

Lewis Wave Power Limited



40MW Oyster Wave Array

North West Coast, Isle of Lewis

Environmental Statement

Volume 1: Non-Technical Summary

March 2012

1. NON-TECHNICAL SUMMARY

1.1 Introduction

This document provides a Non-Technical Summary (NTS) of the Environmental Statement (ES) produced in support of the consent application process for the North West Lewis Wave Array, hereafter known as the development. The ES is the formal report of an Environmental Impact Assessment (EIA) undertaken by Lewis Wave Power Limited (hereafter known as Lewis Wave Power) into the potential impacts of the construction, operation and eventual decommissioning of the development.

1.2 Lewis Wave Power Limited

Lewis Wave Power is a wholly owned subsidiary of Edinburgh based Aquamarine Power Limited, the technology developer of the Oyster wave power technology, which captures energy from near shore waves and converts it into clean sustainable electricity. Aquamarine Power installed the first full scale Oyster wave energy convertor (WEC) at the European Marine Energy Centre (EMEC) in Orkney, which began producing power to the National Grid for the first time in November 2009. That device has withstood two winters in the harsh Atlantic waters off the coast of Orkney in northern Scotland. Aquamarine Power recently installed the first of three next-generation devices also at EMEC which will form the first wave array of its type anywhere in the world.

1.3 Project details

The wave array development will have the capacity to provide 40 Megawatts (MW), enough energy to power up to 38,000 homes and will contribute to meeting the Scottish Government's targets of providing the equivalent of 100% of Scotland's electricity generation from renewable sources by 2020. The wave array will consist of between 40 and 50 Oyster devices.

The development will be located in inshore waters off the north-west coast of the Isle of Lewis near the village of Siadar. The location and an indicative layout of the Oyster devices is displayed in Figure 1 below.

Each Oyster device will consist of a single Fibre Reinforced Polymer (FRP) flap mounted on a steel pile. The pile will be installed into a socket that has been drilled into the seabed. Beneath each flap a "gap filler" constructed from concrete blocks or gabions will be placed to prevent energy within the waves passing beneath the flap.

On the shore side of each Oyster device a relatively small submerged landing platform will be installed to support pipelines and additional components associated with the operation and maintenance of the Oyster device.

The Oyster device is a hinged flap, which is almost entirely underwater. As waves from the Atlantic pass over each Oyster device, the flap pitches backwards and forwards. The movement of the flap drives hydraulic pistons which push high pressure water onshore via a pipeline to drive a conventional hydro electric turbine, located on the seaward side of a ridge that runs, adjacent to the coastline approximately 160m from shore (Figure 1).

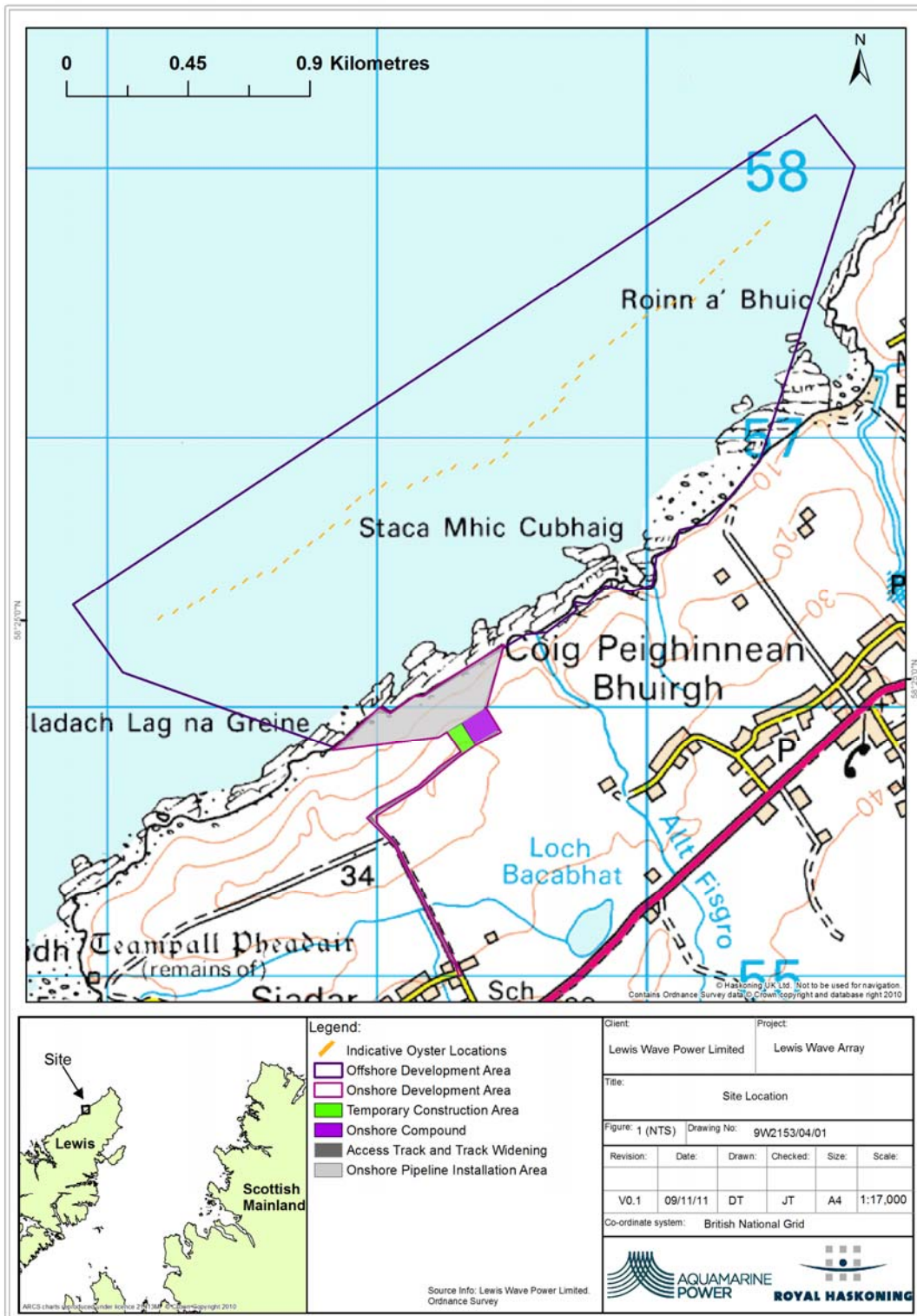


Figure 1 The development site location and layout

Low pressure pipes will transport the water back from the hydro electric power station to the Oyster devices. The pressurised water system will operate as a closed loop so that during operation no fluids will be released to the environment. Figure 2, shows how the individual Oyster WECs connect to the hydro electric power station, while Figure 3, shows an illustrative layout concept.

Once the development is commissioned only the tops of the flaps will be visible offshore, protruding between 3m to 4.5m (at medium sea level) from the surface of the sea. Each flap will be between 26m to 33m wide and 12.5m from the top of the flap to the connecting hinge (depending on final engineering requirements) and will be up to 3.5m thick. The top of the flaps will be marked in a manner agreed with the Northern Lighthouse Board and Maritime and Coastguard Agency to ensure visibility to passing vessels and water craft.

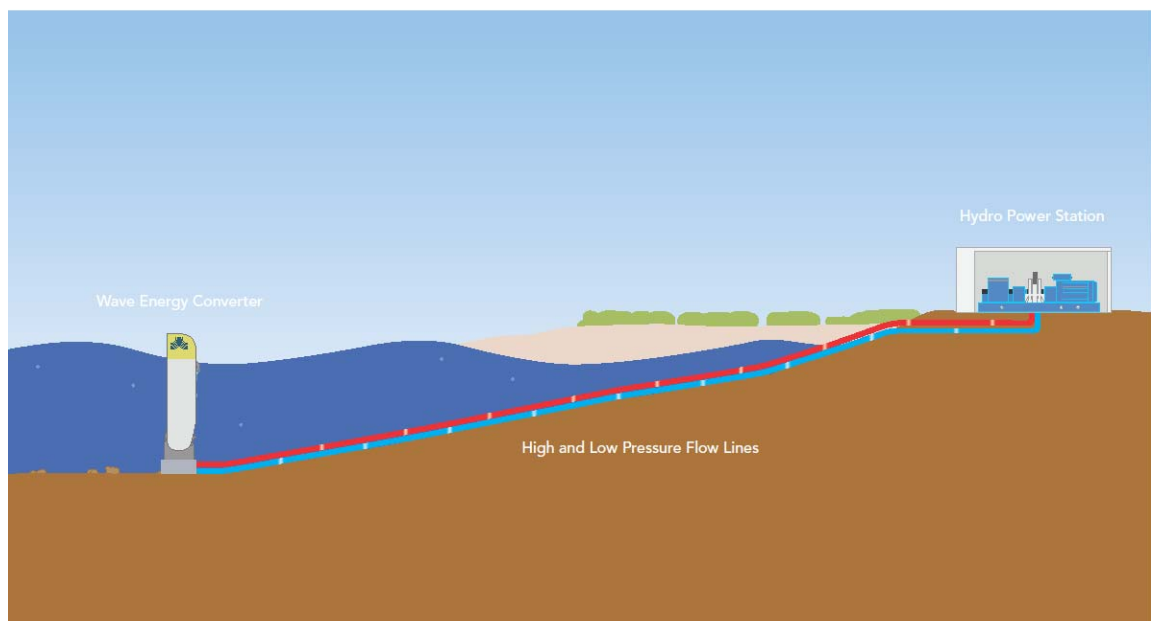


Figure 2 Indicative Illustration of the Oyster wave array

1.4 The need for renewable energy

The central aim of UK Government energy policy is to establish a supply of energy that is diverse, sustainable, secure and is offered at a competitive price. Key to this goal is an 80% reduction of carbon dioxide (CO₂) emissions by 2050 (Section 1 of the Climate Change Act 2008). The development of renewable energy plays a primary role in UK Government strategy for carbon reduction and has set a target that 20% of the UK's electricity supply should come from renewable sources by 2020 (Energy Review, 2006).

UK Government targets for renewable energy will help the UK to meet its international obligations, but also obtain greater security of energy supply through the promotion of indigenous electricity generation.

The Scottish Government has more ambitious targets than Westminster and is keen to achieve a target of the equivalent of 100% of energy from renewable sources by 2020. Plans are developing to ensure that marine renewable energy sources (i.e. wave, tidal and offshore wind) will make a full contribution to meet this target.

1.5 Regulatory requirements and the Environmental Impact Assessment

Regulatory Consents

A number of consents are required for the construction and operation of the development. The Marine Scotland Licensing Operations Team (MS - LOT) will be responsible as the regulatory authority for granting consents for works in the marine and intertidal environment. Comhairle Nan Eilean Siar, will be responsible as the local planning authority for granting planning consent for the onshore infrastructure (generator buildings, road upgrades and grid connections).

Lewis Wave Power will require the following key consents:

- Section 36 of the Electricity Act, 1989;
- Section 20 of the Marine (Scotland) Act Marine Licence (replacing Section 5 Part II of the Food and Environment Protection Act (FEPA), 1985 and Section 34 of Coast Protection Act, 19491).
- Planning permission under the Town and Country Planning (Scotland) Act 1997
- Other consents, such as approval of a decommissioning programme under the Energy Act 2004, may also be required and further detail is given within the main body of the ES.

¹ From April 2011, a Single Marine Licence granted under the Marine (Scotland) Act 2010 and UK Marine and Coastal Access Act 2009 replaced the requirement for Coastal Protection Act consent and a FEPA licence.

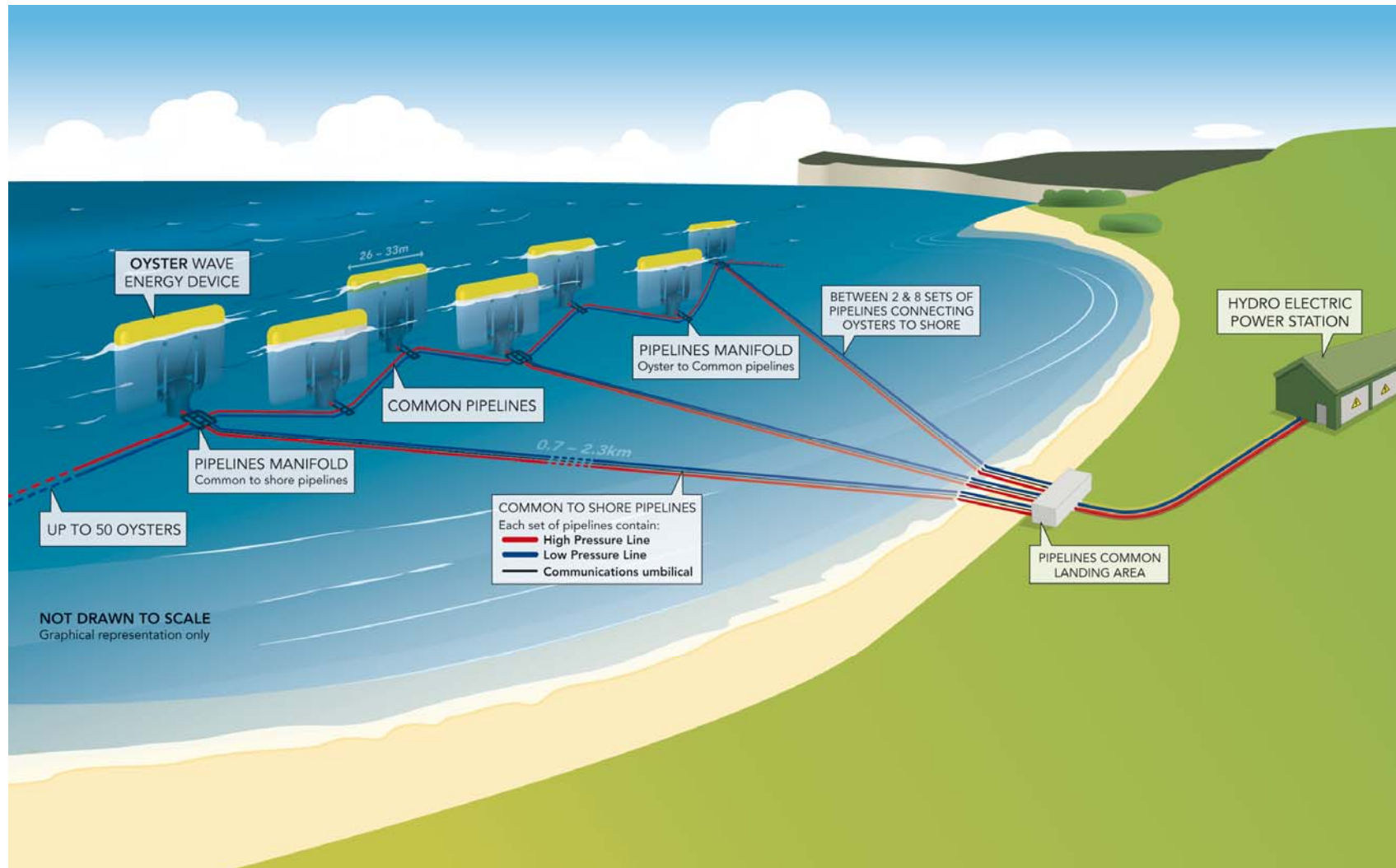


Figure 3 Indicative Illustration of the Oyster wave array

1.6 The need for Environmental Impact Assessment

Lewis Wave Power has carried out an EIA on the development, to meet the requirements of the Electricity Works (Environmental Impacts Assessment)(Scotland) Regulations 2000 and the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011

1.7 The Environmental Impact Assessment (EIA) process

EIA is a systematic process, for examining the possible positive and negative significant impacts of a development project on the receiving environment.

The resultant ES contains:

- A description of the development, including any alternatives considered;
- A description of the existing environment at the site and surrounding areas;
- A prediction of the potential impacts on the existing human, physical and natural environment at the site and assessment of subsequent effects;
- A description of mitigation measures to avoid or reduce such effects; and
- A Non Technical Summary (This document).

1.8 Scoping and consultation

A scoping exercise was carried out to identify the main issues that needed addressing as part of the EIA. Consultation as part of this process included statutory and non statutory bodies representing key interests and user groups on the Galson Estate and across the Isle of Lewis.

Consultation with community groups and special interest organisations has been ongoing as the development plans and EIA has progressed and will continue right up to operation of the wave array. Where possible, representatives from Lewis Wave Power have attended community meetings, presented at a number of forums and met with organisations who have expressed an interest in the development plans. Consultation has also been undertaken in relation to specific receptors such as fisheries and navigation, as required.

1.9 Assessment of Alternatives

The scoping exercise was carried out across the north-west coastline of Lewis, to allow a suitable development site to be identified. Several areas were considered for potential development, however Siadar was considered the most appropriate. The chosen development site at Siadar benefits from suitable physical conditions for the project to be built, whilst avoiding ecologically sensitive areas, and limiting interaction with other users such as fishing activities or surfers. The onshore site is on an area of common ground, avoiding areas of agricultural interest, to minimise adverse impacts to the local community.

1.10 Impacts assessment

Impact identification and evaluation was carried out via a number of standard methods and techniques agreed during scoping and consultation. Due to the developing nature of the technology there are elements of the design detail still to be finalised. The significance of the environmental impacts on key aspects have been assessed and are detailed in the individual ES assessment chapters. Where possible this has been based on quantitative evidence; however, where it has not been possible to quantify impacts they have been assessed qualitatively based on the best available knowledge and professional judgement.

The potential impacts for each aspect related to the development have been produced with regards the following:

- Extent and magnitude of the impact (Table 1);
- Duration of the impact (short, medium or long-term);
- Nature of the impact (direct or indirect; reversible or irreversible);
- Whether the impact occurs in isolation or is cumulative in nature;
- Sensitivity of the receptor (Table 2);
- Whether the effects are positive or negative; and
- The level of mitigation that can be implemented to avoid, reduce or offset the effect.

The magnitude of an impact (i.e. how large an impact is) is assessed based on criteria provided in Table 1 (note, for each of the receptor chapters specific criteria have been developed).

Table 1 Magnitude of impact	
Magnitude of impact	Description
High	A fundamental change to the baseline condition of the receptor.
Medium	A detectable change resulting in the non-fundamental temporary or permanent condition of a receptor.
Low	A minor change to the baseline condition of the receptor (or a change that is temporary in nature).
Negligible	An imperceptible and/or no change to the baseline condition of the receptor.

Sensitivity criteria can be based both on the degree of environmental response to an impact, as well as the 'value' of the receptor. The sensitivity for each impact is determined by consideration of at least one of the following points:

- Comparison with Regulations or standards e.g. British Standards;
- Compliance with policy, plans and guidance documents e.g. Local Plan;
- Reference to criteria such as protected species, designated sites and landscapes;
- Consultation with stakeholders; and
- Experience and professional judgements by specialists on environmental sensitivity.

Generic descriptions of sensitivity are provided in Table 2, below, and a detailed description of the criteria used to assess sensitivity or value for each receptor is provided in the relevant assessment chapter.

Table 2 Sensitivity of the receptor	
Receptor sensitivity/value/importance	Description
High	<p>Environment is subject to major change(s) due to impact.</p> <p>For example the site contains assets of international or national conservation or cultural designation, with development causing a permanent reduction of human activities, such as fish landings</p>
Medium	<p>Environment clearly responds to effect(s) in quantifiable and/or qualitative manner.</p> <p>For example the site contains assets of national or regional conservation or cultural designation , with development causing a permanent modification of human activities</p>
Low	<p>Environment responds in minimal way to effects such that only minor change(s) are detectable.</p> <p>For example the site contains assets of local conservation or cultural value, with development causing a temporary modification of human activities.</p>
Negligible	<p>Environment responds in minimal way to effect such that only minor change(s) are detectable.</p> <p>For example the site contains features of local interest, with development causing little or no change to human activities.</p>

By combining the magnitude of the impact and the sensitivity of the receptor in a matrix (Table 3) the final significance of the effect (prior to the implementation of mitigation measures) can be obtained. It should be noted that any residual effect (the effect after the implementation of mitigation) which remains at the level of 'Moderate' or 'Major' is still regarded by the EIA Regulations as being significant.

Magnitude of Impact	Receptor Sensitivity/Value/Importance			
	Negligible	Low	Medium	High
High	No significant effect	Moderate	Major	Major
Medium	No significant effect	Minor	Moderate	Major
Low	No significant effect	Negligible	Minor	Moderate
Negligible	No significant effect	Negligible	Negligible	Minor

Due to the differences between the individual technical assessments throughout this ES there is no specific definition that can be applied. Therefore, each receptor has its own impact assessment and defines the criteria for the level of residual effect. Where it has been possible to do so, this has been based upon accepted criteria, as well as by employing expert interpretation and value judgements.

1.11 Physical environment and coastal processes

The site is representative of the wider area off north-west Lewis. A Geological Conservation Review (GCR) site (North West Coast of Lewis) is located approximately 20km to the north of the study area, which is noted for its rock formations; however it will be unaffected by the proposed development. The development may affect the dominant wave and tidal conditions (the hydrodynamic regime) local to the site; however, as no sensitive physical receptors were identified from site surveys, the significance of these impacts for the physical environment is considered to be negligible.

1.12 Soils, hydrology and hydrogeology

An area of 1km radius around the development site was assessed to identify the potential impact on soils, hydrology and hydrogeology. The assessment was based on an initial desk based review supplemented by specific peat depth and water feature surveys. The assessment identified potential impacts of moderate adverse significance relating to changes in surface runoff patterns and potential impact on the sensitive peat environment surrounding the site. A range of mitigation measures have been identified, meaning that overall the final impacts are

considered to be negligible. The one exception is a potential localised impact of dewatering peat during construction of the foundations for the hydro electric power station buildings. This remaining impact is considered to be of minor adverse significance. Required improvements to the burn crossing at the access road are considered to offer a positive benefit to the water environment.

1.13 Benthic ecology

Video surveys of the seabed found that the seabed biology (benthic ecology) across the development site was largely determined by the distance from the shore and depth. The dominant habitat consists of kelp either growing as tall and dense plants (forest) or shorter and sparser plants (kelp park). The survey found no evidence of benthic habitats or species of conservation importance within the development site. Furthermore, the underwater plants and animals present at the development site are representative of the wider area around the north-west coast of Lewis and do not present any particular feature of conservation importance. All impacts are expected to be of low magnitude and, therefore, the significance of all potential impacts on benthic ecology is expected to be negligible.

1.14 Ornithology

Site specific surveys used two vantage points overlooking the offshore development area. A wide range of seabirds were seen over the offshore development area. During the breeding season only a small percentage of each seabird species used the development area for feeding and the development area was assessed to be of very low importance for seabirds at this time of year. Except for three species, the numbers of individuals of species that use the survey area for feeding in the non-breeding part of the year (e.g. winter) are also very small in the context of their regional population size. The numbers of red-throated diver, great northern diver and eider regularly feeding in the survey area during the non-breeding period approach or slightly exceed 1% of the regional (Western Isles) population size.

A high proportion of birds seen during survey work were simply flying through the marine survey area and not using it in any other way.

Several species of birds breed in the vicinity of proposed onshore hydro-electric power station. These include small numbers of dunlin, lapwing, curlew, and greylag goose. There is also a small mixed-species colony of breeding gulls.

Impacts during construction, operation and decommissioning are considered in relation to disturbance, collision risk, accidental release of contaminants, and changes to prey resource. Overall the impacts are considered to be of negligible magnitude to all species birds and are judged to be of negligible significance.

1.15 Marine mammals and basking sharks

Marine mammals and basking shark surveys of the marine area of the development site were conducted in 2010 and throughout 2011. Two separate vantage points were used which overlook the area of sea in which the development will be located. A desk based data gathering exercise was also used to assess marine mammal and basking shark usage of the wider region.

A number of marine mammal species are found in the wider region, including grey seal, harbour seal, common dolphin, harbour porpoise, Risso's dolphin and minke whale. Basking shark is also considered in to be present. Available information and data from the surveys do not indicate that the Siadar area is of particular importance to marine mammals or basking sharks.

Impacts during construction, operation and decommissioning are considered in relation to noise, collision risk, accidental release of contaminants, and changes to prey resource. Overall the impacts are considered to be of minor significance to marine mammals and basking sharks based on their ability to avoid the relatively small development area and the unobtrusive nature of the construction activities.

1.16 Fish and shell fish

Studies of the existing environment indicate that a large variety of fish and shellfish species may be present within development site, however, due to the high energy environment and lack of suitable habitat it is unlikely that the area is used extensively for spawning and nursery grounds. The greatest impacts are likely to occur during the construction phase and will be mainly associated with disturbance of habitat with particular significance for less mobile species such as crustaceans. However all impacts were considered to be of negligible significance and with suggested mitigation may have beneficial effects.

1.17 Terrestrial and intertidal ecology

Two field surveys and a desk based study were used to establish the terrestrial and intertidal ecology baselines. The development and surrounding area is not designated for any ecological features of conservation importance. Studies of the existing environment confirm that the most sensitive ecological features were the blanket bog/wet heath habitat and watercourses, the latter of which was also important for otters. These features were considered during the development of site layout and consequently potential impacts have been avoided. Greatest impacts are anticipated to be habitat loss of acid grassland, temporary disturbance of wet heath during upgrades to the access road, temporary disturbance of the intertidal zone and disturbance of otter. Following best practice and further mitigation identified, the impacts are predicted to be not significant. The potential for changes in the intertidal habitats is identified and monitoring post installation is proposed.

1.18 Seascape, landscape and visual impact assessment

A Seascape Landscape and Visual Impact Assessment (SLVIA) was conducted to assess the impacts of the development to the visual nature of the site and the surrounding area. The SLVIA predicts significant adverse effects on the local coastline. Potential cumulative effects between the development and the consented Voith Hydro Wavegen 4MW Siadar Wave Energy Project located to the south of the 40MW Lewis Wave Array were also assessed in the SLVIA. There is predicted to be a significant adverse cumulative effect likely to arise on the local coastal area. Although potential cumulative effects on the seven representative viewpoints considered in the study are not predicted to be significant, the SLVIA recognises that localised significant adverse cumulative impacts on views may occur along the coast for a limited number of receptors.

1.19 Shipping and navigation

In support of the application, and to inform the assessment of impacts to shipping and navigation, a Navigational Risk Assessment (NRA) was conducted. The NRA establishes the existing environment within the proposed development site as one of low use by shipping and other vessels. As part of the NRA a hazard identification workshop was held. This not only identified the hazards, but also identified possible mitigations measures.

The impact assessment was guided by the NRA and assessed a number of potential impacts at construction, operation and decommissioning phases. Due to the low use of the area by vessels the magnitude of the majority of impacts was assessed as low, however as the implications of impacts occurring are severe possibly resulting in injury to personnel the sensitivity of the receptors are often considered high.

The greatest impacts were assessed to be of moderate adverse significance, however with easily implemented mitigation all impacts can be reduced to minor adverse or negligible significance. No cumulative or in combination impacts were predicted.

1.20 Commercial fisheries

Fishing activity off the north-west coast of Lewis is generally considered to be low in comparison to the surrounding waters, and in terms of the UK average. In addition the development site is of low importance locally. The main species targeted with the study area are shellfish, in particular crab and lobster. The site is fished by up to four local vessels, which use the area on a regular basis.

The greatest impact to commercial fisheries is likely to be as a result of the limited displacement of vessels from the development site, which are predicted to be of minor significance.

Through close consultation with the fishing industry and a commitment to work with the local fishermen, impacts on commercial fisheries can be mitigated and therefore the residual impacts are likely to be of negligible significance.

1.21 Traffic and transport

Low levels of traffic are currently recorded in the Isle of Lewis. Although offshore components of the development will be delivered to site mainly by sea, the onshore components will require an increase of Heavy Goods Vehicle (HGV) movements between Stornoway and the development site.

Details of traffic movements are highly dependent on the type of construction method used for the laying of pipelines, and other elements of design. The methods planned for construction are still to be decided and two options are being considered. It has been agreed with Comharile nan Eilean Siar (the Western Isles Council) that due to the differences in the types and quantities of materials to be transported between the construction methods, a Traffic Statement will be produced following submission of this Environmental Statement. This will provide full details of construction, operation and maintenance traffic movements. It may also include swept path analysis of the junction of the A857 and New Road, once the maximum size of vehicle is confirmed, to ensure adequate turning space is available.

The most significant impact is anticipated to be the increase of HGV movements through Stornoway and turning at the junction of the A857 and New Road.

1.22 Archaeology

An archaeological study and impact assessment was carried. The assessment considers potential physical impacts upon assets within the development area and the setting of designated or nationally important assets within 1km of the development site. Baseline studies comprising desk-based assessment and site visits have been completed and the results of these inform the impact assessment.

The results of the baseline studies have fed into the design of the project and impacts have been avoided as far as reasonably practicable. Just two recorded assets will be impacted upon by the development. These comprise an area of lazybeds (ridges formed to increase the cultivable depth of soil and improve drainage) that will be partially removed during construction and a scheduled monument, the setting of which will be slightly impacted by the development. Previously unrecorded archaeological features may be disturbed during construction, though the potential for this to occur is considered low. Impacts have been assessed as being of minor significance following the implementation of mitigation.

1.23 Onshore noise

The potential for onshore noise and vibration impacts associated with the development are mainly limited to the construction phase. The laying of concrete for the hydro electric power station and the horizontal directional drilling (if required for pipeline installation) are the elements expected to give rise to impacts of moderate significance. The distance between the construction site and the nearest noise sensitive receptors is large and consultation with the local community landowner and neighbours will ensure that noise levels will be appropriately managed.

The operational noise arising from the hydro electric power station is considered negligible due to the distance to the nearest noise sensitive properties. Vibration impacts associated with the operational aspect of the development are limited to the infrequent passage of vehicles to conduct maintenance at the onshore site; producing very low, negligible levels of vibration.

1.24 Water quality

A desk based review of the existing environment revealed that all water bodies within the vicinity of the proposed development site have been assessed by the Scottish Environment Protection Agency (SEPA) as of good quality. There are no designated shellfish waters within the immediate vicinity of the development and the nearest bathing waters are located over 80km from the development site at Achmelvich on mainland Scotland.

The greatest potential impacts to water quality could occur during construction as a result of potential pollution from vessels and construction activities. Preparation, planning and management of the construction and operation of the development is proposed to mitigate these impacts.

The introduction of non native species into the Western Isles inshore waters is identified as a potential impact. Although the potential is considered to be very small, it has been treated with

importance given the high quality of the coastal waters of Lewis. A risk assessment will be conducted based on the movements of the installation vessels to be used (home port and recent operations) and measures agreed with regulators will be adopted to mitigate this risk. With mitigation in place all impacts are considered to be negligible.

1.25 Socio-economics

The development of the Oyster wave array will bring minor beneficial socio-economic impacts. A number of local jobs will be created along with an increase in spend on local services during the construction of the project. There will also be on-going spend on local services associated with operation and maintenance.

1.26 Tourism and recreation

Tourism and recreation are vitally important to the economy of the Western Isles; however, the area of the development site is not identified as being of particular importance for tourism and recreation. The impact assessment does not predict any significant long term adverse effect on existing marine and coastal activities, or on visitor numbers or visitor experiences. Adverse impacts are most likely to occur during the construction phase of the development; however these have been assessed as negligible and are therefore unlikely to cause a noticeable impact on tourism and recreation.

The development will create a new point of interest for visitors to Lewis and the Western Isles in general, increasing the islands' profile for renewable energy. This may have minor beneficial impacts on tourism and recreation during operation which in turn may benefit the local community.

1.27 Conclusions

An assessment of the environmental impacts of the development has been carried out in accordance with EU, UK and Scottish regulations, and has consulted statutory and non-statutory bodies and interested parties. The findings have been presented in an Environmental Statement, which includes technical appendices.

Significant impacts in terms of the EIA regulations are limited, after mitigation, to localised Landscape and Visual Impacts (see Table 4, above). All other impacts, after mitigation, are not significant in terms of the EIA regulations.

Measures to mitigate any negative impacts of the development are proposed. Lewis Wave Power has made a number of commitments to establish plans for quality, health, safety and environmental management of the project. This will ensure that the wave array, during construction, operation and decommissioning, will be conducted in a responsible manner and it is predicted that the Lewis wave array should not have any unacceptable long term impacts.

The 40MW Lewis Wave Array Project offers a significant, strong and positive contribution to the UK and Scottish national ambitions to install renewable energy capacity by 2020. The development is also a significant project to demonstrate the potential to harness wave power in Scotland and internationally.

1.28 Further information

Copies of the Environmental Statement (ES) are available for public viewing at the following locations within normal opening times:

- Urras Oighreachd Ghabhsainn (Galson Estate Trust) Business Centre, Tom na Ba, Galson, Isle of Lewis, HS2 0SH; and
- Stornoway Library, 19 Cromwell Street, Stornoway, Isle of Lewis, HS1 2DA.

The Environmental Statement can also be viewed at the Scottish Government Library at Victoria Quay, Edinburgh, EH6 6QQ.

Copies of the Environmental Statement may be obtained from:

- Lewis Wave Power, c/o Aquamarine Power Limited, Elder House, 24 Elder Street, Edinburgh, EH1 3DX, telephone: 0131 524 1440 at a charge of £250 for a hard copy and £10 on CD. Copies of the non-technical summary (NTS) are available free of charge.
- Alternatively a downloadable version is available on the Lewis Project page on the Aquamarine Power Limited website: www.aquamarinepower.com.