Partners in UK offshore wind

MONA OFFSHORE WIND PROJECT

Preliminary Environmental Information Report

Volume 3, chapter 17: Hydrology and flood risk

Image of an offshore wind farm

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FINAL

Document status

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Glossary

Term	Meaning
Catchments	An area that serves a watercourse with rainwater. Every part of land where the rainfall drains to a single watercourse is in the same catchment.
Climate Change	A long term change in weather patterns, in the context of flood risk, climate change will produce more frequent severe rainfall.
Discharge Consents	Consent granted by Natural Resources Wales to discharge into watercourses, subject to conditions.
Field drainage	Limiting the effect of flooding by maintaining surface water and land drainage systems.
Flood consequence assessment (FCA)	A flood consequence assessment is an assessment of the risk of flooding from all flood mechanisms, including the identification of flood mitigation measures, in order to satisfy the requirements of the planning policy Wales and the technical advice note 15.
Flood defences	A structure that is used to reduce the probability of floodwater affecting a particular area.
Flood Zone 1	Low Probability Land having a less than 1 in 1,000 annual probability of river or sea flooding.
Flood Zone 2	Medium Probability Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Flood Zone 3	High Probability Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Flood Zone 3b	The Functional Floodplain. This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Natural Resources Wales.
Fluvial flooding	Fluvial flooding occurs when rivers burst their banks as a result of sustained or intense rainfall.
Geology	The scientific study of the origin, history and structure of the earth.
Greenfield runoff rate	Rates of surface water runoff from a site that is undeveloped (greenfield).
Ground conditions	The chemical and physical characteristics of the soil at a particular location and how it has been affected by historical land uses.
Groundwater	All water which is below the surface of the ground in the saturated zone and in direct contact with the ground or subsoil.
Lead Local Flood Authority	Lead Local Flood Authorities have responsibility for developing a Local Flood Risk Management Strategy for their area identifying local sources of flooding. The local strategy produced must be consistent with the national strategy. It will set out the local organisations with responsibility for flood risk in the area, partnership arrangements to ensure co-ordination between these organisations, an assessment of the flood risk, and plans and actions for managing the risk.
Main rivers	The term used to describe a water course in respect of which the Natural Resources Wales has permissive powers in relation to its management.
Minor watercourses	The term used to describe a water course owned and operated by a local Drainage Board, a Lead Local Flood Authority or a private land owner.
Ordinary watercourses	A river, stream, ditch, cut, sluice, dyke or non-public sewer that is not a designated Main river, and for which the local authority has flood risk management responsibilities and powers.
Planning Policy Wales Edition 11	Planning Policy Wales Edition 11 sets out the land use planning policies of the Welsh Government. The objective is to ensure the planning system contributes towards sustainable development and improves the social, economic, environmental land cultural well-being of Wales.
River Basin Management Plan	River Basin Management Plans describe the current state of the water environment in the river basin district. It sets out what improvements are possible by 2015 and how the actions will make a difference to the local environment - the catchments, estuaries, the coast and groundwater.
Shoreline Management Plan	A Shoreline Management Plan is a large-scale assessment of the risks associated with coastal processes and sets out a policy framework to address these risks to people and the developed, historic and natural environments. Coastal processes include tidal patterns, wave height, wave direction and the movement of beach and seabed materials.
Strategic Flood Risk Assessment	A Strategic Flood Risk Assessment provides information on areas at risk from all sources of flooding.
Surface water resources	Water on the surface of the land such as in a river, lake, wetland, or ocean.
Surface water runoff	Surface water runoff is flow of water that occurs when excess stormwater, meltwater, or other sources of water flows over a surface.
Sustainable urban Drainage Systems	A sequence of management practices and control measures designed to mimic natural drainage processes by allowing rainfall to infiltrate, and by attenuating and conveying surface water runoff slowly at peak times.
Technical advice note 15 (2004)	TAN15 provides technical guidance which supplements the policy set out in Planning Policy Wales in relation to development and flooding. It advises on development and flood risk as this relates to sustainability principles, and provides a framework within which risks arising from both river and coastal flooding, and from additional run-off from development in any location, can be assessed.
Tidal (Coastal) flooding	Tidal flooding is caused by extreme tidal conditions including high tides and storm surges, overtopping local flood defences or coastal features.
Treated Effluent	Water that has received primary, secondary or advanced treatment to reduce its pollution or health hazards and is subsequently released from a wastewater facility after treatment.
UK Climate Projections 2009	Climate projections expressed in terms of absolute values. A projection of the response of the climate system to emission scenarios of greenhouse gases and aerosols, or radiative forcing scenarios based upon climate model simulations and past observations.

Term		Meaning
Undefended Flood Zone		Natural Resources Wales mapped river and sea flood water extents which do not take into account the presence of flood defences.
Water Framework Directive (WFD)	Poor WFD Status	Major change from natural conditions as a result of human activity. Some restrictions on the beneficial uses of the water body. Some impact on amenity. Moderate impact on wildlife and fisheries.
	Moderate WFD Status	Moderate change from natural conditions as a result of human activity. Some restrictions on the beneficial uses of the water body. No impact on amenity. Some impact on wildlife and fisheries.
	Good WFD Status	Slight change from natural conditions as a result of human activity. No restriction on the beneficial uses of the water body. No impact on amenity or fisheries. Protects all but the most sensitive wildlife.
Water Quality		The physical, chemical and biological characteristics of water.
Welsh Water		Welsh Water is a water company which supplies drinking water, drainage and sewerage services for the majority of Wales via a network of pipe and pump infrastructure.

Acronyms

Acronym	Description
bgl	Below ground level
BGS	British Geological Society
CCBC	Conwy County Borough Council
CEA	Cumulative Effect Assessment
CIRIA	Construction Industry Research and Information Association
CoCP	Code of Construction Practice
CFMP	Catchment Flood Management Plan
DB	Drainage Board
DCC	Denbighshire County Council
DEFRA	Department for Environment, Food & Rural Affairs
DMRB	Design Manual for Roads and Bridges
EWG	Expert Working Group
FCA	Flood Consequence Assessment
FRAP	Flood Risk Activity Permit
HDD	Horizontal Directional Drilling
LDA 1991	Land Drainage Act 1991
LLFA	Lead Local Flood Authority
MDS	Maximum design scenario
MLWS	Mean Low Water Springs
MHWS	Mean High Water Springs
NRW	National Resource Wales
OS	Ordnance Survey
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PPW	Planning Policy Wales
SAC	Special Area of Conservation
SFCA	Strategic Flood Consequence Assessment
SPZ	Source Protection Zone
SSSI	Special Site of Scientific Interest
SuDS	Sustainable Drainage Systems
TAN	Technical Advice Note
WFD	Water Framework Directive
WRMP	Water Resource Management Plan

Units

Unit	Description
%	Percentage
g	Gram (weight)
GW	Gigawatt (power)
ha	Hectare (area)
kg	Kilogram (weight)
km	Kilometre
km^2	Square kilometres
kV	Kilovolt (electrical potential)
kW	Kilowatt (power)
l/s	Litres per second (flow rate)
M	Meters (distance)
m^3	Meters cubed (volume)
mm/yr	Millimetres per year (rainfall)
MW	Megawatt (power)

17 Hydrology and flood risk

17.1 Introduction

17.1.1 Overview

17.1.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the assessment of the potential impact of the Mona Offshore Wind Project on hydrology and flood risk. Specifically, this chapter considers the potential impact of the Mona Offshore Wind Project landward of Mean High Water Springs (MHWS) during the construction, operations and maintenance, and decommissioning phases.

17.1.1.2 The assessment presented also informs and is informed by the following technical chapters:

- Volume 3, chapter 16: Geology, hydrogeology and ground conditions of the PEIR
- Volume 3, chapter 18: Onshore ecology of the PEIR
- Volume 3, chapter 20: Land use and recreation of the PEIR.

17.1.1.3 This chapter also draws upon information contained within the following documents:

- Volume 7, annex 17.1: Flood consequences assessment of the PEIR, which assesses the flood risk to the Mona Offshore Wind Project and the potential impact of the project on flood risk elsewhere
- Volume 7, annex 17.2: Surface watercourses and NRW flood zones of the PEIR
- Volume 7, annex 17.3: Surface water abstraction licences, discharge consents and pollution incidents of the PEIR
- Volume 7, annex 17.4: Water Framework Directive surface water and groundwater assessment, of the PEIR.

17.1.2 Purpose of chapter

17.1.2.1 The primary purpose of the PEIR is outlined in volume 1, chapter 1: Introduction of the PEIR. In summary, the primary purpose of an Environmental Statement is to support the Development Consent Order (DCO) application for Mona Offshore Wind Project under the Planning Act 2008 (the 2008 Act). The PEIR constitutes the Preliminary Environmental Information for the Mona Offshore Wind Project and sets out the findings of the EIA to date to support the pre-application consultation activities required under the 2008 Act. The EIA will be finalised following completion of pre-application consultation and the Environmental Statement will accompany the application to the Secretary of State for Development Consent.

17.1.2.2 The PEIR forms the basis for statutory consultation which will last for 47 days and conclude on 04 June 2023 as outlined in volume 1, chapter 2: Policy and legislation of the PEIR. At this point, comments received on the PEIR will be reviewed and incorporated (where appropriate) into the Environmental Statement, which will be submitted in support of the application for Development Consent scheduled for quarter one of 2024.

17.1.2.3 In particular, this PEIR chapter:

- Presents the existing environmental baseline established from desktop studies, site-specific surveys and consultation
- Identifies any assumptions and limitations encountered in compiling the environmental information
- Presents the potential environmental effects on hydrology and flood risk arising from the Mona Offshore Wind Project, based on the information gathered and the analysis and assessments undertaken
- Highlights any necessary monitoring and/or mitigation measures which could prevent, minimise, reduce or offset the possible environmental effects of the Mona Offshore Wind Project on hydrology and flood risk.

17.1.3 Study area

17.1.3.1 The Mona hydrology and flood risk study area to be used for the assessment focuses on areas landward of MHWS where potential impacts are most likely to occur on hydrological and flood risk receptors. As such, the Mona hydrology and flood risk study area includes:

- The area of land to be temporarily or permanently occupied during the construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project (hereafter referred to as the Mona Proposed Onshore Development Area)
- Surface water receptors and flood risk receptors located within 250m of the Mona Proposed Onshore Development Area (excluding the Mona Onshore Substation). The 250m buffer is considered appropriate for data collection taking into account the likely zone of influence by hydrological receptors. The buffer has also been chosen to identify any existing receptors, assets or infrastructure that have the potential to be affected by temporary flood risk as a result of the Mona Offshore Wind Project
- Flood risk receptors located within 1km of the Mona Onshore Substation area. The 1km buffer was chosen primarily to identify any existing receptors, assets or infrastructure that have the potential to be affected by flood risk as a result of the Mona Offshore Wind Project.

17.1.3.2 The Mona hydrology and flood risk study area is shown in Figure 17.1. This area will be reviewed and modified in response to any refinements made to the Mona Proposed Onshore Development Area during the EIA process.

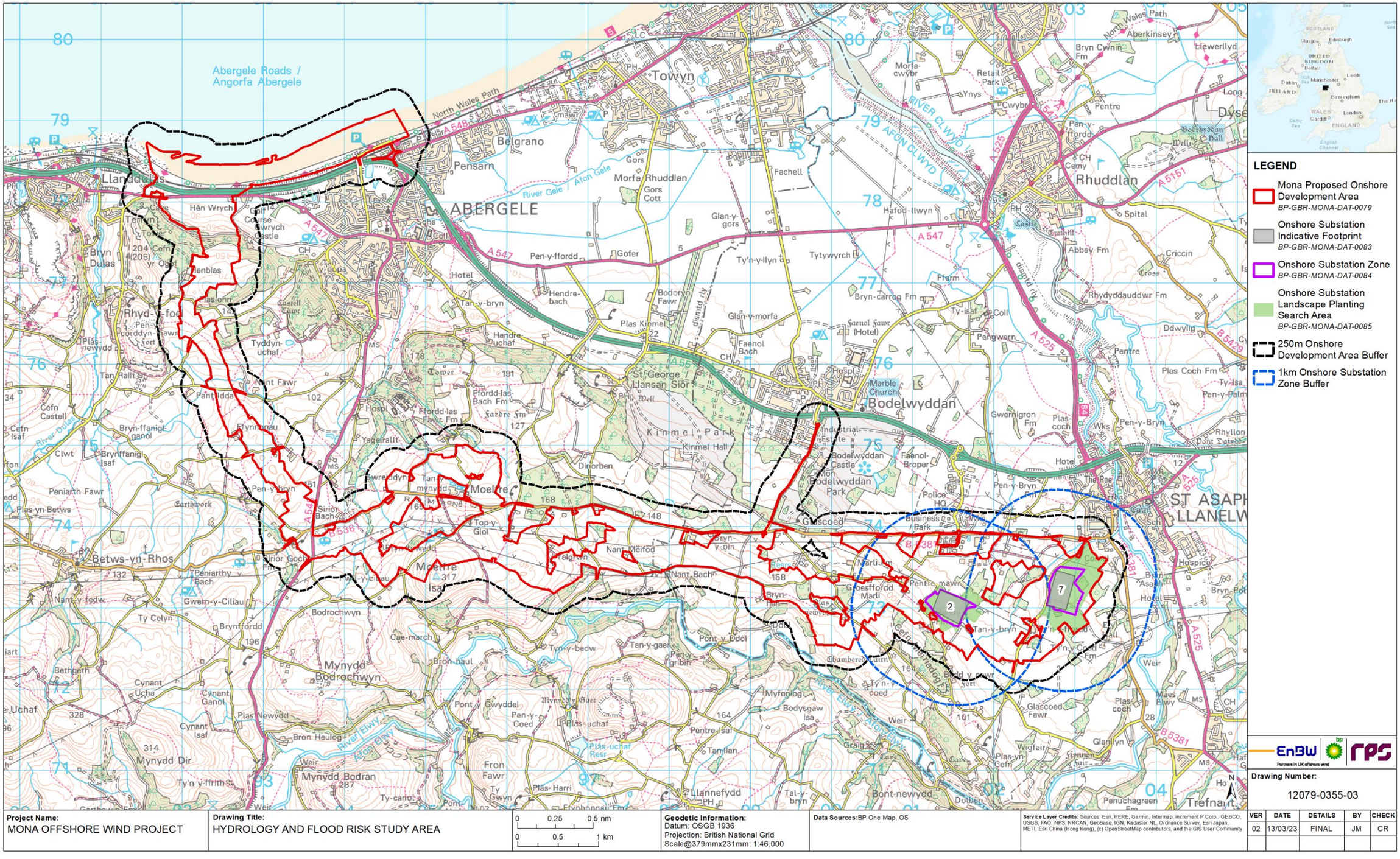

Figure 17.1: Mona hydrology and flood risk study area.

17.2 Policy context

17.2.1 National Policy Statements

17.2.1.1 Planning policy on renewable energy infrastructure is presented in volume 1, chapter 2: Policy and legislation of the PEIR. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to hydrology and flood risk, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1; DECC, 2011a), the NPS for Renewable Energy Infrastructure (EN-3, DECC, 2011b) and the NPS for Electricity Networks Infrastructure (EN-5, DECC, 2011c).

17.2.1.2 NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the assessment. These are summarised in Table 17.1 below. NPS EN-1 and NPS EN-3 also highlight a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 17.2 below.

17.2.1.3 NPS-5 includes guidance on what matters are to be considered in the onshore assessment of electrical networks. These are summarised in

17.2.1.4 Table 17.3. NPS EN-5 also highlights a number of factors relating to the determination of an application and in relation to mitigation. These are summarised in Table 17.4.

17.2.1.5 Table 17.1 refers to the current NPSs, specifically NPS EN-1 (DECC, 2011a) and NPS EN-3 (DECC, 2011b). If the NPSs are updated prior to the application for Development Consent, the revised NPSs will be considered in relation to hydrology and flood risk within the Environmental Statement.

Table 17.1:Summary of the NPS EN-1 and NPS EN-3 provisions relevant to hydrology and flood risk.

Summary of NPS EN-1 and EN-3 provision	How and where considered in the PEIR
NPS-EN1	
Climate Change Adaption	
Applicants for new energy infrastructure must take into account the potential impacts of climate change using the latest UK Climate Projections available at the time the Environmental Statement was prepared to ensure they have identified appropriate mitigation or adaptation measures. This should cover the estimated lifetime of the new infrastructure. Should a new set of UK Climate Projections become available after the preparation of the Environmental Statement, the decision maker should consider whether they need to request further information from the applicant (paragraph 4.8.6 NPS, EN-1).	The characterisation of the flood risk baseline and future baseline has been established using the Natural Resources Wales (NRW) Flood Mapping and Flood Consequence Assessments (FCA), which take into account climate change (see section 2.7.11). An FCA has been undertaken for the Mona Onshore Substation areas and Mona Proposed Onshore Development Area in line with Planning Policy Wales (PPW) 11, Technical Advice Note (TAN) 15 and includes a climate change allowance based on UKCP09 and emerging UKCP18 research data.
Flood Risk	
Applications for energy projects of 1 ha or greater in Zone A in Wales and all proposals for energy projects located on Zones B and C in Wales should be accompanied by an FCA. An FCA will also be required where an energy project less than 1 ha may be subject to sources of flooding other than rivers and the sea (for example surface water), or where the NRW, Drainage Board (DB) or other body have indicated that there may be drainage problems. The FCA should identify and assess the risks of all forms of flooding to and from the project and demonstrate how these flood risks will be managed, taking climate change into account (paragraph 5.7.4, of NPS EN-1).	An FCA has been prepared for the Mona Onshore Substation and Mona Proposed Onshore Development Area as both sites exceed 1ha or are partially located within Zone C. The FCAs consider all forms of flooding and are contained in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR.

Summary of NPS EN-1 and EN-3 provision	How and where considered in the PEIR
The minimum requirements for FCA provided by applicants are that they should: • Be proportionate to the risk and appropriate to the scale, nature and location of the project • Consider the risk of flooding arising from the project in addition to the risk of flooding to the project • Take the impacts of climate change into account, clearly stating the development lifetime over which the assessment has been made • Be undertaken by competent people, as early as possible in the process of preparing the proposal • Consider both the potential adverse and beneficial effects of flood risk management infrastructure, including raised defences, flow channels, flood storage areas and other artificial features, together with the consequences of their failure • Consider the vulnerability of those using the site, including arrangements for safe access • Consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made • Consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes • Include the assessment of the remaining (known as 'residual') risk after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular project • Consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of the project may affect drainage systems • Consider if there is a need to be safe and remain operational during a worst case flood event over the development's lifetime • Be supported by appropriate data and information, including historical information on previous events. (paragraph 5.7.5, NPS EN-1)	An FCA fulfilling the requirements stipulated within NPS EN-1 has been prepared. The FCA is contained in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR.
Further guidance can be found in the Practice Guide which accompanies TAN15 or successor documents (paragraph 5.7.6, NPS EN-1).	An FCA has been prepared taking into account the requirements of PPW and TAN15 on flood risk. The FCA is contained in volume 7, annex 17.1: Flood Consequences Assessment, of the PEIR.
Applicants for the projects which may be affected by, or may add to, flood risk should arrange pre-application discussions with the NRW and, where relevant other bodies such as DBs, sewerage undertakers, highways authority and reservoir owners and operators (paragraph 5.7.7, of NPS EN-1).	NRW, Conwy County Borough Council (CCBC), Denbighshire County Council (DCC), (Lead Local Flood Authorities (LLFAs)) will be consulted during the consenting process and their responses to the scoping report are included in Table 17.6
Consultation on the assessment methodologies should be undertaken at early stages with NRW (paragraph 5.7.8, of NPS EN-1).	NRW and LLFAs have been consulted as detailed in Table 17.6
Water quality and resources	
The applicant should undertake an assessment of the existing status of, and impacts of the proposed project on water quality, water resources and physical modifications to the water environment (paragraph 5.15.2, of NPS EN-1).	The baseline environment (see section 17.4) is described for the Mona hydrology and flood risk study area. An assessment of the impacts on water quality, resources and physical characteristics is provided in section 17.8.
The Environmental Statement should in particular describe: • The existing quality of waters affected by the proposed project and the impacts of the proposed project on water quality, noting any relevant existing discharges, proposed new discharges and proposed changes to discharges • Existing water resources affected by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Catchment Abstraction Management Strategies) • Existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project and any impact of physical modifications to these characteristics; and • Any impacts of the proposed project on water bodies or protected areas under the Water Framework Directive (WFD) and Source Protection Zones (SPZs) around potable groundwater abstractions (paragraph 5.15.3, NPS EN-1)	Baseline water quality and resources for the hydrology and flood risk study area are described in section 17.4.4. Watercourses in the hydrology and flood risk study area have been identified and information on abstractions, discharges, pollution incidents and water quality has been provided (see volume 7, annex 17.3: Surface water abstraction licences, discharge consents and pollution incidents of the PEIR). The impacts on surface water courses are described in section 17.8. SPZs are referred to in chapter 16: Geology, hydrogeology and ground conditions of the PEIR. However, there are no SPZs within the geology, hydrogeology and ground conditions study area. A review of the WFD classifications for watercourses within the hydrology and flood risk study area has been undertaken (see Table 17.9). A WFD assessment is presented in volume 7, annex 17.4: Water Framework Directive surface water and groundwater assessment, of the PEIR.
NPS-EN3	
Offshore and onshore wind farms are less likely to be affected by flooding but applicants should particularly set out how the proposal would be resilient to storms (paragraph 2.3.4, of NPS EN-3).	Resilience to storms is discussed in volume 2, chapter 1: Physical processes of the PEIR in relation to the Mona offshore environment including the intertidal area. The resilience to flood risk along the Mona Proposed Onshore Development Area and the Mona Onshore Substation are set out within this chapter and volume 7, annex 17.1: Flood Consequences Assessment of the PEIR.

Table 17.2: Summary of NPS EN-1 policy on decision making relevant to hydrology and flood risk.

Summary of NPS EN-1 provision	How and where considered in the PEIR
Climate change adaption	
The decision maker should be satisfied that there are no features of the design of new energy infrastructure critical to its operation which may be seriously affected by Môre radical changes to the climate beyond that projected in the latest set of UK climate projections, taking account of the latest credible scientific evidence on, for example, sea level rise (for example by referring to additional maximum credible scenarios – i.e. from the Intergovernmental Panel on Climate Change or NRW) and that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime (paragraph 4.8.8, NPS EN-1).	Climate change has been taken into account in the characterisation of the baseline and future baseline environment (see paragraphs 17.4.5.1 to 17.4.5.8). Climate change is also considered in the FCA (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR).
Flood Risk	
The decision maker should be satisfied that where relevant: the application is supported by an appropriate FCA; the Sequential Test has been applied as part of site selection; a sequential approach has been applied at the site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk; the proposal is in line with any relevant national and local flood risk management strategy; priority has been given to the use of Sustainable urban Drainage Systems (SuDS) (as required in the next paragraph on National Standards); and in flood risk areas the project is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed over the lifetime of the development (paragraph 5.7.9, NPS EN-1).	An FCA has been prepared, (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR) which considers the flood risks from the Mona Offshore Wind Project. The FCA has been undertaken in line with NPS EN-1, TAN 15 and PPW.
The decision maker will need to be satisfied that the proposed drainage system complies with any National Standards published by Ministers under Paragraph 5(1) of Schedule 3 to the Flood and Water Management Act 2010. In addition, the DCO, or any associated planning obligations, will need to make provision for the adoption and maintenance of any SuDS, including any necessary access rights to property. The decision maker should be satisfied that the most appropriate body is being given the responsibility for maintaining any SuDS, taking into account the nature and security of the infrastructure on the proposed site. The responsible body could include, for example, the applicant, the landowner, the relevant local authority, or another body, such as a Drainage Board (paragraph 5.7.10, NPS EN-1).	Drainage strategies will be prepared following the confirmation of the Mona Onshore Substation layout and will be included as part of the DCO application. Proposed attenuation basin search areas have been identified (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR) that will provide sufficient attenuation storage for 1 in 100 year plus climate change worst case storm event. Drainage provisions will be set out in an agreement with the relevant LLFA.
The decision maker should not consent development in Zone B in Wales unless it is satisfied that the Sequential Test [Justification Test in Wales] requirements have been met. It should not consent development in Zone C unless it is satisfied that the Sequential and Exception Test requirements have been met. The technology-specific NPSs set out some exceptions to the application of the Sequential Test. However, when seeking development consent on a site allocated in a development plan through the application of the Sequential Test, informed by a strategic flood risk assessment, applicants need not apply the Sequential Test, but should apply the sequential approach to locating development within the site. (Paragraph 5.7.12, NPS EN-1).	The Mona Onshore Substation options and the majority of the Mona Proposed Onshore Development Area are located entirely within Zone A (volume 7, annex 17.1: Flood Consequences Assessment of the PEIR). Zones C1/C2 are present within the Mona Landfall area only. The approach to flood risk and the assessment are described in the FCA (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR) and has been summarised in this chapter (see section 17.8). A localised area of the Mona Onshore Substation Option 7 is shown to be at low risk from surface water flooding. Appropriate mitigation measures are outlined within the FCA (volume 7, annex 17.1: Flood Consequences Assessment of the PEIR).
Preference should be given to locating projects in Zone A in Wales. If there is no reasonably available site in Flood Zone A, then projects can be located in Zone B. If there is no reasonably available site in Zones A and B, then nationally significant energy infrastructure projects can be located in Zone C subject to the Exception Test. Consideration of alternative sites should take account of the policy on alternatives (paragraph 5.7.13, NPS EN-1).	The entire area of the Mona Onshore Substation options and the majority of the Mona Proposed Onshore Development Area are located in Zone A (as described in section 17.4). The approach to flood risk and the assessment are described in the FCA (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR) and has been summarised in this chapter.
The decision maker will find an Exception Test to be only appropriate for use where the Sequential Test alone cannot deliver an acceptable site, taking into account the need for energy infrastructure to remain operational during floods. It may also be appropriate to use it where, as a result of the alternative site(s) at lower risk of flooding being subject to national designations such as landscape, heritage and nature conservation designations, for example Areas of Outstanding Natural Beauty, Sites of Special Scientific Interest (SSSIs) and World Heritage Sites it would not be appropriate to require the development to be located on the alternative site(s) (paragraph 5.7.15, NPS EN-1).	The approach to flood risk and the assessment are described in the FCA (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR) and has been summarised in this chapter (see paragraph 17.4.3.3 and 17.4.3.4). The Justification Test was only required for the Mona Landfall area which has been passed.
If an Exception Test is required the decision maker will have to be satisfied that all three elements of the test will have to be passed for development to be consented (paragraph 5.7.16, NPS EN-1)	The entirety of the Mona Onshore Substation options and the majority of the Proposed Onshore Development Area are located in Flood Zone 1 (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR).

Summary of NPS EN-1 provision	How and where considered in the PEIR
To satisfactorily manage flood risk, arrangements are required to manage surface water and the impact of the natural water cycle on people and property. The term SuDS refers to the whole range of sustainable approaches to surface water drainage management Site layout and surface water drainage systems should cope with events that exceed the design capacity of the system, so that excess water can be safely stored on or conveyed from the site without adverse impacts. The surface water drainage arrangements for any project should be such that the volumes and peak flow rates of surface water leaving the site are no greater than the rates prior to the proposed project, unless specific off-site arrangements are made and result in the same net effect. It may be necessary to provide surface water storage and infiltration to limit and reduce both the peak rate of discharge from the site and the total volume discharged from the site. There may be circumstances where it is appropriate for infiltration facilities or attenuation storage to be provided outside the project site, if necessary through the use of a planning obligation (paragraph 5.7.18 to 5.7.22, NPS EN-1).	Drainage strategies will be prepared following the confirmation of the Mona Onshore Substation layout and will be included as part of the DCO application. Drainage strategies will be developed in accordance with the NPS, PPW, TAN 15 and the SuDS Manual, whereby sufficient attenuation storage will be provided for 1 in 100 year plus climate change worst case storm event. Proposed attenuation basin search areas have been identified (see volume 7, annex 17.1: Flood Consequences Assessment, of the PEIR) that will provide sufficient attenuation storage. The approach to flood risk is presented in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR and has been summarised in this chapter.
Water quality resources	
The decision maker should satisfy itself that a proposal has regard to the River Basin Management Plans and meets the requirements of the WFD and its daughter directives, including those on priority substances and groundwater. The specific objectives for particular river basins are set out in River Basin Management Plans. The decision maker should also consider the interactions of the proposed project with other plans such as Water Resources Management Plans (WRMPs) and Shoreline/Estuary Management Plans (paragraph 5.15.6, NPS EN-1).	The assessment and the proposed mitigation measures have taken into account the requirements of the River Basin Management Plan and WFD to ensure all potential impacts on the water environment are mitigated to within acceptable levels (see Table 17.20).
The decision maker should consider whether appropriate requirements should be attached to any development consent and/or planning obligations entered into to mitigate adverse effects on the water environment (paragraph 5.15.7, NPS EN-1).	This has been described and considered in relation to the hydrology and flood risk study area within the assessment of Mona Offshore Wind Project.
The decision maker considers whether mitigation measures are needed over and above any which may form part of the project application. A construction management plan may help codify mitigation at that stage. The risk of impacts on the water environment can be reduced through careful design to facilitate adherence to good pollution control practice. For example, designated areas for storage and unloading, with appropriate drainage facilities, should be clearly marked. The impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling (paragraphs 5.15.8 to 5.15.10, NPS EN-1).	The approach to flood risk is presented in volume 7, annex 17.1: Flood Consequence Assessments of the PEIR and has been summarised in this chapter. Appropriate mitigation measures are set out in Table 17.20 and an Outline Code of Construction Practice (CoCP) has been prepared as part of PEIR.

Table 17.3:Summary of NPS EN-5 provisions relevant to hydrology and flood risk.

Summary of NPS EN-5 provision	How and where considered in the PEIR
Climate Change Adaption	
As climate change is likely to increase risks to the resilience of some electricity infrastructure from flooding, for example, in situations where it is located near the coast or is underground, applicants should in particular set out to what extent the proposed development is expected to be vulnerable, and as appropriate, how it would be resilient to flooding, particularly for substations that are vital for the electricity transmission and distribution network (paragraph 2.6.1, NPS EN-5).	Flood consequence assessments (FCAs) have been prepared for the proposed Mona Onshore Substation and Proposed Onshore Development Area (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR).

Table 17.4:Summary of NPS EN-5 policy on decision making relevant to hydrology and flood risk.

Summary of NPS EN-5 provision	How and where considered in the PEIR
Section 4.9 of EN-1 advises that the resilience of the project to the effects of climate change should be assessed in the Environmental Statement accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see Section 5.8 in EN-1) (paragraph 2.6.2, NPS EN-5).	Flood consequence assessments (FCAs) have been prepared for the proposed Mona Onshore Substation and Proposed Onshore Development Area (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR).

17.2.2 Other relevant policies

17.2.2.1 The assessment of potential changes to hydrology and flood risk has also been made with consideration to the specific policies set out in:

- PPW 11
- TAN 15, 2004
- Conwy Local Development Plan, 2013
- Denbighshire Local Development Plan, 2013.

17.2.2.2 Key provisions are set out in Table 17.5 along with details as to how these have been addressed within the assessment.

Table 17.5: Local Planning Policy of relevant to hydrology and flood risk.

Policy	Key provisions	How and where considered in the PEIR
PPW 11		
Chapter 13 'Minimising and Managing Environmental Risk and Pollution' Section 13.4	"*Development proposals in areas designed as being of high flood hazard should only be considered where:* • *New development can be justified in that location, even though it is likely to be at risk from flooding; and*	The FCA in volume 7, annex 17.1: Flood Consequences Assessment, of the PEIR has been undertaken in line with PPW .

Policy	Key provisions	How and where considered in the PEIR
	• *The development proposal would not result in the intensification of existing development which may itself be at risk; and* • *New development would not increase the potential adverse impacts of a flood event*."	
TAN 15		
	"*An FCA to support a development application, should be proportionate to the risk and appropriate to the scale, nature and location of the development. The following will need to be considered:* • *The consequences of flooding on the development, the consequences of the development on flood risk elsewhere and if appropriate mitigation measures can be incorporated into the design.* • *Mechanisms of flooding, including sources of floodwater, how floodwater enters and flows across a site, height, and speed of floodwaters.* • *Uncertainties in estimating flood events including use of historical records and forecasting.* • *Security of proposed developments over their lifetime and ensuring those using the development have an awareness of the potential risks from flooding.* • *Description of consequences under a range of extreme events including: mechanisms, sources, depths, speed, rate of rise, overland flood routes, velocity, access and egress, impacts on natural heritage, impact on flood risk in surrounding areas.* • *Structural adequacy of defences to contain flows and withstand overtopping and if required the suitability of implementing a buffer zone adjacent to defences.* • *Measures required to ensure flooding is managed to acceptable levels and ensure that the impact upon flood risk elsewhere in the flood plain is managed*".	The FCA in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR has been undertaken in line with TAN 15.
Conwy County Borough Council: Adopted Local Development Plan (October 2013)		
Strategic Policy DP/1 – Sustainable Development Principles	Development will only be permitted where it is demonstrated that it is consistent with the principles of sustainable development. All developments are required to: • Take account of and address the risk of flooding and pollution in the form of noise, lighting, vibration, odour, emissions or dust in line with Policies DP/2 and DP/3 – 'Promoting Design Quality and Reducing Crime'.	The risk of flooding as a result of the Mona Offshore Wind Project is identified in the FCA in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR.
Policy DP/3 Promoting Design and Reducing Crime	All new development will be of high quality, sustainable design which provides usable, safe, durable and adaptable places, and protects local character and distinctiveness of the Plan Area's built historic and natural environment. The Council will require development to: • Provide sustainable urban drainage systems to limit waste water and water pollution and reduce flood risk in line with national guidance and Policy NTE/8 – 'Sustainable Drainage Systems.	
Policy NTE/6 Energy Efficiency and Renewable Technologies in New Development	The efficient use and conservation of natural resources are essential to the overall quality of life within the Plan Area and to support wider social and economic sustainability objectives. The Council will: • Ensure that all new developments incorporate the principles of sustainable design such as: appropriate layout, massing, orientation, use of materials, rain water harvesting, energy efficiency, sustainable drainage, and waste recycling areas/storage in line with the Development Principle Policies and NTE/8 – 'Sustainable Drainage Systems', NTE/9 – 'Foul Drainage' and NTE/10 – Water Conservation'.	Sustainable drainage systems are considered in the FCA in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR.
Policy NTE/8 Sustainable Drainage Systems	The use of Sustainable Drainage Systems will be required wherever reasonably practicable with preference for onsite disposal and where satisfactory arrangements can be put in place for the long-term maintenance of those systems. Where this is not proposed a developer will need to justify that discharge is necessary and is adequately controlled. Subsequent preference for surface water drainage will be for: • Drainage to a surface water body (river, lake etc.) subject to appropriate treatment and attenuation • Drainage to surface water sewer • Drainage to combined sewer.	Sustainable drainage systems are considered in the FCA in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR.
Denbighshire Local Development Plan (October 2013)		
Policy RD 1 Sustainable Development and Good Standard Design	Development proposals will be supported within development boundaries provided that all the following criteria are met: • Satisfies physical or natural environmental considerations relating to land stability, drainage and liability to flooding, water supply and water abstraction from natural watercourses. Development will only be permitted where it is demonstrated that it is consistent with the principles of sustainable development. All developments are required to: • Take account of and address the risk of flooding and pollution in the form of noise, lighting, vibration, odour, emissions or dust in line with Policies DP/2 and DP/3 – 'Promoting Design Quality and Reducing Crime'.	The risk of flooding as a result of the Mona Offshore Wind Project is identified in the FCA in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR.

17.3 Consultation

17.3.1.1 A summary of the key issues raised during consultation activities undertaken to date specific to hydrology and flood risk is presented in Table 17.6 below, together with how these issues have been considered in the production of this PEIR chapter.

Table 17.6: Summary of key consultation issues raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to hydrology and flood risk.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
May 2022	Denbighshire County Council - Response to Scoping	The coastal areas of Denbighshire will be impacted by the construction of a series of major infrastructure schemes (coastal defence schemes and Awel y Môr offshore windfarm) and further offshore windfarm development with result in prolonged disruption from construction activities, which has the potential to significantly impact on recreational use of the beaches and the Wales Coastal path, public amenity, tourism and the local economy. The cumulative impact of the construction phase on public amenity, tourism and local economy has the potential to give rise to significant effects and should be scoped in.	Awel y Môr and the coastal defence schemes will be included in the cumulative effects assessment (CEA), section 17.10 of this chapter.
May 2022	Natural Resources Wales – Response to Scoping	There are site specific flood hydraulic models that NRW have commissioned that coincide with the scoping search area, which have not been referred to in the baseline data sources. NRW (A) advise these should be obtained and considered within the FCA. These include models associated with tidal flood risk and fluvial risks including some of the pumped systems due to the presence of NRW owned pumping stations. Models can be requested via: datadistribution@naturalresourceswales.gov.uk once cabling routes have been refined	The Point of Ayr to Pensarn flood model only covers the east extent of the Landfall. We have requested if there is an additional flood model that covers the west extent of the Landfall. The remainder of the Mona Proposed Onshore Development Area is not covered by a flood model as it is located within flood zone 1.
May 2022	Natural Resources Wales – Response to Scoping	NRW (A) also note that the FCA will refer to the current Technical Advice Note (TAN) 15 (Welsh Government, 2004) and will also use the Emerging TAN 15: Development, Flooding and Coastal Erosion (Welsh Government, coming into force June 2023). NRW (A) advise that the NRW Flood Map for Planning (FMfP) is the more accurate data set on future flood risk (due to including allowances for climate change) than the current Development Advice Maps accompanying the existing TAN15. Whilst the scoping report refers to the FMfP all the corresponding figures showing risk areas use the Flood Risk Assessment Wales maps. The figures should be updated accordingly	The relevant figures in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR, have been updated to use the Flood Risk Assessment Wales maps.
May 2022	Natural Resources Wales – Response to Scoping	All designated main river and flood defence infrastructure crossings will be subject to a Flood Risk Activity Permit (FRAP) under the Environmental Permitting Regulations 2016 and the crossing methods for each watercourse should be detailed in the FCA. NRW (A) advise that trenchless technology should be the preferred crossing method.	The Mona Proposed Onshore Development Area does not cross any main rivers. FRAPs will be obtained for the crossings of watercourses and flood defence infrastructure. A crossing schedule will accompany the DCO application that will identify the proposed crossing methodologies.
May 2022	Natural Resources Wales – Response to Scoping	Tidal flood risk should consider using Coastal Design Sea Levels - Coastal Flood Boundary Extreme Sea Levels (2018) dataset whilst climate change allowances will refer to Climate change allowances and flood consequence assessments. The relevant Lead Local Flood Authority (Conwy and/or Denbighshire Councils) will need to advise on surface water flood risk and drainage arrangements as the SuDS Approval Bodies	The FCA uses modelled coastal flood data that accounts for existing tidal flood defences and flooding caused by a breach in these flood defences. Data is from the Point of Ayr to Pensarn coastal flood model. Flood depths within the landfall area from the 1 in 200 and 1 in 1000-year events have been assessed for the present day scenario and the climate change scenario which accounts for rising sea levels.
May 2022	Natural Resources Wales – Response to Scoping	NRW (A) are generally satisfied with Section 6.2 Hydrology and flood risk regarding what has been scoped into the project assessment to manage flood risk. The approach and reference documents to inform the Flood Consequence Assessment (FCA) also appear suitable.	Noted
June 2022	Planning Inspectors Response to Scoping	The Inspectorate agrees that operations and maintenance activities are unlikely to generate contaminated runoff and thus there will be low potential for likely significant effects with regards to pollution. The Inspectorate agrees that impact of contaminated runoff on the chemical and biological status of surface water receptors arising from the operations and maintenance of the onshore transmission assets can be scoped out of further assessment.	Noted

Date	Consultee and type of response	Issues raised	Response to issue raised and/or were considered in this chapter
June 2022	Planning Inspectors Response to Scoping	The Scoping Report proposes to scope out accidental pollution resulting from construction, operations and decommissioning of the Proposed Development. The Inspectorate agrees that such effects are capable of mitigation through standard management practices and can be scoped out of the assessment. The Environmental Statement should provide details of the proposed mitigation measures to be included in the Environment Management Plan. The Environmental Statement should also explain how such measures will be secured.	The storage and use of fuel and chemicals during construction will be managed by measures set out in the Outline CoCP. The use of these substances during the operations and maintenance phase will be limited; measures for their management will be set out in the Hydrological, Ecological and Landscape Management Plan that will accompany the DCO application.
June 2022	Planning Inspectors Response to Scoping	The Inspectorate agrees that operations and maintenance activities are unlikely to result in significant effects on the integrity of existing flood defences and that this matter can be scoped out of the Environmental Statement.	Noted
June 2022	Planning Inspectors Response to Scoping	The Inspectorate agrees that the impact of increased flood risk arising from additional surface water runoff during the operations and maintenance of the onshore export cable can be scoped out of the Environmental Statement given that the slight rise in impermeable land associated with the onshore transmission assets is unlikely to give rise to likely significant effects relating to drainage patterns and surface water runoff rates.	Noted
June 2022	Planning Inspectors Response to Scoping	If the Proposed Development is to implement SuDS during the construction, operation or decommissioning phase e.g. at the Mona Onshore Substation, the location and design of the SuDS should be described in the Environmental Statement and included on a figure(s).	Drainage strategies will be prepared following the confirmation of the Mona Onshore Substation layout and will be included as part of the DCO application. Drainage strategies will be developed in accordance with the NPS, PPW, TAN 15 and the SuDS Manual.
June 2022	Conwy County Borough Council – Response to Scoping	The Environmental Statement should address the impact of the construction, operations and maintenance and decommissioning phases on coastal defence works, including the proposed Llanddulas to Kinmel Bay coastal defence scheme.	The FCA has taken into account the existing coastal defence wall; the proposed coastal defence scheme works will be taken into account in the cumulative effects assessment section of this chapter.
April 2023	Conwy County Borough Council, Denbighshire County Council and NRW	The purpose of the meeting is to discuss the coastal defence schemes and the management of flood risk issues at the landfall and to discuss the approach of the drainage strategy for the Mona Onshore Substation.	Meeting not undertaken at the time of writing

17.4 Baseline environment

17.4.1 Desktop study

17.4.1.1 Information on hydrology and flood risk within the Mona hydrology and flood risk study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 17.7 below.

Table 17.7: Summary of key desktop reports.

Title	Source	Year	Author
British Geological Society (BGS) 1:50,000 and 1:10,000 digital geological mapping	BGS	2022	BGS
SPZs/Aquifer Designations	Groundsure Enviro+Geo insights report	2022	Groundsure
Groundsure Environmental Search (Ref: GSIP-2022-12806-10820_A-D).	NRW, BGS	2022	Groundsure
Climate data	Peak River Flow Allowances by River Basin District	2021	NRW
Local Flood Risk Management Strategies	CCBC, DCC	2013 and 2014	CCBC, DCC
Flood Map for Planning	NRW	2022	NRW
Development Advice Map	NRW	2022	NRW
National Flood Hazard and Risk Maps	NRW	2022	NRW
Shoreline Management Plan	NRW, LLFAs, OS	2015	North West and North Wales Costal Group
Catchment Flood Management Plan	https://www.mycoastline.org.uk/	2021	NRW
CCBC SFCA	CCBC	2012	CCBC
DCC SFCA	DCC	2018	DCC

17.4.2 Identification of designated sites

17.4.2.1 A review of desktop reports, publicly available information and information requests (as identified within Table 17.7) did not identify any designated surface watercourses within the Mona hydrology and flood risk study area.

17.4.3 Site specific assessment

17.4.3.1 A summary of the assessments undertaken to inform the hydrology and flood risk impact assessment is outlined in Table 17.8 below.

17.4.3.2 The Mona Onshore Substation will cover an area of more than 1 hectare (ha); the Mona Proposed Onshore Development Area (at landfall) and the 1km buffer around the Mona Onshore Substation option 7 will pass through areas designated as Flood Zone 2 and 3. In accordance with the guidance in PPW, TAN 15 and NPS EN-1 site-specific FCAs have been undertaken for the Mona Proposed Onshore Development Area and Onshore Substation option locations. The FCA is included in volume 7, annex 17.1: Flood Consequences Assessment of the PEIR. The flood zones are shown in volume 7, annex 17.2: Surface watercourses and NRW flood zones of the PEIR.

17.4.3.3 The key components of the site-specific FCAs are as follows

- Review of publicly available NRW documentation, local flood management plans and future flood management schemes
- Review of strategic FCAs
- Assessment of the flood risk to the existing conditions and future conditions (assuming that the Mona Offshore Wind Project is in place)
- A site-specific assessment of flood risk at the Mona Proposed Onshore Development Area and Onshore Substation.

17.4.3.4 The FCA for the Mona Proposed Onshore Development Area focuses on the locations where the Mona Onshore Cable Corridor will be within Flood Zone 3/Zone C at the landfall location. This is because the majority of the Mona Proposed Onshore Development Area is located within Flood Zone 1.

Table 17.8: Summary of site-specific assessment.

Title	Extent of survey	Overview of survey	Survey contractor	Date	Reference to further information
FCA	Desk based survey for the proposed Mona Onshore Substation and Mona Proposed Onshore Development Area.	The survey comprises a desk based study of flood risk information. The FCA presents the detailed flood risk for each project element in relation to fluvial, tidal, groundwater, surface water etc. and outlined site specific management and drainage strategies (where required) to mitigate flood risk to the Mona Onshore Substation and Mona Proposed Onshore Development Area and surrounding areas.	RPS	December 2022	See volume 7, annex 17.1: Flood Consequences Assessment of the PEIR

17.4.4 Baseline environment

Site description

17.4.4.1 The Mona Proposed Onshore Development Area makes landfall at Llanddulas beach to the west of Abergele and traverses predominantly through agricultural land uses and woodland. Residential settlements are sparse; with development mainly limited to farmhouses peppered within the landscape.

17.4.4.2 Limestone hills are present along the coastline and hinterland, with land steeply rising inland from the heavily modified coastline. Inland areas of the Mona Proposed Onshore Development Area generally consist of rolling hills and valleys.

Hydrological setting

17.4.4.3 The Mona hydrology and flood risk study area includes a number of catchments associated with NRW designated Main Rivers and local authority ordinary watercourses. Definitions of these hydrological features are provided below:

- Main Rivers – watercourses where the NRW has permissive powers over their management.
- Ordinary watercourses – includes rivers, streams, ditches and drains which do not form part of a main river and are managed by CCBC and DCC as LLFAs.

17.4.4.4 The catchments of the Main Rivers within the hydrology and flood risk study area are listed below and their locations are shown in volume 7, annex 17.2: Surface watercourses and NRW flood zones of the PEIR:

- Afon Elwy, that defines the south and east boundary to the hydrology and flood risk study area up to its confluence with Afon Clwyd.
- Afon Clwyd, that flows north to its mouth at Rhyl.
- Afon Dulas, that flows north to its mouth between Llanddulas and Abergele, defining the west boundary to the Mona hydrology and flood risk study area.
- Afon Gele, a short watercourse that flows north onto the low lying, drained, coastal marshes between Abergele and the mouth of Afon Clwyd.

NRW designated Main Rivers

17.4.4.5 There are no Main Rivers identified within the Mona hydrology and flood risk study area.

Ordinary watercourses

17.4.4.6 There are several ordinary watercourses located within the Mona hydrology and flood risk study area:

- Two tributaries of the River Gele
- Nant y Bryniau
- Nant y Cregiau
- Nant Luke
- A tributary of the River Clywd
- A tributary of the River Elwy
- Two tributaries of Nant Ganol,

Surface water body status

17.4.4.7 The current overall WFD status for watercourses potentially affected by the Mona Onshore Cable Corridor, Onshore Substation options and Mona 400kV Grid Connection Cable Corridor have been identified via the publicly available Lle mapping. The open access database provides the most up to date (2021) Current Status classifications for a number of main rivers within the Western Wales River Basin District and within the Mona hydrology and flood risk study area. The WFD classification is not site specific but classifies a defined river reach based on site samples. These watercourses have been included within the WFD assessment as they are watercourses likely to be the most affected by the Mona Offshore Wind Project. A WFD assessment has been undertaken and is provided in volume 6, annex 17.4: Water Framework Directive surface water and groundwater assessment of the PEIR.

17.4.4.8 For surface waters, the WFD objectives are based on the ecological and chemical status of the waterbody (i.e. the predicted future status if technically feasible measures are implemented). These measures are required to prevent deterioration in the current status of the waterbody and (once implemented) produce more benefits than they cost to implement. The date to achieve the objective status is determined by the type of measures which are needed in order to improve the status of the waterbody (i.e. the cost of the measures (are they affordable) and the time taken for the status to improve once the measures have been implemented).

17.4.4.9 Table 17.9 lists the watercourses with catchments within the hydrology and flood risk study area, associated WFD classification grade and overall objectives.

Table 17.9 WFD water quality data.

Name of waterbody	Waterbody type	Classification	Overall objective
Un-named Clwyd estuary west (ID: GB110066059970)	Surface Watercourse (Low, Extra Small, Calcareous)	Overall – good	Good Potential by 2015
Elwy - Clwyd to Afon Melai (ID: GB110066060020)	Surface Watercourse (Mid, Medium, Calcareous)	Overall – good (2021)	Good Potential by 2027
Gele (ID: GB110066059980)	Surface Watercourse (Low, Small, Calcareous)	Overall - moderate (2021)	Good Potential by 2027
Dulas - un-named tributary (ID: GB110066059830	Surface Watercourse (Low, Small, Calcareous)	Overall - moderate (2021)	Good Status by 2015
North Wales (ID: GB641011650000)	Coastal (Moderately exposed, Macrotidal)	Overall - good	Good Potential by 2015

17.4.4.10 A full description of the WFD classification process and associated definitions are available in volume 7, annex 17.4: Water Framework Directive surface water and groundwater assessment of the PEIR.

Geological and hydrogeological setting

Superficial deposits

17.4.4.11 BGS Geology of Britain mapping (1:50,000 scale) indicates the majority of the lower elevations within the Mona Proposed Onshore Development Area is underlain predominantly by glacial till (diamicton) superficial deposits, with limited isolated areas of glaciofluvial (sand and gravel) and alluvium (clay, silt sand and gravel) superficial deposits near pond features. The intertidal area is underlain by storm beach deposits (gravel) (for further details refer to volume 3, chapter 16: Geology, hydrogeology and ground conditions of the PEIR).

Bedrock geology

17.4.4.12 The bedrock underlying the north and east part of the Mona Proposed Onshore Development Area is Clwyd Limestone Group (limestone). A band of Ffernant Formation (mudstone, siltstone and sandstone) is present north of the central area of the Mona Proposed Onshore Development Area, whilst the remainder of the Mona Proposed Onshore Development Area is underlain by Elwy Formation (mudstone, siltstone and sandstone). The east of the Mona Proposed Onshore Development Area is underlain by sandstones of the Carboniferous Warwickshire Group.

Aquifer designation

17.4.4.13 Clwyd Limestone Group (limestone) is categorised as a Principal aquifer; permeable geology able to provide a high level of water storage and able to support water supply and/or river base flow on a strategic scale. Ffernant Formation (mudstone, siltstone and sandstone is classified as a Secondary A aquifer; permeable layers capable of supporting water supplies at a local scale, and in some cases forming an important source of base flow to rivers. Elwy Formation (mudstone, siltstone and sandstone) is classified as a Secondary B aquifer; predominantly lower permeability layers which may store and yield limited amounts of groundwater. The Warwickshire Group is categorised as a Secondary A aquifer.

Source Protection Zones

17.4.4.14 There are no Source Protection Zones within the Mona hydrology and flood risk study area.

Groundwater body status

17.4.4.15 Table 17.10 lists the groundwater catchments within the Mona hydrology and flood risk study area, associated WFD classification grade and overall objectives.

Table 17.10: WFD groundwater quality data.

Name (NRW ID)	Water Body Type	Classification (2019)
Clwyd Permo-Triassic Sandstone (ID: GB41001G202100)	Groundwater (approximately 661 km^2 in area)	Overall – Good
Clwyd Silurian (ID: GB41002G200100)	Groundwater (approximately 154.4 km^2 in area)	Overall – Good
Conwy (ID: GB41002G203000	Groundwater (approximately 185.2 km^2 in area)	**Overall – Poor**

Flood risk

NRW Flood Zones

17.4.4.16 The NRW Flood Zones refer to the probability of flooding from rivers and sea in a given year, assuming no defences are in place and including climate change. Flood zone definitions are set out within Table 17.11.

Table 17.11 Flood Map for Planning Flood Zones.

Flood zone	Flood zone definitions
Flood Zone 1	land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).
Flood Zone 2	land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.
Flood Zone 3	land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

17.4.4.17 The Mona hydrology and flood risk study area is predominantly located within Flood Zone 1. Areas of Flood Zone 3 are located at the Mona Landfall location within the intertidal zone of Traeth Pensarn/Pensarn Beach.

17.4.4.18 A revised edition of TAN 15 is due to be implemented in June 2023 and will be supported by the new Flood Map for Planning to demonstrate how flood risk will be affected by climate change in the next century. Whilst the Flood Map for Planning has no official status for planning purposes until June 2023, NRW may use the Flood Map for Planning as ‘best available information’ on flood risk to inform planning guidance.

Flood Defences

17.4.4.19 The NRW Flood Map for Planning identifies a 1,282m coastal flood defence wall present within the east extent of the Landfall area along the onshore margin of the intertidal zone, which is maintained by CCBC. NRW Flood Map for Planning shows the intertidal zone to the south of the defence to be located within Flood Zone 1.

17.4.4.20 The NRW Flood Map does not identify any flood defences along the west extent of the Landfall area, however groynes are present along the coastline in this area. Whilst groynes may provide some benefits to flood defence through preventing coastal erosion, the benefits cannot be modelled/ quantified in the same way a flood wall or embankment can.

17.4.4.21 The remainder of the Mona Proposed Onshore Development Area does not benefit from any flood defences.

Water supplies, consents and pollution incidents

Surface water abstractions

17.4.4.22 The abstraction licences taken from Groundsure data records identified no surface water abstractions present within the Mona hydrology and flood risk study area.

Groundwater abstractions

17.4.4.23 The abstraction licences taken from Groundsure data records identified no active groundwater abstractions within the Mona Proposed Onshore Development Area (for further details refer to volume 7, annex 16.1: Aquifers, groundwater abstractions and ground conditions of the PEIR).

Discharge consents

17.4.4.24 Discharges of liquid effluent or waste water into surface waters are regulated by the NRW using discharge consents and environmental permits. A review of Groundsure data identified approximately seven consented discharges to surface waters within the Mona hydrology and flood risk study area. The majority of the discharges related to final/treated effluent from domestic properties. Although the volume and parameters of the discharges are regulated (via the discharge consents and permits), the quality of the receiving surface water may potentially be affected.

17.4.4.25 The details and locations of the discharge consents and permits are provided within volume 7, annex 17.3: Surface water abstraction licences, discharge consents and pollution incidents of the PEIR.

Pollution incidents

17.4.4.26 Pollution incident mapping has been used to identify if the quality of watercourses within the Mona hydrology and flood risk study area may have been affected by pollution. A review of Groundsure data identified two pollution incidents in the Mona hydrology and flood risk study area, however both of the incidents were reported as category 3 (minor or minimal impact), see volume 7, annex 17.3: Surface water abstraction licences, discharge consents and pollution incidents of the PEIR. This is defined by NRW, under the common incident classification scheme, as a substantiated incident with no impact to water quality.

17.4.5 Future baseline scenario

17.4.5.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) requires that "*an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge*" is included within the Environmental Statement.

17.4.5.2 In the event that Mona Offshore Wind Project does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

17.4.5.3 The main impact on the hydrology and flood risk future baseline is associated with the potential effects of climate change, which may impact on future peak river flow rates, rainfall intensity and sea levels. A summary of potential climate change allowances as outlined by the NRW (September 2021) is presented below. Further details of climate change allowances can be found at Flood Consequences Assessment: Climate change allowances (Welsh Government, 2021).

17.4.5.4 PPW and TAN 15 sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. This includes demonstrating how flood risk will be managed now and over the development's lifetime, taking climate change into account. In response to this, NRW guidance issued in September 2021, requires that FCAs and Strategic FCAs assess both the central and upper end allowances (see Table 17.12 to understand the potential range of impacts associated with climate change).

17.4.5.5 The range allowances (Table 17.12 to Table 17.14) is based on percentiles. The 50th percentile is the point at which half of the possible scenarios for peak rainfall intensity fall below it and half fall above it:

- The Central allowance is based on the 50th percentile
- The Upper end is based on the 90th percentile.

17.4.5.6 As an example, with a central allowance of 20%, scientific evidence suggests that it is just as likely that the increase in peak rainfall intensity will be more than 20% as less than 20%.

Table 17.12: Changes to extreme rainfall intensity.

Changes to extreme rainfall intensity			
Applies across all of Wales	Total potential change anticipated for '2020s' 2015- 2039)	Total potential change anticipated for '2050s' (2040-2069)	Total potential change anticipated for the '2080s' (2070-2115)
Upper Estimate	10%	20%	40%
Central Estimate	5%	10%	20%

17.4.5.7 Guidance is also provided on increases in river flows as a consequence of climate change. The guidance provides central, upper central and higher central climate change allowance bands which should be utilised within the assessment of flood risk, including the flood risk vulnerability classification, for sites in Flood Zones 2 and 3. (see Table 17.13).

Table 17.13: Climate change allowances.

River Basin District	Allowance category	Total potential change anticipated for '2020s' 2015-2039)	Total potential change anticipated for '2050s' (2040-2069)	Total potential change anticipated for the '2080s' (2070-2115)
Western Wales	Upper Estimate	25%	40%	75%
	Central Estimate	15%	25%	30%

17.4.5.8 Table 17.14 summarises potential sea level rise over various epochs (periods of time) for the Conwy County Borough Council area based on RCP8.5 70th and 95th percentiles.

Table 17.14 Predicted sea level rise.

Area of Wales	Allowence (percentile)	Mean sea level rise by 2100 (meters)	Mean sea level rise by 2120 (meters)
Conwy	70th	0.75	0.89
	95th	1.01	1.21

17.4.6 Data limitations

17.4.6.1 The assessment within this chapter is based on publicly available data obtained from the NRW, CCBC and DCC and commercial data supply companies, as well as additional information supplied from stakeholders during the scoping and consultation stages. The information has been supplemented with consultation such that it is considered sufficient to characterise the baseline environment.

17.4.6.2 The NRW Flood Zone maps do not take into account the impact of local flood defences and climate change on flooding, and do not provide information on flood depth, speed or volume of flow. The maps do not show flooding from other sources such as groundwater, direct runoff from fields or overflowing sewers. However, a description of these sources of flooding is provided in the FCA (see volume 7, annex 17.1: Flood Consequences Assessment of the PEIR), such that sufficient baseline information is available.

- The assessment is limited by a lack of flow and water quality data for the ordinary watercourses in the hydrology and flood risk study area.

17.4.6.3 Notwithstanding the above, overall a moderate to high level of certainty has been applied to the baseline and assessment presented in this chapter. Where available, catchment data regarding water quality has been used to inform the assessment. The information which was available is considered sufficient to establish the baseline within the Mona hydrology and flood risk study area, therefore, there are no data limitations that would affect the conclusions of this assessment.

17.5 Impact assessment methodology

17.5.1 Overview

17.5.1.1 The hydrology and flood risk impact assessment has followed the methodology set out in volume 1, chapter 5: EIA methodology of the PEIR. Specific to the hydrology and flood risk impact assessment, the following guidance documents have also been considered:

- the Welsh Government Statutory standards for sustainable drainage systems (Welsh Government, 2019)
- Non-statutory technical standards for sustainable drainage systems (Defra, 2015)
- Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C532; 2001)
- CIRIA - SuDS Manual (C753; 2015a)
- CIRIA (C741; 2015b) Environmental good practice on site guide
- DMRB, LA104 – Environmental assessment and monitoring
- DMRB LA 113 - Road Drainage and the Water Environment.

17.5.1.2 In addition, the hydrology and flood risk impact assessment has considered the legislative framework as defined by:

- Water Resources Act 1991 which allows the NRW to create byelaws for flood defence and drainage purposes (paragraph 5 of Schedule 25 of the Water Resources Act 1991)
- The Environmental Permitting (England and Wales) Regulations 2016 applies in relation to flood risk activity in, over or under a watercourse. Consent is required from the NRW to undertake works or to erect structures within 8m of a non-tidal water body (and 16m of a tidal body). An environmental permit is also required for any discharges to surface watercourses (Schedule 25 EPR 2016)
- Land Drainage Act 1991 – (under section 23) requires consent from the relevant DB for any works likely to obstruct, or affect the flow of, a watercourse. Under byelaws, consent is required from the relevant drainage authority for any development within a particular distance of a drainage work. The relevant drainage authorities are the NRW, CCBC and DCC
- The Flood and Water Management Act 2010 designated Conwy County Borough Council and Denbighshire County Borough Council as the LLFAs and places a series of responsibilities to improve flood risk management to surface water, groundwater and ordinary watercourses across their jurisdictional area
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 establishes a legislative framework for the protection of surface waters and groundwater. The Regulations place a general duty of the Secretary of State and the NRW to exercise their ‘relevant functions’ so as to secure compliance with the WFD (2000/60/EC).

17.5.1.3 The design and construction of the Mona Offshore Wind Project would also adhere to the relevant regulatory and industry best practice guidance, including, but not limited to:

- Guidance for Pollution Prevention (GPP) 1: A general guide to preventing pollution (NRW *et al.,* 2020)
- GPP 2: Above ground oil storage tanks (NRW *et al.,* 2017a)
- GPP 4: Treatment and disposal where there is no connection to the public foul sewer (NRW *et al.,* 2017b)
- GPP 5: Works and maintenance in or near water (NRW *et al.,* 2018a)
- GPP 8: Safe storage and disposal of used oils (NRW *et al.,* 2017c)
- Pollution Prevention Guidelines (PPG18): Managing Fire Water and Major Spillages (NRW *et al.,* June 2000)

- GPP 20: Dewatering of underground Ducts and Chambers (NRW *et al.*, 2018b)
- GPP 21: Pollution incident response Plans (NRW *et al.,* 2017d)
- GPP 22: Dealing with spills (NRW *et al.,* 2018c)
- GPP 26: Safe storage of drums and Intermediate Bulk Containers (IBCs) (NRW *et al.,* 2018d).

17.5.1.4 Working at Construction and Demolition Sites: PPG 6 Pollution Prevention Guidelines (NRW *et al.* 2012) was withdrawn in December 2015. However, it still provides useful best practice guidance to inform this assessment.

17.5.2 Impact assessment criteria

17.5.2.1 The criteria for determining the significance of effects is a two stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in volume 1, chapter 5: EIA methodology of the PEIR.

17.5.2.2 The criteria for defining magnitude in this chapter are outlined in Table 17.15 below.

Table 17.15: Definition of terms relating to the magnitude of impact.

Magnitude of impact	Definition
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements e.g. significant observable degradation in water resource quality and/or increase in flood risk. Impact is of extended temporal or physical extent and of long term duration (i.e. up to ten years duration). (Adverse).
	Large scale or major improvement or in resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial).
Medium	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements e.g. observable degradation in water resource quality and/or increase in flood risk. Impact is of moderate temporal or physical extent and of medium term duration (i.e. up to five years). (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, features or elements, e.g. degradation in water resource quality and/or slight increase in flood risk Impact is of limited temporal or physical extent and of short term duration (i.e. up to two years). (Adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements for negligible duration (i.e. less than one year) (Adverse) e.g. no observable degradation in water resource quality and/or flood risk.
	Very minor benefit to, or positive addition of one or more characteristics, features or elements (Beneficial).
No change	No loss or alteration of characteristics, features or elements; no observable impact either adverse or beneficial.

17.5.2.3 The criteria for defining sensitivity in this chapter are outlined in Table 17.16 below.

Table 17.16: Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
Very High	Receptor with little to no capacity to accommodate change, is high value or critical importance to the local, regional or national economy. Receptor is highly vulnerable to impacts that may arise from the development and recoverability is long term or not possible. **Surface Water**: WFD current overall status of high. The surface water body supports sensitive aquatic ecological receptors and is extensively used for public water supply and large scale agricultural use. **Flood Risk**: Land is within a high risk flood zone or nationally significant infrastructure is present which is protected from flooding by natural floodplain storage.
High	Receptor with a low a capacity to accommodate change, is of moderate value with reasonable contribution to the local, regional or national economy. Receptor is generally vulnerable to impacts that may arise from the development and recoverability is flow and/or costly. **Surface Water**: WFD current overall status of good. Surface water body may support sensitive aquatic ecological receptors and is used is used for public water supply/ medium scale industrial or agricultural use. **Flood Risk**: Land is within a high to medium risk flood zone or locally significant infrastructure is present which is protected from flooding by natural floodplain storage.
Medium	Receptors with a moderate capacity to accommodate change, is of minor value with small levels of contribution to the local, regional and national economy. Receptor is somewhat vulnerable to impacts that may arise from the development and has moderate to high levels of recoverability. **Surface Water**: WFD current overall status of moderate. The surface water features may be locally important for spawning of Salmonid species. Surface water body is used for private water supply or small scale industrial/agricultural use. **Flood Risk**: Land is within a medium risk flood zone or limited constraints and a low probability of flooding of industrial properties.
Low	Receptor with a high capacity to accommodate change, is of low value with little contribution to the local, regional or national economy. Receptor is not generally vulnerable to impacts that may arise from the development and/or has high recoverability. **Surface Water**: WFD current overall status of poor. Surface water bodies are not significant in terms of sensitive ecological receptors or fish spawning. Small scale (single residential or commercial use) abstraction licences are present in close proximity. **Flood Risk**: Land within a low-risk flood zone or limited constraints and a very low probability of flooding of industrial properties.

Sensitivity	Definition
Negligible	Receptor with a very high capacity to accommodate change, is of negligible value with no contribution to local, regional or national economy. Receptor is not vulnerable to impacts that may arise from the development and/or has high recoverability. **Surface Water**: WFD current overall status of bad. No sensitive ecological receptors or fish spawning are present within the surface water bodies. No abstraction licences present within the area. **Flood Risk**: Land is within a little to no flood risk zone and no major flood risk areas are present within a 250 m radius of the site.

17.5.2.4 The significance of the effect upon hydrology and flood risk is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 17.17. Where a range of significance of effect is presented in Table 17.17, the final assessment for each effect is based upon expert judgement.

17.5.2.5 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended).

Table 17.17: Matrix used for the assessment of the significance of the effect.

Sensitivity of Receptor	Magnitude of impact				
	No Change	**Negligible**	**Low**	**Medium**	**High**
Negligible	No change	Negligible	Negligible or Minor	Negligible or Minor	Minor
Low	No change	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	No change	Negligible or Minor	Minor	Moderate	Moderate or Major
High	No change	Minor	Minor or Moderate	Moderate or Major	Major
Very High	No change	Minor	Moderate or Major	Major	Major

17.6 Key parameters for assessment

17.6.1 Maximum design scenario

17.6.1.1 The maximum design scenarios (MDSs) identified in Table 17.18 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in volume 1, chapter 3: Project description of the PEIR. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

Table 17.18: MDS considered for the assessment of potential impacts on hydrology and flood risk.

[a] C=construction, O=operations and maintenance, D=decommissioning

Potential impact	Phase [a]			MDS	Justification
	C	O	D		
The impact of increased flood risk arising from additional surface water runoff during construction	✓	×	×	**Construction phase** <u>Open cut trenching along the Mona Onshore Cable Corridor:</u> • The area of the permanent Mona Onshore Cable Corridor is up to 540,000m^2 based on a corridor measuring 30m wide and 18km in length. The temporary working corridor requires an additional 70m wide corridor (making the total width of the Mona Onshore Cable Corridor (temporary and permanent requirements) 100m wide representing an area of up to 1,800,000m^2 • There are up to four cable trenches within the permanent Mona Onshore Cable Corridor, each trench measures up to 2.5m wide at the top, 1.5m at the base and the depth is up to 1.8m • The area of each joint bay is up to 200m^2 and each joint bay is 2m deep; the volume of material excavated per joint bay is 400m^3 (a total of up to 38,400m^3 of material excavated for the joint bays based on 96 joint bays) • The area of each link box is up to 6m^2 and each link box is up to 1m deep; the volume of material excavated per link box is 6m^3 (a total of up to 576m^3 of material excavated for the link boxes based on 96 link boxes) • There is one haul road within the Mona Onshore Cable Corridor along the length of the corridor; it is 6m wide excluding passing places. It will be constructed using imported engineered granular fill with geotextile style layers with a nominal thickness of 400mm and a maximum thickness of up to 1000mm. <u>Open cut trenching along the Mona 400kV Grid Connection Cable Corridor:</u> • The area of the permanent Mona 400kV Grid Connection Cable Corridor is up to 48,000m^2 based on a corridor measuring 16m wide and 3km in length. The temporary working corridor requires an additional 44m wide corridor (making the total width of the route to grid connection (temporary and permanent requirements) 60m wide representing an area of up to 180,000m^2 • There are up to two cable trenches within the permanent Mona 400kV Grid Connection Cable Corridor, each trench measures up to 2.5m wide at the top, 1.5m at the base and the depth is up to 1.8m • The maximum number of joint bays along the Mona 400kV Grid Connection Cable Corridor is 10 (based on a minimum distance of 500m between each joint bay on up to two trenches) • The area of each joint bay is up to 200m^2 and each joint bay is up to 2m deep; the volume of material excavated per joint bay is 400m^3 (a total of up to 4,000m^3 of material excavated for the joint bays based on 10 joint bays) • The area of each link box is up to 6m^2 and each link box is 1m deep; the volume of material excavated per link box is 6m^3 (a total of up to 60m^3 of material excavated for the link boxes based on 10 link boxes). • There is one haul road within the Mona 400kV Grid Connection Cable Corridor along the length of the corridor; it is 6m wide excluding passing places. It will be constructed using imported engineered granular fill with geotextile style layers with a nominal thickness of 400mm and a maximum thickness of up to 1000mm.	The MDS for flood risk in terms of the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Corridor is the greatest number of cable trenches, jointing bays, link boxes and construction compounds as it represents the greatest potential for increased flood risk as a result of land disturbance. The use of open cut crossings represents the MDS for flood risk due to the change in the channel dimensions and pumping. The largest footprint of the Mona Onshore Substation and the construction compound represent the MDS for flood risk as it results in the largest possible area of disturbance and flood storage.

Potential impact	Phase a			MDS	Justification
	C	O	D		
				Construction compounds • Up to two primary construction compounds (each measuring 150m x 150m) and up to 10 secondary construction compounds (each measuring 150m x 100m) will be located along the Mona Onshore Cable Corridor. Soils will be removed and stored; crushed stone or other suitable material will be used across the entire area to create hardstanding. Mona Onshore Substation • The maximum footprint of the Mona Onshore Substation will measure up to 125,000m^2 and will be located within the Mona Onshore Substation zone: this area will include the substation buildings and the earthworks to create the platform. The Mona Onshore Substation will comprise up to four buildings. The maximum dimensions of the main building are 20m high, 40m wide and 90m long • A construction compound will be required to support the construction of the substation extending up to 250,000m^2.	
The impact of increased flood risk arising from the diversion of any watercourse	✓	×	×	**Construction phase** Onshore Substation • The maximum footprint of the Mona Onshore Substation will measure up to 125,000m^2 and will be located within the Mona Onshore Substation zone: this area will include the substation buildings and the earthworks to create the platform. The Mona Onshore Substation will comprise up to four buildings. The maximum dimensions of the main building are 20m high, 40m wide and 90m long.	The MDS for flood risk in terms of the diversion of watercourses is represented by Onshore Substation option 7 in the north to south orientation as this will require the maximum length of channel to be diverted around the substation. The diversion of the watercourse has potential to increase flood risk upstream of the diversion if existing flows are not accommodated within the design.
The impact of increased flood risk arising from additional surface water runoff during operation of the Mona Onshore Substation.	×	✓	×	**Operations and maintenance phase** Mona Onshore Substation • The maximum footprint of the Mona Onshore Substation will measure up to 125,000m^2 and will be located within the Mona Onshore Substation zone: this area will include the substation buildings and the earthworks to create the platform. The Mona Onshore Substation will comprise up to four buildings. The maximum dimensions of the main building are 20m high, 40m wide and 90m long • Access to the substation will be via a new permanent access road measuring up to 8m wide and 1.2km in length.	The dimensions of the Mona Onshore Substation and the permanent access road represent the MDS for flood risk as they result in the biggest footprint and area of impermeable surfacing.
The impact of increased flood risk arising from damage to existing flood defences	✓	×	✓	**Construction phase** Open trenching in the intertidal area between Mean Low Water Springs (MLWS) and MHWS: • The area required for the trenches is up to 18,000m^2 based on four trenches each measuring up to 3m wide, 3m deep and 1.5km long. • A total of up to 54,000m^3 of material will be excavated from the trenches based on the area and depth required for the trenches. • The working area required to undertake the open trenching is up to 25m wide on each side of the trench and will extend along the 1.5km length (between MHWS and MLWS). • The maximum total area that will be disturbed for the construction of the trenches (including the working areas) will be 318,000m^2. **Decommissioning phase** The offshore export cable will be removed.	There are no NRW flood defences where the use of open cut techniques at the Landfall will be utilised. The beach profile provides an informal flood defence and open cut techniques at the landfall represent the greatest potential for impact on informal flood defences as this involves trenching across the beach. Open trenching has the potential to disrupt or damage the integrity of the informal flood defence and increasing the impacts of coastal erosion.

Potential impact	Phase a			MDS	Justification
	C	O	D		
The impact of contaminated runoff on the quality of watercourses	✓	×	✓	**Construction phase** Trenchless techniques The maximum number of Horizontal Directional Drilling (HDD) locations along the Mona Onshore Cable Corridor is 72 and 12 on the Mona 400kV Grid Connection Cable Corridor. Primary HDD operations will require a compound, these will measure up to 150m x 100m. Secondary HDDs will require a smaller compound (measuring up to 30m x 20m) and will be located within the 100m temporary construction corridor. Open cut trenching along the Mona Onshore Cable Corridor: • The area of the permanent Mona Onshore Cable Corridor is up to 540,000m^2 based on a corridor measuring 30m wide and 18km in length. The temporary working corridor requires an additional 70m wide corridor (making the total width of the Mona Onshore Cable Corridor (temporary and permanent requirements) 100m wide representing an area of up to 1,800,000m^2 • There are up to four cable trenches within the permanent Mona Onshore Cable Corridor, each trench measures up to 2.5m wide at the top, 1.5m at the base and the depth is 1.8m • There is one haul road within the Mona Onshore Cable Corridor along the length of the corridor; it is 6m wide excluding passing places. It will be constructed using imported engineered granular fill with geotextile style layers with a nominal thickness of 400mm and a maximum thickness of up to 1000mm. Open cut trenching along the Mona 400kV Grid Connection Cable Corridor: • The area of the permanent Mona 400kV Grid Connection Cable Corridor is up to 48,000m^2 based on a corridor measuring 16m wide and 3km in length. The temporary working corridor requires an additional 44m wide corridor (making the total width of the route to grid connection (temporary and permanent requirements) 60m wide representing an area of up to 180,000m^2 • There are up to two cable trenches within the permanent Mona 400kV Grid Connection Cable Corridor, each trench measures up to 2.5m wide at the top, 1.5m at the base and the depth is 1.8m • There is one haul road within the Grid Connection Cable Corridor along the length of the corridor; it is 6m wide excluding passing places. It will be constructed using imported engineered granular fill with geotextile style layers with a nominal thickness of 400mm and a maximum thickness of up to 1,000mm. **Decommissioning phase** • The Mona Onshore Cable Corridor and Mona 400kV Grid Connection Cable will remain in situ but the link boxes will be removed.	The MDS for indirect effects to surface water quality would result from the use of HDD methods. HDD presents a risk of indirectly contaminating surface watercourses where they are hydraulically connected with surface runoff caused by spillages and the movement of sediment For smaller watercourses and drains, the use of open cut trenching to cross ordinary watercourses represents the greatest impacts to surface water quality. Any disruption to the local surface watercourses may affect the hydrological regime of the area increasing turbid runoff into the watercourse, leading to a reduction in WFD classification. The MDS for water quality of ordinary watercourses during decommissioning is the removal of the link boxes as this presents the greatest disturbance and potential risk of sediment and contaminants being released.
The impact of damage to existing field drainage.	✓	×	✓	**Construction phase:** Open cut trenching along the Mona Onshore Cable Corridor: • The area of the permanent Mona Onshore Cable Corridor is up to 540,000m^2 based on a corridor measuring 30m wide and 18km in length. The temporary working corridor requires an additional 70m wide corridor (making the total width of the Mona Onshore Cable Corridor (temporary and permanent requirements) 100m wide representing an area of up to 1,800,000m^2	The greatest number of cable trenches, link boxes and joint bays represents the greatest potential impact to existing field drainage due to the greatest area of land disturbance. The construction of the cable trenches, link boxes and joint bays may result in the removal or temporary blockage of existing drainage pipeline infrastructure. The construction programme represents the maximum duration before field drainage is reinstated.

Potential impact	Phase a			MDS	Justification
	C	O	D		
The impact of damage to existing water pipelines	✓	×	✓	• There are up to four cable trenches within the permanent Mona Onshore Cable Corridor, each trench measures up to 2.5m wide at the top, 1.5m at the base and the depth is 1.8m • The area of each joint bay is up to 200m^2 and each joint bay is 2m deep; the volume of material excavated per joint bay is 400m^3 (a total of up to 38,400m^3 of material excavated for the joint bays based on 96 joint bays) • The area of each link box is up to 6m^2 and each link box is up to 1m deep; the volume of material excavated per link box is 6m^3 (a total of up to 576m^3 of material excavated for the link boxes based on 96 link boxes) • There is one haul road within the Mona Onshore Cable Corridor along the length of the corridor; it is 6m wide excluding passing places. It will be constructed using imported engineered granular fill with geotextile style layers with a nominal thickness of 400mm and a maximum thickness of up to 1000mm. <u>Open cut trenching along the Mona 400kV Grid Connection Cable Corridor:</u> • The area of the permanent Mona 400kV Grid Connection Cable Corridor is up to 48,000m^2 based on a corridor measuring 16m wide and 3km in length. The temporary working corridor requires an additional 44m wide corridor (making the total width of the route to grid connection (temporary and permanent requirements) 60m wide representing an area of up to 180,000m^2 • The maximum number of joint bays along the Mona 400kV Grid Connection Cable Corridor is 10 (based on a minimum distance of 500m between each joint bay on up to two trenches) • The area of each joint bay is up to 200m^2 and each joint bay is up to 2m deep; the volume of material excavated per joint bay is 400m^3 (a total of up to 4,000m^3 of material excavated for the joint bays based on 10 joint bays) • The area of each link box is up to 6m^2 and each link box is 1m deep; the volume of material excavated per link box is 6m^3 (a total of up to 60m^3 of material excavated for the link boxes based on 10 link boxes) • There are up to two cable trenches within the permanent Mona 400kV Grid Connection Cable Corridor, each trench measures up to 2.5m wide at the top, 1.5m at the base and the depth is 1.8m • There is one haul road within the Mona 400kV Grid Connection Cable Corridor for the entire length of the corridor; it is 6m wide excluding passing places. It will be constructed using imported engineered granular fill with geotextile style layers with a nominal thickness of 400mm and a maximum thickness of up to 1000mm • Duration of construction and installation of the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Cable Corridor is up to three years. **Decommissioning phase** • The Mona Onshore Cable Corridor and Mona 400kV Grid Connection Cable will remain in situ but the link boxes will be removed.	The greatest number of cable trenches represents the greatest potential impact to existing water pipeline infrastructure due to the greatest area of land disturbance.

17.6.2 Impacts scoped out of the assessment

17.6.2.1 On the basis of the baseline environment and the description of development outlined in volume 1, chapter 3: Project description of the PEIR, a number of impacts are proposed to be scoped out of the assessment for hydrology and flood risk. These impacts are outlined, together with a justification for scoping them out, in Table 17.19.

Table 17.19: Impacts scoped out of the assessment for hydrology and flood risk.

Potential impact	Justification
The impact of contaminated runoff on the chemical and biological status of surface water receptors arising from the operations and maintenance of the onshore transmission assets.	Activities associated with the operations and maintenance of the onshore transmission assets are unlikely to generate contaminated runoff. Therefore, the potential impact of contaminated runoff on the quality of surface water receptors during the operations and maintenance of the onshore transmission assets is unlikely to be significant and is proposed to be scoped out of the assessment for hydrology and flood risk.
The impact of accidental spillages/contaminant release on the quality of surface water and ground receptors during operations and maintenance of the onshore transmission assets.	Activities associated with the operations and maintenance of the onshore transmission assets are unlikely to require the transport or storage of harmful substances. Therefore, the potential impact of spills/contaminant releases on the quality of surface water receptors during operations and maintenance of the onshore transmission assets is unlikely to be significant and is proposed to be scoped out of the assessment for hydrology and flood risk.
The impact of increased flood risk arising from damage to existing flood defences during the operations and maintenance of the onshore transmission assets.	Activities required to facilitate the operations and maintenance of the onshore transmission assets are unlikely to impact the integrity (or efficacy) of existing flood defences. During decommissioning, the onshore export cable will remain in place and there will be no impact on the integrity (or efficacy) of existing flood defences. Therefore, the potential impact of increased flood risk arising from damage to existing flood defence infrastructure during the operations and maintenance and decommissioning of the onshore transmission assets is unlikely to be significant and is proposed to be scoped out of the assessment for hydrology and flood risk.
The impact of increased flood risk arising from additional surface water runoff during the operations and maintenance of the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Corridor.	The operations and maintenance of the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Corridor may result in a minor increase in the total area of impermeable land (e.g. link boxes). However, the increase is unlikely to result in a notable change in drainage patterns and surface water runoff rates. Therefore, the potential impact of flood risk arising from additional surface water runoff during the operations and maintenance of the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Corridor is unlikely to be significant and is proposed to be scoped out of the assessment.
The impact of contaminated runoff on the quality of ‘Main Rivers’ arising from the construction and decommissioning of the onshore transmission assets.	There are no Main Rivers within the Mona hydrology and flood risk study area.

17.7 Measures adopted as part of the Mona Offshore Wind Project

17.7.1.1 For the purposes of the EIA process, the term 'measures adopted as part of the project' is used to include the following measures (adapted from IEMA, 2016):

- Measures included as part of the project design. These include modifications to the location or design of the Mona Offshore Wind Project which are integrated into the application for consent. These measures are secured through the consent itself through the description of the development and the parameters secured in the DCO and/or marine licences (referred to as primary mitigation in IEMA, 2016)
- Measures required to meet legislative requirements, or actions that are generally standard practice used to manage commonly occurring environmental effects and are secured through the DCO requirements and/or the conditions of the marine licences (referred to as tertiary mitigation in IEMA, 2016).

17.7.1.2 A number of measures (primary and tertiary) have been adopted as part of the Mona Offshore Wind Project to reduce the potential for impacts on hydrology and flood risk. These are outlined in Table 17.20 below. As there is a commitment to implementing these measures, they are considered inherently part of the design of the Mona Offshore Wind Project and have therefore been considered in the assessment presented in section 17.8 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures).

Table 17.20: Measures adopted as part of the Mona Offshore Wind Project.

Measures adopted as part of the Mona Offshore Wind Project	Justification	How the measure will be secured
Primary measures: Measures included as part of the project design		
The Mona Onshore Cable Corridor, Mona 400kV Grid Connection Corridor and the construction site accesses will be designed to minimise land take and to avoid, where possible, impacts on existing drainage networks and features.	To minimise impacts on existing drainage networks and features.	Committed with the project design (see volume 1, chapter 3: Project description of the PEIR).
All major crossings (such as major roads and rail crossings) will be undertaken using HDD techniques	To minimise impacts on existing drainage networks and features.	Committed with the project design (see volume 1, chapter 3: Project description of the PEIR).
The haul road will be constructed from an engineered fill, with geotextile layers, the material will be granular and semi-permeable of an appropriate standard.	To control flood risk	Committed with the project design (see volume 1, chapter 3: Project description of the PEIR).
The diversion of the ordinary watercourse at Onshore Substation option 7 will be appropriately sized to ensure the existing watercourse capacity is maintained (i.e. conveyance of existing flows without increasing fluvial flood risk upstream).	To control flood risk	Committed with the project design (see volume 1, chapter 3: Project description of the PEIR).
Pre-construction drainage will be installed either side of the Mona Onshore Cable Corridor to ensure existing land drainage flow is maintained. Interceptor drains will be installed where the haul road crosses water courses or public highways.	To ensure that the water quality and flow rates are unaffected	Committed with the project design (see volume 1, chapter 3: Project description of the PEIR).
Tertiary measures: Measures required to meet legislative requirements, or adopted standard industry practice		
A surface water drainage scheme will be designed for the Mona Onshore Substation to ensure the existing runoff rates to the surrounding water environment are maintained at pre-development rates. The surface water drainage scheme will be based on a series of infiltration/soakaway tests carried out on site and the attenuation volumes). The tests will be undertaken prior to construction and in accordance with current guidelines. The rate of surface water runoff discharging into local watercourses will be no greater than existing rates for all events up to the 1% AEP (1 in 100 annual chance) plus 40% allowance for climate change. Where practicable the volume of runoff should not increase following development. The surface water drainage scheme will be developed in consultation with DCO and included as part of the Hydrological, Ecological and Landscape Management Plan submitted with the DCO application.	To address the requirements of NPS EN-1, the TAN-15, NRW	These measures would be secured through a requirement of the DCO.
Where the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Corridor crosses smaller watercourses and land drainage ditches measures would be discussed with the relevant stakeholders (e.g. for temporary culvert crossings, appropriately sized flume pipes, equal to or greater than the diameter of the flume upstream and to an agreed length, will be placed on or below the hard bed of the watercourse. An outline method statement for open cut and HDD crossing techniques of watercourses will be included within the CoCP for DCO application.	To control flood risk and pollution	These measures would be secured through a requirement of the DCO.
An 8m buffer will be maintained between the banks of the ordinary watercourses and the Mona Onshore Substation options.	To control flood risk and pollution.	These measures would be secured through a requirement of the DCO.
The final proposed levels of the Mona Onshore Substations sites will be engineered to ensure the flow pathway regime is maintained to convey surface water towards the watercourses and offsite	To control flood risk and pollution.	These measures would be secured through a requirement of the DCO.
At the landfall, construction measures would be adopted to maintain the existing level of flood protection during construction. These measures would be discussed with NRW. This would also include scheduling work windows against tide times with occupants notified at least two weeks in advance. Site personnel will be briefed prior to commencement of works regarding weather conditions, tide times and heights. Works will be halted three hours prior to high time times If.a Flood Warning/Flood Alert is issued for the Abergele Sea Road' Flood Warning Area reference 101FWTWN415 and the North Wales Coast Flood Alert area (reference 101WATNE10) works within the Landfall area would also be stopped whilst the Flood Warning / Flood Alert is active	To control flood risk	These measures would be secured through a requirement of the DCO.
During the construction phase the site manager will sign up to the Flood Warning Service and will be alerted by a phone call or text when a Flood Warning becomes active. The flood warning will be applied to the entire Mona Proposed Onshore Development Area located within Zone C1 and C2 to enable site personnel to be evacuated from the site in a timely manner prior to a flood event occurring	To control flood risk	These measures would be secured through a requirement of the DCO.
Code of Construction Practice (CoCP) to ensure effective management of environmental risk during the construction phase of onshore transmission assets and supporting infrastructure. The CoCP shall include regulatory guidance and industry best practice guidance including: • A surface water and groundwater protection plan that outline the methods for managing surface water runoff e.g. surface water from the cable trenches during the construction period will be pumped via settling tanks or ponds to remove sediment and potential contaminants, before being discharged into local ditches subject to permits being issued.	To control flood risk and pollution. To accord with guidance and best practice for construction works	These measures would be secured through a requirement of the DCO.

Measures adopted as part of the Mona Offshore Wind Project	Justification	How the measure will be secured
• The CoCP shall ensure that routine pollution prevention measures shall be adhered to during the construction phase e.g. Refuelling of machinery will be undertaken within designated areas, areas above MHWS or areas at low risk of flooding and not located within the beach area. Any tanks and associated pipe work containing oils and fuels will be double skinned and be provided with intermediate leak detection equipment. All refuelling will be undertaken using pumps. • The CoCP shall provide emergency response plan for accidents and spillages. • The CoCP will include measures to prevent surface water flooding during construction. • No discharge to surface watercourses will occur without permission from the NRW • Regular cleaning of roads of any construction waste and dirt to be carried out. • Wheel washers and dust suppression measures to be used as appropriate to prevent the migration of pollutants All construction work will be undertaken in accordance with the Outline CoCP and good practice guidance including, but not limited to: • Control of Water Pollution from Construction Sites – Guidance for Consultants and Contractors CIRIA (C650) • CIRIA – SuDS Manual (CIRIA, 2015)		
A field drainage strategy will be developed in consultation with landowners. Any field drainage intercepted during the cable installation will either be reinstated following the installation of the cable or diverted to a secondary channel. Any works undertaken will be in agreement with the appropriate stakeholders	To ensure field drainage is maintained during construction and reinstated on the completion of construction	These measures would be secured through a requirement of the DCO.
Hydrological, Ecological and Landscape Management Plan to include operational measures to prevent pollution and increased flood risk, to include emergency spill response procedures, clean up and remediation of contaminated water runoff.	To reduce the risk of surface water pollution.	These measures would be secured through a requirement of the DCO.
A Decommissioning Plan to ensure effective management of environmental risk during the decommissioning of the Mona Onshore Substation and removal of link boxes.	To control flood risk and pollution	These measures would be secured through a requirement of the DCO.

17.8 Assessment of significant effects

17.8.1.1 The impacts of the construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project have been assessed on hydrology and flood risk. The potential impacts arising from each phase of the Mona Offshore Wind Project are listed in Table 17.18, along with the MDS against which each impact has been assessed.

17.8.1.2 A description of the potential effect on hydrology and flood risk receptors caused by each identified impact is given below.

17.8.2 The impact of increased flood risk arising from additional surface water runoff

Construction phase

Magnitude of impact

17.8.2.1 At the landfall, the use of open cut techniques across the beach has the potential to create a pathway for flood water and lead to a slight increase in flood risk inland. However, by virtue of the onshore land elevations the risk is low.

17.8.2.2 In other parts of the Mona hydrology and flood risk study area, impacts on flood risk would arise from any temporary change in runoff over the areas affected during construction, such as construction compounds, haul road, construction accesses and the Mona Onshore Cable Corridor. Construction methodologies (as set out in Table 17.20) will be implemented to ensure the risk of flooding is not increased (e.g. use of permeable gravel overlying a permeable geotextile membrane of an appropriate standard for construction compounds, haul road and construction accesses and drainage features to maintain land drainage flow). In terms of crossings, all major crossings (such as major roads and rail crossings) will be undertaken using HDD techniques (full details provided within the volume 1, chapter 3: Project description of the PEIR). An outline method statement for the proposed crossing methodologies will be included in the CoCP that will accompany the DCO application. This method statement will be developed further (in discussion with NRW) during the detailed design stage.

17.8.2.3 The impacts on flood risk from the temporary change in runoff are only likely to affect the surrounding local receptors and, assuming that designed in and construction measures (Table 17.20) are implemented, there is unlikely to be any observable degradation in flood risk. The magnitude of impact is predicted to be indirect, of local spatial extent, short term duration and continuous. The impact magnitude is therefore considered to be **negligible**.

Sensitivity of receptor

17.8.2.4 The landfall comprises a shingle beach with a coastal flood defence wall present along the onshore margin of the intertidal area maintained by CCBC. Part of the beach itself is designated as a SSSI: Traeth Pensarn SSSI is designated for its vegetated shingle beach plant communities and as such has a national importance, a medium recoverability and therefore, is considered to have a high sensitivity.

17.8.2.5 The Mona Proposed Onshore Development Area also bisects the Llanddulas Limestone and Gwrych Castle Wood SSSI which is elevated above the Mona Proposed Onshore Development Area. The Mona Proposed Onshore Development Area and Onshore Substation are situated within a mainly rural area, with limited residential properties within the surrounding area. A limited proportion of the Mona Proposed Onshore Development Area is situated within Flood Zone 2 and 3 (DAM

Zone C1 and C2) at the landfall and within the Mona hydrology and flood risk study area at the Mona Onshore Substation option 7. The sensitivity of the land within the Mona hydrology and flood risk study area is of high vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high**. The remainder of the Mona Proposed Onshore Development Area is primarily farmland and therefore is of low vulnerability, high recoverability and low value. The sensitivity of the receptor is considered to be **low**.

Significance of effect

17.8.2.6 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity for the Mona hydrology and flood risk study area is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.8.2.7 The sensitivity of the rest of the Mona Proposed Onshore Development Area is considered to be low. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

17.8.3 The impact of increased flood risk arising from the diversion of an ordinary watercourse

Construction phase

Magnitude of impact

17.8.3.1 An ordinary watercourse bisects the site of the proposed Onshore Substation option 7 in a north south direction. The construction of the Mona Onshore Substation will require the diversion of a section (approximately 400m long) of the watercourse around the perimeter of the substation (see volume 1, chapter 3: Project description of the PEIR). The diversion will be appropriately sized to ensure conveyance of existing flows without increasing fluvial flood risk upstream of the site via the constriction of flows. The magnitude of impact is predicted to be indirect, of local spatial extent, long term duration and continuous. The impact magnitude is therefore considered to be **low**.

Sensitivity of receptor

17.8.3.2 The WFD status of ordinary watercourses is determined by the WFD classifications of surrounding main waterbodies; it is also noted that all watercourses have been assigned an objective to achieve ‘Good’ overall status. Taking this into consideration, the ordinary watercourse is considered to be of high vulnerability, moderate recoverability and moderate value. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of effect

17.8.3.3 Overall, the magnitude of the impact is deemed to be low, the sensitivity of the setting is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.8.4 The impact of increased flood risk arising from additional surface water runoff during operation of the Mona Onshore Substation

Operations and maintenance phase

Magnitude of impact

17.8.4.1 The Mona Onshore Substation options have been subject to an FCA (volume 7, annex 17.1: Flood Consequence Assessment of the PEIR) in order to meet the requirements of planning policy and best practice. The Mona Onshore Substation would be designed to ensure no increase in the greenfield rate of runoff. With the incorporation of mitigation measures outlined in Table 17.20 and a drainage strategy to be agreed with the LLFA it has been determined that there will be no change from the baseline hydrological environment. The magnitude of impact is predicted to be indirect, of local spatial extent, long term duration and continuous. The impact magnitude is therefore predicted to be **no change**.

Sensitivity of receptor

17.8.4.2 The proposed Onshore Substation options are located within Flood Zone 1 and therefore, are not directly at risk of flooding from all sources. The land adjoining the Mona Onshore Substation options are of low flood risk vulnerability within the rural landscape, high recoverability and low value with limited residential, commercial or industrial properties in the vicinity. The sensitivity of the receptor is therefore, considered to be **low**.

Significance of effect

17.8.4.3 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be low. The effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

17.8.5 The impact of increased flood risk arising from damage to existing flood defences

Construction phase

Magnitude of impact

17.8.5.1 While a coastal flood defence wall is present within the east extent of the landfall, no additional flood defence structures are shown to be present on NRW mapping in the western extent where the offshore export cables make landfall. However, the elevation of the beach above the shoreline acts as an informal flood defence.

17.8.5.2 The offshore export cables will be brought through the intertidal area to a location where they can be connected to the onshore export cables. Methods being considered for installation of the export cable in the intertidal area include open cut trenching and trenchless techniques.

17.8.5.3 Trenchless techniques, such as HDD or thrust bore will be used to cross the intertidal area, under the informal sea defences, coastal path, railway, A55 and A547 to reduce disturbance to the receiving environment and infrastructure. These measures are

outlined in volume 1, chapter 3: Project description of the PEIR. An outline method statement for the proposed crossing methodologies will be included in the CoCP accompanying the DCO application

17.8.5.4 The magnitude of impact is predicted to be indirect, of local spatial extent, long term duration and intermittent. The impact magnitude is therefore considered to be **negligible**.

Sensitivity of receptor

17.8.5.5 The landfall comprises a shingle beach which provides an informal flood defence. A coastal flood defence wall maintained by CCBC is present along the east extent of the onshore margin of the intertidal zone. A section of the beach is classified as a SSSI and as such has high value and high vulnerability, a medium recoverability and therefore is considered to have a **high** sensitivity.

Significance of effect

17.8.5.6 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The effect will therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

17.8.5.7 The offshore export cables will be removed during decommissioning. The potential impact from the removal of the export cable under the informal flood defence will be similar to those impacts during the construction phase.

17.8.5.8 The impact magnitude is therefore considered to be **negligible.**.

Sensitivity of receptor

17.8.5.9 The landfall has a high value, high vulnerability, a medium recoverability and therefore is considered to have a **high** sensitivity.

Significance of effect

17.8.5.10 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor adverse**, which is not significant in EIA terms.

17.8.6 The impact of contaminated runoff on the quality of watercourses

Construction phase

Magnitude of impact

17.8.6.1 The majority of watercourses along the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Cable Corridor are expected to be crossed using HDD techniques (see volume 1, chapter 3: Project description of the PEIR). The impacts on these watercourses from construction activities involving the use of HDD techniques and associated machinery could lead to an increase in turbid runoff, high pH water runoff, bentonite breakouts during drilling and spillages/leaks of fuel, oil etc. affecting nearby watercourses. There is the potential for this to impact on water quality and therefore cause a reduction in the WFD classification.

17.8.6.2 Trenched techniques may be used where the Mona Onshore Cable Corridor, Mona 400kV Grid Connection Cable Corridor or the haul road crosses smaller watercourses (that are frequently dry) and drainage channels. Trenching could lead to damage to the banks along the watercourses, an increase in turbid runoff, spillages/leaks of fuel, oil etc. and an alteration in surface water flow pathways that could affect nearby watercourses.

17.8.6.3 The Mona Onshore Cable Corridor and the Mona 400kV Grid Connection Cable Corridor could also act as a drainage channel, leading to runoff from construction areas affecting nearby watercourses.

17.8.6.4 Measures outlined in Table 17.20 and the Outline CoCP are expected to intercept runoff and ensure that discharges are controlled in quality and volume causing no degradation in WFD classification. The magnitude of impact is predicted to be indirect, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore considered to be **negligible**.

Sensitivity of receptor

17.8.6.5 Taking a precautionary approach in assuming surrounding main waterbodies have achieved/maintained ‘Good’ status at the time when construction begins, the surface watercourses within the Mona hydrology and flood risk study area have been assessed with a WFD status of ‘Good’. The watercourses are therefore, considered to be highly vulnerable in relation to WFD classification status, but of moderate recoverability and moderate value in relation to the local economy. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of effect

17.8.6.6 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

17.8.6.7 During decommissioning the Mona Onshore Cable Corridor, Mona and 400kV Grid Connection Cable Corridor will remain in place but the link boxes and Onshore Substation, will be removed.

17.8.6.8 The impacts of decommissioning of the Mona components will be reduced through the incorporation of management measures (outlined in Table 17.20 including emergency spill response procedures including clean up and remediation of contaminated soils, appropriate water proofing of exposed cable ducts and the continued maintenance of onsite drainage. The magnitude of impact is predicted to be indirect, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore considered to be **negligible**.

Sensitivity of receptor

17.8.6.9 The watercourses are considered to be highly vulnerable in relation to WFD classification status, but of moderate recoverability and moderate value in relation to the local economy. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of effect

17.8.6.10 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.8.7 The impact of damage to existing field drainage

Construction phase

Magnitude of impact

17.8.7.1 The impact on field drainage and irrigation from open cut techniques and the installation of link boxes and joint bays during the construction phase could temporarily affect surface water flow pathways, impacting on water quality and potential flow rates.

17.8.7.2 The removal of field drains within the Mona Onshore Substation sites may cause a backup on surrounding field drains, in turn increasing the flood risk to the site and surrounding receptors. Measures to manage surface water flows include the restoration of field drainage following the installation of the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Cable Corridor and techniques to disrupt surface water runoff along the corridor. These measures are included in Table 17.20.

17.8.7.3 With the incorporation of appropriate construction mitigation techniques the impact is predicted to be of local spatial extent with a minor shift away from existing hydrological environment of local receptors. The magnitude of impact is predicted to be direct, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore considered to be **negligible**.

Sensitivity of receptor

17.8.7.4 Field drains are considered to be of moderate vulnerability along the Mona Onshore Cable Corridor, Mona 400kV Grid Connection Cable Corridor and Onshore Substation, moderate to high recoverability and low value. The sensitivity of the receptor is therefore considered to be **medium**.

Significance of effect

17.8.7.5 Overall, the magnitude of impact is deemed to be negligible, the sensitivity of the receptor is considered to be medium. The effect will therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

17.8.7.6 During decommissioning the Mona Onshore Cable and 400kV Grid Connection Cable will remain in place but the link boxes, Onshore substation and hardstanding will be removed. Therefore, decommissioning activities will be less extensive.

17.8.7.7 The magnitude of the impact is predicted to be direct, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore predicted to be **negligible**.

Sensitivity of receptor

17.8.7.8 Field drains are considered to be of moderate vulnerability along the Mona Onshore Cable Corridor, moderate to high recoverability and low value. The sensitivity of the receptor is therefore considered to be **medium**.

Significance of effect

17.8.7.9 Overall, the magnitude of impact is deemed to be negligible, the sensitivity of the receptor is considered to be medium. The effect will therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.8.8 The impact of damage to existing water pipelines

Construction phase

Magnitude of impact

17.8.8.1 The impact on pipeline infrastructure from open cut and HDD techniques during the construction phase could temporarily disrupt local drainage infrastructure, impacting on water quality, potential flow rates and local water supply networks.

17.8.8.2 The site selection of the Mona Proposed Onshore Development Area has taken into account the location of major services utilities (see volume 1, chapter 4: Site Selection of the PEIR), however the presence of local drainage cannot be discounted as it is not always mapped by regulators.

17.8.8.3 Discussions with Welsh Water and other service companies will be undertaken at the detailed design stage to confirm the location of local services. Micro-routing or appropriate construction techniques will be employed where required to avoid impact to local services.

17.8.8.4 Any impacts of construction which affect drainage supply infrastructure are likely to cause temporary disruption of water supply to residents/businesses in the local surrounding area. The impact would be of limited temporal extent and short term duration.

17.8.8.5 The magnitude of impact is predicted to be indirect, of local spatial extent, long term duration and intermittent. The impact magnitude is therefore considered to be **negligible**.

Sensitivity of receptor

17.8.8.6 Drainage pipeline infrastructure comprises water supply pipelines operated by Welsh Water, which are considered to have a moderate value and contribute to the local and regional economy. It has high vulnerability to the construction impacts of the Mona Offshore Wind Project and low recoverability due to high costs. The sensitivity of the receptor is therefore considered to be **high**.

Significance of effect

17.8.8.7 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the setting is considered to be high. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

17.8.8.8 During decommissioning; the Mona Onshore Cable and Mona 400kV Grid Connection Cable will remain in place but the link boxes and Onshore Substation will be removed therefore, decommissioning activities will be less extensive.

17.8.8.9 The magnitude of impact is predicted to be indirect, of local spatial extent, long term duration and intermittent. The impact magnitude is therefore considered to be **negligible**.

Sensitivity of receptor

17.8.8.10 Drainage pipeline infrastructure has high vulnerability to the decommissioning impacts of the Mona Offshore Wind Project and low recoverability due to high costs. The sensitivity of the receptor is therefore considered to be **high.**

Significance of effect

17.8.8.11 Overall, the magnitude of the impact is deemed to be negligible, the sensitivity of the receptor is considered to be high and. The effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.8.9 Future monitoring

17.8.9.1 No hydrology and flood risk monitoring to test the predictions made within the impact assessment is considered necessary ant proposed at this time.

17.9 Cumulative effect assessment methodology

17.9.1 Methodology

17.9.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Mona Offshore Wind Project together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see volume 5, annex 5.3: CEA screening matrix of the PEIR). Each project has been considered on a case by case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

17.9.1.2 The hydrology and flood risk CEA methodology has followed the methodology set out in volume 1, chapter 5: EIA methodology of the PEIR. As part of the assessment, all projects and plans considered alongside the Mona Offshore Wind Project have been allocated into ‘tiers’ reflecting their current stage within the planning and development process, these are listed below.

17.9.1.3 A tiered approach to the assessment has been adopted, as follows:

- Tier 1
  - Under construction
  - Permitted application
  - Submitted application
  - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact
- Tier 2
  - Scoping report has been submitted and is in the public domain
- Tier 3
  - Scoping report has not been submitted or is not in the public domain
  - Identified in the relevant Development Plan
  - Identified in other plans and programmes.

17.9.1.4 This tiered approach is adopted to provide a clear assessment of the Mona Offshore Wind Project alongside other projects, plans and activities.

17.9.1.5 The specific projects, plans and activities scoped into the CEA, are outline in Table 17.21.

17.9.1.6 National Grid Electricity Transmission (NGET) are proposing to undertake upgrades to their Bodelwyddan substation; to facilitate the connection of multiple projects (e.g. Awel y Môr). The upgrades will comprise works to the existing substation, an extension to the substation and associated works and infrastructure (e.g. new overhead gantries).

17.9.1.7 It is understood that works to the existing substation will be undertaken via NGET’s permitted development rights. The proposed extension to Bodelwyddan substation will require planning consent. At the time of writing, an application had not been submitted to Denbighshire County Council but the anticipated timeframe is early 2024. Given that an application has not been submitted, the potential cumulative impacts of the Bodelwyddan upgrade have not been assessed within the PEIR. This will be re-visited in the application for consent for the Mona Offshore Wind Project should further information become available.

17.9.1.8 Planning consent has been granted for a number of coastal defence schemes along the North Wales coastline in the vicinity of the Mona Offshore Wind Project. These schemes include:

- Coastal and storm defence scheme along Colwyn Bay, from Porth Eirias in the west to Splash Point (by Old Colwyn Arches) in the east (planning reference

0/49272) comprising a series of coastal protection measures, including the construction of a rock revetment along with alterations to provide improved pedestrian and cycle access, and associated public realm improvement works in the east

- Construction of coastal defences at Glan-Y-Môr Road and Penrhyn Bay Promenade, Penrhyn Bay (planning reference 0/49274) including a T-shaped rock groyne, eastern groyne raising, repairs to the existing seawall, beach nourishment and public realm improvements including pedestrian/cycle crossing, beach access ramp, re-located and extended car parking, street furniture, promenade resurfacing and soft landscaping
- Improvements to coastal defences as part of the Colwyn Bay Phase 2B proposed development (planning reference 0/49306) which forms part of the wider Colwyn Bay flood defence and public realm improvements
- Development of 5ha of land to form a coastal defence scheme comprising of the formation of flood embankments, ramps, outfall structures and rock armour including landscaping, habitat enhancements, works to existing culverts and associated works ('Central Prestatyn Coastal Defence Scheme' (planning reference 45/2021/1248).

Table 17.21: List of other projects, plans and activities considered within the CEA.

Project/Plan	Status	Distance from the Mona Onshore Proposed Development Area (km)	Distance from the Mona Onshore Substation (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Mona Offshore Wind Project
Tier 1-							
Awel y Môr Offshore Windfarm (Onshore Infrastructure)	Application Submitted	0	0.1 (option 2) 0.7 (option 7)	Application for the construction of a 500MW offshore windfarm. Applicant expects consent in Q3 2023 of 2023.	Construction to commence in 2026.	Site to be commissioned by 2030.	Yes

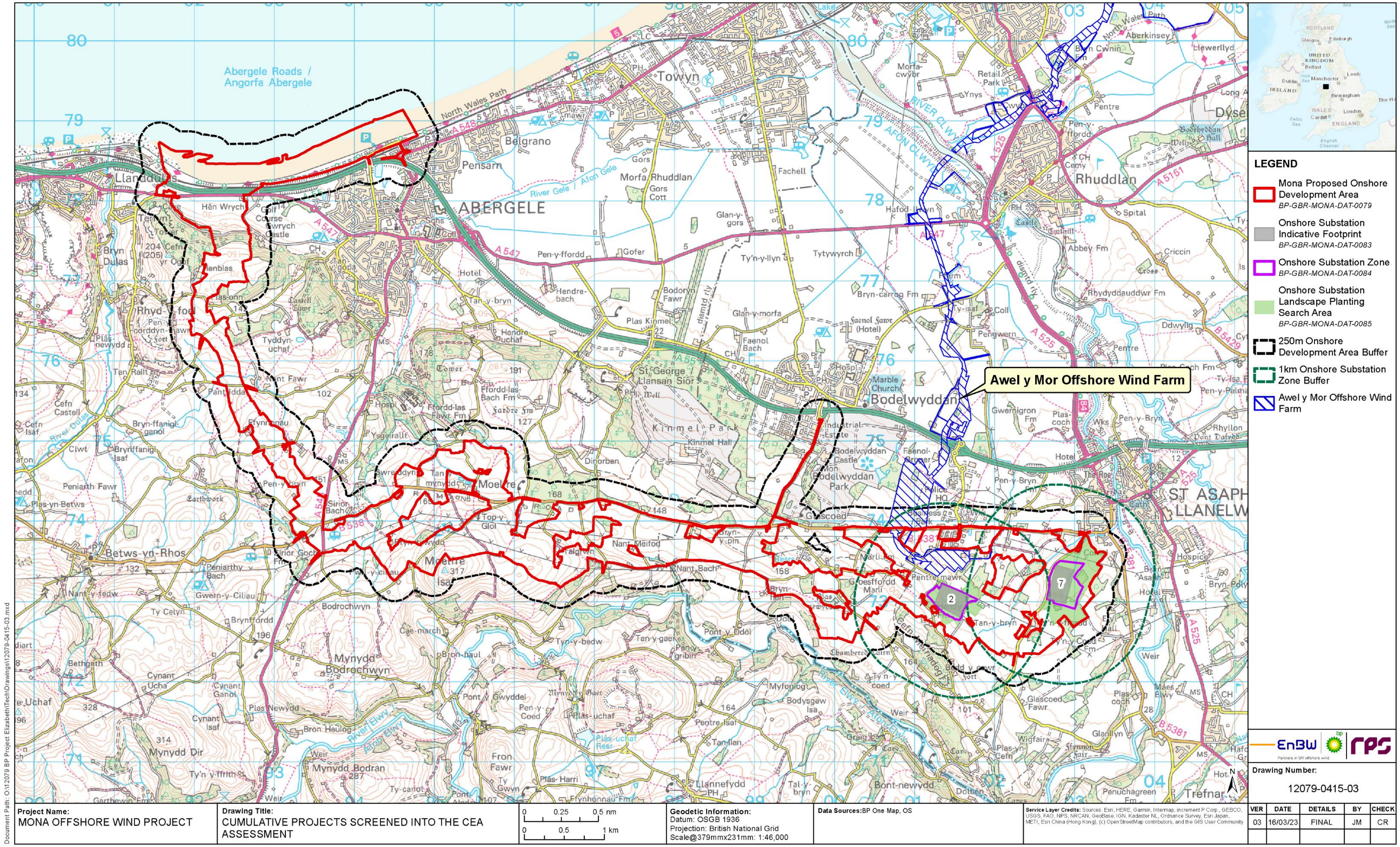

Figure 17.2: Other projects, plans and activities screened into the cumulative effects assessment.

17.9.2 Maximum design scenario

17.9.2.1 The MDSs identified in Table 17.22 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the Project Design Envelope provided in volume 1, chapter 3: Project Description, of the PEIR as well as the information available on other projects and plans, in order to inform a 'MDS'. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different wind turbine layout), to that assessed here, be taken forward in the final design scheme.

Table 17.22: Maximum design scenario considered for the assessment of potential cumulative effects on hydrology and flood risk.

[a] C=construction, O=operations and maintenance, D=decommissioning

Potential cumulative effect	Phase[a]			MDS	Justification
	C	O	D		
The impact of increased flood risk arising from additional surface water runoff	✓	×	×	MDS as described for the Mona Offshore Wind Project (Table 17.18) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel y Môr Offshore Windfarm (onshore infrastructure) – Construction works to occur concurrently with the Mona Offshore Wind Project – Construction of onshore infrastructure will require crossings of watercourses.	Both Mona Offshore Wind Project and Awel y Môr Offshore Windfarm proposed to undertake construction at similar times. There may be a cumulative effect on surface water runoff. There may be a cumulative effect on the potential deterioration of local surface watercourses through turbid runoff.
The impact of contaminated runoff on the quality of watercourses	✓	×	✓	MDS as described for the Mona Offshore Wind Project (Table 17.18) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel y Môr Offshore Windfarm (onshore infrastructure) – Construction works to occur concurrently with the Mona Offshore Wind Project – Construction of onshore infrastructure will require crossings of watercourses.	Both Mona Offshore Wind Project and Awel y Môr Offshore Windfarm proposed to undertake construction at similar times. There may be a cumulative effect on surface water runoff. There may be a cumulative effect on the potential deterioration of local surface watercourses through turbid runoff.
The impact of damage to existing field drainage	✓	×	✓	MDS as described for the Mona Offshore Wind Project (Table 17.18) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel y Môr Offshore Windfarm (onshore infrastructure) – Construction works to occur concurrently with the Mona Offshore Wind Project – Construction of onshore infrastructure will require diversion of existing field drainage.	Both Mona Offshore Wind Project and Awel y Môr Offshore Windfarm proposed to undertake construction at similar times. There may be a cumulative effect on surface water runoff. There may be a cumulative effect on the potential deterioration of local surface watercourses through turbid runoff.
The impact of damage to existing water pipelines	✓	×	✓	MDS as described for the Mona Offshore Wind Project (Table 17.18) assessed cumulatively with the following other projects/plans: **Tier 1** • Awel y Môr Offshore Windfarm (onshore infrastructure) – Construction works to occur concurrently with the Mona Offshore Wind Project – Construction of onshore infrastructure will require diversion of water pipelines.	Both Mona Offshore Wind Project and Awel y Môr Offshore Windfarm proposed to undertake construction at similar times. There may be a cumulative effect on surface water runoff. There may be a cumulative effect on the potential deterioration of local surface watercourses through turbid runoff.

17.10 Cumulative effects assessment.

17.10.1.1 A description of the significance of cumulative effects upon hydrology and flood risk receptors arising from each identified impact is given below.

17.10.2 The impact of increased flood risk arising from additional surface water runoff

Tier 1

Construction phase

Magnitude of impact

17.10.2.1 The construction of Awel y Môr infrastructure (such as compounds, haul roads and the onshore cable corridor) may lead to a temporary change in surface water runoff and an increased flood risk. However, in their CoCP Awel y Môr has committed to implement measures to manage surface water drainage during construction. The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

17.10.2.2 The majority of the Mona culminative hydrology and flood risk study area is located with Flood Zone 1 and is deemed to be of low vulnerability, high recoverability and low value. The sensitivity of the receptor is therefore, considered to be **low**.

17.10.2.3 Where the Mona culminative hydrology and flood risk study area falls within Flood Zone 2 and 3 the sensitivity of the land within the Mona hydrology and flood risk study area is of high vulnerability, medium recoverability and high value. The sensitivity of the receptor is therefore, considered to be **high.**

Significance of effect

17.10.2.4 Overall, the magnitude of the cumulative impact is deemed to be negligible, the sensitivity for the Mona hydrology and flood risk study area is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.10.2.5 The sensitivity of the rest of the Mona Proposed Onshore Development Area is considered to be low. The cumulative effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

17.10.3 The impact of contaminated runoff on the quality of watercourses

Tier 1

Construction phase

Magnitude of impact

17.10.3.1 The impact to watercourses takes into account the WFD classification of surrounding watercourses and the mitigation measures presented within Table 17.20 and measures adopted within the Awel y Môr project.

17.10.3.2 A cumulative impact by HDD and open cut techniques would only occur where crossings of a specific watercourse coincide. However, Awel y Môr has committed to implement measures to manage surface water drainage during construction to limit any surface water runoff from the onshore scheme to surrounding watercourses.

17.10.3.3 The cumulative impact predicted to be of local spatial extent, short term duration, intermittent occurrence and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

17.10.3.4 The watercourses are considered to be highly vulnerable in relation to WFD classification status, but of moderate recoverability and moderate value in relation to the local economy. The sensitivity of the receptor is therefore, considered to be **high.**

Significance of effect

17.10.3.5 Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

17.10.3.6 During decommissioning of the Mona Offshore Wind Project, the Mona Onshore Cable, and Mona 400kV Grid Connection Cable will remain in place but the link boxes and Onshore Substation, will be removed. On this basis, decommissioning activities will be less extensive. The Awel y Môr project has assumed that all infrastructure will be removed, but also clarifies that where this may lead to a greater environmental impact, it may be proposed that export cable etc. will remain in situ. Awel y Môr also commits to preparing a decommissioning plan setting out control measures.

17.10.3.7 The cumulative impact is predicted to be indirect, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore considered to be **negligible.**

Sensitivity of the receptor

17.10.3.8 The watercourses are considered to be highly vulnerable in relation to WFD classification status, but of moderate recoverability and moderate value in relation to the local economy. The sensitivity of the receptor is therefore, considered to be **high**.

Significance of effect

17.10.3.9 Overall, the magnitude of the cumulative impact is deemed to be negligible, the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.10.4 The impact of damage to existing field drainage

Tier 1

Construction phase

Magnitude of impact

17.10.4.1 The impact on field drainage from open cut techniques and the installation of link boxes and joint bays during the construction phase could temporarily affect surface water flow pathways, impacting on water quality and potential flow rates.

17.10.4.2 Cumulative impacts on field drainage and irrigation would only occur where development limits coincide. Projects as a minimum, require a surface water management strategy and drainage scheme to limit any increase in surface water runoff from the site, and to mimic (as close as practicable) the current hydrological regime. It is assumed that Awel y Môr and Mona Offshore Wind Project will be constructed using industry best practice and therefore should limit any effect on field drainage.

17.10.4.3 Given the limited spatial overlap of the two projects and with the incorporation of appropriate construction mitigation techniques, the cumulative impact is predicted to be of local spatial extent, short term duration, of intermittent occurrence and reversible. It is predicted that any impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

17.10.4.4 Field drains are considered to be of moderate vulnerability along the Mona Onshore Cable Corridor, Mona 400kV Grid Connection Cable Corridor and Onshore Substation, moderate to high recoverability and low value. The sensitivity of the receptor is therefore considered to be **medium**.

Significance of effect

17.10.4.5 Overall, the magnitude of the cumulative impact is deemed to be negligible, and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

17.10.4.6 During decommissioning of the Mona Offshore Wind Project, the Mona Onshore Cable, and Mona 400kV Grid Connection Cable will remain in place but the link boxes and Onshore Substation, will be removed. On this basis, decommissioning activities will be less extensive. The Awel y Môr project has assumed that all infrastructure will be removed, but also clarifies that where this may lead to a greater environmental impact, it may be proposed that export cable etc. will remain in situ. Awel y Môr also commits to preparing a decommissioning plan setting out control measures.

17.10.4.7 With the incorporation of appropriate decommissioning mitigation techniques the cumulative impact is predicted to be indirect, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore considered to be **negligible.**

Sensitivity of the receptor

17.10.4.8 Field drains are considered to be of moderate vulnerability along the Mona Onshore Cable Corridor, Mona 400kV Grid Connection Cable Corridor and Onshore Substation, moderate to high recoverability and low value. The sensitivity of the receptor is therefore considered to be **medium.**

Significance of effect

17.10.4.9 Overall, the magnitude of the cumulative impact is deemed to be negligible, and the sensitivity of the receptor is considered to be medium. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.10.5 The impact of damage to existing water pipelines

Tier 1

Construction phase

Magnitude of impact

17.10.5.1 Cumulative impacts on drainage pipeline infrastructure would only occur where water and sewer pipelines were located in proximity to the Mona Onshore Cable Corridor and Mona 400kV Grid Connection Cable Corridor of Mona Offshore Wind Project and Awel y Môr Offshore Wind Farm.

17.10.5.2 The cumulative impact is predicted to be of local spatial extent, short term duration, of intermittent and high reversibility. It is predicted that the impact will affect the receptor directly. The magnitude is therefore, considered to be **negligible**.

Sensitivity of the receptor

17.10.5.3 Pipeline infrastructure comprises water supply pipelines operated by Welsh Water, which are considered to have a moderate value and contribute to the local and regional economy. It has high vulnerability to the construction impacts of the Mona Offshore Wind Project and low recoverability due to high costs. The sensitivity of the receptor is therefore considered to be **high**.

Significance of effect

17.10.5.4 Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

Decommissioning phase

Magnitude of impact

17.10.5.5 During decommissioning of the Mona Offshore Wind Project, the Mona Onshore Cable, and Mona 400kV Grid Connection Cable will remain in place but the link boxes and Onshore Substation, will be removed. On this basis, decommissioning activities will be less extensive. The Awel y Môr project has assumed that all infrastructure will be removed, but also clarifies that where this may lead to a greater environmental impact, it may be proposed that export cable etc. will remain in situ. Awel y Môr also commits to preparing a decommissioning plan setting out control measures.

17.10.5.6 With the incorporation of appropriate decommissioning mitigation techniques the cumulative impact is predicted to be indirect, of local spatial extent, short term duration and intermittent. The impact magnitude is therefore considered to be **negligible.**

Sensitivity of the receptor

17.10.5.7 Pipeline infrastructure comprises water supply pipelines operated by Welsh Water, which are considered to have a moderate value and contribute to the local and regional economy. It has high vulnerability to the construction impacts of the Mona Offshore Wind Project and low recoverability due to high costs. The sensitivity of the receptor is therefore considered to be **high**.

Significance of effect

17.10.5.8 Overall, the magnitude of the cumulative impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **minor** adverse significance, which is not significant in EIA terms.

17.11 Transboundary effects

17.11.1.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to hydrology and flood risk from the Mona Offshore Wind Project upon the interests of other states.

17.12 Inter-related effects

17.12.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Mona Offshore Wind Project (construction, operations and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g. subsea noise effects from piling, operational wind turbines, vessels and decommissioning)
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on hydrology and flood risk, such as increased flood risk may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects.

17.12.1.2 A description of the likely interactive effects arising from the Mona Offshore Wind Project on hydrology and flood risk is provided in volume 3, chapter 24: Inter-related effects of the PEIR.

17.13 Summary of impacts, mitigation measures and monitoring

17.13.1.1 Information on hydrology and flood risk within the Mona hydrology and flood risk study area was collected through desktop review and a site-specific FCA.

- Table 17.23 presents a summary of the potential impacts, measures adopted as part of the project and residual effects in respect to hydrology and flood risk. The impacts assessed include:
  - The impact of increased flood risk arising from additional surface water runoff
  - The impact of increased flood risk arising from the diversion of an ordinary watercourse
  - The impact of increased flood risk arising from additional surface water runoff during operation of the Mona Onshore Substation
  - The impact of increased flood risk arising from damage to existing flood defences
  - The impact of contaminated runoff on the quality of watercourses
  - The impact of damage to existing field drainage
  - The impact of damage to existing water pipelines.

17.13.1.2 Overall it is concluded that there will be no significant effects arising from the Mona Offshore Wind Project during the construction, operations and maintenance or decommissioning phases.

17.13.1.3 Table 17.24 presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed include:

- The impact of increased flood risk arising from additional surface water runoff
- The impact of contaminated runoff on the quality of watercourses
- The impact of damage to existing field drainage
- The impact of damage to existing water pipelines.

17.13.1.4 Overall it is concluded that there will be no significant cumulative effects from the Mona Offshore Wind Project alongside other projects/plans.

17.13.1.5 No potential transboundary impacts have been identified in regard to effects of the Mona Offshore Wind Project.

Table 17.23: Summary of potential environmental effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase[a]			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
The impact of increased flood risk arising from additional surface water runoff	✓	×	×	Outline CoCP incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C negligible	C: high to low	C: negligible to minor adverse	N/A	C: negligible to minor adverse	N/A
The impact of increased flood risk arising from the diversion of an ordinary watercourse	✓	×	×	Outline CoCP incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: low	C: high	C: minor adverse	N/A	C: minor adverse	N/A
The impact of increased flood risk arising from additional surface water runoff during operation of the Mona Onshore Substation	×	✓	×	FCA to meet planning policy requirements and best practise standards, Primary and tertiary measures included as part of the project design listed within Table 17.20	C: no change	C: low	C: negligible	N/A	C: negligible	N/A
The impact of increased flood risk arising from damage to existing flood defences	✓	×	✓	Outline CoCP and decommissioning plan incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: negligible D: negligible	C: high D: high	C: minor adverse D: minor adverse	N/A	C: minor adverse D: minor adverse	N/A
The impact of contaminated runoff on the quality of watercourses	✓	×	✓	Outline CoCP and decommissioning plan incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: negligible D: negligible	C: negligible D: negligible	C: minor adverse D: minor adverse	N/A	C: minor adverse D: minor adverse	N/A
The impact of damage to existing field drainage	✓	×	✓	Outline CoCP and decommissioning plan incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: negligible D: negligible	C: medium D: medium	C: minor adverse D: minor adverse	N/A	C: minor adverse D: minor adverse	N/A
The impact of damage to existing water pipelines	✓	×	✓	Outline CoCP and decommissioning plan incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: negligible D: negligible	C: high D: high	C: minor adverse D: minor adverse	N/A	C: minor adverse D: minor adverse	N/A

Table 17.24: Summary of potential cumulative environmental effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of effect	Phase[a]			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Tier 1										
The impact of increased flood risk arising from additional surface water runoff	✓	×	×	Outline CoCP incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C negligible	C: high to low	C: negligible to minor adverse	N/A	C: negligible to minor adverse	N/A
The impact of contaminated runoff on the quality of watercourses	✓	×	✓	Outline CoCP and decommissioning plan incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: negligible D: negligible	C: negligible D: negligible	C: minor adverse D: minor adverse	N/A	C: minor adverse D: minor adverse	N/A
The impact of damage to existing field drainage	✓	×	✓	Outline CoCP and decommissioning plan incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: negligible D: negligible	C: medium D: medium	C: minor adverse D: minor adverse	N/A	C: minor adverse D: minor adverse	N/A
The impact of damage to existing water pipelines	✓	×	✓	Outline CoCP and decommissioning plan incorporation of mitigation measures outlined in volume 1, chapter 3: Project description of the PEIR. Primary and tertiary measures included as part of the project design listed within Table 17.20	C: negligible D: negligible	C: high D: high	C: minor adverse D: minor adverse	N/A	C: minor adverse D: minor adverse	N/A

17.14 Next steps

17.14.1.1 Following a refinement of the Mona Proposed Onshore Development Area, a hydrological survey will be undertaken of the ordinary watercourses at the selected Onshore Substation and other key watercourse crossings where appropriate. The survey will comprise a walkover survey to provide baseline information on the watercourses including width of the channel, the degree of channel modification, obstacles in the channel etc.

17.14.1.2 Investigations will be undertaken at the Mona Onshore Substation as part of engineering design to confirm the rate of infiltration. The results will be used to inform the drainage design that will be reported in the Hydrological, Ecological and Landscape Management Plan.

17.14.1.3 A survey of private water supply abstractions will be undertaken to further characterise the use of groundwater and surface water resources.

17.14.1.4 Further consultation will be undertaken with CCBC, DCC and NRW regarding the management of surface water during construction and operation.

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