EMEC Tidal Test Facility Fall of Warness
Eday, Orkney

Environmental Statement

The Fall of Warness, Eday, Orkney

June 2005

AURORA environmental

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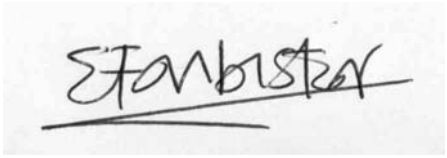

Liz Foubister, Director

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Non-technical summary

S.1 Introduction

When the European Marine Energy Centre (EMEC) was established by Highlands and Islands Enterprise (HIE) and its funding partners in 2003, it was with the intention of stimulating and accelerating the development of both wave and tidal prototype energy generating devices. The wave test centre is now well established, and the next phase is to establish a consented tidal test site ready for future deployment of the novel tidal energy devices that are currently being designed and built by independent developers. The proposed test facilities will allow full scale generating devices to be tested under normal operating conditions and allow the generating capacity and performance to be independently verified.

As part of the on-going Prime Contracting Framework Agreement, Highlands and Islands Enterprise (HIE) has engaged Tulloch Prime Contracting Limited (Tulloch) to undertake the design and construction of the proposed tidal test facility to be located within the Fall of Warness, Eday, Orkney. AURORA Environmental Ltd (AURORA) has been contracted by Tulloch to undertake the environmental works for the construction phase of the tidal test facility, including a number of baseline studies and the production of an Environmental Statement (ES) to support consent applications. The scope of the Environmental Statement covers the construction and presence of the test site, but does **not** cover the installation and testing of individual prototype devices. In order to be able to assess the impacts of the long-term presence and operation of the site, it will be necessary to consider a range of likely potential devices at a generic level. However, detailed consideration of individual devices will be the responsibility of each developer making use of the site. It is the responsibility of each developer to provide an Environmental Statement to EMEC, produced according to the EMEC guidance.

The establishment of a test centre for assessing the performance of new and developing tidal energy technology is a strategically important facility for Scotland and the UK. It is believed that tidal energy could make an important contribution to securing future UK energy supplies and that this in turn will contribute to reducing CO_2 emissions arising from energy production.

S.2 The project

Highlands and Islands Enterprise commissioned a study in 2004 to determine the optimum site for a tidal test facility. This initial work identified eight sites in the Highlands and Islands region for further consideration. Each site was screened based on tidal resource potential, water depths, channel width and integration with the existing EMEC wave test site. Based on these criteria three sites were considered the most favourable:

- Yell Sound, Shetland;
- Fall of Warness, Orkney; and
- Pentland Firth, Orkney.

The Fall of Warness was selected as the location for the tidal test site in preference to other sites as it offered the right physical resources and was close to EMEC. All sites screened and evaluated were in areas that by the nature of their physical resources were also frequented by marine mammals.

The EMEC offices, data centre and wave test facility are based in Stromness on Mainland Orkney, however the tidal test facility is to be located in the Northern Isles. The tidal test berths are to be located off the south western tip of the island of Eday in the area know as the Fall of Warness, lying between Westray Firth and Stronsay Firth. Four export cables between 3,000 m and 4,000 m in length will connect to the new control building adjacent to Cauldale on the south west coast of the island. Cauldale was selected as the location of the onshore control building as it offered the most favourable cable routing to the test berths when the direction of tidal stream was considered, was closest to an existing road system, and offered the Best Practical Environmental Option.

A Supervisory Control & Data Acquisition (SCADA) system will allow EMEC to remotely monitor and operate switchgear in the Eday control building from its data centre in Stromness. No major upgrades to the Stromness data centre are required for the establishment of the tidal test facility.

The lifespan of the project is estimated at 15 years, with individual prototypes being on site for between 6 months and 10 years. Additional devices may be added to each cable in the future, and there is scope to expand the onshore facility within the existing site if required at a later stage.

While the need for land markers to demarcate the limit of the test site covered by the Crown Estate lease has been rejected at this stage, the use of appropriate offshore lighting and marking navigation aids is considered imperative, but at this stage specific details have yet to be finalised with the Marine Coastguard Agency.

Table S.1 provides a summary of the proposed project.

Table S.1 Project summary of proposed tidal test facility

Onshore works	
Substation	
Location	Adjacent to the ruined buildings at Cauldale, Eday.
Size	Total plot: c54 m x 90 m - building c30 m x 5.5 m – external hard standing area c20 m x 15 m.
Construction	A long thin single storey building perpendicular to the coastline. The building finishings will be fully agreed with the local planning department and are proposed as dark rendering and a slate tiled roof, sympathetic to traditional Orkney construction. Security fencing 1.8 m high weld meshes with gate enclosing complete facility (to be replaced by sheep fencing on completion). Septic tank. Sustainable urban drainage system (SUDS).
Electrical	The building will house the 11 kV switchgear, power factor correction equipment, and data handling equipment, uninterruptible power supply (UPS) and standby generator. The subsea cables will be terminated into the high voltage circuit breaker panels.
Road system	
Site access tracks	Hardcore access tracks constructed to forestry standard Type 1.
Public road upgrade	1-2 minor corner improvements to allow articulated vehicle movements may be required. Alternatively aggregate required for construction will be delivered by boat to the landfall site.
Duration of works	
Construction/roads	Approximately 3 months from the beginning of August 2005.
Electrical works	Will commence on completion of internal building works – testing and commissioning due to be completed by end of 2005.
Stromness data centre	
Refurbishment	Internal alterations only will be required.
Landfall	
Cable lay	
Lay cables between MLWS and control building	The cable will be surface laid throughout the intertidal zone. Ductile iron cable protection will be fitted to the cable in the high-energy areas of the surf zone and inter-tidal zone. In addition Armoflex concrete mattresses will be installed on the cable though the inter-tidal zone for added protection Above the high water mark the cables will be laid in a trench to a depth of 900 mm with cable marker tape laid 150 mm above them. Cables will be taken from the foreshore to a cable draw pit, where they will be run in buried concrete ducts to within the building. The ducts will be fitted with lids to allow traffic movements above and also for ease of installation/future removal of cabling. At the top of the beach a standard marine cable marker will be installed.
Duration of works	2 weeks.

Offshore works	
Subsea cable system	
Location	Cables will extend from landfall to 4 test berth locations: Cable 1 – 59° 08.44'N 002° 49.08'W Cable 2 – 59° 08.28'N 002° 48.76'W Cable 3 – 59° 08.04'N 002° 48.44'W Cable 4 – 59° 07.90'N 002° 47.62'W – still to be confirmed
Cable specification	The cable is of double 6 mm wire armour flooded construction with 3 of 11 kV 120 mm^2 copper cores EPR insulated, a 3 core of 2.5 mm^2 copper cored cable for inter-tripping purposes and a fibre optic bundle.
Laying method	Conventional Cable Lay – cable laid in same direction as prevailing tide by specialised cable lay vessel. Ductile iron cable protection will be fitted to the cable in the high-energy areas of the surf zone and inter-tidal zone.
Subsea cable termination	Following the laying of each cable, the cable ends will be sealed, capped and a pulling head fitted. This end will be attached to a retrieval chain to allow fitting of a through joint to be installed onto a device umbilical when available for installation. The cable will be retrieved from the seabed by grappling for the chain.
Post installation survey	A post installation survey will be carried out by ROV to check the stability of the cables and ascertain if any further cable protection is required.
Duration of works	Offshore works will commence in early August 2005. The exact date is tide dependent and is yet to be confirmed. The 4 cables will be laid over a period of 7 consecutive days.

S.3 Environmental impact assessment (EIA) process

While all developments are not automatically required under the Environmental Impact Assessment (Scotland) Regulations 1999 to carry out an EIA, it has been carried out as a matter of good environmental practice and to support consent and lease applications. The process included an informal consultation and scoping exercise, where a number of local and national stakeholders were approached to ensure the scope of the EIA covered all relevant issues. The responses from the scoping exercise helped to identify areas of potential impacts, and where further studies were required. Any identified data gaps have been addressed as far as possible within the timescale of the EIA.

The environmental assessment requires an understanding of the proposed construction and operation of the proposed tidal test facility and the environment upon which there maybe an impact. This then allows identification of all potential sources of risk to the environment as well as any particular environmental sensitivity. Having identified all potential hazards, the potential environmental impacts are described together with any mitigation measures that will be put in place to avoid and/or minimise impacts. This then enables an evaluation of the significance of any residual impacts. The findings of the EIA process are reported in the Environmental Statement (ES).

As the EIA for the tidal test facility progressed and uncertainties in scientific understanding were identified, specific initiatives to address the issues identified were commissioned. These included undertaking a number of surveys to generate baseline environmental data and the commissioning of a range of experts to undertake specific scientific studies to assist in the assessment of impacts. The following key areas of uncertainty were identified:

- European, nationally and locally protected species and habitats in the area, specifically seals, otters, cetaceans, birds, reefs and dune systems, and the impacts the test facility may have on these;
- Potential for sites of archaeological interest;
- Impact of the construction and long term presence of the tidal test facility on coastal and seabed processes; and
- Risk to shipping.

S.4 Environmental overview

S.4.1 Physical environment

The south west coast of Eday from Seal Skerry extending to Newbigging comprises of low-lying dune systems. From Newbigging to beyond War Ness sandstone cliffs with moderately exposed bedrock through the intertidal area dominate. Parts of the coastline are undergoing slow retreat.

Offshore, the ridged bedrock is exposed through much of the test area with occasional boulders, but is swept of any potential mobile sands or gravels. The chart depth readings decrease steadily from 1 m at the coast to between 34 and 51 m in the main channel where the tidal devices are to be deployed.

The Fall of Warness area is subject to strong tidal streams, with peak spring tide speeds in excess of 3.5 m/s.

S.4.2 Biological environment

Habitats and communities

The coastal edge below Cauldale comprises of a small bay dune site of fixed acidic grassland with limited strandline vegetation of low conservation importance. Inland, the area is predominantly semi-improved grassland. The shores around the south west coast of Eday follow the typical pattern of habitats and communities associated with exposed to moderately exposed rocky shores. The seabed surveys undertaken as part of the EIA process identified the sub-littoral areas as being sparsely inhabited with no species of conservation value. The area surveyed was fairly uniform in regard to the limited species fauna in the area. The seabed ranges from eroding sub littoral sandbanks in the east of the area, to smooth scoured bedrock ridges and platforms towards the centre of the test site area.

Wildlife

There are a number of populations of international, national and local importance potentially at risk from the activities of the proposed developments these are described in Table S.2 and seasonal senstivities summarised in Table S.3.

Table S.2 Distribution of protected species

Species	Protection	Location
Otters	Listed in Appendix 1 of CITES, Appendix II of the Bern Convention, Annexes II and IV of the Habitats Directive, and protected under schedule 5 of the Wildlife and Countryside Act 1981.	Evidence of otter activity where suitable habitat is present along the south west Eday coastline.
Harbour (common) seals	Listed in Annex II of the European Habitats Directive. They are also protected under the Conservation (Natural Habitats etc) Regulations 1994 and the Conservation of Seals act 1970.	Haul out sites on Muckle Green Holm and Little Green Holm (SSSI sites), and Seal Skerry. Movements of seals through the Fall of Warness area are unknown.
Grey seals	Listed in Annex II of the European Habitats Directive. Also protected under the Conservation (Natural Habitats etc) Regulations 1994 and the Conservation of Seals act 1970.	Haul out sites and breeding colonies on Muckle Green Holm and Little Green Holm (SSSI sites) and Faray and Holm of Faray (SSSI and marine SAC). Haulout site on Seal Skerry and The Graand. Movements of seals through the Fall of Warness area are unknown.
Cetaceans	Listed in Annex II of CITES, Appendix II of the Bern Convention Annex, and in Appendix IV of the EC Habitats Directive as species of European Community interest and in need of strict protection. They are also protected under Schedule 5 of the Wildlife and Countryside Act, 1981.	Harbour porpoise are regularly observed in Eday waters. Other species that have also been recorded in the area include, minke whale, killer whale, pilot whale and white-sided and common dolphins.

Species	Protection	Location
Shore birds – ringed plover, meadow pipit and rock pipit.	Protected under the general provisions of the Wildlife and Countryside Act, 1981. The ringed plover is listed in the Local Biodiversity Action Plan (LBAP), and all three species are listed as species of local priority.	Nest on beach below Cauldale.
Cormorants	The cormorant is protected under the general provisions of the Wildlife and Countryside Act, 1981. Also listed in the LBAP, due the decline in population numbers in Orkney of approximately 30% in the last 20 years.	Important breeding colony on Little Green Holm.

Table S. 3 wildlife sensitivities

Otters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Where suitable habitat is present along south west Eday coastline, otter resting sites, feeding areas and potential holts have been identified. Otters normally cub in the winter months in Orkney, although they can breed at any time of the year. Due to lack of evidence it is not possible to identify a seasonal sensitivity for the otter, but due to this European protected status any disturbance of these species would receive a high sensitivity ranking.												
Shore birds	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ringed plover, meadow pipit and rock pipit use the stretch of coast below Cauldale for nesting from May to the end of July.												
Common seals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Common seals pup in early June and July, and this is followed by a moulting period in late July and early August. The closest haulout sites to the proposed facility are at Seal Skerry, The Graand (on the south coast of Eday), and on Muckle and Little Green Holms. The moderate sensitivity refers to the risk of pup abandonment due to disturbance, which can increase the mortality rate.												
Grey seals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
The grey seal breeding season is from early October to late November. The moulting period follows in January to March (females), and March to May (males). Grey seal breeding colonies are located on Muckle and Little Green Holms, and Faray and Holm of Faray (approximately 4 km north of Seal Skerry). The moderate sensitivity refers to the risk of pup abandonment due to disturbance, which can increase the mortality rate.												
Cetaceans	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minke whale, killer whale, pilot whale, harbour porpoise and white-sided and common dolphins have all been recorded in the Fall of Warness, but there has been no systematic watching of cetaceans in this area.												
Seabirds	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
There is an important cormorant breeding colony on Little Green Holm (April-June). If the birds are disturbed there is a risk that gulls will steal the eggs.												

Key: High | Moderate | Low | No interaction | Unclear due to lack of available data

S.4.3 Human environment

The island of Eday has recently been included in the 'Initiative at the Edge' programme. Whilst farming provides the backbone of the economy, tourism and craft are making an increasing contribution, and the islanders hope that inclusion in the programme will offer further opportunities for diversification.

The Islands of Orkney have an international reputation for the quality and numbers of archaeological sites. A survey undertaken on Eday in the areas likely to be affected by the proposed development however identified that there were no Scheduled Ancient Monuments, Listed Buildings or designated landscapes within the Cauldale area. Cauldale itself is however considered of local importance as an example of a 19th Century croft, a diminishing and under-protected part of the cultural resource, and features including a stone footbridge were identified within the area of the proposed construction site. In addition an horizon of flagged stones was identified on the dune edge, which could be the remains of a steading, or date back as far as the first millennium AD. A number of ships are known to have wrecked in the Fall of Warness in the last 300 years, and a Spitfire went down during World War II 'off Eday'.

There are a number of different users of the stretch of water in which the test site is to be located. The Fall of Warness is used for passage by cruise liners and pelagic fishing boats, creel fishermen regularly fish the

inshore shell fishing grounds, and the inter island ferries use a number of routes through the channel which vary in response to tidal and weather conditions.

S.5 Key environmental impacts

S.5.1 Construction and installation of test facility infrastructure

Overall the impacts of the installation of the onshore and offshore infrastructure for the tidal test facility were found to be broadly acceptable with identified mitigation in place.

Physical environment

Of the possible physical impacts, the seabed and coastal review carried out as part of the EIA concluded that there would be no impact on seabed and coastal processes.

Biological environment

Of the possible biological impacts, no terrestrial or marine habitats (including maerl and *modiolus* beds) of any conservation importance were identified. The shore birds identified of local importance should have finished nesting before onshore and landfall construction works start in early August. The seal haulout at Seal Skerry is thought to be far enough away from the onshore construction site not to be disturbed by any construction noise, and seals will avoid the areas of activity at sea when the cable is being laid.

The main concern during the construction phase is related to the potential for disturbance of otters at the landfall site. This species has European Protected status, and stringent mitigation measures have been developed to ensure impacts are mimimised. An assessment of the survey data collected during the EIA led to the decision that a further survey should be carried out prior to the start of onshore construction to ensure no natal/occupied holts are present, and if necessary an otter handling licence applied for. In addition, outside construction work will be restricted to between the hours of 0800 and 1800 or two hours after sunrise to one hour before sunset, which ever is the later. All drivers using the access road are to be made aware of the presence of otters and warning signs used to enforce this. A pre construction briefing of all staff involved will also address environmental awareness. Should any concerns relating to the disturbance of otters arise during the construction of the control building Aurora Environmental will be notified immediately and liaise with appropriate experts as to the options which might be followed to mitigate the concern.

All appropriate measures will be implemented to ensure that the risk of pollution during construction activities will be minimised. These measures will be detailed in the Construction Method Statement that will be submitted to, and agreed with, SEPA prior to the commencement of works.

Human environment

Of the possible human impacts it is concluded that any visual impact attributed to the construction and installation activities will be very localised and of a temporary duration.

Creels may have to be temporarily removed from the cable landfall area during cable laying, but this would only be for a short duration, and will be carried out in consultation with the affected fisheries organisations and fishermen.

An archaeological survey carried out identified a number of vulnerable sites within and adjacent to the proposed onshore site, and measures have been outlined to afford these sites protection. Key areas including the Cauldale farm buildings and ruined yard and the stone footbridge on the south east edge of the construction site. If the proposed works are going to impact the flag horizon of unknown origin a watching brief should be undertaken which would be upgraded to a full excavation if the remains proved to be of importance. Discovery of any archaeological remains during construction will result in immediate cessation of operations in the immediate vicinity of the find, and archaeological experts will be brought in to carry out investigations.

An estimated 9% of the total project expenditure (£550,000) will be spent in Orkney directly purchasing goods and services from local businesses. In addition it is anticipated that the construction of the onshore facility and any upgrades of the Stromness data centre will be sub-contracted to Orkney contractors sustaining 15 jobs. The construction work may offer direct job opportunities for Eday residents, but this will depend on the labour requirements and work schedules of the Orkney based subcontractors. Some of the workforce may stay in accommodation on the island, however the initial part of the construction period covers the peak months of the tourist season when accommodation providers are already busy. In addition to accommodation providers, other local businesses that could benefit from the construction work and personal expenditure of workers while on the island include the shop and local farmers etc providing equipment and services to the contractors.

Cumulative impacts

The majority of impacts associated with the onshore and offshore construction and installation activities are temporary disturbance impacts to wildlife, habitats, the local population and tourists and other sea users. These impacts will be of short duration and the studies undertaken to support the EIA indicate that following construction the present status quo will be quickly restored. The mitigation and management measures proposed in relation to potential impacts on cultural heritage interests will ensure that there are no significant impacts to the cultural heritage of the area.

S.5.2 Operation of test facility

Although the scope of the EIA does not include consideration of device specific impacts, it has considered the broader generic impacts from the presence of a tidal test site at the Fall of Warness. The specific impacts of individual devices will be addressed in device specific ESs, following the EMEC guidance on environmental impact assessment for test devices.

Physical environment

Seabed and coastal processes

With the data currently available, the seabed and coastal review undertaken concluded that the operation of the proposed tidal test facility would have little to no impact on seabed and coastal processes, including erosion of the cliffs, and disturbance to the seabed. An insignificant loss of overall tidal stream speed of 0.25% for the Fall of Warness area was predicted, resulting in no overall modification of the marine environment. The presence of cables with concrete mattress covering in the intertidal zone may in the long term influence beach draw down and long shore drift. However, due to the highly mobile nature of the beach material the degree of sand cover is expected to vary considerably over time and any impacts within the scale of natural variability.

Biological environment

Benthic habitats and communities

The seabed that the cables are to be laid upon and where device foundations/moorings are to be placed is heavily scoured and sparsely populated with no sensitive habitats or communities identified. The regular ROV surveys planned to inspect the cables will act to ensure that the prediction of no significant to the benthic environment is confirmed.

Wildlife

Particular concerns relating to the possible interactions between wildlife and devices, and the lack of baseline environmental data was a major issue identified during the EIA. Internationally and nationally important breeding colonies and haul out sites of grey and common seals have been identified in the vicinity of the test site. The group considered to be the most vulnerable are the large number of grey seal pups born adjacent to the test site when they go to forage at sea for the first time. Due to the novel nature of tidal technology, the effects of tidal turbines on seals are unknown. The extent to which seals use the Fall of Warness is also unknown, as are the movements of cetaceans. Casual recordings suggest that it is a regular feeding ground for harbour porpoise and used for passage by other species including minke, killer and pilot whales and white-sided and common dolphins. There is also concern that diving birds may be at risk from interaction with devices, however again there is little data available on the presence of such species in the Fall of Warness area.

The need to start monitoring seal, cetacean and diving bird use and movements in the Fall of Warness has been recognised, and plans to initiate a counting programme are underway. Once these data are available it will be possible to decide if mitigation strategies need to be put in place to afford these populations adequate protection.

Human environment

Socio-economic issues

The operation of the tidal test centre will have a number of economic benefits. It is estimated that 4 new full time jobs will be created at the Stromness data centre. Each developer will also have a small number of staff working in Orkney for varying lengths of time that will generate both personal and business expenditure in Orkney. Benefits to the island of Eday include occasional overnight stays in local accommodation by EMEC staff and developers visiting the Eday facility. The facility will also support the ongoing development of the renewable energy sector in Orkney and provide a test facility of national importance to the development of tidal energy, which will, for example, help manufacturers/developers to sustain and create jobs.

The creel fishing sector contributes a major part to the Orkney fleet due to the decline of the white fishing industry. Up to 14 boats are known to fish in the inshore waters of the Fall of Warness primarily within the 15 m contour, although occasionally creels may be deployed to 30 m and thus on the periphery of the test site. It is not anticipated that creel fishermen will be unable to access any of their habitually used grounds.

Other sea users

The other major concern from the presence of the test site is that of risk to navigation. The results of a separate navigation risk assessment carried out by Abbott Risk Consulting Ltd have been discussed within the ES. Management controls and mitigation measures identified centre on the potential for physical interference of the devices, and the need for appropriate siting of devices, charting and navigation marking to be identified. The navigation risk assessment recommends that during the construction and installation phases of both the test facility elements and the devices normal precautions and controls for such work need to be enforced. During the on-going operation of the test facility, devices which present a hazard to navigation in their normal operating modes should be individually charted and lit/marked appropriately. The test facility area should be defined to encompass only the area in which devices will be deployed such that it is no bigger than is absolutely necessary in order not to unduly constrain vessels. The area should be charted and marked by buoys/lights in order that mariners are aware of the extent of the potential hazard from tidal devices. Issues relating to specific device locations and characteristics are still being assessed and development of appropriate navigational requirements ongoing.

All sea users will be kept informed of intended works via a Notice to Mariners, and a site-specific marine awareness chart detailing locations of test berths and testing activities will be distributed.

In addition to the navigation hazard, there is also potential for harbour congestion from the presence of unusually high number of vessels in Eday/north isles of Orkney. It is imperative that individual developers identify their likely needs early and undertake appropriate consultation with the local harbour authority.

Visual and landscape impact

The onshore building and landscaping has been designed to be sensitive to neighbouring properties, being of traditional Orkney construction with building finishes proposed as dark rendering and a slate tiled roof in accordance with OIC planning approval. In addition the building will be sunk 1 m below existing ground level and screened with bunding. Although the new building will represent a distinct new feature on the landscape, close views will only be obtainable from the immediate neighbours and occasionally from walkers on the coastal path. From the sea, users will have distant views of the facility as part of an existing cluster of buildings.

Little of the offshore infrastructure and devices will be visible from either the island of Eday or by sea users. Of the generic device types considered, the barge mounted device will lie very low in the water and only be visible from close range in calm weather and sea conditions, a rare occurrence. The monopile device, which extends some 9 m out of the water, will only be visible as a distant dot on the horizon from the shore on days with clear visibility. However it should be noted that surface present devices are expected to be marked with navigational markers e.g. lights, which will be clearly visible in all weather conditions and at night.

Archaeology

Of the identified wrecks known to have been lost in the vicinity of the Fall of Warness, no wreckage has ever been found either historically or during recent seabed surveys, and due to the strength of the prevailing currents it is considered extremely unlikely any wreckage exists. If any evidence of these wrecks is found during operations at the test site it will be reported to the County Archaeologist.

Cumulative impacts

As the EIA has only addressed generic issues from the presence and operation of the test site it is not possible to provide a detailed assessment of the potential cumulative impacts. This is something that will need to be addressed in a dedicated research programme of work. EMEC are in discussions with UKERC about forming research partnerships with a variety of institutions, which will address this and other as yet unidentified issues, related to marine energy devices.

S.6 Environmental management plan

An important aspect of the EIA process is mitigation and management planning and the production of the environmental management plan (EMP). Proposed mitigation and management measures have been developed as part of the EIA process in collaboration with the project team and relevant stakeholders.

As a result action checklist/EMP has been produced which documents all the mitigation and management measures identified and detailed in this ES (see Section 11). These commitments will be incorporated into the Tulloch project management system to ensure they are carried through to implementation. It is expected that the EMP will evolve and be updated through final design prior to construction and installation.

Following the construction and installation phase of the project EMEC will become the operator of the tidal test facility. It will be important to ensure that any outstanding issues relating to the EMP are adequately communicated during the project handover.

S.7 Monitoring

During the EIA process possible impacts on the environment have been identified. It is important that once facilities are in operation that such possible impacts are assessed, therefore a robust environmental monitoring strategy is integral to the EMEC IMS. In order to be able to adequately address the actual impacts, this EIA has highlighted that data gathering is required to have a sufficient knowledge of the background environmental conditions. Further studies will also be required to investigate impacts from test devices on sensitive populations.

EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations. It is also involved in plans with a number of other research institutions to identify the knowledge gaps and initiate research aimed at addressing these.

Such research data will be important to developers in order to support future applications for the development of larger scale commercial projects.

S.8 Conclusions

The broad conclusions are that with the identified mitigation strategies in place, the impacts of the construction and installation of the infrastructure for the proposed tidal test facility will be minimal. The main area of concern is with regard to the potential for otter disturbance at the landfall site. This species has European Protected status, and stringent mitigation measures have been developed.

While an attempt has been made to predict the range and character of potential impacts associated with the new technologies, a high degree of uncertainty and ignorance exists. Particular concerns relating to the possible interactions between wildlife and device operation, and the lack of baseline environmental data to

inform the impact assessment process. During the consultation process monitoring requirements were identified, and have been included in the project Environmental Management Plan.

The developer of each individual prototype device will produce an Environmental Statement in accordance with EMEC guidance, and the baseline data that will inform this process, particularly with regard to wildlife interactions, is due to be collated in the near future.

Although there are a number of uncertainties associated with the operational phase of the facility this should not be unexpected given that the facility is to be used for the testing of new technologies. The facility will be used to test not only the technical performance of tidal technologies, but also advance understanding on environmental issues.

1 Introduction

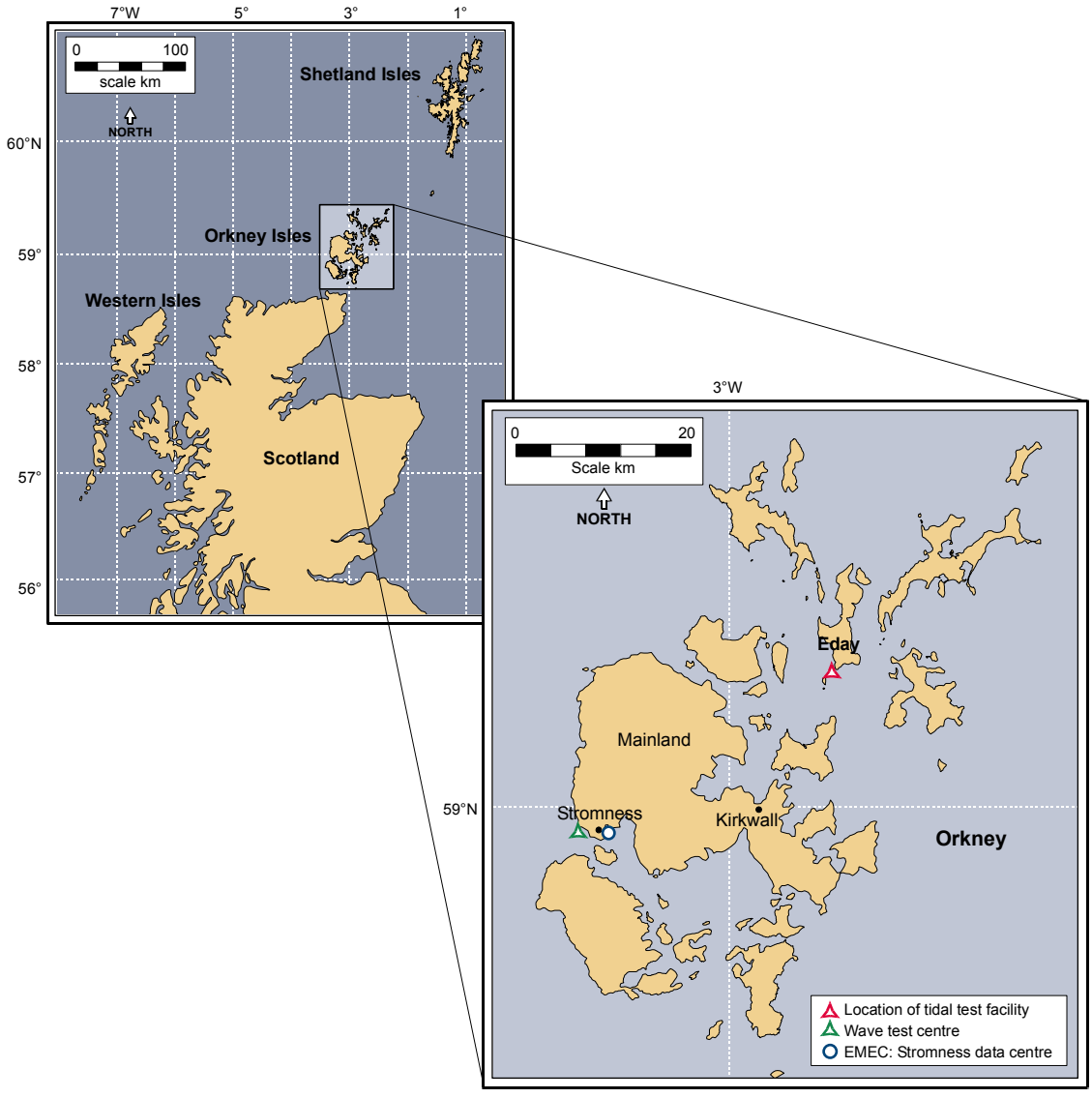
1.1 Background to the project

When the European Marine Energy Centre (EMEC) was established by Highlands and Islands Enterprise (HIE) and its funding partners in 2003, it was with the intention of stimulating and accelerating the development of both wave and tidal prototype energy generating devices. The wave test centre is now well established, and the next phase is to establish a consented tidal test site ready for deployment by developers in the future.

As part of the on-going Prime Contracting Framework Agreement, Highlands and Islands Enterprise (HIE) has engaged Tulloch Prime Contracting Limited (Tulloch) to undertake the design and construction of the proposed tidal test facility to be located within the Fall of Warness, Eday, Orkney (see Figure 1.1).

The establishment of a test centre for assessing the performance of new and developing tidal energy technology is a strategically important facility for Scotland and the UK. It is believed that tidal energy could make an important contribution to securing future UK energy supplies and that this in turn will contribute to reducing CO_2 emissions arising from energy production.

Figure 1.1 Location of tidal test facility



It is still necessary to ensure that in establishing such a facility it is undertaken in a way as to minimise all environmental impacts during its construction and ultimate operation. It is therefore necessary to develop and undertake a programme of environmental work that will support the design work, approval process, construction and operation of the tidal test facility. AURORA Environmental Ltd (AURORA) has been contracted by Tulloch to undertake the environmental works for the construction and installation phase of the tidal test facility, including a number of baseline studies and the production of an Environmental Statement (ES) to support consent applications.

It should be stressed that the scope of the Environmental Impact Assessment (EIA) covers the construction, installation and generic presence of the test site, but does not cover the installation and testing of individual prototype devices. In order to be able to assess the impacts of the long-term presence and operation of the site, it was necessary to consider a range of likely potential devices at a generic level. However, detailed consideration of individual devices will be the responsibility of each developer making use of the site. To this end, EMEC has developed EIA guidance for potential developers in consultation with a wide range of regulatory organisations and local stakeholders (EMEC 2005). These require developers to produce an Environmental Statement (ES) for specific devices. EMEC is in the process of agreeing with consenting bodies on the process through which these ESs will be reviewed.

1.2 Purpose and scope of the environmental assessment

The EIA is a process that identifies the areas where significant environmental impacts are likely to occur as a result of a development, and outlines any mitigation measures/management controls aimed at reducing or ideally offsetting these impacts. The Environment Statement (ES) reports the findings, which informs stakeholders and statutory consultees and provides recommendations for the establishment of an environmental management and monitoring plans. In addition, it forms the framework for future environmental works in connection with the operation of the tidal test site.

Within the EIA process there are a number of key factors to be considered:

- The environment is considered to include both ecological and socio-economic components;
- Interactions between the environment and the project can operate in two directions, effects from facilities/activities and effects upon facilities/activities;
- The overall aim should be to optimise impacts, reducing negative ones and maximising positive ones;
- The methods used for identifying and assessing impacts should be transparent and verifiable, with any remaining areas of uncertainty or gaps in knowledge clearly stated; and
- The implementation of the environmental programme will work within budgetary and schedule constraints, with the overall aim of producing the best outcome for the project.

The key phases of the programme are scoping, consultation, environmental investigations/surveys, design support, impact assessment, reporting, and gaining approvals/consents. The ES reports the findings of the EIA process.

The scope of the EIA includes:

- Installation of onshore building & access road & long term presence;
- Installation of offshore cables & long term presence;
- Presence/use of tidal facility - generic issues only not specific device impacts.

While the need for land markers to demarcate the limit of the test site covered by the Crown Estate lease has been rejected at this stage, the potential environmental issues that would arise should the proposal ever be resurrected in the future have been broadly considered in this document (see Section 6.2).

The tidal test facility is being established to allow developers to test and evaluate their devices. The devices to be installed will not be limited to a single type, so for the purposes of this assessment the devices are being

considered at a generic level, based on the technologies that are known to be interested in testing at the site (see Appendix A for details).

1.3 Legislative framework

While all developments are not automatically required under the Environmental Impact Assessment (Scotland) Regulations 1999 to carry out an EIA, it is considered good environmental practice, particularly in the situation where new technologies are involved. With regard to the main subject of this study, the establishment of the infrastructure of the proposed tidal test facility, an EIA was not requested as a condition of planning approval. However, the importance of identifying sensitive environmental receptors prior to the deployment of devices in the future is recognised, to allow mitigation strategies to be discussed and to inform final device design decisions. In addition, the ES provides support to a number of consents and approvals (see Table 1.1).

Before any devices are installed in the future and power starts to be generated from the test berths, they will be individually required to produce an ES (see Section 11.4). Under the Electricity Works (Environmental Impact assessment) (Scotland) Regulations 2000 there is a requirement to undertake an EIA for offshore electricity developments in excess of 1 MW.

Recent changes in environmental legislation will impact on the regulatory and consent processes. Under the Water Framework Directive (WFD) that came into force in 2000 and the Water Environment Water Services (Scotland) Act 2003, the Scottish Environment Protection Agency (SEPA) has a duty to achieve good ecological status in all water bodies by 2015. The Nature Conservation Act (Scotland) 2004 introduces a new duty to further the conservation of biodiversity which will apply to all Scotland's public bodies who must ensure that biodiversity issues are at the heart of both their policy-making and their day-to-day operations. Statutory consultees including SEPA and Scottish Natural Heritage expect consideration of these recent changes to be reflected in this document.

Prior to commencement of any works there are a number of statutory consents and approvals that have to be gained and these are detailed in Table 1.1. This ES supports these consent applications.

Table 1.1 Legislative framework

Regulations	Authority	Consent requirement
Onshore works		
Town and Country Planning (Scotland) Act 1997	Orkney Islands Council	Planning permission has already been granted for the onshore facility with conditions attached on the design of the building under Section 57 of the Town and Country Planning Act (See Appendix B).
Offshore works		
Crown Estate Act 1971	Crown Estate	A Crown Estate lease is required for use of the seabed within 12 nautical miles of the UK coastline. This consent is recognition of The Crown Estate's landowning interest as is separate to any statutory permission that may be required from other Government departments.
Food & Environment Protection Act 1985 Part II Deposits in the sea (FEPA)	SEERAD department -Fisheries Research Services - Marine Laboratory	Under FEPA a licence is required for the placing of materials in the marine environment during construction and related actions, and the depositing of any articles or substances on or under the seabed. The primary objectives of the legislation are to protect both the marine ecosystem and human health, and to minimise nuisance and interference to other legitimate users of the sea. In deciding whether to grant a licence, the licensing authority will pay particular attention to the environmental implications and other effects of the work including: • The potential hydrological effects; • Interference with other marine activities;

Regulations	Authority	Consent requirement
		• Potential risk to fish and other marine life, including mammals, from contaminants, noise and vibrations; • The effects of increasing turbidity and potential for smothering/burial of benthic fauna and flora; and • Any adverse implications for designated marine conservation areas.
Coast Protection Act 1949 (section 34) (CPA)	Scottish Executive (ETLLD), Transport Division	Section 34 of the Coast Protection Act provides for the restriction and removal of works detrimental to shipping. Written consent is required if the works (while being carried out or subsequently) could cause obstruction or danger to shipping. With respect to the proposed development this applies to the following: • The construction, alteration or improvement of any works on, under or over any part of the seashore lying below the level of mean high water springs; or • The deposit of any object or materials below the level of mean high water springs.
Presence of test devices		
Electricity Act 1989 (section 36)	Scottish Executive (ETLLD)	This Act provides the core legislation for planning consents for the construction and operation of generating stations. Electricity generation proposals over 50 megawatts onshore and 1 megawatt offshore fall to be authorised under section 36 of the Electricity Act 1989, The Electricity (Applications for Consent) Regulations 1990 and the associated Electricity Works (Environmental Assessment) (Scotland) Regulations.

National planning policies

During the EIA, reference was made to relevant national planning policies, in particular, Planning Policy Statement 22: Renewable Energy, which states that:

- The wider environmental and economic benefits of all proposals for renewable energy projects, whatever their scale, are material considerations that should be given significant weight in determining whether proposals should be granted planning permission;

- Planning permission for renewable energy developments likely to have an adverse effect on a site of international importance for nature and heritage conservation (including Special Areas of Conservation), should only be granted once an assessment has shown that the integrity of the site would not be adversely affected;

- If the renewable energy development would have an adverse effect on the integrity of an internationally designated nature conservation site, planning permission should only be granted where there is no alternative solution and there are imperative reasons of overriding public interest, including those of a social or economic nature; and

- In sites with nationally recognised designations (including Sites of Special Scientific Interest), planning permission for renewable energy projects should only be granted where it can be demonstrated that the objectives of designation of the area will not be compromised by the development, and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits (ODPM 2004).

Planning Advice Note PAN 45 (revised 2002): Renewable Energy Technologies covers the characteristics of the main types of electricity generation developments, using renewable energy resources, likely to be deployed in Scotland.

1.4 Data gaps and uncertainties

As the EIA for the tidal test facility progressed and uncertainties in scientific understanding were identified, specific initiatives to address the issues identified were commissioned. These included undertaking a number of surveys to generate baseline environmental data and the commissioning of a range of experts to undertake specific scientific studies to assist in the assessment of impacts. The following key areas of uncertainty were identified:

- European and nationally protected species and habitats in the area, specifically seals, otters, cetaceans, birds, reefs and dune systems and the impacts the test facility may have on these;
- Potential for sites of archaeological interest;
- Impact of the construction and long term presence of the tidal test facility on coastal and seabed processes; and
- Risk to shipping.

Thorough execution of baseline research allows the production of a robust environmental description focussing on the elements of the environment that are considered to be most sensitive to the proposed project and expert studies assist in the assessment of potentially significant impacts.

The following investigations/studies were commissioned as part of the EIA. Full details of the organisations/individuals used to undertake the work and their experience is provided in Appendix C. Full copies of supporting reports are provided on a CD in the back of this report. In addition the economist Brian Burns supplied data and analysis for inclusion in the ES discussion.

- Archaeological survey and assessment;
- Birds desk study and assessment (onshore and offshore);
- Coastal habitats survey;
- Coastal and seabed processes review;
- Coastal wildlife survey and cetaceans desk study;
- Assessment of impacts on otter populations;
- Navigation risk assessment;
- Seabed surveys – preliminary survey identified need for subsequent survey;
- Sea mammal study and assessment;
- Terrestrial habitat and vegetation survey;
- Visual and landscape assessment; and
- Input to the EIA on socio economic issues from an economist.

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2 Assessment of Alternatives

2.1 Introduction

The Environmental Impact Assessment Regulations 1999 requires "an outline of the main alternatives studied by the developer and an indication of the main reasons for his choice, taking into account the environmental effects". This assessment first considers the selection of the tidal test site and then the selection of the site of the onshore facility.

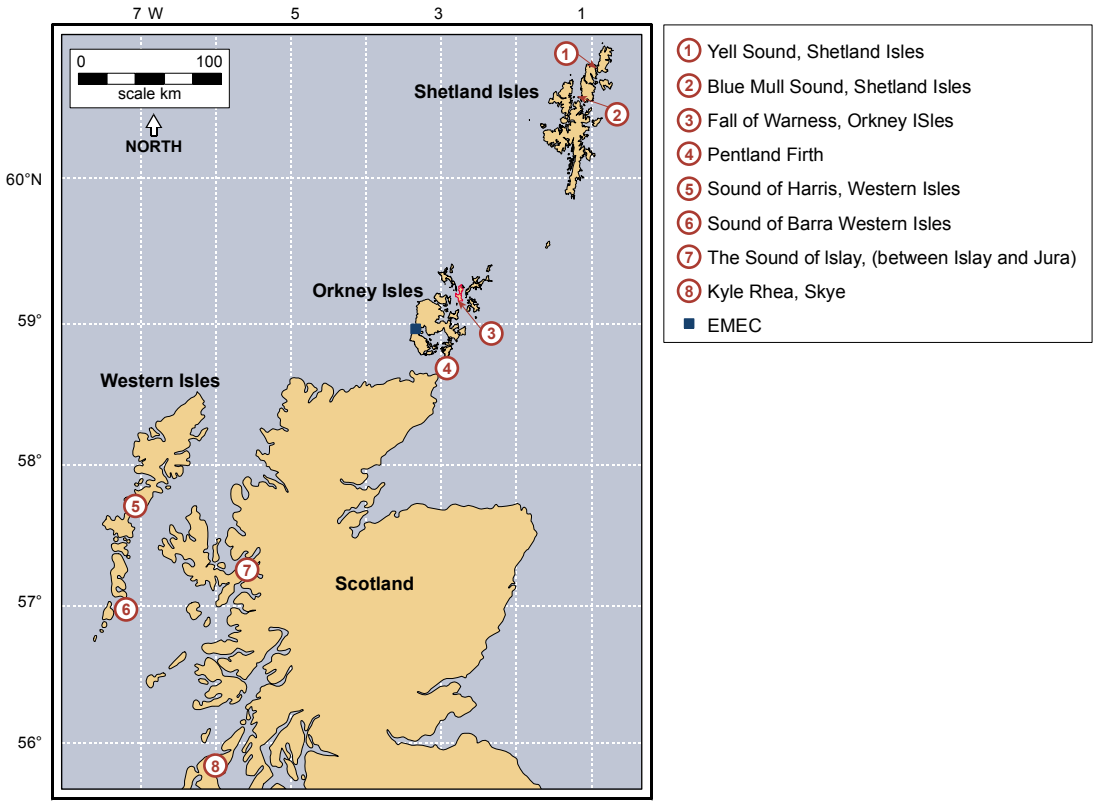
2.2 Alternatives considered

2.2.1 Tidal test site selection

HIE commissioned a study in February 2004 to determine the optimum site for a tidal test centre. A preliminary desktop study was undertaken study by Metoc plc to help determine the most appropriate tidal test site, based on a range of criteria (Metoc 2004). This high-level study first assessed the following eight sites in the Highlands and Islands region (see Figure 2.1).

- Yell Sound, Shetland Isles (YS)
- Blue Mull Sound, Shetland Isles (BS)
- Fall of Warness, Orkney Isles (FW)
- Pentland Firth (PF)
- Sound of Harris, Western Isles (SH)
- Sound of Barra, Western Isles (SB)
- The Sound of Islay (between Islay & Jura) (SI)
- Kyle Rhea, Skye (KH)

Figure 2.1 Location of sites screened



Phase 1 – initial screening

This stage comprised an initial review of all sites, based on tidal resource potential, water depths, channel width and integration with the existing EMEC wave test centre. Based on these criteria, Yell Sound, Fall of Warness and Pentland Firth were considered the three most favourable (see Tables 2.1 & 2.2).

Table 2.1 Screening criteria

	Desired criteria	Sites satisfying criteria
Tidal resource	Peak mean spring tidal current ideally 3.5 m/s	BS, YS, FW and PF
Channel dimensions-area over which tidal resource criteria are satisfied	Width ideally 1.50 km	YS, FW and PF (SH and SB but did not satisfy resource criteria)
Channel depth	30 – 50 m	YS, FW and PF

Source: EMEC; Tidal Phase – Preliminary Site Evaluation Study Metoc 2004

Table 2.2 Distance from EMEC

Site	BS	YS	FW	PF	SH	SB	SI	KH
Distance from EMEC (km)	232	205	35	30	260	310	385	234

Source: EMEC; Tidal Phase – Preliminary Site Evaluation Study Metoc 2004

When considering key environmental and stakeholder issues, all sites were regularly used ferry routes with Yell Sound being also used by deep draught vessels. The exception was Fall of Warness, an Area To Be Avoided by tankers, where shipping traffic was at a reportedly lower level, only occasionally used by cruise liners, and by ferries in adverse weather.

The eight sites chosen for initial screening were selected on the basis of potentially offering the desired physical resources (see Table 2.1). The combination of these characteristics also meant that all sites offered a suitable resource for shell fishing activity and suitable habitat for common and grey seal breeding sites. Cetaceans were important throughout all areas, although to a lesser extent in the Pentland Firth. Finally, all sites were located wholly, partly or adjacent to protected areas of national or international importance (SSSI, NSA, SPA and SAC).

The three most favourable sites were thus selected primarily on physical resource and distance from EMEC.

- Fall of Warness, Orkney;
- Yell Sound, Shetland; and
- Pentland Firth, Orkney.

Phase 2 – detailed evaluation

In the detailed evaluation, the three most favourable sites were ranked against a range of key criteria under the main headings of resource/physical characteristics, environmental sensitivity & constraints, and cost differentials as summarised in Table 2.3. For each issue, the most favoured site was ranked 1, the second 2, and the least favoured 3, and all issues were given equal weighting.

On the basis of indicative cost differentials alone, the Pentland Firth site would be the least expensive option, mainly as a result of lower predicted grid connection costs. However, initial discussions with a small number of potential developers indicated reservations about the Pentland Firth as a tidal test location because of relatively high wave exposure. With Yell Sound the relatively long distance from EMEC was seen as a problem.

Overall, the three sites were ranked in the following order of preference:

1. Fall of Warness, Orkney.
2. Pentland Firth, Orkney.
3. Yell Sound, Shetland.

Table 2.3 Phase 2 site evaluation; ranking of key issues

	Issue	Shetland Yell Sound	Orkney Fall of Warness	Orkney Pentland Firth
Resource/ physical	Tidal stream energy resource	1	1	1
	Channel width	3	2	1
	Range of channel depths	2	1	3
	Shelter from wave exposure	1	2	3
	Geology/seabed conditions *	-	-	-
	Sub total	7	6	8
Environmental sensitivity and constraints	Designated areas	1	1	1
	Benthic ecology	1	1	1
	Marine mammals	2	2	1
	Shellfish	2	2	1
	Fish spawning and nursery areas	2	2	1
	Birds	1	1	3
	Commercial fisheries and shellfisheries	2	1	2
	Human infrastructure & activities	2	1	2
	Wrecks and archaeology *	-	-	-
	Sub total	15	12	15
Cost differentials	Offshore pile installation (mob / demob)	3	2	1
	Marine cable installation	2	1	3
	Waiting on weather	2	1	2
	Logistics	3	2	1
	Labour	3	1	2
	Grid connection capacity (short-term)	3	1	2
	Grid connection cost (long term)	3	2	1
	Data communications	3	1	2
	Integration with EMEC	3	1	2
	Sub total	25	12	16
	Grand total	**47**	**30**	**39**

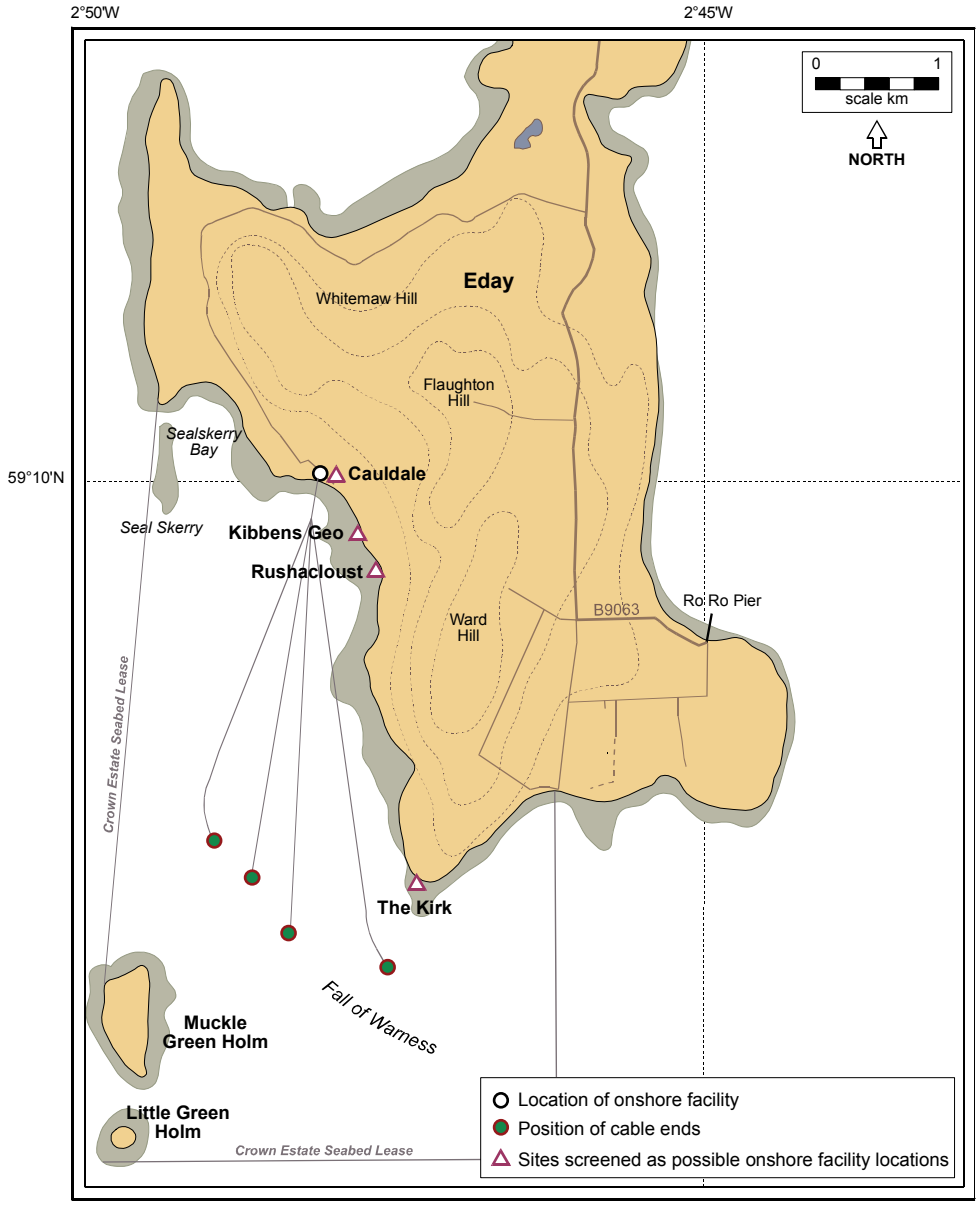
Source: EMEC; Tidal Phase – Preliminary Site Evaluation Study Metoc 2004

**insufficient data to allow assessment*

2.2.2 Onshore facility site selection

The location of the Fall of Warness on the west side of Eday severely restricted the possible locations for making landfalls with the cables. Due to the predominance of rock cliffs only 4 sites were considered; Kibbens Geo, Rushnacloust, Cauldale and The Kirk (see Figure 2.2).

Figure 2.2 Locations of possible landfall site



The selection process considered the following factors:

- Location:
  - o Proximity to proposed tidal sites;
  - o Proximity to existing infrastructure; and
  - o Location relative to tidal direction.

- Access:
  - o Ease of access during construction;
  - o Extent of new access construction;
  - o Perceived cost of access improvements; and
  - o Long term access issues.

- Site Conditions:
  o Existing site use;
  o Anticipated ground conditions at control building;
  o Anticipated ground conditions between MLWS and control building; and
  o Topography from MLWS to control building.

- Ease of construction:
  o Construction of control building;
  o Installation of cables between MLWS and control building; and
  o Construction of off site works i.e. grid connection and access roads.

- Impact of construction works on local area:
  o Disruption during construction; and
  o Disruption post construction.

- Available Construction Techniques.

- Long term construction issues.

- Relative Cost (CAPEX & OPEX).

One of the critical factors under consideration was location relative to tidal direction. Cables ideally should run in line with tidal flows and parallel to the rock strata, to reduce lateral strumming on the cables and damage through wear on the seabed. Although The Kirk was the closest site to the proposed test berths, offered a remote location requiring no unusual working restrictions during construction and was closest to the pier, the cable route from landfall to the individual test facilities would be perpendicular to the general tide direction resulting in the cables having a very limited lifespan.

Cauldale offers the most favourable routing to the test berths when the direction of tidal stream is considered. This location is closest to existing properties and the construction phase and operation of the site could be disruptive. However, the works will be of a relatively short duration, and every effort will be made by the contractor to reduce the impact. While the site at Cauldale is furthest away from the proposed tidal test berths, leading to a marginally higher construction cost than the other options, this would be offset by reduced operating costs due to lesser amounts of access roads to upgrade and maintain, and better topography above MLWS. The site is closest to the existing road system. Consequently the site at Cauldale was considered to offer the most favourable in terms of existing site conditions and the long-term operability of the control building.

A separate environmental screening study (Aquatera Ltd and Ecologic 2004) concluded that the site at Cauldale came a very close second to The Kirk, which when the above factors are taken into consideration supports the decision to site the substation at Cauldale, offering the Best Practical Environmental Option (BPEO).

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3 Development Description

When the EMEC was established in 2003, it was with the intention of facilitating the testing and development of both wave and tidal prototype energy generating devices. The wave test centre is now well established, and the next phase is to establish a tidal test site. The programme of works described in this section only covers the establishment of the test site and does not include details of the installation and testing of specific devices.

3.1 Site location and layout

The EMEC has proposed that the tidal test facility be built on the island of Eday in the Orkney Islands (see Figure 1.1). The test facility will comprise a new control building in a plot adjacent to Cauldale on Eday. There will be 4 export cables between 3,000 m and 4,000 m in length connecting to the 4 offshore test berths – comprising of cable connections but with no permanent moorings. The tidal test berths are located off the south western tip of the island in the area know as the Fall of Warness, lying between Westray Firth and Stronsay Firth (see Figure 3.1).

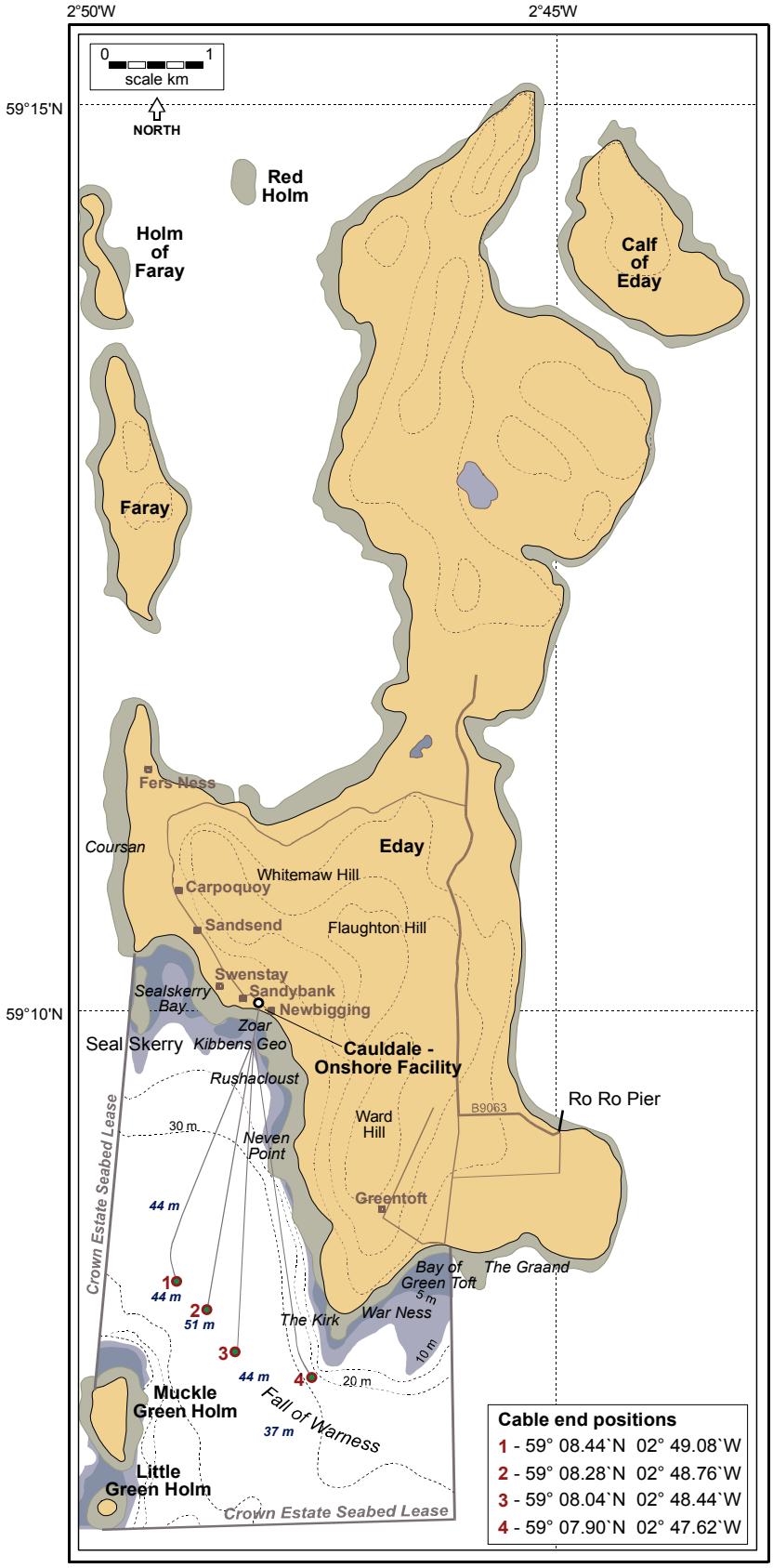
The nautical references of the proposed cable end positions are:

- Cable 1 – 59° 08.44' N 002° 49.08' W
- Cable 2 – 59° 08.28' N 002° 48.76' W
- Cable 3 – 59° 08.04' N 002° 48.44' W
- Cable 4 – 59° 07.90' N 002° 47.62' W

It should be noted that all cable end locations are subject to the provision of satisfactory tidal stream conditions. Cable 4 end point is also subject to review to resolve navigational issues.

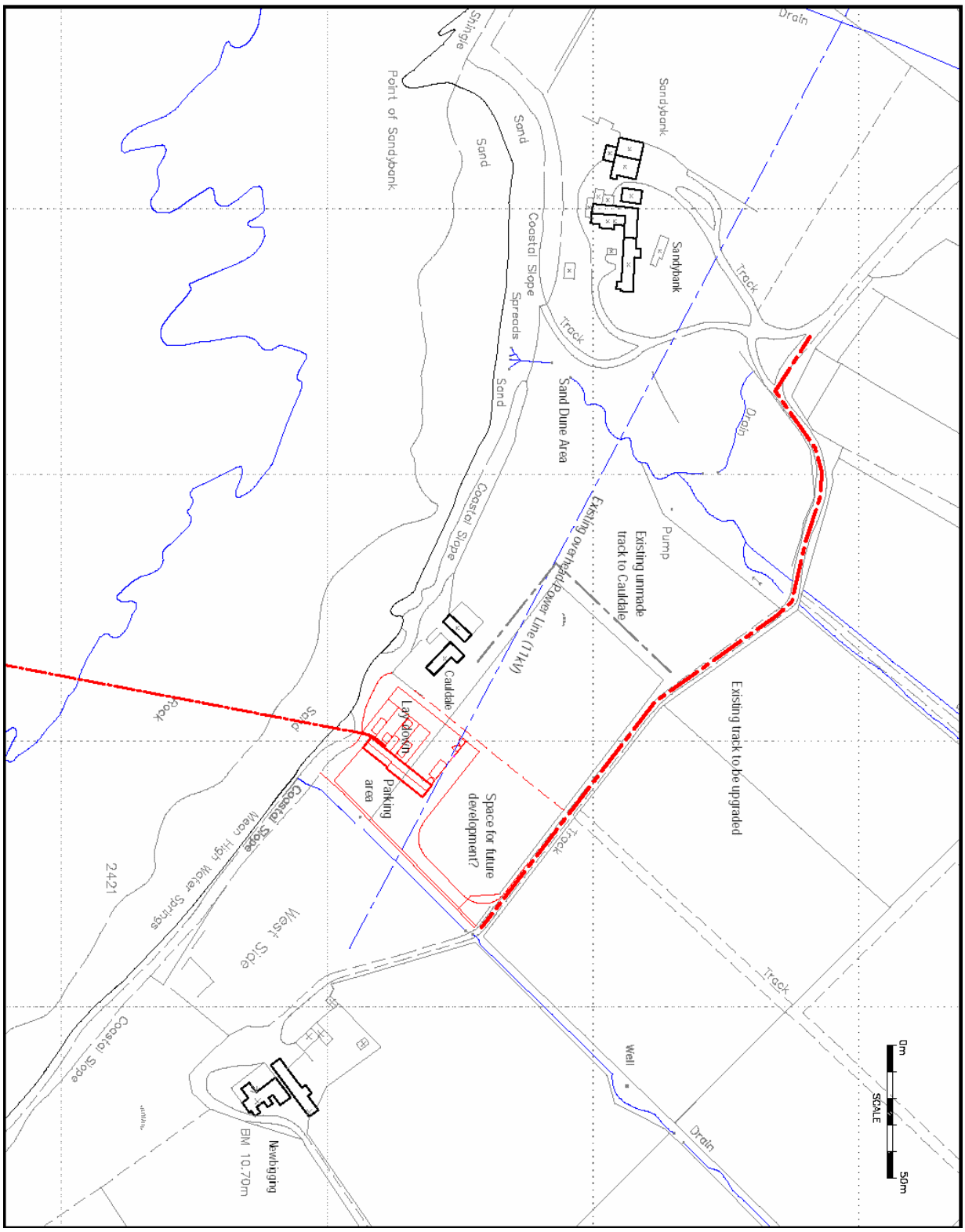
The new control building on Eday will house the main electrical and communication equipment for the tidal stream test facility and was chosen as it was considered the most favourable in terms of existing site conditions and the long-term operability of the control building (see Section 2.2). The site is adjacent to the derelict buildings of Cauldale and located on a farm track at the end of the Westside road 100 m before Newbigging Farm where the road ends. The total plot measures c55 m x 90 m. The proposed building measures c30 m x 5.5 m with a hard standing area c20 m x 15 m directly adjacent to the building providing space should individual developers wish to site a container there in the future. The site backs onto the coastline that will provide the landfall access for the electrical cables. For detailed layout of the onshore facility (see Figure 3.2).

Figure 3.1 Tidal test site



It should be noted that all cable end locations are subject to satisfactory tidal stream conditions. Cable 4 end point is also subject to review to resolve navigational issues.

Figure 3.2 Layout of onshore facility



3.2 Project schedule

It is proposed that the onshore construction works, as detailed below, will commence in August and be completed in approximately 3 months.

Table 3.1 Onshore construction schedule

Establish site compound	1 wk
Strip site/earthworks	1 wk
Construct new access roads	1 wk
Construct control building	8 wks
Construct hard standing	3 wks
External works	2 wks
Landscaping	2 wks

Electrical works in the control building will commence on completion of internal building works, with testing and commissioning to be completed by the end of 2005.

Offshore works will commence in early August. The exact date is tide dependent and is yet to be confirmed. The 4 cables will be laid over a period of 7 consecutive days.

The lifespan of the project is estimated to be 15 years, with individual prototypes being on site for between 6 months and 10 years.

3.3 Site construction and installation

The onshore facilities have been through the planning process and have gained full planning approval (see Appendix B).

3.3.1 Onshore – to MLWS

The proposed tidal test facility at Eday can be broken down into the following component parts:

- New control building located on the island of Eday;
- Construction of new access track to control building;
- Cable landfall;
- Delivery of construction material;
- Construction personnel; and
- Navigation markers.

Control building

The new control building on Eday will house the main electrical and communication equipment for the tidal stream test facility. A switch room, communication room with office, kitchen/personnel area and toilet will be provided. The building size will be approximately 30 m long x 5.5 m width. It is intended that a septic tank with a percolated discharge will be utilised, in compliance with Scottish Environmental Protection Agency (SEPA) regulations.

A 1,250 litre diesel tank to fuel site vehicles during construction will be incorporated into the permanent works as the fuel supply for the generator. The tank will be double skinned to provide adequate secondary containment in the event of a spill, located at least 10 m away from the coastline and sited on a concrete base.

Construction will be sympathetic to traditional Orcadian building techniques, being a long thin single storey building perpendicular to the coastline. The building finishings will be fully agreed with the local planning department and are proposed as dark rendering and a slate tiled roof, sympathetic to traditional Orkney construction. An external concreted hard standing area will be provided (approximately 20 m x 15 m) to site

containers for future developer use. In compliance with legal obligations security fencing (1.8 m high weldmesh with gate) will enclose the complete facility for the duration of the construction period. On completion, this will be replaced with standard wooden post and wire fencing identical to that in surrounding fields. Landscape bunding will be designed to screen the facility from adjacent properties. Material for construction of the bund will only be taken from excavation activities on the site, and not be removed from other areas around the site. Along with the bunding, excavating the ground level around the building to 1.0 m below existing ground level will help minimise the visual impact.

Cables will be taken from the foreshore to a cable draw pit, where they will be run in buried concrete ducts to within the building. The ducts will be fitted with lids to allow traffic movements above and also for ease of installation/removal of future cabling.

On completion, the facility will be remotely operated from the EMEC Stromness data centre. However, on occasion it may be necessary for site visits to take place for general maintenance or technical input once devices are in place in the future. A notice will be placed on the building exterior with emergency phone number/EMEC contact details.

Site access tracks

Hardcore access tracks to forestry standard Type 1 will be provided from the end of the public road network to the control building. The road shall be designed for full highway loading and geometrically for 20 tonnes articulated vehicle movements. Within the control building compound sufficient space shall be allocated for vehicle manoeuvring to allow installation/removal of developer containers. Road works carried out will be in consultation with Orkney Islands Council (OIC) roads department.

Cable landfall

Within the Preliminary Engineering Scheme Design Report (Tulloch 2005) it was specified that the cables would be buried through the intertidal zone, involving excavation of the bedrock. However, concerns raised into the negative impact on wildlife from the noise and vibration that the works would generate has led this approach to be reconsidered. The stratification of the bedrock beneath the sand cover offers natural grooves, likened to saw teeth, along which individual cables will be laid approximately 1 m apart. While it could be possible for the cables to be bundled together this option was rejected for both technical and environmental reasons. It was also felt that this option would be more intrusive in the existing landscape. The proposed solution is for the cables to be encased in specialized cast iron protectors throughout the shore, ensuring security and stability, and partially covered in local sand, if available. In addition, Armoflex concrete mattresses will be installed on the cable though the inter-tidal zone for added protection and to minimise the long-term visual impact. Armorflex is a flexible, interlocking matrix of concrete blocks of uniform size and weight connected by a series of cables that pass longitudinally through preformed ducts in each unit (see Plate 3.1).

Plate 3.1 Armoflex concrete mattress

The superficial sand cover over the main beach is assumed to be mobile under moderate to severe wave conditions, and it is likely that the area of visible bedrock will vary considerably as the sand is drawn down and returned by changing wave conditions. The vertical range of this mobility could be in excess of 2 m (H R

Wallingford 2005). Local reports indicate that the current level of sand is the lowest it has been for over 20 years.

Running seaward through the surf zone, the cable will be surface laid and continue to be armoured affording protection from wave action and scouring.

At the top of the beach a standard marine cable marker will be installed.

Plate 3.2 Cable marker board

Above the high water mark the cables will be laid in a trench to a depth of 900 mm with cable marker tape laid 150 mm above them, before termination in the control building.

It may be necessary for creels to be removed following consultation with local fishermen from inshore waters in the location of the landfall prior to cable laying.

Due to the high-energy nature of the shoreline, there is potential for the cables to be damaged by wave and tidal action, and it is proposed that they are inspected regularly down to mean low water mark, with remedial action taken as necessary.

Delivery of construction materials

It is anticipated that only limited road improvement works will be required with regards to the existing roads network to facilitate access by delivery lorries with construction materials. It is proposed that max 20 tonnes lorries be used, in line with those currently operating on the island of Eday. The road from the pier to the construction site progressively narrows to a single-track road with regular passing places. Where necessary, corner improvements will be carried out to allow articulated vehicle movements on the island. Any road alterations will be carried in liaison with OIC roads department.

Following consultation with OIC roads it may be that the road network in Eday is not suitable for the transport of construction aggregate. It may therefore be necessary to land aggregates on the beach at the landfall location. If this is required, it would be carried out over the course of one day, with the material being lifted directly from the vessel onto dumper trucks and transported directly to the construction site. The track made through the dunes to accommodate vehicular movements will be the same as the route used to installation cables. There will be no storage of materials on the beach.

Construction personnel

It is anticipated that there will be 2 full time operations managers from Tulloch Prime Contracting Ltd, with an additional 15 personnel sourced locally in Orkney. It is unknown as yet whether the construction personnel will be staying on the island or commuting on a daily basis. It is anticipated that the site will operate 12 hours a day (0800– 2000) 5 days a week, and with cars used to transport construction personnel to

and from the site. Outside construction work will be restricted to between the hours of 0800 and 1800, or 2 hours after sunrise and one hour before sunset, which ever is later (to avoid disturbance to otters).

Navigation markers

In the early stages of the project the HIE considered using land based markers based on a test site that covered the whole area of the Crown Estate lease, to be located at Seal Skerry, Muckle Green Holm, Little Green Holm and the Bay of Greentoft. It is now reasonably clear that testing will only take place at certain defined position within the site, so the need for land based markers has been rejected. While the need for land markers has been rejected at this stage, the potential environmental issues that would arise should the proposal ever be resurrected in the future have been broadly considered in this document (see Section 6.2).

In the preliminary assessment carried out by Highlands and Islands Enterprise (HIE), HIE proposed Seal Skerry as the location for a navigation land marker. Under the planned Northern Lighthouse Board (NLB) activities with respect to lights in the Orkney Isles, NLB plan to provide Seal Skerry with a light (GLA 2005), and thus this site will not be considered further in this document.

Abbott Risk Consulting Ltd on behalf of HIE has carried out a navigation risk assessment, and proposed mitigation measures with regard to the appropriate marking, lighting and navigation aids for the offshore test facility. These will be discussed further, and the exact specifications and locations of any navigation markers have yet to be finalised.

3.3.2 Offshore

The proposed offshore electrical system for the tidal energy test centre can be broken down into the following parts:

- Subsea cable installation; and
- Subsea cable termination.

Subsea cable installation

Two options were considered for cable installation. The first option considered was the Directional Drill method. This would involve pulling the cables along pre-drilled bores to the tidal test sites. While this method affords greater protection to the cables from tidal action, there are also significant technical difficulties associated with this technique. Therefore Conventional Cable Lay method was considered the favoured option.

The Conventional Cable Lay method is used by Scottish and Southern Energy to lay and land cables for their numerous subsea crossings. The cable design and routing is chosen such that it is robust, with sufficient weight so it does not move in the prevailing tidal stream and can withstand the environment at the landing site. The cable will be laid generally in the same direction as the prevailing tidal stream and if possible along notches in the rock strata. It is proposed that the vessel MV Galatea (see Plate 3.3) be used to lay the cables one at a time. The vessel will moor 250 m offshore from where the cable will be floated ashore. Ductile iron cable cable protection will be fitted to the cable in the high energy areas of the surf zone and inter-tidal zone, but beyond this point (subsea) the cable self-weight should be sufficient to prevent movement and possible damage. Once the cable has been secured ashore, the vessel will travel in the direction of the cable end point reeling the cable out the back. Once this point has been reached, the cable will be cut and capped (see below). Two support vessels will be required during cable installation operations.

Post installation a survey will be carried out by ROV to check the stability of the cables and to ascertain if any further cable protection is required where there is potential for damage to occur due to the action of the tidal streams. If necessary, divers will be deployed to do the work. The same process will then be used to check the cables on a regular basis.

This operation is weather and tide dependent, but it is expected that it should be possible to lay each cable in one day.

Plate 3.3 Cable installation vessel MV Galatea

Source: ICIT

Subsea cable termination (test berth)

Once the cable end position has been reached the vessel will be anchored and the cable cut. Before being lowered to the seabed, the cable end will be sealed, capped, and fitted with a 1 tonne clump weight, transponder and a pulling eye cable. This end would be attached to 80 m of Grade 2, 30 mm studless retrieval chain to allow recovery by grapnel for fitting of a through joint to be installed onto a device umbilical when the umbilical is available for installation. The cable would be retrieved from the seabed by grappling for the chain.

3.3.3 Electrical specification

The Supervisory Control & Data Acquisition (SCADA) system will allow EMEC to remotely monitor and operate switchgear in the Eday control building from it's data centre in Stromness. It will give developers access to the status and metering data from the circuit breaker associated with their own device. Data transfer to Stromness data centre is anticipated to be by Broadband telecoms link.

The proposed electrical/communications system for the tidal energy test centre can be broken down into the following parts:

- Cable specification;
- Control building on Eday; and
- Communications connection to Stromness data centre.

Cable specification

The cable is of double 6 mm wire armour flooded construction with 3 of 11 kV 120 mm copper cores EPR insulated; a 3 core of 2.5 mm copper cored cable for intertripping purposes and a fibre optic bundle. The cable will have a 5 MW capacity. This is because with respect to tidal devices it is important to be able to test any shadow effect there may be from adjacent devices. Therefore in the long run it is possible that there will be additional devices located at the end of each cable. However it is likely in the first few years of operation of the test site that there will only be one device on the end of each cable.

The diameter of the cable measures 10 cm and 20 cm with cable protection.

Control building on Eday

The control building on Eday will house the 11 kV switchgear, power factor correction equipment, data handling equipment, UPS (uninterruptible power supply) and standby generator. The subsea cables will be terminated into the high voltage circuit breaker panels. One of each will feed the test berth. A standby generator is included in the scheme to provide continuity of supply for the data handling equipment in the event of a power failure to the substation.

In addition to the oil tank supplying fuel to the generator, there will be only very limited inventories of lubes and greases stored and for use within the building.

Communications connection to Stromness data centre

The SCADA system will allow EMEC to remotely monitor and operate switchgear in the Eday control building. It will give developers access to the status and metering data from the circuit breaker associated with their own device. Data storage will be included on the Eday site. Data transfer to Stromness data centre is anticipated to be by Broadband telecoms link.

3.3.4 Stromness data centre

The exact scope of works for the refurbishment of The Old Academy at Stromness has yet to be defined, as detailed negotiations with individual developers are still ongoing and their specific requirements have not been confirmed. The upgrade works will be defined in the next phase of the works, but will be internal works only.

3.4 Operation of test site

On completion of installation and commissioning, the operation of the site will become the responsibility of EMEC. EMEC indicate that the first prototype will be ready for installation early 2006. The devices to be installed will not be limited to a single type. For the purposes of this assessment the devices are being considered at a generic level, based on the technologies that are known to be interested in testing at the site, as detailed below (see also Appendix A):

- Type 1 Bottom sited device, with the turbine mounted on or within a framed structure on the seabed;
- Type 2 Mid-water buoyant device, with the un-shrouded turbine(s) moored to the seabed by a multi-legged, tensioned mooring system;
- Type 3 Pile mounted surface piercing device, with a monopile protruding some 9 m above Mean Sea Level, and 2 un-shrouded turbines mounted on arms on either side of the monopile; and
- Type 4 Buoyant surface device with a single point mooring, with un-shrouded turbine(s) positioned on arm(s) extending from the underside of the buoyant body.

In the first few years of operation it is likely that only one device will be located at the end of each cable end, however in the long term this may increase to a number of devices (for testing purposes only, not commercial generation).

3.5 Decommissioning

EMEC will require a formal device specific decommissioning plan from developers for all devices decommissioned during the project life.

In line with standard consent conditions, at the end of the project life all offshore structures will be removed. All onshore structures will be removed excluding the control building for which alternative uses will be investigated.

4 Environmental Description

4.1 Physical characteristics

4.1.1 Geographical and landscape aspect

Eday is centrally located within the North Isles of Orkney, and lies between the islands of Sanday and Westray. It is 22.5 km northeast of Kirkwall on the Orkney mainland. Eday has a north-south orientation and is roughly 13 km long, by 4 km wide. The Fall of Warness where the test berths are to be located is situated off the southwest coast of Eday between the island and the islands of Muckle Green Holm and Little Green Holm. The onshore facility is to be located adjacent to Cauldale on the west coast of Eday.

The coast from Seal Skerry extending to beyond Newbigging comprises of a low-lying bay dune system flanked by superficial sand partially covering shingle and flagstone outcrops. Beyond Newbigging sandstone cliffs interspersed with gullies, with moderately exposed bedrock throughout the intertidal area, dominate the coast.

The island is relatively low-lying with the highest point being recorded on Ward Hill at 101 m above sea level. The interior is dominated by undulating peat and heather moorland hills. In the area of the onshore facility, coastal heath has been reclaimed to semi-improved pasture that slopes gently down to the sea (Land Use Consultants 1998), and is typically used for grazing sheep.

Sandstone bedrock dominates the area, with associated nutrient poor acidic soil. Limited boulder clay deposits in the Sandybank area offer a small area of deeper more fertile soil.

4.1.2 Geomorphology

The results of the seabed survey carried out by Aquatera (Aquatera 2005), subsequent seabed survey carried out by Sula Diving and the Coastal and Seabed Processes Review undertaken by HR Wallingford (HR Wallingford 2005) have informed this section.

Bathymetry

From the onshore site location the cable route follows a fairly smooth slope across sand and into the sea where the sand gives way to rocks. The chart depth readings then decrease steadily from 1 m to between 34-51 m water depths where the tidal test devices will be deployed (see Figure 4.1). The swathe bathymetry depicted in Figure 4.5 shows that the bedrock forms a series of ridges.

Coastal and seabed geology and surface sediment

The exposed coastal geology of the islands around the test site comprises sequences of Devonian sandstone, siltstone and mudstone (Barne *et al* 1997). The rock is relatively resistant to erosion by wave action, but parts of the coast are undergoing slow retreat, resulting in low cliffed faces about cobble and gravel upper storm beaches.

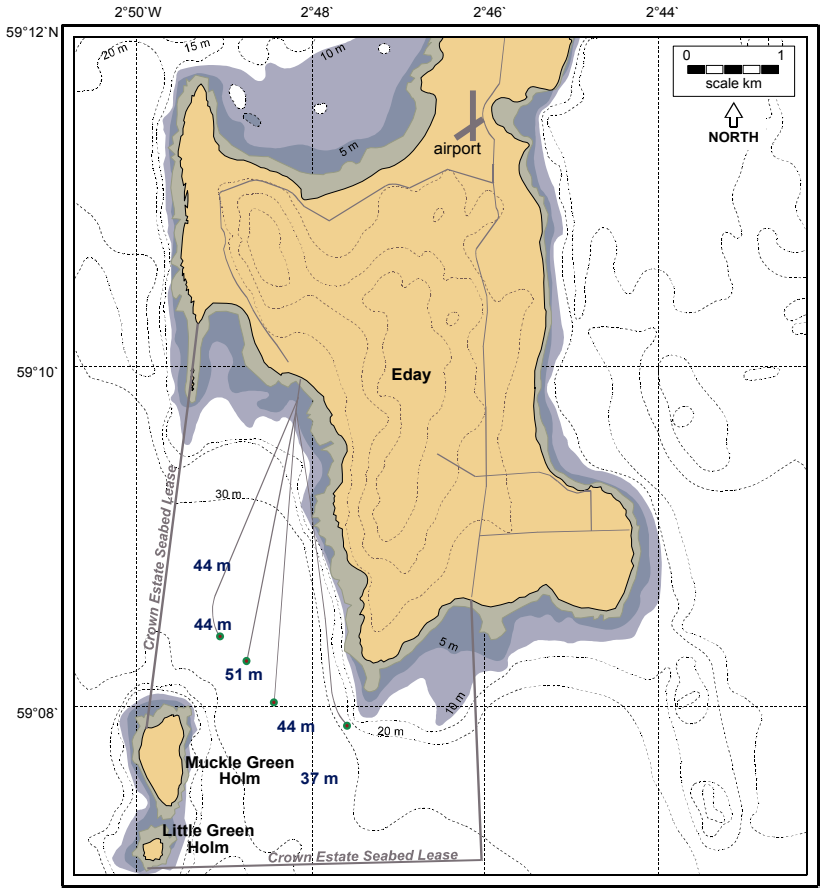
Between the islands the Devonian beds continue to form the solid geology. The swathe bathymetry, geophysical, ROV and dive surveys undertaken by Aquatera (Aquatera 2005) reveal that bedrock is exposed throughout most of the test bay area, with occasional boulders but is swept of any potentially mobile sands or gravels.

To the north and east of the deep basin there are deposits up to 11 m thick of boulders, cobbles, gravel and interstitial shelly sand, presumed to be glacial till deposits with a reworked surface layer. The dive and ROV surveys show these rocks to be well covered with flora and fauna, indicating long term stability and minimal transport of sand or gravel.

Further north along the cable route the data is sparse, with only dive survey observations. There are exposed rock ridges, interspersed with deposits of boulders, cobbles, and pockets of gravel and shelly sand. Close to

shore there are sand deposits within the gullies formed by the rock ridges that run approximately along the line of the cable route.

Figure 4.1 Bathymetry of test site location



Bed forms

There is no information indicating the presence of any significant mobile bed forms in the study area. The swathe bathymetry shows that the bed is either ridged bedrock or featureless till deposits. The dive survey does show occasional patches of potentially mobile shelly sand within areas otherwise dominated by cobbles and boulders. It is assumed that the bed is stable throughout, with negligible bed load transport as there is little mobile material available (Wallingford 2005).

Shoreline

The shoreline near the landfall comprises low sandstone/mudstone cliffs fronted by a storm beach of cobbles and small boulders. The main beach comprises superficial sand overlaying rocky outcrops, constrained to the north and south by the rocky headlands at Sandybank and Neven Point. The intertidal bedrock forms a series of parallel ridges, with sand filling the intervening gullies. The ridges are orientated in the general direction of the cable route (approximately 30° south of beach normal), providing an opportunity to bury the cable within a gully to provide protection and stability.

The low cliffs are assumed to be undergoing slow erosion, but anecdotal evidence from local sources suggests that the rate is not sufficient to present a problem to the cable installation over the life of the project. The storm beach will be mobile under severe wave conditions. The superficial sand over the main beach is assumed to be mobile under much more frequent conditions, and it is likely that the area of visible bedrock will vary considerably as the sand is drawn down and returned by changing wave conditions.

The extent of beach drawdown and the rates of longshore drift have not been modelled or calculated. Site information and experience from other similar locations indicate that extreme drawdown during stormy periods may deplete most of the sand across the middle and upper beach, exposing large areas of underlying

rock. Conversely, low swell conditions could move sand up the beach face, causing the lower beach and nearshore sand levels to drop. The vertical range of this mobility could be in excess of 2 m.

The existing pocket beach is considered to be in dynamic equilibrium with the incident wave regime. Gross drift rates to the north and south may be large, but the nett rate will be low with a northerly residual direction.

Below low tide the ridges and sand patches continue, though the sand cover decreases and boulders become more frequent, providing a suitable substrate for extensive kelp forest.

4.1.3 Hydrodynamics

Tides and currents

A distinction is drawn between tidal streams, which are astronomical in origin, and currents, which are independent of astronomical conditions and which are mainly meteorological origin.

The interaction of two independent tidal systems, in the North Sea and the North Atlantic, results in the tides around Orkney. The tidal waves of both systems have anti-clockwise rotations and they both reach Orkney's coastline with similar strengths, but moving in opposition. The northward Atlantic wave peak arrives roughly 2-3 hours earlier than the southward travelling North Sea wave, producing a net flow of water from east to west and complex interactions among the island sounds (see Figure 4.2) (BGS & Scott Wilson Resource Consultants 1997).

The Fall of Warness area is subject to strong tidal streams, with peak spring tide speeds in excess of 3.5 m/s. It is also exposed to high-energy waves from the southeast and the northwest. The main channel has a water depth of over 50 m, and the bed is rocky, with surface sediment along the coastal fringe. The surrounding shorelines are mainly rocky, with pocket beaches. The area is affected by tidal surges, with the 50 year return period surge level given as about 1.35 m. The combination of gale force weather conditions and the strength of tidal streams can made navigation hazardous in the Fall of Warness, as is shown Extract from Admiralty Sailing Directory below.

Extract from Admiralty Sailing Directory, Section 5.279

Stronsay Firth – North-Western Entrance. Tidal streams in the channels on either side of Muckle Green Holm (59°08'N, 2°50'W) are very strong. They run with great strength over the reef extending S from War Ness, the SE-going tidal stream setting, for the first 1 hour and 10 minutes, E around War Ness towards Eday Sound; after this time it runs SE through Stronsay Firth. During the SE-going stream a race, which is a dangerous during S gales, extends SSW from War Ness. During both SE-going and NW-going tidal streams violent turbulence extends across the entire channel E of Muckle Green Holm when the wind is against the tidal stream (UK Hydrographic Office 2003).

The site has been selected for testing tidal energy devices due to the strong tidal streams. Peak flood (southerly) and ebb (northerly) tidal stream for points at the site and to the north and south are set out below.

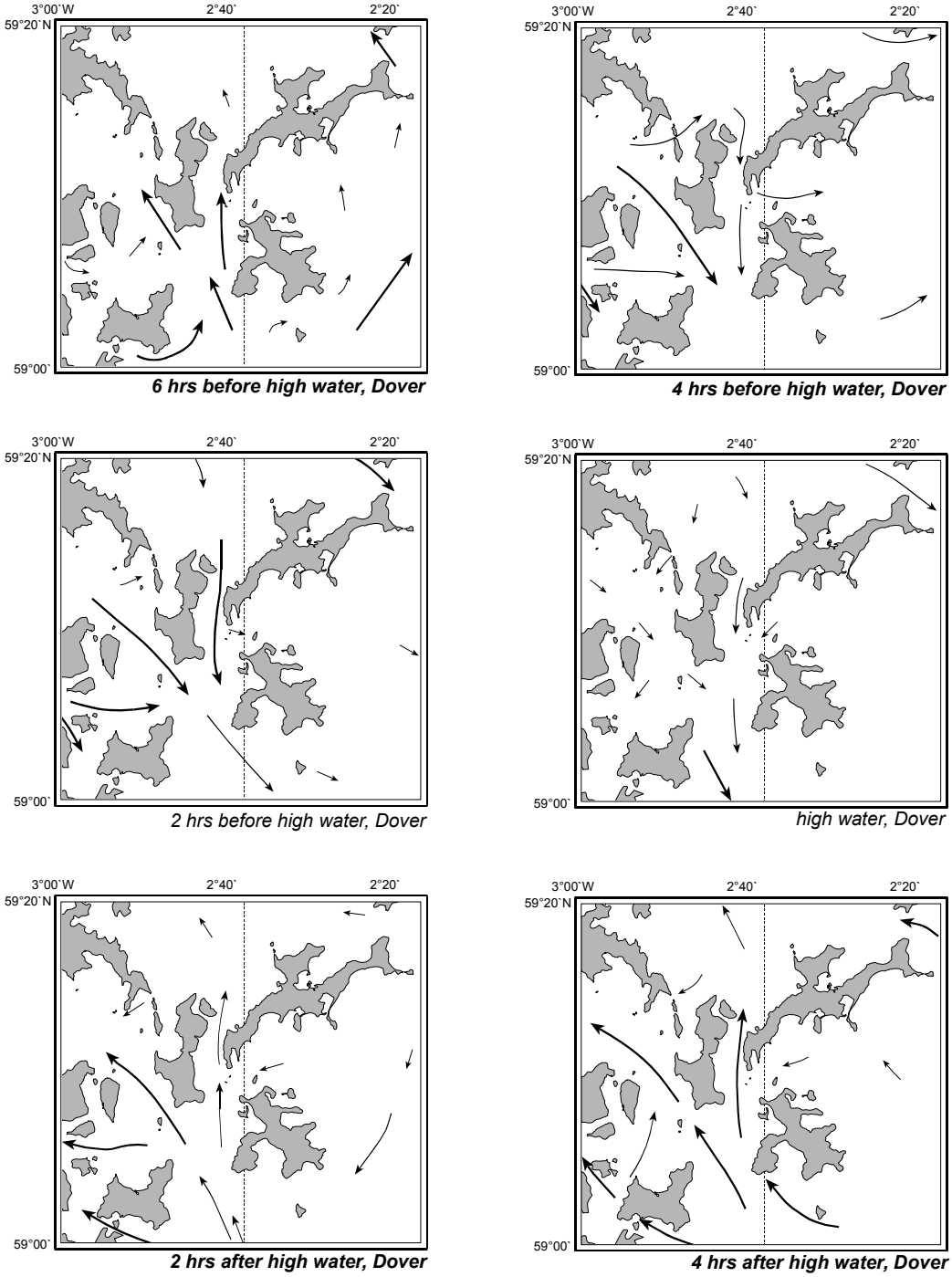
Table 4.1 Tidal stream speeds in relation to the proposed development site (m/s)

		Westray Firth	Fall of Warness	Stronsay Firth
Mean Spring Tide	Peak flood	2.5	3.6	2.2
	Peak ebb	2.6	3.3	1.7
Mean Neap Tide	Peak flood	1.0	1.4	0.9
	Peak ebb	1.1	1.3	0.7

Source: HR Wallingford Coastal and seabed processes review 2005

Maximum tidal streams through the channel may be considerably higher, driven by winds or surge conditions. Unlike most areas of the UK, relative sea levels have fallen in the past due to the isostatic rebound of the earth's crust. Estimates of future change vary but for the purposes of environmental assessment it is reasonable to assume that levels will remain close to the present day for the life of the test site (HR Wallingford 2005).

Figure 4.2 Tidal system around Orkney



Source: Hydrographer of the Navy, 1993

Waves

Winds are predominantly from the west or south, with the most frequent strong winds arriving from the west. Westerly wind seas develop over the North Atlantic, and are therefore not fetch limited. The combination of fully developed wind sea and ocean swell give the severe wave conditions for the west coast of Orkney. Predicted 1 year return period wave heights are 10m (H_s over 3 hour periods) and 100 year heights are 15 m, with an annual 10% exceedence height of 3 m. On the east coast waves from the south can be large, but will not reach such extremes. Very strong winds are not as frequent and the fetch lengths over which the waves can develop are limited to the North Sea. The 10% exceedence significant wave height for the exposed east side of Orkney is 1.5 m.

The test facility area is directly exposed to wind sea and swell from the northwest and the southeast due to the orientation of the channel and the shelter derived from the surrounding islands (see Figure 1.1). Waves from other directions can reach the area due to diffraction and refraction, making the area very dynamic. Overfalls, due to opposing wave and tide directions, are common in the area of the test bays.

The landfall area is much more protected than the Fall area. Shelter from the westerly sector is provided by the intertidal rock out crop at Seal Skerry, but wind, sea and swell can still reach the nearshore from Stronsay Firth and beyond. Locally generated waves from the south are also significant (HR Wallingford 2005).

The mean significant wave height in the months of December-March is 2.5-3 m in the surrounding waters of Orkney. Wave heights in these waters are similar throughout the year, with 2-2.5 m in April and September-November, and 1.5-2 m in May-August (British Oceanographic Data Centre 1998).

Sea temperature and salinity

Orkney sea surface temperatures are influenced by the North Atlantic Drift Current carrying oceanic waters north east into the North Sea. This drift exerts a warming effect in winter, when sea temperatures around the islands remain on average 6.5-7 °C, relatively mild. In the summer this drift allows sea temperatures to rise to 12.0-12.5 °C (BGS & Scott Wilson Resource Consultants 1997).

The sea surrounding Orkney remains relatively constant throughout the year in terms of salinity with an average of between 34.75 and 35 parts per thousand (ppt). Normal seawater has a salinity of 35 ppt which is very close to Orkney values (BGS & Scott Wilson Resource Consultants 1997).

4.1.4 Meteorology

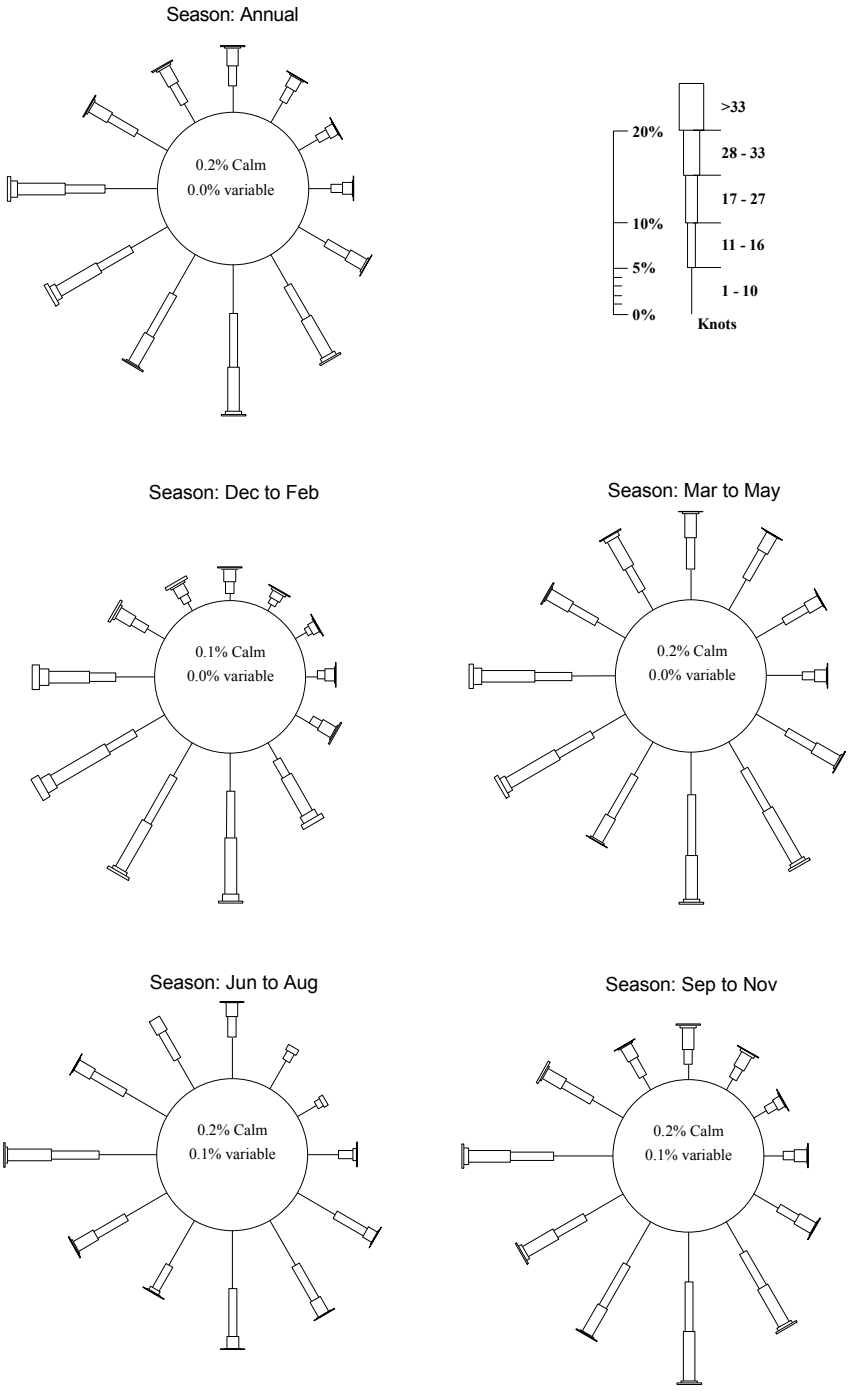
Wind

Strong winds and gales are very common in Orkney, predominately from the west to the south and south-southeast. In the spring and early summer there is a marked increase in the frequency of easterly winds, and in May south-easterly winds are more frequent than winds from any other direction (Plant & Dunsire 1974).

Although no wind survey was carried out at the site location, Meteorological Office data collected from Kirkwall Airport, from 1986-1996, is considered to be representative of the whole of Orkney (see Figure 4.3). The distribution of light winds direction is evenly spread around the compass, with light winds (<18 knots) occurring 63% of the time. However, with stronger winds over 18 knots the direction pattern is asymmetric with the greatest frequencies from the west blowing south-southeast. Periods of calm only occur for 0.06% of the time.

Anticyclones establishing over Scandinavia causes strong winds (>18 knots) with the highest frequency from the west-southwest and southeast. Gale force winds (>34 knots) occur for 1% of the time and are predominantly from the southwest to west. Strong winds are most frequent from October-March but can occur at any time of year.

Figure 4.3 Annual and seasonal wind roses for Orkney (Kirkwall Airport) 1987-1996



Source: Meteorological Office Data

Visibility and daylight hours

Visibility conditions in Orkney are generally good although clear conditions can deteriorate quickly as a result of heavy showers of rain or snow, which can reduce visibility to less than 1 km. Persistent inland fog is not common, but sea fogs do occur. These sea fogs can occur at any time of the year and are most likely with winds from the southeast. They generally clear quickly if the wind changes direction to the southwest.

Orkney has extended periods of daylight during the summer months when the sun is above the horizon for over 18 hours a day and it never really gets dark. In contrast during mid-winter days are much shorter as the sun is very low in the sky and is only above the horizon for 6 hours per day.

4.2 Biological characteristics

4.2.1 Onshore habitats and communities

A survey of the vegetation in the vicinity of the onshore construction site using Phase 1 methodology (JNCC 2004) was commissioned as part of the EIA. The survey took place on the 6th May 2005. Due to the early time of year species identification was difficult, which was also hampered by the particularly slow development of vegetation this season. Habitat type was nonetheless readily identifiable in spite of these limitations.

The coastal edge below Cauldale comprises a small bay dune site. This dune system has been identified in Dargie (1998) as 'fixed acidic grassland'. Strandline vegetation is limited to small quantities of *Atriplex glabriuscala* with *Leymus arenarius* dominating the fore-dune. To the rear of the beach vegetation is colonised predominantly by *Festuca rubra*. Dargie (1998) notes the presence of *Elymus farctus* in the area of yellow/grey dune transition, however this was not identified.

The interior of the surveyed area is predominantly improved/semi-improved grassland with some small areas having been recently ploughed for arable production. There are small areas of coastal grassland to the west of Sandybank with herbaceous species such as *Silene dioica* and *Ligusticum scoticum* present in amongst a predominantly *Festuca rubra* dominated sward. An area of dune heath with patches of acidic dune grassland (*Calluna vulgaris* and *Festuca rubra*) is present nearer the shore and around Cauldale, including the area where the control building is proposed. However the area is of generally poor quality due to partial improvement. This survey concurs with that of Dargie (1998) in concluding that the conservation interest of the site is low to moderate.

4.2.2 Coastal habitats and communities

A coastal habitats and communities survey was commissioned as part of the EIA and took part between the 10th and 13th May 2005. Transect lines, quadrats and cores were used to survey the Eday shoreline where accessible and representative of the whole shore. A desk study was carried out in advance to highlight any areas to be at should have been included in the survey. General coastal habitats are summarised in Figure 4.4.

The west coast of Eday, south of Fer Ness, generally has large expanses of bedrock platforms with boulders, and a series of gullies and geos filled with boulders and occasionally sand. The shore is normally backed with grassy banks. On Seal Skerry a sandy bay is formed and low dunes are present. A band of flat shingle is found further up the shore before dry sand. Low cliffs (5-20 m) become more common south of Sealskerry Bay behind the bedrock wave-cut platforms, and in exposed areas the cliffs are more broken. In this area a significant length of the coast has shingle present at the top of the beach where the low-lying cliffs are found, accompanied by fine gravel and bouldery shingle on the bedrock. Sand collects in the gullies and forms a clean, sandy bank on low-lying bedrock reefs. There is also an area of sand dunes between Sandybank and Cauldale, the proposed test site area (see Figure 4.4).

The coastline from Newbigging south to Warness is characterised by cliffs (20 m) formed by bedrock ridges, and often plunging straight into the sea with a lack of bedrock ridge shore. At the point on War Ness the cliffs are fronted with flat bedrock slabs, above which there are boulders and shingle. Round to the east of the south coast the shore is flat bedrock and shingle banks, with bedrock reefs running seaward. The shore is backed with grassy banks.

The shore is very exposed at certain locations and as such is characterised with a fucoid dominated intertidal zone. The flora present is typical of a rocky shore with *Fucus spp*., and in particular *F.serratus*, and the knotted wrack *Ascophyllum nodosum*. The sub littoral fringe is dominated by extensive *Laminaria* forests, particularly around Seal Skerry and further south to War Ness (OIC unpublished data).

The fauna present on the shore represents those commonly found on rocky shores, including barnacles (*Ballanus balanoides*) and limpets (*Patella vulgata*) (OIC, unpublished data). In exposed areas of the shore species such as dog whelk (*Nucella lapillus*) are found in cracks and crevices. The flat periwinkle (*Littorina obtusata*), the edible periwinkle (*L. littorea*), the common shore crab (*Carcinus maenas*), the common starfish (*Asterias rubens*) and gammarid amphipod species are also likely to be present. Very few species of red seaweed, as well as

Figure 4.4 Coastal habitats of south west Eday

1 Bedrock and boulder shore.

5 Broken bedrock sloping shore.

2 Bedrock ridge shore with boulders.

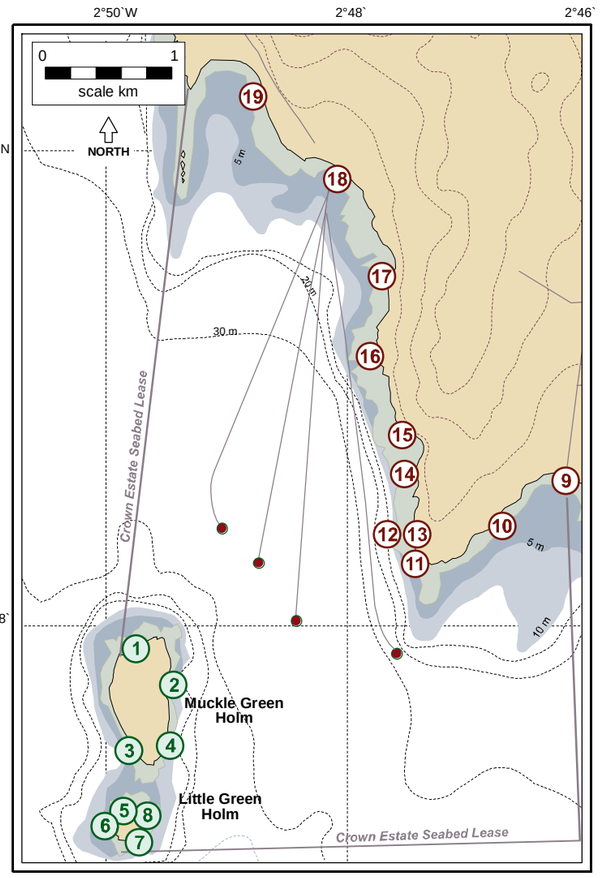
6 Low-lying bedrock ridge cliffs fronted with broken bedrock platorm.

3 Low-lying bedrock ridge cliffs.

7 Smooth bedrock sloping shore.

4 Low-lying bedrock ridge cliffs.

8 Broken bedrock cliff running to outcrop.



18 Bedrock backed with small boulders/cobbles.

19 Sandy beach, backed with shingle ridge and vegetated dunes.

15 Smooth vegetated rock cliff face fronted by bedrock ridge, boulders and shore.

16 Bedrock cliff fronted by boulder beach, Laminaria forest visible.

17 Bedrock platforms with sandy beach cover.

12 Low-lying bedrock ridge cliffs fronted by smooth bedrock platform.

13 Steep bedrock ridge cliff with boulder beach pocket.

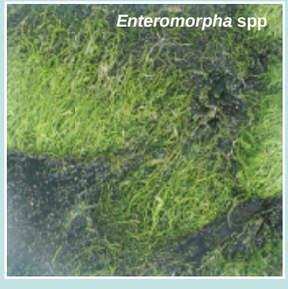
14 Steep bedrockridge cliff with boulder/ shingle collection at base.

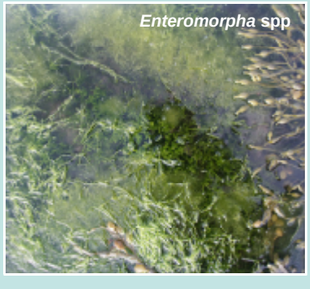
9 Boulder shore by Greentoft Bay.

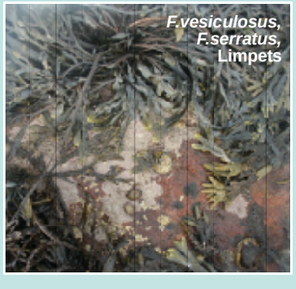
10 Low-lying broken bedrock cliff.

11 Bedrock cliffs and broken bedrock platform outcrop.

Inter-tidal species typical of survey area







thongweed (*Himanthalia elongate*) and dabberlocks (*Alaria esculenta*), are found on the lower shore. Species including pepper dulse (*Laurencia pinnatifida*), carrageen (*Mastocarpus stellatus*) and *Cladophora spp.* find an ideal habitat in the damp crevices.

On less exposed (exposed to moderately exposed) rocky shores fucoid algaes dominate. The typical sequence of a sheltered shore from upper to lower shore occurs; channel-wrack (*Pelvetia caniculata*), spiral-wrack (*Fucus spiralus*), bladder-wrack (*Fucus vesiculosus*), egg-wrack (*Ascophyllum nodosum*) and finally saw-wrack (*Fucus serratus*). On most sheltered shores in Orkney the coverage is nearly complete and underneath the algae canopy the conditions are damp and ideal for sea anemones, sponges and a variety of molluscs, including chitons, snails and sea slugs. The predominant red algae also found under these canopies are usually *Mastocarpus stellatus*, *Laurencia pinnatifida*, *Corallina officinalis* and *Palmaria palmata* which tend to grow over a crust of pink coralline algae. Any patches between the algal turf may be colonised by barnacles *Balanus balanoides*, and limpets *Patella vulgata*. Pits and crevices in the rock often provide a refuge for anemones, gastropods (*Nucella lapillus* and *Littorina neglecta*) and small mussels *Mytilus edulis*.

Toward the upper shore at all of the less exposed survey sites there was a dense coverage of green seaweed, *Enteromorpha spp.*

In summary, the shores around Eday, including Muckle Green Holm and Little Green Holm follow the typical pattern of an exposed to moderately exposed rocky shore, with no unusual species or species of particular interest being recorded.

4.2.3 Sublittoral habitats and communities

A preliminary seabed survey of the area surrounding the proposed tidal test site and along the proposed cable routes was carried out between the 17th and 21st March 2005, the years weakest tide period (Aquatera 2005). The survey was carried out by deploying an ROV that took still photographs and video footage. Divers were also used to take stills and video, as well as making in-water observations and collecting seabed samples using cores and net bags. The samples were later identified, and the stills and video footage was also analysed.

The survey area was selected to cover the areas where the cables would be laid, the location of the tidal devices, and to obtain a general picture of the seabed habitats in the area. Due to unfavourable weather conditions, however, surveying in the exact locations preferred became difficult and divers were moved off course by the strong tidal stream in the area. The majority of areas that had been proposed as seabed survey stations were videoed/photographed and are considered to be representative of the wider habitats of the project area.

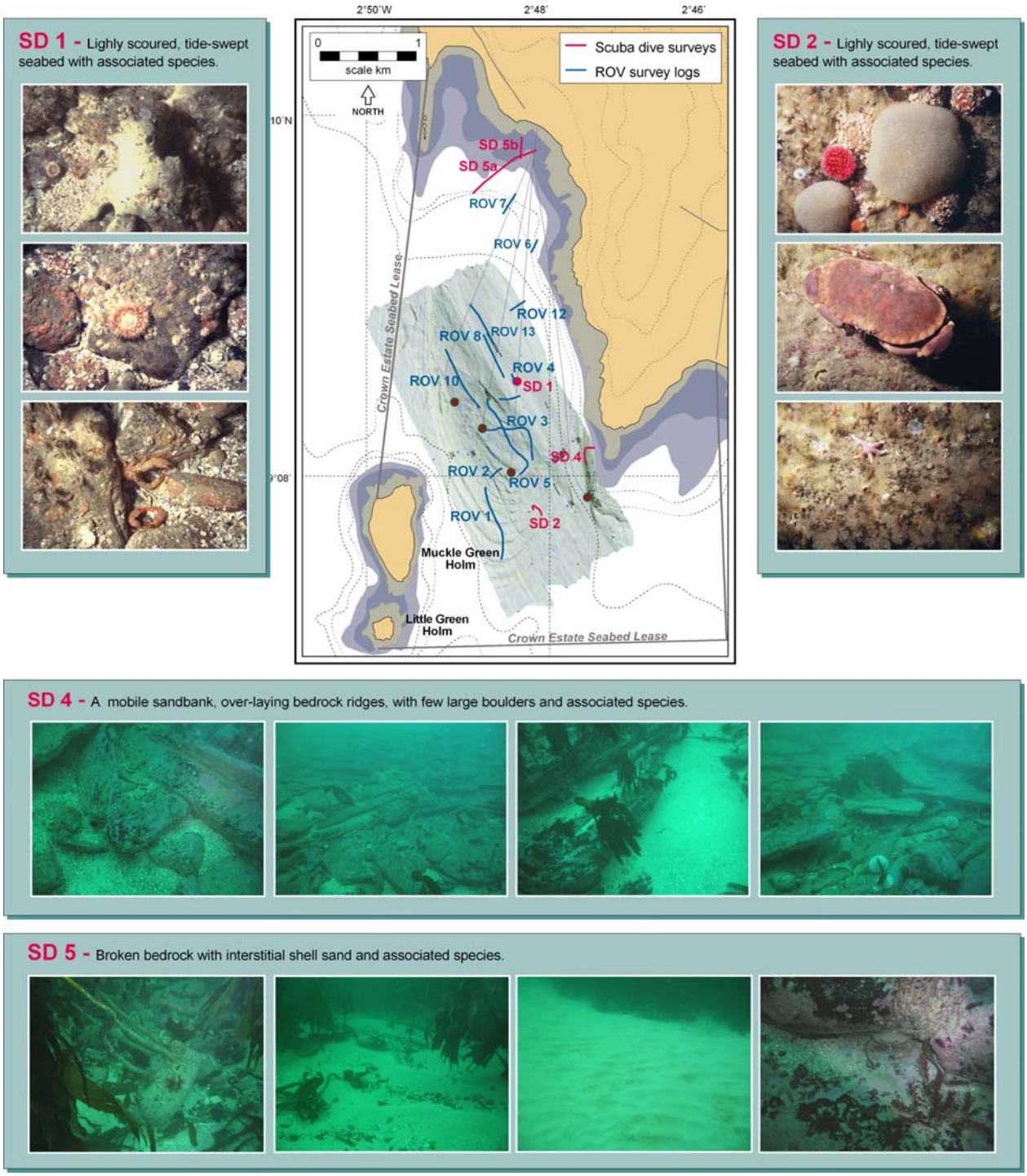
The 2005 seabed survey shows that the area surveyed was fairly uniform in regards to the limited species found in the area. The seabed ranges from eroding sublittoral sandbanks with rocks at the east of the survey area, to smooth scoured bedrock ridges and platforms towards the centre area of the test site. Figure 4.5 shows the bathymetry and survey locations.

It appears from the survey that there are no species of importance in the area, with no unusual species being recorded. Species that were recorded by photography, diver observations, or collected as samples are listed below:

- Velvet crab *Portunus puber;*
- Urchin;
- Starfish;
- Edible crab *Cancer pagurus;*
- Scorpion fish (pink) *Taurulus bubalis;*
- Squat lobster *Munida rugosa;*
- Brittle star;
- Hermit crab *Parugus bernhardus;*
- Butterfish *Pholis gunnellus;*
- Rough periwinkle *Littorina saxitili;s*

- Keel worm *Pomatoceros triqueter;*
- Barnacle *Semibalanus balanoides;*
- Cowrie shell *Trivia monacha;*
- Dog whelk *Nucella lapillus;*
- Pointed topshell *Calliostoma zizyphinum;* and
- Goose barnacle plates.

Figure 4.5 Sublittoral habitats



The epifauna described from the photographic survey indicates that *Laminaria spp.*, and the associated red algae *Rhodymenia palmate*, is present throughout the sample area. Other species present include encrusting coralline algae, sea anemones, velvet crabs, lugworms and old bivalve molluscs. Diver observation also reveal the presence of starfish, sea urchins, squat lobster, hermit crabs, sand blennies, scallops and shoals of saithe.

From the diver observation taken during the Aquatera 2005 survey the seabed at 34-40 m water depth is almost 100% large boulders with interstitial shell sand (refer to survey locations given in Figure 4.5). Other seabed types in the survey area consist mainly of bedrock, however one large patch of sediment was observed and three core samples were taken (SD5 Figure 4.5) at 6.5 m depth.

Due to the lack of clarity in some of the ROV video footage (ROV 6 & 7) collected during the preliminary survey and anecdotal evidence that sensitive seabed habitats (see below) may be present in and around the cable routes, a further diver survey seabed investigation was commissioned (Sula Diving 2005). This survey was located in the area covered by ROV 6 & 7 (see Figure 4.5). The survey was carried out using transect lines, as close as possible to the original ROV transect, and video and still photography. The seabed was comprised of boulders and shell sand patches. No habitats of conservation importance (see below) were identified during this subsequent survey.

A previous survey of Sealskerry Bay carried out in 2000 shows that, from the diver observations, the seabed at 16-23 m is almost 100% very light brown sand, with boulders at one site (59° 09.29' N 002° 48.08' W). This survey consisted of transects being taken from a central location (59°09.65'N 002°48.55'W) heading north and west with survey stations being located at 25 m and 50 m distance from centre point. Core samples were obtained at each station.

The Aquatera (2005) core samples were examined and the sediment was found to contain no infauna. It is thought that this is due to the high mobility of sediment in the area. The core samples taken during the baseline survey of Seal Skerry (2000) were also examined. It should be noted that these cores were taken at a greater depth than the Aquatera samples, although the same general area was sampled. Macrofauna within these sediments had several species that were common at most of the sampling stations, in particular the spionid polychaetes *Aonides oxycephala* and *Spio spp*., and the amphipods *Urothoe marina* and *Ampelisca spp.* The benthic fauna over the whole sampling area was diverse. Species abundance and richness were reasonably high for the sediments found, although the faunal community was deemed to be indicative of normal seabed conditions (Aurora Environmental 2000).

The epifauna described from the photographic surveys (Aquatera 2005 & Sula Diving 2005) indicates that *Laminaria spp*., and the associated red algae *Rhodymenia palmate*, is present throughout the sample area. Other species present include encrusting coralline algae, sea anemones, velvet crabs, lugworms and old bivalve molluscs. Diver observation also reveal the presence of starfish, sea urchins, squat lobster, hermit crabs, sand blennies, scallops and shoals of saithe.

Maerl

Maerl refers to deposits of algal gravels formed by free living coralline algae. Maerl develops when branches of crust-forming red coralline algae break free and persist to grow on the surface of soft sediments. Two of the more common Maerl-forming species, *Lithothamnion corallioi* and *Phymatolithon calcareum*, are included in Annex V (b) of the EC Habitats Directive. Maerl is also the subject of a Habitat Action Plan under the UK Biodiversity Action Plan. Maerl is considered to be of high conservation importance because it harbours a disproportionately high diversity and abundance of associated organisms, and is fragile and slow growing so that it may take decades to recover from damage. It is confined to a very small proportion of European shallow sublittoral waters.

The preliminary seabed survey carried out by Aquatera (Aquatera 2005) indicated the possible presence of Maerl in the inshore waters off the west coast of Eday. A follow up survey was carried out by Sula Diving in May 2005 along the original ROV transects 6 & 7 as shown in Figure 4.4. There was no evidence of Maerl at either of the ROV sites.

Modiolus beds

The horse mussel *Modiolus modiolus* forms dense beds at depths of 5-70 m in fully saline, often moderately tide-swept areas off northern and western parts of the British Isles. Although it is a widespread and common species, true beds forming a distinctive biotope are much more limited. *M. modiolus* is a long-lived species and individuals within beds are frequently 25 years old or more. Recruitment is slow and may be very sporadic;

there may be poor recruitment over a number of years in some populations. Modiolus beds have been identified in Orkney, but none were discovered in either of the Fall of Warness seabed surveys, or have been previously recorded in the vicinity of the proposed test site.

Although this habitat is not protected internationally, there is some national protection in the form of the UK Biodiversity Action Plan (UKBAP). Modiolus beds are afforded protected at a national level as follows:

- Modiolus Bed Habitat Action Plan in the UK Biodiversity Action Plan ; and
- Listed as priority species where Local Marine Nature Reserves (MNR) and Special Areas of Conservation (SACs) are designated.

4.2.4 Plankton

There have been a number of studies of plankton distribution around Orkney. Plankton data on indicator species and the variability on plankton assemblages have been collected since the 1920's. The Continuous Plankton Recorded (CPR) surveys in this region are important because they contain long-term plankton data (1958-1993). The dominant factors affecting the distribution of pelagic biota in the North Sea are the bathymetry and the hydrology.

Although zooplankton in this region is mainly made up of neritic (coastal water) and intermediate (mixed water) species, the inflow of Atlantic water southward along the western edge of the North Sea in late summer/autumn may introduce oceanic species such as the herbivorous salp, *Salpa fusiformis*. Evidence from the CPR survey suggests that the phytoplankton found in this region are fairly typical for North British coastal waters. The spring increase of phytoplankton (mainly diatoms) begins in March and peaks between April and May.

The spring bloom is followed by a decline in June to steady levels until another peak in September. The dinoflagellates (particularly *Ceratium spp.*) show a steady rise through summer (May to August) and then decline to winter levels by November. Diatoms tend to predominate in inshore mixed waters, while dinoflagellates are often more abundant in stratified offshore areas (particularly in summer/autumn) (Adams 1987). Zooplankton species begin to increase after the initial spring bloom of diatoms. The dominant species present include barnacle larvae (Jones and Beards 1983). Jones and Beards (1983) noted that the abundance of zooplankton during the autumn period was noticeably greater than that for phytoplankton and were dominated by crustaceans, principally copepods.

The main components of the zooplankton appears to be small copepods such as *Pseudocalanus spp., Acartia clause, Temora longicornis* and *Oithona similes*. During summer and late autumn *Sagitta elegans* and the ctenophore *Pleuobrachia pileus* appear to be quite common. Other commonly found zooplankton include small hydromedusae such as *Aglantha digitale*, the amphipod *Parathemisto spp.*, and numerous meroplanktonic species. Larger copepods such as *Calanus spp.* are not normally dominant in this area, although in the late summer/autumn they may be found in offshore areas with *Metridia lucens* and euphausiids.

The zooplankton of this region are critical to the survival of important fish species (e.g. herring), which spawn in this region or migrate through the area as larvae and pelagic adults. Studies by Nellen and Schadt (1992) found that fairly large fluctuations in zooplankton taxa occur in this region, indicating that environmental conditions vary from year to year. However, overall variability in the zooplankton biomass is low, indicating a relatively stable ecosystem.

The swift tidal streams in the area and associated mixing regime prevent the waters in the area from stratifying in the summer months. Frontal areas lie just offshore to the east and west of Orkney where these mixed waters meet the stratified waters of the North Sea and the Atlantic respectively. These frontal boundary areas are particularly productive for marine life and are likely to be a focus of sea life activity (Aquatera and Ecologic 2005).

4.2.5 Fish populations

The distribution of fish species can vary greatly between juvenile and adult phases and with seasonal migrations. Barne (1997) used information based on the distribution and relative abundance of fish species as revealed by fisheries catch statistics obtained from recorded commercial landing figures. In addition, information from research vessel catch data and data from biological sampling during fishing surveys was used, although this information can be limited and there may be other areas in addition to those described where species might also occur.

Mackerel (*Scromber scrombus*) are widely distributed around Britain and are present in the seas off Orkney. During the northward feeding migration a small proportion of the population enter and spawn in the coastal waters around Orkney, arriving in May and June. Most of the population keeps migrating northeast, but mackerel do remain in the region throughout the summer months. The highest numbers, however, are found in the late summer and autumn (August to October) when the returning migration to the southwest takes place (Robson 1997).

Herring (*Cluepa harengus*) used to be locally abundant in the summer and autumn feeding areas throughout the region, but the stock is currently very low. Herring, sprat (*Sprattus sprattus*) and sand eel (*Ammodytes sp*) have recognised spawning grounds in Orkney waters. Sprats spawn in the early summer, peaking between May and July, sand eels from November to February, and herring between August and September (Coull *et al* 1998).

Other fish species without defined spawning grounds, but widely distributed in the waters around Orkney include haddock (*Melanogrammus aeglefinus*), ling (*Molva molva*), saithe (*Pollachius limanda*) and cod (*Gadus morhua*). Flat fish species such as plaice (*Pleuronectes platessa*) and dab (*Limanda limanda*) occur on sandy areas of the seabed such as the area of the cable landfall site, with their juveniles living close inshore in nursery areas. None of the flat fish species exhibits extensive migration, though the larvae can drift for several weeks from offshore spawning grounds to sandy inshore nurseries.

In addition to the commercially important fish species, the inshore waters of Eday are also likely to support population of smaller fish species which provide a food source for birds and mammals present in the area. The preliminary seabed survey (Aquatera, 2005) in-water observations noted the presence of butterfish and scorpion fish, and although there is a lack of data on the presence of non-commercial fish species it is known that butterfish are present. This species provides an important food source to the black guillemot which would be sensitive to any detrimental effects on the habitat (Meeks pers comm.).

Juvenille monkfish and non-spawning adult monkfish can be found throughout the waters of Orkney. Other exploited demersal species of minor importance are conger eels and gurnards.

Shellfish

Seabed surveys undertaken during the EIA indicated the presence of shellfish species. Lobster (*Homarus gammarus*), edible crab (*Cancer pagurus*) and velvet crab (*Necora puber*) are distributed inshore throughout Orkney's waters where there is a suitable rocky habitat. Edible crabs are more often found on softer sediments – ranging from sand/gravel to rock – than lobsters. Juveniles tend to be found inshore and adults further offshore (JNCC 1997).

Scallops (*Pecten maximus*) and queen scallops (*Aequipecten opercularis*) live on sandy/gravely areas of the seabed. Important populations of scallops and queen scallops are present in many areas of Orkney. Seabed suitable for these species is found in the Fall of Warness where areas of sand/gravel have accumulated.

4.2.6 Birds

A bird survey was commissioned as part of the EIA to characterise the species present in the area of the test facility including the south west coast of Eday and the Green Holms (Cockram, 2005). The survey was undertaken between the 3rd May 2005 and the 15th May 2005. A thorough desk study assessment was also carried out and the results of both surveys were compared and collated (Collins 1998, OBRD 2005).

The coastline between the east end of the Bay of Greentoft and the west end of Sealskerry Bay provides shelter, nesting sites and feeding sites for a large variety of bird species.

Location of test site building (Cauldale to Sandybank)

On the beach below Cauldale ringed plover (*Charadrius hiaticula*), meadow pipits (*Anthus pratensis*) and rock pipits (*Anthus spinoletta*) nest regularly from May to July. A pair of shelduck (*Tadorna tadorna*) also shares this bay with the eider (*Somateria mollissima*) to rear their young. During the summer months the coast stretching from Cauldale to the Point of Sandybank and to Sealskerry Bay is used for nesting by rock pipits and meadow pipits. The area around Sandybank is also fairly important for lapwing (*Vanellus vanellus*). South of Sandybank the area is fairly important to fulmar (*Fulmarus glacialis*), which nest in cliffs in the winter, and is also very important for black guillemot (*Cepphus grille*).

Seal Skerry

Throughout the winter Seal Skerry is an important feeding area for significant flocks of sanderling (*Calidris alba*) and sometimes a few dunlin (*Calidris alpina*). Shag (*Phalacrocorax aristotelis*), grey heron (*Ardea cinerea*), mallard (*Anas platrhynchos*), the rarer shoveler (*Anus clypeata*) and teal (*Anas crecca*), the regions smallest breeding duck, also feed here.

Seal Skerry is also fairly important for mallard, wigeon (*Anas Penelope*), ringed plover, turnstone (*Arenaria interpres*), purple sandpiper (Calidris maritime), redshank (*Tringa tetanus*) and kittiwake (*Rissa tridactyla*). A few gannet (*Morus bassanus*) may also be present.

Newbigging to Warness

The cliffs from Newbigging to the Point of Warness provide nesting sites for many species. Neven Point is a fairly important are for fulmar and eider in the winter, and a very important area for black guillemot. The War Ness area is very important for shag and cormorant (*Phalacrocorax carbo*) throughout the winter, and is fairly important for eider, oystercatcher (*Haematopus ostralegus*), puffin (*Fratercula arctica*), rock dove, turnstone, purple sandpiper, redshank, great blackback gull (*Larus marinus*) and kittiwake.

The chapel area is fairly important for fulmar, and very important for black guillemot. The Bay of Greentoft is fairly important for ringed plover.

There is an arctic tern (*Sterna paradisaea*) colony and also possibly sandwich terns (*Sterna sandvicensis*) at War Ness, between May and July. Ringed plover and rock pipit nest here regularly.

Greentoft Bay

In summer Greentoft Bay supports at least one pair of nesting ringer plovers. A pair of shelduck rear young in this bay with eider, while rock pipits and meadow pipits nest under the banks. In winter Greentoft Bay is probably the most important and most frequently visited beach in Eday by flocks of waders feeding. Turnstone, dunlin and purple sandpiper are the most numerous with flocks of up to one hundred birds. Curlew (*Numenius arquata*) , bar-tailed godwit (*Limosa lapponica*), ringed plover, oystercatcher and redshank have all been seen regularly feeding on this beach. Grey plover and sanderling are less frequent visitors.

Muckle and Little Green Holms

Muckle Green Holm is an important area for black guillemot and a major site for puffins between April and August. Muckle Green Holm is also an important site for shags (March-August), while both Green Holms are important breeding sites for cormorants (April-June). Little Green Holm there is host to an arctic tern colony (May-July), and is also a very important breeding area for black guillemots. There are also reports that the storm petrel is found on Eday and on Muckle Green Holm.

The birds most likely to be directly affected by project activities are the shorebirds nesting below Cauldale, and the diving birds in particular the cormorants. All these birds are protected under the general provisions of the Wildlife and Countryside Act, 1981, and are listed in the Local Biodiversity Action Plan (LBAP) as local priority species due to declining numbers. Aerial surveys carried out in between 1985 and 2000 show a decline in cormorant numbers of approximately 30% (1985- 570, 1995-491, 2000-412) (Pers comm Eric Meek). Due to the close proximity of the breeding colony on Little Green Holm, these species are potentially at risk from turbines that will be installed in the Fall of Warness in the future, particularly during feeding. Cormorants are known to dive to up to 9 m below sea level when feeding.

4.2.7 Mammals

Otters

Otters are largely solitary, nocturnal animals. From what is known from detailed studies on coastal otters elsewhere in Scotland, females range over relatively long sections of coast, on average about five kilometres, while males average about eight kilometres. Although otters can breed at any time of the year, there is strong evidence to suggest that in this part of Scotland most cubs are born in winter (Conroy & Bacon 2005). Litter size varies between 1 and 4 (usually 2-3). Cubs are born in natal holts which are usually some distance from major watercourses. The young then move to holts nearer the shore, where they are suckled for up to six months and remain with their mothers for 10-12 months before dispersing (Kruuk *et al* 1987).

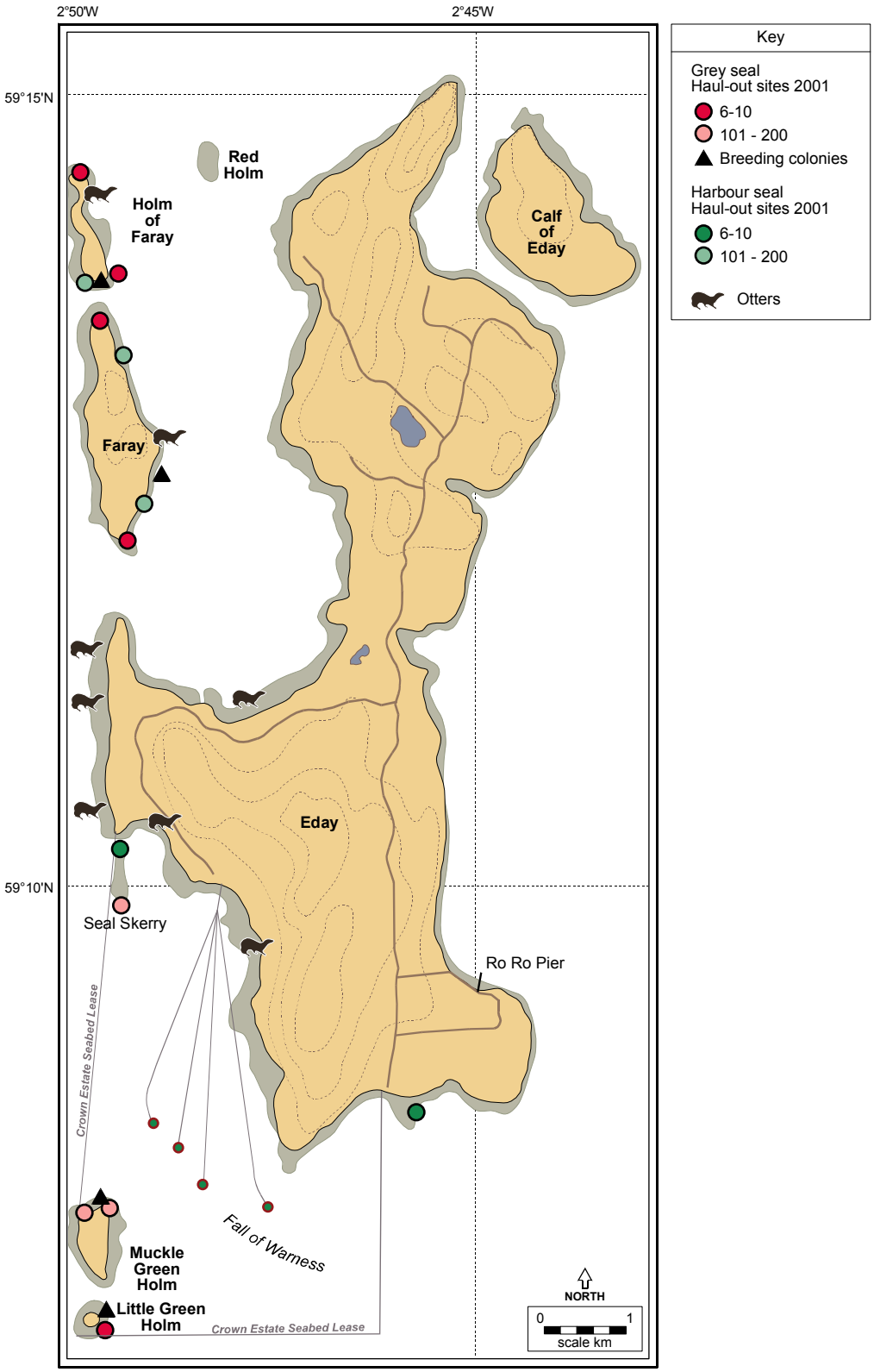
Otters are opportunistic carnivores and although their primary source of food is freshwater habitats they also make extensive use of the seas and coastal areas. In general, the otters diet is dictated by what is abundant and most easily caught. The diet is dominated by demurral fish, which accounts for around 80% of the prey taken. These include eelpout, rocklings, butterfish, eel, blenny and flatfish. Free swimming fish and shore crabs are also eaten, but in much smaller numbers.

Orkney has long been recognised as an important area for otters with a population of national importance. The otter is well distributed and fairly common in Orkney on both the coastal and inland waters of many of the islands, where there is fresh water, absence of human disturbance and often the presence of heath-land behind the coastal sites. In 2001 females with several cubs at several sites along the west coast of Eday and also on Faray (see Figure 4.6) were recorded. Tracks of an adult otter and cubs were found on a beach near Sandybank, a holt was found near Neven Point and there was evidence of otters in Ferness Bay. There have been sightings in Seal Skerry and Ferness Bay, and on the west coast of Eday north of Sealskerry Bay (OIC unpublished data 2000). It is likely that otters occur all round the coastline of Eday and Faray (Booth unpublished data). In light of this a survey was commissioned as part of the EIA to investigate the potential distribution of otters Booth 2005). The broad conclusions were as follows:

- Evidence of otter presence – spraints (faeces), urine marking, footprints and runs through the vegetation – were found at a number of sites along the six kilometres of coast surveyed, including a concentration of sites in the immediate vicinity of the site of the proposed substation;
- Although a number of potential holts were identified, no occupied ones were found;
- No natal holts were recorded; and
- The results of the survey suggested that otters regularly visit the area around the site of the proposed development, there was no evidence that, at the time of the survey (May 2005), they were actually 'living' there (i.e. no occupied holts were found).

The Eurasian otter (*Lutra lutra*) is protected by national and international legislation which makes it an offence to disturb, kill, trap or harm the species as well as damaging and/or disturbing its resting, feeding and breeding sites. The otter is listed on Appendix 1 of CITES, Appendix II of the Bern Convention and Annexes II and IV of the Habitats Directive. It is protected under schedule 5 of the Wildlife and Countryside Act 1981 and Schedule 2 of the Conservation (Natural Habitats, etc.) Regulations 1994 (Regulation 38).

Figure 4.6 Distribution of otters, common seals and common seals



Seals

Both grey (*Halichoerus grypus*) and harbour (common) (*Phoca vitulina*) seals are protected species under European legislation and are listed in Annex II of the European Habitat's Directive. They are also protected under the Conservation (Natural Habitats etc) Regulations 1994 and the Conservation of Seals act 1970). The islands of Muckle Green Holm and Little Green Holm support a breeding colony of grey seals and are designated SSSI sites contributing around 3% of UK annual pup production (SMRU 2005). The islands of

Faray and Holm of Faray are also afforded national protection via a SSSI designation. In addition the inshore waters surrounding Faray and Holm of Faray have been designated a marine Special Area of Conservation (SAC). Both designations are due to the grey seal population found there, which is the second largest breeding colony in the UK, contributing to around 9% of UK annual pup production. Due to their European Protected status, these islands have been included in the EIA despite being some distance from the proposed tidal test site.

Orkney holds over 27% of the counted common seal population in Great Britain. Apart from exposed, steep, west-facing shores, common seals can be found distributed throughout the islands and can be seen at all times of the year. Grey seals can also be found regularly, with over 32% of all the grey seal pups born in Great Britain being born on the Orkney coasts (Barne 1997). The grey seal is the larger of the two species.

The grey seals diet is composed mainly of fish that live on or near the seabed. In particular, sandeels, whitefish (cod, haddock, whiting, ling), and flatfish (plaice, sole, flounder, dab), but the diet varies seasonally and from region to region. The common seal diet is similar with the inclusion of octopus and squid (SMRU unpublished data 1997).

Seals only spend a proportion of their lives in water. They require to haul ashore to breed and to rest, and spend longer ashore when they undertake their annual moult. Grey seals range considerably wider than common seals, who appear to be more faithful to particular haulout sites (Thompson & Miller 1990). During their breeding season, mothers with young pups are susceptible to disturbance, when the formation of the mother-pup bond can be disrupted. Pups abandoned or separated from their mothers may suffer increased mortality rate. Prolonged disturbance can lead to the abandonment of haulout sites (Renouf *et al.* 1981). Grey seal pups begin their offshore life independently and are notoriously inquisitive. Everything they encounter is 'new' and worth investigating, it is possible they may be attracted by objects moving in the water column. Common seal pups forage with their mothers until they wean in about four weeks (Corpe 1996).

Common seals pup in early June and July, and the breeding season is followed by the moulting period in late July and early August. The grey seal breeding season begins in October in the northern Scottish islands and moulting period follows in January to March (females), and March to May (males).

Seal numbers and distribution

The Sea Mammal Research Unit (SMRU) undertakes routine surveys of harbour (or common) and grey seals around Scotland. The most recent findings are provided in the attached supporting report and are summarised below and in Figure 4.6.

Common seals

The closest common seal haulout sites to the test facility, from the most recent breeding and moulting surveys, are: Seal Skerry; along the south-west coast of Eday; just east of The Graand on Eday's south coast and on Muckle and Little Greenholm. Seal Skerry with 79 recorded seals in 2001, is the largest of these haulout sites.

The survey indicated that a small number of single adult males were present along the south west coast of Eday. The presence of these males close to a haulout with a large number of pups strongly suggests that the sea around the Fall of Warness is used as an underwater display area for common seals. Male common seals have underwater display sites where they maintain station, possibly in an underwater territory, and are thought to attract females with a series of complex underwater vocalisations (Van Parijs *et al.* 2000). They alternate between displaying at their particular site and hauling ashore to rest. Common seal females mate approximately four weeks after giving birth to their pups (Thompson 1988, Thompson & Miller 1994). Thus the important time when males are attracting females in oestrus will be somewhere between mid June and the end of July.

The movements of individual common seals within Orkney waters have been determined by satellite telemetry deployment. From the available data, there were no major movements of common seals through the Fall of Warness. Seals did use the haulout sites on The Graand and the Green Holms. These tracks were from seals tagged at haulout sites some distance from the test site and the pattern of usage is likely to be different for seals which normally haulout on Seal Skerry, for instance.

Grey seals

The grey seal breeding colonies of Muckle Green Holm and Little Green Holm, and Faray and Holm of Faray attract a large number of individuals between early October and late November. In 2003, pup production estimates for Muckle and Little Green Holm, Faray and Holm of Faray were 809, 390, 2,038 and 1,387 respectively. In some years a small number of pups (up to about 10) are born on Fers Ness, the headland on Eday pointing to the south tip of Faray. In 2003, Muckle Green Holm and Little Green Holm provided 6.4% of the total Orkney production and Faray and Holm of Faray 18.4%.

Muckle Green Holm and Little Green Holm also act as a haul-out area during the summer for grey seals, as does Seal Skerry to a lesser extent.

Movements of grey seals, tagged both in and outside Orkney, from satellite telemetry studies have shown that grey seals range considerably more widely than common seals. From the available data, the pattern of use of the Fall of Warness by grey seals is unclear. Muckle Green Holm and Little Green Holm appear to be important haulout and breeding sites and there has been some use of the waters to the south and west of Eday. However, as with common seals, none of the grey seals were tagged in the vicinity of test site as part of the survey and this might be reflected in the pattern of use.

Cetaceans

Seven species of the seventeen species of cetacean that have been recorded in Orkneys coastal waters are present throughout the year or are recorded annually as seasonal visitors to the area. The following species have been recorded in the Eday area; minke whale, harbour porpoise, white-sided dolphin, common dolphin, killer whale and pilot whale. The harbour porpoise is the most commonly observed cetacean in Orkney waters, although in relatively small numbers. This is the only cetacean species to be recorded regularly off the south west coast of Eday, and suggests that apart from the harbour porpoise, the above species are probably transitory, although groups of killer whales or dolphins may spend several days in the area before moving on.

There are records of harbour porpoise occurrence throughout the year, but the majority of sightings are from April to September. It has been suggested that this species moves offshore during the winter as sighting are less frequent. The numbers of individuals reported are usually between 1 and 5, although groups of up to 17 have observed. Harbour porpoises use the area for passage between Westray and Stronsay Firths and for feeding on shoaling fish such as sand-eels and sprats (Booth 2005 unpublished data).

Killer whales (*Orcinus orca*) have been recorded between March and August, especially over the last five years. These animals were probably on transit and are associated with attacks on common seals at haulout sites to the east of Egilsay and Papa Westray.

There have been occasional sightings of minke whales (*Balaenoptera acutorostrata*) and pilot (*Globicephala melas*) whales have also been observed. There has been a live stranding of a pilot whale near Ferness Bay. Unidentified dolphins (possibly white beaked (*Lagenorhynchus albirostris*) and Risso's (*Grampus griseus*) dolphins) have also been reported on several occasions, between the months of May to August (Booth 2005 unpublished data).

All species of dolphins, porpoises and whales (cetaceans) are listed in Annex II of CITES, Appendix II of the Bern Convention Annex, and in Appendix IV of the EC Habitats Directive as species of European Community interest and in need of strict protection. They are also protected under Schedule 5 of the Wildlife and Countryside Act, 1981. The harbour porpoise is covered by the terms of ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas), an international agreement with the aim of promoting the conservation of small cetaceans.

Noise pollution in the marine environment is a growing concern. The importance of sound to cetaceans is increasingly being acknowledged, but is inherently difficult to study. Early evidence suggests that cetaceans can be directly harmed by powerful noises. Although lower levels of exposure do not cause physical damage, behavioural reactions may still have significant negative impacts. Investigations into stranded whales have shown evidence of acoustically induced damage including internal bleeding and gross harm to ears. Sound has a much greater transmission range in water than either light or electromagnetic waves, and cetaceans rely

on sound as their primary sense. It is thought that sound from anthropogenic sources interferes with echolocation and masks intra-species communication (WDCS 2004).

Turtles

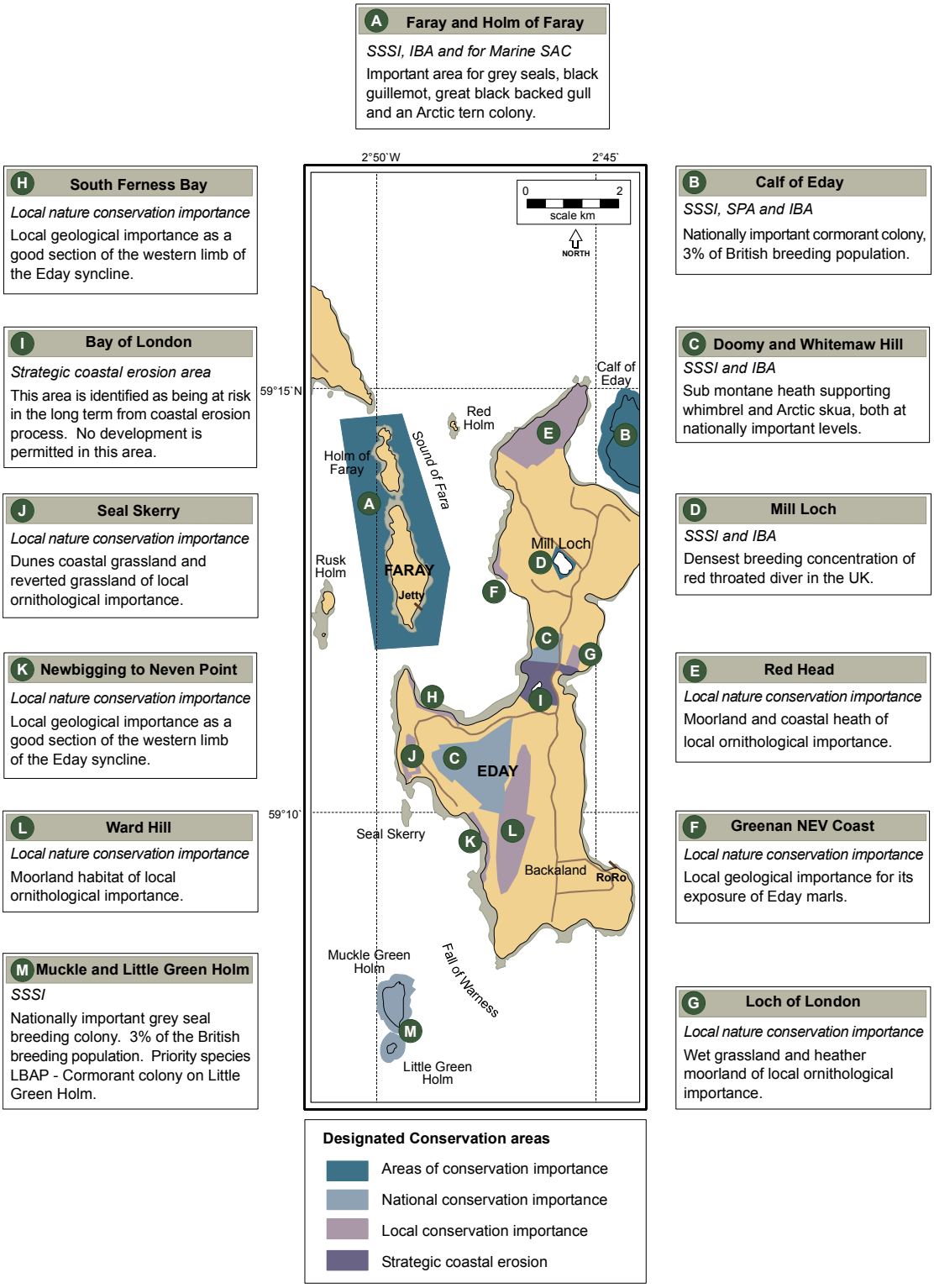
The earliest known record of turtle sightings in Orkney was 1684. While other species tend to occur as wind blown strays, leatherback turtles (*Dermochelys coriacea*) regularly visit Scottish waters between August and November. The leatherback turtle is most commonly found in tropical and sub-tropical waters, but the influence of the Gulf Stream allows this turtle passage to the North Atlantic. The species is listed by the World Conservation Union (IUCN) as critically endangered.

There were nine recorded sightings of individual leatherback turtles in Orkney from 1987 to 1999, and although the majority were in the northern isles, none were sited in the coastal waters surrounding the island of Eday. This cannot however be taken as evidence that these turtles do not feed or pass through this area (Booth 1994).

4.2.8 Conservation and protected sites

Details of the conservation and protected sites on Eday is provided in Figure 4.7. The main areas of concern in relation to the proposed development are the Islands of Faray, Holm of Faray, Muckle Green Holm and Little Green Holm. These are all sites with important colonies of grey and/or common seals that are afforded statutory protection at national and European level. Little Green Holm is also considered of local conservation importance due to the colony of cormorants.

Figure 4.7 Conservation and protected sites in the area surrounding Eday and the Sound of Faray



Source: Orkney Islands Council 2004

4.2.9 Local development policies

The Orkney Local Plan 2004 provides detailed policies for the determining of planning applications. In considering all planning applications for development proposals and change of use the Council will seek to ensure that:

a) The amenity of the area is protected;
b) The development is appropriately located, sited and designed and can be integrated into the landscape;
c) Adequate vehicle access and parking is provided;
d) Unacceptable damage to the environment does not result;
e) Conflict with adjoining uses is avoided; and
f) Undue burdens are not placed on infrastructure.

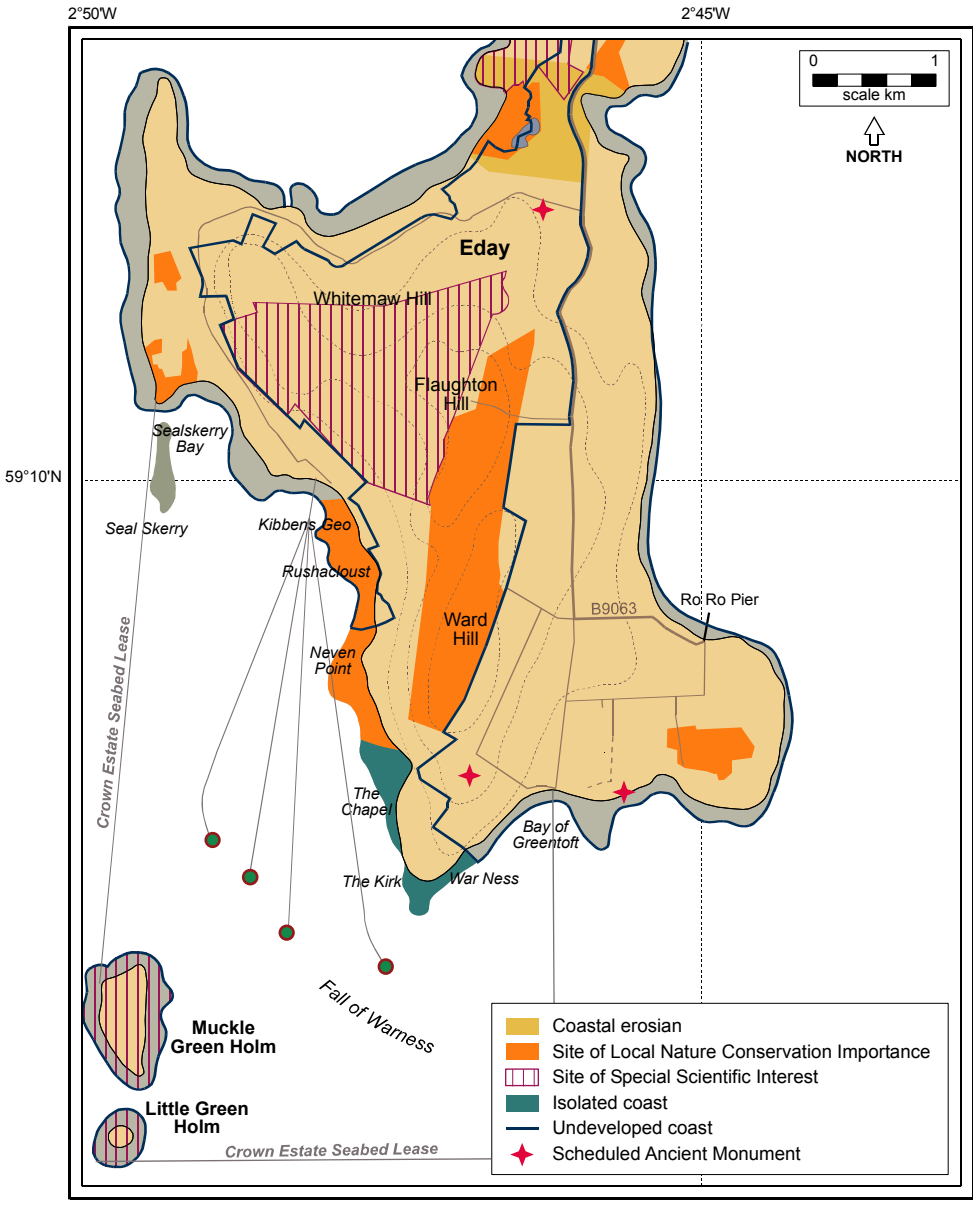
In addition, under Nature Conservation Act (2004) the Local Authority (OIC) has the duty to further biodiversity with regard to local priority species/LBAP species.

The detailed planning policies that are relevant to the proposed development are detailed in Table 4.2 and Figure 4.8.

Table 4.2 Local development policies

Policy	Planning constraints
Natural heritage policies Policy LP/N1 Designated sites	Planning permission will not be granted for any development that would have a significant adverse effect on a site designated or proposed to be designated as a Special Protection Area, Special Area of Conservation or RAMSAR site and not directly connected with, or necessary to the conservation management of that site must be subject to an appropriate assessment as required by the Conservation (Natural Habitats etc.) Regulations 1994, in order to assess the implications for the site's conservation objectives. Development likely to have a significant effect on a Site of Special Scientific Interest or designated nature reserve, will only be permitted where there is no reasonable alternative or less ecologically damaging location and the reasons for the development clearly outweigh the value of the site by virtue of social or economic benefits of national importance. Development which would have a significant adverse effect on the nature conservation interest of existing or proposed Local Nature Conservation Sites will only be permitted if the importance of the development outweighs the local value of the site, and measures are incorporated to minimise impact and conserve the site's interest.
Natural heritage policies Policy LP/N2 – Protection of species, habitats and features of conservation interest.	Planning permission will not be granted for any development that would have a significant adverse effect on any species of animal (or their actively used breeding, feeding and roosting habitats), plant, land and water supporting such species, or habitat protected under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981, Annexes I, II and IV of the European Community Habitats Directive or Annex I of the European Community Wild Birds Directive. Policy LP/N2 also covers any species or habitat listed within Annexes 2 and 3 of "Action for Scotland's Biodiversity" or any species or habitat identified as a priority in the Local Biodiversity Action Plan, unless the public benefits of the development at a local level outweigh the value of the species or habitat being protected.
Coastal Zone policies Policy LP/C1- Development within the coastal zone	Development within the 'isolated coast' will not normally be permitted, unless the development is minor in nature and is dependent on the characteristics of the isolated coast. If development is permitted the highest possible standards of design will apply to minimise the impact of the development on the character of the coast. Development will be permitted in areas defined as 'undeveloped coast' provided that the development is of a minor nature, the economic and social benefits of the development outweigh any potential detrimental effect on the environment and it cannot be reasonably expected to suffer from coastal erosion or tidal inundation (Policy LP/C4). Development in the coastal zone should not result in a reduction in any of the coastal water quality designations.
Policy LP/C4 Coastal erosion	Other than in exceptional circumstances, any development within the undeveloped coastal zone as identified on the Proposals Maps will not be permitted.

Figure 4.8 OIC Local development policies 2004



4.3 Human environment

4.3.1 Population and development

Hamarhill in the north of the island is the main centre of population on Eday, where a small cluster of council houses is located, and the only shop and post office on the island. Eday has no public house, but does have a resident GP and the community school provides a central location for many community based activities. The islanders rely on the RO-RO ferry service for transport to mainland Orkney.

The most serious problem facing the Northern Isles of Orkney, including Eday, is depopulation. There has been a steady decline in island populations since WW2 as agriculture and fishing have become more mechanised and less labour intensive. Between 1991 and 2001 the population census showed a 27% drop from 166 to 121 inhabitants, with a trend towards an increasingly aging population, and falling numbers of young families. The latest population figure excluded the 10 school children (attending Kirkwall Grammar) and students living away from Eday during the school week/term time. 77% of the population aged between 26 and 74 were economically active in 2001. In 2001, Eday's population represented less than 1% of Orkney's total population (The General Register Office for Scotland 2001).

The main component of the island economy is agriculture, of which beef is the most important. This sector employs over a third of the island population. Other economic components include fishing and fish farming, tourism, public sector jobs in the school and post office, the community shop and a number of small craft businesses.

Typically of island communities, while farming remains the backbone of the island economy, there is a trend for individuals to have more than one source of income from part-time jobs at the pier, airport and in tourism activities such operating B&B's for example. Nearly half the population (47%) are self-employed, with 11 part-time and 21 full time employees. Any development opportunities that present themselves are constrained by a small pool of labour, and there is a lack of young people remaining on the islands to take over traditional family run businesses.

In late 2004, Eday's economic and social fragility was recognised by the Scottish Executive when it was announced that the island had been included in the 'Initiative at the Edge' programme. This has stimulated the formation of a group – the Eday Partnership – to implement a development plan for the island, which will be aided by the appointment of a part-time Development Officer in March 2005.

4.3.2 Cultural heritage

An archaeological study commissioned as part of the EIA comprised of a desk-based assessment followed by a walkover survey at the following sites.

- Cauldale: the building site and the access road;
- Greentoft Bay *possible* navigational marker site: the marker site with associated construction area and access;
- Muckle Green Holm *possible* navigational marker site: the marker site with associated construction area and access;
- Little Green Holm *possible* navigational marker site: the marker site with associated construction area and access; and
- The offshore test site: comprising the offshore area within the limits of the test site, including the cable routes and cable end positions.

Cauldale

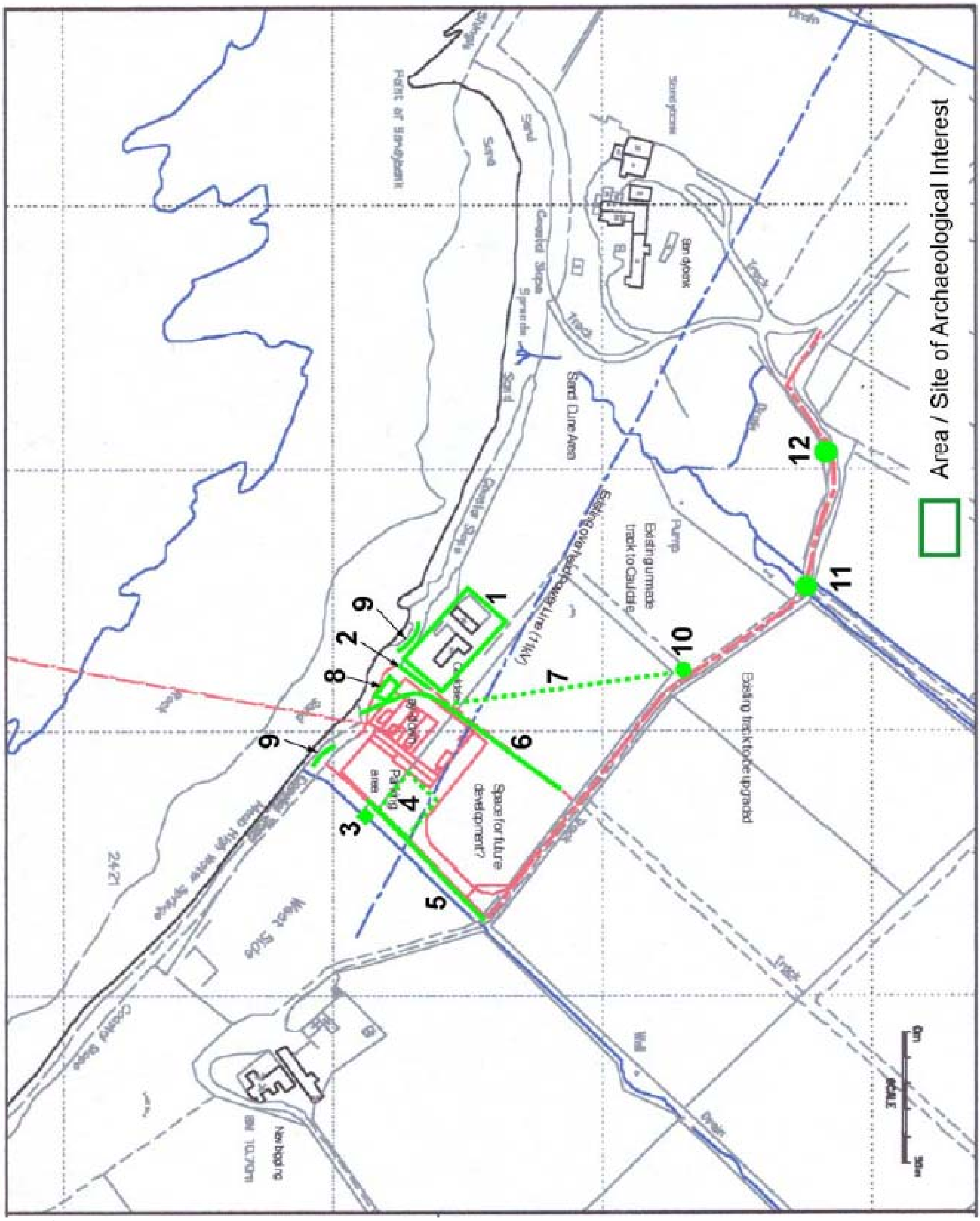
There are no Scheduled Ancient Monuments, Listed Buildings or designated landscapes within the Cauldale study area (see Table 4.3). The Cauldale site is however considered to be of local archaeological interest as an example of a 19th century croft. It is recognised that farm buildings are a diminishing, vulnerable and under-protected part of the cultural resource and as such the site must be considered of local, if not regional, importance (Orkney Archaeological Trust). Figure 4.9 shows the location of the Cauldale sites.

Table 4.3 Archaeological interest within Cauldale area

Site	Description	NGR	Importance 1	SMR 2	NMRS 3	SAM 4
1	Cauldale farmstead-This comprises the Cauldale farmstead, including outbuildings, walled yards and external paving, cut into the dune system	HY 5416 3134	Low/Medium	-	-	-
2	Yard wall, part of Site 1- a ruinous section of the SE side of the yard enclosure.	HY 5418 3133	Low/Medium	-	-	-
3	Footbridge across drain to SE -This forms part of the 19th-century rural architecture of the Cauldale crofting landscape.	HY 5423 3131	Low/Medium	-	-	-
4	Enclosure	HY 5422 3132	Low			
5	Turf track along SE edge of site-former field boundary, part of the 19thcentury crofting landscape.	From HY 5426 3135 to HY 5422 3131	Low			
6	Turf track leading to shore, on NW edge of site- part of the 19thcentury crofting landscape.	From HY 5422 3138 to HY 5418 3131	Low	-	-	-
7	Track leading diagonally across the site to the shore - likely to date from the first half of the 20th century	From HY 5418 3142 to HY 5418 3131	Low			
8	Flag horizon in dunes at cliff section flags could be the remains of a surface associated with the steading, or could be the remains of a grave from the first millennium AD	HY 5417 3131	Unknown	-	-	-
9	Buried peat horizon in dunes at cliff section – likely to date from Bronze Age.	HY 5416 3132	Low	-	-	-
10	Turf track leading to the N side of Cauldale, cut by the access road	HY 5418 3142	Low	-	-	-
11	Turf track beside drain to E of Sandybank, cut by the access road	HY 5414 3146	Low			
12	Turf track near the Sandybank junction, cut by the access road	HY 5408 3147	Low			

[1] *Significance criteria used by OAT*
[2] *Orkney Sites and Monuments record*
[3] *National Monuments Record of Scotland*
[4] *Scheduled ancient monument*

Figure 4.9 Location of archaeological sites at Cauldale



Source: Orkney Archaeological Trust

Greentoft Bay

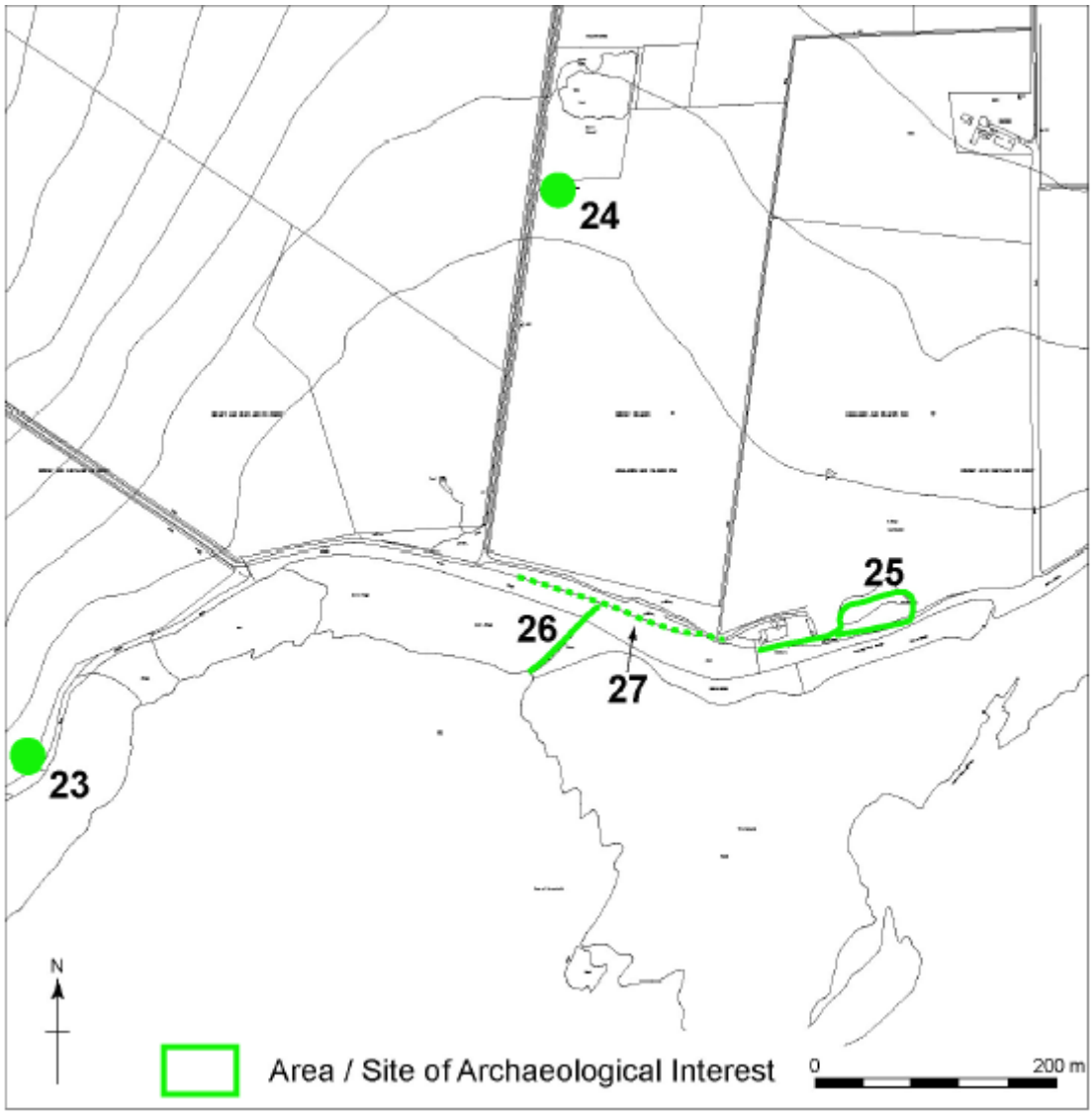
There are no Listed Buildings or designated designed landscapes in the study area. Although there are several Scheduled Ancient Monuments in the Southside of Eday (see Table 4.4) none are in the immediate area of the possible navigation marker. Figure 4.10 shows the location of the Greentoft Bay sites.

Table 4.4 Archaeological interest around Greentoft Bay

Site	Description	NGR	Importance [1]	SMR [2]	NMRS [3]	SAM [4]
23	Hannah's Kirk – site of old chapel.	HY 5569 2873	High	1000	HY52NE 5	-
24	Southside standing stone	HY 5615 2922	High	998	HY52NE 1	1381
25	Castle of Stackel Brae- irregular mound – former core of a high status medieval and post-medieval building and settlement,	HY 5647 2885 to HY 5632 2882	High	741	HY52NE 6	5944
26	Stone jetty-	HY 5616 2885 to HY 5610 2877	Low	-	-	-
27	Sporadic features in links/dunes- most are badly eroded and little is left.	HY 5632 2882 to HY 5613 2888	Low	-	-	-

[1] *Significance criteria used by OAT*
[2] *Orkney Sites and Monuments record*
[3] *National Monuments Record of Scotland*
[4] *Scheduled ancient monument*

Figure 4.10 Location of archaeological sites Greentoft Bay sites



Source: Orkney Archaeological Trust

Muckle Green Holm

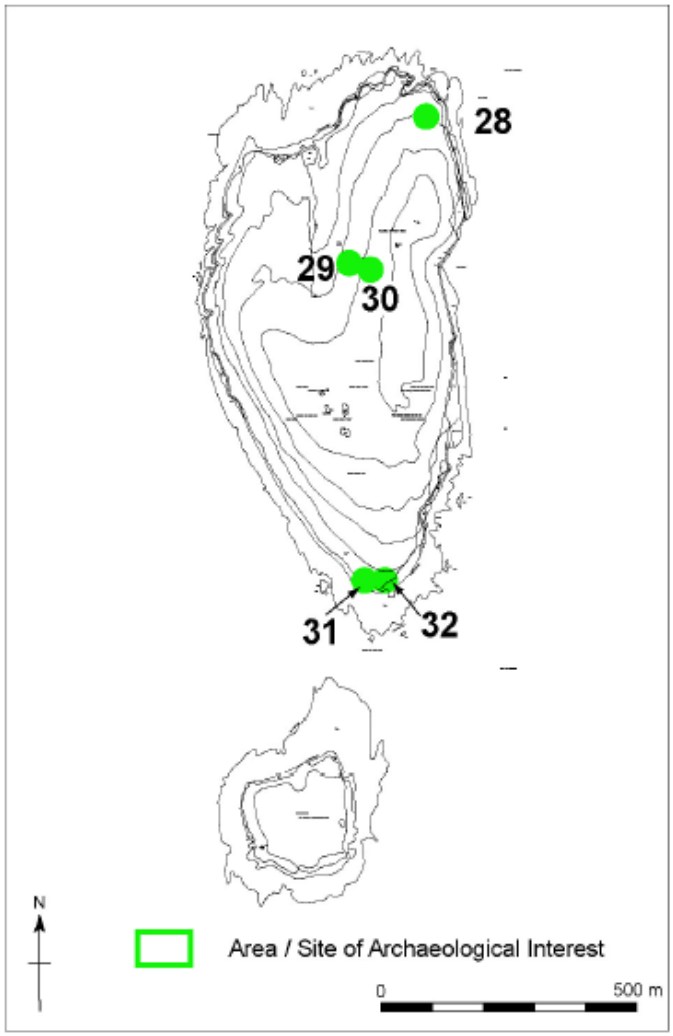
The following sites (see Table 4.5) are the product of a desk-top study only. A walkover survey was not carried out as at the time of the survey there was risk of disruption to sensitive bird species nesting.

Table 4.5 Archaeological interest on Muckle Green Holm

Site	Description	NGR	Importance [1]	SMR [2]	NMRS [3]	SAM [4]
28	Grave – dating from 1881.	HY 5280 2756	High	929	HY52N W 8	-
29	19th century cruciform sheep shelter	HY 5265 2726	Low	-	-	-
30	Monastic buildings & field system - a medieval farmstead, likely to be a monastic grange	HY 5265 2726	High	928 & 933	HY52N W 6 & 7	-
31	Prehistoric mound Several erect slabs are exposed suggesting the internal divisions of a prehistoric house.	HY 5270 2666	Medium	927	HY52N W 1	-
32	Graves – possibly dating from 1879	HY 5270 2666	High	927	HY52N W 1	-

[1] *Significance criteria used by OAT*
[2] *Orkney Sites and Monuments record*
[3] *National Monuments Record of Scotland*
[4] *Scheduled ancient monument*

Figure 4.11 Location of archaeological sites on Muckle Green Holm



Source: Orkney Archaeological Trust

Little Green Holm

There are no known sites of archaeological interest on Little Green Holm.

Offshore area

The following ships have been wrecked in the general area, but no actual wreck sites are known.

Table 4.6 Offshore sites of archaeological interest

Site	Description	NGR	Importance [1]	SMR [2]	NMRS [3]	SAM [4]
33	AGNES, off Seal Skerry – schooner wrecked 1815	HY 529 313	Low	-	HY53SW 8001	-
34	CONCORDIA, off War Ness – schooner wrecked 1875	HY 550 282	Low	-	HY52NE 8001	-
35	COALITION, off Muckle Green Holm – wrecked 1783	HY 525 272	Medium	-	HY52N W 8001	-
36	AGIL, off Little Green Holms – barquentine wrecked 1877	HY 525 262	Low	-	HY52N W 8002	-
37	KATHLEEN ANNIE, off the Green Holms – schooner wrecked 1824.	HY 525 272 or HY 525 262	Low	-	HY52N W 8003	-
38	CERES, between the Green Holms of Eday – steamship wrecked 1912.	HY 525 266	High	-	HY52N W 8004	-
39	Spanish man-o-war?, off the Green Holms - Presence assumed due to graves on Muckle Green Holm.	HY 526 266	High	-	-	-
40	Spitfire aircraft, off Eday – abandoned 'off' Eday 1942.	HY 55 32	High	-	HY53SW 8006	-

4.3.3 Fishing activity

Nationally in Scotland there has been a steady decline in the numbers employed in sea fishing from, and this trend is reflected in Orkney. The number of white fishing boats has been reduced to just one out of Westray, with the other 4 boats in the Orkney fleet fishing from Mainland. As the continued decline and problems faced by the white fish industry is reflected throughout Orkney, the shellfish and creel sector now contribute a major part to the Orkney fleet. The fleet is spread throughout the island group, playing a vital economic and social role that is of particular importance to the northern isles. The main species fished are brown, green and velvet crab and lobsters. Competition from other suppliers and variable prices has led to the development of crab processing factories in Stromness and Westray. In the region of 12 creel fishing boats from Mainland Orkney and 2 from Westray regularly fish on the SW coast of Eday within the Fall of Warness, with the catch amounting to upwards of 30% of their total catch throughout Orkney with a value estimated at £120,000 pa Individual vessels may have a greater reliance on the fishing stocks in the area, estimated as up to 50% in some cases (Orkney Fishermen's Association).

Scallop fisheries show a general decline however. The recurring effects of paralytic and amnesic shellfish poisoning (PSP and ASP) which have resulted in lengthy bans, coupled with invasion by fishers from outside Orkney which has led to over fishing has not left the industry in a strong position. The number of vessels has been reduced from 14 to 5 in recent years. Due to the severity of the tidal stream, scallop diving rarely takes place in the Fall of Warness.

There is no aquaculture activity taking place with the proposed test site Crown Estate lease area.

4.3.4 Shipping

The Fall of Warness is within the International Maritime Organisation (IMO) adopted "Area To Be Avoided" which requires all vessels over 5,000 GT carrying oil or other hazardous cargo to avoid the area designated. The inherent nature of the channel makes it hazardous for small craft (leisure sailing/diving boats), however it is used by larger vessels. Cruise ships and pelagic fishing vessels use the channel for passage, creel fishermen

operate in the area, and the inter-island ferries use a number of routes through the channel which can vary in response to poor weather and associated sea conditions (see Figure 4.9).

Cruise ships

A significant number of cruise ships visit Orkney every year, primarily between April and September. Of these approximately 28 vessels might use the Fall of Warness channel either enroute to Shetland and Iceland, or as part of specialist cruises around various islands in the Orkney Isles (ARC Ltd 2005).

Pelagic fishing vessels

Information from the Scottish Pelagic Fishermen's Association indicates that 20-30 vessels a year use the Fall of Warness as a transit route to the fishing grounds in Shetland (ARC Ltd 2005).

Creel fishing boats

12 creel fishing boats from Mainland Orkney and 2 from Westray regularly fish on the south west coast of Eday within the Fall of Warness. Creeling usually takes place close inshore and usually within the 15 m contour. Very occasionally, creels may be deployed out to 30 m. This limits the creel fishing areas to the periphery of the proposed test facility area.

Inter-island ferries

The normal routes for the inter island ferries is not to traverse the Fall of Warness area. However there are certain tide and weather conditions that alter the route of the normal sailings. In these instances ferries will traverse the Fall of Warness area.

Orkney Ferries make approximately 2,400 voyages per year to and from the islands of Eday, Sandy and Stronsay. Of the 2,400 crossing approximately 1,200 are undertaken when the tide is flooding resulting in vessels having to transit the area where it is proposed to site test devices.

There are also approximately 1,566 voyages per year to and from the island of Westray. Of the 1,566 crossings, approximately 783 are undertaken when the tide is ebbing, resulting in the vessels having to keep to the east side of the Westray Firth, both outward and inward. In general they will not transit the area where it is proposed to site test devices.

Table 4.7 and Figure 4.12 summarise the specific details of different routes through the area.

Table 4.7 Details of different ferry routes through the Fall of Warness area

Eday, Sandy and Stronsay ferry routes
1) Flood tide outward bound from Kirkwall – fine weather
After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will set a course to pass close to the East of the Little Green Holm. From there he will proceed on roughly a Northerly course until the vessel encounters the current flowing in a South Easterly direction past the North end of the Muckle Green Holm. At this point he will alter course to starboard and set a course to pass the Point of Warness where a further alteration of course will be made to take the vessel between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday
2) Flood tide outward bound from Kirkwall – strong to gale force south to southeast winds
After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will set a course to pass West of the Green Holms and he will continue on this course until the vessel reaches a point approximately midway between the North end of the Muckle Green Holm and Seal Skerry, but this may vary depending on the sea state. At this point he will alter course to starboard and set a course to pass close to the point of Warness where a further alteration of course will be made to take the vessel between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday. As this route adds only 5 minutes or thereby to the passage times and offers better passenger comfort and cargo safety for most of the journey, our Masters tend to use it in preference to No.1 as a precautionary measure before winds have reached gale force speeds.

Eday, Sandy and Stronsay ferry routes continued
3) Flood tide inward bound from Eday, Sandy and Stronsay – fine weather After passing between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday, the Master will set a course to pass close to the point of Warness where the vessel will encounter the current flowing in a South Easterly direction. At this point he will alter course to port and set a course to take the vessel close past the East side of the Little Green Holm and on to the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay.
4) Flood tide inward bound from Eday, Sandy and Stronsay – strong to gale force south to southeast winds After passing between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday, the Master will set a course to pass close to the point of Warness where the vessel will encounter the current flowing in a South Easterly direction. At this point he will alter course to starboard and set a course to take the vessel past the North end of the Muckle Green Holm. Once clear of the Muckle Green Holm, a further alteration of course will be made to take the vessel past the West side of both the Green Holms and on to the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay.
5) Ebb tide outward bound – fine weather After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will, allowing for the current flowing in a North Westerly direction, set a course which will take the vessel between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday. At no time will the vessel be near the test area.
6) Ebb tide outward bound – strong to gale force south to southeast winds After passing between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday, the Master will, allowing for the current flowing in a North Westerly direction, set a course which will take the vessel past the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay. At no time will the vessel be near the area in question.
Westray ferry routes
7) Ebb tide outward bound from Kirkwall - gale force west to NW winds and/or heavy seas After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will set a course to pass to the East of the Green Holms. From there he will proceed on roughly a Northerly course until the vessel is in the proximity of Seal Skerry. At this point he will alter course to port and, once the vessel is clear to the West of Seal Skerry, he will alter course to starboard and proceed on roughly a Northerly course running parallel to the Eday Shore.
8) Ebb tide inward bound from Westray - Gale Force West to NW Winds and/or Heavy Seas: After passing Seal Skerry, where the vessel will encounter the current flowing in a North Westerly direction, the Master will alter course to port and set a course to pass to the East of the Green Holms. Once clear of the Little Green Holm, he will alter course to starboard and set a course to take the vessel to the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay.

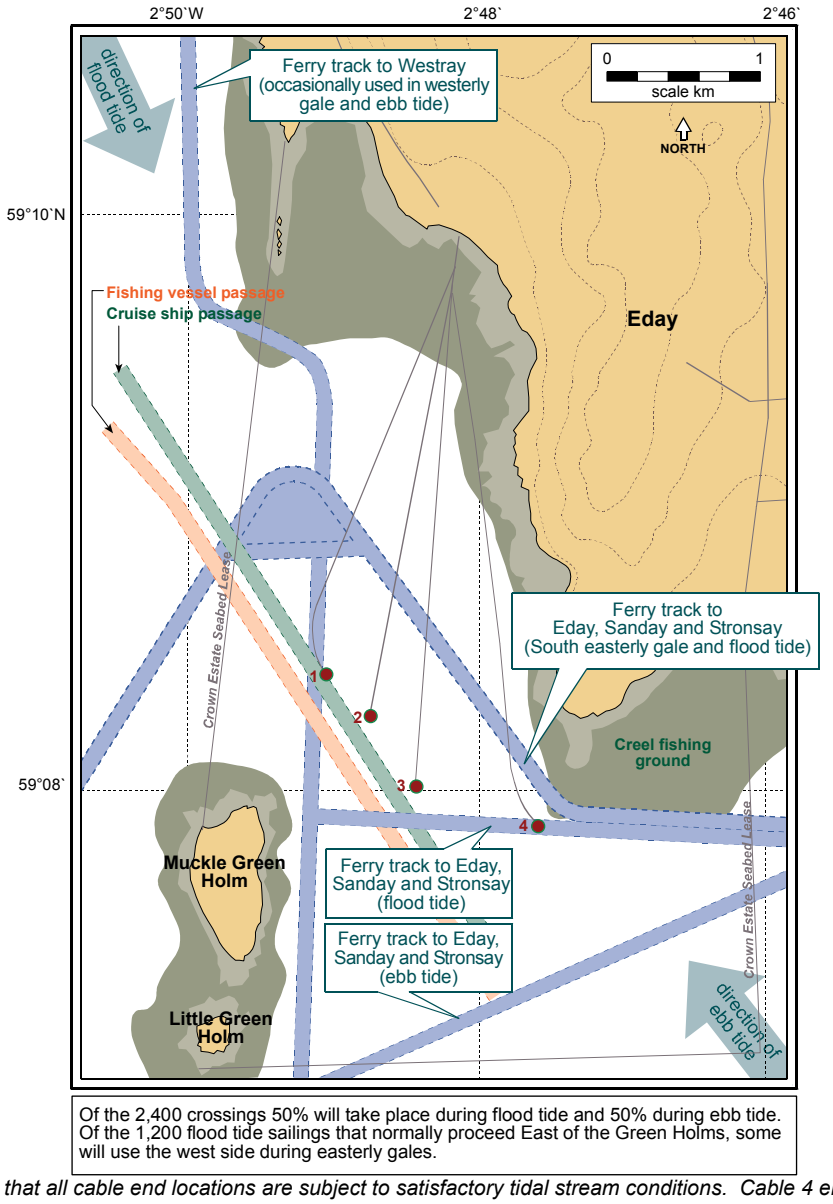
Military usage

There are no military exercise areas immediately adjacent to the proposed area and no indications of the area as being a transit route for other than surface vessels.

Future traffic

In the future the proposed Transhipment Hub in Scapa Flow may increase traffic movement in the area. While the larger transatlantic vessels will probably be excluded, smaller feeder vessels may use the route.

Figure 4.12 Shipping traffic through the Fall of Warness



It should be noted that all cable end locations are subject to satisfactory tidal stream conditions. Cable 4 end point is also subject to review to resolve navigational issues.

4.3.5 Tourism

Tourist activity in Eday tends to be dominated by bird and wildlife watching, with other activities such as visiting ancient monuments and archaeological sites.

There are two walks on Eday. The Warness Walk to Warness Bay for views over the Green Holms, Mainland Orkney and Hoy, and the second Heritage Walk in the north of the island. As part of the OIC commitment under the Land Reform Act 2003 to establish a network of core footpaths 2 additional designated footpaths have been proposed. The first would extend the Warness Walk along the coast as far as Newbigging, and the second around Sealskerry Bay. Both these walks would have views over the tidal test facilities.

Eday minibus tours are also available to tourists. This tour incorporates seal spotting in the south of Eday and bird watching at Mill Loch.

Tourist accommodation comprises of a number of self-catering cottages and B&B's and a youth hostel.

5 Scoping and Consultation

As part of the environmental impact process, a number of stakeholders and statutory consultees were contacted in order to canvas their views on the development. This was not part of a formal consultation but instead a means of scoping the EIA to ensure that all possible issues were addressed during the EIA process. Organisations contacted included those bodies identified by the Crown Estate and the Scottish Executive as their consultees in connection with the Coast Protection Act (CPA) and the Food and Environment Protection Act (FEPA) consents.

Individuals and organisations contacted were:

- Crown Estate;
- Civic Aviation Authority;
- County Archaeologist;
- DTI (Renewable Energy Issues);
- Eday residents, neighbouring landowners & Eday Community Council;
- Environmental Concern Orkney (ECO);
- Fisheries Research Services (FRS);
- Historic Scotland;
- Joint Nature Conservation Committee (JNCC);
- Marine Coastguard Agency;
- Ministry of Defence (submarine surface ship and aircraft interfaces);
- Northern Lighthouse Board (Navigational safety);
- Orkney Creel Fishermen's Association;
- Orkney Coastal Forum;
- Orkney Dive Boat Operators Association;
- Orkney Ferries;
- Orkney Field Club;
- Orkney Fishfarm Association;
- Orkney Fishermen's Association (OFA);
- Orkney Fishermen's Society (OFS);
- OIC Biodiversity Office;
- OIC Harbours;
- OIC Legal Department;
- Orkney Marinas;
- Orkney Renewable Energy Forum (OREF);
- Orkney Sailing Club;
- Orkney Sustainable Energy;
- Royal Society for the Protection of Birds (RSPB);
- Royal Yachting Association;
- Scottish Executive Environment and Rural Affairs Department (SEERAD);
- Scottish Environmental Protection Agency (SEPA);
- Scottish Executive (Environment and Fisheries);
- Scottish Executive (Enterprise, Transport and Lifelong Learning Department) Ecology/ Research Group;
- Scottish Fisheries Protection Agency (SFPA);
- Scottish Natural Heritage (SNH);
- Sea Mammal Research Unit (SMRU); and
- UK Hydrographic Office.

Following receipt of initial responses a number meetings were held. The first meeting took place in Inverness of the 4th May 2005. There were then a series of two meeting in Eday.

Scoping meeting, Inverness

The purpose of the meeting was to provide an opportunity for the mainland regulators and stakeholders to provide feedback on the EIA scoping document. It was also an opportunity to discuss the consenting process and any potential issues that may arise during the planning and development process associated with the test facility and potential devices. The following organisations attended:

- Aurora Environmental Ltd;
- Crown Estate;
- European Marine Energy Centre (EMEC);
- Fisheries Research Services – marine lab;
- Northern Lighthouse Board (NLB);
- Seal Mammal Research Unit (SMRU);
- Scottish Environment Protection Agency (SEPA);
- Scottish Executive - (Environment and Fisheries/Enterprise, Transport and Lifelong Learning Department -Ecology/Research Group);
- Scottish Natural Heritage (SNH);
- Synergie Scotland/Highland and Islands Enterprise; and
- Tulloch Prime Contracting Ltd (Tulloch).

Of the issues discussed, those associated with the construction and installation of the tidal test site infrastructure were expected to be minimal. However, once the site is operational there were a number of concerns regarding the potential impacts of test devices on marine wildlife and it was identified that further research was required, including:

a) Confirmation of the presence/absence and distribution of sensitive wildlife populations in the immediate offshore area of the test devices; and
b) Potential risk to sensitive species from the test devices.

It was deemed important to obtain baseline data as soon as possible to advise developers of any potential risks, and to have baseline data available for inclusion in devices specific ESs.

Public meetings, Eday

A public meeting was held on Eday on Thursday 12th May 2005. The purpose of this meeting was to provide an opportunity for local residents and landowners to provide feedback on the EIA scoping document. It was attended by:

- Aurora Environmental Ltd;
- Tulloch Prime Contracting Ltd (Tulloch);
- Local Development Officer;
- Representatives of the Community Council;
- Neighbours of the proposed development; and
- The wider Eday community.

A second meeting was held with the Eday community on Monday June 13th 2005 with representatives from Synergie Scotland, HIE and EMEC. The main concerns raised realted to the onshore phase of the development centred on any necessary improvements to the public road network, the visual impact of the control building and potential for land based navigational aids/markers. With regards to the longer term operation of the test facilities there were questions raised about the presence of the cables on the beach at the landfall site, what economic benefit the development might bring to the island and the future of the control building once the facility was decommissioned.

Table 5.1 provides a summary of the main issues raised during scoping and consultation. A detailed table of all issues raised is provided in Appendix D.

Table 5.1 Summary of main environmental concerns raised during informal scoping/consultation

Concern	Specific concern(s)/ issues	Raised by the following organisations in alphabetical order	Response and action taken	Relevant ES sections
General issues				
Compliance with environmental legislation	A number of government bodies/statutory organisations sought assurance that legislative requirements that exist to protect the environment from the actions of developers were known of and would be adhered to.	Marine Coastguard Agency OIC OREF SEPA SNH	Tulloch confirmed all pollution control legislation would be adhered to during construction. Tulloch/HIE/EMEC has applied for all appropriate consents relating to construction and operation of the facility. Onshore planning approval gained with conditions.	1.3 3.3 6.2 Appendix B
Local geological feature	Site of Local Nature Conservation Importance designated for geology from Newbigging to Neven Point, which could be affected if development activities impact on coastal erosion.	OIC Biodiversity Officer SNH	Coastal processes review undertaken to investigate possible coastal erosion due to offshore construction and subsequent operation of test facility, concluded no activities would impact on this feature.	4.2.8 6.2 9.1.2
Selection of Fall of Warness as test site	Explanation of the selection process was requested.	Eday residents SNH	The site selection process first screened out 5 potential sites based on physical resource. The 3 remaining sites were further evaluated on environmental and economic grounds with the Fall of Warness emerging as the preferred site.	2.2
Risk to terrestrial and marine archaeology	There is a high risk, particularly on accessible coasts, of encountering archaeology. Absence of recorded archaeological sites does not necessarily indicate evidence of absence of the same. A number of ships have been recorded wrecked in the proposed test area.	Eday resident Historic Scotland OIC County Archaeologist	Orkney Archaeological Trust has undertaken a desk-based assessment, walk-over survey and produced a report outlining potential issues and mitigation strategy.	4.3 6.2 7.1.2 8.1.3 9.7
Navigation risk	The Fall of Warness is transited by inter-island ferries, cruise ships, pelagic fishing vessels, and the inshore coastal area used by creel fishermen. Concerns raised related to navigation safety issues – the physical presence of the devices, increased traffic in the shipping lane and the need for appropriate navigation markers.	Orkney Ferries Orkney Fishermen's Association Orkney Fishermen's Society OIC Harbours Orkney Marinas OREF Northern Lighthouse Board UK Hydrographic Office	A navigation hazard identification and risk assessment was undertaken which assessed the risks presented by the facility and its operations to mariners and identified suitable measures to ensure that any remaining risks were tolerable. Recommendations included device specific advice on positioning charting and marking, that the test facility area should be defined to encompass only the area in which devices will be deployed such that it is no bigger than is absolutely necessary in order not to unduly constrain vessels. Sea users will be notified of test site activities through 'Notice to Mariners' and the distribution of a marine awareness chart. Ongoing communication between EMEC and OIC Harbours during operational phase. Developers are to be advised of navigation risks identified so they can be considered in the design process for test devices.	4.3.4 6.2 8.1.2 9.5 Navigation risk assessment on CD

Concern	Specific concern(s)/ issues	Raised by the following organisations in alphabetical order	Response and action taken	Relevant ES sections
Decommissioning	What will happen to offshore and onshore facilities when the test facility is decommissioned.	Eday residents OREF	At end of project life all offshore structures will be removed. All onshore structures will be removed, excluding the control building for which alternative uses will be investigated.	3.5
Construction/installation of test site infrastructure and long term presence pre device installation				
Wildlife interactions	Possible impact on sensitive bird populations, cetaceans, pinnipeds and otters.	Orkney Field Club OREF Orkney Sustainable Energy RSPB Sea Mammal Research Unit SEPA SNH	An otter survey and follow-up assessment identified a possible risk to otters from onshore construction activities. A detailed site evaluation is due to take place 1 month prior to the start of works which will inform any further specific mitigation. Surveys and assessments undertaken identified an important breeding colony of cormorants on Little Green Holm, and a grey seal breeding colony on Muckle Green Holm, however the offshore works are scheduled to take place outside breeding seasons, and there are no requirements for onshore works on Little Green Holm.	4.2 6.2 7.1.1 7.2.2 9.3
Terrestrial habitat	Possible sensitive dune habitat (acidic dune grassland) identified at Bay of Greentoft and Cauldale with associated species of national importance.	OIC Biodiversity Officer SNH	Terrestrial vegetation and habitat survey undertaken identified this habitat as being present, but in a poor condition, and so of low conservation importance. Any damage done to the dune system at Cauldale will be reinstated post works. If it is required to land construction aggregate by beach the track for vehicle movements will follow the same route proposed for cable installation and be reinstated following installation to avoid potential future erosion problems.	4.2.1 6.2 7.2.1
Intertidal zone	Possible damage to intertidal zone during cable installation.	SEPA	Coastal processes review undertaken. A slight and localised modification to the beach habitat is anticipated, but over time the system is expected to recover.	6.2 7.2
Visual and landscape impact	Colour of onshore building and any landscaping works should be such that landscape and visual impacts are minimised. Concerns were raised over the proposal not to bury the cables on the beach and the resulting visual impact.	Eday residents SNH	Visual and landscape impact survey undertaken and the results informed the final building design. Planning conditions shall also be adhered to. The decision was made not to bury the cables due to wildlife senstivities in the area and potential impacts from bedrock excavation. It is considered that during the life of the project due to the mobile nature of the beach material, the cables will be covered for extended periods with no visual impact.	6.2 7.2.1 9.6

Concern	Specific concern(s)/ issues	Raised by the following organisations in alphabetical order	Response and action taken	Relevant ES sections
Construction issues relating to island infrastructure and cable landfall.	Concerns were raised over which sections of the access roads would require upgrading to facilitate vehicular access to the site by HGV's. Assurance required that any accidental damage done to the pier or roads would be made good on completion, and that no alteration to the pier would be undertaken.	Eday residents	Any road works required will be very minor and undertaken through consultation with OIC roads authority. Any accidental damage will be made good. Aggregates required for the construction phase may be landed directly on the beach at the landfall site if problems with roads access.	6.2
Economic impact	Creel fishermen have lack of access to coastal area during cable laying.	Orkney Creel Fishermen's Association Orkney Fishermen's Association Orkney Fishermen's Society	Offshore cable installation will be carried out in full consultation with fishery organisations and their affected members, and the lack of access will be of temporary duration. A briefing document will be circulated to all interested parties before construction starts.	4.3.3 6.2 8
Operation of test facility				
Control building operation	Possible EMC interference with radio and television signals and acoustic noise from switchgear and transformers.	Orkney Sustainable Energy	Any electrical, magnetic, electromagnetic and acoustic impacts resulting from the electric systems will decay very quickly with distance from the control building, with no predicted impact on the nearest neighbour at Newbigging.	6.2
Wildlife interactions	Concerns relating to the impact of the devices on marine mammals and birds, particularly with regard to blade rotation. It was identified that monitoring of sensitive populations was required for as long a period as possible prior to the deployment of the first device to establish baseline information, and on-going monitoring to determine the risk of impact between devices and sensitive populations.	Crown Estate Fisheries Research Sevices Orkney Field Club OREF RSPB Sea Mammal Research Unit SEPA SNH	Surveys and assessments undertaken as part of the EIA identified an important breeding colony of cormorants of Little Green Holm, and a grey seal breeding colony on Muckle Green Holm. The Fall of Warness is known to be used by cetaceans, but there has been no systematic cetacean monitoring in this area and records obtained have been on a casual basis. EMEC is currently working on establishing monitoring of the impacts of devices on sensitive populations. EMEC is involved in plans with a number of research institutions to identify the knowledge gaps and initiate research aimed at addressing these.	4.2 6.2 7.1.1 7.2.2 9.3
Coastal processes	Concern relating to the role tidal currents through the Fall of Warness have upon the surrounding environment and how modification of these may result in knock on effects.	OREF SNH Eday residents	HR Wallingford commissioned to undertake a study to investigate the potential impacts on seabed and coastal processes, including analysis of estimate of effects of devices on tidal stream of the area.	9.1

Concern	Specific concern(s)/ issues	Raised by the following organisations in alphabetical order	Response and action taken	Relevant ES sections
Benthic habitats and communities	Concern raised over footprint of cables following 4 separate routes from shore to test berths increasing risk of benthic impact. Possible presence of UK Priority habitats (Maerl and *Modiolus modiolus*) to be investigated.	SNH SEPA	The option to bundle the cables together was rejected for both technical and environmental reasons. Seabed surveys undertaken and no sensitive species identified. Additional seabed survey confirmed the absence of Maerl and *Modiolus* beds. All data from both seabed surveys shared with SNH. Coastal and seabed processes assessment undertaken indicated benthic impact considered to be localised and negligible.	4.2 6.2 8.1.1 9.2
Logistics and support	Concern raised over the logistics and support infrastructure for testing activities. Particularly in relation to suitability of local harbour facilities to support operations.	OREF	Developers will be responsible for consultation with local harbour authority to ensure adequate facilities available for their activities.	9.5
Economic impact	Possibility of economic benefit to islanders via the creation of jobs/use of local services.	Eday residents OREF	On-going consultation between Eday Development Partnership and HIE/EMEC.	4.3.1 6.2 9.4
	Creel fishermen lose access to habitually used fishing grounds. Particular concerns relate to location of the pile mounted surface piercing device which is proposed to be on the edge of the fishing ground off War Ness.	Orkney Creel Fishermen's Association Orkney Fishermen's Association Orkney Fishermen's Society	It is not anticipated that creel fishermen will loose access to any areas, beyond the localised temporary lack of access during cable laying activities. The position of the pile mounted device has yet to be finalised, but it will be as clear of the possible ferry routes as possible which should also be clear of the fishing ground.	6.2 9.4 Navigation risk assessment attached.

6 Environmental Impact Assessment

6.1 EIA methodology

6.1.1 Background

An EIA a process designed to identify, interpret, predict and communicate information about the impact of a human action. It has several facets: analytical, legal, procedural and decisional. The fulfilment of an EIA is determined by legislative acts, the main reference being the Council Directive on EIA - Directive 87/335/EEC, amended to 97/11/EC in March 1997. Article 3 of the Directive states that an EIA should identify, describe and assess the direct and indirect effects of a project on the following environmental factors:

- Human beings, fauna and flora;
- Soil, water, air, climate and the landscape;
- Material assets and the cultural heritage; and
- The interaction between the above factors.

This procedure requires a developer to carry out a systematic analysis of the predicted effects of the project on the environment. Having completed the assessment, the developer summarises the findings of the EIA process in ES report and includes:

- An outline of the main alternatives studied;
- An assessment of the projects likely effects on the environment;
- A description of the mitigating measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment;
- Where gaps in knowledge and uncertainty exist; and
- A non-technical summary of the information provided.

6.1.2 Identification and assessment of potential environmental impacts

While pre-submission consultation is not currently a statutory requirement in the EIA process, early and ongoing consultation has provided useful information about the potential concerns and helped to determine the scope of the EIA and the need for additional supporting survey/study requirements (see Section 1.4). The EIA scoping report summarised the main aspects of the project and potential key environmental issues and was distributed to all relevant stakeholders. The scoping responses received combined with existing knowledge allowed the identification of priority issues and focussed the assessment on a manageable number of important issues (see Section 5).

To ensure the integration of the environmental management aspects of the project with the management of other economic and technical project objectives key personnel from Tulloch and Synergie Scotland were invited to an Environmental Issues Identification (ENVID) workshop following preliminary data collection and initial scoping. The ENVID workshop focussed on "brainstorming" the main environmental impacts and identifying technical and management measures to remove or reduce the impacts.

The impact assessment phase of the project addressed all concerns raised during consultation and all regulatory issues and any additional areas where potential impacts were identified. Those impacts highlighted as potentially significant were discussed in greater detail in the ES document.

The issues identified were assessed to define the level of potential risk they presented to the environment and the residual impact that would remain once mitigation/control measures were put in place.

The significance of the potential risks was assessed considering the following[1]:

- Ecological effects;
- Socio-economic effects; and
- Stakeholder issues.

Defining what constitutes unacceptable harm to the natural environment ultimately depends on the values society places on ecosystem integrity and biodiversity. In addressing the ecological effects, broad scientific criteria were applied, whereas for all other effects/issues wider concerns were considered. All low ratings were examined for important negative criteria before rating as negligible, and in cases of uncertainty an issue was rated as presenting minor risk. Each environmental risk that has the potential to have a cumulative impact has been discussed and analysed in more detail at the end of the appropriate section.

The following definitions (see Table 6.1) were used to categorise potential and residual impacts in Tables 6.3 & 6.4.

Table 6.1 Criteria used to assess environmental impact

	Ecological effects	Socio-economic effects	Stakeholder concerns
Major	Degradation to the quality or availability of habitats and/or wildlife with recovery taking more than 2 years *(e.g. widespread seabed excavations, erosion)*	Change to commercial activity leading to a loss of income or opportunity beyond normal business variability/risk Potential short term effect upon public health / well-being, real risk of injury *(e.g. loss of important fishery area, dive site, creation of seabed or floating debris)*	Concern leading to active campaigning locally or wider a field *(e.g. current national wind farm applications)*
Moderate	Change in habitats or species beyond natural variability with recovery potentially within 2 years *(e.g. seabed excavations in a small area)*	Change to commercial activity leading to a loss of income or opportunity within normal business variability/risk Possible but unlikely effect upon public health/well-being. Remote risk of injury *(e.g. small exclusion area away from or small part of actively used areas)*	Widespread concern, some press coverage, no campaigning *(e.g. local small scale wind developments)*
Minor	Change in habitats or species which can be seen and measured but is at same scale as natural variability *(e.g. low level noise from devices)*	Possible nuisance to other activities and some minor influence on income or opportunity. Nuisance but no harm to public. *(e.g. short term congestion at harbours*	Specific concern within a limited group *(e.g. underwater noise affects on cetaceans)*
Negligible	Change in habitats or species within scope of existing variability and difficult to measure or observe *(e.g. localised avoidance of structures by wildlife)*	Noticed by, but not a nuisance to other commercial activities. Noticed by but no effects upon the health and well-being of the public *(e.g. additional shipping at sea)*	An awareness but no concerns *(e.g. exclusion of sea user group from non-critical sea areas)*
No interaction	None	None	None
Positive	An enhancement of ecosystem or popular parameter *(e.g. enhance biodiversity, save in CO_2 emissions)*	Benefits to local community *(e.g. contract to use local skills and expertise on a project)*	Benefits to stakeholder issues and interests *(e.g. prospects of new jobs and local spending)*

Source: EMEC EIA Guidance for developers

[1] The assessment criteria are the same as those recommended in the EMRC EIA guidance for developers.

6.1.3 Environmental risk assessment of accidental events

The environmental risk of accidental events has also been considered during the EIA. For every potential impact, the potential risk was obtained by combining the frequency/probability (rated 1-5 in Table 6.2) with the projected magnitude of the consequences (rated negligible to major in Table 6.1). Both components are at best semi-quantitative judgements representing best judgements on the basis of knowledge and experience available. The outcome of the risk assessment is provided in Table 6.5.

In each case, mitigation measures have been identified in order to reduce the probability/frequency of occurrence. This is then combined with the final consequence rating to give a residual risk.

Table 6.2 Frequency/probability rating of accidental events

Frequency/ probability category	Accidental event	
	Frequency	Probability
5	Continuous, over several years	*Likely* Greater than one event per year
4	Regular, intermittent over each year, typically once per month	*Possible* One or more events within 10 years
3	Regular, intermittent, every 2-5 years	*Unlikely* One event every 11- 100 years
2	One off event, over several days	*Remote* One event every 101 – 1,000 years
1	One off event, up to one day duration	*Extremely remote* One event every 1,001 - 10,000 years

6.2 Matrix of potential environmental impacts

Table 6.3 (a) Construction and installation[2]

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
Onshore works				
Construction crew	Pressure on island rental accommodation/health service/food supplies etc.		Liaison with local community to establish balance between benefit to local economy and pressure on/disruption to local services. Tulloch operations/site manager to oversee project from Eday. Local skills used – Orkney.	
General construction impacts (all onshore /landfall facilities)	Damage and/or contamination to land and/or reduction in water quality during construction. Drainage ditch running along southerly edge of site and onto the beach.		Contractors will adhere to the SEPA guidelines for 'Works in, near or liable to affect watercourses', 'Working at construction and demolition sites', and 'Above ground oil storage tanks': PPG5, PPG6 & PPG 3. The issue of any contract will be dependent on strict adherence to these guidelines. Construction Method Statement produced by Tulloch will detail how each phase will be carried out to avoid or minimise pollution risks, identifying contingency measures. Temporary lay down areas during construction will be away from the burn that runs along the south side of the Cauldale site.	
	Production of waste - building materials, packaging etc.		Tulloch will establish waste minimisation and management strategy. All building waste materials to be dealt with in a manner which conforms with the Waste Management Licence Regulations 1994 and Duty of Care Code Practice 1996. Construction contract will specify that activities must adhere to SEPA PPG6. All waste generated during construction to be removed from island for disposal.	
	Visual intrusion of lorries/diggers during construction.		Only necessary vehicles will be kept on site and all work areas will be kept tidy. Activities will be of a temporary duration.	

[2] See EIA Methodology in Section 6.1 for definitions of column headings and key to significance rankings.

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
	Disruption – noise, increased traffic – to immediate neighbours.		Activities will be of a temporary duration. Heavy construction works should last no longer than 6 weeks. Deliveries of construction materials are not expected to exceed 3-4 per week. Numbers of construction personnel cars to be kept to a minimum. Liaison between Tulloch operations manager and Eday community.	
	Economic benefits to Orkney.		An estimated 9 % (£550,000) of the total project expenditure will be spent in Orkney directly purchasing goods and services from local businesses. The estimate of the total number of people who will work full time on the construction contract is 17 (2 people from Tulloch and 15 from Orkney sub-contractors). Opportunities may exist for Eday residents via direct jobs, or as service providers to the construction crew.	
Access road upgrade/construction	Habitat loss/modification due to construction/alteration of new and existing roadway.		SNH, RSPB, Orkney Biodiversity Records Centre and local experts contacted to determine any potential risks. Terrestrial habitat and vegetation survey undertaken with no sensitivities identified.	

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
	Noise and disturbance to wildlife due to increased human activity during construction.		Surveys/assessments undertaken identified otters as being potentially at risk. The following mitigation measures were recommended to reduce the potential effects. A further otter survey, restricted to the immediate vicinity of the proposed development, is to be undertaken about one month before construction is scheduled to start to ensure that no inhabited/natal holts are present. Outside construction work will be restricted to between the hours of 0800 and 1800 or two hours after sunrise to one hour before sunset, which ever is the later. Aurora Environmental will immediately be made aware of any concerns relating to the disturbance of otters that might arise during the construction of the substation and they, in turn, will liaise with Celtic Environment to discuss the options that might be followed to mitigate the concern. All drivers using the access road will be made aware of the presence of otters and the use of warning signs will be used to enforce this. Discussions taken place with SNH indicate that an application should be made for an otter handling licence in the event that an occupied holt be discovered during the pre-construction survey. As soon as work commences, all staff involved should attend a talk on environmental awareness, pointing out to them the importance of the area, the species they are likely to see and the legal requirements of their work.	
	Disturbance to as yet undiscovered and existing archaeology		Survey commissioned to assess the likelihood of encountering archaeology at all sites where excavation intended. Three sites of raised turf track have been identified that are crossed by the access track to the development. While considered as part of the 19th century crofting landscape, they have already been affected by the existing track and they are only of minor importance. Discovery of any archaeological remains during construction will result in immediate cessation of operations in the immediate vicinity of the find, and archaeological experts will be brought in to carry out investigations.	

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
	Disruption to local residents/tourists due to extra traffic (single track road)/noise. Localised road strengthening 1-2 locations.		Traffic access will be assured at all times. Only necessary vehicles will be kept on site Activities will be of a temporary duration. Liaison with OIC roads department. Proactive communication with local community prior to and during construction.	
Beach landing of aggregate for access road construction	Disturbance to wildlife.		Any beach landings of materials will be carried over one day, so any disturbance to otters or seals at the Seal Skerry haulout will be of a very temporary duration. Consultation with SNH indicates further otter survey will establish if any risk to otter populations.	
	Potential to pollute foreshore and sea with aggregate.		Aggregate will be loaded directly to trucks and transported to construction site. No storage of materials on the beach.	
	Damage to dune habitat		Track will follow the same route as that along which cables will be installed and be reinstated post installation.	
Control building construction	Habitat loss/modification due to construction of new building.		Negotiation with local landowner over loss of farmland. SNH, RSPB, Orkney Biodiversity Records Centre and local experts contacted to determine any potential risks. Terrestrial habitat and vegetation survey undertaken. A small area of poor quality dune grassland will be lost, but this area is considered of low conservation interest.	
	Inappropriately sourced material for landscaping.		Material for constructing the bund will only be taken from excavation activities on the site, and will not be removed from other areas around the site or imported from elsewhere.	No interaction
	Noise and disturbance to wildlife, particularly otters, due to increased human activity during construction. Seal Skerry is used as a haulout site by internationally protected grey and common seals		Surveys/assessments undertaken identified otters as being potentially at risk. Mitigation measures were recommended to reduce the potential effects (see access road upgrade/construction). Construction staff will be made aware that ringed plovers, meadow and rock pipits nest on the beach below the onshore site between May and late July and due care should be taken not to disturb any nesting birds (if still present when construction commences). SMRU undertook assessment of seal populations. Any disturbance will be low level given the distance to Seal Skerry (>1 km) and of a temporary duration.	

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
	Disturbance to as yet undiscovered or existing archaeology.		Archaeology survey commissioned identified Cauldale, adjacent to proposed development site, as a steading with local importance as a 19th C croft. A yard wall and stone footbridge were identified within the site that should be taped off and avoided if possible, or be subjected to detailed evaluation prior to any disturbance if this is not possible. Discovery of any archaeological remains during construction will result in immediate cessation of operations in the immediate vicinity of the find, and archaeological experts will be brought in to carry out investigations	
Cable landfall (to mean low water springs MLWS)	Disturbance to beach material.		HR Wallingford coastal processes study undertaken. The route taken by the armoured cables will follow the ridge and gully features of the intertidal zones as far as possible. Due to the dynamic nature of this beach, any effects from construction will be localised and short lived.	
	Habitat loss/modification due surface laying of cables on seashore. Habitat loss/modification due to trenching above high water mark.		Habitat and terrestrial survey carried out – recommends care be taken to ensure edge of sand dunes not disturbed unnecessarily. No particularly sensitive species/habitats that require mitigation measures were identified beyond reinstatement of the dune system post works. In intertidal zone, cables will be surface laid in 4 separate routes. Some disturbance of sand cover will occur, but due to mobile nature of beach material, the disturbance will not be above normal levels. At the top of the shore the cables continue underground to control building. Any impacts will be localised and temporary.	
	Damage and/or contamination to shore/sub-littoral fringe during construction.		Surface laid cable to avoid excavation of bedrock. Contractors will adhere to the SEPA guidelines for 'Works in, Near or Liable to Affect Watercourses' and 'Working at Construction and Demolition sites': PPG5 & PPG6.	

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
	Noise and disturbance to wildlife due to increased human presence and construction activity. Seal Skerry is used as a haulout site by internationally protected grey and common seals.		Surveys/assessments undertaken identified otters as being potentially at risk. Mitigation measures were recommended to reduce the potential effects (see access road upgrade/construction). In addition it was decided to surface lay cables to avoid excavation of the bedrock, reducing potential disturbance to otters and other wildlife including birds and seals. Construction staff will be made aware that ringed plovers, meadow and rock pipits nest on the beach below the onshore site between May and late July, and due care should be taken to avoid disturbance to any nesting birds if any nests are still occupied when works start in August. Any disturbance to seals will be low level given the distance to Seal Skerry (>1 km) and of a temporary duration. Noise levels are not expected to be significantly greater than that of farm machinery for extended periods of time.	
	Disturbance to as yet undiscovered and existing archaeology		A level horizon of sporadic flagstones exposed in the edge of the low dunes on top of the cliff is an unknown quantity, with the importance anything from low to high. If the proposed works are going to impact on this site a watching brief will be required. Discovery of any archaeological remains during construction will result in immediate cessation of operations in the immediate vicinity of the find, and archaeological experts will be brought in to carry out investigations.	
Installation of navigation markers (if required): • Bay of Greentoft • Muckle Green Holm • Little Green Holm **While the need for land markers to demarcate the limit of the test site covered by the Crown Estate lease has been**	Habitat loss/modification due to installation of navigation markers.		Terrestrial habitat and vegetation survey and assessment undertaken. The results indicated only a very localised and temporary impact – no sensitive habitats/species were identified at any of the sites. Standard care to be taken at each site to ensure that no unnecessary damage is done to surrounding areas, and ensure that any waste is removed from the site.	
	Noise and disturbance to wildlife due to increased human presence and construction activity, in particularly otters, seals, and birdlife.		If it is decided to place markers the timing of any works will be critical to avoid bird nesting times in early summer and grey seal pupping in the autumn on Muckle Green Holm and Little Green Holm.	

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
rejected at this stage, the potential environmental issues that would arise should the proposal ever be resurrected in the future are detailed here.	Disturbance to known and unknown archaeological remains.		A desk study identified a number of archaeological sites on Muckle Green Holm but none on Little Green Holm. If it is decided to place a navigation marker here, a walkover survey should be conducted around the sites and any access routes prior to any works and mitigation measures identified if necessary. A survey at Bay of Greentoft identified no sites in the immediate vicinity of the proposed location of the marker.	
Offshore works				
Subsea cable laying	Modification to coastal processes (e.g. water movement and sedimentation patterns).		Assessment of construction impacts undertaken by HR Wallingford indicated that the presence of the cables will have no impact on coastal processes as the cables will be laid approximately parallel to peak tidal stream and the seabed beyond the surf zone is exposed bedrock with occasional boulders with sparse pockets of mobile material.	No interaction
	Disturbance/modification to benthic habitats and communities due to cable laying in inshore waters.		Preliminary seabed survey completed to characterise seabed habitats/identify potentially sensitive habitats. Area described as being sparsely inhabited. The presence of UK Priority species Maerl and *Modiolus modiolus* (horse mussel) were ruled out by an additional seabed survey following concerns raised in initial survey. FEPA consent process will afford added protection to the marine ecosystem. Cable to be armoured through the surf zone. From this point on the impact of wave activity on cable stability reduces significantly so protection no longer required. Only localised and temporary disturbance anticipated.	
	Disturbance (noise and physical presence) to wildlife including birds, cetaceans, turtles, pinnipeds and otters.		Construction activities will occur for 7 consecutive days in August, towards the end of the bird breeding season (cormorants) and before the start of the grey seal pupping season thus minimising any disturbance. Risk to marine mammals not considered any greater than during normal traffic movements in the channel. Assessment of construction impacts undertaken by SMRU concluded that seals are capable of avoiding any areas where activity occurs, and will not be adversely affected by this activity.	

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
	Disturbance to archaeological remains.		Seven ships are know to have wrecked in the area, and a Spitfire was abandoned 'off Eday' in 1942, but no wreckage has ever been found, or is considered likely to be due to strong tidal streams. Seabed video/ROV surveys have not indicated any wreckage. Any evidence of wrecks encountered during cable laying will be reported immediately to the County Archaeologist.	
	Visual impact from presence of installation vessels.		Distant views only of vessels in existing shipping channel. No mitigation required.	
	Pollution of water column from antifoulants, lubricants and hydraulic fluids.		No polluting substances used as part of cable installation activities. Recognised marine standard materials held on vessel(s). Recognised marine working standards and regulations apply. Fast flowing water will quickly disperse any potential contaminants.	
	The vessels undertaking cable laying or device deploying activities can present a physical hazard to other vessels which normally use the area for transit. They will restrict the channel and present a risk of collision to those vessels.		Navigation risk assessment undertaken. The navigable part of the channel is at its narrowest point still wide enough for vessels to pass provided that the Master/skipper was sufficiently aware of the hazard prior to undertaking the transit. The cable laying vessel will, comply with the International Regulations for Preventing Collisions at Sea (COLREGS) and display the appropriate lights and marks for a vessel restricted in her ability to manoeuvre. The works will be promulgated by appropriate Notices to Mariners and Navigational Warnings. A project briefing document will be circulated to all sea users before construction starts.	
	Ability of other vessels to manoeuvre and the cable laying vessel to conduct operations compromised by strong tidal streams and conditions prevailing in strong wind increasing risk of collision.		Cable laying will take place at neap tides and in good weather conditions, so inter-island ferry would be unlikely to use the offset routes. The cable laying vessel the MV Glatea is experienced at operating in similar chanels.	
	Obstruction to local inshore creel fishery – possible negative economic impact due to loss of earnings due to temporary lack of access from fishing ground.		It may be required that local fishermen temporarily remove creels prior to commencement of installation. This will be carried out in full consultation with fishery organisations and their affected members, and the lack of access will be of temporary duration only. A project briefing document will be circulated before construction starts. Creel fishermen do not use the Fall of Warness exclusively, and due to the temporary nature of the lack of access will be able to conduct fishing activity elsewhere in the islands with no loss of earnings.	

Table 6.3 (b) Long -term presence of onshore facilites[3]

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
Long term presence of onshore facility	Minor increase in traffic levels due to on-going operations.		The control building will be operated remotely from Stromness. Only occasional visits to site anticipated for maintenance and technical input.	
	Localised visual and landscape impacts.		Visual and landscape impact survey undertaken. Compliance with planning approval conditions regarding design of onshore facility. Final colour of harling and roof material will be sensitive to surrounding area. Building will be sunk approximately 1 m below existing ground level to maximise screening and sensitively screened with bunding. Container colour to be non-intrusive – contractual stipulation with developers. The building and landscaping has been designed to blend into the rural landscape. The containers will be screened between the new building and ruined Cauldale steading. Once operational, the building will be largely unoccupied.	
	Contamination of land or reduction in water quality due to sewage/surface water.		The drainage arrangements will be in accordance with SEPA PPG4 'Disposal of sewage where no mains drainage is available'. The sceptic tank will conform to standards set out in BS 5297. Adherence to building control regulations. Minimal use of domestic facilities due to lack of permanent staffing. A sustainable drainage system (SUDS) will be installed for surface water drainage (from roof and hard standing). A source control approach will be used removing the need for an oil separator in accordance with SEPA PPG3 'Use and design of oil separators in surface water drainage systems'.	
	Waste minimisation and disposal.		All efforts will be made to minimise waste. Waste management and disposal will be in accordance with legal requirements. Contractual stipulation with developers to adhere to EMEC waste management procedure.	

[3] See EIA Methodology in Section 6.1 for definitions of column headings and key to significance rankings.

Project activity	Potential environmental and socio-economic impact	Potential significance	Control mitigation	Residual impact
	Modification to coastal processes with potential for altered sedimentation pattern on beach due to presence of armoured cables creating partial barrier to long-shore drift.		The presence of the cables with concrete mattress covering however may in the long term influence existing patterns of beach drawdown and long shore drift. It is recommended that beach prior to device installation takes place, which will enable the potential impacts of the presence of the cables to be more accurately predicted.	
Long term presence of offshore test site – pre installation of devices	Ongoing minor disturbance to seabed communities in the immediate vicinity of the routes where cable is laid on the seabed.		Seabed survey concluded that the cable route was sparsely populated, with no sensitive habitats or communities identified. ROV seabed/cable survey to be undertaken at last once a year.	
	Fishing gear entanglement where sections of cable "bridge" between seabed highpoints.		In order to minimise the hazard, it is intended to lay the cable along the contours of the seabed where possible and to rely on the cable weight and the cable's relative flexibility to ensure that such bridges are eliminated. Distribution of marine awareness chart will provide details of cable routes to local mariners/fishermen. Cables and cable areas to be marked on charts. Cables to be surveyed post laying and at regular intervals.	
	Anchoring hazard to vessels anchoring in the area.		No designated anchoring areas near the cable area and, due to the nature of the seabed and the tidal stream in the area, vessels do not normally use even the inshore area as an anchorage. Risk considered remote.	No interaction.
	Economic benefit of tidal test facility to Orkney and renewable energy sector.		Support the ongoing development of the renewable energy sector in Orkney. Provide a test facility of national importance to the development of tidal energy, which will, for example, help manufacturers/developers to sustain and create jobs.	

Table 6.4 Long- term operation of test site[4]

This EIA has considered generic issues/impacts from the long-term operation of the test site. Additional ES's will be produced for specific devices prior to deployment on site, in accordance with EMEC guidance.

Project impact	Potential environmental and socio-economic impact	Potential significance	Control mitigation/further investigation required	Residual impact
Control building operation	Possible EMC interference with radio and television signals and acoustic noise from switchgear and transformers.		Any electrical, magnetic, electromagnetic and acoustic impacts resulting from the electric systems will decay very quickly with distance from the control building, with no predicted impact on the nearest neighbour at Newbigging.	No interaction
Presence of vessels	Navigation risk during installation/maintenance/decommissioning of devices due to additional vessel presence in shipping channel.		Navigation risk assessment undertaken. The navigable part of the channel is at its narrowest point still wide enough for vessels to pass provided that the Master/skipper was sufficiently aware of the hazard prior to undertaking the transit. Vessels will comply with the International Regulations for Preventing Collisions at Sea (COLREGS) and display the appropriate lights and marks for a vessel restricted in her ability to manoeuvre. The works will be promulgated by appropriate Notices to Mariners and Navigational Warnings.	
	Pollution of water column from antifoulants, lubricants and hydraulic fluids.		Recognised marine standard materials held on vessel(s). Recognised marine working standards and regulations apply. Fast flowing water will quickly disperse any potential contaminants.	No interaction
	Visual impact form Eday coastline-designated and proposed footpaths.		Distant views only of vessels in existing shipping channel. No mitigation required.	No interaction
	Potential for congestion of local harbour/port facilities (from vessel and temporary mooring of devices).		Developers to ensure appropriate consultation with local harbour authority prior to commencement of testing activities.	
Device and mooring installation	Seabed disturbance/modification during foundation installation and during device installation/removal e.g. anchors etc.		HR Wallingford study concludes that test bays are all in an area of ridged bedrock with no deposits of mobile material. Seabed survey indicates test bays are sparsely inhabited and no sensitive or protected species or habitats present. Any disturbance will be localised, with any debris created during installation will quickly disperse due to strength of prevailing tidal stream.	

[4] See EIA Methodology in Section 6.1 for definitions of column headings and key to significance rankings.

Project impact	Potential environmental and socio-economic impact	Potential significance	Control mitigation/further investigation required	Residual impact
	Disturbance (noise and physical presence) to local fish, seabird, seal, otter and cetaceans populations as a result of device installation.		Baseline data to indicate the numbers of seals and cetaceans using the Fall of Warness are being collected prior to device deployment. The count will also record usage of the waters by diving birds.	Unclear due to lack of data presently available.
Presence and operation of devices	Navigation risk from sub-sea level devices.		Navigation risk assessment undertaken. Marking the device and the charted depth on the charts will provide the mariner adequate information.	Issues still being addressed.
	Navigation risk from surface piercing and buoyant surface devices. The siting of such a structure presents a significant hazard to surface vessels of all sizes. They risk colliding with the device due to the strong tidal stream and lack of vessel manoeuvrability in rough seas.		Consideration to be given to site devices clear of the adverse weather ferry routes as possible (in the case of the surface piercing device), and away from the main transit route (in the case of the buoyant surface device). Appropriate marking, lighting and aids to navigation to be specified for all surface piercing devices.	Unclear due to lack of data presently available.
	Navigation risk when devices are being installed/removed from berths.		The vessel will, comply with the International Regulations for Preventing Collisions at Sea (COLREGS) in that he should display the appropriate lights and marks for a vessel restricted in her ability to manoeuvre. The works will be promulgated by appropriate Notices to Mariners and Navigational Warnings.	Unclear due to lack of data presently available.
	Loss of water current energy from the marine environment due to presence/operation of test devices may result in sedimentation and habitat and community modification and increased stratification in the water column.		HR Wallingford study concluded that there would be an insignificant loss of overall speed of 0.25% for the Fall of Warness area, and thus no predicted modification of the marine environment.	
	Foundations could affect seabed current flow and consequent sedimentary processes. Seabed scour around device foundations.		HR Wallingford study concluded that the impact of the presence of the foundations on seabed current flow would be insignificant. In addition, test bays are all in an area with no deposits of mobile material so scour and sediment distribution are not a significant issue.	
	Shoreline disturbance.		HR Wallingford study concluded there would be insignificant loss of speed through test area and no impact on the wave regime – therefore predicated to be no interaction on shoreline.	No interaction

Project impact	Potential environmental and socio-economic impact	Potential significance	Control mitigation/further investigation required	Residual impact
	Disturbance (noise and physical presence) to local fish, seabird, seal, otter and cetaceans populations as a result of device operation. The effect of tidal turbines on seals and cetaceans is at present unknown as is the extent to which these populations pass through the waters of the Fall of Warness.		Supporting wildlife studies/assessment already undertaken, and further investigations identified. EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations. EMEC is involved in plans with a number of other research institutions to identify the knowledge gaps and initiate research aimed at addressing these. These data will inform ES's required for specific prototype devices, and commercial scale developments in the future.	Unclear due to lack of data presently available.
	Wildlife entanglement/entrapment and collision with device blades e.g. diving bird populations, cetaceans (in particular the harbour porpoise), seals (in particular pups) and otters present in the area.			
	Devices that break the sea surface may attract roosting birds and provide a seal haulout.			
	Behaviour changes in wildlife.			
	Disturbance to marine archaeology.		Seven ships are know to have wrecked in the area, and a Spitfire was abandoned 'off Eday' in 1942, but no wreckage has ever been found, or is considered likely to be present due to strong tidal stream. Seabed video/ROV surveys have not indicated any wreckage. Any evidence of wrecks encountered during survey work or device installation will be reported immediately to the County Archaeologist.	
	Pollution of water column from antifoulants, lubricants, hydraulic fluids.		Pollution potential will be determined by specific device design and be addressed in device specific ESs. Fast flowing water will quickly disperse any potential contaminants.	Residual impact will be device dependant
	Airborne noise light and other nuisances during device installation and removal.		Water is acoustically 'hard' i.e. sound waves move over water rather than penetrate. There is limited applicability of most noise control measures used onshore. Suggest survey carried out to identify potential receptors. Restricting working hours could be problematic due to dependence on tides and good weather for device installation.	Unclear due to lack of data presently available.

Project impact	Potential environmental and socio-economic impact	Potential significance	Control mitigation/further investigation required	Residual impact
	Escalating disturbance to recorded archaeology - two bronze age sites badly affected by erosion on the east coast on the point of War Ness. Site of Local Nature Conservation Importance designated for geology from Newbigging to Neven Point, which could be affected if development activities impact on coastal erosion.		HR Wallingford coastal processes review concluded that while parts of the coast are undergoing slow retreat, the operation of the test site will have an insignificant impact on wave activity and thus will not escalate the erosion process.	No interaction.
	Electrical and electromagnetic effects – wildlife interactions		Research has shown that some species of e.g. elasmobranches fish are particularly sensitive to electrical and electromagnetic fields generated from electric cables. EMEC is involved in plans with a number of research institutions to identify the knowledge gaps and initiate research aimed at further addressing areas of uncertainty.	Unclear due to lack of data presently available.
	Electromagnetic Interference (EMI) with navigation systems - EM fields from the cable and device operation once operational could adversely affect magnetic compasses and present a hazard to navigation.		Any detectable effect on a passing vessel from cable EMI would be transitory and would be no greater than that generated by other sub sea inter island cables in the vicinity. EMI from the cables is considered to present little risk to navigation. At this point in the development of tidal energy devices, it is not possible to determine if significant EMI will occur. However the devices will be connected to the national grid system and as such will have to meet strict electrical compatibility requirements as well as being designed to meet and comply with, standards for construction of electrical equipment.	
	Visibility of devices may spoil sea views.		Sub sea devices will have no impact. Any device that breaks the surface will require a visual impact assessment as part of device specific EIA. Distant views of the test site will be visible from the south west Eday coastline from Seal Skerry round to War Ness cliffs, and from moorland hills.	

6.3 Environmental risk assessment matrix of potential accidents and non routine events

Table 6.5 Risk assessment of potential accidental and non-routine events[5]

Project activity	Potential Environmental and Socio-Economic Impact	Potential consequence	Frequency/ probability	Control mitigation	Residual impact
Construction of control building and on-going operation.	Fire in control building either during construction or once operational leading to localised habitat damage and possible contamination of watercourses via water run-off from fire containment activities.			Compliance with HSE Electricity at Works Regulations 1989 and Fire Regulations. All building alarms will be connected to SCADA system. EMEC emergency response procedures in place.	
	Oil spill during refilling of oil tank or refuelling of site vehicles leading to contamination of land/aquatic environment.			Spill contingency plan to be prepared in accordance with SEPA PPG21 'Pollution incident response planning'. A spill kit in a clearly marked container will be kept on site to deal with spillages and staff trained in its use. Materials for clean up will be disposed of in a polythene bag which will be taken to a licensed tip. Designate an area for refuelling of vehicles constructed to avoid contamination of surface run-off.	
	Oil spill due to sudden failure in tank integrity leading to contamination of land/aquatic environment.			The double skinned oil tank to be used for refuelling vehicles during construction and the emergency generator once the facility is operational will be constructed in accordance with SEPA PPG2 'above ground oil storage tanks'.	
	Accidental damage by delivery/site vehicles to pier/access roads.			Liaison with OIC roads department prior to start of works to identify any areas of road that might need to be upgraded to facilitate use by site traffic. Use local hauliers who are familiar with Eday. Contractor to make good any damage post works.	
Installation of test facility offshore infrastructure and on-going operation.	Leak of oils from devices into marine environment leading to contamination of aquatic environment and possible impact on marine wildlife and habitats.			Fast flowing tidal regime will ensure any potential contaminants will quickly disperse with no detrimental effects. Recognised marine standard materials held on vessel(s).	

[5] See EIA Methodology in Section 6.1 for definitions of column headings and key to significance rankings.

Project activity	Potential Environmental and Socio-Economic Impact	Potential consequence	Frequency/ probability	Control mitigation	Residual impact
	Major oil spill resulting from shipping collision due to increased vessel presence in recognised navigation channel/presence of devices/grounding. Contamination/harm to protected habitats and species.			All vessels associated with the installation and operational phase of the tidal test facilities will comply with IMO/MCA codes for prevention of oil pollution and have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs). As far as possible vessels with an established track record of operating in Orkney or similar waters will be used. The potential for and consequences of oil spills and leaks from, and structural failure of, individual test devices will be considered in the production of device specific ES's. EMEC has developed a number of emergency response procedures that cover potential accidental events.	
	Structural failure leading to parts (eg turbine blade 15 m long) breaking free of the device. Potential collision with marine mammals/vessels.			Navigation risk assessment undertaken. Level of impact will depend of device type e.g. those with buoyant turbine blades would present a much greater hazard than un-buoyant ones that would sink to the seabed. Device developers should conduct design stage assessment of risks to navigation from failures.	Unclear due to lack of data presently available.
	Failure in national grid connection.	-	-	All machines will cease generating.	-

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7 Onshore Construction Impacts

A summary of all potential environmental impacts associated with the onshore construction activities is presented in Section 6, Table 6.3 (a). This section of the ES discusses in more detail potentially significant impacts associated with the onshore construction facilities, i.e. the construction of the control building at Cauldale and upgrade of the access track to this site and the cable landfall.

The exact scope of works for the refurbishment of EMEC data centre at The Old Academy in Stromness has yet to be defined but will all be internal with no direct environmental impact.

While the need for navigational land markers has been rejected at this stage, the potential environmental issues that would arise should the proposal ever be resurrected in the future have been broadly considered in this document (see Section 6.2) and require no further discussion at this stage. If this decision is revised, caution should be taken on the Green Holms due to sensitive populations of seals and cormorants, and the potential for disturbance to archaeology.

7.1 Control building and access track

Of the environmental issues discussed in Table 6.2 in relation to the construction of the control building and upgrading of the access track, the following have been screened out due to the residual impact being defined as negligible:

- Terrestrial habitats and communities - no sensitivities identified, and contractor to adhere to SEPA pollution prevention and control regulation and guidelines. In addition, any temporary lay down areas during construction will be away from the burn which runs along the south side of the Cauldale site;
- Coastal habitats - it may be necessary to land aggregates required for the upgrade of the access road on the beach. The track made through the dunes to accommodate the vehicular movements will be used for cable installation later and will be reinstated post works (see Section 7.2.1). All materials will be transported directly to the site of use and there will be no storage of material on the beach;
- Waste disposal – Tulloch will establish a waste minimisation and management strategy that will ensure that all waste materials generated during construction will be dealt with in line with legislative requirements and relevant SEPA guidelines. All waste generated during construction will be removed from the island for disposal.
- Bunding material – Material for constructing the bund/landscaping the control building site will only be taken from excavation activities on site and will not be removed from other areas around the site; and
- Landscape and visual impacts - disruption will be very localised, and of a short duration.

7.1.1 Wildlife

Seals

Background

The European protected sites at Faray and Holm of Faray are out of range of any impacts from the onshore construction phase of the development.

Given the location of the onshore construction at Cauldale, there will be minimal disturbance to harbour and/or grey seals in the area. The closest haulout site is on Seal Skerry, approximately 1 km from the control building. Seal Skerry is used as a haulout site for common seals and mothers and their pups will be present at the site immediately following the breeding season (breeding season June/July). Disturbance could lead to mothers being separated from newborn or young pups. Severe disturbance can lead to increased pup mortality through dissociation of mothers and pups.

It is possible that increased machinery noise might disturb seals, but the level is unlikely to be significantly greater than that of farm machinery which is routinely used in the area.

Management strategy and mitigation

Construction noise associated with use of compressors and occasional pneumatic drilling will only take place for approximately the first 4 weeks of the project. This will occur at a time outwith harbour and grey seal breeding times, and thus any noise generated should not have a negative impact on seals hauled out on Seal Skerry.

Residual impact

Any disturbance will be low level, is not expected to be significant and will be of a temporary duration.

Birds

Background

It has been identified that ringed plovers, meadow pipits and rock pipits nest on the beach below the control building construction site from May to July. However, none of these species are of major conservation importance (see Section 4.2.6). While construction of the control building facilities will not extend onto the beach, due to the isolated nature of this stretch of coastline, and very low level of background noise, the physical presence and activities of the construction crew could be disruptive, and lead to nests being abandoned, if they are still occupied when construction commences (early August).

Management strategy and mitigation

Onshore construction is not scheduled to start until early August, by which time most of the fledglings will have matured and left the nest. Construction staff will be made aware that ringed plovers, meadow and rock pipits nest on the beach below the onshore site and due care will be taken not to deliberately disturb occupied nests.

Residual impacts

The residual impact is considered to be negligible.

Otters

Background

The Eurasian otter (*Lutra lutra*) is protected by national and international legislation which makes it an offence to disturb, kill, trap or harm the species as well as damaging and/or disturbing its resting, feeding and breeding sites. The survey carried out as part of this EIA identified evidence of otters in the vicinity of the construction site and adjacent coastline, but could not confirm the presence of occupied holts (see Section 4.2.7). Assuming otters are present they are at risk from disturbance from construction activities including noise, physical presence, destruction and damage to otter habitats, i.e. holts, resting sites and feeding areas, and possible increase in mortalities due to increased vehicular use of the access road. In general otters can tolerate high levels of disturbance. It is expected that if an otter is disturbed by the construction it would move to another holt within its range, after construction the otter would be expected to return to its original holt after completion. A natal holt in the immediate vicinity would cause concern but this is unlikely to happen as they are usually located away from the coast. In addition, studies have shown that otters in Orkney are normally expected to cub in the winter months. Otters normally feed at dawn and dusk, and it would be at this time that the otter would be most vulnerable to disturbance.

Management strategy and mitigation

The otter is afforded European protected status and as such measures have to be taken to significantly reduce the risk that any otters are harmed or disturbed by the construction activities. The following mitigation measures will be adopted:

- A further otter survey, restricted to the immediate vicinity of the proposed development, will be undertaken about one month before construction is scheduled to start to ensure that no occupied/natal holts are present;
- Discussions taken place with SNH indicate that an application should be made for an otter handling licence in the event that an occupied/natal holt be discovered during the pre-construction survey;

- Outside construction work will be restricted to between the hours of 0800 and 1800 or two hours after sunrise to one hour before sunset, which ever is the later;
- Aurora Environmental will immediately be made aware of any concerns relating to the disturbance of otters that might arise during the construction of the control building and they, in turn, will liaise with Celtic Environment to discuss the options which might be followed to mitigate the concern;
- All drivers using the access road are made aware of the presence of otters and the use of warning signs are made enforce this; and
- Pre construction briefing to all construction personnel on environmental awareness, pointing out to them the importance of the area, the species they are likely to see and the legal requirements of their work.

Residual impacts

Any residual impacts will be dependent on the results of the pending otter survey. If no occupied or natal holts are found, and the measures above are fully adopted by all construction personnel, the impact on any otters is considered to be negligible. In the unlikely event that an occupied/natal holt is located, consultation between Celtic Environmental, SNH and Tulloch will seek to minimise any impact to an acceptable level and if required an otter handling licence obtained.

Any disturbance will be of a temporary nature and once external construction works are completed, there should be no residual impact.

7.1.2 Archaeology

Background

There are no Scheduled Ancient Monuments, Listed Buildings or designated landscapes within the Cauldale study area (see Table 7.1) The Cauldale site is however considered to be of archaeological interest as an example of a 19th century croft. It is recognised that farm buildings are a diminishing, vulnerable and under-protected part of the cultural resource and as such the site must be considered of local, if not regional, importance (Orkney Archaeological Trust). Of the 12 sites identified (see Figure 7.1) 8 are considered of only minor importance and do not require any mitigation.

The Cauldale steading complex (site 1) lies just outside the boundary of the proposed development site and there should be no direct impact upon this site, as long as temporary construction works, such as depot, turning area, storage and site huts are not placed in or against it, or on the flagged area in front of it.

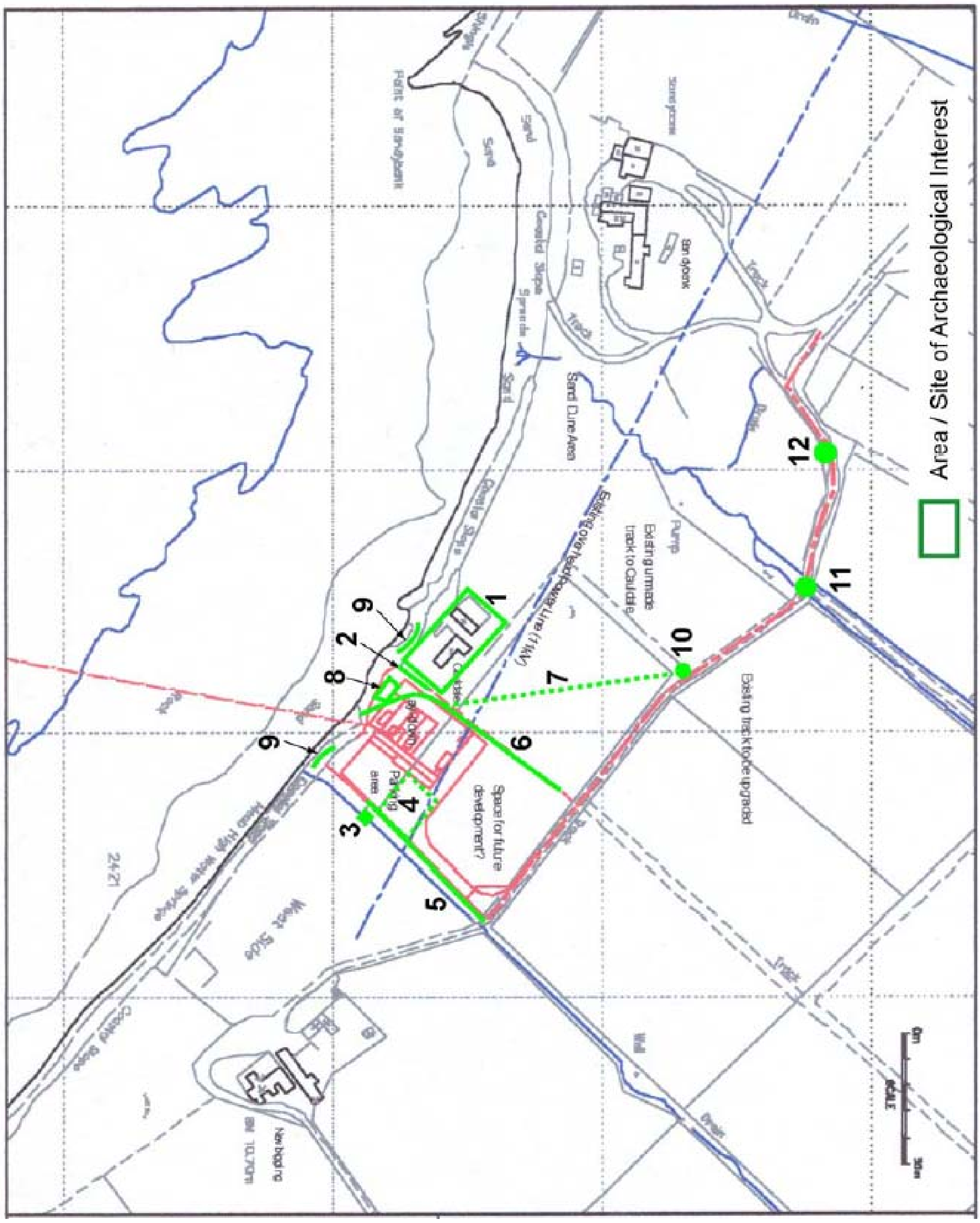
Three sites (10-12) of raised turf track were identified that are crossed by the access track to the development. While considered as part of the 19th century crafting landscape, they have already been affected by the existing track and they are only of minor importance.

There are however 3 sites within the boundary of the development that warrant further discussion.

Site 2, a yard wall, is a ruinous section of the yard enclosure of the Cauldale steading, and forms part of the edge of the proposed development site.

Site 3 is a stone footbridge that crosses the drainage channel along the SE side of the proposed development site (see Plate 7.1). This forms part of the 19th-century rural architecture of the Cauldale crofting landscape.

Figure 7.1 Onshore construction area – identified archaeological sites



Source: Orkney Archaeological Trust

Table 7.1 Summary of Cauldale archaeological sites and their importance

Site	Description	NGR	Importance [1]	SMR [2]	NMRS [3]	SAM [4]
1	Cauldale farmstead	HY 5416 3134	Low/Medium	-	-	-
2	Yard wall, part of Site 1	HY 5418 3133	Low/Medium	-	-	-
3	Footbridge across drain to SE	HY 5423 3131	Low/Medium	-	-	-
4	Enclosure	HY 5422 3132	Low			
5	Turf track along SE edge of site	From HY 5426 3135 to HY 5422 3131	Low			
6	Turf track leading to shore, on NW edge of site	From HY 5422 3138 to HY 5418 3131	Low	-	-	-
7	Track leading diagonally across the site to the shore	From HY 5418 3142 to HY 5418 3131	Low			
8	Flag horizon in dunes at cliff section	HY 5417 3131	Unknown	-	-	-
9	Buried peat horizon in dunes at cliff section	HY 5416 3132	Low	-	-	-
10	Turf track leading to the N side of Cauldale, cut by the access road	HY 5418 3142	Low	-	-	-
11	Turf track beside drain to E of Sandybank, cut by the access road	HY 5414 3146	Low			
12	Turf track near the Sandybank junction, cut by the access road	HY 5408 3147	Low			

[1] *Significance criteria used by OAT*
[2] *Orkney Sites and Monuments record*
[3] *National Monuments Record of Scotland*
[4] *Scheduled ancient monument*

Plate 7.1 19th Century stone footbridge

Source: Orkney Archaeological Trust

Site 8 is a flag horizon, a level horizon of sporadic flagstones exposed in the edge of the low dunes on top of the cliff (see Plate 7.2). It is not possible to interpret the feature with any certainty – for example, the flags could be the remains of a surface associated with the steading, or could be the remains of a grave from the first millennium AD. Therefore, the importance of this site is unknown and could be anything from Low to High[6].

[6] Based on the significance criteria used buy OAT

Plate 7.2 Flag horizon with potential archaeological significance

Source: Orkney Archaeological Trust

Management strategy and mitigation

Site 1 - The Cauldale farm buildings are outside the proposed development area and so should be unaffected. The site should be avoided by all temporary construction works. Flagged tape will be installed around the site for the duration of construction to ensure it is avoided.

Site 2 - The potential impact and its significance depends on whether the wall is avoided, built on or removed. The ruined yard wall that forms part of the Cauldale farm building complex will be avoided if possible, with flagged tape put around it to help machine drivers to be aware.

Site 3 - As with Site 2, the potential impact and its significance depends on the extent of the development and the type of boundary that is placed around the site. The stone footbridge on the south east edge of the development area will be avoided if possible, with flagged tape put around it during the works, otherwise a detailed standing building survey will be implemented.

Site 8 - The small area of buried flags on top of the cliff edge is an unknown quantity. If the proposed works are going to impact on this site a watching brief by a qualified archaeologist should be undertaken, which should be upgraded to full excavation if the remains prove to be of high importance.

Discovery of any archaeological remains during construction will result in immediate cessation of operations in the immediate vicinity of the find, and archaeological experts will be brought in to carry out investigations.

Residual impacts

Provided that the mitigation measures are carried out, the residual impacts at the site are predicted to be negligible.

7.1.3 Socio-economic issues[7]

The establishment of a new facility in any rural area has the potential to affect the population in both a positive and negative manner.

Background

The majority of the expenditure on the project will benefit businesses outside Orkney, with an estimated 9 % (£550,000) of the total spent in Orkney directly purchasing goods and services from local businesses. The type of businesses in Orkney that will benefit from the construction of the facilities include environmental consultancies, architects, ferry operators, construction companies and related trades. The main contractor – Tulloch – will sub-contract the building of the control building on Eday and the associated work at EMEC's data centre in Stromness to local Orkney contractors. The estimate of the total number of people who will work full time on the construction contract is 17 (2 people from Tulloch and 15 from Orkney sub-

[7] This section informed by data and analysis provided by the economist Brian Burns.

contractors). It is likely that the construction of the facilities will sustain existing jobs, and that no new jobs will be created in Orkney directly linked to the construction work.

The construction work may offer direct job opportunities for Eday residents, but this will depend on the labour requirements and work schedules of the Orkney-based sub-contractors working on the project. One option currently being explored is the transport of the workforce by hired boat on a daily basis between Kirkwall and Eday. In addition, some of the workforce may stay in bed and breakfast accommodation on the island, which would obviously benefit these businesses. However, the initial part of the construction period covers the peak months of the tourism season when the accommodation operators are already busy. Thus, for this part of the construction period, there are potentially no net benefits to the accommodation providers. No firm decision has yet been made on the number of workforce members who will stay overnight on Eday. In addition to accommodation providers other local businesses that could benefit from the construction work and the personal expenditure of workers while on the island include the shop and any local farmers, etc providing equipment and/or services to the contractors.

During the construction phases there will be some minor disruption to the island community immediately neighbouring to Cauldale and tourists from the presence of additional vehicles and personnel.

Management strategy and mitigation

Liaison between the Tulloch and the local Community Council and/or Eday Partnership will ensure economic benefit during the construction phase is balanced with potential detrimental impacts to the local tourist economy.

Residual impact

The development will sustain short-term construction jobs in Orkney, and support the ongoing development of the renewable energy sector in Orkney. In addition, the daily or weekly presence of contractors on the island will also have the potential to positively benefit the island economy in terms of use of local facilities e.g. shop, accommodation etc.

In terms of potential negative impacts local disruption will be very localised, and of a short duration. External building works should be completed in approximately 2 months and residual impacts are considered negligible.

7.2 Cable landfall

Of the environmental receptors discussed in Table 6.2 in relation to the cable installation at the landfall site, the following have been screened out due to the residual impact being defined as negligible:

- Coastal processes- the coastal and seabed processes assessment commissioned as part of the EIA concludes that the installation of the surface laid cables will have little impact on coastal processes. The potential impacts from the long term presence of the cables and devices is considered in Section 9.1;
- Socio-economic impacts – disruption will be very localised, and of a short duration; and
- Landscape and visual impacts - Impact will be very localised, and the presence of the concrete mattress covering on the cables will lead to sand accretion over time that will hide the cables.

7.2.1 Habitats

Background

The cable land-fall includes an area of vegetated sand dune at the Cauldale fore-shore. This area is not considered to be of significant conservation importance from a botanical perspective, but is important in the local context as vegetated dunes are a diminishing resource in Orkney.

Each of the four cables will be surface laid across the shore. This removes the need to excavate into the bedrock. The stratification of the bedrock beneath the sand cover offers natural grooves, likened to saw teeth, along which individual cables will be laid approximately 1 m apart. Ductile iron cable protection will be

fitted to the cable in the high energy areas of the surf zone and inter-tidal zone, with additional protection from flexible concrete mattresses where required. Beyond this point the cable self-weight should be sufficient to prevent movement and possible damage.

Management strategy and mitigation

Following cable installation the fore-dune system will be reinstated.

Residual impacts

A slight modification to the existing dune system and beach habitat is anticipated due to the nature of the works, but over time the system is expected to recover, with the residual impact expected to be negligible.

The presence of the cables and protective concrete mattresses will modify the shoreline habitat however due to the mobile nature of beach material the disturbance is not expected to beyond the scale of natural variability due to the dynamic nature of the coastline in the area.

7.2.2 Wildlife

Although construction is taking place on the coast, the construction site is considered far enough away from Seal Skerry to have any significant impact on the common seal populations which haulout at this site. The potential impacts during construction on birds and otters are considered further below.

Birds

Background

It has been identified that ringed plover, meadow pipits and rock pipits nest on the beach that includes the landfall site from May to late July. None of these species are of major conservation importance (see Section 4.2.6). While it is no longer planned to trench the cable into the bedrock, cable laying activities will still lead to a disturbance of the beach. Due to the isolated nature of this stretch of coastline, and very low level of background noise, the physical presence and activities of the construction crew will be very disruptive, and could lead to nests being abandoned. In addition, nests may be unintentionally destroyed.

Management strategy and mitigation

Work on the landfall site is not scheduled to start until August. Construction staff will be made aware that ringed plovers, meadow and rock pipits nest on the beach below the onshore site between May and late July and due care should be taken in case nests are still occupied when works commence. There will no deliberate disturbance to any occupied nests.

Residual impacts

In the short term, nests are expected to be empty prior to the commencement of works, so no impacts are anticipated. In the long term, while construction activities will be of a short duration, on-going survey and maintenance works to ensure the stability and integrity of the cables may have to be carried out during the sensitive period between May and July in future years. The residual impact of these activities is considered to be negligible.

Otters

Background

As was discussed in Section 7.1.1, the possible presence of otters and any potential threats to them has to be considered due to their protected status. There is a possibility that an occupied/natal holt may be identified during the pre-construction survey in the vicinity of the landfall, and otters are known to feed along this stretch of the coastline.

Management strategy and mitigation

See Section 7.1.1.

Residual impacts

See Section 7.1.1.

7.2.3 Archaeology

The small area of buried flags on top of the cliff edge may be at risk from activity at the landfall site. Refer to Section 7.1.2 for management and mitigation strategy.

7.3 Cumulative impacts

The majority of impacts associated with the onshore construction activities are temporary disturbance impacts to wildlife, the local population and tourists. These impacts will be of short duration (weeks) and the studies undertaken to support the EIA indicate that following construction the present status quo will be quickly restored. The mitigation and management measures proposed in relation to potential impacts on archaeological interests will ensure that there are no significant impacts to the cultural heritage of the area.

It is therefore considered that the activities associated with the onshore construction phase of the tidal test facilities will not result in any significant cumulative impacts.

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8 Offshore Construction Impacts

A summary of all potential environmental impacts associated with the offshore construction activities is presented in Section 6, Table 6.3 (a). This section of the ES discusses in more detail potentially significant impacts associated with the offshore cable installation.

Of the environmental issues discussed in Table 6.3 (a) in relation to the offshore cable laying activity, the following have been screened out due to the residual impact being defined as negligible or of no interaction:

- Seabed and coastal processes - the presence of the cables will have no impact on coastal processes as the cables will be laid approximately parallel to peak tidal stream and the seabed beyond the surf zone is exposed bedrock with occasional boulders with sparse pockets of mobile material;
- Water column contamination – recognised marine standard materials only to be held on vessels;
- Disturbance to wildlife – works to take place avoiding sensitive breeding times of cormorants and seals on the Green Holms. Duration of works over 7 consecutive days. Risk to marine mammals not considered any greater than during normal traffic movements in the channel. Laying and fixing the underwater cables in the Fall of Warness should not affect either common or grey seals at any of the designated sites identified (see Section 4.2.7). Seals are capable of avoiding any areas where activity occurs. Once the cables are in place, there should be little impact on seals in the water or on land. The cable installation is occurring out with times when seals might be expected to be present in large numbers i.e. after common seal and before grey seal breeding times (see Section 4.2.7). The installation will not commence until after the end of the cormorant breeding season in June so there is no risk of disturbance.
- Socio-economic impact – temporary lack of access of creel fishermen during cable laying. Creel fishermen do not use the Fall of Warness exclusively, and due to the temporary nature of the requirement to remove creels (days) will be able to conduct fishing activity elsewhere in the islands with no loss of earnings.
- Visual and landscape impact – distant views only from south west Eday coastline in existing shipping channel, with works being of a temporary duration.

8.1.1 Benthic habitats

Background

Disturbance/modification to benthic habitats/communities could occur as a result of cable laying in inshore waters. Both the UK Priority species maerl and the habitat Modiolus beds are known to be present in Orkney in moderately tide-swept conditions, and a seabed survey was commissioned as part of the EIA to establish whether they or any other sensitive or protected habitats/communities were present. The results of the preliminary seabed ROV and diving survey along the proposed cable routes concluded that the seabed was sparsely inhabited, with no sensitivities positively identified. The possible presence of maerl was identified from ROV footage close to the proposed cable landfall site, and an additional survey was commissioned (see Section 4.2.3).

Due to the nature of the waters in the area it was difficult to obtain survey coverage along the entire cable routes and test area. However, the sampling strategy adopted and sites surveyed are considered to be representative of wider habitat areas.

The seabed surveys indicate the area to be fairly uniform with regards to the limited species found in the area. The seabed ranges from eroding sublittoral sandbanks with rocks at the east of the survey area, to smooth scoured bedrock ridges and platforms towards the centre area of the test site (see Section 4.2.3).

Management strategy and mitigation

The survey work undertaken as part of this EIA has provided a clear indication that there are no sensitive or protected habitats or species present within the habitats that characterise the cable route and test berth areas.

In addition a seabed and coastal process study was commissioned to ascertain any potential impacts on seabed processes during construction.

As part of the on-going operation of the test site, all cables will be regularly surveyed by ROV to check their integrity and will provide additional footage of the seabed conditions in the test area. Any video footage obtained from these and any other surveys of the test site will add to the understanding of the marine environment of the area and be made available to SNH for general information if appropriate.

Residual impact

Due to the short duration (days) of the cable installation activities and the absence of identified sensitive or protected habitats/species along the cable routes the residual impact from the cable installation of benthic habitats is considered negligible. Any impact from the laying of the cables will be very localised and the within the natural variability of the dynamic seabed environment.

8.1.2 Other sea users

Background

The Fall of Warness is within the International Maritime Organisation (IMO) adopted "Area To Be Avoided" which requires all vessels over 5,000 GT carrying oil or other hazardous cargo to avoid the area designated. The inherent nature of the channel makes it hazardous for small craft, however it is used by larger vessels. Cruise ships and pelagic fishing vessels use the channel for passage, creel fishermen operate in the area, and the inter-island ferries use a number of routes through the channel which can vary in response to poor weather and associated sea conditions (see Section 4.3.4). The presence of the cable laying vessel and the 2 smaller support vessels could potentially present a physical hazard to other vessels in transit through the Fall of Warness.

Management strategy and mitigation

A navigation risk assessment for the tidal test facility has been undertaken and the recommended the following mitigation and management strategy:

- All sea users will be informed of intended works via a Notice to Mariners. In addition a marine awareness chart will be distributed to local mariners and fishermen prior to installation to inform them pf the proposed works.
- The works will take place in conditions of calm weather and good visibility, making it unlikely that the inter-island ferries will be using the bad weather routes that would take them through the Fall of Warness.
- The channel is wide enough so that cable laying vessel will not restrict transit of other vessels.
- The cable laying vessel will have marking and lighting in accordance with COLREGS (see Table 6.3 (a)).

Residual impact

The presence of the cable laying vessel and the 2 smaller support vessels are expected to have negligible impact on other vessels in the Fall of Warness during cable laying due to the short duration of installation and follow-up survey operations.

Although creel fishermen may temporarily loose access to creeling grounds during installation, lack of access will be temporary and of short duration.

8.1.3 Archaeology

Background

Seven ships have been recorded as wrecked in the general area of the Fall of Warness, but no actual wreck sites are known and it is not expected that any wreckage will still be present. It is known that a Spitfire was abandoned 'off Eday' in 1942, but no wreckage has ever been found. If wreckage is located it would be protected under the Protection of Military Remains Act 1986. Once designated as a protected place by the Secretary of State for Defence, it is an offence to tamper with, damage, move, remove, unearth or enter such remains. A seabed surveys undertaken to date along the proposed cable routes and in the vicinity of the test site area have not reported any evidence of wreckage (see Figure 4.5 for survey coverage).

Management strategy and mitigation

Seabed survey work undertaken to date has not provided any evidence of wreckage in the vicinity of the cable routes and test site.

In the improbable event that wreck sites are located during installation, the cable installation activities will endeavour to avoid these site. If this is not possible, the County Archaeologist will be contacted. The legally protected Spitfire will be avoided altogether.

As part of the on-going operation of the test site, all cables will be regularly surveyed by ROV to check their integrity. Video footage obtained will be made available to County Archaeologist if any evidence of wrecks is found.

Residual impact

Recent seabed surveys carried out uncovered no evidence of any wreckage. It is considered extremely unlikely that any remains will be located, and the residual impact with mitigation in place is considered to be negligible.

8.2 Cumulative impacts

The majority of impacts associated with the offshore construction activities are temporary disturbance impacts to the seabed and other sea users. These impacts will be of short duration and the studies undertaken to support the EIA indicate that following construction the present status quo of the seabed will be quickly restored. The seabed environment is very dynamic and any disturbance impacts during installation are expected to be within the range of natural variability in this area.

The mitigation and management measures proposed in relation to potential impacts on cultural heritage interests will ensure that there are no significant impacts to the cultural heritage of the area.

It is therefore considered that the activities associated with the offshore cable installation will not result in any significant cumulative impacts.

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9 Generic Impacts from the Operation of Tidal Test Facility

Once all construction and installation works have been completed and the facility is operational, the onshore part of the development will have little to no environmental impact. Possible exceptions are the cable landfall and visual impact that are discussed below.

The possible social constraints of EMC interference with radio and television signals and acoustic noise from switchgear and transformers have been highlighted as a potential issue. Any electrical, magnetic, electromagnetic and acoustic impacts resulting from the electric systems will decay very quickly with distance from the control building (Hammons, Taher and Voropai *et al* 1998) with no predicted impact on the nearest neighbour at Newbigging.

A significant reduction in the strength of the tidal stream through the Fall of Warness could lead to reduce mixing of the waters and increase the likelihood of harmful algal blooms occurring locally, and affect the productivity of the frontal sea areas to the east of Orkney (see Section 4.2.4). The seabed and coastal review undertaken concluded that there would be an insignificant loss of overall speed of 0.25% for the Fall of Warness area, and thus no predicted modification of the water column environment is expected.

Although the scope of the EIA does not include consideration of device specific impacts, it has considered the broader generic impacts from the presence of a tidal test site at the Fall of Warness. The specific impacts of individual devices will be addressed in device specific ESs, following the EMEC guidance on environmental impact assessment for test devices.

The following sections discuss the generic impact issues associated with the following:

- Seabed and coastal process;
- Benthic habitats and communities;
- Wildlife;
- Socio economic issues;
- Other sea users;
- Visual and landscape impacts; and
- Archaeology.

9.1 Seabed and coastal processes

9.1.1 Cable landfall

Background

The superficial sand over the main beach is assumed to be mobile due to exposed nature of the site, and it is likely that the area of visible bedrock will vary considerably throughout the life of the tidal test facility as the sand is drawn down and returned by changing wave conditions. It is expected that extreme drawdown during stormy periods may deplete most of the sand across the middle and upper beach, exposing large areas of underlying rock and the cables installed over the beach. Conversely, low swell conditions could move sand up the beach face, causing the lower beach and nearshore sand levels to drop. The vertical range of this mobility could be in excess of 2 m (HR Wallingford 2005).

The existing pocket beach is considered to be in dynamic equilibrium with the incident wave regime. Gross drift rates to the north and south may be large, but the nett rate will be low with a northerly residual direction (see Section 4.2.2).

The decision to surface lay the cables will have a significantly reduced impact on the existing beach than trenching, as was initially proposed. The presence of the cables with concrete mattress, covering however may in the long term influence existing patterns of beach drawdown and long shore drift.

Management strategy and mitigation

As part of the EIA HR Wallingford was commissioned to assess the potential impacts on seabed and coastal processes. Although this work did not include any detailed modeling of the area, based on the Company's previous experience of undertaking similar work for coastal and offshore wind farms it was felt a desk review would adequately inform the assessment of generic issues.

The extent of beach drawdown and the rates of longshore drift were not modelled or calculated as part of the seabed and coastal processes review. Although residual impacts are considered negligible (see below), it is recommended that beach monitoring takes place following cable installation, which will enable the potential impacts of the presence of the cables to be more accurately predicted.

Residual impacts

Anecdotal evidence from Eday residents indicates that the beach material is highly mobile, with the degree of sand cover considerably variable over time. It is considered that any influence the cables have will be within acceptable limits and the residual impact will be negligible.

The concrete mattress protection is designed to be resistant to wave attack and the open structure of the matting (see Section 3.3.1) will actively encourage the binding of sand. It is expected that over time the matting will become filled with sand and hide the cables beneath.

9.1.2 Installation, presence and operation of test devices

Background

The potential impacts on the seabed will vary depending on which generic type of device is installed. Of the generic types described (see Appendix A) some have a requirement for fixed structures to either be placed on or drilled into the seabed, while others have mooring requirements. The presence of the test devices along with operation could result in a loss of water current energy from the marine environment affecting seabed current flow and consequent sedimentary processes. Localised scouring of the seabed around any foundations is also a possibility.

Management strategy and mitigation

As previously discussed HR Wallingford undertook an assessment of potential impacts on coastal and seabed process as part of the EIA. The assessment recommended that ongoing seabed monitoring takes place during the installation of specific devices and their moorings, in order to more accurately predict the impact specific devices may have on the seabed. The regular ROV seabed/cable survey could be used to provide information on the potential impacts of devices and their moorings on the seabed.

Residual impact

Any debris resulting from installation of devices is expected to quickly disperse due to the strong prevailing tidal stream in the channel with no impact.

Based on the available information HR Wallingford broadly concluded that the impact of the presence of the foundations on seabed current flow would be insignificant. Seabed surveys indicate that test bays are all in an area with no deposits of mobile material so scour and sediment distribution are not issues. In addition the presence of test devices[8] is predicted to result in insignificant loss of overall tidal stream speed of 0.25% for the Fall of Warness area, resulting in no modification of the marine environment.

9.2 Benthic habitats and communities

9.2.1 Background

The seabed that the cables are to be laid upon and where device foundations/moorings are to be placed is heavily scoured and sparsely populated with no sensitive habitats or communities identified (see Section 4.2.3). Any disturbance from device installation and presence will be very localised.

[8] Consideration of multiple test devices on each berth.

It is expected that over time the test devices, cables and seabed moorings will become colonised by species characteristic of the hard substrate habitats in the area including seaweeds, barnacles and other invertebrates, which may result in a small increases in species diversity and overall productivity.

9.2.2 Management strategy and mitigation

The regular ROV seabed/cable survey may identify the need to periodically remove any growth as part of routine maintenance.

9.2.3 Residual impacts

No significant change to the current condition of the benthos is anticipated from the long terms presence of the cables and device foundations.

9.3 Wildlife

Otters are not considered to be at risk from the presence of devices as their range is normally confined to the shallower inshore waters where feeding occurs. The potential risks to nationally and internationally protected populations of seals, cetaceans, birds from the physical presence of the devices, are however a cause for concern.

9.3.1 Seals

Background

Internationally and nationally important breeding colonies and haulout sites of grey and common seals have been identified within the vicinity of the proposed test site (see Section 4.2.7). To date, there has been no commercially viable electricity generation from turbines installed in tidal streams, and thus the effect of tidal turbines on seals is, at present, unknown. The extent to which seals use the waters of the Fall of Warness is also unknown.

There is some risk that marine mammals will come into contact with test device turbine blades as they swim through the Fall of Warness. The group of animals most at risk will be seal pups when they go to sea to forage for the first time. There are a large number of grey seal pups born adjacent to the test site and these pups, which begin their offshore life independently, may be the most vulnerable. Grey seal pups are notoriously inquisitive and, since everything they encounter is 'new' and worth investigating, it is possible they may be attracted by objects moving in the water column. Common seal pups may be less at risk as they foraging with their mothers until they wean in about four weeks.

Management strategy and mitigation

Consultation and initial assessment has identified the need to establish a far clearer picture of the numbers and distribution of seals in the Fall of Warness area, and any seasonal variations. Monitoring to establish this baseline will be carried out prior to the deployment of devices. Once these data are available it will be possible to decide of mitigation strategies need to be put in place to afford seals protection. Such strategies may include shielding the device in some way, or acoustic deterrents.

EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations.

Residual impact

It is not be possible to accurately predict the extent of any impact due to the present lack of environmental baseline data and known impacts tidal turbines may have on seals.

It is hoped that any monitoring carried out and mitigation strategies put in place will inform not only on-going deployment at the test site, but also future commercial deployment at other locations.

9.3.2 Cetaceans

Background

There has been no systematic cetacean watching in the Fall of Warness and records obtained have been on a casual basis but suggest that it is a regular feeding area for harbour porpoise and probably killer whale. Other whales including the minke and pilot are thought to use the Fall of Warness for passage (Chris Booth pers. comm.). With regard to cetaceans, potential risks are thought to be entanglement/entrapment and collision with devices, and noise emission resulting in potential physical and behavioural impacts.

Acoustically induced harm can be caused to cetaceans as a result of anthropogenic activities, interfering with echolocation and masking intra-species communication. In recent years an increase in whale strandings has been linked with marine noise pollution. Cetacean research is however inherently difficult to undertake, lacks precision and there are many gaps in knowledge and areas of unknown. Studies undertaken have identified that different species of cetaceans have differing levels of acoustic sensitivities (i.e. the frequency and intensity of sound), but not all species have been studied and the majority of the studies that have taken place have been with captive animals (WDCS 2004). Thus where the frequency and intensity of any sound that might be emitted from the operation of the tidal test facility in the Fall of Warness may be known, this identified incomplete research when combined with the lack of baseline data on the species and numbers of individuals that pass through this area makes an assessment of potential impact extremely problematic.

Management strategy and mitigation

The initial assessment and consultations have identified the need to establish a far clearer picture of the numbers and frequency of cetaceans feeding in or on passage through the Fall of Warness, and any seasonal variations. Monitoring to establish this baseline data will be carried out prior to the deployment of devices. Once these data are available, it will be possible to decide if mitigation strategies need to be put in place to afford these populations adequate protection.

EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations.

Residual impact

It is not be possible to accurately predict the extent of any impact due to the present lack of environmental baseline data.

It is hoped that any monitoring carried out and mitigation strategies put in place will inform not only on-going deployment at the test site, but also future commercial deployment at other locations.

9.3.3 Birds

Background

Due to the depth of water at which the devices will be deployed, the only birds at risk are considered to be diving birds. Diving birds are thought to be at risk from the potential entanglement/entrapment with devices. It has been identified that a nationally important cormorant colony is located on the island of Little Green Holm. What is unclear however is whether these birds, and other diving birds, feed in the Fall of Warness. Diving and ROV surveys undertaken to date have found very little evidence of either the presence of fish or diving birds.

Management strategy and mitigation

The initial assessment and consultations have identified the need to establish a far clearer picture of the bird feeding habits in the Fall of Warness area. Monitoring to establish this baseline data will be carried out prior to the deployment of devices. Once these data are available, it will be possible to decide if mitigation strategies need to be put in place to afford these birds adequate protection.

EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations.

Residual impact

It is not be possible to accurately predict the extent of any impact due to the present lack of environmental baseline data.

It is hoped that any monitoring carried out and mitigation strategies put in place will inform not only on-going deployment at the test site, but also future commercial deployment at other locations.

9.4 Socio-economic issues[9]

9.4.1 Local economic benefits

Once operational, it is estimated that the tidal facility will create up to 4 new full-time jobs at the Stromness data centre (2 people working on the operation of the facility, and 2 researchers). There will be a requirement for someone living on Eday to provide part-time/emergency callout services in relation to operation and maintenance of the facility. Other benefits to Eday may include occasional overnight stays in local accommodation by EMEC staff and developers visiting the Eday facility.

Staff from manufacturers/developers will visit Orkney – principally the EMEC office in Stromness – on an as and when necessary basis. Each developer will have 2/3 people working in Orkney at certain times (for varying lengths of time). These staff will generate both business and personal expenditure in Orkney and Eday (e.g. on travel, accommodation, office supplies, etc) that will benefit the local economy.

9.4.2 Creel fishery

Background

The creel fishing sector contributes a major part to the Orkney fleet due to the decline of the white fishing industry. The fleet is spread throughout the island group and plays a vital economic and social role that is of particular importance to the northern isles. Up to 14 boats are known to fish within the Fall of Warness area. Any economic impact on this industry as a result of the operation of the test site, either through lack of access to fishing grounds and/or damage/loss of fishing gear, would be unwelcome. The fishery is inshore, primarily within the 15 m contour and thus on the periphery of the test site, although occasionally creels may be deployed to 30 m. The only test berth which might interfere with creeling activity is number 4, located off War Ness cliffs. The pile mounted device which it is proposed will be deployed here is likely to be sited in charted depths of between 25 m and 30 m, in close proximity to the creel fishery (see Section 4.3.2).

The possibility of economic loss as a result of creels snagging on the subsea cable is considered to be negligible. The cables are designed to have sufficient weight to maintain position on the seabed, and inherent flexibility to avoid 'bridging'.

Management strategy and mitigation

In the long term, it is not anticipated that creel fishermen will be unable to access any major areas of seabed, beyond cable laying (see Section 8). The location of the pile mounted device has yet to be finalised, but it will be as clear of the adverse weather ferry routes as possible which should also be clear of the creel fishing grounds.

A marine awareness chart will be issued to local fisheries organisations providing locations and details of testing activities.

Residual impact

It will not be possible to accurately predict the extent of any impact until the exact location and type of device to be deployed at test berth 4 is known. The other 3 berths will be in deeper water in excess of 40 m and the impact is considered to be negligible.

[9] This section informed by data and analysis provided by the economist Brian Burns.

9.5 Other sea users

9.5.1 Background

The Fall of Warness is within the International Maritime Organisation (IMO) adopted "Area To Be Avoided" which requires all vessels over 5,000 GT carrying oil or other hazardous cargo to avoid the area designated. The inherent nature of the channel makes it hazardous for small craft, however it is used by larger vessels. Cruise ships and pelagic fishing vessels use the channel for passage, creel fishermen operate in the area, and the inter-island ferries use a number of routes through the channel which can vary in response to poor weather and associated sea conditions (see Section 4.3.3). The proposed location of test berth 4 is very close to the Eday/Sanday/Stronsay alternative ferry route, and the surface piercing device it is proposed will be sited here could present navigational challenges in heavy seas and poor visibility if appropriate navigation aids are not used.

There are no military exercise areas immediately adjacent to the proposed area and no indications of the area as being a transit route for other than surface vessels.

In the future the proposed Transhipment Hub in Scapa Flow may increase traffic movement in the area. While the larger transatlantic vessels will probably be excluded, smaller feeder vessels may use the route.

The presence of vessels associated with the installation/maintenance/decommissioning of devices and the devices themselves could potentially present a physical hazard to other vessels in transit through the Fall of Warness that would interfere with normal sailing.

Meteorological and hydrodynamic effects can increase a vessels draught by several metres, but the risk of collision with devices of the largest vessels is still considered to be low.

In addition to the navigation hazard presented from the devices in the Fall of Warness area, there is also potential for harbour congestion from the presence of unusually high number of vessels in Eday/north isles of Orkney.

9.5.2 Management strategy and mitigation

All sea users will be informed of intended works via a Notice to Mariners. A site specific marine awareness chart detailing locations of test berths and the detail of testing activities will also be distributed to local mariners and fishermen.

Any installation/maintenance/decommissioning works will take place in conditions of calm weather and tidal conditions, and good visibility, making it very unlikely that the inter-island ferries will be using the bad weather routes that would take them through the Fall of Warness. The channel is wide enough so that vessels will not restrict the passage of other vessels.

All vessels will have marking and lighting in accordance with COLREGS (see Table 6.3 (a)).

The major conclusions of the navigation risk assessment undertaken by Abbott Risk Consulting were:

- The construction and de-commissioning phases of both the infrastructure (i.e. sub sea cables) and the devices presents a moderate hazard to navigation for which normal precautions and controls are adequate to ensure that the risk is tolerable;
- Siting the device test positions in the centre of the channel conflicts with the normal route for transiting vessels;
- Certain device Types will present a hazard to navigation in their normal operating modes (i.e. Type 3 and 4 devices);
- Other devices (Type 1 and 2) can present a hazard to navigation as a consequence of severe weather/high sea states (Type 1) or failures (Type 2);
- The effects of weather/sea state on ship's motions can reduce under-keel clearances significantly;

- It is necessary to define the area in which devices can present such hazards as closely as possible in order to restrict vessels as little as possible; and
- The area requires charting and marking order to bring to the attention of mariners the potential hazards to navigation that may be within the area.

Consultation is still ongoing with regard to the findings of the navigation risk assessment and appropriate management and mitigation measures to alleviate the potential impacts still being developed.

With regard to the potential for harbour congestion from both support vessels to test activities and the mooring requirements of test devices, it is imperative that individual developers identify their likely needs early and undertake appropriate consultation with the local harbour authority.

9.5.3 Residual impact

The presence of vessels and test devices associated with tidal facility operations under most conditions are not expected to have any impact on other vessels in transit through the Fall of Warness. Issues relating to specific device locations and potential inter island ferry routes are still being assessed and discussed.

There is potential for harbour congestion from the need to moor vessels and devices during testing the level of which will be dependant on specific developer requirements.

9.6 Visual and landscape impact

Landscape impacts are changes in the character and quality of the landscape as a result of a particular development. The process of landscape character assessment (LCA) is used to assess these changes to enable better landscape planning, conservation, restoration, management and enhancement. LCA is based on the principle that all landscapes have a range of features and characteristics, which not only give them their appearance, but also contribute to their wider character, for example through historical, artistic and social associations. In combination, these features and characteristics provide landscapes with their "character" or distinctiveness.

Visual impacts are a subset of landscape impacts. The assessment is a subjective process as it involves individual perception, aesthetic tastes and visual comprehension. It is possible, however, to bring objectivity to the assessment and treatment of visual impact by considering the factors which influence it, including height, colour, size and associations with nearby features, including (in the marine environment) the presence of rock outcrops, small islands and existing manmade features. These factors are ultimately influenced by meteorological, topographic position, season and observer characteristics.

The aim of landscape and visual impact assessment is to assess the sensitivity to change in the area and to identify the appropriate mitigation measures, such as design guidance and detailed siting requirements. The methodology used to assess the landscape and visual impact of the EMEC tidal test facility follows guidelines produced by the Landscape Institute.

Initially a desk based assessment was undertaken to characterise the features of the proposed development (onshore and offshore) establish the landuse in the area surrounding the development area (see Section 4.1.1), identify potentially sensitive viewpoints and the likely zones of effect. The potentially sensitive viewpoints were identified as:

- Newbigging Farm – direct neighbour of proposed onshore development;
- Near neighbours from west side of island;
- Sealskerry Bay;
- Moorland hills - Flaughton Hill and Whitemaw Hill (SSSI);
- Bay of Greentoft; and
- War Ness cliffs.

Fieldwork was then undertaken to determine the visual envelope and landscape character of the area using field survey forms and photographs. Photographs taken during the field survey were taken at x50 magnification which mimics the human vision and the views produced in the photomontages taken as real size views of the development. The fieldwork was undertaken over two bright sunny days in May 2005 and represents worst-case conditions in terms of visibility of the site, particularly at longer range. It should be noted that poor light conditions and cloud cover are frequently encountered weather conditions for the area and would reduce the visibility of the tidal test facilities.

A summary of the main findings of the landscape and visual assessment for both the onshore and offshore aspects of the project are provided below.

Onshore

Background

The onshore control building facility will comprise a new single storey building constructed adjacent to the ruined steading of Cauldale. An external concreted hard standing area will be provided to site containers for future developer use (see Section 4.3.1).

The coastline from Seal Skerry round to Newbigging farm comprises a narrow strip of low lying sand dunes backed onto by pasture land. South of this point, the cliffs steepen, with heath land to the cliff edge again backed onto by pasture land. Further inland exposed moorland hills dominate. The main use of land along the south west Eday coast is for sheep grazing.

There are a number of land users that may be potential receptors for landscape and visual influence, including cottages, crofts and farmsteads neighbouring the onshore facility. Future plans to designate footpaths around Seal Skerry and to extend the existing War Ness heritage footpath along to Newbigging and over moorland hills back to Bay of Greentoft could increase visitor presence in the area. The main use of land along the coast is for sheep grazing, and consists of pasture land and coastal heath.

From the road approaching the onshore facility, clear views of the site are only obtainable just past the turn-off to Sandybank on the access road parallel to Cauldale (see Plate 9.1). From Sandybank and Swenstay views are partially obscured by the derelict buildings of Cauldale and grassy hummocks. Close views will be only be obtainable from Newbigging Farm and access track (see Plate 9.2), directly neighbouring the control building site where it can be considered that the new building does represent a distinct new feature on the landscape.

If the proposed footpath from Greentoft Bay to Newbigging is developed, walkers using the path will have close views of the facility as they approach Newbigging, with views becoming increasingly distant up to Neven Point (see Plate 9.3).

Distant views of the onshore part of the development will be obtainable from moorland hills (including Whitemaw Hill a designated SSSI) directly behind the site (see Plate 9.4). This area is accessible by a rough track up to a water storage facility on Flaughton Hill, and only occasionally visited.

Sea views of the onshore facility will be possible from the vessels identified in Section 4.3.4, namely the cruise ships and pelagic fishing boats that occasionally transit through the area, creel fishermen who regularly fish the inshore shellfishing grounds, and the inter-island ferries that use alternative routes through the Fall of Warness when tidal and weather conditions dictate the need (see Figure 4.12).

Figure 9.1 Visual envelop of onshore control building

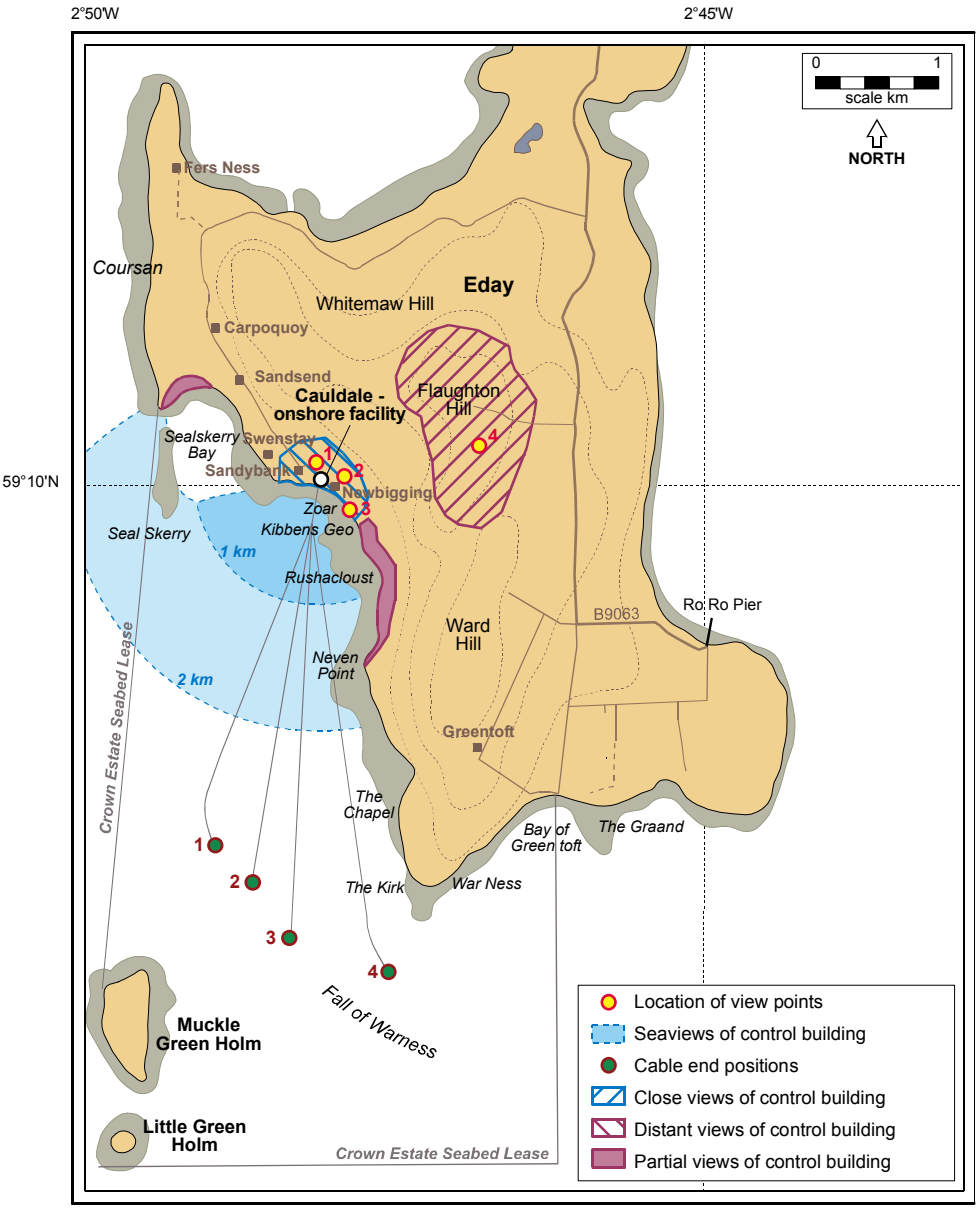

Plate 9.1 Photomontages of onshore control building from access track parallel to Cauldale[10]

[10] ***It should be noted that CAD images generated offer an approximation of the scale of the proposed facilities in relation to the surrounding area – in reality the building finishes which will be much darker.***

Plate 9.2 Photomontages of onshore control building from Newbigging Farm[11]

[11] ***It should be noted that CAD images generated offer an approximation of the scale of the proposed facilities in relation to the surrounding area – in reality the building finishes which will be much darker.***

Plate 9.3 Photomontages of onshore control building from Zoar[12]

[12] ***It should be noted that CAD images generated offer an approximation of the scale of the proposed facilities in relation to the surrounding area – in reality the building finishes which will be much darker.***

Plate 9.4 Photomontages of onshore control building from Flaughton Hill[13]

[13] ***It should be noted that CAD images generated offer an approximation of the scale of the proposed facilities in relation to the surrounding area – in reality the building finishes which will be much darker.***

Plate 9.5 Aerial photomontages of control building[14]

[14] ***It should be noted that CAD images generated offer an approximation of the scale of the proposed facilities in relation to the surrounding area – in reality the building finishes which will be much darker.***

Management strategy and mitigation

The building and landscaping has been designed to be sensitive to the neighbouring properties in accordance with planning approval conditions (see Appendix B). The building finishings will be fully agreed with the local planning department and are proposed as dark rendering and a slate tiled roof, sympathetic to traditional Orkney construction. It is considered this will ensure that the building is in character with others on the south west coast of Eday.

The containers will be screened between the new building and ruined Cauldale steading. The building will be sunk 1 m below existing ground level and sensitively screened with bunding.

As can be seen from Plate 9.5, from the sea the onshore facilities are to be located within an existing cluster of buildings, and as such will offer no greater visual impact than any of the other buildings currently located there. Once construction works are finished virtually no visible activities will take place at the site. The building will be unmanned, being remotely operated from Stromness with only occasional visits from EMEC staff or developers.

Residual impact

Close views of the control building will only be obtainable from the immediate neighbours, and occasionally by walkers on the coast path. Middle to distant views will obtainable from moorland hills and coastal walks, but usage of these areas is expected to light and sporadic. From offshore, the building will be viewed as part of an existing cluster of buildings. Bearing this in mind, in combination with the sensitive design of the building, the residual landscape and visual impact is expected to be minor, due to the fact the building does represent a distinct new feature on the landscape for immediate neighbours.

Offshore

Background

With the information currently available on the generic nature of tidal generating devices, the pile mounted surface piercing device and buoyant surface device would be the only types visible (see Appendix A). It is proposed that a device of the pile mounted type will be located at test berth 4 approximately 0.75 km from War Ness, on the Warness heritage footpath. It is most likely that if a developer wishes to test a buoyant surface device it will be at test berth 2 (see navigation risk assessment attached) located approximately 1.5 km from the south west Eday Coastline, on the path of the proposed extension to the Warness heritage path (see Section 4.3.5).

Sea views of the surface devices will be possible from the vessels identified in Section 4.3.4, namely the cruise ships and pelagic fishing boats that occasionally transit through the area, creel fishermen who regularly fish the inshore shell fishing grounds, and the inter-island ferries that use alternative routes through the Fall of Warness when tidal and weather conditions dictate the need (see Figure 4.12).

Management strategy and mitigation

Middle distant views of the pile mounted surface piercing device will be visible from War Ness and distant views of the whole test site will be visible from much of the south west Eday coastline and from moorland hills (see Figure 9.2). The buoyant surface device will be mounted on a barge and as such lie very low in the water. Normal sea conditions throughout the area are typically choppy, with large swells in stormy conditions which when combined with the distance from the shore make it very unlikely that this device will be visible accept very occasionally as a distant dot on the horizon. Although it will be marked with the necessary navigational markers and these will be visible. The surface piercing device proposed for test berth 4 will extend approximately 9 m above sea level, but as can be seen from Plate 9.6 even when viewed in flat calm conditions, on a bright sunny day offering clear visibility (very unusual conditions for this area) the device is still barely visible from the closest onshore location to the test berth.

Sea users identified will pass through the test facility, and could have much closer views than will be obtainable from shore of the surface device. It is considered very unlikely that this device will be visible from transiting vessels at distances greater than 2 km from the test berth. The surface buoyant device which may be located at test berth 2 lies very low in the water which will again limit any impact. The normal ferry route

to Sanday, Eday and Stronsay, used by approximately 50% of the crossings passes approximately 1 km south of the surface piercing device which will limit any visual impact. The alternative ferry route used when tidal/weather conditions dictate will pass much closer to the device. In adverse weather conditions both this ferry route and the Westray route pass through the Fall of Warness, but due to poor visibility and heavy seas any visual impact will be significantly reduced.

The degree of visual impact of the surface devices will be strongly influenced by the meteorological conditions of Orkney, where the climate is typically wet and windy with gales common from October through to April. Visibility of the devices will be greater in the in the relatively short period of the summer months due to the extended daylight hours and calmer weather conditions. In the autumn and winter months daylight hours reduce significantly and as does visibility due to poor weather, with regular and extended periods of rain and gale force conditions with associated rough seas. However it should be noted that surface present devices are expected to be marked with navigational markers e.g. lights, which will be clearly visible in all weather conditions and at night.

Residual impact

Overall the visual impact of the offshore test sites from both land and sea is considered to be minor, due to the fact there will probably be new navigational markers visible at certain test berths.

Figure 9.2 Visual envelope of for offshore test berths

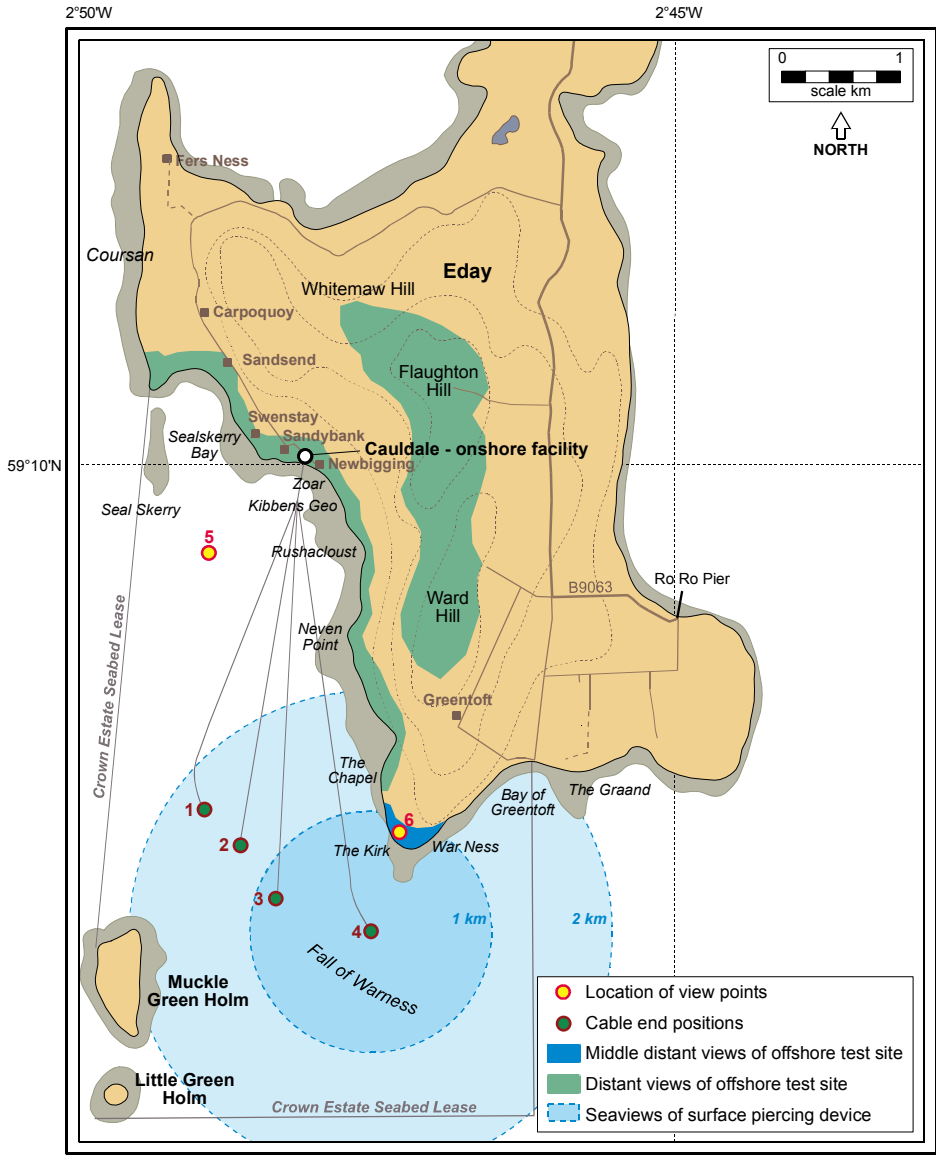

Plate 9.6 Photomontages of surface piercing device from War Ness

9.7 Archaeology

9.7.1 Background

The two bronze age archaeological sites located on the point of Warness already badly affected by erosion were not considered to be at any additional risk. The HR Wallingford coastal processes review concluded that while parts of the coast are undergoing slow retreat, the operation of the test site will have an insignificant impact on wave activity and thus will not escalate the erosion process.

Seven ships have been recorded as wrecked in the general area of the Fall of Warness, but no actual wreck sites are known. It is known that a Spitfire was abandoned 'off Eday' in 1942, but no wreckage has ever been found. If wreckage is located it would be protected under the Protection of Military Remains Act 1986. Once designated as a protected place by the Secretary of State for Defence, it is an offence to tamper with, damage, move, remove, unearth or enter such remains.

9.7.2 Management strategy and mitigation

None of the wreck sites (see Section 4.3.2) has been located and they are unlikely to survive due to the strong tidal stream in the area. However, in order to cover the 'worst case scenario', it is assumed that the cables and/or offshore test bays may impact on the wrecks. Any evidence of wrecks during survey work or device installation will be reported immediately to the County Archaeologist.

In the improbable event that some sites are located on the seabed, the simplest response would be to avoid them. If this is impossible, the County Archaeologist should be contacted and a general or more detailed wreck survey may be carried out. The legally protected Spitfire if located should be avoided altogether.

9.7.3 Residual impact

Recent seabed surveys carried out uncovered no evidence of any wreckage. It is considered extremely unlikely that any remains will be located, and the residual impact with mitigation in place is considered to be negligible.

9.8 Cumulative impacts

As the EIA has only addressed generic issues from the presence and operation of the test site it is not possible to provide a detailed assessment of the potential cumulative impacts. This is something that will need to be addressed a dedicated research programme of work. EMEC is in discussions with UKERC about forming research partnerships, which will address this and other as yet unknown issues, related to marine energy devices.

In terms of the seabed processes the presence of the device foundation on seabed current flow is considered to be insignificant. Seabed surveys indicate that test bays are all in an area with no deposits of mobile material so scour and sediment distribution are not issues. In addition, insignificant loss of overall speed of 0.25% for the Fall of Warness area has been predicted, resulting in no modification of the marine environment.

The EIA has concluded that at present there is insufficient data available on potential sensitive wildlife populations in the test area to be able to make any judgements on the potential impacts of devices on these species. Monitoring of marine wildlife monitoring will take place prior to device installation to assist in any impact predictions.

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In terms of potential cumulative impacts from a landscape and visual perspective, while there are no plans to extend the compound facilities at the onshore site at present, enough land was purchased should the need arise in the future. Any future changes would be similar to the existing facilities. Any additional works at the site would need to be sensitive to the otter population, and the same mitigation strategies applied as during the initial construction phase of the project.

While each test berth has the capacity to accommodate additional devices should the individual developers wish, each additional device will be subject to the production of an ES and the risk to navigation safety reassessed.

10 Accidental and non-routine events

10.1 Onshore construction, installation and operation

10.1.1 Background

The environmental risks from accidental and non-routine events associated with the construction and operation of the onshore facility have been assessed and the results summarised in Table 6.5. The main risks relate to:

- Fire at the onshore facility and resultant pollution;
- Oil spill from refuelling of site vehicles during construction and tank failure or loading spill during the operational phase; and
- Damage to pier/roads from vehicles associated with the development.

An onsite storage tank is required to fuel the building emergency generator. This tank will be installed early in construction and be used to fuel vehicles during the construction phase. The only other oils that will be present on site will be very limited inventories of lubes and greases, stored in the control building.

Firewater run off and oil spills may result in contamination of land and watercourses, and wildlife.

10.1.2 Management and mitigation

All operations will adhere to relevant health, safety and environmental legislation which will ensure that facilities designed and operations are undertaken to minimise the risk of accidental events.

During onshore construction, a specific area will be designated for the refuelling of vehicles and be constructed to avoid surface run off. A spill kit will be maintained in a clearly labelled container and kept on site to deal with spillages and staff trained in its use. In addition, a spill contingency plan will be developed in accordance with SEPA PPG21 'Pollution incident response planning'.

The oil tank to be used for refuelling vehicles during construction and to fuel the emergency generator once the facility is operational will be constructed in accordance with SEPA PPG2 'above ground oil storage tanks'.

The construction contractor will consult with the OIC Roads Department prior to the commencement of onshore works to identify any issues associated with the Eday road network and the potential need to upgrade roads to facilitate use by construction traffic. Where possible local Eday based hauliers will be used to transport materials and personnel to the construction site. In addition, the contractor will make good any damage to roads post works.

Once the facility is operational, EMEC has in place a number of emergency response procedures which cover potential accidental events (see Section 11.2.2).

10.1.3 Residual impact

With the proposed management and mitigation in place all residual impacts are considered to be either minor or negligible.

10.2 Offshore construction, installation and operation

10.2.1 Background

The environmental risks from accidental and non-routine events associated with the installation and operation of the offshore facilities have been assessed and the results summarised in Table 6.5. The main risks relate to:

- Oil spills from vessels during cable installation, device and mooring installation, maintenance, and decommissioning;

- Oil leaks from devices;
- Vessel/vessel, vessel/device or device/device collisions; and
- Structural failure of devices.

Spilled oil at sea can have a number of environmental and economic impacts. Actual impacts depend on a wide range of factors including volume and type of oil spilt, and the sea and weather conditions at the time of the spill and whether environmental sensitivities are present in the path of a spill. These environmental sensitivities will have spatial and temporal variations.

The impact from small oil spills or leaks will be localized to the immediate vicinity of the spill and spilt oil will quickly disperse in the dynamic waters of the Fall of Warness. Small spills/leaks will be most likely to originate from test devices which contain oils. Major oil spills may result from a vessel collision or grounding and the discharge of oil from fuel tanks. Although the impacts from such vessels may be of greater consequence, such events are extremely remote.

Full or partial structural failure of test devices may result in a debris hazard to vessels operating in the area and to wildlife.

10.2.2 Management and mitigation

All vessels associated with the installation and operational phase of the tidal test facilities will comply with IMO/MCA codes for prevention of oil pollution and have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs).

As far as possible vessels with an established track record of operating in Orkney or similar waters will be used. They will be familiar with the weather and operating conditions in the area. The cable installation vessel, MV Galatea is the same vessel as used to install the cables for the EMEC wave test site at Billia Croo.

The potential for and consequences of oil spills and leaks from, and structural failure of, individual test devices will be considered as part of device specific ESs (as required by EMEC, see Section 11.4). In addition, EMEC has in place a number of emergency response procedures which cover potential accidental events (see Section 11.2.2).

10.2.3 Residual impact

The likelihood of a major oil spill from a vessel is very remote, and although the potential consequence could be severe, there are established procedures and practices in place to ensure that an efficient and effective response will be implemented to safeguard personnel and minimise potential environmental impacts.

Specific device impacts from potential accidental events will be assessed as part of device specific ESs.

11 Environmental Management

11.1 Introduction

Marine renewable energies have been viewed as an environmentally beneficial way of generating power in the future. Nevertheless, the installation of any system in the marine environment has the potential to impact the environment and other users of the area. It is necessary therefore to manage the activities associated with marine renewable energy exploitation in a careful and enlightened manner in keeping with the modern principles of sustainable development. This section of the ES therefore recommends how environmental management will be incorporated into the construction and installation, and ongoing operation of the EMEC tidal test facility.

11.2 Environmental management system

Environmental management of the project up to the time of the completion of the ES is achieved primarily through the environmental assessment process (EIA). EIA is an ongoing process that will continue following the production of the ES.

It will encompass the consideration and adoption of mitigation measures highlighted, further stakeholder consultation, a more focused assessment of the environmental aspects individual to each test device and implementation of appropriate environmental monitoring and research programmes. The primary mechanisms for ensuing that environmental assessment continues and that all environmental issues are managed during the operational phase of the test facility, is through the EMEC integrated management system (IMS).

11.2.1 Implementation of ES commitments by the design and construction team during the construction and installation of the tidal test site

An important aspect of the EIA process is mitigation and management planning and the production of the environmental management plan (EMP). Proposed mitigation and management measures have been developed as part of the EIA process in collaboration with the project team and relevant stakeholders.

As a result action checklist/EMP has been produced which documents all the mitigation and management measures identified and detailed in this ES. These commitments will be incorporated into the Tulloch project management system to ensure they are carried through to implementation. It is expected that the EMP will evolve and be updated through final design prior to construction and installation.

Following the construction and installation phase of the project EMEC will become the operator of the tidal test facility. It will be important to ensure that any outstanding issues relating to the EMP are adequately communicated during the handover.

Table 11.1 Construction and installation commitments

Onshore works and facility
General construction issues
1. Tulloch operations manager to liaise with Eday community regarding all aspects of the project activities. Proactive communication to be maintained with local community prior to and during onshore construction.
2. Local (Orkney) skills to be used where available.
3. Adherence to SEPA guidelines PPG5 'Works in or liable to affect watercourses' and PPG6 'Working at construction and demolition sites'.
4. Construction Method Statement production – to detail how each phase will be carried out to avoid or minimise pollution risks, identifying contingency measures.
5. Tulloch will establish waste minimisation and management strategy.
6. All building waste material to be dealt with in a manner which conforms with the Waste Management Regulations 1994 and Duty of Care Code practice 1996.
7. All waste generated during construction to be removed from island for disposal.

8. Only necessary vehicles will be kept on site and all work areas will be kept tidy.
9. Numbers of construction personnel cars to be kept to a minimum.
10. Traffic access will be assured at all times.
11. Pre construction briefing to all staff on environmental awareness, pointing out to them the importance of the area, the species they are likely to see and the legal requirements of their work.
Wildlife
12. Further otter survey to be undertaken one month before construction to ensure no inhabited/natal holts are present.
13. Otter handling licence to be applied for if results of otter survey indicate presence of inhabited/natal holt.
14. Outside construction work to be restricted to between the hours of 0800 and 1800 or two hours after sunrise to one hour before sunset which ever is the later (to avoid/minimise disturbance to otters).
15. All construction personnel to be made aware of environmental senstivities as part of pre construction briefing.
16. Aurora Environmental will immediately be made aware of any concerns relating to the disturbance of otters that might arise during the construction of the substation and they, in turn, will liaise with Celtic Environmental to discuss the options which might be followed to mitigate the concern.
17. All drivers using the access road will be made aware of the presence of otters and the use of warning signs will be used to enforce this.
18. Construction staff will be made aware that ringed plovers, meadow and rock pipits nest on the beach below the onshore site between May and late July, and due care will be taken not to disturb any nesting birds still present when construction commences.
19. Cables to be surface laid across the beach to avoid wildlife disturbance from bedrock excavation.
20. If land based navigational markers required construction periods must avoid sensitive wildlife seasons e.g. seal and bird breeding.
Habitats
21. Temporary laydown areas during construction will be away from the burn that runs along the south side of the Cauldale site.
22. The dune system is to be reinstated as close to original state as possible post works.
Archaeology
23. Discovery of any archaeological remains during construction will result in immediate cessation of operations in the immediate vicinity of the find, and archaeological experts will be brought in to carry out investigations.
24. The Cauldale farm buildings and yard wall of ruined Cauldale croft will be taped off and avoided, during construction.
25. The stone footbridge on the south edge of the construction site will be taped off and avoided during construction. Otherwise a detailed standing building survey will be implemented.
26. A watching brief by a qualified archaeologist will be carried out in the event that works will disturb the flag horizon identified at the edge of the dune system.
27. If construction of land based navigation markers required on Muckle Green Holm and Little Green Holm a walkover survey should be conduction around the proposed construction sites prior to any works to identify if any mitigation are required.
Pollution mitigation
28. Adherence to building control regulations.
29. Drainage requirements to meet SEPA guidance PPG4 'disposal of sewage where no mains drainage is available'.
30. A sustainable drainage system (SUDS) will be installed for surface water drainage (from roof and hard standing).
31. Adoption of a source control approach to remove the need for an oil separator in accordance with SEPA PPG3 'Use and design of oil separators in surface water drainage systems'.
32. Material for constructing the bund will only be taken from excavation activities on the site, and will not be removed from other areas around the site or imported in from elsewhere.
33. Oil tank to be constructed in accordance with SEPA PPG2 'above ground oil storage tanks'.
34. Prepare oil spill contingency plan in accordance with SEPA PPG21.
35. A spill kit in a clearly marked container will be kept on site and staff trained in its use.
36. Designate an area for refuelling of vehicles constructed to avoid contamination of surface run-off
Visual and landscape
37. Adherence to OIC planning approval conditions.
38. Final colouring of harling and roofing material to be sensitive to surrounding area.

39. Building will be sunk approximately 1 m below existing ground level to maximise screening and sensitively screened with bunding.
40. Container colour to be non-intrusive – contractual stipulation with developers
41. The building and landscaping should be designed to blend into the rural landscape.
Non routine accidental events
42. Control building will comply with HSE Electricity at Works Regulations 1989 and fire regulations.
43. Fire alarm in control building to be connected to SCADA system.

Offshore works
Other sea users
44. A project briefing document will be circulated to all sea users before construction starts.
45. The cable laying vessel will, comply with the International Regulations for Preventing Collisions at Sea (COLREGS) and display the appropriate lights and marks for a vessel restricted in her ability to manoeuvre.
46. The works will be promulgated by appropriate Notices to Mariners and Navigational Warnings.
47. Full consultation with creel fishermen required relating to temporary removal of creels during cable installation to include distribution of project briefing to all affected fisheries organisations.
Archaeology
48. Any evidence of wrecks encountered during cable laying will be reported immediately to the County Archaeologist.
Non routine accidental events
49. All vessels associated with the installation and operational phase of the tidal test facilities will comply with IMO/MCA codes for prevention of oil pollution and have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs).

Table 11.2 Operational commitments

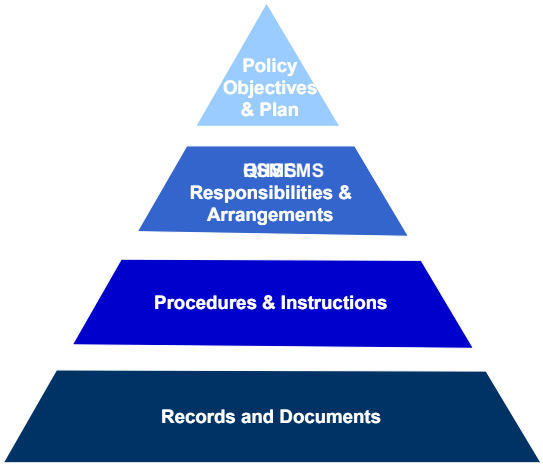
Operational commitments	
1.	Contractual stipulation with developers to adhere to EMEC waste management procedure.
2.	EMEC is involved in plans with a number of other research institutions to identify the knowledge gaps and initiate research aimed at addressing these.
3.	EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations
4.	All works will be promulgated by appropriate Notices to Mariners and Navigational Warnings as appropriate.
5.	Production and distribution of a marine awareness chart for the tidal site.
6.	Continued consultation and discussion to close out issues raised by navigation risk assessment.
7.	Appropriate marking, lighting and aids to navigation to be specified for all surface piercing devices.
8.	Vessels will comply with the International Regulations for Preventing Collisions at Sea (COLREGS) and display the appropriate lights and marks for a vessel restricted in her ability to manoeuvre.
9.	Undertake regular seabed surveys to check integrity of cables.
10.	Any evidence of wrecks encountered during survey work or device installation will be reported immediately to the County Archaeologist.
11.	All vessels associated with the installation and operational phase of the tidal test facilities will comply with IMO/MCA codes for prevention of oil pollution and have onboard Shipboard Oil Pollution Emergency Plans (SOPEPs).
12.	With regard to the potential for harbour congestion from both support vessels to test activities and the mooring requirements of test devices, it is imperative that individual developers identify their likely needs early and undertake appropriate consultation with the local harbour authority.
13.	EMEC emergency response procedures to cover activities at tidal test site.

11.2.2 EMEC IMS

EMEC has implemented an integrated management system (IMS) which demonstrates a clear commitment to the standard of quality, health, safety and environmental (QHSE) management. The system has been developed to meet the requirements of the internationally recognised environmental standard, ISO 14001, to ensure the highest standard of environmental performance from employees, developers and those visiting the centre.

The structure of the system is illustrated in the figure below and the General Statement of Policy documents EMECs policy objectives and plan.

Figure 11.1 Structure of EMEC IMS



EMEC - General Statement of Policy

The European Marine Energy Centre (EMEC) aims to become an international centre of excellence for the development and testing of marine energy conversion technologies (wave and tidal stream) and an industry leader in the achievement of reputable standards of quality of service and the protection of health, safety and the environment.

The Management Board of EMEC recognises the responsibilities it has to its workforce, developers using the centre, visitors and the general public and to minimising any adverse impact on the environment either as a result of its own activities or of developers using the Centre. EMEC believes that the effective management of Quality, Health, Safety and the Environment (QHSE) is vital to the Centre's success.

To this end, EMEC has developed a fully Integrated Management System (IMS), appropriate to the nature and scale of EMEC's activities incorporating the requirements of appropriate Quality, Health, Safety and Environmental standards. The IMS is in process of being submitted to the UK Accreditation Service for the accreditation of EMEC as a measurement laboratory for wave device performance measurement under ISO 17025:2000. EMEC was recommended for accreditation on 16 December 2004.

The Board affirms that all personnel and sub-contractors will be required to familiarise themselves with the quality documentation and implement the necessary policies and procedures required by ISO 17025:2000. Further the Board affirms its commitment to compliance with that standard. The Board is also committed to achieving compliance with the Health & Safety Management Standard OHSAS 18001 and the Environmental Management Standard ISO 14001:1996.

The IMS Policy , which expresses EMEC's commitments, is available to all stakeholders. The system will be reviewed by Management periodically and revised to reflect the development of the system and to emphasise the Board's commitment to continuous improvement of all elements of the Management System.

The EMEC Board is committed to applying measures of good practice to meet all applicable UK safety, health and environmental legislation, relevant standards and other requirements to which it subscribes. The Board will also ensure the provision of adequate resources and trained people to fulfil its Policy obligations. Mr John Griffiths is the Board Member responsible for the formulation and implementation of arrangements under this Policy and is charged with ensuring the appropriate level of board involvement. Mr Griffiths will facilitate communication of the arrangements to all relevant parties.

Signed with electronic signature in pdf: Date: 31 May 2005

Specific procedures and instructions have been developed in order to achieve the planned goals of the system. Procedures with specific relevance to environmental issues include:

Standard operating procedures:

- Developer management;
- Contractor management;
- Hazard identification;
- Legislation management;
- Waste management;
- Audit management;
- Management of change;
- Accident/incident reporting; and
- Accident incident investigation.

Emergency response procedures:

- Loss of device;
- Collision between vessel/devices; and
- Fire & serious injury.

Environmental training and awareness is an important tool to ensure that the project meets its predicted environmental performance. The ISO 14001 standard to which the EMEC operates includes a specific environmental training element. The IMS requires that all personnel whose work may create an impact on the environment have received appropriate training. The IMS has established and maintains procedures to make all employees and contractors aware of:

- The importance of conformance with the requirements of the IMS;
- The environmental impacts, actual or potential, of their work activities;
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirements o the IMS, including emergency preparedness and response requirements; and
- The potential consequences of departure from specified operating procedures.

11.3 Consultation

During the EIA there has been consultation with local and other stakeholders with regard to various aspects of the tidal test facilities and a number of constructive communication channels have been established. These will be maintained throughout all phases of the project. A list of consultees and their interest in the project is provided in Section 5 and Appendix D.

11.4 Environmental assessment of individual test devices

There will be a requirement under some of the consent conditions for EMEC to provide relevant authorities with details of technologies to be tested within its test areas. Developers are required to demonstrate the consideration of environmental issues in the planning, design, deployment and decommissioning of test devices and to summarise the results of this process in an Environmental Statement (ES) document. EMEC has developed guidelines to assist developers in the production of the environmental statements that need to be provided in relation to specific devices.

Device specific ESs will be reviewed and specific management and mitigation measures implemented where necessary.

11.5 Environmental monitoring

During the EIA process possible impacts on the environment have been identified. It is important that once facilities are in operation that such possible impacts are assessed, therefore a robust environmental monitoring

strategy is integral to the EMEC IMS. In order to be able to adequately address the actual impacts, this EIA has highlighted that data gathering is required to have a sufficient knowledge of the background environmental conditions. Further studies will also be required to investigate impacts from test devices on sensitive populations.

EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations. It is also involved in plans with a number of other research institutions to identify the knowledge gaps and initiate research aimed at addressing these.

Such research data will be important to developers in order to support future applications for the development of larger scale commercial projects.

12 Conclusions

When the European Marine Energy Centre (EMEC) was established by Highlands and Islands Enterprise (HIE) and its funding partners in 2003, it was with the intention of stimulating and accelerating the development of both wave and tidal prototype energy generating devices. The wave test centre is now well established, and the next phase is to establish a consented tidal test site ready for future deployment of the novel tidal energy devices that are currently being designed and built by independent developers. The proposed test facilities will allow full scale generating devices to be tested under normal operating conditions and allow the generating capacity and performance to be independently verified.

The Fall of Warness was selected as the location for the test site in preference to 7 other sites as it offered the right physical resources, was close to EMEC and had reportedly lower levels of shipping traffic. All sites screened and evaluated were in areas that by the nature of their physical resources were also frequented by marine mammals.

The tidal test facility will comprise a new control building adjacent to Cauldale on the island of Eday. There will be 4 export cables between 3,000 m and 4,000 m in length connecting to 4 offshore test berths. The tidal test berths are located off the south western tip of the island in the area know as the Fall of Warness, lying between Westray Firth and Stronsay Firth. A Supervisory Control & Data Acquisition (SCADA) system will allow EMEC to remotely monitor and operate switchgear in the Eday control building from it's data centre in Stromness. No major upgrades to the Stromness data centre are required for establishment of the tidal test facility.

The aim of this study was to identify the environmental receptors that might be sensitive to/harmed by the construction and installation of the infrastructure of the proposed test site, and to suggest management controls and mitigation measures to reduce any impacts to a tolerable level. Where this was not possible further study areas were identified.

An attempt was also made to predict potential impacts from the operation of the test site as it was decided that any assessment into the impacts of the installation of the infrastructure could not be undertaken in isolation from the future operation of the facility. The impacts from the general presence of the test site were therefore considered, however it was not possible to assess the potential impacts from specific devices at this stage and these will be subject to individual environmental statements, as specified in EMEC guidance.

The broad conclusions are that with the identified mitigation strategies in place, the impacts associated with the installation phase of the project will be minimal. The main area of concern is with regard to the potential for otter disturbance at the landfall site. This species has European Protected status, and stringent mitigation measures have been developed. Further survey work will be undertaken prior to installation and if required an otter handling licence obtained.

While an attempt has been made to predict the range and character of potential impacts associated with the tidal technologies to be tested at the site, a high degree of uncertainty and ignorance exists. Particular concerns relate to the possible interactions between wildlife and device operation, and the lack of baseline environmental data has been identified. The developer of each individual prototype device will be required to produce ES prior to deployment, and the baseline data that will inform this process, particularly with regard to wildlife interactions, needs to start being gathered immediately.

The other major concern from the presence of the test site is that of risk to navigation. The results of a separate navigation risk assessment carried out by Abbott Risk Consulting Ltd have been discussed within the ES. Management controls and mitigation measures identified centre on the potential for physical interference of the devices, and the need for appropriate siting of devices, charting and navigation marking to be identified. The navigation risk assessment recommends that during the construction and installation phases of both the test facility elements and the devices normal precautions and controls for such work need to be enforced. During the on-going operation of the test facility, devices which present a hazard to navigation in their normal operating modes should be individually charted and lit/marked appropriately. The test facility area should be defined to encompass only the area in which devices will be deployed such that it is no bigger than is absolutely necessary in order not to unduly constrain vessels. The area should be charted and marked

by buoys/lights in order that mariners are aware of the extent of the potential hazard from tidal devices. Issues relating to specific device locations and characteristics are still being assessed and development of appropriate navigational requirements ongoing.

Although there are a number of uncertainties associated with the operational phase of the facility this should not be unexpected given that the facility is to be used for the testing of new technologies. The facility will be not only used to test the technical performance of tidal technologies, but also advance understanding on environmental issues.

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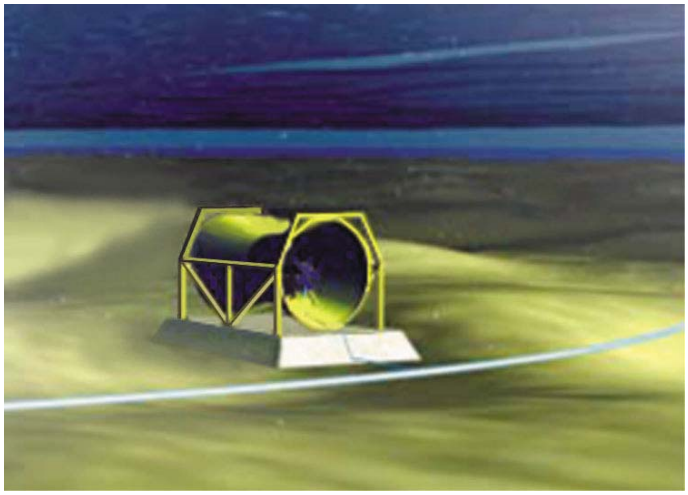
Appendix A Potential Test Devices

As the proposed facility is a test facility, it is not yet possible to provide with any certainty details of the devices that may be sited in the proposed area. At present it is assumed that four types of devices would be tested at the site. Outline details of these are provided below.

As already indicated in the introduction, the present EIA will not include evaluation of the specific impacts associated with each device to be deployed at the test site. This is covered by separate EMEC EIA guidance.

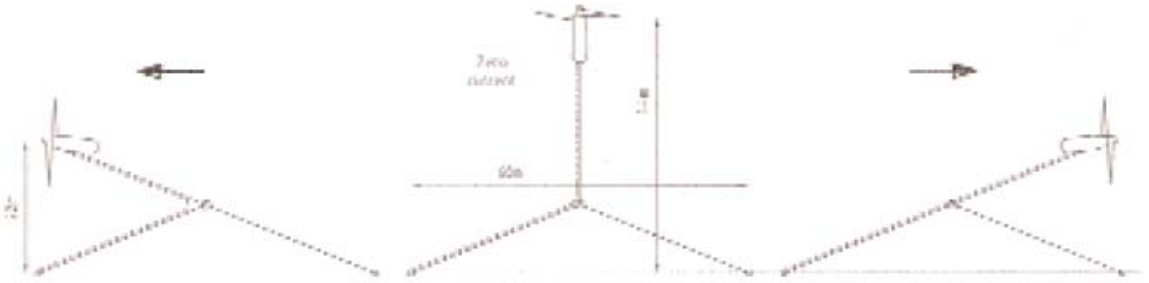
Type 1 - Bottom sited device

Device with turbine mounted on or framed within a structure on the seabed.
Dimensions: length 25 m x height 25 m x width 20 m
Mass: 1,000 tonnes
Likely water depth: 40-45 m
Given the test site characteristics, the charted depth of the top of the turbine assembly would be 15 m minimum.



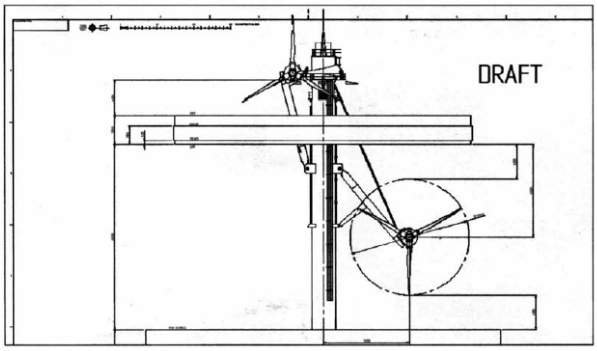
Type 2 - Mid-water buoyant device,

This device is moored to the seabed by a multi-legged, tensioned mooring system with the unshrouded turbine(s) and is buoyant. The mooring allows the device to "flip-over" when the tidal stream direction changes. The device is designed to be in a water depth that gives 15 m clearance from LAT measured at the highest point of the "flip-over" trajectory. Likely water depth 45-50 m.



Type 3 - Pile mounted surface piercing device

In this case the unshrouded turbine(s) are mounted on a pile structure driven into the seabed and with the top of the pile some 6-10 m above Highest Astronomical Tide (HAT). This device is to be installed in the location close to Warness Point in 20-35 m of water.



Type 4 - Buoyant surface device.

A floating barge which would be moored with a single point mooring, with un-shrouded turbine(s) positioned on arm(s) extending from the underside of the buoyant body.

Appendix B OIC Planning Conditions

DEPARTMENT OF DEVELOPMENT SERVICES
PLANNING AND TRANSPORTATION SERVICE

Director: Jeremy Baster, B.A., M.Phil., M.B.A., M.R.T.P.I.
Council Offices, Kirkwall, Orkney, KW15 1NY

Tel.: (01856) 873535 Fax: (01856) 886451

Website: www.orkney.gov.uk

RECEIVED
15 APR 2005

ORKNEY
ISLANDS COUNCIL

DCB/1.0

Our Ref : 05/26/00069/PPF
Your Ref:

Please contact:
Richard Welch

15th April 2005

Highlands and Islands Enterprise
c/o Pentarq
Custom House
33 Albert Street
Kirkwall
Orkney, KW15 1HL

Dear Sirs,

APPLICATION NO: 05/26/00069/PPF
PROPOSAL: Construct Tidal Energy Test Centre (Option 3)
LOCATION: Cauldale, (near),
Eday, HY542313
CLIENT : Highlands and Islands Enterprise

NOTIFICATION OF CONSENT

Orkney Islands Council has approved your application, details of which are given above. I enclose a consent notice, which also lists the conditions attached to the approval. These conditions should be adhered to in every respect and any variation to the plans should be agreed in writing with the Planning Authority before the work is undertaken. A copy of your submitted plans, duly endorsed is also enclosed

Yours faithfully,

Jeremy Baster
Director of Dev. and Protective Servic

Enc:

GRANT PLANNING CONSENT SUBJECT TO CONDITIONS

Ref. 05/26/00069/PPF Page: 1

DECISION NOTICE

Town and Country Planning (Scotland) Act 1997
Town and Country Planning (General Development Procedure)(Scotland) Order 1992

TO
Highlands and Islands Enterprise
Cowan House
Retail and Business Park
Inverness

With reference to your application registered on 18/02/2005 for
Planning Consent for the following development:-

PROPOSAL
Construct Tidal Energy Test Centre (Option 3)

LOCATION
Cauldale, (near),
Eday, HY542313

DECISION
Orkney Islands Council in exercise of their powers under the above Acts and Orders, having considered the above proposal, the plans endorsed as relating to it and the particulars given in the above application hereby:-

GRANT Planning Consent subject to the conditions listed on the attached paper apart.

NOTE: It should be understood that this permission does not carry with it any necessary consent or approval for the proposed development under any other statutory enactments, for example Building (Scotland) Acts, Roads (Scotland) Act 1984, The Water (Scotland) Act 1980, Environmental Protection Act 1990 etc.

Dated 15/04/2005

Signed .....
Director of Development Services
Orkney Islands Council
Council Offices
Kirkwall
Orkney
KW15 1NY

DECISION NOTICE

PAPER APART

TERMS AND CONDITIONS

1 That the processes carried out, or any machinery installed on the site, shall be such as may be carried out on, or used in, any residential area without detriment to the amenity of that area by reason of noise, vibration, smell, fumes, smoke, dust or grit;

Reason: To protect occupants of nearby housing from disturbance and nuisance resulting from noise, disposal of odours.

2 Development shall not begin until full details and/or samples of the facing materials to be used on all external walls and roofs have been submitted to, and approved in writing by, the Planning Authority. Development shall thereafter be carried out using the approved materials;

Reason: To ensure that the visual quality of the area is maintained.

3 That before development starts, full details of the design and location of all fences and walls to be erected on the site shall be submitted to, and approved by, the Planning Authority;

Reason: To reduce landscape and visual impacts.
These details have not been submitted.

4 That before any development of the site commences, a scheme of landscaping, for the whole site area as hatched in blue on the submitted location plan, shall be submitted to, and approved by, the Planning Authority; the scheme shall include:-

(a) details of any earth moulding and bunding, grass seeding and turfing, and areas of hard landscaping and hard landscaping materials;

(b) a scheme of tree and/or shrub planting, incorporating details of the number, variety and size of trees and shrubs to be planted;

(c) details of the phasing of these works;

Reason: To maintain/enhance the visual and landscape quality of the area.

5 That the development hereby permitted shall be started within five years of the date of this permission.

Reason: To accord with the provisions of the Town and Country Planning (Scotland) Act 1997.

DECISION NOTICE

PAPER APART

TERMS AND CONDITIONS

PLEASE NOTE THAT THIS DEVELOPMENT SHOULD BE BUILT IN ACCORDANCE WITH THE HEREBY APPROVED PLANS.

Please ensure that the local Roads Authority is fully informed of all planned vehicle movements and please also discuss arrangements for the developer to carry out repairs to the public road network associated with the movement of any abnormal loads.

DECISION NOTICE

PROCEDURE FOR APPEAL TO THE SECRETARY OF STATE.

1. If the applicant is aggrieved by the decision of the planning authority to refuse permission or approval of reserved matters in respect of the proposed development, or to grant permission or approval subject to conditions, he may appeal to the Secretary of State under section 47 of the Town and Country Planning (Scotland) Act, 1997, within six months of from the date of this notice.

2. If permission to develop land is refused or granted subject to conditions, whether by the local authority or by the Secretary of State, and the owner of the land claims that the land has become incapable of reasonably beneficial use in its existing state and cannot be rendered capable of reasonably beneficial use by the carrying out of any development which has been or would be permitted, he or she may serve on the planning authority a purchase notice requiring the purchase of his or her interest in the land in accordance with the provisions of Part V of the Town and Country Planning (Scotland) Act, 1997.

Any notice of appeal should be addressed to the Scottish Office Inquiry Reporters Unit, 2 Greenside Lane, Edinburgh EH1 3AG, and at the same time a copy of the notice of appeal should be sent to the Director of Development and Planning, Orkney Islands Council, Council Offices, Kirkwall, Orkney, KW15 1NY.

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Appendix C Supporting Studies to EIA

Survey	Organisation	Qualification/experience
Terrestrial habitat and vegetation survey	Dylan de Silva	Dylan has undertaken a PhD in botany and taught plant identification and habitat surveying methodologies to undergraduates at the University of Reading. As an environmental consultant he has undertaken many vegetation and habitat surveys for local clients enabling him to establish a good working knowledge of the vegetation and habitats found in Orkney
Coastal habitats survey	Aurora Environmental Ltd	AURORA Environmental is an environmental consultancy specialising in support to marine, coastal and island industries. The company was established in 2000 and its staff includes trained marine biologists who regularly scope and undertake marine and coastal surveys, including species identification.
Coastal and seabed processes review	HR Wallingford	HR Wallingford, established in 1947, is an independent company offering specialist environmental and engineering consultancy and applied research services and software systems worldwide. Through its work on projects in over 60 countries, HR Wallingford has gained a well-deserved international reputation for scientific and engineering excellence in water related areas. The company has considerable experience of project work in Orkney.
Preliminary seabed survey	Aquatera Ltd	Dr Gareth Davies established Aquatera in 2000. Gareth had previously worked as environmental consultant and divisional manager for the Scottish based company ERT for 13 years.
Additional seabed survey	Sula diving	SULA Diving, based in Orkney, specialises in scientific diving operations. Particular areas of expertise lie in marine biology and maritime archaeology.
Birds desk study and assessment (onshore and offshore)	Mike Cockram	The RSPB recommended Mike as a local bird expert who has lived on Eday and studied birdlife for the past 31 years. He has held a ringing licence for the British Trust for Ornithology since 1969.
Coastal wildlife and cetaceans	Chris Booth	Chris Booth has been the cetacean recorder in Orkney since 1990, the County bird recorder for the past 17 years. He has published many works on Orkney wildlife.
Further assessment of otter populations	Celtic Environmental Ltd	Jim Conroy B.Sc., M.Sc, MEI is a graduate zoologist with over 40 years' experience in ecological and environmental projects. Over the years he has undertaken over 30 environmental assessments where determining the impacts of a development on otters has been part of the project.
Sea mammal study and assessment	Callan Duck of the Sea Mammal Research Unit	The Sea Mammal Research Unit is one of the foremost research institutions carrying out research on marine mammals in the world, including extensive and long standing studies into the British seal populations including those in Orkney. Callan Duck runs the grey and common seal population monitoring programme.
Archaeological survey and assessment	Paul Sharman of Orkney Archaeological Trust	OAT provides Orkney's County Archaeology service, including maintenance of the Sites and Monuments Record. It works in partnership with many other bodies, foremost of which are Orkney Islands Council, Orkney Heritage Society, Orkney College and Historic Scotland. Paul Sharman has had over 20 years archaeological experience including excavation, watching briefs, evaluations, site planning, and wide post-excavation experience including laboratory work, research, report production and publication.
Visual and landscape impact assessment	Aurora Environmental Ltd	AURORA Environmental is an environmental consultancy specialising in support to marine, coastal and island industries. The company was established in 2000 and regularly undertakes landscape and visual assessments in line with Landscape Institute guidance as part of environmental impact assessment studies.
Navigation risk assessment	Mr D Cantello of Abbott Risk Consulting (ARC) Ltd	D J Cantello MNI, MCMI, TechSP (Member of Nautical Institute, Member of the Chartered Management Institute, Technician Safety Practitioner (NEBOSH) is involved in risk and safety management in a range of high risk industries including marine construction and transport. Before joining ARC, Mr Cantello spent 28 years in the Royal Navy and has extensive experience of marine safety matters including navigational safety, harbour management and ship safety.

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Appendix D Responses to Informal Consultation

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
Crown Estate – seabed lease	CPA, FEPA	No concerns regarding infrastructure of test facility.	No action.	Concerns relating to the impact of the devices on marine mammals and birds, particularly with regard to blade rotation.	It is expected that conditions associated with the development of a data management plan will be attached to the seabed lease. EMEC are trying to raise funds to carry out monitoring prior to device deployment. EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations. EMEC is involved in plans with a number of other research institutions to identify the knowledge gaps and initiate research aimed at addressing these. Any environmental data acquired will be made available to developers.
				Monitoring is recommended prior to device installation to gather baseline data on the presence/absence of sensitive populations.	
				Ongoing monitoring programme should be developed to determine whether there is a risk of impact between turbines and sensitive populations whilst the devices are still at a prototype stage prior to future commercial application.	
				A controlled deployment of devices is also recommended, whereby the impacts of the devices on marine mammals are closely monitored. Device blades can be braked if necessary.	

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
Civil Aviation Authority		No concerns.	No action required.	The CAA has no role in assessing the environmental implications of the project and therefore has no comment to make. Given that the various options appear to involve structures with minimal height above water level, there are unlikely to be any generic aviation concerns. CAA suggested establishing the views of the operator of Eday airport to ensure there are no aerodrome safeguarding issues.	OIC Airfield Superintendent contacted. He regarded the development as far enough away from the airport on Eday not to present any problems. He requested that the exact location of the test berth be forwarded to him for his information and this was done.
County Archaeologist		There is a high risk, particularly on accessible coasts, of encountering archaeology. Absence of recorded archaeological sites does not necessarily indicate evidence of absence of the same.	Orkney Archaeological Trust have undertaken desk-based assessment, walk-over survey and produced report outlining mitigation strategy.	Several boats are known to have wrecked off the Eday coast, and the remains, as yet undiscovered, could be located somewhere within the test site. A WW 2 Spitfire was also lost in the area.	Any wrecks discovered will be reported to the County Archaeologist.
DTI (Renewable Energy Issues)		Normal route for information is via HIE.	No action required.	–	–
Eday residents/ neighbouring landowners/ Eday Community Council		Concerns were raised over visual impact of the onshore building external finishes. It was felt that the image portrayed in the scoping report would be very intrusive, being of light coloured harling with a concrete tiled roof. The islanders would prefer a dark finish, with a slate roof to blend in with neighbouring buildings.	Visual and landscape impact assessment was undertaken. Concerns raised were passed onto Tulloch and the architect, who plan to address these issues in the final building design.	Two bronze age sites badly affected by erosion are located on the east coast on the point of War Ness.	Coastal processes review undertaken included consideration of impacts of the devices on coastal erosion.
		Concerns were raised about the route the electric cable will take from control building to Eday substation.	Referred respondents to Scottish and Southern Energy who will be	Possibility of economic benefit to islanders via the creation of jobs/use of local services. Will the	On-going consultation between Eday Partnership and HIE to assess potential economic benefits including

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
			carrying out these works.	control building be open to the public? What will happen to the control building when the site is decommissioned?	interpretation display within new Eday heritage centre.
		Concerns were raised over the proposal not to bury the cables on the beach due to the visual impact.	The decision was made not to bury the cables due to the wildlife sensitivities to bedrock excavation.	Concerns for the welfare of cetaceans was raised.	Baseline data to indicate the numbers of seals and cetaceans using the Fall of Warness are being collected prior to device deployment. The count will also record usage of the waters by diving birds.
		The need for a security fence was questioned.	It is a legal requirement for the security fence to be in place for the duration of the construction phase of the project. On completion, this will be replaced with standard wooden post and wire fencing identical to that in surrounding fields.		
		Concerns were raised over which sections of the access roads would require upgrading to facilitate vehicular access to the site by HGV's. They also wanted assurance that any accidental damage done to the pier or roads would be made good on completion, and that no alteration to the pier would be undertaken.	Any roadworks required will be very minor and under-taken in liaison with OIC road authority. Any accidental damage will be made good.		
		Concerns were raised over the visual impact of any navigation markers/buoys	Visual and landscape impact assessment		

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
		required.	undertaken. The decision to use land markers was rejected as the size of test site that would need marking was reduced to an area just covering devices and not including the cables.		
		The site selection process was questioned	The site selection process initially identified 5 potential sites based on physical resource. The 3 preferred sites were further evaluated on environmental and economic grounds with the Fall of Warness emerging as the preferred site.		
Environment Concern Orkney		No response received.	–	–	–
Explorer Fast Sea Charters		No concerns.	No mitigation required.	No concerns.	No mitigation required.
Fisheries Research Services (FRS)	FEPA	Only concerned with the marine works of the development, and considers that the cable laying and long-term presence are not an issue.	FEPA application.	A FEPA consent is required as structures will be placed on the seabed. The consent ensures that measures are put in place protect both the marine ecosystem to legitimate users of the sea.	Navigation risk assessment, coastal and seabed processes study, coastal and marine wildlife survey and assessment, and seabed surveys to be undertaken to support FEPA application.

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
Historic Scotland		One Scheduled ancient monument identified, a standing stone at Southside, but this is outside the impact range of the proposed development. For information and advice on the treatment of unscheduled archaeological remains, the County Archaeologist should be contacted.	Consultation with County Archaeologist. Orkney Archaeological Trust undertook desk-based assessment, walk-over survey and produced report outlining mitigation strategy.	No concerns.	No action required.
Joint Nature Conservation Committee (JNCC)		Scoping report sent for information only due to their interest in renewable energy projects.	No further action necessary.	–	–
Marine Coastguard Agency	CPA	Sought assurance that the Scottish Executive had been contacted in connection with the Coast Protection Act and consent requirements.	Confirmed necessary contact had been made.	No concerns.	No mitigation required.
Ministry of Defence (submarine surface ship and aircraft interfaces)	NRA	No response received.	There are no military exercise areas immediately adjacent to the proposed area and there are no indications of the area as being a transit route for other than surface vessels. Authors of Navigation risk assessment still awaiting response. No action required.	–	–

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
Northern Lighthouse Board (NLB)	CPA	No concerns with test site infrastructure.	No action required.	From generic descriptions, devices will require appropriate marking.	Navigation risk assessment to address navigational markers for the test site and surface piercing devices.
Orkney Creel Fishermen's Association	NRA	Unconcerned about development over the long-term as long as fishermen are not excluded.	Navigation risk assessment undertaken. Any lack of access to creel areas during inshore cable laying will be of a short duration, and carried out in full consultation with affected fishermen.	Unconcerned about development as long as fishermen are not excluded over the long-term.	Ongoing communication between EMEC and OIC Harbours to ensure that all sea users are notified of test site activities. Charting of offshore test facilities and distribution of marine awareness chart.
Orkney Coastal Forum		Group not due to convene in the near future.	Secretary to be kept informed of future developments.		Secretary to be kept informed of future developments.
Orkney Dive Boat Operators Association	NRA	No concerns to raise.	No action required.		Ongoing communication between EMEC and OIC Harbours to ensure that all sea users are notified of test site activities.

Scoping responses					
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Scoping process	Consent body/NRA				
Orkney Ferries	NRA	Concerns relating to time table delays brought on by speed restrictions imposed on transiting vessels during cable laying were raised.	Navigation risk assessment undertaken.	Positioning test devices in an area where ferry vessels would normally navigate in adverse weather conditions to avoid the more turbulent waters e.g. close to Point of War Ness would invariably result in masters having no alternative but to take the longer route north around the island of Eday. This would inconvenience customers and in many instances severely disrupt the timetable for the remainder of the day.	Conclusions and recommendations resulting from navigation risk assessment will inform the future operation of the test facility and seek to minimise navigational issues. Ongoing discussions with Orkney Ferries.
				Because of the tidal overfalls caused by the combination of South to South Easterly gales and flood tide in this area, small low profile fixed or floating structures would not be easily identified on the radar screen because of sea clutter.	
				Whilst any device attached to the sea bed in this area may have the potential to endanger shipping, It is believed that the type of structure which could obstruct surface craft, especially the small low profile floating type which would most likely be difficult to see, would present an unacceptable danger to navigation, particularly in adverse weather conditions	

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
				When navigating in this area in adverse weather conditions, nature provides the seafarer with enough problems without man adding more to the list.	
Orkney Field Club		Were satisfied that any concerns relating to otters, cetaceans and pinnipeds would be addressed by the cetacean recorder in his survey and assessment.	An otter survey and follow-up assessment identified a possible risk to otters due to onshore activities. A detailed site evaluation is due to take place 1 month prior to the start of works and identify any further required mitigation. Marine wildlife studies undertaken identified no risks to seal or cetaceans.	Due to concerns that harm may be caused to wildlife -cormorants, auks, grey and common seals and harbour porpoises in particular – the Field Club recommend exclusion measures should be incorporated into the design of devices. They also hope that no deterrent measures e.g. sonic devices will be employed.	Monitoring programme should address these issues. Developers' ESs will describe any plans for deterrence.
Orkney Fish Farm Association		No fish farm interest in test site area.	No action required.	–	–
Orkney Fishermen's Association (OFA)	NRA	Estimated 12 boats from mainland Orkney fish in the area at different times during the year. Concerns relate to fishers being excluded from the test area, and the possibility of cables snagging on creels.	Navigation risk assessment to be carried out. Initial round of consultations already taken place. If creels have to be temporarily removed for the 2 week period during cable laying, this will be carried out in full consultation with OFA and their affected	The shell fishing grounds are located adjacent to the coast. Activity normally restricted to 15 m water depth, but occasionally out to 30 m. Any device located below this depth would not present a problem. Test berth 4, which proposed location is closer to shore, is on the edge of a recognised shell fishing ground and is a cause for concern. The major concern for	OIC Harbours and local fisheries will be made aware of test site through distribution of marine awareness chart. The findings from the navigation risk assessment will inform any decision regarding suitability of device design and location of operation. Appropriate marking on navigation charts.

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
			members. A briefing document will be circulated to all interested parties before construction starts.	creel fishermen is the potential loss of valuable fishing grounds.	
Orkney Fishermen's Society (OFS)	NRA	Had no specific concerns to raise with regard to the test site either during construction or when operational. Felt a full-scale commercial operation within the Fall of Warness could present significant problems. 2 boats from OFS organisation fish in the test site area from Westray.	Navigation risk assessment to be carried out. Initial round of consultations already taken place. If creels have to be temporarily removed for the 2 week period during cable laying, this will be carried out in full consultation with OFS and their affected members.	_	OIC Harbours and local fisheries will be kept aware of device deployment proposals. Issue of marine awareness chart. Appropriate marking on navigation charts.
OIC Biodiversity Officer		Possible sensitive dune habitat (acidic dune grassland) identified at Sealskerry Bay, Bay of Greentoft and Cauldale with associated species of national importance.	Terrestrial vegetation and habitat survey undertaken identified this habitat as being present, but in a poor condition, and conservation of low importance.	No concerns.	No mitigation required.
		Site of Local Nature Conservation Importance designated for geology from Newbigging to Neven Point, which could be affected if development activities impact on coastal erosion	Coastal processes review undertaken to investigate possible coastal erosion due to offshore construction and consequent operation of test facility concluded no activities would impact on		

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
			this feature.		
OIC Harbours	NRA	Consulted during navigation risk assessment.	-	Consulted during navigation risk assessment.	-
OIC Legal Department		No response received.	No action required.	_	_
OIC Planning		Concerns dealt with via planning approval and conditions process (see Notification of Consent in Appendix B).	Adherence to planning conditions.	_	_
Orkney Marinas	NRA	Due to the turbulent sea conditions associated with the Fall of Warness that normally prevail, sailors habitually avoid the area.	No action required.	Sought assurance that any structure that emerges from the water will be properly lit and charted.	Notices to Mariners including UKHO notification; awareness chart to marinas for distribution.
Orkney Renewable Energy Forum (OREF)		Concern over socio economic issues associated with the construction period.	Use of local Orkney contractors where feasible during construction. Ongoing liaison with Eday Community Council/ Eday Partnership/local residents re use of local resources and services during construction.	Concern that EIA scope does not include full consideration of impacts from specific test devices.	EIA has considered generic issues associated with the presence of a test site. Device specific ESs will be produced by individual developers.
		Potential impacts on protected species and habitats.	Number of specific surveys and studies undertaken to assess potential impacts on protected species and habitats.	A wide range of issues raised with regard to device specific impacts, impacts on protected species, impacts on seabed and coastal processes, navigation risk, suitability of local harbour facilities, socio	Generic issues addressed as part of the EIA. Device specific ESs will be produced by individual developers. EMEC to attend meeting with OREF to update it on its future plans, with

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
				economic issues and cumulative impacts. Other issues raised considered to be outwith the scope of the present study.	opportunity to discuss issues raised in the scoping response. Suggested contacts with regard to navigation risk passed to contractor undertaking navigational risk assessment.
Orkney Sustainable Energy		Ecological sensitivity of coastline and the potential impact on seal and otter populations. Habitat loss and disturbance to mammals and birds.	Coastal wildlife survey and assessment undertaken as part of the ES, and mitigation put in place with regard to otters. Terrestrial habitat survey undertaken – no sensitivities identified. Bird survey identified sensitive breeding time for locally important shore birds outside onshore scheduled construction works.	Possible EMC interference with radio and television signals and acoustic noise from switchgear and transformers.	Considered during EIA.
		Consideration of pollution potential in EIA.	Considered during EIA.	Consideration of pollution potential in EIA.	Considered during EIA.
Orkney Sailing Club		No response received.	–	–	Ongoing communication between EMEC and OIC Harbours to ensure that all sea users are notified of test site activities.
Royal Society for the Protection of Birds (RSPB)		Concern for nationally important breeding colony of cormorants on Little Green Holm. Construction activities that will directly impact on the islands (eg installation of navigation markers) to avoid sensitive breeding times for birds on Little Green Holm and Muckle Green Holm	Bird survey and assessment undertaken by local bird expert on Eday identified an important breeding colony of cormorants on Little Green Holm, however the offshore	Diving birds are potentially at risk from the blades of devices when diving for food.	EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations.

Scoping responses					
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		from 1st April to 31st July.	works are scheduled to take place outside breeding times.		
Royal Yachting Association	CPA	No response received.	–	–	UKHO notification. Marine awareness charts available on request from Orkney Marinas.
Scottish Environmental Protection Agency (SEPA)	FEPA	The ES should address the legislative and consent requirements under the Water Framework Directive, Water Environment Water Services (Scotland) Act 2003 and the Nature Conservation Act (Scotland) 2004. What steps will be taken to ensure that construction activities will be carried out to avoid (preferably) or minimise pollution risks and what contingency measures will be put in place. The ES should address the sensitivities of the habitats and species that exist within the test area to cable laying and protection activities. To what extent is the intertidal area likely to be damaged by the construction of the test facility and cables? What methods will be employed for cable laying above and below MLWS. Any controlled waste generated that is either recovered or reused must be done in accordance with the Waste Management Licensing Regulations 1994. SEPA considers it good practice to set out within the ES the qualifications and	All issues considered during the EIA. Tulloch to produce a detailed programme of works.	What are the likely potential effects of the devices that will be subsequently deployed?	Each device will be subject to a device specific ES prior to installation.

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
		experience of all those involved in surveying or completing technical sections. SEPA sought confirmation that surface and foul water drainage from the onshore facility had been determined by a separate planning application.			
Scottish Executive (Environment and Fisheries).	Electricity Act, Section 36 consent.	Consent under Section 36 is not required for the construction and establishment of the infrastructure of the development.	No action required.	Under Section 36 of the Electricity Act, any offshore energy installations generating greater then 1 megawatt needs to be consented.	This consent will only be required once devices are installed in 2006 and start generating electricity. EMEC seeking exemption from the Scottish parliament.
Scottish Executive (Enterprise, Transport and Lifelong Learning Dept) Ecology/Research Group		Scoping report sent to Ian Bainbridge for information only. As head of ecology for the Scottish Executive he reviews all section 36 applications.	No action required.	_	_
SEERAD	CPA & FEPA	SEERAD concerns addressed via FRS and FEPA consent process.	Due to legislative interest will be kept in informed of developments.	_	_
Scottish Executive (Coastal protection)	CPA	Their interests will be addressed via CPA consent process. No formal scoping response received.	HR Wallingford coastal and seabed processes review used to inform CPA process.	_	_
Scottish Fisheries Protection Agency (SFPA)	CPA & FEPA	No scoping response received at this stage. FRS consult with SFPA as part of FEPA consent process.	No action required.	_	_

Scoping responses					
Consultee		Concern – construction of tidal test facility	Response/action	Concern – long term presence & operation of tidal test facility	Proposed mitigation/ management control
Scoping process	Consent body/NRA				
Scottish Natural Heritage (SNH)	CPA & FEPA	Colour of onshore building and any landscaping works should be such that landscape and visual impacts are minimised.	Visual and landscape impact survey to be undertaken and the results will inform the final building design.	Potential for noise disturbance from turbines to seals and cetaceans, and risk of harm from blades of devices to both seals and diving birds. Potential for impact on seals and harbour porpoises potentially very high, but unknown. It is unclear how many cetaceans pass through and if cormorants feed in the test area. SNH recommend that effort-based site-specific recording be undertaken to help assess possible impacts on cetaceans.	Baseline data to indicate the numbers of seals and cetaceans using the Fall of Warness are being collected prior to device deployment. The count will also record usage of the waters by diving birds. EMEC is currently working on establishing a monitoring programme in relation to the impacts of devices on sensitive populations.
		Site of Local Nature Conservation Importance designated for geology from Newbigging to Neven Point. SNH seek assurance that there will be no impact on this feature.	Coastal processes review undertaken to investigate possible coastal erosion due to offshore construction and consequent operation of test facility concluded no activities would impact on this feature.		
		Care should be taken to avoid 'intentional or reckless disturbance' of otters, populations afforded European Protected status.	Otter survey to be undertaken. Otter handling licence to be obtained from SNH if required.	SNH would encourage developers to start the consultation process as early as possible regarding the impact assessment of their individual devices.	Developers will be advised to contact SNH for informal advice, to ensure any potential problems are raised and addressed early.
		If beach landing of aggregates required concerned track required for vehicle movements will be wider than that required for the cables. Reinstatement of dunes required to avoid future erosion problems.	Dunes will be reinstated following cable installation works. If beach landing of aggregates goes ahead OIC planning should be informed.		
		Concern raised over footprint of cables following 4 separate routes from shore to test berths increasing risk of benthic impact. Suggested bundling cables split in 4 near the test berths.	Seabed survey undertaken and coastal and seabed processes assessment undertaken indicated benthic impact would be		

Scoping responses					
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Scoping process	Consent body/NRA				
			localised and negligible. Technical requirement to not have cables located in same trench.		
		Possible presence of UK Priority habitats (Maerl and *Modiolus modiolus*) should be further investigated.	Additional seabed survey confirmed the absence of these species from the test site. All data from both seabed surveys shared with SNH.		
		Care should be taken to avoid 'intentional or reckless disturbance' of cetaceans, afforded European Protected status. The use of the local cetacean recorder to input into EIA process supported by SNH.	Coastal and marine wildlife survey and assessment to be undertaken. Included sourcing data from local recorder.		
		Nationally important cormorant colony on Little Green Holm). SNH request that any construction activity in the vicinity of Little Green Holm is avoided between April 1st and July 31, the colony nesting period.	Scheduled offshore works not due to start before mid August. No onshore activities on Little Green Holm anticipated		
		Nationally important colony of breeding grey seals on Little Green Holm and Muckle Green Holm (SSSI's). SNH request that any construction activity in the vicinity of these islands is avoided between September and November during the grey seal pupping season.	Scheduled offshore works due to be completed by the end of August. No onshore activities on Green Holms anticipated.		
		SNH also request that the Faray and Holm of Faray SSSI and SAC, which support a nationally and internationally important colony of breeding grey seals be	Assessment carried out by the Seal Mammal Research Unit.		

Scoping responses					
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Scoping process	Consent body/NRA				
		considered in the EIA. While the site is a sufficient distance from the proposed development to pose little threat, given its European Protected status it should be considered.			
		More detailed explanation of selection process for test site.	Site selection process documented in the ES.		
Sea Mammal Research Unit (SMRU)		Possible disturbance to seals. If identified feed into scoping summary, impacts table, etc.	Construction activity to avoid sensitive time. SMRU got to do survey.	Concerns over device operation.	Initial gathering of baseline data regarding numbers of seals/cetaceans.
UK Hydrographic Office (UKHO)		Requested that the office be kept informed as to position of the cables and any navigation buoys/markers to ensure navigation charts are kept up-to-date.	HIE to keep UKHO informed.	To be kept informed about any additional buoys and details of tidal devices when installed to ensure navigation charts are kept up-to-date.	EMEC to communicate any additions or changes to test site to UKHO.

SEPA
Scottish Environment Protection Agency

Our Ref: SH/FJV/ EA/2005/0533
Your Ref: P05-024-004

Attention: Gina Penwarden

Aurora Environmental
Garson
Stromness
Orkney
KW16 3JU

If telephoning ask for:
Susan Haslam

20 May 2005

Dear Madam

EMEC TIDAL TEST FACILITY EDAY, ORKNEY
ENVIRONMENTAL IMPACT ASSESSMENT SCOPING

Thank you for consulting SEPA on the above proposal. SEPA has the following comments to make which are copied to the planning authority for information.

1. Water Framework Directive

1.1 Under the Water Framework Directive (WFD) that came into force in 2000 and the Water Environment Water Services (Scotland) Act 2003, SEPA has a duty to achieve good ecological status in all water bodies by 2015. Under the Nature Conservation Act (Scotland) 2004, SEPA, and other public bodies, have duties to maintain biodiversity and productivity in intertidal areas in coastal waters, firths and estuaries. The ES should address these legislative and consent requirements.

2. Pollution Control

2.1 The ES should identify how, during the construction phase, each operation will be carried out to avoid (preferably) or minimise pollution risks, identifying contingency measures. This part of the ES can then be used a) to identify residual impacts when mitigation measures are imposed and b) to form the basis for a more detailed Construction Method Statement to be required from the construction operator prior to commencement of development.

2.2 Guidance on such measures can be identified from SEPA's Pollution Prevention Guidelines (available on SEPA's website www.sepa.org.uk/guidance/ppg/index.htm) and CIRIA C584 entitled "Coastal and marine environmental site guide". Reference can be made to the appropriate checklists and good practice advice generally in the latter document, for example to Section 4.8 of the guide entitled "Rock works and placement of concrete units", Section 4.10 of the guide entitled "Piling", Section 4.11 of the guide entitled "Masonry" and Section 4.14 of the guide entitled "Concrete pours and aftercare". In some cases SEPA is disappointed to find that ESs merely refer to this documentation when instead SEPA would look to see the principles contained within them to be incorporated within the ES.

2.3 Examples of risks that could occur include the potential for the pollution of coastal waters from the storage of materials, use of concrete, oil, resuspension of sediments etc. With regards to oil, it is imperative that there is a detailed contingency plan to deal with large oil spills that cannot be dealt with at a local level.

3. Nature Conservation/...

Chairman Sir Ken Collins
Chief Executive Dr Campbell Gemmell

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3. Nature Conservation

3.1 SEPA is pleased to note that coastal and seabed surveys and sampling have been undertaken and will look forward to seeing the interpretation of the results. The ES should address the sensitivities of the habitats and species that exist within the test area to cable laying and protection activities.

3.2 SEPA will require clarification on the extent of the intertidal area that is likely to be damaged by the construction of the test facility and cables. It is important that during the construction phase good working practice is adopted and that habitat damage is kept to a minimum and contained within an agreed limit. SEPA will require clarification with regard to the methods employed for cable laying both above and below MLWS.

3.3 While it is understood that the planning application which this ES will support will only be for the testing facilities (i.e. cabling and test bays) it would be useful if an indication of the likely potential effect the devices that will be subsequently deployed could have was made at this stage.

4. Waste

4.1 SEPA encourages the recovery and reuse of controlled waste provided that it is in accordance with the Waste Management Licensing Regulations 1994. There are specific criteria which if met will constitute an exemption under the above Regulations. These exemptions are required to be registered by SEPA and the details must be forwarded to the relevant SEPA office. Please note that waste soil from excavations spread on this land would not necessarily be to agricultural benefit; if excavated peat or soil is to be used in landscaping the site, then this should be included in the plans, and not dealt with in an ad-hoc fashion as it arises.

5. Surface and foul water drainage

5.1 It is believe that surface and foul water drainage from the onshore facility have already been determined by a separate planning application. If this is not the case then the ES should address these matters.

6. Qualifications and experience

6.1 SEPA considers it good practice to set out within the ES the qualifications and experience of all those involved in surveying or completing technical sections.

Should you wish to discuss the above I can be contacted on 01349 860365.

Yours faithfully

SUSAN HASLAM
PLANNING OFFICER

cc: Mark Williams, Eileen Summers, Chris Mathews (by email)
Jeremy Baster, Director of Dev. and Protective Services, Orkney Islands Council, Council Offices, School Place, Kirkwall, Orkney, KW15 1NY

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Gina Penwarden
Aurora Environmental
Garson
Stromness
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Our ref: CNS/Ren/Tidal/Eday/24737

29 April 2005

Dear Gina

Scoping for proposed tidal test facility – Fall of Warness, Eday

I refer to your letter of 20th April 2005 and accompanying scoping document requesting a response from Scottish Natural Heritage (SNH) on the above proposal. SNH has the following comments:

Natura

1. Faray and Holm of Faray Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC): These 2 islands support a nationally and internationally important colony of breeding Grey Seals. Faray and Holm of Faray has been the largest Orkney Grey Seal colony in every annual count carried out since 1980. In 1995, an estimated 3,522 pups were produced, equivalent to around 28% of the total annual pup production for Orkney, and 10% of the total annual pup production for Britain. SNH considers that the proposed development is of sufficient distance to pose little threat to this site, but given its European Protected status, would expect it to be considered as part of the EIA.

European Protected Species

2. Cetaceans: SNH supports the use of the local cetacean recorder to input into the EIA process. The Atlas of Cetacean distribution in northwest European waters[1] will also provide general species distribution data. However, given the European Protected status of all cetacean species (Schedule 2 of *The Conservation (Natural Habitats, &c.) Regulations 1994*), protected against intentional or reckless disturbance, SNH would recommend that consideration be given to effort-based site-specific recording. It should be noted that a licence is required to undertake research on European Protected Species as stipulated by Regulation 44 of the above Regulations. SNH is the competent authority for the issuing of these licences.

3. Otters: As above, the European Protected status of this species would warrant the collection of site-specific data for the presence of Otter holts, laying-up sites and evidence of activity such as spraints and runs. See point 2 above with respect to licensing requirements.

Details of the legal situation that applies to European Protected Species are given in the appendix to this letter.

Site of Special Scientific Interest

4. Muckle and Little Green Holm SSSI: These islands support a nationally important colony of breeding Grey Seals (*Halichoerus grypus*). SNH has significant concerns about

the deployment of devices adjacent to such an important Grey Seal colony due to the potential for noise disturbance from operating devices as well as risk of harm to seals, for example from rotating blades. Whilst SNH appreciates that this EIA cannot anticipate the properties of all potential devices that may be deployed at the Fall of Warness, clearly this must be carefully assessed at this stage of the EIA process.

The Grey Seal pupping season is from September to November and SNH would request that coastal construction works be avoided during this period in order that disturbance to pupping seals be avoided.

There is a major Cormorant colony on Little Green Holm with 85 nests recorded in 2000 (Orkney Bird Report, 2000). Any construction activity in the vicinity of Little Green Holm should avoid the nesting period (April 1st – July 31st).

Site of Local Nature Conservation Importance

5. Newbigging to Neven point Site of Local Nature Conservation Importance: Situated immediately to the south of the proposed landfall for the Eday Tidal Centre, this area is included in the Orkney Local Plan 2005 because of the exposure of Eday Marls which are of interest in the study of Palaeo environments. SNH would seek assurance that there will be no impact on this geological feature, and/or that appropriate mitigation considered.

Benthic

6. SNH notes that four separate cables are proposed leading from the onshore facilities to the test berths. A single cable that splits into four near the test berths would result in reduced benthic impact. This arrangement has been proposed for the wave-hub site in the Bristol Channel and would seem to be preferable from an environmental perspective.

7. Section 3 of the scoping document states that a survey was undertaken between the 17th and 21st March. Is any further benthic survey work intended or is this regarded as sufficient? The benthic survey proposed should investigate the possible presence of the UK priority habitats Maerl and *Modiolus modiolus* beds that may be in the vicinity of the site. *M. modiolus* in particular favours moderately exposed sites and may be adversely affected by tidal devices in the vicinity.

Landscape

8. Landscape: With respect to the onshore facilities, SNH recommends that details such as colour of external building materials and any landscaping works such as bunding are considered so that landscape and visual impacts are minimised.

Miscellaneous

9. Section 1.2 of the scoping document indicates that eight sites were screened in the Highlands and Islands region, of which three were short-listed for consideration. There is no indication of how the original eight were selected or why the three were considered the most favourable. SNH would request a clarification of the entire selection procedure.

I hope that these comments are useful. Please do not hesitate to contact me should you have any questions on the above comments or any further queries.

Yours sincerely

Tim Dean

Tim Dean
Area Officer, Orkney

cc daybook/file, Sandy Downie, John Uttley

Text from correspondence with the County Archaeologist in regard to the test site area (Response received by Aquatera as part of initial screening process) (Aquatera & Ecologic 2005)

Fall of Warness development

As you are aware, the built heritage is a material consideration (NPPG5 and PAN 42 refers) in the planning system. The developer holds the responsibility to make appropriate plans to ensure its preservation (whether in situ, or by record). It is thus to everyone's advantage to reduce the risk of encountering unforeseen archaeology. As I said, there is a high risk, particularly on accessible coasts, of encountering archaeology. This is because, in addition to the usual types of land-based site which may be found on the coast (e.g. farms) there are sites which are coastal-specific (such as salt-pans). As is to be expected there are some sites in the area under consideration for your development.

Following our meeting earlier in the week, I am writing to advise that your first steps in the process of evaluating the archaeology, would be to commission a Desk-Based Assessment and Walk-over survey of the area(s) under consideration. This would result in a report which would allow the development of a mitigation strategy to ensure, as far as possible, that any significant archaeology could be retained in situ, or by record if that proves the more appropriate strategy. This report may well recommend further evaluation using other techniques – e.g. geophysics or excavation.

I will monitor the archaeological work undertaken to ensure that it is to a good standard and would at each stage need to review the archaeologists reports and recommendations. I have supplied you with a list of suitable archaeological contractors who have a track record of working in Orkney, or who have expressed an interest in working here. I would be grateful when you let the contract, if you would inform me of the name of the contractors and give me an outline of the dates when any archaeological work may be taking place. This will enable me to monitor them in the field if necessary.

You will see that the recorded sites concentrate around the tip of the Warness peninsular. As you will be aware, the presence or absence of recorded archaeology is a reflection of many factors, not least of which is the history of exploration of a particular area. Therefore the absence of recorded archaeological sites does not necessarily mean that they are not there. For instance, in Eday, peat cover may seal and conceal earlier settlement and landscape features. Alternatively, sites may fall within a category that was not, at the time, judged to be archaeology (hence e.g. some WW2 or 19th century sites might not have yet made it onto the SMR). As far as I am aware the last archaeological review of Eday was done some 15+ years ago by Dr Raymond Lamb, and the record will reflect what was visible and significant to him at that time. A Walkover Survey may be able to identify new sites, or provide additional information related to those already on the record. Additional information may also be provided from a review of archive or documentary sources, e.g. aerial photographs or estate maps. This work is the first step towards reducing risk of the development damaging known or presently unknown archaeology.

The sites known to be or have been present are:
• A 19th century shipwreck on the Fall of Warness. No known location.
• Graves at Pea Geo NGR HY 5485 2382 – allegedly sailors graves – wreck above may relate.
• "Treb" dyke Orkney Records (OR) 995 NGR HY5503 2910 to 5494 2910: This is type of land boundary which may be Bronze Age in origin. It consists of a bank spread to about 10m across with a height at cliff edge of c.0.7m. It is traceable for 90m. Its importance lies not only in itself, or its relationship to the landscape, but also to the buried soils which it may seal.
• Quarry and building OR996 HY 54592970: On the edge of a sheer 40m cliff is a quarry for sandstone. A small rectangular building on its margin. Unknown date.
• Middens OR997HY 5548 2828 Along fence line. including numerous limpet shells and traces of bank or tumbled wall. Extends some 60m. Likely to be related to a settlement in this area. Unknown date.
• Burnt mound OR999 HY 5533 2846:: These features are mounds of burnt stones, arising from the practice of boiling water by heating stones in a fire and dropping the hot stones into a tank of water. The stones are then cleared out and placed in a mound close by. Traces of related structures may be observable nearby. This site is partly sea-damaged.
• OR2038 and OR2040 are records of settlement in the area, but neither seems secure as to location, or definition- and will require some definition in the process of walkover etc.

From: Alan Coghill [Alan@orkney-fisheries.freeserve.co.uk]
Sent: 13 June 2005 10:16
To: Gina Penwarden
Subject: Eday Tide Project
Dear Gina

I'm afraid your email coincided with a period when I was out of Orkney and I'm only now able to respond - I hope its not too late.

While Orkney fishermen realise the importance of renewable energy resources and appreciate the need to establish these in the island the site chosen has real importance for the inshore creel fisheries. This fishery has been ongoing in Orkney for over a hundred years and willno doubt continue beyond the viable life of the type of energy mechanisms currently proposed. The fishery is conducted by vessels from both the North Isles and the Mainland of Orkney and comprises up to 50% of the value of some of these vessels fishery. Being seasonal because of the weather dependeny of these small vessels, there will be times when they are vey reliant of the stocks in the area.

The Inshore Fishery is the most important sector in Orkney given that it is carried out by small boats located all over the islands many of them in outlying areas. It is essential therefore that full consideration of the needs of this key area to the economic and social well being of the islands is taken in any conflicting development. Contrary to general belief, inshore creel fishing cannot take place anywhere on the seabed but depends on a variety of parameters according to stocks which generally include tidal ranges.

With regard to this site, fishermen are of a view that both industries can live together but are anxious that their needs are fully understood and observed. Their concern also extends to the knowledge of the area which includes the depostis of substantial amounts of seaweed (tangles) in the area which moves around and often causes creel damage to creels and raises the question of safety of the various methods proposed.

In essence fishermen have real concerns that the testing of there various types of turbines will impact on their fishery, are anxious to avoid conflict and especially loss of valuable fishing grounds. They therefore would submit that full awareness of the need to avoid disturbance to local fisheries on which so many communities depend should be an essential condition of any approval.

Regards

Alan

Orkney Ferries Ltd
Shore Street
Kirkwall
Orkney
KW15 1LG

23 June 2005

Ms Gina Penwarden
Aurora Environmental
Garson
Stromness
KW16 3JU

Dear Madam

Proposed Tidal Test Facility - Falls of Warness

With reference to our conversation of 21 June 2005 regarding the above, I would like to take this opportunity to describe the routes followed by our vessels, both in fair and foul weather. I would also like to express our concerns regarding the proposal to site Tidal Test Devices in an area which is used by our ferries all year round, during the hours of daylight and darkness, in all but the most severe weather conditions.

EDAY, SANDAY AND STRONSAY.

In the course of the year Company operated vessels make approximately 2,400 voyages to and from the islands of Eday, Sanday and Stronsay. Of the 2,400 crossings approximately 1,200 are undertaken when the tide is flooding resulting in the vessels having to transit the area where it is proposed to site these test devices.

1) **Flood tide outward bound from Kirkwall - Fine Weather:**

After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will set a course to pass close to the East of the Little Green Holm. From there he will proceed on roughly a Northerly course until the vessel encounters the current flowing in a South Easterly direction past the North end of the Muckle Green Holm. At this point he will alter course to starboard and set a course to pass the Point of Warness where a further alteration of course will be made to take the vessel between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday.

2) **Flood tide outward bound from Kirkwall - Strong to Gale Force South to SE Winds:**

After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will set a course to pass West of the Green Holms and he will continue on this course until the vessel reaches a point approximately midway between the North end of the Muckle Green Holm and Seal Skerry, but this may vary depending on the sea state. At this point he will alter course to starboard and set a course to pass close to the point of Warness where a further alteration of course will be made to take the vessel between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday. As this route adds only 5 minutes or thereby to the passage times and offers better passenger comfort and cargo safety for most of the journey, our Masters tend to use it in preference to No.1 as a precautionary measure before winds have reached gale force speeds.

3) **Flood tide inward bound from Eday, Sanday and Stronsay - Fine Weather:**

After passing between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday, the Master will set a course to pass close to the point of Warness where the vessel will encounter the current flowing in a South Easterly direction. At this point he will alter course to port and set a course to take the vessel close past the East side of the Little Green Holm and on to the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay.

4) **Flood tide inward bound from Eday, Sanday and Stronsay - Strong/Gale Force South to SE Winds:**

After passing between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday, the Master will set a course to pass close to the point of Warness where the vessel will encounter the current flowing in a South Easterly direction. At this point he will alter course to starboard and set a course to take the vessel past the North end of the Muckle Green Holm. Once clear of the Muckle Green Holm, a further alteration of course will be made to take the vessel past the West side of both the Green Holms and on to the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay

5) **Ebb tide outward bound - Fine Weather:**

After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will, allowing for the current flowing in a North Westerly direction, set a course which will take the vessel between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday. At no time will the vessel be near the area in question.

6) **Ebb tide inward bound - Fine Weather:**

After passing between the North Cardinal Buoy which marks the Eday Gruna and the point of Veness on the Island of Eday, the Master will, allowing for the current flowing in a North Westerly direction, set a course which will take the vessel past the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay. At no time will the vessel be near the area in question.

7) **Ebb tide inward or outward bound - Strong to Gale Force South to SE Winds:**

Nearly always the same as No.5 and No.6 but the Master may, for passenger comfort, very occasionally follow the routes described in No.2 and No.4.

WESTRAY.

In the course of the year, Company operated vessels make approximately 1,566 voyages to and from the island of Westray. Of the 1,566 crossings, approximately 783 are undertaken when the tide is ebbing, resulting in the vessels having to keep to the East side of the Westray Firth both outward and inward bound. In general they will not transit the area where it is proposed to site these test devices.

8) **Ebb tide outward bound from Kirkwall - Gale Force West to NW Winds and/or Heavy Seas:**

After passing the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay, the Master will set a course to pass to the East of the Green Holms. From there he will proceed on roughly a Northerly course until the vessel is in the proximity of Seal Skerry. At this point he will alter course to port and, once the vessel is clear to the West of Seal Skerry, he will alter course to starboard and proceed on roughly a Northerly course running parallel to the Eday Shore.

Proposed Tidal Test Facility - Falls of Warness (continued)

9) **Ebb tide inward bound from Westray - Gale Force West to NW Winds and/or Heavy Seas:**

After passing Seal Skerry, where the vessel will encounter the current flowing in a North Westerly direction, the Master will alter course to port and set a course to pass to the East of the Green Holms. Once clear of the Little Green Holm, he will alter course to starboard and set a course to take the vessel to the North Cardinal Buoy which marks the Galt Skerry North of the island of Shapinsay.

Points of Concern

Positioning test devices in an area where our vessels would normally navigate in adverse weather conditions to avoid the more turbulent waters e.g. close to the Point of Warness would invariably result in the Masters having no alternative but to take the longer route North around the Island of Eday. This would inconvenience our customers and, in many instances, severely disrupt the timetables for the remainder of the day.

Because of the tidal overfalls caused by the combination of South to South Easterly gales and flood tide in this area, small low profile fixed or floating structures would not be easily identified on the radar screen because of sea clutter.

Whilst any device attached to the sea bed in this area may have the potential to endanger shipping, I believe that the type of structure which could obstruct surface craft, especially the small low profile floating type which would most likely be difficult to see, would present an unacceptable danger to navigation, particularly in adverse weather conditions.

When navigating in this area in adverse weather conditions, nature provides the seafarer with enough problems without man adding more to the list.

We therefore feel that, in the interests of the safety of our passengers, crews, vessels and cargoes we must strongly object to the positioning of any such devices in the area known as the Falls of Warness.

Regards

James W King
Marine Superintendent