J&M MURDOCH, SHILLFORD

Drainage Impact Assessment

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61045 | December 2023

Shillford
East Renfrewshire
Drainage Impact Assessment
Planning Application

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61045/ December 2023/ V1

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1.0 INTRODUCTION

1.1 Background

The study area forms a 3.98ha parcel of land to the south of Lochlibo Road and east of Cowden Brae. The site is generally topographically level, although gradually rises from Lochlibo Road to Cowden Brae.

The site comprises a combination of green belt (underutilised grassland) and brownfield land associated with a former bus/coach depot, with an unnamed minor watercourse flowing west to east through the site. Further details of the current site conditions can be found in section 3.3 of the report.

1.1.2 The planning application site (red line) boundary is approximately 3.75ha. The site location and boundary is defined on Figures 1-2 attached to this report in Appendix 1.

1.2 Scope of Report

1.2.1 The purpose of this report is to provide the drainage assessment for the surface water and foul drainage systems of the development site. The following elements are considered;

- Existing site conditions affecting drainage
- Existing drainage infrastructure
- Flood risk consideration
- Surface water drainage and SUDS strategy
- Foul drainage strategy
- Local Authority and statutory consultee guidelines and standards

1.3 Consultation & Data Sources

1.3.1 The following sources have been used in completion of the drainage design and this report;

- Water Assessment and Drainage Assessment Guide (SUDS Working Party)
- The SUDS Manual C753 (CIRIA)
- Sewers for Scotland 4th Edition (Scottish Water)
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011: A Practical Guide (SEPA)
- SUDS Advice Note: Brownfield Sites (SUDS Working Party)
- SUDS for Roads (SUDS Working Party)
- Climate Change Allowances for Flood Risk Assessment in Land Use Planning Version 2, March 2022 (SEPA)
- Topographical Survey Data
- FEH (Flood Estimation Handbook) 2022 Rainfall Data
- Flood maps (SEPA)
- Existing sewer records (Scottish Water)
- Flood Risk Assessment, November 2023 (Kaya Consulting Limited)

1.3.2 The appraisal undertaken in this report is based on existing infrastructure records received, third party consultations and topographical survey data. Further assessment and consultation, if required should be undertaken during detailed design to ensure relevant and applicable standards are met.

2.0 EXISTING SITE DETAILS

2.1 Site Description & Existing Development

2.1.1 The site comprises a combination of green belt (underutilised grassland) and brownfield land associated with a former bus/coach depot, with an unnamed minor watercourse flowing west to east through the site.

2.1.2 The history of the site has been examined using 1:2500, 1: 10,560 and 1:10,000 scale county series and Ordnance Survey Maps provided by Landmark via Envirocheck. These maps date from 1858. Reference has also been made to aerial imagery provided by Google Earth Pro. The following significant features were identified within the site boundary on the historical maps, distances noted are approximate.

Table 2A: Historical Summary – Site Features

Map dates	Feature	Location within Site	Comment
On site Features			
1858 - 1897	Vacant, presumed agricultural land	Entire site	Vacant grassy land with some vegetation split into 4 main plots.
1913 - 1958	Shillford Meal Mill	Northwest of site	Small structure in northwest of site denoted as the Shillford Mill, part of large adjacent off-site building. By 1967 the smaller on-site structure is no longer present and the larger off-site structure is relabelled as Shillford Mill Storage Depot.
1913	Well	Southwest corner of site	Small well located in southwest corner of site on 1913 edition, immediately adjacent to off-site unlabelled road to the west. No longer noted by 1967.
1993 - 1999	Unlabelled structure	Northwest of site	Unlabelled rectangular structure located in northwest of site to the east of where the former on-site mill structure was present. By 2017 structure is replaced by larger building. Likely to be associated with former bus depot.
1992 - Present	Various small unlabelled structures within a fence	Northeast of site	Unlabelled rectangular fence with various small structures located in northeast of site, likely associated with adjacent off-site filling station.
2002 - Present	Hardstanding	West of the site	Hardstanding used as vehicle parking in the west of the site, first evident on Google Earth Pro imagery in 2002 but likely dates prior to this. Connects with adjacent A736 road to the north of site to form a site entrance. Likely to be associated with former bus depot.
2017 - Present	Pile of apparent fly-tipping/waste	Northwest of site	Large pile of waste/possible fly-tipping visible on Google Earth Pro imagery.

2.2 Ground Conditions, Groundwater & Infiltration Potential

2.2.1 Geology

An assessment of the geology of the site has been prepared using information from the following British Geological Survey (BGS) published data:

- BGS Sheet 22E (Kilmarnock) 2003 Solid Edition, 1:50,000 scale.
- BGS Sheet 22E (Kilmarnock) 2002 Solid and Draft Edition, 1:50,000 scale.
- BGS Sheet NS45NW, 1996, 1:10,000 scale, solid and drift editions.
- BGS Sheet NS45NE, 1996, 1:10,000 scale, solid and drift editions.
- BGS GeoIndex Interactive Viewer.
- BGS Boreholes (via Geology of Britain Viewer).

2.2.2 Made Ground

The 1:50,000 scale BGS map sheet does not record any made ground on site. However, the former land uses relating to a meal mill and hardstanding associated with unlabelled structures suggest that a layer of made ground may be present on the site, particularly in the western region. There are no historic BGS boreholes recorded on-site. One borehole is present approximately 130m west of site borders, which does not record any made ground.

2.2.3 Soils

The James Hutton Institute *Soil Map of Scotland* (1:25,000 scale) records soils at the site to be noncalcareous mineral gleys, with drifts derived from basaltic and intrusive basic igneous rocks. The NatureScot *Carbon and Peatland mapping (2016)* records no peatland vegetation at the site or surrounds.

2.2.4 Drift Geology

The 1:50,000 & 1:10,000 scale BGS mapping records the drift geology below the majority of the site as alluvium of the Quarternary Period, which is reported to comprise unconsolidated detrital material of clay, silt, sand and gravel deposited by a body of running water. The southwestern corner of the site is noted to record diamicton till of the Devensian Stage, likely to be firm to stiff clays with sand and gravel lenses. The southeastern region of the site does not report any superficial soils suggesting bedrock may be near to the surface in this location.

2.2.5 Solid Geology

The geological mapping indicates that the majority of the bedrock beneath the site comprises the Neilston Lava Member, extrusive igneous rocks comprising macroporphyritic olivine-augite-feldspar-phyric alkali basalt. The strata are recorded as having a thickness of over 100m. An inferred fault is marked running broadly west-east through the central portion of the site.

A small portion of the northwest corner of the site is recorded as being underlain by sedimentary rock cycles and marine limestones of the Upper Limestone Formation from the Clackmannan Group.

2.2.6 BGS Historic Boreholes

There are no historic BGS boreholes recorded on the site. One borehole is recorded approximately 130m west of site borders (ref. NS45NW18) within the Upper Limestone Formation. This borehole recorded “soil” from ground surface to 0.3m and then “boulder clay” to 1.2m below ground level where shallow rock was encountered. Bedrock at this location comprised “sandstone” which extended to 14m depth in the borehole.

2.2.7 Mining

A Coal Mining Risk Assessment has been prepared for the site and has identified the site as being at low risk. Refer to separate reporting for further details.

2.2.8 Hydrology

There are no classified surface water bodies on the site, although an unnamed drain is culverted under Cowden Brae and part of the former bus depot before daylighting near the western boundary of the site.

The unnamed drain bisects the site, flowing from west to east. A tributary ditch to the unnamed drain flows north along the western boundary of the site, joining with the main drain in a short open section between the road and bus depot culverts. The unnamed drain flows across the site, connecting with the Cowdon Burn to the east of the site.

The Cowdon Burn is located 275m to the east and flows generally south to north. SEPA does not classify this as a water body. The nearest classified water body is the Lugton Water (ID: 10383), which is located approximately 120m north of the site flowing north to south and then east to west. The Lugton Water was classified by SEPA in 2020 as being Moderate Ecological Potential. The surface water has been designated as a heavily modified water body on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land.

2.2.9 Hydrogeology

The BGS UK Hydrogeology Viewer describes the rock unit throughout the site as unnamed extrusive rocks of the Dinantian unit with a low productivity aquifer underlying the site and surrounds with limited potential and within a region generally without significant groundwater except at shallow depth. Small amounts of groundwater can be found in near surface weathered zones and secondary fractures, with up to 2 L/s from rare springs.

The SEPA Water Classification Hub website records the groundwater body beneath the majority of the site as the Newton Mearns groundwater body (ID: 150622). The groundwater body is in the Scotland river basin district and is 166.7km^2 in area. SEPA classified the overall status of the groundwater body as Good in 2020, with no recorded pressures. A small portion of the northwest of the site is underlain by the Kilmarnock groundwater body (ID: 150662), classified as Poor in 2020. Pressures are indicated as poor water quality caused by legacy mining or quarrying.

The Scottish Government Drinking Water Protection maps records that the groundwater body is protected as a Drinking Water Protection Zone (as is all groundwater across Scotland), however there is no surface water drinking protection zone within, or within the vicinity of, the site.

The Envirocheck report does not record any water abstraction points within 1km of the site. SEPA also confirmed that there are no groundwater abstractions authorised under Controlled Activities Regulations (CAR).

2.3 Topography & Existing Catchments

2.3.1 The site generally falls to the watercourse/channel that bisects the site from west to east. A high point of 135m in the south of the site slopes to a low point of 130m at the watercourse/channel in the centre.

2.3.2 Overland flow routes based on existing topography show that the natural catchment for the site area drains to the channel in the centre of the development area.

2.4 Existing Waterbodies

2.4.1 The main existing waterbody in context of the site drainage is the existing channel within the site boundary.

2.5 Existing Site Drainage Infrastructure

2.5.1 Scottish Water records do not indicate the presence of existing surface water or foul sewers within the site boundary.

3.0 FLOOD RISK

3.1 FRA – Kaya Consulting Limited

3.1.1 Flood Risk Assessment (FRA) does not form a part of the scope of this report. An FRA has been prepared by Kaya Consulting Limited.

4.0 LOCAL AUTHORITY, SEPA AND SCOTTISH WATER

4.1 East Renfrewshire Council

East Renfrewshire Council state that they require a Drainage Impact Assessment to be prepared in support of a Planning Application for a development site. They do not have specific guidance on the format of the DIA, therefore, reference is made to the Water Assessment and Drainage Assessment Guide and CIRIA SUDS Manual C753.

4.2 SEPA

4.2.1 The treatment of surface water run-off by sustainable drainage systems (SUDS) is a legal requirement for most forms of development. Surface water run-off from all developments is to be treated by SUDS, in line with Scottish Planning Policy (Paragraph 2009), PAN 51 'Planning and Sustainable Urban Drainage Systems' and PAN 79 'Water and Drainage'. It is important to ensure that adequate space to accommodate SUDS is incorporated within the site layout.

4.3 Scottish Water

4.3.1 Scottish Water's publication Sewers for Scotland 4 provides comment regarding the use of SUDS and hydraulic modelling design, key extracts are given below.

4.3.2 *'The main aim of any SUD system that is to be vested by Scottish Water, is to convey, treat and discharge SW's statutory surface water to the nearest practical water course.'*

4.3.3 *'SUDS shall be used as part of a surface water management train that replicates as closely as possible the natural (undeveloped) flow runoff pattern of the site.'*

4.3.4 *'Surface water drainage shall be designed for runoff from roofs and, subject to the agreement of Scottish Water, roads (including verges) and other hard standing areas.'*

4.3.5 '*Design event rainfall shall be based on the use of the most recent version of the 'Flood Estimation Handbook' specific to the location of the development. An allowance for climate change of an additional 30% (by factoring the rainfall intensity hyetograph values) shall be applied unless otherwise agreed.'*

4.3.6 *'Surface water drainage systems shall not be designed to take runoff from other areas… , groundwater or land drainage. Separate arrangements for this runoff shall be agreed with the Local Authority as part of its flood prevention duties and confirmed to Scottish Water.'*

5.0 PROPOSED DEVELOPMENT

5.1 Development Areas

5.1.1 The drainage strategy described as part of this application relates directly to that infrastructure required to effectively drain the development listed.

5.1.2 The table below outlines the development that will be drained by the surface water drainage network. To inform outline calculations assumed impermeable area contributions (Percent Impermeable, PIMP) have been listed; this is subject to detailed plot layout and design. Total site boundary is measured as 3.75ha.

Table 1: Indicative development areas and impermeable area components

Development	Area	Impermeable %	Impermeable Area
Site Area	3.75ha	63%	**2.35ha**

5.1.3 The remaining areas within the application boundary include landscaping and open green space which will not be connected to the development drainage network as per Sewers for Scotland 4 which states that *'Scottish Water has no statutory duty to, and shall not, accept groundwater or land drainage connections, and so the developer shall make separate disposal arrangements.'*

5.1.4 Land drainage may be included and placed to convey greenfield surface water run-off to existing drainage channels or watercourses on site; seeking to maintain pre-development overland flow conditions.

6.0 SURFACE WATER DRAINAGE STRATEGY

6.1 Surface Water Drainage Strategy

6.1.1 Surface water drainage will be designed and constructed in accordance with the CIRIA SUDS Manual (C753), SUDS for Roads, Sewers for Scotland 4th Edition and SEPA guidance. Safety issues relating to SUDS will refer to the CIRIA Paper RP992/17: Health and safety principles for SUDS.

6.1.2 The surface water drainage strategy will seek to discharge via a main post development catchment and appropriate SUDS measures to the Unnamed Channel within the site area.

6.1.3 Source control SUDS shall be used in combination with site control SUDS features to control discharge rate, provide attenuation and treatment and encourage biodiversity. It will be expected that plot developers ensure best practice SUDS are delivered and provide source control and interception capabilities at the upstream end of the network.

6.2 Limiting Surface Water Discharge Rates

6.2.1 East Renfrewshire Council have advised a limited surface water discharge rate of 7.5l/s/ha for the development area.

Table 2: Pre-development greenfield equivalent discharge rates

Pre-Development Catchment	Area (ha)	Q (l/s/ha)	Q (l/s)
Unnamed Channel	**3.75**	**7.5l/s/ha**	**28.125 l/s**

6.2.2 The runoff rate noted will be maintained post development at the identified discharge points to the Unnamed Channel i.e. there will be no increase in discharge rate to those receiving waterbodies. Pre-development catchment areas will be altered in response to the proposed masterplan layout (as detailed in Table 1), however greenfield discharge rates to the receiving waterbodies will not be increased. SUDS storage features (namely detention basins) will provide attenuation volumes to control the discharge rate.

6.3 Design for Water Quantity (Volume Attenuation)

6.3.1 Surface water will be attenuated within the site drainage system to allow discharge to be limited to 7.5l/s/ha as set out by East Renfrewshire Council. This discharge rate limit will be maintained for a range of storm events up to and including a 0.5% Annual Exceedance Probability (AEP) or 200-year return period.

6.3.2 FEH 2022 rainfall point data has been used in the assessment of the site control SUDS, obtained via the FEH web-service[1]. A +41% uplift in peak rainfall intensity has been applied for the 200-year storm event as required by ERC and advised within SEPA guidance.

6.3.3 The site control SUDS detention basins will provide an attenuation (temporary storage) volume to the top of the basin earthworks slope or emergency spillway level. The volumes presented below present a maximum water depth of 1.3m with a 300mm freeboard to the top of the basin earthworks above. The upstream drainage network and source controls will likely reduce the attenuation volumes required to be held in the downstream site control SUDS basins prior to discharge from the site.

6.3.4 Volume attenuation calculations for a range of storm events have been attached to this report in Appendix 4 and are summarised in Table 3 below. A +10% increase in impermeable area has been included during the 30-year return period as well as a +30% uplift in peak rainfall intensity as per Scottish Water design standards.

Table 3: Attenuation volumes required

Development	Impermeable Area	1 in 30 year Attenuation Vol. (3.33% AEP) +30% CC +10% UC	1 in 200 year Attenuation Vol. (0.5% AEP) +41% CC
Site Area	**2.35ha**	**1135m^3**	**1675m^3**

6.3.5 Specific SUDS component choice and impermeable area contributions are based on the development layout as detailed with the planning application.

6.3.6 Overland flow routes shall be provided during exceedance events and directed to watercourse/waterbody to ensure there is no impact on built development within the site.

[1] https://fehweb.ceh.ac.uk/

6.4 Design for Water Quality (Treatment)

6.4.1 The required treatment volume V_t for development areas has been calculated as per CIRIA SUDS Manual (C753) Equation 23.1. Treatment volumes listed in Table 4 below can be contained within the proposed SUDS. Details attached in Appendix 5.

Table 4: V_t volumes

Development	Area	Impermeable %	V_t (m^3)
Site Area	3.75ha	63%	**400**

6.4.2 V_t calculations are based on soil classification, M5-60 minute rainfall depth and the impermeable area fraction/percentage. Therefore, the treatment volume requirements will be dependent on detailed design layouts and densities. For the purpose of this calculation impermeable area fraction has been assumed for the development areas as described in Table 1.

6.4.3 SUDS components are considered in order to provide appropriate treatment and mitigation against pollutants in line with the CIRIA SUDS Manual Report C753 pollution hazard and mitigation indices (Table 26.2 and 26.3 respectively), as described in the below tables. Each area of site has been considered separately to determine the required treatment indices applicable to the risk posed.

(C753) Table 26.2: Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	High	0.8	0.8	0.9

(C753) Table 26.3: Indicative SUDS mitigation indices for discharges to surface waters

	Mitigation Indices		
Type of SUDS component	**TSS**	**Metals**	**Hydro-carbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8

6.4.4 The CIRIA Simple Index Approach (SIA) Analysis tool has been used to demonstrate that sufficient treatment can be provided against the pollution hazard indices, attached to this report as Appendix 6. The treatment solutions provided by the SUDS components noted in Table 5 and within the SIA tool may change to suit the nature of more detailed development proposals and site layout plans and are listed below as an example treatment management train only.

Table 5: Pollution Hazard Indices and Corresponding SUDS Mitigation Indices for site areas

Type of Contributing Area	Treatment Component	Hazard & Mitigation	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Other roofs (typically commercial/ industrial roofs)	Detention Basin	*Hazard*	*0.2*	*0.2*	*0.05*
		Basin Mitigation	0.5	0.5	0.6
		Total Mitigation	**0.5**	**0.5**	**0.6**
Individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Detention Basin	*Hazard*	*0.5*	*0.4*	*0.4*
		Basin Mitigation	0.5	0.5	0.6
		Total Mitigation	**0.5**	**0.5**	**0.6**
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads motorways	Detention Basin & Filter Drain	*Hazard*	*0.7*	*0.6*	*0.7*
		Basin Mitigation	0.5	0.5	0.6
		Filter Drain Mitigation	0.2	0.2	0.2
		Total Mitigation	**0.7**	**0.7**	**0.8**
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	Downstream Defender, Detention Basin & Filter Drain	*Hazard*	*0.8*	*0.8*	*0.9*
		DD Mitigation	0.5	0.4	0.5
		Basin Mitigation	0.25	0.25	0.3
		Filter Drain Mitigation	0.2	0.2	0.2
		Total Mitigation	**0.95**	**0.85**	**1.0**

6.4.5 The treatment management train and components listed above satisfy the pollution hazard mitigation requirements set out within CIRIA C753 however are subject to change and detailed development layouts. The developer will be expected to provide appropriate SUDS source control measures to ensure that the required treatment criteria are achieved in line with CIRIA and SEPA requirements.

6.5 Design for First Flush Interception

6.5.1 Part 4.3.1 of the CIRIA SUDS manual C753 notes the Water Quality Standard 1 as intercepting runoff from the site to receiving waters for the majority of small rainfall events, i.e., those producing 5mm or less rainfall.

6.5.2 The benefit of achieving interception is particularly pertinent to water quality;

- Within dry periods the initial flush in a rainfall event can mobilise pollutants/ sediment.
- The surface water runoff pollutant concentration may be higher for smaller rainfall events.
- Runoff generated from small rainfall events can contribute to a significant portion of the total runoff.

6.5.3 As such designing for interception will help mitigate against a substantial proportion of the pollutant loading generated from the site. Interception is expected to be incorporated within the surface water design through the use of source control SUDS features such as porous surfaces, filter drains and swales.

6.6 Land Drainage

6.6.1 Post-development greenfield areas including landscaping and earthworks slopes will not be drained to the development surface water drainage network as Scottish Water cannot accept non-statutory inflow from land drains.

6.6.2 Runoff shall be considered as greenfield from these areas. Cut off v-ditches or infiltration trenches placed at the toe or top of earthworks slopes will intercept additional runoff created from the engineered slopes. It is not however considered that runoff from these areas will be greatly increased from that generated in existing conditions.

6.6.3 Localised use of infiltration trenches may be considered upon confirmation of appropriate infiltration rates determined by intrusive ground investigation and testing in accordance with BRE Digest 365 – Soakaway Design.

6.7 Discharge to Water Environment

6.7.1 Surface water discharging from the site will be to an existing drainage channel and watercourse as detailed in the planning application(s).

6.7.2 The design and construction of the outfall structures or headwalls will be designed to best practice to seek to minimise scouring effects on the watercourse channel and bank slopes. Further, the headwalls are to be placed at an appropriate level relative to predicted watercourse levels during storm events to ensure that an unobstructed discharge flow from the development site can be maintained.

6.8 SEPA CAR Regulations

6.8.1 The regulations implement the obligations of Section 20 of the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act). The WEWS transposed the requirements of the Water Framework Directive into Scots Law. A section of this Act refers exclusively to activities occurring in or around a watercourse which could affect the watercourse. This is known as the Water Environment (Controlled Activities, Scotland) Regulations 2011. It is referred to as the CAR Regulations and enforces controls over the following activities;

- Activities liable to cause pollution of the water environment
- Abstraction of water from the water environment
- Discharge of water from the urban or rural areas into the water environment
- The construction, alteration or operations of impounding works in surface water or wetlands
- Carrying out building works, engineering, or other works
    - In inland water other than ground water or wetlands or
    - In the vicinity of inland water or wetlands, and likely to have a significant adverse effect on the water environment
- In the Artificial recharge or augmentation of groundwater

6.8.2 Three types of authorisation under CAR allow for proportionate and risk-based regulation, namely;

a) General Binding Rules (GBR's) – lowest level of control and cover specific low-risk activity

b) Registration – low risk activities which cumulatively pose a risk to the water environment
c) Licence – if site specific controls are required and if constraints upon the activity are to be imposed

6.8.3 Collectively, the above three forms of regulations are known as authorisations. The CAR Regulations state that it is an offence to discharge to any wetlands, surface water systems and ground systems without a CAR authorisation.

6.8.4 Surface water discharges require a licence under CAR Regulations if they are draining;

- >60ha of land used for residential development
- >1,000 car parking spaces
- Non-residential yards within an industrial estate
- Industrial estates (not including business parks (offices) or retail parks (shops) or developments of low significance consisting of one or several small units)
- A roads/ motorways

6.8.5 Discharge consent may specify conditions, which can include limits on the quantity and quality that must be met.

6.8.6 Based on the proposed site uses the development will fall under GBR 10, no express SEPA consent will be required for surface water drainage.

7.0 FOUL WATER DRAINAGE STRATEGY

7.1 Foul & Combined Water Sewers Connection

7.1.1 Scottish Water records indicate that there is no existing wastewater network local to the site. Therefore a localised septic tank/package treatment plant sized appropriately for the proposed development area will be required. This will discharge to the existing unnamed watercourse within the development area.

7.1.2 The development site should be considered as a single foul catchment. The wastewater treatment solution on site shall be located at the low point prior to discharge to watercourse.

7.2 Consultation with Scottish Water

7.2.1 It is not proposed to connect the Foul drainage into the existing Scottish Water sewer networks at either Neilston or Uplawmoor as neither of these would be practical solutions to serve the development area. Therefore no further consultation with Scottish water is proposed.

7.3 Foul Treatment

7.3.1 If applicable, areas that carry a high pollution risk should be minimised and if required provided with overhead cover and directed to the foul sewer via appropriate treatment measures.

7.4 SEPA

7.4.1 A SEPA CAR licence will be required for the Package Treatment plant and its discharge to the channel within the site based on the Population Equivalent of the proposed development.

8.0 CONSTRUCTION AND MAINTENANCE

8.1 Construction & Maintenance Considerations

8.1.1 Compliance with The Water Environment (Controlled Activities) (Scotland) regulations 2011 (as amended) will be required for construction sites covering an area of 4ha or more. Areas under construction will be dependent on site phasing and should be assessed by the Developer and Contractor to ensure that Construction Site Licences (CSL) are in place where required.

8.1.2 Drainage systems, including source control SUDS components within property curtilage will remain the responsibility of private property owners. Where present, SUDS components within the proposed adoptable road extents will be maintained by East Renfrewshire Council as local roads authority. Site control SUDS detention basins, filter drains as well as the main network chambers and pipework will be maintained by Scottish Water.

8.2 Initial SUDS Design Risk Assessment

8.2.1 An initial risk assessment of infrastructure forming part of the surface water and foul drainage networks is attached to this report in Appendix 8.

9.0 SUMMARY

9.1 Existing Site Conditions & Proposed Development Site

9.1.1 The Existing catchment drains to an unnamed channel in the centre of the site area.

9.1.2 Scottish Water records do not indicate the presence of existing surface or foul water sewers within the site boundary.

9.2 Surface Water Drainage Strategy

9.2.1 Surface water drainage will be designed and constructed in accordance with the CIRIA SUDS Manual (C753), SUDS for Roads, Sewers for Scotland 4th Edition and SEPA guidance. Safety issues relating to SUDS will refer to the CIRIA Paper RP992/17: Health and safety principles for SUDS. This will allow for future adoption should this be sought as an option.

9.2.2 A +41% uplift in peak rainfall intensity to reflect climate change has been applied to calculation for sensitivity analysis during the 200-year return period. Surface water discharge will be limited to 7.5l/s/ha as per ERC guidance.

9.2.3 The surface water drainage strategy will seek to discharge via appropriate SUDS measures to the unnamed channel within the site.

9.2.4 Source control SUDS shall be used in combination with site control SUDS features to control discharge rate, provide attenuation, provide treatment and encourage biodiversity. It will be expected that developer ensure best practice SUDS and provide source control and interception capabilities at the upstream end of the network.

9.3 Foul Drainage Strategy

9.3.1 There is no existing foul drainage infrastructure available in the surrounding area. A package treatment plant will be sized and located appropriately on site. This will discharge to the existing watercourse and will be subject to a CAR licence approval.

9.4 Certification

9.4.1 East Renfrewshire Council do not currently seek compliance certification or independent check certification of Drainage Impact Assessments.

APPENDIX 1 – Location Plan (Figure 1)

Site Boundary

Revision	Date	Description	Initials
-	-	-	-
P01	-	For Client Issue	-

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Project Name
Shillford Depot

Client
J&M Murdoch Haulage

Title
Location Plan

N. Point

Scale
1:2500
Scale

Bar Scale
0 50 100m
1:2500

Date
31/11/23

Paper Size
A3

Drawn by
AC

Checked by

Status
WORK IN PROGRESS

Project No
61045-002

Drawing No

Revision
P01

APPENDIX 2 – Existing Hydrological Regime (Drawing 61045/27/001)

Note: Please do not scale from this drawing

Revision	Date	Description	Initials
P01			

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Project Name
Shillford Depot

Client
J&M Murdoch Haulage

Title
Existing Hydrological Regime

N. Point

Scale
1:500
Scale

Bar Scale
0 20 40m
1:1000

Date
15.12.23

Paper Size
A1

Quality Assurance
ISO 9001:2015
SGS UKAS Certificate GB02/54539

Drawn by
KZ

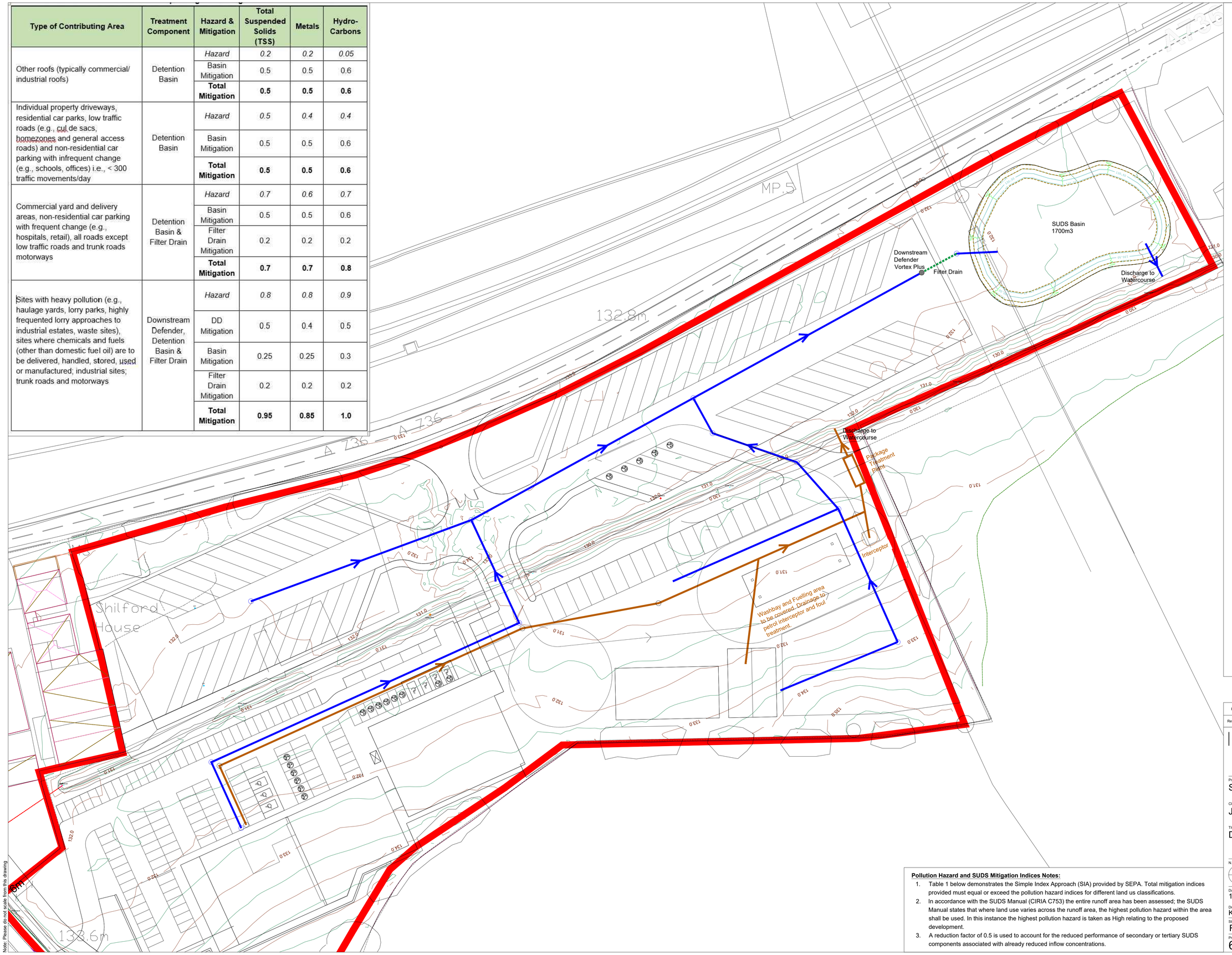
Checked by
NK

Status
FOR APPROVAL

Project No. | Class | Drawing No. | Revision
61045-27-001-P01

APPENDIX 3 – Drainage Strategy Plan (Drawing 61045/33/001)

Type of Contributing Area	Treatment Component	Hazard & Mitigation	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Other roofs (typically commercial/ industrial roofs)	Detention Basin	*Hazard*	*0.2*	*0.2*	*0.05*
		Basin Mitigation	0.5	0.5	0.6
		Total Mitigation	**0.5**	**0.5**	**0.6**
Individual property driveways, residential car parks, low traffic roads (e.g., cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g., schools, offices) i.e., < 300 traffic movements/day	Detention Basin	*Hazard*	*0.5*	*0.4*	*0.4*
		Basin Mitigation	0.5	0.5	0.6
		Total Mitigation	**0.5**	**0.5**	**0.6**
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g., hospitals, retail), all roads except low traffic roads and trunk roads motorways	Detention Basin & Filter Drain	*Hazard*	*0.7*	*0.6*	*0.7*
		Basin Mitigation	0.5	0.5	0.6
		Filter Drain Mitigation	0.2	0.2	0.2
		Total Mitigation	**0.7**	**0.7**	**0.8**
Sites with heavy pollution (e.g., haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways	Downstream Defender, Detention Basin & Filter Drain	*Hazard*	*0.8*	*0.8*	*0.9*
		DD Mitigation	0.5	0.4	0.5
		Basin Mitigation	0.25	0.25	0.3
		Filter Drain Mitigation	0.2	0.2	0.2
		Total Mitigation	**0.95**	**0.85**	**1.0**



Note: Please do not scale from this drawing

Drainage Strategy Notes:

General Strategy
Surface water will discharge to existing channel within the site area.

Discharge Rate
Post development discharge rate from site will be based on **7.5l/s/ha** as advised by East Renfrewshire Council.

Based on site area of **3.75ha** - discharge rate will be **28.125l/s**.
This discharge rate will be maintained for storm events up to and including a 1 in 30 year return period (3.33% AEP) as per Sewers for Scotland requirements.

Attenuation Volume
SUDS will be utilised to provide attenuation volume and allow the post development discharge rate to be met.
An uplift of +30% shall be applied to the peak rainfall intensity as per Scottish Water requirements. Sensitivity analysis will be undertaken for an uplift to the peak rainfall intensity of +41% for the East Renfrewshire region as per SEPA requirements when considering surface water flooding and drainage assessments.
Attenuation volume will be calculated based on the total impermeable area, measured as 63% of gross site area.
Impermeable area = **2.35ha**

30 year attenuation volume = **1135m³** (+30% CC, +10% UC).
100 year attenuation volume = **1440m³** (+41% CC).
200 year attenuation volume = **1675m³** (+41% CC).

Basin will contain 100 year +41% CC within freeboard.
Exceedence volumes at the 200 year return period +41% CC will be routed to avoid detriment to property and FFL (Finished Floor Levels) will be set accordingly.

FEH 2022 rainfall data utilised. Surface water drainage calculations and attenuation storage sizing has been undertaken using PDS Flow software.

Surface Water Treatment
Surface water being discharged from the site will be treated as per CIRIA C753 requirements. Table 1 shown on this drawing provides an example of the treatment management train that could be adopted to satisfy the SIA (Simple Index Analysis) criteria, which assessed the risk posed by each type of hardstanding area within the site.
A treatment volume, Vt, calculated as **400m³** by CIRIA C753 Equation 23.1 will be accommodated within SUDS features.

Foul Discharge
Foul water will be treated locally within a package treatment plant sized appropriately for the development. This will require a SEPA licence to discharge to the local watercourse.

Pollution Hazard and SUDS Mitigation Indices Notes:

1. Table 1 below demonstrates the Simple Index Approach (SIA) provided by SEPA. Total mitigation indices provided must equal or exceed the pollution hazard indices for different land us classifications.
2. In accordance with the SUDS Manual (CIRIA C753) the entire runoff area has been assessed; the SUDS Manual states that where land use varies across the runoff area, the highest pollution hazard within the area shall be used. In this instance the highest pollution hazard is taken as High relating to the proposed development.
3. A reduction factor of 0.5 is used to account for the reduced performance of secondary or tertiary SUDS components associated with already reduced inflow concentrations.

Revision	Date	Description	Initials
P01			

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Project Name
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Title
Drawing Strategy Plan

N. Point | Scale 1:500 | Bar Scale 0 20 40m (1:1000)

Date 15.12.23 | Paper Size A1 | Quality Assurance ISO 9001:2015, SGS UKAS Certificate GB02/54539

Drawn by KZ | Checked by NK

Status
FOR APPROVAL

Project No. 61045 | Class -33- | Drawing No. -001- | Revision -P01

APPENDIX 4 : Volume Attenuation Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Catchment 5	2.350	5.00	100.000	1800	0.000	0.000	1.600

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	15.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	720	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160
30	120	240	480	720	1440	2880

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	30	10	0
100	41	0	0
200	41	0	0

Node Catchment 5 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	98.400	Product Number	CTL-SHE-0226-2810-1300-2810
Design Depth (m)	1.300	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	28.1	Min Node Diameter (mm)	1800

Node Catchment 5 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	98.400
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	780

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	950.0	0.0	1.300	1603.1	0.0	1.600	1778.0	0.0

Results for 30 year +30% CC +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	Catchment 5	570	99.337	0.937	111.5	1135.5330	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
720 minute winter	Catchment 5	Hydro-Brake®	28.0	1836.9

Results for 100 year +41% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Catchment 5	735	99.542	1.142	110.5	1439.8980	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Catchment 5	Hydro-Brake®	28.0	2330.6

Results for 200 year +41% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Catchment 5	1080	99.690	1.290	96.1	1675.0360	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Catchment 5	Hydro-Brake®	28.0	2999.2

APPENDIX 5 – Calculations: Treatment Volumes (V_t)

IronsideFarrar Environmental Consultants				
	Project No:	61045	**By:**	NK
	Project:	Shillford	**Checked:**	
	Sheet Continuation No:	1 of 1	**Date:**	20.12.23

Ref **Calculation:** SUDS Treatment Volume, Vt

Design using CIRIA SUDS Manual (C753), Equation 23.1

SOIL	0.37
D (mm)	17
SOIL/2	0.185
1-SOIL/2	0.815
9D	153

	Area (Ha)	I (fraction)	Vt (m3/Ha)	Vt (m3)
Catchment				
	3.75	0.63	106.86	400.74
				400.74

EQ. 23.1 **Water quality treatment volume calculation using variable rainfall depths (for Scotland)**

$$V_t = 9D\left[\frac{SOIL}{2} + I\left(1 - \frac{SOIL}{2}\right)\right]$$

where:

- V_t = water quality treatment volume (as a function of the total development area) (m^3/ha)
- $SOIL$ = soil classification (from Flood Studies or Wallingford Procedure WRAP map)
- I = fraction of the area that is impervious (eg 30% impermeable area = 0.3)
- D = M5-60 minute rainfall depth (ie 5-year return period, 60 minute duration storm depth determined from the Wallingford Procedure)

APPENDIX 6 – Simple Index Analysis (SIA) Tool: CIRIA (C753) Pollution Hazard & Mitigation Indices

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Haulage yard	These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they 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	High				
Pollution Hazard Indices					
TSS	0.8				
Metals	0.8				
Hydrocarbons	0.9				
SuDS components proposed					
Component 1	Downstream Defender Vortex Plus or Advanced Vortex	Detailed assessment of performance of designed component in reducing inflow concentrations of each pollutant type required as evidence of adopted indices. Enter indices approved by the environmental regulator in appropriate 'User Defined Indices' row below	SEPA only considers proprietary treatment systems as appropriate in exceptional circumstances where other types of SuDS component are not practicable. Proprietary treatment systems may also be considered appropriate for existing sites that are causing pollution where there is a requirement to retrofit treatment. WAT-RM-08 (SEPA, 2014) also provides a flow chart with a summary of checks on suitability of a proprietary system	See Chapter 15 Proprietary treatment systems for approaches to demonstrate product performance. Note: a British Water/Environment Agency assessment Code of Practice is currently under development that will allow manufacturers to complete an agreed test protocol for systems intended to treat contaminated surface water runoff. Full details can be found at: http://www.britishwater.co.uk/Publications/codes-of-practise.aspx.	
Component 2	Filter drain (where the trench is not designed as an infiltration component)	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	Filter drains should be preceded by 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 3	Detention basin	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	Detention basins should be designed to ensure the effective retention and management of sediment, such that the sediment will not be re-suspended and washed out in subsequent events		
SuDS Pollution Mitigation Indices					
TSS	0.95				
Metals	0.85				
Hydrocarbons	>0.95				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.95				
Metals	0.85	**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	>0.95				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				