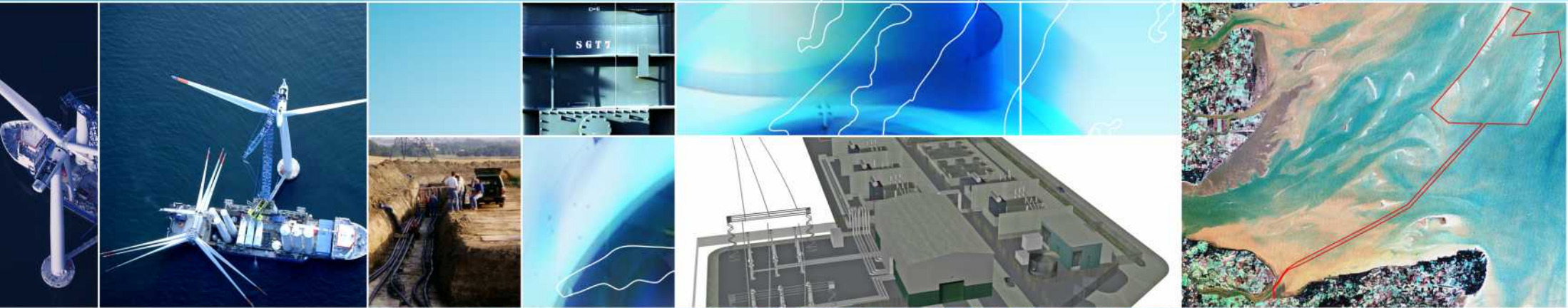


# Environmental Statement



**Non-Technical Summary**  
**London Array Limited**  
**June 2005**



A development proposed by:



Environmental Statement produced by:





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## Introduction

London Array Limited consisting of Shell WindEnergy Ltd, E.ON UK Renewables Developments Ltd and CORE Ltd (referred to herein as London Array) is proposing the development of an offshore wind farm located in the Outer Thames estuary, one of the three strategic areas the Government has identified for the 2nd Round of offshore wind farm development.

The proposed wind farm would be situated midway between the Kent and Essex coastlines, more than 20 km (12 miles) from each shore. It would consist of up to 271 turbines, installed on the Long Sand and Kentish Knock banks and in the Knock Deep channel that lies between. It will occupy an area of up to 245km<sup>2</sup> in water depths ranging from 0 to 23 m.

The wind farm will be connected by undersea cables to a new onshore substation at Cleve Hill in North Kent. From the substation, the electricity will go into the existing transmission network. Once completed, the installed capacity of the wind farm will be 1,000 MW, generating an average of 3,100 GWh of electricity per annum; enough to supply 750,000 homes. This is equivalent to a quarter of the domestic supply for Greater London or all of the homes in Kent and East Sussex.

Subject to obtaining the necessary planning and environmental consents and licences, construction of the onshore substation will begin in late 2006 in time for commissioning of the first phase of the project in 2008. The wind farm will be constructed in four phases with completion scheduled for 2010. London Array have been awarded a 50 year lease for the site from The Crown Estate.

The aim of the proposed development is the generation of energy from a zero carbon, renewable source, to contribute to the government's target of generating 10% of UK electricity demand from renewable sources by 2010. London array will provide almost 10% of the target and will prevent the emission of 1.9 million tonnes of carbon dioxide a year by displacing electricity from fossil fuelled power stations.

The full Environmental Statement describes in detail the need for both the onshore and offshore works, the process of site and cable route selection, the design, construction, operation and eventual decommissioning of the wind farm. It also assesses its environmental impacts in relation to the existing biological, physical and human environments and identifies appropriate mitigation measures and monitoring.

This Non-Technical Summary aims to provide a concise summary of the proposal and its likely environmental effects for the non-technical and non-specialist reader.

## The Need for London Array

In December 1997 the 3rd Conference of the Parties met in Kyoto, Japan as part of the implementation of the United Nations Framework Convention for Climate Change that had been agreed in Rio in 1992. They proposed a global cut of 5.2% of greenhouse gas emissions by 2008-2012, compared to the 1990 levels. This treaty became known as the "Kyoto Protocol" which came into force earlier this year following ratification by the Russian Federation in November 2004. To date 150 countries have ratified the Treaty accounting for 61.6% of global greenhouse gas emissions.

Members of the European Community and other developed countries have set legally binding targets for reducing emissions. The UK Government is committed to reducing levels of greenhouse gas emissions to 12.5% below 1990 levels by 2008-2012. In addition to its Kyoto commitments, the UK Government has set itself a domestic target of a 20% reduction of CO<sub>2</sub> emissions, below 1990 levels, by 2010.

In November 2000, the Government published the UK Climate Change Programme, which outlines the target areas and policies through which it aims to achieve these targets. The programme includes expansion of the production of energy from renewable sources.

The UK Government states that its main objective in the energy sector is to work towards the target of obtaining 10% of the UK's electricity supply from renewable sources by 2010, with an extension of this target to 15% by 2015 and an aspiration that by 2020 the renewables share of the electricity supply will be increased to 20%. The development of renewable energy is vital to the Government's CO<sub>2</sub> reduction targets as well as providing security of energy supply and international opportunities that could benefit the UK economy.

The UK's Chief Scientific Adviser, Sir David King stated in an article in 2004:

*"In my view climate change is the most severe problem that we are facing today, more serious even than the threat of terrorism."*

Meeting this challenge will require a radical change in the way we produce and consume energy. Wind energy will play a key role. The London Array project is an example of the energy industry responding positively to the Government's Renewables Obligation. It is nevertheless a commercial venture and, if consent is

granted, the project will still have to prove its economical viability before contracts will be awarded to allow construction to commence.

At a regional level, the Draft Energy Efficiency and Renewable Energy Strategy sets a regional target for the South East:

*"There will be a progressive and substantial increase in energy efficiency and deployment of renewable energy so that by 2026 at least 16% of the region's electricity generation capacity will be provided from renewable sources. This will be achieved through well-designed development that reflects the tenets of sustainable development and encourages new business and employment."*

Wind power continues to be the fastest growing form of electricity generation globally, with a growth rate which exceeds 30% annually. By the end of 2003 global wind power capacity had reached more than 40,000 MW, with over 70% of this located in Europe. In total, this provides enough power to satisfy the needs of around 19 million households, close to 47 million people (Source: Greenpeace, Windforce 12).

Britain is acknowledged to have the best offshore wind resource in Europe. London Array aims to be a flagship project for the emerging but rapidly growing offshore wind industry and provide the UK's first, if not the world's first, gigawatt scale wind powered electricity generating station.

## Project Alternatives

### Offshore Site

In 1999 an environmental feasibility study was commissioned to establish the best location for a large scale wind farm in the Thames estuary. The study brief was to find the most suitable site to accommodate not less than 1,000 MW and included a large area of search lying more than 15 km offshore but with a maximum water depth of 25 m, to avoid prohibitive foundation costs. It assessed a range of environmental issues, sensitivities, constraints and risks to development, including cable routes to potential onshore grid connection points. It was possible to eliminate areas where development would be technically difficult, due to water depth, sea bed conditions or environmental sensitivity, or where a project would impact existing maritime interests such as shipping channels and aggregates extraction sites. Particular attention was paid to the stability of the sandbanks within

the study area. The study identified an area of approximately 245 km<sup>2</sup> bounded by the Long Sand bank to the northwest and Kentish Knock to the southeast as the most appropriate area to locate the development.

Although the nearest turbines are more than 20 km offshore, the site falls entirely within the 12 nautical mile Territorial Limit. It is located within the Thames estuary Strategic Environmental Assessment area, defined by the DTI and The Crown Estate in 2003 as one of the areas where applications would be invited in the 2nd round of UK offshore wind farm developments.

The current refined site design is the culmination of more than four years of environmental and other feasibility studies and detailed site investigations. The reasons why the location is regarded as particularly suitable for a large-scale offshore wind farm include the following:

- Excellent wind regime;
- Low to medium water depth;
- Minimum interference with established navigation channels;
- Proximity of ports for construction, operation and maintenance;
- Suitable ground conditions;
- Available grid capacity and suitable connection point;
- Proximity to the UK's principal electricity load centre.

The development area, as currently proposed, includes buffer zones between the edges of the site and the nearest turbines, particularly adjacent to buoyed shipping routes in Fisherman's Gat and Black Deep. It does not encroach upon active aggregate extraction areas to the north of the site.

### Cable Route and Grid Connection

The site selection for the onshore substation connecting the wind farm to the National Grid, and the cable route to the substation, were matters requiring careful judgment. The proposed site at Cleve Hill and the proposed cable route to the substation site were chosen after several other sites, in particular Grain Power Station, had been carefully considered taking into account commercial, technical and environmental factors.

Cleve Hill was selected as the best option for the following reasons:

- The cables to shore will not cross the dredged sections of any shipping channels;
- The substation site lies outside national or international nature conservation areas;
- The substation and cable route are not close to built up areas;
- The cables to the substation will not cross any roads or railway lines;
- The cable route through The Swale SPA is shorter than for alternative connection sites in the vicinity;

In addition, the substation can be set back into Cleve Hill and the cut material used for earthworks to screen the substation and to eliminate the need for offsite disposal of spoil.

### Consenting Requirements and Environmental Impact Assessment

The term 'Environmental Impact Assessment' (EIA) describes a procedure to be followed for certain types of development. Legislation requires that the London Array project undertakes a full EIA to support planning and licence applications.

The project will be constructed in phases with different partners in London Array being responsible for separate phases of the project. Applications for offshore turbine arrays will be based upon the 'indicative layout'. (Figure 1)

The EIA has assessed the "worst realistic case" within clearly defined parameters that will govern or define the full range of development possibilities and has considered the most onerous environmental scenarios for every aspect of the project. This process defines clearly the potential boundaries of the development and describes the maximum possible impact.

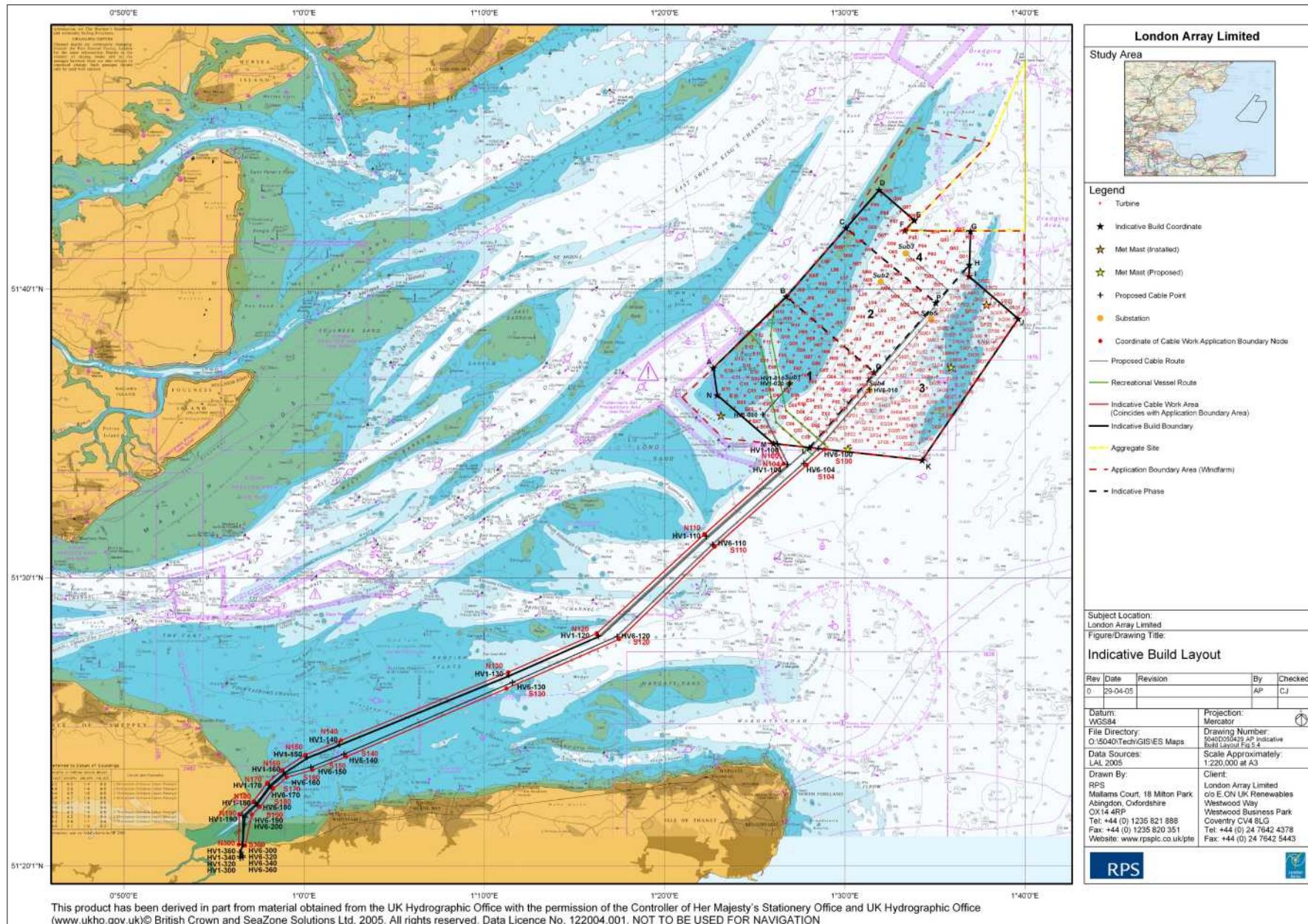


Figure 1. Indicative Build Layout for London Array.

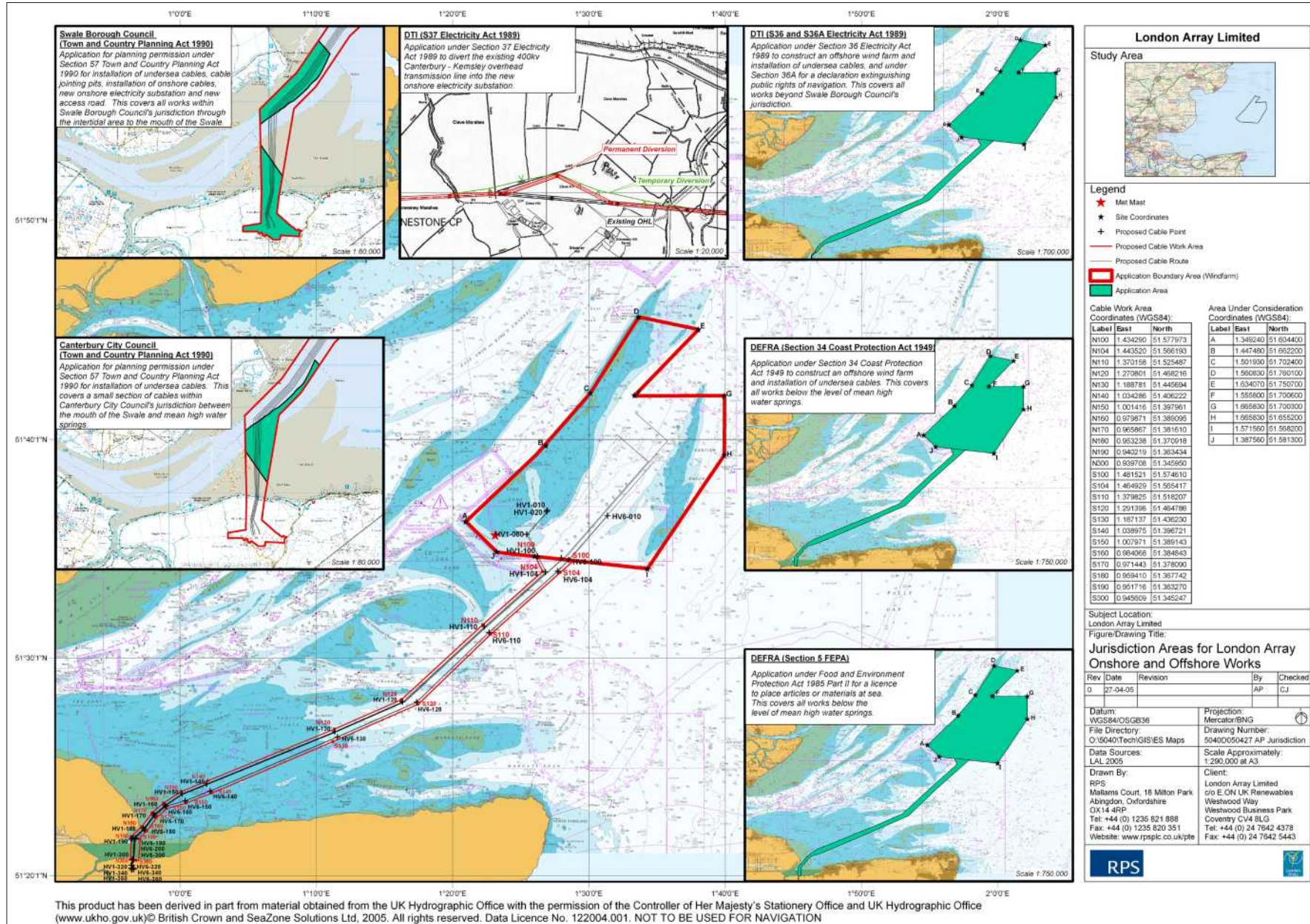


Figure 2. Jurisdiction Areas for London Array Offshore and Onshore Works.

The principal licences, consents and permissions required for London Array are summarised below, in terms of both the commonly used shorthand as well as the legislative context and presented in Figure 2:

FEPA licences	(Food and Environment Protection Act 1985)
Section 36 consent	(Section 36 Electricity Act 1989)
Section 36A declaration	(Section 36A Electricity Act 1989)
Section 37 consent	(Section 37 Electricity Act 1989)
CPA consent	(Section 34 Coast Protection Act 1949)
Planning permission	(Town and Country Planning Act 1990)

All but the last of these applications will be submitted to and determined by the DTI and Defra. The planning permission for the onshore substation at Cleve Hill and installation of cables in The Swale will be submitted to Swale Borough Council and Canterbury City Council. All of the applications will coincide with the issue of this Environmental Statement and, with the exception of the Section 37 consent, the applicant will be London Array. National Grid will apply for the Section 37 Consent required for the transmission line diversion works associated with the connection of a new substation at Cleve Hill.

Other permissions that will be needed to support the project and for which applications will be made at the appropriate time include:

FEPA disposal licenses	(Food and Environment Protection Act 1985)
Safety Zones	(Section 95 Energy Act 2004)
Water Resources Act	(Section 109 Water Resources act 1991 and Bye Laws under Schedule 25)
Land Drainage Act	(Section 23 Land Drainage Act 1991)
River Works Licenses	(Port of London Act Part V and Medway Ports Authority Act 1973)

## The Project Construction Process

The key components of the London Array wind farm are:

- Up to 271 offshore wind turbine generators;
- Up to five offshore substations;
- Up to four meteorological masts (one is already installed);
- Undersea cabling between the turbines;
- Up to six undersea cables (export cables) from the wind farm to shore;
- An onshore substation.

The turbines will be built over a three to four year period. The table below shows a likely construction programme for the wind farm. The actual construction programme will depend on several factors, including the date that full consent is granted.

Phase	Start of construction	Commissioning and completion
1	April 2007	October 2008
2	April 2008	October 2009
3	April 2008	October 2009
4	April 2009	October 2010

Rapid developments in wind turbine technology may allow installation of larger and more efficient turbines in the later phases of the project. For this reason, it is expected that the installed capacity of turbines will range between 3 MW and 7 MW, depending on when they are installed.

While the exact turbine models cannot be specified at this stage, the turbine hub heights will be between 85 m and 100 m above sea level, with the total height no more than 175 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 not be less than 22 m.



The turbines will be installed on the seabed on specially constructed foundation bases. Three types of foundation are currently being considered:

- Steel monopile - a hollow steel cylinder driven into the seabed;
- Gravity base foundation – a large concrete/steel structure that sits on the seabed and remains in position purely by the weight; or
- Tripod foundation - a frame with three or more legs pinned to the seabed usually using driven steel piles.



The foundations would be prefabricated onshore, from where they will be loaded onto transport barges or floated directly to the site. Installation is likely to be carried out from a jack-up or floating vessel. A final decision on the type of foundation will be made after technical investigations during the design phase have established the characteristics of the seabed.

The turbines are expected to be installed using an installation crane of suitable size located on a specialist jack-up vessel. The turbine components will be transported to site either already on the jack-up vessel or to the jack-up on a barge or another jack-up. The installation crane lifts the turbine components from the jack-up or barge onto the foundation.

Experience has shown that it normally takes 24 hours to position the jack-up and erect a turbine, requiring a total of 4-5 lifts per turbine to complete the installation. The bottom tower section is installed first, followed by the top tower section. The nacelle is then lifted onto the top tower section and finally the rotor and blade assembly is fixed to the hub at the front of the nacelle.

The presence of obstacles on the seabed will alter local flows around the structures which may lead to scouring of the seabed. Scour protection material may be placed

around the base of the turbine foundations and cable route to minimize the effects of scour.

The wind turbines are connected to each other in groups by array cables that transmit the electricity to offshore substations. Several groups of turbines will be connected to each substation. It is expected that up to five offshore substations will be required. The height of the substation will be up to 40 m above sea level. Each substation will increase the voltage before transmitting power along the 50km submarine transmission cable to the proposed landfall in The Swale Estuary. The cables are expected to be buried at depths of between 0.5 and 3 m. The array cables and the transmission cables will be installed using one of three methods; ploughing, trenching or jetting subject to local conditions.



From the proposed landfall, underground cables will be laid to a new onshore substation, situated 800 m from the shoreline at Cleve Hill, near the village of Graveney and located directly beneath the existing Kemsley – Canterbury North section of the 400 kV overhead lines. To accommodate the new substation the existing overhead transmission line would be diverted northwards, with three existing towers being replaced by three new towers of a different design.

The proposed substation would be located on the north side of Cleve Hill, close to the existing farm buildings at Cleve Farm. The site for the substation would be cut into the north face of Cleve Hill at a level of 6.4 m to avoid the risk of flooding. The substation would be linked to the Seasalter Road by a new access road.

The largest building would be the National Grid switch house. This building will be about 40 m by 20 m and about 12 m in height.

Up to six transformers would be required, to convert the output from the offshore wind farm to 400 kV, the operating voltage of the existing overhead lines. Each transformer will be enclosed in individual noise enclosures and will be about 10 m in

height. The transformers will be installed in phases, to match the construction and phasing of the offshore works.

There will also be auxiliary services buildings on the substation site, which would be about 8 m in height and switching equipment which would be about 5 m in height.

By the time the first two phases of the project are commissioned, civil construction of the onshore substation will be substantially complete and most of the electrical equipment will have been installed, with the remaining equipment installation activity being dependant on the timing of subsequent project phases.

## Summary of Offshore Environmental Impact Assessment

The overall study area is characteristic of a large estuary, which is influenced by both strong tidal currents and wave action. The coastline is generally low lying, other than in the vicinity of Margate, where it is rocky and rises to 20 m. The shore is characterised by marsh areas, estuaries, backwaters and tidal flats that are havens for wildlife.

### The Physical Environment

Assessment of coastal process effects has been made under a 'realistic worst case' scenario that involves some over-representation of the scheme boundaries, turbine numbers, positions and foundation options. This has been necessary to allow appropriate flexibility in the final engineering design process to ensure design optimisation.

Overall, no significant impacts on the physical environment from the construction, operation or decommissioning are expected to occur. Potential disturbance is expected to be relatively small in magnitude, localised and short term along the cable route and around the location of each turbine position as a result of the operation of construction vessels, installation of piles, interconnecting cables and scour protection. Potential impacts are comparable to disturbance from natural processes such as storm and flood events and other marine activities including commercial shipping, trawling and dredging activities.

The effects of the construction, operation and decommissioning of the wind farm on the wave, tidal current and sediment regime are expected to be insignificant and

localised. No significant alterations are anticipated to the direction or magnitude of regional sediment transport patterns.

During cable laying operations, localised increases in turbidity may cause a temporary deterioration in water quality in relation to its aesthetic quality and Shellfish Water and Bathing Water standards. The effect of this is expected to be minor and temporary in nature. A baseline assessment of historic sediment contamination within the site and along the cable corridor revealed that only a small number of samples across the site exceeded thresholds required to affect local biology.

Recommended mitigation measures against scour are firstly, to ensure that cable burial is of sufficient depth to prevent bed changes leaving cables exposed on the surface of the seabed and secondly, the use of materials around the base of turbine foundations to prevent scour from occurring. Following such mitigation measures, the operational effect of the wind farm on the coastal processes is likely to be insignificant, irrespective of which foundation option is finally selected.

### The Biological Environment

#### *Birds*

This assessment concluded that the only bird group that could be significantly affected by the development, assuming a precautionary worst-case scenario, would be divers, primarily red-throated and to a lesser degree black-throated.

Less significant effects could also potentially affect other species including gulls and migratory waterfowl. During the course of aerial and boat surveys over three seasons, it has been established that divers over-winter off East Anglia, the Thames estuary and off the Kent coast in much greater numbers than was previously understood. These numbers are sufficient to justify classification of a substantial proportion of the east coast and Thames estuary as European Designated Sites for these species.

The impacts on divers could be either displacement from a zone around the wind turbines or the risk of collision with the turbines. This does not mean that there will be a significant impact, but that there is currently insufficient data on the interaction of divers with offshore wind farms to be certain that such an impact would not occur.

To mitigate against the potential displacement effects on these birds the site area has been reduced to avoid some of the key areas for the divers. In addition to this pile driving will be avoided in the peak diver period from mid-November to mid-March.

### *Marine Ecology*

The potential effects of the proposed development on marine ecology include disturbance to benthic invertebrates, marine mammals, fish species and communities, inter-tidal communities and marine flora. Construction activities will result in minor habitat disturbance however the affected area will be highly localised and extremely small and the timescales will be short.

Invertebrate communities identified during surveys are common throughout the Thames estuary with no previously recorded nationally rare or scarce benthic species in the immediate vicinity of the proposed development site. Aggregations of *Sabellaria spinulosa* (Ross worm) were found in small numbers; however an extensive survey revealed no Sabellaria reefs.

Benthic communities will experience disturbance of sediments and increased levels of suspended sediments and turbidity during construction of the turbines and the installation of cables. The increased level of suspended sediments will be very limited in magnitude and short term. The communities in the area are well adapted to disturbed sediments and high levels of suspended sediments and likely to be capable of rapid recovery.

Due to the turbid nature of the waters together with the lack of hard substrata, there is no significant sublittoral plant growth, with seaweeds being found in negligible amounts, while seagrasses are virtually limited to inter-tidal areas. Eelgrass beds within The Swale are sensitive to increases in turbidity. To mitigate against this potential effect the inter-tidal cable route was changed specifically to avoid damaging the eelgrass and mussel beds lying to the west of the study site.

Construction activities may result in the release of historically contaminated sediments with potential consequences for water quality and ecology. Analysis of sediment samples taken across the site and along the cable route revealed that only a small number of samples across the site exceed thresholds that indicate the potential for a contaminant to affect biology. Therefore this disturbance is not expected to cause a significant release and redistribution of contaminants into the surrounding environment.

Scour protection, if used, represents an opportunity to enhance the suitability of the area for a wide variety of encrusting epifauna such as tubeworms, bryozoans, hydroids, sponges and tunicates and larger mobile organisms preferring cryptic hiding places such as many fish and crustaceans, including lobsters.

### *Fish*

The fish fauna of this region has been well documented and the estuaries and coastal waters contain a diverse number of species including 10 sharks and rays and 100 bony fish (Swaby and Potts, 1998). Important commercial fisheries in the Thames estuary include sole, herring, skate (thornback ray) and sea bass. The Thames estuary is also regarded as a major spawning and nursery ground for Sole and the largest nursery grounds for sea bass in the southern North Sea. All of these nursery grounds are very close inshore, although the inshore end of the cable route passes through them, they are well away from the proposed wind farm area.

Many smaller fish species are important as prey items for larger fish and birds, including small gobies and flatfish, especially sole, dab, solenette and plaice. However these species are almost entirely limited to the areas close inshore, including the inshore end of the cable route and not to the region around the proposed wind farm.

Impacts on fish communities in the area could occur through the effects of, sound and vibration, changes in water quality and electromagnetic field (EMF) effects. Construction noise has the greatest potential to cause major impacts however this will be short term and have no long term effect. The most important commercial fish which have, or are likely to have, important spawning grounds within or close to the proposed development are sole and possibly rays, both of which are non-hearing specialists and therefore unlikely to be seriously impacted. In addition, given their high mobility and mitigation measures including the use of soft start during piling activities to allow vacation of the area, the impact is considered to be minor.

It is unlikely that the fish species would be injured directly from the cable laying or anchorage given their mobility and general awareness of their environment. The presence of the turbines may encourage aggregation of fish around the foundations, although the total fish populations in the area may not necessarily increase significantly. The overall long term impact of the development would therefore be potentially beneficial in the local area.

### *Marine Mammals*

Marine mammals, including whales, dolphins, porpoises and seals, are present within the outer Thames estuary. Construction noise has the potential to injure or kill marine mammals in close proximity to the noise source. However given the high mobility of marine mammals and mitigation measures including the use of soft start during piling activities to allow vacation of the area, the impact is considered to be minor.

Within the wind farm site there would be a reduction of fishing activity. This would provide refuge to marine mammals offering shelter and better foraging. Although the habitat itself would remain largely the same, prey fish populations could increase.

## The Human Environment

### *Seascape*

The effect on the landscape of the proposed development is considered minimal as the nearest land is situated some 21 km from the nearest turbine (Figures 3a and 3b). Meteorological Office data indicates that the proposals would not be visible from any land-based receptors for at least 55% of the time, which is equivalent to 200 days a year. Furthermore, the visual baseline comprises a dynamic scene of human activity including commercial shipping and fishing vessels and a range of smaller recreational craft.

Visual impacts would potentially result from construction activity, with its associated craft and lifting gear, during installation of the bases and erection of towers, nacelles and blades. These impacts would be intermittent, for example during lifting operations, and would be temporary, lasting only for the duration of each construction phase.

Visual impacts while at sea would depend on the intervening distance involved in each case. The proposed wind farm site is more than 20 km from the coast, where most recreational activity takes place, and there are no main passenger ferry routes close to the site. Visual impacts arising on these marine based receptors would generally be negligible/slight to moderate. Where fishing boats, commercial traffic and recreational cruising vessels pass within 5 km of the site; substantial visual impacts may temporarily arise.

Depending on atmospheric conditions and visibility, night-time visual effects will result from the aviation and navigation lights fitted to the turbines. London Array has worked with the Civil Aviation Authority and Trinity House Lighthouse Service (THLS) to achieve a safe standard of aviation and navigation marking without introducing unnecessary light pollution. As a result, due to the distances involved and the visual baseline of a continuous background of well-lit commercial shipping and navigation marks, land-based receptors would not experience significant adverse visual effects at night.

### *Pipelines and Cables*

There will be no impact upon existing or proposed pipelines. Cables from the London Array site will cross the cable routes for the Kentish Flats offshore wind farm and the proposed BritNed cable route. Where this occurs, accepted construction techniques will be employed to minimize the impact on seabed topography and suspended sediment. The cable crossing points would be monitored on a routine basis to ensure the integrity of the cables.

### *Oil and Gas Exploration and Related Activities*

There will be no impact upon oil and gas related activities.

### *Dredging and Disposal Areas*

There are a number of commercial sand and gravel extractions activities ongoing to the north of the proposed development area, although no existing marine aggregate operations are located within the wind farm site or cable route. An area previously licensed to British Dredging extends into the eastern end of the development on to Kentish Knock but is no longer used. Consultation with Crown Estate has indicated no plans to extend these areas or license new ones that may affect the study area

### *Electro Magnetic Fields and Heat*

There appears to be no definitive conclusion that the EMF produced from undersea cables results in an impact, either negative or positive, on electro-sensitive marine fauna. There is total agreement however that more detailed and targeted research is required on the subject. However, it can be concluded that any impact resulting from submarine cables buried 0.5 to 3 m under the seabed is likely to be very localised and insignificant in magnitude.



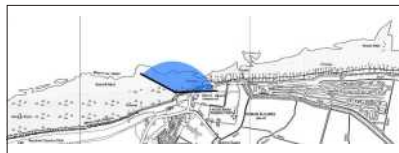
Figure 3a. Photomontage from Reculver, adjacent to St. Mary's Church facing North.



Figure 3b. Computer Wireline from same viewpoint.

**Key:**

	Phase 1		Phase 3
	Phase 2		Phase 4



Grid Reference:	E622561, N169325	Height of camera above ground:	1.5 m
Location:	Reculver	Angle of view:	143°
Date of Photograph:	6 October 2005	Distance to nearest turbine:	27km
Lens Focal length (35 mm format):	50 mm	Distance to furthest turbine:	47.5 km
Ground Elevation AOD (m):	5.6 m		
Direction of View:	16°		

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Localised temperature increases in the water column from electric cables are negligible and are considered to be well within the annual temperature variations of the waters in this region, whether at the wind farm site or along the cable route to shore.

### Archaeology

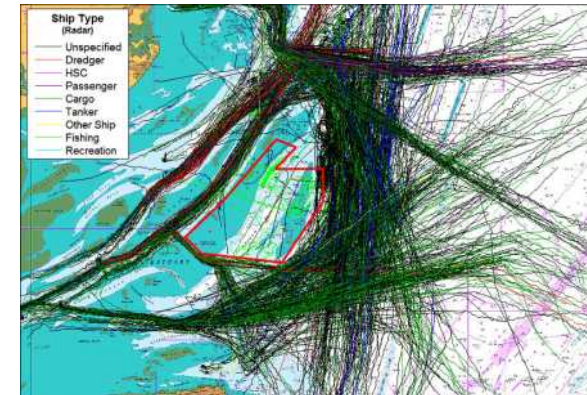
The potential for archaeological remains to be found within the proposed development, along the cable route and onshore is high due to the maritime heritage of the area and submerged historic landscapes across the Thames estuary. From historic data and a detailed survey, the study area is known to contain 19 terrestrial sites and monuments and 104 maritime records, including wrecks and finds of terrestrial archaeology offshore. A detailed plan of monitoring and mitigation measures during construction will be implemented in line with England's heritage related planning guidance and legislation.

### Navigation and Shipping

While the London Array project is located in the Thames estuary, a busy area for commercial shipping, because of the physical characteristics of the site, it has limited merchant vessel activity within it. With the exception of a small number of dredgers, there will be negligible impact on the routing of commercial vessels. London Array has undertaken a risk assessment of the safety of maritime navigation and has taken into account Marine Guidance Note 275 issued by the Maritime & Coastguard Agency (MCA) with respect to navigation risk assessment, turbine markings and other safety provisions. MCA has also been consulted on the effects of turbines on navigation radar. As a result, the site layout has been adjusted by removing turbines to achieve adequate separation between the turbines and shipping in Black Deep and Fisherman's Gat, particularly within Fisherman's Gat Precautionary Area.

In addition to the radar effects discussed with MCA, the Port of London Authority (PLA) has expressed concern that radar equipment on certain vessels can produce reflections of the wind turbines in positions to mask real targets and accordingly increase the risk of collision. They are particularly concerned about the Fisherman's Gat Precautionary Area. London Array has had several discussions with PLA on this issue and will continue to explore with them the extent of any additional risk, in the context of the available suite of aids to navigation safety and the location of turbines adjacent to the Fisherman's Gat Precautionary Area.

The potential risk created by displacing recreational vessels into busier commercial shipping channels has been mitigated through the provision of a marked channel through Foulger's Gat. Other risks to recreational craft are minimised through the turbine design (air draught clearance), emergency shutdown system, navigational markings and individual numbers on each turbine, as well as having an access ladder and platform which could be used by a vessel crew in distress. Furthermore, the site will be marked according to Trinity House Lighthouse Service (THLS) recommendations and marked on Admiralty Charts.



London Array intends to request the Secretary of State to issue Notices under Section 95 of the Energy Act 2004 for safety zones around structures, both during construction and afterwards for the operational life of the wind farm. Temporary safety zones during construction will be marked by navigation buoys and there will be marked channels for recreational craft. Along the cable route, temporary advisory safety zones will be implemented in the vicinity of the cable laying operations, where appropriate in conjunction with the relevant Port Authority. On completion of each phase of construction, permanent safety zones will be requested within 500 m of offshore structures, to prevent or regulate activities such as trawling, drift netting and anchoring that introduce risks to the safety of structures or equipment and individuals on vessels.

### Commercial Fishing

Commercial fishing takes place across the entire inner and outer Thames estuary area to greater or lesser extents. The scale of the proposed London Array Offshore Wind Farm could adversely affect the marine environment and possibly those industries and communities dependent on it.

Generally fishing fleets from each port have distinct fishing grounds, predominantly within 10 km of their home-port and away from the proposed development site.

Limited fishing activity was identified at the wind farm site from the shipping survey, over-flight data and discussions with local fishermen. The main fishing activities were trawling and drift netting. The safety zones will effectively preclude the majority of current fishing activity from taking place within the site. Wind farm maintenance vessels will provide a measure of safety zone enforcement capability. There is a very small risk that this may displace fishing vessels into surrounding areas leading to conflict with commercial shipping.

London Array has engaged in several consultative meetings with fishers to determine the most appropriate means to address possible impacts. This may include a compensation package to assist those fishers directly impacted by the development and the establishment of a community fisheries trust to help offset the knock-on effects on the remaining fishers resulting from increased competition from the displaced vessels. The safety zones will effectively reduce fishing intensity within the site, which may in turn provide refuge for spawning stocks.

### *Shell-Fisheries*

Shell fisheries in the Thames area are mostly small scale, with vessels under 10 m in length and generally operate within 15-20 nm of their homeport. The main commercial shellfish collected around The Swale include oysters, cockles, whelks and Whiteweed. The Thames estuary is also one of few areas classified as A under the Food Hygiene regulations, an important factor in the reputation of the highly reputed 'Whitstable Oyster'.

The proposed cable route passes south of Kentish Flat into Whitstable Bay before proceeding along the main channel into The Swale. Cable laying activity will result in localised disturbance to the seabed however this will be short-term and not significant. There are no active shell fishery interests within the offshore site or turbine array.

### *Marine Vessel Traffic System (VTS)*

Radar coverage in the PLA vessel traffic system's area of interest is provided by a network of radars along the Kent and Essex coastlines. The construction of a wind farm between a radar and an area of interest to the vessel traffic system, such as a navigation channel, may cause the performance of that radar beyond the wind farm to be degraded because of radar shadowing effects. Although the same area may be covered by one of the other radars, the reliability of the overall system may be prejudiced in the affected area. London Array undertakes to ensure that the

operational requirements of the VTS system are maintained after the construction of the wind farm.

### *Military Activity*

Consultations with the Ministry of Defence have confirmed that the construction and operation of the wind farm will not impact on their activities.

### *Munitions*

A study has been undertaken to identify the probability of encountering buried, unexploded munitions. A large number of magnetic anomalies were detected within the wind farm site and along the cable route. There is a high probability of encountering buried unexploded ordnance during the installation of foundations and cables. A detailed site examination will be undertaken prior to disturbance of the sea bed for any construction activities and an Explosives and Ordnance Disposal Specialist will be present when survey and installation work is undertaken.

### *Aviation*

Consultations with the National Air Traffic Services Ltd (NATS) have confirmed that the wind farm will not have a material impact on their services. The Civil Aviation Authority (CAA) provided guidance on the aviation lighting and advised the project to consult with Kent International Airport (KIA).

The London Array Wind Farm is sufficiently far from KIA to have no direct impact on air traffic control. However, turbines may be detectable on the airport's radar. The primary radar at KIA is scheduled for replacement soon, which should resolve any issues related to the London Array turbines. Alternatively, radar data could be made available from the NATS radar at Debden in Essex.

### *Television, Radio and Fixed Microwave Links*

Wind turbines can affect TV rebroadcast links if they are situated in the direct path between the main and relay transmitters. The routes of all the rebroadcast links around the Thames estuary have been examined and there are none that cross the Thames estuary.

### *Socio-economic*

All of the local ports in the Thames estuary have been assessed for suitability to base both the construction and ongoing operation and maintenance of the London Array project. Although the final decision on location of construction ports will be made by the principal contractors, London Array will locate its operation and maintenance base in one of the local ports providing 30 to 60 full time jobs with a further 20 or more required for scheduled maintenance during the summer months.

These figures do not include the service boat personnel required to transport the maintenance crews to and from the site. If local ports are successful in attracting the construction business, then many more jobs will be created. In addition to the direct jobs, the local economy will benefit from the procurement of materials and services to the project. This indirect effect will create further employment opportunities.

## Summary of Onshore Environmental Impact Assessment

The onshore works for the London Array include the landfall of the marine cables from the wind farm; the breaching of the sea wall; the construction of jointing chambers to the south of the sea wall; the route of the cables across the borrow pits and arable farmland; the construction of the access road; the cut and fill operations at Cleve Hill for the substation platform and the construction of the substation. In addition, National Grid will replace and realign three towers at Cleve Hill and restring the existing Kemsley - Canterbury North 400 kV overhead line.

### *Historic Environment*

From historic data and a detailed survey of the area, no significant known extant features are directly affected by the works. However, there is a potential for currently unknown archaeological remains to exist within the area of the proposed works.

An existing pillbox on the site of the proposed substation will be removed by construction works and there will be an indirect adverse impact to the setting of the adjacent observation post and pillbox on the field boundary. There will be no direct adverse impacts on the form or fabric of the conservation areas and the listed buildings in the wider area.

A detailed plan of monitoring and mitigation measures during construction will be put in place to ensure that the effect of the scheme will not be in conflict with historic environment policies and the overall residual effect on the historic environment will be kept to a minimum.

### *Landscape*

The substation site will be cut into the north face of Cleve Hill. Surplus spoil will not be removed from site but will be used to create landscape bunds around the site, principally to the south and to the north along the new access road. The land remodelling to the south of the site will raise contours by about 4 m and to the north of the access road by about 5 m. The landscaping plan (Figure 4) illustrates the plan of the substation and the proposed landscaping.

The proposals will introduce new areas of planting on, and in the immediate surroundings of the substation and Cleve Hill (Figures 5a-c). Of the 20 acre site, around 12 acres will comprise landscaping. The bunds will be created in Year One of the construction programme as spoil becomes available from site levelling. Planting will commence in the first planting season after the bunds have been formed.

The main residual landscape effect will be the long term loss of about 20 acres of arable land, the impact of the substation from certain directions, mainly the north, and the effect that the change in the type and alignment of the three towers will have on the existing landscape.

No construction or operational effects have been assessed as having a major impact. During construction of the onshore elements, there may be moderate landscape effects however these will be localised and temporary in nature.

### *Traffic*

The main effects of traffic and transport for the onshore works are likely to be when bulk materials such as fill and concrete are being delivered. Overall the Heavy Goods Vehicle (HGV) deliveries would be five per day (10 HGV movements) averaged over the entire construction programme. However during the construction of the foundations for the transformers and switchgear, there may be peak deliveries of up to 30 HGV's on some days, when concrete is being delivered to site. The construction of foundations is likely to take place over a three month period.



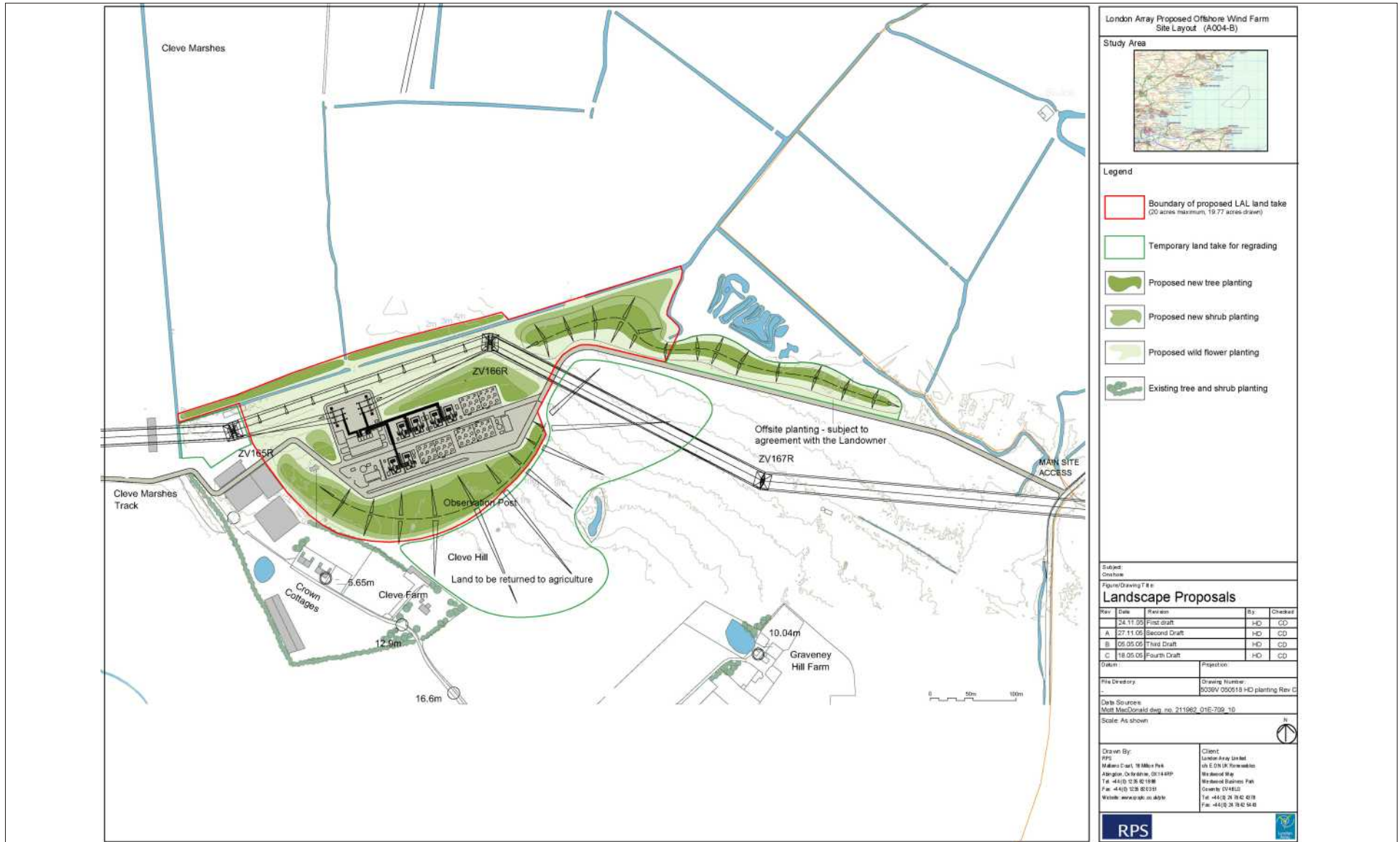


Figure 4. Proposed landscaping of the onshore substation works.

A package of measures to monitor and control the effects of construction traffic will be agreed with the local authority in advance of the commencement of construction, including avoiding traffic movements at busy times near Graveney School. Further mitigation measures that will be considered include voluntary speed limit near sensitive areas, vehicles to be parked off-road and recording and managing vehicle arrivals.

The effects of construction traffic will not be significant or perceptible in respect of visual effects, severance, pedestrian delay, hazardous loads, air pollution, ecological effects cultural heritage, noise, driver delay, accidents and safety. During construction there will be up to six deliveries of abnormal loads when the transformers are delivered to site. In the interest of road safety appropriate temporary traffic management would be introduced along the route.

Once operational, the substation will be unmanned and there will be no regular traffic to the site. Access will be required from time to time for routine maintenance.

### *Ecology and Nature Conservation*

The cable laying works could affect invertebrates on the foreshore. They could be physically damaged by mechanical plant and personnel, from the removal of the food plants, or in the case of burrowing insects, from the removal of sediment habitats. Prior to the works commencing, the issues will be fully identified and mapped. Immediately prior to construction the affected vegetation will be searched for invertebrates and where possible relocated to a safe place.

The disturbance from cable laying and anchorage would be a minor effect given the brief duration and resilience of the communities and environmental conditions. Borrow pits will be crossed by laying cables under the pit via pre-installed conduits. The borrow pit will be temporarily drained to install these conduits. The overall level of effects would be low.

Vegetated shingle along the beach is used throughout the year by birds. The shingle would be disturbed by the winching operations for the inter-tidal cable laying and excavation and trench works required for the cable to pass through the sea wall. As a result, plant species of conservation concern that may exist in these areas would die back. However the collection of seed prior to construction and scattering afterwards would offset this effect.

Mitigation measures have been incorporated in the proposals to avoid damaging the ecological interest and maintain the ecological value of the site.

### *Birds*

The cable route crosses The Swale Special Protection Area (SPA), Ramsar Site and Site of Special Scientific Interest (SSSI) and therefore works would be conducted within the SSSI boundary. The Swale SPA and SSSI lie to the north of the sub-station site on the shoreline and estuary to the landward side of the sea wall.

The Swale SPA and Ramsar site were designated for supporting internationally important populations of breeding, passage and over-wintering birds. Several species: Wigeon, Teal and Grey Plover regularly over-winter in numbers of international importance and others, including Shoveler, Knot, Dunlin and Spotted Redshank are regularly present in winter in nationally significant numbers. Outstanding assemblages of plants and invertebrates are associated with the various constituent habitats of the site.

The cable laying is the only construction process likely to directly affect the interests of the SPA and Ramsar site. The timing of these works would be between April and September to reduce effects on over-wintering and peaks of passage birds. Impacts on birds from cable installation include:

- direct disturbance due to noise, vibration and visual intrusion;
- temporary habitat loss due to excavation activities;
- disturbed birds could be displaced to other areas of the SPA/Ramsar

While the cable laying activity could have an impact on waterbirds and invertebrates the area affected and mobile nature of sediments suggests the effect will be low and short-term.

While potentially significant negative impacts arising from construction have been identified it is considered that appropriate mitigation can be implemented in most cases. Some residual impacts are anticipated however these are all minor. Of these only those associated with net loss of small farmland areas are likely to be permanent.



Figure 5a. Existing View from Seasalter Road facing southwest.



Figure 5b. Photomontage at Year 1.



Figure 5c. Photomontage at Year 10.

	<p><b>Grid Reference:</b> E606044 N164412</p> <p><b>Location:</b> Sea Salter Road <b>View Point Height:</b> 4.9m</p> <p><b>Distance to sub-station:</b> 1km</p>	 <p>Location Plan</p>	<p><b>VIEWPOINT 2</b></p> <hr/> <p><b>LONDON ARRAY LIMITED</b> Proposed on-shore sub-station</p>
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### *Noise and Vibration*

Noise and vibration generated from construction activities will generally be localised and negligible but will vary during the construction programme. Construction will usually be undertaken during normal day time working hours only, although there may be occasions when 24 hour working is necessary. Only the ground improvements and site levelling would be classified as moderate impact but of temporary significance. With regards to local wildlife, there would be disturbance by the physical presence of the works/plant and the noise emissions within a radius of 500 m from the worksite. Consequently, provided no sensitive or protected species are within a radius of 500 m then an adverse noise impact is improbable.

It is proposed that the contractors shall control and limit noise and vibration levels, so far as is reasonably practicable, so that residential properties and all other sensitive receptors are protected from excessive noise and vibration arising from construction activities and traffic. The bunds that will be formed to the south of the site in Year One of the construction programme will also help to reduce the noise of construction activities experienced by local residents. The project will seek to liaise with the local residents if unavoidable construction operations are needed and in particular if 24 hour working is required on limited occasions.

Noise associated with the operation of the substation is considered to be relatively consistent. The design of the substation takes account of the quiet nature of the surroundings. For example, each transformer will be housed in individual noise enclosures.

Monitoring has been undertaken to establish the existing noise levels at the nearest residences. Existing noise levels are, as expected, variable but for the noise assessment a typical existing background night time noise level of 30 dB has been assumed. This has been derived from the noise monitoring surveys.

The substation has been designed to achieve a 'new' noise level (i.e. the noise from the substation) of 27 dB at ground floor level of the nearest residence. These noise levels are substantially below the existing typical night time noise levels and below the recommended sleep disturbance levels as defined in both BS 8233 and the World Health Organisation. Furthermore, the contribution of the substation on the local noise environment would not lead to a perceptible change in noise level.

Local wildlife are highly unlikely to be affected due to the nature of the noise, i.e. low level and constant.

### *Flood Risk and Coastal Defences*

The entire application site behind the sea wall is protected by the existing coastal defences for the 1:200 year flood event both now and in 2060. This level of flood protection is considered acceptable for the purpose of development being permitted in areas at risk of flooding. Flood risk has been taken into account in the design of the substation which meets all relevant planning and engineering criteria in relation to flood risk.

The methods proposed for managing the breach of the sea wall for cable laying, will ensure adequate integrity of sea defences. The sea defences will be fully reinstated after the works are completed and any effect on their integrity will be temporary.

### *Soil and Land Quality*

The development of the substation at Cleve Hill will lead to the permanent loss of approximately 8 hectares of arable farmland. This land is not considered to be of the "best and most versatile" hence the loss of a small area of land has minimal significance and will not have any significant impact on the continued operation of the landowner's farming operation.

The construction programme may lead to the temporary loss of working areas within the 40 ha of agricultural land within the application site during the construction period. However, the implementation of principles of "best practice" for agricultural land reclamation should enable the temporary areas affected to be successfully reclaimed to intensive agricultural use and fully reintegrated with the surrounding high quality land at the end of that period.

### *Water Quality and Drainage*

Surface water currently incident on the proposed substation site drains naturally by infiltration on the agricultural land on which land drains outfall to the network of ditches on Cleve Marshes. Where possible, permeable surfaces will be incorporated within the substation site to reduce surface water run off.

Where land cables cross drainage ditches these shall be restored to their previous condition resulting in no net loss of drainage ditch length or area as a result of these proposals. The scheme includes measures for the protection of the hydrological regime and water quality in these ditches and the overall effect on surface water resource is assessed as neutral.

## Cumulative Effects

London Array Offshore Wind Farm is the largest of the 1st and 2nd Round wind energy projects proposed in the Thames Strategic Area, two of which, Kentish Flats and Gunfleet have planning consent. Applications for consent have not yet been submitted for the Greater Gabbard and Thanet projects. There are a number of proposed port developments, in particular Thames Gateway which has been subject to a public enquiry and the proposed BritNed electricity link. There are also several proposed, licensed and active areas of marine aggregate extraction.

London Array has given due consideration to the possibility of cumulative impacts, based on publicly available data and simple assumptions for projects that have not yet applied for planning consent. Areas considered to be most likely to involve cumulative impacts include fish stocks and commercial fishing, birds (divers in particular), navigation and aviation safety and socio-economic impacts. Due to the proposed location of London Array within the Thames estuary, the conclusion is that cumulative effects are not expected to be a significant issue, with the possible exception of the potential socio-economic benefit to the region if some or all of the offshore wind farms are constructed.

## Concluding Statement

An EIA has been completed in accordance with EU and UK regulations. In parallel London Array carried out detailed and extensive consultation with statutory and non-statutory bodies, interested parties and the public. In addition, due to the uncertainties regarding phased development and future turbine sizes, all of the EIA assessments have addressed the scenario that would have the greatest effect on the environment. This results in a maximum impact assessment, giving future flexibility to the developer and security and confidence to the regulatory bodies that the environmental impact will be no greater than that which is set out in this document and may in fact be considerably less.

The Environmental Statement concludes that the only potentially significant impacts on the physical, biological and human environment resulting from the development of the London Array Offshore Wind Farm would be the impacts on divers and navigational safety in the vicinity of Fisherman's Gat Precautionary Area. Both of these issues are the subjects of ongoing discussions with the relevant stakeholders in an effort to resolve uncertainties and to find mutually acceptable solutions. These and less significant impacts will be minimised through appropriate mitigation measures and monitoring before, during and after the construction of the wind farm.

The proposed London Array Offshore Wind Farm will feed electricity from a sustainable, no carbon energy source into the UK's largest load centre in the southeast of England. It will contribute almost 10% of the Government's renewable energy target for 2010 and will provide employment and contribute to the local economy. Its unique location, beneath the flight path to London's airports, will provide the perfect shop window for UK technology and offer a positive image of a country taking seriously its commitment to combat the threat of climate change.

## Further Information

Further information can be obtained by contacting

London Array Consents Manager  
C/o E.ON UK Renewables Developments Limited  
Westwood Way  
Westwood Business Park  
Coventry  
CV4 8LG

The project web-site covers details of the project including location, proposed turbine types, foundations types and other physical aspects of the development. It also holds information on the EIA process, a list of the studies carried out and details of who has been consulted during the EIA process.  
See <http://www.londonarray.com/>

During the period for comments on the applications, a copy of the full Environmental Statement will be made available for the public to view at the following locations:

- Swale Borough Council, Swale House, East Street, Sittingbourne, Kent ME10 3HT
- Swale Borough Council, Alexander Centre, Preston Street, Faversham, Kent ME13 8NY
- Faversham Library, Newton Road, Faversham, Kent ME13 8DY
- Canterbury City Council, (Whitstable Divisional Office), 57 Harbour Street, Whitstable, Kent CT5 1AQ
- Canterbury City Council (Main Office), Military Road, Canterbury, CT1 1YW
- Thanet District Council (Planning Department), 13 Cecil Street, Margate, Kent CT9 1XZ
- Tourist Information Centre, Tendring Town Hall, Station Road, Clacton-on-Sea, Essex CO15 1SE
- Kent County Council, Invicta House, County Hall, Maidstone, Kent ME14 1XX