

ANNEX E – APPROPRIATE ASSESSMENT

SITE: The MeyGen Tidal Energy Project Phase 1
FILE REF: 009/TIDE/MGIS1 – 6

Appropriate Assessment Conclusion: Marine Scotland ascertains that the installation, operation and decommissioning of MeyGen Tidal Energy Project Phase 1 will not adversely affect the integrity of the SPAs or SACs listed in section 1a. The first phase of the Meygen Phase 1 development shall be restricted to 6 turbines. Monitoring will be required to inform decisions on future deployments and a further Appropriate Assessment will be required before further deployments are authorised to ensure that full consideration is given to any potential increase in impacts.

1a. Name of Natura site affected & current status available from:

<http://www.snh.gov.uk/publications-data-and-research/snhi-information-service/map/>

SPAs

North Caithness Cliffs SPA
Caithness and Sutherland Peatlands SPA
Pentland Firth Islands SPA
Hoy SPA
East Caithness Cliffs SPA
Copinsay SPA
Marwick Head SPA
Rousay SPA
Sule Skerry and Sule Stack SPA
Calf of Eday SPA
West Westray SPA
Fair Isle SPA
North Rona and Sula Sgeir SPA
Noss SPA
Hermaness, Saxa Vord and Valla Field SPA
Fetlar SPA
Foula SPA
Handa SPA
Auskerry SPA

SACs – Marine Mammals

North Rona SAC
Berwickshire and North Northumberland Coast SAC
Faray and Holm of Faray SAC
Isle of May SAC
Dornoch Firth and Morrich More SAC
Sanday SAC
Moray Firth SAC

SACs – Migratory Fish and Freshwater Pearl Mussels

River Thurso SAC
Berriedale and Langwell Waters SAC
River Borgie SAC
River Naver SAC
River Evelix SAC
River Oykel SAC
River Moriston SAC

River Spey SAC
 Little Gruinard River SAC
 Abhainn Clais an Eas and Allt a' Mhuilinn SAC
 River Bladnoch SAC
 Endrick Water SAC
 North Harris SAC
 Langavat SAC
 River Dee SAC
 River South Esk SAC
 River Tay SAC
 River Teith SAC
 River Tweed SAC

1b. Name of component SSSI if relevant

Not relevant for this assessment

1c. European qualifying interests & whether priority/non-priority:

Northern fulmar North Caithness Cliffs SPA	Common guillemot North Caithness Cliffs SPA Hoy SPA East Caithness Cliffs SPA Copinsay SPA Marwick Head SPA Rousay SPA
Razorbill North Caithness Cliffs SPA East Caithness Cliffs SPA	Black-legged kittiwake North Caithness Cliffs SPA Hoy SPA East Caithness Cliffs SPA Copinsay SPA Marwick Head SPA Rousay SPA Calf of Eday SPA West Westray SPA
Atlantic puffin North Caithness Cliffs SPA Hoy SPA East Caithness Cliffs SPA	Red-throated diver Caithness and Sutherland Peatlands SPA Hoy SPA
Arctic tern Pentland Firth Islands SPA	Arctic skua Hoy SPA
Great skua Hoy SPA Fair Isle SPA Noss SPA Hermaness, Saxa Vord and Valla Field SPA Fetlar SPA Foula SPA Handa SPA	Great black-backed gull Hoy SPA East Caithness Cliffs SPA Copinsay SPA Calf of Eday SPA North Rona and Sula Sgeir SPA
Storm petrel Auskerry SPA	Herring gull East Caithness Cliffs SPA
Leach's petrel	Northern gannet

Sule Skerry and Sule Stack SPA	Sule Skerry and Sule Stack SPA Hermaness, Saxa Vord and Valla Field SPA Fair Isle SPA North Rona and Sula Sgeir SPA Noss SPA
Grey seals North Rona SAC Berwickshire and North Northumberland Coast SAC Faray and Holm of Faray SAC Isle of May SAC	Harbour seals Dornoch Firth and Morrich More SAC Sanday SAC
Bottlenose dolphin Moray Firth SAC	
Atlantic Salmon River Thurso SAC Berriedale and Langwell Waters SAC River Borgie SAC River Naver SAC River Oykel SAC River Moriston SAC River Spey SAC Little Gruinard River SAC River Bladnoch SAC Endrick Water SAC North Harris SAC Langavat SAC River Dee SAC River South Esk SAC River Tay SAC River Teith SAC River Tweed SAC	Fresh Water Pearl Mussel River Borgie SAC River Naver SAC River Evelix SAC River Oykel SAC River Moriston SAC River Spey SAC Abhainn Clais an Eas and Allt a' Mhuilinn SAC North Harris SAC River Dee SAC River South Esk SAC
Sea Lamprey River Spey SAC River Tay SAC River Teith SAC River Tweed SAC	

1d. Conservation objectives for qualifying interests:

Conservation Objectives
<p>SPAs</p> <p>(i) to avoid deterioration of their habitat or (ii) significant disturbance to them, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for the species; and</p> <p>To ensure that the following are maintained in the long term:</p> <p>(iii) Population of the species as a viable component of the site. (iv) Distribution of the species within site. (v) Distribution and extent of habitats supporting the species. (vi) Structure, function and supporting processes of habitats supporting the species. repeat of (ii) No significant disturbance of the species.</p> <p>SACs – Marine Mammals</p>

(i) to avoid deterioration of their habitat or (ii) significant disturbance to them, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- (iii) Population of the species as a viable component of the site.
 - (iv) Distribution of the species within site.
 - (v) Distribution and extent of habitats supporting the species.
 - (vi) Structure, function and supporting processes of habitats supporting the species.
- repeat of (ii) No significant disturbance of the species.

SACs – Migratory Fish and Freshwater Pearl Mussels

(i) to avoid deterioration of the habitats of the qualifying species or (ii) significant disturbance to them, thus ensuring that the integrity of the SAC is maintained and that they make an appropriate contribution to achieving favourable conservation status for each species; and

To ensure for each species that the following are maintained in the long term:

- (iii) Population of the species, including range of genetic types for salmon, as a viable component of the SACs.
 - (iv) Distribution of the species within sites.
 - (v) Distribution and extent of habitats supporting each species.
 - (vi) Structure, function and supporting processes of habitats supporting each species.
- repeat of (ii) No significant disturbance of the species.

And for freshwater pearl mussel in particular, to ensure that the following are maintained in the long term:

- (vii) Distribution and viability of freshwater pearl mussel host species
- (viii) Structure, function and supporting processes of habitats supporting freshwater pearl mussel host species

PROPOSAL DETAILS

2a. Proposal title & name of consultee (i.e. applicant or competent authority)	
The MeyGen Tidal Energy Project Phase 1	Marine Scotland
2b. Date of Consultation: SNH Interim advice	26 th October 2013 18 th January 2013 5 th April 2013
SNH Final Advice	7 th June 2013
2c. Type of Case: Offshore renewable tidal array development	

2d. Details of proposed operation (inc. location, timing, methods):

Installation and operation of a tidal array consisting of up to 61 fully submerged turbines, with a generating capacity of 86MW. This proposal is phase 1 of a larger project which will be subject to a separate consenting process. The proposed development site is located within the Inner Sound, Pentland Firth, and is part of the agreement for lease area awarded to MeyGen Ltd from The Crown Estate. The devices are horizontal axis tidal turbines which are fixed to the seabed using one or a mixture of the following turbine support structures: gravity base foundations, pin piles or monopiles. The turbines and support structures will be deployed using a DP vessel. It is proposed to stagger phase 1 with an installed capacity of 2-10MW deployed in year 1, 10-20MW in year 2, and 56-74MW in year 3 taking the total capacity up to 86MW.

Each turbine has a separate electricity export cable which will be laid along the seabed for part of the distance onshore and then passed through Horizontally Directionally Drilled (HDD) bores for the remainder. There are 2 options for the cable landfall and onshore infrastructure along the north Caithness coast, Ness of Quoys and Ness of Huna, both of which have been granted planning permission.

ASSESSMENT IN RELATION TO REGULATION 20 or 48

3a. Is the operation directly connected with or necessary to conservation management of the site? NO If YES give details:

The operation is not connected with or necessary to conservation management of the site.

*If yes and it can be demonstrated that the tests in 3b have been applied to all the interest features in a fully assessed and agreed management plan then consent can be issued but rationale must be provided, including reference to management objectives. If no, or if site has several European qualifying interests and operation is not directly connected with or necessary to the management of **all** of these then proceed to 3b.*

3b. Is the operation likely to have a significant effect on the qualifying interest? Repeat for each interest on the site.

SPAs

SNH advised in their final response on the 7th June that they are content with the approach taken in HRA report and addendum provided by the developer for this stage of the development. In assessing whether the operation is likely to have a significant effect on the qualifying interest, the applicant has considered the following:

- whether the project area overlaps with the species foraging range during the breeding season,
- whether the project lies within an identified migratory path,

- whether a species was observed in the project area during the site characterisation surveys,
- whether a species is sensitive to any of the potential impacts identified, and
- whether or not there is potential for any of the conservation objectives to be undermined.

The following appraisal of SPA qualifying interests is based on the deployment of 86 turbines as originally proposed and applied for in 2012.

SNH have reviewed the HRA report and addendum and provided the following advice regarding likely significant effect (LSE) in relation to birds below:

Northern fulmar – yes – likely significant effect (LSE) with: North Caithness Cliffs SPA	Project located within SPA marine extension
Common guillemot – yes – LSE with: North Caithness Cliffs SPA East Caithness Cliffs SPA Hoy SPA Copinsay SPA Marwick head SPA Rousay SPA	Project located within SPA marine extension Project area within foraging range, species recorded during site surveys and sensitive to potential impacts.
Razorbill – yes – LSE with: North Caithness Cliffs SPA East Caithness Cliffs SPA	Project located within SPA marine extension Project area within foraging range, species recorded during site surveys and sensitive to potential impacts.
Atlantic puffin – yes – LSE with: North Caithness Cliffs SPA East Caithness Cliffs SPA Hoy SPA	Project located within SPA marine extension Project area within foraging range, species recorded during site surveys and sensitive to potential impacts.
Black-legged kittiwake – yes – LSE with: North Caithness Cliffs SPA Hoy SPA East Caithness Cliffs SPA Copinsay SPA Marwick Head SPA Rousay SPA Calf of Eday SPA West Westray SPA	Project located within SPA marine extension Project area within foraging range, species recorded during site surveys and sensitive to potential impacts.
Red-throated diver – yes – LSE with: Caithness and Sutherland Peatlands SPA Hoy SPA	Project area within foraging range, species recorded during site surveys and sensitive to potential impacts
Arctic tern – yes – LSE with: Pentland Firth Islands SPA	Project area within foraging range, species recorded during site surveys and sensitive to potential impacts
Arctic skua – yes – LSE with: Hoy SPA	Project area within foraging range, species recorded during site surveys and sensitive to potential impacts
Great skua – no LSE with: Hoy SPA	Very low numbers recorded during site surveys, low

Fair Isle SPA Noss SPA Hermaness, Saxa Vord and Valla Field SPA Fetlar SPA Foula SPA Handa SPA	sensitivity to the potential impacts identified in the HRA, broad diet and foraging over large distances offshore.
Great black-backed gull – no LSE with: Hoy SPA East Caithness Cliffs SPA Copinsay SPA Calf of Eday SPA North Rona and Sula Sgeir SPA	Although this species is experiencing a decline in abundance, only very low numbers were recorded during the site surveys, and it is considered to have a low sensitivity to the potential impacts identified in the HRA. Furthermore, it has a broad diet and a wide foraging range including terrestrial habitat
Storm petrel – no LSE with: Auskerry SPA Sule Skerry and Sule Stack SPA	Very low numbers recorded, project area is not considered important for this species.
Herring gull – no LSE with: East Caithness Cliffs SPA	Although this species is experiencing a decline in abundance (see SNH trend note), only very low numbers were recorded during the site surveys, and it is considered to have a low sensitivity to the potential impacts identified in the HRA. Furthermore, it has a broad diet and a wide foraging range including terrestrial habitat.
Leach’s petrel – no LSE with: Sule Skerry and Sule Stack SPA	Very low numbers recorded, project area is not considered important for this species.
Northern gannet – yes – LSE with: Sule Skerry and Sule Stack SPA Hermaness, Saxa Vord and Valla Field SPA Fair Isle SPA North Rona and Sula Sgeir SPA Noss SPA	Project area within foraging range, recorded in site surveys.

Marine Scotland have reviewed the Meygen Environmental Statement, addendum, HRA report and the appraisal completed by SNH and agree with the identification of LSE for the species/ SPAs in the table above and are therefore required to complete an Appropriate Assessment (section 3c).

SACs – Marine Mammals

In their interim responses dated 18th January 2013 and 5th April 2013 SNH identified no connectivity with SACs for both grey and harbour seals. They also advised that impacts to both grey and harbour seal populations not connected directly with SACs was of particular concern. Therefore SNH undertook an appraisal of the potential impacts to the population of the Orkney and North Coast Management Unit for grey and harbour seals.

In their final response dated 7th June SNH advised that current consideration is being given to the connectivity through foraging range data of both harbour and grey seals to SACs. In particular whether site fidelity is shown outside the breeding season to haul out sites (whether SAC or not).

SNH concluded that there was no LSE for grey seals from:

- North Rona SAC
- Berwickshire and North Northumberland Coast SAC
- Faray and Holm of Faray SAC
- Isle of May SAC

SNH concluded that there was no LSE for harbour seals from:

- Dornoch Firth and Morrich More SAC
- Sanday SAC

SNH also advised that as their understanding of seal behaviour and movements improves, the conclusions reached in this appraisal may require to be reconsidered for further phases / further turbine deployments at the MeyGen site.

In their final response dated 7th June SNH concluded that there was no LSE for bottlenose dolphins from:

- Moray Firth SAC

Within Scotland there are 2 coastal populations of bottlenose dolphins: 1) the well-studied population of the Moray Firth SAC and 2) a small population ~30 animals on the west coast of Scotland. In addition there is an offshore population. There are limited observations of bottlenose dolphins in the Pentland Firth and Orkney waters (see Evans *et al* 2011). No bottlenose dolphins were recorded as being present in the project area during the baseline surveys. Thompson *et al* 2011 concluded 'the limited sightings reported over the past few years and the movements of known animals on the east and west coast suggest that the north coast and Northern Isles are not significant bottlenose dolphin habitat and very few matches between east and west coast Photo ID catalogues suggests there is very little movement of individuals through this region. The authors also concluded that these northernmost coasts are approaching the latitudinal limit for coastal populations of this species in the north-east Atlantic. It is considered, therefore, that the proposed development is unlikely to have a significant effect on bottlenose dolphins of the Moray Firth SAC.

SNH concluded that the project would have no likely significant effect for any of the SACs designated for marine mammals and that an Appropriate Assessment was therefore not required.

Marine Scotland have reviewed the Meygen Environmental Statement, addendum, HRA report and the advice received by SNH and agree with the conclusion of no likely significant effect for any SACs designated for marine mammals. Therefore an Appropriate Assessment is not required.

SACs – Migratory Fish and Freshwater Pearl Mussels

In their final response dated 7th June 2013 SNH advised that the Pentland Firth is considered to be one of the routes used by Atlantic salmon and sea lamprey migrating between freshwater spawning grounds and the open water feeding grounds. As the migration routes of fish from individual SACs is not currently known, it is considered that the proposed development has connectivity with a number of Atlantic salmon SACs on the east, west and north coast of Scotland, and, due to their limited distribution, sea lamprey SACs on the east coast. Freshwater pearl mussels (FWPM) rely on salmon and sea trout as host species during the larval stage of their reproduction. Any impacts on these host species may therefore have an impact on FWPM.

Potential impacts from the proposed tidal array on Atlantic salmon, FWPM and sea lamprey include:

Installation:

- Noise arising from installation activities including increased vessels activity, deployment of turbines, and piling and/or drilling, resulting in disturbance and barriers

to movement.

- Cumulative and in-combination impacts.

Operation & maintenance:

- Collision risk with the operational turbines.
- Effects of Electromagnetic Fields (EMF) on fish passage.
- Effects of noise on fish passage.
- Effects of turbidity on fish passage.
- Barrier effects on fish passage.
- Noise arising from maintenance activities, such as increased vessel activity, resulting in disturbance. Cumulative and in-combination impacts.

Decommissioning:

- Activity associated with removal of turbines may give rise to disturbance due to increased vessel movements and noise.
- Cumulative and in-combination impacts.

SNH concluded that the proposal is likely to have significant effect on the overall Scottish populations for Atlantic salmon, FWPM, and sea lamprey.

Marine Scotland have reviewed the Meygen Environmental Statement, addendum, HRA report and the advice received by SNH and agree with the identification of LSE for the migratory fish species and FWPM detailed above and are therefore required to complete an Appropriate Assessment (section 3c).

3c. Appropriate assessment of the implications for the site in view of the site's conservation objectives.

- i) Describe for each European qualifying interest the potential impacts of the proposed operation detailing which aspects of the proposal could impact upon them.*
- ii) Evaluate the significance of the potential impacts, e.g. whether short/long term, reversible or irreversible, and in relation to the proportion/importance of the interest affected, and the overall effect on the site's conservation objectives. Record if additional survey information or specialist advice has been obtained.*

Northern fulmar

North Caithness Cliffs SPA

This species is considered to have a low sensitivity to disturbance (Furness *et al* 2012). Any potential impacts during installation, maintenance, or decommissioning from increased vessel activity or installation works are likely to be temporary and over a limited area. Furthermore, Northern fulmars have a large foraging range and any potential displacement is unlikely to affect foraging ability and reproductive success.

In terms of potential habitat loss used for maintenance behaviours within the marine extension of the North Caithness Cliffs SPA, again this would be temporary and over a limited area.

Although in close proximity to the nest sites, any potential pollution incidents are likely to be of low magnitude, i.e. small scale and rapid dispersal, and therefore not of sufficient size to have any significant effects on the populations.

It is concluded that the proposal would have no adverse effect on site integrity.

Common guillemot

North Caithness Cliffs SPA

East Caithness Cliffs SPA

Hoy SPA

Copinsay SPA

Marwick Head SPA

Rousay SPA

Any potential disturbance during installation, maintenance, or decommissioning from increased vessel activity or installation works is unlikely to be significant. Any disturbance would be temporary and over a limited area. Furthermore, any potential disturbance would not affect the population viability of the species for any of the SPAs considered.

In terms of potential habitat loss used for maintenance behaviours within the marine extension of the North Caithness Cliffs SPA, again this would be temporary and over a limited area. There may also be displacement and a loss of foraging habitat due to the physical presence of the turbines. However, this will be over a limited area and unlikely to impact the population viability of the species.

Collision risk of diving birds with operational turbines is poorly understood. However, there is a potential for collision to occur, and MeyGen have used an exposure time-based encounter model to assess this. The predicted collision level is unlikely to have a population level effect for this species. Although collision risk has been considered against a regional population and not apportioned to individual SPAs, it is considered that the population viability of the species for each SPA will be maintained. Furthermore, as the initial deployment is likely to be for only 6 turbines, the predicted collision levels would be substantially reduced.

Although in close proximity to the nest sites, any potential pollution incidents are likely to be of low magnitude, i.e. small scale and rapid dispersal, and therefore not of sufficient size to have any significant effects on the populations.

Changes to the tidal regime caused by the operational turbines, are unlikely to cause significant impacts to the surrounding benthic habitats and associated prey species, which

in-turn is unlikely to have any significant indirect impacts on the qualifying species. It is concluded that the proposal would have no adverse effect on site integrity.

Razorbill

North Caithness Cliffs SPA

East Caithness Cliffs SPA

Please see comments for common guillemot above. It is concluded that the proposal would have no adverse effect on site integrity.

Atlantic puffin

North Caithness Cliffs SPA

Hoy SPA

East Caithness Cliffs SPA

Please see comments for common guillemot above. It is concluded that the proposal would have no adverse effect on site integrity.

Black-legged kittiwake

North Caithness Cliffs SPA

Hoy SPA

East Caithness Cliffs SPA

Copinsay SPA

Marwick Head SPA

Rousay SPA

Calf of Eday SPA

West Westray SPA

Site surveys recorded this species in very low numbers (i.e. a peak abundance in the boat survey area of 2). Black-legged kittiwake are considered to have a low sensitivity to disturbance (Furness *et al.* 2012). Any potential impacts during installation, maintenance, or decommissioning from increased vessel activity or installation works are likely to be temporary and over a limited area. Any indirect impacts through changes in prey availability are likely to be very localised. Furthermore, black-legged kittiwake have a large foraging range and any potential displacement is unlikely to affect foraging ability and reproductive success.

Although in close proximity to the nest sites, any potential pollution incidents are likely to be of low magnitude, i.e. small scale and rapid dispersal, and therefore not of sufficient size to have any significant effects on the populations.

Changes to the tidal regime caused by the operational turbines, are unlikely to cause significant impacts to the surrounding benthic habitats and associated prey species, which in-turn is unlikely to have any significant indirect impacts on the qualifying species.

It is concluded that the proposal would have no adverse effect on site integrity.

Red-throated diver

Caithness and Sutherland Peatlands SPA

Hoy SPA

Although this species is considered to be highly sensitive to disturbance (Furness *et al.* 2012), site surveys recorded red-throated divers in low numbers (i.e. a peak abundance in the boat survey area of 4) and suggest the project area is not an important foraging area for this species. Any potential disturbance during installation, maintenance, or decommissioning from increased vessel activity or installation works are likely to be temporary and over a limited area.

There may be a loss of foraging habitat due to the physical presence of the turbines. However, this will be over a limited area and unlikely to impact the population viability of the species.

Any potential pollution incidents are likely to be of low magnitude, i.e. small scale and rapid dispersal, and combined with the low numbers of red-throated diver observed at the

development site it is considered that impacts are unlikely to be significant, particularly in an SPA context.

Changes to the tidal regime caused by the operational turbines, are unlikely to cause significant impacts to the surrounding benthic habitats and associated prey species, which in-turn is unlikely to have any significant indirect impacts on the qualifying species.

It is concluded that the proposal would have no adverse effect on site integrity.

Arctic tern

Pentland Firth Islands SPA

Although the project area is within the foraging range of Arctic terns from the Pentland Firth Islands SPA, this species was recorded infrequently during site surveys. Arctic tern are considered to have a low sensitivity to disturbance (Furness *et al.* 2012). Any indirect impacts through changes in prey availability are likely to be very localised. Any potential disturbance during installation, maintenance, or decommissioning from increased vessel activity or installation works are likely to be temporary and over a limited area.

Although in close proximity to the nest sites, any potential pollution incidents are likely to be of low magnitude, i.e. small scale and rapid dispersal. Also, due to the low numbers of Arctic tern observed at the development site and the birds spending very little time on the sea surface, there are unlikely to be any significant effects on the SPA population.

Changes to the tidal regime caused by the operational turbines, are unlikely to cause significant impacts to the surrounding benthic habitats and associated prey species, which in-turn is unlikely to have any significant indirect impacts on the qualifying species.

It is concluded that the proposal would have no adverse effect on site integrity.

Arctic skua

Hoy SPA

This species was recorded in low numbers (i.e. a breeding season peak abundance of 2) during the site surveys, and is considered to have a low sensitivity to disturbance (Furness *et al.* 2012). Any indirect impacts through changes in prey availability are likely to be very localised. Any potential impacts during installation, maintenance, or decommissioning from increased vessel activity or installation works are likely to be temporary and over a limited area.

Changes to the tidal regime caused by the operational turbines, are unlikely to cause significant impacts to the surrounding benthic habitats and associated prey species, which in-turn is unlikely to have any significant indirect impacts on the qualifying species.

It is concluded that the proposal would have no adverse effect on site integrity.

Northern gannet

Sule Skerry and Sule Stack SPA

Hermaness, Saxa Vord and Valla Field SPA

Fair Isle SPA

North Rona and Sula Sgeir SPA

Noss SPA

The low numbers of gannets recorded during the site surveys (i.e. a peak abundance in the boat survey area of 13) suggests the project area is not an important foraging area for this species. Any potential disturbance during installation, maintenance, or decommissioning from increased vessel activity or installation works is unlikely to be significant. Furthermore, any potential disturbance would be temporary and over a limited area.

There may also be displacement and a loss of foraging habitat due to the physical presence of the turbines. However, this will be over a limited area and unlikely to impact the population viability of the species.

The predicted collision level is unlikely to have a population level effect for this species. Although collision risk has been considered against a regional population and not apportioned to individual SPAs, it is considered that the population viability of the species for each SPA will be maintained. Furthermore, as the initial deployment is likely to be for only 6

turbines, the predicted collisions levels would be substantially reduced. Although in close proximity to the nest sites, any potential pollution incidents are likely to be of low magnitude, i.e. small scale and rapid dispersal, and therefore not of sufficient size to have any significant effects on the populations. Changes to the tidal regime caused by the operational turbines, are unlikely to cause significant impacts to the surrounding benthic habitats and associated prey species, which in-turn is unlikely to have any significant indirect impacts on the qualifying species. It is concluded that the proposal would have no adverse effect on site integrity.

Cumulative and / in-combination impacts for bird species

Construction:

There are currently no other wave or tidal projects at application stage in the Pentland Firth, and therefore there will be no other offshore renewable developments in this area undergoing construction at the same time as the MeyGen Phase 1 project. A Marine Licence has recently been issued for the Gills Bay breakwater extension. The Marine Licence is valid until May 2014, so it is unlikely the construction works for both projects will overlap. However, if this breakwater extension work is delayed, it is considered there would be no adverse impacts.

Operation/Maintenance:

There are currently no other wave or tidal projects at application stage within the Pentland Firth, therefore there are no other projects to consider in-combination impacts with MeyGen Phase 1 project. However, any future projects, including further phases to the MeyGen project may be required to consider in-combination impacts with MeyGen Phase 1.

Diadromous fish and freshwater pearl mussel

For freshwater pearl mussel, the conservation objective that requires consideration is: Distribution and viability of freshwater pearl mussel (FWPM) host species i.e. impacts on salmonids may have an indirect effect on FWPM. However, if Atlantic salmon are assessed not to be at risk from an adverse effect on site integrity, then the same conclusion applies to FWPM.

Assigning potential impacts to individual SACs

The environmental statement (ES) correctly notes the uncertainty regarding the detailed migration routes of Atlantic salmon, with even less known about the migration routes of sea lamprey at sea. Atlantic salmon smolts migrate to feeding areas in the seas to the north of the British Isles, not just from rivers in close proximity to the proposed development site, but also from other rivers further south; and returning adults may travel through the Pentland Firth to rivers around the Scottish coast. Evidence of these movements is provided in Malcolm *et al* 2010², and also in the preliminary results of a tagging study on the Scottish east coast in 2012 (<http://www.scotland.gov.uk/Topics/marine/science/Research/Freshwater/SoutEskProject>).

Given the substantial uncertainty associated with the migratory behaviour and the potential impacts on these migratory fish species, and consequences for individual river populations and stocks, discussions between Marine Scotland Science (MSS) and SNH have concluded it is not possible to assign any impacts associated with the Meygen proposal to any one individual SAC. In order to assess the potential impacts arising from this proposal, the following aspects are considered on potential impacts to the returning adult Atlantic salmon population:

- Adult Atlantic salmon swim depth and distribution
- A Scottish returning adult population
- Avoidance and survival rates of fish with tidal turbines

Atlantic salmon, sea lamprey, and FWPM for the SACs considered above

Potential impacts from this development

Installation & decommissioning

Noise arising from construction activities including increased vessel activity, deployment of turbines, and piling and/or drilling, resulting in disturbance and barriers to movement.

There is a potential for disturbance to Atlantic salmon and sea lamprey during the installation and decommissioning of the tidal array, caused by increased vessel activity and associated noise, such as piling and/or drilling. Such disturbance could also result in a barrier to movement. The modelling presented in the ES indicates that hearing generalist fish (including Atlantic salmon and sea lamprey) would need to be less than 1 m from the source of the drilling activity to elicit any behavioural response. It is also stated (page 23 of volume 1) that background noise levels in the Inner Sound area are generally high, and that drilling noise would fall to background noise levels at a range of 0.5 km from the noise source. The ES concludes (page 24 of volume 1) that none of the installation and operation scenarios would expose diadromous fish species to noise that would cause mortality or injury.

While recognising data gaps, this would indicate that Atlantic salmon and sea lamprey are unlikely to suffer significant adverse physical impacts directly associated with noise. It also indicates that disturbance would be limited to a small area around the tidal array and temporary in nature whilst installation works were being carried out. It is also considered that there would be no barrier to movement as fish would be able to move through other areas of the Pentland Firth. However, it may be possible that their ability to perceive the devices and take any possible avoidance action is also reduced.

It is concluded that the project would have no adverse effect on site integrity.

Operation & maintenance

Collision risk with the operational turbines.

There is a potential for migrating Atlantic salmon and sea lamprey to collide with the operational turbines. For the impact assessment of the MeyGen proposal, an adapted Band collision risk model (CRM) was used to assess collision risk. Due to concerns regarding the assumptions made in the assessment, MSS and SNH undertook additional work on the following aspects:

A review of the adapted Band CRM

Adult Atlantic salmon swim depth and distribution

A Scottish returning adult population

Avoidance and survival rates of fish with tidal turbines

Using this additional information, the CRM for returning adult Atlantic salmon was revised, and predicted collisions calculated for a returning adult Atlantic salmon population of 540,000, and a range of turbines (see table 1). It should be noted that the predicted collisions presented here do not take into consideration active avoidance (i.e. the fish detecting and actively swimming away from the blade/turbine), or avoidance due to a potential slipstream effect as the water moves over the blade, as it is considered that our current limited knowledge of these avoidance types is not transferable to the MeyGen project. However, post-construction monitoring may help to address these knowledge gaps. The current levels of predicted collisions are, therefore, considered precautionary.

Table 1. Predicted annual collisions for a returning Scottish adult Atlantic salmon population of 540,000 for the MeyGen project.

	6	10	20	61
	turbines	turbines	turbines	turbines
	171	284	567	1730

Due to potentially significant adverse impacts to other natural heritage features, namely the predicted collisions for harbour seals, an initial 1st phase deployment of 6 turbines is

recommended, with a comprehensive post-construction monitoring programme to inform future phases. For adult Atlantic salmon, it is considered that the predicted level of collision (or mortality) of 171 individuals from a population of 540,000 (i.e. 0.03%) would not have a significant adverse effect. Thus, it is concluded that the proposal would have no adverse effect on site integrity to any of the SACs with Atlantic salmon as a qualifying interest.

Less information is available on Atlantic salmon smolts and sea lamprey. However, the predicted collisions of 171 adult Atlantic salmon for 6 turbines is considered a suitable precautionary proxy, and allows a conclusion to be reached of no adverse effect on site integrity to any of the SACs with Atlantic salmon and sea lamprey as a qualifying interest.

Given the symbiotic nature of FWPM with Atlantic salmon, a conclusion has also been reached of no adverse effect on site integrity to any of the sites with FWPM as a qualifying interest.

Given the paucity of empirical data relating to the migratory fish behaviour, and evidence / knowledge of avoidance behaviour, it is identified that there are certain elements relating to tidal stream technologies which merit monitoring. This monitoring should be put in place to monitor fish movement through the area of the tidal array, and the interaction between fish and the tidal devices. This monitoring is not however required in order to conclude no adverse effect on site integrity.

Effects of EMF on fish passage.

The ES states (page 30, volume 1) that the worst case scenario will be for the array to include 1.3 km of subsea cabling. This cabling will stretch from the devices to the subsea boreholes. The cables will be designed with a screen that completely surrounds the conductor, which means that the E-field outside the cable will be zero. However, the ES also states that it is not known what the exact magnitude of the iE fields will be, although they are considered to be low. The ES further states that the magnetic field from the cables will be well below that of the Earth's magnetic field, which is identified as between 30 and 70 μ T.

Some mitigation for potential adverse impacts on fish is put forward on page 31 of volume 1. This includes: laying cables within natural crevices where possible; the length of the drilled boreholes for the cable will, as far as possible, increase the length of cable under the seabed; cables will be bundled into groups of 3.

Both Atlantic salmon and sea lamprey are considered to be open water fish, and Atlantic salmon tend to swim in the upper sections of the water column, it is concluded that the project would have no adverse effect on site integrity.

Effects of noise on fish passage.

There is a potential for disturbance to Atlantic salmon and sea lamprey caused by noise generated from the operational turbines. Based on modelling of the operational turbines, the mild behavioural threshold is predicted to be met for hearing generalist fish species (which includes both Atlantic salmon and sea lamprey) within 68m of the 36 turbine array (based on 2.4 MW turbines). Strong avoidance criteria for hearing specialists and generalists are only exceeded when fish are closer than 1m to the operating turbines.

It is concluded, therefore, that the project would have no adverse effect on site integrity.

Barrier effects on fish passage.

The presence of the array would present a potential barrier to movement in less than 10% of the cross-sectional area of the Pentland Firth, including any potential disturbance from operational noise. It is concluded, therefore, that the project would have no adverse effect on site integrity.

Noise arising from maintenance activities, such as increased vessel activity, resulting in

disturbance.

Potential disturbance from maintenance activities is likely to be temporary in nature and limited to a small zone of impact. It is concluded, therefore, that the project would have no adverse effect on site integrity.

Cumulative and in-combination impacts.

Construction:

There are currently no other wave or tidal projects at application stage in the Pentland Firth, and therefore there will be no other offshore renewable developments in this area undergoing construction at the same time as the MeyGen Phase 1 project. A Marine Licence has recently been issued for the Gills Bay breakwater extension. The Marine Licence is valid until summer 2014. It is not considered that construction of both projects simultaneously would result in any adverse impacts on the integrity of sites.

Operation/Maintenance:

There are currently no other wave or tidal projects at application stage within the Pentland Firth, therefore there are no other projects to consider in-combination impacts with MeyGen Phase 1 project. However, any future projects, including further phases to the MeyGen project may be required to consider in-combination impacts with MeyGen Phase 1.

The HRA (Section 10) considers various projects in the north of Scotland and whether these have a potential for contributing to cumulative and in-combination impacts. Impact mechanisms where cumulative impacts could arise are also identified. The HRA (Section 10) correctly recognises that there is uncertainty over some potential impacts from the project, and that the findings of a post installation monitoring programme will be required to further our understanding of potential cumulative impacts.

It is concluded that the project would have no adverse effect on site integrity of any SACs or SPAs.

iii) In the light of the assessment, ascertain whether the proposal will not adversely affect the integrity of the site for the European interests. Separate conclusions must be provided if the SAC and/or SPA and/or Ramsar site. If conditions required, proceed to 3d.

It is considered that the proposal will not adversely affect the integrity of the sites in 1a.

3d. Conditions required.

Indicate conditions/modifications required to ensure adverse effects on site integrity are avoided, & reasons for these.

Condition:	Reason:
The first phase of the Phase 1 MeyGen development shall be restricted to 6 turbines. Monitoring is required to gain knowledge / evidence of fish interactions with tidal turbines at this location.	Our understanding of fish interactions with tidal turbines in tidal streams is extremely limited. In this particular location it does not exist. Our assessment, particularly for collision risk indicates that adverse effects can be avoided based on collision risk modelling for 6 turbines. Monitoring of the devices to understand fish interaction / behaviour will inform subsequent phases.

4. RESPONSE

a) Marine Scotland Comments

For Marine Scotland advice to other authorities:

Will not adversely affect integrity of the protected sites detailed in section 1a.
--

For Marine Scotland response to request for opinion on effects of permitted development:

Will not adversely affect integrity of the protected sites detailed in 1a.
--

For Marine Scotland response to application:

Licence process will continue

Name of assessor	Finlay Bennet
Date	07 August 2013
Name of approver	Gayle Holland
Date	11 September 2013

References

Evans, P.G.H., Baines, M.E. & Coppock, J. (2011). Abundance and behaviour of cetaceans and basking sharks in the Pentland Firth and Orkney Waters. Report by Hebog Environmental Ltd & Sea Watch Foundation. Scottish Natural Heritage Commissioned Report No.419.

Furness, R. W., Wade, H. M., Robbins, A. M. C., and Masden, E. A. 2012. Assessing the sensitivity of seabird populations to adverse effects from tidal stream turbines and wave energy devices. – ICES Journal of Marine Science, 69: 1466–1479.

Malcolm, I. A., Godfrey, J., and Youngson, A.F. 2010 Review of Atlantic Salmon, Sea Trout and European Eel in Scotland's Coastal Environment: Implications for the Development of Marine Renewables.

Thompson, P.M., Cheney, B., Ingram, S., Slovick, P., Wilson, B. & Hammond, P.S. (Eds) 2011. Distribution abundance and population structure of bottlenose dolphins in Scottish waters. Scottish Government and Scottish Natural Heritage funded report. Scottish Natural Heritage Commissioned Report No.354.