DRAGON LNG PV FARM

Flood Risk Assessment and Surface Water Drainage Strategy

Prepared for: Anesco

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Executive Summary

SLR Consulting Limited (SLR) has prepared this Flood Consequence Assessment (FCA) and Surface Water Drainage Strategy (SWDS) on behalf of Anesco Ltd to support a pre-application submission for proposed Photo Voltaic (PV) Farm, on land off West Perimeter Road, Dragon LNG Terminal, Milford Haven, SA73 1DR. A summary of key findings from this report are provided below.

Subject	Element	Findings
Site Flood Risk	Tidal	The site is bound by the tidal water body of Daugleddau, which, even in consideration of climate change allowances, would not result in flooding of the site.
	Fluvial	The development advice map indicates the site lies wholly in Flood Zone A. there is no fluvial flood outline associated with the channels seemingly operated by Dragon LNG, or the pond and watercourse system in the north west, which all discharge away from the site. These features are not considered to pose a fluvial flood risk to the site.
	Ground Water	Groundwater levels locally are 7-14m bgl and therefore considered unlikely to emerge at the surface.
	Surface Water	The surface water flood mapping provided by Natural Resources Wales indicates there are no areas of elevated surface water or pluvial flood risk on the site. This risk is therefore very low.
	Sewers and Artificial Sources	Welsh Water do not have any mains or sewerage assets within the vicinity of the site. Known artificial sources (pond features associated with Dragon LNG) would follow local topographic gradients either west or south east, away from the site in either occurrence.
Planning Requirements	Justification of Location and Acceptability Criteria	As the site lies wholly in Flood Zone A, there is no need to justify the location of the development, and the acceptability criteria is considered passed.
Mitigation measures	Design Flood Event	The design flood event (DFE) is the defended 1 % AEP event. A climate change allowance has been considered for peak rainfall intensity (20%) at the development site with no anticipated adverse impact.
	Finished Floor Levels	The site is at low risk of tidal, fluvial, and surface water flooding and there is no necessity to raise finished floor levels from the original design.
	Safe access and egress	Not Required.
	Floodplain compensation	Not Required.
	Surface water drainage strategy	A Surface Water Drainage Strategy has been developed following two options of surface water disposal. **Option 1 (infiltration to ground)** Runoff from the impermeable areas will be piped towards the swale for attenuation, pollution mitigation and full infiltration to ground. **Option 2 (discharge to surface waters)** Runoff from the impermeable areas will be piped towards the swale for attenuation and pollution mitigation. Discharge of surface water runoff from the swale is controlled using a hydro-brake to 1l/s. Flows from the hydro-brake are conveyed via an underground pipe system, outfalling into a watercourse north of the site. Both methods (infiltration to ground and discharge to surface water) successfully offset the pollution hazard indices to satisfy the Simple Index Method.
	Residual Risk	Exceedance flood events in excess of the design standard indicates runoff will revert to the pre-existing regime with flows overtopping the swale and flowing west / north west away from the site.
Conclusion		This Flood Consequence Assessment and Surface Water Drainage Strategy concludes that the requirements of national, regional, and local planning policy can be achieved at the site given the nature of development proposed.

1.0 Introduction

SLR Consulting Limited (SLR) has been appointed by Anesco Ltd (the client) to produce a Flood Consequence Assessment (FCA) and Drainage Strategy for the proposed Dragon LNG Photo Voltaic (PV) Farm, on land off West Perimeter Road, Dragon LNG Terminal, Milford Haven, SA73 1DR.

This document, a Flood Consequence Assessment (FCA) and Drainage Strategy, forms part of a Planning Application and records the findings of a site walkover and assessment carried out in October 2021 in order to prepare the Flood Consequence Assessment and Drainage Strategy for the proposals. This FCA has been prepared by SLR Consulting Ltd (SLR), under the direction of a Principal Hydrologist of SLR who specialises in flood risk and associated planning matters.

1.1 Site Location

The site is centred on National Grid Reference (NGR) 92650 04747 and covers a total area of 15.78ha. Situated to the east of Milford Haven, Pembrokeshire, the site sits within the larger Dragon LNG Terminal (oil refinery) and bound by the estuarine waters of Daugleddau in the south. Access to the site is provided to the north by West Perimeter Road off the B4325.

A site location plan is included below in Figure 1-1.

Figure 1-1
Site Location Plan

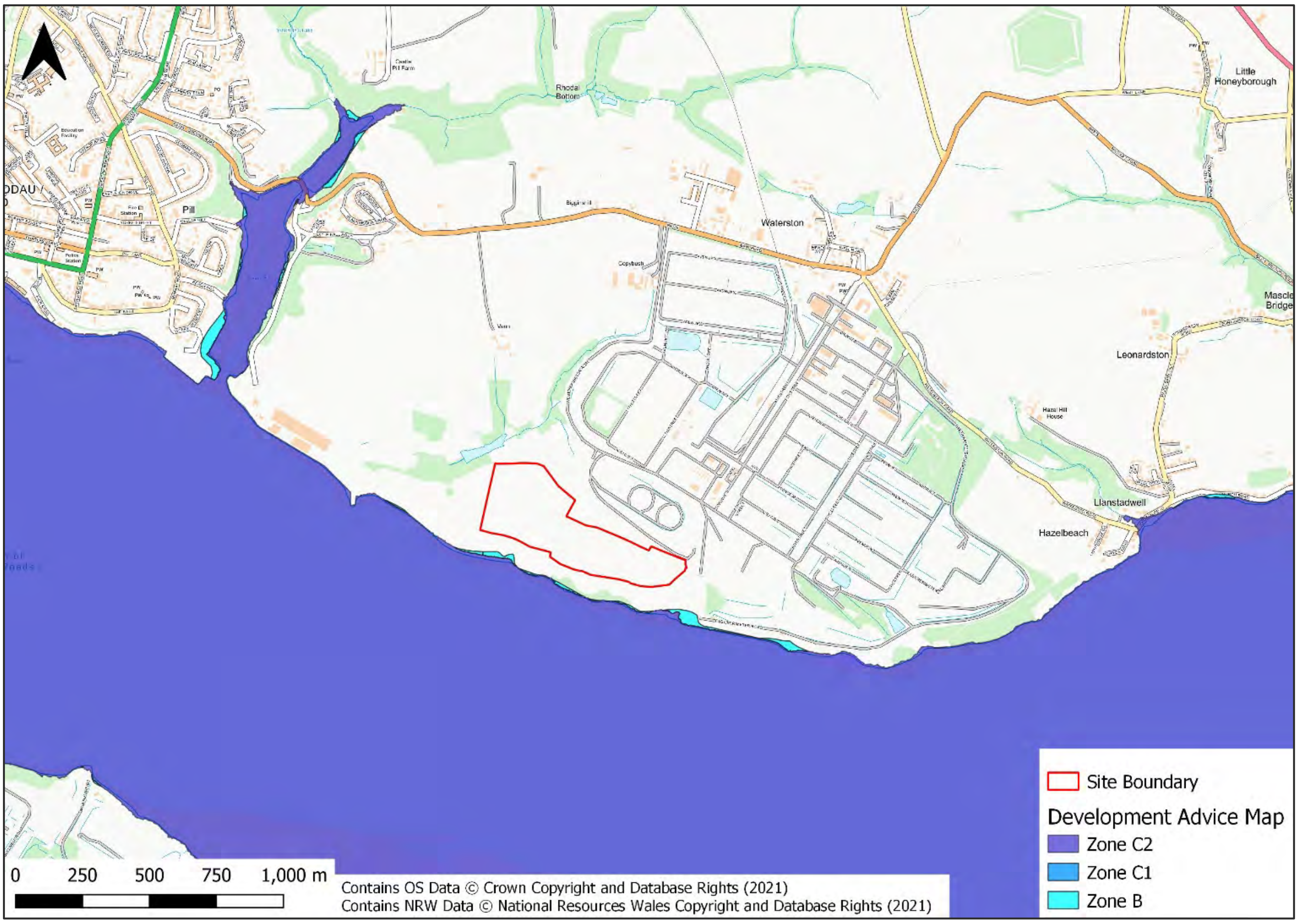
1.2 Aims and Objectives

A Full Planning Application is to be submitted for works related to the development of a Photo Voltaic (PV) Farm, on land off West Perimeter Road, Dragon LNG Terminal, Milford Haven. This document is a Flood Consequence Assessment (FCA) incorporating a Drainage Strategy that has been applied to the full application of this renewable energy development.

With reference to the indicative *Development Advice Map*[1] the site lies within an area considered to be at 'little or no risk of fluvial or coastal/tidal flooding' (Zone A).

An extract of the Development Advice Map is provided in Figure 1-2.

Figure 1-2
Extract of the Development Advice Map



The site lies outside an area at risk of fluvial or tidal flooding, wholly within Flood Zone A. With reference to the Planning Policy Wales[2] and its associated Technical Advice Note 15[3] (TAN15), the justification test is not applicable and there is no need to consider flood risk further.

1 Welsh Government (Accessed on 05/10/2021) https://naturalresources.wales/floodriskmap
2 Planning Policy Wales (Edition 11, February 2021)
3 Technical Advice Note 15: Development and Flood Risk to Planning Policy Wales (2004)

However, the Acceptability Criteria for development in Zone A states that no increase in flooding is to be caused due to the development. The Planning Application for the site must therefore be accompanied by an FCA as outlined in Sections 5 and 7 of TAN15.

1.3 Administrative Context

The site is under the planning jurisdiction of Pembrokeshire County Council responsible for the outcome of this application. Pembrokeshire County Council are also the SuDS Approving Body (SAB) for the area who deal with issue relating to localised flood risk and drainage.

1.4 Best Practice

This report has been prepared in accordance with the advice and requirements prescribed in current best practice documents relating to the management of flood risk in development published by the Construction Industry Research and Information Association (CIRIA)[4], the British Standards Institution (BSI) BS8533[5].

4 CIRIA Report C624, Development and flood risk – guidance for the construction industry (October 2004)
5 BS8533:2017, Assessing and managing flood risk in development – Code of Practice (December 2017)

2.0 Project Description

This FCA has been prepared in support of the proposal for a PV solar farm comprising renewable energy generation on the site.

The proposed development comprises the installation of solar photo voltaic (PV) panels and construction of associated infrastructure, including Feeder pillars and Transformers; Customer Substation; Educational Building and ancillary equipment including Security Fencing and Cable Routes.

An indicative site layout and schematic diagram of the solar array is shown in **Appendix 01**. The site boundary has been determined following preliminary geo-environmental studies of the site unit, with the proposed development being restricted to those areas of the existing Dragon LNG terminal that are not considered likely to affect sensitive environmental assets.

The solar PV panels would be arranged in a series of south-facing arrays running west-east across the site. The panels would be angled to maximise the capture of solar energy, facing south. The PV panels would be bolt anchored to a metal frame (‘table’), mounted on steel posts to 0.9m above ground level, which are driven or screwed into the ground, to a depth of 1-2m depending on ground conditions. Natural grassland and associated wild flowers will form the vegetation across the entire site.

3.0 Site Details

3.1 Existing Site Description

A site inspection was completed on 04/10/2021 following an induction at the Dragon LNG operational site. The weather conditions were heavy rain showers.

The application site, referred to as the Meadow, is accessed off the B4325 main road via the Western Perimeter Road, a tarmac drive approximately 5 m wide. The road turns off into an unmetalled track approximately 2½ m wide to a field gate at the Meadow for some 250 m.

Alongside the site there is a long high mound approximately 30 m high where it is proposed that a visitor Centre for educational purposes will be built on the slopes overlooking Milford Haven. Interestingly, this feature does not appear on 1:10,000 scale Ordnance Survey maps which could have been a result of the reshaping of the topography following demolition of a local farm in the 1960's.

Whilst the site is mostly flat made up of two agricultural field parcels, the topography for the coastal strip (approximately 75m wide) slopes steeply down to the Pembrokeshire Coast Path and the sandstone cliffs beyond. Currently the fields are laid to grass and there is evidence of sheep having been grazed recently.

There are no signs of surface water features or field ditches on the site.

The Pembrokeshire Coast Path passes adjacent to the site on the southern boundary and walking along this path it is evident that there is no surface water features disrupting flow anywhere from the site across the path to the area of cliffs. Whilst most of the site falls towards the coast path and to the sea there is a low spot in the northwest corner of the site that will need to be managed from a drainage perspective. Any surface water that drains to this area will need to be captured and discharged appropriately. Whilst the surface water feature to the northwest of the western perimeter road may be able to accept flows the area was very vegetated and no physical evidence was found of them during the site visit.

There are two sets of leading lights to aid navigation of tankers in the estuary. One set of lights are positioned in the south-west corner and another set towards the middle of the site on the eastern boundary. It is assumed that the sightlines for the navigation aids should not be impeded.

There are two existing wind turbines just to the east of the Dragon LNG site adjacent to where the Pembrokeshire Coast Path passes.

Smaller developments clustered around Dragon LNG terminal generally comprise other commercial / industrial use and the periphery of Milford Haven, as small residential town, is present to the west of the site in Figure 3-1.

Figure 3-1
Satellite imagery of the site

3.2 Topography

A topographic survey of the site is enclosed in **Appendix 02**.

LiDAR topographic data for the site and immediate locality has been downloaded from the National Resources Wales (NRW) open data website[6] and is contained in Figure 3-2. Figure 3-2 provides bare earth elevation data using a Digital Terrain Model (DTM) and thus excludes built features and vegetation.

6 Natural Resources Wales, Lle geoportal, http://lle.gov.wales/Catalogue/Item/LidarCompositeDataset/?lang=en

Figure 3-2
2m DTM LiDAR plot of the site

The LiDAR data presented in Figure 3-2 indicates that the wider topography is dominated by the presence of local water bodies, with steep gradients towards the tidal zone in the south and smaller watercourses west of the site. The Dragon LNG Terminal is generally elevated in comparison to the site with variable topography between c.50-57m above Ordnance Datum (aOD).

The topographic survey included in **Appendix 01** indicates that the topography of the site largely declines in a south and west direction from a topographic high of 56.66in along the north eastern boundary, to 30.46m aOD on the south western site. Topography typically falls towards hydrological features and therefore in the north western site, there is also a gradient towards the north representative of the river valley, which at the site, falls to a minimum elevation of 32.46m aOD. The site is elevated above the access track and West Perimeter Road to the north, which given the extent of the topographic survey, declines to 29.49m aOD at the western edge of Dragon LNG Terminal.

3.3 Hydrological Context

3.3.1 Hydrology

The hydrological features surrounding the site are a combination of both fluvial and tidal water bodies.

Daugleddau, a tidal water body, is situated immediately south of the site at the base of the cliff face. Tidal levels, as extracted on 30/09/2021, fluctuate daily between -0.64 to 1.17m aOD[7] and therefore significantly below the elevation of the site. The water body serves as an active vessel between Pembrokeshire and Rosslare (Ireland) for both general public and freight transportation.

To the immediate west of the site is a small pond (and inlet channels discussed below) which outfalls southwards into Daugleddau. While there may be some tidal interaction at the outfall, it is assumed that the channel declines sharply into Daugleddau from c.7m aOD and, considering that the daily high-water level of Daugleddau is c.1.17m aOD or similar, indicates tidal influence across the reach is negligible. This catchment is therefore fluvial nature and is estimated to drain a total area[8] of 2km^2, encompassing much of the Dragon LNG Terminal.

There are several other ponds and channelised water features on and around Dragon LNG Terminal which are assumed to be used within site operations. Where some of the drainage features outfall, it is assumed they discharge into the pond system to the west or south east into Daugleddau dependant on local topographic gradients.

There are no other relevant hydrological features within 1km of the site.

3.3.2 Drainage Regime

Enclosed in **Appendix 04** is a Welsh Water asset search, which indicates that there are no mains or sewer pipes in the area.

The existing site comprises of undeveloped greenfield land and acks any formal drainage. Runoff will therefore progress in line with local topographic gradients to the south and west into Daugleddau and the reservoir system respectively.

3.4 Geological and Hydrogeological Context

3.4.1 Geology

The National Soils Resources Institute, Soilscapes website[9], identifies *'Freely draining slightly acid loamy soils'* across the site and much of the wider area.

British Geology Survey (BGS) mapping[10] indicates that the area is underlain by the Cosheston Sandstone Group which at the site, is exposed at the surface. Local trial pit and borehole records[11] identified topsoil to 0.2-0.4m below ground level (bgl), underlain by residual soils (primarily weathered sandstone bedrock) from absent to 2.8m bgl until striking highly weathered upper levels of the old sandstone group. The residual soils comprise medium dense to very dense greenish grey and brown sandy locally silty gravel and very gravelly sand.

3.4.2 Hydrogeology

The Cosheston Sandstone Group has been designated as a *'Secondary A'* Aquifer[12], defined as *'' permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers".* The site is not located within a Source Protection Zone (SPZ) associated with local abstractions.

Local borehole records[11] indicate groundwater strike between 7-14m bgl, approximately 28.52 – 34.68m aOD.

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7 Tide Times – Milford Haven, https://www.tidetimes.org.uk/milford-haven-tide-times-20210930
8 Flood Estimation Handbook Web Service, UK Centre for Ecology and Hydrology, https://fehweb.ceh.ac.uk/GB/map
9 Soilscapes online soil map, Cranfield Soil and Agrifood Institute, http://www.landis.org.uk/soilscapes/
10 BGS Geology of Britain Viewer, available at http://mapapps.bgs.ac.uk/geologyofbritain/home.html
11 Enviromena Power Systems UK Ltd, Geotechnical Assessment, South West Geotechnical Ltd, June 2021
12 Magic Map, DEFRA, https://magic.defra.gov.uk/MagicMap.aspx

Previous infiltration testing to BRE 365 have been undertaken at land north of Milford Haven School (Planning Reference: 15/1231/PA), approximately 2.5km north west of the site in the sandstone geology as part of a proposed residential scheme. A total of six trial pits were excavated for the infiltration testing, of which produced a maximum rate of 7.54×10^{-2} m/s, and a minimum rate of 1.78×10^{-4} m/s.

4.0 Policy Status for Proposed Development

4.1 Development Proposals

The development proposals are for a PV solar farm for renewable energy generation. A full, detailed description of the development proposals is included in Section 2.0.

4.2 Flood Risk Vulnerability

In line with TAN15 Figure 2, the site proposals are classified as 'less vulnerable' development.

4.3 Anticipated Lifetime of Development

In lieu of further information, 30-year development lifetime is applied unless there is specific justification for considering a shorter period.

4.4 Planning Policy

The Planning Policy Wales[2] ensures that flood risk is taken into account at all stages in the planning process and that development is sustainable.

This document has been prepared using best practice principals using The SuDS Manual[4], TAN15[Error! Bookmark not defined.] and Statutory standards for Sustainable Drainage Systems[13].

Technical Advice Note 8 (TAN8): Planning for Renewable Energy[14] was published in July 2005 and sets out the Welsh Government planning policy on renewable energy systems. In allegiance with TAN8, the Welsh Government in February 2011 additionally published Planning Guidance- Planning Implications of Renewable and Low Carbon Energy[15] which considers the role of solar PV arrays on hydrology and flood risk.

Paragraph 8.4.18 states:

> *The potential effects of a solar PV array on hydrology and flood risk should be considered. In general, these are unlikely to be significant because the presence of solar arrays will not greatly increase the time for rainwater to reach the ground where it can infiltrate in the usual way and because the panels will typically cover no more than one third of the site area. The effects of the panels, in combination with access tracks, earth works, buildings for inverters, cable trenches and site drainage works will nevertheless need to be assessed. An assessment of existing flood risk at the site should also be undertaken to consider the need for electrical equipment to be raised off the ground and to ensure that any on site works do not exacerbate flooding elsewhere.*

This report, a FCA and Drainage Strategy, provides both an assessment of existing flood risk, and where necessary future flood risk, as well as a supportive drainage strategy which covers the fundamental requirements set out in Paragraph 8.4.18.

At present day, there is no relevant policy regarding flood risk and sustainable drainage within local planning documents of Pembrokeshire County Council. As part of this planning application, a comprehensive SAB application is also undertaken to parallel specific details and conclusions from this report. The SAB requirements are extracted from the Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems[13] which have six key themes:

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13 Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems, Welsh Government, 2018

14 Technical Advice Note 8: Planning for Renewable Energy to Planning Policy Wales (2005)

15 Planning Guidance- Planning Implications of Renewable and Low Carbon Energy, Welsh Assembly Government, February 2011

- S1. Surface water runoff destination
- S2. Surface water runoff hydraulic control
- S3. Water Quality
- S4. Amenity
- S5. Biodiversity
- S6. Design of drainage for construction, operation and maintenance

These themes will be used to adopt an achievable drainage strategy at the site.

4.4.1 Development Category

With reference to TAN 15 Figure 2 and Section 4.1, the proposed solar farm would be considered a ‘less vulnerable development’.

With reference to Section 9 of TAN15, Summary of Policy Requirements, less vulnerable development in Zone A is considered to be acceptable.

4.4.2 Justifying the Location of Development

As the site lies in the Zone A, Section 9 of TAN 15 states that no justification of the location of development needs to be made.

4.4.3 Acceptability Criteria

The proposed development may lead to an increase in the rate and volume of surface water runoff due to new impermeable areas. While an increase in surface water flows would have negligible impact to tidal water bodies, to comply with current guidance and best practice, Sustainable Drainage Systems (SuDS) will be required to be implemented to manage the quantity and quality of surface water runoff discharged off-site from the proposed development.

5.0 Assessment of Flood Risk

5.1 Potential Sources of Flooding

There are a number of potential sources of flooding and these include:

- Flooding from rivers or fluvial flooding;
- Flooding from the sea or tidal flooding;
- Flooding from surface water or pluvial flooding;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from reservoirs, canals, and other artificial sources.

The flood risk from each of these potential sources is discussed below.

5.1.1 Flooding from Rivers or Fluvial Flooding

With reference to the Development Advice Map (Figure 1-2) the site lies wholly within Flood Zone A and is therefore outside an area having less than 0.1% Annual Exceedance Probability (AEP) or less than 1 in 1,000-year annual probability of flooding from fluvial sources.

Flooding from rivers or fluvial sources is very low and not considered further.

5.1.2 Flooding from the Sea or Tidal Flooding

The Development Advice Map included as Figure 1-2 indicates the site is located in Flood Zone A and therefore has an annual probability of flooding greater than 0.1% AEP (less than 1 in 1,000-years). This is additionally confirmed in the Strategic Flood Consequence Assessment for Pembrokeshire[16].

Daugleddau, a tidal waterbody, bounds the site to the south. Extreme tidal levels from Flood Zone B (past evidence of flooding / 0.1% AEP) have been extrapolated from the flood outline using LiDAR datum. The extrapolation indicates an extreme tidal level at the site of 15.5m aOD and therefore elevated significantly below the site; a differential of at least c.14m.

Flooding from the sea or tidal flooding is considered very low and not considered further.

5.1.3 Flooding from Surface Water or Pluvial Flooding

Is it understood from site topography that any runoff derived from the site will either infiltrate into the subsoil, progress south off the cliff face directly into Daugleddau or progress west into the existing pond. There are no noticeable topographic hollows at the site or channelised slopes which may retain or convey water during rainfall events.

The detailed surface water flood risk maps published by Natural Resources Wales[1], shows areas potentially at risk of flooding from surface water. The surface water flood risk categories are defined as:

- Low: less than 1 in 100 (1% AEP) but greater than or equal to 1 in 1,000 (0.1% AEP) chance of flooding in any given year;
- Medium: between 1 in 100 (1% AEP) and 1 in 30 (3.3% AEP) chance of flooding in any given year; and

16 Carmarthenshire & Pembrokeshire Stage 1 Strategic Flood Consequence Assessment (SFCA), Pembrokeshire County Council and Carmarthenshire County Council, September 2019

- High: greater than 1 in 30 (3.3% AEP) chance of flooding in any given year

Mapping contained in Figure 5-1 supports the conceptual understanding that there are no areas of surface water flood risk at the site. Surface water flooding is routed along existing small watercourse features with the Dragon LNG refinery, or along the watercourse and pond feature (fluvial in nature) to the north west of the site. Additionally, ground conditions observed during the site walkover noted firm ground with no evidence of surface water pooling or boggy ground across the site.

Figure 5-1
Extract of the NRW Surface Water Flood Map

The risk of flooding from surface water and pluvial sources is very low and not considered further.

5.1.4 Flooding from Groundwater

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. It is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

Groundwater levels[11] locally vary across the site between 7-14m bgl which, at such depths in permeable geology, would be highly unlikely to emerge at the ground surface.

Flooding from this source is not considered to be significant and therefore not assessed further.

5.1.5 Flooding from Sewers

With reference to **Appendix 03**, there are no mains water pipes or wastewater sewers in the vicinity of the site. Flood risk from sewers is therefore nil.

5.1.6 Flooding from Reservoirs, Canals and Other Artificial Sources

There are no reservoirs upgradient of the site and therefore flooding from this source is nil. There are a few small pond features associated with Dragon LNG Terminal however, in the event of exceedance, is it considered that each pond is overtopped and re-joins its downgradient outfall channel, generally west, and away from the site.

Flooding from Reservoirs, Canals and Other Artificial Sources is negligible and not considered further.

5.1.7 Flooding from Infrastructure Failure

The site is not afforded protection from flood defences, nor are there any sewerage pumping stations or other significant infrastructure within the vicinity of the site which may pose a flood risk.

Flooding from Infrastructure Failure is therefore very low and not considered further.

5.2 Flood Risk Summary

A summary of the potential sources of flooding and the flood risk arising from them is presented in xxx.

Table 5-1
Potential Sources of Flooding

Potential Source of flooding	Significant Flood Risk at the Site (Y/N)
Rivers or Fluvial Flooding	N
Sea or Tidal Flooding	N
Surface Water or Pluvial Flooding	N
Groundwater	N
Sewers	N
Reservoirs, Canals and other Artificial Sources	N
Infrastructure Failure	N

The flood screening assessment indicates that the site is not a significant risk of flooding.

5.3 Flood Risk Classification

The definition of Zones to control and manage development is described in TAN15 Figure 1 and is summarised below:

- *Zone A - Considered to be at little or no risk of fluvial or coastal/tidal flooding* is used to indicate that a justification test is not applicable and there is no need to consider flood risk further.
- *Zone B - Past evidence of flooding by sedimentary deposits* is used as part of a precautionary approach to indicate where site levels should be checked against the extreme 0.1% (1:1,000 year) flood level. Providing site levels are greater than the extreme flood level flood risk in no longer need to be considered.

- *Zone C - Based on EA extreme flood outline* is used to indicate that flooding issues should be considered as an integral part of the decision making by the application of the justification test including assessment of consequences at risk of flooding with an annual probability of occurrence greater than 0.1% (1:1,000 year) from river, tidal or coastal sources.
- *Zone C1 - Areas of floodplain which have significant infrastructure* is used to indicate that development can take place subject to application justification test, including acceptability of consequences at risk of flooding with an annual probability of occurrence greater than 0.1% (1:1,000 year) from river, tidal or coastal sources.
- *Zone C2 - Areas of floodplain without significant flood defence infrastructure* is used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences at risk of flooding with an annual probability of occurrence greater than 0.1% (1:1,000 year) from river, tidal or coastal sources.

Based on the screening study, the entire site lies within Flood Zone A and is therefore at very low risk of flooding from any potential sources.

6.0 Climate Change

In September 2021, the Natural Resources Wales[17] issued updated guidance on the impacts of climate change on flood risk to be used in flood consequence assessments in support of relevant planning applications. This guidance sets out peak rainfall intensity, sea level, peak river flow, and extreme wave heights are all expected to increase in the future as a result of climate change.

The guidance acknowledges that in relation to certain factors there is considerable uncertainty with respect to the absolute level of change that is likely to occur. As such, in these instances, the guidance provides estimates of possible changes that reflect a range of different emission scenarios.

Concerns relating to offshore wind speed and wave height a are only of relevance in contexts that are in direct proximity to the open coast or other large open bodies of water. There are also no associated risks of fluvial flooding from nearby reservoirs or small watercourses. The climate change allowances applicable to the site therefore relate to peak rainfall intensity and sea level rise (Daugleddau).

6.1.1 Peak Rainfall Intensity Allowance

An extract of Table 2 Change to Extreme Rainfall Intensity is reproduced as **Table 6-2**.

Both the central and upper estimates should be assessed to understand the range of impact. The central estimate should be used to inform design levels, whereas where the assessment indicates a significant flood risk for the upper end estimate, the flood consequences assessment will need to provide mitigation measures.

Table 6-1
Table 2 Change to Extreme Rainfall Intensity
(Compared to 1961-90 baseline)

Allowance Category	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Central	5%	10%	20%

Having reviewed the Upper End and Central Allowances and in line with Table 6-2, the Surface Water Drainage Strategy has been developed to take into account increases in rainfall intensity of 20% over the lifetime of the entire development.

6.1.2 Sea Level Rise Allowances

An extract of Table 3: Estimated mean sea level rise (in metres) for relevant local authority areas is reproduced as Table 4-2.

Development proposals should be assessed against the relevant regional 70th percentile presented in Table 3 to inform design levels. The 95th percentile should also be assessed inform mitigation measures, access and egress routes and emergency evacuation plans.

17 Flood Consequences Assessments: Climate Change allowance. Natural Resources Wales, September 2021

Table 6-2
Table 3: Estimated mean sea level rise (in metres) for relevant local authority areas by 2100 and 2120. Allowances are based on RCP8.5 70th and 95th percentiles

Local Authority Area	Allowance Percentile	Mean Sea Level Rise (metres) by 2100 *(UKCP18 baseline 1981-2000)	Mean Sea Level Rise (metres) by 2120 *(UKCP18 baseline 1981-2000)
Pembrokeshire	70th	0.83	0.99
	95th	1.10	1.31

The review of tidal flooding at the site will therefore consider the 1.10m uplift associated with the 95th percentile up until 2100. In reality, the anticipated lifetime of development is 30 years (to 2051), and therefore a 1.10m rise is a precautionary approach to examining tidal flood risk at the site.

As discussed in Section 5.1.2, a 0.1% AEP design flood level has been extrapolated using LiDAR data at 15.5m aOD, with a 1% AEP flood level of approximately 4.5m aOD. An increase of 1.10m in the extreme flood level, to 16.5m aOD and 5.5m aOD respectively, over the lifetime of development will have no impact on the flood risk of a site elevated to over 29.49m aOD.

It is therefore impractical to consider the effects of sea level rise associated with climate change further with regards to flood risk at the site. It is also confirmed the site will remain in Zone A (c*onsidered to be at little or no risk of fluvial or coastal/tidal flooding)* throughout the lifetime of development.

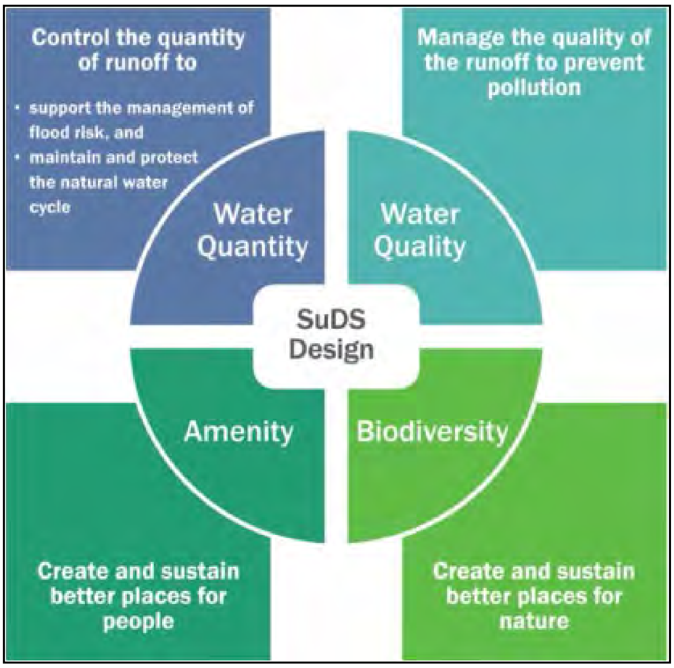
7.0 Surface Water Drainage Strategy

7.1 Sustainable Drainage Systems

Current best practice guidance document, The SuDS Manual[18], promotes sustainable water management through the use of SuDS and is required by the Welsh Government National Standards for sustainable drainage (SuDS). These systems must be approved by Pembrokeshire County Council acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems so long as it is built and functions in accordance with the approved proposals, including any SAB conditions of approval.

There are four main categories which are referred to as the '*four pillars of SuDS*' as summarised in Figure 7-1.

Figure 7-1
Four Pillars of SuDS (after CIRIA Report C753)



The SuDS Manual identifies a hierarchy of SuDS for managing runoff, which is commonly referred to as a 'management train' and is depicted in **Figure 7-2**:

Prevention – the use of good site design and housekeeping measures on individual sites to prevent runoff and pollution (e.g. minimise areas of hard standing).

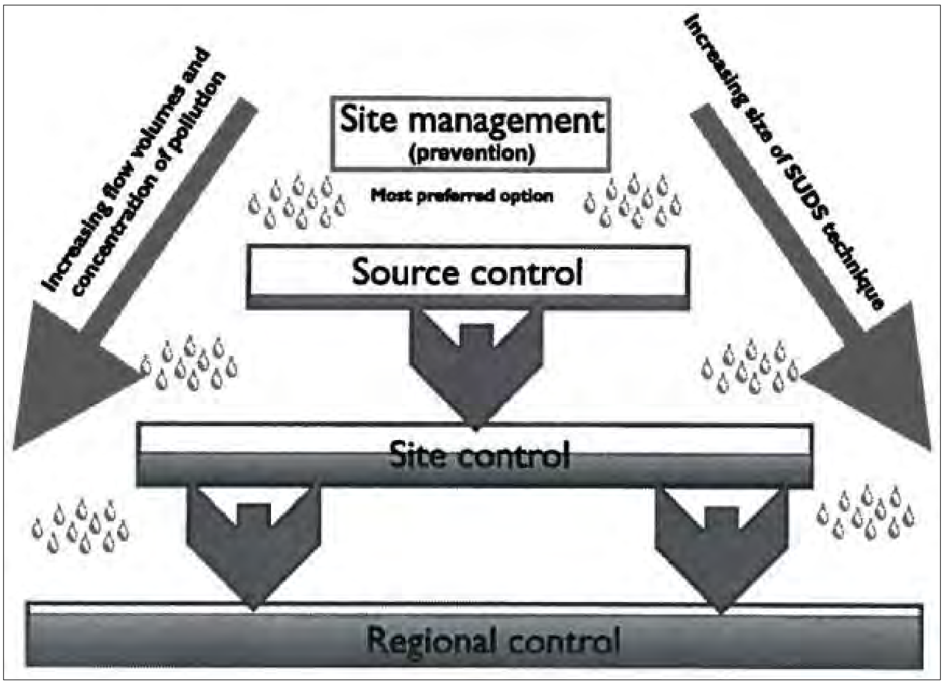
Source Control – control of runoff at or very near its source (such as the use of rainwater harvesting).

Site Control – management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole site).

Regional Control – management of runoff from several sites, typically in a retention pond or wetland.

18 CIRIA (2015). Report C753, The SuDS Manual

Figure 7-2
SuDS Management Train



It is generally accepted that the implementation of SuDS, as opposed to conventional drainage systems, provides a number of benefits by:

- Reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- Reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed sites;
- Improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- Reducing potable water demand through rainwater harvesting; and
- Improving amenity through the provision of public open spaces and wildlife habitat; and replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

In addition to the above, Pembrokeshire County Council, as the lead Local Flood Authority (LLFA) and SuDS Approval Body (SAB), promote the use of Sustainable Drainage Systems (SuDS) as set out in the SuDS Pre-Application.

7.2 Drained Area

It is proposed that all impermeable surfaces (concrete plinths used as hardstanding core for essential infrastructure) will be positively drained.

Section 3.2.7 of The SuDS Manual recommends that the potential increase in the *'impermeability of the contributing catchment through the design life of the drainage system should (…) be taken into account.'*

Section 24.7.2 of The SuDS Manual defines urban creep as:

> *'any increase in impervious area that is drained to an existing drainage system without planning permission being required, and therefore without any consideration of whether the capacity of the receiving sewerage system can accommodate the increased flow.'*

The SuDS Manual recommends that an allowance of 10% is made in respect of urban creep and therefore this has also been applied.

Based on the proposed development masterplan enclosed as **Appendix 01**, the drained impermeable areas are summarised in Table 7-1.

Table 7-1
Drained Areas

Impermeable Land Use Type	Area (m^2)	
	Proposed	Including 10% Urban Creep
Educational Building	126	139
	Total	**139**

7.3 Proposed Discharge Arrangement

With reference to The SuDS Manual, the hierarchy of preferred disposal options for surface water runoff from development sites in decreasing order of sustainability is as follows:

1. Infiltration to Ground;
2. Discharge to Surface Waters; or
3. Discharge to Sewer.

Table 7-2 summarises the suitability of disposal methods suitability in the context of the Site and the proposed development.

Table 7-2
Suitability of Surface Water Disposal Methods

Surface Water Disposal Method (in Order of Preference)	Suitability Description	Method Suitable? (Y / N)
Infiltration to Ground	**Option 1:** With reference to Section 3.4.1, bedrock geology at the site comprises of the Cosheston Group- Sandstone which is exposed at the surface. Top soil locally varies between 0.2-0-4m depth which is underlain by residual soils; essentially weathered sandstone, to 2.8m bgl until highly weathered, more firm sandstone bedrock was identified. The permeable nature of the sandstone geology indicates infiltration to ground is a potentially viable solution for surface water disposal. Infiltration testing to BRE 365 standard would be required in order to determine the infiltration rate at the site which at present, has been suggested to the client.	Potential

Surface Water Disposal Method (in Order of Preference)	Suitability Description	Method Suitable? (Y / N)
	Previous infiltration testing to BRE 365 has been undertaken as part of planning reference 15/1231/PA for a proposed residential scheme c.2.5km north west of the site. This derived a minimum infiltration rate of 1.78 x 10^{-4} m/s. In lieu of infiltration testing data at the site, this rate will be adopted to provide a preliminary size for key SuDS features.	
Discharge to Surface Waters	**Option 2:** As discussed in Section 3.3.1, there are a number of small watercourse features associated with the Dragon LNG Terminal. There is one present to the north of the site which, via gravity drainage, could receive discharge from the site. This watercourse currently discharges into the pond north west of the site, which, alongside Daugleddau, is a current receptor for site runoff. In line with the drainage hierarchy, this method of surface water disposal will be adopted unless the outcome of the infiltration testing is determined as successful.	Y
Discharge to Sewer	With reference to Appendix 03, there is no sewerage infrastructure in the vicinity of the site and therefore this method of surface water disposal is not possible.	N

7.4 Proposed Outline SuDS Strategy

It is proposed to manage surface water runoff from the development via the following 'Source Control', 'Conveyance', and 'Site Control' options as summarised in Table 7-3.

Table 7-3
Summary of Surface Water Management Strategy SuDS Options

SuDS Management Train Mechanism	Application	Potential Suitable SuDS Features
Source Control	For the interception of surface water runoff at the source such as rainfall shedding from the roof areas.	• Guttering
Conveyance	To convey surface water runoff from 'Source Control' mechanisms to 'Site Control'.	• Pipes
Site Control	Provides the required surface water attenuation / storage prior to controlled discharge to the water environment.	• Swale

'Source Control', 'Conveyance' and 'Site Control' in the form of a piped network and swale are considered to be viable and beneficial (in terms of attenuation requirements and water quality enhancements) option and therefore have been integrated into this SWDS and are suitable for both Option 1 (infiltration) and Option 2 (discharge to surface water).

7.4.1 Swale

The piped network used for the "Source Control" and "Conveyance" aspect of the SWDS will discharge flows into a swale feature for attenuation, formally referred to as "Site Control". It is envisaged that the swale will provide sufficient attenuation of runoff within the site boundary for all events up to and including the 1% AEP plus 20% climate change allowance.

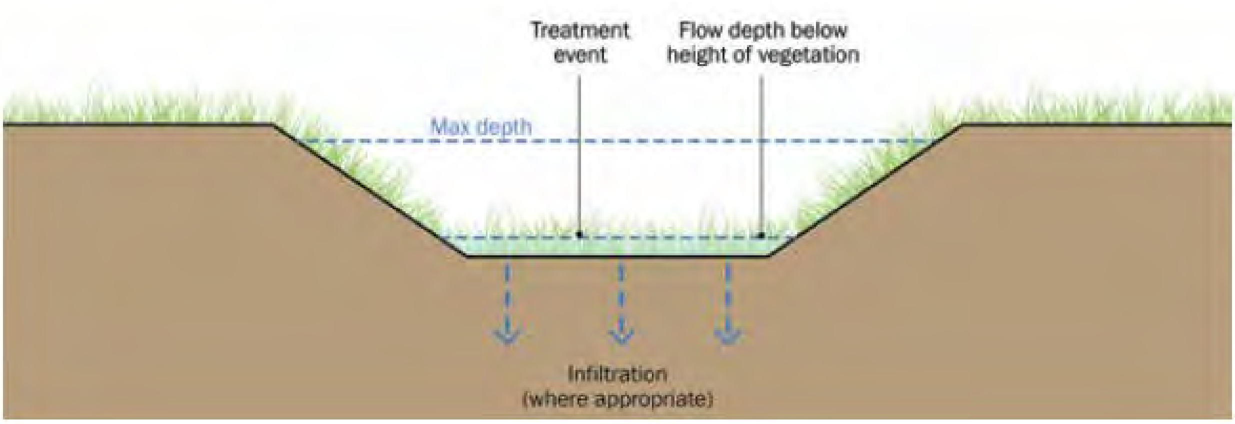
Option 1 (infiltration): Runoff from the roof areas will discharge into the swale and infiltrate completely to ground.

Option 2 (discharge to surface waters): Runoff from the swale will have a restricted outfall, discharging into a below ground pipe which conveys flows to the small watercourse north of the site. The swale will remain unlined to encourage infiltration to ground.

The swale will provide the primary tier of treatment in line with the Simple Index Method.

A typical swale detail is provided below in Figure 7-4. Whilst not demonstrated in the diagram, the swale with be lined with variable sized gravel to encourage infiltration and pollutant filtration. The banks of the swale will comprise short grassland. A 1:3 side slope is adopted to allow for mowing.

Figure 7-3
Swale: Conceptual Design Details



7.4.2 SuDS Summary

Indicative locations of the proposed filter drains and swale serving the proposed development are shown in **Appendix 04**.

It should be noted that the swale will be vegetated to provide natural filtration of pollutant, improve biodiversity and act as an amenity benefit.

7.5 Water Quantity Design Standard

7.5.1 Control of Runoff Volume

Section 3.3.1 of The SuDS Manual sets out volume control criteria for:

- Frequent Rainfall Events
- Extreme Rainfall Events

Frequent Rainfall Events

The SuDS Manual requires *'the prevention of runoff from the [site] for the majority of small (frequent) rainfall events (or for the initial depth of rainfall for larger events)'*. This is known as Interception and '*Interception of about 5mm is normally achievable.'*

With reference to Section 24.8 of The SuDS Manual:

> *'Interception can be delivered using one or a combination of processes:*
>
> - *Rainwater harvesting*
> - *Infiltration*
> - *Evapotranspiration using temporary shallow ponding or storage within the soil or upper aggregate layers.'*

While the SuDS system adopted uses discharge to water in lieu of infiltration testing data, it is considered that SuDS features will provide no runoff for the first 5mm, mimicking a greenfield scenario. Interception of the first 5mm of rainfall at the site is therefore provided as follows:

- With reference to Section 17.4.2 of The SuDS Manual, swales 'deliver Interception because there is usually no runoff from them for the majority of small rainfall events.'

All surface water flows routed from the impermeable areas will be attenuated within a swale which therefore will provide the necessary interception of the first 5mm of rainfall.

Extreme Rainfall Events

For extreme rainfall events, the drainage system should be designed such that 'the volume of runoff from the site (or development) area [does] not exceed the volume of runoff from the equivalent area in its natural undeveloped or "greenfield" state'.

Option 1 (infiltration)

Discharge rates from the site during extreme rainfall events are not requires as all runoff will infiltrate to ground, i.e., no offsite discharge rate.

Option 2 (discharge to surface waters)

As summarised in Table 7-2, in the event infiltration to ground is not feasible, discharge to surface waters will be adopted to discharge runoff from the impermeable areas of development.

In line with Section 3.3.1 of The SuDS Manual, it is proposed that 'all the runoff from the site for the 1:100 year [1% AEP] event [to] be discharged at either a rate of $2ls^{-1}ha^{-1}$ or the average annual peak flow rate (i.e., the mean annual flood, QBAR), whichever is greater.'

Table 24.1 Summary of runoff estimation methods of The SuDS Manual recommends the application of the Revitalised Rainfall-Runoff Method (ReFH2) to estimate greenfield runoff rates. ReFH2 has therefore been used to estimate greenfield runoff rate for the 50% AEP (1 in 2 year) rainfall event as summarised at Table 9-3. It should be noted that QBAR has a return period of approximately 1 in 2.3 years, however, only integers can be inputted into ReFH2. A conservative QBAR peak runoff rate has been estimated assuming a 1 in 2-year return period.

The descriptors for the site extracted from the Flood Estimation Handbook (FEH)[8] Web Service were used in the ReFH2 analysis with the AREA set to 1.00ha.

As discussed in Section 7.2, the proposed drainage area comprises solely of the Education Building, which, with a 10% allowance for urban creep, is equivalent to $139m^2$, or 0.014ha.

The greenfield runoff rate has therefore been estimated based on the proposed impermeable area of 139m^2, or 0.014ha. Full modelled results from ReFH2 are included as **Appendix 05**.

Table 7-4
Greenfield Runoff Rate

AEP (%)	Estimated Greenfield Runoff Rate	
	l/s/ha	l/s/0.014ha
50	5.7	0.08

The discharge rate of 0.08l/s would require a significantly small orifice (c.11mm diameter) that would not be attainable at the site. As discussed in Section 7.3, the site will adopt a swale feature which, naturally, would have some deposition of sediment, vegetation (i.e., leaves) which inherently would regularly cause blockage to an orifice of such a size. The flood risk associated with a blockage occurrence at the site would be significantly greater than a small increase in discharge rate.

In accordance with Section 20.4 of The SuDS Manual, even for below ground (closed) structures, the absolute minimum size should be 20mm. We ultimately advise that for open surface structures, a minimum diameter adopted should be 75mm, and this would not restrict flows to 0.08l/s. Alternatively, a HydroBrake can be used to restrict rates to a minimum of 1l/s.

The discharge rate from the site will therefore be controlled to an acceptable level (c.1 l/s) using a suitable outfall structure not prone to blockage.

7.5.2 Control of Peak Runoff Rate

Section 3.3.2 of The SuDS Manual sets out the peak rate of runoff criteria for:

- Events likely to impact on morphology, ecology or capacity of the receiving surface waters, or the capacity of receiving sewers.
- Extreme events.

Events likely to impact on morphology, ecology or capacity of the receiving surface waters, or the capacity of receiving sewers

Option 1 (infiltration to ground)

The rate of runoff which would discharge from the impermeable area under normal circumstances, i.e., 0.08l/s for a 50% AEP event, is significantly small, and therefore infiltrating all flows to ground will have negligible impact on the receiving water body.

Option 2 (discharge to surface waters)

As discussed in Section 7.5.1, there will be a small but controlled increase (1l/s) in runoff rate to the receiving watercourse associated with the new impermeable area. Significant changes to the hydrological regime, such as an impoundment or uncontrolled / unmanaged impermeable development, would essentially impact the existing morphology and ecology of the receiving surface waters. It is not considered that a relatively small increase in discharge into the receiving ditch would result in any detrimental impacts to the channel.

An assessment of the capacity of the channel to receive the small increase in discharge would require further investigation. This would also need to consider the flows discharge from the upgradient pond associated with the oil refinery. At this stage, it is considered the dimensions of the channel, which from LiDAR indicates a depth of 0.6m, is sufficient to accommodate the extra flows.

Extreme Events

In line with Section 3.3.2 of The SuDS Manual, the SWDS *'should be designed so that peak runoff rates for extreme rainfall events (…) are constrained to the greenfield runoff rates for the same event'*.

Option 1 (infiltration to ground)

There will be no discharge from the site even during extreme events up to and including the 1% AEP plus 20% climate change.

Option 2 (discharge to surface waters)

As discussed above, discharge from the site will be restricted to 1l/s as this is the smallest, viable discharge rate possible.

7.6 Attenuation Volume Estimate

7.6.1 Option 1 (infiltration to ground)

Using the MicroDrainge 'Quick Storage Estimate' module, the attenuation volume for the impermeable area of the site in response to a 1% AEP + 20% climate change have been estimated as follows (Table 7-5) using an infiltration rate of 1.78×10^{-4} m/s as extracted from planning application 15/1231/PA. The results are also summarised in Appendix 06.

Table 7-5
Option 1: Drainage Performance and Sizing

Impermeable Area (ha)	Infiltration Rate (m/s)	Maximum Attenuation Storage (m^3)
0.014	1.78×10^{-4}	5.3

The maximum attenuation volume derived for the site is 5.3m^3 for the critical event of 1% AEP plus 20% climate change, including the 10% urban creep allowance. A precautionary approach will be applied at this stage to account for direct rainfall into the swale. This value will be determined following more detailed modelling of the swale, however at present, an addition of 2m^3 will be allocated, deriving a total attenuation target of 5.3m^3.

The swale will therefore have the following parameters:

- Basal Width: 0.5m
- Depth: 0.5m
- Side Slope: 1:3
- Top of Bank Width: 3.5m
- Length: 7.3m
- Estimated Total Volume: 7.3m^3

7.6.2 Option 2 (discharge to surface waters)

Using the MicroDrainge 'Quick Storage Estimate' module, the attenuation volume for the impermeable area of the site in response to a 1% AEP + 20% climate change have been estimated as follows (Table 7-6) and are presented in **Appendix 07**.

Table 7-6
Option 2: Drainage Performance and Sizing

Impermeable Area (ha)	Discharge Rate (l/s)	Maximum Attenuation Storage (m^3)
0.014	0.1	11.0
0.014	1.0	5.0

Using the existing discharge rate, which we know is not attainable at the site, the maximum attenuation volume required is $11m^3$. The discharge rate from the site will marginally increase (1l/s) as a result of development and therefore the actual maximum volume required for runoff from the building is $5m^3$; which additionally incorporates the urban creep allowance. At this stage, an additional $2m^3$ will be allocated to allow for direct rainfall into the swale however, following the pre-app response, this will be calculated more accurately using Source Control.

The swale will therefore have the following parameters:

- Basal Width: 0.5m
- Depth: 0.5m
- Side Slope: 1:3
- Top of Bank Width: 3.5m
- Length: 7m
- Estimated Total Volume: $7m^3$

This modelling is a precautionary approach which makes no allocation for any localised infiltration to ground.

7.7 Water Quality Design Standard

The drainage of built development has the potential to reduce water quality through increases in suspended solids, metals and hydrocarbons in the surface water runoff. The risks associated with a number of typically drained surfaces (land uses) are assessed in Section 26 of The SuDS Manual and expressed in Table 26.2 as a potential 'Pollution hazard level'. A review of each of the land uses has been completed to reference to Table 26.2 of The SuDS Manual to determine the appropriate Pollution Hazard Levels.

With reference to The SuDS Manual, post development surface water runoff generated from industrial roofs is considered to have a 'Low' Pollution Hazard Level and surface water runoff from non-residential parking areas and general access roads is considered to have a 'Medium' Pollution Hazard Level as set out within Table 7-5.

Table 7-7
Pollution Hazard Potential of the Proposed Development

Land Use	Pollution Hazard Level	Pollution Hazard Indices		
		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Commercial Roof	Low	0.3	0.2	0.05

7.7.1 Option 1 (infiltration to ground)

The most preferable option for surface water runoff disposal is infiltration to ground. The indicative SuDS Mitigation Indices for discharge to surface water is summarised in Table 26.4 of The SuDS Manual and reciprocated below in Table 7-8 with respect to the proposed SuDS features at the site.

Table 7-8
SuDS Mitigation Indices for Discharge to Groundwater

Land Use	Pollution Hazard Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Swale[1]	0.4	0.4	0.4

1. Graded gravel (filtration material) lined swale underlain by a soil with good contaminant attenuation potential of at least 300mm in depth.

A comparison of the *Pollution Hazard Indices* and *Mitigation Indices* for the proposed 'Source Control', 'Conveyance', and 'Site Control' measures are provided in Table 7-9.

Table 7-9
SuDS Performance: Water Quality Indices Assessment (Discharge to Groundwater)

Land Use	Index	SuDS Mitigation Indices Comparison		
		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Commercial Roof	Hazard	0.3	0.2	0.05
	Mitigation	0.4	0.4	0.4
	Water Quality Requirement Met? (Y/N)	**Y**	**Y**	**Y**

Table 7-9 shows that the *Mitigation Indices* are greater than the *Pollution Hazard Indices*, and therefore the water quality requirements are considered met.

7.7.2 Option 2 (discharge to surface waters)

As discussed in Table 7-2, surface water runoff from the site may discharge to surface waters. The indicative SuDS Mitigation Indices for discharge to surface water is summarised in Table 26.3 of The SuDS Manual and reciprocated below in Table 7-10 with respect to the proposed SuDS features at the site.

Table 7-10
SuDS Mitigation Indices for Discharge to Surface Water

Land Use	Pollution Hazard Indices		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Swale	0.5	0.6	0.6

A comparison of the *Pollution Hazard Indices* and *Mitigation Indices* for the proposed 'Source Control', 'Conveyance', and 'Site Control' measures are provided in Table 7-11.

Table 7-11
SuDS Performance: Water Quality Indices Assessment (Discharge to Surface Water)

Land Use	Index	SuDS Mitigation Indices Comparison		
		Total Suspended Solids (TSS)	Metals	Hydrocarbons
Commercial Roof	Hazard	0.3	0.2	0.05
	Mitigation	0.5	0.6	0.6
	Water Quality Requirement Met? (Y/N)	**Y**	**Y**	**Y**

Table 7-11 shows that the *Mitigation Indices* are greater than the *Pollution Hazard Indices*, and therefore the water quality requirements are considered met.

7.8 Design Exceedance Arrangement

The proposed SWDS also considers residual events, i.e., those in excess of the design rainfall event (1% AEP + 20% climate change).

As discussed in Section 3.2, topography across the site falls to the south towards Daugleddau and well as west / north west towards the drainage channel and associated pond feature. As there is no reprofiling of the ground envisaged as part of the development proposals, this exceedance route with be retained.

Therefore, for events in excess of the 1% AEP plus 20% climate change, water would overtop the swale, and due to its location, will follow the pre-existing exceedance route to progress west / north west towards the watercourse and pond feature adjacent to the site boundary.

This design exceedance arrangement is the same for both Options 1 and 2.

8.0 Principal Operation and Maintenance Requirements

At this time, it is assumed that all surface water drainage and pollution control features (swale, hydro-brake and piped network) associated with the site will remain private and be managed by the site operator.

The following section outlines recommended maintenance requirements for the swale, outflow control (Hydro-Brake), and piped network of the drainage system for the development. Note that in the event Option 1 is successful, the hydro-brake is not necessary.

8.1 Swale

The recommended operation and maintenance plan of the swale and hydro-brake is summarised below in Table 8-1.

Table 8-1
Typical Swale and Hydro-Brake Maintenance and Operation Requirements

Maintenance Schedule	Required Action	Minimum 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.
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding > 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 slit removal frequencies.	As required or if bare soil is exposed over 10% or more of the swale treatment area
	Remove sedimentation that has become entrained into the hydro-brake outflow	Every 6 months
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plan types to better suit conditions, if required	Annually
	Periodic measuring of the hydro-brake bore size	Every 3 years
	Checking of the hydro-brake for leakage issues	Annually
Remedial Actions	Repair erosion or other damage by re-turfing or reseeding	As required.
	Relevel uneven surfaces and reinstate design levels	As required.

Maintenance Schedule	Required Action	Minimum Frequency
	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.

8.2 Underground Pipe Network

A recommended operation and maintenance plan for the piped drainage network is summarised in Table 8-2.

Table 8-2
Typical Pipe System Operation and Maintenance Requirements

Maintenance Schedule	Required Action	Minimum Frequency
Regular Maintenance	Ensuring drainage intakes are clear of debris / silt	Monthly, or as required
Occasional Maintenance	Clear Gully Pots	6 monthly
	Jet clean sewer lines, gully tails and kerb channels to remove grease, grit, sediment and other debris to ensure conveyance capacity is not compromised.	Every 2 years
Intermittent Maintenance	CCTV survey of sewer lines to identify any defects/signs of performance degradation such as: • Cracked / deteriorating pipes; • Leaking joints/seals at manholes; • High water lines showing regular high stage in pipes (sign of lack of capacity or downstream constraint); and • Suspected infiltration or exfiltration.	Every 2-5 years
Remedial Actions	Repair defects using suitable methods. Effective temporary repairs may be sufficient in short term until scheduled/capital improvements can be made	As required
Monitoring	Record areas of surface ponding / intake bypassing / surcharging (photos, inundated areas, depths) during extreme storm events and investigate the reasoning for this post-storm	As required

9.0 Conclusions

SLR Consulting Limited (SLR) has been appointed by Anesco Ltd (the client) to produce a Flood Consequence Assessment (FCA) and Drainage Strategy (SWDS) for the proposed Dragon LNG Photo Voltaic (PV) Farm, on land off West Perimeter Road, Dragon LNG Terminal, Milford Haven, SA73 1DR.

Technical information provided in this report on behalf of the Client seeks to demonstrate that a robust and sustainable drainage strategy has been prepared for the site, including residual events. This report has proposed two options for surface water drainage which involve either complete infiltration to ground, or discharge to surface waters.

In lieu of infiltration testing data from the site, an infiltration rate has been extracted testing undertaken locally, 2.5km north west of the proposed development area and in similar sandstone geology.

> **Option 1** indicates that all flows will be conveyed to a swale feature with a volume capacity 7.3m^3 which will completely infiltration to ground.
>
> **Option 2** however adopts a different methodology and provides all attenuation within a swale but with a restricted outflow to discharge runoff into a small watercourse, north of the site boundary. A hydro-brake will be used to restrict flows to the smallest viable discharge rate that can be suitably engineered (1l/s).

In both instances, modelling of the swale has been developed to a design standard of the 1% AEP plus 20% accommodation for climate change based on the urban creep (10%) allowance impermeable area. An extra 2m^3 has been added to both swale volumes to accommodate direct rainfall into the swale.

The pollution mitigation effects of the vegetated swale for both groundwater and surface water discharge are sufficient to satisfy the criteria of the Simple Index Method for runoff draining from the impermeable built development (Education Building).

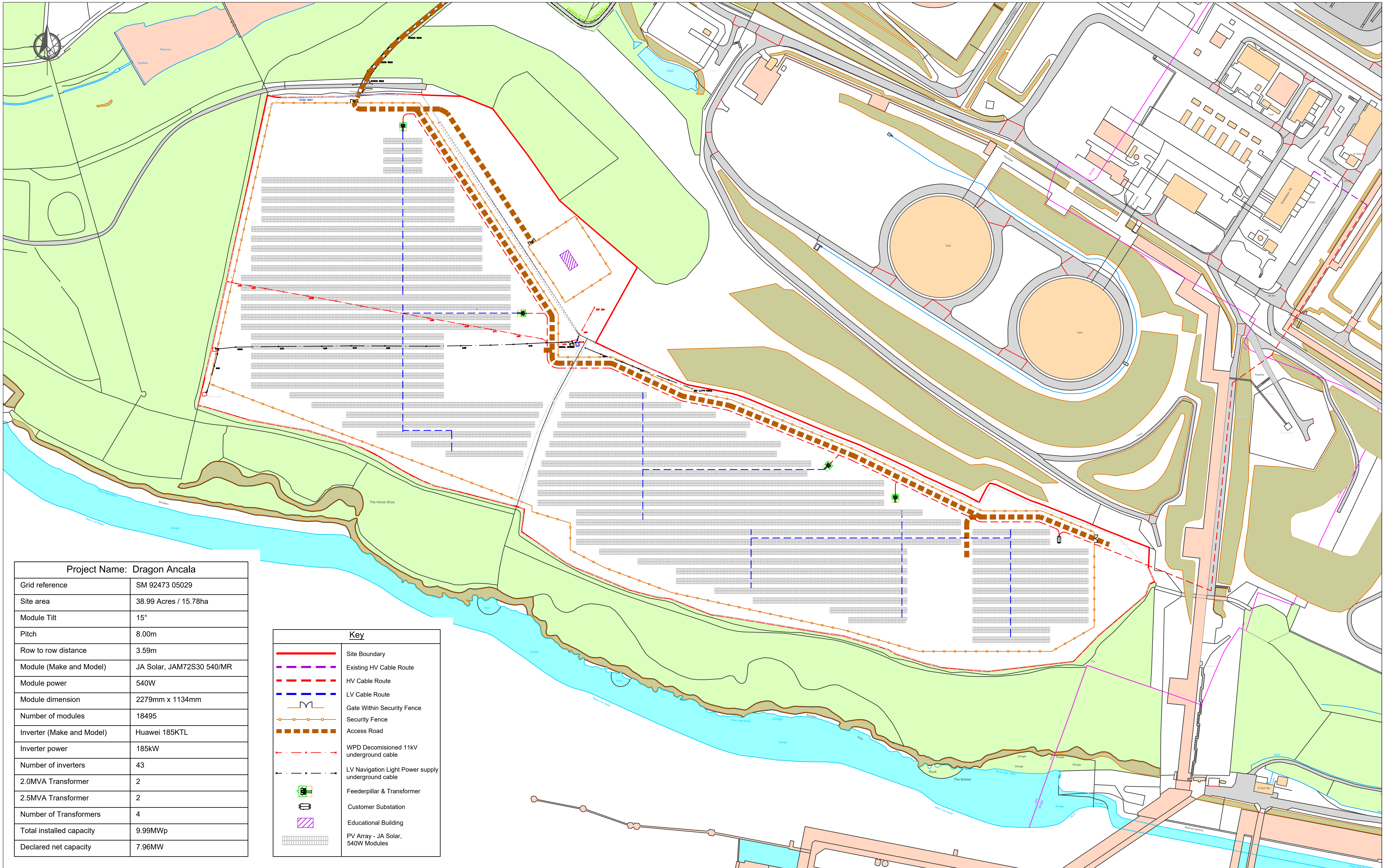
Residual flood events in excess of the design standard have also been considered, and all events greater than the 1% AEP plus 20% climate change will revert to the pre-existing runoff regime discharging west / north west towards the watercourse and pond receptor.

The surface water drainage strategy presented in this report demonstrates that adequate SuDS space provision is afforded within the development and that the proposed scheme is feasible and compliant to appropriate best practice and regulatory requirements and can be maintained in accordance with best practise.

A recommended maintenance plan has been outlined.

APPENDICES

Appendix 01: Development Masterplan



Project Name:	Dragon Ancala
Grid reference	SM 92473 05029
Site area	38.99 Acres / 15.78ha
Module Tilt	15°
Pitch	8.00m
Row to row distance	3.59m
Module (Make and Model)	JA Solar, JAM72S30 540/MR
Module power	540W
Module dimension	2279mm x 1134mm
Number of modules	18495
Inverter (Make and Model)	Huawei 185KTL
Inverter power	185kW
Number of inverters	43
2.0MVA Transformer	2
2.5MVA Transformer	2
Number of Transformers	4
Total installed capacity	9.99MWp
Declared net capacity	7.96MW

Key

- Site Boundary
- Existing HV Cable Route
- HV Cable Route
- LV Cable Route
- Gate Within Security Fence
- Security Fence
- Access Road
- WPD Decomisioned 11kV underground cable
- LV Navigation Light Power supply underground cable
- Feederpillar & Transformer
- Customer Substation
- Educational Building
- PV Array - JA Solar, 540W Modules

Installer Details

Anesco Ltd.
The Green,
Easter Park,
Benyon Road,
Reading,
RG7 2PQ
Tel: 0845 894 4444

Comments

0 10 20 40 60 80 100

Revision	Description	Revised By	Approved By	Date
A	Issued for comment	JH		26/08/2021
B	Educational building added to site and red line boundary amended	JH		07/09/2021
C	Drawing Updated	JH		27/09/2021
D	Amendments for Mitigation Strategy	JH		11/10/2021

Scale	Drawn By	Checked By	Signed by PM	Date Checked	Page	Sheet
1:2000@A2	JH				1 of 1	A2

Installation Address

West Perimeter Road, Dragon LNG Terminal, Milford Haven, SA73 1DR

Project

DRAGON LNG SOLAR FARM - MEADOW

Title

SITE LAYOUT

Drawing No.

C0002459_01

Rev.

D

Anesco™
AMAZING ENERGY

Appendix 02: Topographic Survey

N

NOTES

THIS SURVEY IS ORIENTATED TO ORDNANCE SURVEY GRID NORTH. THE SURVEY IS TO A PLANE GRID. HORIZONTAL MEASUREMENTS TAKEN FROM THIS SURVEY WILL BE GROUND DISTANCES.

LOCAL SCALE FACTOR 1.000

ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM GENERATED BY ACTIVE GPS NETWORK.

DRAINAGE:

NO ALLOWANCE HAS BEEN MADE FOR SUB SURFACE ACCESS TO MANHOLES OR CHAMBERS. ANY PIPE SIZES, DEPTHS OR BELOW GROUND DIMENSIONS ARE TAKEN FROM THE SURFACE AND THUS WILL BE APPROXIMATE ONLY. ANY FLOW TYPES (FOUL WATER, SURFACE WATER OR COMBINED) ARE ASSUMED AND THEREFORE REQUIRE VERIFICATION.

EVERY EFFORT HAS BEEN MADE TO IDENTIFY ALL VISIBLE ABOVE GROUND FEATURES, HOWEVER IT IS POSSIBLE THAT THERE MAY BE ITEMS THAT WERE OBSCURED AT THE TIME OF SURVEY.

TREES:

TREE DIAMETER MEASURED APPROXIMATELY 1.5M ABOVE GROUND LEVEL. TREE SPREADS ARE SYMBOLIC ONLY AND ARE REPRESENTATIVE OF THE GENERALISED CANOPY SIZE. TREE BOLE MAY NOT BE CENTRAL TO THE CANOPY. TREE HEIGHT ESTIMATED FROM GROUND LEVEL.

ONLY TREES OF STEM > 100MM HAVE BEEN SHOWN. ONLY THOSE TREES THAT FALL WITHIN THE SITE LIMITS HAVE BEEN SURVEYED UNLESS OTHERWISE SPECIFIED.

LEGEND

- BANK TOP
- BANK BOTTOM
- BUILDING
- EARTH & STONE HEDGE
- DITCH INVERT
- DITCH TOP
- MISCELLANEOUS
- OVERHEAD CABLE
- RIDGE
- ROAD CHANNEL
- STEPS
- UNDERGROWTH
- WALL
- TOP OF WALL
- FENCE
- GATE
- BT — BT COVER
- MH — MANHOLE
- SI — SIGN POST
- TP — TELEGRAPH POLE
- EP — ELECTRICITY POLE
- TREE

ABBREVIATIONS

ArL	ARCH LEVEL	OHC	OVERHEAD CABLE
AV	AIR VALVE	OSBM	OS BENCHMARK
BL	BOLLARD	PO	POST
BB	BELISHA BEACON	P/R	POST & RAIL FENCE
BH	BOREHOLE	P/W	POST & WIRE FENCE
BT	BT COVER	RE	RODDING EYE
B/W	BARBED WIRE FENCE	RF	ROCK FACE
C/B	CLOSE BOARD FENCE	RP	REFLECTOR POST
C/L	CHAIN LINK FENCE	RWI	RETAINING WALL
CL	COVER LEVEL	SAP	SAPLING
CT	CCTV	SEC	SECURITY CAMERA
D	DIAMETER	SGY	STRIP GULLY
DK	DROPPED KERB	SI	SIGN POST
DP	DOWNPIPE	SoL	SOFFIT LEVEL
EC	ELECTRIC INSP. COVER	SV	STOP VALVE
EP	ELECTRICITY POLE	SY	CABLE STAY
ER	EARTH ROD	TCB	TELEPHONE KIOSK
FH	FIRE HYDRANT	ToW	TOP OF WALL
FL	FLOOR LEVEL	ToH	TOP OF HEDGE
FP	FLAG POLE	TP	TELEPHONE POLE
GU	GULLY	TRK	TRACK LINE
GU/D	GULLY & DOWNPIPE	TL	TRAFFIC LIGHT
GP	GATE POST	VP	VENT PIPE
GV	GAS VALVE	W/P	WOODEN PANEL FENCE
IC	INSPECTION COVER	W/M	WIRE MESH FENCE
IL	INVERT LEVEL	WLV	WATER LEVEL
I/R	IRON RAILING FENCE	WM	WATER METER
KO	KERB OUTLET	WT	WATER TAP
LP	LAMP POST		
MH	MANHOLE		
MKR	MARKER		
OHB	OVERHEAD BUILDING		

STATION CO-ORDINATES

Rev	Date	Revision Notes	By
*	*	*	*

DO NOT SCALE

Project

Dragon LNG
Waterston, Milford Haven
SA73 1DP

Drawing Title

Topographic Survey

Originator

3D Land Surveys Ltd
Reen Cottage
Reen Manor Farm
Perranporth
Cornwall
TR6 0AJ

www.3dlandsurveys.co.uk
info@3dlandsurveys.co.uk

Drawn By	Checked By	Publish Date	Scale(s)
BRO	BRO	07/04/21	1:1000 @ A1

Project No.	Drawing No.	Revision
21-000	Topo_01_3D	0

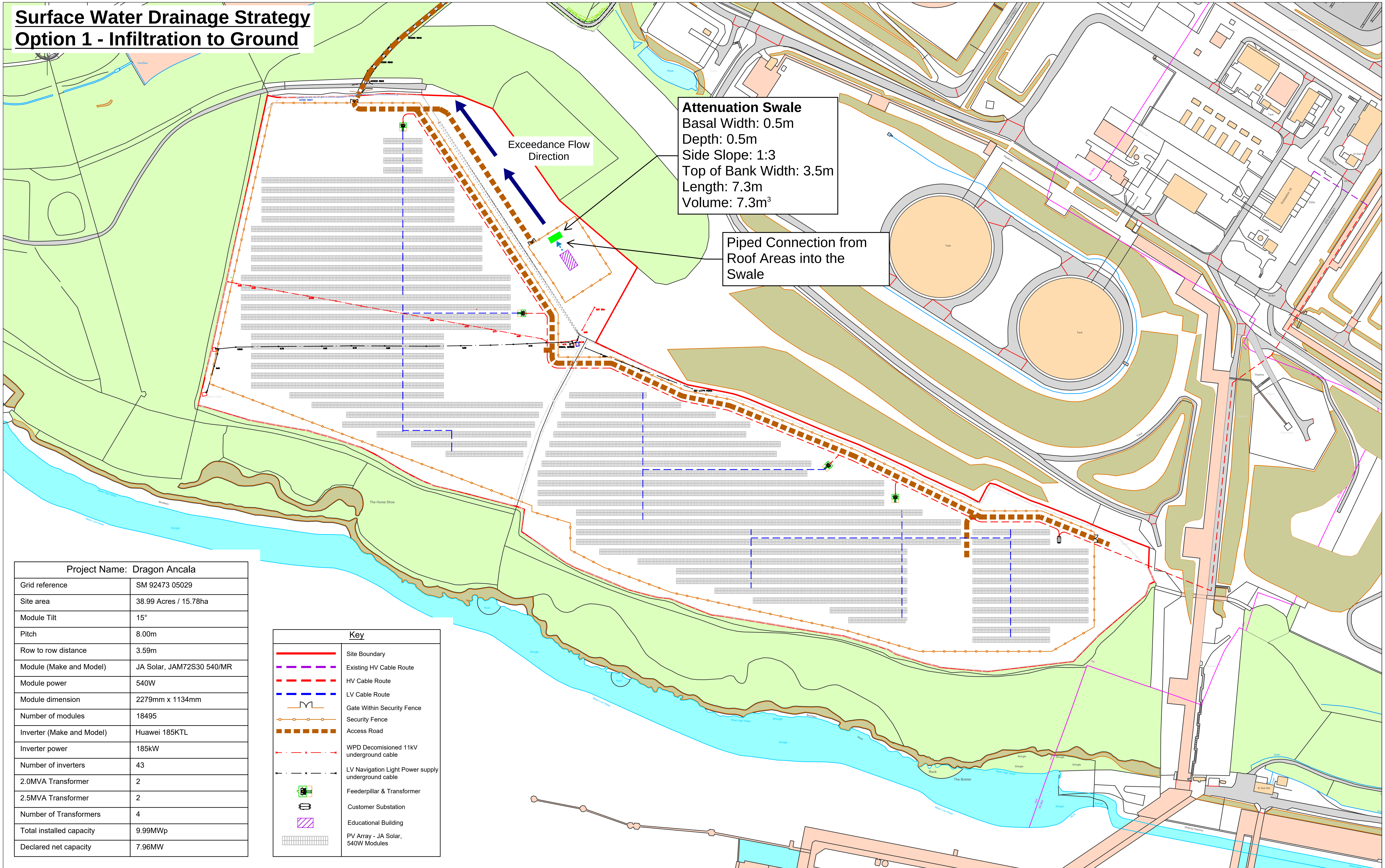
Appendix 03: Welsh Water Asset Search

Dŵr Cymru Welsh Water

We have checked Dŵr Cymru Welsh Water's website (for both Water & Sewer) and in this instance your area is not affected.

Appendix 04: Surface Water Drainage Strategy

Surface Water Drainage Strategy
Option 1 - Infiltration to Ground



Project Name:	Dragon Ancala
Grid reference	SM 92473 05029
Site area	38.99 Acres / 15.78ha
Module Tilt	15°
Pitch	8.00m
Row to row distance	3.59m
Module (Make and Model)	JA Solar, JAM72S30 540/MR
Module power	540W
Module dimension	2279mm x 1134mm
Number of modules	18495
Inverter (Make and Model)	Huawei 185KTL
Inverter power	185kW
Number of inverters	43
2.0MVA Transformer	2
2.5MVA Transformer	2
Number of Transformers	4
Total installed capacity	9.99MWp
Declared net capacity	7.96MW

Key

- Site Boundary
- Existing HV Cable Route
- HV Cable Route
- LV Cable Route
- Gate Within Security Fence
- Security Fence
- Access Road
- WPD Decomisioned 11kV underground cable
- LV Navigation Light Power supply underground cable
- Feederpillar & Transformer
- Customer Substation
- Educational Building
- PV Array - JA Solar, 540W Modules

Installer Details

Anesco Ltd.
The Green,
Easter Park,
Benyon Road,
Reading,
RG7 2PQ
Tel: 0845 894 4444

Comments

0 10 20 40 60 80 100

Revision	Description	Revised By	Approved By	Date
A	Issued for comment	JH		26/08/2021
B	Educational building added to site and red line boundary amended	JH		07/09/2021
C	Drawing Updated	JH		27/09/2021
D	Amendments for Mitigation Strategy	JH		11/10/2021

Scale	Drawn By	Checked By	Signed by PM	Date Checked	Page	Sheet
1:2000@A2	JH				1 of 1	A2

Installation Address: West Perimeter Road, Dragon LNG Terminal, Milford Haven, SA73 1DR

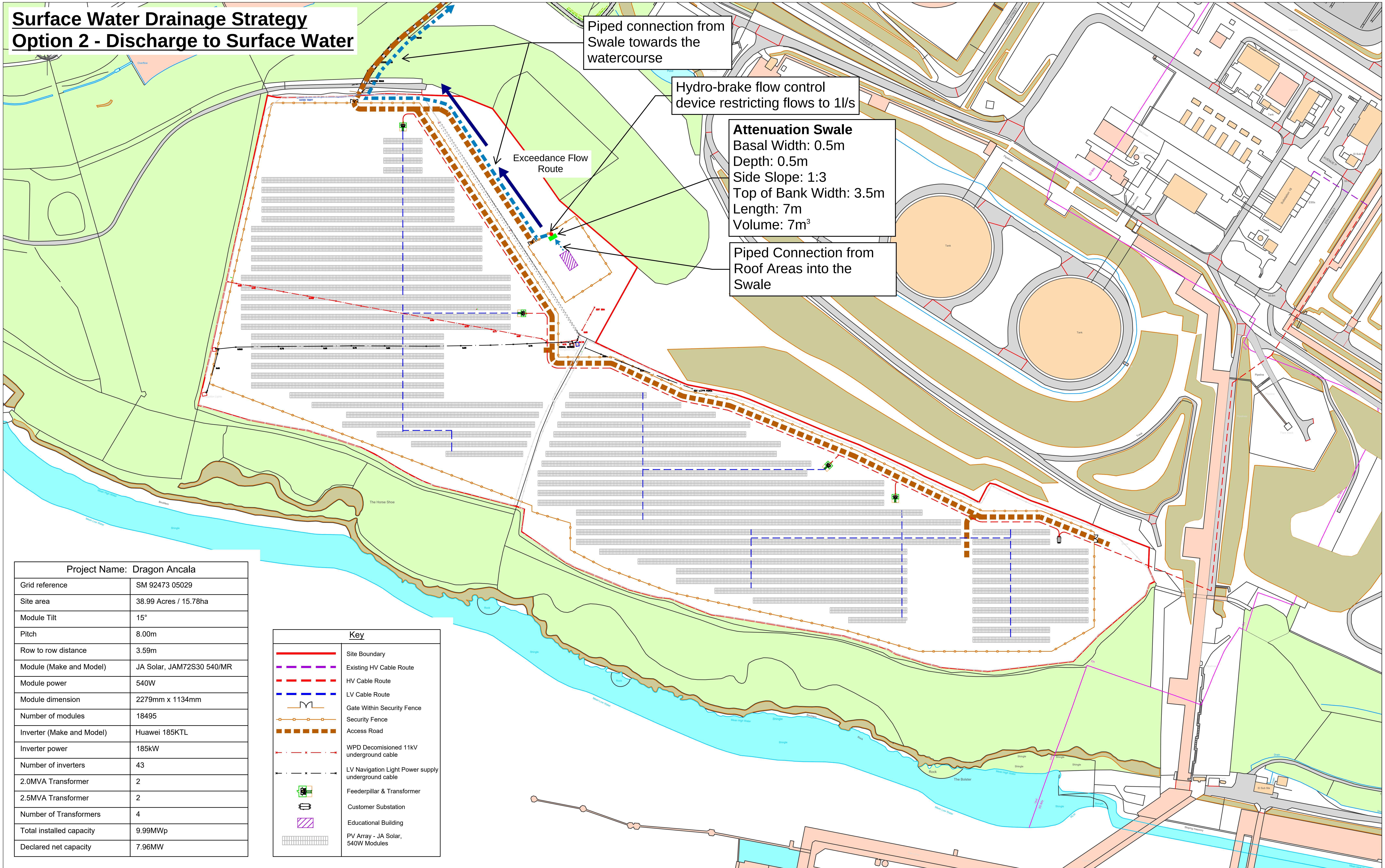
Project: DRAGON LNG SOLAR FARM - MEADOW

Title: SITE LAYOUT

Drawing No.: C0002459_01 | Rev.: D

Anesco™ AMAZING ENERGY

Surface Water Drainage Strategy
Option 2 - Discharge to Surface Water



Project Name:	Dragon Ancala
Grid reference	SM 92473 05029
Site area	38.99 Acres / 15.78ha
Module Tilt	15°
Pitch	8.00m
Row to row distance	3.59m
Module (Make and Model)	JA Solar, JAM72S30 540/MR
Module power	540W
Module dimension	2279mm x 1134mm
Number of modules	18495
Inverter (Make and Model)	Huawei 185KTL
Inverter power	185kW
Number of inverters	43
2.0MVA Transformer	2
2.5MVA Transformer	2
Number of Transformers	4
Total installed capacity	9.99MWp
Declared net capacity	7.96MW

Key

	Site Boundary
	Existing HV Cable Route
	HV Cable Route
	LV Cable Route
	Gate Within Security Fence
	Security Fence
	Access Road
	WPD Decomisioned 11kV underground cable
	LV Navigation Light Power supply underground cable
	Feederpillar & Transformer
	Customer Substation
	Educational Building
	PV Array - JA Solar, 540W Modules

Installer Details

Anesco Ltd.
The Green,
Easter Park,
Benyon Road,
Reading,
RG7 2PQ
Tel: 0845 894 4444

Comments

0 10 20 40 60 80 100

Revision	Description	Revised By	Approved By	Date
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Scale	Drawn By	Checked By	Signed by PM	Date Checked	Page	Sheet
1:2000@A2	JH				1 of 1	A2

Installation Address

West Perimeter Road, Dragon LNG Terminal, Milford Haven, SA73 1DR

Project: DRAGON LNG SOLAR FARM - MEADOW

Title: SITE LAYOUT

Drawing No.: C0002459_01

Rev.: D

Anesco™ AMAZING ENERGY

Appendix 05: Greenfield Runoff Rates

UK Design Flood Estimation

Generated on 11 October 2021 14:29:12 by chloenelson
Printed from the ReFH2 Flood Modelling software package, version 3.2.7650.24314

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH2)

Site details

Checksum: 4E86-ADFF

Site name: FEH_Point_Descriptors_192627_204808

Easting: 192627

Northing: 204808

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01

Using plot scale calculations: Yes

Model: 2.3

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH 2013 model (mm):	18.80	Total runoff (ML):	0.04
Total Rainfall (mm):	13.21	Total flow (ML):	0.13
Peak Rainfall (mm):	1.64	Peak flow (m³/s):	0.01

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 2013 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	02:06:00	No
Timestep (hh:mm:ss)	00:06:00	No
SCF (Seasonal correction factor)	0.71	No
ARF (Areal reduction factor)	0.99	No
Seasonality	Winter	No

Loss model parameters

Name	Value	User-defined?
Cini (mm)	94.02	No
Cmax (mm)	370.15	No
Use alpha correction factor	No	No
Alpha correction factor	n/a	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	1	No
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	25.68	No
BR	2.68	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0	No
Urbext 2000	0	No
Impervious runoff factor	0.7	No
Imperviousness factor	0.4	No
Tp scaling factor	0.75	No
Depression storage depth (mm)	0.5	No
Exporting drained area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
00:00:00	0.1332	0.0000	0.0339	0.0000	0.00039	0.00039
00:06:00	0.1747	0.0000	0.0445	0.0000	0.000388	0.000391
00:12:00	0.2289	0.0000	0.0584	0.0000	0.000387	0.0004
00:18:00	0.2996	0.0000	0.0767	0.0000	0.000386	0.000418
00:24:00	0.3915	0.0000	0.1005	0.0001	0.000385	0.000449
00:30:00	0.5105	0.0000	0.1317	0.0001	0.000384	0.000496
00:36:00	0.6641	0.0000	0.1724	0.0002	0.000384	0.000565
00:42:00	0.8608	0.0000	0.2253	0.0003	0.000385	0.000661
00:48:00	1.1096	0.0000	0.2933	0.0004	0.000387	0.000795
00:54:00	1.4131	0.0000	0.3784	0.0006	0.000391	0.000978
01:00:00	1.6359	0.0000	0.4447	0.0008	0.000397	0.00122
01:06:00	1.4131	0.0000	0.3900	0.0011	0.000405	0.00154
01:12:00	1.1096	0.0000	0.3100	0.0015	0.000417	0.00193
01:18:00	0.8608	0.0000	0.2428	0.0019	0.000434	0.00236
01:24:00	0.6641	0.0000	0.1887	0.0024	0.000455	0.00284
01:30:00	0.5105	0.0000	0.1458	0.0028	0.00048	0.00333
01:36:00	0.3915	0.0000	0.1123	0.0033	0.00051	0.00382
01:42:00	0.2996	0.0000	0.0862	0.0038	0.000545	0.0043
01:48:00	0.2289	0.0000	0.0661	0.0042	0.000584	0.00474
01:54:00	0.1747	0.0000	0.0505	0.0045	0.000627	0.00513
02:00:00	0.1332	0.0000	0.0386	0.0048	0.000672	0.00543
02:06:00	0.0000	0.0000	0.0000	0.0049	0.00072	0.00562
02:12:00	0.0000	0.0000	0.0000	0.0049	0.000769	0.00571
02:18:00	0.0000	0.0000	0.0000	0.0049	0.000817	0.00569
02:24:00	0.0000	0.0000	0.0000	0.0047	0.000864	0.0056
02:30:00	0.0000	0.0000	0.0000	0.0045	0.000909	0.00545
02:36:00	0.0000	0.0000	0.0000	0.0043	0.000951	0.00526
02:42:00	0.0000	0.0000	0.0000	0.0040	0.000991	0.00504
02:48:00	0.0000	0.0000	0.0000	0.0038	0.00103	0.0048
02:54:00	0.0000	0.0000	0.0000	0.0035	0.00106	0.00454
03:00:00	0.0000	0.0000	0.0000	0.0032	0.00109	0.00429
03:06:00	0.0000	0.0000	0.0000	0.0029	0.00112	0.00405
03:12:00	0.0000	0.0000	0.0000	0.0027	0.00114	0.00382
03:18:00	0.0000	0.0000	0.0000	0.0024	0.00117	0.00361
03:24:00	0.0000	0.0000	0.0000	0.0022	0.00119	0.00341

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
03:30:00	0.0000	0.0000	0.0000	0.0020	0.0012	0.00323
03:36:00	0.0000	0.0000	0.0000	0.0018	0.00122	0.00305
03:42:00	0.0000	0.0000	0.0000	0.0016	0.00123	0.00288
03:48:00	0.0000	0.0000	0.0000	0.0015	0.00124	0.00271
03:54:00	0.0000	0.0000	0.0000	0.0013	0.00125	0.00255
04:00:00	0.0000	0.0000	0.0000	0.0011	0.00126	0.00239
04:06:00	0.0000	0.0000	0.0000	0.0010	0.00127	0.00224
04:12:00	0.0000	0.0000	0.0000	0.0008	0.00127	0.0021
04:18:00	0.0000	0.0000	0.0000	0.0007	0.00127	0.00196
04:24:00	0.0000	0.0000	0.0000	0.0005	0.00128	0.00182
04:30:00	0.0000	0.0000	0.0000	0.0004	0.00128	0.0017
04:36:00	0.0000	0.0000	0.0000	0.0003	0.00128	0.0016
04:42:00	0.0000	0.0000	0.0000	0.0002	0.00127	0.00151
04:48:00	0.0000	0.0000	0.0000	0.0002	0.00127	0.00144
04:54:00	0.0000	0.0000	0.0000	0.0001	0.00127	0.00138
05:00:00	0.0000	0.0000	0.0000	0.0001	0.00126	0.00134
05:06:00	0.0000	0.0000	0.0000	0.0001	0.00126	0.00131
05:12:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00129
05:18:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00127
05:24:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00125
05:30:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
05:36:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
05:42:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
05:48:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
05:54:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
06:00:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
06:06:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
06:12:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
06:18:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
06:24:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012
06:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
06:36:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
06:42:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
06:48:00	0.0000	0.0000	0.0000	0.0000	0.00118	0.00118
06:54:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
07:00:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
07:06:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
07:12:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
07:18:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
07:24:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
07:30:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
07:36:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
07:42:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
07:48:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
07:54:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
08:00:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
08:06:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
08:12:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
08:18:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
08:24:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
08:30:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
08:36:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
08:42:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
08:48:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
08:54:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
09:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
09:06:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
09:12:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
09:18:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
09:24:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
09:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
09:36:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
09:42:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
09:48:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
09:54:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
10:00:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
10:06:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
10:12:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
10:18:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
10:24:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
10:36:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
10:42:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
10:48:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
10:54:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
11:00:00	0.0000	0.0000	0.0000	0.0000	0.001	0.001
11:06:00	0.0000	0.0000	0.0000	0.0000	0.000997	0.000997
11:12:00	0.0000	0.0000	0.0000	0.0000	0.000993	0.000993
11:18:00	0.0000	0.0000	0.0000	0.0000	0.00099	0.00099
11:24:00	0.0000	0.0000	0.0000	0.0000	0.000986	0.000986
11:30:00	0.0000	0.0000	0.0000	0.0000	0.000982	0.000982
11:36:00	0.0000	0.0000	0.0000	0.0000	0.000978	0.000978
11:42:00	0.0000	0.0000	0.0000	0.0000	0.000974	0.000974
11:48:00	0.0000	0.0000	0.0000	0.0000	0.00097	0.00097
11:54:00	0.0000	0.0000	0.0000	0.0000	0.000967	0.000967
12:00:00	0.0000	0.0000	0.0000	0.0000	0.000963	0.000963
12:06:00	0.0000	0.0000	0.0000	0.0000	0.000959	0.000959
12:12:00	0.0000	0.0000	0.0000	0.0000	0.000955	0.000955
12:18:00	0.0000	0.0000	0.0000	0.0000	0.000952	0.000952
12:24:00	0.0000	0.0000	0.0000	0.0000	0.000948	0.000948
12:30:00	0.0000	0.0000	0.0000	0.0000	0.000944	0.000944
12:36:00	0.0000	0.0000	0.0000	0.0000	0.000941	0.000941
12:42:00	0.0000	0.0000	0.0000	0.0000	0.000937	0.000937
12:48:00	0.0000	0.0000	0.0000	0.0000	0.000933	0.000933
12:54:00	0.0000	0.0000	0.0000	0.0000	0.00093	0.00093
13:00:00	0.0000	0.0000	0.0000	0.0000	0.000926	0.000926
13:06:00	0.0000	0.0000	0.0000	0.0000	0.000923	0.000923
13:12:00	0.0000	0.0000	0.0000	0.0000	0.000919	0.000919
13:18:00	0.0000	0.0000	0.0000	0.0000	0.000915	0.000915
13:24:00	0.0000	0.0000	0.0000	0.0000	0.000912	0.000912
13:30:00	0.0000	0.0000	0.0000	0.0000	0.000908	0.000908
13:36:00	0.0000	0.0000	0.0000	0.0000	0.000905	0.000905
13:42:00	0.0000	0.0000	0.0000	0.0000	0.000901	0.000901
13:48:00	0.0000	0.0000	0.0000	0.0000	0.000898	0.000898
13:54:00	0.0000	0.0000	0.0000	0.0000	0.000894	0.000894
14:00:00	0.0000	0.0000	0.0000	0.0000	0.000891	0.000891
14:06:00	0.0000	0.0000	0.0000	0.0000	0.000887	0.000887
14:12:00	0.0000	0.0000	0.0000	0.0000	0.000884	0.000884

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
14:18:00	0.0000	0.0000	0.0000	0.0000	0.00088	0.00088
14:24:00	0.0000	0.0000	0.0000	0.0000	0.000877	0.000877
14:30:00	0.0000	0.0000	0.0000	0.0000	0.000874	0.000874
14:36:00	0.0000	0.0000	0.0000	0.0000	0.00087	0.00087
14:42:00	0.0000	0.0000	0.0000	0.0000	0.000867	0.000867
14:48:00	0.0000	0.0000	0.0000	0.0000	0.000863	0.000863
14:54:00	0.0000	0.0000	0.0000	0.0000	0.00086	0.00086
15:00:00	0.0000	0.0000	0.0000	0.0000	0.000857	0.000857
15:06:00	0.0000	0.0000	0.0000	0.0000	0.000853	0.000853
15:12:00	0.0000	0.0000	0.0000	0.0000	0.00085	0.00085
15:18:00	0.0000	0.0000	0.0000	0.0000	0.000847	0.000847
15:24:00	0.0000	0.0000	0.0000	0.0000	0.000843	0.000843
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00084	0.00084
15:36:00	0.0000	0.0000	0.0000	0.0000	0.000837	0.000837
15:42:00	0.0000	0.0000	0.0000	0.0000	0.000834	0.000834
15:48:00	0.0000	0.0000	0.0000	0.0000	0.00083	0.00083
15:54:00	0.0000	0.0000	0.0000	0.0000	0.000827	0.000827
16:00:00	0.0000	0.0000	0.0000	0.0000	0.000824	0.000824
16:06:00	0.0000	0.0000	0.0000	0.0000	0.000821	0.000821
16:12:00	0.0000	0.0000	0.0000	0.0000	0.000818	0.000818
16:18:00	0.0000	0.0000	0.0000	0.0000	0.000814	0.000814
16:24:00	0.0000	0.0000	0.0000	0.0000	0.000811	0.000811
16:30:00	0.0000	0.0000	0.0000	0.0000	0.000808	0.000808
16:36:00	0.0000	0.0000	0.0000	0.0000	0.000805	0.000805
16:42:00	0.0000	0.0000	0.0000	0.0000	0.000802	0.000802
16:48:00	0.0000	0.0000	0.0000	0.0000	0.000799	0.000799
16:54:00	0.0000	0.0000	0.0000	0.0000	0.000796	0.000796
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000793	0.000793
17:06:00	0.0000	0.0000	0.0000	0.0000	0.000789	0.000789
17:12:00	0.0000	0.0000	0.0000	0.0000	0.000786	0.000786
17:18:00	0.0000	0.0000	0.0000	0.0000	0.000783	0.000783
17:24:00	0.0000	0.0000	0.0000	0.0000	0.00078	0.00078
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000777	0.000777
17:36:00	0.0000	0.0000	0.0000	0.0000	0.000774	0.000774
17:42:00	0.0000	0.0000	0.0000	0.0000	0.000771	0.000771
17:48:00	0.0000	0.0000	0.0000	0.0000	0.000768	0.000768

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
17:54:00	0.0000	0.0000	0.0000	0.0000	0.000765	0.000765
18:00:00	0.0000	0.0000	0.0000	0.0000	0.000762	0.000762
18:06:00	0.0000	0.0000	0.0000	0.0000	0.000759	0.000759
18:12:00	0.0000	0.0000	0.0000	0.0000	0.000756	0.000756
18:18:00	0.0000	0.0000	0.0000	0.0000	0.000753	0.000753
18:24:00	0.0000	0.0000	0.0000	0.0000	0.00075	0.00075
18:30:00	0.0000	0.0000	0.0000	0.0000	0.000748	0.000748
18:36:00	0.0000	0.0000	0.0000	0.0000	0.000745	0.000745
18:42:00	0.0000	0.0000	0.0000	0.0000	0.000742	0.000742
18:48:00	0.0000	0.0000	0.0000	0.0000	0.000739	0.000739
18:54:00	0.0000	0.0000	0.0000	0.0000	0.000736	0.000736
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000733	0.000733
19:06:00	0.0000	0.0000	0.0000	0.0000	0.00073	0.00073
19:12:00	0.0000	0.0000	0.0000	0.0000	0.000727	0.000727
19:18:00	0.0000	0.0000	0.0000	0.0000	0.000725	0.000725
19:24:00	0.0000	0.0000	0.0000	0.0000	0.000722	0.000722
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000719	0.000719
19:36:00	0.0000	0.0000	0.0000	0.0000	0.000716	0.000716
19:42:00	0.0000	0.0000	0.0000	0.0000	0.000713	0.000713
19:48:00	0.0000	0.0000	0.0000	0.0000	0.000711	0.000711
19:54:00	0.0000	0.0000	0.0000	0.0000	0.000708	0.000708
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000705	0.000705
20:06:00	0.0000	0.0000	0.0000	0.0000	0.000702	0.000702
20:12:00	0.0000	0.0000	0.0000	0.0000	0.0007	0.0007
20:18:00	0.0000	0.0000	0.0000	0.0000	0.000697	0.000697
20:24:00	0.0000	0.0000	0.0000	0.0000	0.000694	0.000694
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000692	0.000692
20:36:00	0.0000	0.0000	0.0000	0.0000	0.000689	0.000689
20:42:00	0.0000	0.0000	0.0000	0.0000	0.000686	0.000686
20:48:00	0.0000	0.0000	0.0000	0.0000	0.000684	0.000684
20:54:00	0.0000	0.0000	0.0000	0.0000	0.000681	0.000681
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000678	0.000678
21:06:00	0.0000	0.0000	0.0000	0.0000	0.000676	0.000676
21:12:00	0.0000	0.0000	0.0000	0.0000	0.000673	0.000673
21:18:00	0.0000	0.0000	0.0000	0.0000	0.00067	0.00067
21:24:00	0.0000	0.0000	0.0000	0.0000	0.000668	0.000668

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000665	0.000665
21:36:00	0.0000	0.0000	0.0000	0.0000	0.000663	0.000663
21:42:00	0.0000	0.0000	0.0000	0.0000	0.00066	0.00066
21:48:00	0.0000	0.0000	0.0000	0.0000	0.000657	0.000657
21:54:00	0.0000	0.0000	0.0000	0.0000	0.000655	0.000655
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000652	0.000652
22:06:00	0.0000	0.0000	0.0000	0.0000	0.00065	0.00065
22:12:00	0.0000	0.0000	0.0000	0.0000	0.000647	0.000647
22:18:00	0.0000	0.0000	0.0000	0.0000	0.000645	0.000645
22:24:00	0.0000	0.0000	0.0000	0.0000	0.000642	0.000642
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00064	0.00064
22:36:00	0.0000	0.0000	0.0000	0.0000	0.000637	0.000637
22:42:00	0.0000	0.0000	0.0000	0.0000	0.000635	0.000635
22:48:00	0.0000	0.0000	0.0000	0.0000	0.000632	0.000632
22:54:00	0.0000	0.0000	0.0000	0.0000	0.00063	0.00063
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000627	0.000627
23:06:00	0.0000	0.0000	0.0000	0.0000	0.000625	0.000625
23:12:00	0.0000	0.0000	0.0000	0.0000	0.000623	0.000623
23:18:00	0.0000	0.0000	0.0000	0.0000	0.00062	0.00062
23:24:00	0.0000	0.0000	0.0000	0.0000	0.000618	0.000618
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000615	0.000615
23:36:00	0.0000	0.0000	0.0000	0.0000	0.000613	0.000613
23:42:00	0.0000	0.0000	0.0000	0.0000	0.000611	0.000611
23:48:00	0.0000	0.0000	0.0000	0.0000	0.000608	0.000608
23:54:00	0.0000	0.0000	0.0000	0.0000	0.000606	0.000606
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000603	0.000603
24:06:00	0.0000	0.0000	0.0000	0.0000	0.000601	0.000601
24:12:00	0.0000	0.0000	0.0000	0.0000	0.000599	0.000599
24:18:00	0.0000	0.0000	0.0000	0.0000	0.000596	0.000596
24:24:00	0.0000	0.0000	0.0000	0.0000	0.000594	0.000594
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000592	0.000592
24:36:00	0.0000	0.0000	0.0000	0.0000	0.00059	0.00059
24:42:00	0.0000	0.0000	0.0000	0.0000	0.000587	0.000587
24:48:00	0.0000	0.0000	0.0000	0.0000	0.000585	0.000585
24:54:00	0.0000	0.0000	0.0000	0.0000	0.000583	0.000583
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00058	0.00058

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
25:06:00	0.0000	0.0000	0.0000	0.0000	0.000578	0.000578
25:12:00	0.0000	0.0000	0.0000	0.0000	0.000576	0.000576
25:18:00	0.0000	0.0000	0.0000	0.0000	0.000574	0.000574
25:24:00	0.0000	0.0000	0.0000	0.0000	0.000571	0.000571
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000569	0.000569
25:36:00	0.0000	0.0000	0.0000	0.0000	0.000567	0.000567
25:42:00	0.0000	0.0000	0.0000	0.0000	0.000565	0.000565
25:48:00	0.0000	0.0000	0.0000	0.0000	0.000563	0.000563
25:54:00	0.0000	0.0000	0.0000	0.0000	0.00056	0.00056
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000558	0.000558
26:06:00	0.0000	0.0000	0.0000	0.0000	0.000556	0.000556
26:12:00	0.0000	0.0000	0.0000	0.0000	0.000554	0.000554
26:18:00	0.0000	0.0000	0.0000	0.0000	0.000552	0.000552
26:24:00	0.0000	0.0000	0.0000	0.0000	0.00055	0.00055
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000547	0.000547
26:36:00	0.0000	0.0000	0.0000	0.0000	0.000545	0.000545
26:42:00	0.0000	0.0000	0.0000	0.0000	0.000543	0.000543
26:48:00	0.0000	0.0000	0.0000	0.0000	0.000541	0.000541
26:54:00	0.0000	0.0000	0.0000	0.0000	0.000539	0.000539
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000537	0.000537
27:06:00	0.0000	0.0000	0.0000	0.0000	0.000535	0.000535
27:12:00	0.0000	0.0000	0.0000	0.0000	0.000533	0.000533
27:18:00	0.0000	0.0000	0.0000	0.0000	0.000531	0.000531
27:24:00	0.0000	0.0000	0.0000	0.0000	0.000529	0.000529
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000527	0.000527
27:36:00	0.0000	0.0000	0.0000	0.0000	0.000525	0.000525
27:42:00	0.0000	0.0000	0.0000	0.0000	0.000522	0.000522
27:48:00	0.0000	0.0000	0.0000	0.0000	0.00052	0.00052
27:54:00	0.0000	0.0000	0.0000	0.0000	0.000518	0.000518
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000516	0.000516
28:06:00	0.0000	0.0000	0.0000	0.0000	0.000514	0.000514
28:12:00	0.0000	0.0000	0.0000	0.0000	0.000512	0.000512
28:18:00	0.0000	0.0000	0.0000	0.0000	0.00051	0.00051
28:24:00	0.0000	0.0000	0.0000	0.0000	0.000508	0.000508
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000506	0.000506
28:36:00	0.0000	0.0000	0.0000	0.0000	0.000504	0.000504

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
28:42:00	0.0000	0.0000	0.0000	0.0000	0.000503	0.000503
28:48:00	0.0000	0.0000	0.0000	0.0000	0.000501	0.000501
28:54:00	0.0000	0.0000	0.0000	0.0000	0.000499	0.000499
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000497	0.000497
29:06:00	0.0000	0.0000	0.0000	0.0000	0.000495	0.000495
29:12:00	0.0000	0.0000	0.0000	0.0000	0.000493	0.000493
29:18:00	0.0000	0.0000	0.0000	0.0000	0.000491	0.000491
29:24:00	0.0000	0.0000	0.0000	0.0000	0.000489	0.000489
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000487	0.000487
29:36:00	0.0000	0.0000	0.0000	0.0000	0.000485	0.000485
29:42:00	0.0000	0.0000	0.0000	0.0000	0.000483	0.000483
29:48:00	0.0000	0.0000	0.0000	0.0000	0.000481	0.000481
29:54:00	0.0000	0.0000	0.0000	0.0000	0.00048	0.00048
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000478	0.000478
30:06:00	0.0000	0.0000	0.0000	0.0000	0.000476	0.000476
30:12:00	0.0000	0.0000	0.0000	0.0000	0.000474	0.000474
30:18:00	0.0000	0.0000	0.0000	0.0000	0.000472	0.000472
30:24:00	0.0000	0.0000	0.0000	0.0000	0.00047	0.00047
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000469	0.000469
30:36:00	0.0000	0.0000	0.0000	0.0000	0.000467	0.000467
30:42:00	0.0000	0.0000	0.0000	0.0000	0.000465	0.000465
30:48:00	0.0000	0.0000	0.0000	0.0000	0.000463	0.000463
30:54:00	0.0000	0.0000	0.0000	0.0000	0.000461	0.000461
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000459	0.000459
31:06:00	0.0000	0.0000	0.0000	0.0000	0.000458	0.000458
31:12:00	0.0000	0.0000	0.0000	0.0000	0.000456	0.000456
31:18:00	0.0000	0.0000	0.0000	0.0000	0.000454	0.000454
31:24:00	0.0000	0.0000	0.0000	0.0000	0.000452	0.000452
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000451	0.000451
31:36:00	0.0000	0.0000	0.0000	0.0000	0.000449	0.000449
31:42:00	0.0000	0.0000	0.0000	0.0000	0.000447	0.000447
31:48:00	0.0000	0.0000	0.0000	0.0000	0.000445	0.000445
31:54:00	0.0000	0.0000	0.0000	0.0000	0.000444	0.000444
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000442	0.000442
32:06:00	0.0000	0.0000	0.0000	0.0000	0.00044	0.00044
32:12:00	0.0000	0.0000	0.0000	0.0000	0.000439	0.000439

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m³/s)	Baseflow (m³/s)	Total Flow (m³/s)
32:18:00	0.0000	0.0000	0.0000	0.0000	0.000437	0.000437
32:24:00	0.0000	0.0000	0.0000	0.0000	0.000435	0.000435
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000433	0.000433
32:36:00	0.0000	0.0000	0.0000	0.0000	0.000432	0.000432
32:42:00	0.0000	0.0000	0.0000	0.0000	0.00043	0.00043
32:48:00	0.0000	0.0000	0.0000	0.0000	0.000428	0.000428
32:54:00	0.0000	0.0000	0.0000	0.0000	0.000427	0.000427
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000425	0.000425
33:06:00	0.0000	0.0000	0.0000	0.0000	0.000423	0.000423
33:12:00	0.0000	0.0000	0.0000	0.0000	0.000422	0.000422
33:18:00	0.0000	0.0000	0.0000	0.0000	0.00042	0.00042
33:24:00	0.0000	0.0000	0.0000	0.0000	0.000418	0.000418
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000417	0.000417
33:36:00	0.0000	0.0000	0.0000	0.0000	0.000415	0.000415
33:42:00	0.0000	0.0000	0.0000	0.0000	0.000414	0.000414
33:48:00	0.0000	0.0000	0.0000	0.0000	0.000412	0.000412
33:54:00	0.0000	0.0000	0.0000	0.0000	0.00041	0.00041
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000409	0.000409
34:06:00	0.0000	0.0000	0.0000	0.0000	0.000407	0.000407
34:12:00	0.0000	0.0000	0.0000	0.0000	0.000406	0.000406
34:18:00	0.0000	0.0000	0.0000	0.0000	0.000404	0.000404
34:24:00	0.0000	0.0000	0.0000	0.0000	0.000403	0.000403
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000401	0.000401
34:36:00	0.0000	0.0000	0.0000	0.0000	0.000399	0.000399
34:42:00	0.0000	0.0000	0.0000	0.0000	0.000398	0.000398
34:48:00	0.0000	0.0000	0.0000	0.0000	0.000396	0.000396
34:54:00	0.0000	0.0000	0.0000	0.0000	0.000395	0.000395
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000393	0.000393

Appendix

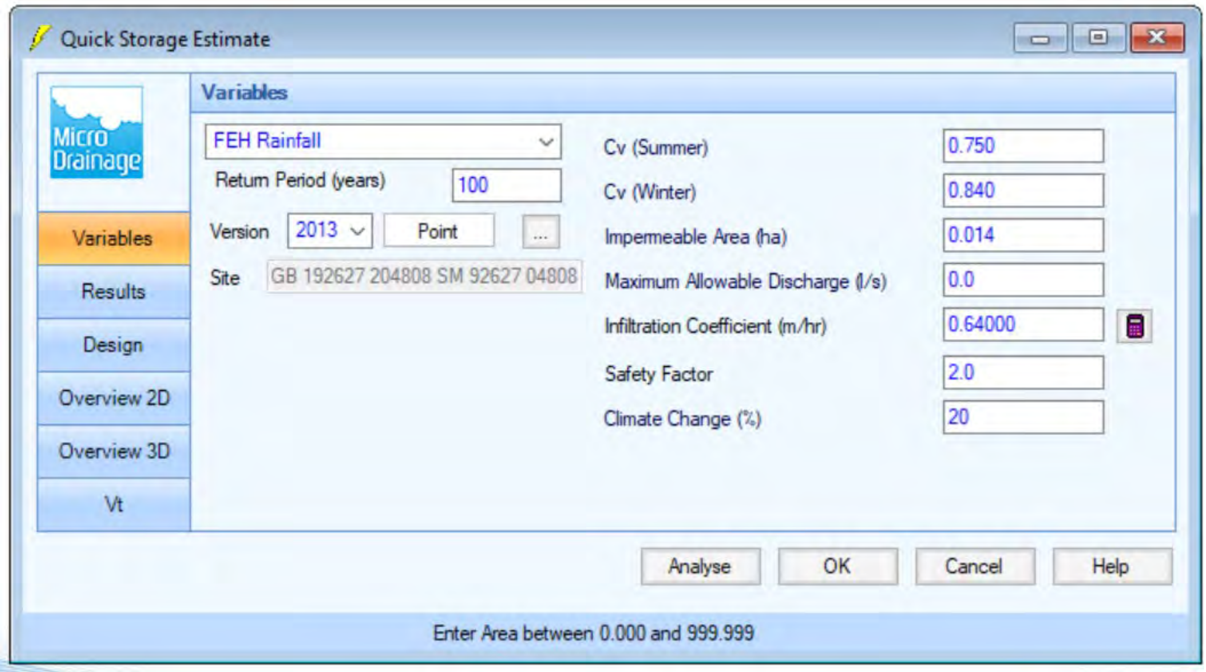
Catchment descriptors

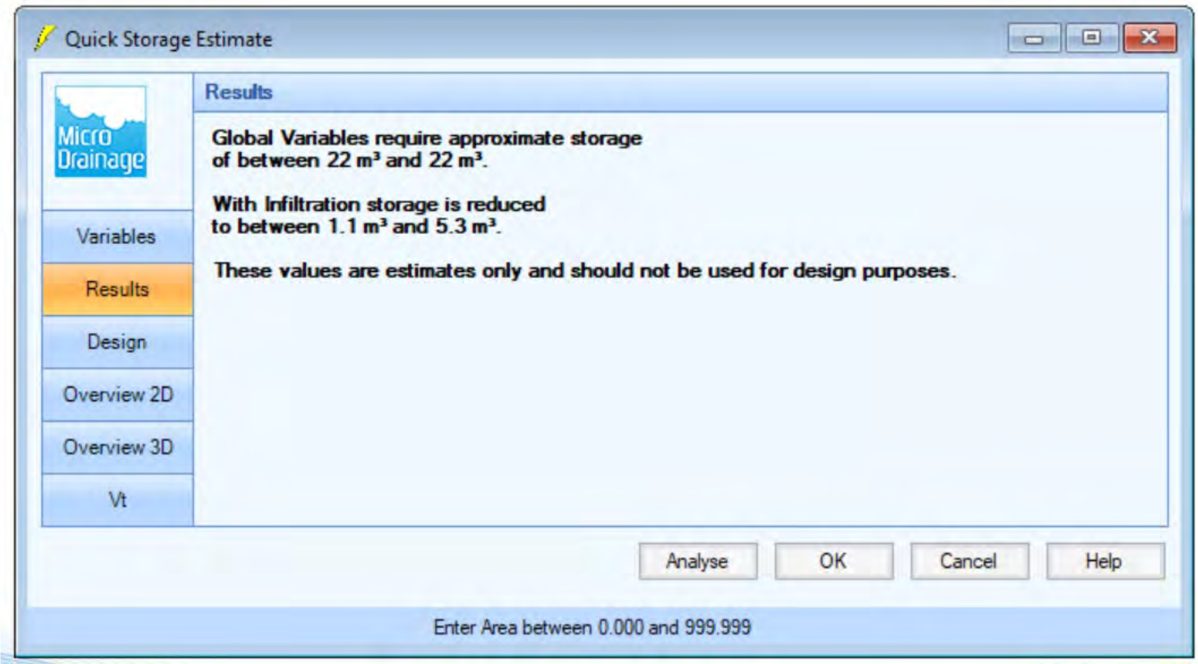
Name	Value	User-defined value used?
BFIHOST	0.59	No
BFIHOST19	0.48	No
PROPWET (mm)	0.44	No
SAAR (mm)	1012	No

Appendix 06: Option 1 - Quick Storage Estimate of Attenuation Requirements

MicroDrainage
Quick Storage Estimate
Anesco Ltd: Dragon LNG Solar Farm

Infiltration to Ground





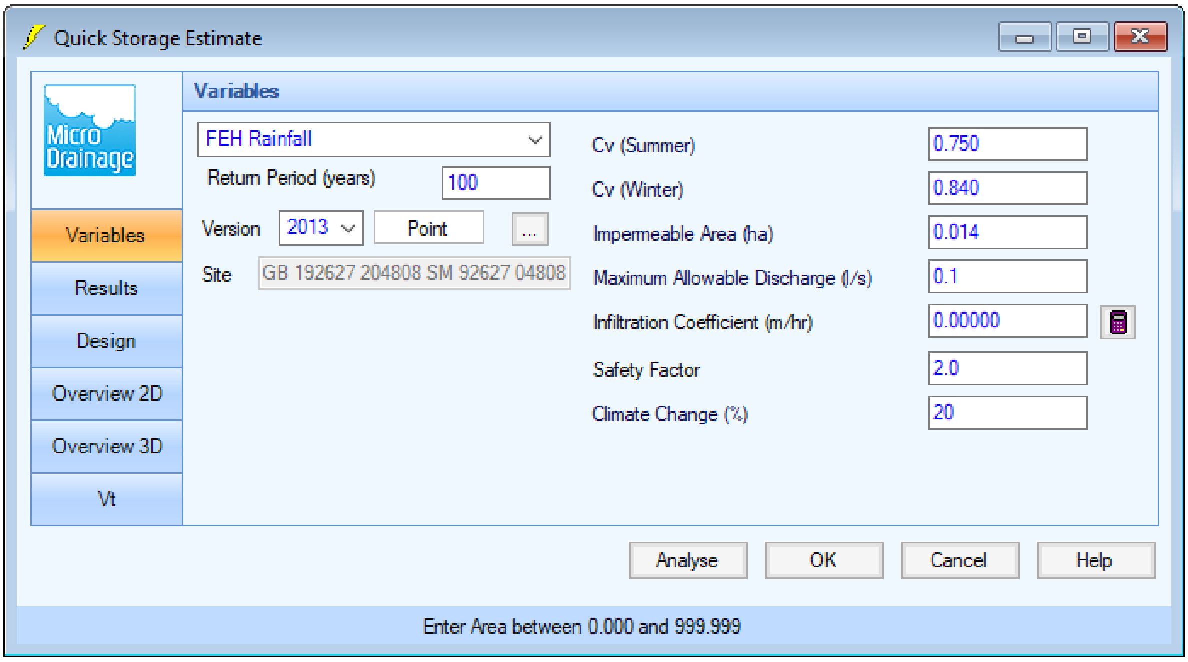
Appendix 07: Option 2 - Quick Storage Estimate of Attenuation Requirements

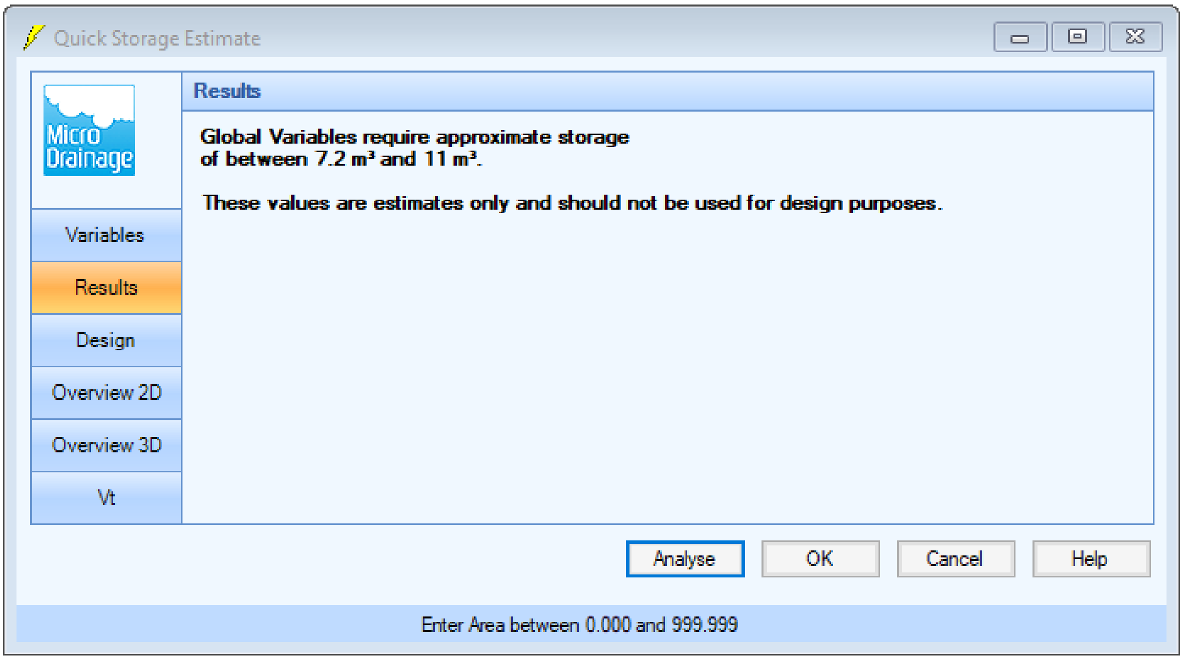
MicroDrainage

Quick Storage Estimate

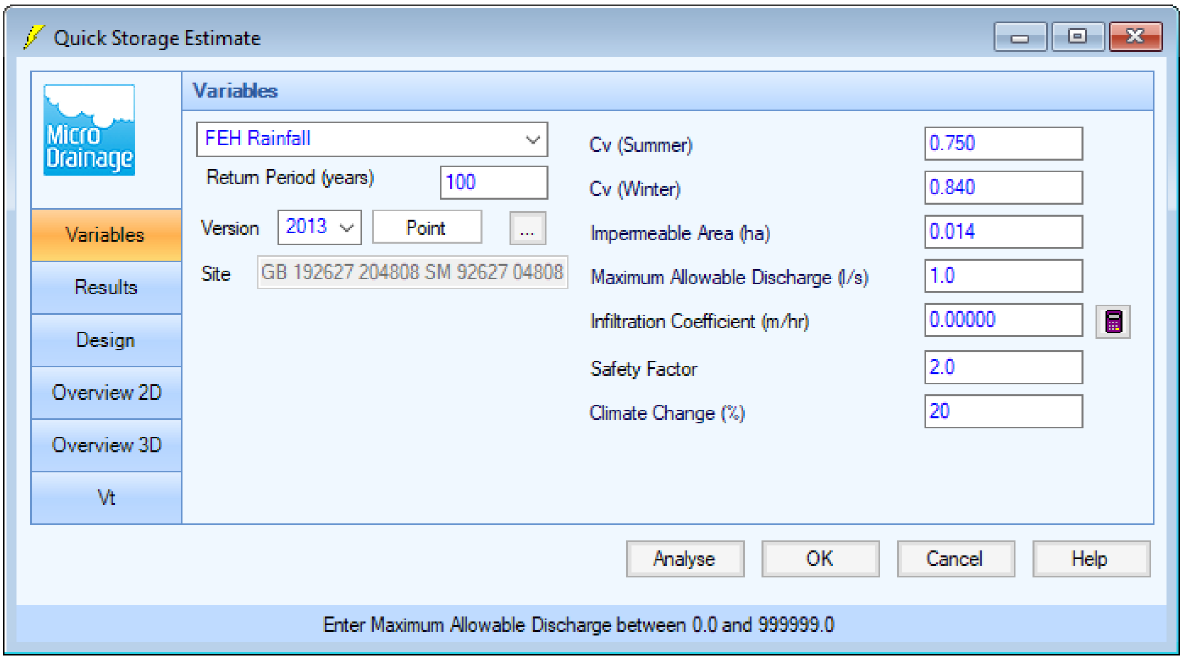
Anesco Ltd: Dragon LNG Solar Farm

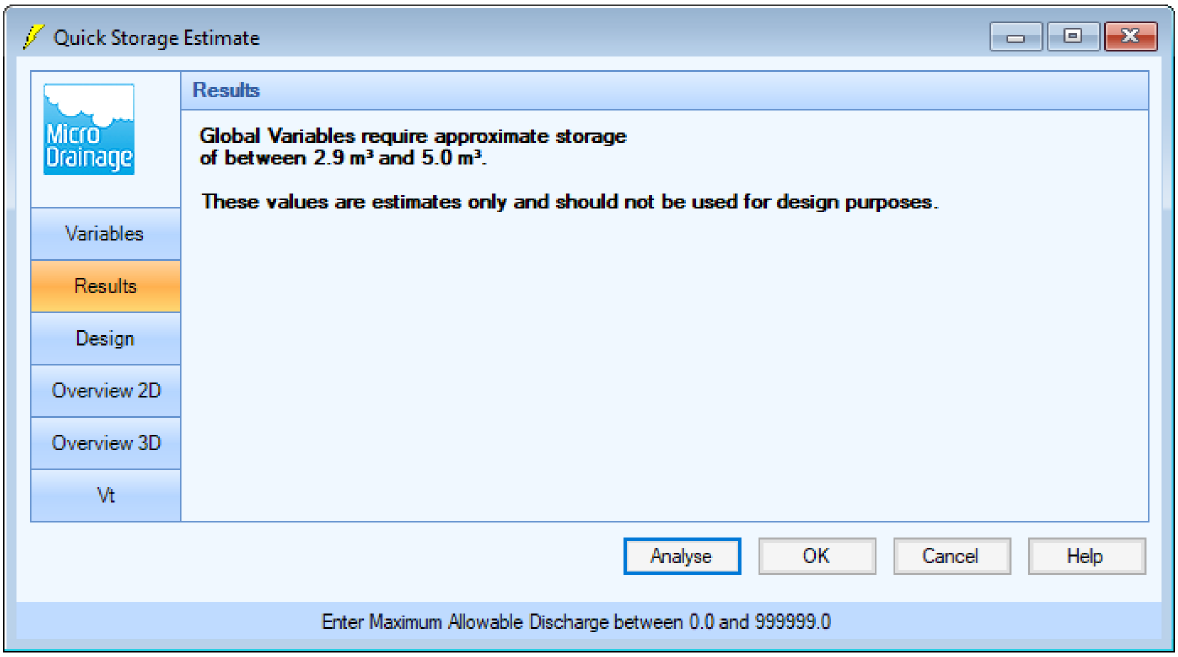
Discharge: 0.1l/s





Discharge: 1l/s





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