Alleston Solar Farm, Pembrokeshire

Sustainable Drainage Maintenance Plan

Reference Number: 3.0.9

October 2024

Job Name: Alleston Solar Farm

Job No: 333100437

Date: October 2024

Prepared By: A Harman

Subject: **Detailed SuDS Asset Operation and Maintenance Plan**

1. Executive Summary

1.1. This Detailed Sustainable Drainage System (SuDS) Asset Operation and Maintenance Plan has been prepared by Stantec, on behalf of our client, Alleston Clean Energy Limited, to outline the necessary SuDS maintenance activities to be carried out on all proposed SuDS features.

1.2. This Maintenance Plan has been prepared in support of development proposals for Land at Alleston Farm, Lower Lamphey Road, Lamphey, Pembrokeshire. This Maintenance and Operation Plan has been prepared in line with national policy and industry guidance. Continued SuDS maintenance will ensure the effective operation of the Surface Water Drainage Strategy, including the continued SuDS performance for water quantity, water quality, amenity, and biodiversity.

1.3. For further information, refer to the Stantec *Alleston Solar Farm, Flood Consequences Assessment*.

2. Responsibilities

2.1. Construction Design Management (CDM) regulations, 2015, dictate, designers must identify, mitigate, and reduce the likelihood of maintenance risks where possible.

2.2. During the construction phase, the principal contractor is responsible for ensuring the SuDS maintenance activities as specified in this document are carried out. The principal contractor should adhere to strict preventative measures to ensure pollution of SuDS and onsite watercourses is avoided. The principal contractor is also responsible for the preparation of a Construction Phase Health and Safety Plan, to ensure the risks associated with the construction of SuDS features have been identified, mitigated against, and controlled.

2.3. Through consultation with Pembrokeshire SuDS Approval Body (SAB), the SAB have indicated they will not adopt any of the proposed SuDS features at this development. Following construction, the maintenance and operation of the proposed SuDS features will therefore be passed onto the landowner. The landowner will likely appoint a private SuDS Maintenance Company to undertake the required SuDS maintenance activities during the operational phase of the development.

3. SuDS Operation and Maintenance Policy

3.1. This drainage strategy has been designed to establish a SuDS management train to satisfy the statutory SuDS Standards S1 to S6 as set out under the SuDS Standard document (Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems, Welsh Government, 2018). The SuDS Standards are the minimum criteria a SAB require for approvals. These standards aim to manage rainwater sustainably, contrasting with traditional underground pipe-based drainage systems. In summary, the six standards:

- Surface Water Runoff Destination (S1): Prioritise the choice of runoff destination.
- Surface Water Runoff Hydraulic Control (S2): Control the volume and rate of runoff.
- Water Quality (S3): Provide treatment for runoff to prevent negative downstream impact.

- Amenity (S4): Enhance the environment and create pleasant spaces.
- Biodiversity (S5): Promote biodiversity and habitat creation.
- Design of Drainage (S6): Ensure proper construction, operation, and maintenance, including structural integrity.

3.2. Standard S6 'Design of Drainage for Construction, Operation and Maintenance and Structural Integrity', explains '*all elements of the surface water drainage system should be designed to ensure maintenance and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effectively, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).*'

3.3. Standard S6 sets out the required information expected in the preparation of a Maintenance Plan, as included below;

- *'Inspection and maintenance required for the system to function as designed with regard to meeting the performance levels set by compliance with these Standards.*
- *Inspection and maintenance required during the establishment of vegetative components and for the long-term management of that vegetation.*
- *Locations where sediment removal is necessary to ensure sediment control measures continue to function as designed, together with the anticipated frequency and appropriate means of sediment removal and disposal'.*

3.4. S6 advises guidance on the production of a Maintenance Plan can be found in the *CIRIA SuDS Manual C753*, 2015. The information to be included in a Maintenance Plan, as indicated by the CIRIA guidance, and refined to ensure suitability to this development are listed below;

- Location of all SuDS components on the site.
- Summary of the design intent, how SuDS components work, their purpose and potential performance risks.
- Depth of silt that will trigger requirement for removal.
- Visual indicator that will trigger maintenance.
- Maintenance requirements.
- Maintenance plan.
- Explanation of the objectives or the maintenance proposed and potential implications of not meeting those objectives.
- Identification of areas where certain activities are prohibited.
- An action plan for dealing with accidental spillages of pollutants.
- Advice on what to do if alterations are to be made to a development or if service companies need to undertake excavations or other similar works that could affect the SuDS.
- Details of whom to contact if pollution is seen in the system or if it is not working correctly.

3.5. In addition to the above, this technical note demonstrates the following;

- The SuDS design should allow free, safe, and easy access (including easements where required) for all personnel, vehicles and machinery required to undertake maintenance of the SuDS (see **Appendix A**).
- The SuDS design should ensure that all components which are intended to promote infiltration should incorporate or be preceded by a pretreatment component which effectively protects the infiltration surface from clogging (see **Section 6**).

4. Construction

4.1. Swale excavations should ideally be undertaken in dry weather, to prevent mobilisation of sediments from exposed surfaces. Native grass planting should be undertaken soon after excavation, to promote swale base and side-slope stabilisation. Signage should be erected to mark the position of swales, to prevent accidental damage during construction. Swales should be protected by silt fencing during the construction phase.

4.2. Excavation of infiltration trenches should be free of earth and rainwater to avoid contamination. Once constructed, silt fences should be installed around infiltration trenches during the construction phase.

5. Operation

Easy and Safe Access for Maintenance

5.1. In accordance with *Statutory Standards for Sustainable Drainage Systems – Designing, Constructing, Operating and Maintaining Surface Water Drainage Systems* Standard S1, for correct operation of SuDS assets, adequate access must be provided for maintenance (see **Appendix A**). Whilst swale locations are indicative at this stage, swales are proposed entirely on the downslope side of proposed solar PV panel parcels, and not surrounded by development. Swales are also proposed to lie at least 5m from any onsite watercourse. Therefore, swales will be easily and safely accessible for maintenance activities.

5.2. In accordance with S6, infiltration trenches are located on the downslope side of proposed transformer stations, adjacent to maintenance access tracks and not within 5m of onsite watercourses. Therefore, infiltration trenches will also be easily and safely accessible for maintenance activities.

Operational Risk

5.3. In accordance with S1, the surface water drainage strategy has been designed to ensure no pumping is required, as such minimising the risk of operational failure and ensuring no operational energy use.

5.4. In accordance with S1, the health and safety risks associated with the operation of proposed Assets has been considered. All runoff generated onsite is discharged via infiltration trench at source. Hence, there is no permanent storage of water at surface, reducing the operational risk of the surface water drainage strategy. The proposed swales are designed with shallow 1 in 4 side slopes and a depth of only 150mm. 150mm deep swales may have vertical side slopes, in accordance with CIRIA guidance, thus the proposed swales adopt a safe design.

Sediment Disposal

5.5. If contaminated, the waste needs to be removed and safely disposed of as contaminated waste in a legal manner with appropriate waste classification testing where required.

5.6. If uncontaminated, the sediment should be utilised onsite, returned ideally to the location of the upstream point of origin as fill if suitable, together with suitable binding or scour prevention works, or spread out evenly onsite in suitable locations ensuring flow routes are not disturbed. The upstream sediment swales catchment of this Alleston site is not considered to contain land uses posing a significant pollution risk, and therefore the sediment could be considered uncontaminated.

Cost-effective Operation and Maintenance

5.7. In accordance with S6, the cost effectiveness of operation has been considered. The development has been designed with permeable surfaces where possible, to ensure a very minimal increase in impermeable area. This significantly reduces the required provision of SuDS. Surface water runoff generated by proposed impermeable development will be managed at source, therefore reducing the required scale of SuDS assets. Pumping is not proposed, thus ensuring no operational energy use. As such, the affordability of the proposed Surface Water Drainage Strategy has been maximised.

Accidental Spillages and Pollution Prevention

5.8. During the construction phase, it is the responsibility of the principal contractor to mitigate against spillages. During the operational phase, this responsibility will be transferred to the private SuDS maintenance company. Both are responsible for ensuring spillage kits are available, in the event of a spillage.

5.9. In the event of a spillage, Natural Resources Wales (NRW) should be contacted, either online through the 'Report an Incident' [1]webpage, or via calling 0300 065 3000.

5.10. An Environmental Pollution Protection Plan should also be prepared and made available to those working onsite. The SuDS Manual explains the two major pollution sources from construction activities are sediment pollution and oil and hydrocarbon spills. Mitigation activities to avoid accidental pollution are included below (see **Table 5-1** and **Table 5-2**).

Table 5-1: Measures to Prevent Sediment Pollution (CIRIA C753)

Activity	Pollution Prevention Methods Required
Excavated ground and exposed ground	Silt fences, hay bales or stilling ponds should be placed downstream of excavated or exposed ground. Runoff diversion or interception devices should be placed upstream.
Stockpiles	Stockpiles should be located away from onsite watercourse and SuDS features. Protective coverings should be applied on stockpiles.
Plant and wheel washing	This activity should take place in designated locations. The area should be tanked and not be allowed to discharge to watercourse or ground. Proprietary treatment can be employed to collect solid waste materials. This waste will be treated as contaminated waste.

Table 5-2: Measures to Prevent Oil and Hydrocarbon Pollution (CIRIA C753)

Activity	Pollution Prevention Methods Required
Use of machinery	Appropriate maintenance of machinery and checking for oil leaks
Storage	Corectly storing fuel, checking for wear and tear on tanks, regular emptying of bunds and tanks secured to prevent vandalism
Refuelling	Drip tray use, procedures for refuelling, designated areas for refuelling, emergency spill kit located near refuelling areas

Protocol in the Event of Spillage

5.11. In the event of a hydrocarbon/oil spill, booms should be employed to capture the oil/hydrocarbon films, allowing for subsequent removal.

5.12. In the event of pollution in the system, or if the system is not working correctly, the private SuDS maintenance company should be contacted.

Future Alterations and Utilities Considerations

5.13. If alterations are to be made to the development or if service companies need to undertake excavations or other similar works that could affect SuDS assets, permission should first be sort from the landowner in consultation with the private SuDS maintenance company for a suitable strategy to be developed to ensure continued SuDS performance.

[1] Natural Resources Wales / Report an incident

6. Maintenance Requirements

6.1. The proposed maintenance activities included below (see **Table 6-1**,**Table 6-2** and **Table 6-3**) have been taken from the CIRIA guidance.

6.2. The CIRIA guidance breaks down maintenance activities into maintenance schedule classification groups. Regular maintenance activities consist of basic tasks carried out on a frequent schedule. Occasional maintenance activities are required periodically and are less frequent and less predictably scheduled than regular maintenance. Remedial activities are associated with intermittent tasks that may only be required to rectify faults with SuDS Assets. These activities are thus not scheduled activities.

6.3. The frequency of the various maintenance activities should be refined as necessary, based on site specific requirements.

Sediment Collection Swale

Design Intent, Purpose, and Potential Performance Risks

6.4. Sediment collection swales are proposed to intercept all runoff from proposed parcels of solar PV panels, and convey surface water to onsite watercourses, following the fall of the land. Some infiltration would be expected along the base and side-slopes of swales, whilst temporary storage is provided on the upstream side of leaky dams. Thus, the implications of improper maintenance would result in the conveyance of sediment pollution to onsite watercourses and the increase in frequency of exceedance events and subsequent erosion of hillside slopes, thus again increasing sediment pollution.

Visual Indicators Prompting Maintenance Activities

6.5. Visual indicators triggering the requirement for maintenance include the presence of debris, excessive grass lengths, sediment accumulation, areas of bare earth, damage to check dams and an increase in the frequency of swale bank overtopping.

Sediment Accumulation Depths

6.6. Removal of sediment within swales are undertaken when the sediment depth reaches a level that restricts and so impairs the operation of the asset. In line with CIRIA guidance, the typical frequency of sediment removal should ensure sediment deposits do not exceed 25mm. However, given proposed swales are primarily for sediment collection, rather than conveyance of surface water, sediment accumulation up to 75mm, is appropriate, after which removal is required.

Maintenance Activities

6.7. The primary role of swales at this development, is for the collection of sediment in runoff generated in solar PV panel parcels. Thus, the frequency of sediment removal required at this site, may be higher than other sites.

Table 6-1: Vegetated Swale Maintenance Activities (CIRIA C753)

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range*	Monthly (during growing season), or as required in the Outline Landscape and Ecological Management Plan (oLEMP)
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets, and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required*
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices.	As required
*Whilst CIRIA guidance recommends mowing should retain grass lengths of 75-150mm across treatment surfaces, longer vegetation lengths are not considered to pose a significant risk to functionality and as such, grass lengths suitable for native grass planting can be adopted.		
** Leaky dams constructed with permeable material (e.g. rip-rap or timber boards) are proposed every 10-20m to slow the velocity of surface water within the sediment collection swales to mitigate against scour and resultant re-suspension of collected sediments.		

6.8. Leaky dams should be repaired as required.

6.9. A biodegradable erosion protection mat is proposed along the length of exceedance flow routes generated when swales overtop in high intensity rainfall events. The inspection and maintenance required during the establishment of vegetation in these areas will fall under the Landscape Management Plan.

6.10. Any damage due to sediment removal or erosion should be repaired and immediately reseeded or planted.

Infiltration Trenches

Design Intent, Purpose, and Potential Performance Risks

6.11. Infiltration trenches are proposed on the downslope side of transformer stations (the only proposed impermeable development). Infiltration trenches are protected from sediment accumulation by filter strips of minimum width 3m (see below filter strip maintenance) located between transformer stations and the trenches themselves. Runoff generated by transformer stations will flow overland across minimum 3m wide filter strips prior to interception by infiltration trenches. Infiltration trenches will discharge this surface water to ground.

6.12. Thus, the implications of improper maintenance include the increase in runoff generated by the site.

Visual Indicators Prompting Maintenance Activities

6.13. Visual indicators triggering the requirement for maintenance include the presence of debris, vegetation growing over the infiltration trench surface, sediment accumulation and continuous high water levels within the infiltration trench.

Maintenance Activities

Table 6-2: Infiltration Trench Maintenance Activities (CIRIA C753)

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter, debris, and trash	Monthly
	Cleaning of any gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
	Inspect for and remove sediment and debris from floor of inspection tube	Annually (or as required)
	Cut grass – around trench	Half yearly: spring (before nesting season) or as required
Remedial actions	Replace or clean void fill if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile	As required
Monitoring	Check infiltration trench inspection tube to ensure emptying is occurring	Annually

Table 6-3 Filter Strip Maintenance Activities (C753)

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter, debris, and trash	Monthly (or as required)
	Cut the grass – to retain grass heights within specified design range	Monthly (during growing season), or as required in the Outline Landscape and Ecological Management Plan (oLEMP)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation, and contamination (e.g. oils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed >10% of the filter strip area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

7. Caveats

7.1. The conclusions made in this SuDS Asset Operation and Maintenance Plan are based on data available at the time of the study and on the subsequent assessment that has been undertaken in relation to the development proposals as outlined in the associated Flood Consequences Assessment (FCA) report.

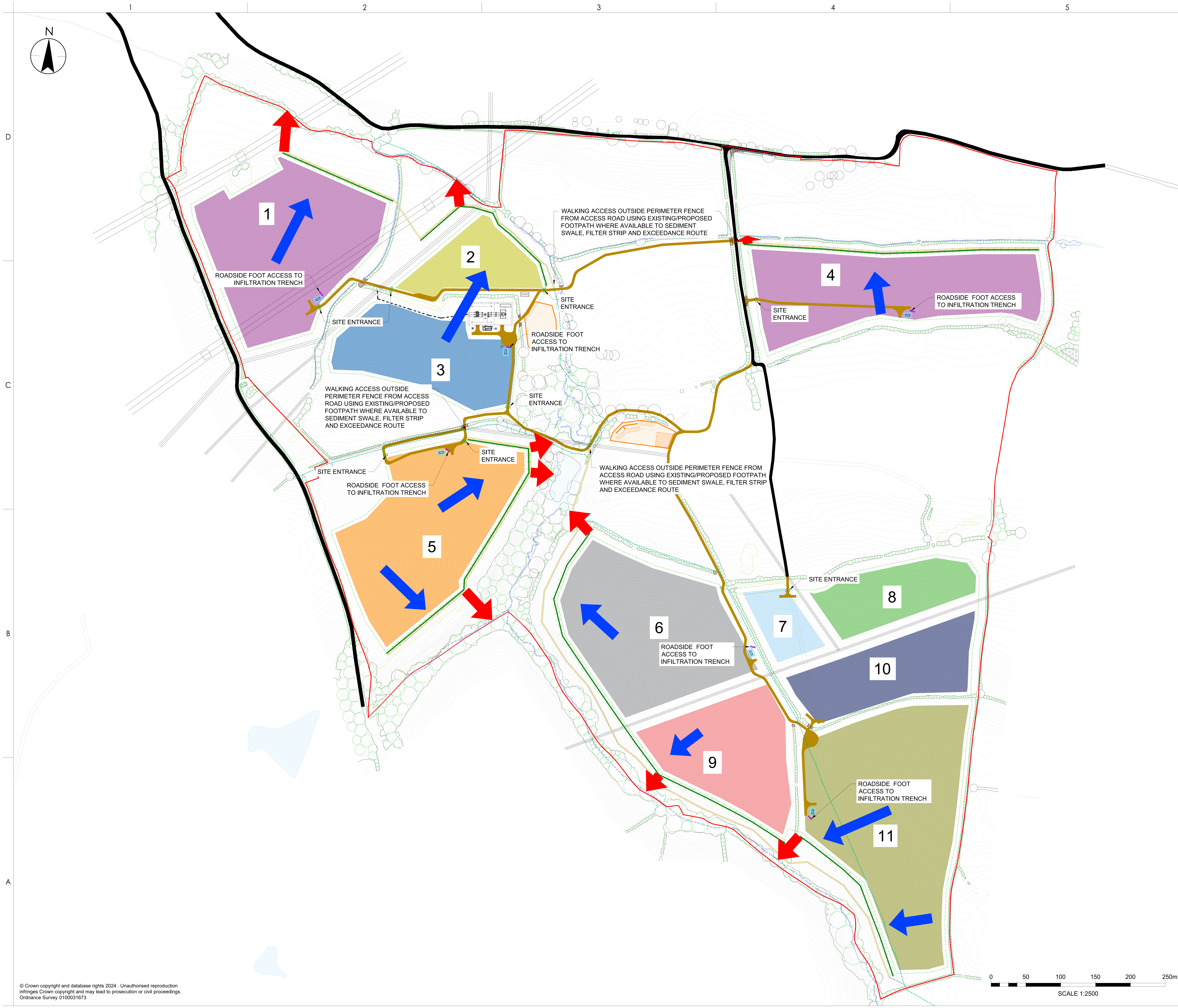
7.2. The Construction (Design and Management) Regulations (CDM Regulations) will apply to any future development of this site which involves “construction” work, as defined by the CDM Regulations. As such it is the responsibility of the proposed developer (ultimate client) to fulfil its duties under the CDM Regulations.

DOCUMENT ISSUE RECORD

Report	Rev	Date	Prepared	Checked	Reviewed (Discipline Lead)	Approved (Project Manager)
333100437/300/TN001	A	08/07/24	A Harman	A Johns	P Mennell	P Mennell
333100437/300/TN001	B	13/09/24	A Harman	L Whalley	P Mennell	P Mennell
333100437/300/TN001	C	02/10/24	A Harman	L Whalley	P Mennell	P Mennell

T: +44 1173 327 840 E: bristolqueensquare@stantec.com

Appendix A Proposed SuDS Maintenance Drawing



Stantec

Stantec UK Limited
Lakeside House, Blackbrook Business Park, Blackbrook Park Avenue
Taunton
TA1 2PX
Tel. +44 1823 218 940
www.stantec.com/uk

Notes

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

DRAWING NOTES:

1. SEE THE FOLLOWING SECTIONS OF THE FLOOD CONSEQUENCE ASSESSMENT REPORT (333100998-STN-HDG-SW-RP-CD-FCA_01_ALLESTON SOLAR FARM FCA):
   - SECTION 6.2 CONSTRUCTION & MATERIALS OF MAINTENANCE ACCESS FOOTWAY, AS PER 'INTERNAL TRACK SECTION DETAIL' (SCUKX-ALLES-000-MCS-201)
   - SECTION 6.3: SIZING AND TYPICAL DETAILS OF FILTER STRIPS, INFILTRATION TRENCHES, SWALES AND LEAKY DAMS
2. DRAWING CONTAINS INFORMATION FROM: SKUKX-ALLES-000-PVL-100.01K (Planning) (1)

KEY:

- RED LINE BOUNDARY
- PROPOSED EXCEEDANCE ROUTE
- PROPOSED INFILTRATION TRENCH WITH UPSTREAM FILTER STRIP (42lin.M)
- PROPOSED SEDIMENT SWALE LOCATION (2179lin.M)
- PROPOSED MAINTENANCE ACCESS FOOTWAY WITH UPSTREAM FILTER STRIP (2426lin.M).

Issued/Revision		By	Appd	YYYY.MM.DD
P04	MAINTENANCE ASSESS FOOTWAY & SWALE REVISED.	CR	PM	2024.10.04
P03	UPDATED MASTERPLAN	CR	PM	2024.09.12
P02	UPDATED MASTERPLAN	CR	PM	2024.07.24
P01	FIRST ISSUE FOR PLANNING	AH	AJ	2024.07.08

Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
CR	AH	PM	2024.07.08

Issue Status

S2 - FOR INFORMATION

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ALLESTON SOLAR FARM,

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Title

PROPOSED SUDS MAINTENANCE

Project No. 333100437

A1 Scale 1:2500

Revision P04

Drawing No. 333100437-STN-HDG-XX-DR-HY-4102