Awel y Môr Offshore Wind Farm

Category 6: Environmental Statement

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Glossary of terms

TERM	DEFINITION
AyM	The Awel y Môr Offshore Wind Farm
Cable Works TCC	TCC associated with cable works
EIA	Environmental Impact Assessment
Electromagnetic Fields (EMF)	Electric and magnetic fields produced by the generation and use of electricity
ES	Environmental Statement (the documents that collate the processes and results of the EIA).
Maximum Design Scenario (MDS)	The maximum design parameters of the combined project assets that result in the greatest potential for change in relation to each impact assessed.
Mitigation	Mitigation measures are commitments made to reduce and/or eliminate the potential for significant effects to arise as a result of the project. Mitigation measures can be embedded (part of the project design) or secondarily added to reduce impacts in the case of potentially significant effects.
Onshore Export Cable Corridor (Onshore ECC)	The proposed cable route which represents a corridor, typically 40 m to 60 m wide, within which the cable trenching, haul road and stockpiling areas associated with cable construction, will be undertaken and the cables will be installed.
OnSS Access Zone	The area which will contain the final OnSS access route(s) (both construction and operational) – The route(s) of the construction and operational accesses within the OnSS Access Zone will be confirmed following detailed design (post consent)

TERM	DEFINITION
OnSS Cable Corridor Zone	The area within which will contain final cable connection into and out of the substation will be made. The route of the cable connections to the substation will be confirmed following detailed design (post consent). The cable route will be either east or west of the pond located immediately south of the substation.
OnSS Construction Area	The area within which the substation construction would take place. This area incorporated both the OnSS Footprint and areas of cut and fill required to construct the substation platform.
OnSS Footprint	The footprint for the substation which would incorporate either Air Insulated Switchgear or Gas Insulated Switchgear technology.
Order Limits	The area within which development will be carried out including all works, access routes, TCCs and visibility splays
PEIR	Preliminary Environmental Information Report. The PEIR was written in the style of a draft Environmental Statement (ES) and formed the basis of statutory consultation
The Applicant	Awel y Môr Offshore Wind Farm Limited.

Abbreviations and acronyms

TERM	DEFINITION
AC	Alternating Currant
AIS	Air Insulated Substation
COMAH	Control of Major Accident Hazards

TERM	DEFINITION
DC	Direct Currant
DCC	Denbighshire County Council
DECC	Department of Energy & Climate Change
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
ETG	Expert Topic Group
EU	European Union
GIS	Gas Insulated Substation
HDD	Horizontal Directional Drilling
HIA	Health Impact Assessment
HVAC	High Voltage Alternating Current
ICNIRP	International Commission on Non-Ionizing Radiation Protection
NPS	National Policy Statement
NSIP	Nationally Significant Infrastructure Project
O&M	Operations and Maintenance
OnSS	Onshore substation
PEIR	Preliminary Environmental Information Report
PHW	Public Health Wales
PINS	Planning Inspectorate
SABP	St Asaph Business Park
UK	United Kingdom

Units

UNIT	DEFINITION
µT	Microteslas
Km	Kilometre
kV	Kilovolt
M	Metre
V/m	Volts per metre

12 Public Health

12.1 Introduction

1 This chapter describes the approach taken in the assessment on potential impacts to public health. The approach to this chapter has been agreed with Public Health Wales (see Table 2) and draws on information that has been gathered and presented in other chapters of the Environmental Statement (ES) for the Awel y Môr Offshore Wind Farm (AyM). The purpose of this chapter is to consider the potential impacts of AyM on the health of the local population.

2 Public health is an inherent part of a number of technical areas assessed within the ES, including flood risk, air quality, noise and vibration and traffic and transport. This chapter provides a summary of the conclusions, relevant to public health, for each relevant ES chapter assessment, which are referenced below, and provides a further assessment of the potential effects arising from electromagnetic fields (EMF), as these effects are not considered in the wider ES in the context of Public Health.

3 Following a summary of the relevant policy and legislation, the chapter describes the assessment methodology, the potential impacts relating to public health, the mitigation measures considered by the assessment and the likely significant environmental effects.

4 This public health assessment should be read alongside the following chapters and annexes of the ES, which are referred to and drawn upon throughout this document:

- Volume 3, Chapter 1: Onshore Project Design (application ref: 6.3.1);
- Volume 3, Chapter 6: Ground Conditions and Land Use (application ref: 6.3.6);
- Volume 3, Chapter 7: Hydrology, Hydrogeology and Flood Risk (application ref: 6.3.7);
- Volume 3, Chapter 9: Traffic and Transport (application ref: 6.3.9);
- Volume 3, Chapter 10: Airborne Noise and Vibration (application ref: 6.3.10); and
- Volume 3, Chapter 11: Air Quality (application ref: 6.3.11).

12.2 Statutory and policy context

5 Detail regarding the relevant legislation and policy is outlined in Table 1. This section identifies legislation, guidance, national and local policy of particular relevance to the potential impact on public health associated with the construction, operation and decommissioning of AyM.

6 The Planning Act 2008 and the Environment Act 1995 are considered along with the more specific legislation relevant to health. As noted previously the consideration of health and well-being matters are inherent within a number of the technical assessments presented within the ES and specific policies apply specific topic areas and impacts. Where impacts have already been assessed in another chapter further policy information should be sought in that relevant chapter.

7 Planning policy relating to health, which is of relevance to the proposed development, is provided by the National Policy Statements (NPSs). These provide the primary basis for decisions by the Secretary of State for Business Energy and Industrial Strategy on applications for Development Consent Orders (DCO) for nationally significant renewable energy projects. Overarching guidance on nationally significant energy projects is provided in the Overarching National Policy Statement (NPS) for Energy (EN-1) (DECC 2011a).

8 Guidance specifically relating to onshore grid connections is provided in the NPS for Electricity Networks (EN-5) (DECC 2011c). This policy focuses on guidance primarily in relation to overhead lines which is not applicable to AyM as all onshore export transmission cables from the landfall location to the east of Rhyl to the proposed onshore substation (OnSS)located to the west of St Asaph Business Park (SABP) and existing National Grid Bodelwyddan substation will be underground.

9 In addition to the current NPS, draft NPSs were consulted upon in September to November 2021. The draft NPSs have been reviewed to determine the emerging expectations and changes from previous iterations of the NPSs. This includes the Draft Overarching NPS EN-1 (DECC, 2021a) and EN-5 (DECC, 2021b).

10 Consideration has been given to the advice provided in the Institute of Environmental Management and Assessment, 2017: Health in Environmental Assessment, a primer for a proportionate approach (Cave *et al*., 2017a). The advice notes that Health Impact Assessment (HIA) is a separate process to EIA and is used to provide specific health input to project design and to identify appropriate actions to improve and protect health. The advice goes on to acknowledge that EIA include some aspects of health, for example consideration of human receptors in relation to air or water quality and noise or light disturbance. Furthermore, the socio-economics chapter of ESs typically include the implications on public services (including health services), education and employment (as is the case for AyM).

11 Policies specifically relating to air emissions can be found in Volume 3, Chapter 11: Air Quality (application ref: 6.3.11) and Volume 3, Chapter 9: Traffic and Transport (application ref: 6.3.9).

12 Policies specifically relating to water and soil emissions can be found in Volume 3, Chapter 6: Ground Conditions and Land Use (application ref: 6.3.6) and Volume 3, Chapter 7: Hydrology and Flood Risk (application ref 6.3.7).

13 Policies specifically relating to noise emissions can be found in Volume 3, Chapter 10: Airborne Noise and Vibration (application ref 6.3.10) and Volume 3, Chapter 9: Traffic and Transport.

14 Relevant legislation and policy is outlined in Table 1.

Table 1: Legislation and policy context.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
Well-being of Future Generations (Wales) Act 2015	The Act provides for a shared purpose through seven well-being goals for Wales. These well-being goals are indivisible from each other and explain what is meant by the well-being of Wales. One of the well being goals represents the ambition for 'A Healthier Wales'.	Impacts to health are considered throughout this chapter and assessed in sections 12.9, 12.10, 12.11 and 12.12
NPS EN-1 Para 4.13.1 to 4.13.5 (DECC 2011a)	'*Energy production has the potential to impact on the health and well-being ("health") of the population. Access to energy is clearly beneficial to society and to our health as a whole. However, the production, distribution and use of energy may have negative impacts on some people's health.* *As described in the relevant sections of this NPS and in the technology specific NPSs, where the proposed project has an effect on human beings, the ES should assess these*	Impacts to health are assessed in sections 12.9, 12.10, 12.11 and 12.12.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	effects for each element of the project, identifying any adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant and the IPC should consider the cumulative impact on health. *The direct impacts on health may include increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation, and increases in pests.* *New energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to key public services, transport or the use of open space for recreation and physical activity.*	

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	Generally, those aspects of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either constitute a reason to refused consents or require specific mitigation under the Planning Act 2008. However, the IPC will want to take account of health concerns when setting requirements relating to a range of impacts such as noise.'	
Draft NPS EN-1 Para 4.3.1 to 4.3.5 (DECC 2021a)	*'Energy production has the potential to impact on the health and well-being ("health") of the population. Access to energy is clearly beneficial to society and to our health as a whole. However, the production, distribution and use of energy may have negative impacts on some people's health.*	Impacts to health are assessed in sections 12.9, 12.10, 12.11 and 12.12.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	As described in the relevant sections of this NPS and in the technology specific NPSs, where the proposed project has an effect on human beings, the ES should assess these effects for each element of the project, identifying any potential adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. The impacts of more than one development may affect people simultaneously, so the applicant should consider the cumulative impact on health in the ES where appropriate. *The direct impacts on health may include increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation, and increases in pests.* *New energy infrastructure may also affect the composition and size of the local population, and in doing so have indirect*	

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	health impacts, for example if it in some way affects access to key public services, transport or the use of open space for recreation and physical activity. *Generally, those aspects of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either by themselves constitute a reason to refuse consent or require specific mitigation under the Planning Act 2008. However, not all potential sources of health impacts will be mitigated in this way and the Secretary of State will want to take account of health concerns when setting requirements relating to a range of impacts such as noise. Opportunities should also be taken to mitigate indirect impacts, by promoting*	

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	local improvements to encourage health and wellbeing, this includes potential impacts on vulnerable groups within society i.e. those groups within society which may be differentially impacted by a development compared to wider society as a whole.'	
NPS EN-5 Para 2.10.2 (DECC 2011b)	All overhead power lines produce EMFs, and these tend to be highest directly under a line, and decrease to the sides at increasing distance. Although putting cables underground eliminates the electric field, they still produce magnetic fields, which are highest directly above the cable (see para 2.10.12). EMFs can have both direct and indirect effects on human health. The direct effects occur in terms of impacts on the central nervous system resulting in its normal functioning being affected. Indirect effects occur through electric charges building up on the surface of the body producing a	The potential effects of EMF is described in section 12.10.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	microshock on contact with a grounded object, or *vice versa*, which, depending on the field strength and other exposure factors, can range from barely perceptible to being an annoyance or even painful.	
Draft NPS EN-5 Para 2.13.2 (DECC 2021b)	All overhead power lines produce EMFs. These tend to be highest directly under a line, and decrease to the sides at increasing distance. Although putting cables underground eliminates the electric field, they still produce magnetic fields, which are highest directly above the cable (see para 2.10.12). EMFs can have both direct and indirect effects on human health. The direct effects occur in terms of impacts on the central nervous system resulting in its normal functioning being affected. Indirect effects occur through electric charges building up on the surface of the body producing a microshock on contact with a grounded object, or *vice versa*, which, depending on	The potential effects of EMF is described in section 12.10.

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	the field strength and other exposure factors, can range from barely perceptible to being an annoyance or even painful.	
Planning Policy Wales (2021)	Para 324 states that *'Where significant effects on human health are likely to arise as a result of development plans or individual development proposals, environmental impacts should be considered in full knowledge of the likely consequences for health. Information to assess potential impacts on health can be required through various mechanisms, such as sustainability appraisal of development plans and environmental impact assessments, and where relevant, health impacts should be incorporated into such assessments.'*	Impacts to health are assessed in sections 12.9, 12.10, 12.11 and 12.12.
Future Wales – The National Plan 2040 (WelshGovernment, 2021a)	*Future Wales – The National Plan 2040* sets out a strategy for addressing key national priorities through the planning system, including sustaining and developing a	Impacts to health are considered throughout this chapter and assessed in

LEGISLATION/ POLICY	KEY PROVISIONS	SECTION WHERE COMMENT ADDRESSED
	vibrant economy, achieving decarbonisation and climate-resilience, developing strong ecosystems and improving the health and well-being of communities.	sections 12.9, 12.10, 12.11 and 12.12
DCC Policy VOE 10	Development proposals which promote the provision of renewable energy technologies may be supported providing they are located so as to minimise visual, noise and amenity impacts and demonstrate no unacceptable impact upon the interests of nature conservation, wildlife, natural and cultural heritage, landscape, public health and residential amenity.	Impacts to health are assessed in sections 12.9, 12.10, 12.11 and 12.12.

15 There are no statutory regulations in the UK with regard to exposure to EMF. However, in 2004 the UK Government adopted guidelines published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP, 1998) in accordance with the terms of the 1999 EU Council recommendation on limiting public exposure to EMF (EU, 1999). Whilst no longer bound by EU recommendations, the UK adoption of the guidelines remains appropriate, and the criteria within the guidelines establish acceptable limits for exposure of the public to EMF that adopt a precautionary approach taking into account various scenarios and potentially more vulnerable groups (such as infants) which are considered appropriate for the purposes of this assessment.

16 Whilst there are no statutory regulations in the UK that limit the exposure of people to power-frequency EMF, responsibility for implementing appropriate measures for the protection of the public lies with the UK Government, who have a clear policy, restated in October 2009 (Department of Health, 2009) and incorporated in NPS EN-5 (DECC, 2011), on the exposure limits and other policies they expect to see applied. It is important to note however that whilst reference is made to EN-5 insofar as it relates to electrical infrastructure AyM has been actively designed to avoid overhead lines and the associated effects by committing to installing all electrical cable infrastructure underground. Practical details on EMF exposure limits, appropriate design of electrical infrastructure and how the policy is to be implemented are contained in Codes of Practice (see below) agreed between industry and Government. This guidance is referenced by Public Health England within its position paper on 'NSIP Planning Statement on Electromagnetic fields', which has also been adopted by Public Health Wales:

- Power Lines: Demonstrating compliance with EMF public exposure guidelines – a Voluntary Code of Practice (DECC, March 2012a);
- Optimum Phasing of high voltage double-circuit Power Lines – a Voluntary Code of Practice (DECC, 2012b); and
- Power Lines: Control of microshocks and other indirect effects of public exposure to electric fields - a Voluntary Code of Practice (DECC, July 2013).

17 The UK Government, in turn, acts on the scientific advice from Public Health England and/or Public Health Wales, which has responsibility for advising on non-ionising radiation protection, including power frequency fields.

18 The ICNIRP guidance, to which the UK Government policy follows, outlines two categories of public exposure levels, 'reference levels' and 'basic restriction' levels. The ICNIRP 'reference levels' for the public are:

- 100 microteslas (μT) for magnetic fields; and
- 5 kilovolts (kV) per metre for electric fields.

19 While the ICNIRP 'basic restriction' for levels of public exposure are higher at:

- 360 μT for magnetic fields; and
- 9 kV per metre for electric fields.

20 In the ICNIRP guidelines and the associated UK Guidance, the actual limit is the basic restriction. The reference levels are not limits but are guides to when detailed investigation of compliance with the actual limit, the basic restriction, is required. If the reference level is not exceeded, the basic restriction cannot be exceeded, and no further investigation is needed. If the reference level is exceeded, the basic restriction may or may not be exceeded.

21 If the fields produced by an item of equipment are lower than 9 kV/m and 360 μT, the fields corresponding to the ICNIRP basic restriction, it is compliant with the ICNIRP guidelines and hence with Public Health England recommendations and Government policy. If the fields are greater than these values, it is still compliant with Government policy if the land use falls outside the residential and other uses specified in the Code of Practice (DECC, 2012a) and it may still be compliant if the fields are non- uniform.

12.3 Consultation and scoping

22 A formal scoping opinion was requested from Secretary of State (SoS) following the submission of the Scoping Report (AyM 2020) in March 2020.

23 EIA Scoping was undertaken at a stage when the landfall, cable route and OnSS were undetermined. As such, the Scoping Opinion was sought on the basis of an onshore Search Area which extended from Prestatyn in the east to Penrhyn Bay in the west and extended south to include St Asaph.

24 Within the July 2020 EIA Scoping Opinion the SoS did not consider that sufficient evidence had been provided to support scoping out a number of matters pertaining to the assessment of potential impacts to health, the matters are listed in Table 2.

25 With regard to EMF, although the exact location of transmission infrastructure was not determined, the EIA Scoping Request made reference to ICNIRP guidelines and, through project design, committed to comply with current guidelines on levels of public exposure and design of electrical infrastructure. As such, the EIA Scoping Request proposed that the impact would be of negligible magnitude and would not result in significant effects in EIA terms such that it was intended to scope the onshore impact of EMF during operation of the AyM out of further consideration within the EIA.

26 In response, the SoS did not consider that sufficient evidence had been provided within the Scoping Request to support scoping these matters out from the assessment. The SoS advised that the Applicant should make effort to agree the approach to the assessment with relevant consultation bodies ensuring that the assessment is both proportionate and robust.

27 The proposed approach to the assessment of EMF was discussed during the Human Environment Expert Topic Group (ETG), meeting on the 29th September 2020. During the meeting it was confirmed that a technical note would be provided against the final preferred route with a focus on EMF with reference to ICNIRP guidelines with an aim to scope EMF out of assessment within the EIA. A copy of this technical note is provided in Annex 5.12.1.

28 Ongoing consultation post-scoping has been important in the evolution of the project and the parameters for assessment. As part of the Environmental Impact Assessment (EIA) process, ongoing consultation has been undertaken with various statutory and non-statutory authorities via the Expert Topic Group (ETG) forum.

29 AyM statutory consultation, under Section 42 of the Planning Act 2008, ran from 31 August to 11 October 2021, a period of six weeks. A Preliminary Environmental Information Report (PEIR) was published as part of formal consultation which provided preliminary information on EMF within Volume 3, Chapter 12: Public Health.

30 Table 2 provides a summary of consultation to date. Full details of consultation and scoping have been included in a separate Consultation Report (application ref: 5.1).

Table 2: Summary of consultation relating to Public Health Assessment

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
Scoping Opinion (July 2020)	Within the EIA Scoping Opinion the SoS did not consider that sufficient evidence had been provided to support scoping the following matters out from the assessment: • Impacts on health due to water emissions during operation; • Impacts on health due to electromagnetic radiation during all phases of AyM; • Pests and odours during all phases of AyM; and • EMF cumulative effects during operation.	See Sections 12.9 and 12.10 of this Chapter. As set out in Volume 3, Chapter 6 Ground Conditions and Land Use, the Natural Resources Wales (NRW) website was consulted for the presence of landfills (authorised and historic). The search identified no authorised landfills within 1km of the onshore Export Cable Corridor (ECC), however one historic landfill (RHU/011/95) was located adjacent to the onshore ECC at NGR 302300, 379300, previously licenced for inert waste. There is no evidence of this on site. The former landfill is considered to present a very low risk given the nature of the fill material (inert). Therefore potential effects related to pests and odours from former landfill sites are considered negligible and are

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
		not considered further as agreed with the Human Environment ETG.
Scoping Opinion (July 2020)	Within the EIA Scoping Opinion the SoS did not consider that sufficient evidence had been provided to support scoping out impacts from major disasters during all phases of AyM;	Consideration of potential impacts from major disasters is included in Volume 1, Chapter 2: Policy and Legislation.
Human Health Expert Topic Group	The proposed approach to the assessment of EMF was discussed during the Human Environment Expert Topic Group (ETG), meeting on the 29th September 2020. During the meeting it was confirmed that a technical note would be provided against the final preferred route with a focus on EMF with reference to ICNIRP guidelines with an aim to scope EMF out of assessment within the EIA.	The contents of the Technical Note on EMF are incorporated into this chapter. Consideration of EMF, in line with the technical note, is provided in Sections 12.9 and 12.10 of this chapter

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	A technical note was issued to ETG members, including Public Health Wales, Public Health England and Denbighshire County Council on 4th June 2021. Public Health Wales response confirmed that on the basis of the EMF public exposure voluntary code of practice, for 275 and 400 kV cables a calculation or measurement of the maximum fields directly above the cable is required to provide evidence of compliance with exposure guidelines. This has been achieved somewhat indirectly by referring to examples from A National Grid -maintained industry websitei	

[redacted]

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	The compliance conclusion, therefore, is wholly dependent on the windfarm cables being constructed and operating in the same way as the National Grid examples. Further assurance, in terms of detailed cable layout information, phase arrangement and operating loads etc, could be provided to confirm this is indeed the case	
October 2021 Section 42 Consultation Response	PHW requested further information in order to understand how the maximum and typical magnetic field values reported within PEIR have been estimated. For example, do the values come from the generic cable information provided on National Grid's www.emfs.info page, or have they been calculated specifically for AyM export cable design and	The maximum and typical magnetic field values reported within this ES (and the PEIR) come from the generic cable information provided on National Grid's www.emfs.info page. At this stage in the AyM development process, decisions on precise technologies and construction methods that will be employed have not been made.

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
	operating conditions? The latter is preferable because the conclusion about compliance is dependent on the export cable being constructed and operating in the same way as the National Grid examples. Therefore, it would be helpful if it can be made clearer as to how the reported values were derived	These will be determined during detailed design that would take place between a decision on the DCO application and the start of construction. As a result, the final export cable design and operating conditions cannot be fully defined and so generic cable information has been used for the EIA. In line with NPS EN-5 (DECC, 2011), the electrical infrastructure will be designed to comply with current guidelines on levels of public exposure and design of electrical infrastructure. The Applicant provides a commitment that the AyM Onshore ECC will not exceed guidance levels for EMF established by the International Commission on Non-Ionizing Radiation Protection (ICNIRP)

DATE AND CONSULTATION PHASE/ TYPE	CONSULTATION AND KEY ISSUES RAISED	SECTION WHERE COMMENT ADDRESSED
November 2021 Human Health Expert Topic Group	PHW suggested the Public Health Chapter includes reference to the contribution to net zero that the project will make.	During its operation, the AyM project will contribute to meeting global, European and national targets on carbon dioxide (CO_2) reduction through the provision of clean energy for approximately 400,000 homes, and in overall terms meeting approximately 6% of the Wales' electricity consumption, and making a significant contribution towards Wales' target of 70% renewables by 2030, and the ambitious UK's deployment target of 40 GW by 2030;

Potential impacts scoped into assessment

31 The potential impacts scoped into the EIA process have been assessed within relevant chapters and summarised within this chapter (as proposed in the Scoping Report). The relevant chapters which assess the impact of AyM on public health are listed in Table 3. The study area, methodology and baseline data for each topic is dependent on each potential impact and are defined in detail within each relevant ES chapters.

Table 3: Relevant chapters which assess the impact of AyM on public health.

POTENTIAL IMPACT ON HEALTH	RELEVANT ES CHAPTER
Impact on health due to air emissions including dust (construction)	Volume 3, Chapter 11: Air Quality and Volume 3 (application ref: 6.3.11), Chapter 9: Traffic and Transport (application ref: 6.3.9)
Impact on health due to water quality (all phases)	Volume 3, Chapter 7: Hydrology and Flood Risk (application ref: 6.3.7)
Impact on health due to soil contamination (construction)	Volume 3, Chapter 6: Ground Conditions and Land Use (application ref: 6.3.6)
Impact on health due to noise emissions (all phases)	Volume 3, Chapter 10: Noise and Vibration (application ref: 6.3.10) and Volume 3, Chapter 9: Traffic and Transport(application ref: 6.3.9)
Impact on health due to disruption to local road network (construction)	Volume 3, Chapter 9: Traffic and Transport (application ref: 6.3.9)
Impact on health due to electromagnetic radiation (operational phase only)	This chapter - Volume 3, Chapter 12: Public Health (application ref: 6.3.12)

32 The EIA Scoping Report had proposed consideration of potential impacts on health due to temporary loss of access to green space on the basis that a preferred cable corridor and substation location had not been identified. The onshore ECC has subsequently been identified and contains no areas of green space. Therefore, no further consideration of the potential impact of AyM upon green space has been made.

33 Only one potential impact on Public Health, electromagnetic radiation during operation, is not already assessed in a relevant ES chapter. This is assessed within this chapter with respect to the study area encompassing the Onshore ECC which is described in in detail in Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1). In summary, as a result of the project commitment to bury the cable infrastructure, the potential impact is restricted to a very localised study area <10m of the export cables.

12.4 Assessment criteria and assignment of significance

34 This assessment considers the potential impacts associated with the construction, operations and maintenance (O&M) and decommissioning of AyM and the subsequent effects upon public health, with a particular focus in this chapter on EMF.

35 Information about the onshore aspects of AyM and the activities for all stages of the project life cycle (construction, O&M and decommissioning) have been combined with information about the environmental baseline to identify the potential interactions between the project and the receptors. These potential interactions are known as potential impacts. The potential impacts are then assessed to give a likely level of significance of effect upon the receiving receptors.

36 The outcome of the assessment is to determine the significance of these effects against predetermined criteria.

37 This chapter does not define criteria for magnitude of impacts, receptor sensitivity and significance of effect with regard to air quality, water emissions, soil contamination, noise and traffic as there are well established criteria that have been used for these topics that are set out in the relevant topic chapters.

Magnitude of impact

38 The magnitude of potential impacts is defined by a series of factors including the spatial extent of any interaction, the likelihood, duration and frequency of a potential impact. The definitions of the levels of magnitude used in the consideration of potential electromagnetic radiation are shown in Table 4.

Table 4: Magnitude of impact classification

MAGNITUDE	DESCRIPTION
High	Exposure to electromagnetic radiation of high intensity and/or long duration and/or over a wide geographical area and/or likely to affect a large number of people (over 500) and/or vulnerable groups e.g. children/older people. Long-term and/or permanent effects on physical and mental health.
Medium	Exposure to electromagnetic radiation of medium term and/or moderate intensity and/or over a relatively localised area and/or of intermittent duration and/or likely to affect a moderate-large number of people (between 100-500) and/or vulnerable groups. Medium-term and/or temporary effects which may affect physical and mental health.
Low	Exposure to electromagnetic radiation of low intensity and/or short/intermittent duration and/or over a small area and/or affect a small number of people (less than 100). Short-term and/or temporary effects which are unlikely to affect physical and mental health.
Negligible	Health effects are barely discernible or measurable though complete absence cannot be shown.

Sensitivity of receptors

39 The definitions of terms relating to the sensitivity of public health receptors with regard to electromagnetic radiation are detailed in Table 5.

Table 5: Sensitivity of receptor with regard to electromagnetic radiation

SENSITIVITY OF RECEPTOR	RECEPTOR DESCRIPTION
High	Such receptors include pupils in residential educational facilities and patients in healthcare facilities and are defined as a "vulnerable subgroup" with very high or continuous rates of occupancy.
Medium	Residential receptors. Receptors are categorised as medium sensitivity where electromagnetic radiation may cause disturbance and a level of protection is required but a level of tolerance is expected.
Low	Area used primarily for agricultural activities as well as public rights of way (PRoW), sports facilities and sites of historic or cultural importance. Receptors are categorised as low sensitivity where electromagnetic radiation may cause short duration effects in a recreational setting.
Negligible	Not applicable to this assessment.

40 The matrix used for the assessment of significance is shown in Table 6 The magnitude of the impact is correlated against the sensitivity of the receptor to provide a level of significance.

41 For the purposes of this assessment, any effect that is moderate or major, and shaded in in the matrix table, is considered to be significant in EIA terms. Any effect that is minor or below, is not significant in respect to the EIA.

Table 6: Matrix to determine effect significance.

		SENSITIVITY			
		HIGH	MEDIUM	LOW	NEGLIGIBLE
ADVERSE MAGNITUDE	HIGH	Major	Major	Moderate	Minor
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
BENEFICIAL MAGNITUDE	NEGLIGIBLE	Minor	Minor	Negligible	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	MEDIUM	Major	Moderate	Minor	Negligible
	HIGH	Major	Major	Moderate	Minor

Note: Effects of 'moderate' significance or greater are defined as significant with regards to the EIA Regulations 2017[ii]

[ii] The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.

12.5 Uncertainty and technical difficulties encountered

42 Any uncertainty and technical difficulties encountered with regard to impacts on health assessed in other chapters can be found in the relevant chapter.

43 Large-scale offshore wind developments such as AyM involve complex engineering and multi-year development programmes where it is not possible to identify the exact components to be used within the final development at the point of DCO application. Within the offshore wind industry, technology is constantly improving, with larger and more efficient turbines being developed which in turn affect a number of other onshore design aspects of the scheme such as:

- options for the number of export circuits,
- layout and technology requirements for the proposed OnSS,
- precise siting of onshore infrastructure; and
- construction methods.

44 These details will be determined during detailed design that would take place between a decision on the application for development consent and the start of construction. As a result, the precise rating of the underground cables that would be installed as part of the onshore elements of AyM is not currently known and so typical magnetic field value for 400kV underground cables, published by National Grid, alongside alternative data sources (ICF, 2003), have been used for the consideration of magnetic fields (see Section 12.10 for further information).

12.6 Existing environment

45 The existing environment for each potential health impact identified in Table 3 is described in the relevant ES chapter. This chapter has not sought to duplicate that information and instead focusses on providing a description of the existing environment with regards the specific potential impact considered in this chapter namely electromagnetic fields.

46 EMFs are produced both naturally and as a result of certain human activities. The earth has a magnetic field produced by currents deep inside the core of the planet. The Earth is also subject to electric fields produced by electrical activity in the atmosphere such as thunderstorms. The direction of the Earth's magnetic field is normally constant, varying in size only slowly over time, and is referred to as a static or "DC" field. The Earth's magnetic field is approximately 50 µT in the UK. Other fields that alternate in their intensity more frequently over time are referred to as alternating or "AC" fields. EMFs are inevitable wherever electricity is produced, distributed, and used, including electrical substations, power lines and from household electrical equipment.

47 Electric fields are produced by voltage. Voltage is the pressure behind the flow of electricity. Electricity inside UK homes is at 230 volts (V), whereas electrical distribution systems in the UK utilise much higher voltages generally from 11,000 to 400,000 volts (11kV to 400kV). The higher the voltage the greater the electric field, which is measured in volts per metre (V/m). Electric fields are eliminated when electrical cables are buried due to the effect of the ground and protective sheath surrounding the cable.

48 Magnetic fields are produced by current, which is a measure of the flow of electricity. Generally, the higher the current (measured in amperes or amps) the greater the magnetic field. Magnetic fields are measured in microteslas (µT).

49 The Onshore ECC represents a corridor, typically 40 m to 60 m wide, within which the cable trenching, haul road and stockpiling areas associated with cable construction, will be located and runs from landfall southwards to the proposed OnSS to the west of St Asaph Business Park. From the proposed OnSS the Onshore ECC continues south eastwards and connects the proposed OnSS to the existing 400kV National Grid Bodelwyddan substation which is located to the south of St Asaph Business Park. A more detailed description of the Onshore ECC is provided in Volume 3, Chapter 1: Onshore Project Description (application ref: 6.3.1), and the Onshore ECC can be seen see in Volume 3, Chapter 1: Project Description, Figures 4 to 16.

12.7 Key parameters for assessment

50 A maximum design scenario based on the Rochdale envelope principle has been developed for the project EIA.

51 The Onshore ECC represents a corridor, typically 40 m to 60 m wide, within which cables will be installed (along with soil stockpiling and haul road). For the purpose of this the assessment of EMF impacts, it is assumed that the cable circuits could be located anywhere within the 40-60m wide Onshore ECC (see Volume 6, Chapter 3: Onshore Project Description (application ref 6.3.1) for further details of the proposed cable configuration and installation).

52 The maximum design scenarios identified in Table 7 have been selected as those having the potential to result in the greatest effect on the identified receptor or receptor group. These scenarios have been selected from the details provided in the onshore project description chapter (Volume 3, Chapter 1: Onshore Project Description). Effects of greater adverse significance are not predicted to arise should any other development scenario (based on the details within the project description) to that assessed here be taken forward in the final design scheme.

53 It is noted that only variations in those design parameters detailed under each specific impact in Table 7 have the potential to influence the significance of the effect described. Therefore, if a particular design parameter is not discussed, then any change to that parameter is not considered to have a material bearing on the outcome of the assessment.

54 For the purpose of the assessment, only the impact of magnetic fields caused by electricity transmission will be taken forward within the scope of this assessment. This is due to the elimination of electric fields when cables are buried (see Section 12.10 for further details).

Table 7: Maximum design scenario.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
CONSTRUCTION		
Impact on health due to air emissions	See Table 18 in Volume 3, Chapter 11: Air Quality.	The parameters represent the worst-case for impacts to health with respect to air quality.
Impacts on health due to water emissions	See Table 10 in Volume 3, Chapter 7: Hydrology and Flood Risk	The parameters represent the worst-case for impacts to health with respect to water emissions.
Impacts on health due to soil emissions	See Table 10 in Volume 3, Chapter 6: Ground Conditions and Land Use	The parameters represent the worst-case for impacts to health with respect to soil emissions.
Impacts on health due to noise emissions	See Table 48 in Volume 3, Chapter 10: Noise and Vibration	The parameters represent the worst-case for impacts to health with respect to noise and vibration.

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
Impacts on health due to construction traffic	See Table 26 in Volume 3, Chapter 9: Traffic and Transport	The parameters represent the worst-case for impacts to health with respect to construction traffic.
OPERATION		
Impact on health due to air emissions	See Table 18 in Volume 3, Chapter 11: Air Quality	The parameters represent the worst-case for impacts to health with respect to air quality.
Impacts on health due to water emissions	See Table 10 in Volume 3, Chapter 7: Hydrology and Flood Risk	The parameters represent the worst-case for impacts to health with respect to water emissions.
Impacts on health due to noise emissions	See Table 48 in Volume 3, Chapter 10: Noise and Vibration	The parameters represent the worst-case for impacts to health with respect to noise and vibration.
Impacts on health due to	Onshore cable length (per cable): 12 km	The maximum design scenario consists of the longest cable length combined with the highest

POTENTIAL EFFECT	MAXIMUM ADVERSE SCENARIO ASSESSED	JUSTIFICATION
electromagnetic radiation	Cable Depth: minimum Depth of Burial (DOB) from the original ground level to the top of the duct of 0.6m Cable location: cables can located anywhere within the 40 m to 60 m wide m wide Onshore ECC Maximum transmission voltage to OnSS: 400 kV Maximum transmission voltage between onshore OnSS and National Grid connection: 400 kV Maximum number of onshore export cable circuits: two Number of power cables per circuit: 3	voltages and number of cable circuits (i.e. 2 circuits each with 3 power cables so 6 power cables in total).
DECOMMISSIONING		
Impacts from decommissioning are expected to be similar to those listed above for construction, if project infrastructure is removed at the end of the development's operational life. If it is decided closer to the time of decommissioning that removal of certain parts of the development (e.g. cables) would have a greater environmental impact than leaving *in situ*, it may be preferable to leave those parts *in situ*. In this case, other than the removal of potential EMF, the impacts would be similar to those described for the operational phase.		
CUMULATIVE EFFECTS		
Cumulative effects are assessed in section 12.12		

12.8 Mitigation measures

55 Mitigation measures that were identified and adopted as part of the evolution of the project design (embedded into the project design) and that are relevant to Public Health are listed in Table 8. The mitigation includes embedded measures such as design changes and applied mitigation which is subject to further study or approval of details; these include avoidance measures that will be informed by pre-construction surveys, and necessary additional consents where relevant. The composite of embedded and applied mitigation measures apply to all parts of the AyM development works, including pre-construction, construction, O&M and decommissioning

Table 8: Mitigation measures relating to public health.

PARAMETER	MITIGATION MEASURES
GENERAL	
Routing of Onshore ECC and Siting of OnSS	The onshore elements have been routed to avoid residential properties falling within the Onshore ECC. The OnSS has been located away from residential properties.
Infrastructure design	In line with NPS EN-5 (DECC, 2011), the electrical infrastructure will be designed to comply with current guidelines on levels of public exposure and design of electrical infrastructure. The AyM Onshore ECC will not exceed guidance levels for EMF established by the ICNIRP. It is also important to note that the Applicant has made an active design decision to bury all electrical cable infrastructure.
CONSTRUCTION	
Code of Construction	The final CoCP will contain the measures which will be taken to manage the potential environmental impacts of the onshore construction of AyM and limit the disturbance from onshore construction activities such as

PARAMETER	MITIGATION MEASURES
Practice (CoCP)	site preparation, material delivery and removal, works activities and site reinstatement as far as is reasonably practicable. An outline CoCP is provided in Volume 8, Document 3.0: Outline Code of Construction Practice (application ref 8.3.1) and includes a number of outline management plans that set out the principles to be followed for the management of noise, potentially polluting substances, dust, traffic and construction waste.
OPERATION	
Project Environmental Management Plan (PEMP)	A Project Environment Management Plan (PEMP) is proposed to be produced to ensure that the potential for contaminant release into the offshore environment is strictly controlled. The PEMP will include a Marine Pollution Contingency Plan (MPCP) and will also incorporate plans to cover accidental spills, potential contaminant release and include key emergency contact details. It will also include key emergency contact details (e.g. NRW, Maritime Coastguard Agency and the project site co-ordinator). The PEMP will be secured as a condition in the Marine Licence.
Environment Management System (EMS)	Operational practices will incorporate measures to prevent pollution and increased flood risk, including emergency spill response procedures, clean up and control of any potentially contaminated surface water runoff. These measures will be included within an Environmental Management System (EMS).

12.9 Environmental assessment: construction phase

56 This section assesses the construction phase impacts, through reference to the MDS presented in Table 7 and relevant topic chapters. The level of significance (in EIA terms) that has been concluded within relevant topic chapters is provided, with a summary of the level of significance, magnitude and sensitivity from those chapters provided in Table 9.

Impact on health due to air emissions including dust

57 For detailed consideration of the potential construction impacts on health due to air emissions refer to Volume 3, Chapter 11: Air Quality which concludes that effects from traffic emissions, with the standard best practice and mitigation measures applied, will be ***Negligible*** significance and effects from dust during construction will be ***Negligible*** significance (neither effect is significant in EIA terms).

Impact on health due to water quality

58 For the detailed consideration of the potential construction impacts on health caused by water emissions refer to Volume 3, Chapter 7: Hydrology and Flood Risk which concludes that impacts from water emissions will be of ***Negligible to Minor adverse*** significance, which is not significant in EIA terms.

Impact on health due to soil contamination

59 For the detailed consideration of the potential construction impacts on health caused by soil contamination refer to Volume 3, Chapter 6: Ground Conditions and Land Use which concludes that impacts from soil contamination will be of ***Minor adverse*** significance, which is not significant in EIA terms.

Impacts on health due to noise emissions

60 For the detailed consideration of the potential construction impacts on health caused by noise emissions refer to Volume 3, Chapter 10: Noise and Vibration which concludes that impacts from noise emissions, with the standard best practice mitigation measures applied; will be of ***Minor to Major adverse*** significance, which is significant in EIA terms.

61 As noted in Chapter 10, the identified temporary Moderate or Major Adverse noise impacts would relate to:

- Construction activities at Landfall during weekday daytime and on Saturday afternoons;
- Trenchless crossing activities at landfall during the evening and night-time;
- Construction activities along the onshore ECC during weekday daytime and on Saturday afternoons;

- Trenchless crossing activities along the onshore ECC during the evening and night-time;
- Construction of access roads during weekday daytime and on Saturday afternoons; and
- Construction traffic accessing the construction working area and haul road during weekday daytime, on Saturday afternoons and at night-time in a limited number of places.

62 The noise assessment in Chapter 10 considers a range of additional construction mitigation measures that would be informed by detailed design post consent and included within a final Noise and Vibration Management Plan (NVMP) which would be submitted for approval by DCC as part of the final CoCP that is secured within the DCO. These measures relate to the specifics of the detailed design, and so cannot be accurately included in the assessment at this stage. However, examples of what these mitigation measures may be, and an indication of how much mitigation they may afford is provided in Chapter 10.

63 The measures are anticipated to reduce magnitude, and therefore significance of effect to ***Minor adverse*** and 'not significant' in EIA terms.

64 The assessment in Chapter 10 also identifies potential for piling activities associated with construction of the offshore wind turbines during the night-time during neutral weather conditions to give rise to a temporary moderate adverse impact. The assessment suggests appropriate mitigation as well as a DCO Requirement that specifies construction noise limits at receptor locations.

65 The measures are anticipated to reduce magnitude, and therefore significance of effect to ***Minor adverse*** and 'not significant' in EIA terms

Impacts on health due to vibration

66 For the detailed consideration of the potential construction impacts on health caused by vibration refer to Volume 3, Chapter 10: Noise and Vibration which concludes that impacts from vibration emissions, with the standard best practice mitigation measures applied; will be of ***Minor*** to ***Major adverse*** significance, which is significant in EIA terms.

67 As noted in Chapter 10, the identified temporary Moderate or Major Adverse vibration impacts would relate to:

- Trenchless crossing activities (including vibratory piling) at major road crossing locations during the daytime
- Trenchless crossing activities at Landfall and major road crossing locations during the night time

68 Trenchless crossing activities along the onshore ECC during evening and night-time;

69 However, it is considered that as the drilling would be temporary in nature and based on worst case vibration levels that could be tolerated if prior warning has been given. These measures are anticipated to reduce magnitude, and therefore significance of effect to ***Minor adverse*** and 'not significant' in EIA terms.

Impacts on health due to disruption to local road network

70 For the detailed consideration of the potential construction impacts on health caused by disruption to local road network refer to Volume 3, Chapter 9: Traffic and Transport which concludes that impacts from disruption to local road network will be of ***Negligible*** to ***Minor adverse*** significance, which is not significant in EIA terms.

Impacts on health due to electromagnetic radiation

71 Electromagnetic radiation is emitted from cables which are operational. Therefore, no assessment can be conducted on the impacts of construction on public health with regards to electromagnetic radiation.

12.10 Environmental assessment: operational phase

72 This section assesses the operational phase impacts, through reference to the MDS presented in Table 7 and relevant topic chapters. The level of significance (in EIA terms) that has been concluded within relevant topic chapters is provided, with a summary of the level of significance, magnitude and sensitivity from those chapters provided in Table 9.

Impact on health due to air emissions

73 For detailed consideration of the potential operation impacts on health due to air emissions refer to Volume 3, Chapter 11: Air Quality which concludes that effects from traffic emissions, will be ***Negligible*** significance (which is not significant in EIA terms.

Impacts on health due to water quality

74 For the detailed consideration of the potential operational impacts on health caused by water emissions refer to Volume 3, Chapter 7: Hydrology and Flood Risk which concludes that impacts from water emissions will be of ***Negligible to Minor adverse*** significance, which is not significant in EIA terms.

Impacts on health due to noise emissions

75 For the detailed consideration of the potential operational impacts on health caused by noise emissions refer to Volume 3, Chapter 10: Noise and Vibration which concludes that impacts from noise emissions, with the standard best practice mitigation measures applied; will be of ***Moderate adverse*** significance, which is significant in EIA terms.

76 Chapter 10 identifies the mitigation levels that would be required for the OnSS to reduce the specific noise level at the nearest noise sensitive receptor to a level where the identified impacts would be significantly reduced. Such mitigation that relates to the operational noise from the OnSS is controlled via a DCO Requirement that specifies noise levels at surrounding properties.

77 The measures are anticipated to reduce magnitude, and therefore significance of effect to ***Minor adverse*** and 'not significant' in EIA terms.

Impacts on health due to electromagnetic radiation

78 Electromagnetic radiation will result from the operation of up to two onshore export cable circuits extending over a maximum distance of 12 km and one OnSS located to the west of St Asaph Business Park with access by authorised personnel only. The transport of electricity through the cables has the potential to emit a localised electromagnetic radiation which could potentially affect public health depending on vulnerability, levels of EMF and exposure time.

79 Studies on human health impacts caused by exposure to electromagnetic radiation suggest there may be an increased risk of Alzheimer's disease and childhood leukaemia due to higher than usual magnetic field exposures in homes, some of which are near to large above ground powerlines. However, the balance of evidence is towards no effects and there is no known mechanism or clear experimental evidence to explain how these effects might happen (Public Health England, 2013[iii]).

80 As a consequence of their design, some types of equipment do not produce an external electric field. Electric fields are eliminated when electrical cables are buried due to the effect of the ground and protective sheath surrounding the cable. This applies to underground cables and gas insulated switchgear (GIS), which are enclosed in a metal sheath (a protective metal layer within the cable) and have solid metal enclosures respectively.

81 For the purpose of the assessment, only the impact of magnetic fields caused by electricity transmission from the onshore ECC will be taken forward. This is due to the elimination of electric fields when cables are buried.

82 The strength of the magnetic field decreases rapidly horizontally and vertically with distance from source. Objects such as trees, buildings and earth will reduce the strength further still.

83 National Grid provides the following information with regards the magnetic fields for buried underground cables and substations via the National Grid guide to the debate on electric and magnetic fields and health website[iv].

84 The website provides maximum and typical magnetic field value for 400kV underground cables at a point 1m above ground levels for three main types of underground cable:

- Trough: the separate cores of the cable are in a concrete trough, typically only 0.3 m or less below ground, but also only 0.15 m apart
- Direct buried: the separate cores of the cable are laid directly in the ground, typically 1 m below ground and 0.3-0.5 m apart

[iii] Public Health Wales has adopted guidance on EMF from Public Health England
[iv] h[redacted]

- Tunnel: the cable is carried within ducts in a tunnel typically 20 m below ground

85 The AyM Onshore ECC will utilise a combination of direct buried cable and tunnel (HDD or other trenchless crossing technique) cable.

86 The maximum magnetic field that is typically produced by a single circuit direct buried underground 400kV HVAC cable is estimated at 96.17 µT directly over the cable, dropping to 13.05 µT at 5m from the cable centreline, and further to 3.58 µT at 10m from the cable centreline. These maximum magnetic field values are all below the 'reference levels' and significantly below the 'basic restriction' of the ICNIRP guidance exposure levels.

87 The typical magnetic field values for a 400kV direct buried underground cable are considerably lower at 24.06 µT directly over the cable, dropping to 3.26 µT at 5m from the cable centreline, and further to 0.9 µT at 10m from the cable centreline. The typical magnetic field values are significantly below both the 'reference levels' and the 'basic restriction' of the ICNIRP guidance exposure levels.

88 The nearest residential receptor will be at least 29m from the edge of the Onshore ECC. As the anticipated magnetic field levels are lower than 9 kV/m and 360 µT, the fields corresponding to the ICNIRP basic restriction, the AyM Onshore ECC is compliant with the ICNIRP guidelines and hence with Public Health England recommendations and UK Government policy which have been adopted by Public Health Wales.

89 Alternative data sources (ICF, 2003) also indicate that magnetic field strength from a typical 400 kV cable buried at 1 m below ground would be over 30 µT at ground level directly over the cable, falling to 10 µT at 2 m above the ground (lower for lower voltages).

90 With regard to caravan users at the Robin Hood Holiday Park, the cables will be installed via HDD (or other trenchless installation technique) at an anticipated depth of 10-20m below ground level. As such, the cables cannot be approached closely by members of the public, and the magnetic field at the surface is much reduced, lower than an equivalent overhead line and often lower than background fields from other sources.

91 Fields from substations are usually measured rather than calculated. Calculations are not usually feasible because of the complex geometry of the current paths within a substation. At the perimeter fence of a large, high-voltage substation, the highest fields are invariably produced by overhead lines or underground cables entering the substation. Away from these lines and cables, the field would normally be below 1μT. The nearest residential receptor to the OnSS Footprint is 350m to the south west.

92 The Onshore ECC crosses the underground cable connection for the Gwynt y Môr offshore wind farm approximately 750m north of the A55. The nearest residential property to the intersection of the proposed and existing underground cable connections is approximately 500m away. At this distance, there will be no combined impact arising from magnetic fields from AyM and the Gwynt y Môr connections.

93 In conclusion, all infrastructure built will comply with the government guidelines on electromagnetic radiation emission (ICNIRP, 1998; DECC, 2012a; DECC, 2012b; ENA, 2017). The mitigation in place as well as no conclusive scientific evidence relating EMF and certain health effects leads to the magnitude of impact to be deemed as **Negligible**.

94 The area within the onshore ECC within which the proposed cables will pass through is primarily agricultural and contains no residential properties with the Onshore ECC. Therefore, the sensitivity of the receptor to electromagnetic radiation is considered to be **Low**.

95 With a magnitude of impact assessed as **Negligible** and the sensitivity of the receptor to electromagnetic radiation being assessed as **Low**, the effect is therefore assessed as ***Negligible adverse*** significance, which is not significant in EIA terms.

12.11 Environmental assessment: decommissioning phase

96 Other than EMF, impacts from decommissioning are expected to be similar to those listed for construction, if the project infrastructure is removed at the end of the development's operational life. The nature and scale of impacts arising from decommissioning are expected to be of similar, or reduced magnitude, to those generated during construction, however, certain activities such as HDD (or other trenchless crossing technique) would not be required.

97 It may be deemed, closer to the time of decommissioning, that removal of certain parts of the development (e.g. cables) would have a greater environmental impact then leaving *in situ*. In this case, the impacts would be similar to those described for the operational phase.

12.12 Environmental assessment: cumulative effects

98 The health impacts assessed in standalone chapters, such as noise emissions and air emissions, will outline the projects scoped in for cumulative assessment. The relevant chapters will also proceed to assess any cumulative impacts on those potential health impacts.

99 The Cumulative effects assessment methodology and long list are described in Volume 1, Annex 3.1: Cumulative Effects Assessment. The long list of projects has been reviewed based on a 200 m search area from the onshore ECC, which is considered a suitable distance to screen for other projects that might have cumulative effects given the localised nature of electromagnetic effects. Consideration of the underground cable connection for the Gwynt y Môr offshore wind farm is given in Section 12.10. No other sources of electromagnetic fields were identified within this search area.

12.13 Inter-relationships

100 Inter-relationships have been assessed within the relevant chapters. It is the nature of the AyM ES that impacts on health are considered in all relevant chapters. The effects associated with changes in traffic and transport feed through to the air quality chapter and noise chapters. Consideration of interrelated effects on public health is therefore already considered within ES chapters. It is therefore not expected that there will be any significant inter- related effects associated with health impacts that are not already discussed in the context of the individual chapters. A summary of the inter-relationships assessments undertaken to date is contained within Volume 2, Chapter 15: Inter-relationships (application ref: 6.2.15).

12.14 Transboundary effects

101 No transboundary effects of relevance to public health are predicted to result from the construction, O&M and decommissioning of AyM.

12.15 Summary of effects

102 This chapter has investigated the potential effects on public health receptors arising from AyM. The range of potential impacts and associated effects considered has been informed by Scoping responses and responses from Statutory Consultation as well as reference to existing policy and guidance. The impact considered exposure to electromagnetic radiation. The outcome of the assessment deems this impact to be of ***Negligible adverse*** significance, which is not significance in EIA terms.

Table 9: Summary of effects.

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
CONSTRUCTION				
For impacts on health due to traffic emissions see Table 25 in Volume 3, Chapter 11: Air quality	**Negligible** (below relevant screening criteria)	**High**	Not required	***Negligible*** (not significant)
For impacts on health due to dust emissions see Table 25 in Volume 3, Chapter 11: Air quality	**Low to Medium**	**Low to High**	Implementation of best-practice mitigation as specified in industry guidance via a CoCP	***Negligible*** (not significant)
For impacts on health due to water emissions see Table 13 in Volume 3, Chapter 7, Hydrology,	**Negligible** to **Low**	**Low** to **Medium**	Pollution Prevention and Emergency Incident Response Plan (PPEIRP) provided as part of the outline	***Minor adverse*** (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
hydrogeology and flooding			Code of Construction Practice (OCoCP)	
For potential impacts on health caused by soil contamination see Table 13 in Volume 3, Chapter 6: Ground Conditions and Land Use	**Negligible**	**High**	PPEIRP provided as part of the OCoCP	***Minor adverse*** (Not Significant)
For potential impacts on health caused by Noise see Table 80 in Volume 3, Chapter 9: Airborne noise and vibration	**Negligible to High**	**Medium to High**	NVMP provided as part of the OCoCP	***Minor adverse*** (not Significant)
For potential impacts on health caused by Vibration see Table 80 in Volume 3, Chapter	**Negligible to High**	**Medium to High**	Prior warning to sensitive residential receptors.	***Minor adverse*** (not Significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
9: Airborne noise and vibration				
For potential impacts due to disruption to local road network see Table 38 in Volume 3, Chapter 9: Traffic and Transport	**Negligible to low/medium**	**Negligible to high**	Measures within OCTMP	***Negligible adverse to Minor adverse*** *(n*ot significant)
OPERATION				
For impacts on health due to traffic emissions see Table 25 in Volume 3, Chapter 11: Air quality	**Negligible** (below relevant screening criteria)	**High**	Not required	***Negligible*** (not significant)
For impacts on health due to water emissions see Table 13 in Volume 3,	**Negligible**	**Low to Medium**	None required	***Negligible to Minor adverse*** (not significant)

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Chapter 7, Hydrology, hydrogeology and flooding				
For potential impacts on health caused by Noise see Table 80 in Volume 3, Chapter 9: Airborne noise and vibration	**High**	**High**	Reduction in operational noise levels through the use of acoustic enclosures, silencers and covers.	***Minor Adverse*** (not significant)
Impacts on health due to electromagnetic radiation exposure	**Negligible**	**Low**	None Required	***Negligible*** (not significant)
DECOMMISSIONING				
For impacts on health due to dust and traffic emissions see Table 25 in Volume 3,	Comparable to construction, perhaps lesser if underground cables remain in situ.			

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Chapter 11: Air quality.				
For impacts on health due to water emissions see Table 13 in Volume 3, Chapter 7, Hydrology, hydrogeology and flooding	**Negligible**	**Low to Medium**	None required	***Negligible to Minor adverse*** (Not significant)
For potential impacts on health caused by Noise Table 80 in Volume 3, Chapter 9: Airborne noise and vibration	Not anticipated to exceed construction phase worst-case criteria. Potential impacts reduced as it is assumed that no night-time or piling decommissioning operations are required.			
For potential impacts due to disruption to local road network see Table 38 in	Comparable to construction, perhaps lesser if underground cables remain in situ.			

IMPACT	MAGNITUDE	SENSITIVITY OF RECEPTOR	MITIGATION MEASURES	RESIDUAL EFFECT
Volume 3, Chapter 9: Traffic and Transport				
For impacts on health due to electromagnetic radiation exposure	Upon decommissioning the negligible adverse affect during operation would become neutral			

12.16 References

Department of Energy and Climate Change (DECC) (2011), 'National Policy Statement (NPS) for Electricity Network Infrastructure (EN-5)'.

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