

Our ref: 794-PLN-WWP-00230 Aston Flamville Solar Development

20 Farringdon Street
London, EC4A 4AB
T +44 20 3691 0500

Date: 6th September 2024

Elgin Energy EsCo Ltd,

Re: Aston Flamville Solar – Discharge of Conditions 17, 18 and 19

This technical note has been prepared to provide the information requested in the planning permission dated 3rd August 2022 for the planning application no. 22/00739/FUL, for a proposed Solar development at Land North and South of Lychgate Lane, Aston Flamville (nearest postcode LE10 3AQ). The conditions addressed in this technical note are no. 17, 18 and 19. These are summarised below:

- *Condition 17: Prior to the commencement of the development, a surface water drainage scheme shall be submitted to and approved in writing by the Local Planning Authority.*
- *Condition 18: Prior to the commencement of the development details in relation to the management of surface water on site during construction of the development shall be submitted to and approved in writing by the Local Planning Authority.*
- *Condition 19: Prior to the operational use of the approved development, details of the long-term maintenance of the surface water drainage system within the development shall be submitted to and approved in writing by the Local Planning Authority. The approved details shall thereafter be implemented for the duration of the operational phase .*

This technical note should also be read in conjunction with the Flood Risk Assessment (FRA) document reference no. HLEF82297, version 002, dated September 2022 compiled by RPS consulting services Ltd.

The technical note deems to provide further information regarding the drainage strategy for the site by providing details on the following aspects:

1. Greenfield and proposed runoff rates;
2. Drainage layout;
3. Attenuation calculations;
4. Clarification regarding impermeable area proposed in relation to the solar panels;
5. Confirmation of permeable surfacing construction materials and associated construction details;
6. Outline general drainage maintenance schedule; and
7. Surface water and groundwater construction management plan.

1.1 Introduction

Elgin Energy EsCo Ltd has submitted a planning application for a ground mounted photovoltaic solar farm with an electrical generating capacity of approximately 20MW together with associated equipment, infrastructure and ancillary works at Land North and South of Lychgate Lane, Aston Flamville. The application site covers an area of approximately 40 hectares (ha) in total with the western parcel occupying approximately 13ha and the eastern parcel occupying approximately 27ha.

The proposed development will comprise seven elements with supporting assets:

- Photovoltaic (PV) Solar Panels erected on steel frames in arrays of 24 or 48 panels;
- A primary sub-station typically measuring 6m (l) x 3.2m (w) x 3.4m (h);
- 19 inverters substations typically measuring 7m (l) x 2.5m (w) x 3m (h);
- Perimeter high tensile fixed knot fence;
- A number of strategically located CCTV security cameras (c. 3m high);
- Access will be via existing accesses into the site via Lychgate Lane; and
- Associated internal service tracks.

The planning application was supported by a Flood Risk Assessment (FRA) prepared by RPS in September 2022 (reference no. HLEF82297, version 002).

1.2 Climate Change

Peak rainfall climate change allowances are now provided on a catchment basis (updated July 2021). The site is situated within the Soar Management Catchment peak rainfall allowances. The peak rainfall allowances for this catchment are provided in **Table 1** below.

Table 1. 1% Annual Exceedance Rainfall Event - Soar Management Catchment peak rainfall allowances

Epoch	Central Allowance	Upper End Allowance
2050s	20%	40%
2070s	25%	40%

The 2070 'central' allowance has been assessed for developments within a lifetime between 2061 and 2100. This is as the development is an 'essential infrastructure' with an estimated lifetime of 40 years.

1.3 Development Impacts

Solar Panels

Compared to agricultural (arable & livestock) use, a solar farm is likely to be inherently better for surface water drainage than a continuation of the existing use. This is detailed further in the FRA report.

The majority of the Proposed Development will be occupied by solar arrays. Although arrays have a large land take, the actual ground impact is negligible. The only intrusion will be from the pile-driven posts. There will be one post for about 6-7 panels, so likely to be 6-7m between each post. Posts are made of galvanized steel and are not solid poles. Traditional fixed solar arrays have surface area ground impact in the range of 0.0012 m² - 0.0014 m².

Based on the drawings the panel width would be 1.3m. Assuming there will be posts every 6m the total number of posts would be 8,840.

Based on this, if the 0.0014m² per post is assumed, the total solar farm ground impact would be 12.38m² on a 40.75ha (407,500m²) Site. This means that what covers the majority of the land as "development" will have a ground impact on 0.003% of the Site.

There are 5 meters between solar arrays.

Substation Building

The substation building would create 20.0m² of new impermeable surface. The FRA takes a conservative approach and suggests that the building entails new impermeable surfaces. It is proposed to construct a French drain around the building which will have enough capacity to attenuate the runoff from the building during the 1 in 100 plus Climate Change event (40%).

20m² of substation control building dispersed across the 40.75ha (407,500 m²) site will represent a 0.005% impact based on a top-down view that assumes they create new impermeable surface.

Inverters

There will be 19 Inverter Units on the Site. Each unit would be approximately 2.5 m x 7 m (area of 17.5 m²), giving rise to 332.5m² of new impermeable surface. 332.5m² of inverter units dispersed across the 40.75ha (407,500 m²) site will represent a 0.082% impact based on a top-down view that assumes they create new impermeable surface.

The report takes a conservative approach and suggests that the ancillary buildings on Site will entail new hardstanding. However, this is not entirely accurate, as per the plans. The Inverter units are prefabricated containers. They are not intended as permanent buildings. The Site will require full reinstatement of the land to agricultural use at the end of the solar farm's operational life. Therefore, there is no interest in creating any kind of permanent foundation for the temporary ancillary buildings. No poured concrete or other non-permeable foundation will be used.

The containers must have a floor level that is off the ground by at least 100mm and they are typically on plinths or blocks 100-500mm off the ground. At Aston Flamville Solar Farm, the inverters will sit atop a 300mm deep gravel base with a 500mm void between the floor level of the unit and the permeable foundation beneath. Therefore, the only impermeable surface would be the area of blocks that stabilise the invertors on the gravel base.

Access Tracks

It is proposed that the internal access tracks will be comprised of gravel and fully permeable with no tarmac or other hardstanding type surface. The majority of rainwater will infiltrate through aggregate. Road design is composed by Type 2 aggregate or Type 3 to reduce runoff originated from the roads. Most will follow existing farm tracks so would not even be new access routes. As such they will have no impact with respect to surface water drainage. Geotextile membrane layers will help to secure the aggregate to prevent it sinking into the soil and this will help prevent ground compaction.

After the construction of the solar farm the heaviest vehicles likely to use the tracks are occasional van or 4x4 type vehicles. There will be less intensive traffic around the Site compared to existing farm use. This means there is low risk of over-use causing compaction that could compromise permeability. Despite this, it will be reasonable to include monitoring and maintenance of the internal accesses over the lifetime of the solar farm.

In construction there will be no HGVs using the internal access tracks around the Site except from the highway into the Site. All HGVs making deliveries to the Site for construction will drop off in temporary construction compounds at the access point, to be shown on design and layout drawings. Materials will then be delivered around the Site by tractor-trailer type vehicles which are the same as vehicles that currently use these routes around the working farm. This means there is low risk of traffic/vehicles causing excess soil compaction either in construction or during operation which could limit the efficacy of the tracks' permeability.

As such no impermeable area is anticipated as part of the development.

1.4 Impact Potential Conclusions

Impermeable Areas

The proposed actual/potential impermeable surface area within the 40.75ha (407,500m²) site is presented within **Table 2** below.

Table 2. Impermeable Areas

Development	Area (m ²)
Solar Arrays	12.4
Substation	20
Inverters	332.5
Total	364.9m²

This equates to 364.9 m² of potential new impermeable surfaces at the Site. This is equivalent to 0.09% of the whole site area.

1.5 Proposed Development SuDS Strategy

Greenfield Runoff Rates

The Site is currently undeveloped farmland and therefore the runoff rate is considered to be greenfield runoff rate. The existing greenfield runoff rates for the site area have been calculated using the FEH Method. The greenfield runoff calculations are summarised in **Table 4** below, and included in full as Appendix A.

Table 4. ICP SuDS Calculations Greenfield Runoff

Return Period (years)	Runoff Rate (l/s)
1 in 1	114.45
QBAR	137.90
1 in 30	275.79
1 in 100	354.39

Solar Panels

The impact of the solar panels is deemed negligible.

The Proposed Development is classified as “major” due to the development occupying an area greater than 1ha. However, a new building with a floorspace of more than 1000m² would also be classified as ‘major’. If the site sought planning permission based on developed (hard engineered) area alone it would not be classed as major.

The arrays are designed to avoid sheeting/ pooling/ erosion. Water drips off at multiple points onto vegetated ground below. In addition, there is significant space between rows (5m) to act as natural filter strips with vegetated ground that slows the movement of surface water.

Due to the size of the addition of the impermeable area, no additional SuDS features have been recommended. The proposed development will mimic existing ground conditions as detailed in the FRA.

Substation

It is recommended to place the substation on a permeable gravel base. This will not alter the underlying condition beyond the topsoil. What would otherwise be topsoil will be replaced by gravel, which has 30% more porosity and storage capacity than the existing topsoil would have. This means even if the gravel base is insufficient for storage and infiltration, the resulting conditions are no different than they would be on the as-is

farmland, except that the extra storage capacity of the gravel base is a betterment compared to the topsoil in the event that underlying conditions are not supporting effective infiltration.

The calculations have been run for the substation area of 20m². The required attenuation has been modelled in Causeway Flow as being 1.6m³. Appendix B provides full calculations for the 20m² substation. Based on the size of the substation and it being situated on a 300 mm subbase with a 30% porosity ratio, this will provide 1.8 m³ of storage.

The bases formed by gravel will provide storage of surface water runoff prior to infiltration, providing a betterment to current conditions.

Inverters

The containers must have a floor level that is off the ground by at least 100mm and they are typically on plinths or blocks 100-500mm off the ground. Within the Proposed Development, the inverters will sit atop a 300mm deep gravel base with a 500mm void between the floor level of the unit and the permeable foundation beneath. Therefore, the only impermeable surface would be the area of blocks that stabilise the invertors on the gravel base.

Lack of hardstanding beneath the building, the permeable foundation, and the void between the building and ground means that although the transformer units would have a total top-down area of 332.5m² in both the north and south respectively. This addition will not have the same effect as if these were creating 332.5m² of new impermeable surface. Instead, the bases formed by gravel will provide storage of surface water runoff prior to infiltration.

The calculations have been run for the individual inverters, which have an impermeable area of 17.5m². Within Causeway Flow the area needed to be rounded up to 20m², as the area is input in hectares with a maximum of three decimal places (rounded up to 0.002ha). The required attenuation has been modelled in Causeway Flow as being 1.6 m³. Appendix B provides full calculations for a singular inverter. Based on the size of the inverters, and that they will be situated on a 300mm subbase with a 30% porosity ratio, this will provide 1.8 m³ of storage, same for the substation.

The bases formed by gravel will provide storage of surface water runoff prior to infiltration, providing a betterment to current conditions.

Access Tracks

No attenuation is required.

A copy of the drainage layout is presented in Appendix C of this technical note.

Drainage Maintenance

In accordance with the requirements of Condition 19, a Maintenance plan detailing the maintenance arrangements including who is responsible for different elements of the surface water drainage strategy has been prepared. This is available as Appendix E of this technical note.

In accordance with the requirements of Condition 18, a Surface Water and Groundwater Construction Management Scheme has been prepared. This is available as Appendix F of this technical note.

Drainage maintenance will be undertaken by the Applicant or appointed management company.

1.6 RPS Comments and Recommendations

It has been demonstrated that the solar panels will have a negligible impact on the runoff and the runoff will mimic existing runoff conditions.

The access tracks will be constructed using permeable material as such no mitigation is required for these.

It has been demonstrated that 300mm gravel subbases beneath the Substation and inverters will be needed to provide sufficient level of attenuation for the site.

Our ref: : 794-PLN-WWP-00230 Aston Flamville Solar Development

We trust that this information sufficiently addresses your information requirements for discharging condition 17, 18 and 19 of the planning permission dated 3rd August 2022 for the planning application 22/00739/FUL, however should you require any further information or clarification then we would be happy to provide this.

Yours sincerely,
for RPS Consulting Services Ltd

Francesca Caggiano
Principal Consultant - Hydrology
Francesca.caggiano@rpsgroup.com
+44 02072803246

Appendix A – Greenfield Runoff Rate Calculations

Calculated by:	Josh Hughes
Site name:	Aston Flamville
Site location:	Aston Flamville

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	52.52382° N
Longitude:	1.3233° W
Reference:	3789819939
Date:	Sep 03 2024 16:48

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):	41.746
-----------------------	--------

Methodology

Q _{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.397
Q _{MED} (l/s):	
Q _{BAR} / Q _{MED} factor:	1.12

Hydrological characteristics

	Default	Edited
SAAR (mm):	639	633
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):		137.9
1 in 1 year (l/s):		114.45
1 in 30 years (l/s):		275.79
1 in 100 year (l/s):		354.39
1 in 200 years (l/s):		419.21

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix B – Attenuation Calculations



Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	9.000
CV	1.000	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)
1-Area	0.002	1.00	100.000	1200	1010.000	1000.000	0.500
2-Storage			100.000	1200	1020.000	1000.000	0.550

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	0.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	2880	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Node 2-Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	99.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

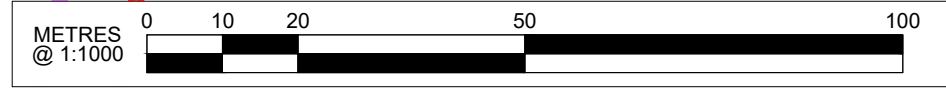
Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	20.0	0.0	0.300	20.0	0.0



Results for 100 year +40% 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	1-Area	630	99.650	0.150	0.1	0.1691	0.0000	OK
960 minute winter	2-Storage	630	99.649	0.199	0.1	1.4181	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	1-Area	1.001	2-Storage	0.1	0.431	0.001	0.0327	
960 minute winter	2-Storage	Pump		0.0				0.0

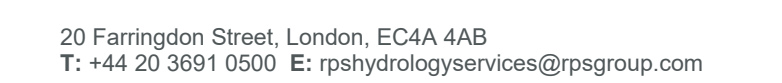
Appendix C – Drainage Layout



This drawing illustrates a sketch proposal only and as such is subject to detailed site investigation including ground conditions/contaminants, drainage, design and planning/density negotiations. The layout may be based upon an enlargement of an OS sheet or other small scale plans and its accuracy will need to be verified by Survey. Full risk analysis under the CDM Regulations has not been undertaken.

General Subbase

P01	First Issue.	JH	FC	05.09
Rev	Description	By	Ckd	Date



Status	Scale	Date Created
Preliminary	1:1000 @A0	05.09.24
Task Team Manager	Information Author	Task Information Manager
FC	JH	FC
Document Number		
00230-RPS-SD-ZR-D-D100-P01		

RPS Project Number
794-PLN-WWP-00230
rpsgroup.com

P01	First Issue.	JH	FC	05.09.24
Rev	Description	By	Ckd	Date



20 Farringdon Street, London, EC4A 4AB
T: +44 20 3691 0500 E: rpshydrologyservices@rpsgroup.com

Client **Elgin Energy EsCo Ltd**

Project **Aston Flamville Solar Farm**

Title Conceptual Surface Water
Drainage Strategy
Sheet 2

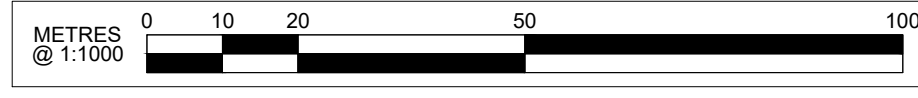
Status	Scale	Date Create
--------	-------	-------------

Task Team Manager	Information Author	Task Inform Manager
----------------------	-----------------------	------------------------

Document Number

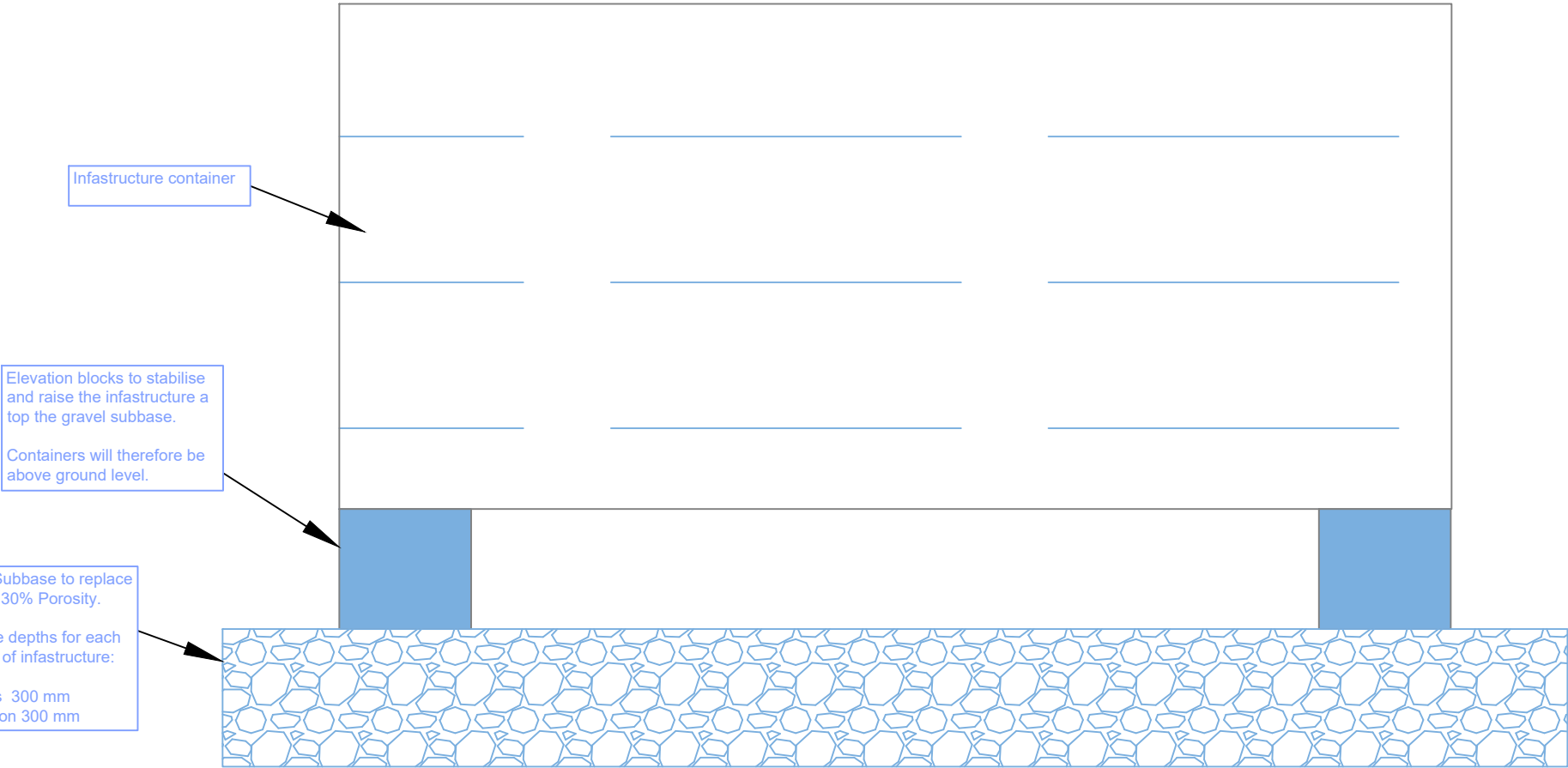
794-PLN-WWP-0023

P01



Appendix D – Sub-base gravel section

O:\Environment\01 Projects\794-ENV-HYD\Sub Projects\794-PLN-WWP-00230 - Aston Flamville\6 Drainage\Subbase Drawing.dwg



© 2024 RPS Group

- Notes
1. This drawing has been prepared in accordance with the scope of RPS's appointment with its client and is subject to the terms and conditions of that appointment. RPS accepts no liability for any use of this document other than by its client and only for the purposes for which it was prepared and provided.
 2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.
 3. This drawing should be read in conjunction with all other relevant drawings and specifications.

A	First Issue.	JH	FC	05.09.24
Rev	Description	By	Ckd	Date



A TETRA TECH COMPANY

20 Farringdon Street, London, EC4A 4AB
T: +44 20 3691 0500 E: rpshydrologyservices@rpsgroup.com

Client Elgin Energy EsCo Ltd

Project Aston Flamville Solar Farm

Title Conceptual Subbase Drawing

Status Conceptual Scale NTS Date Created 05.09.24

Task Team Manager JM Information Author FC Task Information Manager JM

Document Number - D01

RPS Project Number 794-PLN-WWP-00230

rpsgroup.com

Revision A

Appendix E – Maintenance Plan and Schedule for Storm Drainage

ASTON FLAMVILLE SOLAR FARM

Maintenance Plan and Schedule for Storm Drainage Infrastructure



794-PLN-WWP-00230
Construction drainage scheme
1
September 2024

MAINTENANCE PLAN AND SCHEDULE FOR SITE DRAINAGE INFRASTRUCTURE



Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
0	Draft	Francesca Caggiano	Jonathan Morley	Jonathan Morley	06.09.2024



Approval for issue

Jonathan Morley

1 September 2024

© Copyright RPS Consulting Group Limited. All rights reserved.

The report has been prepared for the exclusive use of our client and unless otherwise agreed in writing by RPS Consulting Group Limited, any of its subsidiaries, or a related entity (collectively 'RPS'), no other party may use, make use of, or rely on the contents of this report. The report has been compiled using the resources agreed with the client and in accordance with the scope of work agreed with the client. No liability is accepted by RPS for any use of this report, other than the purpose for which it was prepared. The report does not account for any changes relating to the subject matter of the report, or any legislative or regulatory changes that have occurred since the report was produced and that may affect the report. RPS does not accept any responsibility or liability for loss whatsoever to any third party caused by, related to or arising out of any use or reliance on the report.

RPS accepts no responsibility for any documents or information supplied to RPS by others and no legal liability arising from the use by others of opinions or data contained in this report. It is expressly stated that no independent verification of any documents or information supplied by others has been made. RPS has used reasonable skill, care and diligence in compiling this report and no warranty is provided as to the report's accuracy. No part of this report may be copied or reproduced, by any means, without the prior written consent of RPS.

Contents

1	INTRODUCTION.....	4
1.1	Location and Proposed Development.....	4
2	RECOMMENDED MAINTENANCE	5
2.1	Land / Ground Cover.....	5
2.2	Gravel Sub-base	6

1 INTRODUCTION

RPS were commissioned to prepare a Maintenance and Schedule Plan for site drainage infrastructure in support of the proposed development at Land North and South of Lychgate Lane, Aston Flamville (planning application reference no. 22/00739/FUL). This document contains a design intent for the plan and schedule for the future maintenance of the site drainage infrastructure to mitigate against the risk of flooding at the site and surrounding environments.

1.1 Location and Proposed Development

The site is located to the south west of Aston Flamville, on both sides of M69. Grid Reference SP 45699 92094, is irregular in shape and occupies an area of approximately 40 hectares (ha).

Accesses to the site would be provided through existing tracks into the site via Lychgate Lane.

RPS has been appointed to prepare a maintenance plan and schedule for the surface water drainage infrastructure at the site. Elgin Energy EsCo Ltd will remain responsible for Operational and Maintenance (O&M) activities and frequencies.

Elgin Energy EsCo Ltd has allowed for, within the Project Business Case, for a O&M budget for the life time of the solar farm operation. Surface water maintenance is included within a future O&M Contract draft scope of services, which is expected to be undertaken for the life time of the solar farm development.

A copy of the drainage layout is shown as Appendix C of the Aston Flamville Technical note (reference 794-PLN-WWP-00230 dated September 2024).

2 RECOMMENDED MAINTENANCE

2.1 Land / Ground Cover

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Litter/debris removal	Monthly
	Manage vegetation	Monthly (at start, then as required)
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years then half yearly, or as required
	Weed Killing	Monthly (During growing season), or as required
	Burn out fence lines	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth (wildflower mix meadows), alter plant type to better suit conditions if required	As required
	Remove sediment from inlet and outlet when required	Every 5 years or as required
Remedial Maintenance	Repair Erosion or other damage by reseeding Wildflower mix meadows	As required

MAINTENANCE PLAN AND SCHEDULE FOR SITE DRAINAGE INFRASTRUCTURE

2.2 Gravel Sub-base

Maintenance schedule	Require Action	Typical Frequency
Regular Maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of 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)
Occasional Maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspection
Remedial Actions	Reconstruct and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check gravel to ensure emptying is occurring	Annually

Annex 1

Proposed Maintenance and Inspection Schedule Record Sheet

rpsgroup.com

Appendix F – Surface Water and Groundwater Construction Management Scheme

ASTON FLAMVILLE

Surface Water Drainage and Groundwater Strategy for Construction Phase



PLN-WWP-OO230
Construction drainage scheme
1
September 2024

REPORT



Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
0	Draft	Francesca Caggiano	Jonathan Morley	Jonathan Morley	06.09.2024
1	Final	Francesca Caggiano	Jonathan Morley	Jonathan Morley	06.09.2024

Approval for issue

Jonathan Morley

September 2024

© Copyright RPS Consulting Group Limited. All rights reserved.

The report has been prepared for the exclusive use of our client and unless otherwise agreed in writing by RPS Consulting Group Limited, any of its subsidiaries, or a related entity (collectively 'RPS'), no other party may use, make use of, or rely on the contents of this report. The report has been compiled using the resources agreed with the client and in accordance with the scope of work agreed with the client. No liability is accepted by RPS for any use of this report, other than the purpose for which it was prepared. The report does not account for any changes relating to the subject matter of the report, or any legislative or regulatory changes that have occurred since the report was produced and that may affect the report. RPS does not accept any responsibility or liability for loss whatsoever to any third party caused by, related to or arising out of any use or reliance on the report.

RPS accepts no responsibility for any documents or information supplied to RPS by others and no legal liability arising from the use by others of opinions or data contained in this report. It is expressly stated that no independent verification of any documents or information supplied by others has been made. RPS has used reasonable skill, care and diligence in compiling this report and no warranty is provided as to the report's accuracy. No part of this report may be copied or reproduced, by any means, without the prior written consent of RPS.

Contents

1	INTRODUCTION.....	4
1.1	Construction Approach.....	4
2	SITE SETTING.....	7
2.1	Site Location	7
2.2	Proposed Development.....	7
2.2.1	Operational Phase Drainage Design	7
2.3	Hydrological Setting	8
2.4	Groundwater Vulnerability	8
2.5	Site Activities which could be a source of groundwater pollution	8
3	POLLUTION PREVENTION AND MITIGATION.....	10
3.1	Responsibility	10
3.2	General Pollution Prevention Measures	10
3.3	COSHH	11
3.4	Pollution Monitoring & Controls.....	11
4	TEMPORARY DRAINAGE.....	12
4.1	Scope and Minimum Requirements	12
4.2	Silt Mitigation.....	12
4.3	Soil Management	13
4.4	Road Drainage	13
5	CHECKLIST.....	15
6	CONSTRUCTION SCHEDULE	16

1 INTRODUCTION

The National Planning Policy Framework (released in March 2012 and updated in December 2023) paragraph 158 and paragraph 173 state that local planning authorities should ensure development does not increase flood risk elsewhere and does not contribute to water pollution.

Hinckley and Bosworth Borough Council and Blaby District Council have granted planning permission for the Aston Flamville Solar Farm at Land North and South of Lychgate Lane, Aston Farmville. The planning permission is granted for a 20MW solar photovoltaic farm with associated equipment, infrastructure and ancillary works. The planning application reference no. is 22/00739/FUL and 22/0048/FUL respectively for the two decision notices. Both decision notices require specific pre-commencement conditions to be discharged.

Condition no. 18 and 19 respectively for Hinckley and Borough Council and Blaby District Council are as follows: *“Prior to the commencement of the development details in relation to the management of surface water during the construction of the development shall be submitted to and approved in writing by the Local/District Planning Authority”.*

This report outlines the Surface Water and Groundwater Drainage Strategy which needs to be applied to construction activities relating to the proposed development.

1.1 Construction Approach

A construction environmental management plan for the site will be prepared as a separate document.

The development will require the assembly and erection of ground mounted solar panels. In addition, the works will entail the establishment of a stone access track with geotextile underlay, underground cabling, a grid connection hub and associated infrastructure, landscaping and environmental enhancements. No demolition is required to facilitate the construction works.

The works will include:

- Site set-up works including establishment of secure site access, works signage, dedicated laydown area(s) and construction compound;
- Site preparation including soil stripping in areas of temporary hardstanding (e.g. construction compounds) to avoid soil compaction and for the establishment of the access track;
- Laying of stone aggregate to form access track through the site;
- Erection of steel frame mounting systems in rows across the site;
- Fixing of solar panels onto steel frame system;
- Installation of inverter units and substation;
- Digging of trenches and laying of electrical cables;
- Erection electrical transmission components;
- Installing security fencing around the site and ancillary equipment; and
- Landscaping and biodiversity enhancements.

Specifically, the construction work is likely to consist of the following activities:

- Enabling
 - Site preparation and civil engineering works
 - Preparation of land for construction (e.g. seeding). Site preparation including soil stripping in areas of temporary hardstanding (e.g. construction compounds) to avoid soil compaction and for the establishment of the access track;
 - Establishment of the key habitat management areas;
 - Import of construction materials, plant and equipment to site;
 - Installing security fencing around the site and ancillary equipment;
 - Establishment of the perimeter deer fence;
 - Establishment of internal tracks,
 - Establishment of the site access track, and site entrance highway improvements,
 - Establishment of the main construction compound;
 - Drainage works;
 - Marking out the location of the development infrastructure;
 - Landscaping and biodiversity enhancements; and
 - Demobilisation, removal of construction compound.
- Construction of Solar Installation
 - Solar PV array construction
 - Import of components to site
 - Installation of module mount verticals
 - Erection of steel frame mounting systems in rows across the site;
 - Mounting of modules and inverters;
 - Erection of steel frame mounting systems in rows across the site, both piled and ballasted;
 - Mounting of modules and inverters;
 - Trenching and installation of electric cabling;
 - MVS foundation excavation and construction;
 - Installation of MVS units;
 - Install CCTV system;
 - Testing and commissioning; and
 - Landscaping and habitat creation.

- Construction of Supporting Infrastructure
 - Construction of on-site electrical infrastructure to facilitate the export of generated electricity;
 - Site preparation and civil engineering works for the substations;
 - Trenching and directional drilling for pit and duct system, and installation of electrical cabling;
 - Import of components to site; and
 - Installation of the substation.

The proposed drainage scheme for the construction phase is outlined in the sections below.

2 SITE SETTING

2.1 Site Location

The site is located to the south west of the village of Aston Flamville, National Grid Reference SP 455839 92721, is irregular in shape and occupies an area of approximately 40 hectares (ha).

2.2 Proposed Development

The development proposes to construct a solar photovoltaic (PV) system. Details of the development and the associated plans are presented in the “Aston Flamville Solar Farm” FRA report v002 dated September 2022 (ref HLEF82294).

The site is currently comprised of arable agricultural land. It is formed by two separate parcels of land with the western parcel occupying approximately 13ha and the eastern parcel occupying approximately 27ha.

Site access to the parcels will be retained via existing tracks into the site via Lychgate Lane.

While the solar panels will not increase the impermeable area as soft landscaping will remain beneath them, the proposed proportions are approximately as follows:

- 20% solar panels, underlain by soft landscaping
- <1% hardstanding
- 79% open soft landscaping.

The development comprises the construction of solar array which will not result in an increase in impermeable area beneath the solar panels themselves. One substation of approximately 20m² is proposed as part of the development and no. 19 inverters of approximately 17.5m² each.

2.2.1 Operational Phase Drainage Design

The proposed development comprises the construction of a solar array on driven piles which will not result in an increase in impermeable area beneath the solar panels themselves. A very limited area of hardstanding will be created beneath the proposed substation and inverters.

It is proposed to provide screening planting which will help intercept the overland flow that could be caused by the new energy facilities, providing limited attenuation and increased infiltration potential. Additionally, the substation and inverters will be placed on permeable gravel bases. This will not alter the underlying condition beyond the topsoil. What would otherwise be topsoil will be replaced by gravel, which has 30% more porosity and storage capacity than the existing top soil would have.

The aforementioned techniques will discourage soil erosion within the site, whilst maintaining the existing overland flow paths which feed into the local fluvial network. It is noted that the runoff quality from the panels will be clean and poses a low environmental risk.

2.3 Hydrological Setting

OS Mapping indicates that the western parcel is intersected by an 'Ordinary Watercourse' which appears to flow in a north easterly direction before joining another 'Ordinary Watercourse'. This was confirmed during a site visit as part of the original FRA submitted with the planning application.

Mapping also indicates that the eastern parcel is bounded by watercourses along the southern and eastern boundaries. The watercourses form a confluence at the south east corner of the site and flow into the Soar Brook approximately 460m south of the site. The Soar Brook flows east where it becomes a Main River at approximately 750m south east of the site.

This report presents details of the proposed drainage and pollution avoidance measures for the construction of the proposed solar farm.

2.4 Groundwater Vulnerability

British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that the site is underlain by superficial deposits of the Bosworth Clay Member, which are described as comprising Clay and Silt. The site is shown to be wholly underlain by bedrock deposits from the Mercia Mudstone Group, which is described as comprising of Mudstone.

The soils are described as 'slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils' by the National Soils Research Institute.

According to the EA's Aquifer Designation Mapping, the Bosworth Clay Member at the surface are classified as Unproductive Strata. These formations have a low permeability and have negligible significance in water supply or base flow.

The bedrock deposits from Mercia Mudstone are classified as Secondary B Aquifer. These formations are generally formed of lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.

EA online groundwater Source Protection Zone (SPZ) mapping indicates that the site is not located within a groundwater SPZ.

The principal potential risk to the underlying aquifer from the development is acknowledged to be during the constructional phase of works. Whilst this represent a short-term potential risk to the groundwater body the risk will be appropriately managed and constrained via the implementation of robust pollution prevention measures and mitigation controls (presented below).

2.5 Site Activities which could be a source of groundwater pollution

Table 1 identifies the key activities on-site that have the potential to be a source of soil and groundwater pollution during the construction phase of the development and any potential pathways. The activities outlined in Table 1 are indicative and these may be amended or developed following an appointment of the Principal Contractor.

Table 1: Potential pollution sources & pathways identified within the site

Potential Source	Potential Pathway	Potential Receptor	Risk
Spillage of hydrocarbons, oils etc. during construction and operation activities.	Migration to surface water.	Drains and wider surface water network	Low to Moderate
Spillage of hydrocarbons, oils etc. during construction and operation activities.	Leaching of contaminants to soils and into shallow groundwater.	Bosworth Clay Member (Unproductive Strata)	Low
Spillage of hydrocarbons, oils etc. during construction and operation activities.	Vertical migration into deep groundwater.	Mercia Mudstone (Secondary B Aquifer)	Low

A reduction of risk to surrounding receptors will be possible through the implementation of appropriate mitigation measures (Section 5 of this report) and surface water drainage strategy (Section 6 of this report) during the construction and operation phase of the development as outlined below.

3 POLLUTION PREVENTION AND MITIGATION

3.1 Responsibility

The Contractor is responsible for pollution prevention for the duration of the contract and until such time as permanent measures, such as permanent drainage and silt mitigation controls, are deemed to be adequate and appropriately constructed.

This responsibility will include the actions of any third party who is sub-contracted by the Contractor or otherwise involved in the project.

It is the responsibility of the Contractor to contact the EA, other statutory and non-statutory bodies in the vicinity of and downstream of the proposed project so that the requirements and interests of these parties are adhered to and protected throughout the duration of the Contract.

The Contractor is familiar with and executes works in accordance with the guidance provided in the EA Pollution Prevention Guidelines and other guideline documents as detailed in Section 9.

The Contractor ensures that all staff and subcontractors working on site will be familiar with pollution prevention and mitigation measures as detailed in this document; this includes subcontractors, Employer's direct contractors and other Employer's representatives working on the site.

3.2 General Pollution Prevention Measures

The following points (not exhaustive) indicate general pollution prevention measures in accordance with those highlighted within the guidelines referenced in this document and the associated FRA and Outline Drainage (HLEF82294 - RPS, 2022). Pollution Prevention measures relating to specific tasks are also detailed in the respective sections of this document.

- Any material or substance which could cause pollution, including fuels / oils, wet cement, raw concrete or silty water will be prevented from entering groundwater, surface water drains or watercourses by the appropriate use of and appropriate placement of (temporary) silt fences, cut-off drains, silt traps where appropriate. Any sign of failing water treatment measures or sight of silted or contaminated water entering any watercourse or open excavation on site will be reported immediately. This will include evidence of any perched water ingress via exposed granular lenses within shallow excavations across the site.
- Any silty water generated on site will ideally be settled out as much as possible through drainage mitigation measures (silt traps, etc.).
- External fuel delivery lorries will only be allowed as far as the site compound where there will be a refuelling area equipped with an impermeable base.
- Fuel transfer / refuelling will be undertaken by specifically trained and competent staff or undertaken under competent supervision.
- Areas of waste oil / fuel / chemical storage and refuelling will be located an appropriate distance away from watercourses, drainage paths and/or open excavations. Where this is not possible, a minimum distance will be agreed with the Employer. Such storage areas will be sited on an impervious base to prevent the downward percolation of contaminants to natural soils and groundwater.

- All refuelling will be carried out at least 8 metres from watercourses and open excavations. Where this buffer distance cannot be achieved a minimum distance will be agreed with the EA. Fuel pipes on plant, outlets at fuel tanks etc will be regularly checked and maintained to ensure that no drips or leaks to ground occur.
- Oils/ fuels / chemicals required on site will be stored within a lock secured unit.
- Site personnel will be formally trained in the use of spill kits which will be available within each plant on site and also located close to identified pollution sources or sensitive receptors (fuel storage areas, water course crossings, etc).
- Irrespective of the buffer distance and location of refuelling, interceptor drip trays (or similar, e.g. plant nappies, – open metal drip trays are not acceptable) will be available. Interceptor drip trays will be positioned under any stationary mobile plant to prevent oil contamination of the ground surface or water.
- All stockpiled materials will be stored in designated areas and isolated from any surface drains and a minimum of 8 metres away from watercourses.
- Washing-out of concrete wagons on site shall only be permitted when the Contractor has provided a designated, suitably prepared wash-out area with signage identifying the area as suitable for concrete wagon wash-out.
- The concrete ‘washout’ in the designated area will not be emptied into any watercourse and/or discharged onto ground and shall be disposed of in accordance with the Site Waste Management Plan. This will include removal from site via a tanker or similar.
- Tools, equipment or materials will not be washed in watercourses. Mortar mixing and material storage areas must be away from watercourses. Dirty water will be directed to a holding tank prior to removal from site via a tanker or similar.

3.3 COSHH

The Contractor is responsible for ensuring that all materials ordered or brought to site listed as hazardous under the Control of Substances Hazardous to Health (COSHH) Regulations are accompanied with a hazardous information sheet. The Contractor complies with the COSHH Regulations.

A site specific Construction Environmental Management Plan will be produced prior to any construction works. This will be available as a separate document.

3.4 Pollution Monitoring & Controls

The Contractor carries out regular inspections of oil/fuel storage areas and plant. The frequency and responsibility for undertaking these inspections will be recorded by the Contractor and communicated to the Employer prior to commencement of the works.

To ensure compliance of the works with this document and pollution prevention requirements, the Employer regularly monitors the Contractor's works. Should the Employer identify any failure to comply with the requirements of this document or the Contractor's own method statements the Employer may stop the associated works until such time as the failure is rectified.

4 TEMPORARY DRAINAGE

4.1 Scope and Minimum Requirements

The Contractor to submit all temporary drainage designs and drawings in a timely manner prior to the start of the works. Where approval of these designs is required by Local Planning Authority and their Consultees, the Contractor allows an appropriate amount of time for approval in accordance with the Local Planning Authority approval timeframes.

The Contractor undertakes maintenance of all temporary and permanent drainage solutions as and when required at a frequency at least weekly and maintains a Drainage Maintenance Register which is issued to the Project Manager on a weekly basis.

The Contractor designs all new drainage (excluding temporary drainage) to accommodate a 1:100 year + 40% climate change storm event, as a minimum.

The Contractor designs and constructs a drainage system including all silt mitigation measures necessary to prevent the pollution of watercourses and groundwater via open excavations for construction and post construction activities.

As a minimum all temporary drainage is installed as the road is constructed, where possible the permanent drainage is installed as the works progress. In the event that temporary drainage is installed at the time of construction the permanent drainage is installed within 3 months of that section of road being completed.

All drainage associated with the works, with the exception of that carrying purely Greenfield run-off, is not permitted to discharge directly into any existing drainage or watercourse without at least 2 treatment volumes.

The Contractor does not discharge water on either a temporary or permanent basis unless he has acceptance from the EA, and complied with the requirements of the relevant Authorities, Utilities and Service Providers.

The Contractor does not discharge any drainage within a watercourse unless accepted otherwise by the Project Manager.

4.2 Silt Mitigation

The Contractor erects and maintains silt fences to protect all watercourses and open excavations, which may be affected by the works. The Contractor maintains these weekly to the satisfaction of the Project Manager.

All drainage associated with the works, with the exception of that carrying purely greenfield run-off, is not permitted to discharge without receiving the equivalent of at least 2 treatment volumes as a minimum.

The Contractor undertakes maintenance of all temporary and permanent drainage solutions as and when required and at a frequency of at least weekly and manages a Drainage Maintenance Register which is issued to the Project Manager on a weekly basis.

Silt laden run off should be expected from any areas of recently exposed soil. This silt laden run-off will be captured and directed towards specially constructed sediment control structures.

4.3 Soil Management

The management of soil is essential to ensure the natural drainage of the site is maintained and avoid an increase in surface water flooding.

To minimise the potential impacts from soil compaction and changes in flow pathways a number of mitigation techniques have been suggested as follows. To meet soil protection guidance, DEFRA objectives of Construction Code of Practice for the Sustainable Use of Soils on Construction Sites are recommended.

Soil compaction will be limited during the construction phase by a number of measures;

- Using only light machinery to install the solar panels and low ground pressure vehicles to be used during extreme rainfall events.
- Where construction has resulted in soil compaction, the areas between panel rows would be tilled / scarified to an appropriate depth and then re-seeded with an appropriate vegetation cover.
- During the first few years there should be frequent inspections of the planting and soil to ensure it is growing properly, isn't bare and isn't compacted. Any remedial work should occur as soon as possible.
- During operation, maintenance of infrastructure will be limited and only require light machinery, therefore no change in the existing permeability of the soil would be caused.

The presence of appropriately maintained vegetation at all times across the site will mitigate potential increases in runoff and soil erosion, which can be a contributing factor to greater runoff.

Any existing field or tile drainage system would be restored where affected by construction.

All access tracks will be made out of granular material and will therefore be permeable, reducing the potential increase in surface runoff.

4.4 Road Drainage

The Contractor designs all new drainage to be installed alongside the proposed development, where appropriate.

The Contractor installs all permanent drainage (in this case it is gravel bases under solar associated substations and inverters) concurrently with all adjacent infrastructure, in particular the Contractor installs the permanent drainage in tandem with the road construction such that no section of road is trafficked until the associated drainage is complete.

If the Contractor constructs any parts of the works without its designated drainage system in place, or a sufficient temporary alternative, the Project Manager may instruct the Contractor to exclude all non-essential traffic from that area until the drainage system is in place.

Greenfield run-off and development run-off will be kept separate where possible and will be channelled separately to suitably vegetated areas at least 8 metres from watercourses to allow the settlement of solids on site.

REPORT

Internal site roadways will be excavated by 360 excavator, topsoil material side cast and spread on existing field, then compacted. Sized aggregate installed on geotextile (woven or unwoven) material in layers of 200mm deep then compacted. majority of rainwater will infiltrate through aggregate. Road design is composed by Type 2 or Type 3 permeable aggregate to reduce runoff originated from the roads.

5 CHECKLIST

The information listed in the table below will be provided by the Contractor to the Employer according to the provisions of the contract, as indicated.

Pre-commencement of works:	Yes/No
Name and CV of nominated and appropriately qualified person for site based single point of contact for all environmental matters	
Communication Plan	
Risk Assessment & Method Statements	
Schedule of toolbox talks	
A Site Waste Management Plan	
Details of proposed waste contractors and site plan showing waste collection / storage points	
Drainage Maintenance Register	
Excavation / Reinstatement plans	
Environmental Incident and Emergency Response Plan	
During and post-completion of works:	Yes/No
Records of relevant communication, meetings and reports	
Records of site inductions and tool box talks	
Records of communication with EA, LPA and LLFA	
Records of all environmental checks/inspections	
COSHH documentation	
Site Waste Management Plan and related information	
Drainage Maintenance Register	
Records of water quality monitoring	
Excavation Register	

Note: The above list only relates to requirements of this Drainage Construction Strategy. As part of the Contract, other information provisions will be required from the Contractor.

6 CONSTRUCTION SCHEDULE

It is proposed that initial on site works would be progressed in the stages listed below. Commentary specific to how surface water run-off would be managed is also provided.

- Temporary access road installation– run-off directed to a lined attenuation features for settlements and removal from site. Water to be tested prior to discharge. Any potentially contaminated water to be tanked off site on a regular basis to preserve available storage capacity.
- Permanent access road prep work including sub-base and kerbs– run-off directed to a lined attenuation features for settlements and removal from site. Water to be tested prior to discharge. Any potentially contaminated water to be tanked off site on a regular basis to preserve available storage capacity.
- Following installation of the surface water attenuation features all future run-off from the new impermeable areas will be dealt with by the purpose built gravel sub-base with capacity for a 1 in 100 including climate change event.