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Morlais Project
Environmental Statement

Chapter 25: Socio-Economics, Tourism and Recreation

Volume III

Applicant: Menter Môn Morlais Limited

Document Reference: PB5034-ES-025

Chapter 25: Socio-Economics, Tourism and Recreation

Author: Aquatera

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Morlais Project
Environmental Statement

Appendix 25.1: Assessment Matrices

Volume III

Applicant: Menter Môn Morlais Limited
Document Reference: PB5034-ES-0251
Appendix 25.1: Socio-Economics, Tourism and Recreation
Author: Aquatera

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TABLE OF CONTENTS

TABLE OF TABLES

1. ASSESSMENT MATRICES

Table 1-1 Sensitivity table

Impact topic	Mechanism	Range (L=local, R= regional, N=national)	Sensitivity	Type of change	Reason for sensitivity
Social issues					
Social benefits	Decentralisation of economic growth	L,R	Low/Medium	Beneficial	Anglesey diverse economy already – low North Wales more challenged - Med
Impacts from worker influx	Population change	L	Low	Beneficial	Anglesey - No particular de-population issues
Housing availability	House purchase prices	L	Low		Normal housing market, depressed due to BREXIT
Rental housing market	Availability, Cost & Quality	L	Low		Anglesey and region have a high level of rental accommodation
Wellbeing of future generations	Green branding for locality	L,R,N	Medium	Beneficial	Strengthens progressive branding at all levels
Welsh language impacts	Cultural dilution from influx of workers	L	Low	Adverse	Language in a strong position, good political support, widespread opportunities for learning language
	Opportunity for language development	R	Negligible	Beneficial	widespread opportunities for learning language
Economic issues					
Economic impacts	Direct & secondary income	L,R,N	Medium	Beneficial	New economic pressures in sensitive economic setting
	Accumulation of grant support	L,R,N	Medium	Beneficial	Uncertainty over grant support mechanisms
	Local investment opportunities	L,R,N	Low	Beneficial	Add alternative route for local investment
	Sustainability of growth	L	Medium	Adverse	New economic pressures in sensitive economic setting
Level of commerce activity	Green cluster creation	L	Medium	Beneficial	Limited technology focus in local area
	Diversification of economy	L, R	Low	Beneficial	Already diverse economy
Employment issues					
Jobs opportunities	Numbers	L,R, N	Medium	Beneficial	Increased employment levels
	Types, quality, skills areas	L, R	High	Beneficial	Strong demand for local maritime skills, wider technology/engineering needs
	Wage levels	L	Low	Beneficial	Economy based upon normal wage levels
Worker availability	Movement from key existing roles	L	Low	Adverse	Anglesey forms a micro-economy to some extent
Skills availability	Reduced performance in project	L	Medium	Adverse	Tidal energy production can be difficult to achieve successfully at present and needs the right skills and experience
Training and education issues					
Training opportunities	New skills and competence needs	L,R, N	Medium	Beneficial	Number of new skills areas required
	Novel technologies	L,R	Low	Beneficial	Application of existing technologies in new settings
Provision of education and visitor facilities	Primary syllabus Secondary syllabus, job pathways	L	Low	Beneficial	A case study for educational purposes
	Tertiary BSc, Eng, PhD	L,R, N	Medium	Beneficial	Likely broadening of teaching topics to include more tidal energy
	Visitor outreach and public info. media	L	Low	Beneficial	Many existing visitor interests, limited visibility but interesting activities
Inter-sector interaction issues					
Effects on shipping	Obstruction to navigate around	L	High	Adverse	Cross ref

Impact topic	Mechanism	Range (L=local, R= regional, N=national)	Sensitivity	Type of change	Reason for sensitivity
Effects on port activities	Congestion on/at quayside	L	Low	Adverse	Limited but available existing areas of quay
	Obstacles from towage	L	Low	Adverse	Frequent fast vessel movements
	Debris creation	L	High	Adverse	Sensitive to debris creation in busy restricted channels
Effects on tourism	Changes to tourist behaviour	L	Negligible	Beneficial	Increased use of existing viewpoints
	Sense of coastal industrialisation	L	Low	Adverse	Many existing coastal activities
Tourist accommodation	Availability, cost, quality	L	Low	Adverse	Extensive accommodation capacity available
Public rights of way	Setting of walks, obstruction of walks	L	Low	Adverse	Short term closures acceptable
	Improvement of walks – interpretation		Negligible	Beneficial	Limited capacity
Beach closures	Disruption of recreation and tourism (walking, surfing). Beach works scarring	L	Low	Adverse	Short term closures acceptable
	Beach litter	L	Low	Adverse	Key issue at present
Recreational angling	No access to fishing marks	L	Negligible	Adverse	Limited marks in tidal stream areas
	Ease of navigation	L	Low	Adverse	Most journeys close to coast or out of tidal areas
	Water safety issues	L	High	Adverse	Exposed and harsh sea area with few alternatives available for small boats
Target angling species	Reef and refuge areas	L	Low	Beneficial	Many other reef areas but few refuge area
Fisheries and shellfisheries	Obstruction of fisheries activities	L	Medium	Adverse	Limited fisheries in tidal stream areas, but transit routes lengthened
	Reef and refuge areas	L	Low	Beneficial	Many other reef areas but few refuge area
Geology UNESCO status	New facts to enhance Geo Park status	L	Low	Beneficial	Most focus on onshore/coastal geology
Capacity building issues					
Additional local services	New technical skills, workboats, cranes, better sea knowledge	L	Medium	Beneficial	New local vessels and associated quayside handling capacity
New infrastructure outside project budget	New piers, storage and laydown areas	L	Medium	Beneficial	Although strong existing infrastructure all used quite heavily already
	New grid connections	L,R	Low	Beneficial	Strong connections already
	New offices and housing	L	Negligible	Beneficial	Existing capacity
Local transport services	Encouragement of EV options	L	Low	Beneficial	Possible extension of charging network
	New boat hire options	L	Medium	Beneficial	New local vessels
Energy security	More green electricity, local supply, diversity of supply	L,R, N	Medium	Beneficial	Significant extra capacity at full scale (240 MW)
Decarbonisation	Clean energy, balancing services, spin-off capacity	L,R,N	Medium	Beneficial	Significant extra capacity at full scale (240 MW)
	Life cycle emissions	L	Low	Adverse	Vessel emissions
	Life cycle wastes				
Cumulative effects	On other tidal, maritime, energy, local projects	L,R	Medium	Beneficial	Role of the Project in relation to other activities
	In combination with other projects	L,R	Neg/Low	Adverse	Role of the Project in relation to other activities

Table 1-2 Impact assessment table

Impact topic	Mechanism	Range	Sensitivity	P/N	Construction	Operation	Repowering	Decommissioning
Social issues								
Social benefits	Decentralisation of economic growth	L,R	Low/Medium	Beneficial	Medium Scale of opportunity around Anglesey and N Wales	Low	Low	Low
					Minor/moderate	Minor	Minor	Minor
Impacts from worker influx	Population change	L	Low	Beneficial	Low 100s of new residents	Negligible 10s of new residents	Negligible 10s of new residents	N/A
					Minor	Negligible	Negligible	-
Housing availability	House purchase prices	L	Low	P/N	Low dispersed through communities	Negligible	Negligible	N/A
					Minor	Negligible	Negligible	-
Rental housing market	Availability, Cost & Quality	L	Low	P/N	Low dispersed through communities	Negligible	Negligible	N/A
					Minor	Negligible	Negligible	-
Wellbeing of future generations	Green branding for locality	L,R,N	Medium	Beneficial	Low Start-up publicity	Medium key brand visibility phase	Low	N/A
					Minor	Moderate	Minor	-
Welsh language impacts	Cultural dilution from influx of workers	L	Low	Adverse	Low 100s of new residents	Negligible 10s of new residents	Negligible 10s of new residents	N/A
					Minor	Negligible	Negligible	-
	Opportunity for language development	R	Negligible	Beneficial	Negligible	Low key period for exploiting new tech lexography	Negligible	N/A
					Negligible	Negligible	Negligible	-
Economic issues								
Economic impacts	Direct & secondary income	L,R,N	Medium	Beneficial	Medium major spend in construction	Low	Low	Medium major spend in decommissioning
					Moderate	Minor	Minor	Moderate
	Accumulation of grant support	L,R,N	Medium	Beneficial	Medium major spend in construction	Low	Low	N/A
					Moderate	Minor	Minor	-
	Local investment opportunities	L,R,N	Low	Beneficial	Low significant but small contribution possible	Negligible	Medium better prospects once technology proven	N/A
					Minor	Negligible	Minor	-
	Sustainability of growth	L	Medium	Adverse	Low short term but variable stimulus	Low longer term but lower level stimulus	Low longer term but lower level stimulus	Low short term but variable stimulus
					Minor	Minor	Minor	Minor
Level of commerce activity	Green cluster creation	L	Medium	Beneficial	Medium key spin-out opportunity if additional customers can be found	Medium continues to build reputation and continuity	Medium continues to build reputation and continuity	Low Adds new skills to cluster experience, but need to reduce reliance on development to support cluster
					Moderate	Moderate	Moderate	Minor
	Diversification of economy	L, R	Low	Beneficial	Low – new skills and activities added	Negligible – diversity maintained	Negligible – diversity maintained	Negligible – diversity maintained
					Minor	Negligible	Negligible	Negligible
Employment issues								
	Numbers	L,R, N	Medium	Beneficial	Medium	Low	Low	Low

Impact topic	Mechanism	Range	Sensitivity	P/N	Construction	Operation	Repowering	Decommissioning
Jobs opportunities					Moderate	Minor	Minor	Minor
	Types, quality, skills areas	L, R	High	Beneficial	Medium – new roles created in local economy	Medium – roles maintained in local economy	Medium – roles maintained in local economy	Low –roles reduced in local economy
					Major	Major	Major	Moderate
	Wage levels	L	Low	Beneficial	Negligible (check) – normal wage levels compared to other sectors	Negligible	Negligible	Negligible
					Negligible	Negligible	Negligible	Negligible
Worker availability	Movement from key existing roles	L	Low	Adverse	Low limited migration to new sector from existing roles	Negligible	Negligible	Negligible
					Minor	Negligible	Negligible	Negligible
Skills availability	Reduced performance in project	L	Medium	Adverse	Low Need to establish relevant experience base very quickly	Low Need to maintain skills base	Low Sector now well established	Negligible Sector now well established
					Minor	Minor	Minor	Negligible
Training and education issues								
Training opportunities	New skills and competence needs	L,R, N	Medium	Beneficial	Medium Need to bring new work force up to speed	Low Lower level of recruitment	Low	Negligible
					Moderate	Minor	Minor	Negligible
	Novel technologies	L,R	Low	Beneficial	Low Need to get familiar with specific technology traits	Low Ongoing for new technologies	Negligible Sector established	N/A
					Minor	Minor	Negligible	-
Provision of education and visitor facilities	Primary syllabus Secondary syllabus, job pathways	L	Low	Beneficial	Negligible Technology promo material available	Low Possible school visits to control centre/site	Negligible Sector established	N/A
					Negligible	Minor	Negligible	-
	Tertiary BSc, Eng, PhD	L,R, N	Medium	Beneficial	Low Case study opportunities	Medium Case study, research and internship opportunities	Low Case study, research and internship opportunities	Low Case study opportunities
					Minor	Moderate	Minor	Minor
	Visitor outreach and public info. media	L	Low	Beneficial	Low Press coverage	Medium Ongoing publicity and engagement	Low Ongoing publicity and engagement	N/A
					Minor	Minor	Minor	-
Inter-sector interaction issues								
Effects on shipping	Obstruction to navigate around	L	High	Adverse	Medium New navigation instructions will be issued	Low Established exclusion zones will be maintained	Low Established exclusion zones will be maintained	Negligible
					Major	Moderate	Moderate	Negligible
Effects on port activities	Congestion on/at quayside	L	Low	Adverse	Medium Many devices and associated infrastructure needing to be mobilised	Low Regular but less activity on/at quayside	Low Regular but less activity on/at quayside	Medium Many devices and associated infrastructure needing to be demobilised
					Minor	Minor	Minor	Minor
	Obstacles from towage	L	Low	Adverse	Low Numerous towing vessel movements to and from site	Negligible Some towing vessel movements to and from site	Negligible Some towing vessel movements to and from site	Low Numerous towing vessel movements to and from site

Impact topic	Mechanism	Range	Sensitivity	P/N	Construction	Operation	Repowering	Decommissioning
					Minor	Negligible	Negligible	Minor
	Debris creation	L	High	Adverse	Negligible Accidental event only	Negligible Accidental event only	Negligible Accidental event only	Negligible Accidental event only
					Minor	Minor	Minor	Minor
Effects on tourism	Changes to tourist behaviour	L	Negligible	Beneficial	Low Tourists attracted to view construction operations	Low Tourists attracted to view operating site	Negligible Established activity, less interest	N/A
					Negligible	Negligible	Negligible	-
	Sense of coastal industrialisation	L	Low	Adverse	Medium Little observable change	Low Surface devices only visible	Low Surface devices only visible	Low
					Minor	Minor	Minor	Minor
Tourist accommodation	Availability, cost, quality	L	Low	Adverse	Low Some use of available accommodation	Negligible Low use of accommodation	Negligible Low use of accommodation	Negligible Low use of accommodation
					Minor	Negligible	Negligible	Negligible
Public rights of way	Setting of walks, obstruction of walks	L	Low	Adverse	Medium Construction of cables and substations	Negligible No ongoing works	Negligible	Negligible
					Minor	Negligible	Negligible	Negligible
	Improvement of walks – interpretation		Negligible	Beneficial	Negligible	Low Interpretation from applicable viewpoints	Low	N/A
					Negligible	Negligible	Negligible	-
Beach closures	Disruption of recreation and tourism (walking, surfing). Beach works scarring	L	Low	Adverse	Medium Installation of cable landings	Negligible No on-going works	Negligible No on-going works	Medium Removal of cable landings
					Minor	Negligible	Negligible	Minor
	Beach litter	L	Low	Adverse	Low Some items may be lost overboard during installation	Negligible No on-going works	Negligible No on-going works	Low Some items may be lost overboard during decommissioning
					Minor	Negligible	Negligible	Minor
Recreational angling	No access to fishing marks	L	Negligible	Adverse	Medium Significant area unavailable	Medium Significant area unavailable	Medium Significant area unavailable	Low Area available once again
					Negligible	Negligible	Negligible	Negligible
Recreational boating and angling	Ease of navigation	L	Low	Adverse	Low Coastal routes and transit routes still needed	Low Coastal routes and transit routes still needed	Low Coastal routes and transit routes still needed	Low Coastal routes and transit routes still needed
					Minor	Minor	Minor	Minor
Recreational boating and angling	Water safety issues	L	High	Adverse	Low Presence of new structures and additional construction craft	Low Presence of new structures and additional construction craft	Low Presence of new structures and additional construction craft	Low Presence of additional removal craft
					Moderate	Moderate	Moderate	Moderate
Target angling species	Reef and refuge areas	L	Low	Beneficial	Low Reduced fishing and angling pressure	Low Reduced fishing and angling pressure	Low Reduced fishing and angling pressure	Low Reduced fishing and angling pressure
					Minor	Minor	Minor	Minor
Fisheries and shellfisheries	Obstruction of fisheries activities	L	Medium	Adverse	Medium Significant area unavailable	Medium Significant area unavailable	Medium Significant area unavailable	Low Area available once again
					Moderate	Moderate	Moderate	Minor
	Reef and refuge areas	L	Low	Beneficial	Low	Low	Low	Low

Impact topic	Mechanism	Range	Sensitivity	P/N	Construction	Operation	Repowering	Decommissioning
					Reduced fishing and angling pressure	Reduced fishing and angling pressure	Reduced fishing and angling pressure	Reduced fishing and angling pressure
					Minor	Minor	Minor	Minor
Geology UNESCO status	New facts to enhance Geo Park status	L	Low	Beneficial	Low Greater understanding of shallow seas geology	N/A	N/A	N/A
					Minor	-	-	-
Capacity building issues								
Additional local services	New technical skills, workboats, cranes, better sea knowledge	L	Medium	Beneficial	Medium New vessels and plant procured by supply chain	Low On-going up-skilling, capacity building by supply chain	Low On-going up-skilling, capacity building by supply chain	N/A
					Moderate	Minor	Minor	-
	New grid connections	L,R	Low	Beneficial	N/A	Medium Site may be major connection	Medium Site may be major connection	N/A
					-	Minor	Minor	-
	New offices and housing	L	Negligible	Beneficial	Low Most needs already catered for	Low Most needs already catered for	Low Most needs already catered for	N/A
					Negligible	Negligible	Negligible	-
Local transport services	Encouragement of EV options	L	Low	Beneficial	N/A	Low Opportunity for tidal energy EV charging points	Low Opportunity for tidal energy EV charging points	N/A
					-	Minor	Minor	-
	Availability of new boats	L	Medium	Beneficial	Low Additional boat hire options	Low Additional boat hire options	Low Additional boat hire options	Low Additional boat hire options
					Minor	Minor	Minor	Minor
Energy security	More green electricity, local supply, diversity of supply	L,R, N	Medium	Beneficial	N/A	Medium Local supply	Medium Local supply	N/A
					-	Moderate	Moderate	-
Decarbonisation	Clean energy, balancing services, spin-off capacity	L,R,N	Medium	Beneficial	N/A	Medium Direct and indirect support for decarbonisation	Medium Direct and indirect support for decarbonisation	N/A
					-	Moderate	Moderate	-
	Life cycle emissions	L	Low	Adverse	Low Vessel and road haulage emissions significant	Negligible Vessel emissions smaller, possible low carbon vessels	Negligible Likely low carbon vessels	Negligible Likely low carbon vessels
					Minor	Negligible	Negligible	Negligible
	Life cycle wastes	L	Low	Adverse	Low Scrap metal, plastics and excess soils	Negligible Scrap metal, plastics	Negligible Scrap metal, plastics	Negligible Scrap metal, plastics
					Minor	Negligible	Negligible	Negligible
Cumulative effects	Effects upon other tidal, maritime, energy, local projects	L,R	Medium	Beneficial	Medium Particularly regards economics, employment, skills, training and supply chain issues	Medium Particularly regards economics, employment, skills, training and supply chain issues	Medium Particularly regards economics, employment, skills, training and supply chain issues	Medium Particularly regards economics, employment, skills, training and supply chain issues
					Moderate	Moderate	Moderate	Moderate
	Effects along with other projects	L,R	Medium	Adverse	Medium Particularly regards navigation, fisheries	Medium Particularly regards navigation, fisheries	Medium Particularly regards navigation, fisheries	Medium Particularly regards navigation, fisheries

Impact topic	Mechanism	Range	Sensitivity	P/N	Construction	Operation	Repowering	Decommissioning
					Moderate	Moderate	Moderate	Moderate

Table 1-3 Assessment of cumulative impact

Impact topic	Mechanism	Range	P/N	Assessed in/out (N/O)	Cumulative effects	Magnitude (H,M,L,N)	Cumulative effects
	Social issues						
Social benefits	Decentralisation of economic growth	L,R		O	N		
Impacts from worker influx	Population change	L	N	O	Y	L	Housing impacts
Housing availability	House purchase prices	L	N	O	N		
Rental housing market	Availability, Cost & Quality	L	N	O	Y	L	Combined project competing for rental market
Wellbeing of future generations	Green branding for locality	L,R,N	P	N	N		
Welsh language impacts	Cultural dilution from influx of workers	L	N	O	N		
	Opportunity for language development	R	P	O	N		
	Economic issues						
Economic impacts	Direct & secondary income	L,R,N	P	N	Y	L	Competition for staff
	Accumulation of grant support	L,R,N	P	N	Y	N	Competition for grants
	Local investment opportunities	L,R,N	P	O	Y	L	Competition for investments
	Sustainability of growth	L	P	O	N		
Level of commerce activity	Green cluster creation	L	P	N	Y		Supports clustering activity
	Diversification of economy	L, R	P	N	Y		Supports diversification
	Employment issues						
Jobs opportunities	Numbers	L,R, N	P	N	Y	M	Competition for staff
	Types, quality, skills areas	L, R	P	N	Y	M	Competition for staff
	Wage levels	L	P	N	Y	L	Competition for staff
Worker availability	Movement from key existing roles	L	N	O	Y	L	Competition for staff
Skills availability	Reduced performance in project	L	N	N	N		
	Training and education issues						
Training opportunities	New skills and competence needs	L,R, N	P	N	Y	M	Combined training opportunities
	Novel technologies	L,R	P	N	Y	L	Combined training opportunities
Provision of education and visitor facilities	Primary syllabus Secondary syllabus, job pathways	L	P	O	N		
	Tertiary BSc, Eng, PhD	L,R, N	P	N	Y	M	Supports courses and students
	Visitor outreach and public info. media	L	P	O	Y	L	Combined opportunities with others
	Inter-sector interaction issues						
Effects on shipping	Obstruction to navigate around	L	N	N	N		
Effects on port activities	Congestion on/at quayside	L	N	O	Y	L	Increases congestion
	Obstacles from towage	L	N	O	N		
	Debris creation	L	N	O	N		
Effects on tourism	Changes to tourist behaviour	L	N	O	N		
	Sense of coastal industrialisation	L	N	O	Y	N	May enhance this

Impact topic	Mechanism	Range	P/N	Assessed in/out (N/O)	Cumulative effects	Magnitude (H,M,L,N)	Cumulative effects
Tourist accommodation	Availability, cost, quality	L	N	O	N		Minor competition for accommodation
Public rights of way	Setting of walks, obstruction of walks	L	N	O	N		
	Improvement of walks – interpretation	L	P	O	N		
Beach closures	Disruption of recreation and tourism (walking, surfing). Beach works scarring	L	N	N	N		
	Beach litter	L	N	O	N		
Recreational angling	No access to fishing marks	L	N	N	N		
Recreational boating and angling	Ease of navigation	L	N	N	Y	L	Some more areas not fishable
Recreational boating and angling	Water safety issues	L	N	N	N		
Target angling species	Reef and refuge areas	L	P	O	N		
Fisheries and shellfisheries	Obstruction of fisheries activities	L	N	N	Y	L	Reduced fish catch
	Reef and refuge areas	L	P	O	N		
Geology UNESCO status	New facts to enhance Geo Park status	L	P	O	N		
	Capacity building issues						
Additional local services	New technical skills, workboats, cranes, better sea knowledge	L	P	N	Y	M	Supports training
New infrastructure outside project budget	New piers, storage and laydown areas	L	P	N	Y	M	Support new infrastructure
	New grid connections	L,R	P	O	Y	L	Supports needs case shared costs
	New offices and housing	L	P	O	N		
Local transport services	Encouragement of EV options	L	P	O	N		
	Availability of new boats	L	P	O	Y	L	Utilised across the projects
Energy security	More green electricity, local supply, diversity of supply	L,R, N	P	N	Y	M	Supports new energy sources
Decarbonisation	Clean energy, balancing services, spin-off capacity	L,R,N	P	N	N		
	Life cycle emissions	L	P	O	N		
	Life cycle wastes	L	N	O	N		

Non-significant issues that have cumulative potentials	Beneficial
	Adverse
Significant issues that also have cumulative potential	Beneficial
	Adverse

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Morlais Project
Environmental Statement

Appendix 25.2: Public Health Impact Assessment

Volume III

Applicant: Menter Môn Morlais Limited

Document Reference: PB5034-ES-0252

Appendix 25.2: Public Health Impact Assessment

Author: MarineSpace

MarineSpace
Making Sense of the Marine Environment ™

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TABLE OF CONTENTS

TABLE OF TABLES

GLOSSARY OF ABBREVIATIONS

AC	Alternating Current
DC	Direct Current
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
ES	Environmental Statement
ICNIRP	International Commission on Non-Ionizing Radiation Protection
kV	Kilovolts
MDZ	Morlais Demonstration Zone
NPS	National Policy Statement
µT	microteslas

GLOSSARY OF TERMINOLOGY

Array	A set of multiple tidal devices connected to a common electrical grid connection.
Array area	The whole area taken up by an array, including the spaces in between tidal devices.
Berth	Discrete area of the Morlais Demonstration Zone (MDZ) identified for a specific tenant's array project demonstration.
Tidal Device	One complete unit including: Tidal Energy Converter(s) (TEC; i.e. rotors and nacelle), foundations, support structure.
Export Cable	The cables which bring electricity from the offshore electrical platform to the landfall.
Export Cable Corridor (ECC)	The corridor within which the export cables will be routed from the development site to the landfall location at Abraham's Bosom.
Grid Connection Substation	Grid connection substation at Orthios.
Hub	Electrical infrastructure used to connect two or more tidal devices into an array.
Inter-array cables	Seabed laid cables connecting the devices within an array to each other and to an electrical hub.
Landfall	Physical location where the offshore cables come ashore. For the Project this is the inshore area of Abraham's Bosom.
Landfall Substation	Landfall substation at Ty-Mawr.
Morlais Demonstration Zone	An offshore area of 35km^2 within which the Project will deploy arrays of tidal devices and associated infrastructure. Defined by The Crown Estate Lease boundary, the area within which the tidal devices/arrays will be deployed along with associated infrastructure such as inter-array cables, export cables, marker buoys, site monitoring equipment and electrical connections to the export cables.
Offshore Cable Corridor	The area within which up to nine export cables will be laid, from the landfall to the location of arrays within the MDZ.

Onshore components	The combined name for all onshore infrastructure associated with the project from landfall to grid connection.
Onshore Development Area	The area including the intertidal landfall location at Abraham's Bosom, the short onshore cable route between landfall and the landfall substation infrastructure, and the onshore cable route to the grid connection substation.
Onshore cables	The cables which take the electricity from landfall substation to the grid connection substation.
Project Design Envelope	The parameters within which the potential extent of the project in terms of materials, scale, time and location can be described. Sometimes referred to as the 'Rochdale envelope'.
Repowering	The removal of a tenant's infrastructure at the end of a demonstration period and replacement with new tenant infrastructure.
Substation	A compound containing electrical equipment to enable connection to the National Grid. This also contains equipment to help maintain stable grid voltage.
Switchgear Building	Switchgear building at Parc Cybi.
Subzone	A part of the MDZ, within which defined types of tidal device may be deployed. There are eight subzones within the MDZ.
Tenant / developer	A company or organisation which reaches agreement with the Project to deploy an array of tidal devices within the MDZ.
Tidal Device	A tidal energy convertor, with supporting structures, foundations and / or anchors.
Tidal Energy Convertor	A device that convert kinetic and potential energy contained within moving tidal water into electricity.
Transition Pits	Underground structures that house the joints between the offshore export cables and the onshore cables within the landfall.

1. INTRODUCTION

1. This Appendix to **Chapter 25, Socio-economics, Tourism and Recreation** (**Volume I**) provides an overview of the existing baseline in relation to public health and the potential impacts which may arise to public health due to the development of the Morlais Tidal Array (the Project). The approach to this section was to draw on information that has been gathered and presented in other chapters of the ES for the Project. The purpose of this section is to consider the potential impacts of the project on the health of the local population. This section has been prepared by MarineSpace Ltd on behalf of Menter Môn.

2. Menter Môn Cyf (Menter Môn) proposes the development of 240 MW of tidal generating capacity within the Morlais Demonstration Zone. The development of the Morlais Tidal Array (the Project) will support the development of renewable energy technology objectives of the Anglesey and Gwynedd Joint Local Development Plan, providing a consented tidal technology demonstration zone which supports installation, testing and commercial demonstrations of tidal energy devices. The Project will also provide opportunities for the local communities via direct employment and support of the local supply chain.

3. The purpose of this section is to provide an assessment of possible impacts which may arise through the development of the project on the public health of the local population. This section describes the baseline, identifies potential impacts which may arise and their related receptors, presents an impact assessment and associated results, and where applicable proposes mitigation measures.

4. This section should be read alongside the following chapters of the ES:

    - **Chapter 4, Project Description;**
    - **Chapter 8, Marine Water and Sediment Quality**;
    - **Chapter 17, Water Resources and Flood Risk**;
    - **Chapter 18, Ground conditions and Contamination**;
    - **Chapter 21, Noise and Vibration**;
    - **Chapter 22, Air Quality**;
    - **Chapter 23, Traffic and Transport**; and
    - **Chapter 25, Socio-economics, Tourism and Recreation**.

2. POLICY, LEGISLATION AND GUIDANCE

5. This section identifies legislation, guidance and policy of particular relevance to the potential impact on public health associated with the construction, operation and decommissioning of the Project.

6. The Planning Act 2008, Infrastructure Planning EIA Regulations 2017 and Environment Act (1995) are considered along with the more specific legislation relevant to health. As previously mentioned, this section leans upon the detailed assessments presented within various other chapters within this ES, and therefore these chapters should be referred to for further detail on relevant policies and legislation.

7. The Well-being of Future Generations (Wales) Act 2015 "Well Being Act" places a statutory duty on public bodies in relation to sustainable development based on seven well-being goals. PPW at paragraph 4.2.1 explains that the Planning (Wales) Act 2015 introduced a statutory purpose for the planning system in Wales – any statutory body carrying out a planning function must exercise those functions in accordance with the principles of sustainable development as set out in the Well Being Act.

8. Guidance specifically relating to onshore grid connections is provided in EN-5 (DECC 2011), which focuses on guidance primarily in relation to overhead lines. This is however not applicable to the Project as all export transmission cables from the offshore site through to the landfall would be buried or encased in appropriate bunding.

9. Although there are no statutory regulations in the UK with regard to exposure to EMF, guidelines were adopted in 2004 which were 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). A precautionary approach is adopted within this guideline regarding exposure of the public to EMF, taking into account those who may be more vulnerable (such as children).

10. Whilst there are no statutory regulations in the UK limiting public exposure to power-frequency EMF, the Government is responsible for implementing appropriate measures to protect the public. A clear restated policy which is incorporated in NPS EN-5 (DECC, 2011) is in place which covers exposure limits and other policies expected to be applied. However, whilst reference is made to EN-5, the Project has been designed to avoid overhead lines and the associated effects as detailed within **Chapter 4, Project Description**.

11. 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 agreed between industry and Government:

    - 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).

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

13. The ICNIRP 'reference levels' for the public are:

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

14. 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.

15. Reference levels are not limits, but 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.

3. CONSULTATION

16. **Table 3-1** summarises relevant consultation responses of the Project received prior to and during preparation of the EA and which were considered in this appendix. A full list of consultation responses and how they have been taken into account in finalising the Project is presented in **Chapter 6, Consultation** (**Volume I**).

Table 3-1 Consultation Responses

Consultee	Comment	Response
Planning Inspectorate	Human health offshore: The Scoping Report states that human health will be considered within relevant onshore aspect Chapters of the ES. The Scoping Report has not addressed potential human health impacts offshore, however significant health impacts offshore are unlikely and therefore do not need to be considered within the ES.	Section does not address offshore impacts.
Planning Inspectorate	Health impact assessment: The Scoping Report refers to the Human Health aspect chapter of the ES as the 'health impact assessment' (HIA). The Applicant is advised that the term HIA refers to a separate process which is a non-statutory requirement in Wales. Whilst a HIA can be submitted to support the Proposed Works, this should not constitute the Human Health aspect chapter of the ES. The Applicant is advised to consult with Wales HIA Support Unit (WHIASU) for further guidance relating to HIA if required.	Comment noted.
Planning Inspectorate	Potential impacts: The Scoping Report states that all potential impacts to human health are to be addressed, as relevant, in other aspect chapters of the ES. It is not always clear where this would be the case. For example, 'hazardous waste and substances', 'EMFs' (to humans) and 'loss of access to green space' do not appear to have been considered elsewhere in the Scoping Report. The Applicant should ensure that these impacts are assessed within the ES where significant effects are likely to occur.	These topics have been considered within this Appendix and discussed further within other ES chapters (**Volume I**), where relevant.
Planning Inspectorate	EN-1: The Scoping Report refers to National Policy Statement (NPS) for Energy (EN-1). The Proposed Works is not a National Significant Infrastructure Project and so the applicability of the NPS is not obvious. However, the direct impacts on health that are addressed by the NPS may be relevant to this project. The Scoping Report is unclear as to whether impacts are to be assessed within the ES as not all are identified in Table 9-13 of the Scoping Report. For the avoidance of doubt, odour, exposure to radiation and increase in pests are not considered likely to result in significant effects and therefore do not need to be assessed within the ES.	Noted.
IACC 2018	A statement should be provided of how the proposals contribute to the Well Being and Future Generations Act.	See **Chapter 2, Policy and Legislation**.

Consultee	Comment	Response
IACC 2017	The Well-being of Future Generations (Wales) Act 2015 "Well Being Act" places a statutory duty on public bodies in relation to sustainable development based on seven well-being goals. PPW at paragraph 4.2.1 explains that the Planning (Wales) Act 2015 introduced a statutory purpose for the planning system in Wales – any statutory body carrying out a planning function must exercise those functions in accordance with the principles of sustainable development as set out in the Well Being Act. A statement should be provided of how the proposals contribute to the Well Being Act and material planning policies.	Included within description of relevant policy.
IACC 2018	The new Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 now require you to "describe and assess the direct and indirect significant effects of proposed development on…. population and human health". Within 9.12.1 you state that "The assessment will identify potential impacts on the health of the local population in relation to the proposed project. Receptors that are sensitive to potential health impacts will be identified within the topic specific ES chapters, and a review of these will be presented within the health impact assessment". We welcome the inclusion of a HIA and would recommend that you follow the specific approach contained in the guidance published by the Wales Health Impact Assessment Support Unit:- https://whiasu.publichealthnetwork.cymru/files/7714/9555/1126/Whiasu_Guidance_Report_English_V2_WEB.pdf	Noted.
NRW	HSE are the regulatory authority for occupational health and safety standards for construction, operation, maintenance and decommissioning for the onshore and offshore element of this type of project. The project will be subject to the Health and Safety at Work Etc Act 1974 and subordinate legislation including the Construction (Design and Management) Regulations 2015. The latter places a duty on designers to eliminate risk where possible and where not possible reduce so far as is reasonably practicable. We have no comments in relation to health on the scoping report but recommend that you contact HSE, prior to construction work, to discuss the management of health and safety for the project.	Noted.

4. EXISTING ENVIRONMENT

17. The existing environment for each potential health impact identified in **Table 4-1** is described in the relevant ES chapter. Likewise, of the potential impacts presented within **Table 4-1**, only electromagnetic radiation during operation is not already assessed within a relevant ES chapter.

18. Therefore, this section does not duplicate this information and provides detail only on the existing environment with regards to electromagnetic fields. This is assessed within this section with respect to the study area encompassing the onshore cable route which is described in **Chapter 4, Project Description** (**Volume I**).

Table 4-1 Relevant chapters which assess the impact of the Project on public health

Potential Impact	Relevant ES Chapter
Air emissions	Chapter 22, Air Quality
Water emissions	Chapter 17, Water Resources and Flood Risk
Soil emissions	Chapter 18, Ground Conditions and Contamination
Noise emissions	Chapter 21, Noise and Vibration
Temporary loss of access to green space (construction only)	Chapter 19, Onshore Ecology

19. EMFs are both naturally produced and a result of human activities, through the natural magnetic field of the Earth and through voltage. The Earth's magnetic field is 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. This magnetic field is referred to as a static or "DC" field as it is usually constant and varies in size only slowly over time. Other fields that alternate in their intensity more frequently over time are referred to as alternating or "AC" fields.

20. Magnetic fields are measured in microteslas (μT) and 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. In the UK, the Earth's magnetic field is approximately 50 μT.

21. EMFs are also produced via electricity production, distribution and use, including substations, power line and household equipment. Electric fields are produced by a voltage, which is recorded at 230 volts (V) inside UK homes whereas electrical distribution systems in the UK utilise much higher voltages generally from 11,000 to 400,000 volts (11kV to 400kV). Higher voltages relate to a greater electric field, measured in volts per metre (V/m). However, electric fields are eliminated through burying of cables due to the ground and protective sheaths around cables. The Morlais project will involve maximum voltages of up to 132,000 volts (132kV).

5. IMPACT ASSESSMENT

5.1. EMBEDDED MITIGATION

22. 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.

5.2. IMPACT FROM AIR EMISSIONS

23. A detailed discussion and consideration of the potential construction impacts on health due to air emissions are presented within **Chapter 22, Air Quality**. Within this chapter, it is concluded that with the standard best practice mitigation applied, there will be no significant impacts from air emissions.

5.3. IMPACTS FROM WATER EMISSIONS

24. A detailed discussion and consideration of the potential construction impacts on health due to water emissions are presented within **Chapter 17, Water Resources and Flood Risk**. Within this chapter, it is concluded that with the standard best practice mitigation applied, there will be no significant impacts from water emissions.

5.4. IMPACTS FROM SOIL EMISSIONS

25. A detailed discussion and consideration of the potential construction impacts on health due to soil emissions are presented within **Chapter 18, Ground Conditions and Contamination**. Within this chapter, it is concluded that with the standard best practice mitigation applied, there will be no significant impacts from soil emissions.

5.5. IMPACTS FROM NOISE EMISSIONS

26. A detailed discussion and consideration of the potential construction impacts on health due to noise emissions are presented within **Chapter 21, Noise and Vibration**. Within this chapter, it is concluded that with the standard best practice mitigation applied, there will be no significant impacts from noise emissions.

5.6. TEMPORARY LOSS OF ACCESS TO GREEN SPACE (CONSTRUCTION ONLY)

27. A detailed discussion and consideration of the potential construction impacts on health due to temporary loss of access to green space are presented within **Chapter 19, Onshore Ecology**. Within this chapter, it is concluded that with the standard best practice mitigation applied, there will be no significant impacts from temporary loss of access to green space.

5.7. ELECTROMAGNETIC RADIATION (OPERATIONAL PHASE ONLY)

28. The Project will include permanent communal infrastructure for tidal technology developers which provides a shared route to a local grid connection via nine export cable tails, an onshore landfall substation, and an onshore electrical cable route to a grid connection via a grid connection substation.

29. Therefore, electromagnetic radiation will result from the operation of an onshore electrical cables extending onshore from landfall at Abraham's Bosom near Penrhos Feilw to a grid connection substation. This transport of electricity through the onshore cables creates the potential for emission of a localised electromagnetic radiation, which could potentially affect public health depending on vulnerability, levels of EMF and exposure time.

30. Exposure to EMF have been suggested to increase the risk of developing 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, there is no known mechanism or clear experimental evidence to explain how these effects may occur, and the balance of evidence is towards no effects (DECC, 2013).

31. Further, the strength of magnetic fields decreases rapidly with the distance from the source and objects such as trees, building and earth further reduce their strength. For example, a high voltage powerline (400 kV) will be reduced to household levels within 50-100m, even in the instance of no objects present between the source and receptors (National Radiation Laboratory, 2008). Other studies suggest that a 400 kV buried at 1 m depth 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) (ICF, 2003). Therefore, these values are below the 'reference levels' of the ICNIRP guidance exposure levels.

32. Noting that the Morlais project will only involve voltages of up to 132kV, no significant issues are predicted via EMF effects.

6. SUMMARY

33. This section has provided an overview of the potential public health impacts which may arise due to the development of the Project. The potential impacts considered has been supported by

the details presented within the Scoping responses, with a focus on exposure to EMF. Following an assessment, EMF potential impacts are deemed to have no significant impacts.

7. REFERENCES

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

International Commission on Non-Ionizing Radiation Protection (ICNIRP) (1998), 'Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)'. Health Phys, 74: 494-522.

European Union (1999), 'Council Recommendation on the limitation of exposure of the general public to electromagnetic fields (0 Hz – 300 GHz)'. Official Journal of the European Communities 1999/519/EC.

Department of Energy and Climate Change (DECC) (2013), 'Power Lines: Control of microshocks and other indirect effects of public exposure to electric fields – a Voluntary Code of Practice'.

National Radiation Laboratory (2008) Electric and Magnetic Fields and Your Health, Ministry of Health New Zealand. https://www.health.govt.nz/publication/electric-and-magnetic-fields-and-your-health [Accessed: April 2019].

Europe. Prepared for the DG TREN/ European Commission. https://ec.europa.eu/energy/sites/ener/files/documents/2003_02_underground_cables_icf.pdf [Accessed: May 2019].