

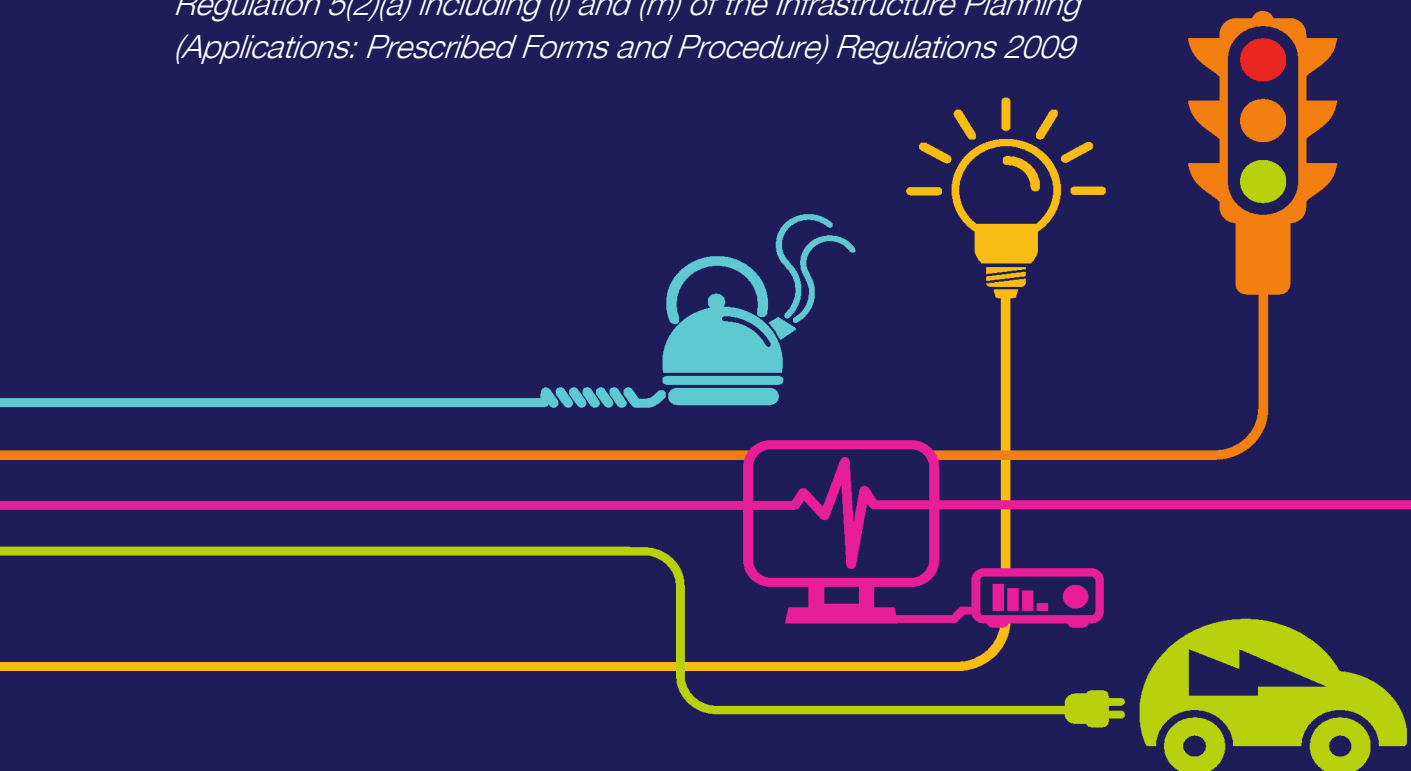
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5.12.2.1

Overarching Flood Consequences Assessment Chapter 12 – Appendix 1

National Grid (North Wales Connection Project)

*Regulation 5(2)(a) including (l) and (m) of the Infrastructure Planning
(Applications: Prescribed Forms and Procedure) Regulations 2009*





North Wales Connection Project

Volume 5

5.12.2.1 Appendix 12.1 Overarching Flood Consequences Assessment

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1 Introduction

1.1 CONTEXT

1.1.1 This Flood Consequences Assessment (FCA) accompanies an application by National Grid Electricity Transmission (plc) (National Grid) to seek powers to construct, operate and maintain a new 400,000 volt (400 kV) connection between Wylfa Substation and Pentir Substation, together with various associated development and other works (“The Proposed Development”).

1.1.2 This document is the first of four FCA volumes that together comprise an appendix to Chapter 12, Water Quality, Resources and Flood Risk (**Document 5.12**) of the Environmental Statement. The four FCA volumes are:

Document 5.12.2.1: Volume 1 - Overarching FCA

Document 5.12.2.2: Volume 2 - Pentir Substation Extension FCA

Document 5.12.2.3: Volume 3 - Cable Sealing End Compounds and Tunnel Head Houses FCA

Document 5.12.2.4: Volume 4 - Overhead Lines FCA

1.1.3 In addition there are four annexes, which comprise.

Document 5.12.2.1A Consultation Log

Document 5.12.2.1B FCA Method Statement

Document 5.12.2.1C National Grid Flood Mitigation Policy PS(T)_095

Document 5.12.2.3A Afon Braint Modelling Report

Document 5.12.2.3B Outline Drainage Strategy

1.1.4 This suite of FCA documentation provides an FCA for the construction, operation and maintenance of the Proposed Development. While a decommissioning phase is being considered within the DCO application, it is not possible to assess this phase at this stage and thus decommissioning is not considered further.

- 1.1.5 The principle of presenting the FCA in multiple volumes was set out in the FCA Method Statement (**Annex 5.12.2.1B**), as issued to NRW, IACC and Gwynedd Council. NRW and IACC confirmed their agreement with the FCA volumes approach. Gwynedd Council did not provide comment in this regard.
- 1.1.6 The purpose of FCA Volume 1 is to present common background relating to planning policy, technical guidance, consultation and methodology in order to avoid significant repetition in the subsequent FCA volumes.
- 1.1.7 All technical terms and abbreviations used within the FCA are defined in the Glossary included within this FCA Volume 1.

1.2 FCA STRUCTURE - VOLUME 1

- 1.2.1 The remainder of **Section 1** provides: the structure of FCA Volumes 2, 3 and 4 (section 1.3); an overview of the Proposed Development (section 1.4) and; an outline of the other DCO documents that are applicable to this FCA (section 1.5).
- 1.2.2 **Section 2** sets out the planning policy and guidance of relevance to the FCA. Planning policy relating to flood risk for Nationally Significant Infrastructure Projects (NSIPs) and Wales planning policy is reviewed in sections 2.1 and 2.2 respectively. National Grid internal flood mitigation policy is summarised in section 2.3. FCA definitions are given in section 2.4. Applicable guidance on accounting for the potential effects of climate change on flood risk is provided in section 2.5 and a full list of data and information used in the FCA is provided in section 2.6.
- 1.2.3 **Section 3** describes the consultation undertaken during the preparation of this FCA. An overview is provided in section 3.1, with further detail provided in subsequent sub-sections, including comments received as part of the SoS's Scoping Opinion (section 3.2), details of consultee responses following the issue of the PEIR (section 3.3), and other consultation such as on the FCA Method Statement with NRW, IACC and Gwynedd Council (section 3.4). The consolidated FCA scope is then presented in section 3.5, followed by items not considered in the FCA (section 3.6).
- 1.2.4 **Section 4** presents details of the assessment methodology, including applicable design standards (section 4.2), methods used in identifying flood hazards (section 4.3), methods used to identify and group flood receptors (section 4.4), flood risk assessment methodology (section 4.5), and planning justification (section 4.6).

- 1.2.5 **Section 5** presents a summary of mitigation, including a discussion of flood avoidance (section 5.2), proposed control and management measures that would be implemented as part of the Proposed Development (section 5.3), as set out in the subsequent FCA Volumes 2, 3 and 4 (**Documents 5.12.1.2, 5.12.1.3 and 5.12.1.4**). Section 5 also sets out how these measures are integrated into the Construction and Environmental Management Plan (CEMP) (**Document 7.4**) (section 5.4) and information on other mitigation measures such as flood management plans (section 5.5), drainage (section 5.6) and design of works affecting watercourses (section 5.7).
- 1.2.6 **Section 6** provides a brief summary of FCA Volume 1 together with guidelines on its use in conjunction with the other FCA Volumes 2, 3 and 4 (**Documents 5.12.1.2, 5.12.1.3 and 5.12.1.4**).

1.3 FCA STRUCTURE - VOLUMES 2, 3 AND 4

- 1.3.1 The structure of FCA Volumes 2, 3 and 4 (**Documents 5.12.1.2, 5.12.1.3 and 5.12.1.4**) is the same in each case and is summarised as follows:
- **Section 1 - Introduction:** sets out the context of the FCA volume within the wider FCA, defines its scope and structure; and refers to FCA Volume 1 for information common across all FCA volumes such as policy, guidance, climate change and methods.
 - **Section 2 - Study Area:** details of the study area applicable to the specific FCA volumes are given.
 - **Section 3 - Flood Hazard Identification:** describes the baseline flood hazards that may affect the Proposed Development, including potential changes in the baseline over the lifetime of the Proposed Development.
 - **Section 4 - Receptor Flood Risk:** defines the main receptor groups that could be affected and the process of individual receptor identification.
 - **Section 5 - Flood Risk Assessment:** assesses flood risk to the main receptor groups.
 - **Section 6 - Flood Risk Management:** covers the flood risk management measures to be adopted within the design, construction, operation and maintenance of the Proposed Development.

- **Section 7 - Planning Requirements:** applies the Sequential and Exception Tests as necessary to meet planning requirements (Note: this section only appears in FCA Volume 4 as the Sequential and Exception Tests are not required for FCA Volumes 2 and 3).
- **Section 8 - Summary and Conclusions:** summarises the main points arising from the FCA carried out in each FCA volume.

1.4 OVERVIEW OF THE PROPOSED DEVELOPMENT

- 1.4.1 A brief overview of the Proposed Development is provided here; further details are provided in ES Chapter 3: Description of the Proposed Development (**Document 5.3**) and Chapter 4: Construction, Operation, Maintenance and Decommissioning of the Proposed Development (**Document 5.4**). An overview of the Proposed Development is shown in Figure 12.2 (**Document 5.12.1.2**), together with the Order Limits.
- 1.4.2 The Proposed Development would provide a new 400 kilovolt (kV) connection between the existing substations at Wylfa and Pentir and includes the following principal components:
- extension to the existing substation at Wylfa;
 - Sections of new 400 kV overhead line (OHL) between Wylfa substation and Braint Tunnel Head House (THH) and Cable Sealing End Compound (CSEC) on Anglesey including modifications to parts of the existing 400 kV OHL between Wylfa and Pentir;
 - Braint THH and CSEC on Anglesey;
 - Tunnel between Braint and Tŷ Fodol THHs;
 - Tŷ Fodol THH and CSEC in Gwynedd;
 - New section of 400 kV OHL between Tŷ Fodol THH and CSEC and Pentir Substation;
 - Extension to the existing substation at Pentir; and
 - Temporary construction compounds, access tracks, construction working areas, localised widening of the public highway and third party works that are required to construct the infrastructure listed above.
- 1.4.3 Temporary construction works are described in Chapter 4, Construction, Operation, Maintenance and Decommissioning of the Proposed Development (**Document 5.4**) and would include the following elements:

- Construction compounds at Penmynydd Road, to the east of Llangefni and immediately south of Pentir substation;
- Construction compounds for tunnelling works at Braint and Tŷ Fodol including drainage areas that would include localised water treatment (surface water runoff and tunnel dewatering arisings) and attenuation facilities;
- Bellmouths and visibility splays where temporary access tracks connect to the public highway;
- Temporary access tracks and associated culvert and clear-span bridge watercourse crossings, including bridge working areas;
- Working areas for temporary pylons;
- Construction and installation of pylons and temporary pylons and dismantling of existing pylons (where required);
- Installation of Scaffolding Protection Prior to Stringing of Conductors Scaffold; and
- Establishment of conductor pulling positions.

1.4.4 The construction is scheduled to commence in 2020 and would take six years to complete. Site preparation works for the tunnel are expected to commence in 2020 and for the overhead lines in 2022. The Proposed Development is expected to be operational by 2026.

1.4.5 Typically, pylon steelwork and foundations have a life expectancy of approximately 80 years, the conductors have a life expectancy of about 60 years and the insulators and fittings have a life expectancy of between 25 and 40 years. Further details regarding the construction, operation and maintenance of the Proposed Development are provided in ES Chapter 4 Construction, Operation, Maintenance and Decommissioning of the Proposed Development (**Document 5.4**).

1.5 RELATIONSHIP TO OTHER DOCUMENTS

1.5.1 This FCA comprises an appendix to the Environmental Statement (ES), Chapter 12: Water Quality, Resources and Flood Risk (**Document 5.12**). Flood risks to third parties and associated mitigation measures that are identified in the FCA have been used to inform the assessment of effects on flood risk receptors for the Proposed Development, as reported in ES Chapter 12 (**Document 5.12**).

- 1.5.2 The FCA should be read in conjunction with applicable sections of the CEMP (**Document 7.4**), which details the principles and procedures for the environmental management of the Proposed Development during its construction phase, including flood management and drainage control and management measures.
- 1.5.3 Other chapters of the ES that should be read in association with the FCA include Chapter 2 Alternatives and Proposed Development History (**Document 5.2**), Chapter 3 Description of the Proposed Development' (**Document 5.3**), Chapter 4 Construction, Operation, Maintenance and Decommissioning of the Proposed Development (**Document 5.4**) and Chapter 11 Geology, Hydrogeology and Ground Conditions (**Document 5.11**). The subsequent FCA Volumes 2, 3 and 4 (**Documents 5.12.1.2, 5.12.1.3 and 5.12.1.4**) should be read in conjunction with FCA Volume 1 (**Document 5.12.1.1**).

2 Planning Policy and Guidance

2.1 NATIONAL POLICY STATEMENTS

2.1.1 The FCA for the Proposed Development has been prepared in accordance with the Planning Act 2008, Overarching National Policy Statement for Energy (NPS EN-1) (Ref 12.1.2), which sets out planning policy with regard to NSIPs in the energy sector, and National Policy Statement for Electricity Networks Infrastructure (NPS EN-5) (Ref 12.1.3), which covers electricity transmission and distribution.

2.1.2 The ‘*minimum requirements for FRAs*’¹ as set out in para 5.7.5 of NPS EN-1 (Ref 12.1.2) 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;*

¹ Flood Risk Assessments - as used in England

- *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; and*
- *Be supported by appropriate data and information, including historical information on previous events.”*

2.1.3 While NPS EN-1 (Ref 12.1.2) and NPS EN-5 (Ref 12.1.3) provide the principal policy test in terms of setting out National Policy for energy infrastructure and electricity networks infrastructure, NPS-EN1 refers to Technical Advice Note 15: Development and Flood Risk (TAN15 – Ref 12.1.4) in terms of providing guidance for NSIPs in Wales further to that provided in NPS-EN1 (Ref 12.1.2), as summarised in the preceding paragraph.

2.1.4 NPS-EN1 also requires that the Sequential Test and Exception Test are applied. The following paragraphs indicate that this applies to NSIPs in Wales as well as England.

2.1.5 Paragraph 5.7.12 of NPS EN-1 states that *“The IPC [Infrastructure Planning Commission – now replaced by PINS] should not consent development in Flood Zone 2 in England or Zone B in Wales unless it is satisfied that the Sequential Test requirements have been met. It should not consent development in Flood Zone 3 or Zone C unless it is satisfied that the Sequential and Exception Test requirements have been met.”*

The Sequential Test

- 2.1.6 The Sequential Test is set out in para 5.7.13 of NPS EN-1 as follows:
“Preference should be given to locating projects in Flood Zone 1 in England or Zone A in Wales. If there is no reasonably available site in Flood Zone 1 or Flood Zone A, then projects can be located in Flood Zone 2 or Zone B. If there is no reasonably available site in Flood Zones 1 or 2 or Zones A & B, then nationally significant energy infrastructure projects can be located in Flood Zone 3 or Zone C subject to the Exception Test.”
- 2.1.7 A footnote to paragraph 5.7.13 of NPS EN-1 goes on to say *“When making the application, the applicant should justify with evidence what area of search has been used in examining whether there are reasonably available sites. This will allow the IPC [Infrastructure Planning Commission – now replaced by PINS] to consider whether the Sequential Test has been met as part of site selection.”*
- 2.1.8 NPS EN-1 also requires that a sequential approach should be applied to the layout and design when allocating land for development and land use types within development sites.

The Exception Test

- 2.1.9 Para 5.7.14 of NPS EN-1 states *“If, following application of the sequential test, it is not possible, consistent with wider sustainability objectives, for the project to be located in zones of lower probability of flooding than Flood Zone 3 or Zone C, the Exception Test can be applied. The test provides a method of managing flood risk while still allowing necessary development to occur.”*
- 2.1.10 In accordance with para 5.7.16 of NPS EN-1, for the Exception Test to be passed:
- 1) *“it must be demonstrated that the project provides wider sustainability benefits to the community that outweigh flood risk [benefits to the community would include the benefits (including need), for the infrastructure];*
 - 2) *“the project should be on developable, previously developed land or, if it is not on previously developed land, that there are no reasonable alternative sites on developable previously developed land subject to any exceptions set out in the technology-specific NPSs; and*

- 3) *“a FRA must demonstrate that the project will be safe, without increasing flood risk elsewhere subject to the exception below and, where possible, will reduce flood risk overall.”*

2.1.11 The ‘exception below’ mentioned in the third part of the Exception Test is set out in paragraph 5.7.17 of NPS EN-1: *“Exceptionally, where an increase in flood risk elsewhere cannot be avoided or wholly mitigated, the IPC [Infrastructure Planning Commission – now replaced by PINS] may grant consent if it is satisfied that the increase in present and future flood risk can be mitigated to an acceptable level and taking account of the benefits of, including the need for, nationally significant energy infrastructure as set out in Part 3 above. In any such case the IPC should make clear how, in reaching its decision, it has weighed up the increased flood risk against the benefits of the project, taking account of the nature and degree of the risk, the future impacts on climate change, and advice provided by the EA and other relevant bodies.”*

2.2 WELSH PLANNING POLICY AND GUIDANCE

Technical Advice Note 15 (TAN15)

- 2.2.1 Technical Advice Note 15: Development and Flood Risk (TAN15 – July 2004) (Ref 12.1.4) was produced by the then Welsh Assembly Government (now the Welsh Government). TAN15 provides technical guidance which supplements the policy set out in Planning Policy Wales (Edition 9, Nov 2016) (PPW9) (Ref 12.1.26) in relation to development and flooding, providing 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. The consultation draft of an updated edition of Planning Policy Wales (PPW10) was issued for consultation in March 2018 (Ref. 12.1.35). Policies relating to development and flood risk in PPW10 remain broadly the same as those set out in PPW9.
- 2.2.2 As highlighted in section 2.1, NPS EN-1 (Ref 12.1.2) refers to TAN15 as a source of further guidance in Wales.
- 2.2.3 TAN15 is supplemented by the Development Advice Map (DAM) which provides the basis for assessment under TAN15. The DAM was last updated in July 2017 and is summarised in section 2.4 and in Table 2.1 of this FCA Volume.
- 2.2.4 The TAN15 equivalent of the Exception Test, as given in NPS-EN1 (Ref 12.1.2), is the Justification Test. However, there are subtle differences between the two which are discussed in more detail in the following section. TAN15 has no equivalent of the Sequential Test.

TAN15 Justification Test

- 2.2.5 The Exception Test is more or less equivalent to the TAN15 Justification Test, albeit with some subtle differences. As with the Exception Test (see section 2.1 of this FCA Volume) the Justification Test must be passed in order to secure development in DAM Zone C (see section 2.4 for DAM Zone definitions) for certain development types, as summarised in Section 9 of TAN15 (Summary of Policy Requirements).
- 2.2.6 The requirements of the Justification Test are:
- i. “Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; or,*
 - ii. Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;*
- and,*
- iii. It concurs with the aims of PPW and meets the definition of previously developed land (PPW fig 2.1); and,*
 - iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1, found to be acceptable.”*
- 2.2.7 It can be seen from the requirements of the TAN15 Justification Test, as set out in the preceding paragraph, that Points i and ii are not directly comparable with Point 1 of the Exception Test. The Justification Test is clearly focused on Local Authority initiatives, as opposed to strategic and nationally significant infrastructure, the benefits of which, in the case of the Proposed Development, extend beyond the Local Authorities of IACC and Gwynedd Council.
- 2.2.8 While Point 2 of the Exception Test and Point iii of the Justification Test are similar, the Justification Test, in conjunction with PPW9, is more focused on steering new developments to previously developed land whereas the Exception Test, while still allowing for the use of previously developed land, nonetheless allows for the use of land that might not necessarily have been previously developed.

- 2.2.9 Point 3 of the Exception Test and Point iv of the Justification Test both focus on the need to demonstrate that the consequences of flooding have been considered and that the development is safe without increasing the risk of flooding elsewhere. However, as outlined in Paragraph 2.1.12 of this FCA Volume, the Exception Test allows for potential increases in flood risk elsewhere if it cannot be avoided or wholly mitigated, subject to demonstrating that it can be mitigated to an acceptable level under present and future scenarios.
- 2.2.10 For the reasons set out in Paragraphs 2.2.7 - 2.2.9, and because the Exception Test is required to be applied under NPS-EN1 (Ref 12.1.2), the subsequent FCA Volumes 2, 3 and 4 (**Documents 5.12.1.2, 5.12.1.3 and 5.12.1.4**) use the Exception Test and not the Justification Test.

Additional Guidance

- 2.2.11 To meet their statutory requirements under the Flood Risk Regulations 2009 (Ref 12.1.6) NRW has produced Flood Risk Management Plans (FRMP) for the three administrative regions in Wales known as River Basin Districts (RBD) which are the Dee, Severn and West Wales RBDs, the West Wales RBD being applicable to the Proposed Development. The 'Western Wales Flood Risk Management Plan' 2015 (Ref 12.1.7) is the current version applicable to the Proposed Development study area. Although in the context of the Proposed Development the Western Wales Flood Risk Management Plan (FRMP) is high level, it nonetheless provides a useful insight into the pertinent issues in the Proposed Development study area.
- 2.2.12 IACC and Gwynedd Council, in their capacities as LLFAs, have independently produced Local Flood Risk Management Strategy (LFRMS) documents (Ref 12.1.24 and 12.1.25) and, under the IACC and Gwynedd Council Joint Local Development Plan (LDP), have produced a joint Stage 1 Strategic Flood Consequence Assessment (SFCA – March, 2016) (Ref 12.1.8). The SFCA has provided some useful background information, particularly with regards to the range and locations of applicable flood hazards, together with information on potential receptors.
- 2.2.13 No applicable Preliminary Flood Consequence Assessments have been produced for IACC and Gwynedd Council, either jointly or separately.
- 2.2.14 The Pembrokeshire County Council (2012) West of Wales Shoreline Management Plan 2: Cardigan Bay and Ynys Enlli to the Great Orme Coastal Group West of Wales Shoreline Management Plan (SMP) 2 (Ref 12.1.10), is applicable to the Isle of Anglesey and north-west Gwynedd coasts.

- 2.2.15 All of the aforementioned strategic and regional planning advice documents were reviewed in preparing this FCA.

2.3 NATIONAL GRID FLOOD MITIGATION POLICY

- 2.3.1 National Grid has produced a 'Flood Mitigation Policy' (PS(T)_095) (2011) (Ref 12.1.11, included in **Annex 5.12.2.1C**) which defines their declared target standards of protection (SoP) for flood defence/resilience that should be applied to all new build electricity transmission substations and at legacy substations subjected to an expansion or a major refurbishment programme.
- 2.3.2 This document effectively sets out that the minimum standard of protection (SoP) for critical elements of National Grid installations is 0.1% AEP (Annual Exceedance Probability – see section 2.4) in terms of fluvial and coastal flood risk, to include the applicable allowances for climate change as provided in the relative national guidance statements (and in section 2.5 of this FCA Volume).
- 2.3.3 The National Grid Flood Mitigation Policy notes that where the target standard of protection cannot be achieved on grounds of cost or engineering constraints, a lower standard may be acceptable, but that the minimum standard of protection should be the 0.5% Annual Exceedance Probability (AEP) event (equivalent to a 1 in 200 year return period), including allowance for climate change and freeboard. A 50 year lifespan for the design of flood defences for substations is also specified when required.
- 2.3.4 No element of National Grid's Flood Mitigation Policy provides design standards that afford a lower level of protection and safety standards than those standards stated in the applicable policy and guidance documents set out in Sections 2.1 and 2.2 of this FCA volume.

2.4 FCA DEFINITIONS

Probability of a Flood Event

- 2.4.1 Throughout the four FCA Volumes, 'Annual Exceedance Probability' (AEP) terminology is used to describe the magnitude and likelihood of a flood event. AEP expresses the probability of a flood occurring in a given year. For example, a '1 in 100 year flood event' is referred to as a '1% AEP event' (i.e. a flood with a 1 in 100 or 1% probability of occurring in any given year).

Flood Zones

- 2.4.2 Flood zones used within this FCA are based on present day conditions in accordance with the DAM and NRW flood risk mapping (see Figure 12.10,

Document 5.12.1.10), with no allowance for climate change. These maps are usually based on fluvial catchments greater than 3km² in area.

2.4.3 NPS-EN1 refers to the Welsh Government DAM terminology (i.e. Zones A, B, C, C1, C2) as forming the basis of TAN15 guidance for planning purposes. The DAM definitions are given in Table 2.1.

Table 2.1 Reproduction of Figure 1 from TAN15 [Ref 12.1.4]		
Description of Zone	Zone	Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define the adjacent extreme flood outline (as defined below) there is no need to consider flood risk further
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% AEP (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

2.4.4 The NRW website states that “*The Development Advice Map (DAM) shows areas at risk of flooding for the purposes of land-use planning. The DAMs should be used alongside Planning Policy Wales and Technical Advice Note*

(TAN) 15 to guide new development away from areas at risk of flooding wherever possible. Together, they form a precautionary framework to guide planning decisions. The maps shown here are not designed for small-scale investigation beyond 1:25,000 and should be considered as a trigger for following policy advice in TAN15. The maps are based on Natural Resources Wales's extreme flood outlines (Zone C) and the British Geological Survey 10k Superficial Geology data (Zone B)".

2.4.5 In addition to the DAM, NRW has produced flood risk mapping based on Flood Zones 1, 2 and 3 definitions. The NRW Flood Zone 1, 2 and 3 definitions are as follows:

- **NRW Flood Zone 1 (Low probability):** Land having less than a 1 in 1,000 or 0.1% AEP of river or sea flooding.
- **NRW Flood Zone 2 (Medium probability):** Land having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) AEP of river flooding; or land having between a 1 in 200 (0.5%) and 1 in 1,000 (0.1%) AEP of sea flooding.
- **NRW Flood Zone 3 (High probability):** Land having a 1 in 100 (1%) or greater AEP of river flooding; or land having a 1 in 200 (0.5%) or greater AEP of sea flooding.

2.4.6 From March 2017 DAM Zones C1 and C2 are updated quarterly to align with NRW's extreme flood outline updates. DAM Zone B data was originally published in 2004, and revised in 2017. DAM Zones C1 and C2 are directly equivalent to NRW Flood Zone 2 (i.e. 0.1% AEP) but with the determination of whether DAM zones are C1 or C2 being based on the protection afforded by flood defence infrastructure (see Table 2.1).

2.4.7 For the purposes of this FCA, NRW Flood Zones 2 and 3 GIS layers and the DAM layers were downloaded, (see section 2.6 of this FCA Volume) and reviewed. It was confirmed that DAM Zone C2 is virtually identical to NRW Flood Zone 2. It was also noted that DAM Zone C2, as opposed to DAM Zone C1, is prevalent throughout the Order Limits due to the lack of flood defence infrastructure in the area.

2.4.8 This FCA is primarily based on the DAM flood zone terminology but interchanges with NRW Flood Zone 1, 2 and 3 terminology where appropriate in terms of demonstrating certain points.

Groundwater Flood Zones

- 2.4.9 Throughout FCA Volumes 2, 3 and 4 use is made of the British Geological Society (BGS) groundwater flooding susceptibility mapping for which an A, B and C classification is also adopted, as follows: (A) limited potential for groundwater flooding to occur; (B) potential for groundwater flooding of property situated below ground level; and (C) potential for groundwater flooding to occur at the surface.
- 2.4.10 The BGS groundwater flooding susceptibility flood zones should not be confused with the DAM zones and thus, throughout Volumes 2, 3 and 4, any reference to flood zones are clearly preceded by either 'DAM' or 'Groundwater'.

Development Lifetime

- 2.4.11 TAN15 states that non-residential developments should have an assumed lifespan of 75 years in order to adequately assess flood risk and the potential impacts of climate change within that window. This assumption has been adopted for the purposes of this FCA; the implications of this for the assessment of the effects of climate change on flood risk over the lifetime of the development are discussed in section 2.5.

Other Definitions

- 2.4.12 Throughout the FCA, flood sources are referred to as flood hazards (see section 4.3). Flood receptor and receptor group terminology is used throughout (see section 4.4).
- 2.4.13 As discussed in more detail in section 5.3, generic design and mitigation measures have been used – generic in the sense that they are not site-specific and are applicable to multiple locations and receptor groups. These are hereinafter referred to as control and management measures.
- 2.4.14 Control and management measures within the CEMP include, for example, the implementation of a flood management and response plan for temporary works within the Order Limits.

2.5 CLIMATE CHANGE

- 2.5.1 NPS EN-1 (Ref 12.1.2) and NPS EN-5 (Ref 12.1.3) gives advice on accounting for climate change, to the effect that developments should be resilient and adaptive to the latest climate change projections. Planning Policy Wales Edition 9 (Ref 12.1.26) and TAN15 (Ref 12.1.4) state that

when considering the impacts of climate change, the latest set of UK Climate Projections should be used.

- 2.5.2 Welsh Government guidance on the potential effects of climate change on flood risk is provided in 'Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales' (FCERM) (Ref 12.1.13). This was originally published in 2011, and an updated version was issued in December 2017. The December 2017 version includes some changes to climate change factors compared to 2011, as well as a change to the recommendations for H++ scenarios.
- 2.5.3 In August 2016, the Welsh Government published a policy clarification 'Flood Consequence Assessment: Climate Change Allowances' guidance letter (Ref 12.1.17). This policy clarification covers river flows, sea level and wave heights but does not include updates to rainfall allowances. The letter states that these climate change allowances should be incorporated into FCAs accompanying planning applications submitted from December 1, 2016.
- 2.5.4 There is no discussion of sea level climate change allowances in the following paragraphs as flooding from the sea is scoped out of this FCA (see section 3.7).

River Flow

- 2.5.5 Table 2.2 presents applicable allowances regarding increases in peak river flows for the West Wales River Basin District. The August 2016 guidance (Ref 12.1.17) recommends that the central estimate, or change factor, should be used to factor the 1961-1990 baseline data to assess the potential impact of climate change as part of an FCA.
- 2.5.6 Peak river flow allowances are provided for three future time horizons or 'epochs': '2020s', '2050s' and '2080s'. The 2020s epoch covers the period 2015 to 2039, the 2050s the period 2040 to 2069, and the 2080s the period 2070 and 2099. The guidance also states that the 2080s time period should be used when considering timeframes beyond 2100. In the context of Proposed Development, the 2020s epoch has been used for all construction activities and the 2080s epoch has been used for permanent infrastructure.

Table 2.2 Peak river flow allowances for the West Wales RBD, reproduced from Table 1 of Welsh Government (2016) [Ref 12.1.17]

	Total potential change anticipated by the...		
	2020s	2050s	2080s

Table 2.2 Peak river flow allowances for the West Wales RBD, reproduced from Table 1 of Welsh Government (2016) [Ref 12.1.17]

	Total potential change anticipated by the...		
Upper end estimate	+25%	+40%	+75%
Change factor /central estimate	+15%	+25%	+30%
Lower end estimate	+5%	+10%	+15%

- 2.5.7 The August 2016 guidance (Ref 12.1.17) also advises that an assessment should be made of the upper end projections (see Table 2.2) to ensure the long term resilience of a development and to identify potential future adaptation requirements that might not necessarily be applicable from the outset of a project. This FCA only provides an assessment of upper end scenarios for permanent infrastructure.

Rainfall

- 2.5.8 As noted above, the 2016 Welsh Government guidance for climate change allowances for FCA does not provide allowances for rainfall. However, the 2017 Welsh Government FCERM guidance does provide rainfall allowances, which are set out in Table 2.3 below.

Table 2.3 Change to extreme daily rainfall intensity compared to a 1961-90 baseline, reproduced from Table 3 of Welsh Government FCERM (2017) [Ref 12.1.13]

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 2080s (2070-2115)
Upper estimate	+10%	+20%	+40%
Central estimate	+5%	+10%	+20%

- 2.5.9 As with river flood flows, the 2017 FCERM guidance recommends that the central estimate is used for the applicable time period (2020s for construction and 2080s for permanent infrastructure) as the basis for the evaluation of flood risk and the design of flood mitigation measures. However, as with river flows, an assessment has also been made of the upper end scenario for permanent/operational infrastructure where applicable to ensure the long term resilience of the Proposed Development

and to identify potential future adaptation requirements that might not necessarily be applicable from the outset of the Proposed Development.

H++

- 2.5.10 With regards to extreme event H++ scenarios which apply to fluvial and tidal flooding, the Welsh Government August 2016 guidance (Ref 12.1.17) refers to the Welsh Government FCERM guidance (2011). However, as noted above, the FCERM guidance was updated in December 2017 (Ref 12.1.13).
- 2.5.11 At the time at which the method was developed and discussed with NRW (see section 3.4 for consultation details, and **Annex 12.2.1B** for the FCA method statement), the 2011 version of the Welsh Government FCERM guidance was applicable. The guidance presented a map showing the coverage of non-standard catchments, and advised that only schemes located within non-standard catchments should be considered under H++ scenarios. According to the map, the only coverage of non-standard catchments in the context of the Proposed Development was in and around the Wylfa area. As Wylfa substation and the OHL in the near vicinity are not at risk of fluvial or tidal flooding, the H++ climate change scenarios were scoped out and not considered in this assessment.
- 2.5.12 The December 2017 FCERM guidance (Ref 12.1.13) no longer provides any indication as to which locations may require assessment of H++ scenarios. Given the generally low level of fluvial flood risk to the Proposed Development and the low vulnerability of those aspects of the infrastructure to be located in floodplain areas (pylons, temporary access tracks and other construction working areas), no further consideration has been given to the potential use of H++ scenarios following issue of the December 2017 guidance.
- 2.5.13 H++ allowances for coastal flooding are not applicable for the Proposed Development, as discussed in section 3.7.
- 2.5.14 The EA FCERM update note of 2015 (Ref 12.1.18) states that no H++ scenario is provided for changes to extreme rainfall. As such, an H++ rainfall scenario is not considered in this FCA.

Climate Change Epochs and Development Lifespan

- 2.5.15 Two time periods are applicable to the Proposed Development: (i) the construction period, for which the 2020s epoch is applicable; and (ii) the operation and maintenance period, for which the 2080s epoch is applicable.

2.6 FCA DATA AND INFORMATION

2.6.1 A variety of data and information from different sources was used in preparing this FCA. Data and information broadly fall into four categories: (1) data provided by third parties such as NRW; (2) data acquired through publicly available reports; (3) data generated in-house through calculations and analysis; and (4) project data (e.g. design drawings and plans).

2.6.2 Third party data used in preparing this FCA includes²:

- Ordnance Survey (OS) Mastermap (properties & infrastructure and rivers network layers);
- DAM mapping (LGP);
- NRW Flood Zones 2 and 3 mapping (LGP);
- IACC sewer flooding records;
- Flood alert and flood warning areas (LGP);
- Spatial flood defences without attributes and spatial flood defences with standardised assets (LGP);
- Flood storage areas (LGP);
- Mapping of recorded flood outlines (LGP);
- Risk of flooding from river or sea mapping (LGP);
- Surface water flood risk mapping (LGP);
- Wales high water mark (LGP);
- Groundwater flood risk mapping (from British Geological Survey);
- Geological mapping (from British Geological Survey);

² (Note: the majority of third party data used was downloaded from the Welsh Government Lle Geoportal, as denoted by LGP)

- Light Detection and Ranging - LiDAR topography data (LGP); and
- Aerial photography.

2.6.3 In addition to the above data, enquiries were made of NRW regarding the availability of hydraulic models or model outputs for the Proposed Development study area. NRW confirmed that no data or models were available for this area (see **Annex 5.12.2.3A**).

2.6.4 Publicly available guidance documents used in preparing this FCA include:

- Welsh Government, Technical Advice Note 15 (TAN15): Development and Flood Risk (Jul, 2004) (Ref 12.1.4) and associated Development Advice Maps (Ref 12.1.5);
- West of Wales Shoreline Management Plan 2 (Jun, 2012) (Ref 12.1.10);
- Gwynedd Council Local Flood Risk Management Strategy (Feb, 2013) (Ref 12.1.25);
- Anglesey Local Flood Risk Management Strategy (Jul, 2013) (Ref 12.1.24);
- Anglesey & Gwynedd Joint Local Development Plan Strategic Flood Consequence Assessment – Stage 1 (Mar, 2016) (Ref 12.1.8);
- NRW West Wales River Basin Management Plan 2015-2021 (Dec, 2015) (Ref 12.1.9);
- NRW Western Wales Flood Risk Management Plan (2015) (Ref 12.1.7);
- Environment Agency Coastal flood boundary conditions for UK mainland and islands. Project: SC060064/TR2: Design sea levels (2011) (Ref 12.1.15);
- Welsh Government (2011). Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales (Ref 12.1.13);
- Environment Agency (2010). Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG) (Ref 12.1.16);
- Welsh Government (2016). Guidance on Climate Change Allowances for Planning Purposes (Ref 12.1.17);

- Environment Agency (2015). Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities (Ref 12.1.18);
- NetRegs (2017). Guidance for pollution prevention, works or maintenance in or near water GPP5 (Ref 12.1.19);
- CIRIA C753 (2015). The SuDS Manual (Ref 12.1.20);
- Centre for Ecology and Hydrology (2013). Flood Estimation Handbook. To include revisions and online services (Ref 12.1.21);
- Institute of Hydrology (1994). Report No. 124: Flood estimation for small catchments (Ref 12.1.22); and
- Centre for Ecology and Hydrology (2016). The Revitalised Flood Hydrograph Model ReFH 2.2: Technical Guidance (Ref 12.1.23).

3 FCA Consultation and Scope

3.1 INTRODUCTION

- 3.1.1 Sections 3.2 to 3.4 set out the flood-related issues raised by stakeholders in consultation to date and how these have been addressed in the FCA. These comprise (i) the Secretary of State's (SoS) Scoping Opinion, (ii) consultee responses to the Preliminary Environmental Information Report (PEIR), and (iii) FCA-specific consultation responses from NRW, IACC and Gwynedd Council.
- 3.1.2 Section 3.5 sets out the scope of the FCA following the above consultation and in regard to the planning context set out in section 2.

3.2 SCOPING CONSULTATION

- 3.2.1 The Secretary of State's Scoping Opinion, and how it has been addressed in the FCA, is set out in Appendix 5.1: Schedule of Responses to the Secretary of State's Scoping Opinion (**Document 5.5.2.1**).
- 3.2.2 Tables 3.1 and 3.2 outline the issues relevant to flood risk that were raised by stakeholders in consultation on the scoping report, and sets out how these have been addressed in the FCA.

Table 3.1 NRW Scoping Response to the North Wales Connection EIA Scoping Report

Paragraph	Issue Raised by NRW	Response
39	<i>We do have concerns regarding the siting of the potential locations of the sealing end compounds where they are in or adjacent to flood zones C2.</i>	Further to subsequent consultations with NRW, a hydrodynamic modelling assessment of the risk of flooding to the Braint THH/CSEC site was undertaken, as reported in FCA Volume 3 (Document 5.12.2.3) and Annex 5.12.2.3B . There is no fluvial or tidal flood risk to the Tŷ Fodol THH/CSEC site as shown in FCA Volume 3 (Document 5.12.2.3).

Table 3.1 NRW Scoping Response to the North Wales Connection EIA Scoping Report		
Paragraph	Issue Raised by NRW	Response
40	<i>NRW advises that relevant legislation relating to flood risk should also refer to The Environmental Permitting (Amendment) Regulations 2016 for Flood Risk Activity Permits (which replace the Water Resources Act 1991 S.109/S.210)</i>	The requirements for FRAPs are highlighted in FCA Volume 4 (Document 5.12.2.4)
40	<i>'Ordinary' watercourse crossings/culverting will require a FDC [Flood Defence Consent] from the Lead Local Flood Authority.</i>	Applications for Ordinary Watercourse Consent would be made in accordance with measure FM12 in the CEMP (Document 7.4) (as covered in FCA Volume 4 (Document 5.12.2.4))
43	<i>The proposed corridor route is not positioned within any serviced Flood Warning areas and as such any flood action plans should reflect weather forecasts and observed local conditions.</i>	As set out in measure FM11 of the CEMP (Document 7.4) the Flood Management Plan (FMP) reflect weather forecasts and observed local conditions and are highlighted as specific requirements in FCA Volume 4 (Document 5.12.2.4).
44	<i>NRW advises that the applicant seeks further advice from NRW with regard to the above assessments</i>	A draft FCA Method Statement was issued to NRW for consultation (see Annex 5.12.2.1B), to which NRW responded. Email, phone and meeting consultations were also undertaken with NRW (see Section 3.5 of this FCA volume).

3.2.3 IACC and Gwynedd Council provided a joint response to the SoS's consultation on the Scoping Report the main points of which are detailed in Table 3.2.

Table 3.2 IACC and Gwynedd Council Scoping Response to the North Wales Connection EIA Scoping Report

Section / Para	Issue Raised by IACC/Gwynedd Council on the Scoping Report	Response
9.4, Para 4	<i>Use of the H++ scenario may also need to be considered where the consequences of design exceedance would be catastrophic.</i>	See section 2.4 of this Report Note that H++ could only apply to modelling of the Afon Braint at the Braint THH/CSEC site. However as this area is not located in a 'non-standard' catchment (Ref 12.1.13), H++ has not been considered further.

3.3 STAGE 3 CONSULTATION

3.3.1 In December 2016, NRW provided comments on the PEIR (see **Annex 5.12.2.1A**), from which comments relating to FCA are shown in Table 3.3.

Table 3.3 PEIR comments issued by NRW (Dec 2016)

Paragraph	Issue Raised by NRW on the PEIR	Response
4.6	<i>The run-off rates should mimic those of existing rates and where applicable reflect green-field rates/volumes. The use of sustainable drainage principles should be adopted in the design.</i>	Drainage strategies would be based on discharges to greenfield rates, and on sustainable drainage principles in accordance with the SuDS Manual (Ref 12.1.20). This is covered in section 5.3 of this FCA volume (Document 5.12.1.1) and also in section 7 of FCA Volumes 3 and 4, (Documents 5.12.2.3 and 5.12.2.4).
4.7	<i>We would expect that mitigation measures are proposed to negate any negative impact or increased drainage/flooding issues to third parties during the construction period and secured in the CEMP</i>	See Para 2.5.12, section 5.3 of this Report, FCA Volumes 2, 3 and 4 (Documents 5.12.2.2, 5.12.2.3 and 5.12.2.4) and the CEMP (Document 7.4), where the use of robust control and management measures for mitigation is set out.

Table 3.3 PEIR comments issued by NRW (Dec 2016)

Paragraph	Issue Raised by NRW on the PEIR	Response
4.13	<i>Although de-watering is referred to in Chapter 10, Table 11.8 under the 'Aquatic Environment & Water Resources' section, we would advise that this should also be included under the Flood Risk Section.</i>	Dewatering is considered in the FCA with respect to dewatering of excavations (FCA Volume 4) (Document 5.12.2.4) and dewatering of the proposed shaft and tunnel (FCA Volume 3) (Document 5.12.2.3).

3.3.2 In addition to NRW's comments, IACC and Gwynedd Council also provided comments on the PEIR in December 2016 and January 2017 respectively (see **Annex 5.12.2.1A**) but there were no substantive comments regarding flood risk.

3.4 OTHER CONSULTATION

3.4.1 In January 2017, a Stakeholder Thematic Group Meeting was held, which was attended by IACC, Gwynedd Council and NRW. This meeting covered a number of water-related topics and it was agreed that an FCA Method Statement should be produced and issued to stakeholders for comment.

3.4.2 A draft FCA Method Statement was issued to NRW, and to IACC and Gwynedd Council in their capacities as Lead Local Flood Authorities (LLFA). The updated Method Statement is included as **Annex 5.12.2.1B**. The aim of the draft FCA Method Statement was to set out the proposed approach to the FCA for agreement with these bodies.

3.4.3 Table 3.4 below outlines the key comments made by NRW in their response to the draft FCA Method Statement and how these have been addressed in the respective FCA volumes. The full response is included as **Annex 5.12.2.1A**.

Table 3.4 Comments raised by NRW in response to the FCA Method Statement (January 2017)

Paragraph	NRW Comment	Response
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Table 3.4 Comments raised by NRW in response to the FCA Method Statement (January 2017)

Paragraph	NRW Comment	Response
3 rd Para	<i>We are in agreement with the suggested elements to be scoped out of the FCA (the Pylons(3.1) and Flooding from the Sea)</i>	This position has been reconsidered in light of concerns raised by IACC (see Table 3.5) and in terms of robustly applying the Exception Test. It was concluded that pylons should be assessed with the overhead lines FCA Volume 4 (Document 5.12.1.4)
5 th Para	<i>We note that the Welsh Governments Climate Change allowances (CL-03-16) as outlined in their letter dated 23/08/2016 and implanted for use as of the 01/12/2016 is to be used</i>	This point has been addressed (See section 2.5 of this Report)
6 th Para	<i>We would suggest that the use of the EA guidance (Ref 12.1.14) would be appropriate for CC allowances for rainfall, however the views of both Lead Local Flood Authorities should also be sought.</i>	The February 2017 EA guidance on rainfall (Ref 12.1.32) is the same as the Welsh Government FCERM 2011 (Ref 12.1.13) with subsequent updates as outlined in section 2.5 of this FCA Volume. LLFA comments are provided in Table 3.4 and 3.5 of this Report
9 th Para	<i>It is suggested that in section 7 reference is made to the fact that the flood zones are based on present day flows i.e. they do not include climate change. NRW only publish flood zones 1, 2 and 3- we do not publish 3b.</i>	Reference added. Also see section 2 of this Report re: flood zone definitions.

Table 3.4 Comments raised by NRW in response to the FCA Method Statement (January 2017)

Paragraph	NRW Comment	Response
10 th Para	<i>Vol 3 (Menai Strait and associated Infrastructure) should contain hydraulic modelling using upper end estimates for cc along with the influences of structures (culverts/bifurcation) for the river Braint (and adjacent tributaries) adjacent to the CSEC.</i>	A hydrodynamic modelling assessment of the risk of flooding to the Braint THH/CSEC site has been undertaken, and is reported in FCA Volume 3 (Document 5.12.2.3) and Annex 5.12.2.3A .
11 th Para	<i>Consideration should also be given to likely debris loading for the specific watercourse and likely blockage scenarios. The inclusion of freeboard may negate the need for blockage scenarios for some crossings.</i>	FCA Volume 4 (Document 5.12.2.4) identifies watercourse crossings and crossing methods. Specific design constraints are identified in the discussion of mitigation measures (section 5.3 of this Report and FCA Volume 4, section 6) (Document 5.12.2.4). The fitness for purpose of all watercourse crossings as built would be demonstrated post grant of a DCO via applications for Flood Risk Activity Permits (to NRW for main rivers) and Ordinary Watercourse Consent (to LLFAs). A mitigation measure (FM12) is provided in the CEMP (Document 7.4) as secured through DCO Requirement 6.

Table 3.4 Comments raised by NRW in response to the FCA Method Statement (January 2017)

Paragraph	NRW Comment	Response
12 th Para	<i>We would also have concerns regarding any proposed haul roads which are to be elevated above existing ground levels within any flood zones 2. Ideally haul roads should be designed so as not to have an impact of the existing flooding regime.</i>	The issue of raised haul roads (now referred to as access tracks) is discussed with regard to the generic control and management measures (see FM13, section 5.3 of this FCA Volume and in FCA Volume 4 (Document 5.12.2.4))

3.4.4 Table 3.5 below outlines the key comments made by IACC in their response to the draft FCA Method Statement and how these have been addressed in the respective FCA volumes. The full list of IACC comments, together with National Grid responses, is included as **Annex 5.12.2.1C**.

Table 3.5 Comments raised by IACC in response to the FCA Method Statement (March 2017)

Line	Issue Raised by IACC	Response
Line 2	<i>It would be useful to have a flood risk overview section. This could include the Development Advice Map (DAM) which would show the relevant flood zones.</i>	The DAM is included in section 2.4. Also, the DAM and NRW Flood Zones are discussed specifically in FCA Volumes 2, 3 and 4 (Documents 5.12.1.2, 5.12.1.3 and 5.12.1.4) in the context of the specific elements of the Proposed Development that are being assessed within those volumes.
Line 3	<i>There are 91 pylons across the whole route. Some of these would be in areas of flood risk and some would not. It is too early to completely scope out all of the pylons from the FCA.</i>	Pylons are now considered within the assessment of overhead lines provided in FCA Volume 4.

Table 3.5 Comments raised by IACC in response to the FCA Method Statement (March 2017)		
Line	Issue Raised by IACC	Response
Line 6	<i>Is flood modelling proposed for this FCA? If so, please can you provide information on your methodology for this?</i>	A hydrodynamic modelling assessment of the risk of flooding to the Braint THH/CSEC site has been undertaken, as reported in FCA Volume 3 (Document 5.12.2.3) and in the Afon Braint Modelling Report (Annex 5.12.2.3A). No other modelling has been carried out.
Line 7	<i>Will the FCA include a surface water drainage strategy or is this being undertaken separately? Section 6 refers to drainage modelling. Is this proposed as part of the FCA?</i>	Outline drainage strategies for the construction and operation of the tunnel and the THH/CSECs are provided in FCA Volume 3 (Document 5.12.2.3). Outline drainage information is also referenced in FCA Volume 4 (Document 5.12.2.4) for the construction compounds at Penmynydd Road and Pentir. The key requirements for drainage throughout the Order Limits are discussed in FCA Volume 4 (Document 5.12.2.4) and in the CEMP (Document 7.4).
Line 17	<i>IOH124 is largely superseded by ReFH2. Consider using ReFH2 as this is a more accurate methodology.</i>	ReFH2.2 has been used for generating hydrology inputs to the Afon Braint modelling study (See Annex 5.12.3A , 'Afon Braint Modelling Report'). The IH124 component of the UK SuDS online tools is used for reporting preliminary greenfield runoff and storage calculations in this FCA.

3.4.5 Table 3.6 below outlines the key comments made by Gwynedd Council in their response to the draft FCA Method Statement and how these have been addressed in the respective FCA volumes. The full response is included as **Annex 5.12.2.1A**.

Table 3.6 Comments raised by Gwynedd Council in response to the FCA Method Statement (February 2017)		
Paragraph	Issue Raised by Gwynedd Council	Response

Table 3.6 Comments raised by Gwynedd Council in response to the FCA Method Statement (February 2017)

Paragraph	Issue Raised by Gwynedd Council	Response
1st Para	<i>I have mainly reviewed your methodology for temporary and permanent drainage works and agree with both, only addition is that you use the drainage hierarchy in the drainage strategy.</i>	The SuDS hierarchy has been used in the drainage methodology.
2nd Para	<i>We would also recommend the use of ReFH2.2 as opposed to ReFH2; in addition following recommendation from the new Suds manual, the plot scale method using ReFH2.2 is used for smaller catchments. We would accept the IH124 method as well.</i>	ReFH2.2 has been used for generating hydrology inputs to the Afon Braint modelling study (see Annex 5.12.3A, 'Afon Braint Modelling Report'). The IH124 component of the UK SuDS online tools is used for reporting preliminary greenfield runoff and storage calculations in this FCA.

3.4.6 Drafts of the four FCA Volumes and associated annexes were issued to NRW in June 2017. Table 3.7 below gives the key comments made by NRW in their response to the draft FCA Volumes 1-4 (dated 21 July 2017) and how these have been addressed in the respective FCA volumes. The full response is included as **Annex 5.12.2.1A**.

Table 3.7 Comments raised by NRW in response to the draft FCA Volumes 1 to 4, July 2017

Paragraph	NRW Comment	Response
NWCP FCA Vol 1 – Overarching FCA DRAFT 22.06.17		
<i>1st Para</i>	<i>Chapter 2 of the Overarching FCA refers to National Policy – National Policy Statement (NPS) EN-1 and EN-5. (response quotes Paragraph 2.1.2 of FCA Method Statement – Annex 5.12.1B) we are satisfied with this approach and consider that TAN15 provides the level of detail required for the assessment of flood risk for the proposed development.</i>	Further to the draft FCA being issued for review, the final FCA now focuses more on TAN15
<i>2nd Para</i>	<i>We would therefore advise that the FCA report should be revised so that it focuses on TAN15 rather than National Policy Framework. For instance, Chapter 2 refers to the application of the ‘Sequential and Exception Tests’ which are not applicable under TAN15. We also note that the FCA advocates the use of the compatibility matrix, including vulnerability classification that is based on the National Policy Framework. Given that the policy in Wales differs significantly from the National Policy Framework (Zones A, B, C, C1 and C2 are not direct equivalents of the English Flood Zones 1, 2, 3, 3a and 3b – in fact Zones 3a and 3b have not been mapped for Wales) we believe that it would be appropriate to refocus the FCA on the principles of TAN15.</i>	<p>While NPS-EN1 remains the primary planning document for a DCO, the FCA has now been revised to focus on TAN15 and any references to the NPPF have been removed.</p> <p>While the Exception Test is not applicable under TAN15, it is under NPS-EN1. Section 2.2 outlines the differences between the TAN15 Justification Test and the Exception Test. As such, and in terms of seeking to primarily comply with NPS-EN1, where applicable, this FCA is based on the Exception Test and not the Justification Test</p>

Table 3.7 Comments raised by NRW in response to the draft FCA Volumes 1 to 4, July 2017

Paragraph	NRW Comment	Response
5 th Para	<i>We would seek further clarity on paragraph 2.4.12. It is unclear if the design flows will be the 0.1% + the applicable cc allowance e.g. will the temporary watercourse culverts be designed to accommodate the 0.1% AEP flow +15% or the 1%AEP +15%. We would welcome clarification on this aspect within Volume 1.</i>	Paragraph 2.4.12 is now part of section 4.2 and provides the requested clarity.
7 th Para	<i>Paragraph 4.2.4 refers to fluvial flooding. We question the use of +40% on modelling flow inputs since this may relate to pluvial/rainfall</i>	+40% was a typographic error and has now been changed to +30%
8 th Para	<i>It is noted that stockpiles are to be in flood zone 1 (Zone A in TAN15) (which we support. It is suggested that since flood zones have only been mapped for fluvial catchments in excess of 3km², that reference is also made to the surface water flood maps (SWFM). Any stockpiles located within the SWFM should consider flood risk and appropriate mitigation measures should be considered e.g. gaps left in stockpiles to allow for overland flow routes</i>	Reference to the lack of mapping for catchments <3 km ² is made in FCA Volumes 2, 3 and 4 (Documents 5.12.1.2, 5.12.1.3 and 5.12.1.4), and to the use of SWFM data, not only for the purposes of assessing that element, but also as a proxy dataset to assess potential risk from streams with catchment areas <3 km ² since the SWFM typically highlights flood hazard associated with small watercourses as well as surface water runoff pathways.

Table 3.7 Comments raised by NRW in response to the draft FCA Volumes 1 to 4, July 2017

Paragraph	NRW Comment	Response
9 th Para	<p><i>Table 5.1 – Flood Control and Management Measures –</i></p> <p><i>- We would also require that freeboard is also considered in the design for crossings along with allowances for blockages where applicable. This would be on a case for case/individual crossing basis.</i></p> <p><i>- It is noted that the culverts are to be installed during periods of normal to low flow conditions in a dry channel. We would advise that there should be no instream works between mid-October until the following April. This would likely to be a condition on the Flood Risk Activity Permits (FRAP) issued. Over pumping arrangements should cater for flood conditions in the temporary works arrangements.</i></p> <p><i>- We would expect that more detail is provided in the final FCA on the ‘water management system’. Any effluent from a package plant would require a water discharge permit under the Environmental Permitting Regulations 2016 (EPR2016).</i></p>	<p>Details pertaining to freeboard and blockage analysis would be provided in the FRAP/OWC consent applications.</p> <p>Any seasonal restrictions on instream works would be considered on a case-by-case basis at the time that applications are made for FRAP/OWC, taking into account the details of the proposed works and the sensitivity of the watercourse, particularly with regard to requirements to minimise impacts on fish spawning. Works would be undertaken in accordance with the Biodiversity Mitigation Strategy (Document 7.7).</p> <p>FCA Volume 3 (Document 5.12.2.3) provides details of the water management plans for the Braint and Tŷ Fodol THH/CSEC sites (during construction and operation). Further detail is also provided in Chapter 12 Water Quality, Resources and Flood Risk (Document 5.12)</p>

Table 3.7 Comments raised by NRW in response to the draft FCA Volumes 1 to 4, July 2017

Paragraph	NRW Comment	Response
10 th Para	<i>Dewatering from excavations may require a Waste Disposal Permit under the EPR2016 should the temporary discharge not meet the requirements as per the attached Environment Agency regulatory position statement 'Temporary water discharges from excavations (adopted by NRW). We would be grateful for confirmation as to whether the dewatering from excavations meets the requirement of the position statement or if a permit will be required. Water discharge permits do not differentiate between main rivers and ordinary watercourses.</i>	This matter is discussed in Chapter 12 Water Quality, Resources and Flood Risk (Document 5.12)
11 th Para	<i>It would be beneficial for our review purposes if the FCA includes relevant plans within the FCA document.</i>	Due to the draft nature of the document it was not possible to provide the relevant plans but the final FCA, Volumes 1-4, includes all relevant plans (Figures 12.1 to 12.13, Documents 5.12.1.1 to 5.12.1.13).
NWCP FCA Vol 2 – Substations FCA DRAFT 22.06.17		
1 st Para	<i>We agree with the Summary and Conclusion of this volume and have no additional comments.</i>	No response required
NWCP FCA Vol 3 – Cable Sealing End Compounds FCA DRAFT 22.06.17		

Table 3.7 Comments raised by NRW in response to the draft FCA Volumes 1 to 4, July 2017

Paragraph	NRW Comment	Response
1 st Para	<i>Details of the actual receiving watercourse referred to in paragraph 1.3.6 should be provided. The site should natural drain to the proposed discharge point. Should this not be the case then the receiving watercourse may become overloaded even if run off rates are controlled to 3.02 l/s/ha. Paragraph 1.3.5 confirms that dewatering of the shaft and tunnel will be required. We would be grateful for clarification as to the extent of the operational water management zone.</i>	FCA Volume 3 (Document 5.12.2.3) provides details of the outline drainage strategies for the Braint and Tŷ Fodol THH/CSEC sites (during the construction and operation phases). Further detail is also provided in Chapter 12 Water Quality, Resources and Flood Risk (Document 5.12)
2 nd Para	<i>A permit under the EPR2016 for Water discharge will be required for the bentonite package plant during construction and is also likely to be required for the operational discharge.</i>	Further detail is also provided in Chapter 12 Water Quality, Resources and Flood Risk (Document 5.12)
3 rd Para	<i>Again, we agree with the Summary and Conclusion of this volume and have no additional comments. We would welcome the inclusion of figure 5.12.1.8 that is referred to in paragraph 6.2.3 and 6.2.4 within the final version of volume 3.</i>	Figures are provided with the final FCA, Volumes 1-4
NWCP FCA Vol 4 – Overhead Lines Route Corridor FCA DRAFT 22.06.17 - Note the title of this document has now changed to ‘Overhead Lines Flood Consequence Assessment’ (Document 5.12.2.4)		

Table 3.7 Comments raised by NRW in response to the draft FCA Volumes 1 to 4, July 2017

Paragraph	NRW Comment	Response
2 nd Para	<i>There are numerous references in this volume regarding flood zones being limited to main rivers. This is incorrect since Fluvial flood zones are associated with catchments in excess of 3km² and do not distinguish between main rivers/ordinary watercourses. e.g. paragraph 3.2.2</i>	Noted and corrected. It is acknowledged that flood maps are not generally produced for catchments <3km ² and thus the surface water flood mapping dataset has been used as a proxy to indicate where flooding on these smaller watercourse may occur.
3 rd Para	<i>It is unclear if the undergrounding works for 3rd party OHL/3rd cable / gas pipeline are proposed beneath main rivers/ordinary watercourses. We seek clarification on this matter and if they are proposed beneath main rivers/ordinary watercourses it is suggested that detail is provided regarding depth/cover beneath bed of watercourse(s) as well as detail of suitable flood mitigation in the FRAP/ordinary watercourse application.</i>	These details would be provided during the FRAP/OWC application process.
4 th Para	<i>We are generally satisfied with this volume including the summary and conclusions section.</i>	No response required.
NWCP Afon Braint modelling DRAFT 22.06.17 (Doc. 5.12.5B) & EVY0611 Afon Braint Model Document For Issue		
1 st Para	<i>We note that the approach undertaken with regards to flood risk is extremely precautionary and simulates the 0.1% AEP (1 in 1000) with an additional +75% in flow volumes for climate change.</i>	No response required.

Table 3.7 Comments raised by NRW in response to the draft FCA Volumes 1 to 4, July 2017

Paragraph	NRW Comment	Response
3 rd Para	<i>As such we are satisfied with the final estimates and the methodology used to derive the flows along with the content of the Afon Braint Modelling Document.</i>	No response required.

3.4.7 Revised drafts of the four FCA Volumes and associated annexes were issued to NRW, IACC and GC in February 2018. Table 3.8 below gives the key comments made by NRW in their response to the revised draft FCA Volumes 1-4 (dated 22 March 2018) and how these have been addressed in the respective FCA volumes. The full response is included in **Annex 5.12.2.1A**. IACC confirmed that they did not have any comments on the FCA. Comments received from Gwynedd Council on 21 June 2018 are set out in Table 3.9.

Table 3.8 Comments raised by NRW in response to the revised draft FCA Volumes 1 to 4, March 2018

Paragraph	NRW Comment	Response
NWCP FCA Vol 1 – Overarching FCA (revised draft)		
14	<i>Paragraph 2.4.2 NRW would request an additional sentence for clarity is added “.... These maps are usually based on fluvial catchments which are greater than 3km² in area.”. This is also applicable to table 3.7 (1-4 2nd para.)</i>	This sentence has been added to paragraph 2.4.2. No changes have been made to Table 3.7, where the catchment area minimum is already mentioned

Table 3.8 Comments raised by NRW in response to the revised draft FCA Volumes 1 to 4, March 2018

Paragraph	NRW Comment	Response
15-17	<p><i>Paragraph 2.5.10 to 2.5.13. As of 2nd February 2018, Welsh Government has revised its guidance on Adapting to Climate Change:</i></p> <p><i>Http://gov.wales/topics/environmentcountryside/epq/flooding/nationalstrategy/guidance/climateguide/?skip=1&lang=en</i></p> <p><i>The ES must appropriately reference and consider this.</i></p>	<p>The revised guidance has been accounted for throughout section 2.5 as appropriate.</p>
19	<p><i>Table 3.7. With regards to the responses provided in the 9th paragraph we do have some concerns regarding the use of 'considered' in the response. We would prefer that 'adhered/followed' should be used or that the National Grid state that additional mitigation/management measures would be included.</i></p>	<p>The text in Table 3.7 has been revised. Periods of high flow could likely occur during the summer months, i.e. would not be avoided by this constraint. Conversely, periods of low flow could occur between October-April but would not be able to be taken advantage of. As such the wording has been revised to include a case by case consideration of seasonal restrictions, particularly taking account of fish spawning requirements and measures included within the Biodiversity Mitigation Strategy (Document 7.7).</p>
NWCP FCA Vol 2 – Substations FCA (revised draft)		

Table 3.8 Comments raised by NRW in response to the revised draft FCA Volumes 1 to 4, March 2018

Paragraph	NRW Comment	Response
21	<i>NRW has no detailed comments to make regarding this FCA. We would however question as to why the whole route plans are included since this FCA relates to the Pentir substation alone.</i>	Pentir substation is shown within those plans: references have been added to the relevant sheet (Sheet 6 of Documents 5.12.1.10, 5.12.1.11 and 5.12.1.12).
NWCP FCA Vol 3 – Cable Sealing End Compounds FCA (revised draft)		
23	<i>NRW is generally satisfied with this assessment but would request clarification regarding Table 1.1 which shows the estimated dewatering rates at the tunnel head houses. Should the dewatering rate during operation not be 0.02l/s for Ty Fodol?</i>	The dewatering rates have been updated and unit versions corrected. The rates are presented in Document 5.4 and Document 5.12.2.3A .
NWCP FCA Vol 4 – Overhead Lines Route FCA (revised draft)		
	<i>NRW is satisfied with the contents of this document.</i>	No response required.

Table 3.9 Comments raised by Gwynedd Council in response to the revised draft FCA Volumes 1 to 4, June 2018

Paragraph	Gwynedd comment	Response
NWCP FCA Vol 2 –Substations FCA (revised draft)		

Table 3.9 Comments raised by Gwynedd Council in response to the revised draft FCA Volumes 1 to 4, June 2018

Paragraph	Gwynedd comment	Response
	<i>Sections 4.3.7 to 4.3.7 should acknowledge the potential for downstream third-parties to be affected as a result of uncontrolled discharge of site drainage to the Nant y Gareth / Afon Heulyn and their tributaries. Both watercourses have known historic flooding issues, with property flooding associated with both.</i>	All discharges from the site during both construction and operations phases would be limited to greenfield runoff rates through the provision of appropriate site drainage incorporating runoff attenuation, as set out in para. 4.3.9 of Volume 2 of the FCA (Document 5.12.2.2).
	<i>Table 5.1 and section 6.2.1 – the Council is in agreement that an appropriate drainage strategy is required for the extension works, and would suggest that an ‘outline’ drainage design should be produced prior to DCO submission in order to give comfort that an adequate solution, compatible with SuDS principles, can be implemented. Note that, in future, impermeable areas greater than 100m2 are likely to require the consent of the SuDS Approval Board (SAB).</i>	Although an outline drainage strategy has not been prepared for Pentir substation, the principles which the drainage design should adhere to are set out in the CEMP (Document 7.4 , measures WE51-59, and WE510-511), which is secured through Requirement 6. Furthermore, the preparation of a Drainage Management Plan is secured via Requirement 7. The DMP would include full details of the proposed drainage design for Pentir substation, and would be subject to the approval of Gwynedd Council in their capacity as LLFA prior to commencement of works.
	<i>Section 6.2.2 – Granular fill: the drainage design will need to consider possible compaction of fill and the generation of “fines” which may impede drainage and increase runoff rates.</i>	Specific reference to granular fill has been removed, as it is not explicitly incorporated in the development description provided in Document 5.3 .

Table 3.9 Comments raised by Gwynedd Council in response to the revised draft FCA Volumes 1 to 4, June 2018

Paragraph	Gwynedd comment	Response
NWCP FCA Vol 3 – Cable Sealing End Compounds FCA (revised draft)		
	<i>Section 1.3.5 – the Council notes the low discharge rates from tunnel dewatering (0.1 l/s during construction; 0.04 l/s during operation). It is also noted that, after passing through a treatment works, these discharges will be routed to the site's drainage. Given the low discharge rates, the Council is satisfied that these discharges alone would not pose any measurable increase in flood risk to the Nant y Garth or its tributaries.</i>	The final assessment also considers the option of drill and blast being used for tunnel construction, which would result in higher rates of dewatering compared to TBM (as set out in Chapter 4 of the ES, Document 5.4). Discharge of dewatering arisings to the Nant y Garth would be by permit, and the CEMP (Document 7.4) includes a requirement for dewatering discharges to cease during periods in which flood alerts/warnings are in place, mitigating potential increases to flood risk downstream.
Overarching comments		
	<i>The comments raised by the Council at s42 consultation have been addressed, however the Council requests acknowledgement of the potential for downstream third parties to be affected by flooding due to the proposed works at Pentir Substation, the CSECs and THHs.</i>	The potential for flood risk to third parties as a result of uncontrolled runoff from the Pentir and Ty Fodol sites is acknowledged in Vols. 2 and 3 of the FCA (Document 5.12.2.2 , para. 4.3.8 for Pentir; Document 5.12.2.3 , paras. 4.2.1 and 4.2.2 for Ty Fodol).

Table 3.9 Comments raised by Gwynedd Council in response to the revised draft FCA Volumes 1 to 4, June 2018

Paragraph	Gwynedd comment	Response
	<i>The Council requests that detailed drainage designs for all watercourse crossings is produced, and that a drainage strategy is shared with the Council prior to DCO submission.</i>	<p>An outline drainage strategy has been produced for the Ty Fodol THH/CSEC (Document 5.12.2.3B). Detailed drainage designs will be produced for both the Pentir substation extension and the Ty Fodol THH/CSEC as part the the Drainage Management Plan, which is secured via Requirement 7 of the draft DCO (Document 2.1). Those sections of the DMP relating to Pentir and Ty Fodol would be subject to the approval of Gwynedd Council in their capacity as LLFA prior to commencement of works. Drainage designs would adhere to the principles set out in the CEMP (Document 7.4, measures WE51-59, and WE510-511), which is secured through Requirement 6 of the draft DCO (Document 2.1).</p> <p>Detailed designs for watercourse crossings would be submitted in support of applications for relevant Ordinary Watercourse Consents or Flood Risk Activities Permits. These designs would be in accordance with the relevant design principles set out in the CEMP (Document 7.4, FM14).</p>

3.5 SCOPE OF FCA

- 3.5.1 This section sets out the scope of work for the FCA taking into account the planning policy context set out in sections 2.1, 2.2 and 2.3 and the comments received through the consultation process as summarised above.
- 3.5.2 This FCA considers flood risk associated with the construction, operation and maintenance of the Proposed Development. Decommissioning is not considered, as set out above. Flood risk is assessed to the development itself (infrastructure and personnel). In addition, any changes to flood risk to third party receptors arising from the Proposed Development are assessed.
- 3.5.3 The epochs used to assess the impacts of climate change on flood risk are the '2020s' for construction and the '2080s' for operation and maintenance, as discussed in section 2.5.
- 3.5.4 The FCA covers all activities within the Order Limits (see Chapter 3 Description of the Proposed Development (**Document 5.3**) and section 1.4 of this Report). While the locations of access tracks and working areas for the OHL are shown on the Construction Plans (included as Figure 4.1 of Chapter 4 Construction, Operation, Maintenance and Decommissioning of the Proposed Development (**Document 5.4.1.1**), it is noted that they are not fixed and there is flexibility to move within the Order Limits, post grant of a DCO, subject to the Schedule of Environmental Commitments (**Document 7.4.2.1**).
- 3.5.5 In addition, the permanent infrastructure elements of the OHL are also not fixed and could potentially move within the limits of deviation (LOD), as set out in Chapter 3 Description of the Proposed Development (**Document 5.3**) and Chapter 6 EIA Methodology and Basis of Assessment (**Document 5.6**).
- 3.5.6 Where applicable, the Study Area (see section 1.4) extends beyond the Order Limits in order to ensure all risks to third party off-site receptors are identified and assessed, as discussed in more detail in section 4.3 (Flood Hazard Identification) and section 4.4 (Flood Risk Receptor Identification).
- 3.5.7 Outline drainage strategies have been provided for the Braint and Tŷ Fodol construction compounds and for the operational Braint and Tŷ Fodol THH/CSEC sites. These show that flood risk due to surface water generated on site would be adequately mitigated, as required by EN-1 and TAN15. In accordance with measure WE59 of the CEMP (**Document 7.4**). Drainage Management Plans (DMP), including detailed drainage strategies and design details would be prepared following and would be submitted to the appropriate authorities (NRW and/or LLFAs) for prior approval and permitting/consenting as required.

- 3.5.8 In accordance with measure FM14 of the CEMP (**Document 7.4**) measures would be in place (see section 5.3) stipulating requirements for the design of any culverts and bridges required for the construction of the Proposed Development. Detailed calculations for sizing would be prepared and would be submitted to the appropriate authorities (NRW and/or LLFAs) for prior approval and permitting/consenting as required.
- 3.5.9 Due to the large number of individual receptors within the Order Limits, often potentially affected by the same flood hazard(s) and with the same flood risk vulnerabilities, multiple receptors were amalgamated into four groups for assessment purposes and discussed in terms of the hazards that may impact that particular receptor group. Individual flood hazards are however identified, as are all key individual third party receptors. This approach allows for appropriate control and management measures (see section 5.3) to be specified and implemented at specific locations if required.
- 3.5.10 In some cases additional assessment has been needed to quantify the risk. For example, following discussions with NRW, a site-specific modelling study was undertaken for the Braint THH/CSEC site in order to provide greater certainty regarding the assessment of fluvial flood risk and specification of appropriate mitigation measures at that site.
- 3.5.11 With due consideration to the temporary nature of much of the Proposed Development, which would only be required during construction of sections of new overhead line, the approach taken in this FCA is considered to be proportionate to the risk and appropriate to the scale, nature and location of the Proposed Development.
- 3.5.12 Relevant guidance for the assessment of the potential impacts of climate change on flood risk over the lifetime of the Proposed Development was reviewed in section 2.5. In summary, river flow allowances are as stated in Welsh Government 2016 (Ref 12.1.17) and rainfall allowances are as stated in Welsh Government 2011 (Ref 12.1.13). No H++ analyses (fluvial, tidal or rainfall) has been considered in this FCA.

3.6 ITEMS NOT CONSIDERED IN THIS FCA

Wylfa Substation

- 3.6.1 The proposed works at Wylfa Substation comprise an upgrade of existing equipment, with all works taking place within the curtilage of the existing substation. As a result, no extra land take would be required and no new areas of hardstanding would be created. The plan of the substation is shown in DCO Drawing **DCO_DE/PS/01** (Sheet 2 of 10).

- 3.6.2 As the works at Wylfa would not require any extension of the footprint of the existing development and because it is located in NRW Flood Zone 1 (See Figure 12.2, **Document 5.12.1.2**) an FCA is not required. Wylfa Substation is therefore not considered further within this FCA.

Flooding from the sea

- 3.6.3 Flooding from the sea, as a flood hazard, has been scoped out of this assessment, as agreed with NRW (see Table 3.4) on the grounds that the land levels within the Order Limits are well above any tidal influence. At Wylfa, where the Order Limits come close to the shore, the lowest land level within the Order Limits is 14.6 mAOD. The Braint and Tŷ Fodol THH/CSECs are both at higher ground elevations, the Braint THH/CSEC site is at a level of over 30 mAOD and at the Tŷ Fodol THH/CSEC site the level is over 80 mAOD.
- 3.6.4 By comparison, based on the coastal flood boundary conditions for UK Mainland and Islands (2011) (Ref 12.1.15) the 0.01% AEP sea-level at Holyhead is 4.22 mAOD. Even with the application of the H++ scenario for extreme sea level rise through to 2115 (+2.4m according to allowances given in Table 5, Ref 12.1.18) the resulting sea level of 6.62 mAOD would pose no risk to the Proposed Development and would not result in increased flooding elsewhere as a result of the Proposed Development.
- 3.6.5 The lowest point along the whole of the Order Limits is at an elevation of 7.5 mAOD, where they cross the Afon Ceint, to the east of Llangefnî (NGR 248590 374515). Although this location is over 10 km from the coast at Maltreath Sands, the intervening low-lying area of the Maltreath Marshes could possibly provide a pathway for tidal flooding. However, using the same rationale as in para 3.6.4 (i.e. 0.01%AEP plus H++ event), this low point of the Order Limits is nearly a metre higher than the most extreme sea level of 6.62 mAOD. It has been concluded that flooding from the sea poses no hazard to the Proposed Development over its proposed lifetime, even at the lowest elevation within the Order Limits.

4 Methodology

4.1 INTRODUCTION

4.1.1 This section covers the following FCA elements:

- Design standards and climate change allowances;
- Flood risk hazard identification;
- Receptor identification and proposed use of receptor groups;
- Assessment methodology.

4.2 DESIGN STANDARDS AND CLIMATE CHANGE ALLOWANCES

4.2.1 Based on policy and guidance relating to flood risk (see section 2.1, 2.2 and 2.3) and climate change (see section 2.5), a summary of the design standards and climate change allowances applicable to the various elements of the Proposed Development is as follows:

- For the construction period, temporary watercourse crossing designs would be based on being able to safely convey the 1% AEP river flow event plus 15% which represents the change factor allowance for up to the 2020s epoch.
- For construction drainage design, attenuation storage would be designed to safely attenuate runoff from the 1% AEP critical duration rainfall event, including a 5% allowance for climate change which represents the change factor allowance for the 2020s epoch. Discharge from construction drainage systems would be limited to the Greenfield runoff rate (i.e. QBAR).
- While the fluvial design standard for operational infrastructure would ordinarily be the 0.1% AEP +30% (representing the change factor for the 2080s epoch), for the specific case of the Braint THH/CSEC (the only operational infrastructure element potentially at risk of fluvial; flooding), an assessment has been made of the 0.1% AEP river flow event plus 75% which represents the upper end allowance for up to the 2080s epoch, as requested by NRW.

- For the Pentir Substation and the Braint and Tŷ Fodol THH/CSECs operational drainage designs, no flooding should occur for the 3.33% AEP rainfall event and no flooding of operational areas of the site should occur for the 1% AEP event. For both scenarios, the drainage design should ensure that excess runoff arising from a surcharged drainage system should not impact third party land. Discharge from construction drainage systems would be limited to the Greenfield runoff rate.
- For the Pentir Substation and the Braint and Tŷ Fodol THH/CSECs operational drainage designs, rainfall would be increased by 20% which represents the change factor allowance for the 2080s epoch. Furthermore, an additional assessment would be made using the upper end (+40%) rainfall allowance to determine whether further climate change adaptation measures may require consideration over the lifetime of the Proposed Development. However, designs would be based on the change factor (+20%) allowance.
- No H++ climate change scenarios (fluvial or tidal) have been considered in this FCA.

4.3 FLOOD HAZARD IDENTIFICATION

4.3.1 Flood hazards fall into two main categories:

External hazards include baseline flood hazards that may potentially impact Proposed Development infrastructure receptors, either during construction or when operational, together with human receptors in the form of construction workers, site operatives and visitors.

Internal hazards arise from construction and operational activities that may impact the same receptors as above, but also potentially impact third party receptors such as the public, properties, third party infrastructure, agricultural land and nature conservation areas.

4.3.2 External flood hazards include:

- Fluvial flooding;
- Flooding from the sea;
- Surface water flooding (also known as pluvial flooding);
- Flooding from sewers;
- Groundwater flooding; and

- Flooding from artificial sources such as reservoirs and canals.

4.3.3 Internal flood hazards include:

- Flooding from surface water runoff arising from the implementation of inadequately specified drainage systems;
- Fluvial flooding affecting Proposed Development elements arising from loss of floodplain storage due to Proposed Development elements being constructed in floodplains; and
- Fluvial flooding arising from flow conveyance being impeded, e.g. due to raised access tracks obstructing overland flow paths or due to inappropriately sized culverts on access track watercourse crossings.

4.3.4 External flood hazards were identified by the following methods:

- A comprehensive review of the data and information listed in section 2.6.
- A comprehensive walkover throughout the Order Limits was undertaken by two suitably qualified and experienced personnel (SQEP) in March 2017.
- Through engagement with NRW and the LLFAs as set out in a series of consultations (see section 3 of this FCA volume).

4.3.5 Flood hazard identification initially involved review of the applicable Anglesey and Gwynedd Joint Level 1 Strategic Flood Consequence Assessment (SFCA) (Ref 12.1.8), the IACC and Gwynedd Council Flood Risk Management Strategies (Ref 12.1.24 and 12.1.25), the NRW West Wales River Basin Management Plan (Ref 12.1.9), the West of Wales Shoreline Management Plan 2 (Ref 12.1.10) and sewer flooding records from IACC. Gwynedd Council confirmed they held no sewer flooding records for the Tŷ Fodol to Pentir area (see **Annex 5.12.2.1A**).

4.3.6 The geographic scope of the flood hazard search was based on the Order Limits, plus an additional 250m buffer. Moreover, where it was deemed feasible that certain internal hazards could propagate in excess of 250 m down or upstream, the search area was extended to 1 km beyond the Order Limits.

4.3.7 A detailed assessment of flood hazards was then undertaken through a process of GIS analyses, based on extensive datasets covering DAM and NRW fluvial and surface water flood mapping, OS MasterMap water network

layers and property and infrastructure layers, BGS groundwater flood susceptibility mapping, BGS superficial and bedrock geology layers. These data layers were then combined with plans of proposed permanent and temporary infrastructure.

4.3.8 Further to the detailed GIS analysis, a walkover by two experienced hydrologists was undertaken over three days in March 2017. The walkover served to both verify and dismiss previously identified flood hazards and receptors and also identified hazards and receptors not identified during the desk-based processes.

4.3.9 All external hazards applicable to the respective elements of the Proposed Development are tabulated in FCA Volumes 2, 3 and 4 (**Document 5.12.2.2, 5.12.2.3 and 5.12.2.4**). Potential external flood hazards included:

- Fluvial flooding;
- Surface water flooding;
- Groundwater flooding; and
- Artificial flood hazards including reservoirs, canals and sewers.

4.3.10 All internal hazards applicable to the respective elements of the Proposed Development are tabulated in section 3 of FCA Volumes 2, 3 and 4 (**Document 5.12.2.2, 5.12.2.3 and 5.12.2.4**). Potential internal flood hazards included:

- Flood storage displacement;
- Fluvial flow obstruction;
- Surface water flow obstruction; and
- Surface water flooding arising from inadequate surface water management and drainage.

4.3.11 Where flood hazards are discussed in subsequent FCA volumes in terms of their 'Hazard Rating', Hazard Ratings are given as presented in Defra FD2320/2321 (Ref 12.1.30 and 12.1.31) as reproduced in Table 4.1. For on-site impacts affecting the construction phase, it is only the 'Danger for Most' and 'Danger for all' categories that are applicable as construction personnel would not include children, or the elderly or the infirm.

Table 4.1: Reproduction of Table 4 from Defra FD2321 (2008) [Ref: 12.1.31]

Flood Hazard Rating (HR)	Colour Code	Hazard to People Classification
Less than 0.75		Very low hazard – Caution
0.75 to 1.25		Danger for some – includes children, the elderly and the infirm
1.25 to 2.0		Danger for most – includes the general public
More than 2.0		Danger for all – includes the emergency services

4.4 RECEPTORS

Receptor Vulnerability

- 4.4.1 Receptor vulnerability categories are based on the development categories specified in TAN15 Section 5, Figure 2. For the purposes of this assessment, to allow compatibility with NPS EN-1, one further category 'Essential Energy Infrastructure' has been added. The complete list is given in Table 4.2.

Table 4.2: Development Vulnerability Categories

TAN15 Development Category	Type
Emergency Services	Hospitals, ambulance stations, fire stations, police stations, coastguard stations, command centres, emergency depots and buildings used to provide emergency shelter in time of flood.
Essential Energy Infrastructure	The Proposed Development, including the Overhead Lines and tunnelled sections and all works associated with them including cable sealing end compounds, tunnelling works, construction access tracks, working areas and watercourse crossings.
Highly Vulnerable Development	All residential premises (including hotels and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development

Table 4.2: Development Vulnerability Categories	
TAN15 Development Category	Type
	(e.g. power stations, chemical plants, incinerators), and waste disposal sites
Less Vulnerable Development	General industrial, employment, commercial and retail development, transport and utilities infrastructure, car parks, mineral extraction sites and associated minerals processing facilities, excluding waste disposal sites

Third Party Receptor Identification

- 4.4.2 Third Party Receptor identification has been based on a GIS analysis of Ordnance Survey (OS) MasterMap properties and infrastructure in order to identify most individual properties, and significant transport and utilities infrastructure (i.e. third party receptors). The MasterMap data was used in conjunction with the fluvial and surface water flood mapping, as described in section 4.4.
- 4.4.3 LiDAR topography data was used in order to determine whether potential receptors were located upstream, upslope, downstream and downslope of the Order Limits. For example, where surface water arising from the Proposed Development was identified as an internal hazard, receptors located upslope of this hazard could be ruled out.
- 4.4.4 A buffer zone of 250 m was applied to the Order Limits. However, it was acknowledged that watercourses may provide hazard pathways to receptors in excess of 250 m upstream, downstream and downslope of the nearest part of the Order Limits, in which cases the search was discretionally extended to 1 km beyond the Order Limits.

Receptor Groups

- 4.4.5 Due to the large number of individual receptors, often potentially affected by the same flood hazard(s) and with the same flood risk vulnerabilities, multiple receptors were amalgamated into four groups for assessment purposes.

- 4.4.6 The four receptor groups (RGs) are described in Table 4.3 below, together with their flood risk vulnerability, as defined in Table 4.2.

Table 4.3 Summary of receptor groups					
Group	Type	Description	Flood risk vulnerability	Duration	Comments
RG1	Construction phase activities and temporary infrastructure	Personnel, plant and temporary infrastructure associated with all construction and dismantling phase activities.	Essential Energy Infrastructure ¹ & Less Vulnerable ²	Temporary	These activities and associated infrastructure would occur during the construction phases only.
RG2	Operational phase infrastructure	Braint and Tŷ Fodol THH/CSECs, Pentir substation extension, and associated permanent access roads.	Essential Energy Infrastructure ¹	Permanent	Permanent infrastructure with a higher vulnerability to flooding requiring robust design measures to account for climate change over the development's lifetime.
RG3	Operational phase maintenance activities and associated temporary infrastructure	Personnel, plant and temporary infrastructure associated with inspection and periodic maintenance activities.	Essential Energy Infrastructure ¹ & Less Vulnerable ²	Temporary	Maintenance activities to be carried out for short periods throughout the operational phase. E.g. walkovers for inspection of infrastructure in FZ3 is Less Vulnerable. Temporary infrastructure for repair & maintenance of permanent infrastructure classed as Essential Infrastructure.

Table 4.3 Summary of receptor groups					
Group	Type	Description	Flood risk vulnerability	Duration	Comments
RG4	Third party receptors	Third-party people, property and infrastructure within and outside of the Order Limits.	Variable – see detailed assessment in FCA Volumes 2, 3 and 4 and Chapter 12 (Document 5.12, 5.12.2.2, 5.12.2.3 and 5.12.2.4).	Temporary / Permanent	Planning policy dictates that a project cannot increase flood risk to third parties or in watercourses downstream. However, <i>“Exceptionally, where an increase in flood risk elsewhere cannot be avoided or wholly mitigated, PINS may grant consent if it is satisfied that the increase in present and future flood risk can be mitigated to an acceptable level”</i> , as set out in NPS-EN1 (Ref 12.2.2)
<p>Table notes:</p> <p>1 ‘Essential Infrastructure’ covers all works required as part of the Proposed Development, including the permanent works, construction access tracks, working areas and watercourse crossings.</p> <p>2 ‘Less Vulnerable’ uses include the offices and welfare facilities located within the temporary construction laydown areas in NRW Flood Zone 1 / DAM Zone A</p>					

4.5 FLOOD RISK ASSESSMENT

- 4.5.1 Once the detailed flood hazard and receptor identification processes were complete, the outputs were synthesised in a flood risk assessment table, an example of which is provided as Table 4.4 (extract of Table 5.1 from FCA Volume 4 (**Document 5.12.2.4**)). An explanation of some of the table headers is provided in the paragraphs that follow Table 4.4.

Table 4.4: Flood risk assessment summary

Flood Hazard	Location	Summary Of Risk	Receptor Group(s) Affected ¹	Control and Management Measures Prescribed ²	Exception Test Required	Further Assessment Required	Comment
Fluvial (External)	Multiple locations within the Order Limits	Fluvial flooding of areas of the Order Limits intersected by Main Rivers and Ordinary Watercourses	RG1	FM11 FM14	YES	NO	Exception test required to be passed due to RG1 and RG2 being classed as Essential Energy infrastructure or Less Vulnerable and located in Flood Zone 3/DAM Zone C2. The Exception Test is provided in FCA Volume 4, section 7.3 (Document 5.12.2.4). During the evolution of the design the Penmynydd Road Construction Compound was relocated out of FZ3. Given that the construction activities in flood zones would be unavoidable, FM11 provides appropriate mitigation.
			RG2				
			RG3				
Surface Water (External)	Multiple locations along the route within the Order Limits	Surface water flooding of areas of land within the Order Limits, including adjacent to surface water	RG1	FM11	NO	NO	The production of a robust Flood Management Plan (FMP) as part of FM11 is required as mitigation.
			RG3		NO	NO	

		flowpaths and in areas of ponding.					
Groundwater	Throughout the route within the Order Limits		RG1	WE41-43 WE51-59 WE510 WE511 FM11	NO	NO	Multiple control and management measures are required including specification of appropriate drainage strategies and DMP (FM51-59 and WE510-511), dewatering plans (WE41-43) and provision of robust FMPs (FM11).
			RG3				
Notes: 1. Receptor groups are shown in Table 4.3 2. Control and management measures are shown in Table 5.1							

- 4.5.2 **Mitigation** - On the basis of the flood hazard and corresponding receptor group, appropriate mitigation is prescribed in accordance with the control and management measures. In the case of third party receptors, the outcome of the flood risk assessment table was cross checked with the detailed information presented in the appendices to ensure that each prescribed mitigation measure is indeed appropriate on a case by case basis.
- 4.5.3 **Exception Test** - If the Exception Test was required to be passed then a 'Yes' was entered in this field. Since the application of the Exception Test is limited to Essential Infrastructure elements at risk of flooding from either rivers, the sea or from externally derived surface water hazards, this field was a 'No' for the majority of the entries.
- 4.5.4 **Further Assessment** - On the basis that generic mitigation was deemed to be insufficient to fully manage the identified flood risks and/or that the Exception Test was required to be satisfied, this would be flagged up as a 'Yes' in this field, indicating that a more detailed assessment would follow. Where a 'No' was entered for both the 'Exception Test' and the 'Further Assessment Required', the assessment was deemed to be concluded on the premise that the specified control and management measures would be implemented and would be sufficient to provide any mitigation required.
- 4.5.5 If the 'Exception Test' field was a 'Yes' then the Exception Test is documented in a subsequent section of the same FCA Volume.
- 4.5.6 Similarly, if the 'Further Assessment Required' was a 'Yes' then that assessment is provided in the respective FCA Volume, including supporting appendices as required. For example, this was the case for the Braint THH/CSEC (see FCA Volume 3 (**Document 5.12.2.3**) for which fluvial flood risk was identified but for which no control and management measures were applicable, thus necessitating a further assessment in the form of a hydrodynamic modelling study, a summary of which is provided in FCA Volume 4 (**Document 5.12.2.4**) and a supporting modelling technical Annex (**5.12.2.3A**).

4.6 PLANNING JUSTIFICATION

- 4.6.1 NPS EN-1 is the primary policy document for a DCO application and application of the Sequential and Exception Tests are requirements of that policy document. While NPS EN-1 refers to the use of TAN15 in Wales, Section 2.2 highlights that TAN15 presents no guidance on applying the Sequential Test. Moreover, while the TAN15 Justification Test is similar to the Exception Test, there are differences, as outlined in Section 2.2. The

Exception Test has therefore been adopted as the process through which the location of development in flood risk areas is justified.

4.6.2 Pursuant to NPS EN-1 para 5.7.24, essential energy infrastructure is permissible in flood risk areas provided it is designed to remain operational when floods occur and subject to conditions, notably that any energy projects proposed in Flood Zone 3 (in England) or DAM Zone C (in Wales) should only be permitted if the development will not result in a net loss of floodplain storage and will not impede water flows.

4.6.3 In order to clearly apply the guidance set out in NPS EN-1, this FCA uses a form of the compatibility matrix, including vulnerability classification, that is based on TAN15 (Ref 12.1.4), as illustrated in Table 4.5, which provides the basis for determining whether the Exception Test is required.

Table 4.5 Flood risk compatibility table			
Development type	Flood risk vulnerability classification	DAM Flood Zone(s) in which development type occurs	Flood risk vulnerability and flood zone compatibility
Construction Phase			
Construction support areas (offices, welfare facilities)	Less vulnerable development	A, B	Development is appropriate
		C1, C2	Exception Test required
Construction and dismantling activity areas (temporary access tracks, temporary laydown areas and working areas) Watercourse crossing points	Essential Energy Infrastructure	A, B	Development is appropriate
		C1, C2	Exception Test required
Operational Phase			
Pylons THH/CSEC	Essential Energy	A, B	Development is appropriate

Table 4.5 Flood risk compatibility table

Development type	Flood risk vulnerability classification	DAM Flood Zone(s) in which development type occurs	Flood risk vulnerability and flood zone compatibility
Pentir Substation extension	Infrastructure	C1, C2	Exception Test required

4.6.4 The requirements for the Sequential and Exception Tests are set out in NPS-EN1 (see section 2.1). As discussed in section 2.2, the Exception Test, as set out in NPS-EN1 differs from the TAN15 equivalent Justification Test. Therefore, the NPS-EN1 Exception Test has been used throughout this FCA where applicable.

5 Mitigation

5.1 INTRODUCTION

- 5.1.1 This section sets out the approach to specifying flood mitigation. Flood avoidance is discussed in section 5.2. The use of control and management measures is described in section 5.3, including the details of the individual control and management measures in Table 5.1. The key documents and plans that would be required are discussed in the following sections such as the CEMP (**Document 7.4**) in section 5.4, the Flood Management Plan (FMP) set out in section 5.5, and Drainage Management Plan set out in section 5.5.

5.2 FLOOD RISK AVOIDANCE

- 5.2.1 As a general principle the design and layout of the Proposed Development has taken a sequential approach and sought to avoid areas of flood risk when siting key components.
- 5.2.2 The siting has sought opportunities to locate the THH/CSECs, and other flood vulnerable aspects of the Proposed Development, in areas with the lowest possible flood risk. However, the location of new infrastructure at Pentir Substation (extension to an existing substation) is constrained by the existing facilities. Consequently, a further design principle to raise flood sensitive infrastructure above an appropriate level has been incorporated in the design (see Section 2.3).
- 5.2.3 The proposals have also sought opportunities to use existing watercourse crossings where available and to minimise the number of temporary watercourse crossings required for access. However, the majority of temporary watercourse crossings required for the Proposed Development would be new.

5.3 CONTROL AND MANAGEMENT MEASURES

- 5.3.1 As highlighted in section 3.5, this FCA is based on the concept of applying a set of generic control and management measures. The subsequent FCA volumes all include a common Table 5.1 which combines the information from the preceding flood hazard identification (section 3) and flood risk

assessment (section 4) sections and then prescribes what measures are required to mitigate the risk.

- 5.3.2 As shown in section 5.3, control and management measures are included in the CEMP (**Document 7.4**) and a summary of those measures pertinent to the FCA are provided in Table 5.1.

Table 5.1: Control & Management Measures		
CEMP Code	Description	Comment
FM11	<p>Flood Management Plan:</p> <p>A detailed Flood Management Plan (FMP) will be prepared and submitted to NRW and LLFAs for approval post grant of the DCO. The following measures will be implemented.</p> <ul style="list-style-type: none"> FMPs would apply equally to all sources of flooding, including main river and ordinary watercourses, surface water (external) and groundwater, together with internal sources of flood risk as appropriate. The FMP would cover both construction and operational/maintenance phases as different receptor groups would be affected for each phase. The FMP would, as a minimum include details as to how frequently weather and stream flow observations would be made, how forecasts, alerts and actions would be disseminated, signage, roles and responsibilities, emergency response procedures, including detailed evacuation plan and procedures for making safe plant and equipment. Procedures would be presented to facilitate the periodic robust assessment of any potential floodplain and surface water flow obstructions, ensuring that activities do not coincide with those areas of mapped fluvial and surface water flood risk. 	<p>To ensure the safety of site operatives who may be working in the floodplain, or may need to cross it for access/egress within the Order Limits.</p> <p>A new FMP would need to be prepared for the decommissioning phase based on up to date information at the time.</p>
FM12	<p>Permits and consents:</p> <ul style="list-style-type: none"> No works would be undertaken within 3 m of any watercourse (other than for watercourse 	<p>To minimise the risk of any impacts to</p>

Table 5.1: Control & Management Measures		
CEMP Code	Description	Comment
	<p>crossings and drainage mitigation).</p> <ul style="list-style-type: none"> All works within 8m of non-tidal Main River and 16 m of tidal Main River would be subject to a Flood Risk Activity Permit (FRAP) from NRW. Any works within 8m of an Ordinary Watercourse would be subject to an Ordinary Watercourse Consent (OWC) from the relevant LLFA (either IACC or Gwynedd Council). 	watercourses, including flood flow conveyance.
FM13	<p>Structures in floodplains:</p> <ul style="list-style-type: none"> As far as possible, no raised structures (such as access tracks, working areas and associated topsoil stockpiles) would be located within the floodplain (Flood Zone C2). Approaches to bridges and culverts in Flood Zone C2 would minimise ramping up to the bridge deck so as not to impede flood flow conveyance. Access tracks that are shown to intersect areas of surface water flooding (exc. those coincident with watercourse crossings) should not provide a topographic barrier to the flow path. Temporary trackway (i.e. interlocking panels) at existing ground surface levels would be used in areas of Flood Zone C2 wherever practicable. Stockpiles would be present for the shortest practicable timeframe, with stockpiled material being reinstated as the construction works progress. 	To minimise the potential for loss of flood storage and floodplain compartmentalisation.

Table 5.1: Control & Management Measures		
CEMP Code	Description	Comment
	<ul style="list-style-type: none"> Soil stockpiles would be located in DAM Zone A to minimise reductions in floodplain storage/conveyance, and in areas that don not coincide with mapped areas of surface water flood risk. Sufficient gaps would be left in stockpiles so as to not impede flood flow pathways. Stockpile gaps would be located at topographic low points to preserve existing flow paths. Where stockpiles are placed on either side of access tracks, the gaps should coincide. 	
FM14	<p>Design of watercourse crossings:</p> <ul style="list-style-type: none"> All temporary watercourse crossings would be designed to safely convey the 1% AEP event plus a 15% allowance for climate change. Culverts would be designed with a pipe/opening of an appropriate size for the watercourse in addition to the minimum size requirement based on the design flow criteria. Culverts would be installed with the invert set below the natural bed level in order for a semi natural bed to establish within the culvert. Culverts would be installed in a dry channel isolated from upstream and downstream channel flow. These activities would need to take place during periods of normal to low flow conditions to avoid conveyance-related flood risk effects. Flow would be diverted around the culvert working area by overpumping. Pumped water high in 	To minimise any impacts on watercourse flow conveyance

Table 5.1: Control & Management Measures		
CEMP Code	Description	Comment
	<p>suspended solids would be pumped out into a sediment trap, before being discharged back into the watercourse downstream of the working area.</p> <ul style="list-style-type: none"> Operations and maintenance (O&M) plans would be prepared covering, as a minimum, details as to how blockages would be prevented/minimised/detected/removed, periodic inspection schedules, roles and responsibilities, and details of associated FRAP or OWC requirements. Sufficient information will be provided to NRW and LLFAs to enable appropriate screening and permitting decisions to be made for FRAP and OWC purposes. <p>Following construction, temporary watercourse crossings will be removed and bed and bank material will be reinstated in the same general profile as the pre-installation state. Bed and bank profiles will be recreated with appropriate measures to ensure stability that do not involve hard engineering (unless such stability measures were in place before the watercourse crossing works are carried out).</p>	
WE51 WE52 WE53 WE54 WE55 WE56 WE57 WE58 WE59 WE510	<p>Provision of robust drainage strategies:</p> <p>A Drainage Management Plan (DMP) will be prepared prior to the commencement of construction activities. The CEMP (Document 7.4) presents a detailed account of those drainage management measures and the following list is not an exhaustive replication of those measures, but a summary of those most pertinent to the FCA.</p> <ul style="list-style-type: none"> Detailed drainage strategies would be prepared for the construction compounds at Penmynydd Road and Pentir, for transient works along the overhead lines and for the construction and 	To allow for surface water management and water quality.

Table 5.1: Control & Management Measures		
CEMP Code	Description	Comment
WE511	<p>operation of the Braint and Tŷ Fodol THH/CSEC sites. Detailed drainage strategies would build on the basis of those outline strategies presented as annexes to the FCA. The detailed drainage strategies for construction would be incorporated within the DMP.</p> <ul style="list-style-type: none"> • Drainage schemes would utilise SuDS principles for any areas requiring new drainage systems. • Runoff from construction areas (including for example access tracks, works areas, soil stockpiles, underground sections) would be directed to adjacent vegetated verges to allow natural infiltration rather than collection and concentration. Temporary surface water drainage design at the construction compounds would follow SuDS principles as per the DMPs. • SuDS measures would be implemented at construction compounds, either through use of soakaways, infiltration trenches or attenuation storage. The type of measure would be commensurate with local conditions, and the scale/duration of the construction compound, the detail of which would be specified for individual locations in the DMP. • Temporary access tracks would generally be as close to ground level as possible. Should surface water runoff pathways be potentially disrupted, cross drains would be provided. 	
WE41 WE42 WE43	<p>Management of dewatering arisings:</p> <p>The CEMP presents a detailed account of dewatering arisings management measures and the following list is not an exhaustive replication of those measures, but a summary of those most pertinent</p>	To manage groundwater flood risk and to ensure no negative impacts on

Table 5.1: Control & Management Measures		
CEMP Code	Description	Comment
	<p>to the FCA:</p> <ul style="list-style-type: none"> Dewatering arisings from the tunnelling works would be to a separate designated pond with a control valve, from where the water quality could be tested and treated if appropriate. If the water quality is acceptable within limits stipulated as part of the Environmental Permit then it would be discharged into the water management systems for the Braint and Tŷ Fodol construction compounds. Discharge of dewatering arisings would cease if a Flood Alert or Flood Warning were to be issued by NRW for an area downstream. The receipt of the Flood Alert/Warning and actions to be taken would be detailed in the Flood Management Plan (FM11). Dewatering arisings from other excavations would be discharged to adjacent grassed/vegetated agricultural land, away from watercourses as far as possible. If the volume results in a surface water runoff hazard then pumping would be to a formal drainage area. Where discharges to a watercourse are required, Environmental Permits would need to be obtained from NRW. 	<p>flooding downstream.</p> <p>To ensure there is no increase in flood risk due to water discharges.</p>

5.4 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

- 5.4.1 When a control and management measure is included in Table 5.1 of the subsequent FCA Volumes, those control and management measures have been included within the CEMP which forms part of the DCO submission (**Document 7.4**) and is secured via Requirement 6 of the draft DCO (**Document 2.1**). .
- 5.4.2 The CEMP requires a Drainage Management Plan (DMP) and a Flood Management Plan (FMP) to be produced. These documents would then be subject to approval by NRW and/or the LLFA prior to commencement of works. In addition, all necessary consents would need to be obtained from the appropriate regulatory authority prior to commencement of works, including FRAPs from NRW for works in or near main rivers, OWCs from the LLFAs for works affecting ordinary watercourses, and discharge permits from NRW for discharges to all controlled waters.

5.5 FLOOD MANAGEMENT PLAN (FMP)

- 5.5.1 As is shown in the subsequent FCA Volumes, the Flood Management Plan (FMP) forms an important element of the mitigation prescribed as a result of the assessment. As such, and as outlined in the previous section, the FMP is secured through the CEMP, which in turn is secured via Requirement 6 of the draft DCO (**Document 2.1**). The FMP would cover all working areas located within the Order Limits, in particular those potentially impacted by fluvial, surface water and groundwater flooding. These plans would also cover those working areas that are accessed via DAM Zone C2, to/from which access/egress could be compromised during a flood event. Where relevant, the plan would also give consideration to surface water and groundwater flood risk.
- 5.5.2 The key requirements of an effective FMP are outlined in FM11 in Table 5.1. Details of emergency responses for different parts of the Proposed Development would be developed prior to commencement of construction in that area.

5.6 DRAINAGE MANAGEMENT PLAN (DMP)

- 5.6.1 Preparation of a Drainage Management Plan (DMP) is secured through Requirement 7 of the Draft DCO (**Document 2.1**). A DMP would be provided for all construction elements of the Proposed Development and would comprise drainage strategies for managing drainage with the Order Limits.

DMP Scope

- 5.6.2 Outline drainage information is provided in this FCA for the construction compound and operation phases of the Pentir Substation extension (FCA Volume 2, **Document 5.12.1.2**), the Braint and Tŷ Fodol Construction Compounds and the Braint and Tŷ Fodol THH/CSEC operational sites (FCA Volume 3, **Document 5.12.1.3**). This demonstrates that the drainage for each of the aforementioned sites has been sufficiently considered and that flood risk due to surface water generated on site would be adequately mitigated as required by EN-1 and TAN15.
- 5.6.3 Further detailed drainage strategies and design information would be contained within the Drainage Management Plan (DMP), which would be prepared and would be submitted to the appropriate authorities (NRW and/or LLFAs) for prior approval and permitting/consenting as required.
- 5.6.4 Drainage schemes would be based, as a minimum, on current best practice guidance, namely GPP5 (Ref 12.1.19), the SuDS Manual (Ref 12.1.20) and with the Welsh Governments 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems' (Ref 12.1.33).
- 5.6.5 The requisite FRAP/OWC would be required where drainage outfalls comprise formal structures and/or intrusive works adjacent to the bank of the receiving watercourse. For example, the Penmynydd Road Construction Compound drainage system would discharge to an ordinary watercourse and for this an OWC would be required from IACC. The Pentir Construction Compound would also discharge to an ordinary watercourse and thus any outfall would require an OWC from Gwynedd Council. However, for both of these discharges, an Environmental Permit may also be required from NRW.

Drainage Calculations

- 5.6.6 Greenfield runoff rates have, for this FCA, been calculated using the IH124 component of the UK SuDS online tool (Greenfield runoff rate estimation) (Ref 12.1.27). Furthermore, preliminary estimations of attenuation storage requirements have also been based on the UK SuDS online tool (surface water storage volume estimation) (Ref 12.1.27).

5.7 DESIGN OF WORKS AFFECTING WATERCOURSES

- 5.7.1 Measures are in place stipulating minimum requirements for the design of all culverts and bridges required for Proposed Development (see FM14, Table 5.1, section 5.3 of this FCA Volume (**Document 5.12.1.1**)). Detailed calculations for sizing would be prepared following grant of a DCO and would be submitted to the appropriate authorities (NRW or LLFAs) for permitting/consenting as required.

6 Summary

- 6.1.1 This Overarching FCA has been prepared with the specific purpose of consolidating the requirements and information that are common to the specific FCA Volumes 2, 3 and 4 (**Document 5.12.1.2**, **Document 5.12.1.3** and **Document 5.12.1.4**), therefore streamlining the processing of FCA reporting.
- 6.1.2 Section 2 provides the primary source of reference regarding policy and guidance. As such, while reference has been made to this section from the subsequent FCA Volumes, no further information regarding policy and guidance is provided in FCA Volumes 2, 3 and 4 (**Document 5.12.1.2**, **Document 5.12.1.3** and **Document 5.12.1.4**).
- 6.1.3 Similarly, the FCA consultation and scope section (section 3) summarises Scoping Opinion and consultations to date. No further reference has been made to consultation responses in FCA Volumes 2, 3 and 4 (**Document 5.12.1.2**, **Document 5.12.1.3** and **Document 5.12.1.4**), although reference has been made to elements of the scope as discussed in sections 3.5 to 3.7.
- 6.1.4 There is no repetition of the climate change information in the subsequent FCA volumes although each FCA volume contains a table that summarises the allowances applicable to that specific FCA volume.
- 6.1.5 No further details have been provided in the subsequent FCA volumes regarding the methods used to identify flood hazards and flood receptors. Instead, referral has been made to this FCA volume (**Document 5.12.1.1**) from the respective FCA volumes prior to proceeding to discuss the applicable flood hazards. However, identified flood hazards and receptors are presented in the respective FCA Volumes 2, 3 and 4 (**Documents 5.12.1.2**, **5.12.1.3** and **5.12.1.4**) as applicable.
- 6.1.6 Section 5 sets out the approach to mitigation. The approach to providing generic control and management measures was set out. These control and management measures are also set out in the

CEMP and their effective implementation would be secured via DCO Requirements 6 and 7 of the draft DCO (**Document 2.1**).

- 6.1.7 FCA Volumes 2, 3 and 4 (**Document 5.12.1.2**, **Document 5.12.1.3** and **Document 5.12.1.4**) do not contain a glossary or reference list. The glossary and reference list provided at the back of this Overarching FCA are intended to be used as reference by all FCA volumes.

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Annex A

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North Wales Connection Project

Volume 5

5.12.2.1 Appendix 12.1 Annex 1A: Consultation Log

National Grid
National Grid House
Warwick Technology Park
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CV34 6DA

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1.0 NRW Consultation

1.1

DATA REQUEST AND ACQUISITION EMAILS

From: [REDACTED]@cyfoethnaturiolcymru.gov.uk>
Sent: 31 October 2016 11:12
To: [REDACTED]
Subject: FW: ATI-11367a- National Grid North Wales Connection - Data requests hydrology
Attachments: NWC_ProjectBoundary_OSRIvers.pdf; NRW Open Data Approval Policy.doc

Categories: Future Reference

Dear [REDACTED]

Self Service and Open Data: You can now make the most of open data provided **free** online. You can:

- create and **export an A4 or A3 PDF map** using the [NRW Flood Risk Map](#), from the NRW Website. Here you will find many spatial risk layers, and be able to produce a map up to scale on 1:10000 (to be increased to 1:5000 in future updates). **Or**
- **download** Flood Map layers and other spatial flood datasets from "[Lle](#)" the [Welsh Government Portal for Open GIS data](#). Spatial data is free to download, view and use within your own GIS system. You will be able to find Flood Zones, Flood Defences, Recorded Flood Outline, Areas Benefiting Defences and more. More datasets will be released in the coming year.
- download the Extreme Tide level report and data from the [Coastal Flood Boundary Conditions for the Mainland UK Coasts and Islands \(SC060064\)](#), covering still water levels for the whole Welsh Coastline. Wave overtopping is **not** covered.

We do not have any hydraulic models within your area of interest and are therefore unable to provide any flood depths, flows etc.

Below is a link to access Recorded Flood Outlines and Flood Map for Surface Water that comes under the Open Government Licence Provided above.

<http://lle.gov.wales/catalogue/item/RecordedFloodOutlines/?lang=en>

<https://naturalresourceswales.sharefile.eu/d-s390c7929267476e9>

Metadata: <https://libcat.naturalresources.wales/webview/?tiarray=full&oid=116273>

I hope this is of some use to you.

Kind Regards

[REDACTED]

[REDACTED]

Swyddog Cymorth Busnes/Business Support Officer
Cyfoeth Naturiol Cymru/Natural Resources Wales
Llwyn Brain
Parc Menai
Bangor
LL57 4DE

Ffon/Tel: [REDACTED]

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[\[REDACTED\]@naturalresourcescymru.gov.uk](mailto:[REDACTED]@naturalresourcescymru.gov.uk)

Gwefan/Website:

www.cyfoethnaturiolcymru.gov.uk/ www.naturalresourceswales.gov.uk

Ein pwrpas yn sicrhau fod adnoddau naturiol Cymru yn cael eu cynnal, gwella a'u defnyddio yn cynnal, gwella a'u defnyddio yn gynaliadwy, yn awr ac i'r dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, used and enhanced, now and in the future

From: [REDACTED]
Sent: 12 October 2016 16:08
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: ATI-11367a- National Grid North Wales Connection - Data requests hydrology

Hi

I've been sent the following data request and informed [REDACTED] that I have done so.

Kind regards,

[REDACTED]

[REDACTED]

Swyddog Cynllunio Adnoddau Naturiol/Natural Resources Officer, NFRM PM

Cyfoeth Naturiol Cymru / Natural Resources Wales

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From: [REDACTED] <[\[REDACTED\]@amecfw.com](mailto:[REDACTED]@amecfw.com)>
Sent: 11 October 2016 17:13
To: [REDACTED] <[\[REDACTED\]@cyfoethnaturiolcymru.gov.uk](mailto:[REDACTED]@cyfoethnaturiolcymru.gov.uk)>
Cc: [REDACTED] <[\[REDACTED\]@aecom.com](mailto:[REDACTED]@aecom.com)> [REDACTED] <[\[REDACTED\]@amecfw.com](mailto:[REDACTED]@amecfw.com)>
Subject: National Grid North Wales Connection - Data requests hydrology

Dear [REDACTED]

I work with [REDACTED] of AECOM on the hydrology aspects of the North Wales Connection Project. I have a number of data and consultation requests to support the hydrology ES Chapter I am hoping you will be able to help me with.

We would like to request the following data for Anglesey:

- Flood Map for Surface Water
- Records of historic floods
- Peak flood levels, depths, flows and velocities from the latest available flood models of the watercourses shown on the attached map

Please let me know if you require any more information. I would also be grateful if you could let me know how long it will take to collate this data.

Kind regards,

[REDACTED]

[REDACTED]

Senior Consultant, Water Management, Amec Foster Wheeler Environment & Infrastructure UK Ltd
Ground Floor, Redcliff Quay, 120 Redcliff Street, Bristol BS1 6HU, United Kingdom

[REDACTED] [\[REDACTED\]@amecfw.com](mailto:[REDACTED]@amecfw.com) amecfw.com



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1.2

MINUTES OF MEETING (JAN 2017, PENTIR)



Contact Report

Title of Meeting: Hydrology and Drainage Meeting

Date of Meeting: 12th January 2017

Present:

NRW: [REDACTED]

IACC: [REDACTED]

Apologies: [REDACTED]

Item No: Item

NG = National Grid

1. Project timescale – It was confirmed that it is proposed to release an interim design in March with the aim of having a final design in place by August. NG are currently reviewing the responses received for the PEIR consultation. NG did indicate that the interim design in March would include some design change. NRW wish to have full sight of any changes at the earliest convenience and for any change to include a full assessment of any potential environmental effects not assessed in the PEIR consultation including details of any required mitigation. DCO submission anticipated October 2016.
2. Thematic Groups - NG confirmed that Thematic Groups have been set up/are to be set up which are specialist task groups for each topic area. NRW would wish to be aware of any groups/meetings that we require attendance at the earliest opportunity possible so that we can plan resources.
3. CEMP – NRW confirmed that the ES needs to include a comprehensive and project specific CEMP. Also advised that CEMP needs to include details of waste, soil, water and silt management. The proposals for management needs to adhere with best working practice. NRW wish to see the details of the management proposals at the earliest opportunity and before DCO submission. Where the full detail of the mitigation/working method is not known at DCO stage and until the contractor has been selected, the aim of a particular means of mitigation/working method need to be written into the DCO to ensure agreement, full implementation and compliance. Where we confirm any sensitive locations, full design details, construction methods and management methods needs to be included in the CEMP at DCO stage (such as crossings/discharges in protected site areas).

-
4. FCA – An approach to the FCA to be circulated following the meeting and NRW to comment.
NRW advised that the FCA needs to include consideration for all proposed infrastructure including substations, tunnel head houses, sealing end compounds, proposed access road and all crossings. We need to understand specifically the locations of access roads and crossings including culvert design.
The FCA needs to assess any increase in flood risk to all receptors – including all third-party land – as TAN15 advises that the assessment needs to include assessment of an increase in risk 'elsewhere' and not only within Proposed Project Boundary. NG confirmed that FCA will include a table identifying all receptors.
DCO needs to confirm if infrastructure proposed is temporary or permanent. NG advised that some of the culverts will need be permanent and will require future access for maintenance works. NRW advised that all permanent infrastructure will need to include calculations for climate change.
NG confirmed that default position in submission will be to assume that all infrastructure will be permanent (precautionary approach).
NRW satisfied with this approach.
Consultant undertaking FCA to have a separate discussion with NRW regarding highlighting any locations of concern within the Project Boundary and also to discuss how assessment is to consider climate change. NG advised that initially a 'generic approach' would be taken in the FCA – not including hydraulic calculation at this stage. NRW expressed some concern about the approach but will comment on the FCA summary note which will be circulated shortly.
-
5. Water Management - The construction and operation phase will include the need to deal with water arising from construction of access roads, shafts and tunnel. The ES needs to include full details of the quantity of any water arising as this will be an additional flow to the natural flow and for appropriate management methods to be included for agreement. The magnitude of impact needs to be fully identified.
NG confirmed that it is anticipated that operation phase will involve 6000 litres of water per 24hrs and NRW confirmed that this volume is likely to be acceptable if released at a low rate. Discharge rate during construction not known yet. NRW advised that submission needs to include volumes and disposal methods.
Dewatering will need a permit from NRW under the EPR 2016.
Proposed to discharge from tunnel at its lowest point and proposed currently to construct tunnel with an alignment to low point. NRW confirmed reservations with dewatering on Gwynedd tunnel side due to historic flooding problems associated with the receiving watercourse (Nant y Garth).
We will also need to understand fully the quality of the water to be discharged as we need to know about the salinity of the water to determine if it would be acceptable to discharge to a freshwater stream.
-

-
6. WFD – An approach to the WFD Assessment to be circulated following the meeting and NRW to comment.
NRW confirmed that we are happy with standalone WFD assessment.
NRW confirmed that EA guidance 488_10 is currently being updated
NRW confirmed that 'Clearing the Waters' guidance has recently been updated by the EA. NRW will review this as we update our guidance.
Consideration needs to be given to how close to watercourses infrastructure needs to be located for any assessment of potential impact to be made in WFD Assessment.
NRW referred to Bund Case Law. NRW confirmed that this is not currently reflects in EA guidance 488_10 adopted by NRW, but needs to be a consideration in the project WFD Assessment.
NRW advised that we have provided comments on the WFD guidance currently subject to consultation by PINS but confirmed that we weren't sure if it was subject to public consultation.
Also confirmed that we are currently drafting our own WFD guidance.
As advised in our PEIR consultation response – WFD assessment needs to include consideration for any effects on bathing waters.
NG advised that the access tracks will be subject to generic assessment and that more sensitive locations will have more details and standalone assessment and any waterbody carried into further assessment if required.
-
7. Design principles of drains and culverts –
NRW confirmed that the project shall include no cross catchment drains.
NRW confirmed our policy position with regards to culverts and that the preference is for clear span bridges.
NG confirmed that they have a preference for us of multiple culverts rather than aggregating flows to a single culvert as they mimic natural drainage flows.
Risk of blockages needs to be a consideration in FCA.
The submission needs to include full designs for all culverts and that they are sized so that they can pass the design-flow. In some instances, it may be appropriate to design the road and culvert so that they can overtop and water returned back to watercourses.
NRW promoted use of SUDS methods and mitigation at site
NG confirmed that should any temporary culvert at end of project be requested to remain by any landowner, the landowner will be required to gain necessary consent for retention and adopt culvert to ensure liability does not remain with NG.
NRW advised that culvert design should arise from hydrology calculations at specific crossing points. NG confirmed that they are not proposing to undertake hydrology calculations. NRW confirmed that all culvert designs should be justified and that red line boundary needs to include enough land to accommodate culvert design areas.
NRW advised that a Flood Risk Activity Permit (FRAP) will be required for all culverts in main rivers as well as other structures within 8 meters of a main river. FRAP applications for main-rivers will usually need to be supported by hydraulic calculations. NG advised
-

that they are currently looking into which permits are required and maybe seeking to remove requirements for permits under disapplication. (See disapplication meeting note 9).
Consent for work on ordinary watercourses will be given by relevant Local Authority and NRW advised that discussions take place with appropriate officers at earliest convenience.

8.	Timing of in-channel work – NRW advised that generally main river works are not allowed during the fish spawning period (Mid Oct – Mid April). If construction of clear span bridges does not include in-channel work we may lift the timing restriction.
9.	Disapplication – National Grid confirmed that they are currently reviewing which separate consents the scheme will require separately to the DCO and considering if a submission will be made under Article 33 (Disapplication of Legislative Provisions). NRW as a 'relevant body' under the Planning Act confirmed that any provision included in the DCO to disapply the requirement for any separate consent needs to be presented and discussed with NRW at the earliest convenience. If such a submission is made, NRW would require the full details and assessments required in relation to the consent to be available at DCO for us to assess the issues relevant to the separate consent. Any application by National grid needs to fully justify the basis upon which the request for disapplication is made. Every submission for disapplication is unique and NRW cannot provide any guidance currently if we would approve a request for disapplication.
10.	PPGs – NRW confirmed that PPGs are superseded by best practice but that we still believe that PPGs are a starting point to identification of best practice and to ensure no pollution. Note following meeting – NG should be aware that GPP5 has replaced PPG5 'Works and maintenance in or near water'. PPG6 is also of relevance and is currently under review. NRW to provide update on likely timescale of revised version.
11.	Waste – NRW advised that full consideration needs to be given to disposal of waste arising from construction phase. NRW also advised that all appropriate permits under the EPA 2016 needs to be applied for.
12.	Lime Stabilisation Technique was referred to at the meeting. NRW confirmed that full details of this method if to be used needs to be included in the submission for NRW to be able to review any environmental implications.
13.	Topsoil Stripping – NRW advised that consideration needs to be given in project construction programme to duration of topsoil exposure and ensure that it is not exposed during periods of heavy rainfall as this could result in pollution.
14.	Construction Compound Drainage Methods– NG confirmed that the Ceint compound area will avoid area of mapped flood risk. Ground cover will consist of crushed stone with bonding around. Drainage will be SUDS with storage ponds and soakaway.

NRW advised that the Pentir compound site needs to be attenuated for due to known flooding issues at Nant y Garth (an ordinary watercourse) and its tributary, the Afon Heulyn. NRW would not approve any additional flows into Nant y Garth. Should be attenuated to the greenfield runoff rate on site by use of SUDS.
NRW advised that we would wish to see a site layout plan for construction compounds at the earliest convenience and to provide further flood risk advice.

-
- 15.** Comments on plans –
DE/PS/08 – Sheet 2 of 3 – Drainage proposals for access roads - NG confirmed that local permeability testing is to be undertaken. NRW confirmed that use of SUDS method should be first option for disposal of surface water. If ground condition not suitable, surface water will be directed to ditches. NRW does not want to see any long drainage flows.
All drainage methods needs to consider site specific sensitivities. Proposals needs to include details of how long temporary access tracks are to be in place and include maintenance details.
Any material arising to be stockpiled outside flood risk zones. If this not possible an assessment will be required as with any raised roadways/embankments.
DE/PS/09 – Sheet 2 of 4 – Access road design plan - No material arising should be deposited in flood plain
Only watercourses more than 3sqkm has flood outline but flood risk may also exist in relation to smaller watercourses. The surface water flood map may provide additional information for smaller catchments. All drainage proposals should avoid cross catchment flows and should mimic natural drainage patterns.
DE/PS/09 – Sheet 3 of 4 – Culvert Design – Sizing of culvert should be site specific and if permanent needs to consider climate change in assesement. If temporary use 1 in 100. Usual requirement is to bury the culvert-invert to allow for a natural bed to form – this would necessitate over-sizing the culvert.
Submission needs to confirm what type of concrete is to be used for bedding.
DE/PS/11 – Sheet 1 of 3 – Design Plan tunnel head cable sealing end - NRW confirmed that our preference is for sewage to be disposed of to foul sewage. Where no sewer is available, consideration must be given to installation of package treatment plant or septic tank. NRW do not consider cesspits as a sustainable sewage management system.
A Permit will be required from NRW for any discharge to ground/watercourse.
DE/PS/11 – Sheet 2 of 3 – Drainage Design Plan for tunnel and sealing end compound - Slurry de-sanding plant, wheel wash and lagoon needs to be managed
NRW confirmed that we do not approve cess pits and that drainage method shown on plan will have to be either septic tank or treatment plant.
-

Permit will be required from NRW for any discharge to
ground/watercourse.

Surface water will need to be attenuated to greenfield run off rates

DE/PS/11 – Sheet 4 of 4 – All bridge approach ramps to be based on
calculations and need to pass 100 year flow. NG confirmed that
bridges will have open parapet.

1.3 EMAIL DISCUSSION REGARDING THE POTENTIAL FOR FLOODING AT BRAINT CSEC

From: [REDACTED] <[REDACTED]@cyfoethnaturiolcymru.gov.uk>
Sent: 28 February 2017 08:26
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Discussion re: Afon Braint

Good Morning

I would strongly recommend that you consider carrying out a hydraulic modelling exercise to ensure that the CSEC is not affected during the design flood event (1% AEP) along with sensitivity testing for climate change allowances (+30% and +75% in flow).

The 2m freeboard has been (I assume) based on estimating ground levels on the flood zone outlines. The flood zones do not take into account the influence of structures on the river Braint which may produce a vastly differing flood outline to those generated using the generalised modelling technique (JFLOW). The flood zones do not allow for any increases in flows due to climate change allowances.

In the late 1990's a tributary of the Braint (Bridin) was diverted to facilitate the construction of the A55 trunk road. The diversion was along the north of the road cutting and as can be seen from the picture below the soffit could be considered restrictive should debris accumulate or flows in excess of the culverts capacity be experienced. The same can be said on the two other crossings downstream between the A55 and the bifurcation structure (namely the A5 structure and the Railway crossing-shown below). The structure at Pont Rhonwy (unclassified road) for the River Briant Bifurcation leg may also influence the flooding regime in the area around the CSEC.



TAN15 advises that any assessment on flood risk should be appropriate to the size and scale of the development. As such we would strongly advise a detailed assessment for the CSEC to be undertaken which includes the influence of structures during times of flood flows and flood routes which may not initially be expected and shown on the flood maps for the +cc events.

We shall be providing a detailed response to the North Wales Connection projects Flood Consequence Assessment Method Statement which has been submitted as soon as possible.

Regards

Peiriannydd Datblygiad a Risg Llifogydd / Development and Flood Risk Engineer
Cyfoeth Naturiol Cymru / Natural Resources Wales
Ffôn/Tel: [REDACTED]
E-bost/E-mail: [REDACTED]@cyfoethnaturiolcymru.gov.uk [REDACTED]@naturalresourceswales.gov.uk

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From: [REDACTED] [mailto:[REDACTED]@amecfw.com]
Sent: 23 February 2017 11:21
To: [REDACTED] <[REDACTED]@cyfoethnaturiolcymru.gov.uk>
Cc: [REDACTED] <[REDACTED]@cyfoethnaturiolcymru.gov.uk>
Subject: RE: Discussion re: Afon Braint

Hi [REDACTED]

Thanks very much for your response below and for your time on the phone this morning.

Further to our discussion, in responding to our FCA method statement it would be very much appreciated if you're able to provide further commentary/advice regard the risk of flooding from the Afon Braint to the cable sealing end compound (CSEC). Please see the attached jpeg for information - the site is the grey oblong corresponding with the gantries on the attached image.

To recap, I've estimated the flood level to be approx. 34mAOD and the proposed platform level for the CSEC is 36mAOD. So the issue is (i) whether 2m of freeboard is taken as acceptable, even assuming the flood flows to be increased by 75% to allow for climate change, and (ii) what would constitute a logical and proportional approach to back up this assertion.

Thanks again,

[REDACTED]

[REDACTED]

Principal Consultant, Water Management, Environment & Infrastructure Uk Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU
D [REDACTED] M [REDACTED]
[REDACTED]@amecfw.com amecfw.com

From: [REDACTED] [mailto:[REDACTED]@cyfoethnaturiolcymru.gov.uk]
Sent: 22 February 2017 14:23
To: [REDACTED] <[REDACTED]@amecfw.com>
Cc: [REDACTED] <[REDACTED]@cyfoethnaturiolcymru.gov.uk>
Subject: RE: Discussion re: Afon Braint

Dear Sir

[REDACTED] asked me to contact you to discuss your request below. I have tried to call you but thought an e-mail response would suffice.

The river Braint was subject to a significant land drainage scheme in the 1950's by our predecessors. Part of the scheme involved the construction of the Bifurcation structure near Rhosbothan, LlanfairPG. The structure incorporates a fixed concrete beam to limit the peak flows which flow towards the outfall in Dwyrn; the excess

flows outfall into the Pwllfanogl leg. During prolonged dry periods (when stock required watering), timber boards could be placed in the structure to divert flows towards Dwyran.

Dwyran was subject to fluvial flooding on the 26/12/2015 and as such we would not wish to see any amendments to the structure which could allow any additional flows towards the Dwyran outfall.

Should you wish to discuss, please do not hesitate to contact me.

Regards

Peiriannydd Datblygiad a Risg Llifogydd / Development and Flood Risk Engineer
Cyfoeth Naturiol Cymru / Natural Resources Wales
Ffôn/Tel: [REDACTED]
E-bost/E-mail: [REDACTED]@cyfoethnaturiolcymru.gov.uk [REDACTED]@naturalresourceswales.gov.uk

Gwefan / Website:
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Ein diben yw sicrhau fod adnoddau naturiol Cymru yn cael eu cynnal, eu gwella a'u defnyddio yn gynaliadwy, yn awr ac yn y dyfodol.

Our purpose is to ensure that the natural resources of Wales are sustainably maintained, enhanced and used, now and in the future

Oddi wrth: [REDACTED] [mailto:[REDACTED]@amecfw.com]
Anfonwyd: 21 Chwefror 2017 14:31
At: [REDACTED] <[REDACTED]@cyfoethnaturiolcymru.gov.uk>
Pwnc: Discussion re: Afon Braint

Hi [REDACTED]

I just tried calling/left voicemail as I was hoping you could shed some light on the hydrology of the Afon Braint. This is in the context of the NG North Wales Connection Project and, specifically, the Anglesey tunnel head house and cable sealing end compound and the potential risk of flooding to it from what seems to be a south flowing watercourse arising from a bifurcation of the Afon Braint a few 100m to the north.

On the face of it, given a platform level of 36mAOD and what appears to be a 0.1% AEP water level of ~34mAOD, it's highly unlikely that the site is at risk, even considering climate change. However, in order to broadly qualify this assertion I need a better handle on the hydrology and hydraulics of the watercourses which is not clear from various data and mapping.

We're doing a series of site walkovers in a couple of weeks so it would be good to discuss before then. I'm available the rest of today, out of office Wednesday and then back in Thu & Fri. Hopefully we can catch up then

Thanks

[REDACTED]
[REDACTED]

Principal Consultant, Water Management, Environment & Infrastructure UK Ltd, Amec Foster Wheeler
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1.4 RESPONSE TO THE FCA METHOD STATEMENT



National Grid North Wales Connection Project: Response to NRW on the FCA Method Statement

1. Introduction

In February 2017, Amec Foster Wheeler issued a Flood Consequences Assessment (FCA) Method Statement to Natural Resources Wales (NRW). The Method Statement set out our proposed approach to preparing an FCA for the North Wales Connection Project (NWCP), a Nationally Significant Infrastructure Project (NSIP) and thus subject to a Development Consent Order (DCO) application to the Planning Inspectorate (PINS). In early March 2017, Amec Foster Wheeler received comments from NRW on the FCA Method Statement (NRW Ref: CAS-29582-Z6W1). The NRW response is included as Appendix A to this document.

Firstly on behalf of National Grid and Amec Foster Wheeler, we would like to thank NRW for their time in reviewing the FCA method statement and in providing valuable advice. This document sets out our responses to NRW comments and, with respect to the requirement to undertake hydrodynamic modelling of Afon Braint, sets out our proposed approach to that task.

2. Summary of points of agreement

A summary of the main points of agreement is as follows:

- Pylons and flooding from the sea are scoped out of the assessment.
- Climate change allowances for river flows will be based on the Welsh Government Letter dated 23/08/16.
- The 'Upper End' climate change scenarios will be assessed in the case of permanent infrastructure.
- Climate change allowances regarding rainfall should be based on the Environment Agency guidance but we will also seek agreement from the Lead Local Flood Authorities (LLFAs) in this regard.
- The proposed development lifespan is acceptable.
- We will highlight in the FCA that flood zone mapping is based on current day flows and thus is exclusive of climate change. Also, we will highlight that NRW only publish flood zones 1, 2 and 3 and not 3b.
- The proposed presentation of the FCA as five volumes is agreed.
- We acknowledge your advice regarding modelling of the Afon Braint (see Section 4 of this document for further details).

April 2017
Doc Ref: 37803G11



3. Amendments

3.1 Attenuation pond design standard

With regard to the design standard of permanent attenuation ponds, we set out a standard of 0.1% Annual Exceedance Probability (AEP). However, it is noted that this is a National Grid design target and not a statutory requirement. As such, we are now proposing that the DCO scheme is based on a 1%AEP standard of protection.

3.2 Watercourse crossing assessment

NRW's comments regarding culvert assessment including blockage scenarios are noted. Similarly, comments regarding the location of bridges in floodplains are also noted. It is not our intention to provide a quantitative/modelling assessment of culverts and bridges. The FCA submitted for DCO will identify all watercourse crossings (within limits of deviation), together with proposed crossing methods, which will be qualitatively deemed to be fit for purpose. However, the fitness for purpose of all watercourse crossings as built will be demonstrated post-DCO via applications for Flood Risk Activity Permits (to NRW for main rivers) and Flood Defence Consent (to LLFAs for ordinary watercourses).

4. Afon Braint Modelling

As advised in NRW's response to the FCA method statement, and further to email communications between Iwan Hughes (NRW) and Ben Thomas (Amec Foster Wheeler), we will be undertaking hydrodynamic modelling of the Afon Braint in the vicinity of the Braint Cable Sealing End Compound (CSEC) and Tunnel Head House (THH) site. This is to ensure that the site remains safe throughout its operational lifetime and is resilient to the 0.1%AEP event, including applicable 'Upper End' climate scenario (+75% on flow) given the site's status as essential energy infrastructure.

We propose to simulate the site using a linked model combining Flood Modeller Pro and TUFLOW Classic. These are standard, widely adopted models that are used for similar purposes throughout the UK and, in our view, offer the best combination of model accuracy and numerical stability.

The model will encompass an area defined by the following characteristics (and see Appendix B):

- The model boundary to the north will be the downstream face of the A55 culvert. Consideration was given to the prospects for flood attenuation upstream of the A55 but this was considered to be insignificant. Furthermore, we note from topography and surface water flood mapping that a possible flowpath along the A55 extends to the west of the Braint crossing. However, the volume of water lost to this pathway from the flood cell south of the A55 is considered insignificant and thus this element will not be explicitly considered. As a result of the loss of some attenuation to the north and west of the A55, we consider our choice of upstream boundary location to be conservative.
- The model will extend to the West to the crossing of the road between the A5 and Llandaniel Fab. Due to the underlying topography it is not considered necessary to include any areas further to the west in the model domain.
- It will extend to the east to the crossing under the A4080. The need to extend this far east may not be necessary but we have noted the topography of the A4080 is such that if flows under it are constrained then backwater effects could feasibly impact patterns of flood inundation much further upstream; and
- It will extend south to a sufficient distance to resolve flows along the southern tributary/distributary of the Afon Braint in the vicinity of Tyddyn Fadog.

We have instructed a topographic surveying contractor (Storm Geomatics) whom will be undertaking the survey during week commencing April 24th. The survey specification issued is attached as Appendix B to this



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National GIU North Wales Connection Project
Flood Consequence Assessment Method Statement

Appendix A

NRW Response to FCA Method Statement

April 2017
Doc Ref: 37803G11



Ein cyf/Our ref: CAS-29582-Z6W1
Eich FCA Methodology

Cyfoeth Naturiol Cymru / Natural Resources Wales,
Maes y Ffynnon,
Penrhosgarnedd,
Bangor,
Gwynedd,
LL57 2DW

National Grid NW Connection

E-bost/Email: [REDACTED]@cyfoethnaturiolcymru.gov.uk
Ffôn/Phone: [REDACTED]

10²nd March 2017

Dear Sir/Madam,

Application by National Grid Electricity Transmission Plc for an Order Granting Development Consent for the North Wales Connection Project

Flood Consequence Assessment (FCA) Methodology

Thank you for consulting us with regard to the 'Flood Consequence Assessment Method Statement (February 2017). We have reviewed the Methodology and have the following comments to make on the proposed methodology.

We note that the main aim of the document is to '...solicit opinion, comment and/or confirmation of the acceptance of the methodologies presented within in order to achieve mutual agreement that our final approach is fit for purpose...' which is welcomed.

We are in agreement with the suggested elements to be scoped out of the FCA (the Pylons(3.1) and Flooding from the Sea (3.2)).

Section 4.3 of the document refers to National Grid's Flood Mitigation Policy (2011) and the minimum standard of protection which is stated as the 0.1% AEP plus the applicable allowances for climate change. It would be beneficial to state the CC allowances proposed; we would assume that the Welsh Governments guidelines (Ref 18) are to be applied.

It is noted that the FCA is to be prepared in accordance with the National Policy Statement (NPS) EN-1 [Ref.4] with reference to TAN15:Development & Flood Risk and associated climate change documentation. We note that the Welsh Governments Climate Change allowances (CL-03-16) as outlined in their letter dated 23/08/2016 and implanted for use as of the 01/12/2016 is to be used We would agree that the use of the upper end scenarios (5.2) should be considered for permanent infrastructure including that of the cable sealing end compounds.

We would suggest that the use of the EA guidance (Ref.19) would be appropriate for CC allowances for rainfall, however the views of both Lead Local Flood Authorities should also be sought.

The development lifespan section is acceptable in the various three time periods being looked at with climate change.

We note that the design of attenuation ponds are to be designed to a 0.1% AEP for the permanent ponds. Future maintenance requirements will need to be addressed and again the LLFA will need to agree the design basis for surface water drainage/attenuation ponds.

It is suggested that in section 7 reference is made to the fact that the flood zones are based on current day flows i.e. do not include cc. NRW only publish flood zones 1,2 and 3- we do not publish 3b.

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Crossewllr gofodolaeth yn y Gymraeg a'r Saesneg
Correspondence welcomed in Welsh and English

We are in general agreement with the suggested volumes proposed for the FCA but would advise that Vol 3 (Menai Straits and associated Infrastructure) should contain hydraulic modelling using upper end estimates for cc along with the influences of structures (culverts/bifurcation) for the river Braint (and adjacent tributaries) adjacent to the CSEC. It is suggested that the only way to ensure that flood sensitive infrastructure (the CSEC) is raised above the appropriate flood level is to carry out a detailed hydrology/hydraulic model for the area.

We note that watercourse crossings are to be designed so that they can adequately convey the 1% AEP (+cc) without resulting backwater effects. Consideration should also be given to likely debris loading for the specific watercourse and likely blockage scenarios. The inclusion of freeboard may negate the need for blockage scenarios for some crossings.

Section 9.7 suggests that at this stage it is unclear how many access and haul road crossings are required. We would also have concerns regarding any proposed haul roads which are to be elevated above existing ground levels within any flood zones 2. Ideally haul roads should be designed so as not to have an impact of the existing flooding regime; an activity within the floodplain of a main river which is likely to divert or obstruct flood waters may be subject to a Flood Risk Activity permit.

We thank you for consulting with us with regard to the proposed methodology and trust that our comments will be of assistance to you.

Please do not hesitate to contact us if we can be of any further assistance to you.

Yn gywir / yours faithfully

[Redacted signature]

[Redacted name]

Uwch-gynghorydd Cynllunio Datblygu / Senior Development Planning Adviser
Gwasanaeth Cyngori Cynllunio Datblygu / Development Planning Advisory Service



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National GIU North Wales Connection Project
Flood Consequence Assessment Method Statement

Appendix B

Afon Braint Survey Specification

April 2017
Doc Ref: 37803G11

07 April, 2017
Ref – 37803G14



Storm Geomatics
Unit 28, Ditchford Farm
Nr. Moreton-in-Marsh
Gloucestershire
GL56 9RD

For the attention of [REDACTED]

Dear [REDACTED]

Watercourse survey – Afon Braint, Anglesey

Further to your recent commission to undertake a topographic survey of sections of the Afon Braint on Anglesey, please find below the specifications for the survey (as updated 07/04/17). Please also find a shapefile of the survey area attached to the email in which this letter was issued.

The survey data will be used to develop a 1-dimensional hydraulic model of the watercourse, which will be linked to a 2D TUFLOW model.

1. Survey extent

A channel and floodplain cross-section survey is required for an approximately 3000 m long length of the Afon Braint and tributary (See Figure 1-1).

- The upstream extent of the reach is the downstream face of the culvert under the A55 (NGR: 250754 371687). The river flows south from here under the A5 and railway line, turning east just downstream of a confluence with a tributary that flows west to east.
- The western extent of the survey is on this tributary at the downstream face of the culvert under the road between the A5 and Llanddaniel Fab (NGR: 250632 370509), this section of watercourse converging with the Afon Braint some 500m downstream. A further 170m on from the confluence the channel bifurcates at a concrete structure from whereon they're referred to as the South Braint and the East Braint
- The southern extent of the South Braint is just upstream of a left bank tributary (NGR: 251093, 370774). Approximately 700 m downstream of the bifurcation.
- The eastern extent of the East Braint is the upstream face of the crossing under the A4080 (NGR: 252731 371242).

Any structures (weirs, bifurcation flow control, footbridges, road bridges and culverts) located in the watercourse within the survey extent will need to be surveyed. From a review of OS maps of the site, eight structures have been identified, although others may be present on site which will also require surveying. The modelling extents and key structures to be captured are shown in Figure 1-1 below.

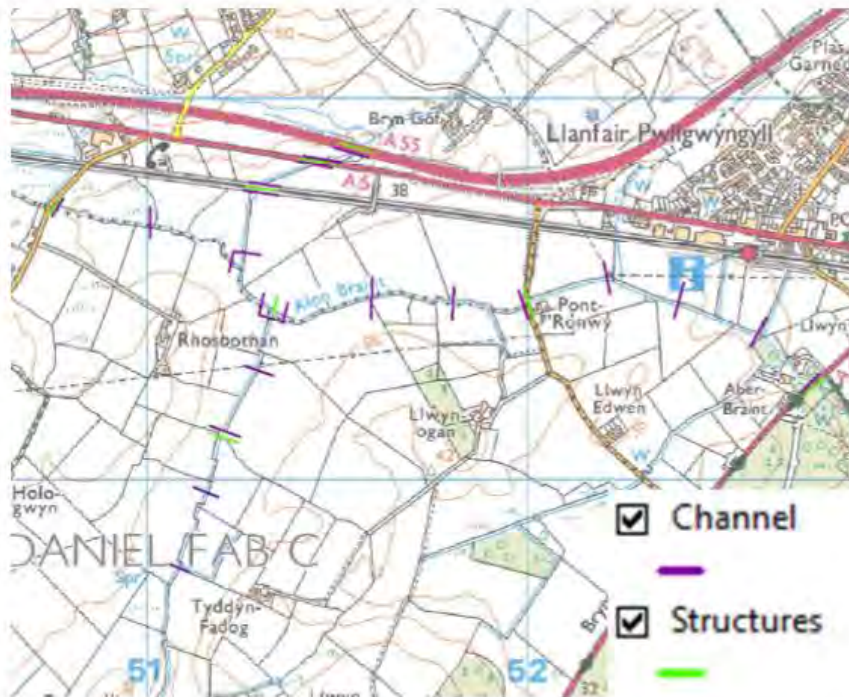
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Registered in England
No. 2190074



Continued...

Figure 1-1 Proposed survey extents and key infrastructure



2. General survey specification

2.1 Cross sections

Cross-sections should be surveyed perpendicular to the watercourse (location as shown in Figure 1-1, 22 in total, 6 of which are associated with the upstream of a structure and 4 of which are downstream of structures). Cross-sections, including structures, need to be presented from left to right as viewed looking downstream with the cross-chainage at the left at zero. An example cross-section deliverable is shown in Figure 2-1.

Photographs should be provided of each cross-section showing the channel (looking upstream and downstream) as well as the wider floodplain.

Detailed representation is required in bank. Sufficient survey points need to be taken across each cross-section to accurately represent the channel shape, usually requiring a minimum of 5 points at left/right top of bank, left/right bottom of side slope and channel invert, as appropriate to the channel (Figure 2-2). Additional points will be required if there is a change

Continued...

in slope. Each cross-section should extend into the floodplain on both banks to the 'true' land level, at least 5m beyond the bank top. If there are trees or shrub line along the bank the cross-section survey should extend to 5m beyond the vegetation.

The bank crest is defined as the line over which water will spill from river to surrounding ground if raised, or the change of gradient from surrounding ground to eroded channel where no raised bank exists.

Bed levels should be the current state of the river (soft bed). The nature of the bed material should be recorded, as should any presence of vegetation.

In addition, if there is a depth of water in the channel, the water level should be recorded.

All elevation values should be provided in metres above ordnance datum and presented to at least 3 decimal places.

Figure 2-1 Example of AutoCAD cross-section output required

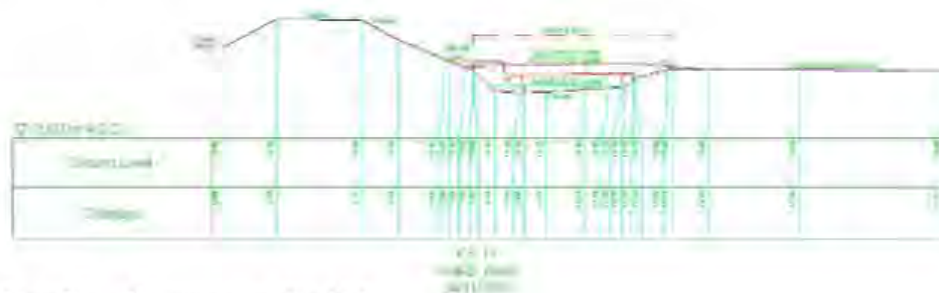
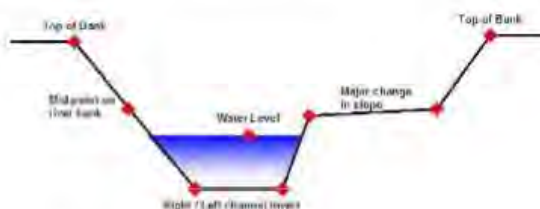


Figure 2-2 Minimum cross section detail



2.2 Structures

Any structures (weirs, bifurcation, footbridges, road bridges and culverts) located in the watercourse within the survey extent will need to be surveyed. From a review of OS maps of

Continued...

the site, six structures have been identified, although others may be present on site which will also require surveying. Any other features observed by the surveyors which act as structures (such as rock outcrops) should also be surveyed.

2.2.1 Bridges & Culverts

Cross-sections at structures to be taken at upstream face, including the channel. The details recorded should include the following:

- ▶ Invert level (upstream and downstream)
- ▶ Internal diameter of circular culverts or dimensions of box/arch culverts and bridge openings
- ▶ Soffit and springing levels of culverts/bridge deck
- ▶ Length of structure in direction of flow
- ▶ Wingwall dimensions
- ▶ Trash screens
- ▶ Elevations along the ground above the culvert, perpendicular to the watercourse, incorporating the road and parapet levels

The structure section should include the banks at the structure. Where a structure constricts river flow, the open channel section details should be surveyed where they are representative of the reach (not necessarily up against the structure). Where there is a change in shape of the structure along its course the downstream face should also be surveyed.

If a structure is skewed, the skew span should be measured and presented on drawings, together with the approximate skew angle.

2.3 Bifurcation Flow Control Structure

There is a bifurcation flow control structure as shown in .

Continued...

Figure 2-3 and Figure 2-4. The channel bed and banks through this structure are lined with concrete. This structure will need to be captured in sufficient detail to enable a hydraulic model to represent the split in flows at this juncture.

In particular a weir structure with low flow orifice is observed on the southern branch of the structure. Please note that the water level is below the weir crest level but that the low flow orifice is submerged with the soffit level approximately 0.3m below the weir crest level. It is important that both the weir and the low flow office are surveyed.

Continued...

Figure 2-3 Upstream, looking downstream towards the bifurcation



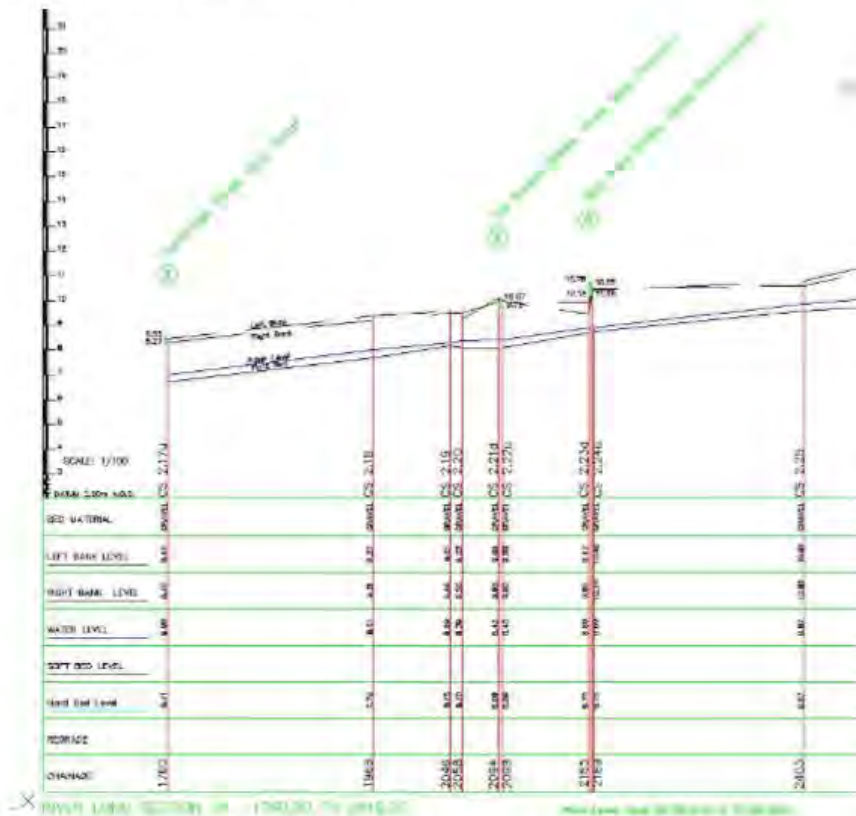
Flow can pass both above (during higher flows) and below the walled structure shown in Figure 2-4 crossing the channel. The survey will need to take note of all relevant soffit and spill levels as identified for both the bridge and weir structures.

Figure 2-4 Looking upstream at structure on the Eastern branch of the bifurcation



Continued...

Figure 2-5 Example Long Section



2.5 Deliverable

All survey information should be provided in electronic format compatible with **AutoCAD**. The output should show the cross-chainage and associated levels to Ordnance Datum as illustrated on the example on Figure 2-1. All cross-sections, whether open channel or structure, shall be viewed looking downstream.

A CSV file should be provided detailing all the survey cross sections in the format shown in Figure 2-6.

In addition to the cross sections and long sections, a plan will be required showing the location and extent of the cross-sections and structures surveyed. On the plan drawing, any elevations should be incorporated into the Z data of the AutoCAD file (3D model), as opposed to just being displayed as text.

Continued...

A longitudinal section through the centre line along both branches should be produced showing all structure details, such as the position of the weir, upstream and downstream extents of concrete apron, position of walls etc.

The longitudinal section should show the following information:

- ▶ upstream water level
- ▶ upstream bed level
- ▶ weir crests, gates and any bridge structures
- ▶ Internal diameter of the opening (box culvert) under the walled crossing (southern branch)
- ▶ Length of structure in direction of flow
- ▶ Wing wall dimensions
- ▶ downstream water level
- ▶ downstream bed level, including maximum depth of scour hole where it is safe to obtain levels
- ▶ water and bed levels at the tail of any weir pool

An additional cross-section will be taken both upstream and downstream of the bifurcation where the channel returns to its normal cross-section and is free from the influence of deposition and scour.

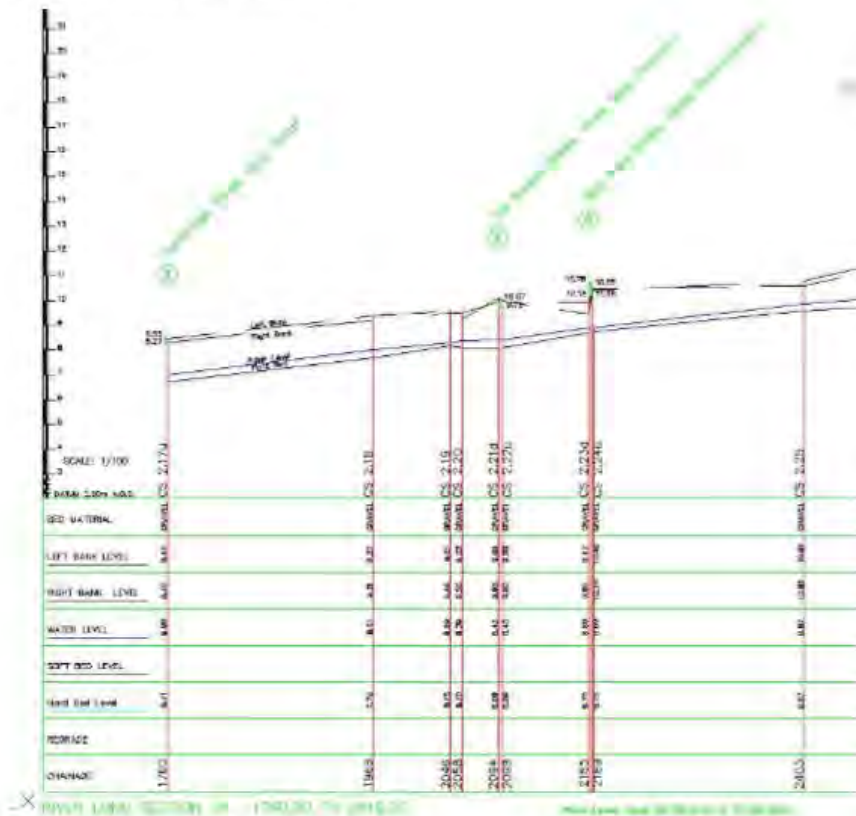
2.4 Long section

We will require longitudinal sections of all watercourses. An example is provided in Figure 2-5. The longitudinal section should show the following information:

- ▶ scale to Ordnance Datum
- ▶ bed material
- ▶ left bank level
- ▶ right bank level
- ▶ water level
- ▶ soft bed level
- ▶ hard bed level
- ▶ chainage (i.e. distance upstream from the most downstream cross section, 0m chainage at the downstream of the model)
- ▶ cross section locations
- ▶ structures (culverts e.t.c. including upstream and downstream invert and soffit levels)
- ▶ any major outfalls.

Continued...

Figure 2-5 Example Long Section



2.5 Deliverable

All survey information should be provided in electronic format compatible with **AutoCAD**. The output should show the cross-chainage and associated levels to Ordnance Datum as illustrated on the example on Figure 2-1. All cross-sections, whether open channel or structure, shall be viewed looking downstream.

A CSV file should be provided detailing all the survey cross sections in the format shown in Figure 2-6.

In addition to the cross sections and long sections, a plan will be required showing the location and extent of the cross-sections and structures surveyed. On the plan drawing, any elevations should be incorporated into the Z data of the AutoCAD file (3D model), as opposed to just being displayed as text.

Continued...

The photographs should be presented with the cross section reference, and whether they were taken facing up stream or downstream.

Figure 2-6 Example CSV deliverable format

Section Number	Chainage (m)	Elevation (mAOD)	Easting	Northing
1	0	4.849	352281.2	379074.1
1	1.112	4.822	352284.1	379072.6
1	2.35	4.204	352285.7	379071.8
1	3.57	3.364	352286.4	379071.4
1	4.88	4.019	352288.2	379070.5
1	5.97	4.307	352290.2	379069.5
1	6.87	4.924	352291.4	379068.8
1	8	5.045	352292.6	379068.2

3. Land Access and Health & Safety

We will require a detailed risk assessment and method statement (RAMS) that will also need to be approved by National Grid prior to the survey commencing. An example of a recent RAMS is provided for convenience.

You will be required to undertake a National Grid induction prior to commencing the survey. This will be undertaken at the Pentir Reporting Centre, Pentir Substation, nr. Bangor. In advance of the induction you will need to supply passport photos of field personnel further to which National Grid ID cards will be produced for collection at the induction.

Please note that specific PPE requirements will be made clear during the induction and see also specific examples in the RAMS forwarded with this specification. Please note that your work may be subject to spot audits by National Grids H&S team.

Land access arrangements are made through National Grids land agent. Amec Foster Wheeler will make the necessary arrangements and provide you with details of access together with further advice on requirements. Please note that a minimum of 10 working days is required regarding land access arrangements.

A land access status shapefile will be provided to you prior to the survey commencing and it is encouraged that you have this loaded on a tablet computer during the survey as a point of reference and in case some deviation to the original plan is necessary in which case easy access to land parcel IDs and owner details may expedite swift access for isolated parcels of land.

If you have any questions regarding the survey requirements, please do not hesitate to contact me.

Yours faithfully


Principal Consultant

Email @amecfw.com@amecfw.com



Ein cyf/Our ref: CAS-32234-S5V7
Eich FCA Methodology

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National Grid NW Connection

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Ffôn/Phone: [REDACTED]

02nd May 2017

Dear Sir/Madam,

Application by National Grid Electricity Transmission Plc for an Order Granting Development Consent for the North Wales Connection Project

Response to NRW on the FCA Method Statement - Flood Consequence Assessment (FCA) Methodology

We thank you for providing a response to the comments that we provided in relation to the Flood Consequence Assessment (FCA) Methodology dated 02nd March 2017.

We are satisfied with the content of the document. With regards to the Afon Braint modelling it is recommended that blockage scenarios are carried out in the modelling works and outputs considered in any FCA. Attached is a copy of our 'Flood Risk Management: Modelling blockage and breach scenarios' which confirms details of the expected blockage proportions which should be used.

To assist in your estimating/modelling work we would advise that a tributary of the Braint (the river Bridin) was diverted to accommodate the construction of the A55 in 1999/2000. Prior to the diversion the watercourse flowed from 250840,371081 to 250819,371870 but now flows from 250840,371081 to 251600,371901.

We thank you for consulting with us with regard to the proposed methodology and trust that our comments will be of assistance to you.

Please do not hesitate to contact us if we can be of any further assistance to you.

Yn gywir / yours faithfully

[REDACTED]

[REDACTED]

Uwch-gynghorydd Cynllunio Datblygu / Senior Development Planning Adviser
Gwasanaeth Cynghori Cynllunio Datblygu / Development Planning Advisory Service

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Crosseir gohebiaeth yn y Gymraeg a'r Saesneg
Correspondence welcomed in Welsh and English

1.5

NRW RESPONSE TO DRAFT FCA



Ein cyf/Our ref: CAS-35187-N7R2
Eich cyf/Your ref: FCA and Hydraulic Model

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National Grid NW Connection

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Ffôn/Phone: [REDACTED]

21st July 2017

Dear Sir/Madam:

Application by National Grid Electricity Transmission Plc for an Order Granting Development Consent for the North Wales Connection Project

Flood Consequence Assessment (FCA)

Further to providing us with the following documentation we confirm that we have now had the opportunity to review the submission, which we note is currently in draft form, and have the following comments to make.

- NWCP FCA Vol 1 – Overarching FCA DRAFT 22.06.17
- NWCP FCA Vol 2 – Substations FCA DRAFT 22.06.17
- NWCP FCA Vol 3 – Cable Sealing End Compounds FCA DRAFT 22.06.17
- NWCP FCA Vol 4 – Overhead Lines Route Corridor FCA DRAFT 22.06.17
- NWCP Afon Braint modelling DRAFT 22.06.17
- EVY0611_AfonBraint_Model_Document_ForIssue

NWCP FCA Vol 1 – Overarching FCA DRAFT 22.06.17 Environmental Statement (Document 5.12.1):

Chapter 2 of the Overarching FCA refers to National Policy – National Policy Statement (NPS) EN-1 and EN-5. Paragraph 2.1.2 confirms that 'where the respective NPSs do not provide the necessary level of detail, reference will be made to Planning Policy Wales 9 and associated Technical Advice Note 15 (TAN15): Development and Flood Risk including the Development Advice Maps updates (Jan 2015) and associated climate change documentation, as set out in FCA Volume 1, Section 2.4'. As confirmed in our response to the FCA Method Statement (NRW response reference CAS-29582-Z6W1 dated 02nd March 2017) we are satisfied with this approach and consider that TAN15 provides the level of detail required for the assessment of flood risk for the proposed development.

We would therefore advise that the FCA report should be revised so that it focuses on TAN15 rather than National Policy Framework. For instance, Chapter 2 refers to the application of the 'Sequential and Exception Tests' which are not applicable under TAN15. We also note that the FCA advocates the use of the compatibility matrix, including vulnerability classification, that is based on the National Policy Framework. Given that the policy in Wales differs significantly from the National Policy Framework (Zones A, B, C, C1 and C2 are not direct equivalents of the English Flood Zones 1, 2, 3, 3a and 3b – in fact Zones 3a and 3b have not been mapped for Wales) we believe that it would be appropriate to refocus the FCA on the principles of TAN15.

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Correspondence welcomed in Welsh and English

It is noted that the FCA suggests that the lifespan of the overhead line may be longer than the anticipated 80 years.

We note that National Grid have their own 'Flood Mitigation Policy PS(T)_095' which sets out a minimum standard of protection for all new builds as being the 0.1% AEP plus applicable allowances for climate change. The document advises that the Welsh Governments' (CL-03-16 - *Climate change allowances for Planning purposes*) upper end estimates for river flows are to be used. Therefore, the plus 25% in flow will be used in the construction period and the plus 75% will be used in the permanent infrastructure.

We would seek further clarity on paragraph 2.4.12. It is unclear if the design flows will be the 0.1% + the applicable cc allowance e.g. will the temporary watercourse culverts be designed to accommodate the 0.1% AEP flow +15% or the 1%AEP +15%. We would welcome clarification on this aspect within Volume 1.

In relation to paragraph 3.6.2, the British Geological Society has recently provided updated data in order to redefine zone B outlines for the DAM. As such it is likely that additional pylons will be within zone B. Nevertheless, we are satisfied that the statements confirmed in paragraphs 3.6.3 and 3.6.4 would address any additional pylons located in zone B (and C).

Paragraph 4.2.4 refers to fluvial flooding. We question the use of +40% on modelling flow inputs since this may relate to pluvial/rainfall.

It is noted that stockpiles are to be in flood zone 1 (Zone A in TAN15) (which we support. It is suggested that since food zones have only been mapped for fluvial catchments in excess of 3km², that reference is also made to the surface water flood maps (SWFM). Any stockpiles located within the SWFM should consider flood risk and appropriate mitigation measures should be considered e.g. gaps left in stockpiles to allow for overland flow routes.

Table 5.1 – Flood Control and Management Measures –

- We would also require that freeboard is also considered in the design for crossings along with allowances for blockages where applicable. This would be on a case for case/individual crossing basis.
- It is noted that the culverts are to be installed during periods of normal to low flow conditions in a dry channel. We would advise that there should be no instream works between mid-October until the following April. This would likely to be a condition on the Flood Risk Activity Permits (FRAP) issued. Over pumping arrangements should cater for flood conditions in the temporary works arrangements.
- Section 8 of table 5.1 should replace the reference to the EA with NRW.
- We would expect that more detail is provided in the final FCA on the 'water management system'. Any effluent from a package plant would require a water discharge permit under the Environmental Permitting Regulations 2016 (EPR2016).

Dewatering from excavations may require a Waste Disposal Permit under the EPR2016 should the temporary discharge not meet the requirements as per the attached *Environment Agency* regulatory position statement '*Temporary water discharges from excavations* (adopted by NRW). We would be grateful for confirmation as to whether the dewatering from excavations meets the requirement of the position statement or if a permit will be required. Water discharge permits do not differentiate between main rivers and ordinary watercourses.

It would be beneficial for our review purposes if the FCA includes relevant plans within the FCA document.

NWCP FCA Vol 2 – Substations FCA DRAFT 22.06.17

We agree with the Summary and Conclusion of this volume and have no additional comments. Gwynedd Council as the Lead Local Flood Authority should also provide comments.

NWCP FCA Vol 3 – Cable Sealing End Compounds FCA DRAFT 22.06.17

Details of the actual receiving watercourse referred to in paragraph 1.3.6 should be provided. The site should natural drain to the proposed discharge point. Should this not be the case then the receiving watercourse may become overloaded even if run off rates are controlled to 3.02 l/s/ha.

Paragraph 1.3.5 confirms that dewatering of the shaft and tunnel will be required. We would be grateful for clarification as to the extent of the operational water management zone. A permit under the EPR2016 for Water discharge will be required for the bentonite package plant during construction and is also likely to be required for the operational discharge.

Again, we agree with the Summary and Conclusion of this volume and have no additional comments. We would welcome the inclusion of figure 5.12.1.8 that is referred to in paragraph 6.2.3 and 6.2.4 within the final version of volume 3.

NWCP FCA Vol 4 – Overhead Lines Route Corridor FCA DRAFT 22.06.17

Table 3.1 – our comments above relating to Zone B made in relation to volume 1 paragraph 3.6.2 applies.

There are numerous references in this volume regarding flood zones being limited to main rivers. This is incorrect since Fluvial flood zones are associated with catchments in excess of 3km² and do not distinguish between main rivers/ordinary watercourses. e.g. paragraph 3.2.2

It is unclear if the undergrounding works for 3rd party OHL/3rd cable / gas pipeline are proposed beneath main rivers/ordinary watercourses. We seek clarification on this matter and if they are proposed beneath main rivers/ordinary watercourses it is suggested that detail is provided regarding depth/cover beneath bed of watercourse(s) as well as detail of suitable flood mitigation in the FRAP/ordinary watercourse application.

We are generally satisfied with this volume including the summary and conclusions section.

NWCP Afon Braint modelling DRAFT 22.06.17 (Doc. 5.12.5B) & EVY0611 Afon Braint Model Document For Issue

We note that the approach undertaken with regards to flood risk is extremely precautionary and simulates the 0.1% AEP (1 in 1000) with an additional +75% in flow volumes for climate change.

We have reviewed the Flood Estimation Calculation record provided and would advise the following-

- Peak flows version 4.1 released in May 2016 has been used in this study. Since then Peak Flows version 5 has been released in April 2017. Version 5 contains an additional year of data over version 4.1 and so includes data up to September 2015. For this study the

estimates provided by the consultants using version 4.1 are more conservative than if version 5 had been used.

- Estimation of QMED - Four donor stations have been used to adjust QMED from catchment descriptors. These are chosen based on distance from the study site rather than hydrological similarity. This agrees with Wallingford Guidance based on published research. For this study the use of four donor stations produces reasonable QMED estimates.
- Pooling groups – detailed information regarding the pooling groups is included. The justification for the removal of a site is reasonable.
- The hybrid/ratio approach has been used for the final estimates which follows NRW best practice guidelines.

As such we are satisfied with the final estimates and the methodology used to derive the flows along with the content of the Afon Braint Modelling Document.

We thank you for sharing the draft assessment with us and trust that our comments will be of assistance to you and will be incorporated into the final assessments supporting your submission.

Please do not hesitate to contact us if we can be of any further assistance to you or if you wish to discuss our comments further.

Yn gywir / yours faithfully

[Redacted Signature]

[Redacted Name]

Uwch-gynghorydd Cynllunio Datblygu / Senior Development Planning Adviser
Gwasanaeth Cynghori Cynllunio Datblygu / Development Planning Advisory Service

2.0 Isle of Anglesey C.C. Consultation

2.1 HYDROLOGY DATA REQUEST EMAILS

From: [REDACTED] <[REDACTED]@ynysmon.gov.uk>
Sent: 02 November 2016 09:03
To: [REDACTED]
Subject: RE: National Grid North Wales Connection - Data requests hydrology
Categories: Future Reference

Hello [REDACTED]

My colleague [REDACTED] is going to try and collate the relevant information for you and may contact you to clarify some aspects of the proposals, or if he requires the maps in an alternative format.

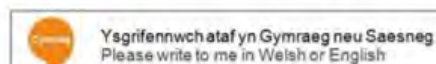
I would reiterate that while we do not perceive any increased flood risk from the proposals at this early stage, once more detailed information is available regarding the construction works, we will be able to make a more comprehensive assessment.

In addition, one point not mentioned during our conversation was if any part of the scheme along the proposed route (including possible temporary works for access etc.) is likely to impact on an ordinary watercourse or land drainage system, then consent may be required from this Authority under Section 23 of the Land Drainage Act 1991.

[REDACTED]

[REDACTED]

Uwch Beiriannydd Cynorthwyl - Senior Assistant Engineer,
Adran Briffyrdd - Highways Department
Gwasanaeth Priffyrdd, Gwastraff ag Eiddo - Highways, Waste and Property Service
Cyngor Sir Ynys Mon - Isle of Anglesey County Council
LL77 7TW.
Tel: [REDACTED]
Epost/Email: [REDACTED]@anglesey.gov.uk



Ysgrifennwch ataf yn Gymraeg neu Saesneg
Please write to me in Welsh or English

From: [REDACTED] [mailto:[REDACTED]@amecfw.com]
Sent: 01 November 2016 12:34
To: [REDACTED]
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hi [REDACTED]

Thank you for your time on the phone just now. As discussed I attach a map showing the proposed project boundary. Please let me know if providing the boundary in a different format such as GIS would be more useful.

Thank you for aiming to provide your records of flooding within this boundary by the end of next week (11 November). I am hoping for good weather!

Thank you also for your advice in your role as Lead Local Flood Authority. I understand that you require:

- Management of surface water runoff to greenfield rates;
- Drain surface water to ground (soakaways) wherever possible, in preference to connecting to stormwater network or local watercourses; and
- No negative impact on flood risk elsewhere from the proposed development.

You have raised no particular concerns about the proposed project relating to flood risk. I can confirm that we are also in contact with NRW and that they are providing flood maps.

Kind regards,

[REDACTED]

[REDACTED]

Senior Consultant, Water Management, Amec Foster Wheeler Environment & Infrastructure UK Ltd
Ground Floor, Redcliff Quay, 120 Redcliff Street, Bristol BS1 6HU, United Kingdom
T: [REDACTED] M: [REDACTED]
[REDACTED]@amecfw.com amecfw.com

From: [REDACTED] [mailto:[REDACTED]@ynysmon.gov.uk]

Sent: 18 October 2016 14:51

To: [REDACTED] <[REDACTED]@amecfw.com>

Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hello [REDACTED]

Apologies for the delay in responding to your enquiry.

We do have some records available of historic flooding incidents, which may be of some assistance to you.

It would probably be easier if you could arrange to call at the council offices so that you can view the information available on our database and assess whether it is what you require. In addition, we could also discuss the nature of the proposed construction works and the possible requirements in respect of surface water drainage.

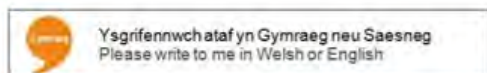
My direct line is shown below, if you wish to discuss this matter further, or clarify any specific points.

Regards,

[REDACTED]

[REDACTED]

Uwch Beiriannydd Cynorthwyol - Senior Assistant Engineer,
Adran Briffyrdd - Highways Department
Gwasanaeth Priffyrdd, Gwastraff ag Eiddo - Highways, Waste and Property Service
Cyngor Sir Ynys Mon - Isle of Anglesey County Council
LL77 7TW.
Tel: [REDACTED]
Epost/Email: [REDACTED]@anglesey.gov.uk



From: [redacted] [mailto:[redacted]@amecfw.com]
Sent: 12 October 2016 15:35
To: [redacted]
Cc: [redacted]
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hi [redacted]

You might have seen that I am looking to obtain records of historic and sewer flooding for the council's area. Does your department hold such records and would you be able to share these?

I am also looking for the council's advice in their role as Lead Local Flood Authority. I would be grateful if you could point me in the right direction as to who would be able to provide this advice (see questions in below email).

Kind regards,

[redacted]

From: [redacted] [mailto:[redacted]@ynysmon.gov.uk]
Sent: 12 October 2016 14:34
To: [redacted] <[redacted]@amecfw.com>
Cc: [redacted] <[redacted]@ynysmon.gov.uk>
Subject: RE: National Grid North Wales Connection - Data requests hydrology
Importance: High

[redacted]

Thank you for your email concerning the information search for historic flooding and sewer flooding. Unfortunately the Environmental Health Department would not be the most appropriate department to contact regarding your search regarding flooding.

May I therefore suggest you liaise with Natural Resources Wales / Environment Agency as they should hold such information relating to your request on historic land flooding and Dwr Cymru / Welsh Water regarding sewer flooding.

Additionally I have taken this opportunity of copying this Local Authority's Senior Assistant Engineer [redacted]; located within the Highways, Waste and Property Department into this email as he may possibly hold some information.

Therefore, it may be worth contacting the Highways, Waste and Property Department directly.

Sorry we can't be of more assistance.

Kind regards,

[redacted]

[REDACTED]

Swyddog Iechyd Yr Amgylchedd / Environmental Health Officer
Adran Datblygu Cynladwy / Sustainable Development Department
Cyngor Sir Ynys Môn / Isle of Anglesey County Council
Llangefni
Ynys Môn
LL77 7 TW

Direct Dial [REDACTED]
E-bost / e-mail [REDACTED]@ynysmon.gov.uk

Adborth am ein gwasanaeth / Feedback on our service
<http://www.surveymonkey.com/s/8T97JF3>



From: [REDACTED] [mailto:[REDACTED]@amecfw.com]
Sent: 11 October 2016 17:25
To: [REDACTED]
Subject: National Grid North Wales Connection - Data requests hydrology

Dear [REDACTED]

I work with [REDACTED] of AECOM on the hydrology aspects of the North Wales Connection Project. I have a number of data and consultation requests to support the hydrology ES Chapter I am hoping you will be able to help me with in your function as the Lead Local Flood Authority.

We would like to request the following data for your area:

- Records of sewer flooding
- Records of historic floods

We would like to ask the following questions:

- Do you have any particular requirements for the attenuation of surface water for the proposed infrastructure (pylons, substations, cable sealing end compounds, tunnel heads for underground section, temporary stockpiling, construction compounds, access tracks)?
- Do you have any particular concerns about the proposed project relating to flood risk?
- Do you have any local information relating to flood risk that we should be aware of?

Please let me know if you require any more information. I would also be grateful if you could give me an estimate of how long it will take to collate this data and come back on our questions.

Kind regards,

[REDACTED]

[REDACTED]
Senior Consultant, Water Management, Amec Foster Wheeler Environment & Infrastructure UK Ltd
Ground Floor, Redcliff Quay, 120 Redcliff Street, Bristol BS1 6HU, United Kingdom
[REDACTED]@amecfw.com amecfw.com



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Croeso i chi ddellio gyda'r Cyngor yn Gymraeg neu'n Saesneg. Cewch yr un safon o wasanaeth yn y ddwy iaith.

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Mae cynnwys y neges e-bost hon yn cynrychioli sylwadau'r gyrrwr yn unig ac nid o angenrheidrwydd yn cynrychioli sylwadau Cyngor Sir Ynys Mon. Mae Cyngor Sir Ynys Mon yn cadw a diogelu ei hawliau i fonitro yr holl negeseuon e-bost trwy ei rwydweithiau mewnol ac allanol.

Croeso i chi ddellio gyda'r Cyngor yn Gymraeg neu'n Saesneg. Cewch yr un safon o wasanaeth yn y ddwy iaith.

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You are welcome to deal with the Council in Welsh or English. You will receive the same standard of service in both languages.

From: [REDACTED]
Sent: 11 April 2017 12:55
To: [REDACTED]
Subject: FW: National Grid North Wales Connection - Data requests hydrology
Attachments: NG flood data - Plan 10.pdf; NG flood data - Plan 9.pdf; NG flood data - Plan 8.pdf; NG flood data - Plan 7.pdf; NG flood data - Plan 6.pdf; NG flood data - Plan 5.pdf; NG flood data - Plan 4.pdf; NG flood data - Plan 3.pdf; NG flood data - Plan 2.pdf; NG flood data - Plan 1.pdf; Flooding Incident table - within NG proposed project boundary.xlsx; Flooding Incident table - in and around NG proposed project boundary.xlsx

Hi [REDACTED]

Here you are. I had saved all the received data onto the project file. It looks as if someone has tidied it up though, so I'm not sure where it's all gone. I imagine you are sorting it out now.

[REDACTED]

From: [REDACTED] [mailto:[REDACTED]@ynysmon.gov.uk]
Sent: 08 November 2016 08:50
To: [REDACTED] <[REDACTED]@amecfw.com>
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Dear [REDACTED]

I refer to your email on the 1st November 2016 regarding flood data and information request. I have attached location plans for all the historical flooding incidents recorded by the Isle of Anglesey which are located within and around the area of interest. I have also attached two spreadsheets with the details for each incident; a spreadsheet which lists the incidents recorded within the area boundary and another which also lists the incidents situated within and in the immediate vicinity of your area of interest. The data within the spreadsheets have been collated from various sources and in some cases are incomplete as there was no detail recorded of the specific flooding incident.

I hope that this will be of some assistance.

Thank you,

[REDACTED]

Technegydd Rheoli Dŵr a Llifogydd / Flood and Water Management Technician
Prifffyrdd, Gwastraff ac Eiddo / Highways, Waste and Property
Cyngor Sir Ynys Môn / Isle of Anglesey County Council



Ysgrifennwch ataf yn Gymraeg neu Saesneg
Please write to me in Welsh or English

From: [REDACTED] [mailto:[REDACTED]@amecfw.com]
Sent: 04 November 2016 12:15
To: [REDACTED]
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hi [REDACTED]

Please see attached for a shapefile of the boundary. Apologies for the delay.

Many thanks,

[REDACTED]

From: [REDACTED] [mailto:[REDACTED]@ynysmon.gov.uk]
Sent: 01 November 2016 15:01
To: [REDACTED] <[REDACTED]@amecfw.com>
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hi [REDACTED]

Please can you provide the boundary in a GIS format if possible as this might allow us to provide you with more useful data/plans.

Thank You,

[REDACTED]

Technegydd Rheoli Dŵr a Llifogydd / Flood and Water Management Technician
Prifffyrdd, Gwastraff ac Eiddo / Highways, Waste and Property
Cyngor Sir Ynys Môn / Isle of Anglesey County Council



Ysgrifennwch ataf yn Gymraeg neu Saesneg
Please write to me in Welsh or English

From: [REDACTED]
Sent: 01 November 2016 13:27
To: [REDACTED]
Subject: FW: National Grid North Wales Connection - Data requests hydrology

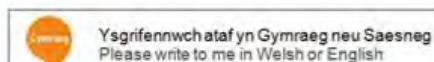
[REDACTED]

Copy of e-mail requesting details of flood events.

[REDACTED]

[REDACTED]

Uwch Beiriannydd Cynorthwyol - Senior Assistant Engineer,
Adran Briffyrdd - Highways Department
Gwasanaeth Prifffyrdd, Gwastraff ag Eiddo - Highways, Waste and Property Service
Cyngor Sir Ynys Môn - Isle of Anglesey County Council
LL77 7TW.
Tel: [REDACTED]
Ebost/Email: [REDACTED]@anglesey.gov.uk



From: [redacted] [mailto:[redacted]@amecfw.com]
Sent: 01 November 2016 12:34
To: [redacted]
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hi [redacted]

Thank you for your time on the phone just now. As discussed I attach a map showing the proposed project boundary. Please let me know if providing the boundary in a different format such as GIS would be more useful. Thank you for aiming to provide your records of flooding within this boundary by the end of next week (11 November). I am hoping for good weather!

Thank you also for your advice in your role as Lead Local Flood Authority. I understand that you require:

- Management of surface water runoff to greenfield rates;
- Drain surface water to ground (soakaways) wherever possible, in preference to connecting to stormwater network or local watercourses; and
- No negative impact on flood risk elsewhere from the proposed development.

You have raised no particular concerns about the proposed project relating to flood risk. I can confirm that we are also in contact with NRW and that they are providing flood maps.

Kind regards,

[redacted]

[redacted]
Senior Consultant, Water Management, Amec Foster Wheeler Environment & Infrastructure UK Ltd
Ground Floor, Redcliff Quay, 120 Redcliff Street, Bristol BS1 6HU, United Kingdom

[redacted] @amecfw.com amecfw.com

From: [redacted] [mailto:[redacted]@ynysmon.gov.uk]
Sent: 18 October 2016 14:51
To: [redacted] <[redacted]@amecfw.com>
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hello [redacted]

Apologies for the delay in responding to your enquiry.

We do have some records available of historic flooding incidents, which may be of some assistance to you.

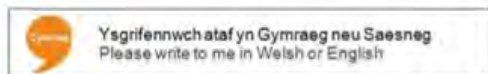
It would probably be easier if you could arrange to call at the council offices so that you can view the information available on our database and assess whether it is what you require. In addition, we could also discuss the nature of the proposed construction works and the possible requirements in respect of surface water drainage.

My direct line is shown below, if you wish to discuss this matter further, or clarify any specific points.

Regards,



Uwch Beiriannydd Cynorthwyl - Senior Assistant Engineer,
Adran Briffyrdd - Highways Department
Gwasanaeth Priffyrdd, Gwastraff ag Eiddo - Highways, Waste and Property Service
Cyngor Sir Ynys Mon - Isle of Anglesey County Council
LL77 7TW.
Tel: [REDACTED]
Ebost/Email: [REDACTED]@anglesey.gov.uk



From: [REDACTED] [mailto:[REDACTED]@amecfw.com]
Sent: 12 October 2016 15:35
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: National Grid North Wales Connection - Data requests hydrology

Hi [REDACTED]

You might have seen that I am looking to obtain records of historic and sewer flooding for the council's area. Does your department hold such records and would you be able to share these?

I am also looking for the council's advice in their role as Lead Local Flood Authority. I would be grateful if you could point me in the right direction as to who would be able to provide this advice (see questions in below email).

Kind regards,



From: [REDACTED] [mailto:[REDACTED]@ynysmon.gov.uk]
Sent: 12 October 2016 14:34
To: [REDACTED] <[REDACTED]@amecfw.com>
Cc: [REDACTED] <[REDACTED]@ynysmon.gov.uk>
Subject: RE: National Grid North Wales Connection - Data requests hydrology
Importance: High

Hello [REDACTED]

Thank you for your email concerning the information search for historic flooding and sewer flooding. Unfortunately the Environmental Health Department would not be the most appropriate department to contact regarding your search regarding flooding.

May I therefore suggest you liaise with Natural Resources Wales / Environment Agency as they should hold such information relating to your request on historic land flooding and Dwr Cymru / Welsh Water regarding sewer flooding.

Additionally I have taken this opportunity of copying this Local Authority's Senior Assistant Engineer [REDACTED] located within the Highways, Waste and Property Department into this email as he may possibly hold some information.

Therefore, it may be worth contacting the Highways, Waste and Property Department directly.

Sorry we can't be of more assistance.

Kind regards,

[REDACTED]

[REDACTED]

[REDACTED]

Swyddog Iechyd Yr Amgylchedd / Environmental Health Officer
Adran Datblygu Cynladwy / Sustainable Development Department
Cyngor Sir Ynys Môn / Isle of Anglesey County Council
Llangefni
Ynys Môn
LL77 7 TW

Direct Dial [REDACTED]
E-bost / e-mail [REDACTED]@ynysmon.gov.uk

Adborth am ein gwasanaeth / Feedback on our service
<http://www.surveymonkey.com/s/8T97JF3>



From: [REDACTED] [<mailto:Angela.Dhaliwal@amecfw.com>]
Sent: 11 October 2016 17:25
To: [REDACTED]
Subject: National Grid North Wales Connection - Data requests hydrology

Dear [REDACTED]

I work with [REDACTED] of AECOM on the hydrology aspects of the North Wales Connection Project. I have a number of data and consultation requests to support the hydrology ES Chapter I am hoping you will be able to help me with in your function as the Lead Local Flood Authority.

We would like to request the following data for your area:

- Records of sewer flooding
- Records of historic floods

We would like to ask the following questions:

- Do you have any particular requirements for the attenuation of surface water for the proposed infrastructure (pylons, substations, cable sealing end compounds, tunnel heads for underground section, temporary stockpiling, construction compounds, access tracks)?
- Do you have any particular concerns about the proposed project relating to flood risk?
- Do you have any local information relating to flood risk that we should be aware of?

Please let me know if you require any more information. I would also be grateful if you could give me an estimate of how long it will take to collate this data and come back on our questions.

Kind regards,

[Redacted]

[Redacted]

Senior Consultant, Water Management, Amec Foster Wheeler Environment & Infrastructure UK Ltd
Ground Floor, Redcliff Quay, 120 Redcliff Street, Bristol BS1 6HU, United Kingdom

[Redacted]@amecfw.com amecfw.com



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bwriadwyd eu gyrru nhw ato. Petaech wedi derbyn y neges e-bost hon mewn camgymeriad yna, os gwelwch yn dda, rhowch wybod i'r Rheolwr Systemau yn syth gan ddefnyddio'r manylion isod, a pheidiwch datgelu na chopio'r cynnwys i neb arall.

Mae cynnwys y neges e-bost hon yn cynrychioli sylwadau'r gyrrwr yn unig ac nid o angenrheidrwydd yn cynrychioli sylwadau Cyngor Sir Ynys Mon. Mae Cyngor Sir Ynys Mon yn cadw a diogelu ei hawliau i fonitro yr holl negeseuon e-bost trwy ei rwydweithiau mewnol ac allanol.

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2.2 DATA REQUEST



Document Review Form

Document Details					
Document Title	Flood Consequence Assessment Method Statement		Document Author	Amec Foster Wheeler for National Grid	
Document Reference	n/a	Document Date	06/02/2017	Document Revision	1
Document Status	n/a	Purpose of Issue		Document Marking	
Document Purpose	Methodology for review and agreement				

Review Details					
Review Issue Date	27/02/2017	Review Deadline	23/02/2017	Review Owner	
Review Purpose	To review methodology proposed only.				
Response Issue Date	Click here to enter a date.	Response Deadline	Click here to enter a date.	Response Owner	

Review Schedule			
Sequence	Name (Initials)	Organisation	Role/Title
1		Arup	Senior River and Coastal Scientist
2		Isle of Anglesey County Council	Senior Assistant Engineer
General Notes			
Reviewer	Notes	Author Response	

Detailed Review Comments				Author Response
No	Page / Section	Para. / Subsection	Reviewer Comment(s)	
1	General	General	<p>General structure: The aim of this document is to provide an FCA method statement. The actual methodology is in Section 9 of the report.</p> <p>We suggest that it would be very useful to clarify upfront that the aims of an FCA should be to show that the development is justified and the consequences of any flooding issues anticipated are acceptable.</p> <p>We suggest that the introduction should include the aims and objectives of this FCA, whether it's purely a desk based study to scope all the flooding issues and identify any requirements for detailed modelling, or whether any such requirements have already been identified. If the latter, then the methodology should outline as a minimum the anticipated modelling approaches.</p> <p>Please state that the FCA will assess flooding from all relevant sources – fluvial, tidal, pluvial (surface water), artificial sources and groundwater. And that off-site impacts should be considered both in terms of impacts on existing flood mechanisms and attenuation of runoff from new areas of hard-standing.</p>	
2	Page 2	Section 2	<p>It would be useful to have a flood risk overview section. This could include the Development Advice Map (DAM) which will show the relevant flood zones.</p>	<p>Yes we will provide a brief overview in Volume 1. However, it is proposed that the topic specific FCA volumes (i.e. 2, 3 and 4) will include the specific overviews as per the second bullet point in Section 8.2 of the method statement. It is sensible to do this at a more focused scale in the specific volumes, as opposed providing an overview in Volume 1.</p>

3	Page 3	Section 3.1	<p>There are 91 pylons across the whole route. Some of these will be in areas of flood risk and some will not. It is too early to completely scope out all of the pylons from the FCA. The pylons will be located in different catchments with different characteristics. Each pylon location should be screened with regard to the potential impact on flood risk outlined below as a minimum:</p> <ul style="list-style-type: none"> • Proximity to watercourse and potential erosion risk zones, ensuring that there is clear access for maintenance of the watercourses. • Likelihood of debris capture during flood events if located in floodplain flood routes or SW flowpaths, where blockage of these might affect local receptors. • The impact of the foundations on land drainage systems or groundwater in superficial deposits and subsequent localised surface water flooding during construction and/ or operation. • If the concrete foundation pad protrudes above ground they may impact upon surface water flow paths and if they are below ground they may cause groundwater mounding. <p>On what basis can it be concluded that all the flood events will be a low velocity (second line, second paragraph).</p>	<p>Avoiding floodplains has been a priority in the route selection and scheme design from the outset. After a number of iterations through original specification, constraints, PEIR/s42 design freeze and recently the interim design freeze, only one pylon (4AP033) is located in zone c2, and two (4ZA042 and 4AP070) on the edges of flood zone 3. In the case of these pylons, they will get specifically mentioned in the FCA.</p> <p>It is not possible to assess pylon coincidence with flood zones in the context of climate change, due to the lack of modelling coverage in this area.</p> <ul style="list-style-type: none"> • We are unclear how pylons would impact access to watercourses. • Pylon legs are typically 7-10 metres apart. It is highly unlikely that any debris big enough to cause a blockage at the base of a pylon could be transported by the range of flows on Anglesey. • Impacts on groundwater and land drainage will be addressed in the EIA. <p>Flow velocity in the outer extent of floodplains (where, as identified above, the three pylons in the floodplain will be located) is generally low.</p> <p>NRW has accepted our proposal to scope out pylons. The same position has been taken by the Environment Agency with regards to the North West Coast Connection project, which is running in parallel with North Wales.</p>
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4	Page 3	Section 3.2	<p>The FCA should assess flooding from all sources. Therefore for completeness please include this initial assessment of tidal flooding in the initial section (s) of the FCA.</p> <p>The Development Advice Maps shows flood zone C1 extends almost to Llangefni. Please state that no flood vulnerable development will be located in this area (with allowance for climate change)</p>	<p>The same rationale as presented in the method statement will be presented in the FCA.</p> <p>The drawings issued as part of the PEIR show that no vulnerable development will be located in this area. Drawings in the FCA and Environmental Statement will do the same.</p>
6	Page 5	Section 5.2 and 5.3	<p>These sections give information about the climate change allowances to be used for rainfall and river flow. Section 5.2, Line 2 mentions that modelling may be required. No further information is given on modelling in this document nor the proposed approach. Is flood modelling proposed for this FCA? If so, please can you provide information on your methodology for this? If not, please can you explain why it is not necessary and what other methods will be used instead to assess the impact of the development on flood risk to the development itself and elsewhere?</p>	<p>Modelling is being undertaken for the main river Afon Braint. The modelling methodology has been developed in consultation with NRW</p>
7	Page 6	Section 6	<p>Will the FCA include a surface water drainage strategy or is this being undertaken separately?</p> <p>Section 6 refers to drainage modelling. Is this proposed as part of the FCA? If so, please provide details of the methodology and application be provided.</p> <p>Please also include a section on groundwater flooding.</p>	<p>Surface water drainage strategies will be produced for the construction and permanent cases of the CSEC/THH, as well as for the Llangefni construction compound. More generic drainage strategies for construction areas along the OHL route will also be included in the CEMP.</p> <p>Groundwater flooding will be considered in the FCA</p>
8	Page 7 & 8	Section 7, Para 2	<p>This FCA will form part of the decision making within the planning process in Wales. Therefore, the flood zones terminology should relate to those given in Tan15.</p> <p>If the English terminology is used please state clearly the relationship between the English and Welsh flood zones. Please include a table and map to clearly demonstrate this (see note 10 below).</p>	<p>We will set out the relationship between TAN15 and equivalent flood zones</p>

9	Page 8	Section 7, Para 4 (after the definitions of flood zones)	This is a FCA so suggest that flood relevant terminology is used as opposed to that given in NPS EN-1 which is an energy document.	The FCA will comprise an element of the DCO application for a NSIP submitted to the Planning Inspectorate. As such, it will be determined on the basis of National Policy Statements, of which EN-1 is applicable.
10	Page 8	Table 7.1	If English terminology is used, this table needs to be amended to show exactly how this relates back to the Welsh classifications. The relationship from NPPF to Tan 15 needs to be stated clearly to make the decision making process easier. Construction support areas should not be located in flood zone 3a due to the pollution risk.	Clarity will be provided as to the relationship between NPPF and TAN15. The scheme design has now avoided locating construction support areas in flood zone 3a.
11	Page 9	Section 8	Please note that Section A1.5 of Tan 15 requests clear and simple descriptions of the following in a FCA: <ul style="list-style-type: none"> • The likely mechanisms of flooding • The likely sources of flooding • The depths of flooding throughout the site • The speed of inundation of the site • The rate of rise of floodwaters throughout the site. • Velocities of floodwaters across the site • Overland flood routes • The effects on access and egress and infrastructure, for example public sewer outfalls, combined sewer overflows, surface water sewers and effluent discharge pipes from waste water treatment works • The impacts of the development on natural heritage • The impact of the development in terms of flood risk on neighbouring properties and elsewhere on the flood plain. 	The requirements of TAN15 have been accounted for and will be addressed as necessary throughout the FCA.

12	Page 10	Section 8.2	<p>Please include a note that these volumes will include the flood modelling approach and findings.</p> <p>With reference to note 7 above, where will the surface water drainage strategy sit within these volumes?</p> <p>Bullet point 2 – Consider using more granularity than 'third party receptor group'.</p> <p>Bullet point 5, line 3 – what are the assessment methodologies that will be applied?</p>	<p>Modelling will be included in the CSEC/THH volume.</p> <p>The surface water drainage strategy for CSEC/THH sites is likely to sit within Vol 5 (appendices).</p> <p>As mentioned throughout the method statement, the proposed treatment of receptors is proportionate to the scale of the scheme and in aiming to produce a suite of documents that is straightforward, unrepetitious and, of course, compliant. Receptor grouping is subsequently discussed in more detail in Section 9 of the method statement.</p> <p>Section 8.2, bullet point 5 is referring to the methodologies that are subsequently presented in Section 9.</p>
13	Page 11	Section 9	<p>Final bullet point – the section on 'coastal flood risk' does not exist.</p>	<p>Agreed, there is no specific sub-section on coastal flood risk. However it is mentioned within the bullet points and in Section 9.1 to reiterate that it is being scoped out, which has been agreed with NRW.</p>
14	Page 11	Section 9.1	<p>Paragraph 2, line 3; should also refer to sewer flooding records maintained by Dwr Cymru Welsh Water, as the sewerage undertaker.</p>	<p>Noted</p>
15	Page 15	Section 9.4	<p>Note that the access tracks themselves may have implications on land drainage, flood flows and conveyance locally.</p>	<p>Noted</p>
16	Page 15	Section 9.4	<p>HDM4; Design and construction details for proposed soakaway systems should be established utilising site specific porosity tests to determine their adequacy and suitability.</p>	<p>Soakaways are no longer being considered</p>
17	Page 16	Section 9.6	<p>IOH124 is largely superseded by ReFH2. Consider using ReFH2 as this is a more accurate methodology.</p>	<p>We will be using ReFH2.2 and also the Wallingford SUDSUK online tools for greenfield runoff and storage calcs. Please note however, that any storage calculations are assumed to be indicative and used only to demonstrate the outline feasibility of drainage scheme which, post-DCO, will be subject to detailed</p>

				design together with fulfilling all statutory consultation and permitting requirements
18	Page 16	Section 9.7	Again please ensure that the access tracks themselves are assessed.	The access tracks will be assessed as part of Volume 4, Overhead Lines.
19	Page 16	Section 9.7. Last line on page	For work on an ordinary watercourse you need to apply for Ordinary Watercourse Consent not Flood Defence Consent	Noted
20	Page 17	Section 10.1	Include Welsh flood zone data and the DAM.	Covered above
21	Page 17	Section 10	Will any stakeholder consultation be undertaken as part of the data collection process? Suggest contacting NRW, local councils and the local water company.	Yes IoACC, Gwynedd CC, NRW and DCWW have been/are being consulted with. Consultation with NRW is ongoing.

To Be Completed By The Review Owner (Developer Discretion)	
To Be Completed By The Review Owner (Developer Discretion)	For Completion Post Review Only
Overall Document Review Status (tick box) <input type="checkbox"/> Document(s) accepted and work may proceed <input type="checkbox"/> Document(s) are accepted with comments and work may proceed <input type="checkbox"/> Document(s) are not accepted and must be resubmitted before work may proceed	I confirm all Review Team comments have been addressed: Name: Initials: Date: Click here to enter a date:

Once review status assigned please return to document author/owner.

3.0 Gwynedd Council Consultation

3.1

RESPONSE TO FCA METHOD STATEMENT EMAILS

From: [REDACTED]
Sent: 11 April 2017 09:20
To: [REDACTED]@gwynedd.gov.uk'
Cc: [REDACTED]; [REDACTED]@landuse.co.uk'; [REDACTED]
Subject: RE: NWCP

Dear [REDACTED]

Many thanks for your comments on the North Wales Connection FCA method statement.

I assume you mean the SUDS hierarchy in the drainage strategy. Yes, this will be applied for permanent drainage schemes and, as far as is practicable, for temporary construction activity related drainage.

Your advice regarding ReFH 2.2 is noted and will be implemented. Note also that, since the aim of the DCO application is to demonstrate feasibility of drainage schemes (with the details being confirmed post-DCO, in consultation with yourselves where applicable), we may use the Wallingford SUDSUK online calculation tools for Greenfield and storage calcs.

Thanks for the heads up re: bylaws. If there are any developments in this regard throughout 2017 then I'd be grateful if you could let me know.

Thanks also for your offer of shapefiles of assets. I'll be in touch under separate cover in this regard.

All the best

[REDACTED]

[REDACTED]
Principal Consultant, Water Management, Environment & Infrastructure Uk Ltd, Amec Foster Wheeler
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M [REDACTED]
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From: [REDACTED] [mailto:[REDACTED]@gillespies.co.uk]
Sent: 24 February 2017 10:07
To: [REDACTED]@amecfw.com>
Cc: [REDACTED]@amecfw.com>
Subject: FW: NWCP

FYI

Regards

[REDACTED]

[REDACTED]
Associate Partner
GILLESPIES LLP

On behalf of the National Grid North Wales Connection Project

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2015 RIBA Stirling Prize Shortlist: NEO Bankside
2015 RIBA National Award Winner: NEO Bankside
2015 RIBA Regional Award Winner: NEO Bankside | Southwater One
2014 Civic Trust Award Winner: Brent Civic Centre
2014 Landscape Institute Winner: Maida Hill Place



From: [REDACTED] (YMG) [[mailto:\[REDACTED\]@gwynedd.llyw.cymru](mailto:[REDACTED]@gwynedd.llyw.cymru)]
Sent: 24 February 2017 10:07
To: [REDACTED] <[\[REDACTED\]@gillespies.co.uk](mailto:[REDACTED]@gillespies.co.uk)>
Subject: RE: NWCP

No problem, let me know if you'll need shapefiles of our assets ect

[REDACTED]
Uwch Beiriannydd /Senior Engineer



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From: [REDACTED] [[mailto:\[REDACTED\]@gillespies.co.uk](mailto:[REDACTED]@gillespies.co.uk)]
Sent: 24 February 2017 10:03
To: [REDACTED]
Subject: RE: NWCP

Morning [REDACTED]

Thanks for your comments, we will be in touch again once we have comments back from all the stakeholders.

Regards

[REDACTED]

Associate Partner
GILLESPIES LLP

On behalf of the National Grid North Wales Connection Project

Westgate House
44 Hale Road, Hale
Cheshire, WA14 3EX

T: [REDACTED]
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2015 RIBA Stirling Prize Shortlist: NEO Bankside
2015 RIBA National Award Winner: NEO Bankside
2015 RIBA Regional Award Winner: NEO Bankside | Southwater One
2014 Civic Trust Award Winner: Brent Civic Centre
2014 Landscape Institute Winner: Maida Hill Place



From: [REDACTED] (YMG) [[mailto:\[REDACTED\]@gwynedd.llyw.cymru](mailto:[REDACTED]@gwynedd.llyw.cymru)]

Sent: 24 February 2017 09:57

To: [REDACTED] <[\[REDACTED\]@gillespies.co.uk](mailto:[REDACTED]@gillespies.co.uk)>

Cc: [REDACTED] <[\[REDACTED\]@gwynedd.llyw.cymru](mailto:[REDACTED]@gwynedd.llyw.cymru)>; [REDACTED]

<[\[REDACTED\]@gwynedd.llyw.cymru](mailto:[REDACTED]@gwynedd.llyw.cymru)>; [REDACTED] <[\[REDACTED\]@gwynedd.llyw.cymru](mailto:[REDACTED]@gwynedd.llyw.cymru)>

Subject: NWCP

Good Morning [REDACTED]

Thank you for the comprehensive method statement for the FCA, I have mainly reviewed your methodology for temporary and permanent drainage works and agree with both, only addition is that you use the drainage hierarchy in the drainage strategy.

We would also recommend the use of ReFH2.2 as opposed to ReFH2; in addition following recommendation from the new Suds manual, the plot scale method using ReFH2.2 is used for smaller catchments. We would accept the IH 124 method as well.

We note your intentions of applying for OWC once you have detail plans in place, we would welcome viewing the plans as they progress. Also when you have the information available if you could give us the locations of all OW crossing proposed, preferably before planning so we can get the ball rolling for the OWC.

I would also point out that Welsh Government recently have allowed local authorities to set in to place a new set of bylaws associated with works near Ordinary Watercourses. These have yet to be implemented by Gwynedd Council but are likely to be in place for at least part of the construction period.

Please feel free to contact me on the numbers below.

[REDACTED]
Uwch Beirannydd /Senior Engineer



Stryd Y Jel
Caernarfon
Gwynedd
LL55 1SH

Tel: [REDACTED]
ext: [REDACTED]

Mail: [REDACTED]@gwynedd.gov.uk

Mae'r e-bost hwn ac unrhyw atodiad iddo yn gyfrinachol ac fe'i bwriedir ar gyfer y sawl a enwir arno yn unig. Gall gynnwys gwybodaeth freintiedig. Os yw wedi eich cyrraedd trwy gamgymeriad ni ellwch ei gopio, ei ddosbarthu na'i ddangos i unrhyw un arall a dylech gysylltu â'r anfonwr ar unwaith.

Mae unrhyw gynnwys nad yw'n ymwneud â busnes swyddogol y corff sy'n anfon yr e-bost yn bersonol i'r awdur.

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3.2 SEWER FLOODING AND TY FODOL FLOODING INFORMATION REQUEST EMAILS

From: [REDACTED] <[REDACTED]@gwynedd.llyw.cymru>
Sent: 27 April 2017 18:13
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: North Wales Connection
Attachments: 20170427-1213-Ty Fodol to Pentir 1 to 10000 - prominent watercourses + main river..pdf

[REDACTED]

Please find attached a plan showing the most prominent ordinary watercourses located within your interest area and also what appears to be the only main river in the locality. Please bear in mind there will inevitably be other ordinary watercourses not shown for whatever reason which should also be given due consideration.

Regards

[REDACTED]

Peiriannydd Cynorthwyl / Assistant Engineer

Rheoli Risg Llifogydd ac Erydiad Arfordirol
Flood and Coastal Erosion Risk Management



Stryd y Jêl
Caernarfon
Gwynedd
LL55 1SH

Tel: 01286 679 375
Email: [REDACTED]@gwynedd.llyw.cymru

From: [REDACTED]@amecfw.com]
Sent: 26 April 2017 12:43
To: [REDACTED] <[REDACTED]@gwynedd.llyw.cymru>
Cc: [REDACTED]@gwynedd.llyw.cymru>
Subject: RE: North Wales Connection

[REDACTED]

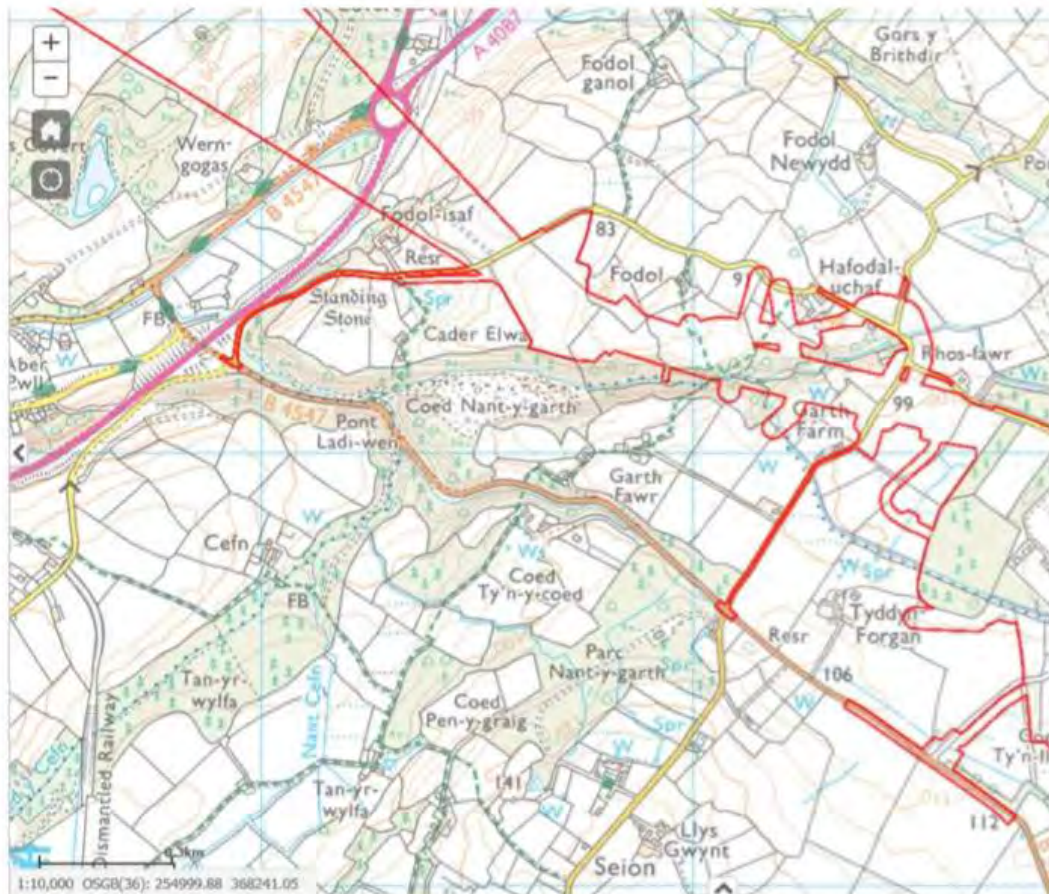
Thanks for getting back to me and I apologise but thought I'd sent a plan in an earlier email so see below (note NGR in bottom left corner). Our search area is within the red line east of Fodol Isaf +250m so lots of Fodols and I assume you were looking at the right area. Thanks for confirmation which I'll assume still stands unless you get back to me with the benefit of the map. Thanks also for copying in Ian.

Yes we're well aware of FRAP and OWC requirements although NRW are unable to provide a main river GIS map. They referred us to the OS mastermap water network layer but that doesn't include main river attributes. Furthermore, the NRW online flood map claims to show only main rivers but when you zoom in it clearly shows OWs too. I don't suppose you can shed any light on this matter? What mapping do you use to determine requirements for OWC as opposed to FRAP?

Thanks again

[REDACTED]

[REDACTED]
Principal Consultant, Water Management, Environment & Infrastructure UK Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU
[REDACTED]@amecfw.com amecfw.com



From: [REDACTED]@gwynedd.llyw.cymru]
Sent: 26 April 2017 12:22
To: [REDACTED]@amecfw.com>
Cc: [REDACTED]@gwynedd.llyw.cymru>
Subject: RE: North Wales Connection

Hi [REDACTED]

In the absence of any plans showing the corridor of your study area, and also not being able to find the location of Ty Fodol on my plans (but assume it is located in the vicinity of other numerous properties with the name 'Fodol' as

part of their address), I wish to inform you that as far as I'm aware this Unit has no records of flooding incidents between Pentir and Ty Fodol.

As regards to any highway related records, I have copied in my colleague [REDACTED] in the Highways Unit for his comments.

To reiterate following my previous reply email, if you propose to work in or near a watercourse you are requested to contact this Unit, as soon as possible, to ensure the proper procedures are followed.

Regards

[REDACTED]

[REDACTED]
Peiriannydd Cynorthwyl / Assistant Engineer

Rheoli Risg Llifogydd ac Erydiad Arfordirol
Flood and Coastal Erosion Risk Management



Stryd y Jâl
Caernarfon
Gwynedd
LL55 1SH

Tel: [REDACTED]
Email: [REDACTED]@gwynedd.llyw.cymru

From: [REDACTED]@amecfw.com]

Sent: 25 April 2017 17:51

To: [REDACTED]

Subject: FW: North Wales Connection

Hi [REDACTED]

Further to my last email a month ago, I can confirm that we've been successful in getting some sewer flooding records from DCWW. We also have from IoACC a list of reported flood incidents (covering everything from fluvial, to highways, to blocked drains and surcharged sewers, adopted/highways or otherwise).

So in an effort to close out this part of the study, I'd be grateful if you can please confirm that there are definitely no Gwynedd County Council records of flooding of any variety or source for the area between Ty Fodol and Pentir.

Many thanks

[REDACTED]

[REDACTED]
Principal Consultant, Water Management, Environment & Infrastructure Uk Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU

[REDACTED]@amecfw.com amecfw.com

From: [REDACTED]

Sent: 28 March 2017 09:38

To: [REDACTED]@gwynedd.llyw.cymru>
Subject: RE: North Wales Connection

Hi [REDACTED]

Thanks for getting back to me and apologies for not responding sooner. We are interested in both DCWW assets and Gwynedd/loACC (which primarily will be highways drains?). I've contacted DCWW a couple of times at the same numbers you listed below but my requests have been unsuccessful as they repeatedly try to advise that there's not much they can do given the linear nature and extent of the project (i.e. they're used to providing on a post code basis as part of general asset searches). So I was hoping you may have a line into DCWW that would circumvent the customer services dept. Not to worry though [REDACTED] and I'll keep pursuing.

So if you are able to provide information for non-DCWW assets that would be very much appreciated.

We have the mastermap OS river networks that, in conjunction with main river mapping has mostly allowed us to differentiate ordinary watercourses. While the scheme involves multiple ordinary watercourse crossings – most on Anglesey but a few near Pentir - such is the nature of the DCO application that permitting requirements will only be dealt with in detail after/if the DCO is secured (into 2018). However, the ES will flag up the locations of all watercourse crossings albeit with the qualification they'll be movable post DCO within set limits of deviation within the development order boundary (though I'd bet in most or all cases if moved after the fact they will still cross the same watercourse).

Look forward to hearing from you re: prospective data around Pentir but if not that is understandable.

Many thanks

[REDACTED]

Principal Consultant, Water Management, Environment & Infrastructure UK Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU

[REDACTED]@amecfw.com amecfw.com

From: [REDACTED]@gwynedd.llyw.cymru]
Sent: 23 March 2017 17:32
To: [REDACTED]@amecfw.com>
Subject: RE: North Wales Connection

Hi [REDACTED]

Can you please confirm it is the Dŵr Cymru/ Welsh water asset location information you require, in which case you are advised to contact Dŵr Cymru Customer Service on [REDACTED] or Dŵr Cymru Sewerage services [REDACTED] (this may be an old number as I have not used it for a while)

As regards to your reference to water/flood aspects, I do not have specific plans of the locations of ordinary watercourses. However, some but not all watercourses can be seen on OS Maps. Please note underground watercourses (culverts) are not usually surveyed by the OS.

If your proposal does involve working near or above watercourses you are request to contact me so that I can inform you of the required procedures to follow.

Please reply if you consider I can be of further service, as I am a bit unclear what exactly you require in this instance.

Regards

Peiriannydd Cynorthwyl / Assistant Engineer
Rheoli Risg Llifogydd ac Erydiad Arfordirol
Flood and Coastal Erosion Risk Management



Stryd y Jêl
Caernarfon
Gwynedd
LL55 1SH

Email: @gwynedd.llyw.cymru

From: @amecfw.com

Sent: 23 March 2017 09:59

To:

Subject: North Wales Connection

Hi

I'm working on the water/flood aspects of the North Wales grid connection DCO application and was given your name from a colleague whom had previously connected with your colleague. The enquiry was regarding the availability and supply sewer flooding records.

I'd be grateful if you could let me know whether you are able to provide any such records which for Gwynedd, would only be for the immediate area around the Pentir substation.

Also, I was told you'd know the best person at Welsh Water to speak to in the same regard, albeit for that person I'd be interested records along the whole of the route corridor across Anglesey?

Thanks for your time

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Mae unrhyw gynnwys nad yw'n ymwneud â busnes swyddogol y corff sy'n anfon yr e-bost yn bersonol i'r awdur.

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4.0 Dwr Cymru Welsh Water Consultation

4.1 ANGLESEY SEWER FLOODING RECORDS REQUEST EMAILS

From: [REDACTED]@dwrcymru.com>
Sent: 25 April 2017 16:16
To: [REDACTED]
Subject: RE: Anglesey sewer flood records request

Hi [REDACTED]

That's fine. While I don't normally deal with Anglesey, you can certainly contact me and I can point you in the direction of the relevant persons or departments.

Thanks,



[REDACTED]
Project Engineer | Developer Services | Wholesale Business Services | Dwr Cymru Welsh Water
PO Box 3146 | Cardiff | CF30 0EH | [REDACTED]



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From: [REDACTED]@amecfw.com]
Sent: 25 April 2017 16:12
To: [REDACTED]@dwrcymru.com>
Subject: RE: Anglesey sewer flood records request

***** External Mail *****

Great – thanks [REDACTED] I should be able to make do with the postcodes.

Yes we're in continual communication with NRW re: main river and surface water flooding and with Isle of Anglesey and Gwynedd CC also whom have provided some info on highways drains, ordinary watercourses and I think some instances of unadopted sewers too.

Thanks again and while I think that's all, would you mind if I use you as a point of contact for future enquires?

Cheers

[REDACTED]

Principal Consultant, Water Management, Environment & Infrastructure Uk Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU

amecfw.com amecfw.com

From: [REDACTED]@dwrcymru.com]
Sent: 25 April 2017 16:03
To: [REDACTED]@amecfw.com>
Subject: RE: Anglesey sewer flood records request

Hi [REDACTED]

No problem at all, I'm glad to be of assistance. The "floods" recorded at the three addresses are recorded as Other Flooding (OF), which essentially is any external discharge which isn't considered serious. All three OF instances here equated to slight foul discharge from domestic manholes. As such, we would not have recorded such details as extent, depth or duration. Just to clarify, we wouldn't have any data on any flooding from watercourses, culverts etc. unless they affected the sewers. This information would likely be held by the local authority/NRW.

Due to floods affecting individual properties/customers, with data protection, I'm not sure I can send you the exact details of the flood locations, would the postcodes suffice?

LL68 9PY
LL61 6PU (x2 but at different addresses)

If you require further detail on the locations, I'll seek clarification on how much info I can release.

Best regards,



[REDACTED]
Project Engineer | Developer Services | Wholesale Business Services | Dwr Cymru Welsh Water
PO Box 3146 | Cardiff | CF30 0EH | [REDACTED]



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From: [REDACTED]@amecfw.com]
Sent: 25 April 2017 15:31
To: [REDACTED]@dwrcymru.com>
Subject: RE: Anglesey sewer flood records request

***** External Mail *****

Hi [REDACTED]

Many thanks for getting back to me and I'm sorry you had to search such an extensive area for only 3 records.

Are you able to send me a shapefile of the 3 locations inc. attributes re flood extent, depth and duration? If not are you able to provide this info in an email including grid references of the assets?

Cheers

[REDACTED]

[REDACTED]

Principal Consultant, Water Management, Environment & Infrastructure UK Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU

[REDACTED]@amecfw.com amecfw.com

From: [REDACTED]@dwrcymru.com]
Sent: 25 April 2017 15:27
To: [REDACTED]@amecfw.com>
Subject: RE: Anglesey sewer flood records request

Hi [REDACTED]

We've now completed searching the area for flooding data from the sewer network. Within the area you sent +100mm buffer. There are three flood records on our database, two in Llanfair PG and one in Rhosybol. They were minor flooding instances, one caused by a problem with a pump station, and the other two due to debris within the sewer.

I hope this helps, please let me know if I can be of further assistance.

Best regards,



[REDACTED]
Project Engineer | Developer Services | Wholesale Business Services | Dwr Cymru Welsh Water
PO Box 3146 | Cardiff | CF30 0EH | [REDACTED]



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From: [REDACTED]@amecfw.com]
Sent: 21 April 2017 09:25
To: [REDACTED]@dwrcymru.com>
Subject: FW: Anglesey sewer flood records request

***** External Mail *****

Hi [REDACTED]

It's been over a week now since I emailed and I've not heard back from anyone. Can you please give me an update on my request.

Thanks

[REDACTED]

Dr Ben Thomas
Principal Consultant, Water Management, Environment & Infrastructure Uk Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU
M +44 (0)7900 588880
ben.thomas@amecfw.com amecfw.com

From: [REDACTED]
Sent: 11 April 2017 13:33
To: [REDACTED]@dwrcymru.com>
Subject: Anglesey sewer flood records request

Hi [REDACTED]

Thanks for your call. It looks like I'm out of luck re: getting someone to do a quick a quick drawing before Easter so I've attached a png of the area which is pretty grainy when zoomed right in but may suffice. Otherwise, I've also attached the shapefile so if you get a GIS bod to open it up it shouldn't take them more than a couple of mins to generate a PDF.

To confirm that it is sewer flooding records (surface water, foul and or combined) that I'm after for the whole route inc. +100m beyond the red line boundary as attached.

Any problems or questions then please feel free to call back or email

Cheers

[REDACTED]

[REDACTED]

Principal Consultant, Water Management, Environment & Infrastructure Uk Ltd, Amec Foster Wheeler
Redcliff Quay, Redcliff Street, Bristol, UK, BS1 6HU
[REDACTED]
[REDACTED]@amecfw.com amecfw.com

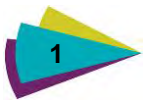
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Annex B

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National Grid North Wales Connection Project: Flood Consequence Assessment Method Statement

1. Introduction

National Grid's (NG) North Wales Connection Project (NWCP, 'the Project') comprises a new 400kV electricity connection across Anglesey from Wylfa to Pentir on mainland Wales. The connection comprises overhead lines (OHL), a tunnel under the Menai Straits together with tunnel head houses (THH) and cable sealing end compounds (CSEC) on either side, upgrading of Wylfa substation and the extension of Pentir substation and all associated construction activities.

An Environmental Statement (ES) is a statutory document required to be submitted with the application for a Development Consent Order (DCO) to the Planning Inspectorate (PINS) under the Planning Act, 2008. A Flood Consequence Assessment (FCA) will be included as an appendix to the ES with extracts regarding flood risk to receptors being reported within the Water Quality, Resources and Flood Risk chapter of the ES.

This FCA Method Statement provides an outline of our proposed approach to producing the FCA and is intended for disclosure to, as a minimum, Natural Resources Wales (NRW) as well as Isle of Anglesey County Council (IoACC) and Gwynedd County Council (GCC) in their capacities as Lead Local Flood Authorities (LLFAs). As such, the main aim of this document is to solicit opinion, comment and/or confirmation of the acceptance of the methodologies presented within in order to achieve mutual agreement that our final approach is fit for purpose.

Further to responses via the public consultation process (i.e. Scoping Report and PEIR) [Refs:1,2], consultation and stakeholder meetings are expected to be held throughout the duration of the Project. This included a meeting held on Jan 12, 2017 in Pentir regarding water related ES and FCA matters that was attended by representatives from NG, NRW and IoACC. During this meeting, preliminary discussions were held and it was agreed that a FCA Method Statement should be prepared and circulated.

The subsequent sections of this document are as follows:

Section 2	Project Overview
Section 3	Elements Scoped Out of FCA
Section 4	Planning Context, Guidance and Requirements
Section 5	Climate Change
Section 6	Design Standards Summary
Section 7	FCA Definitions
Section 8	FCA Structure
Section 9	FCA Methods
Section 10	FCA Data and Information
Section 11	Summary and Expectations
Section 12	Glossary

2. Project Overview

A brief overview of the development is provided here to establish terminologies and understandings that will assist with the review of this paper. For more details the reader is referred to the Preliminary Environmental Information Report (PEIR) [Ref:2]. An overview of the project corridor is shown in Figure 1 below, together with the Proposed Project Boundary (PPB) as presented for Section 42 consultation in 2016.



Figure 1 Overview of the NWCP corridor including the PPB as indicated by the red line

The NWCP is approximately 35km long and would comprise the following permanent infrastructure elements:

- A new 400Kv Overhead line (OHL) supported by 91 pylons, each pylon comprising 4 foundations typically 25m² in area;
- Upgrading of Wylfa 400kV substation;
- Upgrade and extension of Pentir 400/132kV substation;
- A tunnel to accommodate the 400kV cable crossing under the Menai Strait, approximately 4km long;
- A Tunnel Head House and Cable Sealing End (CSE) compound at both ends of the tunnel;
- The undergrounding of existing third party utilities (i.e. lower voltage Distribution Network Operator overhead lines, telecommunications, sewers etc.); and
- A small number of permanent tracks and watercourse crossings for access/egress to critical infrastructure

Temporary construction works would include:

- Site compounds;
- Construction of temporary access and haul roads; and
- Construction of temporary watercourse crossings.

The construction is scheduled to commence in 2018 and to take 6 years to complete, thus being completed well advance of the scheduled commencement of generation at the Wylfa Newydd nuclear power station. The NWCP is expected to be operational by 2025 and remain operational for a minimum of 45 years. Currently, the high level construction programme, as presented in the PEIR [Ref:2], shows site preparation commencing in Q1 of 2019, for main construction activities to commence in Q2 of 2020 and for construction to be completed by the end of Q2 in 2024. Typically, pylons have a life expectancy of approximately 80 years, the conductors have a life expectancy of approximately 60 years and the insulators and fittings have a life expectancy of approximately 25 to 40 years. The lifespan of the overhead line may be longer than the anticipated 80 years, depending on a number of factors. The lifespan of the CSECs and substations are assumed to be 40 years, as stated in the PEIR [Ref:2].

3. Elements Scoped Out of FCA

3.1 Pylons

We are proposing that flood risk associated with overhead line pylons and conductors is scoped out from this assessment. This applies to the risk to the infrastructure itself, as well as any risks to other receptors arising from the presence of the infrastructure. This approach is as accepted on similar National Grid connection projects (i.e. Richborough) and the justification for this approach is set out below.

Lattice pylons, such as those proposed to be used in the Project, pose no material obstruction to water flow and therefore are not liable to extensive physical structural damage during the type of low velocity flooding in times of flood. Similarly, it is considered highly unlikely that debris carried by floodwater could cause significant damage to a pylon to the extent that the structural integrity of the pylons could not be repaired through standard maintenance activities. Furthermore, pylons are resilient to water damage from occasional flooding, and the conductors are located well above the highest conceivable flood level (accounting for the most extreme allowances for climate change), thus ensuring that they remain operational in times of flood and do not pose a safety risk.

In terms of risks arising from the presence of the new OHL pylon infrastructure, the negligible effect on water flow discussed above, combined with the negligible displacement of water posed by the lattice steel pylons would ensure that any impact on floodplain storage and/or conveyance would also be negligible.

3.2 Flooding from the Sea

We are proposing that flooding from the sea as a flood hazard is scoped out of this assessment. The reason for this is that, at the Wylfa end of the route, the lowest part of the edge of the PPB is 14.6mAOD and, based on the coastal flood boundary conditions for UK mainland and islands (2011) [Ref:3] the 0.01% AEP sea level at Holyhead is 4.22mAOD. Therefore, even with the application of H++ scenarios through to 2100 and extreme wave surge considerations, there remains no risk to the Project from flooding from the sea. Furthermore, the Anglesey end of the tunnel is over 30mAOD and the Pentir end over 80mAOD.

4. Planning Context, Guidance and Requirements

4.1 Pan UK and national policies

The 400kV Overhead Line (OHL) is classed within Section 16 of the Planning Act 2008 (the Act) as a Nationally Significant Infrastructure Project (NSIP). Under Section 31 of the Act, development consent is required to the extent that it is, or forms part of, an NSIP. Development consent is granted by the making of a Development

Consent Order (DCO) for which an application may be made to the Planning Inspectorate (PINS) under Section 37 of the Act.

In a hierarchical context, The NWCP FCA will be prepared in accordance with the Planning Act 2008, National Policy Statement (NPS) EN-1 [Ref:4], which sets out planning policy with regard to NSIPs in the energy sector, and NPS EN-5 [Ref:5], which covers electricity transmission and distribution. Where the respective NPSs do not provide the necessary level of detail, reference will be made to Planning Policy Wales 8 and associated Technical Advice Notes (TAN), specifically TAN15: Development and Flood Risk [Ref:6] including the Development Advice Maps updates (Jan 2015) [Ref:7] and associated climate change documentation, as set out in Sections 5.1 to 5.2.

Please also see Section 5.5 (definitions) which relates to the subject of guidance insofar as it discusses the differences in terminology between TAN15, NPS EN-1 and equivalent English guidance, and proposes an approach to take forward throughout the preparation of the FCA.

4.2 Additional National Guidance

To meet their statutory requirements under the Flood Risk Regulations 2009 [Ref:8] NRW have produced Flood Risk Management Plans (FRMP) for the three administrative regions in Wales known as River Basin Districts (RBD) which are the Dee, Severn and West Wales RBDs, the West Wales RBD being applicable to the NWCP. The final 'Western Wales Flood Risk Management Plan' 2015 [Ref:9] is the current version applicable to the NWCP area. Although in the context of NWCP the Western Wales FRMP is high level, it nonetheless provides a useful insight into the pertinent issues in the project area and thus will be reviewed and accounted for in the FCA.

We are aware that IoACC and GCC, in their capacities as LLFAs, have independently produced Local Flood Risk Management Strategy (LFRMS) documents [Refs: 10,11] and that, under the IoACC and GCC Joint Local Development Plan (LDP) have produced a joint Stage 1 Strategic Flood Consequence Assessment (SFCA – March, 2016) [Ref:12]. A preliminary review of this SFCA has provided some very useful background information, particularly with regards the range and locations of applicable flood hazards, together with information on potential receptors.

We are unaware of any applicable Preliminary Flood Consequence Assessments having been produced, either jointly or for IoACC and GCC. We are also aware of the 'West Wales River Basin Management Plan' (RBMP) [Ref:13] and the West of Wales Shoreline Management Plan (SMP) 2 [Ref:14]. All of the aforementioned strategic and regional planning advice documents will be reviewed as part of our preparing the NWCP FCA.

4.3 National Grid Flood Mitigation Policy

National Grid have produced their own 'Flood Mitigation Policy' (2011) [Ref:15] which defines their declared target standards of protection (SoP) for flood defence / resilience that should be applied to all new build electricity transmission substations and at legacy substations subjected to an expansion or a major refurbishment programme. This document effectively sets out that the minimum standard of protection (SoP) as being a 0.1%AEP plus the applicable allowances for climate change as provided in the relative national guidance statements.

5. Climate Change

5.1 Climate change guidance overview

NPS EN-1 and EN-5 [Refs:4,5] give only high level advice to the effect that developments should be resilient and adaptive to the latest climate change projections. Overarching guidance on climate change is provided in Planning Policy Wales 8 and TAN15 which state that when considering the impacts of climate change, the latest set of UK Climate Projections should be used. Welsh Government guidance on climate change and adaptation is provided in 'Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales' (Dec, 2011) [Ref:16] and is supplementary to the Environment Agency's Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG; Mar, 2010) [Ref:17] and Flood and Coastal Defence Project Appraisal Guidance.

In August 2016, the Welsh Government published a policy clarification letter and supplemental 'Flood Consequence Assessment: Climate Change Allowances' guidance note [Ref:18] that supersedes the projections provided in the Dec 2011 document and covers river flows, sea levels and wave heights but does not include updates to rainfall allowances. The letter states that these climate projections should be incorporated into FCAs accompanying planning applications submitted from 1 December 2016. Therefore, we propose using the Aug 2016 guidance on allowances for climate change that apply to the West Wales River Basins Districts.

5.2 Climate change allowance: river flow

River flows including climate change allowances may be required in prescribing mitigation for permanent watercourse crossings and in the event that hydrodynamic modelling is required. Table 5.1 (see below) is a duplicate of Table 1 from the supplemental 'Flood Consequence Assessment: Climate Change Allowances' (Aug, 2016) [Ref:18] and shows increases in peak river flows for the West Wales RBD noting that the guidance recommends the central estimate, or change factor, should be used to factor the 1961-1990 baseline data to assess the potential impact of climate change as part of a flood consequence assessment.

The Aug 2016 supplemental guidance also advises that an assessment should also be made of the upper end projections to ensure the long term resilience of the development, noting that the upper end estimate may not be applicable to every site. We propose only to provide an assessment of upper end scenarios for permanent infrastructure if applicable.

Table 5.1 Duplicate of Table 1 from the Welsh Government's update note to 'Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales' (Aug, 2016) [Ref:18]

	Total potential change anticipated by the 2020s		
	2020s	2050s	2080s
Upper end estimate	25%	40%	75%
Change factor /central estimate	15%	25%	30%
Lower end estimate	5%	10%	15%

5.3 Climate change allowance: rainfall

Rainfall data, principally in the form of Intensity Duration Frequency (IDF) data (otherwise known as Depth Duration Frequency – DDF), may be used to undertake assessments as to the adequacy of drainage schemes, to calculate runoff from construction facilities and calculate design flows at watercourse crossings. Rainfall climate change factors are assumed to be limited to daily maximum rainfall, a parameter rarely used in FCAs, and are based on factoring the 1961-1990 baseline data.

The most up to date guidance was obtained from the 2015 update of the Environment Agency (EA) 'Adapting to Climate Change: Advice for Flood And Coastal Erosion Risk Management Authorities' (2015) [Ref:19] which is the equivalent document to 'Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales' (2011) but noting that this English update contains rainfall advice whereas the Welsh version [Ref:18] does not. That said, the 2015 EA rainfall guidance is the same as the 2011 Welsh guidance, albeit lower end estimates are not included. The data are set out in Table 5.2 below.

Table 5.2 Duplicate of Table 4 from the Welsh Government's 'Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales' (2011) [Ref:16]

Applies across all of Wales	Total potential change anticipated for 2020s	Total potential change anticipated for 2050s	Total potential change anticipated for 2080s
Upper end estimate	10%	20%	40%
Change factor	5%	10%	20%
Lower end estimate	0	5%	10%

We propose using the rainfall climate change allowances as per the above table and applying them to 1961-1990 baseline values of IDF/DDF rainfall value, despite the factors being limited to daily maxima as per the guidance. For the same reasons set out for river flow above, we will only apply the change factor for the 2020s for watercourse crossings and the change factor for the 2080s for permanent drainage scheme assessment (if required). If during the progression of the FCA it becomes apparent that permanent watercourse crossing will be required for access roads, we will use the change factor for the 2080s.

As with river flood flows, it is recommended that the 2080s changes are used when considering any time from 2100 on. The 2020s covers the period 2015 to 2039, the 2050s the period 2040 to 2069, and the 2080s the period 2070 and 2099. These ranges should be used in assessments in a similar way to the illustration set out for river flood flows. Furthermore, no H++ scenarios for rainfall are given in any of the guidance we have reviewed and thus we propose not to include an assessment of H++ scenarios.

5.4 Climate change allowance: sea level

Subject to regulatory agreement, flooding from the sea will be scoped out of the NWCP FCA. Nonetheless, we propose setting out the reasons for this in Volume 1 of the FCA, to include a brief discussion around climate change including H++ scenarios in the context of Wylfa substation (the lowest lying infrastructure element and closest to a coastal flood risk zone). However, we highlight that this discussion will simply be to justify scoping out sea flooding. To this end, we are satisfied that the application of sea level rise climate change factors, as presented in Table 5 on Page 12 of 'Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales' (2011) is unambiguous.

5.5 Climate change and development lifespan

Three time periods are applicable to the NWCP: (i) the construction period which is expected to occur between 2019 and 2024, (ii) the operational period, and (iii) the decommissioning period. In summary, we will assume the 2020s scenario is applicable to construction and the 2080s to operation and decommissioning. On this basis and in referral to Table 1 of Aug 2016, we propose the following application of climate change projections:

- For the construction period, stream and river flows will be increased by 25% which represents the change factor for up to the 2020s for the West Wales river basin district.
- For operational infrastructure and, if required, permanent watercourse crossings, stream and river flows will be increased by 30% which represents the change factor for up to the 2080s for the West Wales river basin district.
- Where applicable on the basis of identified risk, we will undertake an assessment of the upper end scenario for up to the 2080s for operational infrastructure and, if required, permanent watercourse crossings, and accordingly will increase river flows by 75%.

With regards to extreme event H++ scenarios, we note that the August 2016 update [Ref:18] refers back to 'Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales' (2011) [Ref:16] and it is to that document that we refer. On Page 9 a map is presented showing the coverage of non-standard catchments for which it is advised that these are the only areas that need to be considered under H++ scenarios. According to the map, the only coverage of non-standard catchments is in and around the Wylfa area and thus as the Wylfa substation is not at risk of fluvial flooding we are not proposing to undertake any H++ climate change analyses for fluvial flood risk.

6. Design Standards Summary

Having presented the various sources of guidance relating to flood risk and climate change, a summary of salient elements and standards of protection are provide below.

Drainage (permanent infrastructure)

- For drainage schemes associated with permanent infrastructure, the generic hydrological design measures (see Section 9.4) as prescribed in the FCA will be based on a 0.1%AEP standard of protection with the appropriate climate change allowances for the 2080s change factor scenarios.

- For permanent drainage schemes involving attenuation ponds, the generic hydrological design measures (see Section 9.4) as prescribed in the FCA will be based on the assumption that discharge from such schemes to local watercourses will not exceed the 2.33 year greenfield runoff rate (also known as QBAR) for the associated area drained. No climate change allowances will be included in the QBAR calculation.
- For permanent drainage schemes involving attenuation ponds, the generic hydrological design measures (see Section 9.4) will be based on the assumption that pond capacities will be designed to a 0.1%AEP standard with the 2080s change factor for rainfall scenarios being applied to drainage modelling input data.

Drainage (temporary construction)

- For drainage schemes associated with temporary construction activities, the generic hydrological design measures (see Section 9.4) as prescribed in the FCA will be based on a 1%AEP standard of protection with the appropriate climate change allowances for the 2020s change factor scenarios.
- For temporary construction and permanent infrastructure drainage schemes involving attenuation ponds, the generic hydrological design measures (see Section 9.4) as prescribed in the FCA will be based on the assumption that discharge from such schemes to local watercourses will not exceed the 2.33 year greenfield runoff rate (also known as QBAR) for the associated area drained with no climate change allowances included in the QBAR calculation.
- For temporary construction drainage schemes involving attenuation ponds, the generic hydrological design measures (see Section 9.4) will be based on the assumption that pond capacities will be designed to a 1%AEP standard with the 2020s change factor for rainfall scenarios being applied to drainage modelling input data.

Fluvial Flooding

- Permanent infrastructure (excluding pylons) will have a minimum 0.1%AEP standard of protection with the appropriate climate change allowance for the 2080s change factor scenario.
- In addition to specifying the minimum standard of protection of permanent infrastructure (excluding pylons), an assessment will be made of the 2080s upper end climate change scenario to assess the adequacy of the minimum proposed mitigation and, if required, advise as to the adaptability of mitigation measures and make further recommendations as to periodic assessment work as and when revised climate change data become available.

Flooding From the Sea

- As previously highlighted, we are proposing that risk of flooding from the sea is scoped out of the FCA and thus design standards are not applicable in this regard.

7. FCA Definitions

Throughout this report, 'Annual Exceedance Probability' (AEP) terminology is used to describe the magnitude and likelihood of a flood event. AEP expresses the probability of a flood occurring in a given year. For example, what is often referred to as a '1 in 100 year flood event' will be referred to as a '1% AEP event' (i.e. a flood with a 1 in 100 or 1% probability of occurring in any given year).

We acknowledge the use of development advice map terminology (i.e. Zones A, B, C, C1, C2) as forming the basis of TAN15 guidance for planning purposes. However, for consistency with information already in the public domain (namely the PEIR), the flood zones as shown on NRW's online flood risk mapping, and for consistency with project data sets, we propose using the flood zone classification used by the Environment Agency, as set out below:

Flood Zone 1 (Low probability)	Land having less than a 1 in 1,000 or 0.1% AEP of river or sea flooding.
Flood Zone 2 (Medium probability)	Land having between a 1 in 100 (1%) and 1 in 1,000 (0.1%) AEP of river flooding; or land having between a 1 in 200 (0.5%) and 1 in 1,000 (0.1%) AEP of sea flooding.
Flood Zone 3a (High probability)	Land having a 1 in 100 (1%) or greater AEP of river flooding; or land having a 1 in 200 (0.5%) or greater AEP of sea flooding.
Flood Zone 3b (Functional floodplain)	Land where water has to flow or be stored in times of flood. Planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the EA. The extent of the 5% AEP event is often used as a proxy for Flood Zone 3b, although it is not part of the official definition.

We acknowledge that the term Sequential Test is common across NPS EN-1 and TAN15 but that, in TAN15, the 'Justification Test' term is used instead of the equivalent 'Exception Test' which is used in NPS EN-1. Since NPS EN-1 uses only the 'Exception Test' terminology we propose that the 'Exception Test' be the adopted terminology for the NWCP FCA.

Other differences in definitions include the omission of an 'Essential Infrastructure' vulnerability category in TAN15 which features in the equivalent English Planning Practice Guidance and as referred to as 'Essential Energy Infrastructure' in NPS EN-1. This may be important in undertaking the FCA as 'Essential Energy Infrastructure' carries certain exclusions such as it being permissible in Flood Zone 3, subject to conditions, and also permissible in Flood Zone 3b, subject to conditions. As such, we propose to adopt the 'Essential Energy Infrastructure' definition in undertaking the NWCP FCA. In order to clearly apply this guidance we proposed adopting a form of the compatibility matrix based on the English Planning Policy Guidance [Ref:20], as illustrated in Table 7.1.

Table 7.1 Example flood risk compatibility matrix

Development type	Flood risk vulnerability classification	Flood Zone(s) in which type occurs	Flood risk vulnerability and flood zone 'compatibility'
Construction Phase			
Construction support areas (offices, welfare facilities)	Less Vulnerable	1 & 2, & 3a	Development is appropriate
		3b	Development should not be permitted
Construction and dismantling activity areas (access routes, temporary laydown areas and working areas) Associated infrastructure (e.g. helicopter compounds) Watercourse crossing points	Essential Energy Infrastructure	1 & 2	Development is appropriate
		3a & 3b	Exception Test required
Operational Phase			
400kV transmission route (OHL and THHs and cable SECs) Substation upgrades	Essential Energy Infrastructure	1 & 2	Development is appropriate
		3a & 3b	Exception Test required

In terms of development lifetime, TAN15 states that non-residential developments should have an assumed lifespan of 75 years in order to adequately assess flood risk and the potential impacts of climate change within that window. While it has been noted that the pylons have an estimated lifespan of 80 years (subject to environmental factors) other infrastructure elements do not. However, for planning purposes, and in maintaining consistency with similar National Grid connection projects, it will be assumed that the lifespan of the development is 80 years from its completion in 2025 and thus our assessment will extend to 2105.

8. FCA Structure

The proposed FCA format is based on the continued development of flood risk assessment approaches on recent DCO connection projects for National Grid including the Richborough connection in Kent and, most recently, the North West Connection in Cumbria. It also builds on experience gained on the Hinkley Point C EIA/FRA DCO application, on recent work at Wylfa Newydd as well as several other DCO projects in the energy sector for which Amec Foster Wheeler has undertaken water studies including ES and flood risk assessment.

At present we propose to provide the FCA in five main sections, probably as separate volumes. The reason for this is because of the scale of project, in terms of geographic extent and, in particular, the range of permanent infrastructure and temporary construction elements, each element arguably requiring its own FCA were they discrete non-DCO projects. As such, if all the required content was provided in a single report it would be unmanageably large, difficult to navigate, unfocused, repetitious and, on the whole, unfit for purpose in terms of its primary function of setting out all the required information in a clear and precise manner. We hope that makes for an expedient review and adjudication process for regulators and stakeholders.

The proposed FCA Volumes are as follows:

- Vol 1** Overarching Flood Consequence Assessment
- Vol 2** Wylfa and Pentir Substation Upgrades FCA
- Vol 3** Menai Straits Tunnel and Associated Infrastructure FCA
- Vol 4** Overhead Lines FCA
- Vol 5** Appendices

The proposed content of the five FCA volumes is discussed in the following sections.

8.1 Volume 1 – Overarching flood consequence assessment

The primary aims of Volume 1 are as follows:

- 1) Provide the context of the project, an overview of the scheme, FCA scope, key project definitions and outline of the FCA structure;
- 2) Set out the UK and Welsh National planning context, present other sources of guidance, data and information used in preparing the FCA. The principal requirements will be set out in a table together with the source, the FCA element (i.e. flood risk, climate change, drainage etc.) and the locations within the five volumes where the specific requirements are covered;
- 3) Detail all applicable outcomes of regulatory and other stakeholder consultations relating to FCA, including statutory forums such as the scoping and PEIR stages, the response to this FCA Method Statement, and additional meetings, phone calls and emails;
- 4) Summarise the design standards, standards of protection and climate change allowances to be used throughout the subsequent volumes;
- 5) Present the principles of the Sequential Test (noting that the project element specific sequential tests will be applied in the applicable FCA volumes);

- 6) Provide a detailed overview of the scheme, to include the various temporary construction activities and permanent infrastructure elements. This section will also discuss development vulnerability and appropriateness together with assumptions and limitations;
- 7) Present an overview of the study area including the hydrological and flood hazard baseline characterization; and
- 8) Present the generic mitigation measures that may apply to the various combinations of flood risk hazard, receptor and project element that will be referred back to from the subsequent flood risk volumes, including the concept of 'Hydrological Design Measures' (HDM), applicable to the various project elements (i.e. watercourse crossings, drainage schemes etc.).

In summary, Volume 1 will provide a basis and clear roadmap for the subsequent volumes. The intention is to minimise significant duplication of common elements to provide a more focused and accessible suite of documents.

8.2 Volumes 2, 3 and 4

Volumes 2, 3 and 4 will be set out as follows:

- The context for the respective project elements will be introduced together with the scope of the respective volumes, clearly distinguishing between permanent infrastructure, temporary construction and decommissioning elements. Data sources and definitions will be summarised (but in the main will refer back to Volume 1).
- The flood hazard and receptor identification methodologies will be set out together with summaries of the applicable hazards and receptors (noting referral will be made to detailed tables of flood hazards and receptors presented in appendices). Receptors will be arranged into receptor groups (i.e. individual properties will be lumped into a third party receptor group).
- An assessment section will take the consolidated flood hazards and receptor groups and screen against the various construction and permanent infrastructure elements to determine requirements for mitigation or for further assessment. This section will be presented as three discrete sub-sections covering construction activities, permanent infrastructure elements and operational activities, and decommissioning activities.
- A flood risk management section will consider the application of generic mitigation measures and conclude whether and, if deemed appropriate will conclude that no further assessment is required.
- Where it is concluded that further assessment is required (i.e. for drainage schemes for which required ponds may be of a certain scale so as to be deemed material components of the project) then the associated assessment methodologies and findings will be presented along with referral to appendices for more detailed methodologies and calculations.
- Details of maintenance requirements for flood risk management measures will be presented.
- Planning requirements will be summarised, together with the application of the Sequential and Exception Tests as required.
- Summaries of the respective volumes will be presented together with glossaries and references.

8.3 Volume 5 – Appendices

The FCA appendices will include, but not be limited to: (a) figures and drawings, (b) photographs as appropriate, (c) complete and comprehensive table of flood risk hazards, receptors and associated receptor groupings, (d) detailed site specific assessment if required, (e) complete and chronological documentation of all forms of consultation undertaken and responses received in relation to the FCA up to the DCO submission.

9. FCA Methods

This section covers the following FCA elements:

- Flood risk hazard identification
- Receptor identification and proposed use of receptor groups
- Assessment methodology
- Use of hydrological design measures
- Runoff and general water management
- Runoff calculations
- Watercourse crossings
- Coastal flood risk

9.1 Flood hazard identification

Flood hazards fall into two main categories:

- 1) External hazards such as rivers, the sea, groundwater and surface water that may potentially impact project infrastructure receptors, either during construction or when operational, together with human receptors in the form of construction workers, site operatives and visitors;
- 2) Internal hazards arising from construction and operational activities that may impact the same receptors as above, but also potentially impact third party receptors such as the public, properties, non-project infrastructure, agricultural land and nature conservation areas.

The flood hazard identification task will review the applicable Anglesey and Gwynedd joint Level 1 Strategic Flood Consequence Assessment (SFCA), the IoACC and GCC Flood Risk Management Strategies, the NRW West Wales River Basin Management Plan, the West of Wales Shoreline Management Plan 2, sewer flooding records from IoACC and GCC. Additionally, Amec Foster Wheeler is already experienced in working on Anglesey in our capacity as a framework consultant with Horizon Nuclear Power in relation to the Wylfa Newydd development. So together with stakeholder feedback, we expect that at this stage we'll have a robust understanding of the pertinent flood issues throughout the project area.

In addition we'll undertake a detailed assessment of flood hazards through a process of GIS analysis. This will be based on extensive datasets covering, but not at all limited to: river networks, tidal and fluvial flood zones, groundwater flood susceptibility mapping, SW flood mapping, various geology layers, route infrastructure and elements and PPB, proposed access road networks, OS Mastermap property and infrastructure layers. Data is covered in more detail in Section 10. All of the spatial data flows into a dedicated project data team and is available through project servers and also made available in a highly function GIS web browser which will provide the platform for identifying flood hazards as well as wider facets of the project.

The geographic scope of the flood hazard search will be on the basis of the Design Order Limits and we will reference our assessment in relation to discrete project elements along the line of the route. For each element, the applicable flood hazards will be identified from the following categories:

External

- Flooding from the sea affecting project elements (note proposal for this hazard being scoped out)
- Fluvial flooding affecting project elements
- Surface water flooding affecting project elements
- Groundwater flooding affecting project elements
- Artificial flood hazards including reservoirs, canals, sewers that may affect project elements

Internal

- Surface water run-off flooding affecting project elements arising from inadequate surface water management and drainage
- Fluvial flooding affecting project elements arising from loss of floodplain storage
- Fluvial flooding affecting project elements arising from flow conveyance being impeded
- Surface water run-off flooding affecting third parties arising from inadequate surface water management and drainage
- Fluvial flood flooding affecting third parties arising from loss of floodplain storage
- Fluvial flooding affecting third parties arising from flow conveyance being impeded

Where flood hazards are identified, they are noted together with comments and assigned a unique identifier with prefix FS. The FS identifiers are then assigned to the specific receptors (see Section 9.2) that then feeds forward into the assessment (see Section 9.3).

9.2 Receptor identification and proposed use of receptor groups

As discussed above, we have an extensive coverage of data (See Section 10) that will be viewed in the project GIS web browser. As an example viewable data layers will include but not be limited to main rivers, MasterMap Rivers Network, flood mapping zones, surface water flooding areas, groundwater flood risk, PPB, OHL route, surface water bodies, flood defences, historic flood occurrence locations, housing and property, roads, other drainage pathways, access and haul roads.

The route and all elements within will be reviewed manually. A buffer zone will be applied 250m around the nearest PPB. As it is acknowledged that watercourses may frequently provide hazard pathways to receptors in excess of 250m downstream or downslope of the nearest PPB, where this pathway is applicable the search will extend beyond the 250m buffer. Where a flood hazard is conveyed along a pathway such as a watercourse it is recognised that the receptors could conceivably be affected throughout the length of the watercourse downstream and in some instances where channel blockage may be a flood hazard, receptors could conceivably be impacted more than 250m upstream from the PPB. Where such instances occur, our area of consideration will extend beyond the 250m/1km buffer zone.

The process of working down the OHL route involves firstly logging project elements down to the individual pylon level. Additionally, we'll determine zones in which watercourse crossing are unavoidable, based on the PPB, access track and haul road drawings, as well as the flood mapping and river network data. In summary, every infrastructure element within the PPB will be tabulated with the corresponding flood hazards as applicable, the range of receptors and an initial high level appraisal of the likely need for mitigation.

As outlined above, a complete list of receptors will be provided as an appendix to the FCA. However, due to the large volume of individual receptors, often potentially affected by the same flood hazard(s) it is necessary to lump multiple receptors into groups for assessment purposes. We propose using four receptor groups (RGs) which are described in Table 9.1 below.

Table 9.1 Summary of proposed receptor groups for use on the NWCP FCA

Group	Type	Description	Development vulnerability	Duration
RG1	Construction phase activities and temporary infrastructure	Personnel, plant and temporary infrastructure associated with all elements of construction (OHL, substations upgrades, tunnel and associated works)	Essential Infrastructure & Less Vulnerable	Temporary (during construction phase only)

RG2	Essential Energy Infrastructure	Wylfa and Pentir substations, THHs and CSECs at the Anglesey and Pentir ends. Note that pylons are scoped out as receptors.	Essential Infrastructure	Permanent
RG3	Operational phase maintenance activities and temporary infrastructure, and permanent access roads	Personnel, plant and temporary infrastructure associated with inspection and periodic maintenance activities. Permanent access roads Maintenance activities to be carried out for short periods throughout the operational phase. For example, a walkover by staff for inspection of infrastructure in Flood Zone 3 would be Less Vulnerable to flooding. Any temporary infrastructure for maintenance/repair works to permanent infrastructure would be classed as Essential Infrastructure.	Essential Infrastructure & Less Vulnerable	Temporary
RG4	Third party receptors	Third-party people, property, land and infrastructure inside and outside the PPB.	Variable	Temporary & Permanent

9.3 Assessment methodology

Once the detailed flood hazard and receptor identification processes are complete, we will extract the salient elements from the spreadsheets and summarise them in a single assessment table that will be included in the corresponding FCA volumes 2-4. See Table 5 below for an example of how this will work in practice. The following header descriptions apply to those in Table 5:

Master Table Ref	Comprises references to the respective detailed flood hazards (prefix: FS) and receptors (prefix: RID) contained within the full lists that will be included in the appendix. Therefore, summarised flood hazards by receptor can be cross checked with the detailed list and vice versa thus providing complete transparency and confidence in the exhaustiveness of the assessment.
Location	Refers to the location in which flood hazards and receptors are identified. Please note that while the locations refer to specific items of infrastructure such as substations and pylons, they are merely intended as a guide to facilitate the systematic geographic coverage of the full project area and ensure all possible flood hazards and receptors are captured. This also further facilitates the ease of cross comparison with the detailed hazards and receptor tables included in the appendices.
Summary of Hazards	Comprises a summary of the hazards of flood hazards, as given in detail in the detailed flood hazards list included in the appendices. Note that multiple flood hazards can be entered in this field.
Receptor Group	Comprises the receptor group to which individual receptors are assigned (as outlined in Section 9.2) in order to provide ease of cross checking with detailed tables.
Required mitigation	On the basis of the flood hazard, appropriate mitigation will be prescribed in accordance with the Hydrological Design Measures (HDMs) set out in Section 9.4. Again, these conclusions can be cross checked with the detailed information presented in the appendices to ensure that the prescribed mitigation measure is indeed appropriate or simply been accidentally omitted. Note that for example in the last row, generic mitigation is not appropriate and thus 'Other' is entered, indicating that further assessment is required to more accurately demonstrate the development is appropriate.

Exception Test

If the Exception Test is required to be passed then a 'Yes' will be entered in this field. Since the application of the Exception Test is limited to critical infrastructure elements at risk of flooding from either rivers, the sea or from externally derived surface water hazards, this field will be a 'No' for the majority of the entries. However, the worked example in the bottom row of the table below shows that for that specific combination of flood hazard (i.e. development in flood zone 3 under climate change scenarios) and receptor group (RG2 being pertinent in this case as outlined in Section 9.2) it results in the requirement for the Exception Test to be satisfied.

Further Assessment

On the basis that no generic mitigation is applicable and that the Exception Test is required to be satisfied, this will be flagged up as a 'Yes' in this field, indicating that a more detailed assessment will follow, as is the case for the worked example in Table 9.2 below.

Table 9.2 Indicative example of summary FCA assessment table

Master Table Ref	Location	Summary of Risk	Receptor Group(s)	Required Mitigation	Exception Test	Further Assessment Required
FS001 RID001	Wylfa substation	<ul style="list-style-type: none"> Run-off during construction Run-off during operation 	RG1 RG4	HM4	No	No
FS003 RID007	4AP005	<ul style="list-style-type: none"> Runoff from access roads during construction Flow impedance at watercourse crossing 	RG1 RG4	HM1 HM4	No	No
FS007 RID011-016	4AP008-013	<ul style="list-style-type: none"> Runoff from access roads 	RG5	HM4	No	No
FS087 RID0113	Anglesey THH & CSEC	<ul style="list-style-type: none"> Infrastructure in FZ3 under climate change / H++ scenario 	RG2 RG3	Other	Yes	Yes

Where a 'No' is entered for both the 'Exception Test' and the 'Further Assessment Required', the assessment is deemed to be concluded on the premise that the specified generic mitigation or Hydrological Design Measures are implemented. If the 'Exception Test' field is a 'Yes' then the Exception Test will be documented in a subsequent section of the same FCA Volume. Equally, if the 'Further Assessment Required' is a 'Yes' then that detailed assessment will be included within the main body of the same FCA Volume if the size of the assessment is manageable (i.e. no more than few pages long and not in addition to multiple detailed assessments) otherwise it will be included in an appendix and summarised in the same FCA Volume. As an example of a detailed assessment, this may simply include details that critical electrical equipment is located at a suitable level above the anticipated design flood level. Alternatively, it may include the output from a hydrodynamic modelling study

9.4 Use of hydrological design measures (HDMs)

Throughout similar previous National Grid OHL connection projects, we have developed an approach to discussing generic mitigation methodologies. These are known as 'Hydrological Design Measures' and we propose adopting the same methods for the NWCP. These are referred to in the previous section as comprising an element of the FCA assessment summary tables and it is noted that HDMs are also referred to as generic mitigation.

Where the assessment determines that the risk to receptor groups from identified flood hazards requires mitigation, in the first instance the suitability of recommending HDMs will be determined. Where HDMs are recommended, it is on the understanding that these will be written into the Construction and Environmental Management Plan (CEMP) which will form part of the DCO submission. It will then be a DCO Requirement that the contractor carrying out the works must prepare detailed method statements and a number of specific environmental plans post-DCO consent including, but not limited to, a drainage and surface water management plan and an emergency flood response plan where applicable. These plans and method

statements would need to be approved by the local planning authority, in consultation with NRW and the LLFA as appropriate before construction commences.

An overview of the HDMs proposed for the NWCP are as follows.

HDM1 Vulnerable infrastructure to be located in areas of low flood risk:

The proposals have sought opportunities to locate substations and other flood vulnerable aspects of the Project (e.g. 400kV cable sealing end compounds) in areas with the lowest possible flood risk. However, most substations are extensions to existing substations and so the location of new infrastructure is generally constrained. Consequently, a further design principle to raise flood sensitive infrastructure above an appropriate level has been incorporated in the design. Notwithstanding the necessary and proportionate degree of flexibility required, no infrastructure would be moved within the PPB such that it would increase the flood risk above that which has been assessed as part of the baseline.

HDM2 Minimise the number of new access track watercourse crossings:

The proposals have sought opportunities to utilise existing watercourse crossings and to minimise the number of watercourse crossings required for access. However, the majority of Project watercourse crossings will be new.

HDM3 Appropriate watercourse crossing design:

For culvert crossings, the culvert size would be selected to ensure culvert dimensions are commensurate with those of the existing channel and that they can adequately convey the 1%AEP event (+climate change) without resulting in backwater effects.

The assessment considers the sensitivity of watercourses and identifies where it would not be appropriate to use a culvert, to which end, the FCA will closely interact with the ES chapter in this regard.

Where working within 8m of watercourses, construction approaches would follow guidance in *PPG5: Works in, near or liable to affect watercourses* and will be subject to control via an NRW Flood Risk Activities Permit Consent for Main Rivers or a LLFA Land Drainage Consent for Ordinary Watercourses.

HDM4 Effective drainage design:

The use of effective drainage design for areas of new impermeable surfaces, incorporating sustainable drainage (SuDS) elements, to ensure that runoff rates are not increased above those prevailing prior to development. Design principles include appropriate design and use of infiltration trenches/soakaways and attenuation storage.

However, we may provide headline numbers that can provide the design basis for post-DCO design activities such as the maximum permissible discharge for a drainage system and specific locations, advice on sensible locations of outfalls if into the river network. Alternatively the drainage system may primarily comprise a soakaway, in which case we may estimate an appropriate size for the soakaway and then comment on the feasibility of the size in relation to site layouts that may or may not be in the public domain.

9.5 Runoff and general water management

A significant portion of the generic mitigation prescribed will be associated with runoff and general water management, in particular arising from construction activities. We are aware that Pollution Prevention Guideline 5 has now been superseded by Guidance for Pollution Prevention works or maintenance in or near water GPP5 (Jan, 2017) [Ref:21]. Additionally, we are aware that the SuDS Manual [Ref:22] provides a very useful alternative point of reference where more detail is required, particularly with regard to runoff and general water management for construction activities and for general water management design principles for the operational case also. To this end, we anticipate that much of the generic mitigation relating to runoff and general water management during construction and operation will be based on the design principles presented in the SUDS Manual.

We are aware from feedback from IoACC and GCC during the scoping and PEIR consultation phases that the preferred method of draining water from sites, compounds, construction and operational infrastructure is by local disposal at source, preferably via soakaway. This is in accordance with best SUDs practice and is acknowledged and accepted although we anticipate that soakaways may not always be a feasible option. This view is based on a preliminary review of geology, groundwater flood risk and FEH SPRHOST data [Ref:23], and also based on the volume of water arising not only from rainfall runoff, but also from dewatering of the tunnel shafts, tunnel itself and of associated excavations.

Using soakaways for draining construction water also brings additional considerations regarding water turbidity as water high in suspended sediment concentrations may lead to the increasingly reduced efficacy of soakaways without regular maintenance and/or water treatment measures being implemented prior to discharging to soakaway which may then result in the requirement for additional infrastructure such as water treatment lagoons, small water treatment works and pumping etc., and not to mention potential waste disposal considerations, all of which may then render the process unfeasible on land availability grounds alone, in which alternative drainage philosophies would need to be explored. We trust this rationale regarding potentially seeking alternatives to soakaways is acceptable.

9.6 Runoff calculations

In terms of calculating Greenfield runoff rates we will use the Institute of Hydrology No. 124 method (IOH124) [Ref:24] to calculate Greenfield runoff. We are assuming that, as an absolute minimum, any discharges to watercourses will not exceed the Greenfield rate for the 2.33 year return period (otherwise known as QBAR). We are not proposing to apply climate change to these prescribed flows and thus in some cases it's entirely feasible that some betterment may be achieved over the lifetime of the development.

For instances where we may flag up indicative requirements for culvert sizings, we will need flow data. It is noted that for most of the watercourses, they are small and ungauged and thus no robust methods of flow calculation may be available. Therefore, given that the output will comprise only indicative estimates upon which no designs will be based, we propose using whichever of ReFH2 [Ref:25] or IH124 provides the highest value. We will then add the requisite climate change factors as set out in Section 5.1. Rainfall intensity duration frequency data will be taken from the FEH13 DDF rainfall model.

9.7 Watercourse crossings

We are not yet able to confirm how many access and haul road watercourse crossings are required and, indeed, this is likely to remain the case until after the DCO application has been submitted. Nonetheless, we anticipate there being approximately 30 watercourse crossings. We are aware and accept that there is a national and pan-UK aspiration to avoid culverting of watercourses if possible but in some instances, culverting will be the most cost effective and appropriate option,

So further to the above, we reiterate that culvert design and construction details will not be provided at the DCO stage. We propose that culverting is covered under generic mitigation, because it can then be efficiently reported in the respective FCA volume, thus avoid potentially significant duplication of text. However, we will commit to outlining a small range of culvert options that cover the following options, for example; (i) single bore, (ii) multiple bore, (iii) additional culverting on ramps in floodplains where flow conveyance should not be impeded. We will also set out the required design principles, for example, specifying culvert inverts be below the bed level, that semi natural beds will be facilitated in the culverts, culvert sizes will adequately convey a 1%AEP event (inc. climate change) without surcharging and excessive backwatering and downstream rapid head loss that may result in bed scour and bank erosion and associated impacts like downstream deposition that may increase flood risk.

As discussed in Section 9.4, these principles would then be written into the CEMP which forms part of the DCO submission and would, therefore, need to be adhered to by the eventual construction contractor during the detailed design and construction phases, to include gaining all necessary prior approvals from the Local Planning Authorities and statutory consultees (i.e. NRW and LLFAs) for method statements and water management plans for associated works. It is acknowledged that watercourse crossings and any other works on or near a main river will require a Flood Risk Activity Permit (FRAP) from NRW under the Environmental Permitting (amended) Regulations (2016) by NRW. Works affecting ordinary watercourses will be subject to Flood Defence Consent by the appropriate LLFA under Section 23 of the Land Drainage Act (1991).

In the case of bridges, if indeed there prove to be bridges then a similar approach as outlined above for culverts will be adopted. We're anticipating that any bridges may, unless unfeasibly so, be clear span structures. Where established floodplains are present we'll ensure that the potential need to ensure that floodplain flow conveyance is not impeded, together with outline design principles that should be adhered to achieve that aim.

10. FCA Data and Information

In order to carry out the FCA to the required standards, a variety of data and information from vary sources will be required. Data and information broadly fall into four categories: (1) third party data, (2) data acquired through publically available reports, (3) data generated in-house through calculations and analysis, and (4) data and information for sole use by the project team.

10.1 Third Party Data

Currently, our third party data holdings include those items in the following list, noting the format in brackets:

- Main rivers mapping (GIS)
- River network mapping (GIS)
- Flood zones 2 and 3 mapping (GIS)
- Sewer flooding records (Spreadsheet)
- Flood alert areas (GIS)
- Flood warning areas (GIS)
- Spatial flood defences without attributes (GIS)
- Flood storage areas mapping (GIS)
- Recorded flood outlines (GIS)
- Risk of flooding from river or sea mapping (GIS)
- Surface water flood risk mapping (GIS)
- Spatial flood defences with standardised assets (GIS)
- Wales high water mark (GIS)
- Groundwater flood risk mapping (GIS)
- Geological mapping (GIS)
- LiDAR (GIS)
- OS base mapping (GIS)
- OS MasterMap including full property and land cover classifications (GIS)
- Aerial photography (GIS)

In addition to the above data we made enquiries regarding hydraulic models or model outputs for the project area and also regarding flow gauge data noting that these items were not available or, in the case of the flow gauge data, was not applicable to the project area.

10.2 Publicly Available Reports

Publically available guidance documents from which we will extract guidance, data and information include:

- Welsh Government, Technical Advice Note 15 (TAN15): Development and Flood Risk (Jul, 2004)

- West of Wales Shoreline Management Plan 2 (Jun, 2012)
- Gwynedd Council Local Flood Risk Management Strategy (Feb, 2013)
- Anglesey Local Flood Risk Management Strategy (Jul, 2013)
- Anglesey & Gwynedd Joint Local Development Plan Strategic Flood Consequence Assessment – Stage 1 (Mar, 2016)
- NRW West Wales River Basin Management Plan 2015-2021 (Dec, 2015)
- NRW Western Wales Flood Risk Management Plan (2015)
- Environment Agency Coastal flood boundary conditions for UK mainland and islands. Project: SC060064/TR2: Design sea levels (2011)

10.3 Other data generated in-house

In addition to available data acquired through third parties, it is anticipated that some data and information will be extracted from publically available reports as well as being generated in-house using software and through analyses as indicated below:

- **Synthetic Flow Data** may be generated for watercourse crossings to in order to provide indicative culvert size requirements. We'll use the most conservative 1%AEP value (+20% as discussed in Section 9.6) from either the Institute of Hydrology 124 method, FEH ReFH model, Wallingford Procedure, Rational Method.
- **Time of Concentration** data will be required if using the Wallingford Procedure or the Rational Method to generate synthetic design flows. If required we will extract the time of concentration / critical duration / time to peak value from ReFH or, if not applicable, we will use the Bransby Williams method.
- **Rainfall Intensity Duration Frequency (IDF)** data may be needed if using the Wallingford Procedure or Rational Method to calculate runoff in which case we'll use the data FEH DDF rainfall model.
- **SPRHOST** will be required for IOH124 calculations and this will be extracted from the applicable sets of catchment descriptors via the FEH online service and compare with the Flood Studies Report WRAP mapping.

10.4 Data and information for sole use by the project team

As is to be expected, we have full access to the project database and thus all applicable drawings are available to us and will be used as applicable, including, but by no means limited to: OHL route plan, pylon locations, PPB, substations plans, indicative construction compound plans, indicative tunnel construction compounds and drainage scheme, access and haul roads and bell mouth location plans. These drawings are being continually updated and alerts sent throughout the project teams such that continual design changes, including the forthcoming subsequent design freezes, will all be picked up.

11. Summary

This FCA Method Statement has been issued with the purpose of presenting to key regulators (namely NRW, IoACC and GCC) our proposed approach to undertaking the FCA for the National Grid North Wales Connection Project. Throughout the method statement we have solicited confirmation of approaches being acceptable and also request that in responding to this paper that clear and unambiguous advice is provided where practicable.

12. Glossary

AEP	Annual Exceedance Probability
CEMP	Construction and Environmental Management Plan
CSEC	Cable sealing end compounds
DCO	Development Consent Order
DDF	Depth Duration Frequency
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environmental Assessment
FCA	Flood Consequence Assessment
FCERM-AG	Flood and Coastal Erosion Risk Management – Appraisal Guidance
FEH	Flood Estimation Handbook
FRMP	Flood Risk Management Plan
GCC	Gwynedd County Council
IOH124	Institute of Hydrology Report No. 124
IDF	Intensity Duration Frequency
IoACC	Isle of Anglesey County Council
LDP	Local Development Plan
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
NG	National Grid
NPS	National Policy Statement
NRW	Natural Resources Wales
NSIP	Nationally Significant Infrastructure Project
NWCP	North Wales Connection Project
OHL	Overhead lines
PEIR	Preliminary Environmental Information Report
PINS	Planning Inspectorate
PPB	Proposed Project Boundary
Q1	Quarter 1 (referring to the months of Jan, Feb and Mar in a given year)
Q2	Quarter 1 (referring to the months of Apr, May and Jun in a given year)
Q3	Quarter 1 (referring to the months of Jul, Aug and Sep in a given year)
Q4	Quarter 1 (referring to the months of Oct, Nov and Dec in a given year)
RBD	River Basin District
RBMP	River Basin Management Plan
ReFH	Revitalized Flood Hydrograph
SFCA	Strategic Flood Consequence Assessment
SMP	Shoreline Management Plan
SoP	Standard of Protection
TAN	Technical Advice Note
THH	Tunnel head houses

Author

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[Redacted]

Reviewer

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[Redacted]

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- ¹ National Grid North Wales Connection (2016). Environmental Impact Assessment Scoping Report. Accessed at <https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/projects/EN020015/EN020015-000093-Scoping%20Report%20and%20Appendices.pdf>
- ² National Grid North Wales Connection Project (2016). Preliminary Environmental Information Report (PEIR). Accessed at <http://northwalesconnection.com/current-documents-and-maps.aspx>
- ³ Environment Agency (2011). Coastal flood boundary conditions for UK mainland and islands. Project: SC060064/TR2: Design sea levels.
- ⁴ Department of Energy and Climate Change (2011). Overarching National Policy Statement for Electricity (EN-1). The Stationary Office.
- ⁵ Department of Energy and Climate Change (2011). National Policy Statement for Electricity Networks Infrastructure (EN-5). The Stationary Office.
- ⁶ Welsh Government (2004). Technical Advice Note 15: Development and Flood Risk.
- ⁷ Welsh Government (2015). TAN15 Development Advice Maps updates.
- ⁸ Secretary of State 2009 No. 3042, Environmental Protection, The Flood Risk Regulations 2009.
- ⁹ Natural Resources Wales (2015). Western Wales Flood Risk Management Plan.
- ¹⁰ Isle of Anglesey County Council (2013). Local Flood Risk Management Strategy.
- ¹¹ Gwynedd County Council (2013). Local Flood Risk Management Strategy.
- ¹² Isle of Anglesey and Gwynedd County Councils Joint Development Plan (2016): Strategic Flood Consequence Assessment.
- ¹³ Natural Resources Wales (2015). Western Wales River Basin Management Plan 2015-2021.
- ¹⁴ Pembrokeshire County Council (2012). West of Wales Shoreline Management Plan 2: Cardigan Bay and Ynys Enlli to the Great Orme Coastal Group.
- ¹⁵ National Grid – Internal and Contract Specific Policy Statement (Transmission) (2011). Flood Mitigation Policy.
- ¹⁶ Welsh Government (2011). Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales.
- ¹⁷ Environment Agency (2010). Flood and Coastal Erosion Risk Management Appraisal Guidance (FCERM-AG)
- ¹⁸ Welsh Government (2016). Guidance on Climate Change Allowances for Planning Purposes. Accessed at <http://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>
- ¹⁹ Environment Agency (2015). Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities.

²⁰ Planning Practice Guidance. Department for Communities and Local Government. 2014.
<http://planningguidance.planningportal.gov.uk/>

²¹ NetRegs (2017). Guidance for pollution prevention, works or maintenance in or near water GPP5

²² CIRIA C753 (2015). The SUDS Manual.

²³ Centre for Ecology and Hydrology (1999). Flood Estimation Handbook. To include revisions and online services.

²⁴ Institute of Hydrology (1994). Report No. 124: Flood estimation for small catchments

²⁵ Centre for Ecology and Hydrology (2016). The Revitalised Flood Hydrograph Model ReFH 2.2: Technical Guidance.

Annex C

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FLOOD MITIGATION POLICY

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PURPOSE AND SCOPE

This policy document defines National Grid's declared target levels for flood defence / resilience that should be applied to existing transmission substations, all new build electricity transmission substations and at legacy substations subjected to an expansion or a major refurbishment programme.

Its aim is to ensure that flood risk is a material consideration at all stages of National Grid's capital planning process.

It draws guidance from the following documents:

- Communities and Local Government, Planning Policy Statement 25 (PPS25) - Development and Flood Risk
- Planning Policy Wales, Technical Advice Note 15 (TAN15) - Developments and Flood Risk
- The Energy Network Association Engineering Technical Report (ENA ETR138) – Resilience to Flooding of Grid and Primary Substations.
- UK Climate Change Projections 2009 (UKCP09)

PART 1 – POLICY

1 GENERAL POLICY

As defined in PPS25, TAN15, and ETR138, National Grid needs to ensure that new and existing sites (or key equipment located therein) meet declared flood resilience levels defined within this document.

In doing so, ensuring the site is safe and operational during flooding events with no loss of supply or risk to system stability.

2 FLOOD RISK ASSESSMENTS

When looking to select a site for a new facility or during consultations with planning authorities for works on existing sites, early consultation with both the local authority and the Environment Agency is advised irrespective of whether planning permission is required. If flood risk is raised as a concern, a detailed Flood Risk Assessment (FRA) shall be undertaken to determine the level of risk. Failure to submit a FRA could result in a planning application being delayed or refused planning permission due to lack of information.

3 RESILIENCE LEVELS

If a risk is identified it shall be accurately assessed. If no other suitable location can be found then this will be recorded and submitted as part of undertaking a Sequential Test (see PPS25 Practice Guide).

The aim of the Sequential Test is to steer new development towards areas with the lowest probability of flooding (Zone 1). Where this is not possible it must be demonstrated to both the Local Planning Authority and the Environment Agency that there are no reasonably available sites for the type of development proposed in a lower risk category. Only where there are no reasonably available sites in Flood Zones 1 and 2, should sites within Flood Zone 3 be considered.

National Grid infrastructure should be located in a Low Probability Zone 1 (risk less than 1:1000). Where this is not possible the infrastructure shall be located in a medium probability Zone 2 (risk between 1:100 and 1:1000), and must be accompanied by a Flood Risk Assessment to demonstrate how flood risks from all sources of flooding to the development itself and flood risk to others will be managed. It will also be necessary to take account of climate change and errors in data when establishing a flood height for any mitigation measures.

3.1 New Sites

Target - 1:1000 flood resilience with suitable allowance for climate change;

- River, surface water, ground water and sewers flooding climate change – refer to PPS25 - 20% increased peak river flow or where unknown add 300mm (Environment Agency standard practice)
- Tidal flooding climate change – refer to PPS25

In addition to climate change add 300mm for errors in data if not already accounted for in information provided.

3.2 Existing sites and extensions to existing sites resilience level

Target - 1:1000 flood resilience with suitable allowance for climate change;

- River, surface water, ground water and sewers flooding - 20% increased peak river flow or where unknown add 300mm (Environment Agency standard practice)
- Tidal flooding risks for existing sites – Expansion beyond the boundary fence line tidal risk sites refer to PPS25 where practicable or add 433mm (UKCP09) if no accurate data can be obtained from the Environment Agency
- Expansion within the boundary fence line tidal risk sites refer to PPS25 where practicable or add 433mm (UKCP09) if no accurate data can be obtained from the Environment Agency and base solution on Design Justification Report (TP146.2)

In addition to climate change add 300mm for errors in data if not already accounted for in information provided.

In circumstances where the 1:1000 + Climate Change + 300mm is not practical due to cost or engineering constraints a lower level of resilience will be acceptable with a minimum standard of resilience to 1:200 + Climate Change + 300mm flooding.

Parameters which may permit a reduction in the target resilience include

- The projected lifespan of the site (< 10 years)
- Engineering constraints on site mean mitigation option cannot be practically accommodated
- Flood defence wall not exceeding 2.4m high
- The cost of the target resilience (1:1000 + CC + 300mm) exceeds the minimum defence option (1:200 +CC + 300mm) by £1m or 50% whichever figure is the greater amount
- The site can be switched out safely at any time and not impact supplies

A suitable cost benefit analysis shall be carried out detailing and recording the decision process.

3.3 Shared ownership sites and adjacent DNO / Generator sites

In accordance with ETR138 Appendix 6 the flood risk assessment and any necessary mitigation works shall ensure the resilience of the site and security of supply.

3.4 Off site 3rd Party Flood Defences

Where a site is shown to be at risk from flooding but benefits from defences off site (e.g. EA or local authority owned and maintained river or coastal defences) to the target resilience level there may still be a risk from surface water which may require flood mitigation work this will be established through the FRA.

Where the off site defence is to a lesser standard but above the minimum resilience level, consideration may be given to improving the defence through either on site protection or improving the off site protection.

Where the off site defence is to a lesser standard and below the minimum resilience level, the site defence shall be improved through either on site protection or improving the off site protection.

A suitable cost benefit analysis shall be carried out detailing and recording the decision process.

4 FORMS AND RECORDS

Not applicable.

PART 2 - DEFINITIONS AND DOCUMENT HISTORY

5 DEFINITIONS

Not applicable.

6 AMENDMENTS RECORD

Issue	Date	Summary of Changes / Reasons	Author(s)	Approved By (Inc. Job Title)
1	January 2011	New document	Doug Dodds Asset Engineering	David Wright Electricity Network Investment Manager

7 IMPLEMENTATION

7.1 Audience Awareness

Audience	Purpose	Notification Method
	Compliance (C) / Awareness (A)	Memo / letter / fax / e-mail / team brief / other (specify)
Asset Management, UK Construction, Network Operations, Alliances	C	E-mail

7.2 Training Requirements

Training Needs	Training Target Date	Implementation Manager
N/A / Informal / Workshop / Formal Course		
N/A	N/A	N/A

7.3 Compliance

Compliance will be ensured through the investment scheme process and internal audit.

7.4 Procedure Review Date

8 years from publication date.

PART 3 - GUIDANCE NOTES

8 REFERENCES

UKBP/TP 213 Substation flood risk assessment and flood risk monitoring

TGN(E) *** - Flood Mitigation Technical Guidance

PPS25 – Communities and Local Government, Planning Policy Statement – Development and Flood Risk

ETR138 – Energy Network Association Engineering Technical Report – Resilience to Flooding of Grid and Primary Substations

Planning Policy Wales, Technical Advice Note 15 (TAN15) - Developments and Flood Risk

UK Climate Change Projections 2009 (UKCP09)