



# dublin array

An Offshore Wind Farm  
on the Kish and Bray Banks



## Environmental Impact Statement

Addendum February 2013

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Volume 1 of 5  
Non-Technical Summary (Rev. 1 - February 2013)

# **DUBLIN ARRAY**

## **An Offshore Wind Farm on the Kish and Bray Banks**

### **Environmental Impact Statement**

#### **Volume 1**

## **Non-Technical Summary** (Rev.1 – February 2013)

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## 1 Introduction

Kish Offshore Wind Ltd and Bray Offshore Wind Ltd propose to develop an offshore wind farm, to be known as Dublin Array, on the Kish and Bray Banks approximately 10 km off the coasts of Dublin and Wicklow (Figure 1.1).

The proposed development will comprise up to 145 wind turbines with a maximum blade tip height of 160m (max. rotor diameter of 130m and max. hub height of 100m) above mean sea level and associated infrastructure including the turbine foundations, inter-turbine/export cabling and offshore substation. It will be located within an area of 54 km<sup>2</sup> in water depths ranging from 2 to 30m.

The electricity generated by Dublin Array will be exported to the national grid via a subsea cable which will run from the offshore substation on the banks to a proposed connection point at the existing Eirgrid Substation in Carrickmines, Co. Dublin via an underground cable landfall site at Shanganagh, south of Shankill, Co. Dublin and north of Bray, Co. Wicklow (Figure 1.1). The project is one of only three offshore wind energy projects that has a grid connection available to it under the Commission for Energy Regulation's "Gate 3" process for awarding grid connections.



Figure 1.1 Development Layout and Cable Route

(Dashed Blue = Off-shore Cable Route, Purple = cable route on land) (OSI License No. EN0034812)

The Foreshore Acts, 1933 to 2009, require that a lease or licence must be obtained from the Minister for Environment, Community and Local Government, for undertaking any works or placing structures or material on, for the occupation of or removal of material from the State-owned foreshore. The foreshore is the seabed and shore below the line of high water of ordinary or medium tides and extends outwards to the twelve nautical mile limit. Foreshore Leases are generally granted under the Acts for development that requires exclusive use of the foreshore (e.g. jetties, bridges, piers, marinas, offshore wind farms and reclamation of any foreshore) whereas a Foreshore Licence is generally issued for a development that does not require exclusive occupation of the foreshore (e.g. repair work, some coastal protection work, undersea pipelines, cables, site investigation works and dredging works).

This project was awarded two Foreshore Licences in April 2001, one for the Kish Bank and another for the Bray Bank. These licences allowed the company to undertake preliminary site investigations and baseline surveys as part of an environmental impact assessment for the proposed development. The Foreshore Acts, and the terms of the Foreshore Licences granted to the project promoters, require that a Foreshore Lease application must be submitted to and granted by the Minister of the Environment, Community and Local Government prior to undertaking any work on the construction and operation of an offshore electricity-generating station.

An Environmental Impact Statement (EIS) was compiled on behalf of the project promoters to accompany the application for the Foreshore Leases for the project. The full Environmental Impact Statement describes in detail the need for the development, the process of site and cable route selection and the design, construction, operation and eventual decommissioning of the wind farm. It also assesses the environmental impacts of the proposed development on the physical, biological and human environments and identifies appropriate mitigation measures and monitoring.

The EIS comprises five volumes plus an Addendum. This document (Volume 1) represents the Non-Technical Summary of the EIS and aims to provide a concise summary of the proposal and its likely environmental effects for the non-technical and non-specialist reader. The main EIS, comprising the full environmental assessment for the development, is presented in Volume 2. Volume 3 contains the specialist environmental assessment reports that were commissioned for the EIS as well as details of consultations with interested bodies. The Zone of Theoretical Visibility (ZTV) maps and Photomontages that were produced to document the visual impact of the proposed development are presented in Volumes 4 and 5 respectively. An Addendum to the EIS was prepared in early 2013 and provides additional information in relation to certain aspects of the development. All of this material is being made publicly available on the project's dedicated website, [www.dublinarray.com](http://www.dublinarray.com)

## 2 Need for Dublin Array

At the 1997 World Summit Conference in Kyoto, Japan, a Protocol was drawn up which aimed at reducing emissions of the six main greenhouse gases from developed countries overall to 5.2% below the 1990 levels over the "commitment period" 2008-2012. This target is legally binding. The EU agreed to reduce emissions to 8% below 1990 levels over the period 2008-2012. Within this target, Ireland agreed to limit its production of the six greenhouse gases to 13% above 1990 levels over the same period. In the event that Ireland fails to meet its target under the Kyoto Protocol, Ireland will be penalised.

In March 2007, the Irish government published its White Paper on Energy entitled 'Delivering a Sustainable Energy Future for Ireland' which set out its policy framework for the period 2007 to 2020. It established targets of 15% of electricity from renewable energy sources by 2010 and 33% by 2020. In October 2008, the government increased the 2020 target to 40%. The White Paper noted that wind energy would provide the pivotal contribution to achieving the 2020 target.

In February 2008 the Minister for the Department of Communications, Energy & Natural Resources announced that the REFIT scheme will include offshore wind energy projects at a value of €14 per MWh. In September 2009 the offshore REFIT support measures were published by the Department. However, in 2012, Government announced that offshore REFIT would not be progressed at this time, due to the global economic downturn. However, at the same time, Government began to actively explore the possibilities for export of Irish renewable energy to the UK. Such renewable energy could include both onshore and offshore wind energy projects and there are several such projects actively seeking to connect to the UK and supply electricity in the medium term.

This process has now reached the stage where the Irish and UK Governments signed a Memorandum of Understanding on Energy Trading on January 24th 2013. At the signing of this agreement, Minister Rabbitte said:

"Ireland has the potential to generate far more wind energy than we could consume domestically. The opportunity to export this green power presents an opportunity for employment growth and export earnings which we must seize if we can. Today the two Governments are committing themselves to a programme of work.

"We will work closely with the UK government so we are in a position to move towards a formal agreement on energy trading. We will tease out the very complex engineering and market issues so that, subject to their successful resolution and a decision by UK and Irish Ministers to proceed, in a year's time, we will be in a position to make an intergovernmental agreement providing a formal basis for energy trading."

While Ireland enjoys a potential surplus of wind energy, the United Kingdom faces a number of challenges. Due to changes in policy in relation to coal and nuclear energy, the UK faces a substantial threat to energy supply from 2016 onwards. Ofgem, the UK regulator, have made it clear, that they will require imported energy to help meet the UK's energy needs. The UK also faces its own 2020 climate change targets. With the closure of nuclear plants and the decision by a number of nuclear project promoters not to pursue projects, the UK faces a challenge. This has been made more pressing due to a slowdown in onshore wind consenting in the UK. While the UK has ambitious long term plans for offshore, many of its projects are in deeper waters and are thus more expensive to develop than those in Ireland. The UK thus has a need for energy and a preference for green energy.

Because of this, the Governments intend to facilitate large scale wind energy projects that will contribute to the achievement of Irish and UK 2020 EU targets and security of supply. Dublin Array therefore has two potential routes to market. Government may, depending on the prospects for achieving current and future mandatory EU targets, proceed with a scheme to construct offshore wind energy for domestic consumption in Irish waters. If so, Dublin Array will be in a position to assist in the achievement of targets in this way. The revenue of the project in this case will come from sales of electricity onto the Irish market together with a market-based investment support initiated by Government.

Alternatively, the measures to be proposed in the forthcoming Inter Governmental Agreement in relation to green energy export may allow offshore wind energy projects in the Irish Sea to export renewable energy to the UK, either by way of "statistical transfer" as mandated by the EU Renewables Directive or by way of new interconnector cables across the Irish Sea. The revenue of the project in this case will come from sales of electricity onto the UK market together with a market-based investment support initiated by the UK Government. The exact nature of such a scheme is dependent on measures yet to be introduced by both Governments. However, it is clear as of the time of writing in February 2013 that both Governments wish to encourage Irish export projects such as Dublin Array. In this sense, it is important that projects such as Dublin Array are ready to proceed to construction once the relevant enabling framework is put in place by the authorities. Dublin Array is completing the necessary consenting programme in parallel with these government initiatives.

#### OREDP

In late 2010, the Department of Communications, Energy and Natural Resources published the Draft Offshore Renewable Energy Development Plan (OREDP) for public consultation. The main aim of the OREDP is to establish scenarios for the development of offshore renewables in Irish waters up to 2030 and set out a longer term vision for the growth of the offshore renewable energy sector. The publication of the Draft OREDP was accompanied by a report presenting the results of a Strategic Environmental Assessment (SEA) of the potential effects that the proposals contained in the OREDP would have on the marine and coastal environment of Ireland. The SEA considered three development scenarios (low, medium and high) in the period to 2030 as follows:

- Low Scenario - this scenario consists of the 800 MW of offshore wind which has access to grid connection offers under the Gate 3 process (Oriel, Sceirde and Dublin Array as outlined above). It also includes 75 MW of wave and tidal development included in the National Renewable Energy Action Plan (NREAP).
- Medium Scenario - the medium scenario comprises of 2300 MW of offshore wind on the basis of the non-modelled scenario presented in Table 10 of the NREAP (broadly based on the combination of offshore wind projects with either foreshore lease or grid connection - Arklow Bank (Phase 2), Codling Bank, Oriel, Sceirde and Dublin Array). It also includes 500 MW of wave and tidal energy included in the same table of the NREAP.
- High Scenario - the high development scenario originates from the OREDP SEA Scoping document and consists of 4,500 MW of offshore wind and 1,500 MW of wave and tidal energy.

It is noted that three projects, including Dublin Array, are considered as 'existing renewable infrastructure' for the purpose of the SEA.

Overall, the OREDP SEA concluded that, based on the extent of the offshore renewable energy resource within Irish waters, in particular offshore wind and wave energy, and

### 3 Site Selection

Ireland is internationally recognised as having one of the best wind resources in the world. There are numerous potentially excellent offshore wind farm sites off the coast of Ireland, particularly off the east coast in the Irish Sea where there are a number of coast parallel sand banks approximately 5 to 10 km off the Dublin and Wicklow coastlines. The Kish Bank and Bray Bank were earmarked several years ago by the project promoters as potentially suitable sites for an offshore wind farm installation, primarily due to their relatively shallow water depths, proximity to existing electricity infrastructure, proximity to the main Irish energy demand centre on the East coast and the potential for export to the UK using a marine cable and obvious wind resource potential.

The study area selected for the proposed wind farm development on the Kish and Bray Banks is defined by the Foreshore Licences issued to the project promoters by the Minister for Marine and Natural Resources in 2001, under the Foreshore Acts, 1933 to 1998, for the purpose of investigating the suitability of the area as a site for the ultimate construction of and operation of an offshore electricity generating station. It extends for approximately 3 km in the east-west direction and approximately 18 km in the north-south direction giving an overall study area in the order of 54 km<sup>2</sup> (Fig. 3.1).

Site selection, project design and layout for Dublin Array is the culmination of several years of feasibility studies, environmental assessments, detailed site investigations and baseline studies. The reasons why the proposed location on the Kish and Bray Banks is regarded as particularly suitable for such a wind farm development include the following:

- **Excellent wind regime** - Wind speeds offshore are generally higher than average onshore speeds and initial desk-based assessment concluded that wind speeds at the Kish and Bray Banks are high enough to justify conducting a feasibility study on the viability of installing an offshore wind farm. The project promoters arranged for the installation of meteorological instruments on the Kish Lighthouse at the northern tip of the Kish Bank in July 1999 to record wind speed and direction and the data provided on the wind resource at the site formed the basis for a wind yield assessment to determine the expected long term energy yield from a wind farm located on the banks. The results of this wind yield assessment confirmed the project promoter's expectations regarding the potential

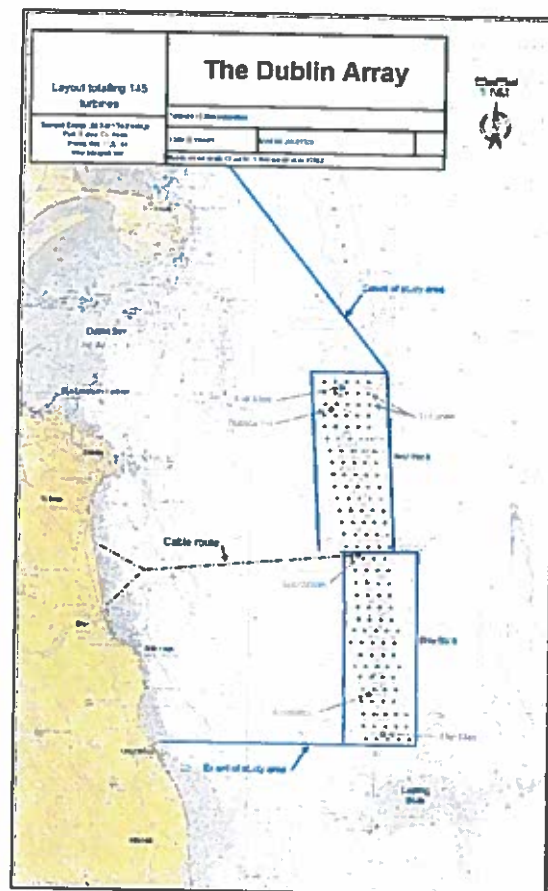


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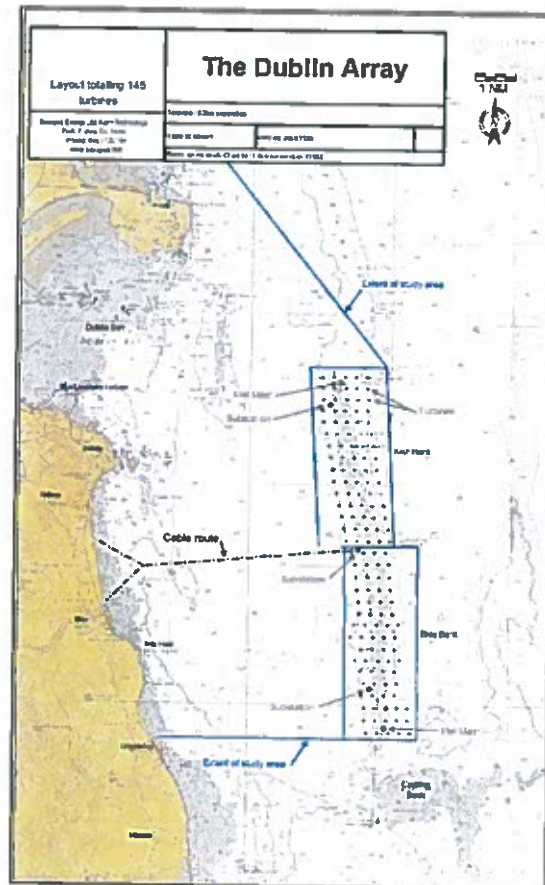


Figure 3.1 Study Area



wind resource at the site. This data has been further enhanced by using state of the art LIDAR (light detection and ranging) wind measurement instrumentation that was installed on the Kish Lighthouse in June 2010. The project promoters contribute wind data to Met Eireann from the Kish Lighthouse to assist in their forecasting work.

- **Low to medium water depths** - Current fixed foundation technology for offshore wind turbines limits their deployment to water depths of up to 40m. Lower water depths are also beneficial for the future operation and maintenance of the project. Existing bathymetric data for the Kish and Bray Banks, as represented on Admiralty Chart No. 1468, indicated water depths over the area of the site generally in the range of 2 to 30 m. These were confirmed by subsequent bathymetric surveys undertaken by the project promoters.
- **Site area** - A key factor in determining the viability of an offshore site is the overall area of the site and its capacity to accommodate a sufficient number of turbines. The area of the Kish and Bray Banks that was identified for exploration on the basis of suitable water depths for the deployment of turbines extended approximately 18 km north-south and 3 km east-west.
- **Suitable ground conditions** - The Kish and Bray Banks are submarine banks consisting mainly of sand and gravel. The banks' seabed conditions are suitable for the installation of offshore wind turbine foundations, and for the placement of subsea cables. This was verified in geotechnical investigations carried out by the project promoters which included a full seismic survey and borehole investigations.
- **Moderate Wave, Current and Tidal Climate** - Conditions in the Irish Sea are generally not as vigorous as those experienced on the more exposed Atlantic coast. This facilitates installation and also operation and maintenance.
- **No interference with established navigation channels** - Although the area around the Kish and Bray Banks is a busy one for shipping, with established marine transit routes passing to the north, south, east and west of the banks, no navigation channels cross the banks themselves on account of the shallow water depths. Indeed, these banks present a hazard to navigation. To this extent, it was deemed the presence of the turbines would help delineate a shipping hazard.
- **Proximity of ports for construction, operation and maintenance** - The Kish and Bray Banks site is easily serviced from several ports and harbours along the east coast, including Dublin, Arklow, and Wicklow. This is important for the project and also allows the opportunity to maximise the local economic benefits from both the construction and operational phases.
- **Available grid capacity and suitable connection point** - Dublin Array has a grid connection offer available to it under the 'Gate 3' process and a suitable connection point has been identified at the EirGrid Substation at Carrickmines, Co. Dublin. A suitable underground cable route onshore has also been identified.
- **Proximity to Ireland's principal electricity load centre** - Dublin Array is located close to the high population centre and industrial demands of the Dublin region and would be the closest renewable energy facility to Dublin.
- **Potential for export across the Irish Sea to the UK** - Dublin Array's location in the Irish Sea provides it with the option of exporting to the UK. The recent commissioning of the East West interconnector has put in place the infrastructure for trade. The recent signing of an agreement between the Irish and UK

governments, is putting in place the mechanisms to allow trade of renewables to happen.

## 4 Description of Development

The key components of the Dublin Array offshore wind farm development on the Kish and Bray banks will include the following:

- Up to 145 offshore wind turbines including associated foundations and scour protection
- Offshore substation
- Two meteorological masts of up to 100m in height
- Undersea cabling between the turbines and offshore substation (array cables)
- Undersea cable (export cable) between the offshore substation and the shore (landfall site)
- Underground cable between the landfall site and the proposed connection point to the national grid at Carrickmines substation.

It is envisaged, at this stage, that the turbines will be installed in a continuous operation over a two to three year period with work planned to commence in 2016. The actual construction programme will depend on several factors including the granting of foreshore leases and confirmation of the regulatory framework for connection to the grid and export of power from the wind farm.

There continues to be dynamic growth in the development of offshore wind turbines and on this basis it is not possible to specify at this stage the exact turbine model which will be installed on the Dublin Array. It is expected that the installed capacity of turbines will range between 3 and 6 MW, depending on when they are installed. The turbine hub heights will be between 85 and 100m above sea level, with a total height to the tip of the blades of no more than 160 m as measured from Mean High Water Springs (MHWS). The distance between the sea level at MHWS and the blade tip at the lowest point will be not less than 30 m.



Figure 4.1 Typical Offshore Wind Farm  
(Photo courtesy Vestas Wind Systems A/S)

The wind turbines at Dublin Array will be supported on a foundation consisting of a steel monopile and a transition piece. A monopile is a long cylindrical steel tube with a diameter in the range 4.0 to 6.5 m and is installed in the seabed to a depth of between 20 and 40 metres by a large special purpose ship or rig (Fig. 4.2). Some localised preparation of the seabed to remove large rocks or similar obstructions may be required prior to piling. Once the monopile is in place a transition piece is lifted on to the top of the pile and securely attached. The transition piece has ladders and platforms for maintenance access which are generally painted yellow so that they are clearly visible at sea. Once the transition piece is fitted the turbine tower is bolted onto a flange on top of the transition piece, at a point high enough above mean sea level to be above the highest predicted wave crest.



Figure 4.2 Installation of Steel Monopile at London Array Offshore Wind Farm

It is envisaged that Dublin Port will be the hub of operations for the installation process. The turbines will be installed using a large installation crane located on a specialist vessel, such as a jack-up vessel similar to that used for installing the monopiles.

Scour is the term that is used to refer to erosion occurring on the seabed as a result of local alterations of flows around obstacles such as marine foundations. Given the highly energetic sea current and tidal regimes that exist in the vicinity of the Kish and Bray Banks, it is envisaged that rock armour protection will need to be placed locally on the seabed around the base of each of the monopiles to minimise the effects of scour. The rock will be sourced from a quarry on-shore and be delivered to Dublin, Arklow or Wicklow Ports where it will be loaded on to a specialist vessel which will transport the material to the site and place it onto the seabed.

The turbines within the wind farm will be connected to each other in groups by low voltage submarine array cables which will transmit the power generated by each turbine to the offshore substation. The array cables will be buried in the seabed using a plough which forms the trench, installs the cable and backfills the trench in a single operation.

The proposed offshore substation will be located towards the centre of the array and is likely to be supported on a multipile foundation structure. A typical offshore substation is illustrated in Figure 4.3. At the offshore substation the voltage will be increased for transmission along a higher voltage export cable to the shore for connection to the national grid.



Figure 4.3 Typical Offshore Substation

The proposed cable route to connect the offshore substation to the grid connection point onshore is illustrated in Figure 1.1. The first part of this route will be along the seabed from the substation at the centre of the array to the proposed landfall site in the townland of Shanganagh, Co. Dublin approximately 2 km north of Bray. The cable will be buried beneath the seabed using similar techniques to those described for the inter-turbine array cables. In order to minimise any impacts on existing ecology in the intertidal region it is intended that the last section of the offshore cable route will be completed by directional drilling under the beach and cliff face.

From the cable landfall, the connection of the project to the National Grid will be completed by means of an underground cable to the ESB Substation at Carrickmines, Co. Dublin approx. 6.5 km north west of the landfall location (Figure 4.4). The underground cable route will travel along a route which has been subjected to both an archaeological and a terrestrial ecological assessment and then be routed along public roads to the connection point at Carrickmines Substation. The project promoters have already had discussions with Dunlaoghaire Rathdown County Council regarding necessary licensing agreements with the relevant roads authority along this route to facilitate the installation of the cable along this route.

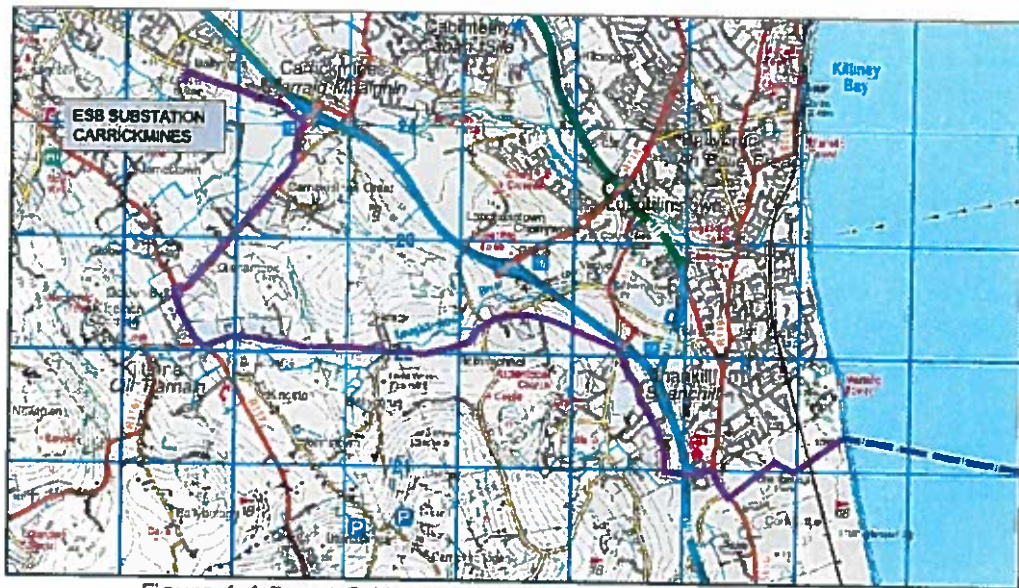


Figure 4.4 Export Cable Landfall and Indicative Onshore Cable Route  
(OSI License No. EN0034812)

During construction of the wind farm a number of construction activities will need to take place onshore and it is envisaged that the project promoters will lease space from Dublin Port to facilitate these operations. Dublin Port has made such facilities available in their recently published Masterplan. The facilities that would be required would include the following:

- Storage for major turbine components such as towers and rotors
- Storage and assembly areas for piled foundation sections and transition pieces
- Covered area for dry working
- Berths for construction vessels
- Other temporary storage facilities
- Fuel storage facilities
- Staff offices and canteens.

## 5 Summary of Environmental Impacts

In order to assess the potential environmental impacts of the proposed development on the Kish and Bray Banks and surrounding area, a series of detailed investigations was commissioned by the project promoters. These investigations, which were carried out by experts in each area of study, sought to establish the physical, ecological and human baseline conditions of the study area, and to document the likely impacts of the proposed development on these environments. The information provided by these investigations assisted in shaping the site design and allowed the most effective mitigation measures to be selected to minimise the environmental impact of the development.

Full details of the Environmental Impact Assessment undertaken for the project are presented in the main body of the Environmental Impact Statement (Volume 2), while the full specialist reports are supplied in the Appendices contained in Volume 3.

### The Physical Environment

The Kish and Bray Banks occur as part of a series of coast-parallel north-south trending offshore banks along the east coast of Ireland. The scientific literature indicates that near-shore Irish Sea sandbanks such as the Kish Bank and Bray Bank formed as moraines (immobile mounds of glacial debris). These moraines are now overlain by mobile sand and gravel. Water depths on the Kish and Bray Banks vary between 2 and 26 m. The area of the banks shallower than 20 m is 35 km<sup>2</sup>, of which 33% (10 km<sup>2</sup>) is shallower than 10 m. The largest waves in the area come from the south to southeast direction, with some input from the northeast. The banks experience a southern flow during ebb tides and a northern flow during flood tides, with maximum tidal velocities of 2.2 knots (1.13 m/s) being experienced close to the banks. The results of the borehole drilling and seismic surveys that were carried out on the banks in 2008 have indicated that the banks contain thicknesses of sand and gravel from 5 m to 35 m, with a stiff clay underlying these. Results of a hydrodynamic modelling assessment undertaken on behalf of the project promoters in late 2012 show that the upper sand layer within the banks is mobile and capable of successive erosion and deposition taking place over spring and neap tidal cycles. Overall net sediment transport characteristics reveal a clockwise circulation along the banks with a northwards trending residual flow on the west side and southwards trending residual flow on the east. Such residual flow pattern maintains the sand banks integrity by retaining sediment within the circulation.

During the construction period there would be an increase of suspended solids in the vicinity of the banks as a result of piling of foundations and cable laying. These increases would be short term and confined to the immediate area of construction. The hydrodynamic modelling assessment showed the proposed development would have an insignificant effect on the sediment transport processes of the banks and on bank stability. The installation of turbines on the banks would create obstacles in the water that would interfere with local flow patterns, which may result in local scour development. Scour protection will be deployed around the base of the foundations to mitigate the effects of local scour. The effects on water depths would be negligible. The development would not affect coastal stability, coastal defences or erosion processes.

In conclusion, the proposed development would have an insignificant effect on the hydrography and sediment transport processes of the banks, and the effects on coastal stability and coastal erosion would be negligible. During the initial construction phase, monitoring would provide valuable insights into scour effects that may be incorporated into later stages.

## The Human Environment

### Noise

The only noise from the construction of the proposed wind farm with potential to be of significance onshore is that from the installation of the turbine foundations. The project site is approximately 10 km from the shore, and it is predicted that noise from this installation and the rest of the construction process, as experienced onshore, would be below the recommended daytime noise limit, specified in the EPA Guidance Note for Noise. Considering the distance from the closest habitation to the proposed turbines, the impacts of piling operations in terms of nuisance noise during the construction of this project are considered to be insignificant.

A noise intensity profile map was produced by a leading wind turbine manufacturer for the type and size of turbines typically used on a project of this size. These calculations concluded that operational noise levels received onshore along the coast would be significantly less (< 30 dB(A)) than existing background noise levels. It follows that turbine noise would have no discernible or measurable effect on overall ambient noise levels, and that turbines would be inaudible even when the wind blows directly onshore. In periods of calm, the turbines would be silent.

### Marine Navigation

The area in the vicinity of the Kish and Bray Banks is a busy one for shipping, with marine transit routes passing to the north, south, east and west of the banks. However, due to the dangerous nature of the shallow water and wave action that is posed by the banks to shipping, there are no shipping routes that cross the banks. The volume of recreational traffic in the form of pleasure craft that cross the banks is small for the same reasons. Fishing is mostly confined to areas inshore from the banks.

During construction, working areas will be established and clearly marked in accordance with the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Marine Buoyage System (MBS). Shipping traffic will be excluded from the immediate vicinity of construction works to ensure safety for workers and mariners. However, this would not have an impact on commercial shipping, as ships do not make use of the banks.

During the operational phase of the wind farm, trawling within the wind farm boundary would be discouraged to minimise potential damage to cables. It is expected that this would not have an adverse effect on fishing since the incidence of trawling on the Kish and Bray Banks, particularly bottom trawling, is negligible. The setting of pots for whelk will not be affected. Notices will be placed on the turbines forbidding vessels from mooring alongside the turbines.

The northern part of the turbine array extends into the Dublin Port approaches and into the area of coverage of the Dublin Port Vessel Traffic System (VTS). However, Dublin Port Company have confirmed that this does not present an issue for them. Any other impacts on onboard radar equipment would be insignificant.

In order to minimise the risk of collision of vessels with turbines, the turbines will be marked and fitted with lighting in accordance with the requirements of the Commissioners of Irish Lights.



### **Submarine Cables and Pipelines**

Given that Ireland is an island state, it is connected by several existing and proposed submarine power and telecommunications cables and gas pipelines to the UK, continental Europe and the USA. The operation, maintenance and development of these key utility connections is vital to the economic development of the state and it is important therefore that offshore wind farms and other renewable energy developments are located away from active and proposed cables and pipelines in order to enable utility owners access for any necessary maintenance and repairs. There are no active submarine telecommunications cables, power cables or pipelines in the vicinity of the proposed Dublin Array Offshore Wind Farm development. Similarly, the proposed submarine cable between the wind farm and the proposed land fall site near Bray will not cross any existing cables.

### **Aviation**

There are a number of licensed aerodromes/airports on the east coast in the vicinity of the Kish and Bray Banks including Dublin Airport, Baldonnell Military Aerodrome, Weston Civil Aerodrome and a private aerodrome at Newcastle, near Greystones, Co. Wicklow. Consultations with the Irish Aviation Authority have confirmed that they have no objections to the proposed development. As required by the IAA, the turbines will be fitted with aviation lights in accordance with OAM 09/02 "Offshore Wind Farms Conspicuity Requirements". As required under the Obstacles to Aircraft in Flight Order, S.I. 215 of 2005, notification of the erection of turbines will also be provided to the IAA.

### **Military Activity**

Given the absence of designated Military Practice and Exercise Areas and Danger Areas in the vicinity of the proposed development and the shallow depth of water over the banks it is not envisaged that there would be any significant military use of the waters in the vicinity of the proposed development. Consultations with the Department of Defence have confirmed that the construction and operation of the wind farm will not have an impact on their activities.

### **Television Reception and Broadcast Signals**

Given the switchover to digital terrestrial television and the switch off of existing analogue signals in October 2012, modelling has indicated that there will be no interference to digital or satellite television reception on the east coast in the vicinity of the proposed development. Consultations with mobile phone network operators confirmed they had no objections to the proposed development.

### **Minerals, Oil and Gas**

There will be no impacts upon activities relating to production or exploration for oil and gas.

### **Socio-Economic Effects**

The Irish Economy is currently undergoing a significant recession. Unemployment is running at over 14%, with over 400,000 people on the live register. However the 'green economy' and in particular the significant energy resource associated with potential wind, wave and tidal energy projects within the Irish EEZ has been identified as a key potential contributor to Ireland's economic recovery. The Government's *Action Plan for Jobs 2013*, acknowledges the important contribution that renewable energy projects can make. Positive impacts on the local, regional and Irish economy would result from the construction and operation of Dublin Array.

The design, construction and commissioning of Dublin Array would result in an investment in the order of €2 billion. The construction phase would involve a broad range of business activities drawn from civil, marine, wind turbine and electrical engineering, as well as legal services, banking, environmental consultancy and support services. It is estimated that the construction phase of the project would employ over 600 people both onshore and offshore over a period of 2-3 years. The local economy would benefit from the influx of construction workers during this construction period. Local, direct employment would also be created through the provision of support services such as shipping, transportation, rental of port facilities, environmental monitoring, legal and accounting services and plant hire.

At least 250 full time equivalent jobs would be created by the proposed wind farm on the Kish and Bray Banks (Deloitte "Jobs and Investment in Irish Wind Energy, 2009"). These jobs would primarily be local jobs and would, therefore, result in a boost to the local economy. Furthermore, these jobs would be technical, skilled jobs and jobs that could not be out-sourced, given the requirement for the operational staff to be local to the site.

There is also a strong case to be made that this project can contribute to the development of job opportunities based on the development of projects in the Irish Sea zone, both in Irish and UK waters. Since the development of the limited Arklow Bank project a number of firms have been established, initially to work on that project, which are now working on UK wind farms. A number of trade events, held in Dublin and Belfast would indicate that through Enterprise Ireland and Invest NI, that there is considerable interest from Irish companies in the development of supply chain opportunities in the Irish Sea. Indeed, the authorities in Belfast, through a pro-active campaign of relationship building within the sector have attracted the major multinational Dong to the city, with the creation of 300 jobs. Iconic company Harland and Wolff now relies on the renewable industry for the majority of its current business. The aim is to make Belfast a renewable energy hub. The same could be achieved in Dublin or another port on the eastern seaboard.

### **Traffic**

Given the fact that most major deliveries, including turbine components and foundations, associated with the construction of the Dublin Array Offshore Wind Farm on the Kish and Bray Banks will be by sea either directly to the wind farm site on the Kish and Bray Banks or to Dublin Port for offloading, storage, prefabrication to required lengths and loading onto specialist vessels prior to delivery to the site, the main HGV deliveries to the Port will be those associated with delivery of rock armour for scour protection (if Dublin Port is used for trans-shipment) along with miscellaneous smaller quantities of other materials. It is not envisaged that the traffic movements associated with such deliveries will have a significant impact on existing traffic movements at the Port or in the greater Dublin area given that the recent investment in road infrastructure including the Dublin Port Tunnel and upgrading of the M50 enables the Port to currently handle up to c. 13,000 HGV movements per day. Similarly, it is not envisaged that the slight increase in passenger vehicle traffic movements associated with personnel travelling to and from the Port during both the construction and operational stages of the project will have a significant impact on traffic given that there are currently over 4000 people employed in the Port area.

## Archaeology/Cultural Heritage

Both the Kish and Bray Banks are areas of high potential for underwater archaeology, particularly in the form of shipwrecks as the banks have presented natural navigation hazards for several centuries and represent the location of a large number of vessels that have foundered due to bad weather, grounded on the banks at low tide or a combination of both. Pre-development archaeological assessment of development in a marine environment, such as the proposed Dublin Array Offshore Wind Farm on the Kish and Bray banks, is required under the EU Environmental Impact Directives 85/337/EC and 97/11/EC.

Wrecks greater than 100 years old and archaeological objects found underwater are protected under the National Monuments (Amendment) Acts 1930 to 1994. The Act also allows the imposition of an Underwater Heritage Order to protect sites of historical, archaeological or artistic importance. This can, in exceptional cases, include wrecks less than 100 years old. Under the Merchant Shipping (Salvage and Wreck) Act 1993 the Director of the National Museum of Ireland (NMI) has a statutory role regarding dealing with notifications from receivers of unclaimed wreck and the retention on behalf of the state of unclaimed wreck if it is of archaeological interest.

As part of the consultation process for the Environmental Impact Assessment, the project promoters consulted with the Development Applications Unit of the Department of the Environment, Heritage and Local Government (DoEHLG) and were advised that the area to be impacted should be subject to an underwater archaeological impact assessment, the scope of which was included in the written correspondence received from the Development Applications Unit, in advance of any works taking place.

The project promoters engaged Hydrographic Surveys Ltd and Headland Archaeology Ltd to undertake an underwater archaeological assessment of the areas to be impacted which included the Kish and Bray Banks themselves, the seabed for the cable route from the banks to the foreshore, the foreshore itself and immediate land areas selected for the proposed cable landfall. The project promoters commissioned a magnetometry and side-scan sonar survey from Hydrographic Surveys Ltd following consultation with the Department of Environment, Heritage and Local Government. Hydrographic Surveys completed this survey during summer 2008 and, as part of their study, commissioned Headland Archaeology to complete a desk-study of the existing literature and to assess the findings of the surveys.

Since 1751 forty-eight ships have been recorded as lost on the Kish and Bray Banks. A relatively recent side-scan sonar survey of the Kish and Bray Banks by Wheeler *et al.* (2000) revealed only two identifiable shipwrecks. Wheeler *et al.* noted that the high-energy current and tidal conditions on the Kish and Bray Banks suggest a low preservation potential for wrecks.

Both the installation of turbines and the laying of cables between turbines, combined with the laying of the export cable to shore have the capacity to damage remains of archaeological interest through mechanical disturbance. Because of this, the project will adopt a strategy of avoidance in relation to archaeological artefacts. The project promoters have already done extensive surveying and will undertake to do more, ensuring that the project can remove any archaeological concerns during the project design phase.

Thus far, the project promoters have identified a number of sites which have already been incorporated into the project's planning. In completing the archaeological surveys on the banks, and the subsequent desk study, a total of 32 targets of possible significance were detected. A total of 4 of these coincide with the locations of known

wrecks, or are very likely associated with known wrecks, given their proximity to the wrecks

A survey of the proposed cable route to shore was also included as part of the side-scan sonar survey and subsequent desk study. In total 12 potential targets were identified, which will require confirmatory surveys at the construction stage.

The knowledge gained in these and future surveys will be of critical importance to the project design.

The immediate landfall area (at which the cable to shore would reach the shore located at Shanagh, Co. Dublin) was also subjected to a metal detector survey and desk study, both completed by Headland Archaeology. The findings of these surveys were that the area in question was not of archaeological significance and that the chances of future archaeological finds in this area is extremely low.

The initial section of the onshore cable route was also assessed by Headland Archaeology and some amendments were made to avoid areas of potential archaeological significance. The remaining section of the onshore cable will be ducted underground along public roads and is unlikely to have an archaeological impact on this basis.

### **Commercial Fisheries**

The Irish Sea supports commercial fisheries for cod, plaice and sole, all of which fall under the remit of the EU Common Fisheries Policy (CFP), as well as significant fisheries for nephrops, crabs, scallops, razors and whelks. Herring and sprat are the main pelagic fish species recorded in the Irish Sea.

The main fishery in and around the banks is for whelks which are primarily landed into Dun Laoghaire harbour and, to a lesser extent, into Howth by small boats. The surrounding area is extensively trawled for haddock, plaice and spur dog, although very little trawling occurs inside the 20 m depth contour area around the banks. In addition Welsh and Spanish boats are reported to trawl the surrounding area for ray. The Bray Bank is too dangerous to trawl, due to the shallow nature and associated wave characteristics, and, therefore, acts as a sanctuary for fish. This area is utilised by sea angling excursions, where tope and spurdog are caught in large numbers. On the shallows of the banks flounder, plaice, dab, gurnard, whiting, coalfish, haddock and codling are caught. Mussel seedbeds are important to the Irish bottom mussel culture industry. While mussel seedbeds have been located inshore from the Kish and Bray Banks and on many sites to the south of the banks, they have not been located on the Kish or Bray Banks themselves.

Potential impacts on fish communities in the area of the proposed development include the effects of noise and vibration, electromagnetic field (EMF) and changes in water quality. The construction noise associated with the installation of the monopile foundations for the turbines was identified as having the greatest potential to cause significant impact. However, only three fish were identified as being known to spawn within the development site, namely lemon sole, sprat and the prawn, all of which have extensive spawning grounds around the Irish coast. Given the limited duration of the underwater construction work, the mobility of fish species and associated capability to avoid the area during the works, the extensive habitat available and mitigation measures that will be used, including cofferdams and soft start piling, it was concluded that the works would not have a significant impact on fish.

Potential impacts on commercial fishing activity depend on the type of activity involved. The use of static gear would not be affected. This means that the setting out of pots for

whelk or similar shellfish would remain possible in the presence of the turbines. Indeed, rock armouring could provide habitat suitable for lobster and other crustaceans fished for with static gear. The use of bottom trawls for plaice would not be possible in the vicinity of the turbines. However, since the Bray Bank is already too dangerous to trawl and little trawling takes place close to the crest of the Kish Bank, this impact would be minimal.

## **Landscape**

The Visual Impact Assessment of the proposed development on the landscape and seascape was prepared by Macro Works Ltd. on behalf of the project promoters. A 30 km radius study area was defined for the proposed development at the Kish and Bray Banks and zone of theoretical visibility (ZTV) maps were prepared to identify the extent of the proposed wind farm's visibility. A general landscape description concerning essential landscape and seascape character of the study area with respect to landform, vegetation, land use and structure was prepared. The capacity of the existing landscape to accommodate change was assessed and the most sensitive areas from which the development would be seen onshore were identified. Viewshed reference points (VRPs) were selected from within these areas from which to document the visual impact of the proposed development in detail. The local authorities were informed of the proposed VRPs and invited to comment on them. A photomontage was prepared from each of these VRPs. All photomontages included the cumulative effect of the consented Codling Bank and Arklow Bank wind farms if these wind farms were visible from the VRP site. If there was overlap between the turbines of Dublin Array and one of the other developments, additional photomontages were produced to depict the impact of Dublin Array's turbines in isolation. The visual impact of the development was assessed from the resulting photomontages.

A detailed description of the likely visual impacts of the proposed development is provided in the main EIS (Volume 2), while the ZTV maps and photomontages are presented in volumes 4 and 5 respectively. Due to the linear layout of the development that runs parallel to the coastline, the visual impact of the development would be significant from many viewpoints along the coast. The site layout design, which consists of regular rows of turbines, ensures that the turbines appear in regularly spaced rows from most viewpoints. The east coast from Rush in north Dublin to Wicklow town in the south is already heavily influenced by human development, while the western Irish Sea is a busy one for marine traffic. While the wind farm would be visible from many points along the coast, it would be set in the context of a landscape that has a tolerance for man-made developments.

## **Water Quality, Air and Climate**

There is a risk of spillage of potentially polluting substances, such as oil and grout, during construction and operation of the wind farm. This risk will be minimised by ensuring that all materials that are to be used during construction be approved for use in the marine environment. Potentially polluting substances will be stored in bunded containers to prevent contamination in the event of leakage. Contractors will be required to put preventive measures in place to prevent spillage of contaminating substances, particularly when grouting is being performed during construction.

Since the wind farm would produce electricity that would otherwise be produced from fossil fuel burning power stations, it will have a positive impact on air quality and climate, by reducing emissions of greenhouse gases and other pollutants.



The area of the site impacted by construction is not expected to cause changes to food sources on the bank and therefore any such potential impact during this period of construction is expected to be very low.

Effects from offshore cable laying operations in the wind farm area would be short term and localised to the seabed resulting in the magnitude of the potential impacts being low to negligible. Such operations are not thought likely to cause significant impacts on seabirds and the seabed is expected to recover within the short term. Therefore the predicted impacts are determined to be very low.

Most seabirds identified as key species fly at altitudes of less than 7m. The significance of the potential risk of birds colliding with the turbines ranged from low to very low depending on the key species. While gannets and divers are considered to be the most susceptible to collision as a result of their flight and dive height, studies from other offshore wind farms have shown that these species actively avoid the wind farm therefore reducing the likelihood of collision. Collision risks were also considered negligible or zero for the four most important species on the nearby Codling Bank: namely Manx shearwaters, guillemot, shags and razorbills and not significant for kittiwakes and gannets. This combined information has resulted in the magnitude of collision risk for all key species being determined as low or negligible.

The magnitude of the disturbance to feeding sites is thought to be medium for a number of species based on the percentage of the Irish population recorded feeding in this area i.e. the Manx shearwater, shag, terns and razorbills. Some species where the percentage of the population is less than 5% is considered to be of low magnitude. A reduced sensitivity is expected in breeding birds (or rapid habituation during the breeding season) where alternative feeding sites are not available and this may see the magnitude for terns such as the Roseate tern being reduced and consequently the potential impact being subsequently determined as low. Similarly the common and arctic terns are also predicted to enter the wind farm but to avoid the turbines.

Gannet and shag are found along our coast all year, although some gannets migrate south to southern Europe and the west coast of Africa. The herring gulls appear to be resident in Ireland. Adults are generally non-migratory. Kittiwakes are migratory spending most of the winter in the north Atlantic far offshore and thus the proposed development is not along its migratory route. The Arctic tern is a summer migrant from Antarctic waters. There is no evidence that the proposed Dublin Array would act as a barrier to migrating species and based on the magnitude of the potential impact all species have been predicted to have a low to very low impact in relation to migration.

An increase in gull numbers is predicted to include the little gull, herring gull and great-black-backed gull due both to resting opportunities on the foundations of the turbines and/or the attraction to increased ship traffic.

In relation to the disturbance of flight paths at wind farms there was little direct effect of the wind farm on the passage of roseate terns at Carnsore Point wind farm, however at the Kentish Flats wind farm the common terns have shown a change in their flight path used to return to their colonies. There was little evidence to suggest a disruption in the flight plan of any other bird species at the Kentish Flats and monitoring surveys at Horns Rev have indicated that habituation may occur as the birds such as scoters gain experience. Therefore the magnitude of impact on all key species is low resulting in the predicted impacts to be low and very low which also reflects the key species baseline sensitivity; see Table 8.12 in Volume 2 of this EIS.

The assessment of impacts on birds was carried out by firstly determining the sensitivity of the bird species that make use of the banks. This was done by determining the numbers of birds that use the banks from the results of the survey data. These numbers





marine mammals was undertaken on behalf of the project promoters by BEC Consultants in order to inform the Appropriate Assessment for the project. This assessment is included in the Addendum to the EIS.

Marine mammals common in the Irish Sea include the harbour porpoise, bottle-nosed dolphin, common dolphin and common and grey seal. All Irish waters were declared a sanctuary for whales and dolphins by the Irish government on 7 June 1991. All cetaceans and seals found within Irish waters are afforded national and international protection, and for the purposes of this study are considered to be of high sensitivity. There is currently only one Special Area of Conservation (SAC) designated for marine mammals on the Irish east coast. Grey seal is a Qualifying Interest for the Lambay Island SAC (site code 000204), which is approximately 20 km from the proposed Dublin Array. However, since the completion of the Dublin Array EIS, the Department of Arts, Heritage and the Gaeltacht has proposed the Rockabill to Dalkey Island pcSAC (site code 003000) for designation for the protection of harbour porpoises.

The main impacts of the development on marine mammals during construction would be from noise and disturbance due to construction activities, particularly during the installation of the foundations. However, due to their high degree of mobility and sensory awareness, marine mammals would tend to avoid the construction area over the period of disturbance.

In order to minimise the negative effects of the development on marine mammals, the use of cofferdams, MMOs (marine mammal observers) and a soft-start procedure will be instigated during the foundation installation. The assessment concluded that a temporary reduction in the activity of harbour porpoise within a range of 10 km of active piling operations will not be significant and that the overall effects on marine mammals will not be significant.

### **Terrestrial Ecology**

The initial section of the onshore cable route from the proposed landfall site at Shanganagh will extend underground from the seashore under the railway line and across Shanganagh Park to the R119 regional road on the western side of the park. An assessment was carried out of the potential impacts of the installation of the underground cable ducts along this route on terrestrial ecology. The initial proposed cable route across the park was amended on the basis of this assessment to avoid a section of woodland and a badger sett. It was considered that, subject to this amendment and appropriate mitigation measures, the installation of the underground cable ducts across the park would not have a significant impact on terrestrial ecology.

## 6 Cumulative Impacts

There are currently two proposed offshore wind developments that have already secured a foreshore lease and, separate to this, there are three offshore wind projects that have received grid connection offers under the Gate 3 process. Both a grid connection and a foreshore lease are necessary for projects to be developed.

The two foreshore leases which have been granted to date are for the operation of a 520 MW wind farm on the Arklow Bank, and a 1,100 MW wind farm on the Codling Bank both in the Irish Sea off the Wicklow coast. Seven turbines, totalling 25.2 MW have been installed on the Arklow Bank.

Three offshore wind farm projects have secured access to approximately 800 MW of grid connection capacity under the Gate 3 process. These include the Dublin Array which has secured access to 364 MW, as well as Oriel Wind Farm which is located in Dundalk Bay (330 MW) and Fuinneamh Sceirde Teoranta (100 MW) in outer Galway Bay on the Atlantic coast.

There are also several existing and permitted offshore wind farm developments in the eastern Irish Sea off the west coast of the UK.

Dublin Array has considered the possibility of cumulative impacts based on publicly available data for these projects. Areas considered likely to involve cumulative impacts included commercial fishing, birds, mammals, socio-economic and visual impacts.

It is noted that the Offshore Renewable Energy Development Plan (OREDPP) concluded that the development of up to 1200 MW (less than 5 arrays) and 1800 MW (less than 7 arrays) in Assessment Area 1 (East Coast – North) and Assessment Area 2 (East coast – South) respectively would have a negligible to negative cumulative impact. The Dublin Array is split between these two assessment areas.

It is concluded, given the localised nature of many of the potential impacts and the significant extent of similar habitat available in the Irish Sea and around the coast that cumulative impacts will not be significant.

## 7 Concluding Statement

In accordance with the requirements of EU and Irish regulations, an Environmental Impact Statement (EIS) was compiled on behalf of the project promoters to accompany the application for the Foreshore Leases for the Dublin Array Offshore Wind Farm on the Kish and Bray banks. The full Environmental Impact Statement describes in detail the need for the development, the process of site and cable route selection and the design, construction, operation and eventual decommissioning of the wind farm. It also assesses the environmental impacts of the proposed development on the physical, biological and human environments and identifies appropriate mitigation measures and monitoring.

The Environmental Impact Statement concludes that, subject to the appropriate mitigation measures being put in place, there will be no significant adverse impacts on the physical, human and biological environments resulting from Dublin Array.

Dublin Array will generate renewable energy from a zero carbon sustainable source. The project offers the opportunity to harness Ireland's exceptional wind resource to stimulate investment and create jobs. The project will assist Ireland's economic recovery by the creation of a new export resource. Should the Government choose, the project can also make a major contribution to Ireland's climate change targets as indicated in a number of policy documents including the National Renewable Energy Action Plan. It can also help increase our long term security of energy supply.

### **Further Information**

*Further information can be obtained by contacting:*

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