Environmental Statement: Chapter 9 – Water Environment

Development of National Significance Pre-Application Consultation

Alaw Môn Solar Farm

Land west of the B5112, 415m south of Llyn Alaw, 500m east of Llantrisant and 1.5km west of Llannerch-y-Medd, Anglesey

October 2023

9.0 WATER ENVIRONMENT

Introduction

9.1 This Chapter assesses the likely significant effects of the Development on the environment with regard to water quality, hydrology and flood risk. It describes the methods used to assess the effects; the baseline conditions currently existing at the Site and the surrounding area; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the likely residual effects after these measures have been adopted. This Chapter assesses the impact of the construction, operational and decommissioning phases of the Development on surface and groundwater quality. It also considers the impacts with regard to the risk of flooding.

9.2 This Chapter has been prepared by RMA Environmental Ltd and, as required by the EIA Regulations, has been prepared by Melissa Seymour BSc (Hons) who has over 5 years of experience in water quality and hydrology, drainage and flood risk impact assessment and has been reviewed by Rob Murdock BSc (Hons) PhD, who has over 25 years of experience in water quality and hydrological drainage and flood risk impact assessment.

9.3 The impacts of the Development on water resources and water supply have been scoped out of the assessment as confirmed in the Planning Inspectorate Wales's (now Planning and Environment Decision Wales ('PEDW')) EIA Scoping Direction included as Appendix 2.2 of the ES.

Planning Policy and Legislative Context

National Planning Policy

Future Wales: The National Plan 2040 (2021)[i]

9.4 Future Wales – the National Plan 2040 is the national development framework, setting the direction for development in Wales to 2040. It is a development plan with a strategy for addressing key national priorities through the planning system, including sustaining and developing a vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of communities. Policy 8 - Flooding considered relevant to water quality and flood risk. It states:

> ***'Flood risk management that enables and supports sustainable strategic growth and regeneration in National and Regional Growth Areas will be supported. The Welsh Government will work with Flood Risk Management Authorities and developers to plan and invest in new and improved infrastructure, promoting nature-based solutions as a priority. Opportunities for multiple social, economic and environmental benefits must be maximised when investing in flood risk management infrastructure. It must be ensured that projects do not have adverse impacts on international and national statutory designated sites for nature conservation and the features for which they have been designated'.***

Planning Policy Wales[ii]

9.5 The Planning Policy Wales ('PPW') document, published in 2021, and associated Technical Advice Notes ('TANs') set out the Welsh Government's planning policies for Wales and how these are expected to be applied. The principles of policy relevant to water resources, drainage and flood risk are provided within TAN 15 'Development and Flood Risk'[iii] and 'Water Resources Management Plan' (2016)[iv], which form the current policy at the national level.

9.6 Paragraph 6.65 of the PPW document states the following:

'The Welsh Government aims to secure the provision of water services whilst minimising adverse impacts on the environment, amenity, health and communities, in light of the consequences of climate change. Development which is poorly designed or badly located can exacerbate problems associated with resource depletion, exposure to surface water flooding and diffuse pollution. The planning system should:

- ***protect and improve water resources by promoting and encouraging increased efficiency and demand management of water as part of new developments, particularly in those areas where water resources may be under pressure or may not be available;***
- ***ensure that the infrastructure on which communities and businesses depend is adequate to accommodate Proposed Development so as to minimise risk to human health and the environment and prevent pollution at source;***
- ***ensure sustainable drainage systems are an integral part of design approaches for new development; and***
- ***ensure the protection of the quantity and quality of surface and ground water supplies is taken into account as part of development proposals.'***

Local Planning Policy

9.7 The Anglesey and Gwynedd Joint Local Development Plan, 2011-2026 (2017)[v] provides the following policies that are considered relevant to water resources and flood risk for the Development:

- Strategic Policy PS 5: Sustainable Development, which states:

  'Development will be supported where it is demonstrated that they are consistent with the principles of sustainable development All proposals should: Reduce the amount of water used and wasted; reducing the effect on water resources and quality; managing flood risk and maximizing use of sustainable drainage schemes; and progressing the objectives of the Western Wales River Basin Water Management Plan';

- Strategic Policy PS 6: Alleviating and Adapting To The Effects Of Climate Change, which states:

  'In order to adapt to the effects of climate change, proposals will only be permitted where it is demonstrated with appropriate evidence that they have fully taken account of and responded to the following:

  3. Implementing sustainable water management measures in line with the objectives in the Western Wales River Basin Management Plan;

  4. Locating away from flood risk areas, and aim to reduce the overall risk of flooding within the Plan area and areas outside it, taking account of a 100 years and 75 years of flood risk in terms of the lifetime of residential and non-residential development, respectively, unless it can be clearly demonstrated that there is no risk or that the risk can be managed; ...

8. Aim for the highest possible standard in terms of water efficiency and implement other measures to withstand drought, maintain the flow of water and maintain or improve the quality of water, including using sustainable drainage systems (in line with Policy PCYFF 6)';

- Strategic Policy PS 8: Proposals for National Significant Infrastructure Projects and Related Developments, which states:

'In their role as determining authorities for related development for a National Significant Project the Councils will require compliance, where appropriate, with the criteria set out in this Policy. In responding to proposals forming part of a Development Consent Order application to the Secretary of State the Councils will take the same considerations into account in the preparation of a Local Impact Report… The provision of flood protection measures to manage flood risk and, where feasible, deliver improvements in the locality. The provision of an assessment of anticipated impacts of the proposal on the surrounding marine and terrestrial environment and delivery of measures to manage and minimise any harm caused'; and

- Policy PCYFF 2: Development Criteria, which states:

'planning permission will be refused where the Proposed Development would have an unacceptable adverse impact on:

7. The health, safety or amenity of occupiers of local residences, other land and property uses or characteristics of the locality due to increased activity, disturbance, vibration, noise, dust, fumes, litter, drainage, light pollution, or other forms of pollution or nuisance.'

Legislative Context

9.8 A summary of key relevant UK water legislation is provided below:

- Water Resources Act (1991; Amendment) (England and Wales) Regulations 2009[vi]: consolidated previous water legislation with regard to both the quality and quantity of water resources;
- Land Drainage Act (1991) and (1994)[vii]: requires that a watercourse be maintained by its owner in such a condition that the free flow of water is not impeded;
- Environment Act (1995)[viii]: this is a UK Act of Parliament which created a number of new agencies and set standards for environmental management;
- Water Industry Act (1999)[ix]: consolidated previous legislation relating to water supply and the provision of sewerage services;
- Water Act (2003)[x]: extends the provisions of the Water Resources Act (1991) and the Environment Act (1995) with regard to abstractions and discharges, water conservation and pollution control;
- The Flood Risk Regulations (2009)[xi]: set out the duties regarding producing preliminary flood risk assessments, flood hazard maps and flood risk maps and flood risk management plans;
- Flood and Water Management Act (2010)[xii]: makes provisions for the management of risks in connection with flooding and coastal erosion; and

- Water Environment (Water Framework Directive ('WFD')) (England and Wales) Regulations (2017)[xiii]: requires the development and implementation of a new strategic framework for the management of the water environment and establishes a common approach to protecting and settling environmental objectives for groundwater and surface waters.

Assessment Methodology

Consultation

9.9 Consultation has been undertaken with the following consultees, as summarised within Table 9.1 below.

Table 9.1 Water Quality and Flood Risk Consultations

Summary of Matter Raised	Reference in ES Chapter
Isle of Anglesey County Council EIA Scoping Direction Response	
'For completeness, the Council suggest that flood risk is scoped in to the EIA with the results of the FCA drawn into that topic area, as per the proposed approach for ground and surface water impacts.' *'Section 5.16 confirms that it is not deemed necessary to provide SuDS measures to manage runoff, but that a SuDS application will be required post consent. The Council suggests that the applicant sets out the proposed drainage strategy for the site within the relevant ES Chapter.'*	The impacts of Flood Risk have been assessed in paragraphs 9.52 to 9.56 and 9.80 to 9.90 of this chapter. The impacts on surface water quantity are covered in paragraphs 9.57 to 9.59 and 9.91 to 9.93 and the impacts on surface water quality are covered in 9.60 to 9.71 and 9.73 to 9.76 of this chapter. The surface water drainage strategy is also included as Appendix 9.1.
Isle of Anglesey County Council Flood Consequences Assessment ('FCA') Consultation Response (refer to Appendix F of Appendix 9.1)	
'1. Grassland mitigation is acceptable… details to confirm continued maintenance of this feature will be required within the full application.' *'2. Infiltration testing not considered a requirement on this development as the water runs off the units at regular intervals on the ground giving it an opportunity to mimic its natural management at source and not concentrating runoff to one point. As water is managed on the surface, there is no real outfall to control, 6 metre buffer zones from site perimeter and watercourses have been specified in previous solar farm pre-apps giving any surface water runoff more opportunity to be slowed down and controlled naturally.'* *'3. I have discussed the required maintenance buffer to the ordinary watercourse with the LLFA, they confirm that at least 3 metres from top of bank on both sides would be required.'*	The Landscape and Ecology Management Plan ('LEMP') (to be secured by planning condition) will detail the planting framework and maintenance regime for the Site. This is also summarised within paragraphs 9.105 and 9.106 of this chapter. Consultation has been undertaken with National Resources Wales ('NRW') and the Isle of Anglesey County Council who act as the Lead Local Flood Authority ('LLFA') and this has confirmed that 8m wide maintenance buffers are required to main rivers and 3m wide maintenance buffers are required for other watercourses. This is included within paragraphs 9.77 to 9.79 of the chapter.
Natural Resources Wales EIA Scoping Direction Response	
'With regard to flood risk, we are satisfied that the applicant has outlined that a Flood Consequences Assessment (FCA) report will be prepared, which assesses the potential risk of flooding to the site, and the potential impacts of the proposals on flood risk elsewhere. The FCA will need to demonstrate that the flood risk in any flood zone (Zone B or C) can be acceptably managed in accordance with TAN 15.' *'The applicant should consult with the Authority's drainage engineers in respect of any issues relating to flooding issues from these sources. We note there is a small section in the south west of the proposed site which runs adjacent to a main river (Cors y Bol). NRW have permissive powers in relation to any main rivers which we may use in relation to our Flood Risk management duties therefore any proposals within 8m of the main river may require a Flood Risk Activity Permit (FRAP).'*	The FCA is included as Appendix 9.1 and summarised throughout chapter. Paragraphs 9.52 to 9.56 and 9.80 to 9.90 also confirms that the Development will be safe and that it would not increase flood risk elsewhere. An 8m wide maintenance buffer has been provided within the inherent design of the Development as confirmed within paragraphs 9.77 to 9.79. In addition, consultation correspondence with the LLFA is included as Appendix F of the FCA.
Welsh Water EIA Scoping Direction Response	

Summary of Matter Raised	Reference in ES Chapter
'As of 7th January 2019, this Proposed Development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. It is therefore recommended that the developer engage in consultation with the Isle of Anglesey Council, as the determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, Dwr Cymru Welsh Water is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation.' *'Firstly, whilst it appears the application does not propose to connect to the public watermains system, we would advise that the Proposed Development is crossed by 25mm and 4" distribution watermains, with their approximate positions being shown on the Statutory Public Watermains Record. Dwr Cymru Welsh'* *'With respect to this scoping opinion, we would highlight that the hydrological impact assessment submitted as part of the EIA will need to consider the effect of the scheme on runoff quality and quantity to Alaw reservoir. Based on the information available, it appears only the far northernmost part of the site drains to the reservoir, with the remainder draining to the Alaw river downstream, albeit the impact of the development in this area will need to be considered on the reservoir.'* *'Furthermore, we refer to comments from our drinking water catchment team which reinforces the associated risks to the catchment at Llyn Alaw, which is a safeguard zone and therefore further information will be required regarding the assessment of the water environment. Please find our full comments and request for further information within the attached report.'*	A surface water drainage strategy is included as Appendix 9.1 of this chapter and is summarised throughout the assessment. This strategy included a preliminary enquiry with the LLFA who agreed to the approach and design of the SuDS proposal as determined in Appendix F of Appendix 9.1. The water mains within the Site run along the roads and the design of the Development has ensured that there is no built Development within 3m of the water mains. The impacts on surface water quantity are covered in paragraphs 9.57 to 9.59 and 9.91 to 9.93 and the impacts on surface water quality are covered in 9.60 to 9.71 and 9.73 to 9.76 of this chapter. The impacts on surface water quantity are covered in paragraphs 9.57 to 9.59 and 9.91 to 9.93 and the impacts on surface water quality are covered in paragraphs 9.60 to 9.71 and 9.73 to 9.76 of this chapter and appropriate mitigation measures are proposed, where necessary.
Natural Resources Wales Preliminary Pre-App Advice Consultation Response (refer to Appendix E of Appendix 9.1)	
'As indicated above any proposal to erect any structure within 8m of a main river may require a FRAP. You will need to discuss matters which may impact on ordinary watercourses or surface water with the LLFA' *'We advise that detailed pollution prevention measures, detailing how relevant Guidelines for Pollution Prevention and best practice will be implemented, should be set out in a Construction Environmental Management Plan*.'	Consultation has been undertaken with both the LLFA and NRW in respect to maintenance buffers and this is included within Appendices E and F of Appendix 9.1. An assessment on the suitable pollution prevent measures in respect to surface water and ground water quality has been included within the Construction Environmental Management Plan ('CEMP') and is outlined in the construction phase affects within this chapter.

Baseline Data

9.10 As set out in Chapter 1 Introduction of the ES, the Site comprises the land shown on Figure 1.1. However, for the purposes of this assessment, 'the Site' and study area for this assessment is generally defined as the area within a 2km radius of the Site boundary, excluding the land within the adopted highway of local roads for the underground cabling route to the National Grid Substation at Wylfa, although a number of issues are considered at a greater distance or at the river catchment level, where necessary. The assessment of likely significant effects encompasses surface water and groundwater quality and flood risk.

9.11 This assessment has been undertaken in accordance with the PPW, relevant TANs and has involved review of the following sources of baseline data:

- review of NRW data records on groundwater Source Protection Zones ('SPZs'), groundwater and surface water quality, using NRW's Water Watch Wales catchment maps and NRW flood zone mapping;
- review of the relevant planning frameworks (i.e. PPW and the Anglesey and Gwynedd Joint Local Development Plan, 2011-2026 (2017)) to identify specific plans and policies relating to water quality and flood risk;
- review of the Anglesey and Gwynedd Strategic Flood Consequence Assessment ('SFCA') 2013 and accompanying reports; and
- review of the accompanying FCA and Drainage Strategy for the Development, prepared by RMA Environmental (refer to Appendix 9.1).

Assessment and Evaluation of Effects

9.12 The assessment of the Development's likely significant effects has involved the following general approach:

- the sensitivity or importance of aquatic receptors has been established on the basis of their use, proximity to the Site and existing resource value (refer to Table 9.2);
- the evaluation of the magnitude of the potential changes in water quality and flood risk and assessment of the sensitivity of the resource to the predicted changes (refer to Table 9.3);
- the potential effects have been given a significance of 'Negligible' or 'Minor', 'Moderate' or 'Major' adverse or beneficial, based on the matrix in Table 9.4; and
- where any predicted effects are 'Minor', 'Moderate' or 'Major' adverse, these are considered to be significant and, therefore, mitigation measures beyond those inherent within the design of the Development have been committed to in order to eliminate or reduce the effects to a non-significant level. The residual effects (effects following the implementation of additional mitigation measures) are discussed in the 'Residual Effects' section of this chapter.

Table 9.2 Definition of Receptor Sensitivity

Receptor Sensitivity	Receptor Type	Sensitivity Detail
High	Flood Risk	Flood Zone C1 or C2
	Surface Water	WFD Surface water waterbody catchment overall status of 'High' or 'Good'
	Groundwater	Principal Aquifer or SPZ1 or Drinking Water Catchment Area.
	Surface Water Drainage	Located within an Internal Drainage District area
Medium	Flood Risk	Flood Zone B
	Surface Water	WFD Surface water waterbody catchment overall status of 'Moderate'
	Groundwater	Secondary A or B Aquifer or SPZ2/3
	Surface Water Drainage	Medium to High surface water flood risk
Low	Flood Risk	Flood Zone A
	Surface Water	WFD Surface water waterbody catchment overall status of 'Poor' or 'Bad'.
	Groundwater	Unproductive Strata, i.e. non aquifer
	Surface Water Drainage	Low or no surface water flood risk

Table 9.3 Methodology for Assessing Magnitude

Magnitude of Impact	Criteria for Assessing Impact
Major	Total loss or major/substantial alteration to key elements/features of the baseline (pre-Development) conditions such that the post-development character/composition/attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post-development character/composition/attributes of the baseline will be materially changed.
Minor	A minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible/detectable but not material. The underlying character/composition/attributes of the baseline condition will be similar to the pre-development circumstances/situation.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Table 9.4 Effect Significance Matrix

Magnitude	Sensitivity		
	High	Medium	Low
Major	Major Adverse/Beneficial	Moderate to Major Adverse/Beneficial	Minor to Moderate Adverse/Beneficial
Moderate	Moderate to Major Adverse/Beneficial	Minor to Moderate Adverse/Beneficial	Minor Adverse/Beneficial
Minor	Minor to Moderate Adverse/Beneficial	Minor Adverse/Beneficial	Negligible to Minor Adverse/Beneficial
Negligible	Negligible	Negligible	Negligible

Limitations and Assumptions

9.13 When referring to data from web-based data searches within this chapter, the distances and directions are quoted directly. It is possible that some of the data locations are at a different distance and/or direction from the closest part of the Site boundary.

9.14 The Development is assumed to have a modelled operational lifetime of 40 years.

9.15 The assessment of construction phase effects is based on the indicative construction methodology and phasing of the Development as described in Chapter 5 Construction Methodology and Phasing of the ES.

9.16 The assessment of operational phase effects is based on the maximum parameters of the detailed elements of the Development as described in Chapter 3 Site and Development Description of the ES.

Baseline Conditions

Surface Water

Hydrological Features

9.17 A number of 'main rivers'[xiv] and 'ordinary watercourses'[xv] are located throughout the Site and surrounding area.

9.18 A main river, hereafter referred to as 'Tafarn Brook', flows along the eastern boundary of Field 62. This watercourse has a total catchment area of approximately 1km^2 and flows in a northerly direction into the Llyn Alaw reservoir.

9.19 A main river known as the 'Cors Y Bol' is located approximately 20m to the west of the Site. This watercourse has a total catchment area of approximately 5.6km^2 and flows in a north-easterly direction into the Llyn Alaw reservoir.

9.20 Llyn Alaw reservoir is located approximately 415 north of the Site and is 4.3km long, with a surface area of approximately 360ha. This reservoir supplies drinking water for the northern half of Anglesey.

9.21 An unnamed ordinary watercourse (hereafter referred to as 'Carmel Brook') flows through Fields 6, 7, 8, 9 and 12 and along the western boundaries of Fields 36, 37, 38, and 39. Carmel Brook has a small total catchment area of approximately 1.79km^2 and flows in a north-westerly direction into Cors Y Bol, a 'main river', approximately 210m to the west of the Site.

9.22 An unnamed ordinary watercourse (hereafter referred to as 'Pennant Brook') flows along the boundaries of Fields 30, 31, 33, 50, 53, 54, 55, 56, 57, 58, 59 and 60. Pennant Brook has a small total catchment area of approximately 1.15km^2 and flows in a north-easterly direction into Tafarn Brook approximately 30m to the north of Field 62.

9.23 As indicated on Ordnance Survey ('OS') mapping, a number of ordinary watercourses flow into the Tafarn Brook, Carmel Brook and Pennant Brook and the Flood Estimation Handbook ('FEH') Web Service map[xvi] does not define the catchment areas of these tributary watercourses as they are smaller than 0.5km2 in area.

9.24 A large pond is located in Fields 32 and 33. A pond is located along the northern boundary of the Site within Field 29. A large unnamed surface water pond is also located adjacent to Hen Nantanog, located immediately beyond the Site's boundary near the centre of the Site. Two ponds are located in Field 21.

9.25 Figure 2.1 of the FCA (Appendix 9.1) provides a plan showing the location of the watercourses in reference to the Site.

Surface Water Quality

9.26 According to NRW Water Watch Wales WFD Catchment maps, the Site is located within the Western Wales River Basin District and in particular is located within the 'Alaw-upstream Llyn Alaw' surface water river catchment. This has an overall waterbody status of 'Good' (in 2018) and has an overall status objective of 'Good Potential by 2027'.

Sensitivity

9.27 In accordance with Table 9.1, as the Site is located within a WFD Surface water waterbody catchment with an overall status of 'Good', then surface water is considered to be of 'High' sensitivity.

Groundwater

Hydrogeological Features

9.28 The British Geological Society ('BGS') geological mapping indicates that the majority of the Site is underlain by superficial deposits of the Till Devensian, comprising Diamicton. The land along the eastern boundary of Field 62 and along the western boundaries of Fields 2, 9 and 21 of the Site is underlain by Alluvium, comprising clay, silt, sand and gravels. An area along the eastern boundary of Field 62 and an area along the access road leading to Field 63 is underlain by the superficial Glaciofluvial Deposits comprising sand and gravel.

9.29 The majority of the Site is further underlain by the bedrock geology of the Ordovician Rocks, comprising mudstone and sandstone. Areas in Fields 7, 11, 59, 61 and 63 are underlain by the bedrock geology of Ordovican Rocks, comprising interbedded sandstone and conglomerate. An isolated area in Field 23 is underlain by an unnamed igneous intrusion comprising gabbro, microgabbro and diorite.

9.30 The Till Devensian superficial geology is classified as a 'Secondary Undifferentiated Aquifer' and the Alluvium and Glaciofluvial Deposits is classified as a 'Secondary A Aquifer'. The bedrock geology of the Ordovician Rocks is classified as a 'Secondary B Aquifer'.

9.31 These aquifer classifications are described by NRW as the following:

- ***'Secondary A - 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. These are generally aquifers formerly classified as minor aquifers;***
- ***Secondary B - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers; and***
- ***Secondary Undifferentiated - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.'***

9.32 According to BGS mapping, there are no publicly accessible borehole records identified within the Site boundary. However, it is considered reasonable to assume that there is potential for groundwater to be perched within Alluvium deposits that underly the Site.

Groundwater Quality

9.33 The NRW Water Watch Wales WFD Catchment maps identify the Site as being located within the 'Ynys Mon Secondary' Groundwater catchment area. This has an overall status of 'Poor' (in 2018) which is due to the quantitative status being 'Good'. However, its chemical status is 'Poor'. There is no further information available on the status objective for the future.

Groundwater Designations

9.34 According to NRW designation mapping, the Site is not located within a groundwater SPZ.

9.35 However, the Site is located within the Dŵy Cymru Welsh Water ('DCWW') Drinking Water Catchment known as 'Llyn Alaw' (associated with the Llyn Alaw Reservoir located 415 north of the Site). It is stated in Article 7 of the WFD[10] that *'Member States shall ensure the necessary protection for the bodies of water identified with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. Member States may establish safeguard zones for those bodies of water'*.

Sensitivity

9.36 In accordance with Table 9.2, as the Site is located within the DCWW Llyn Alaw Drinking Water Catchment, groundwater is considered to be of 'High' sensitivity.

Flood Risk

9.37 When reviewing the NRW flood maps, and as reported within the FCA (Appendix 9.1), the majority of the Site is located within fluvial Flood Zone A. There are limited areas along the western boundary and north-eastern corner located in fluvial Flood Zone B. A very limited area along the western boundary is located in Fluvial Flood Zone C2, associated with Cors Y Bol.

9.38 According to TAN 15 of the NRW, Zone A is considered to be at little or no risk of fluvial or tidal/coastal flooding; Zone B is defined as areas known to have been flooded in the past, evidenced by sedimentary deposits; Zone C is based on the extreme flood outline, equal to or greater than 0.1% Annual Exceedance Probability ('AEP'; river, tidal or coastal); Zone C1 is defined as areas of the floodplain which are developed and served by significant infrastructure, including flood defences and Zone C2 is defined as areas of the floodplain without significant flood defence infrastructure.

9.39 According to NRW long term flood risk mapping, the Site is not considered to be at risk from tidal flooding.

9.40 The majority of the Site has a very low surface water flood risk, with limited areas of up to a high surface water flood risk associated with the ordinary watercourses within the Site and isolated ponding.

9.41 The Anglesey Local Flood Risk Management Strategy[xvii] indicates that *'groundwater flooding usually occurs in combination with pluvial and fluvial flooding. As such groundwater flooding occurs in low lying areas'.* As the Site is not considered to be located within a low lying area, the risk from groundwater flooding is low.

9.42 According to NRW long term flood risk mapping, the Site is not within a reservoir flood risk extent and, therefore, is not considered to be at risk from reservoir flooding.

9.43 The Anglesey Strategic Flood Consequence Assessment (2015) ('SFCA')[xviii] has not identified any records of sewer flooding or flood risk within the vicinity of the Site.

9.44 As reported within the FCA, the principal flood risks to the Site are from fluvial and surface water flooding.

Sensitivity

9.45 In accordance with Table 9.2, as the Site is located partially within Flood Zone B, flood risk at the Site is considered to be of 'Medium' sensitivity.

Surface Water Drainage

9.46 An Internal Drainage District ('IDD') is defined by NRW as *'Areas of land where there is a particular need for drainage and water level management. IDDs are operated in accordance with the Land Drainage Act 1991'*.

9.47 From reviewing the SFCA for the Site, it is confirmed that the Site is not located within an IDD. Further to this, the Site is currently undeveloped greenfield land used for agriculture.

9.48 Figure 2.2 of the FCA (refer to Appendix 9.1) shows the existing surface water overland flow routes for the Site and this is based on the Site's topography. This identifies that the northern half of the Site falls in a north-north western direction towards the Llyn Alaw Reservoir. The central southern extent of the Site falls in towards the Pennant Brook ordinary watercourse, which flows along the field boundaries of Fields 30, 31, 33, 50, 53, 54, 55, 56, 57, 58, 59 and 60. The far south-western corner of the Site falls in a north-north-west direction towards Carmel Brook, which runs along the western part of the Site boundary.

Sensitivity

9.49 The Site is not located within an IDD and, therefore, surface water drainage is considered to be of 'Low' Sensitivity.

Future Baseline

9.50 The principal factor with regard to the evolution or change to the current baseline condition in relation to water quality and flood risk is climate change. The current baseline has therefore been assessed with regard to existing conditions (i.e. current flood zones) and the predicted impacts of climate change taken into account in this assessment, in line with Adapting to Climate Change Guidance (2017)[xix].

9.51 Furthermore, this assessment has considered the existing baseline with regard to surface water and groundwater quality and the predicted water catchment status in future years as defined by NRW for the relevant river and/or groundwater catchment.

Likely Significant Effects

Construction Phase

9.52 There are four potentially significant effects on water quality and flood risk during the construction phase of the Development, comprising:

- external flood risk during construction;
- increase in surface water runoff rates during construction;
- potential remobilisation of existing contamination and its impact on surface water (Alaw Reservoir) and groundwater (Llyn Alaw Drinking Water Catchment); and
- potential contamination arising from general construction activities and its impact on surface water (Alaw Reservoir) and groundwater (Llyn Alaw Drinking Water Catchment).

External Flood Risk during Construction (All Sources)

9.53 As set out in the 'Baseline Conditions' section of this chapter and within the FCA included as Appendix 9.1, the Development sensitivity to flood risk is 'Medium'. This is because the Site is located partially within Flood Zone A and Flood Zone B and a very limited area along the western boundary located in Fluvial Flood Zone C2, and will remain so for its operational lifetime (including accounting for the impacts of climate change). Furthermore, the majority of the Site is located within an area of very low surface water flood risk, with limited parts of the Site located within areas of up to medium and high risk of surface water flooding, associated with small watercourses and isolated ponding.

9.54 The FCA confirms that the Development will be located outside of Flood Zone B and C2 and the fluvial flood extents and the energy storage facility and substation will be located outside of the low surface water flood extents.

9.55 Given that the majority of the Development will be located in areas at very low surface water flood risk and outside of fluvial flood extents, it is considered that construction of the Development will not increase the risk of flooding off-site. The construction of the Development within parts of the Site located in areas at low risk of surface water flooding will not be undertaken during times of heavy rainfall to avoid the unlikely event of the construction phase being impacted by a flood event and/or increasing flood risk off-Site.

9.56 The Development includes an underground cable route which runs from the main part of the Site along the public highway to the National Grid Substation at Wylfa, located approximately 9.5km north of the main part of the Site. The cable route will be underground and will follow the road network. The construction activities for the installation of the cable route will be temporary in nature and times of heavy rainfall or a flood event is unlikely to occur during the construction phase.

9.57 Based on the above, the effect magnitude of flood risk during the construction phase is considered to be 'Negligible'. The effect significance is therefore considered to be 'Negligible' for flood risk and therefore no additional mitigation measures are required.

Increase in Surface Water Runoff Rates during Construction

9.58 During the construction phase of the Development, there will potentially be an overall increase in impermeable area, as various areas of hardstanding are constructed on the Site. Although it is confirmed that the construction compound will be formed on permeable aggregate and therefore will not increase in runoff rates during construction, the increase in runoff rates could have an impact on water quantity within the Llyn Alaw reservoir as the northern part of the Site drains to the reservoir.

9.59 The underground cable route will run along the public highway which is already fully impermeable. Therefore, there will be no increase in impermeable area as a result of construction of this cable route.

9.60 The effect magnitude of the increase in surface water runoff during the construction phase of the Development is considered to be 'Minor'. Prior to mitigation, the effect significance is considered to be 'Negligible' to 'Minor Adverse' for drainage and additional mitigation measures are set out in the 'Mitigation Measures' section below.

Remobilisation of Existing Contamination and its Impact on Surface Water (Llyn Alaw) and Groundwater (Llyn Alaw Drinking Water Catchment)

9.61 Construction activities would disturb the ground at the Site, resulting from activities such as localised Site levelling, excavation of the sub-base for the battery storage area, substation and inverter stations, micro piling for the solar photovoltaic ('PV') panels and excavation for the cable route along the public highway, all of which have the potential to remobilise any existing contamination within soils and hydrogeology, as well as to create contamination pathways.

9.62 On review of the baseline conditions, the Site is currently greenfield agricultural land, therefore, it is considered that the only potential contamination on-Site is in relation to any fertilisers and agricultural chemicals that are used on-Site as a result of farming activities. There is no evidence of any additional contaminants in relation to any historical land uses on-Site and, therefore, contamination within the Site is considered to be low.

9.63 The solar PV panels will be micro piled to a depth of 1.5m to 2m below ground level ('bgl'). There is no evidence of any shallow groundwater on-Site and given that the Site is not located within a low-lying area and there are no historical records of groundwater on-Site, it is considered unlikely that groundwater is located at shallow depths. The majority of the Site is underlain by Devensian Till superficial deposits which are a relatively impermeable Secondary Undifferentiated aquifer. Therefore, for the majority of the Site which is underlain by Till, it is considered that the solar PV panels with micro piling to a depth of up to 2m bgl will not open up pathways for any existing contamination to remobilise.

9.64 A limited area of the Site along the eastern boundary and western boundary is underlain by the superficial deposits of Alluvium and Glaciofluvial Deposits which are classified by NRW as Secondary A aquifers and therefore are relatively permeable strata. As a worst-case scenario, it is considered that there could be perched groundwater located within the Alluvium underlaying the Site; however, given that the solar PV panels will be micro piled, it is considered that even if perched groundwater is encountered during the construction phase, due to the small footprint of the micro piles, remobilisation of any contamination is extremely unlikely and would not have any impact on the existing contamination condition of the Site.

9.65 It is necessary to consider the risk of potentially remobilising any existing contamination on the main rivers and ordinary watercourses within the Site and surrounding area, including the Llyn Alaw reservoir located 440m north of the Site, particularly given that this surface water catchment area has a WFD objective for water quality of 'good' for 2027.

9.66 Given that the only potential contaminant on-Site is in relation to fertilisers and/or other agricultural chemicals used on-Site which will flow overland as per the existing drainage arrangement of the Site, it is considered that the construction phase of the Development will not create any material changes to the overland flow routes or cause any remobilisation of contaminants during construction phase.

9.67 The underground cable route will run along the public highway and therefore the risk of remobilising any existing contamination is considered to be low.

9.68 Based on the above, it is considered that the risk of remobilisation of any existing contamination on-Site is 'Negligible' when compared to the existing Site on surface water and groundwater. The significance of effect is therefore considered to be 'Negligible' and mitigation measures are not required.

Contamination Arising from General Construction Activities on Surface Water and Groundwater

9.69 Construction vehicles and general construction activities, including micro piling of the solar PV panels and construction of the underground cable route among the public highway, give rise to the potential for the nearby watercourses, including the Llyn Alaw reservoir (hydrology) and the drinking water catchment area (hydrogeology), to become contaminated with chemical contaminates such as hydrocarbons,

chemicals and physical contaminants, such as waste, silt and other construction materials. There is also the potential for the redistribution of contaminated material to other parts of the Site via construction plant and through transporting fuels and oils for proposed inverter stations and battery storage areas.

9.70 The micro pile foundations for the solar PV panels will be shallow (1.5m to 2m below ground level) and with a small footprint area. Similarly, the permeable tracks and inverter stations will be 0.3m bgl and the ground within the energy storage facility and substation will be made level through cut and fill. The trenches for the cables will be up to 1.2 m depth. Any piling or excavation poses a potential risk to the underlying Secondary A aquifers along the western and eastern extent of the Site, including the Llyn Alaw drinking water catchment zone becoming contaminated, as piling could open up pathways for contamination from construction machinery and equipment.

9.71 The watercourses within the Site and the reservoir located 440m north of the main part of the Site are also considered to be sensitive receptors, as there is potentially a risk that these receptors could be exposed to contamination, especially given that a large proportion of the Site drains in a north-north-westerly direction towards the Llyn Alaw Reservoir. This contamination could arise from general construction-related activities via untreated surface water runoff directly entering the rivers or reservoir via overland flow and ultimately entering the river untreated. In addition, contaminated soils and dust could remobilise and enter the aforementioned surface water features via dust generation.

9.72 The effect magnitude of the contamination arising from general construction activities on surface water and groundwater during the construction phase of the Development is considered to be ‘Minor’. Prior to mitigation, the effect significance is considered to be ‘Minor Adverse’ for surface water (high sensitivity receptor) and groundwater (high sensitivity receptor) and additional mitigation measures are required.

Operational Phase

9.73 There are four potentially significant effects on water quality and flood risk during the operational phase of the Development, comprising:

- potential contamination from accidental or process discharges on surface water and groundwater;
- inclusion of appropriate maintenance buffers to watercourses;
- external flood risk to the Development once operational; and
- increase in surface water runoff rates from Development.

Contamination from Accidental or Process Discharges on Surface Water and Groundwater

9.74 The Development could have the potential to contaminate the underlying aquifers and Llyn Alaw drinking water catchment, as well as the on-Site and surrounding ordinary watercourses and main rivers, including the Llyn Alaw reservoir located to the north.

9.75 The main source of potential contamination during the Development’s operational phase would be from the proposed inverter stations, battery storage and substation area. Some of these units will hold fuels, oils and chemicals. Should these containers leak or spill, then contaminants could enter into the ground or runoff via overland flow and have an adverse impact on nearby watercourse, especially the Llyn Alaw reservoir which a large portion of the Site drains towards and this reservoir supplies drinking water to most of Anglesey.

9.76 There is also a risk as a result of any contamination from surface water runoff from the solar PV panels and infrastructure, including access tracks within the Site. This could enter into the nearby surface water features and reservoir as well as infiltrate into underlying groundwater.

9.77 Based on the above, the effect magnitude of contamination from accidental or process discharged on both groundwater and surface water is considered to be ‘Moderate’. Prior to mitigation, the effect significance is considered to ‘Moderate to Major Adverse’ for surface water (high sensitivity receptor) and groundwater (high sensitivity receptor) and additional mitigation measures are required.

Inclusion of Appropriate Maintenance Buffers to Watercourses

9.78 It is necessary to ensure that there are sufficient easements to any watercourses on-Site to allow for access and maintenance in the future. The design of the Development has ensured that there is a minimum 8m wide buffer to the relevant 'main rivers' (Tafarn Brook and Cors Y Bol) and a minimum 3m wide buffer to the relevant 'ordinary watercourses' (Pennant Brook and Carmel Brook). These buffers are from the top of the bank of the river to the Development's fences on the Site and do not contain any built Development.

9.79 Consultation with NRW and the LLFA have confirmed these easements and this correspondence is included as Appendix E and F of the FCA (refer to Appendix 9.1).

9.80 In accordance with Table 9.3 and 9.4 and given that appropriate maintenance buffers have been included within the design of the Development, the magnitude and effect significance of appropriate maintenance buffers to watercourses is 'Negligible' and no further mitigation measures are required.

Risk of External Flood Risk to the Development Once Operational

9.81 As set out within the 'Baseline Conditions' section of this chapter and within the FCA, the principal risks to the Site are from fluvial and surface water flooding. The majority of the Site is located in fluvial Flood Zone A and limited areas along the western boundary and in the north-eastern corner are located in Fluvial Flood Zone B. A very limited area along the western boundary is located in Fluvial Flood Zone C2, associated with Cors Y Bol.

9.82 NRW have confirmed that they do not hold any modelled flood levels for the main rivers or watercourses on the Site. In addition, the catchment areas of the watercourses have an area less than 3km^2 and therefore these watercourses are excluded from NRW's JFLOW model (except Cors Y Bol which has a catchment of 5.6km^2). However, in this instance, the NRW's surface water flood map appears to show that surface water flooding is interlinked with fluvial flooding from these watercourses.

9.83 Based on the above, it is considered appropriate to use NRW's surface water flood map as an indicator for fluvial flood depths and extents. On review of the surface water flood maps, the majority of the Site is either located outside of the low risk extent or affected by shallow depths, i.e. less than 600mm. However, isolated areas are affected by greater depths, principally in the vicinity of watercourses.

9.84 The modelled operational lifetime of the Development is 40 years and, therefore, the climate allowances by the 2080s are considered to be appropriate. Based on this operational timescale, the latest guidance on climate change states that a climate change allowance of 30% would be appropriate for the West Wales river basin district, in which the Site is located.

9.85 It is considered appropriate to use the low risk surface water flood depths as a proxy indicator for the 1% AEP event plus 30% climate change. Given the operational lifetime of the Development and that the low risk scenario represents an extreme 0.1% AEP event, this is a conservative approach.

9.86 The Development's design has ensured that the most vulnerable elements of the Development to potential flooding will be located in the areas at lowest risk of flooding. The Development will be located outside of the Flood Zone B and C2 and the low risk fluvial flood extents. Additionally, the energy storage area, substation and inverter stations will be located outside of the low risk surface water flood extents.

9.87 The solar panels and sensitive electrical equipment will be raised above the low surface water flood risk depths. To achieve this, solar panels and sensitive electrical equipment will be elevated on a framework above the surface water flood depths and, therefore, flow would not be impeded and the displacement of floodplain storage would be negligible.

9.88 NRW's low surface water flood depth map indicates a maximum flood depth of approximately between 400mm and 600mm in the area of the solar panels. Therefore, the maximum height the panels need to be raised above ground level is approximately 0.6m; however, the flood depths for the vast majority of the Site are significantly less. It is proposed for the solar panels to be raised 800mm above ground level which will elevate the panels significantly above the low surface water flood depths.

9.89 It is necessary to distribute the inverter stations throughout the Site, as these convert direct current ('DC') generated by the panels into alternating current ('AC') and, therefore, need to be located in close proximity to the solar arrays. All of the inverter stations are located outside of the low surface water flood extent and therefore would not displace floodplain storage.

9.90 Parts of the cable route are located within Flood Zones B and C2 and areas at risk of surface water flooding, however, the cables will be installed underground and will have no impact on flood risk. Given that the cable route is underground, there is no potential for an adverse impact within the Site or an increase in flood risk elsewhere.

9.91 The FCA included as Appendix 9.1 has demonstrated that the Development will be safe and that it would not increase flood risk elsewhere. Therefore, in accordance with Table 9.3 and 9.4, the mitigation and effect significance of the risk of external flooding as a result of the Development is considered to be 'Negligible' and no further mitigation measures are required.

Risk of the Increase in Surface Water Runoff Rates from the Development

9.92 The Site is undeveloped and considered to be greenfield agricultural land. The Development will include the incorporation of solar panels as well as access roads, battery storage units and inverter stations which, if not managed appropriately, could result in an increase in surface water runoff rates and volumes which could impact Llyn Alaw reservoir and downstream receptors.

9.93 The underground cable route will run along the public highway which is already 100% impermeable, therefore there will be no increase in impermeable area as a result of this cable route.

9.94 The effect magnitude of the increase in surface water runoff during the operational phase of the Development is considered to be 'Minor'. Prior to mitigation, the effect significance is considered to be 'Negligible' to 'Minor Adverse' for drainage and additional mitigation measures are set out in the 'Mitigation Measures' section below.

Mitigation Measures

Construction Phase

Increase in Surface Water Runoff Rates during Construction

9.95 During each phase of the Development, a construction compound will implement a drainage system designed and managed to comply with BS6031:198 'The British Standard Code of Practice for Earthworks', which details methods that should be considered for the general control of drainage on construction sites. Further advice is contained within the British Standard Code of Practice for Foundations (BS8004, 1986).

9.96 All necessary drainage works would be installed to ensure that there would be no increase in surface water runoff as set out in the accompanying FCA (refer to Appendix 9.1).

9.97 The permeable sub-base beneath the battery storage area, inverter station and containers will be installed at the same time as the facilities are built and therefore there will be no uncontrolled increase in surface water discharge during construction. Similarly, all proposed roads and tracks will be constructed of a permeable material (e.g. MOT Type 3 or similar); therefore, there would be no increase in runoff from these areas. The solar panels and their metal framework do not have a significant effect on runoff volumes, peaks or time to peak if grass cover is located underneath panels and between rows and therefore will be no uncontrolled increase in surface water during construction.

Contamination Arising from General Construction Activities on Surface Water and Groundwater

9.98 The implementation of a CEMP will ensure that contamination arising from general construction related activities does not have an adverse impact on surface water or groundwater. The CEMP includes measures such as (but not limited to):

- ensuring any construction vehicles will be maintained appropriately in accordance with good site practices to reduce the risk of hydrocarbon contamination and to ensure that construction plant will only be active when required;

- ensuring any construction materials will be stored, handled and managed with due regard to the sensitivity of the local aquatic environment and thus the risk of accidental spillage or release will be minimised;

- in accordance with The Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016[xx], oil must be stored in a container which is situated within a secondary containment system and it must have capacity not less than 110% of the storage capacity of the largest container;

- Oil interceptors will be regularly inspected, cleaned and maintained. Full records will be kept of inspections, maintenance works and measures undertaken to sustain equipment performance. These provisions should ensure that no significant impacts occur on water quality. The use of settlement facilities will aid the removal of any contaminated particulate material that might result from construction activities; and

- dust suppression measures will be outlined within the CEMP such as ensuring sand and other aggregates are stored in bunded area and, where possible, not allowed to dry out, avoid dry sweeping of large areas and ensure surfacing equipment is only operated with any manufacturer's dust measurements in place.

Operational Phase

Contamination from Accidental or Process Discharges on Surface Water and Groundwater

9.99 The main source of potential contamination during the Development's operational phase would be from the proposed inverter stations, battery storage and substation area which hold fuels, oils and chemicals. However, the design of the inverter stations and battery storage area will include providing double skinned tanks which hold contaminants such as oil and fuels and locating these within containers and, therefore, should an accidental spillage or leak occur it will be contained within the unit. The entrance into the container will include a 'lip' so that should a spillage or leak occur within the container then it will be contained and not enter the ground.

9.100 As identified above, there is also a risk of any contaminated runoff from the solar panels and infrastructure and access tracks entering surface water features and or groundwater. However, any surface water runoff from the proposed solar arrays will be treated to an appropriate standard in line with the SuDS Manual[xxi]. Planting is proposed beneath the solar panels, and this will provide a similar level of treatment to a filter strip. Table 26.2 of the SuDS Manual provides pollution hazard indices for different land use classifications and mitigation indices for a number of SuDS features. The pollution hazard indices for solar arrays are considered to be 0.2 for Total Suspended Solids ('TSS'), 0.2 for metals and 0.05 for hydrocarbons as the pollution hazard level would be very low. The proposed planting beneath the panels will provide mitigation indices of 0.4 for TSS, 0.4 for metals and 0.5 for hydrocarbons; as these exceed the target pollution hazard indices, the mitigation measures are considered acceptable in water quality terms.

9.101 The other land uses on-Site, including the inverter stations, energy storage facilities, associated buildings within the substation compound and the permeable access tracks are all considered to have a pollution hazard level of 'low' and therefore have combined indices of 0.3 for TSS, 0.2 for metals and 0.05 for hydrocarbons. The energy storage facility, inverter stations and substation will be located above a permeable subbase to promote infiltration without significantly concentrating runoff. The access tracks will be constructed of permeable material. It is considered that the granular material in the sub-base will provide a similar level of treatment to permeable paving which has mitigation indices of 0.7 for TSS, 0.6 for metals and 0.7 for hydrocarbons. Given that the mitigation indices exceed the target pollution hazard indices for the land use, the mitigation measures are considered acceptable in water quality terms.

9.102 The Site currently comprises greenfield land used for agricultural purpose and grazing and fertilisers and herbicides/pesticides are currently used on Site. The Development will provide a betterment in groundwater and surface water quality as the use of pesticides and herbicides/fertilisers will cease and

appropriate SuDS have been proposed to treat any surface water discharge prior to it entering the ground.

Inclusion of Appropriate Maintenance Buffers

9.103 As detailed above, the design of the Development has ensured that a minimum of 8m buffer is from 'main rivers' and a 3m buffer from 'ordinary watercourses' is included within the Development. An additional mitigation measure is to ensure that where planting is proposed in these maintenance buffers, this will be in the form of neutral grassland with wildflowers or tussocky grassland that would not prohibit access to the watercourses.

Risk of the Increase in Surface Water Runoff Rates from the Development

9.104 A surface water drainage strategy has been undertaken by RMA Environmental and is included within Appendix 9.1. This strategy has been informed by the research report *Hydrologic Response of Solar Farms*[xxii]. It should be noted that the report states *'this study, along with design recommendations, can be used as a guide for the future design of solar farms'*.

9.105 This research report demonstrates that solar PV panels and their metal framework do not have a significant effect on runoff volumes, peaks or time to peak if grass cover is located underneath panels and between rows. The study concludes that this is applicable to the 1 in 2-year, 1 in 25-year and 1 in 100-year flooding events and for a range of storm durations. The report also notes that although panels have the potential to concentrate runoff onto the ground, this only has the potential to cause erosion if it falls directly onto bare ground or a gravel surface.

9.106 On this basis, it is concluded that the proposed planting framework provided beneath the panels will maintain the current hydrological response of the Site and will not increase flood risk elsewhere. Consultation with the LLFA has confirmed that the proposed planting framework would be '*recognised as a SuDS feature'* and '*grassland mitigation is acceptable'* for sustainably manage runoff from the Development (refer to Appendix F of the FCA).

9.107 The Landscape and Ecological Management Plan ('LEMP') to be secured through a planning condition will outline the proposed planting framework and enhancement to the quality of grass cover. The Site will be permanently vegetated with grassland located beneath the solar arrays and between rows. Grass cover would be inspected and maintained at least twice a year or after periods of significant drought and any patchy grass or bare ground is re-seeded. The maintenance requirements for the planting mitigation will be provided in detail in the LEMP.

9.108 Based on the above, it is therefore considered that the Development will result in a reduction in runoff rates due to the absence of typical farming activities such as ploughing and soil compaction by heavy machinery.

9.109 The research report also investigated the effects of ground slope on the solar farm and concluded that the '*greater ground slope did not significantly influence the response of the solar farm*'.

9.110 The Development's design shows that the energy storage facility and the majority of the substation buildings will be located above a 500mm deep sub-base formed of permeable material, i.e. MOT Type 3 or similar. The auxiliary transformer within the substation compound needs to be mounted on a small 4.1m x 4.1m concrete base; however, this will drain to the surrounding sub-base. The permeable sub-base will extend wider than the energy storage facility and substation buildings footprints.

9.111 The inverter station containers will be located above a 400mm deep sub-base formed of permeable material with a 30% void ratio, i.e. MOT Type 3 or similar. The plan area of the sub-base will extend at least 500mm beyond the footprint of the containers to allow the collection of roof runoff.

9.112 The permeable sub-base would receive surface water from the containers and would promote infiltration to the ground without significantly concentrating runoff. This will mimic the existing greenfield surface water runoff arising from the Site and ensure that runoff rates are not increased post-development.

9.113 Internal tracks would be required to facilitate vehicle movement around the Site for construction and maintenance purposes. The Development will utilise the existing access tracks where possible to minimise the extent of new tracks required.

9.114 All proposed roads and tracks will be constructed of a permeable material (e.g. MOT Type 3 or similar); therefore, there would be no increase in runoff from these areas. As recommended by the LLFA, the proposed roads and tracks will have an alternating camber to direct drainage to different sides of the roads and tracks and to reduce the concentration of runoff (refer to Appendix F of Appendix 9.1).

Residual Effects

Construction Phase

9.115 A summary of the residual effects for each identified construction phase effect and the related mitigation measures for these effects is set out below:

- the residual effect from the risk of external flood risk during construction is **'**Negligible' following the implementation of the mitigation measures set out in the FCA ensuring the majority of the built Development is located within Flood Zone A and infrastructure being raised above the flood levels;
- the residual effect from the increase in surface water runoff during construction is 'Negligible' with the compliance with BS6031:198 'The British Standard Code of Practice for Earthworks' and phasing of necessary drainage works;
- due to the majority of the Site being underlain by relatively impermeable aquifers and the solar panels being micro piled, as well as the lack of existing contamination on the Site, the residual effects of the remobilisation of existing contamination and its impact on surface water and groundwater is 'Negligible'; and
- the residual effect from contamination arising from general construction related activities is 'Negligible' on surface water and groundwater with the implementation of the CEMP.

Operational Phase

9.116 A summary of the residual effects for each identified operational phase effect and the related mitigation measures for these effects is set out below:

- due to an appropriately designed surface water drainage strategy and double skinned fuel and oil tanks located within the units, the residual effect of contamination from accidental or process discharges on surface water and groundwater is considered to be 'Negligible to Minor Beneficial';
- the residual effect of the inclusion of appropriate maintenance buffers to watercourses is 'Negligible' on the relevant watercourses;
- the residual effect of the risk of external flooding to the Development once operational is considered to be 'Negligible' due to the Development's design ensuring infrastructure is located away from flood risk areas or appropriately raised above the flood levels; and
- the residual effect associated with the risk of the increase in surface water runoff rates from the Development is considered to be 'Negligible to Minor Beneficial'. This is due to the implementation of the appropriately designed surface water drainage strategy and that there will be reduction in runoff rates when compared to the existing Site, as there will be an absence of typical farming activities, such as ploughing and soil compaction by heavy machinery when compared to the existing Site.

Cumulative Effects

9.117 No cumulative effects on the water environment from the Development are anticipated.

Decommissioning

9.118 The modelled operational lifespan of the Development is 40 years, and its decommissioning phase will result in similar water quality and flood risk impacts associated with its construction phase.

9.119 Given that the majority of the Development is located within Flood Zone A, it is considered that the risk of external flood risk during the decommissioning phase of the Development is insignificant. Decommissioning of the Development will result in the removal of solar panels and associated infrastructure and this will not be undertaken when heavy rainfall or a flood event is forecast. This will reduce the risk of flooding at the Site and off-Site during the decommissioning phase of the Development.

9.120 It is expected that during decommissioning, there will be a negligible impact on surface water runoff rates, as although there may be a minor increase in impermeable areas as infrastructure and compounds are brought to the Site, the decommissioning will result in the removal of impermeable areas which in turn is unlikely to have an impact on runoff rates during this phase. Decommissioning activities at the Site would comply to the appropriate British Standards for decommissioning and ensure that drainage features are only removed once the infrastructure they supply has been removed.

9.121 It is considered unlikely that the decommissioning of the Development would result in any remobilisation of existing contamination on-Site. Firstly, the assessment concluded that during the construction phase of the Development, due to the majority of the Site being underlain by relatively impermeable geology and the use of micro piling, the risk of remobilisation of any pesticides/fertilisers is negligible when compared to the existing site use. Secondly, the drainage strategy that will have been implemented for the operational phase of the Development will ensure that there is a 'Negligible to Minor beneficial' effect on contamination as a result of the Development. It is therefore considered that the decommissioning phase of the Development will not result in any remobilisation of contamination on-Site.

9.122 Finally, it is considered that prior to the implementation of mitigation measures, contamination arising from the general decommissioning activities on surface water and groundwater is a potential impact that could have an adverse impact on sensitive receptors. However, this would be mitigated by ensuring that all decommissioning vehicles and activities comply with the mitigation measures set out in the CEMP. This includes measures such as ensuring vehicles are maintained appropriately, ensuring materials are stored, handled and managed with due regard to the sensitivity of the environment and ensuring dust suppression measures are in place to reduce any contamination of nearby surface water receptors.

9.123 As with the construction phase impacts, it is considered that the residual effect associated with the decommissioning phase would be 'Negligible' on water quality and flood risk.

Summary

9.124 This assessment considers the potential effects of the Development on Water Quality and Flood Risk. The impacts on water resources and supply have been scoped out of this assessment. The key considerations are the potential effects on surface water quantity and quality, groundwater quantity and quality, flood risk and surface water drainage.

9.125 Table 9.5 gives an overview of the assessment and summarises the potential effects that have been identified for the construction and operational phases of the Development as well as the associated classification, mitigation measures and residual effects.

9.126 The key potential effect during the Development's construction phase is the risk of contamination arising from general construction activities on surface water and groundwater and in particular its impact on the Llyn Alaw reservoir and its drinking water catchment area. However, with the recommended mitigation measures in place, the residual effects are considered to be 'Negligible'.

9.127 During the operational phase of the Development, due to the implementation of the mitigation measures set out in the FCA and the surface water drainage strategy within the Development's design, there will be a 'Negligible to Minor Beneficial' impact on the risk of contamination from accidental or process discharges on surface water and groundwater, this is due to appropriate design SuDS as double skinned

tanks as well as the absence of typical farming activities which includes the use of fertilisers and pesticides.

9.128 Similarly, it is concluded that the risk of increase in surface water runoff as a result of the Development will be 'Negligible to Minor Beneficial' due to the inclusion of SuDS features for reducing runoff rates and the absence of absence of typical farming activities such as ploughing and soil compaction by heavy machinery which can promote overland flow.

9.129 In conclusion, given the location and nature of the receptors, the overall residual effects of the Development with regard to water quality and flood risk is considered to be 'Negligible to Minor Beneficial'.

9.130 Table 9.5 contains a summary of the likely significant effects of the Development.

Table 9.5: Table of Significance – Water Environment

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)
				I	UK	W	R	C	B	L	
Construction Phase											
Effects on external flood risk during construction	Temporary	Negligible	None required							X	Negligible
Effects resulting from increase in surface water runoff rates during construction	Temporary	Negligible to Minor Adverse	Compliance with BS6031:198 'The British Standard Code of Practice for Earthworks'							X	Negligible
Effects resulting from potential remobilisation of existing contamination on surface water (Llyn Alaw Reservoir) and groundwater	Temporary	Negligible	None required							X	Negligible
Effects resulting from potential contamination arising from general construction activities on surface water and groundwater	Temporary	Minor Adverse	Implementation of measures set out in the CEMP							X	Negligible
Operational Phase											
Effects resulting from potential contamination from accidental or process discharges on surface water and groundwater	Temporary	Moderate to Major Adverse	Implementation of the surface water drainage strategy and the double-skinned containers						X		Negligible to Minor Beneficial
Effects resulting from incorporation of appropriate maintenance buffers to watercourses	Temporary	Negligible	Planting in the buffers will ensure they do not prohibit access to the watercourses.							X	Negligible
Effects on risk of external flood risk to the Development once operational	Temporary	Negligible	None required						X		Negligible

Potential Effect	Nature of Effect (Permanent/ Temporary)	Significance (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)	Mitigation / Enhancement Measures	Geographical Importance*							Residual Effects (Major/Moderate/Minor) (Beneficial/Adverse/ Negligible)
				I	UK	W	R	C	B	L	
Effects on risk of the increase in surface water runoff rates from the Development	Permanent	Negligible to Minor Adverse	Implementation of surface water drainage strategy and LEMP and the absence of typical farming activities						X		Negligible to Minor Beneficial
Cumulative Effects											
No cumulative effects have been identified											

*** Geographical Level of Importance**
I = International; UK = United Kingdom; W = Wales; R = Regional; C = County; B = Borough; L = Local

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[ix] Her Majesty's Stationery Office, 1991. Water Industry Act 1991. 1991 Chapter 56
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[xi] Her Majesty's Stationery Office, 2009. 2009 No. 3042. Environmental Protection. The Flood Risk Regulations 2009
[xii] Her Majesty's Stationery Office, 2010. Flood and Water Management Act 2010. 2010 Chapter 29
[xiii] Her Majesty's Stationery Office, 2017. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. 2017 No. 407 Water Resources, England and Wales
[xiv] Main river is defined as a watercourse shown as such on the Main River Map and for which the Natural Resource Wales has responsibilities and powers.
[xv] Ordinary watercourse is defined as all watercourses that are not designated Main River and which are the responsibility of riparian owners.
[xvi] UK Centre for Ecology and Hydrology. Flood Estimation Handbook Web Service. Available at: **https://fehweb.ceh.ac.uk/**
[xvii] Isle of Anglesey County Council. 2013. Anglesey Local Flood Risk Management Strategy. Strategy Document
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[xx] Welsh Government, 2016. The Water Resources (Control of Pollution) (Oil Storage) (Wales) Regulations 2016
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[xxii] Cook and McCuen. 2013. Journal of Hydrologic Engineering.