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Drainage Strategy Report

PROPOSED HOUSING DEVELOPMENT, LAND NORTH OF STATION ROAD, DRIGG, CUMBRIA

22-C-16573

Rev C

September 2024

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Contents

1. INTRODUCTION

A L Daines & Partners LLP (ALD) have been engaged by Sunshine Properties Ltd to undertake a Surface and Foul Water Drainage Strategy, in accordance with the National Planning Policy Framework (NPPF) [1] for the proposed housing development at Land north of Station Road, Drigg, Cumbria.

The purpose of this report is to provide a strategy to manage surface and foul water flows from the site, in support of the planning application, while fulfilling the requirements of the Local Planning Authority (LPA) and the Lead Local Flood Authority (LLFA).

2. PLANNING CONTEXT

2.1. PLANNING POLICY

NPPF footnote 55 states that "*a site-specific flood risk assessment should be provided for all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use*."

Paragraph 169 reads *"Major developments should incorporate sustainable drainage systems unless there is clear evidence that this would be inappropriate. The systems used should:*

a) take account of advice from the lead local flood authority;
b) have appropriate proposed minimum operational standards;
c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
d) where possible, provide multifunctional benefits."

A major development, as per The Town and Country Planning Order 2015, is partly, but not wholly, categorised as development involving the provision of dwellinghouses where the number of dwellinghouses to be provided is 10 or more and a development carried out on a site having an area of 1 hectare or more.

The Cumbria Minerals and Local Waste Plan – Strategic Flood Risk Assessment (June 2018) references the same criteria for local planning policy.

The site is therefore not classed as a major development under the above criteria with the site hosting 9No dwellings and a total site area of 0.687 hectares.

2.2. PLANNING POLICY IN SITE CONTEXT

The site covers 0.687ha and covers existing greenfield agricultural land. According to the most recent Environment Agency (EA) flood risk maps, the site lies entirely within Flood Zone 1.

The NPPF site categorisation Table 1.1 puts a residential development of this nature within the 'Highly vulnerable' category. Developments in this category are acceptable within Flood Zone 1 and therefore the site-specific Flood Risk Assessment (FRA) need only be brief. The FRA statement is included within this report.

2.3. SITE INFORMATION

2.3.1. SITE PLAN

The proposed development is located to the north of a section of the B5344 between Station Road and Old Shore Road as shown on red line bordered plan in Figure 1.

Figure 1: Aerial photo of site - Bing Maps

The proposed layout of the development is shown on Ashwood Design Associates Site Layout Plan drawing 2406-001 in *Appendix A*.

2.3.2. SITE TOPOGRAPHY

The site generally runs from high ground on the northern boundary to the low point at the centre of the southern boundary adjacent to the B5344.

The eastern boundary of the site adjoins an unsurfaced rural single-track lane, while the northern and western boundaries adjoin open pastureland. The southern boundary adjoins the B5344 which runs approximately east-west.

2.3.3. EXISTING LAND USE

The existing site is agricultural open pastureland. The site is approximately 0.687ha in land area, all of which is currently greenfield.

2.3.4. DEVELOPMENT DESCRIPTION

The proposed development will see a new access formed off the north side of the B5344. This access will adjoin a spine road running north to south from which 9No proposed properties are served. The remaining land area is retained as landscaped gardens.

3. SURFACE WATER MANAGEMENT

The existing flow paths are likely north to south towards the low point on the site through the higher levels of strata, with a small strip of land area draining towards the eastern boundary due to a slight fall in level.

The proposed development drained areas are split as follows:

- 0.566ha positively drained areas (inl. 10 urban creep to dwellings)
- 0.121ha landscaping areas not contributing to drainage network.

The majority of the garden areas will retain existing flow paths (north to south generally) and shall be considered in the design of the drainage network.

A plan of the proposed and existing hardstanding areas, 22-C-16573/01, is given in *Appendix B*.

3.1. PERMEABILITY AND SOIL PROFILE

British Geological Survey (BGS) and Land Information Systems (LandIS) mapping services have been used determine the following land make-up:

Bedrock: Sellafield Member - Sandstone.

Superficial drift: Till, Devensian - Diamicton

Soil: Soilscape 6 – Freely draining slightly acid loamy soils.

This soilscape is similar to that observed during trial hole excavations which show a 250-300mm topsoil generally underlain by silty clay soils becoming denser with depth.

Excavations were carried out on 25 March 2022 in clear, dry conditions.

The trial holes were excavated to a minimum depth of 1.5m below ground level to enable percolation tests to proceed to determine the infiltration rate of the ground. These tests were carried out in accordance with the guidance document BRE 365 Soakaway Design.

The trial holes were filled to an average depth of 1m above the base level and monitored to record infiltration rates. After 6 hours, all pits showed low reduction in water levels and the tests were abandoned. No infiltration rate was able to be calculated.

Both BRE365 and The SuDS Manual indicate that each pit must drain to at least half depth within 24 hours to be suitable for consideration with an infiltration rate above $1x10^{-5}$ m/s. The tests did not achieve these thresholds and therefore infiltration should not be considered as a means of wastewater disposal on this site.

The tests did however show that initially there was some infiltration in the upper layers of less dense soils which could be utilised for local restriction of flows at source – such as permeable paving.

The percolation tests results are shown in *Appendix C* along with photos of the excavations.

3.2. CURRENT SURFACE WATER DRAINAGE PROVISION

Existing watercourses

No watercourses, culverted or open, are present within the boundary of the development site. The closest open watercourse is the river Irt approximately 500m southeast of the site.

Existing sewers

There are no existing United Utilities (UU) owned sewer systems present on or near the site. To the south of the site there are existing UU sewers within Wray Head residential development (approx. 135m from site) and further down Station Road (approx. 270m from site). These are both combined sewers.

The United Utilities sewer records are shown in *Appendix D*.

3.3. FLOOD RISK ASSESSMENT

As described earlier in the report, the current Environment Agency Flood Map for Planning shows the whole of the site within Flood Zone 1, as can be seen in the figure below.

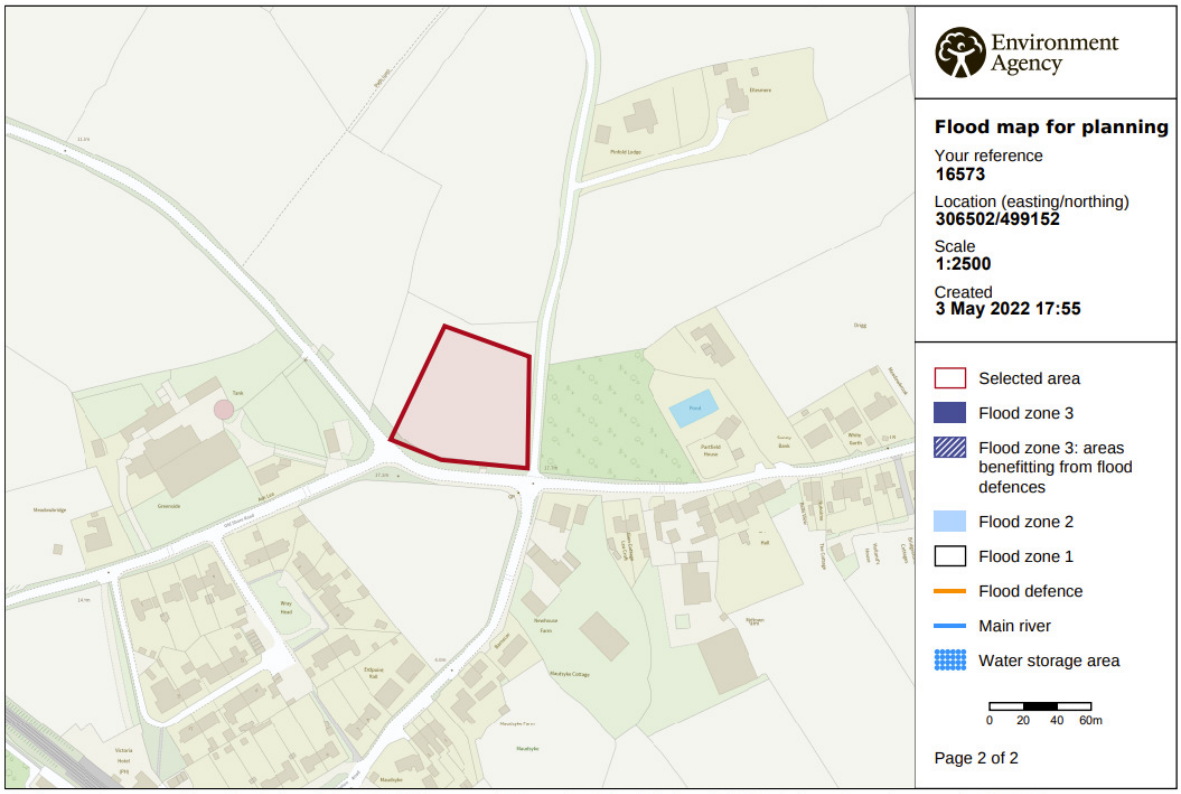

Figure 2: Flood map for planning

A full FRA is therefore not required, although the Environment Agency long term flood risk maps are included below to further inform this report.

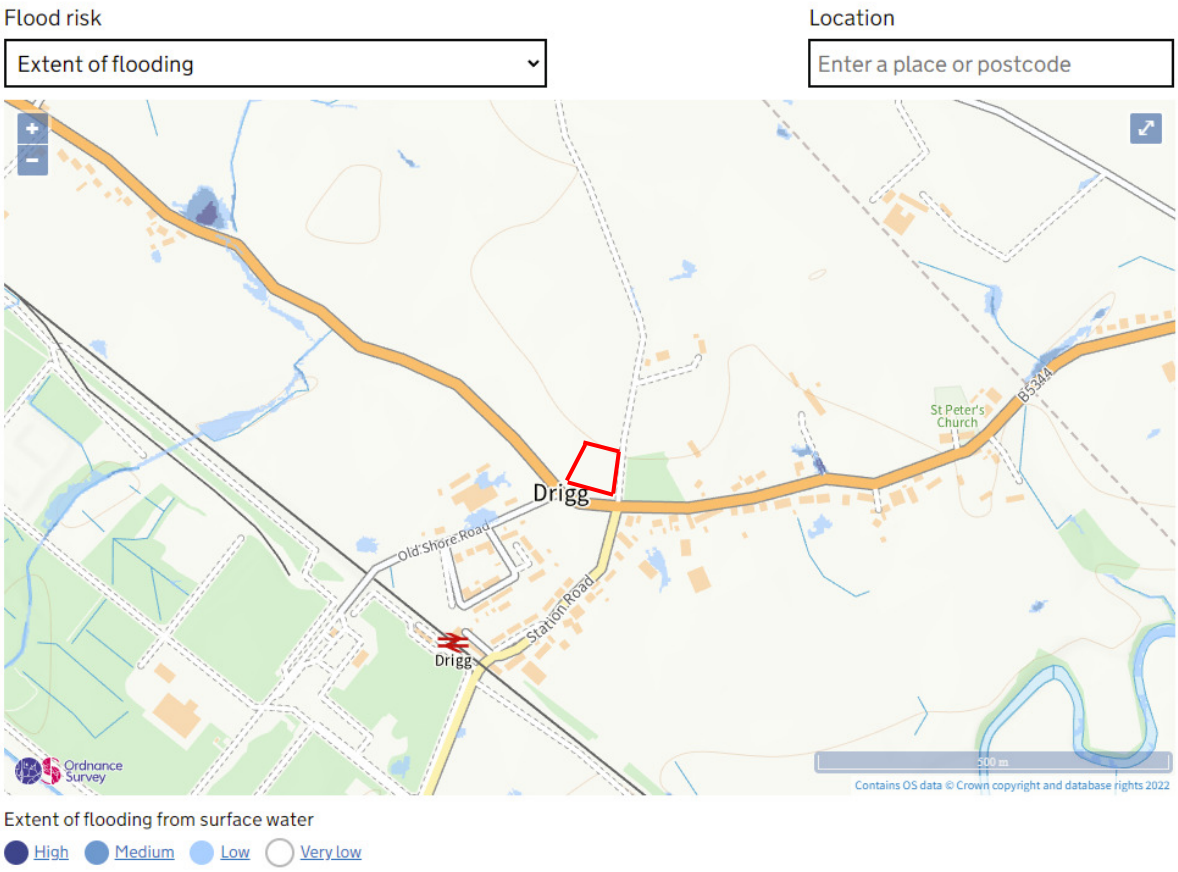

Figure 3: EA long term surface water flood risk map

The long-term surface water flood risk map shows no areas of flood risk within or near the site.

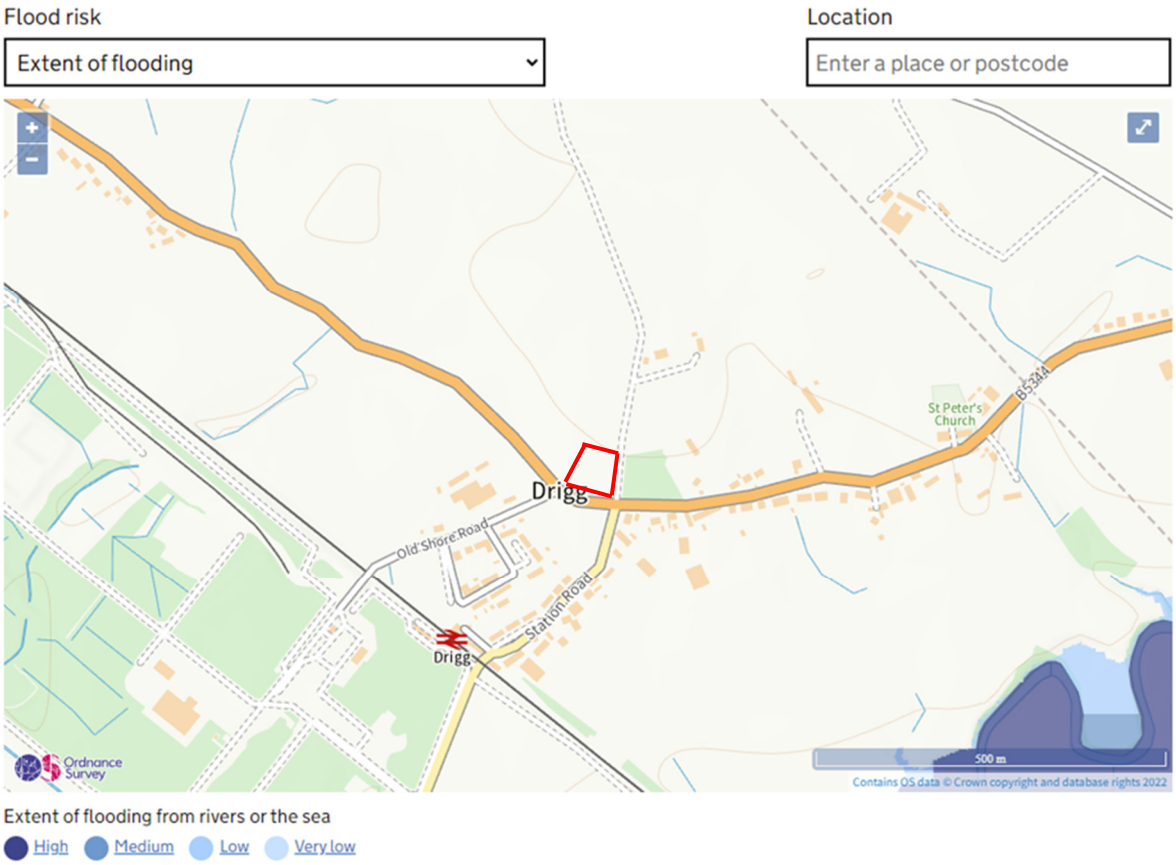

Figure 4: EA long term river and seas flood risk map

There is no perceived risk of flooding from rivers or seas within the site.

Figure 5: EA long term reservoir flood risk map

There is no perceived risk of flooding from reservoirs within the site.

From analysis of the above flood maps it is clear the existing flood risk to the site is very low and further flood risk assessment is not warranted.

3.4. SURFACE WATER DRAINAGE STRATEGY

The aim of the strategy is to provide a design which will avoid, reduce, and delay the discharge of surface water flows into public sewers and watercourses. This will aid in the protection of watercourses but will also ensure that no knock-on effects are seen beyond the site and that the risk of localised flooding and pollution within the site are reduced as far as possible.

To satisfy these criteria, surface water flows shall be subject to assessment via the hierarchy of drainage in accordance with the LASOO Non-Statutory Technical Standards for Sustainable Drainage: Practice Guidance. The hierarchy is as follows:

Hierarchy options:

1. Drain into the ground (infiltration).
2. To a surface water body.
3. To a surface water sewer, highway drain or another drainage system.
4. To a combined sewer.

The drainage strategy for the site is to be developed using the second level on the above hierarchy for the following reasons:

1. Drain into the ground (infiltration) – proven not possible for site.

The site has been shown through trial hole excavation and percolation tests to be unsuitable for site wide infiltration. There is however capacity in the upper levels of substrata to provide storage and retention of flows prior to discharge at lower site levels.

2. Drain to a surface water body – proved not possible for site.

It was previously suspected that a culverted watercourse was present along the southern site boundary. However, following site investigations this was an old stone drain which has long collapsed and no longer serves as a positively draining structure.

3. To a surface water sewer, highway drain or another drainage system.

A camera survey was undertaken by the applicant on the 4 July 2022 which determined that the highway drain is currently blocked approximately 21m from the site boundary. As such this method of surface water disposal is not viable.

4. To a combined sewer.

The preferred option for the development is to construct a new 150mm diameter combined sewer down Station Road to connect into the existing system United Utilities combined network to the West of the Low-Level Waste Repository (LLWR), north of the railway line.

3.5. SURFACE WATER PROPOSED DESIGN

It is proposed to utilise a combination of permeable paving and positive drainage to route the site flows to an attenuation basin/structure to the south end of the site prior to outfall to the existing culverted watercourse.

The greenfield run off calculations, via the ICP SuDS Mean Annual Flood method, for the site are summarised below and shown in *Appendix E*.

Event	Q1	Qbar	Q1	Q30	Q100
Site greenfield runoff	5.0	5.0	4.3	8.5	10.4

In accordance with the earlier mentioned hierarchy of drainage full site infiltration is not feasible and as such the system will be designed to utilise storage-based SuDS components prior to outfall to the combined sewer.

As per the LASOO guidance, the peak runoff rate from the development for the 1 in 1yr rainfall event and the 1 in 100yr rainfall event should not exceed the peak greenfield runoff for the same event.

The design is also required to prevent flooding to any part of the site for storms up to and including the 1:30yr rainfall event, while any exceedance for the 6 hour 1:100yr event should be controlled within the site and should not flood any properties or service areas.

In this case, it is proposed to restrict all flows off the site to a maximum of QBar, 5.0l/s for all storm events up to 1:100yr +40%.

Climate change

Environment Agency guidance issued in 2016 estimates that peak rainfall intensity will increase due to climate change over the next 100 years. There is therefore an allowance of 50% attributed to the 30yr and 100yr storm event calculations in line with the Upper End estimate of rainfall increases for small and urban catchments.

Percentage impermeability (PIMP)

All impermeable area is modelled as 100% PIMP. This will allow for sufficient capacity for all hardstanding areas to be positively drained.

Volumetric Runoff Coefficient (Cv)

Industry standard Cv values vary for summer and winter and account for water volumes which do not enter the drainage system i.e., that is lost through infiltration, depression storage, evaporation, initial wetting etc. Standard values are 0.75 for summer and 0.84 for winter.

Given the site layout, it is foreseen that due to the poor infiltration rates available on the site, 80% of the land area will contribute to the drainage system and should therefore be accounted for in the design.

In accordance with section 24.8 of The SuDS Manual, the areas to be retained as grassed permeable space provide interception through evapotranspiration and storage within the soil which can be assumed to account for 75% of rainfall volumes. The catchment areas have been calculated using this volumetric run-off coefficient for these areas.

The remainder of the drained network comprises a combination of permeable and impermeable hardstanding areas. The standard Cv values have been utilised here.

Surface water quality

The SuDS Manual provides best industry practice for assessing the pollutant potential of developments and providing mitigation methods to increase run off water quality through the use of SuDS components.

The simple index approach has been utilised here to assess the pollutant hazard indices and proposed treatment components. Note, this has been carried out in conjunction with the above SuDS component suitability assessment for the site and as such many features have already been discounted.

Table 26.2 from The SuDS Manual below outlines the pollution hazard indices for different land uses.

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 (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg 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[1]	High	0.8[2]	0.8[2]	0.9[2]

Figure 6: SuDS Manual Table 26.2 Pollution hazard indices

This development is to be classed as a mix of 'Very low' and 'low' risk land uses due to the presence of residential roofs and individual property driveways and access roads.

This level of risk demands the following level of pollution control:

Land use	Suspended solids	Metal	Hydrocarbons
Residential roofs	0.2	0.2	0.05
Parking/access road	0.5	0.4	0.4

Table 26.3 from the SUDS Manual, shown below, details pollution mitigation indices for various SUDS components.

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

	Mitigation indices[1]		
Type of SuDS component	**TSS**	**Metals**	**Hydrocarbons**
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	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[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

Figure 7 SuDS Manual Table 26.3 SuDS mitigation indicies

The highest risk element comes from the access roads and parking areas. As can be seen below, the proposed detention basin mitigation provides sufficient treatment for the higher risk elements and are therefore sufficient for those lower risk elements too.

Land use	Suspended solids	Metal	Hydrocarbons
Risk element	0.5	0.4	0.4
Detention basin	0.5	0.5	0.6

Surface water drainage proposals

Max site outflow: 5.0/s

Storage provision: Attenuation tank, grassed areas, and detention basin

Treatment systems: Detention basins

Storage requirements

Utilising the figures above, the system has been designed using Infodrainage software to store all storm flows up to a 6 hour 1:100yr +50%. The Infordrainage calculations are included within *Appendix G* for reference.

The proposed drainage arrangement proposals are shown on drawing 22-C-16573/02 in *Appendix F*.

4. FOUL WATER DRAINAGE STRATEGY

Foul water from the new development will be positively drained to a new combined sewer along Station Road, Drigg.

There are 9No. proposed houses, assuming 3No. inhabitants per dwelling.

The total flow rate from the development will be 0.416l/s as shown in the Infodrainage calculations in *Appendix H.*

A plan of the proposed foul water system is shown in *Appendix F* drawing 22-C-16573/02.

5. MANAGEMENT & MAINTENANCE

All separate surface and foul water drainage systems within the site are proposed to remain private and managed through a site management company.

All components shall be maintained in accordance with the relative requirements shown in the SuDS Manual. These intervals should be deemed as a minimum frequency and reference should also be made to the manufacturers and landscape designers guidance to ensure all components are maintained correctly.

Table 22.1 from the SuDS Manual for detention basins has been included below for reference.

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

Table 21.3 from the SuDS Manual for attenuation storage tanks has been included below for reference.

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

6. APPENDICES

Appendix A – Ashwood Design Associates Site Layout 2046-001A.

Appendix B – Drained areas plan 22-C-16573/01.

Appendix C – Percolation test results and images.

Appendix D – United Utilities Sewer Records.

Appendix E – Proposed site greenfield run-off calculations.

Appendix F – Proposed drainage plan 22-C-16573/02.

Appendix G – Infodrainage calculations for SW system up to 100yr + 50% storm.

Appendix H – Infodrainage calculations for FW system.

Appendix A

NOTES AND AMENDMENTS

REVISIONS

Rev	Description	Drawn	Date

N

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Purpose:
Planning

Client:
Sunshine Properties West Coast Ltd

Project:
Land to the North of Station Road, Drigg

Title:
Site Layout

Scale:	Sheet Size:	Drawn:	Date:
1/500	A3	jc	01-22

Project No:	Drawing No:	Revision:
2046	001	A

Appendix B

AREA INCLUDED IN NEW SITE DRAINAGE PLAN

AREA TO DRAIN AS Ex. NOT INCLUDED IN SITE DRAINAGE CALCS

HARDSTANDING AREAS TO BE POSITIVELY ROUTED TO SuDS STORAGE STRUCTURES

REMAINING GRASSED/LANDSCAPED AREAS TO NATURALLY DRAIN TO SOUTHERN END OF SITE THROUGH HIGH LEVEL INTERCEPTION. AREAS ACCOUNTED FOR IN SUDS STORAGE FEATURES

PROPORTION OF GRASSED/LANDSCAPED AREAS TO DRAIN AS EXISTING TOWARDS HEDGELINE ON EASTERN SITE BOUNDARY

DETENTION BASIN

DETENTION BASIN

HARDSTANDING AND ROOF AREAS POSITIVELY DRAINED TO SUDS STORAGE FEATURES

SOFT LANDSCAPING FLOW PATH

TOTAL SITE AREA: 0.687ha

POSITIVELY DRAINED AREAS: 0.566ha
(INC. 10% URBAN CREEP)

LANDSCAPED AREA NOT CONTRIBUTING TO DRAINAGE NETWORK: 0.121ha

5914

REV	DATE	AUTHOR	NOTES
A	27/09/24	SM	DRAWING UPDATED

DRAWING STATUS: PRELIMINARY

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TITLE: LAND TO NORTH STATION RD, DRIGG
DRAINED AREAS PLAN

DRAWN	DATE	SCALE	DRAWING NO.	
SM	MAY 22	1:200 @A1	22-C-16573/01	A