Basin, perimeter fence and underground grid connection cable.

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 partial greenfield empty site at Gleniffer Road, Paisley, Renfrewshire Council, Scotland, G78 3AW and covers a total area of approximately 13.9 ha of proposed development area. The north corner comprises an installed battery storage area that has been constructed as part of a Phase 1 & 2 of the works, under the approved 23/0224/PP application. The approximate OS coordinates are 245060, 659853. 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.

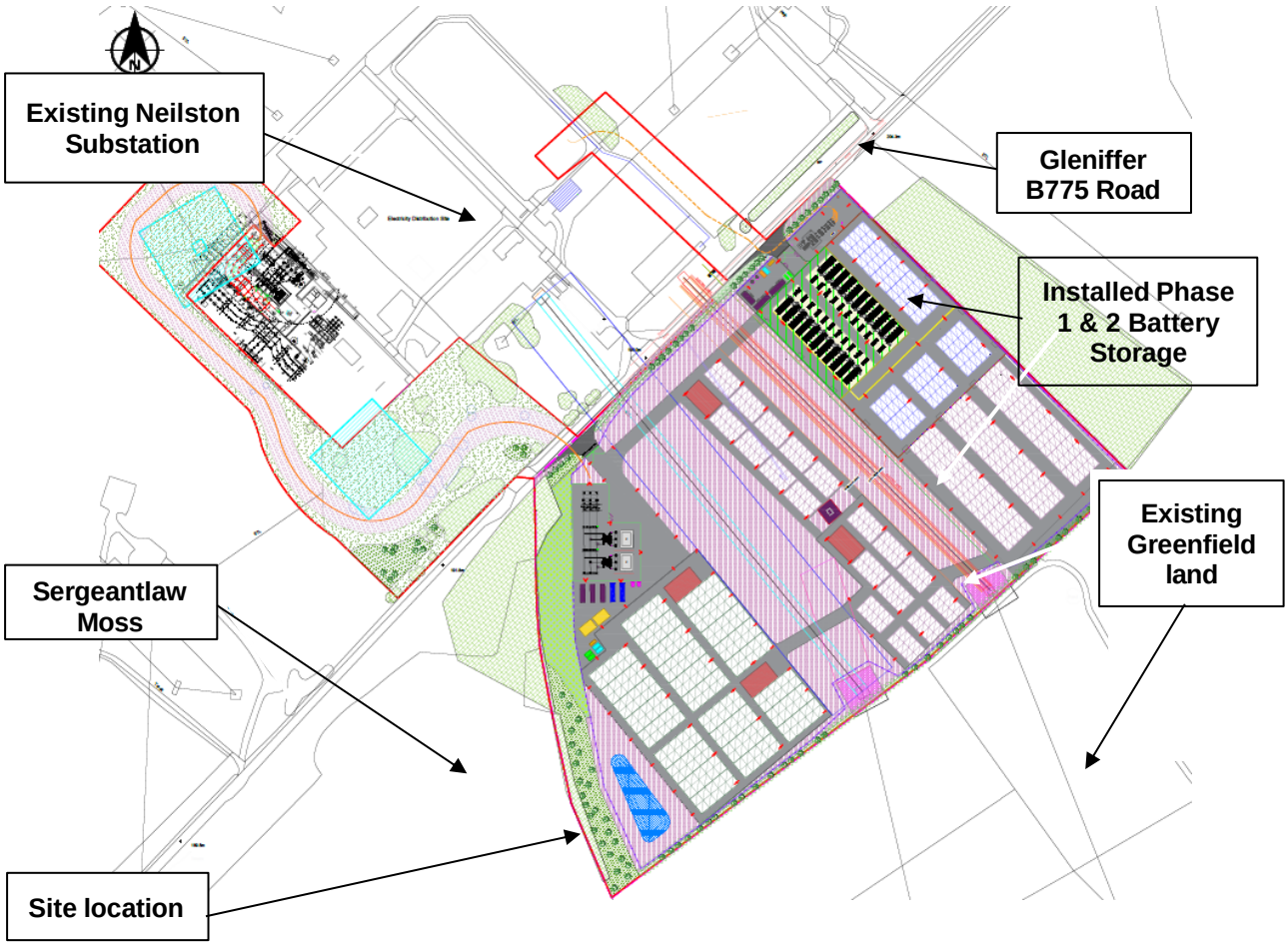


**Figure 2-1. Site location (source: OS Open Data).**

## 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 C.

## 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.

2.4.2 The ORC Geomatics topographical survey is included within Appendix B.

## 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.

A Phase 2 Combined Geotechnical and Geo-Environmental Assessment Report was undertaken by WSP in February 2023 for the eastern site area and some soakaway testing has been undertaken as part of the WSP report. The infiltration rates show inconclusive results with various results. WSP reflects the following conclusion: "*The soakaway tests typically recorded slow infiltration from 60minutes up to 180minutes. Infiltration was recorded to cease after this*

*period. The initial infiltration is considered likely to be due to surface soil loosening occurring during the trial pit excavation works"*

*"Traditional infiltration / soakaway drainage will likely not be feasible due to the low permeability Glacial Till and shallow Bedrock recorded below the entirety of the site. The direct infiltration testing via soakaways in selected trial pits recorded minimum infiltration in both the Glacial Till and Bedrock, as outlined in Section 3.2.7."*

# 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 As agreed as part of the planning conditions discharge (21/0034/PP), the proposed site surface water discharge IL at the wetland area should be set to a min. level of 189.4mAOD (to be confirmed on site) 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 and the VB Detailed Drainage Strategy within Appendix G.

## 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 |
| Aggregated Surface Water Pollution Mitigation Indez | | 0.65 | 0.65 | 0.7 |

**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 all land use types.

## 5.5 Proposed Surface Water Drainage

5.5.1 Based on the GeoIndex website review and following the WSP Phase 1 SI report recommendations, 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-42, to limit the discharge to a maximum rate of 74.4 l/s up to and including the 1 in 200yr plus 41% CC.

5.5.4 The total site impermeable area has been remeasured from the approved Outline ARCUS Strategy and from the VB Detailed Drainage Strategy based on the amended site layout. It has been calculated to be 2.2ha based on:

5.5.4 Installed Phase 1 & 2 of the works = 0.47ha

5.5.4 78No batteries x 79.0m$^2$ = 0.61ha

5.5.4 54No batteries x 135.1m$^2$ = 0.73ha

5.5.4 78No Inverters x 15.3m$^2$ = 0.12ha

5.5.4 27No Inverters x 19.4m$^2$ = 0.05ha

5.5.4 4No MV Room areas = 0.17ha

5.5.4 Transformer Area = 0.06ha

5.5.4 3No MV Switchgear Containers = 0.016ha

5.5.4 2No Protection Control Buildings = 0.01ha

5.5.4 2No Aux Transformers = 0.001ha

5.5.4 Welfare Buildings = 0.008ha

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 2.24ha, has been calculated as 1,260m3, 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 a minimum 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 27.5m$^3$ flooding at the proposed manhole CP-24 and 53.2m$^3$ at CP-25 under a 30min. storm event, please refer to Appendix E for the drainage layout information. However, based on the MWP proposed site levels, this flooding is expected to locally pond at the western side of the transformer area and it will be discharge via the proposed drainage system after the critical storm event (30 min.), so no flooding water is expected to leave the application site boundary for any of the events considered. Safe egress and access to the site is provided 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 D for the surface water drainage calculations.

5.5.9 It is also recommended that any proposed site levels are designed in line with the MWP site levels, drawings 24496-MWP-00-ZZ-DR-C-0200 to 0206 so the surface water runoff from the proposed impermeable areas 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 H.

# 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. It also follows the approved Vazquez Besada Consulting Detailed Drainage Strategy (DDS) undertaken in September 2023 that has been prepared to address the planning conditions as part of the 21/0034/PP application.

6.1.2 The proposed development comprises the Formation of an up to 750MW Battery Storage Facility, comprising up to 88 battery storage container blocks and associated infrastructure, storage containers, welfare, diesel generators, CCTV and lighting columns and associated access, internal access roads, hard and soft landscaping, SuDS Basin, perimeter fence and underground grid connection cable.

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, and with the VB DDS 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-42, to limit the discharge to a maximum rate of 74.4 l/s up to and including the 1 in 200yr plus 41% CC.

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 2.2ha, has been calculated as 1,260m3, 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 a minimum of 300mm of freeboard at the 1 in 30yr plus 41% CC event.

6.1.8 For the 1 in 200yr event plus 41% CC, the proposed drainage system calculations show 27.5m$^3$ flooding at the proposed manhole CP-24 and 53.2m$^3$ at CP-25 under a 30min. storm event,

please refer to Appendix E for the drainage layout information. However, based on the MWP proposed site levels, this flooding is expected to locally pond at the western side of the transformer area and it will be discharge via the proposed drainage system after the critical storm event (30 min.), so no flooding water is expected to leave the application site boundary for any of the events considered. Safe egress and access to the site is provided 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 in line with the MWP site levels, drawings 24496-MWP-00-ZZ-DR-C-0200 to 0206 so the surface water runoff from the proposed impermeable areas 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 SuDS basin is to be lined to prevent infiltration with a penstock at control manhole (CP-42) to allow the drainage system to be shut-off under fire events as recommended by Gondolin Land and Water.

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

6.2.5 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.

6.2.6 The proposed site surface water discharge IL at the wetland area should be set to a min. level of 189.4mAOD 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.

6.2.7 The proposed 300mm DIA uPVC discharge pipe shall be set to a minimum gradient of 1 in 200 to comply with the maximum discharge limits as agreed with Renfrewshire Council.

# Appendix A – Proposed Development

# Appendix B – Topographical Survey

# Appendix C – Public Sewer Plans

# Appendix D – Causeway Flow Drainage Calculations

# Appendix E – Proposed Drainage Layout and SuDS detail

# Appendix F – ARCUS Outline Sustainable Drainage System (SuDS)

# Appendix G – VB Detailed Drainage Strategy

# Appendix H – Drainage Maintenance Schedule

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