

CHAPTER 1 – Non Technical Summary

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1.1 Introduction

- 1.1. This document is the Non-Technical Summary (NTS) of the Environmental Statement (ES) which has been prepared in support of applications made by GlaxoSmithKline Montrose (GSK Montrose) for licences for a Marine Renewable Energy Project in the Territorial Sea and UK Controlled Waters Adjacent to Scotland under the Marine (Scotland) Act 2010. This project is called the Montrose Tidal Array.
- 1.2. The ES is the formal report of an Environmental Impact Assessment (EIA) undertaken by GSK Montrose into the potential impacts of the construction, operation and eventual decommissioning of the development and provides details of any mitigations required to address potential impacts.
- 1.3. The ES has been undertaken in consultation with statutory and non-statutory consultees and local stakeholders.
- 1.4. With the support of GSK Montrose and other contributors including Swanturbines Ltd, a significant amount of resources and effort have been made available to undertake this EIA process and important progress has been made towards the provision of the required data for this ES. With the express permission of the developer, this data is expected to be made available for use throughout the industry to assist in other potential developments.

1.1.1 Confidentiality

- 1.5. The GSK Montrose Tidal Array Environmental Statement, comprising chapters 1 to 23 and associated appendices, is marked as Commercial Confidential and should not be circulated to third parties or made public without written permission from GlaxoSmithKline.
- 1.6. A revised version of the ES, with appropriate redactions, will be made available for public release.

1.1.2 GSK Montrose

- 1.7. The developer for this project is GlaxoSmithKline Montrose (GSK Montrose). The GSK Montrose site is a primary manufacturing and supply facility and a key provider of active pharmaceutical ingredients (APIs) for some of GSK's most therapeutically and commercially important products. Operating since 1952, the site covers approximately 45 acres and employs around 280, many of whom are graduates. The site is at the beginning of manufacturing processes which ultimately deliver vital medicines and healthcare products used daily by millions of patients around the globe.
- 1.8. Over £50 million has been invested recently upgrading plant and renewing infrastructure enabling the site to meet GSK's exacting standards and to offer its vast experience and modern manufacturing capabilities both to GSK and to third-party clients. In looking at alternative energy generation, Montrose has recently installed a Combined Heat and Power plant and commissioned work to assess the potential for both tidal and wind power.
- 1.9. GSK aims to be the greenest pharmaceutical company in the world. The pharmaceutical industry creates greenhouse gas emissions and therefore must contribute to the increasingly urgent global efforts to counter climate change. GSK is committed to reducing its impact and has set challenging energy and carbon reduction targets which will also support its business by cutting energy costs.
- 1.10. In 2011 GSK signed up to the UN Caring for Climate initiative, reflecting its commitment to taking action on climate change. GSK's long-term goal is for its entire value chain to be carbon neutral by 2050, the first step being a 10% reduction in the carbon footprint by 2015. GSK achieved Carbon Trust Standard Global certification in 2010, the first company to achieve this recognition of global excellence in carbon management.

1.1.3 Project Details

- 1.11. The progression of the Montrose Tidal Array is subject to the required Consents and Licenses being obtained. If successful, it has the potential to be the first tidal array of its kind.
- 1.12. The proposal is to develop a tidal array in the River South Esk Estuary. The tidal stream array will be installed in 2 phases over a period of 14 months, eventually having a capacity of up to 0.7MW and will contribute to meeting the Scottish Government's targets of providing 100% of Scotland's electricity from renewable sources by 2020.
- 1.13. The project comprises 15 tidal turbines with gravity foundations. These transmit electricity to the shore with armoured cables where they are connected to a shore station. The shore-station comprises control systems and power conditioning equipment including switch gear and a transformer. The power is then transmitted to the GSK Montrose site using a buried electrical cable. The offshore site is marked by navigational markers and appropriate warning signs.

1.1.3.1 Crown Estate sea bed lease

- 1.14. During 2011 Swanturbines successfully bid, on behalf of GSK, for a Crown Estate Lease for the river bed from Montrose Bridge to the sea, securing a tenancy lease for a 25 year operational period.

1.1.3.2 Location

- 1.15. The proposed development is located in the town of Montrose (Figure 1-1), Angus which is on the east coast of Scotland in the United Kingdom.



Figure 1-1 - Montrose location

- 1.16. Figure 1-2 shows the proposed site at Montrose relative to the GSK manufacturing site. Figure 1-3 shows the layout of the proposed tidal array (Phase 1 green circles and Phase 2 yellow circles), the proposed substations (blue rectangles), and the proposed cable route which is denoted by the red line.

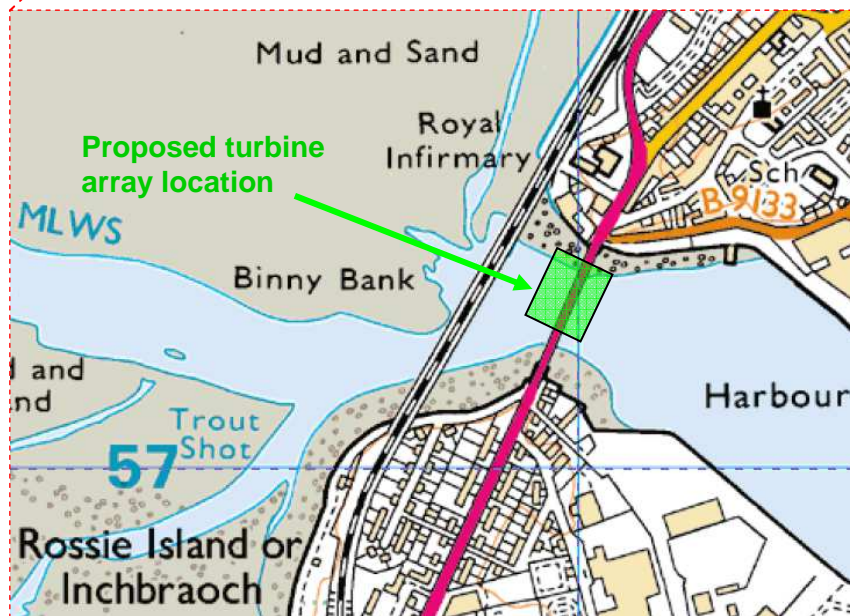
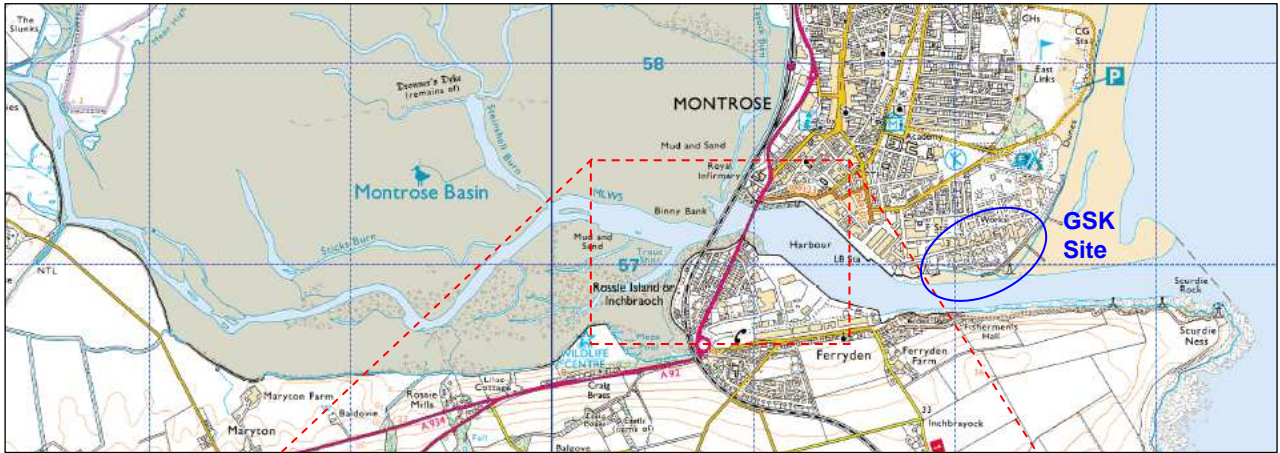


Figure 1-2 - Proposed location for development



Figure 1-3 – Site layout

1.1.3.3 Site selection

- 1.17. Consideration has been given to the deployment of devices at a remote location. This could take the form of a remote generation site using a tidal resource elsewhere, such as the north of Scotland or Wales. The electricity would then be transmitted to the site through the national grid.
- 1.18. Although this may provide advantages in terms of a larger available resource and potentially less sensitive environmental issues it does not fulfil the primary requirement of GSK Montrose, which is to invest in the site at Montrose and to integrate the system into the manufacturing facility such that it is directly powered by renewable energy. In addition the transmission of the energy over long distances would result in increased losses through transmission efficiencies and higher maintenance requirements and complexities.
- 1.19. The primary driver in site selection is the locality to the GSK factory. The kinetic energy in the tidal currents in the Montrose channel is apparent, and it is this conspicuous energy resource that has inspired the inception of the project. A study was therefore initiated to investigate the potential energy resource around this area and to examine the following factors:
- Technical (tidal resource, grid and accessibility);
 - Environmental (habitats, species and seabed profile);
 - Commercial (fishing, shipping and recreation);
 - Economics; and
 - Policy and Designation.
- 1.20. The final location and layout has therefore been reached through consideration of alternatives from remote sites to local aspects of the array. An iterative process has been undertaken has already incorporated several aspects of mitigation into the final design through the avoidance of specific features of marine navigation and technical difficulty.
- 1.21. The proposed development site is therefore located at the entrance to the Montrose Basin on both sides of the bridge carrying Rossie Island Road (A92) across the harbour.
- 1.22. More detail on site selection is presented in ES Chapter 5 - Alternatives.

1.1.3.4 Turbine technology

- 1.23. The turbines being considered for installation are being developed by Swanturbines Ltd. Swanturbines has been developing tidal energy projects and technology in the UK since 2001. The team has a wealth of practical experience in tidal stream technology development, financing and deployment.
- 1.24. The specific unit for this site is the Cygnus Inshore Tidal Turbine (Cygnus ISTT) in Figure 1-4. These are free standing axial-flow turbines which look very much like wind turbines placed underwater. They are installed rapidly using gravity foundation technology which is intended to minimise environmental disruption. The blades move slowly which may reduce the risk of collision impact, and the absence of a gearbox will reduce underwater noise and hence may reduce disruption to marine mammals. The proposed array does not use the whole width of the channel such that a clear passage for fish, mammals, birds and boats remains at all times. The use of a clear channel as a mitigation technique will require that this channel be monitored both pre and post construction to evaluate success of this mitigation.

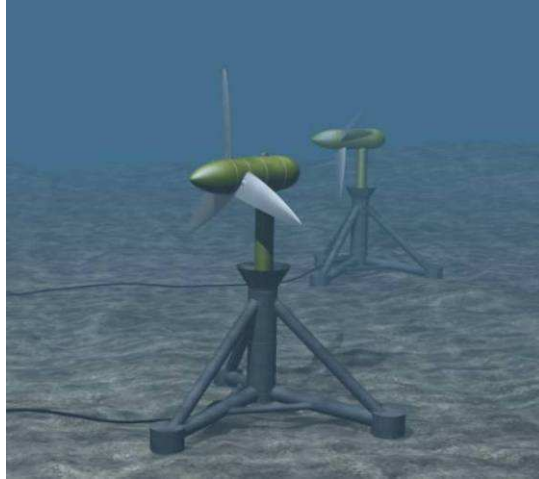


Figure 1-4 – Cygnus ISTT

Power extraction: ≤ 150 MWhr per annum	Generator: 1 x low speed (direct drive)
Rotors: 1 x 3 bladed axial flow	Gearing: NONE
Rotor Diameter: ≤ 6.7 m	Yaw: Full 360 degree yawing capability
Rotational speed: 0 -23RPM	Depth range: 6-25m
Operational tip speed: 0-8 m/s	Foundation: Gravity base tripod technology
Nacelle mass: ≤ 5 Tonnes	
Seabed footprint: $\leq 25\text{m}^2$	
Rotor Pitch: Fixed	

Maintenance method: Nacelle removed to shore using patented system

- 1.25. The foundation system used for the Cygnus-ISTT is a tripod gravity foundation that is installed in one lift from a crane barge. The tripod is constructed using steel for the structural elements and another material with high density properties for ballast.
- 1.26. The turbine is connected to the foundation using a technology which enables a swift mating and un-mating of the nacelle and foundations as the nacelle is lowered into position. A mating operation using the system is shown below in Figure 1-5. This system also allows turbine to rotate about the yaw axis to maximise energy capture from different directions of flow.



Figure 1-5 – The Cygnus ISTT maintenance method

1.1.4 Energy Context

- 1.27. The Scottish Government (SG) is committed to promoting the increased use of renewable energy sources and has set the following ambitious targets, which move beyond those set by the UK Government. These targets are a 100% reduction in greenhouse gas emissions by 2050, with an interim target of a 42% emissions reduction by 2020.
- 1.28. The SG has also stated that Scotland is uniquely placed to be a world leader in tidal power. This statement is supported by a number of recent studies and strategies. The Scottish Marine Energy Road Map (2009) is the most recent publication and it reflects an up-to-date assessment of the status and potential of the marine energy industry in Scotland alongside recommended actions to ensure its continuing growth.

1.2 Designations, Regulatory Requirements and the EIA Process

1.2.1 Designated sites

- 1.29. The Montrose basin has international designations as a Special Protection Area (SPA) and Ramsar site (due to the site being considered a wetland of international importance). Both of these designations are primarily due to the assemblages of wintering waders and wildfowl and the mudflat habitat that attracts them to the area.
- 1.30. The site condition of the SPA is currently considered to be favourable and maintained. WeBS count data indicates that the overall overwintering populations are in excess of the mean total numbers cited in the SPA.
- 1.31. In addition the River South Esk is designated as a Special Area of conservation (SAC) and the qualifying features are the population of Freshwater pearl mussel *Margaritifera margaritifera* and Atlantic Salmon *Salmo salar*.
- 1.32. The Montrose Basin qualifies as a Site of Special Scientific Interest (SSSI) by supporting wintering wildfowl populations and being a nationally important breeding population of Eider duck. Also within the citation the non breeding (over wintering) populations of Pink-footed and Greylag Geese, Redshank, Eider, Oystercatcher, Knot, Wigeon and Mute Swan are species of notified particular importance. Notified natural features include the mudflat, saltmarsh coastland habitats and the transition saltmarsh fen habitat.
- 1.33. Lastly, the Montrose Basin Local Nature Reserve designation was granted by Angus Council in 1981.
- 1.34. In addition to these local designations there is the possibility that animals from adjacent protected areas may use the Montrose Basin. This is discussed in detail in the main body of the ES.

1.2.2 Regulatory Consents

- 1.35. The proposed project is below 1 MW in total capacity so the development is not required to gain consent under Section 36 of the Electricity Act 1989.
- 1.36. It is also worthy of note, that this scale of project (<1MW) would not normally require an EIA but due to the projects close proximity to various protected sites the developer agreed with the regulator to carry out an EIA to fully explore the potential impacts of the project. The project whilst not lying within a designated site has a high degree of connectivity with the sites described above.
- 1.37. Up until recently a marine development, such as the one proposed, would be required to gain individual consents relating to the Food and Environment Protection Act (FEPA) 1985 and the Coast Protection Act (CPA) 1949.

- 1.38. New guidance on consenting of renewable energy developments in Scotland was issued by the Scottish Government in April 2010 under the Marine (Scotland) Act.
- 1.39. The new Marine (Scotland) Act 2010 (section 20) will allow for FEPA and CPA licenses to be consolidated into one 'Marine Licence', to be administered by Marine Scotland's Licensing and Policy Team.
- 1.40. Application for a Marine Licence under Part 4 of The Marine (Scotland) Act 2010 will be made.
- 1.41. Requests for a formal scoping opinion should be submitted under The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).
- 1.42. The Conservation (Natural Habitats) Regulations 1994 as amended; (the "Habitats Regulations") apply to European Sites. The requirements include at paragraph 12: "The Regulations require that, where an authority concludes that a development proposal unconnected with the nature conservation management of a Natura 2000 site is likely to have a significant effect on that site, it must undertake an appropriate assessment of the implications for the conservation interests for which the area has been designated."
- 1.43. The Conservation of Seals Act (1970) protects both Common Seals and grey during their breeding season. The closed season for Grey Seals is from 1st Sept to 31st Dec, and for Common Seals from 1st June to 31st August. The Conservation of Seals (Scotland) Order 2007 effectively extends the current close season for Common Seals to the whole year in Shetland, Orkney and an area of the east coast between Stonehaven and Dunbar.
- 1.44. Certain species are listed on Annex IV of the Habitats Directive as species of European Community interest and in need of strict protection. The protective measures required are outlined in Articles 12 to 16 of the Directive. The species listed on Annex IV whose natural range includes any area in the UK are called 'European Protected Species' (EPS).
- 1.45. Licences may be given authorising activities that could affect EPS which would otherwise be illegal under the Habitats Regulations.
- 1.46. Three tests must be satisfied before the licensing authority can issue a licence under Regulation 44(2) of the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) to permit otherwise prohibited acts.

1.2.3 EIA process

- 1.47. The following aspects have been addressed during the EIA process:
 - Scoping the EIA
 - Gathering information on the project
 - Gathering information on the environment
 - Consultation throughout the core EIA
 - Assessing the significance of impacts
 - Mitigation measures
 - Environmental Management Plan
 - Environmental Monitoring Plan
- 1.48. The timeline of activities during the EIA is shown in Figure 1-6.
- 1.49. Initial feasibility work commenced in July 2010 and comprised engineering assessment, initial environmental considerations and informal stakeholder consultation. This work formed a key part of the site selection process.

1.2.3.1 Scoping

- 1.50. A formal scoping opinion was requested in November 2010 and received in January 2011. Revisions were made to the scoping document in May 2011 and further scoping opinions were received in August 2011.

- 1.51. The scoping document focused on environmental issues associated with the proposal and their potential impacts. The aim was to identify which areas needed most attention and which were unlikely to require further detailed study.
- 1.52. The initial assessment included all potential receptors and considers their respective designations and protection status.

Stage	Date
Initial feasibility study	Jul-10
Informal stakeholder consultation	Aug-10
Request formal scoping opinion	Nov-10
Gather navigational traffic data	Dec-10
Start 12 months survey	Dec-10
Start baseline data collection	Jan-11
Commission specialist environmental investigations	Dec-10
Continued consultation	Throughout
Receipt of scoping opinion	Feb-11
Marine Renewables Facilitators Group workshop 1	Mar-11
Marine Renewables Facilitators Group workshop 2	Sep-11
Fish receptors: MRFG sub group meeting	Nov-11
Navigational Risk - Preliminary Hazard Review	Nov-11
Completion of ES	Dec-11
Consent applications	Dec-11

Figure 1-6- EIA timeline

1.2.3.2 Baseline data collection

- 1.53. Twelve months of survey data for birds and marine mammals commenced in December 2010.
- 1.54. Literature review of available data, publications, technical papers and discussions with specialist groups has been ongoing throughout the process.

1.2.3.3 Environmental investigations

- 1.55. A series of specialist environmental investigations were commissioned or conducted by the developer in support of the EIA

1.2.3.4 Ongoing consultation

- 1.56. The following organizations have been consulted during the project:

- Marine Scotland
- Marine Scotland Science – Fisheries
- Marine Scotland Science - Population Biology Group
- Scottish Wildlife Trust
- Scottish Natural Heritage
- Archaeology Scotland
- Aberdeenshire Council
- Historic Scotland
- Maritime and Coastguard Agency
- Montrose sailing club
- Montrose Port Authority
- The Crown Estate

- Scottish and Southern Energy
- Esk District Salmon Fisheries Board
- Esk Rivers and Fishery Trust
- Angus Council
- RNLI
- Montrose & District Angling Club
- Bell Rock Sea Angling Club
- Brechin Angling Club
- SMRU
- Montrose Basin Ranger
- JNCC
- Whale and Dolphin Conservation Society (WDCCS)
- Network Rail

- 1.57. The Marine Renewable Facilitators Group (MRFG) as met on two occasions to review and discuss the project (17th March 2011 and 28th September 2011).
- 1.58. A sub group of the MRFG was formed to discuss fish specific issues. This group met on 11th November 2011.

1.2.4 Monitoring and Mitigation Strategy

- 1.59. To the extent that data gaps remain in this ES, worst case assumptions have been made to assess the maximum possible severity of a particular potential impact. This conservative approach will firstly allow impacts to be assessed prior to deployment and then if unacceptable risks remain then mitigations will be employed to bring the anticipated potential impact down to an acceptable level.
- 1.60. Once Phase 1 has been deployed, extensive monitoring will be undertaken to validate assumptions made in the impact assessment and refine the environmental models. The information gained will be reviewed and the mitigation measures applied or relaxed accordingly.
- 1.61. Assuming that any potential impacts are shown to be acceptable with the agreed level of mitigation in place, the Phase 2 potential impacts will be re-assessed with respect to the further information gained in Phase 1. If Phase 2 impacts are then considered to be acceptable, the remaining 10 turbines will be installed alongside the agreed appropriate mitigations.

1.3 Summary of Environmental Impacts and Mitigations

1.3.1 Archaeology & Cultural Heritage

- 1.62. A number of potential cultural heritage assets are considered as part of this assessment, the significance of these sites vary from national to local importance. Various sources were utilised to identify cultural assets within the area and are separated into the following site types including Scheduled Ancient Monuments, Listed Buildings, Maritime Losses and Wrecks and Other Archaeological Sites.
- 1.63. Potential effects upon sensitive receptors may include:
- Physical damage to onshore cultural heritage assets resulting from ground works associated with the construction
 - Physical damage to offshore cultural heritage assets resulting from seabed disturbance
 - Adverse impacts upon the setting of onshore cultural heritage assets in the form of visual and noise impacts

- 1.64. An assessment of any cultural heritage assets within the study area has been completed using publicly available GIS data. The area of study is zone 1km buffer from all the physical aspects of the project such as the substation building and underground cable route.
- 1.65. There are a number of listed buildings and some other interesting features within the search area and, as part of this assessment, those buildings that are present along the cable route of the turbine or located on the coastline have been included. The coastal sites have been included within this assessment as the location of the array may be considered to impact upon the overall setting of the buildings.
- 1.66. It is considered that no significant direct or indirect effects will occur at cultural heritage assets in the area, therefore no mitigation measures have been proposed. Best practice construction methods will be observed during the construction of the array and the associated ancillary structures.

1.3.2 Seabed Ecology

- 1.67. The proposed site for development is a channel containing a number of man-made elements and operations. The channel bed within the immediate area is considered to consist of gravel and cobbles to an unknown depth with bed rock below.
- 1.68. As a high energy environment with non-sandy substrate this area is not currently considered to be a habitat of conservation importance for species of flora or fauna. The nearby road and rail bridges are known to have mussels growing on them but at this time it is not considered they would be classed as ‘mussel beds’ given their location on man made structures.
- 1.69. The main potential impacts on the seabed are loss of habitat owing to the placement of the gravity foundations, smothering of seabed life from disturbed sediment, colonisation of the structures and pollution from routine and accidental discharges. There is also the potential to indirectly impact on other seabed and riverbed habitats located upstream and downstream of the array. The Montrose basin and South River Esk contain protected habitats and/or species with international and national protected status.
- 1.70. It is considered that although there may be some localised alteration to the seabed ecology this is unlikely to be significant as the seabed is already largely a man-made habitat and has been recently disturbed by the construction of the A92 bridge.
- 1.71. With respect to sedimentary effects and alteration of habitat, further monitoring and modelling work is proposed to allow for a greater understanding of how the operation of the tidal array may alter tidal flow and subsequent changes that may occur to sedimentation, particularly with reference to Montrose Basin.
- 1.72. With regard to pollution the turbine manufacturers and installers will follow industry good practice and Pollution Prevention and Control Measures to minimise the risk of accidental spills or discharges.

1.3.3 Birds

- 1.73. The Montrose Basin is an enclosed tidal basin fed by the River South Esk. It is considered to be a very good natural example of an estuary and the sites supports a large population (typically ~50,000) of overwintering water birds. There are also breeding populations on the basin and many of the overwintering and breeding birds have a significant level of individual protection in addition to being qualifying species of the national and international conservation designations of the site.
- 1.74. The proposed site for deployment is outside any ecologically designated sites. The array location is however within 200m of the Montrose Basin and this is a site of significant ornithological importance with international and national protection. The international designation is as a Special Protection Area (SPA) and RAMSAR site (due to being a wetland of international importance). Both of these designations are primarily due to the assemblages of wintering waders and wildfowl and the mudflat habitat that attracts them to the area. The site is also designated as a Site of Special Scientific Interest

- 1.75. Data has been collected by a desk based assessment of existing records, consultation with stakeholders and field survey work to allow an understanding of the movement and behaviour of bird species in the proposed deployment area. In terms of the potential effects of the turbines, the most sensitive species found at the site is the Eider duck. This is a diving bird of international importance.
- 1.76. The main potential impacts are considered to be displacement of birds from their habitat, disturbance and collision with the rotor blades whilst diving. Disturbance is not considered to be significant but the potential for collision and displacement by changing tidal patterns within the basin are considered to be moderately significant.
- 1.77. There is the potential that the operation of the array may have a wider impact on feeding habitats in the navigation channel (mussels) and Montrose Basin (mudflats and eelgrass). A potentially significant impact on the basin's attractiveness to bird species may occur if the extraction or alteration of tidal energy led to a significant alteration in the species and abundance of food sources.
- 1.78. Although these effects are not expected to affect the bird populations in any significant way, these risks will be mitigated by a monitored approach in which the array will be installed in phases and close monitoring will be undertaken to observe any unexpected effects.
- 1.79. Pre and post installation monitoring will be undertaken using visual survey and by active sonar systems to observe any changes in diving bird behaviour. Monitoring of tidal patterns in the basin will also be undertaken to observe any changes in wetland habitat.
- 1.80. It is considered that the main reason birds would come into contact with the array is when foraging for food on the seabed. For this reason, if an effect is observed, a proposed mitigation would be reinstate old mussel beds in other parts of the river and reduce the likelihood of mussels growing on the turbine structures by using specific coatings. In addition, and if deemed to be necessary after monitoring, the operation of the array can be limited to avoid sensitive periods.
- 1.81. In the case of persistent significant impact there is the accepted route that the array and associated structures would ultimately be removed from the location.

1.3.4 Coastal & Sedimentary Geology Processes

- 1.82. A series of studies have been undertaken to assess the tidal heights and flows, the bathymetry and sedimentary processes at and around the site. This has included desk studies in which existing data and literature has been analysed, computational modelling of aspects of the site to gain a better understanding of flow patterns, and a series of physical surveys.
- 1.83. Potential impacts considered include any alteration in sediment transport during installation and operation with a particular focus on silting up of the basin or navigational channel, alteration to tidal height in the basin, flood risk and the potential to alter the supply of marine nutrients to habitats in the basin.
- 1.84. It should also be noted that any alteration in sediment regime will be considered in the context of ongoing dredging activities within the harbour.
- 1.85. The majority of impacts for coastal and sedimentary processes are considered to be insignificant and will be mitigated by the phased installation approach. Due to the high sensitivity of the potential impact of a variation to tidal heights in the basin, monitoring of tidal heights is proposed. Two tide gauges are proposed to be deployed; one within the Montrose basin and a reference gauge to the east of the turbine site. For the pre-installation monitoring period, measurements will be taken over a 6 month period in order to include a full (equinoxal) tidal cycle. Bathymetry or photography methods will be employed to relate tidal heights to available habitat areas and this data will be used to understand the sensitivity of the basin ecology to tidal levels.
- 1.86. In addition, a two dimensional flow and sediment model is proposed to increase the level of understanding of the hydrodynamic regime in the basin and estuary and verify the anticipated effect of the array

installation. This will consider flow speeds and sediment sizes and predict sediment movements in the area. Further sediment samples are likely to be taken in support of this modelling.

- 1.87. This model will be used to add further detail to the assessment of the magnitude of silting, variation of basin tidal height, backwater flooding and estuarine flushing. If significant detrimental effects are observed, the ultimate mitigation would be removal of the turbines.

1.3.5 Fish & Shellfish

- 1.88. The River South Esk is one of the most attractive salmon and Sea Trout rivers in Scotland and is of both of commercial and recreational importance. Furthermore the River South Esk is designated under the Habitats Directive as a Special Area of Conservation for Atlantic salmon and freshwater pearl mussel based on qualifying features of international importance.
- 1.89. Atlantic salmon, sea trout, European eel, river and sea lamprey, flatfish, elasmobranchs, freshwater pearl mussel, blue mussel and horse mussel have been considered through desk based studies and consultation. In addition computational models have been developed to assess the potential effect of injury to a fish through an interaction with the rotor blades. The potential effect of electromagnetic interference has also been considered.
- 1.90. The expected significance of the environmental and social impacts has been quantified using the current understanding of the specific project considerations. These have been assessed for each distinguishable impact. Where possible this has been based on quantitative evidence; however, at this early stage in development many of the effects they have been assessed qualitatively based on the best available knowledge at the time and professional judgement.
- 1.91. Although there is limited data available in support of a quantitative risk assessment, the ability of migratory fish to navigate fast flowing and complex geographical terrain to reach spawning grounds suggests that the slow moving turbines will not present a significant obstacle to migration. It is also considered that although slow moving, there is a possibility that fish will experience injury during an interaction with the turbine rotor.
- 1.92. Both of these risks are mitigated by the fact that the turbines are low speed and will have extended periods throughout the tidal cycle in which they are completely stationary. However owing to the embryonic nature of the tidal stream technology the effect cannot be quantified so a worst case scenario must be considered. On this basis, a collision model has been developed to establish the likelihood of interactions between fish and the turbines for each species.
- 1.93. An assessment of electromagnetic interference from power cables has shown that levels from the turbines are lower than an existing power cable that crosses the river South Esk at Ferryden.
- 1.94. In terms of monitoring and validation, it is practically challenging to observe fish behaviour around tidal stream turbine rotors as visibility can be limited and current speeds mean that events happen quickly. In addition, in open sea migratory routes the frequency of device interactions may be too low to enable statistically significant data to be obtained. The Montrose Tidal Project presents an opportunity to observe fish behaviours around rotors throughout the phased implementation of the project. As potentially the first operational array, this valuable information has the potential to be of great benefit to the industry as a whole including developers, stakeholders and regulators.
- 1.95. Although the expected impact on fish is expected to be minimal, the proposed post-installation monitoring of fish continues the pre-installation programme of sonar observation and tracking, acoustic tagging and catch data to provide a holistic view of the effect of the phased installation. In addition short term experiments are proposed with high definition sonar systems to observe detailed device interactions. This data will be compared to pre-installation data to assess the effect of the turbines on the fish receptors.
- 1.96. The primary aim of this monitoring is to assess the impact of the turbine installation on the South Esk SAC salmon population and also other SACs such as the North Esk and Dee if connectivity is shown. In addition, any effect on the health of the Esk Fisheries will be quantified.

1.3.6 Marine Mammals

- 1.97. Information on marine mammals in the vicinity of the development has been collected through literature, data records, consultation and detailed visual survey at the proposed site over a period of 12 months.
- 1.98. Harbour Seals and Grey Seals are regularly seen in the Montrose basin and have been observed at the proposed turbine site.
- 1.99. Typically 15 to 20 seals are seen hauled out within the basin at low tide.
- 1.100. There are records of occasional sightings of Otter and Bottlenose Dolphin in the Montrose area but none were seen during the 12 months of survey that was specifically commissioned for this project. Otter and Bottlenose Dolphin are not considered to be a common occurrence.
- 1.101. Following consultation with specialist groups and organisations, the key potential impacts on marine mammals from tidal turbines are considered to be injury to the animals owing to a collision with turbine blades, disturbance as a result of underwater noise and the presence of the turbines creating a barrier to movement in and out of the Montrose basin.
- 1.102. Theoretical predictions have been made to assess the likelihood of seals colliding with moving turbine blades. Due to lack of data at this stage, it has not been possible to demonstrate that risks to seals are of a low level. Consequently, a method of turning off the turbines when seals are detected is proposed. This method will use underwater sonar imaging cameras to detect seals if they approach the turbines.
- 1.103. Although risks are considered to be minimal, a small residual risk may remain and therefore there exists the potential to disturb the animals and may result in the developer requiring an EPS licence.
- 1.104. Data will be collected over the next 12 months to further understand the behaviour of the seals at Montrose. This data may show that the risk of collision is acceptable without the need to turn off the turbines.
- 1.105. Underwater noise from the turbines may cause changes in behaviour of marine mammals. Relatively low levels could cause them to avoid the area or could disturb their normal activities such as feeding, breeding and social interaction. High noise levels could cause injury or damage to hearing.
- 1.106. The predicted maximum noise level from the turbines is close to the measured background level at Montrose so the turbines may not be detectable above the background level. The maximum noise level is at or below the threshold of hearing for seals so it is considered unlikely that a disturbance response will occur.
- 1.107. After the turbines have been installed, the noise levels will be measured to confirm that they are acceptable.
- 1.108. There may be potential for the array to act as a barrier to movements of marine mammals. This may occur due to one impact or several impacts working in combination and could include avoidance due to a perception of risk, avoidance of moving structures, noise disturbance or electromagnetic interference from power cables.
- 1.109. An assessment of electromagnetic interference from power cables has shown that levels from the turbines are lower than an existing power cable that crosses the river South Esk at Ferryden.
- 1.110. The turbines will be deployed in two phases (initially 5 turbines and then a further 10) so that any post installation barrier effects can be monitored. The number of seals within the basin will be monitored by visual survey and the numbers of seals passing the turbine area by underwater acoustic imaging cameras.
- 1.111. There are two Special Areas of Conservation for seals in the region which have the potential to be affected by the Montrose tidal turbines; the Tay and Eden SAC for Harbour Seals and the Isle of May SAC for Grey Seals. The Habitats Regulations state that the competent authority shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of a Natura site.
- 1.112. The population of Harbour Seals at the Tay and Eden SAC has fallen dramatically over the past 10 years to around 120 animals in 2011. There are initial indications that Tay and Eden SAC animals interact with

those at Montrose so there may be risks to animals at the Tay and Eden SAC associated with tidal turbines at Montrose (including collision with blades).

- 1.113. An Appropriate Assessment must be carried out to demonstrate that the integrity of the Tay and Eden SAC will not be adversely affected. GPS tracking of animals or photographic recognition may be used to determine to what extent animals from Montrose interact with those at the Tay and Eden SAC.
- 1.114. The Isle of May SAC has a large and increasing Grey Seal population with pup production of around 1200 in 2009 and the total population associated with the Firth of Forth colonies is in excess of 12000 animals.
- 1.115. The low numbers of Grey Seals observed at Montrose would suggest that even in the worst case the Montrose tidal array will not affect the integrity of the Isle of May SAC.

1.3.7 Marine Navigation

- 1.116. Informal consultation with stakeholders commenced in August of 2010 during the early feasibility stages of the project. Initially five potential sites were assessed of which only two were considered technically feasible.
- 1.117. The feedback from meetings with Montrose Port Authority was that they had no initial concerns over the chosen site by the road bridge but would have potential concerns over an alternative site at the edge of the navigation channel. This feedback and technical considerations were key in choosing the bridge site for the proposed development.
- 1.118. As part of the Environmental Statement, a dedicated Preliminary Hazard Analysis and Navigation Risk Assessment must be produced for the proposed project. It should address all potential navigational effects on other users of the sea, including commercial and leisure users.
- 1.119. The key water users were identified as Montrose Port Authority, the RNLI, Montrose Sailing Club and small recreational and fishing vessels.
- 1.120. Stakeholders consulted include Montrose Port Authority, RNLI, Montrose Sailing Club, Northern Lighthouse Board, Montrose Small Boat Owners Association, RYA Scotland and the Maritime and Coastguard agency.
- 1.121. The hazard review concluded that the proposed tidal array introduces additional risks to commercial vessels, recreational vessels and persons in the water in the vicinity of the turbines.
- 1.122. Key risks include vessels with loss of power drifting towards the turbines and additional risks to vessels transiting the site as they will be required to use an alternative arch of the A92 road bridge.
- 1.123. There are risks to dinghy sailors in the event of capsize or becalming and to persons in the water that have fallen from vessels, quay side or the A92 road bridge.
- 1.124. A number of mitigations are proposed to reduce risk levels including: warning notices on the rail bridge, road bridge and navigation channel, an emergency stop button at a 24 hour manned control room at GSK, CCTV covering the bridge and turbine area to be monitored at GSK and a dedicated emergency telephone number on road bridge. It is proposed that Montrose Sailing club would be in VHF contact during club activities and that training of sailing club members and GSK control room operators would take place.
- 1.125. It is proposed that a small boat channel would be marked and lit to allow 24 hour access to the Montrose basin through the Southern arch of the A92 road bridge. Discussions with Northern Lighthouse board, Montrose Port Authority and other stakeholders are ongoing regarding the details of the scheme.
- 1.126. The risks to navigation from the operational phase are currently considered to be “tolerable with modifications” but this assessment is subject to continuing review. The controls required to achieve this are required to be implemented prior to installation and monitored throughout operation and decommissioning
- 1.127. Continuation of discussions with stakeholders is required to reduce risks to as low as reasonably practicable.

1.3.8 Onshore Noise & Vibration

- 1.128. The proposed tidal array is located within the Montrose town and there are a number of residential areas located adjacent to both ends of the road bridge and along the roadside route for the cable run back to the GSK site. In addition there will be others that are potentially sensitive to noise for example those travelling by foot through Montrose or visiting nearby sites such as the Basin.
- 1.129. Noise measurements have been undertaken at the site to ascertain the existing levels of background noise and it is considered that during installation there may be some additional noise generated by the machinery used to undertake the work. This will primarily come from boat movements at the development site and from the installation of the underground cable to take the electricity back to the GSK Montrose site. In addition there may be short-term piling activities to install the 3 navigational markers which would be undertaken over the course of 1-2 days.
- 1.130. As the turbines are completely submerged during operation, there is not expected to be any noise or vibration detectable above the water. It has been concluded that noise from the Cygnus ISTT turbine will be of the same or lower magnitude that the background noise levels at all frequencies and over all operating conditions.
- 1.131. To mitigate against the impacts of noise on the local community during construction, a series of general mitigation measures are proposed including limiting scheduled working hours at the site during the construction phase to 08:00 to 19:00 Monday to Saturday inclusive. Work on Sundays or public holidays will only be conducted in exceptional circumstances or in an emergency. In addition inherently quiet plant will be selected where appropriate.

1.3.9 Onshore Traffic & Transport

- 1.132. An assessment has been undertaken which considered transport routes within the vicinity of the development and construction area, delivery of materials and routes that will be physically affected by construction activities along the cable route.
- 1.133. The assessment identified potential impacts including an increase in volume of traffic, damage to roads as a result of use by heavy vehicles and cabling, congestion and hazards.
- 1.134. It is considered that during all phases of the project the impact on onshore traffic and transport will be negligible and that during the laying of the onshore cable there is the potential for minor disruption in specific areas.
- 1.135. Consequently suitable mitigation measures will be implemented in consultation with Angus Council in order to reduce the level of traffic congestion during the construction period. These measures will include ensuring road disruption is minimised by developing a traffic management plan and timing some parts of the construction to take place at less sensitive periods.

1.3.10 Other Sea & Land Users

- 1.136. An examination of sea and land users who may be impacted by the proposed development has been undertaken. Typically these users will include local communities, businesses, tourists and those participating in recreational activities. These individual users are expected to experience positive as well as negative impacts and both possibilities are considered.
- 1.137. The users that have been considered potentially likely to be impacted include those undertaking marine extraction or disposal activities, those operating within the port, local businesses, local communities, recreational users including water sports and fishing and the RNLI.

- 1.138. The impacts on local businesses, academic bodies and GSK Montrose are considered to be positive with an increase in activity around the installation and maintenance of the turbines. Impacts on commercial shipping, sport fishing, tourism, the MOD and the RNLI are expected to be relatively insignificant. However there is a small potential impact on recreational and small boat users as the development of the tidal turbine array will require them to adjust the navigational routes through the estuary.
- 1.139. The mitigation of this impact is the provision of a revised navigation channel and appropriate navigational markings. In addition, an emergency response system will be set up to allow for the rapid shut down of the turbine array in the event of an accident or other safety issue.

1.3.11 Terrestrial Geology, Hydrology & Hydrogeology

- 1.140. The potential impacts on the land and water courses have been considered with reference to the proposed project development plan. The impact of the installation of the shore station to the north west of the bridge and the impact of the cable burial to the GSK Montrose site have been considered.
- 1.141. All aspects of the development site are in built up areas as the proposed substation will be located on an area of existing hardstanding while the proposed cable route will be located underground, parallel to an existing roadway so no ancillary development is intended to take place on areas of undisturbed or sensitive ground.
- 1.142. Although the potential impacts are therefore considered minimal, good practice will be employed and risk assessments will be undertaken before starting work. Appropriate measures will be undertaken to minimise any residual risk including spill prevention plans and appropriate storage areas for fuels or other potentially hazardous substances.

1.3.12 Terrestrial Habitats & Ecology

- 1.143. Ecological surveys at the site of the proposed development were undertaken in December 2010 and this included an assessment of terrestrial species which could be affected by onshore activities. A desktop study has also been undertaken which included a search of the information contained in the relevant databases.
- 1.144. The potential impacts of the development include disruption to or loss of terrestrial habitats, displacement of animals or important plants. As the on-shore development is situated on land which has been previously been developed for either the bridge foundations or road ways, none of the habitats are particularly sensitive and any impact is considered to be insignificant.
- 1.145. However, mitigation measures to protect terrestrial habitats and ecology will be employed as best practice.

1.3.13 Landscape, Seascape & Visual Impact

- 1.146. The landscape, seascape and visual impacts of the proposed tidal array and associated ancillary structures have been assessed. This process considered the potential changes to the character of the landscape and seascape of the area and also considered the effect on sensitive views within the area. A number of photo-montages were created to demonstrate the potential visual impact of the array development.
- 1.147. The major mitigating factor is that the development will be confined to a small area of the Montrose Estuary near the existing Rossie Island Road Bridge and Rail Bridge. The surrounding landscape character is expected to be unaffected by the development as the existing developments will contain the views and the tidal array will only act as an additional manmade element within the landscape.
- 1.148. As the turbines are completely submerged for the majority of the time and are situated in an area characterised by the busy port of Montrose, any visual impact from the turbines themselves is considered

to be minimal. In addition, some navigational marks will be required to mark the development, but these are set against a background of the existing port operations.

- 1.149. The visual impact from the immediate surrounding area was also assessed. The impact of visual amenity of the surrounding area is not considered significant due to the presence of man-made structures containing the development and will only have a minor change to the existing view.

1.4 Conclusion

- 1.150. GSK aims to be the greenest pharmaceutical company in the world. The pharmaceutical industry creates greenhouse gas emissions and therefore must contribute to the increasingly urgent global efforts to counter climate change. GSK is committed to reducing its impact and has set challenging energy and carbon reduction targets which will also support its business by cutting energy costs.
- 1.151. The proposal is to develop a tidal array in the River South Esk Estuary to provide electricity to the GSK manufacturing site as part of a balanced scheme of renewable technologies (wind and tide) which with the inclusion of the combined heat and Power plant already installed, will make the GSK site carbon neutral.
- 1.152. The tidal stream array will be installed in 2 phases over a period of 14 months, eventually having a capacity of up to 0.7MW and will contribute to meeting the Scottish Government's targets of providing 100% of Scotland's electricity from renewable sources by 2020.
- 1.153. The project comprises 15 tidal turbines with gravity foundations. The candidate devices are the Cygnus-ISTT which are under development at Swanturbines Ltd. These will transmit electricity to the shore with armoured cables where they are connected to a shore station. The shore-station comprises control systems and power conditioning equipment including switch gear and a transformer. The power is then transmitted to the GSK Montrose site using a buried electrical cable. The offshore site is marked by navigational markers and appropriate warning signs.
- 1.154. An Environmental Impact Assessment has been undertaken by Swanturbines Ltd on behalf of GSK. This has considered the range of potential impacts on the environmental receptors in the vicinity of the site. A Navigational Risk Assessment and Decommissioning Plan have also been produced for the project.
- 1.155. Although the proposed array is not within the boundaries of any designated sites, it is 200m away from the Montrose Basin which is designated as a Ramsar and SPA. In addition the River South Esk upstream of the Montrose Basin is designated as an SAC. The basin also qualifies as an SSSI site and Local Nature Reserve.
- 1.156. It is worthy of that that this scale of project (<1MW) would not normally require an EIA but due to the projects close proximity to various protected sites the developer agreed with the regulator to carry out an EIA to fully explore the potential impacts of the project.
- 1.157. It is not considered that the turbine array will significantly impact on the environment, but some uncertainties remain owing to a lack of information about the receptors and the technology. It is proposed that further investigations are undertaken prior to deployment to improve the level of understanding of the potential impacts from the array.
- 1.158. Worst case assumptions have therefore been made to assess the maximum possible severity of a particular potential impact. This conservative approach is intended to allow a progressive deployment in which the installation of the turbines is phased to allow gradual introduction to the environment and close monitoring of the effects. The initial assumptions will be validated and an appropriate level of mitigation used at each stage to bring the impact down to an acceptable level.
- 1.159. If the impacts are still considered to be unacceptable after the full level of mitigations has been applied, the turbines may have to be removed from the site.
- 1.160. If the impacts are shown to be acceptable, the turbine array will operate for a continuous period of 25 years before being decommissioned.

1.5 Further Information

Enquiries should be addressed to:

Mr Ian Morrow
Renewable Energy and Facilities Lead
GSK Montrose
Cobden Street
Montrose
DD10 8EA

