East Anglia ONE
Offshore Windfarm

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Code of Construction Practice
DCO Requirement 20
Final for Discharge

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1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State for the Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE). The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. In February 2015 EAOL secured a Contract for Difference (CfD) award to build a 714MW project and ScottishPower Renewables (SPR) announced its role in leading East Anglia ONE towards construction. In April 2015, EAOL submitted a non-material change application to DECC to amend the consent from direct current (DC) technology to alternating current (AC). In March 2016, DECC authorised the proposed change application and issued a Corrections and Amendments Order.

3. This document relates to the onshore construction works associated with EA ONE which, based on the AC technology, with a capacity of 714MW, and a transmission connection of 680MW comprises;

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, approx. 37km in length.
- Up to four cable ducts for future East Anglia Three project.
- An onshore substation located at Bramford, adjacent to existing National Grid infrastructure.

1.2 Purpose and Scope

4. The purpose of this Code of Construction Practice (CoCP) is to support the construction management team in its duties to ensure legal compliance with the DCO. The document is also a mechanism to deliver environmental commitments as set out in the Environmental Statement and to promote environmental and construction best practice.

5. This CoCP sets outs a series of objectives and measures to be applied to the construction of the onshore works associated with EA ONE and fulfils Requirement 20 of the DCO.

6. The requirement, states the following:

> ***20***.—(1) *No stage of the connection works shall be commenced until a code of construction practice has for that stage been submitted to and approved in writing by the relevant local planning authority, in consultation with the relevant highway authority. The code of construction practice shall cover all the matters set out in the outline code of construction practice.*
>
> *(2) The code of construction practice shall include—*
>
> *(a) a surface water and drainage management plan;*
> *(b) watercourse crossing method statements;*
> *(c) a flood plan;*
> *(d) a written scheme for noise and vibration management during construction;*
> *(e) an air quality monitoring plan;*
> *(f) artificial light emissions plan;*
> *(g) a site waste management plan;*
> *(h) a pollution prevention and emergency incident response plan; and*
> *(i) a project community and public relations procedure.*
>
> *(3) The code of construction practice approved in relation to the relevant stage of the connection works shall be followed in relation to that stage of the connection works.*

7. The CoCP provides a key mechanism, enforceable by Requirement 20 of the DCO, through which the regulatory authorities can be assured that environmental impacts associated with the construction of the onshore infrastructure will be appropriately controlled and mitigated.

8. This CoCP reinforces commitments made in the EA ONE Environmental Statement, November 2012 (ES) and associated documents and complements other requirements set out in Schedule 1, Part 3 of the DCO, issued in accordance with the Planning Act 2008.

9. The CoCP sets out the management and control measures which EAOL will require its contractors to adopt and implement for any onshore construction works and related off-site activities. Works and locations within the scope of this document include site preparation works, infrastructure construction, and commissioning phases of the project for onshore works from landfall (Mean Low Water Springs (MLWS)) to the connection at Bramford, and include:

- Enabling works associated with the Onshore Cable Route and Substation including installation of fencing, accesses, the haul road and construction compounds.
- Duct and Cable installation along the Onshore Cable Route, including joint bays and Horizontal Directional Drilling.
- Construction of a new Onshore Substation, new access road and peripheral works.
- Interface between the EA ONE assets and existing National Grid Electrical Transmission (HNET) assets.
- Reinstatement and mitigation works carried out during the construction phase.

10. The term ‘construction’ in the CoCP refers to all onshore site enabling works, all related engineering and construction activities and reinstatement and mitigation works carried out during the construction phase. The CoCP sets out the general objectives and measures for the construction activities, required across the onshore construction works for EA ONE and provides the framework for the preparation of various Environmental Management Plans (EMP’s) to be developed.

11. The practical implementation and compliance arrangements, associated with the CoCP commitments, will primarily be delivered via the Project Environmental Management Plan (PEMP) and the Construction Environmental Management Plans (CEMP) and through the other associated and topic specific plans produced (including for air quality, noise, waste management, landscape and ecology). These plans will be developed and updated as work proceeds and will be audited and enforced both by EAOL, and by their appointed Contractor(s).

1.3 Structure of the CoCP

12. In accordance with the DCO Requirement 2 (a) to (i) a series of topic specific environmental plans and strategies for construction management have been prepared as part of this CoCP and each of the plans are attached as appendices, see Table 1-1.

Table 1-1 DCO Requirements

DCO Requirement 20 (2):		Appendix
a)	surface water and drainage management plan;	Appendix 5
b)	watercourse crossing method statements;	Appendix 6
c)	a flood plan;	Appendix 8
d)	a written scheme for noise and vibration management during construction;	Appendix 1
e)	an air quality monitoring plan;	Appendix 2
f)	artificial light emissions plan;	Appendix 3
g)	a site waste management plan;	Appendix 4
h)	a pollution prevention and emergency incident response plan; and	Appendix 7
i)	a project and community and public relations procedure	Appendix 9

13. As well as fulfilling the Requirement 20 of the DCO, a number of these plans and strategies are submitted as standalone documents to also fulfil individual DCO Requirements. In addition, certain topics such as archaeology, ecology, landscape and traffic management are covered by independent DCO Requirements. Detailed plans have been prepared to fulfil these

Requirements and are provided under separate cover. As such this document provides a summary of these plans however the detailed information does not form part of this document. Table 1-2 provides a brief overview of the structure of this CoCP and reference to the relevant DCO Requirement.

Table 1-2 Structure of CoCP

Section Reference	Section Name	Description	DCO Requirement No.
2	General Principles	This section includes details how EAOL will identify and manage significant risks associated with its operations and how environmental policy commitments are to be delivered. This covers the following topics: • Environmental Management Principles • Health and Safety Principles • Construction Principles	Requirement 20
3	General Site Operation	This section outlines the main construction activities and includes details as to how EAOL will conduct the general operation of the site, throughout the construction phase of the project, including, construction details, working hours and timing of work, housekeeping, site induction, screening and fencing, site security, welfare and reinstatement.	Requirement 20
4	Traffic and Transport Management	This section provides a brief summary of the Traffic Plans produced as per DCO Requirement 23. Detailed information is presented in the Traffic, Travel and Access Plans, provided under separate cover, and so detailed information on these does not form part of the CoCP.	Requirement 25
5	Public Rights of Way (PRoW)	This section provides a summarised methodology of how EAOL will deal with locations at which PRoW, are affected by the development.	Requirement 20
6	Noise and Vibration	A Construction Noise & Vibration Management Plan has been produced, attached as **Appendix 1**. This section identifies the likely noise receptors and provides a description of the best practice noise mitigation measures which will be implemented and managed throughout the project.	Requirement 20 (2) (d) and Requirement 22
7	Air Quality	An Air Quality Monitoring Plan has been produced, attached as **Appendix 2**. This section provides a summary of the emission control measures, identifies the risk level for potential dust impacts at different stages of the project, summarises the monitoring requirements, and provides an outline of best practice guidance and procedures that will be in place.	Requirement 20 (2) (e)
8	Artificial Lighting	A Construction Artificial Lighting Control Plan has been produced and is attached as **Appendix 3**. This section provides a summary of the light emission control measures to be implemented.	Requirement 20 (2) (f) and Requirement 21(1)
9	Contaminated Land	This section provides a brief summary of knowledge relating to contaminated sites and provides a procedure to follow in the event of encountering unexpected contamination. More detailed information is presented in the Written Scheme of Potentially Contaminated Land Mitigation provided under separate cover, and so detailed information does not form part of the CoCP.	Requirement 17

10	Oils, Fuels and Chemicals	This section provides a summary of the storage and use of Oils, Fuels and Chemicals across the onshore construction works, a description of the control measures that are to be adopted to ensure the safe storage and use of these substances and a procedure for monitoring their safe use.	Requirement 20
11	Waste Management	A Site Waste Management Plan has been produced and is attached as **Appendix 4**. This section sets objectives for EAOL in relation to waste management and provides a brief description of the control measures to be adopted by the project, and the appointed contractors, to ensure waste is eliminated where possible and minimised where it is unavoidable.	Requirement 20 (2) (g)
12	Protection of Surface and Groundwater Resources	A Surface Water and Drainage Management Plan for construction has been produced and is attached as **Appendix 5**.This section includes a summary of this plan and the general provisions and control measure to be implemented during the onshore construction works to protect surface water and groundwater resources. This section includes a Watercourse Crossing Method Statement, presented as Appendix 6.	Requirement 20 (2) (a), Requirement 20 (2) (b) and Requirement 16 (1)
13	Environmental Incident Response and Contingency	A Pollution Prevention and Emergency Incident Response Plan and a Flood Risk Plan have been produced and are attached as **Appendix 7** and **Appendix 8**, respectively. This section provides a brief summary of these two documents.	Requirement 20 (2) (h) Requirement 20 (2) (c)
14	Landscape and Ecological Management	Separate Landscape Management Plans and Ecological Management Plan have been produced, to fulfil DCO Requirements 12 and 19, and are provided under separate cover. This section provides a brief summary of these documents however detailed information does not form part of the CoCP.	Requirements 12 and Requirement 19
15	Archaeology and Heritage	A separate Written Scheme of Archaeological Investigation has been produced, to fulfil DCO Requirement 18 and is provided under separate cover. This section provides a brief summary of the document and gives an overview of the controls however detailed information does not form part of the CoCP.	Requirement 18
16	Monitoring and Inspections	The separate Project Environmental Management Plans will provide a more detailed account of the environmental management activities proposed across the project. This section provides a summary of the monitoring which will be further detailed in those Environmental Management Plans.	Requirement 20
17	Community Liaison and Public Relations	A Community Liaison and Public Relations procedure has been produced and is attached as **Appendix 9.** This section provides a brief summary of this document how EAOL will manage public relations with local residents and businesses that may be affected by noise or other amenity aspects resulting from the construction works.	Requirement 20 (2) (i)

2 General Principles

2.1 Environmental Management Principles

14. EAOL, the developer of the EA ONE wind farm, is a wholly owned subsidiary of ScottishPower Renewables (SPR). SPR operates an Environmental Management System (EMS), based on the requirements of IS0 14001:2015, that describes the processes and procedures by which they identify and manage significant environmental risks associated with its operations. The EMS is a primary mechanism by which SPR Environmental Policy commitments, including compliance with relevant legislation and standards, pollution prevention and continual improvement in environmental performance, are delivered.

15. The EMS includes an Environmental Management Framework Plan (EMFP), which provides internal guidance to managers on the approach and framework of controls that will be adopted to manage the environmental risks associated with all phases of project activities. The EMFP includes reference to the preparation of environmental management documents at an organisational and project level, including the Project Environmental Management Plan (PEMP), Construction Environmental Management Plan (CEMP) and the CoCP.

16. The PEMP, produced by EAOL, sets out how EA ONE intends to manage environmental risks associated with the development, including the onshore construction works and will set out specific control measures necessary to deliver the requirements of this CoCP and any other mitigation measures that have been committed to by EAOL that relate specifically to the construction phase of the project. The PEMP also includes the EAOL minimum requirements, for inclusion within a CEMP to be produced by contractors, and sets out guidance and best practice for their implementation at EA ONE construction sites.

17. Through the EMS, contractors undertaking work on behalf of EAOL are screened and selected, using a variety of criteria that include environmental credentials. Where works have the potential to impact the environment, contractors are required to prepare a CEMP, reflecting their identified environmental risks. An individual CEMP will therefore be prepared for each major scope of work. For each activity, the contractor produced CEMP will also identify the specific construction work process/aspects, the environmental impact of each process/aspect, the mitigation measure/best practice to be used and the relevant procedure or method of work to be followed.

18. The appointed Contractors are likely to have internal management system requirements and environmental management plan templates, so the actual CEMP may vary from what is set out within the PEMP for onshore works as provided to them. Site specific sensitivities and requirements of the DCO, along with updates in legal requirements and construction best practice, will all be addressed in the production of the CEMP.

19. A number of topic specific environmental plans and strategies for construction management have been prepared, (see Table 1-1 for details) and will be implemented. These plans will be developed and updated as work proceeds and will be, audited and enforced both by EAOL, and by their appointed Contractor(s).

20. The PEMP and CEMPs will provide for the preparation and implementation of a programme of suitable environmental monitoring and auditing, to ensure that EAOL's environmental standards are adhered to and will be implemented by EAOL and their appointed Contractor(s). A number of environmental roles are referred to within the CoCP, and in the other plans attached as appendices. The PEMP and CEMP will contain a more comprehensive description of the environmental roles and responsibilities.

21. EAOL will publish this CoCP and provide a copy to Statutory Bodies and the Local Authorities. The measures and standards identified in the CoCP will then be implemented by the appointed Contractors.

2.2 Health and Safety Principles

22. EAOL recognises that its decisions and activities may have a direct impact on the health, safety and welfare of those working for us and on our behalf. All construction works will be undertaken in accordance with the Construction (Design and Management) Regulations 2015. EAOL will set project specific health and safety goals and monitor performance in relation to the construction, operation and maintenance of our renewable energy generating projects. By our commitments EAOL will:

- Demonstrate commitment to health and safety, through action and behaviour.
- Ensure that Health and Safety issues are fully considered, as an integral part of project management, throughout the project life; from design, through to construction, operation and maintenance and future decommissioning.
- Require all designers to consider and include the control measures necessary to minimise the risks to the health and safety of all those engaged in construction, maintenance (and demolition) of the project or to others who may otherwise be affected.
- Ensure that suitably competent employees and other designers, engineers, supervisors and contractors from other organisations are engaged to undertake the responsibilities associated with the project
- Ensure that all products, materials and processes used in construction, operation and maintenance present no significant risk to the health and safety of persons carrying out those duties or to others who may be affected by that activity.
- Ensure that suitable and sufficient resources, (including labour, materials, time and finances), are made available to effectively manage the health and safety requirements.
- Require that all those parties involved in the construction or operation and maintenance or decommissioning of our renewable energy generating projects (Principal Designer, Principal Contractor and Operator), fulfil their roles and responsibilities, both legal and organisational, to health, safety and welfare.
- Require that parties involved in our renewable energy generating projects have, where appropriate, a readily available, valid, suitable and sufficient Pre Construction Information document and Health and Safety Plan as defined in the Construction (Design and Management) Regulations 2015.
- Ensure that, upon completion of construction activity, a suitable and sufficient Health and Safety File is completed and transferred, where appropriate, to the ultimate owner.

2.3 Construction Principles

23. The appointed Onshore Construction Manager, and associated management team, will be responsible for implementation and monitoring of the provisions of this CoCP, and for ensuring that the various construction contractors remain in compliance with these requirements. The practical implementation arrangements and responsibilities conferred to the construction contractors will be detailed in further environmental management protocols to be developed, including the PEMP and CEMP.

24. The provisions of the CoCP will be incorporated into the contracts for the onshore construction works, and these will be required to be adhered to, as a demonstration of compliance with the DCO. EAOL and its implementing Contractors are required to comply fully with the terms of this CoCP.

25. The CoCP includes information on mitigation of nuisance to the public and the measures adopted to safeguard the environment during construction. Construction activities will be monitored and environmental performance enforced by an Environmental Clerk of Works (EnCoW), supported by other specialists as necessary (including Ecological, Arboriculturist, Archaeological and Environmental Auditing specialists).

26. In addition to the arrangements under this CoCP, appointed Contractors will also be encouraged to register with the Considerate Constructors Scheme, if they have not already done so. The Scheme requires constructors to adhere to the Scheme's Code of Considerate Practice which is a voluntary code of practice that seeks to:

- Minimise any disturbance or negative impact (in terms of noise, dirt and inconvenience) sometimes caused by construction sites to the immediate neighbourhood.
- Eradicate offensive behaviour and language from construction sites; and to recognise and reward the constructor's commitment to raise standards of site management, safety and environmental awareness beyond statutory duties.

3 General Site Operations

3.1 Construction Details

3.1.1 Enabling Works

27. The onshore construction works will commence with the enabling works, which includes the establishment of the construction compounds (herein referred to as Construction Consolidation Sites), fencing and securing the working width, the topsoil strip and the installation of a haul road.

28. The onshore construction works will be supported by the installation of nine Construction Consolidation Sites (CCSs) (referenced A to I), these are compounds which will be utilised to provide welfare, site staff accommodation, parking, and secure storage for materials, plant and equipment. The CCSs are categorised as either Primary or Secondary, depending on their intended uses. There are two Primary CCSs; CCS B will be a designated storage and delivery facility and the main administrative compound and CCS E will be a main storage and delivery facility, with designated office space. The remaining seven Secondary CCSs shall be used to access the internal haul road, storage and deliveries. The establishment of the CCS compounds will be one of the first construction activities undertaken.

29. During the construction of the substation, site establishment and laydown areas will be required, including temporary offices, welfare, car parking, materials and equipment storage. The area directly east of the substation will be used as the temporary works area (referred to as Work No 38 within the DCO). At the start of the works the onshore substation compound and temporary works will be temporarily fenced.

30. The linear nature of the onshore cable route site will require fencing to be installed to both sides along the working width, not only to delineate the route but also to prevent possible vandalism and theft which could lead to possible contamination incidents.

31. Topsoil shall be stripped from the haul road location, trench areas and subsoil storage areas and stored. Topsoil storage and management shall be compliant with the recommendations and requirements set out in the Cable Landscape Management Plan (EA1-CON-R-IBR-010129). Topsoil shall be stored to one side of the working width, in such a way that it is not mixed with any subsoil. Typically this would be stored as an earth bund of a maximum height of two metres, to avoid compaction from the weight of the soil. Storage time shall be kept to a minimum, to prevent the soil deteriorating in quality. Topsoil stripped from different fields shall be stored separately, as would soil from specific hedgerow banks or woodland strips.

32. A temporary haul road will be installed along the route between the CCS locations and access points onto the local roads. Temporary haul road construction typically involves the placement of suitable imported stone material on a geotextile, however others methods such as soil stabilisation may be used if considered appropriate. In some instances the temporary haul road may comprise temporary trackway rather than stone due to site specific constraints. Following the initial topsoil stripping the haul road will be installed for a width of 5.5m along a designated route,. The temporary haul road shall be constructed working from the installed CCS locations in two directions, away from the CCS and towards the adjacent CCS, along the onshore cable route.

3.1.2 Onshore Cable Route

33. The onshore cable route comprises a 37km corridor, between the Suffolk coast at Bawdsey and the substation at Bramford, passing the northern side of Ipswich. The onshore cable works comprise the installation of electricity transmission cables and ducts between the landfall location at Bawdsey and the new substation station, which is adjacent to the existing substation at Bramford. The majority of the route will be constructed using open trenching methods, other than in certain locations where the cable route traverses a number of major transport networks and natural obstacles. To enable the installation of the cable under these features, specialist trenchless techniques will be employed, such as Horizontal Directional Drilling (HDD).

34. Construction activities will be undertaken within a temporarily fenced strip of land, referred to as the working width. The working width is determined by electrical and civil engineering considerations and allows for sufficient space between the cables trenches to prevent the cables overheating, plus space for the associated temporary construction works i.e. soil storage, drainage, haul road installation and work areas for personnel and machinery. In accordance with the DCO, the

working width shall not exceed 55m, except at the HDD locations identified in DCO Requirement 10 (6), where the working width is permitted to be increased to allow for the installation and use of the specialist equipment to undertake the HDD.

35. There are two basic techniques to be used for the installation of the cable ducts during the construction of the onshore cable route. These are:

- **Open Cut techniques**; where a trench is excavated and the cable ducts laid in the trench before reinstatement, using the excavated material; and
- **Trenchless Technique**; typically HDD, where a pit is excavated to access the crossing and from which a drill is passed through the ground on one side of the obstacle to a receiving pit created on the opposite side. The bore is then gradually enlarged to receive the duct, which is the technique that will be used to pass under roads, main rivers and other sensitive sites.

36. For the open cut technique two trenches will be excavated for the EA ONE ducts and cables and an additional trench will be excavated in parallel for the cable ducts that will be installed to serve EA THREE in the future. An indicative construction swathe cross section showing the open trench layout is presented in Drawing EA1-GRD-E-IEC-007883. As the trench excavation progresses, subsoil will be removed to create the trenches to working depth for duct installation, the subsoil will be temporarily stored separately from the topsoil, and then reused to backfill the trenches.

37. Particular care will be taken when backfilling the trenches with the excavated material (subsoil) to reinstate it in the order in which it was excavated, again to minimise any disruption to the existing ground drainage pattern. The ducts will be installed in the trench, where they will be bedded on and then surrounded and topped by Cement Bound Sand (CBS) or equivalent which will gradually set and harden in situ as water is absorbed. Above this, the subsoil will then be used to reinstate the trench to the previous level.

38. Where, due to the existence of obstacles, it is not possible to install the cable ducts using the open trench method, trenchless installation techniques shall be used. The onshore cable route traverses a number of major transport networks and natural obstacles, to enable the installation of the cable across these features specialist techniques are required, namely the use of HDD. These key locations are referred to a 'Category 1' HDD sites as identified in Table 3-1.

39. These HDD sites will require additional equipment, storage and ancillary facilities to that required for the conventional open trench installation methods in order to accommodate the drilling activities. As such, a specialist HDD compound will be set up at each side of the HDD location to enable the specialist plant and materials to be delivered directly.

40. In addition to the above major features, a number of other features have been identified where the conventional open cut trenching technique are not appropriate. At these locations 'trenchless' methods will also to be implemented, which will comprise of a smaller HDD or auger bore. These sites are referred to as 'Category 2' HDD/trenchless. As the features to be crossed are less significant, they will not require any additional compounds and works will take place within the standard working width. Table 3-1 provides a list all the HDD / trenchless locations.

Table 3-1 HDD / Trenchless Locations

Reference	Category	Location/ Feature	Approximate Length (m)	Max Width (m)
HDD-01	Cat 1	Millers Wood off Bullen Lane	200	130
HDD-02	Cat 2	Somersham Watercourse	70	55
HDD-03	Cat 2	Pound Lane	60	55
HDD-04	Cat 1	River Gipping and Network Rail track west of A14	385	130
HDD-05	Cat 1	A14 Trunk Road and Old Ipswich Road	200	160
HDD-06	Cat 2	River Fynn	30	55
HDD-07	Cat 2	Lodge Road	60	25
HDD-08	Cat 1	A12 Trunk Road	165	120

HDD-09	Cat 2	Top Street	90	55
HDD-10	Cat 2	Sandy Lane	90	50
HDD-11	Cat 1	Martlesham Creek and Network Rail tracks south of Woodbridge	650	160
HDD-12	Cat 2	Waldringfield Road	70	55
HDD-13	Cat 2	Watercourse east of Howe's Farm	50	55
HDD-14	Cat 1	Kirton Creek	550	110
HDD-15	Cat 2	Sewage works outfall watercourse	50	55
HDD-16	Cat 1	River Deben	700	55
HDD-17	Cat 2	Queen's Fleet	70	55
HDD-18	Cat 1	Landfall, Bawdsey	1000	160
HDD-19	Cat 2	Bramford Road	60	55
HDD-20	Cat 2	Grundisburgh Road	50	55

41. The HDD technique is expected to be used at the majority of locations on the route where a trenchless method is required. This involves creating an access pit on either side of the obstacle to facilitate the installation of the drilling equipment and allow drilling under the obstacles, at an appropriate depth allowing the installation of the ducts. The HDD sites will have two access points, one either side of the HDD location, the drilling rig will be positioned on one side of the feature with ducting placed at the opposite side ready to be pulled back through the opening on completion of drilling.

42. Once the cable duct installation is completed then works will commence on the installation of the EA ONE cables within the pre-installed ducting system. As the onshore cabling typically comes on drums of up to 1,300m in length, jointing bays will be required along the cable route to join each section of cable together. These jointing bays, approximately 10m long x 5m wide x 5m deep, will be constructed at regular intervals along the onshore cable route to allow cable pulling and jointing at a later stage. The joint bay with be excavated to size and a concrete poured floor with concrete or blockwork walls surround will be installed and topped with concrete slabs to leave ground cover to a depth of 1.1m.

43. Further details on the construction methodology for the onshore cable route are presented in the Cable Method Statement (EA1-CON-R-IBR-021238).

3.1.3 Onshore Substation

44. The EA ONE onshore substation will be located within a fenced compound (150m by 190m) to the north of the existing National Grid Bramford Substation. The substation will contain electrical equipment including power transformers, switchgear, reactive compensation equipment, harmonic filters, cables, control buildings and other associated equipment, which will largely be outside with a number of the components being within the buildings.

45. The construction of the substation will include a number of key stages; include enabling works, foundations and building construction and equipment installation and commissioning. The enabling will include grading and earthworks to remove any unsuitable materials from the substation area and provide a level platform at an elevation of 56m AOD. Where possible, the materials excavated will be reused on site as engineering fill or landscaping depending on material properties. The enabling works will also include the construction of the main concrete access road.

46. Following the completion of the site grading, works will commence of the excavations for foundation for the building and trenches to accommodate electrical infrastructure and installation of the drainage networks.

47. The building is largely comprised of steel and cladding materials, with brick/blockwork at the base. The structural steelwork will be fabricated and prepared off site and delivered to site for erection activities using cranes. The composite cladding panels (e.g. Kingspan) will be delivered to site ready to erect and be fixed to the steelwork.

48. For the installation and commissioning phases a variety of specialist activities are required. The main items of electrical infrastructure, for example transformers, will be delivered sealed to site. Due to their size and weight they will be delivered via specialist means and offloaded with the use of a mobile crane (please see Traffic Management Plan (EA1-CON-R-IBR-009583) for details of abnormal load transport procedures). The smaller electrical components will be constructed on site using small mobile plant and lifting apparatus.

3.2 General Control Measures

49. Procedures and contingency plans will be in place at each work site to deal with the clean-up of small spillages and dealing with any emergency incident. A spill response procedure has been set up and project staff will be suitably trained to deal with spillages, including the use of spill kits and other practical measures, to retain any pollution on site. The used spill kits or absorbents will be disposed of off-site at a suitably licenced tip or recycling centre. The Pollution Prevention and Emergency Incident Response Plan (Appendix 7) documents these procedures in more detail.

50. Mitigation measures to minimise physical damage to watercourses and prevent pollution, flooding and erosion during construction are summarised as follows:

- Where necessary, watercourses requiring crossing will be temporarily flumed (by the installation of a suitably sized pipe) and then a ramp constructed over the flume, allowing the continued uninterrupted flow of water within the watercourse but allowing a continuous haul road to be installed for construction traffic. The cable ducts will then be installed under the temporary flume pipe, at a suitable depth below the crossing. Entry into water would be avoided and as plant and vehicles have to make repeated crossings along the internal haul route a flume or, at some crossings, a temporary bridge will be installed.
- A vegetated strip will be left adjacent to the watercourse, where possible, during construction.
- Banks will be reinstated following construction, using soft revetment materials wherever possible to stabilise banks, and returning removed vegetative cover where possible to assist in the re-establishment of bankside vegetation.
- The cable will be buried at sufficient depth to prevent scour and to allow a natural substrate to develop, following Environment Agency (EA) guidance and advice.
- Bankside vegetation will be reinstated, subject to restrictions on the replanting of large tree species in close proximity to the cable route.
- Fuels, lubricants, chemicals etc. will be stored in appropriately bunded areas, with any additional appropriate pollution prevention measures in place.
- All soils will be stored at least 5m from the top of the bank of any watercourse and any potentially contaminated soil will be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters; Procedures for dealing with unexpected contaminated materials are included in the Written Scheme of Potentially Contaminated Land Mitigation (EA1-CON-R-IBR-010156).
- Limited sections of the trench route will be excavated and remain open at any one time; any localised dewatering will have appropriate treatment and disposal applied before being discharged.

51. As described earlier, the cable route will be constructed beneath a number of obstacles or sensitive features, including main rivers, flood defences, SSSI's and major highways. This will be achieved using HDD technique as described in Section 3.1. Any existing flood defences will also be passed under and so left intact during construction, to prevent any increase in risk of flooding.

52. The phasing and programming of the works will ideally be timed to limit exposure of the subsoil to inclement weather, reducing the likelihood of excessive erosion and the generation of suspended solids in the runoff. Similarly the installation of flume pipes will be avoided in periods of heavy flow in any watercourse. It will not be possible to prevent this impact at all times, so appropriate mitigation measures will also be put in place, as and where appropriate (further information is included in the Surface Water Management Plan - Appendix 5). All temporary flumes and bridges will be removed and the watercourse suitably reinstated, after the completion of construction and the cable installation and commissioning phase.

3.3 Working Hours and Timing of Works

53. The working hours for the onshore construction works are defined within DCO Requirement 23 which states:

> **23**.*—(1) Construction work for the connection works and any construction-related traffic movements to or from the site of the connection works shall not take place other than between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sundays or bank holidays,*
> *save—*
> *(a) where continuous periods of operation are required as assessed in the environmental statement, such as concrete pouring and directional drilling (subject to sub-paragraphs (3) and (4));*
> *(b) for internal fitting out works associated with the onshore substation, within Work No. 39;*
> *(c) for the delivery of abnormal loads to the connection works, which may cause congestion on the local road network; and*
> *(d) where connection works are being carried out on the foreshore.*
>
> *(2) All construction operations which are to be undertaken outside the hours specified in subparagraph (1) must be agreed with the relevant planning authority in writing in advance, and must be carried out within the agreed times.*
> *(3) Construction of Work No. 21 shall not take place other than between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sunday or bank holidays.*
> *(4) Construction of Work No. 26 shall not take place other than between 0700 hours and 1900 hours Monday to Friday and 0700 hours and 1400 hours on Saturday, with no activity on Sunday or bank holidays.*

54. Construction works shall be undertaken in accordance with the hours set out above, except under those circumstances set out in the DCO ((a) to (d)). This would be particularly relevant for the completion of continuous processes predicted to last more than 12 hours, such as HDD. In these above circumstances, approval will be sought from the Local Planning Authority, prior to the works commencing, and sensitive receptors notified of the proposals, where relevant. The type of receptor deemed to be sensitive will vary, depending on the works, but categories are defined as follows:

- Residential
- Commercial/Industrial
- Leisure
- Ecological

55. Where works are to be undertaken outside the consented hours in response to an emergency situation, the appropriate Local Planning Authority will be advised as soon as practical, outlining the circumstances for the works, the likely duration and the mitigation measures implemented. As stated in the DCO and through consultation with the local community, no approval will be sought for out of prescribed hours working during Work packages No. 21 or No. 26, to satisfy the local residents requirements.

3.4 Construction Site Layout and Housekeeping

56. As detailed in Section 3.1 the onshore cable works will be supported by nine CCSs sites with the onshore substation having a dedicated temporary works area. In addition the Category 1 (major) HDD sites will require additional equipment, storage and ancillary facilities to that required for the conventional open trench installation methods in order to accommodate the drilling activities. As such, a specialist HDD compound will be set up at each side of the HDD location to enable the specialist plant and materials to be delivered directly.

57. Further details on the layouts of these construction compounds, to include locations of welfare, offices, storage, access and waste management, will be provided in CEMP.

58. A good housekeeping policy applies across all construction areas. This includes the following requirements:

- All working areas shall be kept in a clean and tidy condition.
- All site compound areas shall be non-smoking. Specific areas within the worksites shall be designated as smoking areas and shall be equipped with containers for smoking waste. These shall not be located at the boundary of working areas or adjacent to areas deemed sensitive to local residents, workers or visitors.
- Open fires and burning of rubbish are prohibited at all times.

- Radios (other than two-way radios used for the purposes of communication related to the works) and other forms of audio equipment (other than associated with safety mechanisms (such as reversing bleepers) shall not be operated during construction activities.
- Site waste facilities shall be suitable for the waste streams to be handled and the containers will be in good condition and well signed to identify contents.
- Site waste susceptible to spreading by wind shall be stored in enclosed or covered suitable containers and waste shall be removed at frequent intervals.
- Static plant should have suitable drip tray or plant nappy protection.
- Hoardings and boundary fences shall be frequently inspected, repaired and repainted as necessary.
- Adequate welfare facilities shall be provided for all site staff and visitors.

59. In addition, where working areas are within Flood Zone 2 or 3 (see Appendix 8 Flood Plan for locations), additional housekeeping measures shall be taken to minimise pollution risk during periods of extreme weather (i.e. flooding) by including the following:

- Fuels, oils and chemicals will be surrounded by an impervious bund wall. The volume of the bunded compound shall be at least equivalent to the capacity of the tank or tanks plus 10%. This would constitute general site practice for the prevention of spills. In addition the bunded installation will be installed in the remotest location possible at least risk from rising water and the walls will be of sufficient height and structural soundness to withstand any potential for flood water ingress.
- Debris or wastes will be safely contained, reducing the risk of large items entering the flood flow.
- Machinery will be stored or returned to areas of hard standing, remote from flood waters.

60. Where working areas are adjacent to watercourses or cross Flood Zone 2 or 3 (see Appendix 8 Flood Plan for locations), the following measures will be implemented:

- Spoil storage bunds will be laid out with gaps at regular intervals to minimise potential impact on flood water movement.
- There will be no storage of spoil directly on watercourse banks. Spoil storage will be set back from watercourses by 5m to prevent excessive loading on the watercourse banks and to minimise the risk of stored material entering the watercourses.

3.5 Site Induction

61. All construction projects require personnel working on site to have a site induction that includes an environmental component. Prior to commencing work on site, personnel must attend the site induction. EA ONE Project EMP guidance require site inductions to include reference to compliance with relevant DCO Requirements, license conditions, Client environmental requirements (including the CoCP), environmental management roles and responsibilities, site specific environmental sensitivities, the management of waste, water and wastewater, hazardous material, fuel, oil and chemicals; to include spill contingency and environmental emergency response and the reporting of all incidents and complaints.

3.6 Screening and Fencing

62. Details of permanent and temporary fencing, walls and any other means of enclosure to be installed during the onshore construction works are detailed in the Fencing and Enclosure Plan (EA1-CON-R-IBR-009818) which is provided under separate cover. As such, detailed information does not form part of the CoCP, however a summary of fencing requirements is provided in Table 3-2 (taken from the Fencing and Enclosures Plan).

Table 3-2 Summary of Fencing and Enclosure Requirements

Category	Fencing & Gateway Types
Construction Working Width	Post & Rail or Post & Wire or Stock Proof Fencing; Single or double gateway.
Haul Road	Chapter 8 cones or barriers; Heras panels and gateways at either end.
Access Points	Heras Fencing or Metal Hoarding; Chapter 8 Signing, Lighting and Guarding.
Primary CCS	Metal Hoarding with double gateways; Manual arm barrier; Chapter 8 Signing, Lighting and Guarding.
Secondary CCS	Heras Fencing with double gateways; Chapter 8 Signing, Lighting and Guarding.
HDD Compound	Metal Hoarding with double gateways; Chapter 8 Signing, Lighting and Guarding.
Construction Work Area	Chapter 8 barriers for trenches, cones; Heras panels for excavations.
Crossings – Road, Private Tracks and Bridleways	Post & Rail with Double or Single Gateway as required; Chapter 8 Signing, Lighting and Guarding.
Crossings – Footway, Public Rights of Way and Bridleways	Post & Rail with Gateways; Chapter 8 Signing, Lighting and Guarding.
Tree Protection	Heras fencing
Hedgerow Protection	Crowd Barriers
New Planting Protection	Post & Rail or Post & Wire or Stock Proof Fencing; Additional Deer/Rabbit protection as required
Protected Species	Temporary newt/reptile fencing Semi-permanent newt fencing Badger exclusion Fencing
Substation Compound	Metal Hoarding with double gateways; Manual arm barrier; Chapter 8 Signing, Lighting and Guarding
Operation Onshore Substation	Permanent Mesh Fencing and Gateways

3.7 Site Security

63. Adequate security will be provided by contractors, working on behalf of EAOL, to protect the public and staff, prevent theft from or damage to the works and to prevent unauthorised entry to or exit from the site. Site gates shall be closed and locked when there is no site activity and appropriate security measures shall be implemented and maintained throughout the project work.

3.8 Welfare

64. The construction areas will be provided with temporary construction offices and necessary welfare facilities, including mess rooms, locker rooms, showers and toilet facilities, plus additional facilities for the mobile construction teams. These shall be installed subject to contractual agreements and will be in compliance with relevant legislation and codes of practice and be sited at the identified CCSs.

3.9 Reinstatement

65. The reinstatement of land affected by the onshore construction activities is controlled under DCO Requirement 28, which states:

> ***28.*** *Any land landward of mean low water within the Order limits which is used temporarily for construction of the connection works and not ultimately incorporated in permanent works or approved landscaping, must be reinstated in accordance with such details the relevant planning authority in consultation with the relevant highway authority may approve, as soon as reasonably practicable and in any event within twelve months of completion of the relevant stage of the connection works.*

66. In addition landscaping works must be carried out in accordance with the Landscape Management Plans approved under DCO Requirement 12 (see Section 14 for further information).

4 Traffic and Transport Management

4.1 Introduction

67. During the onshore construction works, the majority of traffic movement will be within the site boundary, along the installed internal haul road, with associated traffic movement on the local road network. This will include heavy goods vehicles. To ensure that construction traffic does not have an unacceptable impact either on other road users or on the local environment, three traffic related management plans have been completed to fulfil DCO Requirement 25, which states:

> ***25.****—(1) No stage of the connection works shall be commenced until for that stage, after consultation with the relevant highway authority, the following have been submitted to and approved by the relevant local planning authority in consultation with the relevant highway authority—*
>
> *(a) a traffic management plan which must be in accordance with the outline traffic management plan;*
> *(b) a travel plan which must be in accordance with the outline travel plan; and*
> *(c) an access management plan which must be in accordance with the outline access management plan.*
> *(2) The plans approved under paragraph (1) must be implemented upon commencement of the relevant stage of the connection works.*

68. These documents are provided under separate cover, so detailed information on these does not form part of this CoCP, but this section provides a brief summary of these documents.

4.2 Summary of Traffic Plans

- Traffic Management Plan (EA1-CON-R-IBR-009583): This plan sets out the standards and procedures for managing the impact of Heavy Goods Vehicle traffic during the construction period. It identifies and controls the numbers, types and timing of vehicles expected on the various parts of the highway network, based on compliance with those parameters assessed and described in the ES and the Supplementary Environmental Information (SEI).

- Travel Plan (EA1-CON-R-IBR-010149): This plan sets out how construction personnel traffic will be managed and controlled during the construction period. It details measures which will be taken to encourage sustainable transport of construction personnel, again within the parameters assessed in the ES and SEI.

- Highways and Access Improvements Plan (EA1-CON-R-IBR-009582): This plan sets out the details of all of the agreed site access points onto the existing road network and the localised road improvements necessary to facilitate the safe use of the existing road network.

5 Public Rights of Way

5.1 Introduction

69. This section provides an overview of how EAOL will work with their appointed contractors to ensure that all Public Rights of Way (PRoW) are effectively managed during onshore construction. Further details on the crossing of the PRoW are provided in the Traffic Management Plan (EA1-CON-R-IBR-009583).

70. A pre and post-construction survey of the Public Rights of Way (PRoW) affected will be undertaken by an experienced surveyor, including identification and assessment of the surface condition and with a scope of coverage and methodology to be agreed with the Suffolk County Council. An Agricultural Liaison Officer (ALO) will be employed to ensure that corresponding information on existing land conditions is obtained, recorded and verified during the PRoW surveys.

71. Where they will be impacted by the works, the surveyed PRoW will be restored to original condition or to a condition as agreed with Suffolk County Council (SCC). The ALO will act as the point of contact for the restoration of the rights of way.

5.2 Control Measures

72. Any PRoW to be affected by the works will be closed for the minimum time practical, commensurate with the work requirements and degree of restoration proposed. Diversionary routes have been proposed and these are included in the Schedule 3 of the DCO, any variation from this would be subject to prior agreement with SCC.

73. All diversions will be advertised in advance, following the SCC standards for advertising temporary closures of PRoW. This will include:

- Provision of a map showing the extent of the closure and an alternative route, if there is one.
- Confirmation that the alternative route is safe and fit for public use.
- County, District and Parish Councils will be notified in advance (4 – 6 weeks) of temporary closure.
- A legal notice describing the closure will be published in the press (East Anglia Daily Press) two weeks in advance of closure.
- Site notices (i.e. notices to members of the public warning of diversions ahead) will be posted in advance, at appropriate places to minimise likelihood of unintentional trespass at obstruction to the crossing and unnecessary aborted journeys.
- These site notices will be erected in sensible locations on the route 1 – 2 weeks in advance of closure.
- The above notices will describe the duration of closure and the alternative (diversion) proposed.
- Any extensions to closure of a PRoW will be discussed with SCC.

6 Noise and Vibration

6.1 Introduction

74. There is the potential for noise and vibration to be generated during the construction process, especially from the movement and operation of heavy plant and machinery. Measures will be implemented on site to minimise any effects and a programme of monitoring may be required.

75. A Construction Noise and Vibration Management Plan has been produced in fulfilment of Requirement 22 of the DCO and in accordance with DCO Requirement 20 2 (d), attached as Appendix 1. The Construction Noise and Vibration Management Plan sets out the mitigation and control measures to be applied to the onshore construction works to minimise potential noise and vibration impacts on nearby residents and other sensitive receptors. A brief summary of the noise control measures is provided below; however, please refer to Appendix 1 for full details.

6.2 Control Measures

76. Best practice noise mitigation measures, implemented and controlled through the Construction Noise and Vibration Management Plan, will include:

- Management of construction operating hours (in accordance with those specified within the DCO).
- Implementation of traffic management measures, such as agreed routes for construction traffic.
- Use of modern, fit for purpose, well maintained plant equipment to minimise noise generation. Plant and vehicles will be maintained in good working order. Use of silenced equipment, as far as possible and low impact type compressors and generators fitted with lined and sealed acoustic covers. Doors and covers housing noise emitting plant will be kept closed when machines are in use.
- Where reasonably practicable, vibrating and noisy equipment should be located as far from sensitive premises as possible, and, if on a structure, not on one which is continuous with that of the sensitive premises; contractors and subcontractors should be trained to employ appropriate techniques to keep site noise to a minimum, and should be effectively supervised to ensure that best working practice in respect of noise and vibration reduction are followed.
- Minimise drop height of materials.
- Start-up plant, equipment and vehicles sequentially rather than all together.
- No working during night hours except at specific locations and for specific activities which have been agreed with the Local Planning Authority and should be discouraged as much as possible.
- Radios (other than two-way radios used for the purposes of communication related to the works) and other forms of audio equipment (other than associated with safety mechanisms (such as reversing bleepers) shall not be operated during construction activities.
- Avoid shouting, and minimise talking loudly and slamming vehicle doors.
- Ensuring engines are switched off when machines are idle.
- Noise and vibration should be controlled at source and the spread of noise and vibration should be limited.
- Use screens and noise barriers / acoustics screens, where considered necessary.

77. Based on the noise assessment undertaken as part of the ES, the following specific mitigation measures will be introduced to minimise disturbance at nearest residences during HDD works at night at Kirton Creek and Martlesham Creek if required:

- At the nearest residences installation of screening equipment such that there is no line of sight between receptor windows and the noise emitting elements of the plant on the site.
- The use of silencers (silencer or enhanced enclosure) on the drill rig engine to provide the additional sound reduction. This additional mitigation is unlikely to be required should the plant associated with the drill rig be containerised, as would be expected from a drill rig transported on a trailer.

78. To ensure that excessive vibration levels on the road network are not caused by HGVs travelling over discontinuities in the road, visual checks should be made of roads adjacent to listed buildings by contractors and the construction management team (identified in the Construction Noise and Vibration Management Plan).

6.3 Monitoring

79. A scheme of noise monitoring will be implemented and maintained during construction in order to ensure compliance with the noise limits and to verify the effectiveness of the best practice and attenuation measures.

80. The purpose of the monitoring is to facilitate data acquisition to demonstrate that the EA ONE onshore works are being constructed within the guideline noise limits set out in accordance with the BS 5228-1 and in such a manner as to minimise the noise impacts as nearby sensitive receptors.

81. Those monitoring locations stated in the Environmental Statement will be used to plan where monitoring locations are set during construction. A review of these locations may be considered if changes or updates of the project are observed.

82. Noise monitoring shall be flexible in its frequency and should cover all construction activities and stages. Noise and vibration monitoring should be undertaken immediately after any mitigation measures have been implemented and where complaints arise or if required by the Authorities.

7 Air Quality

7.1 Introduction

83. There is the potential for construction works to have an adverse impact on air quality. Measures will be implemented on site to facilitate the avoidance, remediation and mitigation of any adverse effects of emissions generated from the construction activities of the project.

84. An Air Quality Monitoring Plan (AQMP) has been produced, in fulfilment of DCO Requirement 20 2 (e), attached as Appendix 2. The AQMP contains a characterisation of the air quality in the construction area and an identification of the air quality impacts and risks from the construction activities. It then describes the implementation of the control measures and mitigation to minimise any adverse effects and finally includes a monitoring plan to evaluate the efficiency of the control measures and mitigation. A brief summary is provided below; however, please refer to Appendix 2 for full details.

7.2 Characterisation and Assessment

85. The main construction activities with a potential to impact on air quality considered in this AQMP are: earthworks, construction and Heavy Goods Vehicles (HGV) movements. The AQMP focuses on the risk of an increased particulate matter concentration as the main pollutant that may be released during construction works.

86. Results of the baseline air quality characterisation show that, generally, air quality in the vicinity of the onshore construction works is good, with the expected concentrations of particulate matter being consistently lower than the Air Quality Objectives.

87. Regarding the onshore substation, the risk of dust impacts has been identified as "low", except for the "medium" risk to ecology during construction phase, due to the close proximity vicinity of the Fore and Bushey Groves County Wildlife Site to the onshore substation and the potential presence of protected species.

88. For the onshore cable route, the risk is "medium" in the majority of categories; however, there is potential "high" risk to human health, identified during earthworks and construction phases, due to the presence of residential properties close to the Development Order Limits boundary, the high number of HGV movements expected and the size and scale of the works.

89. After the identification of the main potential air quality impacts from earthworks, construction and HGV movements, the control measures and mitigation have been specified to minimise the level of risk of potential dust impacts as detailed in Section 7.3.

7.3 Control Measures

90. The Table 7-1 (taken from AQMP) includes the recommended measures to be implemented in order to avoid the potential impacts to air quality associated with the onshore construction works. The table specifies the three main project activities (earthworks, construction and/or vehicle movements) and summarises the controls required at the two main areas of works (onshore cable route and the onshore substation).

Table 7-1. Control and mitigation measures to implement during works

Source description	Control measures	Areas		Timing	Project activity			Responsibility
		Onshore Cable Route	Onshore substation		Earthworks	Construction	Track out	
Plant and Machinery	All construction plant and machinery will be fitted with adequate emission control devices, maintained in good working order and there shall be no excessive exhaust emissions.	✓	✓	One off	✓	✓	✓	Contractor
	All off-road mobile machinery to use low sulphur diesel.	✓	✓	As needed	✓	✓		Contractor
Loading and unloading of materials	Restricting or ceasing dust-generating activities on extremely windy or dry days. Weather forecast information can be obtained from the MetOffice website (http://www.metoffice.gov.uk/public/weather/forecast) to provide warnings of adverse meteorological conditions. Minimise deliveries of dry materials in windy weather. Minimise drop height during loading or unloading	✓	✓	As needed	✓	✓	✓	Site Manager/ Contractor
Stockpiled Materials	Stockpiles and handling areas will be maintained in a condition that minimises windblown or traffic generated dust by water sprays or by seeding (i.e. if greater than 4 weeks).	✓	✓	As needed	✓	✓	✓	Contractor
	Stockpiles are to to be located away from residential areas.	✓	✓	As needed	✓	✓		Site Manager/ Contractor
	Stockpiles would be retained for the shortest possible time. Seeding, spraying or covering any vulnerable areas to prevent windblown surface dust.	✓	✓	As needed	✓	✓		Site Manager/ Contractor
	Ensure sand and other aggregates are stored and covered and not allowed to dry out, unless required for a particular process, to ensure that appropriate additional control measures are in place.	✓	✓	As needed	✓	✓		Site Manager/ Contractor
	In covered stockpiles, only remove the cover in small areas during work and not all at once.	✓	✓	As needed	✓	✓		Contractor/ all personnel
Vehicle Fleet Operation and traffic	Start-up of vehicles will, where practicable will be undertaken away from areas of sensitivity.	✓	✓	Daily	✓	✓	✓	All personnel
	Ensure that vehicles on site travel at speeds that do not generate excessive amounts of dust (i.e. 10 mph or less).	✓	✓	Daily			✓	Contractor/ all personnel
	Ensure that vehicles working on site are maintained to manufacturer's specifications and that there are no excessive exhaust emissions.	✓	✓	As needed	✓	✓	✓	Contractor/ all personnel
	Vehicles leaving site would be washed, if necessary. Wheel wash units will be installed at key locations	✓	✓	As needed			✓	Contractor/ all personnel
	Install hard surfaced haul routes, which are regularly damped down with mobile sprinkler systems or mobile water bowsers, and regularly cleaned.	✓	✓	As needed			✓	Contractor
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	✓	✓	As needed			✓	Contractor
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	✓	✓	Daily			✓	Contractor
	Use road sweeper(s) on the access and any local roads, to remove, any material tracked out of the site. This may require the sweeper being continuously in use.	✓	✓	As needed			✓	Contractor/ all personnel
General	No burning of any materials on site.	✓	✓	One off	✓	✓	✓	All personnel

Source description	Control measures	Areas		Timing	Project activity			Responsibility
		Onshore Cable Route	Onshore substation		Earthworks	Construction	Track out	
	Dust generating activities will be minimised.	✓	✓	Daily	✓	✓	✓	All personnel
	Access should be located at least 10m from receptors where possible.	✓	✓	As needed	✓	✓		Contractor
	Temporarily cover or re-vegetate earthworks if possible.	✓	✓	As needed	✓			Contractor/ all personnel
	Exposed sections of the work will be damped down regularly where there is a risk that surface dust will be generated. Water would be used as a dust suppressant as appropriate.	✓	✓	Daily	✓	✓	✓	Contractor
	The frequency of dust suppression (such as damping down) will be increased as appropriate, e.g. during dry and windy conditions, to ensure no visible dust emissions.	✓	✓	As needed	✓	✓	✓	Contractor

91. The mitigation measures described in Table 7-1 will be monitored by the contractor's, construction management team and EnCoW throughout the construction phase, as set out in the PEMP and CEMP. If non-conformity with any of the control and mitigation measures is identified, it will be recorded during a site inspection or audit and appropriate remedial actions will be implemented.

7.4 Monitoring

92. If the control and mitigation measures in Table 7-1 are implemented correctly during the onshore construction works, then dust production and other emissions from the construction site will be minimised. However, site inspections and visual monitoring will be undertaken as an effective way to verify that air pollution control measures have been properly designed and implemented.

93. Visual monitoring and site inspections shall be undertaken throughout the onshore construction works and shall include:

- Visual inspections for clouds of dust generated from haul trucks, vehicle traffic, earthworks, etc.
- Check the weather forecast and if it indicates dry weather and strong winds are likely, this will be a trigger for preventive dust management action to be taken.
- Verify if vehicle traffic emissions are consistently black. This is a signal that an engine is not operating optimally.
- Check for the presence of deposited dust on haul roads, welfare areas, residences or vegetation nearby the construction works.

94. During works classified as high risk activities for generating dust (earthworks and construction of the onshore cable route), additional particulate monitoring at sensitive receptors may be considered to confirm effectiveness of mitigation, if the visual monitoring identifies signs of impacts. The implementation and effectiveness of the control measures will be monitored by the contractor's, construction management team and EnCoW.

8 Artificial Lighting

8.1 Introduction

95. During the construction works, temporary lighting will be required for the illumination of areas to carry out various works, for security purposes and lighting for plant and equipment. Lighting from these sources has the potential to have the following impacts:

- Intrusive lighting impacting nearby residents and causing disturbance and annoyance, particularly with regard to sleep patterns;
- Impact on ecological sensitive receptors from light spill;
- Impact on the visual amenity due to the illumination of the night sky; and
- Lighting on surrounding roads, distracting passing motorists.

96. A Construction Artificial Lighting Emissions Plan (ALMP) (EA1-CON-F-GBE-008548) has been prepared in fulfilment of DCO Requirement 21 (1) and 20 (2) (f), and is attached as Appendix 3. The plan sets outs mitigation measures to be applied to the construction activities to reduce the potential for significant impacts from light emissions. A brief summary is provided below; however, please refer to Appendix 3 for full details.

8.2 Objectives

97. The main objectives for managing artificial lighting emissions are:

- To ensure temporary lighting installations are positioned so as to avoid light spill directly towards roads, residences and other potential viewing locations or ecological receptors.
- To ensure the potential impacts from light emissions on haul roads for mobile equipment are reduced so far as practicable.
- To utilise vegetation screens to minimise the impact of any light spill in the direction of roads, residences and other viewing locations or ecological receptors.
- To use directional lighting to reduce light spill and minimise light emissions from night time construction works to retain dark night skies.
- To ensure procedures are in place to record and effectively respond to any complaint in respect to lighting.
- To record and report the effectiveness of lighting emission controls.

8.3 Control Measures

98. The onshore construction works have been carefully designed to reduce the potential for significant impacts and to minimise impacts on the environment by the implementation of mitigation measures. Light spill from artificial lighting sources will be controlled to avoid or minimise impacts on sensitive receptors, in particular for nocturnal species. This includes the use of directional lighting, non-reflective surfaces and introduction of barriers and screens to avoid light spill nuisance whilst maintaining safety and security obligations.

99. A summary of the control measures to be adopted during construction to avoid to minimise potential impacts are listed below:

- Site lighting will be positioned and directed to minimise nuisance to footpath users, residents, distractions to drivers passing the site on adjacent public highways and to minimise light spill at night, as far as is reasonably practicable.
- No 24hr lighting except at CCSs and for specific work activities which have been agreed with the Local Planning Authority, which may include HDDs or where night time road closures/working is required.
- Where night time works are required and have been approved by the Local Planning Authority lighting would be directional to avoid unnecessary lighting on woodland and water edge, so as not to disturb emerging or foraging badgers.

- Where HDD is used to cross the Deben Estuary and Martlesham Creek the additional mitigation measures in the Ecological Mitigation Plan for the Deben Estuary Special Protection Area (SPA) non-breeding birds and Schedule 1 breeding birds (see Ecological Management Plan (EA1-CON-F-IBR-021237)) will be applied.
- Limited 24 hour lighting at substation compound site during particular construction activities (concrete pours, etc.), as agreed with the Local Planning Authority.
- At the substation, external lighting at night should be avoided as far as feasible, particularly during the months of higher bat activity (August – October). When lighting at night is required, it will comply with the Bat Conservation Trust (2014) recommendations on external lighting as agreed with Natural England. This would include provisions for directional lighting to be used at the substation during 24hr working, in order to avoid lighting the bat flight paths. This would illuminate the construction working area and avoid potential flight paths associated with boundary features.

8.4 Monitoring

100. Regular inspections of lighting mitigation measures will be undertaken by the contractor's, construction management team and EnCoW throughout the construction phase, as set out in the PEMP and CEMP, to ensure effective implementation and report any non-compliances. If non-conformity with any of the control and mitigation measures is identified, it will be recorded during a site inspection or audit and appropriate remedial actions will be implemented.

101. Any complaint regarding lighting on the site will be directed to the EnCoW. The EnCoW will investigate the complaint and provide a response within 24 hours. This may include investigation of alternatives, such as the use of lower wattage lighting, or re-direction of lighting or re-positioning shielding.

9 Contaminated Land

9.1 Introduction

102. This section of the CoCP provides a summary of knowledge relating to contaminated sites and the proposed specific control measures for dealing with this contamination. It also provides a procedure to follow in the event of encountering unexpected contamination, and measures for working in areas of suspected contamination.

103. A Written Scheme of Potentially Contaminated Land Mitigation (EA1-CON-R-IBR-010156) has been produced to fulfil Requirement 17 of the DCO which states:

> ***17.****—(1) No connection works comprised in stage (vii) shall commence until a written scheme applicable to that stage, to mitigate the potential for release of contaminants within the Order limits has, after consultation with the Environment Agency, been submitted to and approved by the relevant planning authority.*
> *(2) The scheme must include an investigation and assessment report, prepared by a specialist consultant approved by the relevant planning authority, to identify the extent of any contamination within the Order limits comprised in stage (vii) and mitigation measures to be undertaken to limit impacts arising from the potential release of contaminants.*
> *(3) The written scheme referred to in sub-paragraph (1) must be implemented as approved.*

104. This document is provided under separate cover, thus detailed information does not form part of this CoCP however a brief summary of the knowledge relating to contaminated sites and proposed mitigation is provided below.

9.2 Current Knowledge of Contaminated sites

105. During previous preparation of the Environmental Statement in 2012, (Volume 3 Onshore Impacts; 7.4.1 Chapter 20 – Ground Conditions and Contamination), locations of potential contamination concern were identified and preliminary risk assessments applied along the whole 37 km onshore route. A Phase 1 Desk Study was undertaken for the section of the onshore works identified as requiring further assessment.

106. In the Environmental Statement, the potential contamination source of greatest concern for the whole onshore cable route was identified as the historic landfill to the north of the village of Tuddenham St Martin. Tuddenham St Martin landfill is classified by Suffolk Coastal District Council as Contaminated Land under Part IIA of the Environmental Protection Act 1990; it has also been designated as a ‘special site’ on the basis of pollution of controlled waters and is now regularly monitored by the Environment Agency, the regulatory authority for controlled waters. At the time of the Environmental Statement, this historic landfill at Tuddenham St Martin was identified as the only site where cable route construction trenching would be required through either landfill, or infilled pits. However, the Phase 1 Desk Study identified that the route also passes though Culpho Hall Landfill, identified as a former sand pit from historic maps, about which little is known.

107. Intrusive Phase 2 investigation of both Tuddenham St Martin and Culpho Hall landfill areas, has been completed in June 2016 by specialist site investigation contractors. The agreed scope of work at Tuddenham St Martin comprised surface water quality monitoring, three cable percussion boreholes and six trial pits with associated sampling and in situ testing. The Phase 2 investigation has confirmed construction of the cable corridor route at this location will be through Landfill waste (Made Ground) deposits.

108. The scope of work at Culpho Hall comprised ten trial pits with associated sampling and in situ testing. The Phase 2 investigation has confirmed construction of the cable corridor route at this location will not be through Landfill waste (Made Ground) deposits, but natural ground.

109. For full details of the site investigation works and the analytical results please see the Written Scheme of Potentially Contaminated Land Mitigation (EA1-CON-R-IBR-010156).

9.3 Control Measures at Tuddenham St Martin

110. At Tuddenham St Martin, whilst it is not anticipated that the proposed construction works will impact on the existing Environment Agency Significant Pollutant Linkages associated with controlled waters, the implementation of some control measures through the landfill will be required. The mitigation measures are summarised below, further details provided in the Written Scheme of Potentially Contaminated Land Mitigation (EA1-CON-R-IBR-010156):

- Construction workers should minimise direct contact with the waste materials, including inhalation of dust. Appropriate Personal Protective Equipment (PPE) would include overalls and gloves.
- There is potential for asbestos fibre contamination to be encountered and it is recommended that licenced asbestos specialists carry out a suitable programme of air quality monitoring during excavation and backfiling works.
- Man entry into trenches/excavations/confined spaces within the landfill should be avoided as there is potential for toxic carbon dioxide gas to be present.
- The identification of the waste being poorly compacted in places, particularly at shallow depth, raises some geotechnical concerns regarding differential settlement of the cabling in the long term. Consideration of cable tolerance for movement and the suitable positioning of jointing chambers through the landfill will be considered during final construction design.
- The cable route will remain above the groundwater table, however to protect the cables and prevent the cable trench becoming a conduit of surface water runoff, which could possibly increase leachate generation, the cables will be surrounded by relatively impermeable cement bound sand (CBS), rather than sand.
- The waste material to be reused as backfill for the top metre of cable trenches has been assessed and is considered suitable, once any large fragments (cobbles and boulders) have been removed. This would minimise off-site disposal of waste materials.
- Following construction completion it is recommended that a further round of surface water sampling and analysis for the six existing Environment Agency monitoring points, between the landfill and the River Fynn is repeated to provide quantitative data on the short term impact (if any) of the cable route construction activities, on spring and river water quality.

9.4 Encountering Unexpected Contamination

111. Site Managers will be instructed in the potential for encountering unexpected contamination, and made aware of the procedure should such an event occur. The Site Manager will be provided with contact details of the EnCoW who will contact an appropriate environmental specialist who can provide telephone advice as to whether construction needs to be halted to allow a site inspection to be undertaken.

112. In the event that unexpected contamination is encountered, work in the area will cease on instruction by the Site Manager or delegate and be contained and made as safe as reasonably practical pending assessment by suitably qualified environmental consultants, consultation with the local authorities and the Environment Agency, and agreement on plans for further investigation and remediation measures where necessary.

113. The environmental specialist will visit the location of the unexpected contamination, if necessary, and determine what action is required to allow construction to recommence. It may be necessary to collect soil or water samples for laboratory analysis. Some types of contamination may need to be removed to ensure the safety of construction workers, in which case this will be advised by the environmental consultant.

114. Where necessary, laboratory analysis will be completed (on an expedited turnaround, where possible), allowing conclusions to be reached as to whether material needs to be removed from the construction area.

9.5 Measures for Working in Areas of Suspected or Unexpectedly Found Contamination

115. Risk of exposure of site workers to contaminants at sites where contamination is suspected or unexpectedly found will be minimised through the adoption of good practice procedures as described in guidance documents such as the Protection of Workers and the General Public during the Development of Contaminated Land. HSE, 1991 and A Guide for Safe Working on Contaminated Sites, R132, CIRIA 1996. In addition to the specific control measures identified in Section 9.3 for Tuddenham St Martin the following measures will be in place at areas of suspected or unexpectedly found contamination:

- Prior to work being undertaken that may have an effect on workers, the public or the environment, an approved site specific Risk Assessment and Method Statement (RAMS) must be completed. The Risk Assessment will identify risks associated with the proposed work at the site together with mitigation measures to adequately address the risks and embed these in the work Method Statement.
- Implementation of controls such as defining, demarcating and isolating the working area, use of designated access and egress routes, provision of hygiene facilities and maintenance of high hygiene standards, provision of first aid facilities and provision and use of appropriate PPE, together with any specific measures required and relating to the particular site environment.
- Where required, provision will be made for the safe storage of contaminated materials at designated locations. Where disposal of contaminated material is required, it is proposed that advice will be sought from suitably qualified environmental specialist who will advise on the best method of disposal (e.g. licensed landfill, tanker for liquids). Transfers will be undertaken by registered waste carriers to authorised disposal sites in accordance with Duty of Care requirements, under the Waste (England and Wales) Regulations 2011.
- Where material is to be removed from site due to contamination it will be undertaken in a manner to prevent the generation of pathways and the egress of pollutants from the site. Appropriate and clean replacement fill material will be imported to site and where necessary, fill material will be analysed prior to import to site to ensure that it is suitable for use.

10 Storage and Use of Oils and Chemicals

10.1 Introduction

116. The main objectives with regard to managing potential hazardous materials including oils and chemicals are:

- To ensure that appropriate measures are in place to prevent hazardous materials being released into the environment:
- Complying with relevant legislation and good practice associated with the storage and use of hazardous materials.

117. A Pollution Prevention and Emergency Response Plan (PPERP) has been produced, in fulfilment of DCO Requirement 20 (2) (h), attached as Appendix 7. The PPERP details the requirements for pollution prevention that any contractor working during the onshore construction works will need to comply with. A brief summary of the control measures for appropriate storage of use of oils and chemicals is provided below however please refer to Appendix 7 for full details.

10.2 Control Measures

118. The following best practice will be implemented:

- All contractor's shall detail with their CEMP specific controls necessary for the delivery, storage and handling of hazardous materials relevant to their works, and in particular oils and fuels, taking into account the requirements of the Control of Pollution (Oil Storage) (England) Regulations.
- Ensure that Fuels, Oils and Chemicals are only ordered in manageable quantities and stored responsibly, i.e. in a bunded area able to contain 110% of the volume or in a suitable container/storage area within designated areas and in accordance with relevant legislation.
- Oil and fuel storage tanks shall be robust and provide adequate secondary containment and be located in designated areas taking into account security, the location of sensitive receptors and pathways such as drains and watercourses, and safe access and egress for plant and manual handling. Spill response materials shall be provided nearby and be readily accessible, with local project personnel trained in spill response.
- Facilities storing oils, fuels and chemical shall be locked and made secure when not in use.
- Oils and chemicals shall be clearly labelled and the contractor will retain an up-to-date Control of Substances Hazardous to Health (COSHH) inventory. Spillage kits or portable bund kits must be available at or near the delivery point for emergencies.
- Oil and chemical storage areas shall be inspected, at least weekly for signs of spillage, leaks and damage. Rainwater, materials and general debris will be stored in bunds and drip trays that compromise contingency storage shall be removed as part of the maintenance programme and in accordance with regulatory protocols.
- Activities involving the handling of large quantities of hazardous materials, such as deliveries and refuelling will be undertaken by designated and trained personnel.
- Where portable storage is required at active working areas these shall be sited at appropriate distances from watercourses, possible routes to watercourses and drains. Storage areas shall located in areas free from vehicle movements to minimise the risk of collision damage.
- Use of portable bowsers with built-in bunds for any refuelling activities required in the active working area, with the return of bowsers to the main construction compounds overnight.
- Inspection of all construction plant for fuel leaks before being delivered to the working area.

10.3 Monitoring

119. The control measures described above will be monitored by the contractor's construction management team and the EnCoW, throughout the construction phase. If non-conformity with any of the mitigation measures is identified, it will be recorded during a site audit and appropriate remedial actions will be implemented.

11 Waste Management

11.1 Introduction

120. During the construction works waste materials can arise during the general operations or from surplus imported materials or those generated on site. Considerations shall be given to the management of such waste, such as waste reduction; segregation of waste; disposal of waste; the financial impacts of waste disposal and the processes of recording, monitoring, training and reviewing.

121. A Site Waste Management Plan (SWMP) has been produced and included as Appendix 4 to fulfil DCO Requirement 20 (2) (g).

122. The SWMP outlines the procedures that will be implemented during the onshore construction works in order to optimise the sustainable management of waste by encouraging the review of waste reduction and recovery practice levels and highlighting areas where Good and Best Practice in waste minimisation and management can be achieved. This section provides a summary of the SWMP and summarises the objectives, control measures to be employed and monitoring that will be put in place. Please refer to Appendix 4 for full details.

123. The SWMP is a working document and as such information will continue to be added as the document remains live throughout the works.

11.2 Objectives

124. EAOL aims to manage waste in accordance with the following objectives:

- **Environmental Protection:** Manage and reduce the amount of waste produced, and therefore to be disposed of at landfill. Additional environmental benefits include; less harm to the local environment, avoidance of fly tipping, reduced energy consumption and greater opportunities for reusing and recycling materials.
- **Cost Saving:** Managing materials more efficiently will immediately cut costs. Better storage and handling of materials will reduce waste and enable better recovery. Reusing and recycling materials cuts disposal costs.
- **Legal Requirements:** Ensuring compliance with relevant waste legislation including their Duty of Care obligations. The requirements for Duty of Care involve all parties (Operator, Contractor, Sub-Contractors, Waste Management Companies etc.) ensuring that waste is only transported and received by those licenced to do so. In addition the written record of waste movements will be retained for 2 years (where non-hazardous) and 3 years (where waste is hazardous).The Duty of Care obligations also extend to ensuring that waste is stored and contained appropriately at all times.

11.3 Control Measures

125. The Waste Prevention, Reduction and Management and Recover Actions will identified and recorded throughout the onshore construction works. The key elements of waste management to be implemented are:

- A person responsible for producing, implementing and maintaining the Project and individual Contractor SWMPs will be identified. This person will also be responsible for ensuring compliance with Duty of Care regulations.
- Target recovery rates for key waste type, along with some formal measurement will be identified.
- All waste streams (for example, soils and stones, plastics and metals etc.), to be produced during construction and excavation, will be considered for their potential for reuse (on or off site) or for recycling.
- The most significant opportunities to increase reuse and recycling rates (termed Waste Recovery Quick Wins) and the realistic recovery rates will be identified.
- Suitable waste management contractors will be identified and the appropriate licences, permits, Waste Transfer Notes (WTNs) and Hazardous Waste Consignment Notes (HWCNs) will be recorded and retained.
- Appropriate site practices, such as identifying how waste materials will be segregated and measures that will be used to raise site operatives’ awareness of waste reduction, reuse and recycling (e.g. toolbox talks) will be implemented.
- The method for measuring and auditing construction and excavation waste will be set out.

126. Duty of Care requirements, in relation to the storage, transfer and disposal of waste, will be fully complied with. The following information will be recorded, as a minimum by contractors:

- The types and quantities of waste generated.
- The management approach for each waste type (Reuse, Recycle, Recover, Dispose) including any treatment.
- The storage arrangements for each waste type.
- The site waste monitoring and reporting arrangements.

127. All contractors will identify and appoint waste carriers and appropriate waste management facilities prior to the construction activities commencing, ensuring first that they are fully licenced, obtain copies of all licences and record details of all identified waste carriers and waste management facilities.

128. Site waste will be segregated, as far as practical, (and as a minimum to separate hazardous wastes) and will be stored in in line with the following:

- Skips and containers used for waste must be in good condition and suitable for use.
- The area to be used for waste storage shall be clearly signed and segregated.
- Clear signage shall be used to identify the contents of any waste container.
- Materials stored on site will be protected, by whatever means necessary, to prevent any deterioration or contamination prior to use.
- The waste storage facilities provided will be located on a suitable hard surface to prevent spillage and to prevent surface run-off discharging onto the surrounding ground.
- Any spilt or lost material will be immediately dealt with by the Contractor to prevent seepage into the ground.
- The location and details of the proposed material handling and storage facilities to be installed will be agreed in advance for acceptance.

129. EAOL and appointed contractors will provide suitable on-site instruction on the appropriate segregation, handling, recycling, reuse, and return methods which will be used by all parties, during all stages of the onshore construction works. The SWMP will also be outlined in the site induction process. In addition to the site environmental inductions, targeted Toolbox talks will be carried out, which will inform contractors and sub-contractors as to how they should be involved with the waste, reuse and recycling requirements of their works.

11.4 Monitoring

130. Monitoring of waste arising, transfers and disposals will be monitored by each appointed Contractor(s), with this information being input by them into the SMARTWaste system to consolidate the waste figures for the onshore project works. Day to day monitoring of waste management and the storage facilities will be undertaken by both the Contractor's environmental management representative and EnCoW throughout the construction phase.

12 Protection of Surface and Groundwater Resources

12.1 Introduction

131. A Surface Water and Drainage Management Plans (SWDMP) (EA1-CON-F-GBE-008546) has been prepared in fulfilment of DCO Requirement 16 and 20 (2) (a) and is attached as Appendix 5. A further SWDMP has been produced detailing the surface water and drainage management related to the operational substation (EA1-CON-F-GBE-008555), in fulfilment of DCO Requirement 16 (2), this information is, however, not presented as part of this CoCP.

132. The SWDMP sets out the methods for the collection, treatment and storage of surface and foul water associated with the construction works to prevent any adverse impact on water quality. A summary of the objectives and control measures is provided below; however, please refer to Appendix 1 for full details.

12.1.1 Objectives

133. The main objectives with regards to managing potential surface water and foul water drainage are as follows:

- To protect surface and groundwater by ensuring that appropriate measures are in place to prevent contaminants from entering the surrounding environment and in particular pathways that might lead to water receptors. An overview of proposed controls for hazardous or contaminated materials is provided in Section 9 and 10 of this document.
- To ensure the protection of watercourses during open cut watercourse crossings.
- To ensure protection of aquatic flora and fauna, and their habitats, during open cut crossings.
- To comply with relevant legislation and good practice in terms of managing surface and foul water abstractions and discharges.
- To maintain and protect private water supplies during construction.

12.1.2 Control Measures

134. Contamination of surface water runoff is the highest potential risk of pollution during the construction work. The construction work will minimise the production of runoff containing elevated levels of suspended solids using a combination of the following to achieve the required water quality for discharge back to local watercourses:

- Installation of drainage ditches at the toe of the soil storage bunds, running parallel to the trenches and bunds and collecting water close to source.
- Drainage ditches to intercept water that otherwise may flow from off-site, across the corridor width, picking up suspended matter as it crosses.
- Haul road constructed with suitable road stone material preventing excessive ground damage from vehicles.
- Soil stored locally to excavation to minimise handling and exposure.
- River and watercourse crossings carried out in accordance with proposed methods.
- Use of silt fencing to retain solids prior to collection of run off, e.g. along the toe of bunds.
- Seeding of stored topsoil bunds at first opportunity, to reduce surface erosion.
- Construction of holding sumps along drain routes and use of filter bags on outlets or pumps.
- Use of proprietary mobile water treatment systems (e.g. Siltbuster or similar).

135. The control of any likely sources of the pollution will be undertaken by:

- Avoidance of excessive vehicle or plant tracking directly over topsoil stripped areas. Use of haul road and additional use of trackmat, or similar, where temporary off road access is required for excavator or other plant.
- Controlling and minimising runoff across the site, which otherwise might erode or impact on exposed soil and stockpiles, to carry suspended solids in the runoff. Intercept ditches and silt fences will be first line of defence.
- Contain heavily silt laden water at source (e.g. silt fencing at toe of soil piles or other affected points, addition of filter bags on pump outlets).

- Using best practice methodologies when working in or near water and when placing any concrete or grouting products.
- Storing and using fuel oils, lubricants, solvents, etc. to best practice, avoiding any spillage.

136. Details on the management of each of the common pollutants (sediment; cement/concrete products; hydrocarbons; contamination land and organic waste) are provided in the SWDMP (Appendix 5).

137. The SWDMP also provides control measures relating to abstractions, discharge, protection of water supplies and licensing requirements. Please Appendix 5 for further details.

12.1.3 Water Framework Directive

138. A Water Framework Directive (WFD) Assessment has been carried out for the onshore construction works, which is provided as Appendix 1 to the SWDMP (Appendix 5).

139. Consideration of the WFD is required for any development which has the potential to cause deterioration in ecological, quantitative and/or chemical status of a water body, or to compromise any improvements that might otherwise lead to a waterbody failing to meet its WFD objectives. Therefore, it is necessary to consider the potential of the onshore construction works to impact on any designated WFD water bodies.

140. The WFD assessment concludes that any effect on the status of WFD parameters that are significant at the water body level, due to the onshore construction work, will be temporary (i.e. non-permanent). In addition, the onshore construction works are not predicted to cause deterioration to the current status of water bodies that may be impacted by the construction, nor will these works prevent these water bodies from achieving their future status objectives or improvements.

12.2 Watercourse Crossings

141. In addition, and in fulfilment of DCO requirement 20 (b) a detailed Watercourse Crossing Method Statement has been produced and is presented as Appendix 6. The document provides information on the watercourses to be crossed, the different type of crossing which will be required and details of the proposed crossing method. A summary is provided below; however, please see Appendix 6 for full details.

142. The cable route crosses watercourses at 45 locations along the onshore cable route, from the substation at Bramford to the landfall at Bawdsey, Suffolk. This includes eight main rivers and multiple smaller ordinary watercourses.

143. The majority of watercourses will need to be crossed in two ways. First the installation of a temporary crossing, to allow construction vehicles to be able to pass along the haul route constructed along the cable route corridor during construction. Secondly, a permanent crossing will be required under the watercourses for the installation of the ducts and cables.

144. At larger crossings Horizontal Directional Drilling (HDD) will be used. At these crossings, no temporary vehicle crossing will need to be constructed.

145. At the smaller watercourse crossings, open cut techniques will be used to excavate a trench below the bed of the watercourse into which the ducts and cables can be installed. At these locations the preferred technique will be the use of temporary culverting or flume pipes installed into the width of the crossing, under which the ducts and cables will be installed. Several crossings will involve the installation of a temporary bridge over the watercourse for access for the temporary haul road.

146. Details of each of the watercourse crossing techniques and the measures employed to protect the environment are provided in more detail in the Watercourse Crossing Method Statement, attached as Appendix 6.

13 Environmental Incident Response and Contingency

13.1 Introduction

147. It is important to identify and document the controls and procedures that will be in place to respond to an environmental incident during the construction phase of the onshore construction works.

148. A Pollution Prevention and Emergency Incident Response Plan has been produced to fulfil DCO Requirement 20 (2) (h) and is attached as Appendix 7, which details the procedures for emergency incident response. In addition, a Flood Plan has been produced to fulfil DCO Requirement 20 (2) (c) which sets out the procedures to be followed in the unlikely event of a flood emergency. This section provides a brief summary of these documents, for further details see Appendix 7 and 8.

13.2 Pollution Prevention and Emergency Incident Response

149. The Pollution Prevention and Emergency Incident Response Plan (Appendix 7) summarises the controls and procedures that will be put in place to respond to an environmental incident during the construction phase of the project and contains information on:

- Pollution Risk Assessment
- Chemical, Material and Waste Inventory
- Pollution Prevention Equipment
- Key Site and Emergency Contacts
- Emergency Response Procedure
- Training

13.3 Flood Plan

150. The Flood Plan (Appendix 8) sets out the procedures to be followed in the unlikely event of a flood emergency along the onshore cable route. The aim of the plan is to provide contractors during the onshore construction works clear indicators confirming when the construction works area should be evacuated in the unlikely event of a flood emergency. The plan also provides the key information for planning and responding to an evacuation.

151. Based on review of the Environment Agency Flood Zone Map the plan identified that the majority of the cable route will cross Flood Zone 1 (low risk), however the route does cross sections of Flood Zone 2 and 3 (medium and high risk respectively). The main areas at high flood risk are associated with the floodplains of the River Deben, the Mill River, Martlesham Creek, River Lark, River Fynn, River Gripping and Somersham watercourse. The cable route also crosses numerous ordinary watercourses, including several areas of marsh located between the landfall site and the River Deben. The substation is located fully within Flood Zone 1 (low risk).

152. The Flood Plan has been informed by the findings of the RSK Flood Risk Assessment (FRA) (RSK, 2012) and updated with flood data from the Environment Agency (EA) which was received in November 2015. The Flood Plan will be stored in an accessible location and be revisited on a regular basis. During the construction phase of the project, the contractors will be responsible for reviewing the Flood Plan, to ensure suitable preparation and protection of construction site personnel in the event of a flood.

A number of pre-occupation actions have been outlined within the Plan, including registering the areas of the construction works which are at risk of flooding with the EA Floodline Warning Direct service, identifying appropriate access and egress routes and designating evacuation points.

153. The Plan also provides contact details for key contacts and emergency services and the relevant instances for contacting each service. Such information will be utilised in the training of construction site personnel to ensure a flood-safe working environment during the construction works.

154. The Plan sets out the Flood Warning and Evacuation Procedures which shall be implemented and are outlined in Table 13-1 (taken from the Flood Plan). Please see Appendix 8 for further details.

Table 13-1 Flood Evacuation Procedures

Warning Triggers	Procedures
EA Flood Alert	Place Staff on Green Alert and review Flood Warning and Evacuation Plan Procedures. Check that all equipment can be accessed, is available and in good condition for use, with specific reference to - closed road signs, torches (check battery life/spares), high visibility jackets for all staff. Secure construction compounds and relocate vulnerable plant/machinery/stores to Flood Zone 1 if possible. Allow for handover should shift change occur before the warning is lowered. Check staff registers are complete and available to ensure all staff are accounted for post- evacuation
EA Flood Warning	Place staff on Red Alert and begin evacuation of construction work sites and compounds (trigger Fire Alarm at compounds). Use allocated evacuation route to facilitate / direct the safe evacuation of all personnel. A register should be taken to ensure all staff are accounted for. Contact the Emergency Services and EA to confirm that the work sites and compounds are being closed due to the risk of flooding. The Contractor's Construction Site Manager shall operate the emergency electrical shut off switches terminating the electricity supply and all power supplies to construction works sites/compounds if safe to do so.
EA Severe Flood Warning	Immediately start evacuation of construction work sites and compounds if not actioned on receipt of the Flood Warning (trigger Fire Alarm at compounds). Use allocated evacuation route to facilitate / direct the safe evacuation of all personnel. A register should be taken to ensure all staff are accounted for. Contact the Emergency Services and EA to confirm that the works sites and compounds are being closed due to the risk of flooding. The Contractor's Construction Site Manager shall operate the emergency electrical shut off switches terminating the electricity supply and all power supplies to construction works sites/compounds, if safe to do so.

14 Landscape and Ecological Management

14.1 Introduction

156. The onshore construction works have been carefully designed to reduce the potential for significant impacts on ecological receptors and to minimise impacts on landscape features such as trees and hedgerows.

157. To ensure that construction works does not have an unacceptable impact on landscape features Landscape Management Plans have been produced to fulfil DCO Requirement 12, which states:

158. Due to the differing site characteristics separate landscape management plan plans have been produced for the substation (EA1-CON-F-GBE-008554) and the cable route (EA1-CON-R-IBR-010129).

159. To detail how, when and by whom the measures to be implemented to minimise and avoid any adverse impacts to wildlife an Ecological Management Plan (EA1-CON-F-IBR-021237) has been produced to fulfil DCO Requirements 19 and 27, which state:

> ***19.*** *—(1) No stage of the connection works shall be commenced until for that stage a written ecological management plan (which accords with the outline landscape and ecological management strategy) reflecting the survey results and ecological mitigation and enhancement measures included in the environmental statement has been submitted to and approved in writing by the relevant planning authority in consultation with Natural England.*
> *(2) The ecological management plan must include an implementation timetable and must be carried out as approved.*
>
> **27.** —(2) *Where a European protected species is shown to be present, the relevant part(s) of the connection works must not begin until, after consultation with Natural England and the relevant planning authority, a scheme of protection and mitigation measures has been submitted to and approved in writing by the relevant planning authority. The connection works shall be carried out in accordance with the approved scheme.*

160. These documents are provided under separate cover, detailed information does not form part of this CoCP but this section provides a brief summary of these documents.

14.2 Summary of Landscape Management Plans

161. The Cable Landscape Management Plan (EA1-CON-R-IBR-010129) describes the landscape proposals and the general maintenance requirements for the landscape works for the mitigation proposals related to the onshore cable route.

162. The plan provides information on the design process undertaken for the onshore cable route (with respect to the landscape) and the corresponding proposed mitigation landscape works and their required maintenance to ensure successful plant establishment.

163. It provides details of the planting strategy, based on the following key elements

- Replacement individual tree planting on a 2 for 1 basis and where possible a like for like species. This is for hedgerow trees and other distinct standalone trees that are felled as part of the cable works.
- Reinstatement of hedgerows and in-filling of gaps created within hedgerows as part of the cable works.
- Compensatory mitigation planting of groups of trees using a native woodland mix where the cable works require the felling of groups of one or more trees.
- Grass re-seeding to reinstate disturbed areas, using either a species rich mix, wetland meadow mix or general purpose amenity mix for verges and embankments, depending upon the location.

164. It identified the tress and hedgerows to be impacted by the works, the compensatory planting to be undertaken and how this is to be implemented and maintained. It also provides details on tree and hedgerow protection and the topsoil storage strategy during construction.

165. The Substation Landscape Management Plan (EA1-CON-F-GBE-008554) describes the landscape proposals and the general maintenance requirements for the landscape proposals for the onshore substation. The landscape proposals for the substation are designed to meet a key requirement: to provide visual screening of the substation in views from the surrounding area. The key elements and approaches in the landscape proposals include:

- Hedgerows and woodland blocks provide required mitigation and visual screening.
- Hedgerows and woodland relate to local landscape context.
- The size and shape of woodland blocks respond to technical constraints (e.g. overhead and underground cable routes).
- Earthworks bunding around the western and southern perimeter will have natural looking, gentle slopes where possible (1:5 to 1:20) when looking towards substation.
- Western bund planted with trees to provide additional visual screening
- Hedgerow planted along top of bund to screen and soften the substation perimeter fence – especially in views from the public bridleway to the south where technical constraints restrict planting opportunities for trees.
- Access road framed by hedges and woodland blocks to create visual separation from the existing wide bridleway and the National Grid substation access road.
- Species rich grassland areas will be established to provide a low maintenance ground cover which also enhances the local biodiversity in areas that are not to be returned to agricultural use or planted as woodland.
- Existing agricultural land use will be retained in other areas with arable fields, such as to the east between Bullenhall Farm and the Bramford NG substation.
- Amenity grasses used immediately next to perimeter foot track and along access track verge.
- Sustainable Drainage System (SuDS) attenuation basin to include a permanent water pond which will have ecological benefits through habitat creation on the site.
- Additional ecological mitigation where deemed appropriate and necessary.

166. The plan provides details of the proposed landscaping scheme for both hard and soft landscaping, including species mix, and implementation and maintenance of the scheme. It also provides details on tree protection and the topsoil storage strategy during construction.

14.3 Summary of Ecological Management Plan

167. The Ecological Management Plan (EcoMP) (EA1-CON-F-IBR-021237) sets out the ecological mitigation methods to be implemented during onshore construction works that are reflective of the ecological surveys and impact assessment. It includes Species Protection Plans for European Protected Species and protected species in England which occur within the Development Order Limits.

168. The EcoMP provides details of the legal requirements, responsibilities of the contractor and Ecological Clerk of Works (ECoW), baseline conditions, pre-construction, construction and post-construction mitigation measures, and an implementation timetable.

169. Species Protection Plans (SPP) will be implemented during construction of the onshore construction works, in compliance with DCO Requirement 27 (2). The SPP will act as a live document, to be referenced throughout construction works on the site, to ensure the protection of the identified species.

170. These ecological surveys confirmed the presence of the following protected species:

- Otter*;
- Water vole;
- Reptiles including: Slow worm, grass snake and Common lizard
- Great crested newt*;
- Bat species*;
- Badger; and

- Schedule 1 breeding birds: Marsh Harrier (*Circus aeruginosus*) and Cetti's warbler (*Cettia cetti*).
  * European Protected Species

171. The EcoMP also provides baseline conditions and mitigation measures for habitats, dormouse, fish and invertebrates and details of general mitigation measures.

15 Archaeology and Heritage

15.1 Introduction

172. It is important to ensure that the construction works are designed and executed to avoid unnecessary impacts upon cultural-heritage assets (known and yet to be discovered) within and adjacent to all working areas, and to mitigate those impacts upon assets that cannot be avoided.

173. An Archaeological Written Scheme of Investigation (WSI) (EA1-CON-F-IBR-010138) has been prepared to fulfil DCO Requirement 18 which states:

> ***18.—(****1) No stage of the connection works shall be commenced until for that stage a written scheme of archaeological investigation (which accords with the outline written scheme of investigation: archaeology and cultural heritage (onshore)) has, after consultation with English Heritage and Suffolk County Council, been submitted to and approved in writing by the relevant planning authority.*
> *(2) The scheme must include details of the following—*
> *(a) an assessment of significance and research questions; and*
> *(b) the programme and methodology of site investigation and recording;*
> *(c) the programme for post investigation assessment;*
> *(d) provision to be made for analysis of the site investigation and recording;*
> *(e) provision to be made for publication and dissemination of the analysis and records of the site investigation;*
> *(f) provision to be made for archive deposition of the analysis and records of the site investigation; and*
> *(g) nomination of a competent person or persons/organisation to undertake the works set out within the written scheme of investigation.*

174. The WSI identifies areas where a programme of archaeological investigation (evaluation, mitigation, excavation, built heritage recording and watching brief) is required, and the measures to be taken to protect or preserve in situ or by record any significant archaeological remains that may be found. Any archaeological investigations or watching briefs must be carried out in accordance with the approved WSI.

175. The WSI is provided under separate cover, thus detailed information does not form part of this CoCP but this section provides a brief summary.

15.2 Summary of Archaeological Written Scheme of Investigation

176. The potential archaeological sensitivity of the onshore construction works was recognised at an early stage and it has been evaluated through a variety of non-invasive and invasive techniques. The WSI builds on the previous archaeological surveys and reports and baseline data was collected from the Suffolk County Council Historic Environment Record (SCC HER) to identify areas of enhanced archaeological potential along the proposed route.

177. The WSI provides detail of the geophysical survey and trial trenching fieldwork which has been undertaken across the onshore construction works to identify core areas of archaeological interest and areas where mitigation are measures required.

178. The areas requiring mitigation have been divided into three distinct phases of work:

- 25 Set Piece Excavation (SPE) areas where there are extensive and complex archaeological remains;
- 10 Strip Map Excavation (SME) areas where significant but less complex archaeological remains are anticipated; and
- 11 Watching Brief (WB) areas suitable for archaeological monitoring during groundworks.

179. The aim of the SPE, SME and WB work is to mitigate the impacts of the proposed onshore construction works on known and potential archaeological features, through preservation by record, at specified locations along the consented cable corridor route. No element of the onshore construction works shall take place in any of these identified archaeological sensitive areas until the required mitigation works have been completed.

180. The WSI sets out the scope, site investigation methodology, programme for the implementation of the mitigation works and details the post-excavation assessment, analysis, reporting and archiving to be undertaken.

181. In the even that previously unidentified archaeology is discovered by any construction contractor, in areas not included within the Written Scheme of Investigation, the works will be stopped. The contractor will then contact a specialist archaeology contractor who will attend site. The construction and archaeology contractors will be required, in consultation with EAOL, to contact the Suffolk County Council (SCC) archaeology department to develop a strategy to deal with the find in a manner satisfactory to SCC. Works will only recommence after agreement with SCC that the matter has been resolved.

16 Monitoring and Site Inspections

16.1 Introduction

183. To ensure compliance, a programme of monitoring shall be established for the onshore construction works. This should be documented within the PEMP and CEMP and include, but not necessarily be restricted to, the following items and any monitoring requirements identified with the topic specific plans attached as appendices, including the Air Quality Monitoring Plan (Appendix 2), Construction Artificial Lighting Plan (Appendix 3).

16.1.1 Site Inspections

184. EAOL and relevant contractors will undertake site inspections on a periodic basis. These site inspections should include an environmental component which should, as a minimum and where relevant, cover waste management, water management, management of hazardous materials, wastewater management, emergency response, incidents and complaints, nuisance, air quality visual monitoring, inspection of light mitigation measures and other site sensitive specific issues.

185. An environmental inspection program will be agreed with each contractor prior to commencing work.

186. A responsible person will be allocated to each raised action to manage its close out. Records of the inspections carried out will be retained onsite and any remedial actions required must also be recorded and implemented.

8.8.2 Environmental Audits

187. Environmental audits will be completed by qualified members of the EAOL management team and the EnCoW. A programme of Environmental Audits for onshore will developed and these audits will be agreed and arranged with the contractor at least 2 weeks in advance.

188. A responsible person will be allocated to each raised action to manage its close out. Records of the audits carried out will be retained onsite and any remedial actions required must also be recorded and implemented.

17 Community Liaison and Public Relations

17.1 Introduction

189. EAOL will manage public relations with local residents and businesses that may be affected by noise or other amenity aspects caused by the construction works. A proactive public relations campaign will be maintained, keeping local residents informed of the type and timing of works involved, paying particular attention to potential evening and night time works (where permitted) and activities which may occur in close proximity to receptors.

190. A Community Liaison and Public Relations Procedure has been produced and is attached as Appendix 9, it sets out communication processes to be applied during the onshore construction works and aims to ensure that the construction works are fully communicated to interested parties. A brief summary of the processes are provided below; however, please refer to Appendix 9 for full details.

17.2 Objectives

191. The Community Liaison and Public Relations Procedure sets out the communication processes which EAOL and contractors will be required to adopt and implement during any onshore construction works. The purpose of the plan is:

- To ensure a clear understanding and consistent approach across the project and by contractors.
- To reduce the likelihood that conflicts will occur between projects in terms of external relationships and internal resource
- To maximise and take advantage of potential synergies in consultation/communication
- To ensure a clear understanding and consistent approach across all the SPR East Anglia projects.
- To provide a record of communication activity for EA ONE onshore construction works.

17.3 Communication Processes

192. A combination of communication mechanisms will be employed to keep the local communities informed this include:

- Use of the ScottishPower website.
- Emails and notices.
- Advert/Articles.
- Letters.
- Exhibitions/Public information days.
- Exhibition boards.
- Parish magazines.
- Parish council meetings (as requested).
- Newsletters.

193. A Community Liaison Officer will be in post for 2.5 days a week from commencement of the pre-construction works and the position will become full-time from January 2017 when main construction works commence. The individual will be based at CCS B at Claydon, but will travel frequently along the cable route. They will manage and respond to any public concerns, queries or complaints and will maintain a record of all correspondence.

194. They will also review contractors' programmes to identify potential community concerns, identify solutions and ensure these are in place. In addition, they will be mindful of activities taking place on other proposed ScottishPower Renewables (SPR) projects in the area, to ensure consistency of messaging and that synergies between projects can be maximised.

195. Internally, the Community Liaison Officer will work closely with the:

- Stakeholder Manager

- Construction Team
- Land Manager
- EA ONE Project Team
- Onshore Contractors and Subcontractors
- Agricultural, Aboricultural and Ecological Clerk of Works etc.,
- Sub-contractors
- Health & Safety team
- Environmental team

196. Externally, the Community Liaison Officer will work closely with the:

- Emergency Services
- SCC Highways Authority
- Local Planning Authorities
- Local Communities and Organisations

17.4 Enquiries

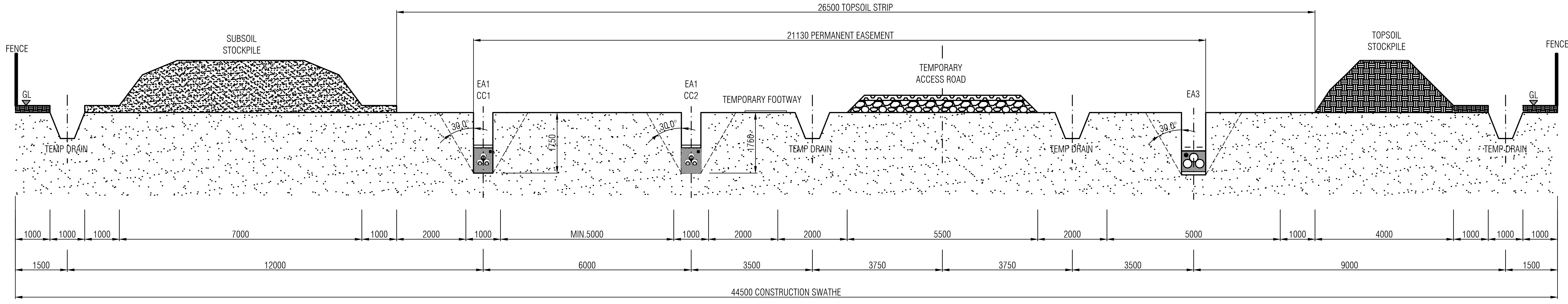
197. All enquiries relating to the onshore works should be directed to the Community Liaison Officer in the first instance. The Community Liaison Officer will keep a record of all issues raised. Any matters requiring action or consideration will be raised with the Local Planning Authorities at the monthly steering group meetings.

198. Contact details for the Community Liaison Officer will be made available on the website and in any communications nearer to the start of the works.

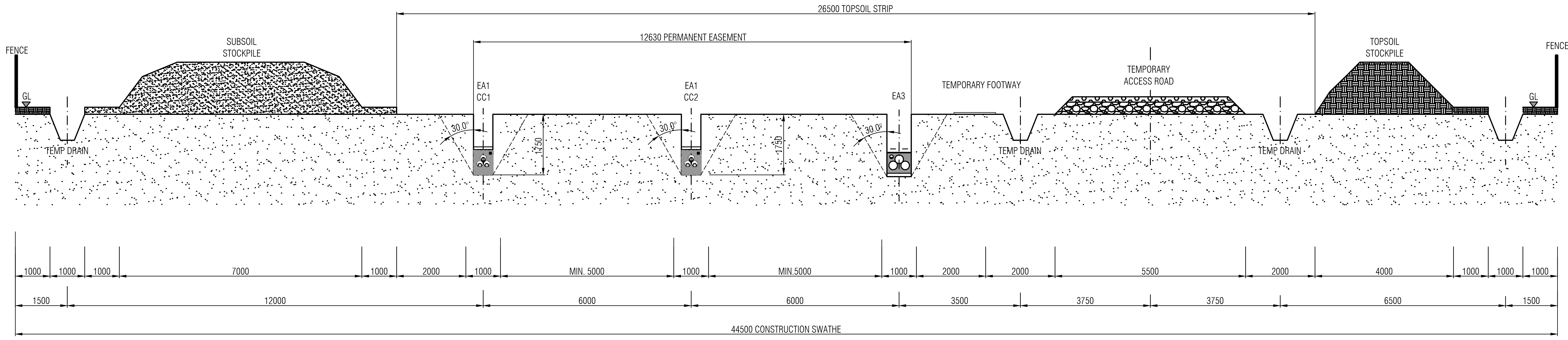
199. Queries can also be directed to the Stakeholder Manager, Joanna Young. Tel: 01502 509 236; Mob: 07738 063 259; jyoung@scottishpower.com.

Drawings

VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 1



VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 2



NOTES:
1- PASSING PLACES EACH 250 m.(FIG.1)
2- TURN ARROUND AREAS EACH 750m. (FIG.2)
3- "V" BUCKET MAY BE USED (SEE PHOTO)

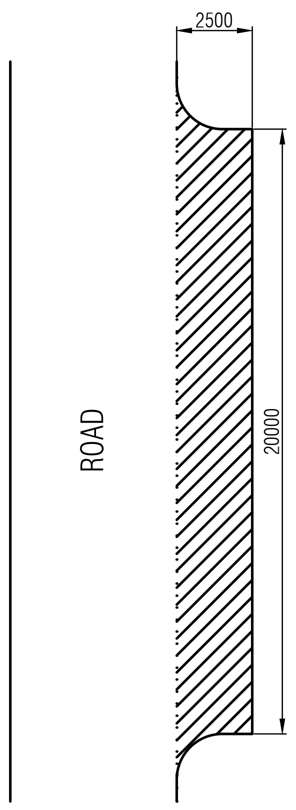


FIGURE 1

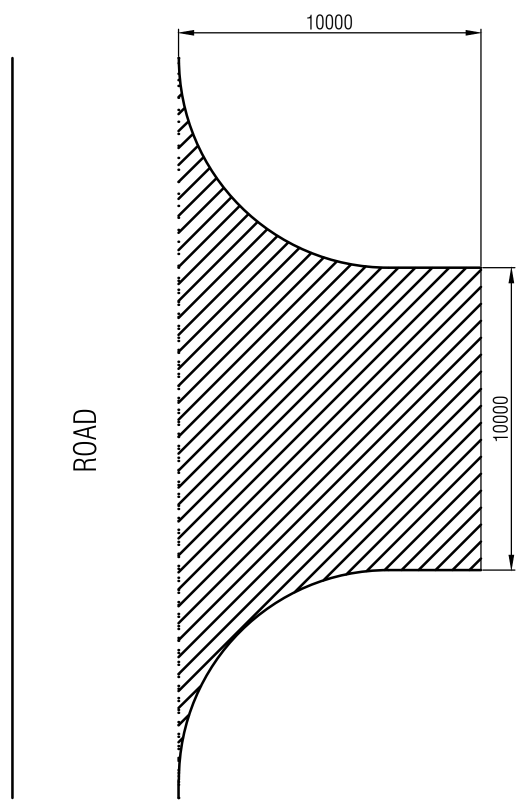


FIGURE 2

"V" BUCKET

Rev.	Date	Prepared	Reviewed	Approved	Reason / Description of changes.

IBERDROLA Engineering & Construction

Status Stamp:

Project: EAST ANGLIA

Location: BAWDSEY TO BRAMFORD

Contractor:

Status Stamp:

Drg. Title: CONSTRUCTION SWATHE TYPICAL CROSS SECTION

Client: SCOTTISHPOWER RENEWABLES

Date of First Issue: 15-07-2016

Prepared	Reviewed	Approved
IMFE	GRAT	FEDO

Drg. No.: EA1-GRD-E-IEC-007883

Contractors Drg. No. :

Sheet: 1 Next: - Rev: 0

Scale: 1:100 Size: A2

Appendix 1 Construction Noise & Vibration Management Plan

East Anglia ONE
Offshore Windfarm

East Anglia ONE Offshore Windfarm

Construction Noise and Vibration Management Plan
DCO Requirement 22 and 20 (2) (d)
Final for Approval

ID: EA1-CON-F-GBE-008549

Created by / date:	IEC / 02 Sep 2016
Checked by / date:	KW / 03 Sep 2016
Approved by / date:	PS / 08 Sep 2016

SCOTTISHPOWER RENEWABLES

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REVISION CONTROL

Revision and Approvals					
Rev	**Date**	**Reason for Issue**	**Originated by**	**Checked by**	**Approved by**
0	30-11-16	Draft	IEC	CD	DH
1	04-12-16	Interim for Consultation	IEC	GV	RM
2	08-09-16	Final for Approval	IEC	KW	PS

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Appendix

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE). The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. In February 2015 EAOL secured a Contract for Difference (CfD) award to build a 714MW project and ScottishPower Renewables announced its role in leading East Anglia ONE towards construction. In April 2015, EAOL submitted a non-material change application to DECC to amend the consent from direct current (DC) technology to alternating current (AC). In March 2016 DECC authorised the proposed change application and issued a Corrections and Amendments Order.

3. This plan relates to the onshore construction works associated with EA ONE, which based on the AC technology with an installed capacity of 714MW and a transmission connection of 680MW comprises of;

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, approx. 37km in length.
- Up to four cable ducts for the future East Anglia THREE project.
- An onshore substation located at Bramford next to existing National Grid infrastructure.

1.2 Scope and Purpose

4. This Construction Noise and Vibration Management Plan sets out the mitigation and control measures to be applied to the construction of the EA ONE onshore works to minimise potential noise and vibration impacts on nearby residents and other sensitive receptors during construction. This plan has been produced to fulfil DCO Requirement 22 (1) & (2) and 20 (2) (d) and which state:

> ***20*** *(2)* (d).*The code of construction practice must include:*
> - *a written scheme for noise and vibration management during construction;*
>
> ***22***. *(1). No stage of the connection works shall commence until a written scheme for noise and vibration management (which must accord with the outline code of construction practice) during construction of that stage has been submitted to and approved by the relevant planning authority. The scheme for noise and vibration management must form part of the code of construction practice.*
> *(2). The scheme must set out the particulars of—*
> *(a) the construction works, and the method by which they are to be carried out;*
> *(b) the noise attenuation measures to be taken to minimise noise resulting from the construction works, including any noise limits; and*
> *(c) a scheme for monitoring the noise during the construction works to ensure compliance with the noise limits and effectiveness of the attenuation measures.*

5. The purpose of this Construction Noise and Vibration Management Plan is to ensure that the onshore construction works of EA ONE comply with relevant European and UK legislation, DCO Requirements, environmental commitments as set out in the Environmental Statement (ES), and environmental and construction best practice.

2 Legislation and Guidelines

6. The following legislation and guidelines for the assessment of noise and vibration, arising from construction activities, will be utilised throughout the duration of the project:

- Noise and Statutory Nuisance Act 1993.
- Environmental Protection Act 1990.
- Control of Pollution Act 1974 (CoPA).
- Overarching National Policy Statement for Energy (EN-1). Department of Energy and Climate Change (July 2011).
- National Planning Policy Framework (NPPF). Department for Communities and Local Government (March 2012).
- BS7445-1:2003: Description and Measurement of Environmental Noise. Guide to quantities and procedures.
- BS5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 1: Noise.
- BS5228-2:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration.

3 Construction Details

3.1 Construction Details

3.1.1 Enabling Works

7. The onshore construction works will commence with the enabling works, which includes the establishment of the construction compounds (herein referred to as Construction Consolidation Sites), fencing and securing the working width, the topsoil strip and the installation of a haul road.

8. The onshore construction works will be supported by the installation of nine Construction Consolidation Sites (CCSs) (referenced A to I), these are compounds which will be utilised to provide welfare, site staff accommodation, parking, and secure storage for materials, plant and equipment. The CCSs are categorised as either Primary or Secondary, depending on their intended uses. There are two Primary CCSs; CCS B will be a designated storage and delivery facility and the main administrative compound and CCS E will be a main storage and delivery facility, with designated office space. The remaining seven Secondary CCSs shall be used to access the internal haul road, storage and deliveries. The establishment of the CCS compounds will be one of the first construction activities undertaken.

9. During the construction of the substation, site establishment and laydown areas will be required, including temporary offices, welfare, car parking, materials and equipment storage. The area directly east of the substation will be used as the temporary works area (referred to as Work No 38 within the DCO). At the start of the works the onshore substation compound and temporary works will be temporarily fenced.

10. The linear nature of the onshore cable route site will require fencing to be installed to both sides along the working width, not only to delineate the route but also to prevent possible vandalism and theft which could lead to possible contamination incidents.

11. Topsoil shall be stripped from the haul road location, trench areas and subsoil storage areas and stored. Topsoil storage and management shall be compliant with the recommendations and requirements set out in the Cable Landscape Management Plan (EA1-CON-R-IBR-010129). Topsoil shall be stored to one side of the working width**,** in such a way that it is not mixed with any subsoil. Typically this would be stored as an earth bund of a maximum height of two metres, to avoid compaction from the weight of the soil. Storage time shall be kept to a minimum, to prevent the soil deteriorating in quality. Topsoil stripped from different fields shall be stored separately, as would soil from specific hedgerow banks or woodland strips.

12. A temporary haul road will be installed along the route between the CCS locations and access points onto the local roads. Temporary haul road construction typically involves the placement of suitable imported stone material on a geotextile, however other methods such as soil stabilisation may be used if considered appropriate. In some instances the temporary haul road may comprise temporary trackway rather than stone due to site specific constraints. Following the initial topsoil stripping the haul road will be installed for a width of 5.5m along a designated route. The temporary haul road shall be constructed working from the installed CCS locations in two directions away from the CCS and towards the adjacent CCS along the onshore cable route.

3.1.2 Onshore Cable Route

13. The onshore cable route comprises a 37km corridor, between the Suffolk coast at Bawdsey and the substation at Bramford, passing the northern side of Ipswich. The onshore cable works comprise the installation of electricity transmission cables and ducts between the landfall location at Bawdsey and the new substation station, which is adjacent to the existing substation at Bramford. The majority of the route will be constructed using open trenching methods, other than in certain locations where the cable route traverses a number of major transport networks and natural obstacles. To enable the installation of the cable under these features, specialist trenchless techniques will be employed, such as Horizontal Directional Drilling (HDD).

14. Construction activities will be undertaken within a temporarily fenced strip of land, referred to as the working width. The working width is determined by electrical and civil engineering considerations and allows for sufficient space between the cables trenches to prevent the cables overheating, plus space for the associated temporary construction works i.e. soil storage, drainage, haul road installation and work areas for personnel and machinery. In accordance with the DCO, the

working width shall not exceed 55m, except at the HDD locations identified in DCO Requirement 10 (6), where the working width is permitted to be increased to allow for the installation and use of the specialist equipment to undertake the HDD.

15. There are two basic techniques to be used for the installation of the cable ducts during the construction of the onshore cable route. These are:

- **Open Cut techniques**; where a trench is excavated and the cable ducts laid in the trench before reinstatement, using the excavated material; and
- **Trenchless Technique**; typically HDD, where a pit is excavated to access the crossing and from which a drill is passed through the ground on one side of the obstacle to a receiving pit created on the opposite side. The bore is then gradually enlarged to receive the duct, which is the technique that will be used to pass under roads, main rivers and other sensitive sites.

16. For the open cut technique two trenches will be excavated for the EA ONE ducts and cables and an additional trench will be excavated in parallel for the cable ducts that will be installed to serve EA THREE in the future. An indicative cross section showing the open trench working width layout is included in Appendix 1. As the trench excavation progresses, subsoil will be removed to create the trenches to working depth for duct installation, the subsoil will be temporarily stored separately from the topsoil, and then reused to backfill the trenches.

17. Particular care will be taken when backfilling the trenches with the excavated material (subsoil) to reinstate it in the order in which it was excavated, again to minimise any disruption to the existing ground drainage pattern. The ducts will be installed in the trench, where they will be bedded on and then surrounded and topped by Cement Bound Sand (CBS) or equivalent which will gradually set and harden in situ as water is absorbed. Above this, the subsoil will then be used to reinstate the trench to the previous level.

18. Where, due to the existence of obstacles, it is not possible to install the cable ducts using the open trench method, trenchless installation techniques shall be used. The onshore cable route traverses a number of major transport networks and natural obstacles, to enable the installation of the cable across these features specialist techniques are required, namely the use of HDD. These key locations are referred to a 'Category 1' HDD sites as identified in Table 3-1.

19. These HDD sites will require additional equipment, storage and ancillary facilities to that required for the conventional open trench installation methods in order to accommodate the drilling activities. As such, a specialist HDD compound will be set up at each side of the HDD location to enable the specialist plant and materials to be delivered directly.

20. In addition to the above major features, a number of other features have been identified where the conventional open cut trenching technique are not appropriate. At these locations 'trenchless' methods will also to be implemented, which will comprise of a smaller HDD or auger bore. These sites are referred to as 'Category 2' HDD/trenchless. As the features to be crossed are less significant, they will not require any additional compounds and works will take place within the standard working width. Table 3-1 provides a list all the HDD / trenchless locations.

Table 3-1 HDD / Trenchless Locations

Reference	Category	Location/ Feature	Approximate Length (m)	Max Width (m)
HDD-01	Cat 1	Millers Wood off Bullen Lane	200	130
HDD-02	Cat 2	Somersham Watercourse	70	55
HDD-03	Cat 2	Pound Lane	60	55
HDD-04	Cat 1	River Gipping and Network Rail track west of A14	385	130
HDD-05	Cat 1	A14 Trunk Road and Old Ipswich Road	200	160
HDD-06	Cat 2	River Fynn	30	55
HDD-07	Cat 2	Lodge Road	60	25

HDD-08	Cat 1	A12 Trunk Road	165	120
HDD-09	Cat 2	Top Street	90	55
HDD-10	Cat 2	Sandy Lane	90	50
HDD-11	Cat 1	Martlesham Creek and Network Rail tracks south of Woodbridge	650	160
HDD-12	Cat 2	Waldringfield Road	70	55
HDD-13	Cat 2	Watercourse east of Howe's Farm	50	55
HDD-14	Cat 1	Kirton Creek	550	110
HDD-15	Cat 2	Sewage works outfall watercourse	50	55
HDD-16	Cat 1	River Deben	700	55
HDD-17	Cat 2	Queen's Fleet	70	55
HDD-18	Cat 1	Landfall, Bawdsey	1000	160
HDD-19	Cat 2	Bramford Road	60	55
HDD-20	Cat 2	Grundisburgh Road	50	55

21. The HDD technique is expected to be used at the majority of locations on the route where a trenchless method is required. This involves creating an access pit on either side of the obstacle to facilitate the installation of the drilling equipment and allow drilling under the obstacles, at an appropriate depth allowing the installation of the ducts. The HDD sites will have two access points, one either side of the HDD location, the drilling rig will be positioned on one side of the feature with ducting placed at the opposite side ready to be pulled back through the opening on completion of drilling.

22. Once the cable duct installation is completed then works will commence on the installation of the EA ONE cables within the pre-installed ducting system. As the onshore cabling typically comes on drums of up to 1,300m in length, jointing bays will be required along the cable route to join each section of cable together. These jointing bays will be constructed at regular intervals along the onshore cable route to allow cable pulling and jointing at a later stage. The joint bay with be excavated to size and a concrete poured floor with concrete or blockwork walls surround will be installed and topped with concrete slabs to leave ground cover to a depth of 1.1m.

23. Further details on the construction methodology for the onshore cable route are presented in the Cable Method Statement (EA1-CON-R-IBR-021238).

3.1.3 Onshore Substation

24. The EA ONE onshore substation will be located within a fenced compound (150m by 190m) to the north of the existing National Grid Bramford Substation. The substation will contain electrical equipment including power transformers, switchgear, reactive compensation equipment, harmonic filters, cables, control buildings and other associated equipment, which will largely be outside with a number of the components being within the buildings.

25. The construction of the substation will include a number of key stages; include enabling works, foundations and building construction and equipment installation and commissioning. The enabling will include grading and earthworks to remove any unsuitable materials from the substation area and provide a level platform at an elevation of 56m AOD. Where possible, the materials excavated will be reused on site as engineering fill or landscaping depending on material properties. The enabling works will also include the construction of the main concrete access road.

26. Following the completion of the site grading, works will commence of the excavations for foundation for the building and trenches to accommodate electrical infrastructure and installation of the drainage networks.

27. The building is largely comprised of steel and cladding materials, with brick/blockwork at the base. The structural steelwork will be fabricated and prepared off site and delivered to site for erection activities using cranes. The composite cladding panels (e.g. Kingspan) will be delivered to site ready to erect and be fixed to the steelwork.

28. For the installation and commissioning phases a variety of specialist activities are required. The main items of electrical infrastructure, for example transformers, will be delivered sealed to site. Due to their size and weight they will be delivered via specialist means and offloaded with the use of a mobile crane (please see Traffic Management Plan (EA1-CON-R-IBR-009583) for details of abnormal load transport procedures). The smaller electrical components will be constructed on site using small mobile plant and lifting apparatus.

3.2 Schedule and Working Hours

29. The onshore construction works are proposed to start works in January 2017 and are planned to take approximately 2 year to complete.

30. DCO Requirement 23 defines the construction working hours as follows:

> ***23.****—(1) Construction work for the connection works and any construction-related traffic movements to or from the site of the connection works shall not take place other than between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sundays or bank holidays, save—*
>
> > *(a) where continuous periods of operation are required as assessed in the environmental statement, such as concrete pouring and directional drilling (subject to sub-paragraphs (3) and (4));*
> >
> > *(b) for internal fitting out works associated with the onshore converter station comprised within Work No. 39;*
> >
> > *(c) for the delivery of abnormal loads to the connection works, which may cause congestion on the local road network; and*
> >
> > *(d) where connection works are being carried out on the foreshore.*
>
> *(2) All construction operations which are to be undertaken outside the hours specified in subparagraph (1) must be agreed with the relevant planning authority in writing in advance, and must be carried out within the agreed times.*
>
> *(3) Construction of Work No. 21 shall not take place other than between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sunday or bank holidays.*
>
> *(4) Construction of Work No. 26 shall not take place other than between 0700 hours and 1900 hours Monday to Friday and 0700 hours and 1400 hours on Saturday, with no activity on Sunday or bank holidays.*

4 Noise and Vibration Assessment

4.1 Noise Assessment

35. In undertaking the Environmental Impact Assessment for EA ONE a noise and vibration assessment was completed to identify and assess the potential activities associated with the proposed onshore construction works that could lead to noise and vibration impacts on receptors (Environmental Statement Volume 3, Chapter 26 Noise and Vibration). The Environmental Statement (ES) was undertaken by Environmental Resource Management in November 2012 and the Noise and Vibration Assessment by RSK in October 2012.

36. The noise and vibration assessment was done, taking in to account the requirements stated in the Sections 5.11.4 to 5.11.7 of the National Policy Statement EN-1 (NPS EN-1). In this sense, the NPS EN-1 states that, "*where noise impacts are likely to arise, the applicant should include:*

- *a description of the noise generating aspects of the development proposal leading to noise impacts including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise;*
- *identification of noise sensitive premises and noise sensitive areas that may be affected;*
- *the characteristics of the existing noise environment;*
- *a prediction of how the noise environment will change with the proposed development;*
  - *in the shorter term such as during the construction period;*
  - *in the longer term during the operating life of the infrastructure;*
  - *at particular times of the day, evening and night as appropriate;*
- *an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive area; and*
- *measures to be employed in mitigating noise."*

37. To carry out the noise and vibration assessment a worst case scenario was selected taking into account the following aspects:

Table 4-1 Worst Case Criteria

Worst Case Criteria	Notes
Onshore Cable Route	
Maximum construction period	• Up to 44 weeks. This period could be non continuous,spread over 2 years
Construction Hours	• For cable trenching: assumes Mon-Sat12 hour days • For HDD a worst case of 24hour operations
Maximum number of vehicle movements	• 29 HGV deliveries per day for each of the sections of Onshore Cable Route; • 45 HGV deliveries per day for each HDD location
Maximum number of personnel	• 79 per 500km cable route section per day • 9 per HDD rig per day
Spoil and backfill	• Assumes removal off site using tipper trucks. Estimated 25 trucks per week for removal. • Assumes importation of sand for backfill generating 20 trucks per week. • This is worst case. Likely that all spoil will be reused on site.
Onshore Substation	
Maximum construction period	• Up to 46 weeks. This period could be non continuous, spread over 2 years
Construction hours	• Assumes 6 day week and 12 hours days
Maximum number of vehicle movements	• 14 HGV movements per day
Maximum number of personnel	• 100 per day

38. The methods within BS 5228-1 and BS 5228-2 were used to assess noise and vibration from the onshore construction works, as defined in Section 1.1, and include the onshore cable route, onshore substation, CCSs and HDD locations.

39. In order to assess the noise from road traffic, the method CRTN (Calculation of Road Traffic Noise) produced by the Department of Transport / Welsh Office and the guidance provided by the Highways Agency (Design Manual for Roads and Bridges. Volume 11, Section 3, Part 7 Had 213/11 Noise and Vibration) were taken into account.

40. The noise levels of the equipment to be used for different stages of the onshore construction works are shown in Table 4-2 to Table 4-4.

Table 4-2 Noise Levels of Construction Equipment – Onshore Cable Route

Noise Levels of Construction Equipment – Cable Installation						
Scenario	**Activity**	**Plant**	**No.**	**BS 5228 ref.**	**Operational hours %**	**A-weighted SPL (dB(A) at 10 m)**
Onshore Cable Route						
A	Site clearance	Chainsaw	1	D.2.14	25%	86
B	Topsoil strip	Tracked excavator (22t)	2	C.2.3	90%	73
		Dozer	3	C.2.1	90%	75
C	Construction of temporary site access road	Wheeled backhoe loader (8t)	1	C.2.8	90%	68
		Dumper (5t)	2	C.4.7	90%	78
		Vibratory roller (3t)	1	C.2.40	90%	73
D	Trench excavation	Tracked excavator (16t)	1	C.2.2	90%	76
		Tracked mobile crane	1	C.3.29	90%	70
		Sheet Piling – Hydraulic jacking	1	C.3.9	90%	63
		Powe Pack	1	C.3.10	90%	68
	Trench bedding	Wheeled backhoe loader (8t)	1	C.2.8	90%	68
		Vibratory roller (3t)	1	C.2.40	90%	73
	Junction Bay	Welding generator	3	C.3.32	90%	73
		Welder	3	C.3.31	90%	73
		Generator	3	C.4.94	100%	75
		Angle grinder	2	C.4.93	90%	80
		Side boom (Use tracked mobile crane data)	1	C.3.28	90%	67
D&E	Pumping	Water pump	1	C.4.88	100%	68
E	Cable pulling	Conveyor drive unit	1	C.10.20	100%	77
		Field conveyor (rollers)	2	C.10.23	100%	53
	Lower and lay ducting	Side boom (Use tracked mobile crane data)	3	C.3.28	90%	67
		Wheeled backhoe loader (8t)	1	C.2.8	90%	68
F	Reinstatement	Wheeled backhoe loader (8t)	1	C.2.8	90%	68
		Tracked excavator (16t)	1	C.2.5	90%	76
		Dumper (5t)	2	C.4.7	90%	78
		Vibratory roller (3t)	2	C.2.40	90%	73
G	Horizontal Directional Drilling Entry Point	Drill Rig Option: Smaller Sites – Crawler	1	A E Yates*	100%	80 at 5 m
		Drill Rig Option: Larger Sites - Track Mounted	1	C.3.21	100%	79
		Power Pack	2	C.3.10	100%	68
		Mixing Unit / Recycling Unit (Pumps)	2	C.4.88	100%	68
		Generator	1	C.4.86	100%	65
	Horizontal Directional Drilling Exit Point	Generator	2	C.4.86	100%	65
		Water pump	2	C.4.88	100%	68

Table 4-3 Noise Levels of Construction Equipment – Construction Consolidated Sites

Noise Levels of Construction Equipment – Primary Construction Consolidation Sites			
Plant	**No.**	**Operational hours**	**A-weighted SPL (dB(A) at 10m)**
Wheeled loader	1	80%	71
Dumper	1	80%	76
Wheeled mobile telescopic crane	1	80%	67
Diesel generator for site cabins	1	100%	65
Noise Levels of Construction Equipment – Secondary Construction Consolidation Sites			
Plant	**No.**	**Operational hours**	**A-weighted SPL (dB(A) at 10m)**
Wheeled loader	1	60%	71
Dumper	1	60%	76

Table 4-4 Noise Levels of Construction Equipment – Onshore Substation

Noise Levels of Construction Equipment – Onshore Substation			
Plant	**No.**	**Operational hours**	**A-weighted SPL (dB(A) at 10m)**
Earthworks			
Front end loaders (wheeled)	1	90%	82
Tracked excavator	1	90%	77
Wheeled backhoe loader	1	90%	68
Wheeled loader	1	90%	71
Dozer	1	90%	80
Articulated dump truck	1	90%	76
Road roller	1	90%	80
Diesel generator for site cabins	1	100%	74
Foundation			
Plant	**No.**	**Operational hours**	**A-weighted SPL (dB(A) at 10m)**
Cement mixer truck	1	90%	75
Truck mounted concrete pump and boom arm	1	90%	80
Diesel generator for site cabins	1	100%	74
Building Construction			
Plant	**No.**	**Operational hours**	**A-weighted SPL (dB(A) at 10m)**
Wheeled mobile telescopic crane	1	90%	78
Diesel generator for site cabins	1	100%	74

4.1.1 Potential Impacts

41. The Environmental Statement predicted the following impacts:

Table 4-5 Potential Noise Impacts

	Sensitivity of receptors	Magnitude Impact	Significance of Impact
Onshore Cable Route	Medium	Low	**Not Significant**
Horizontal Directional Drilling Sites (HDD)	Medium	Medium	**Moderate Significance**
Construction Consolidate Sites (CCS)	Medium	Negligible	**Not Significant**
Onshore Substation	Medium	Negligible	**Not Significant**
Construction Traffic	Medium	Low	**Not Significant**

42. Only predicted noise levels at many of the noise sensitive receptors to the HDD works marginally exceed the noise criteria and therefore in it will be necessary to consider noise mitigations measures to minimise disturbance (see Section 0).

4.2 Vibration Assessment

43. Vibration levels decay very rapidly with distance from a source, as shown by empirical data presented in BS5228-2. A representative example of HDD given within BS5228-2 is for boring through silts overlying sandstone with a Peak Particle Velocity (PPV) of 8 mm/s at 4.5m from the source, decreasing to a PPV of 2.7mm/s at 7m from the source and 1.8mm/s at 12m from the source. Given the distances between sources of vibration during the construction works and sensitive receptors it is clear that PPV levels would be below the criteria outlined in Table 4-19 at the nearest sensitive receptors to Onshore Cable Route, HDDs and CCSs sites and construction works on the Onshore Substation. Vibration impacts from construction works would be of negligible magnitude on receptors of medium sensitivity and therefore **not significant**.

44. Heavy vehicles on smooth road surfaces do not produce significant levels of vibration at road side receptors. However, vibration can result from sudden wheel impacts as vehicles pass over holes and cracks on the road surface. Potentially this may result in transient exceedances of BS5228-2 criteria. The majority of buildings would be resilient to the worst case vibration levels anticipated. However, a precautionary approach has been considered for listed buildings and non-earthwork related scheduled ancient monuments as these are considered of high sensitivity.

45. Archaeological sites and listed buildings have been identified within 10m of the designated construction HGV routes. 10m is considered the largest distance from the road at which there is potential for vibration impacts from HGV along roads, with a distance of 5m considered as a distance for a potentially significant effect. A review of the scheduled ancient monuments has identified only earthworks / barrows which would not be considered sensitive to the worst case vibration levels anticipated.

46. Listed buildings have been assessed based on distance to the road and also the extent of current use by HGV along these roads using the Suffolk Lorry Route Network. Listed buildings on the existing lorry route would not be subjected to higher vibration levels than are already within the baseline environment. The following listed buildings are within 5m of the road and on a route not designated on the Suffolk Lorry Route Network (with the exception of buildings in Coddenham, which is a restricted route and therefore considered of greater sensitivity):

- Grange Farmhouse, unnamed road, Alderton;
- Red Lion Inn, The Street, Martlesham;
- Red Lion Cottages, The Street, Martlesham;
- Martlesham Hall, Church Lane, Martlesham;
- The Red House, B1078, Coddenham;
- Church Cottages, B1078, Coddenham;
- Gryffon House, B1078, Coddenham;
- The Cottage, B1078, Coddenham;
- The Old Lodge and the Post Office, B1078, Coddenham;
- The Dukes Head Inn, B1078, Coddenham;

- Birdshill, Road between Lodge Road and A12, Seckford;
- Seckford Hall Lodge, Road between Lodge Road and A12, Seckford;
- Barn at Seckford Hall Lodge, Road between Lodge Road and A12, Seckford; and
- Ford House, Woodbridge Road, Gundisburgh.

5 Baseline Conditions

47. According with the information included in the ES (Volume 3, Chapter 26 Noise and Vibration) noise measurements were carried out in sensitive receptors along the onshore cable route and in the surroundings of the onshore substation.

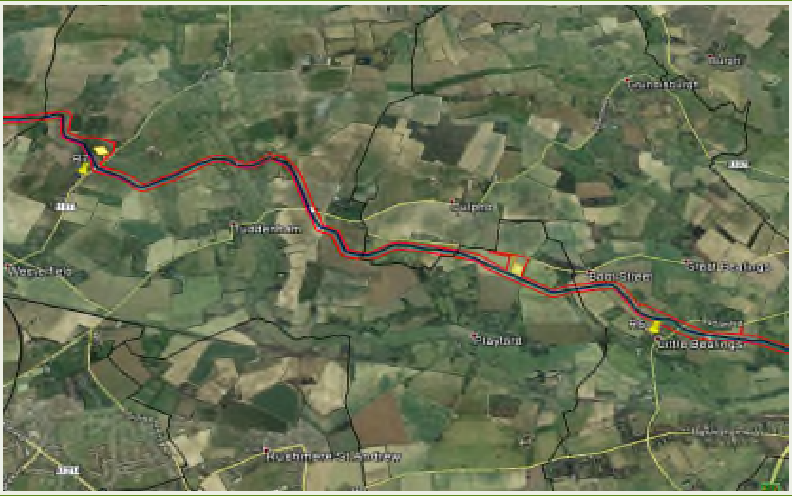
48. Attended measurements were conducted at three sensitive receptors surrounding the onshore substation during the day of the 29th September 2011 and early morning on the 30th September 2011. The closest sensitive receptors identified are isolated houses separated from the site by agricultural land. The three receptors chosen for noise monitoring, and agreed with the local Environmental Health Department, (the nearest three properties) are presented in Table 5-1.

Table 5-1 Noise Sensitive Receptors – Onshore Substation

Receptor	Coordinates (WGS84)		Image
	Easting	Northing	
MP1 - Bullenhall Farm	367553	5771415	
MP2 - Hill Farm House	366275	5770453	
MP3 - Burstall Hall	367393	5769843	

49. Further measurements were taken on 29th to the 31st May 2012 at locations representing residential receptors nearest to HDD and Construction Consolidation Sites along the onshore cable route and are presented in Table 5-2.

Table 5-2 Noise Sensitive Receptors – Onshore Cable Route – Horizontal Directional Drillings – Construction Consolidation Sites

Receptor	Coordinates (WGS84)		Image
	Easting	Northing	
R8 - Sycamore House, Somerham Road	368501	5772703	
R10 - Bramford Road	369597	5773795	
R1 - Premier Inn, Claydon	370400	5773855	
R7 - Pine Lodge (south of golfcourse), Westerfield Road	374999	5773013	
R6 - Village hall carpark, Little Bealings	380292	5772058	

Receptor	Coordinates (WGS84)		Image
	Easting	Northing	
R2 - Top Street, Martlesham	382667	5771569	
R3 - Broom Hill Park, Woodbridge	383819	5771462	
R4 - Church Carpark, Church Lane, Martlesham	383387	5770684	
R13 - North of Newbourne	384726	5768701	
R11 - Kirton Lodge / Sluice Farm, Kirton	385187	5764120	
R5 - Crossing at Red House Farm, Falkenham	386924	5762689	
R12 - Ferry Lane	391071	5762059	

50. R9 is represented by location MP1 at Bullenhall for the purposes of assessing the Converter Station and therefore was not measured during this second site visit.

51. Measurements were undertaken at a height of 1.5m and in free-field conditions i.e. >3.5m from a reflective surface using a Norsonic 118 type 1 sound level meter (‘SLM’) (serial no. 31677) with pre-amplifier and microphone protected by foam windshield and a Norsonic type 1251 acoustic calibrator (serial no. 32194).

52. The calibration of the sound level meters was checked before and after the measurements using the acoustic calibrator, with no drift being observed. The SLMs conform to BS EN 61672-1:2003 Electroacoustics - Sound level meters, and the calibrator conforms to BS EN 60942:2003 Electroacoustics - Sound calibrators. The equipment used has a calibration history that is traceable to a certified calibration institution.

53. Table 5-3 and Table 5-4 present the results of the background noise measurements for Day-time and Night-time:

Table 5-3 Day-time Background Noise Measurements

Day-Time Background Noise Measurements								
ID	**Date**	**Start**	**Duration (hr:min)**	**LAeq**	**LAF(max)**	**LA10**	**LA90**	**Comments**
Day-time				**dB(A)**				
MP1	29/09/2011	13:25	01:00	44.0	70.2	45.3	32.4	
MP2	29/09/2011	16:10	01:00	45.2	68.2	47.8	35.8	
MP3	29/09/2011	14:48	01:00	41.3	64.2	44.1	37.4	
R1	30/052012	15:42:04	01:00	56.5	74.8	58.3	51.7	Dominated by traffic noise on the A14, ocassiona train to the west and birds
R2	30/05/2012	10:30:25	01:00	56.3	74.8	58.4	--	Traffic on local road, birds, larger vehicles and sirens on A12
R3	29/05/2012	16:12:56	00:45	54.5	80.6	45.6	35.8	Birds and pedestrians, some boats on Martlesham Creek and occasional passing vehicles
R4	29/05/2012	15:01:49	01:00	45.2	78.0	47.1	33.8	Small amount of local traffic, distant A12, trains, birds and breeze in trees
R5/R11	29/05/2012	12:38:00	00:55	46.2	73.4	41.1	28.1	
R6	30/05/2012	11:43:00	01:00	50.5	79.3	53.1	36.5	Passing vehicles, birds and occasional aircraft overhead
R7	30/05/2012	13:01:08	01:00	60.7	78.8	65.5	36.3	Vehicle noise on Westerfeld Road and birds
R8	30/05/2012	16:55:46	01:00	62.0	87.2	62.1	36.0	Distant A14, traffic on Somersham Road and birds
R10	30/05/2012	14:33:01	01:00	60.3	76.9	64.7	44.3	Traffic on Bramford Road and nearby animals
R12	29/05/2012	10:49:45	00:50	49.8	76.2	46.5	33.2	Local traffic, birds and insects
R13	29/05/2012	13:50:00	00:50	41.2	61.4	42.7	31.1	Birds, distant farm noise, no traffic, noise from golf course

Table 5-4 Night-time Background Noise Measurements

Night-Time Background Noise Measurements								
ID	**Date**	**Start**	**Durantion (hr:min)**	**LAeq**	**LAF(max)**	**LA10**	**LA90**	**Comments**
Night-time				**dB(A)**				
MP1	30/09/2011	02:27	01:00	32.6	68.2	33.2	26.3	
MP2	30/09/2011	03:34	01:00	26.9	61.7	28.5	21.6	
MP3	30/09/2011	03:28	01:00	35.7	67.0	37.6	27.7	
R1	31/05/2012	02:20:08	00:15	45.2	58.0	48.2	39.6	Dominated by HGV noise on A14
R2	30/05/2012	03:16:16	00:10	39.8	60.8	42.4	23.5	Birds, aircraft and very distant engine noise from Martlesham Creek
R3	30/05/2012	02:34:46	00:15	37.2	68.7	35.5	28.7	Engine or generator on Creek, distant vehicle noise from A12
R4	30/05/2012	02:06:30	00:15	29.1	48.9	31.9	25.3	Distant hum of traffic and water cannon in field
R5/R11	30/05/2012	00:39:50	00:20	32.7	45.6	34.9	29.4	
R6	31/05/2012	01:08:26	00:15	27.5	47.4	27.5	22.8	Very quiet, dripping of recent rain and high level aircraft
R10	31/05/2012	01:53:00	00:15	53.7	79.3	43.0	28.6	Traffic on Bramford Road, A14, owls
R13	30/05/2012	01:39:30	00:15	28.7	46.3	29.9	25.0	Very distant generator, no audible road noise, sprinkler on golf course

54. A baseline survey will be carried out prior to any construction works commencing in order to update and characterise the nature of noise and vibration ambient in the vicinity of the onshore construction works to provide a basis for assessments and to ensure that any potential changes during the works are identified and correctly attributable to the construction works.

6 Noise and Vibration Criteria

55. Noise levels generated by construction activities were deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5dB or more, subject to lower cut-off values of 65dB, 55dB and 45dB L_{Aeq} from construction noise alone, for the daytime (Monday-Friday 07:00-19:00, Saturday 07:00-13:00), evening and weekend (Monday-Friday 19:00-23:00, Saturday 13:00-23:00, Sunday 07:00-23:00) and night-time (23:00-07:00) periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

56. Annex E of BS 5228-1 also provides criteria for providing sound insulation at affected receptors. Exceedance of identified levels trigger a responsibility on the developer to provide noise insulation or a scheme to facilitate temporary rehousing.

57. The standard suggests that noise insulation should be provided, in spite of mitigation measures, in the following cases:

- noise levels exceed the noise insulation trigger level, presented in Table 6-1; or
- the total noise (pre-construction ambient plus construction noise) is 5 dB above the existing airborne noise level for the corresponding times of day, whichever is the higher; and
- for a period of ten or more days of working in any fifteen consecutive days or for a total of days exceeding 40 in any 6 month period.

Table 6-1 Time Periods, Averaging Times and Noise Levels Applicable to Assessing Eligibility for Noise Insulation BS 5228-1:2009 (Annex E).

Time Periods, Averaging Times and Noise Levels Applicable to Assessing Eligibility for Noise Insulation			
Time	**Relevant Time Period**	**Averaging time, T**	**Noise trigger level dB $L_{Aeq,T}$**
Monday to Friday	07.00-08.00	1 h	70
	08.00-18.00	10 h	75
	18.00-19.00	1 h	70
	19.00-22.00	3 h	65
	22.00-07.00	1 h	55
Saturday	07.00-08.00	1 h	70
	08.00-13.00	5 h	75
	13.00-14.00	1 h	70
	14.00-22.00	3 h	65
	22.00-07.00	1 h	55
Sunday & Public Holidays	07.00-21.00	1 h	65
	21.00-07.00	1 h	55
Note 1) Equivalent continuous A-weighted noise level predicted or measured at a point in front of the most exposed windows or doors leading directly to a habitable room (living room or bedroom) in an eligible dwelling			

58. BS5228-2 provides guidance on the control of vibration from construction sites and response limits for cosmetic damage in buildings as reproduced in Table 6-2.

59. **Error! Reference source not found.**Table 6-2 shows the limits at which the vibration level (measured as a peak particle velocity) would result in cosmetic damage at a range of vibration frequency levels.

Table 6-2 Transient Vibration Guide for Cosmetic Damage (from BS 5228-2:2009)

Transient Vibration Guide for Cosmetic Damage		
Type of Building	**Peak Component Particle Velocity (PPV) in Frequency Range of Predominant Pulse**	
	4Hz to 15Hz	**15Hz and above**
Reinforced or framed structures Industrial and heavy commercial buildings	50mm/s at 4Hz and above	50mm/s at 4Hz and above
Unreinforced or light framed structures Residential or light commercial buildings	15mm/s at 4Hz increasing to 20mm/s at 15 Hz	20mm/s at 15Hz increasing to 50mm/s at 40Hz and above
Note 1) Values referred to are at the base of the building Note 2) For line 2, at frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) is not be exceeded		

60. BS 5228-2 also presents levels of vibration that may cause complaint, which is predicted to occur between 0.3 mm/s (just perceptible) and 1.0 mm/s (likely to cause complaint). BS 5228-2 values have been taken into consideration in the assessment of vibration levels from construction HGV traffic.

7 Noise and Vibration Controls

61. EA ONE onshore construction works will comply with the recommendations set out in BS 5228-1 and BS5228-2 and in the Environmental Statement.

62. Best Practice Measures (BPM) and attenuation measures will be applied during construction works to minimise noise and vibration at neighbouring residential properties and other sensitive receptors arising from construction activities.

63. BPM are defined in Section 72 of the Control of Pollution Act 1974 and Section 79 of the Environmental Protection Act 1990, as those measures which are 'reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implications'.

64. The BPM and mitigation measures to be implemented and controlled during the onshore construction works are described in Table 7-1

Table 7-1 Best Practice and Mitigation Measures

Construction Best Practice Mitigation Measures
General
• Consideration of noise levels when selecting construction methods and equipment used. • Management of construction operating hours (in accordance with those specified within the DCO). • Training of construction workers on site to ensure noise is considered through all stages. • Implementation of traffic management measures such as agreed routes for construction traffic. • Use of modern, fit for purpose, well maintained plant equipment to minimise noise generation. Plant and vehicles will be fitted with mufflers / silencers maintained in good working order. Use of silenced equipment, as far as possible and low impact type compressors and generators fitted with lined and sealed acoustic covers. Doors and covers housing noise emitting plant will be kept closed when machines are in use. • Where reasonably practicable, vibrating and noisy equipment should be located as far from sensitive premises as possible, and, if on a structure, not on one which is continuous with that of the sensitive premises; contractors and subcontractors should be trained to employ appropriate techniques to keep site noise to a minimum, and should be effectively supervised to ensure that best working practice in respect of noise and vibration reduction are followed. • Minimise drop height of materials. • Start-up plant, equipment and vehicles sequentially rather than all together. • No working during night hours except at specific locations and for specific activities which have been agreed with the Local Planning Authority and should be discouraged as much as possible. • Radios (other than two-way radios used for the purposes of communication related to the works) and other forms of audio equipment (other than associated with safety mechanisms (such as reversing bleepers) shall not be operated during construction activities. • Construction activities with the potential for significant impacts should be discouraged if possible during night hours. • Avoid the use of radios or stereos outdoors where neighbours may be affected. • Avoid shouting, and minimise talking loudly and slamming vehicle doors. • Ensuring engines are switched off when machines are idle. • Noise and vibration should be controlled at source and the spread of noise and vibration should be limited. • Use screens and noise barriers / acoustics screens where deemed necessary. • Regular communication with site neighbours to inform them of the construction schedule, and when noisy activities are likely to occur. • Where necessary, noise monitoring to check noise levels in response to any concerns if raised.

65. Based on the noise assessment undertaken as part of the ES, the following specific mitigation measures will be introduced to minimise disturbance at nearest residences during HDD works at night at Kirton Creek and Martlesham Creek, where required:

- Screening equipment such that there is no line of sight between receptor windows and the noise emitting elements of the plant on the site; and / or
- The use of silencers (silencer or enhanced enclosure) on the drill rig engine to provide the additional sound reduction. This additional mitigation is unlikely to be required should the plant associated with the drill rig be containerised, as would be expected from a drill rig transported on a trailer.

66. To ensure that excessive vibration levels on the road network are not caused by HGVs travelling over discontinuities in the road (at this stage uncertain), visual checks should be made of roads adjacent to the buildings listed in Section 4.2 by contractors, the construction management team and Environmental Clerk of Works.

8 Noise and Vibration Monitoring

8.1 Noise Monitoring

67. A scheme of noise monitoring will be implemented and maintained during construction in order to ensure compliance with the noise limits and to verify the effectiveness of the best practice and mitigation measures identified in Section 7. The frequency will be flexible (weekly during initial stages and monthly once compliance with levels established) and should cover all construction activities and stages.

68. The purpose of the noise monitoring is to facilitate data acquisition to demonstrate that the EA ONE onshore works are being constructed within the noise criteria set out in accordance with the BS 5228-1 and in such a manner to minimise the noise impacts at nearby sensitive receptors, and if required in response to complaints.

69. The monitoring locations stated in the ES will be used to plan where monitoring locations will be located. A review of these locations may be considered if changes or updates of the project are observed.

70. Noise monitoring shall be flexible in its frequency and should cover all construction activities and stages according to the construction schedule.

71. Noise short term attended measurements shall be taken by a suitably qualified acoustician in the vicinity of the property in order to assess the fulfilment of the noise criteria stated in Section 6. Where access to a property is not granted to undertake such measurements, measurements shall be undertaken at a location that is considered by the suitably qualified acoustician, to be representative of noise levels at the property or properties in question.

72. The noise measurement sample duration at each location for both day and night-time monitoring will be no less than 30 minutes. Data collected for the identified receptors will include at least the following parameters: L_{A1}, L_{A5}, L_{A10}, L_{A50}, L_{A90}, L_{A95}, L_{A99}, L_{Aeq}, L_{Amax} and L_{Amin}.

73. Type 1 integrating averaging Sound Level Meters and Class 1 Sound Calibrators will be used. Sound Level Meters and Calibrators must fulfil the requirements established in the following British and European standards:

- BS EN 61672-1:2003. Electroacoustics. Sound level meters. Specifications
- BS EN 61672-2:2003. Electroacoustics. Sound level meters. Pattern evaluation tests
- BS EN 61672-3:2006. Electroacoustics. Sound level meters. Periodic tests
- BS 7580-1:1997. Specification for the verification of sound level meters. Comprehensive procedure.
- BS EN 60942:2003. Electroacoustics. Sound calibrators

74. Sound Level Meters and Calibrators shall be calibrated to a traceable standard by a UKAS-accredited laboratory, within a 12-month period before the survey. The Sound Level Meters shall be field-calibrated before and after monitoring using an acoustic calibrator.

75. The Sound Level Meter shall be positioned such that the microphone is located 1.5 m above the ground level in free-field conditions (at least 3.5m from the nearest vertical reflecting surface), at all receptors. A note of the prevailing weather conditions shall be made at the time of the measurements.

8.2 Vibration Monitoring

76. It is not anticipated that vibration monitoring will be required during the normal course of construction works. Vibration monitoring would only be adopted upon receiving a complaint or a specific directive from the local authority.

77. Where required vibration monitoring instrumentation will be deployed as close to the sensitive buildings as possible.

78. The instrumentation will be installed, operated and maintained by suitable qualified personnel. Vibration levels shall be measured using instrumentation calibrated to a traceable standard by a UKAS-accredited laboratory according with BS 5228-2:2009.

9 Reporting

9.1 Noise Report

79. On completion of each noise survey a report shall be prepared in a format suitable submission to the local authority. The report shall be submitted within seven working days of the scheduled date.

80. The report shall contain at least:

- the results of the noise survey;
- details of the instrumentation and measurement methods used;
- calibration details;
- weather conditions and factors that might have adversely affected the reliability or accuracy of the measurements;
- plans of the site and neighbourhood showing the position of plant, associated buildings and notes of site activities during monitoring period(s); and
- time, date and name of person carrying out the measurement.

9.2 Vibration Report

81. If required, on completion of a vibration survey a report shall be prepared in a format suitable submission to the local authority. The report shall be submitted within seven working days of the scheduled date.

82. The report shall contain at least:

- the results of the vibration survey;
- details of the instrumentation and measurement methods used;
- plans of the site and neighbourhood showing the position of plant, associated buildings and notes of site activities during monitoring period(s); and
- time, date and name of person carrying out the measurement.

10 Noise and Vibration Environmental Incident

83. The following situations represent potential noise and vibration environmental incidents and as such will be subject to the relevant controls:

- a complaint received from a member of the public or Local Authority;
- an incident or activity which results in a breach of consent conditions e.g. non-compliance with the working hours, non-permitted plant/equipment or non-compliance with BPM or mitigation measures; and
- measured exceedance.

11 Non-compliance with Noise Limits

84. If the noise criteria levels set out Section 6 are exceeded during the noise and vibration surveys as a result of construction works or a complaint is received from local resident, an investigation shall be instigated to identify the cause of the non-compliance.

85. Such an investigation may involve the identification and cessation of the activity or activities considered to be the cause of the non-compliance and/or the investigation of the mitigation measures to reduce the noise or vibration emission levels from the activity or activities, for example the replacement of the noisy plant with quieter alternatives and/or the use of temporary screens.

86. Any deviation from agreed working practices shall be identified immediately and conformance to the working practice reinstated.

87. A further noise or vibration survey shall be undertaken as soon as possible following the implementation of mitigation to re-assess the noise or vibration levels against the guideline levels.

12 Training

88. All site personnel should be trained to employ appropriate techniques to keep noise to a minimum, and should be effectively supervised to ensure that best working practice in respect of noise reduction is followed.

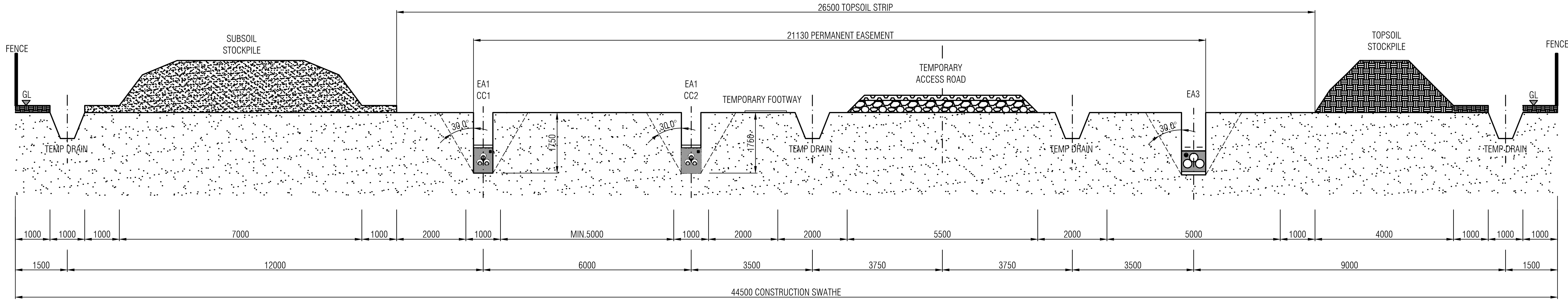
89. All employees should be advised regularly of the following, as part of their training:

- the proper use and maintenance of tools and equipment;
- the positioning of machinery on site to reduce the emission of noise to the neighbourhood and to site personnel;
- the avoidance of unnecessary noise when carrying out manual operations and when operating plant and equipment;
- the protection of persons against noise; and
- the operation of sound measuring equipment (selected personnel).

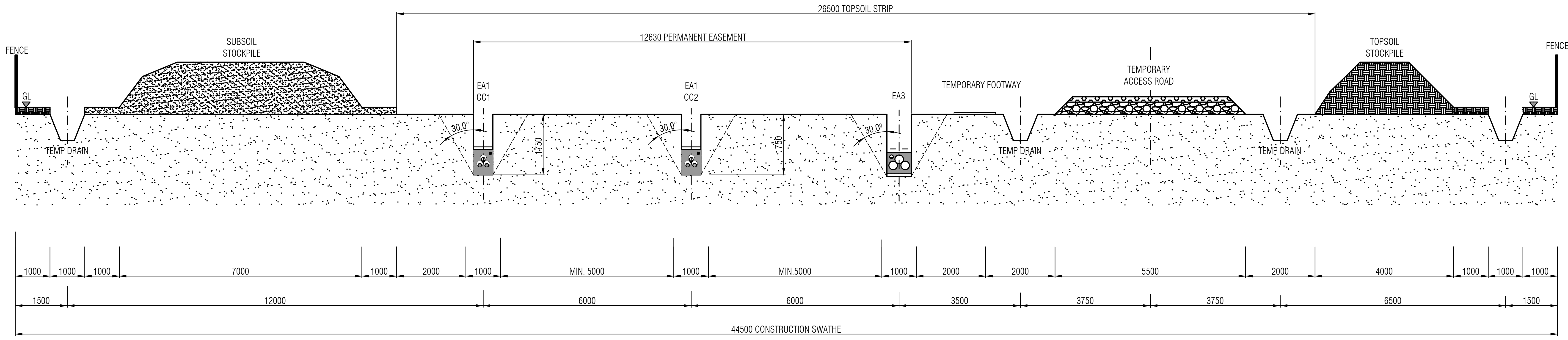
90. All site personnel will be made aware of the noise and vibration issues covered in this Noise and Vibration Management Plan during site induction.

Appendix 1 Construction Swathe Indicative Cross Section

VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 1



VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 2



NOTES:
1- PASSING PLACES EACH 250 m.(FIG.1)
2- TURN ARROUND AREAS EACH 750m. (FIG.2)
3- "V" BUCKET MAY BE USED (SEE PHOTO)

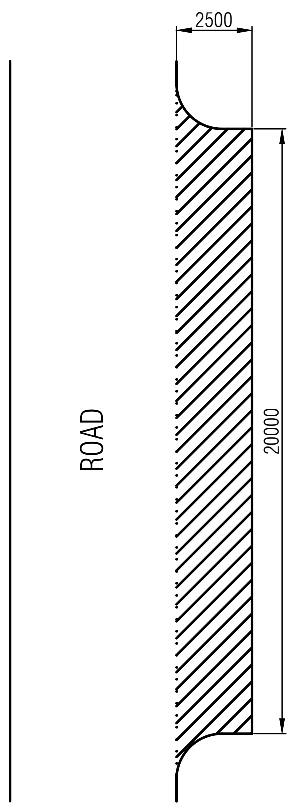


FIGURE 1

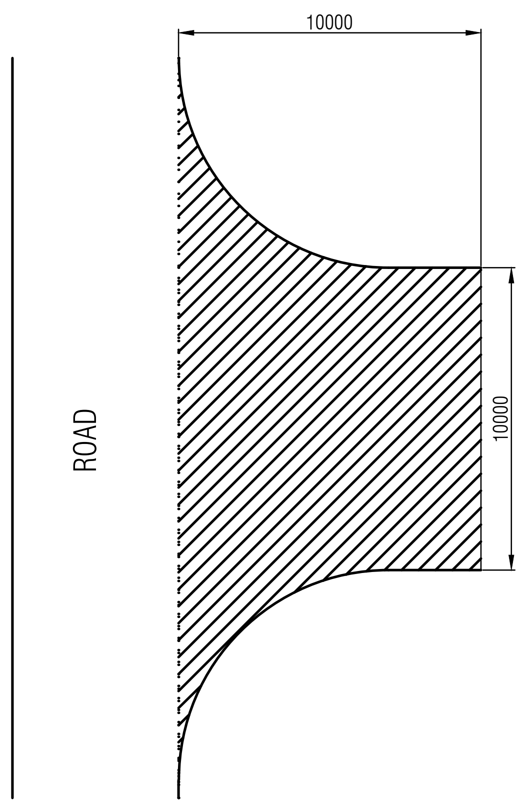


FIGURE 2

"V" BUCKET

Rev.	Date	Prepared	Reviewed	Approved	Reason / Description of changes.

IBERDROLA Engineering & Construction

Status Stamp:

Project: EAST ANGLIA

Location: BAWDSEY TO BRAMFORD

Contractor:

Status Stamp:

Drg. Title: CONSTRUCTION SWATHE TYPICAL CROSS SECTION

Client: SCOTTISHPOWER RENEWABLES

Date of First Issue: 15-07-2016

Prepared	Reviewed	Approved
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Drg. No.: EA1-GRD-E-IEC-007883

Sheet: 1 Rev: 0
Next: -

Contractors Drg. No. :

Scale: 1:100 Size: A2

Appendix 2 Air Quality Monitoring Plan

East Anglia ONE Offshore Windfarm

Air Quality Monitoring Plan

Appendix 2 Code of Construction Practice

Final for Approval

Table of contents

Figures

Abbreviations

AC - Alternating Current
AONB - Area of Outstanding Natural Beauty
AQMP - Air Quality Management Plan
AQMA - Air Quality Management Areas
CCS - Construction Consolidation Sites
CEMP - Construction Environmental Management Plan
CoCP - Code of Construction Practice
CfD - Contract for Difference
CWS - County Wildlife Site
DCO - Development Consent Order
DECC - Department for Energy and Climate Change
DEFRA - Department for Environment, Food and Rural Affairs
EAOL - East Anglia One Limited
EA ONE - East Anglia ONE Offshore Wind Farm
EPA - Environmental Protection Act
HDD - Horizontal Directional Drilling
HGV - Heavy Goods Vehicles
IAQM - Institute of Air Quality Management
LAQM - Local Authority Quality Management
LBAP - Local Biodiversity Action Plan
MW - Megawatts
PEMP – Project Environmental Management Plan
PM - Particulate Matter
PM2.5 - Particulate matter of less than 2.5µm in diameter
PM10 – Particulate matter of less than 10µm in diameter
SPA - Special Protections Area
SSSI - Site of Special Scientific Interest
UKBAP - UK Biodiversity Action Plan

1. Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE).

2. This document relates the onshore construction works associated with EA ONE, comprising;

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, approx. 37km in length.
- Up to four cable ducts, for the future East Anglia THREE project.
- An onshore substation located at Bramford, next to existing National Grid infrastructure.

1.2 Purpose and Scope

3. This Air Quality Monitoring Plan (AQMP) sets out the control and mitigation measures to be applied to the construction of EA ONE onshore connection works, to ensure that any potential effects are minimised. This AQMP is submitted as an appendix to the Code of Construction Practice (CoCP) and fulfils DCO Requirement 20 (2) (e) which states:

> ***20.****—(2) The code of construction practice must include (...)*
> *(e) an air quality monitoring plan*

4. This AQMP has been prepared to manage potential air pollution impacts during the onshore construction works. The main purpose of this AQMP is to facilitate the avoidance, remediation and mitigation of any adverse effects of emissions generated from the onshore construction works, and to promote proactive solutions to their control.

5. The following objectives have been identified in terms of air quality management for the onshore construction works:

- Release of dust/particulate matter must not cause an environmental nuisance at any human or ecological receptor.
- No complaints received regarding excessive dust generation or air pollution, as a result of construction activities.
- Ensure exhaust emissions of the plant and equipment used in construction activities are controlled.
- Monitor and maintain dust controls throughout the construction of the onshore elements.
- Monitor the effects of all activities on air quality and the effectiveness of mitigation measures.
- Limit the disturbed area and reinstate as soon as practicable, following the completion of works.
- Ensure all personnel are appropriately trained in environmental awareness.
- No environmental fines or prosecutions relating to dust and air quality.

6. This AQMP contains a characterisation of the air quality in the construction area and an identification of the potential environmental impacts and risks derived from construction activities. The AQMP sets out the implementation of the appropriate control measures and mitigation to minimise the adverse environmental effects and the design of a monitoring plan to evaluate the efficiency of those control measures and mitigation. It covers all phases of the construction process and takes into account the work of all contractors or sub-contractors.

7. As the main pollutant potentially released during construction works will be particulate matter (dust), this AQMP is focused on this parameter as a pollutant. A lesser concern identified is nitrogen dioxide, released by plant, equipment and vehicles, but this will be taken into account in the baseline air quality characterisation and further considered in the definition of control and mitigation measures.

8. Any risks associated with potential contaminated land are addressed in the Written Scheme of Mitigation for Potential Contaminated Land (EA1-CON-R-IBR-010156), provided under separate cover and as such are not covered within this plan.

2. Legislation, Guidelines, Best Practices and Standards

2.1 Legislation

9. This section includes the relevant legislation in place that is used to control dust and emissions, in this case from the onshore construction activities.

- Air Quality Directive 2008/50/EC.
- Air Quality Standards Regulations 2010.
- Environmental Protection Act (EPA) 1990 and Pollution Prevention and Control (England and Wales) Regulations 2007.
- Environment Act 1995 and Air Quality Regulations 2010.
- Clean Air Act 1993.

2.2 Guidelines, Standards and Best Practices

10. Several guides, standards and best practices documents are considered in the development of this plan. These documents are designed to offer guidance in reducing impacts of air pollution, based on expert evaluation of current scientific evidence. These documents are not legally binding, they are however often referred to as references for defining and measuring air quality.

- Institute of Air Quality Management (2015). Land-Use Planning & Development Control: Planning For Air Quality;
- Greater London Authority and London Councils (2014). Best Practice Guidance-The control of dust and emissions from construction and demolition;
- Institute of Air Quality Management´s (IAQM) 2014. Guidance on the Assessment of dust from demolition and construction works;
- Environment Agency (2013). Technical Guidance Document (Monitoring) M17- Monitoring of particulate matter in ambient air around waste facilities;
- Suffolk Air Quality Management Group (2011). Supplementary Guidance-Air Quality Management and New Development;
- Environmental Protection UK (2015). Guidance from Environmental Protection UK and the Institute of Air Quality Management for the consideration of air quality within the land-use planning and development control processes.

3. Construction Details

11. The onshore construction works comprise the construction of a new substation, adjacent to the existing substation at Bramford and the installation of electricity transmission cables and ducts, between the landfall location at Bawdsey and the new substation. The majority of the cable route will be constructed using open trenching methods while in certain locations where the cable route traverses a number of major transport networks and natural obstacles, to enable the installation of the cable across these features specialist trenchless techniques are required, such as Horizontal Directional Drilling (HDD).

12. The installation of such infrastructure requires a series of enabling works including establishment of construction compounds (referred to Construction Consolidation Sites (CCSs)), installation of a temporary haul road and earthworks. Please refer to the Section 3 of the CoCP for further details.

13. This section identifies the main construction activities associated with the onshore construction works which may affect air quality, based on location and extent of the construction works, and the times and frequency of the different construction activities.

3.1 Construction Works

14. During construction works, the potential for emission of airborne pollutants are variable, and will depend on the type of plant and equipment being used and the extent of the activity, soil type, road surface and prevailing weather conditions.

15. The activities associated with the onshore construction works with the potential to impact on air quality are identified in Table 3-1.

Table 3-1 Activities with Potential to Impact on Air Quality

Activity	Description
Earthworks	Earthworks activities primarily involve excavating material, haulage, tipping and stockpiling. This also involves levelling the site to provide a safe working platform. - The commencement of the earthworks will involve the stripping and local storage of the topsoil, from the defined working width required for the installation of the ducts and cables. The DCO Order Limit is 75 metres wide, but the working width is restricted in maximum of 55 metres and has been refined and reduced, wherever possible, to minimise the area needed to accommodate the construction activities. - The cable route is 37 kilometres long and will be accessed by the construction of a number of hard standing Consolidated Construction Sites (CCS), or, where agreed, directly off the public highways, such as at the HDD locations. These accesses will provide providing access to the temporary haul road which will provide required access along the length of the cable route. - The topsoil will be stored along the cable route for later reuse in reinstatement of the works. The subsoil removed to create the three trenches will be temporarily stored, separately to the topsoil, and will be sequentially replaced to backfill the trenches as installation of the works proceed. - The new onshore substation is to be constructed adjacent to the existing National Grid Substation at Bramford in a single compound. This requires the levelling of the substation site to create a level working platform. The area around the substation will be landscaped and planted, the details being contained in the Landscape Management Plan (EA1-CON-F-GBE-008554).
Construction Works	The key issues which determine the magnitude of potential dust emission during the construction phase include the size of the building(s) or other infrastructure, methods of construction and construction materials to be used. - The construction of the onshore cable route requires a range of different construction methods, depending on the ground conditions and also any particular requirements for owners of the land through which the cable route is to be constructed. In general, open trenching will be the main construction technique used to install the majority of the ducts and cables.

Activity	Description
	- In areas where the cable route crosses watercourses, existing physical constraints (such as roads or railways) and environmental constraints, such as environmentally sensitive areas, trenchless techniques, such Horizontal Directional Drilling (HDD), will be used to make the crossing. A typical HDD crossing will require a site area to be prepared at either side of the crossing. The first for the HDD rig site, where the HDD enters the ground and the second is the exit point on the other side of the crossing. A total of 8 Category 1 HDD crossings and 12 Category 2 (more minor) HDD crossings are required along the cable route (explained in more detail in the Cable Method Statement (EA1-CON-R-IBR-021238). - A total of 9 hardstanding CCSs are to be installed along the onshore cable route, to facilitate access to the internal haul route, allow storage of materials, provide welfare facilities and accommodate site offices. - The construction of the onshore substation includes the installation of a temporary works compound, foundations, the construction of the main building and the equipment installation (transformers, cooling systems, etc.) and a new concrete access road.
HGV Haulage Movements	The haulage movements include a consideration of the movements of all vehicles, including those along the internal haul roads used during the onshore construction works. A haul road (5.5m wide) will be installed along the route providing access for construction personnel, HGV deliveries and plant alongside the cable route. The temporary haul road will be accessed from a number of agreed points on local roads, primarily via CCS locations.

3.2 Vehicle and Plant Movement

16. In relation to the movement of vehicle and plant around the construction site, several factors that can affect air quality should be analysed. The following provides more details on number of intended vehicles in the construction site, their characteristics, the number of planned trips per day, type of pavement of roads, etc.

17. The Heavy Good Vehicle (HGV) movements for the onshore cable route are a maximum of 29 HGV deliveries to per day to each of the seven 5km trenching sections, a maximum of 38 deliveries to the HDD locations (at their peak) and for the onshore substation maximum 14 HGV deliveries per day.

18. The road vehicles used during works will include private vehicles, transit vans, 4x4s, pickups, lorries, low loaders, concrete wagons, concrete pumps, road sweepers, wheeled excavators, wheeled dumpers, crawler cranes, vacuum and fuel tankers, tractors and trailers.

19. The off-road mobile machinery will include tracked excavators, ride on rollers, mobile cranes, diesel generators HDD rigs and cable pulling equipment.

20. Generators will only remain in those locations where mains power is not readily available. The two Primary CCS compounds, which will include main office accommodation and welfare, will be supplied by main utility delivered supplies, where availability and access can be confirmed.

3.3 Working Hours and Programme Duration

21. Working hours are specified in Requirement 23; Schedule 1, Part 3 of the DCO which states.

> *23.—(1) Construction work for the connection works and any construction-related traffic movements to or from the site of the connection works shall not take place other than between **0700 hours and 1900 hours Monday to Saturday**, with no activity on Sundays or bank holidays, save—*

(a) where continuous periods of operation are required as assessed in the environmental statement, such as concrete pouring and directional drilling (subject to sub-paragraphs (3) and (4));
(b) for internal fitting out works associated with the onshore substation comprised within Work No. 39;
(c) for the delivery of abnormal loads to the connection works, which may cause congestion on the local road network; and
(d) where connection works are being carried out on the foreshore.

(2) All construction operations which are to be undertaken outside the hours specified in subparagraph (1) must be agreed with the relevant planning authority in writing in advance, and must be carried out within the agreed times.

(3) Construction of Work No. 21 shall not take place other than between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sunday or bank holidays.

(4) Construction of Work No. 26 shall not take place other than between 0700 hours and 1900 hours Monday to Friday and 0700 hours and 1400 hours on Saturday, with no activity on Sunday or bank holidays.

22. The onshore construction works are planned over two years from the commencement in early 2017. The onshore cable works will comprise the following and be undertaken in the following sequence:

- Site Enabling Works (i.e. preparation of CCSs, fencing, topsoil strip, installation of haul road).
- Duct Installation either via open cut trenching or trenchless drilling.
- Cable Installation.
- Reinstatement.

23. The onshore substation construction will comprise the following

- Site enabling works (e.g. ground levelling, drainage installation).
- Construction of buildings.
- Installation of electrical equipment.
- Electrical commissioning works.

24.

4. Baseline Air Quality Characterisation

25. The purpose of this section is to characterise the air quality in the vicinity of the onshore construction works to determine how the works might affect the air quality in the area. This baseline air quality characterisation considers the main potential pollutants likely to be released during the proposed construction works, focussing on the key air pollutants, particulate matter and nitrogen oxides.

4.1 Baseline Data Sources

26. This Air Quality characterisation has used the information from the Environmental Statement as a basis, which has been updated using the analysis of the most up to date information available, from existing local air quality monitoring networks and from the “Local Air Quality Management” (LAQM) reports, representing every district where the construction works are located. No site-specific air quality surveys or monitoring have been undertaken as part of this AQMP.

27. The Department for Environment, Food and Rural Affairs (DEFRA) and the Local Authorities undertake the assessment of air quality across the UK and report this annually, with modelling used to supplement the assessment providing a more detailed picture of average air quality concentrations across the UK. So, in addition to the local monitoring data and LAQM assessment reports, information on the predicted background annual average pollutant levels from the, nationally recognised, UK-AIR (Air Information Resource) website have also been included to establish the likely background pollutant levels along the onshore construction site.

28. The onshore cable route and the onshore substation are located in Suffolk, in areas administered by the districts of Suffolk Coastal District Council, Ipswich Borough Council, Mid Suffolk and Babergh Council. Assessments undertaken in these districts have not identified a risk of particulate matter of less than 10µm in diameter (PM10) exceeding the Air Quality Objectives and so no site specific monitoring has been conducted for PM10. In absence of any monitoring data for PM10 and PM2.5 (particulate matter of less than 2.5µm in diameter) for the onshore cable route and onshore substation construction areas, predicted results for the air pollution background concentration maps published by DEFRA have instead been used to assess the likely baseline concentrations..

29. Generally air quality in Suffolk County is reported as good, primarily due to efforts during the last few decades to reduce pollution from the industrial and domestic use of fossil fuels. Transport is now considered one of the largest single contributors to pollution (mainly nitrogen dioxides [NO_2] and particulates).

30. It is important to note that any reported high concentrations of NO_2 tend to decrease rapidly with distance from source (i.e. roads). The onshore cable route and the substation sites are relatively isolated from both main roads and urban areas, therefore it is expected than the annual average of NO_2 concentrations normally present here will be lower than the nationally defined target and objectives.

4.2 Air Quality Management Areas

31. In the UK, Local Authorities have a duty to assess, review and annually report local air quality, under Part IV of the Environment Act 1995. Where a Local Authority considers that one or more of the objectives are unlikely to be met and there is relevant exposure, it must declare an Air Quality Management Areas (AQMAs) and develop an action plan setting out measures to work towards an improvement of the air quality in the area.

32. The designation of an AQMA does not mean that development will not be allowed within the area, but that greater weight must be given to the consideration and removal of the impacts that any proposed development may have on air quality. The onshore works do not, however, pass through any designated AQMAs.

33. Figure 1 shows the air quality monitoring locations and the AQMAs referred to in the following baseline air quality characterisation.

4.3 Ambient Air Quality

34. The following paragraphs describe the ambient air quality in the onshore construction works area and immediate surroundings, focused on the levels of nitrogen oxides and particulates focusing on (PM10).

4.3.1 Suffolk Coastal District Council

35. Suffolk Coastal District Council has declared three AQMAs in relation to the annual average air quality objective for NO_2. One AQMA is on Ferry Lane, Felixstowe (approximately 6km from the onshore cable route), one is at Woodbridge junction (approximately 1.6km from the onshore cable route) and the last one is at Long Row, Main Road, Stratford St. Andrew (approximately 15.5km from the onshore cable route).

36. During 2014 there were two new monitoring sites added within the district, bringing the total number of sites to 47. All sites measure concentrations of nitrogen dioxide (NO_2) using passive diffusion tubes, exposed on a monthly basis. The nearest air quality monitoring sites to the onshore cable route are the series of NO_2 diffusion tubes located in Kesgrave, Martlesham, Woodbridge and Felixstowe (located approximately 0.2km, 2.5km, 1.6km and 3km respectively, from the onshore cable route)[1].

37. The diffusion tubes closest to the onshore cable route have recorded annual mean concentrations below the air quality objective for NO_2 of 40 µg/m^3 (29 µg/m^3 in Kesgrave, 22 µg/m^3 in Martlesham 1, 16 µg/m^3 in Martlesham 2, 13 µg/m^3 in Woodbridge 3 and 27 µg/m^3 in Felixstowe 23).

38. Regarding predicted values of PM10 in Suffolk Coastal District, the onshore cable route and surrounded areas present expected annual average concentration between 13-17 µg/m^3, lower than the objective annual mean (40µg/m^3).

4.3.2 Ipswich Borough Council

39. The Ipswich Borough Council has declared four AQMAs. They are all situated in the center of Ipswich and are located approximately 3km, or more from the onshore cable route.

40. During 2013, Ipswich Borough Council carried out monitoring of $NO_{2,}$ using diffusion tubes located at 69 different sites in the city centre. The nearest monitoring site to the onshore cable route is the Valley Norwich Road (named DT 13) located in the north of Ipswich[2]. The annual average concentration obtained for NO_2 in this location was 34.1 µg/m^3.

41. In the area of the onshore construction works, the annual average background predicted PM10 concentration, from UK-AIR is lower than 25 µg/m^3 in 2014, lower than the target objective of 40 µg/m^3.

4.3.3 Mid Suffolk District Council

42. Mid Suffolk District Council has not declared any AQMAs. However, there were during 2014 four diffusion tubes installed in Stowmarket and another one in Needham Market, located 7km from the onshore cable route. The annual mean concentration of nitrogen dioxide measured at this monitoring site was 23.3 µg/m^3, lower than the objective mean concentration of 40 µg/m^3.

43. Regarding PM10, the annual mean concentration predicted for the background data for the onshore construction works is between 13-20 µg/m^3, lower than the 40 µg/m^3 objective included in the air quality legislation.

4.3.4 Babergh District Council

44. The onshore substation and the final kilometres of the onshore cable route are located in the Babergh District. The Babergh District Council has declared a single AQMA, which is located approximately 23km from the onshore substation[3]. Accordingly, there are no monitoring sites near the project in this District.

45. The predicted levels of PM10 nearest to the onshore construction works are between 13 and 20 µg/m^3 in 2014, complying with the annual mean objective concentration of 40 µg/m^3.

[1] 2015 Updating and Screening Assessment for Suffolk Coastal District Council. July 2015. Suffolk Coastal District Council
[2] 2014 Air Quality Progress Report for Ipswich Borough Council. Ipswich Borough Council. July 2014.
[3] 2015 Updating and Screening Assessment for Babergh and Mid Suffolk District Councils. August 2015.

5. Potential Air Quality Impacts & Dust Impact Assessment

46. This section is focused on the assessment of potential impacts on local air quality that could result from the construction of the onshore cable route and the substation. Based on the air quality characterisation undertaken in Section 4, as a minimum, the assessment needs to determine and evaluate the potential effects on sensitive receptors (areas of ecological interest, sensitive population, etc.). It then will categorise the level of risk due to the dust emissions to include a quantitative and qualitative explanation of these. For each work activity, the risk of dust nuisance and / or health or ecological impacts will be determined using risk categories of low, medium and high risk.

47. The main construction activities that may potentially impact on the air quality have been considered below. This includes a consideration of the concentration and type of pollutants likely to occur in the construction site and also the presence of any sensitive receptors in the vicinity. The main air quality impacts that may arise during construction activities are:

- Dust deposition, resulting in the deposition on surfaces;
- Visible dust plumes, which are evidence of unacceptable dust emission;
- Elevated PM10 concentrations, as a result of dust generating activities on site; and
- A significant increases, and over a prolonged period, in concentrations of airborne particles and nitrogen dioxide, due to exhaust emissions from diesel powered vehicles and equipment used on site (off-road mobile plant and machinery) and road vehicles accessing the site.

48. To control dust from construction activities, it is important to understand the risk from the pollutants released. The risk that dust emissions from a construction site may have detrimental effects on amenity, health and the natural environment is directly related to the activities being undertaken (earthworks, construction and HGV movements).

49. The impact assessment methodology used in this AQMP is established following the evaluation process set out in the Institute of Air Quality Management´s (IAQM) 2014 Guidance on the Assessment of dust from demolition and construction works.

50. Due to the low releases of nitrogen dioxides expected during construction works, the following section is focused on the dust pollution.

5.1 Screening

51. Following the above mentioned guidance, the first step in the assessment methodology is to use the following screening criteria to determine the need for a detailed assessment of the Project. An assessment will normally be required where there is:

- a 'human receptor' within: 350m of the boundary of the site or 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s); and/or
- an 'ecological receptor' within: 50m of the boundary of the site or 50m of the route(s) used by construction vehicles on the public highway, up to 500m from the site entrance(s).

52. The onshore cable route passes through the Deben Estuary, which is designated as an AONB (Area of Outstanding Natural Beauty), RAMSAR and has several SSSI (Site of Special Scientific Interest) and SPA (Special Protections Area) designations. The rest of the onshore cable route is not in close proximity to any statutory designated ecological sites, but there are a number of non-statutory ecological receptors in close proximity to the onshore cable route. Several hedgerows are in the construction area, being the hedgerows referred to as Priority Habitats in the UK Biodiversity Action Plan (UKBAP) and Suffolk Local Biodiversity Action Plan (LBAP). Therefore, parts of the onshore cable route are located less than 50m from sensitive ecological sites and protected species. Additionally, several residential properties are also within 350m of the cable route corridor.

53. The onshore substation is located directly adjacent to a non-statutory designated site (Fore and Bushey Groves County Wildlife Site, CWS). There are no residential properties less than 350m from substation.

54. Therefore, as the onshore cable route is within the defined proximity to both ecological and human receptors, and the onshore substation proximity to a country wildlife site, a more detailed risk assessment of air quality impacts of the onshore cable route and the onshore substation is required.

5.2 Define the Potential Dust Emission Magnitude

55. The Air Quality (Dust) Risk Assessment is set out using the following phases of development: earthworks, construction and associated haulage vehicle movements. There is no demolition works proposed in this project, therefore this activity has not been considered. The risk assessment considers the potential effects of each phase of the development.

56. The scale and nature of the construction activities, which determines the potential dust emission magnitude as small, medium or large, are further defined in Table 5-1.

Table 5-1 Definition of Construction Activities

Activity	Definitions
Earthworks	- Large: Total site area >10,000 m^2, potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth moving vehicles active at any one time, formation of bunds >8m in height, total material moved >100,000 tonnes. - Medium: Total site area 2,500m^2 – 10,000m^2, moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4m - 8m in height, total material moved 20,000 tonnes – 100,000 tonnes. - Small: Total site area <2,500m^2, soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4m in height, total material moved <20,000 tonnes, earthworks during wetter months.
Construction Works	- Large: Total building volume >100,000m^3, on site concrete batching, sandblasting. - Medium: Total building volume 25,000m^3 – 100,000m^3, potentially dusty construction material (e.g. concrete), on site concrete batching. - Small: Total building volume <25,000m^3, construction material with low potential for dust release (e.g. metal cladding or timber).
HGV Haulage Movements	- Large: >50 HGV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100m. - Medium: 10-50 HGV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50m – 100m. - Small: <10 HGV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50m.

57. Using the criteria in Table 5-1, the potential magnitude of dust emission for the construction activities are indicated in Table 5-2.

58. The potential scale of dust emission is categorised as “large” during earthworks, construction and HGV vehicle movement for the onshore cable route, due to the extent of works (large construction area and high frequency of vehicle movements expected in project area). In relation to the onshore substation, the potential for dust emission would also be considered as be “large” during earthworks and construction and “medium” due to the expected HGV movements in the area (14 HGV movements per day).

Table 5-2 Dust Emission Magnitudes

Activity	Project element	Dust Emission Magnitude
Earthworks	Onshore cable route	Large
	Onshore substation	Large
Construction	Onshore cable route	Large
	Onshore substation	Large
HGV Vehicle Movement	Onshore cable route	Large
	Onshore substation	Medium

5.3 Define the Sensitivity of the Area

59. The IAQM suggest some criteria to help define the receptor sensitivity of the surrounding area. The following table summarises these criteria.

Table 5-3 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Human Receptors	Ecological Receptors
Very High	Very densely populated area; >100 dwellings within 20m; Local PM10 concentrations exceed the objective; Contaminated buildings present; Very sensitive receptors (e.g. oncology units); Works continuing in one area of the site for more than one year	European designated site[4]
High	Densely populated area; 10 - 100 dwellings within 20m of site; Local PM10 concentrations close to the objective (annual mean 36 – 40□g/m^3); Commercially sensitive horticultural land within 20m	Nationally designated site
Medium	Suburban or edge of town area; Less than ten dwellings within 20m; Local PM10 concentrations below the objective (annual mean 30 – 36□g/m3)	Locally designated site
Low	Rural or industrial area; No dwellings within 20m; Local PM10 concentrations well below the objectives (<75%) Wooded area between site and receptors	No designations

60. To analyse the sensitivity of the construction area, it is necessary to consider the types and locations of the various receptors from the site boundary, or from the dust generating activities. The following tables show how the sensitivity of the area has been determined for the impacts of dust soiling, on human health and on ecological receptors respectively, in accordance with the IAQM criteria:

[4] Only if there are habitats that are sensitive to dust

Table 5-4 Sensitivity of the Area to Dust Soiling Effects on People and Property

Receptor Sensitivity	Number of Receptors	Distance from the Source (m)			
		<20	<50	<100	<350
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Table 5-5 Sensitivity of the Area to Human Health Impacts

Receptor Sensitivity	Annual mean PM10 concentration (µg/m3)	Number of receptors	Distance from the Source (m)				
			<20	<50	<100	<200	<350
High	32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28-32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24-28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Table 5-6. Sensitivity of the Area to Impacts on Ecological Receptors

Receptor Sensitivity	Distance from the Source (m)	
	<20	<50
High	High	Medium
Medium	Medium	Low
Low	Low	Low

61. The Table 5-7 presents the sensitivity of the surrounding area considering construction of both the onshore cable route and the onshore substation. In general, population is low in the areas close of the construction works. The cable route does however run within 50m of a small number of existing residential properties at certain locations (Waldringfield and Woodbridge). Therefore, the sensitivity of the area in relation to the potential for any human health impacts is “low” for the onshore substation area and “high” for the onshore cable route.

62. Regarding ecology sensitivity, this is determined as “medium” for both the onshore cable route and area surrounding the substation, due to the presence of protected species and ecological sites nearby.

Table 5-7 Sensitivity of the Surrounding Area

Development phase	Project component	Sensitivity of the Surrounding Area		
		Dust soiling	Human Health	Ecology
Earthworks	Onshore cable route	Medium	High	Medium
	Onshore substation	Low	Low	Medium
Construction	Onshore cable route	Medium	High	Medium
	Onshore substation	Low	Low	Medium
HGV Movements	Onshore cable route	Medium	Medium	Medium
	Onshore substation	Low	Low	Medium

5.4 Assess the Risk of Dust Impacts

63. The dust emission magnitude in combination with the sensitivity of the area, as defined above, is used to determine the level of risk of dust impacts to the area surrounding the construction works.

64. The assessment of risk, according to the criteria in the IAQM is summarised below:

Table 5-8 Risk of dust impacts during Earthworks

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 5-9 Risk of dust impacts during Construction

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Medium Risk	Low Risk
Low	Low Risk	Low Risk	Negligible

Table 5-10 Risk of dust impacts during HGV vehicle movements

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Low Risk
Medium	Medium Risk	Low Risk	Negligible
Low	Low Risk	Low Risk	Negligible

65. The Table 5-11 summarises the risk categorisation of the construction of both the onshore cable route and the onshore substation for each of the construction activities considered.

Table 5-11 Risk of dust impacts in the Surrounding Area

Development phase	Project component	Risk of Dust Impacts		
		Dust Soiling	Human Health	Ecology
Earthworks	Onshore cable route	Medium risk	High risk	Medium risk
	Onshore substation	Low risk	Low risk	Low risk
Construction	Onshore cable route	Medium risk	High risk	Medium risk
	Onshore substation	Low risk	Low risk	Medium risk
Trackout	Onshore cable route	Medium risk	Medium risk	Medium risk
	Onshore substation	Low risk	Low risk	Low risk

66. For the onshore substation, the risk of dust impacts has been identified as “low”, except for the elevated risk to ecology during construction phase, defined as “medium,” due to the location of the Fore and Bushey Groves County Wildlife Site.

67. For the onshore cable route, the risk is “medium” in two out of three of the categories considered. Whilst, the onshore cable route passes directly through the Deben Estuary Special Protection Area, a Horizontal Directional Drilling (HDD) crossing is planned in to this area in order to avoid any impacts on this ecology sensitive area.

68. It is important to note the indicated potential “high” risk to human health identified during both earthworks and construction phases. This level of risk is due to the close proximity of some residential properties in certain areas of the construction works, the relatively high number of daily HGV movements expected and the size and extent of the works.

6.Control measures and Mitigation

69. Having identified the main potential air quality impacts resulting from earthworks, construction and HGV vehicle movements, this section sets out the control measures and mitigation required to mitigate any defined impacts. The appropriate mitigation measures will be established to minimise the level of risk for potential dust impacts. The mitigation measures considered in the AQMP are included in the various standards and best practice guidelines, detailed in Section 2 .

70. The aim of the dust and pollution control measures outlined is to reduce dust nuisance impacts on local receptors. With this in mind, the control measures are focused, on the following aspects[5]:

- **Site Planning**. Good site management practices should be followed to ensure that the site is responsibly managed during the construction of the project.
- **Site Activities**. The implementation and continued development of construction activities can have a significant impact on the control of dust emissions.
- **Construction Traffic**. Emissions from construction vehicles can significantly increase levels of local air pollution, so it is important to take into account best practices to reduce this impact.

71. As the indicated in the IAQM 2014 'Guidance on the Assessment of dust from demolition and construction works', the mitigation measures have been defined considering the risk categories determined in the risk impact assessment. For those aspects established with several risk categories (low, medium and high), the highest risk category will be applied to ensure the most conservative mitigation measure required is in place. For example, if the site is medium risk for earthworks and construction, but a high risk for haulage movements, the general requirements applicable to mitigation of a high risk site will be enforced.

72. The Table 6-1 includes the recommended measures to be implemented in order to avoid the potential impacts to air quality associated with the Project. The table specifies the three main project activities (earthworks, construction and/or Vehicle Movements) and summarises the controls required at the two main areas of works (onshore cable route and the onshore substation).

Table 6-1 Control and mitigation measures to implement during works

Source description	Control measures	Areas		Timing	Project activity			Responsibility
		Onshore Cable Route	Onshore substation		Earthworks	Construction	Track out	
Plant and Machinery	All construction plant and machinery will be fitted with adequate emission control devices, maintained in good working order and there shall be no excessive exhaust emissions.	✓	✓	One off	✓	✓	✓	Contractor
	All off-road mobile machinery to use low sulphur diesel.	✓	✓	As needed	✓	✓		Contractor
Loading and unloading of materials	Restricting or ceasing dust-generating activities on extremely windy or dry days. Weather forecast information can be obtained from the MetOffice website (http://www.metoffice.gov.uk/public/weather/forecast) to provide warnings of adverse meteorological conditions. Minimise deliveries of dry materials in windy weather. Minimise drop height during loading or unloading	✓	✓	As needed	✓	✓	✓	Site Manager/ Contractor
Stockpiled Materials	Stockpiles and handling areas will be maintained in a condition that minimises windblown or traffic generated dust by water sprays or by seeding (i.e. if greater than 4 weeks).	✓	✓	As needed	✓	✓	✓	Contractor
	Stockpiles are to be managed to be located away from residential	✓	✓	As	✓	✓		Site Manager/

[5] Institute of Air Quality Management´s (IAQM). Guidance on the Assessment of dust from demolition and construction works (2014).

Source description	Control measures	Areas		Timing	Project activity			Responsibility
		Onshore Cable Route	Onshore substation		Earthworks	Construction	Track out	
	areas.			needed				Contractor
	Stockpiles would be retained for the shortest possible time. Seeding, spraying or covering any vulnerable areas to prevent windblown surface dust.	✓	✓	As needed	✓	✓		Site Manager/ Contractor
	Ensure sand and other aggregates are stored and covered and not allowed to dry out, unless required for a particular process, to ensure that appropriate additional control measures are in place.	✓	✓	As needed	✓	✓		Site Manager/ Contractor
	In covered stockpiles, only remove the cover in small areas during work and not all at once.	✓	✓	As needed	✓	✓		Contractor/ all personnel
Vehicle Fleet Operation and traffic	Start-up of vehicles will, where practicable will be undertaken away from areas of sensitivity.	✓	✓	Daily	✓	✓	✓	All personnel
	Ensure that vehicles on site travel at speeds that do not generate excessive amounts of dust (i.e. 10 mph or less).	✓	✓	Daily			✓	Contractor/ all personnel
	Ensure that vehicles working on site are maintained to manufacturer's specifications and that there are no excessive exhaust emissions.	✓	✓	As needed	✓	✓	✓	Contractor/ all personnel
	Vehicles leaving site would be washed, if necessary. Wheel wash units will be installed at key locations	✓	✓	As needed			✓	Contractor/ all personnel
	Install hard surfaced haul routes, which are regularly damped down with mobile sprinkler systems, or mobile water bowsers and regularly cleaned.	✓	✓	As needed			✓	Contractor
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	✓	✓	As needed			✓	Contractor
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	✓	✓	Daily			✓	Contractor
	Use road sweeper(s) on the access and any local roads, to remove, any material tracked out of the site. This may require the sweeper being continuously in use.	✓	✓	As needed			✓	Contractor/ all personnel
General	No burning of any materials on site.	✓	✓	One off	✓	✓	✓	All personnel
	Dust generating activities will be minimised.	✓	✓	Daily	✓	✓	✓	All personnel
	Access should be located at least 10m from receptors where possible.	✓	✓	As needed	✓	✓		Contractor
	Temporarily cover or re-vegetate earthworks if possible.	✓	✓	As needed	✓			Contractor/ all personnel
	Exposed sections of the work will be damped down regularly where there is a risk that surface dust will be generated. Water would be used as a dust suppressant as appropriate.	✓	✓	Daily	✓	✓	✓	Contractor
	The frequency of dust suppression (such as damping down) will be increased as appropriate, e.g. during dry and windy conditions, to ensure no visible dust emissions.	✓	✓	As needed	✓	✓	✓	Contractor

73. The mitigation measures described in Table 6-1 will be monitored by the Contractors, Site Manager and Environmental Clerk of Works throughout the construction phase, as set out in the Project Environmental Management Plan and Construction Environmental Management Plans. If non-conformity with any of the control and mitigation measures is identified, it will be recorded during a site inspection or audit and appropriate remedial actions will be implemented.

74. All employees, contractors and staff working on site will undergo site induction training, which will include environmental awareness training, including an understanding of air quality management issues. Individually focussed toolbox talks will also be required to be delivered by those contractors involved in the activities most likely to impact on the air quality.

75. The training will provide specific instructions about:

- Requirement for dust suppression at all times.
- How to avoid and suppress dust across worksite.
- Available dust suppression options.
- Work methods to prevent dust generation, such as maintaining site speed limits.
- Covering trucks loads.
- Cleanliness of vehicles, prior to exiting site.
- Road cleanliness, with regard to vehicles leaving the site onto public roads.
- Sensitive areas / receptors.
- Potential for condition changes and response strategies in windy conditions.
- The importance of equipment maintenance.

7.Monitoring

76. The need for monitoring generally depends on existing air quality, the air pollution risks identified from the onshore construction works and the technical practicalities to consider during construction.

77. If the control and mitigation measures in Section 6 are implemented correctly during the onshore construction works, then dust production and other emissions from the construction site will be minimised. However, site inspections and visual monitoring will be undertaken as an effective way to verify that air pollution control measures have been properly designed and implemented.

78. The baseline air quality characterisation, undertaken in Section 4, indicates that particulate matter concentrations (PM10) are unlikely to be in exceedance of any Air Quality Objectives.

79. The risk assessment obtained in the onshore substation is “low” for human health and dust soiling in earthworks, constructions works and HGV haulage movements. However, during construction phase, there is a “medium” risk to affect the ecology of the area surrounding the works with a CWS adjacent to the onshore substation. Therefore, visual monitoring will be undertaken to assess dust generation during the works. In this location, visual monitoring would also require a check for any deposited dust in the vegetation of this protected area.

80. Generally, visual monitoring and sites inspections will include, but not be limited to:

- Visual inspections for clouds of dust generated from haul trucks, vehicle traffic, earthworks, etc.
- Check the weather forecast and if it indicates dry weather and strong winds are likely, this will be a trigger for preventive dust management action to be taken.
- Verify if vehicle traffic emissions are consistently black. This is a signal that an engine is not operating optimally.
- Check for the presence of deposited dust on haul roads, welfare areas, residences or vegetation nearby the project site.

81. The onshore cable route presents “medium” risk of dust impacts during earthworks, construction and from vehicle movement’s. However, the risk assessment identified a potentially “high” risk of dust impacts on human health during earthworks and construction due to the close proximity of some residential areas to the cable route. As such visual monitoring and site inspections, as detailed above, will also be undertaken throughout the onshore cable route construction work, with additional focus on works in proximity of residential areas.

82. Optionally, during these high risk activities, additional monitoring may be considered for human or ecological sensitive receptors, during earthworks and construction activities of the onshore cable route.

83. This additional monitoring would consist of spot checks of known or anticipated sensitive areas if the visual monitoring identifies signs of impacts. The spot checks will be conducted using a portable particulate monitor. If concentrations measured approach an Air Quality Objective, then additional control measures will be immediately implemented. The frequency and the location of the spot checks will be determined by the Environmental Clerk of Works.

84. The air quality control measures set out in this AQMP will be included in the relevant Risk Assessment and Method Statement that will be submitted for each construction activity by all appointed contractors.

85. A procedure to manage the investigation and reporting of complaints will be included in the Project Environmental Management Plan (produced by EAOL) and the Construction Environmental Management Plans (produced by contractors). Where a complaint is received the circumstances will be promptly investigated, mitigation undertaken and implementation of a procedure to notify project management. In certain situations it may be necessary to notify the local authority of the complaint, the actions taken and the measures to put in place to rectify any problem.

8. Conclusions

86. This Air Quality Monitoring Plan (AQMP) sets out the controls and mitigation measures applicable to the EA ONE onshore construction works to ensure that any potential effects on air quality are minimised. This AQMP is submitted as an appendix to the Code of Construction Practice (CoCP) and fulfils DCO requirement 20 (2) (e).

87. The AQMP considers the entire onshore cable route, including construction compounds, and the onshore substation.

88. This AQMP contains a characterisation of the air quality in the construction area and an identification of the air quality impacts and risks from the construction activities. It then describes the implementation of the control measures and mitigation to minimise any adverse effects and finally includes a monitoring plan to evaluate the efficiency of the control measures and mitigation.

89. The main construction activities with a potential to impact on air quality considered in this AQMP are: earthworks, construction and HGV vehicle movements. This AQMP is focused on the risk of an increased particulate matter concentration, as the main pollutant that may be released during construction works.

90. Results of the baseline air quality characterisation show that, generally, air quality in the vicinity of the project (Suffolk County) is good, with the expected concentrations of particulate matter being consistently lower than the Air Quality Objectives.

91. Regarding the onshore substation, the risk of dust impacts has been identified as "low", except for the "medium" risk to ecology during construction phase, due to the close proximity vicinity of the Fore and Bushey Groves County Wildlife Site to the onshore substation and the possibility of presence of protected species nearby the placement.

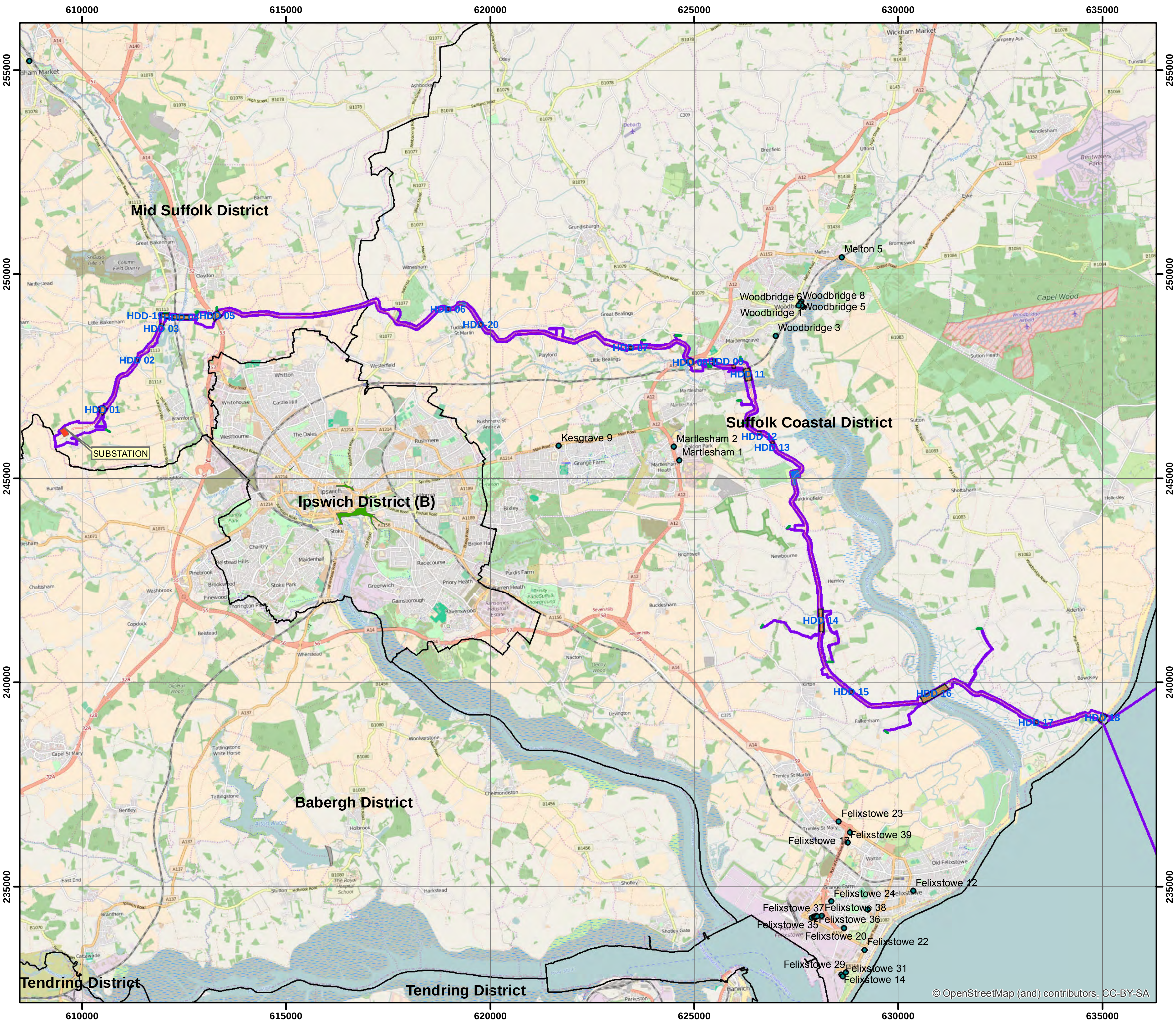
92. For the onshore cable route, the risk is "medium" in the majority of categories. It is important to note the potential "high" risk to human health, identified during earthworks and construction phases, is due to the presence of residential properties close to the Development Order Limits boundary, the high number of HGV movements expected and the size and scale of the works.

93. After the identification of the main potential air quality impacts from earthworks, construction and HGV movements, the control measures and mitigation have been specified to minimise the level of risk of potential dust impacts. These measures focus on the minimisation of dust generation during construction works including:

- Use of water as a dust suppressant.
- Temporarily cover or seed stockpiles.
- Skips must be covered and loading drop heights minimised.
- Dust-generating activities should be minimised.
- Stockpiles should be kept in place for the shortest possible time.
- Vehicles leaving site should be washed if necessary.
- All loads entering and leaving site would be covered.
- No bonfires will be allowed on site.
- Machinery and dust-generating activities will be located from sensitive receptors.
- Speed limit on un-surfaced roads to minimise potential for dust generation.

94. Continuous site inspection and monitoring is an effective way to verify that air pollution control measures have been properly designed and implemented. Generally, visual monitoring of dust generating activities will be effective to assess a potential impact from dust emissions from the site. During works classified as high risk activities for generating dust (earthworks and construction of the onshore cable route), additional particulate monitoring at sensitive receptors may be considered to confirm effectiveness of mitigation. The implementation and effectiveness of the control measures will be monitored by the Contractors, Site Manager and Environmental Clerk of Works.

Figure 1 Air Quality Monitoring Locations



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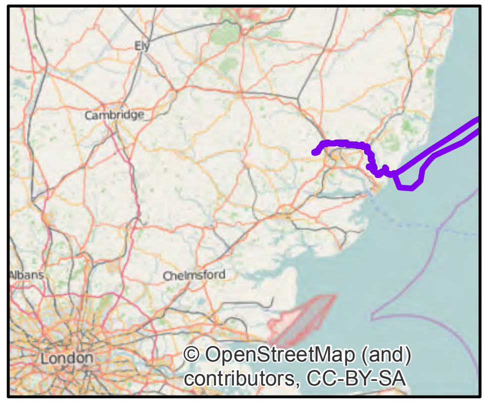

Legend

- Air Quality Management Areas
- Onshore Cable Route
- HDDs
- Access Roads Locations
- Lockout Zones
- Onshore Substation
- Development area
- Air Quality Monitoring Locations

1:10,000
SCALE @ A3

0 1.300 2.600 Meters

DATE: 30/06/2016 EA1-CON-F-GBE-008556

FIGURE 1: Air Quality Monitoring Locations

Air Quality Monitoring Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction

Appendix 3 Construction Artificial Lighting Emissions Plan

East Anglia ONE
Offshore Windfarm

East Anglia ONE Offshore Windfarm

Construction Artificial Lighting Emissions Plan
DCO Requirement 21 (1) and 20 (f)
Final for Approval

ID: EA1-CON-F-GBE-008548

Created by / date:	IEC / 02 Sep 2016
Checked by / date:	KW / 05 Sep 2016
Approved by / date:	PS / 08 Sep 2016

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REVISION CONTROL

Revision and Approvals					
Rev	**Date**	**Reason for Issue**	**Originated by**	**Checked by**	**Approved by**
0	30-11-2016	Internal review	BS	CD	AM
1	07-12-2016	Interim for Consultation	IEC	GV	GG
1A	05-08-2016	Final for Review	BS	CD	DH
2	05-09-2016	Final for Approval	IEC	KW	PS

Table of Contents

Appendices

Abbreviations

AC – Alternating Current
CALEP – Artificial Lighting Emission Plan
CCS – Construction Consolidation Sites
CfD – Contract for Difference
CoCP - Code of Construction Practice
DC – Direct Current
DCO – Development Consent Order
DECC – Department for Energy and Climate Change
DOL – Development Order Limits
EA – Environment Agency
EA ONE – East Anglia ONE Offshore Wind Farm
EAOL – East Anglia One Limited
EcoMP – Ecological Management Plan
ECoW – Ecological Clerk of Works
EPS – European Protected Species
EPSL – European Protected Species Licence
ES – Environmental Statement
GCN – Great Crested Newt
HDD – Horizontal Directional Drilling
IEC – Iberdrola Engineering and Construction
LED – Light Emitting Diode
MW - Megawatts
NE – Natural England
OLEMS – Outline Landscape and Ecological Management Strategy
SPA – Special Protection Area
UK – United Kingdom
W&CA – Wildlife and Countryside Act 1981 (as amended)

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm. The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. In February 2015 EAOL secured a Contract for Difference (CfD) award to build a 714MW project and ScottishPower Renewables announced its role in leading East Anglia ONE towards construction. In April 2015 EAOL submitted a non-material change application to DECC to amend the consent from direct current (DC) technology to alternating current (AC). In March 2016 DECC authorised the proposed change application and issued a Corrections and Amendments Order.

3. The onshore construction works associated with EA ONE comprise of the following, which based on the AC technology with a capacity of 714MW, comprises;

- A landfall site at Bawdsey, Suffolk
- Up to six underground cables, approx. 37km in length
- Up to four cable ducts for the future East Anglia THREE project
- An onshore substation located at Bramford next to existing National Grid infrastructure

1.2 Scope and Purpose

4. This Construction Artificial Lighting Emissions Plan (CALEP) sets outs mitigation measures to be applied to the construction activities being undertaken as part of EA ONE onshore construction works to reduce the potential for significant impacts from light emissions. This plan has been produced to fulfil DCO Requirements 21 (1) & (2) and 20 (2) (f) which state:

> ***21.** - (1) No stage of the connection works shall commence until written details of any external lighting to be installed in connection with that stage, including measures to prevent light spillage, have, after consultation with the highway authority, been submitted to and approved by the relevant planning authority; and any approved means of lighting shall be installed in accordance with the approved details and retained for the duration of the construction period.*
> *(2) Any means of construction lighting approved under sub-paragraph (1) must be removed on completion of the relevant stage of the connection works.*
>
> ***20**. (2) The code of construction practice must include-*
> *(f) artificial light emissions plan;*

5. The scope of this plan is the onshore construction works, which includes all construction activities associated within the onshore cable route and onshore substation, referred to within the DCO as Work No's 3B to 38.

6. The purpose of this CALEP is to ensure that the onshore construction works of EA ONE comply with relevant European and UK legislation, DCO conditions, environmental commitments as set out in the Environmental Statement (ES), and environmental and construction best practice.

7. This plan sets out the management measures which EAOL will require its contractors to adopt and implement for any onshore construction works for EA ONE. This includes the installation of the ducts and cables along the onshore cable route, the construction of the new onshore substation and any associated temporary works, such as temporary haul road and Construction Consolidation Sites (CCS).

2 Guidelines and Standards

8. This CALEP has been in accordance with the following guidance and standards:

- The Institution of Lighting Engineers (2000) *Guidance notes for the reduction of light pollution*[1]. The Institution of Lighting Engineers, UK.
- The Institution of Lighting Professionals (2011) *Guidance Notes for the Reduction of Obtrusive Light GN01:2011*[2]. The Institution of Lighting Professionals, UK.
- British Standard BS EN 12464-2:2014 Light and lighting. Lighting of work places. Outdoor work places.
- British Standard BS 5489-1:2013 Code of practice for the design of road lighting. Lighting of roads and public amenity areas.
- Bat Conservation Trust (2014). Artificial lighting and wildlife: Interim Guidance – Recommendations to help minimise the impact of artificial lighting. BCT. London.

[1] https://www.gov.je/SiteCollectionDocuments/Planning%20and%20building/SPG%20Lightpollution%202002.pdf
[2] https://www.theilp.org.uk/documents/obtrusive-light/guidance-notes-light-pollution-2011.pdf

3 Construction Details

3.1 Construction Details

3.1.1 Enabling Works

9. The onshore construction works will commence with the enabling works, which includes the establishment of the construction compounds (herein referred to as Construction Consolidation Sites), fencing and securing the working width, the topsoil strip and the installation of a haul road.

10. The onshore construction works will be supported by the installation of nine Construction Consolidation Sites (CCSs) (referenced A to I), these are compounds which will be utilised to provide welfare, site staff accommodation, parking, and secure storage for materials, plant and equipment. The CCSs are categorised as either Primary or Secondary, depending on their intended uses. There are two Primary CCSs; CCS B will be a designated storage and delivery facility and the main administrative compound and CCS E will be a main storage and delivery facility, with designated office space. The remaining seven Secondary CCSs shall be used to access the internal haul road, storage and deliveries. The establishment of the CCS compounds will be one of the first construction activities undertaken.

11. During the construction of the substation, site establishment and laydown areas will be required, including temporary offices, welfare, car parking, materials and equipment storage. The area directly east of the substation will be used as the temporary works area (referred to as Work No 38 within the DCO). At the start of the works the onshore substation compound and temporary works will be temporarily fenced.

12. The linear nature of the onshore cable route site will require fencing to be installed to both sides along the working width, not only to delineate the route but also to prevent possible vandalism and theft which could lead to possible contamination incidents.

13. Topsoil shall be stripped from the haul road location, trench areas and subsoil storage areas and stored. Topsoil storage and management shall be compliant with the recommendations and requirements set out in the Cable Landscape Management Plan (EA1-CON-R-IBR-010129). Topsoil shall be stored to one side of the working width**,** in such a way that it is not mixed with any subsoil. Typically this would be stored as an earth bund of a maximum height of two metres, to avoid compaction from the weight of the soil. Storage time shall be kept to a minimum, to prevent the soil deteriorating in quality. Topsoil stripped from different fields shall be stored separately, as would soil from specific hedgerow banks or woodland strips.

14. A temporary haul road will be installed along the route between the CCS locations and access points onto the local roads. Temporary haul road construction typically involves the placement of suitable imported stone material on a geotextile, however others methods such as soil stabilisation may be used if considered appropriate. In some instances the temporary haul road may comprise temporary trackway rather than stone due to site specific constraints. Following the initial topsoil stripping the haul road will be installed for a width of 5.5m along a designated route. The temporary haul road shall be constructed working from the installed CCS locations in two direction away from the CCS and towards the adjacent CCS along the onshore cable route.

3.1.2 Onshore Cable Route

15. The onshore cable route comprises a 37km corridor, between the Suffolk coast at Bawdsey and the substation at Bramford, passing the northern side of Ipswich. The onshore cable works comprise the installation of electricity transmission cables and ducts between the landfall location at Bawdsey and the new substation station, which is adjacent to the existing substation at Bramford. The majority of the route will be constructed using open trenching methods, other than in certain locations where the cable route traverses a number of major transport networks and natural obstacles. To enable the installation of the cable under these features, specialist trenchless techniques will be employed, such as Horizontal Directional Drilling (HDD).

16. Construction activities will be undertaken within a temporarily fenced strip of land, referred to as the working width. The working width is determined by electrical and civil engineering considerations and allows for sufficient space between the cables trenches to prevent the cables overheating, plus space for the associated temporary construction works i.e. soil storage, drainage, haul road installation and work areas for personnel and machinery. In accordance with the DCO, the

working width shall not exceed 55m, except at the HDD locations identified in DCO Requirement 10 (6), where the working width is permitted to be increased to allow for the installation and use of the specialist equipment to undertake the HDD.

17. There are two basic techniques to be used for the installation of the cable ducts during the construction of the onshore cable route. These are:

- **Open Cut techniques**; where a trench is excavated and the cable ducts laid in the trench before reinstatement, using the excavated material; and
- **Trenchless Technique**; typically HDD, where a pit is excavated to access the crossing and from which a drill is passed through the ground on one side of the obstacle to a receiving pit created on the opposite side. The bore is then gradually enlarged to receive the duct, which is the technique that will be used to pass under roads, main rivers and other sensitive sites.

18. For the open cut technique two trenches will be excavated for the EA ONE ducts and cables and an additional trench will be excavated in parallel for the cable ducts that will be installed to serve EA THREE in the future. An indicative cross section showing the open trench working width layout is included in Appendix 2. As the trench excavation progresses, subsoil will be removed to create the trenches to working depth for duct installation, the subsoil will be temporarily stored separately from the topsoil, and then reused to backfill the trenches.

19. Particular care will be taken when backfilling the trenches with the excavated material (subsoil) to reinstate it in the order in which it was excavated, again to minimise any disruption to the existing ground drainage pattern. The ducts will be installed in the trench, where they will be bedded on and then surrounded and topped by Cement Bound Sand (CBS) or equivalent which will gradually set and harden in situ as water is absorbed. Above this, the subsoil will then be used to reinstate the trench to the previous level.

20. Where, due to the existence of obstacles, it is not possible to install the cable ducts using the open trench method, trenchless installation techniques shall be used. The onshore cable route traverses a number of major transport networks and natural obstacles, to enable the installation of the cable across these features specialist techniques are required, namely the use of HDD. These key locations are referred to a 'Category 1' HDD sites as identified in Table 3-1.

21. These HDD sites will require additional equipment, storage and ancillary facilities to that required for the conventional open trench installation methods in order to accommodate the drilling activities. As such, a specialist HDD compound will be set up at each side of the HDD location to enable the specialist plant and materials to be delivered directly.

22. In addition to the above major features, a number of other features have been identified where the conventional open cut trenching technique are not appropriate. At these locations 'trenchless' methods will also to be implemented, which will comprise of a smaller HDD or auger bore. These sites are referred to as 'Category 2' HDD/trenchless. As the features to be crossed are less significant, they will not require any additional compounds and works will take place within the standard working width. Table 3-1 provides a list all the HDD / trenchless locations.

Table 3-1 HDD / Trenchless Locations

Reference	Category	Location/ Feature	Approximate Length (m)	Max Width (m)
HDD-01	Cat 1	Millers Wood off Bullen Lane	200	130
HDD-02	Cat 2	Somersham Watercourse	70	55
HDD-03	Cat 2	Pound Lane	60	55
HDD-04	Cat 1	River Gipping and Network Rail track west of A14	385	130
HDD-05	Cat 1	A14 Trunk Road and Old Ipswich Road	200	160
HDD-06	Cat 2	River Fynn	30	55
HDD-07	Cat 2	Lodge Road	60	25

HDD-08	Cat 1	A12 Trunk Road	165	120
HDD-09	Cat 2	Top Street	90	55
HDD-10	Cat 2	Sandy Lane	90	50
HDD-11	Cat 1	Martlesham Creek and Network Rail tracks south of Woodbridge	650	160
HDD-12	Cat 2	Waldringfield Road	70	55
HDD-13	Cat 2	Watercourse east of Howe's Farm	50	55
HDD-14	Cat 1	Kirton Creek	550	110
HDD-15	Cat 2	Sewage works outfall watercourse	50	55
HDD-16	Cat 1	River Deben	700	55
HDD-17	Cat 2	Queen's Fleet	70	55
HDD-18	Cat 1	Landfall, Bawdsey	1000	160
HDD-19	Cat 2	Bramford Road	60	55
HDD-20	Cat 2	Grundisburgh Road	50	55

23. The HDD technique is expected to be used at the majority of locations on the route where a trenchless method is required. This involves creating an access pit on either side of the obstacle to facilitate the installation of the drilling equipment and allow drilling under the obstacles, at an appropriate depth allowing the installation of the ducts. The HDD sites will have two access points, one either side of the HDD location, the drilling rig will be positioned on one side of the feature with ducting placed at the opposite side ready to be pulled back through the opening on completion of drilling.

24. Once the cable duct installation is completed then works will commence on the installation of the EA ONE cables within the pre-installed ducting system. As the onshore cabling typically comes on drums of up to 1,300m in length, jointing bays will be required along the cable route to join each section of cable together. These jointing bays, approximately 10m long x 5m wide x 5m deep, will be constructed at regular intervals along the onshore cable route to allow cable pulling and jointing at a later stage. The joint bay with be excavated to size and a concrete poured floor with concrete or blockwork walls surround will be installed and topped with concrete slabs to leave ground cover to a depth of 1.1m.

25. Further details on the construction methodology for the onshore cable route are presented in the Cable Method Statement (EA1-CON-R-IBR-021238).

3.1.3 Onshore Substation

26. The EA ONE onshore substation will be located within a fenced compound (150m by 190m) to the north of the existing National Grid Bramford Substation. The substation will contain electrical equipment including power transformers, switchgear, reactive compensation equipment, harmonic filters, cables, control buildings and other associated equipment, which will largely be outside with a number of the components being within the buildings.

27. The construction of the substation will include a number of key stages; include enabling works, foundations and building construction and equipment installation and commissioning. The enabling will include grading and earthworks to remove any unsuitable materials from the substation area and provide a level platform at an elevation of 56m AOD. Where possible, the materials excavated will be reused on site as engineering fill or landscaping depending on material properties. The enabling works will also include the construction of the main concrete access road.

28. Following the completion of the site grading, works will commence of the excavations for foundation for the building and trenches to accommodate electrical infrastructure and installation of the drainage networks.

29. The building is largely comprised of steel and cladding materials, with brick/blockwork at the base. The structural steelwork will be fabricated and prepared off site and delivered to site for erection activities using cranes. The composite cladding panels (e.g. Kingspan) will be delivered to site ready to erect and be fixed to the steelwork.

30. For the installation and commissioning phases a variety of specialist activities are required. The main items of electrical infrastructure, for example transformers, will be delivered sealed to site. Due to their size and weight they will be delivered via specialist means and offloaded with the use of a mobile crane (please see Traffic Management Plan (EA1-CON-R-IBR-009583) for details of abnormal load transport procedures). The smaller electrical components will be constructed on site using small mobile plant and lifting apparatus.

4 Potentially Sensitive Receptors

4.1 Introduction

31. During the construction phases, temporary lighting will be required. The sources of temporary lighting are:

- Flood lighting required for the illumination of areas to carry out various works and for security purposes; and
- Lighting for equipment such as conveyors, trucks, stockpiles and emplacement areas.

32. Lighting from these sources has the potential to have the following impacts:

- Intrusive lighting impacting nearby residents and causing disturbance and annoyance, particularly with regard to sleep patterns;
- Impact on ecological sensitive receptors from light spill;
- Impact on the visual amenity due to the illumination of the night sky; and
- Lighting on surrounding roads, distracting passing motorists.

4.2 Potentially sensitive receptors to artificial light emissions

33. Potentially sensitive receptors that could be affected by temporary artificial lighting during construction works include visual and ecological receptors.

4.2.1 Visual receptors

34. There are very few potential sensitive visual receptors in close proximity to the construction works. These include occupiers of residential properties, users of outdoor recreational facilities and off road users. The greatest potential for visual impact from light spill would be at locations where lighting is required at higher elevations for the construction of some structures within the substation. In order to establish a reference of potential buildings that could be affected by light spill, a distance of 100m from the CCSs and Horizontal Direction Drilling (HDD) locations is shown in Appendix 1.

4.2.2 Ecological receptors

35. Light spill and intrusive lighting from night time works could potentially disturb ecologically sensitive receptors which include nocturnal species. The key ecologically sensitive receptors include badgers, bats, otters and Schedule 1 birds (breeding and non- breeding birds). Detailed baseline data, survey results and mitigation measures are provided in the Ecological Management Plan (EcoMP) (EA1-CON-F-IBR-021237) and the findings from the surveys and mitigation measures agreed with the authorities have been taken into account in this report, and are identified in Appendix 1.

4.2.2.1 Bats

36. All species of British bats are protected by The Wildlife and Countryside Act 1981 (as amended) (W&CA) extended by the Countryside and Rights of Way Act 2000. Bats are also European Protected Species listed on The Conservation of Habitats and Species Regulations 2010. Different bat species vary in their sensitivity to lighting. *Myotis/Plecotus* species are the most light-sensitive species which have been recorded in the survey area. The effect of lighting has the potential to impact the available foraging and roosting habitat for bats as the lighting may deter bat from using a hedgerow or reaching a roosting site.

37. Little Blakenham Pit Site of Special Scientific Interest (SSSI), which is a known hibernation site for bats, is situated approximately 1km to the north west of the onshore cable route and approximately 3km from the onshore substation. There is therefore the potential for lighting impacts on favoured commuting corridors associated with the designated site in the proximity to the onshore cable route and substation.

38. Pre-construction surveys have been carried out in 2015 and 2016 (results presented in EcoMP). Ground and tree climb surveys were carried out to re-assess the potential of bat features and a further dusk and/or dawn activity surveys were undertaken in certain trees when required due to their location in relation to the cable route corridor, their bat roost suitability or if they could not be effectively surveyed previously.

39. The pre-construction surveys updated information of trees with potential Bat Features Category 1 to 3 and the three trees (TN 70, TN123 and TN128) with confirmed roost bat locations is shown in Appendix 1.

40. Bats hibernate through the winter months and begin to feed on warmer nights from March. Females begin to move to maternity roosts around April and by May the pregnant females are in maternity roosts. Young bats are born in June and July and by august are usually flying and feeding. Mating and swarming occurs September and October prior to hibernation.

41. Therefore, external lighting at night should be avoided as far as feasible, particularly during the months of higher fly activity (August – October). If lighting at night is required, it will comply with Bat Conservation Trust (BCT) recommendations on external lighting as agreed with Natural England.

42. In order to prevent the potential reduction in available foraging opportunities and access to roosting sites for bats, as a result of lighting impacts, no working at night will be undertaken along the cable route, except at specified locations where it cannot be avoided (i.e. for 24 hour HDD operations, construction consolidation sites or night time road closures).

43. Furthermore, there will be limited 24 hour lighting at the Substation compound site during particular construction activities (e.g. concrete pours) and directional lighting or shields will be used during Autumn (August – October).

4.2.2.2 Badger

44. Badgers and their setts are comprehensively protected by the Protection of Badgers Act 1992 (as amended). The varying habitats along the cable route corridor provide good opportunities for badger (*Meles meles*). The badger surveys carried out in 2012 for the ES and the 2015 and 206 pre-construction surveys have found several badger setts within the cable route corridor. As badger setts locations are confidential information as such they are not shown in Appendix 1. The species and locations are detailed in a confidential section of the EcoMP.

45. The badger breeding season is from 1st December to 30th June. Works that could result in disturbance of a breeding sett should be avoided at this time. However, if granted for the known badger setts, the licence may allow, with conditions, some activities that may disturb badgers occupying a breeding sett during the breeding season.

46. Where night time works are required lighting would be directional to avoid unnecessary lighting on woodland and water edge, so as not to disturb emerging or foraging badgers.

4.2.2.3 Otter

47. Otters are a European Protected Species (EPS). Otters and their resting sites/shelters are protected in the UK under The Conservation of Habitats and Species Regulations 2010 (as amended). Otter field signs (spraint, slides and resting sites) were recorded at various locations along the cable route in the 2012 surveys for the ES and in further pre-construction surveys carried out in 2015 and 2016. The locations of otter resting sites within and near the DOL are shown in Appendix 1.

4.2.2.4 Great Crested Newts

48. Great crested newts are a European protected species under the Conservation of Habitats and Species Regulations 2010 (as amended). Some waterbodies around the cable route showed presence of Great Crested Newts (GCN) in the 2012 and pre-construction surveys. These are shown in Appendix 1.

4.2.2.5 Schedule 1 birds and SPA Non-breeding birds

49. Bird species listed on Schedule 1 of the W&CA are afforded extra protection making it an offence to intentionally or recklessly disturb any such bird when it is building its nest or while it is in or near a nest containing dependant young, and / or disturb the dependant young of any such bird. Schedule 1 birds have been recorded in some areas surrounding the cable route. As Schedule 1 locations are sensitive information, they are not shown in Appendix 1. The species and locations are detailed in a confidential section of the EcoMP.

50. An Ecological Mitigation Plan for the Deben Estuary Special Protection Area (SPA) non-breeding birds and Schedule 1 breeding birds were presented as Appendix 4 of the Outline Landscape and Ecological Management Plan (2013). This Ecological Mitigation Plan outlines the requirement applicable for lighting mitigation for Schedule 1 bird species and SPA Non-breeding birds:

- An exclusion area for specified activities around the Marsh Harrier nest of between 100m and 400m radius, with that radius dependent on the stage of nesting activity that the Marsh Harrier has reached (nest building, eggs or chicks).

- Where HDD is used to cross the Deben Estuary and Martlesham Creek, mitigation measures will be implemented at construction site compounds and construction activities to avoid light spill and disturbance. Together with appropriate monitoring this will ensure that artificial illumination of areas used by concentrations of Brent Goose and Avocet is kept below 1 lux.

5 Lighting Scheme

5.1 Introduction

51. The objectives and performance outcomes for this CALEP are detailed below in Table 5-1.

Table 5-1 Objectives and Performance Outcomes

OBJECTIVES	PERFORMANCE OUTCOMES
• To ensure temporary lighting installations are positioned so as to avoid light spill directly towards roads, residences and other potential viewing locations or ecological receptors. • To ensure the potential impacts from light emissions on haul roads for mobile equipment are reduced so far as practicable. • To utilise vegetation screens to minimise the impact of any light spill in the direction of roads, residences and other viewing locations or ecological receptors. • To use directional lighting to reduce light spill and minimise light emissions from night time construction works to retain dark night skies. • To ensure procedures are in place to record and effectively respond to any complaint in respect to lighting. • To record and report the effectiveness of lighting emission controls.	• Sufficient lighting is provided on site to ensure that safety is not compromised. • External lighting complies with relevant European and UK legislation, DCO conditions, environmental commitments as set out in the ES and environmental and construction best practice. • The safety of external traffic on nearby roads is not affected by light sources on site. • Impacts from light emissions from the site on nearby sensitive visual receptors is avoided or minimised where avoidance is not possible. • Impacts from light emissions from the site on ecological receptors is avoided or minimised, where avoidance is not possible. • Complaints are responded to quickly and effectively. • The effectiveness of lighting emission controls are reported.

5.2 Lighting Requirements

52. The majority of the construction activities will be conducted during daylight hours and will not require artificial lighting, unless daylight conditions are not sufficient for specific works to ensure safe working. It is anticipated that there would be some limited activities requiring work on a 24 hour basis, these works will require the use of artificial temporary lighting to ensure safe working. Artificial lighting will also be needed particularly during the winter months when daylight hours are much shorter and shorter than the specified working hours. For the highest structures within the substation lighting at higher elevations will be required.

53. The activities which may require artificial lighting at night are:

- Where continuous periods of operation are required, such as concrete pouring and directional drilling.
- For internal fit out works associated with the onshore substation.
- For the delivery of abnormal loads.
- Works on the foreshore, if required.
- Potential emergency works.

54. The locations where activities that might require temporary construction lighting are described below and shown in Appendix 1:

- Temporary working areas along the cable route will only require artificial lighting during times where natural light is not sufficient to carry out the works. There will also be a requirement for artificial lighting on emergency works.
- At HDD locations there may be the need for lighting for 24 hour working (except at Work No. 21 or Work No. 26 as per the DCO Requirement).
- At Primary CCS sites there will be 24 hour onsite security presence and a need for artificial lighting for the duration of the works. At Secondary CCS sites security will be 24 hour with limited lighting specific to compound offices and parking area and will be programme dependant.
- Onshore substation compound and temporary works area.

5.3 Types and Positioning Requirements

55. Lighting should be sufficient to enable people to work, use facilities and move from place to place safely and without experiencing eye-strain. Table 5-2 below, which has been adapted from Health and Safety and Executive (HSE) document Health and Safety Guidance 38 (HSG38) 'Lighting at Work', details the recommended minimum lighting levels for different types of work activity and location applicable to the outside working areas. It makes recommendations for average illuminance for the work area as a whole and for minimum measured illuminance at any position within it.

Table 5-2 Recommendations for Minimum Lighting Levels (adapted from HSE document HSG38 (Lighting at Work).

Activity	Typical locations/ types of work	Average illuminance measured (lux) 1x	Minimum illuminance measured (lux) 1x
Movement of people, machines and vehicles(a)	Access roads and vehicle compound/parking areas.	20	5
Background work including movement of people, machines and vehicles in hazardous areas; rough work not requiring perception of detail	Construction site clearance, excavation and soil work.	50	20
Task based lighting and work requiring limited perception of detail	Where specific work tasks are required along the cable route focusing on a particular point in a trench or at a feature.	100	50

56. The artificial lighting required at HDD locations, CCS sites and at the onshore substation (only for key construction activities) will comply with the minimum requirements for safe work operations, the guidance and standards (Section 2) and mitigation measures avoiding or minimising the impacts on sensitive visual and ecological receptors.

57. Where HDD is used to cross the Deben Estuary and Martlesham Creek mitigation measures will be implemented with appropriate monitoring, to ensure that artificial illumination of areas used by concentrations of Brent Goose and Avocet is kept below 1 lux.

58. Light types will be selected taking into account the Bat Conservation Trust (2014) guidelines:

- Use narrow spectrum light sources to lower the range of species affected by lighting.
- Use light sources that emit minimal ultra-violet light.
- Lights should peak higher than 550nm.
- Avoid white and blue wavelengths of the light spectrum to reduce insect attraction and where white light sources are required in order to manage the blue short wave length content they should be of a warm / neutral colour temperature <4,200 kelvin.

59. Directional beams and non-reflective surfaces will be used to ensure light spill and nuisance does not encroach onto adjacent areas. The light columns will be up to 5m high with directional flow towards specific work areas.

5.4 Hours of lighting

60. The need for artificial lighting will be dependent on seasonality and will be switched on 30 minutes before sunset (which will change through the winter) to the end of the shift. It will also be switched on at the start of the shift to up to 30 minutes after sunrise. Again dependant on seasonality and will change through the winter months and with daylight savings adjustments. Temporary construction lighting will be also provided along the cable route during working hours only at times where natural light is not sufficient to carry out specific works to ensure safe working conditions.

61. Working hours will comply with DCO Requirement 23, which states:

***23.—(**1) Construction work for the connection works and any construction-related traffic movements to or from the site of the connection works shall not take place other than between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sundays or bank holidays, save—*

(a) where continuous periods of operation are required as assessed in the environmental statement, such as concrete pouring and directional drilling (subject to sub-paragraphs (3) and (4));

(b) for internal fitting out works associated with the onshore converter station comprised within Work No. 39;

(c) for the delivery of abnormal loads to the connection works, which may cause congestion on the local road network; and

(d) where connection works are being carried out on the foreshore.

(2) All construction operations which are to be undertaken outside the hours specified in sub-paragraph (1) must be agreed with the relevant planning authority in writing in advance, and must be carried out within the agreed times.

(3) Construction of Work No. 21 shall not take place other than between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sunday or bank holidays.

(4) Construction of Work No. 26 shall not take place other than between 0700 hours and 1900 hours Monday to Friday and 0700 hours and 1400 hours on Saturday, with no activity on Sunday or bank holidays.

62. There will be the need for lighting at certain HDD sites for 24 hour working. This will be concentrated on the working area with minimal light spill and disturbance outside of the working area. Approval will be sought prior to commencing any 24 hour works and residential receptors notified of the proposals. As per DCO approval will not be sought for 24 hour working at Work No. 21 or Work No. 26.

63. There may also be a requirement for artificial lighting on emergency works, which in any case will need to comply with the minimum requirements for safe work operations, the guidance and standards (Section 2) and mitigation measures avoiding or minimising the impacts on sensitive visual and ecological receptors.

64. At Primary CCS sites security will be 24 hour with lighting for the duration of the onshore construction works. At Secondary CCS sites security will be 24hr with limited lighting specific to compound offices and parking area and will required when the compound is in operation.

6 Mitigation

6.1 Background

65. The onshore construction works have been carefully designed to reduce the potential for significant impacts and to minimise impacts on the environment and include a series of embedded mitigation measures. These have been adopted as part of the project design to avoid or minimise potential impacts from artificial lighting, relating to construction, on the sensitive receptors are summarised in Table 6-1.

Table 6-1 Embedded Mitigation Measures

Construction Mitigation Measures	Rationale
Onshore Cable Route	
No 24hr lighting except at CCSs and for specific work activities which have been agreed with the Local Planning Authority, which may include HDD or where night time road closures/working is required.	Minimise light pollution and disturbance to ecological receptors.
Careful routeing of the onshore cable route to avoid key areas of sensitivity (e.g. near Howes Farm, meadows near Martlesham Hall, Fynn Valley).	Avoidance of impact.
Where possible, night-time working during open trenching of watercourses would be minimised.	Minimise Impact on otters.
Pre-construction surveys for protected species and Schedule 1 birds.	To ensure that mitigation is based on up to date survey data.
Where HDD is used to cross the Deben Estuary and Martlesham Creek mitigation measures in the Ecological Mitigation Plan for the Deben Estuary Special Protection Area (SPA) non-breeding birds and Schedule 1 breeding birds will be applied.	Avoid significant disturbance to breeding and non-breeding birds.
Onshore Substation	
Careful siting of the onshore substation compound to the north of the existing Bramford substation to gain maximum benefit from the screening effect provided by existing woodland.	Minimise Impact.
Directional lighting or shields during Autumn (August to October).	Minimise Impacts on bats.
Pre-construction surveys for protected species and Schedule 1 birds.	To ensure mitigation is based on up to date survey data.
Substation to be constructed on lowered ground levels.	Minimise Impact.
Limited 24 hour lighting at substation compound site during particular construction activities (concrete pours, etc.).	Minimise Impact.

6.2 Measures to Prevent Light Pollution

68. In addition to the embedded mitigations, the following additional mitigation, presented in Table 6-1, will be implemented.

Table 6-2 Additional Mitigation Measures

Mitigation Measures	Rationale
Pre-construction	
Pre-construction bat activity surveys were undertaken in May 2016. However, it should be noted that survey works have an expiry of approximately 18-24 months. Therefore, if works on trees (removal/pruning/disturbance) are to take place 18-24 months after the current surveys, a re-survey should be undertaken in order to confirm that the status of the trees has not changed.	Minimise Impacts on bats.
A bat mitigation licence will need to be obtained from Natural England in order to avoid an offence under the Conservation of Habitats and Species Regulations 2010 (as amended) if any of the three trees identified as having bat roosts (TN70, TN123, TN128) are to be removed/pruned/disturbed by the works. Further details see EcoMP (EA1-CON-F-IBR-021237).	Minimise Impacts on bats
Construction	
There will be no 24 hour lighting along the onshore cable route except at CCSs and for specific activities locations agreed with the Local Planning Authority. There would however need to be 24 hour lighting at the onshore substation only for key construction activities, as agreed with the Local Planning Authority.(See Section 5)	Minimise Impact on sensitive receptors
At the substation, external lighting at night should be avoided as far as feasible, particularly during the months of higher bat activity (August – October). When lighting at night is required, it will comply with the Bat Conservation Trust (2014) recommendations on external lighting as agreed with Natural England. This would include provisions for directional lighting to be used at the onshore substation during 24hr working, in order to avoid lighting the flight path potentially used by the Little Blakenham Pit SSSI bats. This would illuminate the construction working area and avoid potential flight paths associated with boundary features.	Avoid Impacts on bats.
Where night time works are required lighting would be directional to avoid unnecessary lighting on woodland and water edge, so as not to disturb emerging or foraging badgers.	Avoid impact on badgers
As otters are largely nocturnal, mitigation measures during construction would focus on the restriction of night-time working (to avoid disturbance to roaming otters). Wherever possible, lighting close to watercourses would be minimised.	Avoid impact on otters.
Site lighting shall be positioned and directed to minimise nuisance to footpath users, residents, to minimise distractions to passing drivers on adjoining public highways and to minimise skyglow, so far as reasonably practicable. Temporary lighting will be selected and positioned in accordance with guidance and standards provided in Section 2.	Minimise Impact on visual receptors.
An exclusion area for specified activities detailed in the Schedule 1 Bird Ecological Mitigation Plan around the Marsh Harrier nest of between 100m and 400m radius, with that radius dependent on the stage of nesting activity that the Marsh Harrier has reached (nest building, eggs or chicks).	Avoid impact on Schedule 1 breeding birds
Where HDD is used to cross the Deben Estuary and Martlesham Creek, mitigation measures will be applied, with appropriate monitoring, to ensure that that artificial illumination of areas used by concentrations of Brent Goose and Avocet is kept below 1 lux.	Avoid impact on SPA non-breeding birds

6.3 Commitment

71. All lighting relating to the onshore construction works are temporary and will be removed as soon as possible on completion of the relevant element of works.

7 Monitoring

7.1 Monitoring

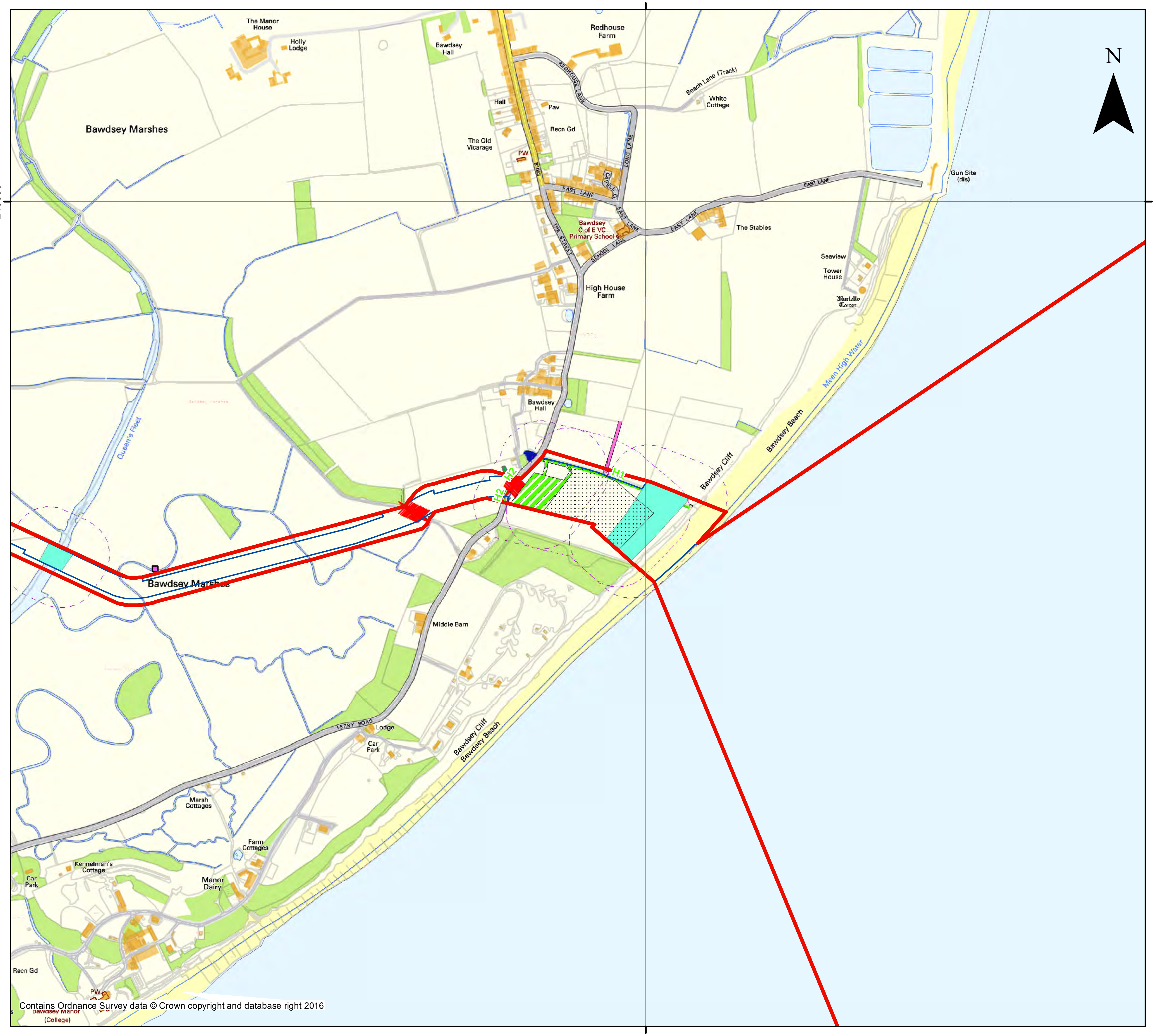
72. Regular inspections of lighting mitigation measures will be undertaken by the contractor's, construction management team, Environmental Clerk of Works (EnCoW) and ecological specialists where required, to ensure effective implementation and report any non-compliances. If non-conformity with any control and mitigation measures is identified, it will be recorded and appropriate remedial action will be implemented.

73. The frequency and the location inspections will be determined by the Environmental Clerk of Works (EnCoW) and will be included in the Project Environmental Management Plan (prepared by EAOL) and the Construction Environmental Management Plan (preperatred by contractors). Any complaint regarding lighting on the site will be directed to the EnCoW. The EnCoW will investigate the complaint and provide a response within 24 hours. This may include investigation of alternatives, such as the use of lower wattage lighting, or re-direction of lighting or re-positioning shielding.

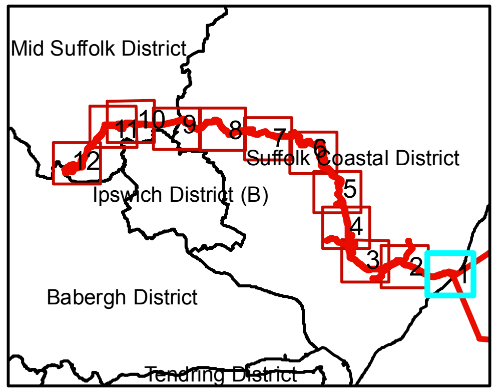
7.2 Reporting

74. The effectiveness of lighting controls will be reported in the Site Inspection and Audit Reports .Inspections undertaken by the ecological specialists, where required and will be reported to the EnCoW.

Appendix 1 Temporary Construction Lighting Figures



SCOTTISHPOWER RENEWABLES



Legend

- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- GCN Ponds (Pre Construction survey 2015)
- Proposed GCN Compensation habitat (2016)
- Surveyed Hedge Important for Bats
- Otter Couch and Layup Areas

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Protective Fencing
- Tree Felling
- Group Tree Replanting Area

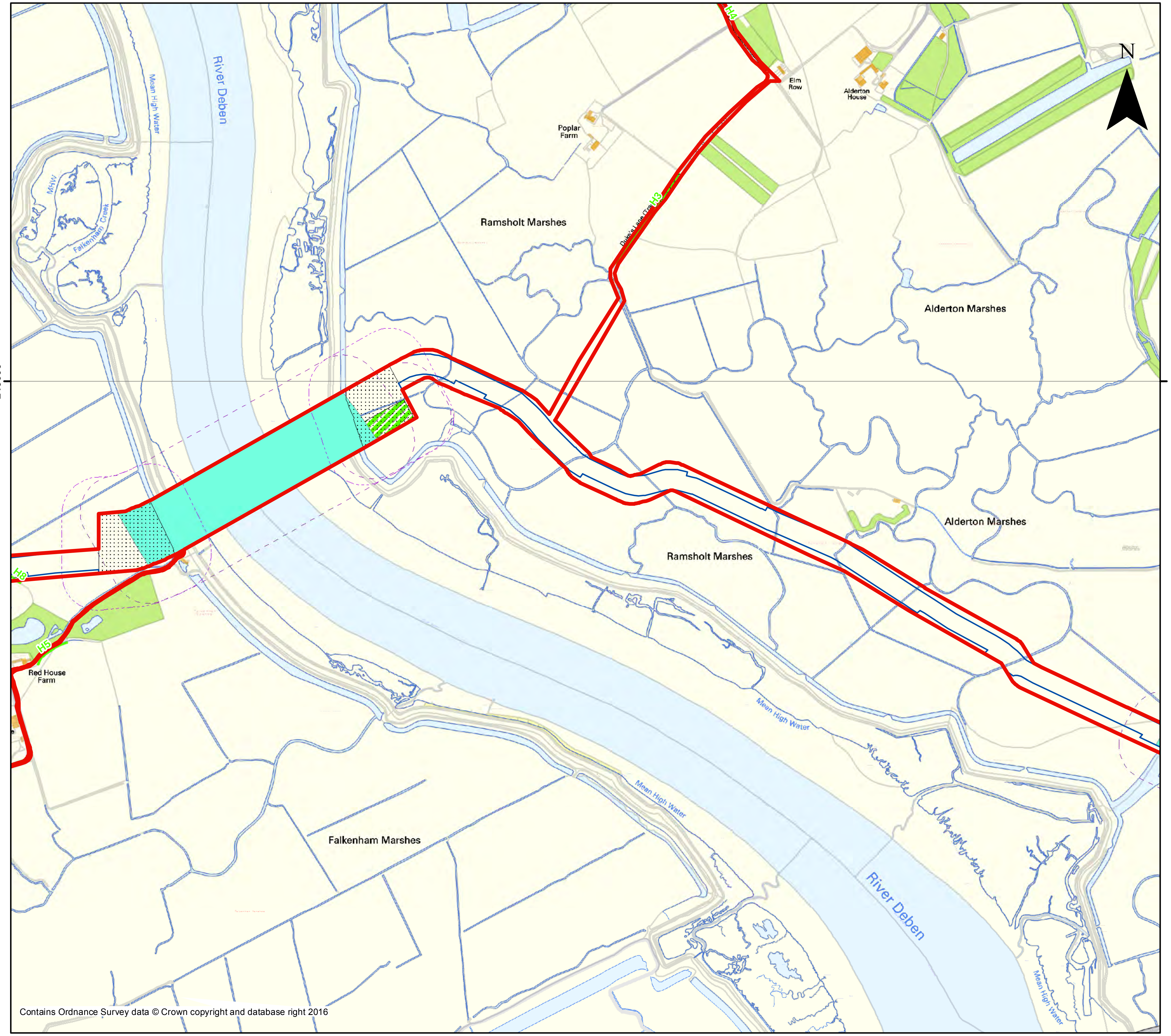
1:10,000
SCALE @ A3
0 150 300
Meters

DATE: 30/08/2016 EA1-CON-F-GBE-008548

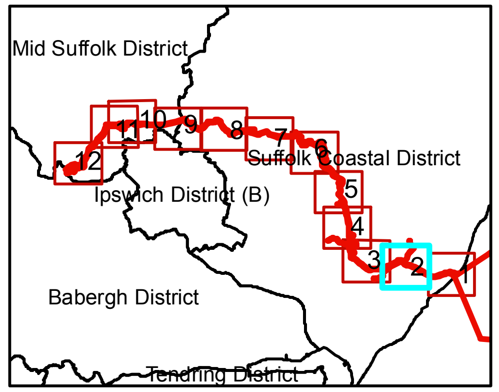
FIGURE 1.1: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA
Engineering & Construction



SCOTTISHPOWER RENEWABLES



Legend

- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Existing Hedgerow
- Tree Protective Fencing

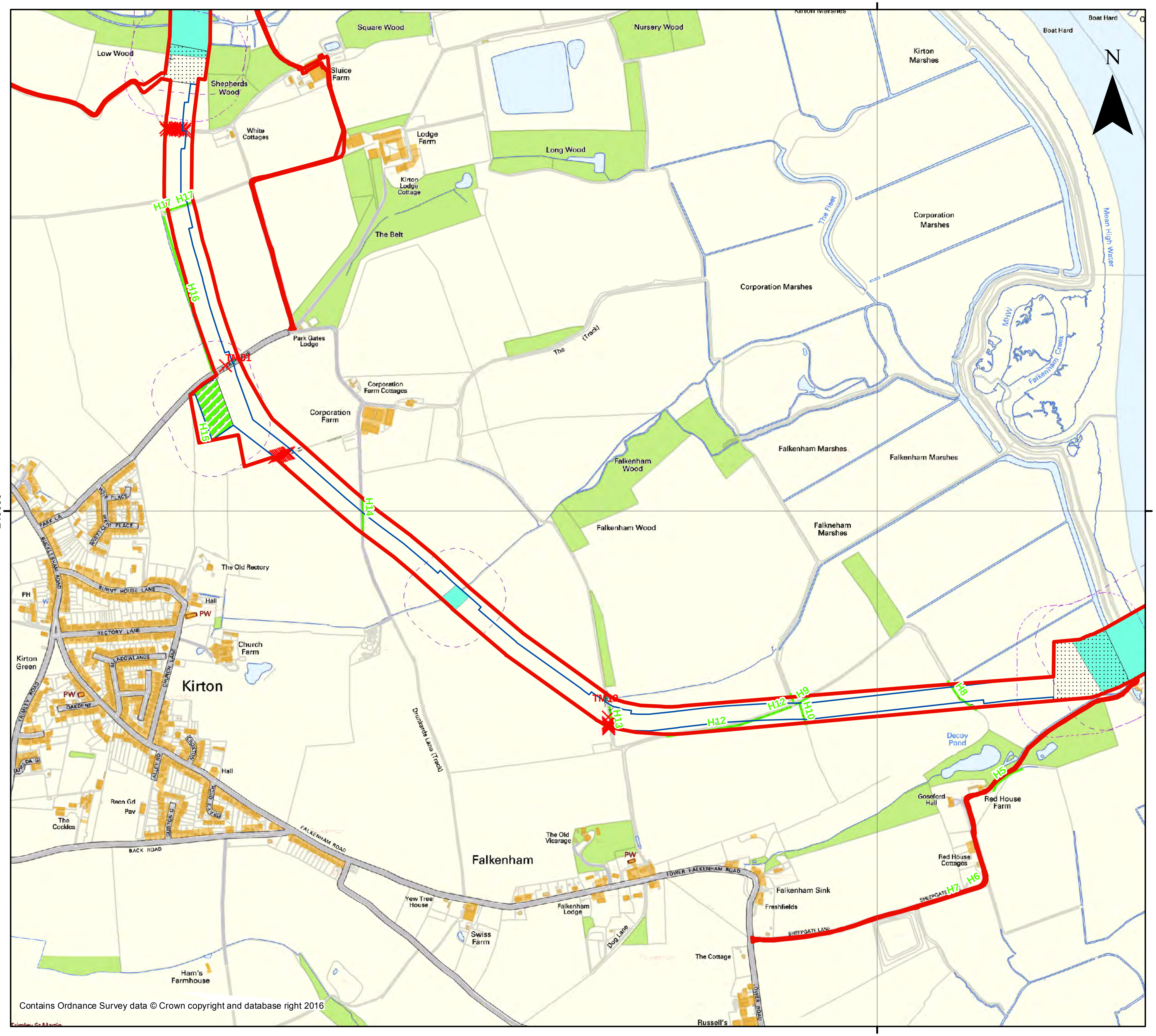
1:10,000
SCALE @ A3
0 150 300
Meters

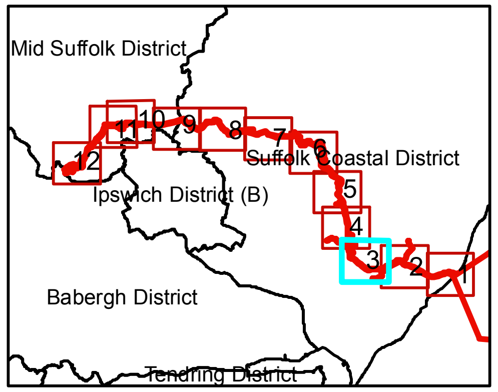
DATE: 30/08/2016 EA1-CON-F-GBE-008548

FIGURE 1.2: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction





Legend

- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA
- Group Tree Replanting Area

1:10,000
SCALE @ A3
0 150 300
Meters

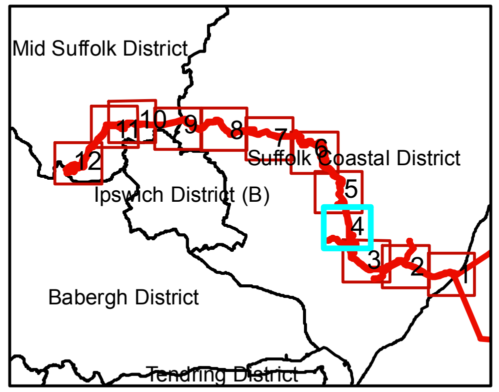
DATE: 30/08/2016 EA1-CON-F-GBE-008548

FIGURE 1.3: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction

SCOTTISHPOWER RENEWABLES



Legend

Trees with potential Bat Features (Category 1 to 3 from updated 2015-2016 surveys data)

- Category 1
- Category 2
- Category 3
- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- Surveyed Hedge Important for Bats
- Otter Couch and Layup Areas

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA

1:10,000
SCALE @ A3
0 150 300
Meters

DATE: 30/08/2016 EA1-CON-F-GBE-008548

FIGURE 1.4: Temporary Construction Lighting

Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction

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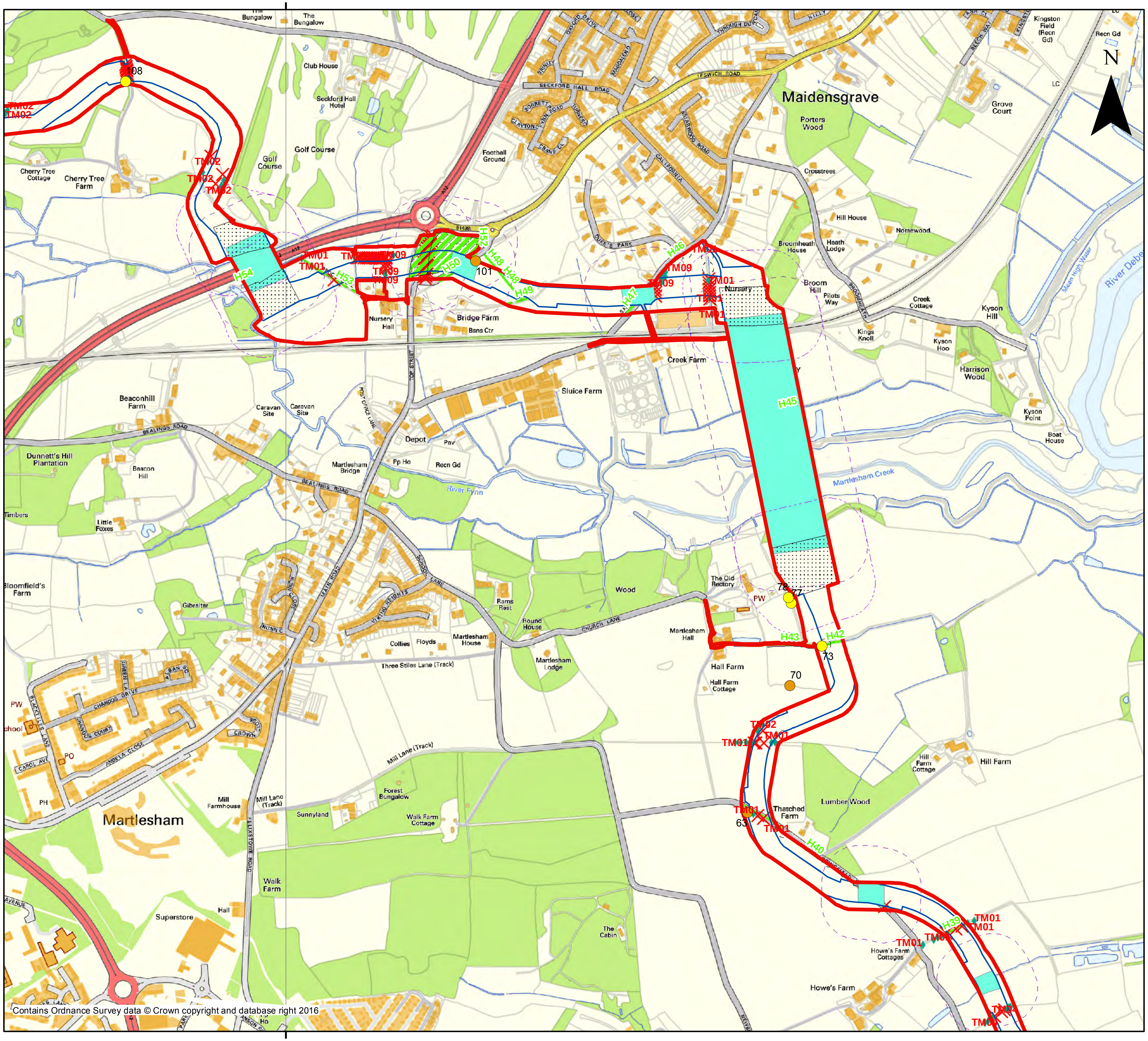
DATE: 30/08/2016 EA1-CON-F-GBE-008548

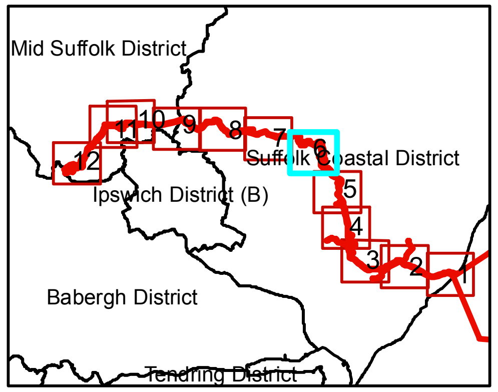
FIGURE 1.5: Temporary Construction Lighting

Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction





SCOTTISHPOWER RENEWABLES

Legend

Trees with potential Bat Features (Category 1 to 3 from updated 2015-2016 surveys data)

- Category 1
- Category 2
- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- Surveyed Hedge Important for Bats
- Otter Couch and Layup Areas

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA
- Group Tree Replanting Area

1:10,000
SCALE @ A3
0 135 270
Meters

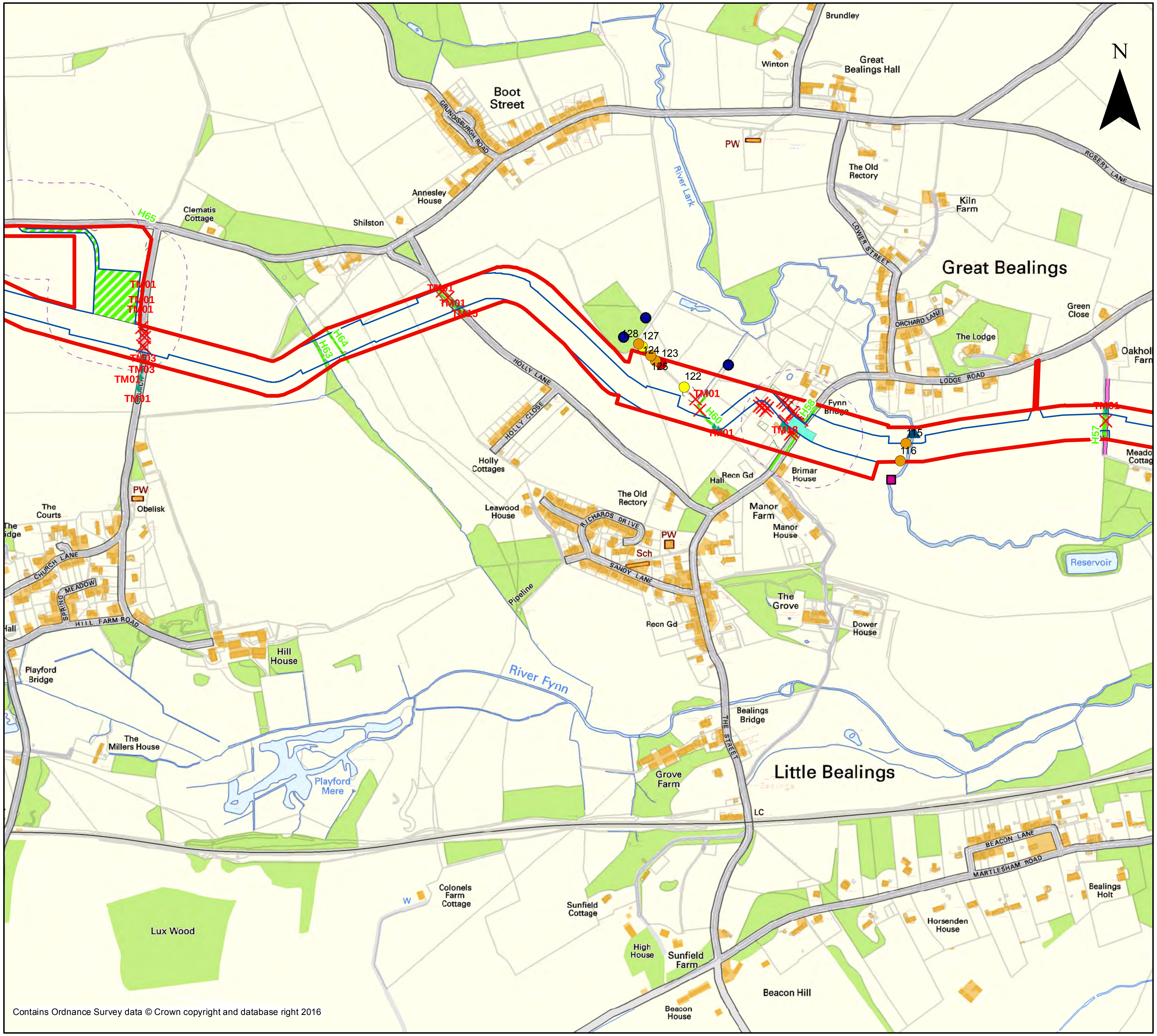
DATE: 30/08/2016 EA1-CON-F-GBE-008548

FIGURE 1.6: Temporary Construction Lighting

Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction



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SCOTTISHPOWER RENEWABLES

Legend

Trees with potential Bat Features (Category 1 to 3 from updated 2015-2016 surveys data)
- Category 1
- Category 2
- Category 3
- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- Surveyed Hedge Important for Bats
- Otter holts
- Otter proposed artificial holt
- Potential mitigation locations Batbox

Tree and Hedgerow Mitigation
- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA
- Group Tree Replanting Area

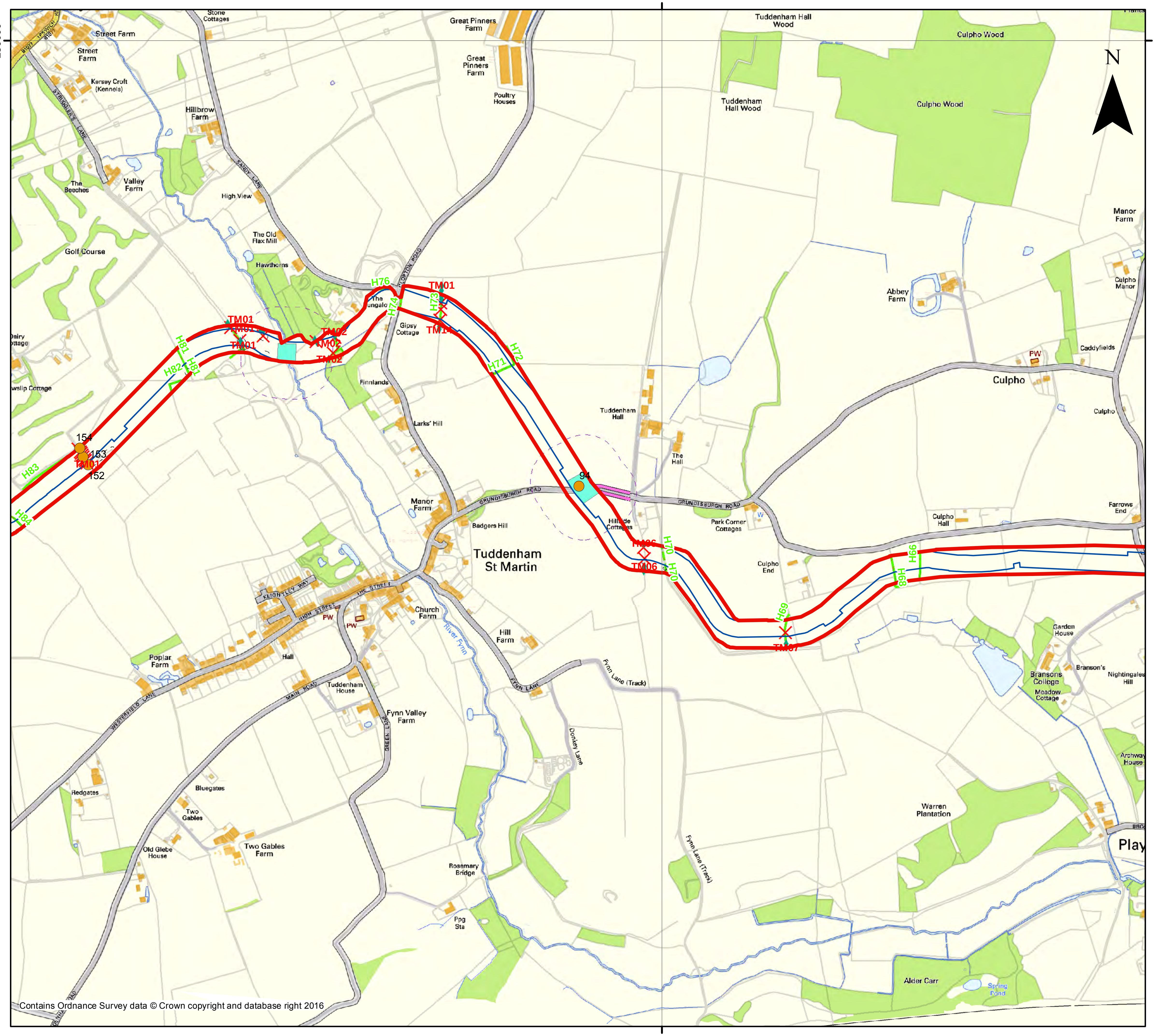
1:10,000
SCALE @ A3
0 105 210 Meters

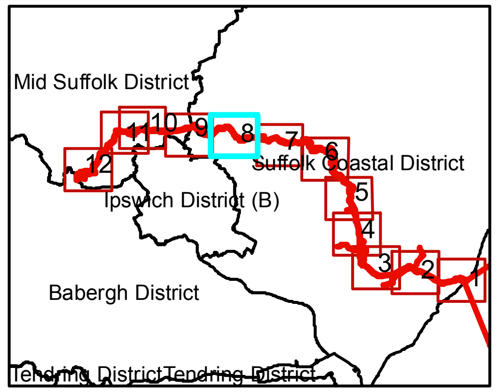
DATE: 30/08/2016 EA1-CON-F-GBE-008548

FIGURE 1.7: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction





Legend

Trees with potential Bat Features (Category 1 to 3 from updated 2015-2016 surveys data)
- Category 2
- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Zones
- HDD 100m buffer
- Buildings (OS Maps)
- Surveyed Hedge Important for Bats

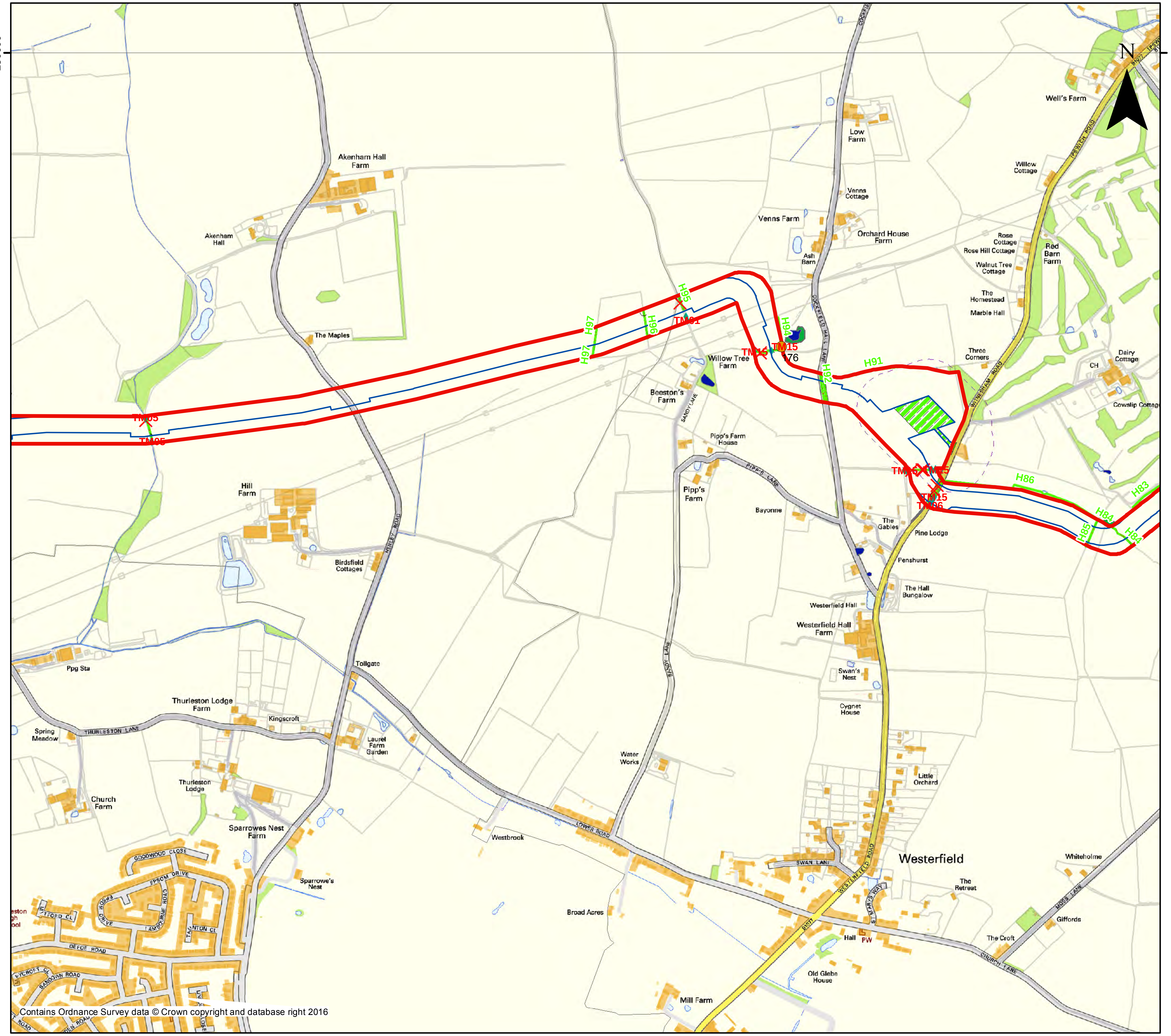
Tree and Hedgerow Mitigation
- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA

1:10,000
SCALE @ A3
0 150 300 Meters

DATE: 30/08/2016 EA1-CON-F-GBE-008548

FIGURE 1.8: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm



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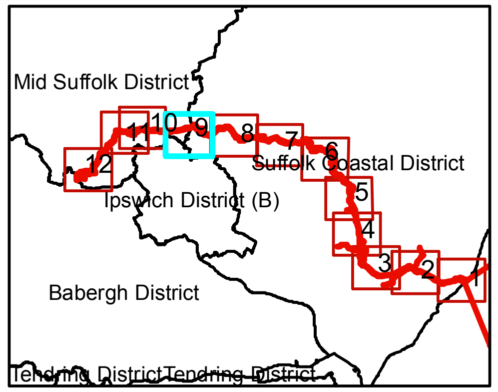


Legend

Trees with potential Bat Features (Category 1 to 3 from updated 2015-2016 surveys data)
- Category 2
- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- GCN Ponds (Pre Construction survey 2015)
- Proposed GCN Compensation habitat (2016)

Tree and Hedgerow Mitigation
- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA

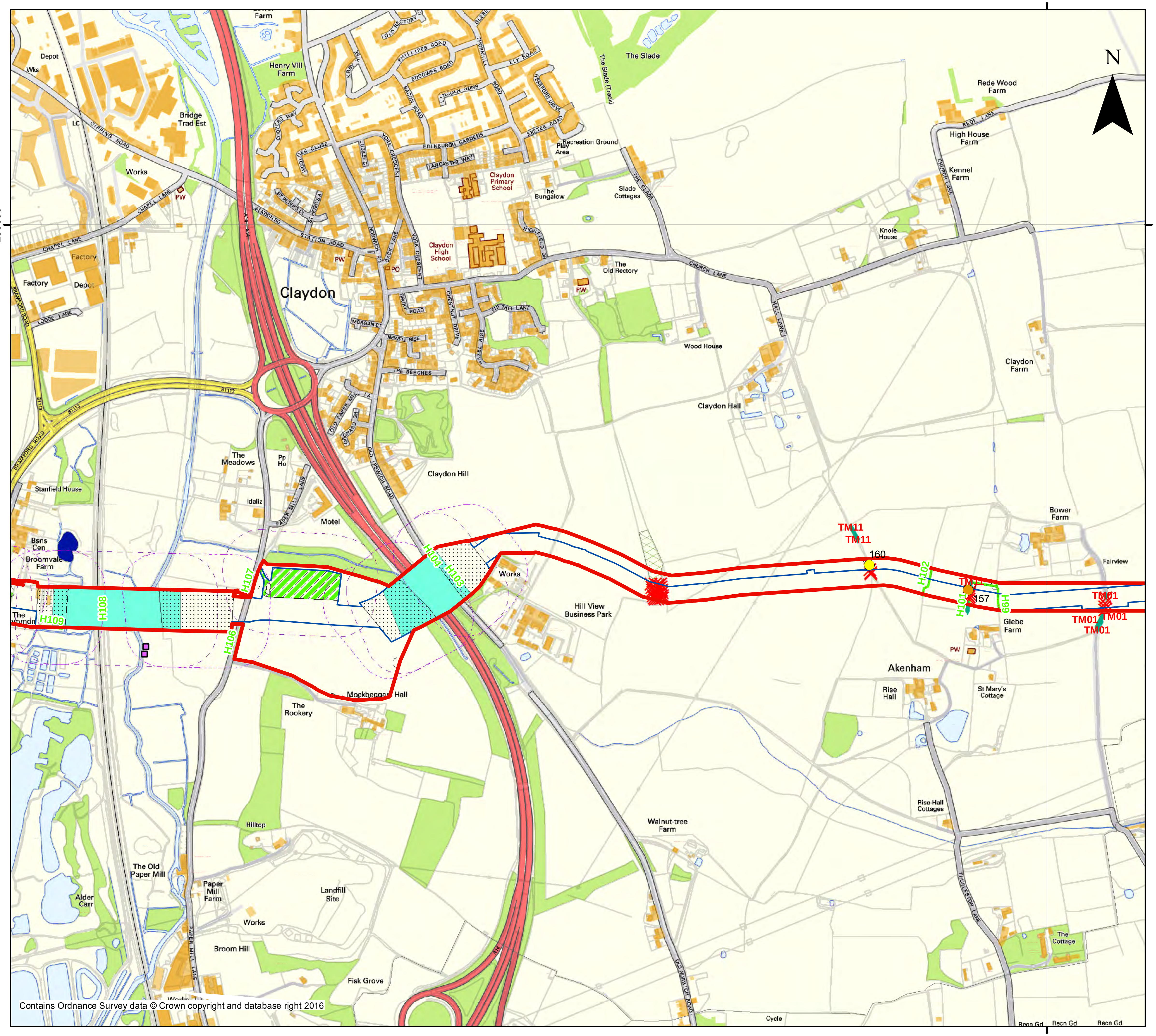
1:10,000
SCALE @ A3
0 150 300
Meters

DATE: 30/08/2016 EA1-CON-F-GBE-008548

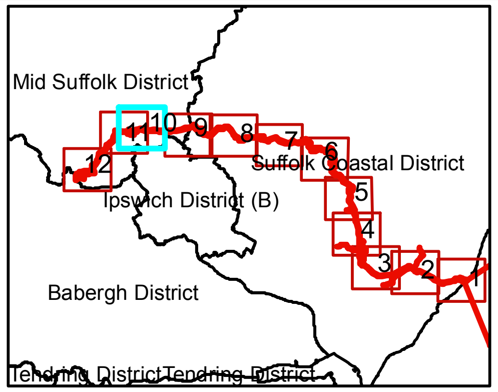
FIGURE 1.9: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA
Engineering & Construction



SCOTTISHPOWER RENEWABLES



Legend

Trees with potential Bat Features (Category 1 to 3 from updated 2015-2016 surveys data)

- Category 1
- Category 2
- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- GCN Ponds (Pre Construction survey 2015)
- Otter Couch and Layup Areas

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA
- Group Tree Replanting Area

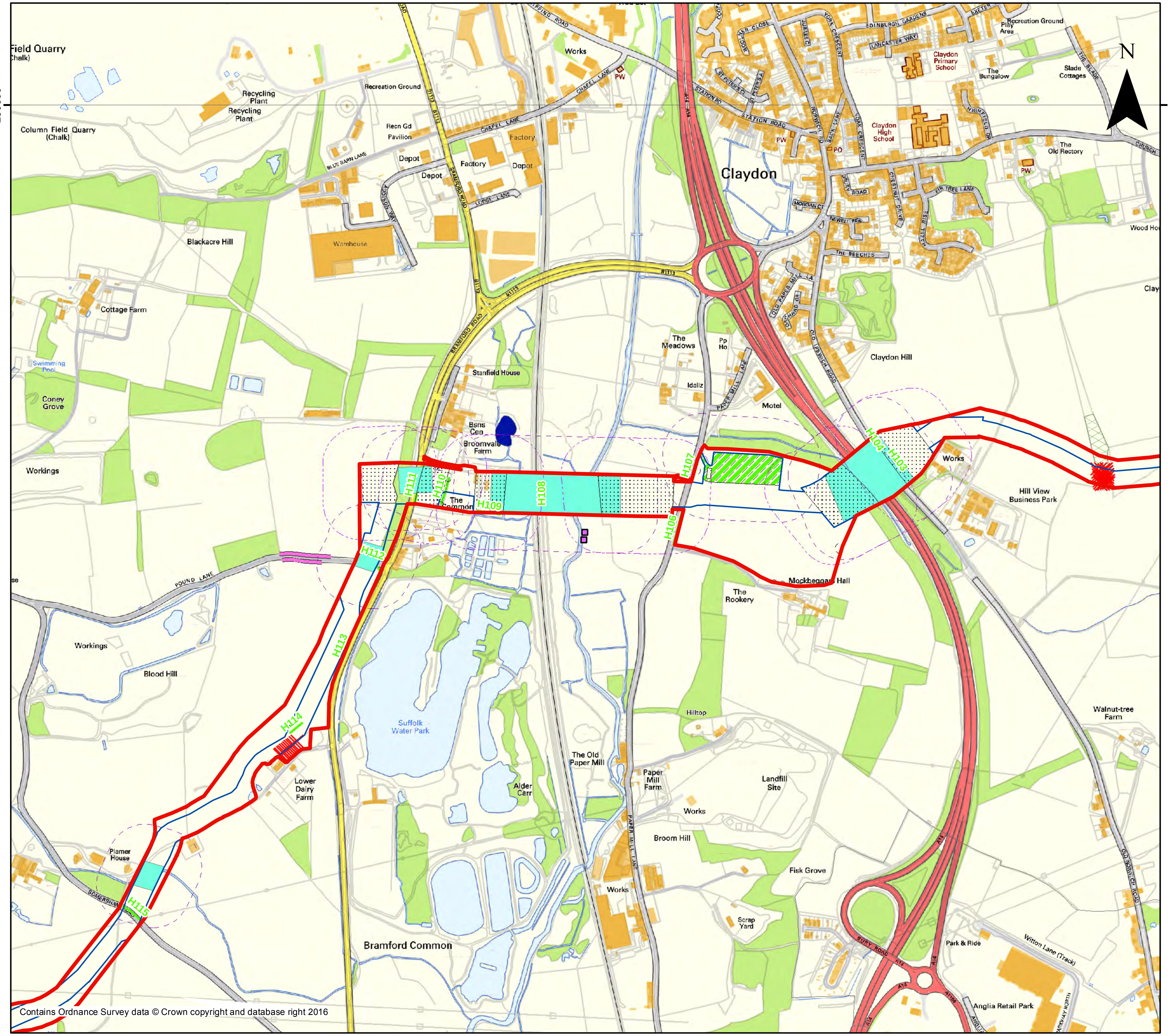
1:10,000
SCALE @ A3
0 150 300 Meters

DATE: 30/08/2016 EA1-CON-F-GBE-008548

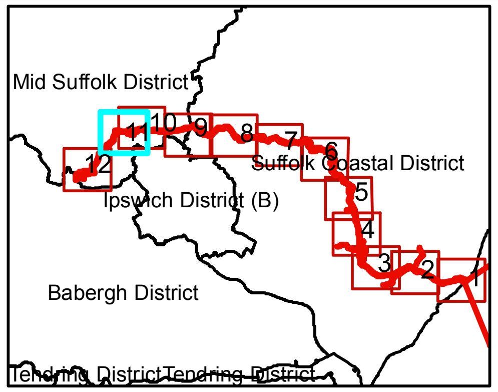
FIGURE 1.10: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction



SCOTTISHPOWER RENEWABLES



Legend

- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- Little Blakenham Pit SSSI
- GCN Ponds (Pre Construction survey 2015)
- Surveyed Hedge Important for Bats
- Otter Couch and Layup Areas

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Protective Fencing
- Tree Felling
- Group Tree Replanting Area

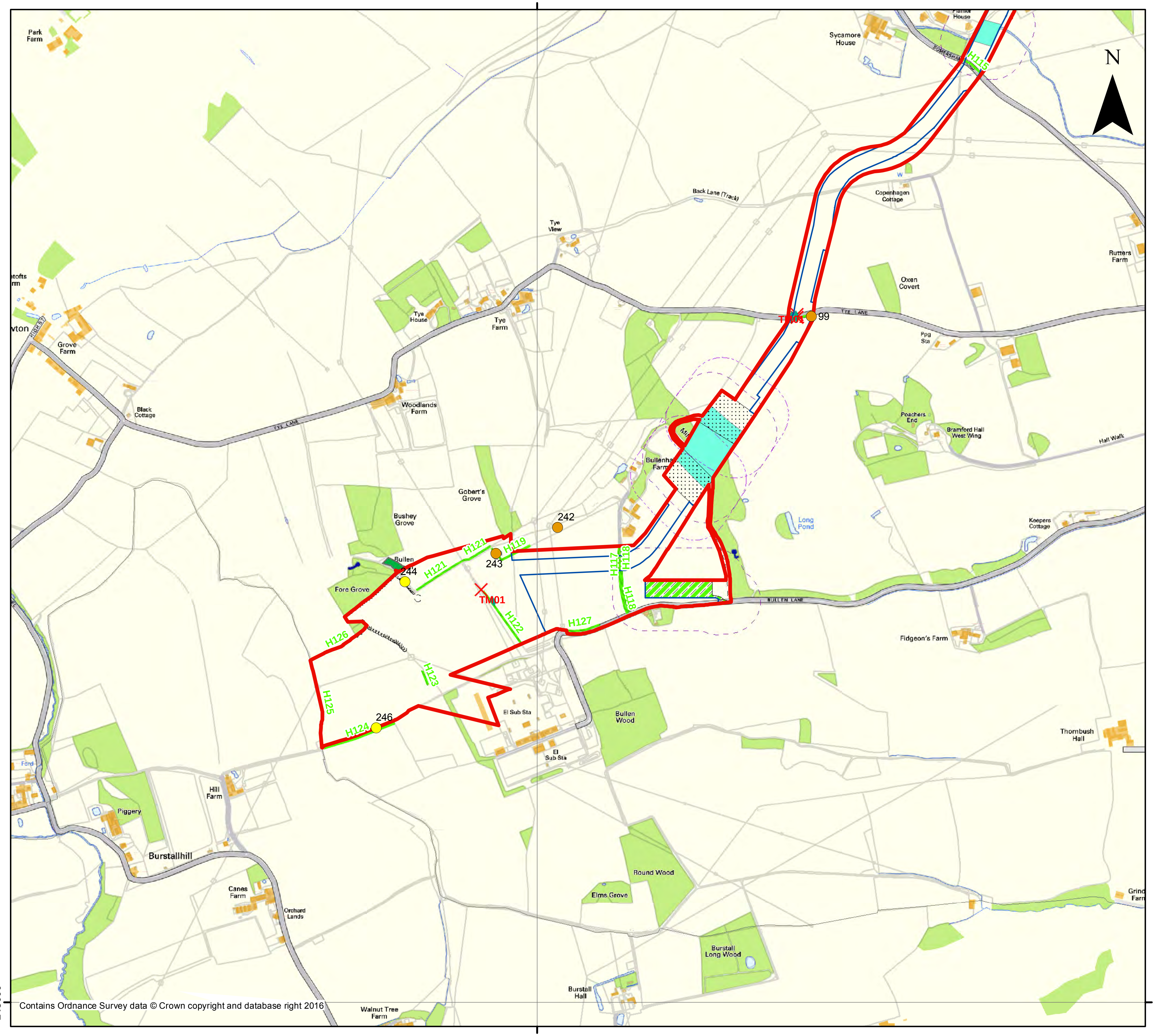
1:10,000
SCALE @ A3
0 150 300 Meters

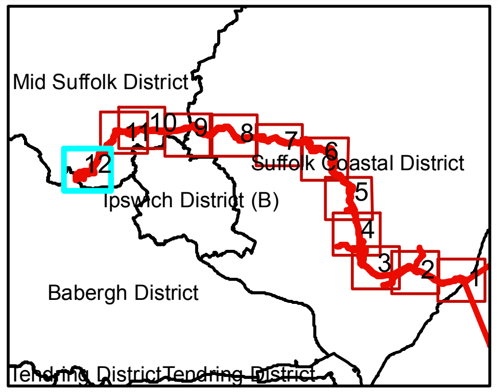
DATE: 30/08/2016 EA1-CON-F-GBE-008548

FIGURE 1.11: Temporary Construction Lighting
Construction Artificial Lighting Emissions Plan

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction





Legend

Trees with potential Bat Features (Category 1 to 3 from updated 2015-2016 surveys data)

- Category 1
- Category 2
- EA1 DCO Boundary
- EA1 Construction Corridor (BLB)
- EA1 HDD Compounds
- HDD Compound 100m buffer
- EA1 HDD Zones
- HDD 100m buffer
- EA1 CCS Areas
- CCS 100m buffer
- Buildings (OS Maps)
- GCN Ponds (Pre Construction survey 2015)
- Proposed GCN Compensation habitat (2016)

Tree and Hedgerow Mitigation

- Hedgerow Protection
- Hedgerow Felling
- Existing Hedgerow
- Tree Replanting
- Tree Protective Fencing
- Tree Felling
- Tree Replanting RPA

1:10,000
SCALE @ A3
0 150 300 Meters

DATE: 30/08/2016 EA1-CON-F-GBE-008548

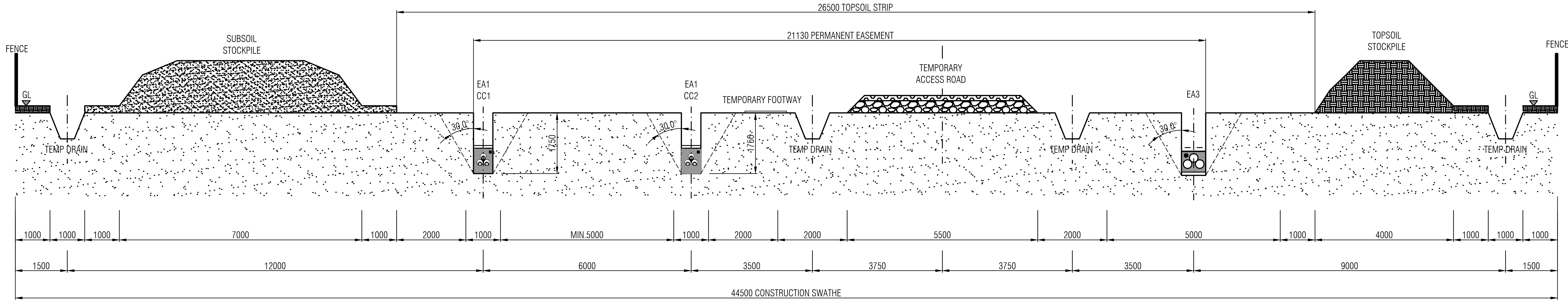
FIGURE 1.12: Temporary Construction Lighting

Construction Artificial Lighting Emissions Plan

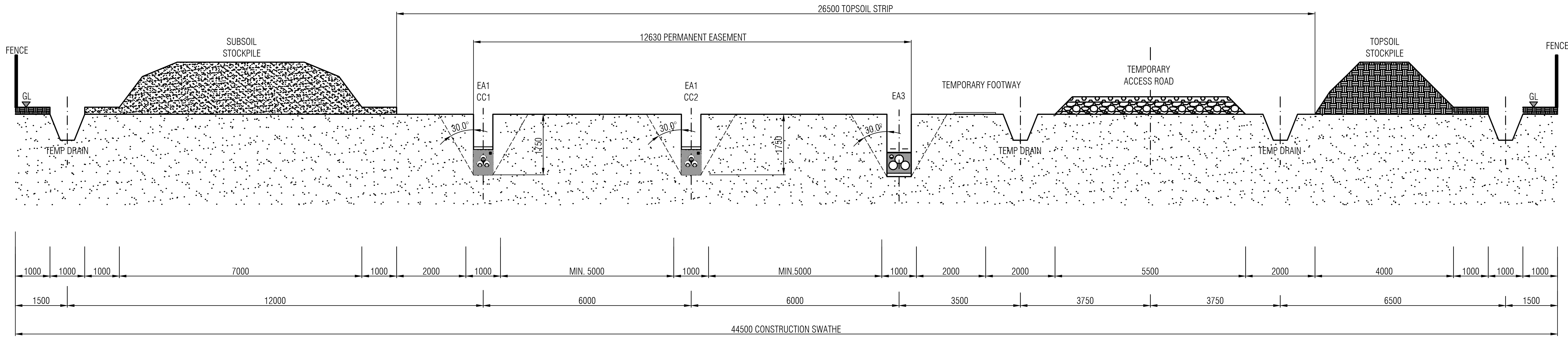
East Anglia ONE Offshore Windfarm

Appendix 2 Construction Swathe Indicative Cross Section

VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 1



VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 2



NOTES:
1- PASSING PLACES EACH 250 m.(FIG.1)
2- TURN ARROUND AREAS EACH 750m. (FIG.2)
3- "V" BUCKET MAY BE USED (SEE PHOTO)

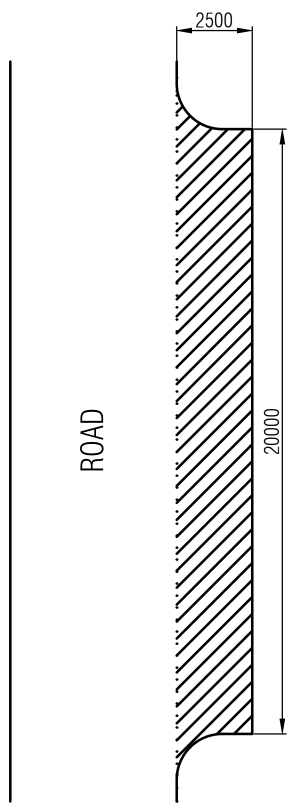


FIGURE 1

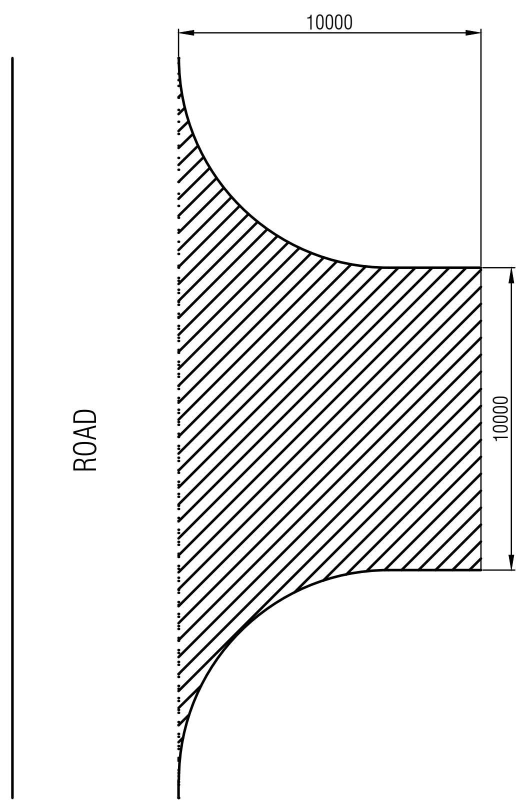


FIGURE 2

"V" BUCKET

Rev.	Date	Prepared	Reviewed	Approved	Reason / Description of changes.

IBERDROLA Engineering & Construction

Status Stamp:

Project: EAST ANGLIA

Location: BAWDSEY TO BRAMFORD

Contractor:

Status Stamp:

Drg. Title: CONSTRUCTION SWATHE TYPICAL CROSS SECTION

Client: SCOTTISHPOWER RENEWABLES

Date of First Issue: 15-07-2016

Prepared	Reviewed	Approved
IMFE	GRAT	FEDO

Drg. No.: EA1-GRD-E-IEC-007883

Sheet: 1 Rev: 0 Next: -

Contractors Drg. No. :

Scale: 1:100 Size: A2

Appendix 4 Site Waste Management Plan

East Anglia ONE
Offshore Windfarm

East Anglia ONE Offshore Windfarm

Site Waste Management Plan
Appendix 4 Code of Construction Practice
Final for Approval

SCOTTISHPOWER
RENEWABLES

www.scottishpowerrenewables.com

Table of Contents

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE). The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. This plan relates to the onshore construction works associated with EA ONE comprising:

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, each approx. 37km in length.
- Up to four cable ducts for future East Anglia THREE project.
- An onshore substation, located at Bramford, next to existing National Grid infrastructure.

1.2 Purpose and Scope

1. This Site Waste Management Plan (SWMP) sets outs the methods that will be used in reducing, controlling and managing waste, arising from the EA ONE onshore construction works. This document forms an appendix to the Code of Construction Practice (CoCP), and fulfils DCO Requirement 20 (2) (g) which states:

> ***20.***—*(2) The code of construction practice must include (...)*
> *(g) a site waste management plan*

2. For the purposes of this document, all the areas involved in the onshore construction works as list in Section 1.1 shall be considered the 'Site'.

3. The purpose of this document is to encourage the review of waste reduction and recovery practice levels, highlighting areas where Best Practice in waste minimisation and management can be achieved. The SWMP also facilitates the identification and implementation of waste minimisation measures at the design stage and reuse and recycling opportunities during on site operations ultimately reducing the quantities of waste sent to landfill.

4. This SWMP provides options for planning and processing waste during the construction and excavation activities. It also demonstrates that EAOL is committed to maximising opportunities for reuse and recycling that are cost neutral (or cost negative) and in diverting waste from landfill.

5. As this is a working version of the SWMP, it has been necessary to include areas within the document where information will continue to be added throughout the works, as the document remains live. As the work progresses, the online BRE SMARTWaste system (www.smartwaste.co.uk) will be used by all contractors for inputting waste data and maintaining records relevant to their activities, allowing EAOL to report and analyse this, providing the necessary information to identify trends and areas for improvement.

1.3 Background

6. Surplus or waste materials can arise from materials imported to the works or from those generated on site. Imported materials are those which are brought onto the site for temporary use (in enabling and construction activities) and also those brought in for inclusion into the permanent works. Generated materials are those which exist on the site such as subsoil arising from excavation works. However, there are other considerations to waste management, such as waste reduction; segregation of waste; disposal of waste; the financial impacts of waste disposal and the processes of recording, monitoring, training and reviewing the SWMP.

7. This SWMP outlines the procedures that will be implemented during the onshore construction works and demonstrates the benefit to the environment. It also details how the effects of these procedures have been measured and how they are sustainable. In order to optimise the sustainable management of waste, EAOL and its appointed Contractors will follow the Waste Hierarchy, as shown in Figure 1 below, with each level of the Hierarchy described then subsequently discussed in more detail:

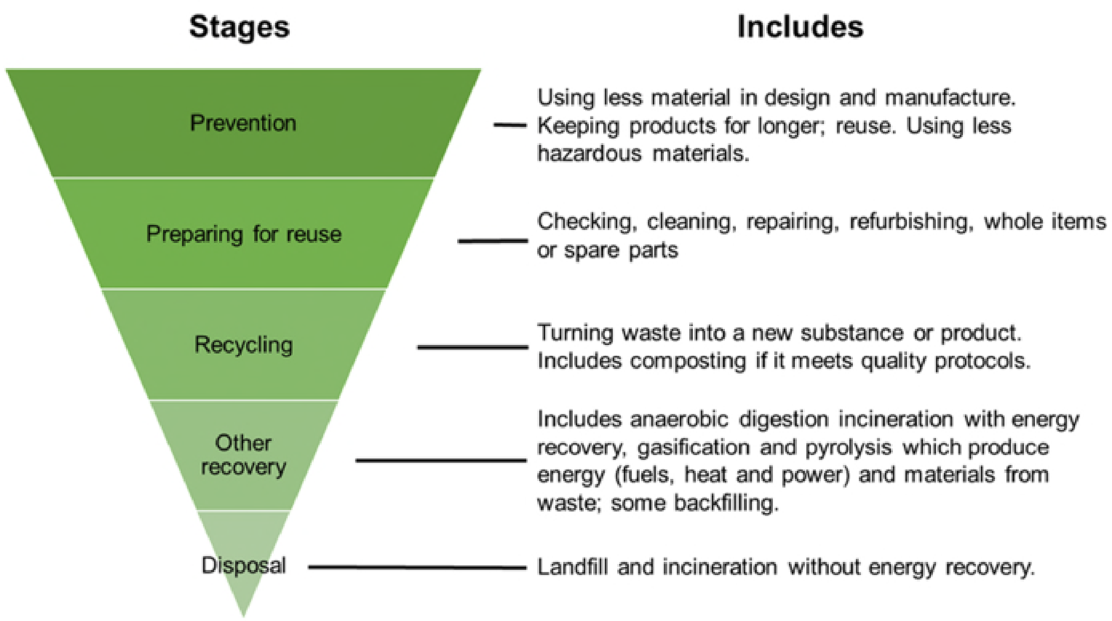


Figure 1: Waste Hierarchy

1.3.1 Waste prevention

8. Designers can greatly influence the waste produced on site and therefore they have been encouraged to consider the issue of waste in their design. For example, this has been achieved by:

- Reducing the need for temporary work;
- Setting the level of the construction to reduce excavations; and
- Reusing spoil to form landscaping features and for backfilling.

9. If waste is not produced on site, it will not need to be dealt with. Options that have been considered include:

- Ordering the correct materials, as specified;
- Ordering the correct quantity of materials from accurate take-offs;
- ‘Just in time’ delivery of materials to prevent risk of spoilage; and
- Storing and handling materials correctly.

10. Waste that will not be eliminated or reduced falls into one of the following four waste management categories.

1.3.2 Reuse

11. Surplus materials which will be used in the permanent works (e.g. materials derived from excavation works) will be classified as materials reused on site. If there are materials surplus to requirements from the site, but are still to be used in their present form, they will be classified as materials which can also be reused off site. All materials subject to any reuse will be managed via one or more of the following available mechanisms;

- Environmental Permit;
- Environmental Permitting Regulations Exemption;
- Materials Management Plan;
- Non Directive Waste Exemption; or
- Waste and Resource Action Plan (WRAP) Protocols, each depending on the applicable reuse scenario.

12. If waste materials are to be exported off site for reuse, they will be subject to inspection (and testing if appropriate) to ensure that they are suitable for the intended use and will again require to be managed within one of the above mechanisms.

1.3.3 Recycling

13. Surplus materials which will not be reused in their present form, but may be used on site in a different form, will then be classified as recycled on site (provided they have been processed on site). Materials which are not reused on site in any form will be classified as recycled off site, e.g. non-returnable pallets reprocessed off site to make chipboard.

1.3.4 Recovery

14. Surplus materials which will not be reused in their present form or used on site in a different form, but will instead require to be diverted from landfill, will be classified as materials which will be recovered. Recovery mainly refers to energy recovery (e.g. reuse as fuel) or biological recovery (e.g. composting).

1.3.5 Disposed of at Landfill

15. If none of the above can be satisfied, then the only remaining option left will be to send the waste to landfill. It will, however, be the objective of EAOL to minimise the quantities of any waste, arising from the construction works, ending up in landfill.

2 Regulatory Framework

16. The following list provides a brief description of the main European and National legislation and other relevant reference documentation on waste management in the UK (relevant to England).

- **Waste (England and Wales) Regulations 2011:** Updates some aspects of previous legislative requirements for waste and implements the Waste Framework Directive. Includes requirements on the use of waste transfer notes and Duty of Care requirements.
- **The Site Waste Management Plans Regulations 2008 (England):** As of the 1st December 2013, the SWMP Regulations have been revoked, however, East Anglia ONE will continue to use waste management criteria which use these regulations as a basis.
- **The Environmental Permitting (England and Wales) (Amendment) Regulations 2015:** Aims to protect the environment while simplifying the regulatory system, and minimising the administrative burden on the regulators and the operators of the facilities regulated under the regime. Several Exemptions are listed within the Regulations with regard to waste treatment, use and disposal.
- **Landfill Directive: (EC) Directive 1999/31** Aims to improve standards of waste to landfill across Europe, by setting specific requirements for the design, operation and aftercare of landfills, and for the types of waste that can be accepted at landfill sites.
- **Hazardous Waste Regulations 2005 (as amended):** Sets out the criteria under which hazardous waste is being produced and removed from premises.
- **Waste Framework Directive:** (2008/98/EC), Establishes a framework for the management of waste across the EU and aims to encourage reuse and recycling of waste. It also aims to define certain terms such as 'waste', 'recovery' and 'disposal'.
- **Contaminated Land: Applications in Real Environments (CL:AIRE) Definition of Waste: Development Industry Code of Practice:** Sets out good practice in dealing with excavated materials and their reuse, without the requirement for an Environmental Permit.
- **ICE Demolition Protocol:** Describes the overarching implementation approaches for Materials Resource Efficiency (MRE) associated with demolition activities.
- **Planning Policy Statement 10 (PPS10):** Planning for Sustainable Waste Management (July 2005, revised 2011): Establishes decision making principles to which regional planning bodies and all planning authorities should adhere when preparing planning strategies.

3 Roles and Responsibilities

17. EAOL and their appointed contractors will be responsible for adopting, implementing and updating the SWMP throughout the construction works, to meet the following key objectives:

- **Environmental Protection:** The SWMPs help to manage and reduce the amount of waste produced, and therefore to be disposed of at landfill. Additional environmental benefits include: less harm to the local environment, avoidance of fly tipping, reduced energy consumption and greater opportunities for reusing and recycling materials.

- **Cost Saving:** Managing materials more efficiently will immediately cut costs. Better storage and handling of materials will reduce waste and enable better recovery. Reusing and recycling materials cuts disposal costs.

- **Legal Requirements:** Compliance with the SWMP will ensure compliance with relevant waste legislation, including all Duty of Care obligations. The Duty of Care also requires all parties (operator, contractor, sub-contractors, waste management companies etc.) to ensure that waste is only transported and received by those licenced to do so. In addition, the written record of all waste movements will be retained for 2 years (where non-hazardous) and 3 years (where waste is hazardous). The Duty of Care obligations also extend to ensuring that waste is stored and contained appropriately at all times.

3.1 Specific Responsibilities

18. The key roles and associated responsibilities for delivery of this SWMP are summarised below. These roles and responsibilities have been based on those required by the Site Waste Management Plans Regulations 2008 (England), which although revoked, as of the 1st December 2013, EAOL will continue to use waste management criteria and use these regulations as a basis for delivering the waste management.

19. The EA ONE Designers shall:

- Apply the WRAP 'Designing out Waste' process. This will help them identify, prioritise and implement ways of meeting the onshore construction works targets for waste reduction.
- Identify methods to reduce total waste and waste sent to landfill.
- Identify opportunities to increase the reused and recycled content (where there will not be a significant impact on cost or performance).
- Work with the onshore construction works team to ensure design actions to reduce construction waste and increase reused / recycled content are implemented.
- Support the development / implementation of the SWMP from an early design stage, including waste forecasts and data on reduction targets and actions.
- Provide the Client with a full Design Decision Record.

20. The Designers will refine and implement these responsibilities throughout the duration of the works. Designers will refer to the WRAP guidance on Designing out Waste.

21. EAOL will:

- Ensure that the waste is managed, with regard to their Duty of Care obligations.
- Ensure that the SWMP is implemented and updated, to include all contractor responsible waste information.
- Provide necessary direction to their appointed contractors e.g. setting contractual obligations on waste handling.
- Review, revise and refine the SWMP as necessary, in liaison with the appointed contractors.

22. This will provide a simple and effective system for specifying waste management, waste auditing and waste monitoring across the onshore construction works, and between contractors and sub-contractors. The SWMP provides a consistent approach to waste management, reuse, recycling and disposal.

23. Contractors appointed by EAOL shall work in accordance with the requirements of this SWMP to:

- Ensure their waste is managed, to comply with their Duty of Care obligations, and that the volumes and type of waste material used remain consistent with the applicable Permit / Exemption / Material Management Plan (MMP) in place.
- Ensure all procedures within this SWMP document are followed.
- Demonstrate they are suitably qualified and experienced in waste management and associated environmental issues, and that the waste management responsibilities, contained within the terms of their contract, are fully understood.
- Ensure that all legal and contractual requirements relating to the SWMP and the environment, are met by implementing adequate and realistic plans/procedures and by obtaining relevant licences/permits and certificates.
- Ensure that waste is classified correctly (including arranging sampling and analysis, where required).
- Ensure that any unexpected contamination found in the ground, during excavation, is managed in a way that does not cause an unnecessary degree of risk to environment.
- Assist with required inputs, providing forecasts of waste streams produced through their activities when requested.
- Measure and routinely report onshore construction works waste generated and waste to landfill, measured in tonnes/m^3.
- Ensure the written record of waste movements is retained for 2 years (where non-hazardous) and 3 years (where waste is hazardous).
- Maintain all records relevant to SMARTWaste online reporting platform.
- Regularly review SWMP and regularly input data into SMARTWaste online reporting platform to ensure that it accurately reflects the progress of the onshore works.
- Within three months of work being completed, confirm that the SWMP / SMARTWaste online reporting platform has been fully updated with all relevant records throughout the onshore construction works; compare the actual waste quantities against the earlier forecasted quantities of each waste type; and provide an explanation of any deviation from the plan.
- Record any lessons learnt that could be incorporated into future SWMPs.
- Contractors will implement these responsibilities, throughout the duration of the onshore construction works, and will include the requirements into their own respective SWMP.

24. All appointed contractors will refine and implement their responsibilities, throughout the onshore construction works.

25. Waste Management Companies retained shall:

- Provide a copy of their Waste Carrier's Licence before starting work.
- Provide permits or exemption notifications, authorising the use of mobile plant, i.e. crushing / screening plant, Waste Carriers Licence(s), Environmental Permit(s), Notification of Waste Exemption(s).
- Provide copies of all Waste Transfer Notes (WTNs) (for inert and non-hazardous waste); and all Hazardous Waste Consignment Notes (HWCNs), including Hazardous Waste Quarterly Returns..
- Identify ways to increase the recovery rate of materials by finding end destinations with high recovery rates.
- Advise on the most appropriate waste management actions.
- Provide details of the end-destination of all waste removed from site, including the following information: name and address of destination, type of facility, copies of Environmental Permit and recovery rate achieved for that material.

- Report on the different types of waste managed, and the split of each different type of waste, according to the appropriate waste management method (reuse, recycling, recovery, landfill and other) and, in the case of reuse, recycling and recovery, whether this has taken place on or off site.
- Submit relevant data quarterly, in the form of an Environment Agency Return from the waste transfer station.
- Use a systematic process to record and check waste, recovery and recycling data and this will be made available for inspection on request.

26. The Waste Management Companies appointed will refine and implement their responsibilities, throughout the onshore construction works.

4 Training

4.1 On-site training

27. EAOL and their contractors will provide suitable on-site instruction on the appropriate segregation, handling, recycling, reuse, and return methods which will be used by all parties, during all stages of the onshore construction works. The SWMP will also be outlined in the site induction process.

28. In addition to the site environmental inductions, targeted Toolbox talks will be carried out, which will inform contractors and sub-contractors as to how they should be involved with the waste, reuse and recycling requirements of their works. In a number of contracts they will retain full responsibility for the waste management and disposal and this will be reflected in the training and awareness provided.

29. Training and awareness on site waste management will be provided to all staff, including subcontractors. Training will include:

- Understanding the SWMP and SMARTWaste online reporting platform input.
- Roles & Responsibilities.
- Waste Procedures.
- Hazardous Waste.
- Duty of Care.
- Material Storage.

5 Waste Management Process

5.1 SWMP Implementation

30. The implementation and management of the SWMP will be secured as works progresses through the construction phases. These responsibilities are set out in more detail below.

5.1.1 Preparation Stage

31. EAOL is responsible for preparing the SWMP, with the outline and structure being submitted and signed-off internally and by other stakeholders, as appropriate. This Plan will then continue to be populated and updated, as relevant information becomes available.

5.1.2 Detailed Design Stage and Pre-construction Stage

32. At detailed design stage, the SWMP will be further updated with relevant updated and refined waste information. As required, the following stakeholders will also provide information to further inform the SWMP:

- Project Design Coordinator; and
- Project Quantity Surveyor.

5.1.3 Construction and Excavation Stages

33. By the commencement of the onshore construction works, the SWMP will be fully developed, then implemented, monitored and reviewed by the onshore construction and environmental team, including:

- Reviewing the SWMP and updating it as necessary.
- Ensure information contained within the SWMP and the SMARTWaste online reporting platform is consistent.
- Require routine information updating on waste to be input into the SMARTWaste online.
- Identify any further waste prevention actions.
- Make the SWMP accessible to all relevant contractors and subcontractors.
- Provide instruction and training as necessary.
- Carry out regular reviews of the SWMP and record findings.
- Within 3 months of the onshore works completion, carry out a final review and describe any lessons learnt from any differences between the predicted SWMP before EA ONE broke ground and actual SWMP performance.

5.2 SWMP Distribution

34. EAOL appointed contractors will provide information from their respective SWMP to fully inform and update this SWMP, prior to commencement of their works, with attention drawn to any suggested actions for waste prevention and reduction. The Project SWMP will be included in all contractor enquiries that are sent out for the onshore works.

5.3 Key Waste Streams

35. Key waste streams produced during the onshore construction works will include:

- Soils and stones.
- Stripped vegetation.
- Concrete and inert materials.
- Drill tailings and drilling muds recovered from Horizontal Direct Drilling (HDD) activities
- Cable wastes.

- Packaging.
- Wood.
- Plastics.
- Mixed metals.
- General Waste

36. Additional waste streams will be identified and included in the SWMP, as further contractors are brought on board and consideration of their activities and wastes are made

5.4 Waste Prevention, Reduction, Minimisation and Management Actions

37. The Waste Prevention, Reduction, Minimisation and Management Actions will be identified and recorded at different stages throughout the onshore construction works. EAOL appointed contractors will record and confirm any recommended actions, as they are identified. They will also be required to enter and record such information directly into the BRE SMARTWaste online reporting platform under EA ONE (here in referred to as SMARTWaste). Any decisions taken during the construction stage, used to eliminate certain wastes or to reduce waste to landfill, will also be entered.

38. To deliver effective waste minimisation, the following topics will be implemented as a waste minimisation strategy to support decisions taken to reduce waste and consider these actions as embedded into the SWMP:

- Arrange a Kick Off meeting, with individual contractors, to agree the best approach to waste minimisation for the different construction phases of the onshore works.
- Provide presentation material for the site induction, so that all staff are fully aware of the SWMP.
- Prepare and deliver a series of waste management toolbox talks, to further raise the awareness of all contractors working on site.
- Implement colour code of skips required on site to identify segregated waste streams, using the National Colour Coding Scheme.

39. The key elements of waste management to be implemented by all contractors are:

- A person responsible for producing, implementing and maintaining the Project and individual contractor SWMPs will be identified. This person will also be responsible for ensuring compliance with Duty of Care regulations.
- Target recovery rates for key waste type, along with some formal measurement will be identified.
- All waste streams (for example, soils and stones, plastics and metals etc., to be produced during construction and excavation, will be considered for their potential for reuse (on or off site) or for recycling.
- The most significant opportunities to increase reuse and recycling rates (termed Waste Recovery Quick Wins) and the realistic recovery rates will be identified.
- Suitable waste management contractors will be identified and the appropriate licences, permits, Waste Transfer Notes (WTNs) and Hazardous Waste Consignment Notes (HWCNs) will be recorded and retained in the SMARTWaste data management system.
- Appropriate site practices, such as identifying how waste materials will be segregated and measures that will be used to raise site operatives' awareness of waste reduction, reuse and recycling (e.g. toolbox talks) will be implemented.
- The method for measuring and auditing construction and excavation waste will be set out.

40. The specific aspects for different construction stages and activities will include:

Logistics

- The development of a logistic plan at the early stages of the onshore construction works will ensure that consideration is given to material requirements throughout construction, enabling efficient management of the delivery and storage of materials to ensure that the most effective logistic methods are adopted.

- 'Just-in-time' delivery – to alleviate space constraints for storage and site congestion, wherever possible.

Materials Procurement

- Sustainable and higher than average recycled content products and materials will be considered.

Storage Facilities

- Skips and containers used for waste must be in good condition and suitable for use.
- The area to be used for waste storage shall be clearly signed and segregated.
- Clear signage shall be used to identify the contents of any waste container.
- Materials stored on site will be protected, by whatever means necessary, to prevent any deterioration or contamination prior to use.
- The waste storage facilities provided will be located on a suitable hard surface to prevent spillage and to prevent surface run-off discharging onto the surrounding ground.
- Any spilt or lost material will be immediately dealt with by the contractor to prevent seepage into the ground.
- The location and details of the proposed material handling and storage facilities to be installed will be agreed in advance for acceptance.

5.5 Forecast of Waste Generation

41. Waste forecasts will be developed as contractors are brought in and then their forecasts will be documented in the SMARTWaste system, allowing the construction team to make appropriate assumptions to enable realistically robust quantifications.

42. Waste forecasts will be broken down into likely waste stream, using the standard List of Waste Codes and the Work Package from which the waste arises.

43. In addition to the SWMP, in the wider management of the onshore construction works and its environmental impacts, a Materials Management Plan (MMP) will be developed for the onshore construction works, with reference to the CL:AIRE Definition of Waste: Development Industry Code of Practice. The MMP will focus on the quantification of the wastes generated from construction related excavation and its potential reuse throughout the construction works, with an aim to maximise the reuse and so have minimal export of any these materials as waste. The MMP will also include the import and potential later removal and disposal or reuse of materials, in particular all the stone used for the installation of surfacing for the various construction compounds and the temporary access and haul roads to be used along the onshore works.

5.6 Waste Carriers and Waste Management Facilities

44. The SMARTWaste online reporting platform will be used by all contractors involved in the onshore construction works and will include details of all companies who remove waste from site. This includes the identity of the waste carriers removing the waste, all licence numbers and a copy of the licence. It will also include details of the sites that the waste is taken to and whether the operators of those sites hold a permit under the Environmental Permitting (England and Wales) Regulations or are registered under those Regulations as a waste operation exempt from the need for such a permit, and copies of the permit / exemption.

45. Information will be entered into Table 6-1 and Table 6-2 as the onshore construction works progresses, and as and when the waste carriers and / or waste management facilities are identified. This information will be reflected in the relevant sections of SMARTWaste online reporting platform.

46. EAOL and their appointed contractors will identify and appoint appropriate waste carriers prior to the construction elements of the works commencing, ensuring first that they are fully licenced. These details will be added to Table 6-1 as and when available.

Table 6-1: Waste Carriers

Name	Contact Details	Date Checked with the Environment Agency	Registration Number	Expiry Date

52. EAOL and their appointed Contractors will identify and commit to utilising appropriate waste management facilities prior to the construction elements of their works commencing, ensuring first that they are fully licenced.

Table 6-2: Waste Management Facilities

Name	Type of facility	Date checked with Environment Agency	Permit number

6 Monitoring

6.1 Data Collection

57. The SMARTWaste online reporting platform will be maintained and act as the point of contact for all enquiries. Instructions will be given to contractors as to how to assess waste volumes or tonnage and how to upload data to SMARTWaste online reporting platform. A paper-based system for recording data will also be used, but data will be required to be uploaded to SMARTWaste online reporting platform on a monthly basis. Persons nominated as responsible for contractor waste management will also utilise the standardised coding system for their individual waste entries and for the associated Waste Transfer Notes (WTNs) codes and Hazardous Waste Consignment Notes (HWCNs) as appropriate. All WTNs and HWCNs will be kept as a hard-copy on site.

6.2 Records and Monitoring

58. All waste collected from site by the contractor's employed waste carrier(s) will be recorded and monitored in SMARTWaste online reporting platform. The waste carrier(s) will provide WTNs or HWCNs on collection of the waste and records of the quantities of waste recycled or sent to landfill. This procedure will be applied whether the waste has been segregated on site or sent off as general mixed waste. The preference is always to segregate waste, as this is generally a cheaper alternative to sending away untreated or unsegregated waste, which ultimately leads to a higher rate of recycling.

59. The waste management contractor will provide records of the quantities of each waste stream when general mixed waste is segregated at a waste transfer station, as opposed to on site. This will allow for the appropriate tracking of the quantities of individual waste streams produced by the onshore construction works.

60. Skips will be monitored to ensure that there is no contamination of any segregated waste streams. The type of surplus materials being produced will be regularly reviewed so that the site set-up can be changed to maximise reuse or recycling of waste.

61. Where appropriate, the beneficial use of recycled aggregates and won materials from on and off site will be monitored. The WRAP Quality Protocol will be used by contractors and sub-contractors to verify the suitability of the recycled aggregates for use. The Quality Protocol will also act as a benchmark to gauge the utilisation of materials on site.

62. SMARTWaste online reporting platform will be used to record the total waste removed from the onshore construction works. The SWMP will be reviewed monthly and updates provided to project management.

63. Office/Welfare waste will be sorted into one or more separate container(s), to allow for the on-site segregation of general waste and mixed recyclables.

Appendix 5 Construction Surface Water and Drainage Management Plan

East Anglia ONE
Offshore Windfarm

East Anglia ONE Offshore Windfarm

Construction Surface Water and Drainage Management Plan
DCO Requirements 16 and 20 (2)
Final for Approval

ID: EA1-CON-R-IBR-021238

Created by / date:	IEC / 02 Sep 2016
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REVISION CONTROL

Revision and Approvals					
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Appendices

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE). The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. In February 2015, EAOL secured a Contract for Difference (CfD) award to build a 714MW project and ScottishPower Renewables announced its role in leading East Anglia ONE towards construction. In April 2015, EAOL submitted a non-material change application to DECC to amend the consent from direct current (DC) technology to alternating current (AC). In March 2016 DECC authorised the proposed change application and issued a Corrections and Amendments Order.

3. This plan relates to the onshore construction works associated with EA ONE which, based on AC technology, with an installed capacity of 714MW and a transmission connection of 680MW, comprises:

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, each approx. 37km in length.
- Up to four cable ducts for future East Anglia THREE project.
- An onshore substation, located at Bramford, next to existing National Grid infrastructure.

1.2 Purpose and Scope

4. This Surface Water and Drainage Management Plan sets out the methods to be used for the collection, treatment and storage of surface, ground and foul water associated with the onshore construction works for EA ONE, including installation of the onshore cables route and the construction of the onshore substation (referred to as Work No 3B to 38 in the DCO). This document is prepared to fulfil DCO Requirement 16 (1), with respect to Stages a to i, which states:

> ***16*** *(1) No stage of the connection works shall be commenced until for that stage written details of the surface and (if any) foul water drainage system (including means of pollution control) have, after consultation with the relevant drainage authorities, Suffolk County Council and the Environment Agency, been submitted to and approved by the relevant planning authority.*

5. This document is also included as an appendix to the Code of Construction Practice (CoCP), to fulfil DCO Requirement 20 (2) (a), which states:

> ***20 -*** *(2) The code of construction practice shall include—*
> *(a) a surface water and drainage management plan;*

2 Existing Conditions and Constraints

2.1 Existing Site

6. The ground elevation along the 37km onshore cable corridor varies from approximately 56m to 0m AOD, with the gradient of the land generally sloping from the west to the east, falling from the Bramford Substation towards the coast. There are local variations in the gradient but this represents a typical gradient over the whole of the onshore works.

7. The majority of the onshore cable route is currently agricultural, undeveloped greenfield land, most of which is located in Flood Zone 1.There are however smaller sections in Flood Zone 2 and 3 where the cable route crosses the main rivers of the River Deben, Mill River, Martlesham Creek, River Lark, River Fynn, River Gripping and Somersham Watercourse. The onshore cable route also crosses numerous smaller ditches and watercourses and several marsh areas located between the landfall site and the River Deben.

8. At the landfall, there is an area of shingle beach to the eastern end of the onshore cable route where the export cables will come to shore, from the offshore substation.

2.2 Local Hydraulic Conditions

9. The construction of the onshore cable route will be affected by, and may also impact upon, the following water resources;

- Surface water; and
- Groundwater.

10. Surface watercourses and waterbodies provide important water resources, including potable and other supply, general amenity and aesthetic value. Pollution of any of these may result in prosecution and could result in ecological damage, loss of water supply, amenity value or recreational use.

11. Groundwater is an equally important source of potable and non-potable water and will be present at varying depth across the onshore cable route, but the degree of vulnerability of the groundwater regimes to pollution will also vary widely along the route and will be dependent on the aquifer and soil characteristics and depth of the water table.

12. All construction sites can produce contaminated water from a number of sources. Any water that is wholly or partially produced as a result of construction activity is considered as an effluent and must be treated accordingly before discharge, to prevent pollution of the environment.

13. The onshore cable route, the substation and access road are constructed across what is predominantly greenfield, agricultural land which drains through a series of open ditches to join other watercourses and eventually to main rivers along the route. The watercourses and ditches are influenced by local topography and land use, which will affect the runoff characteristics from a particular catchment.

2.3 Cable Route Crossings

14. In addition to main rivers and the ordinary watercourses, the onshore cable route will also cross a number of existing utilities, public highways and private access roads, public rights of way and bridleways. These crossings will all need to be maintained during construction, details of these crossings are provided in the Traffic Management Plan (EA1-CON-R-IBR-009583) provided under seperate cover. The details of the watercourse crossings required are provided in the Watercourse Crossing Method Statement, which forms a part of the Code of Construction Practice (EA1-CON-F-GBE-008547) provided under separate cover.

3 Construction Details

3.1 Enabling Works

15. The onshore construction works will commence with the enabling works, which includes the establishment of the construction compounds (herein referred to as Construction Consolidation Sites), fencing and securing the working width, the topsoil strip and the installation of a haul road.

16. The onshore construction works will be supported by the installation of nine Construction Consolidation Sites (CCSs) (referenced A to I), these are compounds which will be utilised to provide welfare, site staff accommodation, parking, and secure storage for materials, plant and equipment. The CCSs are categorised as either Primary or Secondary, depending on their intended uses. There are two Primary CCSs; CCS B will be a designated storage and delivery facility and the main administrative compound and CCS E will be a main storage and delivery facility, with designated office space. The remaining seven Secondary CCSs shall be used to access the internal haul road, storage and deliveries. The establishment of the CCS compounds will be one of the first construction activities undertaken.

17. During the construction of the substation, site establishment and laydown areas will be required, including temporary offices, welfare, car parking, materials and equipment storage. The area directly east of the substation will be used as the temporary works area (referred to as Work No 38 within the DCO). At the start of the works the onshore substation compound and temporary works will be temporarily fenced.

18. The linear nature of the onshore cable route site will require fencing to be installed to both sides along the working width, not only to delineate the route but also to prevent possible vandalism and theft which could lead to possible contamination incidents.

19. Topsoil shall be stripped from the haul road location, trench areas and subsoil storage areas and stored. Topsoil storage and management shall be compliant with the recommendations and requirements set out in the Cable Landscape Management Plan (EA1-CON-R-IBR-010129). Topsoil shall be stored to one side of the working width**,** in such a way that it is not mixed with any subsoil. Typically this would be stored as an earth bund of a maximum height of two metres, to avoid compaction from the weight of the soil. Storage time shall be kept to a minimum, to prevent the soil deteriorating in quality. Topsoil stripped from different fields shall be stored separately, as would soil from specific hedgerow banks or woodland strips.

20. A temporary haul road will be installed along the route between the CCS locations and access points onto the local roads. Temporary haul road construction typically involves the placement of suitable imported stone material on a geotextile, however others methods such as soil stabilisation may be used if considered appropriate. In some instances the temporary haul road may comprise temporary trackway rather than stone due to site specific constraints. Following the initial topsoil stripping the haul road will be installed for a width of 5.5m along a designated route. The temporary haul road shall be constructed working from the installed CCS locations in two direction away from the CCS and towards the adjacent CCS along the onshore cable route.

3.2 Onshore Cable Route

21. The onshore cable route comprises a 37km corridor, between the Suffolk coast at Bawdsey and the substation at Bramford, passing the northern side of Ipswich. The onshore cable works comprise the installation of electricity transmission cables and ducts between the landfall location at Bawdsey and the new substation station, which is adjacent to the existing substation at Bramford. The majority of the route will be constructed using open trenching methods, other than in certain locations where the cable route traverses a number of major transport networks and natural obstacles. To enable the installation of the cable under these features, specialist trenchless techniques will be employed, such as Horizontal Directional Drilling (HDD).

22. Construction activities will be undertaken within a temporarily fenced strip of land, referred to as the working width. The working width is determined by electrical and civil engineering considerations and allows for sufficient space between the cables trenches to prevent the cables overheating, plus space for the associated temporary construction works i.e. soil storage, drainage, haul road installation and work areas for personnel and machinery. In accordance with the DCO, the working width shall not exceed 55m, except at the HDD locations identified in DCO Requirement 10 (6), where the working width is permitted to be increased to allow for the installation and use of the specialist equipment to undertake the HDD.

23. There are two basic techniques to be used for the installation of the cable ducts during the construction of the onshore cable route. These are:

- **Open Cut techniques**; where a trench is excavated and the cable ducts laid in the trench before reinstatement, using the excavated material; and
- **Trenchless Technique**; typically HDD, where a pit is excavated to access the crossing and from which a drill is passed through the ground on one side of the obstacle to a receiving pit created on the opposite side. The bore is then gradually enlarged to receive the duct, which is the technique that will be used to pass under roads, main rivers and other sensitive sites.

24. For the open cut technique two trenches will be excavated for the EA ONE ducts and cables and an additional trench will be excavated in parallel for the cable ducts that will be installed to serve EA THREE in the future. An indicative cross section showing the open trench working width layout is included in Appendix 2. As the trench excavation progresses, subsoil will be removed to create the trenches to working depth for duct installation, the subsoil will be temporarily stored separately from the topsoil, and then reused to backfill the trenches.

25. Particular care will be taken when backfilling the trenches with the excavated material (subsoil) to reinstate it in the order in which it was excavated, again to minimise any disruption to the existing ground drainage pattern. The ducts will be installed in the trench, where they will be bedded on and then surrounded and topped by Cement Bound Sand (CBS) or equivalent which will gradually set and harden in situ as water is absorbed. Above this, the subsoil will then be used to reinstate the trench to the previous level.

26. Where, due to the existence of obstacles, it is not possible to install the cable ducts using the open trench method, trenchless installation techniques shall be used. The onshore cable route traverses a number of major transport networks and natural obstacles, to enable the installation of the cable across these features specialist techniques are required, namely the use of HDD. These key locations are referred to a 'Category 1' HDD sites as identified in Table 3-1.

27. These HDD sites will require additional equipment, storage and ancillary facilities to that required for the conventional open trench installation methods in order to accommodate the drilling activities. As such, a specialist HDD compound will be set up at each side of the HDD location to enable the specialist plant and materials to be delivered directly.

28. In addition to the above major features, a number of other features have been identified where the conventional open cut trenching technique are not appropriate. At these locations 'trenchless' methods will also to be implemented, which will comprise of a smaller HDD or auger bore. These sites are referred to as 'Category 2' HDD/trenchless. As the features to be crossed are less significant, they will not require any additional compounds and works will take place within the standard working width. Table 3-1 provides a list all the HDD / trenchless locations.

Table 3-1 HDD / Trenchless Locations

Reference	Category	Location/ Feature	Approximate Length (m)	Max Width (m)
HDD-01	Cat 1	Millers Wood off Bullen Lane	200	130
HDD-02	Cat 2	Somersham Watercourse	70	55
HDD-03	Cat 2	Pound Lane	60	55
HDD-04	Cat 1	River Gipping and Network Rail track west of A14	385	130
HDD-05	Cat 1	A14 Trunk Road and Old Ipswich Road	200	160
HDD-06	Cat 2	River Fynn	30	55
HDD-07	Cat 2	Lodge Road	60	25
HDD-08	Cat 1	A12 Trunk Road	165	120
HDD-09	Cat 2	Top Street	90	55
HDD-10	Cat 2	Sandy Lane	90	50

HDD-11	Cat 1	Martlesham Creek and Network Rail tracks south of Woodbridge	650	160
HDD-12	Cat 2	Waldringfield Road	70	55
HDD-13	Cat 2	Watercourse east of Howe's Farm	50	55
HDD-14	Cat 1	Kirton Creek	550	110
HDD-15	Cat 2	Sewage works outfall watercourse	50	55
HDD-16	Cat 1	River Deben	700	55
HDD-17	Cat 2	Queen's Fleet	70	55
HDD-18	Cat 1	Landfall, Bawdsey	1000	160
HDD-19	Cat 2	Bramford Road	60	55
HDD-20	Cat 2	Grundisburgh Road	50	55

29. The HDD technique is expected to be used at the majority of locations on the route where a trenchless method is required. This involves creating an access pit on either side of the obstacle to facilitate the installation of the drilling equipment and allow drilling under the obstacles, at an appropriate depth allowing the installation of the ducts. The HDD sites will have two access points, one either side of the HDD location, the drilling rig will be positioned on one side of the feature with ducting placed at the opposite side ready to be pulled back through the opening on completion of drilling.

30. Once the cable duct installation is completed then works will commence on the installation of the EA ONE cables within the pre-installed ducting system. As the onshore cabling typically comes on drums of up to 1,300m in length, jointing bays will be required along the cable route to join each section of cable together. These jointing bays, approximately 10m long x 5m wide x 5m deep, will be constructed at regular intervals along the onshore cable route to allow cable pulling and jointing at a later stage. The joint bay with be excavated to size and a concrete poured floor with concrete or blockwork walls surround will be installed and topped with concrete slabs to leave ground cover to a depth of 1.1m.

31. Further details on the construction methodology for the onshore cable route are presented in the Cable Method Statement (EA1-CON-R-IBR-021238).

3.3 Onshore Substation

32. The EA ONE onshore substation will be located within a fenced compound (150m by 190m) to the north of the existing National Grid Bramford Substation. The substation will contain electrical equipment including power transformers, switchgear, reactive compensation equipment, harmonic filters, cables, control buildings and other associated equipment, which will largely be outside with a number of the components being within the buildings.

33. The construction of the substation will include a number of key stages; include enabling works, foundations and building construction and equipment installation and commissioning. The enabling will include grading and earthworks to remove any unsuitable materials from the substation area and provide a level platform at an elevation of 56m AOD. Where possible, the materials excavated will be reused on site as engineering fill or landscaping depending on material properties. The enabling works will also include the construction of the main concrete access road.

34. Following the completion of the site grading, works will commence of the excavations for foundation for the building and trenches to accommodate electrical infrastructure and installation of the drainage networks.

35. The building is largely comprised of steel and cladding materials, with brick/blockwork at the base. The structural steelwork will be fabricated and prepared off site and delivered to site for erection activities using cranes. The composite cladding panels (e.g. Kingspan) will be delivered to site ready to erect and be fixed to the steelwork.

36. For the installation and commissioning phases a variety of specialist activities are required. The main items of electrical infrastructure, for example transformers, will be delivered sealed to site. Due to their size and weight they will be delivered via

specialist means and offloaded with the use of a mobile crane (please see Traffic Management Plan (EA1-CON-R-IBR-009583) for details of abnormal load transport procedures). The smaller electrical components will be constructed on site using small mobile plant and lifting apparatus.

5 Water Framework Directive

5.1 Summary of WFD Assessment

37. A Water Framework Directive (WFD) Assessment has been carried out for the onshore construction works, provided as Appendix 1 to this document.

38. Consideration of the WFD is required for any development which has the potential to cause deterioration in ecological, quantitative and/or chemical status of a water body or to compromise any improvements, which might otherwise lead to a waterbody meeting its WFD objectives. Therefore, it is necessary to consider the potential of the onshore construction works to impact on any designated WFD water bodies.

39. The cable route crosses numerous watercourses along the onshore cable route, from the substation at Bramford to the landfall at Bawdsey, Suffolk. This includes seven main rivers, multiple smaller ordinary watercourses (drains/ditches) and two groundwater water bodies, before reaching coastal waters.

40. The WFD assessment concludes that the onshore construction work is unlikely to have a 'non-temporary' (i.e. permanent) effect on the status of WFD parameters that are significant at the water body level. In addition, the onshore construction works are not predicted to cause deterioration to the current status of water bodies that may be impacted by the construction, nor will these works prevent these water bodies from achieving their future status objectives or improvements. Any opportunities to assist in the localised improvements during construction activities will nevertheless be considered, subject to approval and agreement with all parties concerned.

6 Surface Water and Drainage Strategy

41. Once the topsoil strip has occurred the haul road construction material will be installed as soon as possible to reduce the area and duration of the exposure to rainfall scour and also ensure the existing drainage patterns are interrupted for the shortest duration possible.

42. As part of the enabling works intercept drainage ditches will be installed in parallel to the cable trenches and soil bunds to provide interception of surface water run-off from the topsoil and subsoil bunds and any runoff from across the subsoil. The drainage ditches will be directed via sumps, constructed periodically along the route. These sumps will be used to collect the runoff from where it can be directed, either by pump or gravity (depending on the topography of the working site), to a settlement basin or water treatment facility (e.g. Siltbuster ® unit or similar), where suspended solids will be contained and removed, before the runoff is discharged to a watercourse.

43. Particular care will be taken when backfilling the trenches with the excavated material (subsoil) to reinstate it in the order in which it was excavated, again to minimise any disruption to the existing ground drainage pattern. The ducts will be installed in the trench, where they will be bedded on and then surrounded and topped by Cement Bound Sand (CBS) which will gradually set and harden in situ as water is absorbed. Above this, the subsoil will then be used to reinstate the trench to the previous ground level. Where there is an excessive gradient, or undulating topography along the cable route, impermeable “plugs” may need to be placed at strategic locations along the route, to discourage the reinstated trench from acting as an artificial land drain and changing normal drainage profiles.

44. The substation is to be constructed on an area of open arable fields, with no formal surface water drainage system. All runoff from the existing, undeveloped, site currently naturally infiltrate the ground, pond on the surface and evaporate, or eventually find its way into adjacent field drainage ditches. The existing topography of the substation is on a natural watershed, with gentle gradients falling away to both the west and the north east of the site, so the existing natural surface waters flow in one of two directions.

45. During the substation construction works, a temporary contractor’s compound is to be installed east of the substation site. The compound will provide accommodation and welfare facilities for the contractor and storage of materials, plant and equipment. All construction activities will be controlled so as not to impact on the water quality in the local watercourses. This compound will drain to a separate, temporary, detention and settlement basin which will attenuate the flow and maintain runoff at pre-development levels. Any additional water treatment required, before draining to the detention basin, will be in place for the duration of the construction activities. The compound itself will be removed at the end of the construction works to allow for reinstatement and final landscaping. All drainage from this area will be the direct responsibility of the enabling contractor and all appropriate measures will be included to prevent any contamination of the surface water drainage from the compound.

46. When earth works commence, any potential for silt laden runoff will be identified and suitable pollution control measures put in place to ensure all discharges are treated to a level that can be considered as uncontaminated. Any rainfall influenced runoff, after any appropriate pre-treatment on site (e.g. Siltbuster or similar water treatment units), will ultimately be discharged through one of the SuDS facilities, to be installed during the construction phase.

47. During the construction phase, if required, the main access will have a wheel wash facility installed to prevent construction vehicles and plant carrying mud off site onto public roads. This will be a closed loop recycled facility so will not discharge and its use, operation and maintenance will be monitored on site.

48. Details on the operational permanent drainage system for the onshore substation are presented in the Surface Water and Drainage Management Plan Work No 39 (EA1-CON-F-FGBE-008555) and are not detailed within this plan.

7 General Control Measures

49. Procedures and contingency plans will be put in place at each work site to deal with the clean-up of small spillages and dealing with an emergency incident. A spill response procedure has been set up and staff will be suitably trained to deal with spillages, including the use of spill kits and other practical measures, to retain any pollution on site. The used spill kits or absorbents will be disposed of off-site at a suitably licenced tip or recycling centre. The Pollution Prevention and Emergency Incident Response Plan (submitted as Appendix 8 to the CoCP) outlines these procedures in more detail.

50. Mitigation measures to minimise physical damage to watercourses and prevent pollution, flooding and erosion during construction are described below:

- Where necessary, watercourses requiring crossing will be temporarily flumed or culverted (by the installation of a suitably sized pipe) and then be ramped over to allow uninterrupted flow of water within the watercourse and a continuous haul road for construction traffic. The cable ducts will then be installed under the temporary flume pipe, at a suitable depth below the crossings. Entry into water would be avoided and where plant or vehicles have to make repeated crossings along the route a flume or, at some crossings, a temporary bridge will be installed.
- A vegetated strip will be left adjacent to the watercourse, where possible, during construction.
- Banks will be reinstated following construction, using soft revetment materials wherever possible to stabilise banks, and returning removed vegetative cover where possible to assist in the re-establishment of bankside vegetation.
- The cable will be buried at sufficient depth to prevent scour and to allow a natural substrate to develop, following EA guidance and advice.
- Bankside vegetation will be reinstated, subject to restrictions on the replanting of large tree species in close proximity to the cable route.
- Fuels, lubricants, chemicals etc. will be stored in appropriately bunded areas, with any additional appropriate pollution prevention measures in place.
- All excavated soils will be stored at least 5m from the top of the bank of any watercourse and any potentially contaminated soil will be stored on an impermeable surface and covered to reduce leachate generation and potential migration to surface waters; Procedures for dealing with unexpected contaminated materials is included in Written Scheme of Potentially Contaminated Land Mitigation (EA1-CON-R-IBR-010156).
- Limited sections of the trench route will be excavated and remain open at any one time; any localised dewatering will have appropriate treatment and disposal applied before being discharged.

51. The cable route will be constructed beneath a number of obstacles or sensitive features, including main rivers, flood defences, Sites of Special Scientific Interest (SSSI's) and major highways, using a specialist trenchless technique, such as HDD as described above. Any existing flood defences will be passed under and so left intact during construction, to prevent any increase in risk of flooding.

52. Ideally the programming of the works will be timed to limit exposure of the subsoil to the most inclement weather, reducing excessive erosion and the generation of suspended solids in the runoff. It will not however be possible to prevent this impact at all times, so appropriate mitigation measures will be in place, as and where appropriate to manage any resultant runoff generated. After the completion of onshore cable construction and the commissioning phase all temporary flumes and bridges installed will be removed and the watercourse suitably reinstated.

53. Contamination of surface water runoff is the highest potential risk of pollution during the cable route construction and the measures that will be used to contain and treat this are discussed in more detail below. The main source of contamination of the surface water runoff will be suspended solids, mobilised by the exposure of stored and stripped area of soils to rainfall along the route, as work progresses. The construction work will be designed to minimise the production of runoff containing elevated levels of suspended solids. The design will be refined along the route, with much depending on the local requirements and the availability of suitable points to treat and return construction affected water. The measures will include any combination of the following necessary to achieve the required water quality for discharge back to local watercourses:-

- Installation of drainage ditches at the toe of the soil storage bunds, running parallel to the trenches and bunds and collecting water close to source.
- Drainage ditches to intercept water that otherwise may flow from off-site, across the corridor width, picking up suspended matter as it crosses.

- Temporary haul road constructed with clean road stone material preventing excessive ground damage from vehicles.
- Soil stored locally to excavation to minimise handling and exposure.
- River and watercourse crossings carried out in accordance with proposed methods.
- Use of silt fencing to retain solids prior to collection of run off, e.g. along the toe of bunds.
- Covering or seeding of stored topsoil bunds at first opportunity, to reduce surface erosion.
- Construction of holding sumps along drain routes and use of filter bags on outlets or pumps.
- Use of proprietary mobile water treatment systems (e.g. Siltbuster or similar).

54. The onshore cable route will cross many surface water drainage systems and could provide alternative routes for the surface water runoff to follow within the catchment area. This Plan includes information on the basic works design and procedures that will be used to prevent any permanent alterations to existing drainage patterns and, at the same time, preventing contamination during temporary rerouting of natural runoff, during construction. The techniques used in the installation of the cables will be designed to discourage any long term changes to surface, and groundwater movements, as a consequence of the installation of the cable ducts. Existing drainage systems encountered during excavation will be fully reinstated, wherever practicable, as the route is progressed.

8 Mitigation Measures

55. Linear sites, like the onshore cable route, can be more challenging than a large, more conventional construction site. Each section of works will be handled as a smaller site, with a number of natural or man-made barriers existing between them, including roads, rivers and railways. In all circumstances, the priority will be to control the likely sources of the pollution by:

- Avoidance of excessive vehicle or plant tracking directly over topsoil stripped areas with the use of haul road supplemented by trackmat, or similar, where off road access is required for excavator etc.
- Controlling and minimising runoff across the site, which otherwise might erode or impact on exposed soil and stockpiles, to carry suspended solids in the runoff. Intercept ditches and silt fences will be first line of defence.
- Contain heavily silt laden water as near as possible to the source (e.g. silt fencing along toe of soil storage piles or other affected points, addition of filter bags on pump outlets).
- Using best practice methodologies when working in or near water and when placing any concrete or grouting products.
- Storing and using fuel oils, lubricants, solvents, etc. to best practice, avoiding any spillage.

56. The most common pollutants present in water from a construction site are:

- Sediment (as suspended solids).
- Cement / concrete products
- Hydrocarbons, such as fuel oils and lubricants.
- Groundwater and Contaminated Land issues
- Organic waste (plus sewage and effluent from welfare facilities).

8.1 Sediment

57. Sediment includes all suspended solids picked up as the surface or ground water on site flows through, or over, the soil and is the most common pollutant from construction sites. The impact of excessive amounts of suspended material in a receiving watercourse can have a significant negative impact on the ecology of the stream, smothering the natural fauna and flora. Once appropriate source control measures have been put in place to contain the runoff, a suitable method to remove the suspended solids must be used to ensure the water then discharged back to the watercourse is of a suitable quality. To establish the best method of treatment for any particular location, a combination of the following options will be employed:

- Pumped to run across flat grassland (grass swathe), discharge to soakaway or an infiltration basin.
- Pumped or drained to an adequately sized settlement lagoon or tank.
- Pass through a silt trap or filtration system.
- Installation of specialist treatment equipment, such as an interceptor or solids separator (e.g. Siltbuster ® unit).
- Pumped into a tanker for disposal at a licenced facility, or by holding and transferring water to disposal via any of the treatment methods identified above.

8.2 Concrete and Cementitious Products

58. Concrete and cementitious products will be prevented from entering the water at source. The majority of cement used during the installation of the ducts will be handled as a dry mix with sand, which will be installed into each of the trenches as a bedding material surrounding the cable ducts, which will subsequently set in the trench, as it naturally absorbs moisture. In some areas this dry material may be used to fill sand bags which will be placed as protection over ducts installed at watercourse crossings, particularly where riparian maintenance and cleaning is likely. Other uses will require the delivery of ready mixed concrete to various locations. This will be used to form concrete slabs, both below ground (e.g for the construction of cable joint bays) and at ground level, to form concrete pads where two temporary access bridges are to be installed to span watercourses , used to provide required support either side of a crossing.

59. During the construction of the substation, a concrete access road is to be installed at the commencement of the enabling works to provide a new vehicle access. Additional areas of concrete bases and equipment bunds are also to be constructed within the compound area. With anticipated use and delivery of ready mix to site cement polluted water will be generated from concrete washout, concreting operations and any cement grouting.

60. The extent of and location treatment facilities to be provided will depend on the frequency and volume of washout and the availability on site. The treatment provided will remove suspended solids in the effluent, using settlement basins, skips or proprietary treatment equipment (Silt buster or similar) all would need to include pH adjustment to an acceptable range. Treated water will be assessed for its suitability for discharge, along with other clean site runoff, or for its reuse on site. Any accumulated solid cement wastes would be removed, in accordance with the requirements of the Site Waste Management Plan (included as Appendix 5 of the CoCP), if necessary, to an appropriately licenced facility for disposal.

8.3 Fuel Oils and Lubricants

61. Fuel oils, lubricants and other chemicals will be prevented from entering any drain or watercourse on site. There will always be the potential for a small amount of loss of fuel oils, and lubricants on a construction site from the use of plant and equipment and the storage and refuelling locations. However, with the proper management procedures in place, this risk will be minimised and effectively controlled, using best practice.

62. Each task undertaken on site will be subject to the approval of a detailed method statement and risk assessment, which will help to minimise any unacceptable risk of the loss of this type of material. An integral part of the risk assessment also requires the contractor to describe how they will prevent spillage or loss (e.g. refuelling procedures, storage and handling arrangements, and maintenance of plant) and how they will deal with an unexpected loss or spillage and confirm they have the knowledge and capability to do so. The prevention of loss or containment and removal of spilt or lost oil products will include one or more of the following;

- Oil Separators, installed just prior to any outfall from site to remove hydrocarbons from catchment areas with a high risk of spillage. This level of capture and treatment will be applicable to main refuelling areas in the main site Construction Consolidation Compounds where bulk storage will be contained. Any facilities installed shall be in accordance with The Control of Pollution (Oil Storage) (England) Regulations 2001.
- Use of drip trays or plant “nappy” pads under mobile plant and equipment.
- Use of oil-absorbent materials to absorb and remove small quantities of oil and provide ready access to the same oil-absorbent materials for use in emergency spillage clean-up.
- Safe storage and handling procedures.
- Regular Inspection and maintenance procedure for plant and equipment.
- Removal and suitable licenced disposal of ground accidentally contaminated.

8.4 Contaminated Land

63. In the need to dig through the ground at locations that have been subject to previous contamination, pollutants, including total and soluble heavy metals, can be transferred to the surface water and groundwater and subsequently collect in open excavations during construction and, in some situations, this can present a problem for the discharge of this type of water offsite. Section 9 of the CoCP (EA1-CON-F-IBR-008547) summarises the approach to the encountering of unknown contaminated land, and also refers to Written Scheme of Contamination Land Mitigation Plan (EA1-CON-R-IBR-010156) produced to fulfil DCO Requirement 17.

8.5 Sewage and Organic waste

64. Whilst it is preferable for sewage generated by site welfare units to be disposed of to a foul sewer, for the key locations where temporary sewage facilities are required, there are currently no foul sewers available. Sewage and other foul water from welfare and accommodation units installed across the onshore cable route, including the main offices and accommodation, will therefore be discharged to sealed tanks on the various sites, from where it will be routinely collected by tanker, for disposal at a licenced facility.

8.6 Specialist Advice

65. The construction and environmental management team will call on specialist consultants (i.e. ecologists, hydrologists, ornithologists etc.), as and when necessary, to ensure that construction is being carried out in accordance with the requirements of the Environmental Statement, the conditions attached to the planning permission, environmental best practice and the approved Method Statements.

8.7 Pollution Prevention and Emergency Incident Response Plan

66. Works carried out adjacent to water bodies pose major risks of pollution and should be subject to detailed method statements and risk assessment, which includes pollution control and emergency planning procedures. A Pollution Prevention and Emergency Incident Response Plan (Appendix 8 to the CoCP) for the onshore construction works has been prepared identifying appropriate equipment and requirements for suitably trained personnel and their availability at the various locations identified in the risk assessment, to help prevent or resolve any pollution incidents. The Pollution Prevention and Emergency Incident Response Plan includes a description of the general requirements in place to identify and manage likely sources of pollution from the construction activities.

9 Disposal Options and Temporary Outfalls

67. An Environmental Permit is usually required to discharge liquid or waste water (poisonous, noxious or polluting matter, waste matter, or trade or sewage effluent) into surface water, e.g. rivers, streams, estuaries. However, for the temporary discharge of uncontaminated water from the runoff or from construction activities and excavations to surface water (e.g. pumping water out of excavations) a permit is not required, provided the discharge is made in full compliance with the Environment Agency's Regulatory Position Statement (RPS). Under the following circumstances, the Environment Agency considers such a discharge to be low risk and have therefore issued a RPS to provide the appropriate level of control.

68. The RPS covers the discharge of uncontaminated water from excavations and is applicable, provided the discharge complies with all of the following conditions, the discharge must:

- Be temporary and last less than 3 consecutive months (applicable to any one location).
- Be made to a surface water (river, stream or to the sea).
- Not pollute surface water or adversely affect aquatic life, or designated sites or species.
- Not result in the spread of non-native invasive species, parasites or disease.
- Not cause flooding from surface water
- Not cause erosion of the banks or bed of surface water.

69. There are restrictions to this exemption that will be adhered to when deciding locations that are suitable for discharge from the onshore construction works.

70. No discharge must be located within, or less than 500 metres upstream of:

- Sites of Special Scientific Interest (SSSI)
- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Sites in process to become SACs or SPAs ('candidate SACs', 'possible SACs', 'potential SPAs' and 'sites of community importance (SCIs)'
- Internationally designated Ramsar sites
- Other nature conservation sites, (e.g. ancient woodlands, Local and National Nature Reserves)
- Local wildlife sites (i.e. sites with high local value for wildlife.

71. The above features have all been identified in the Environmental Statement and environmental briefings will be provided all contractors, as part of the site induction and training process. Any particularly important or sensitive sites will be highlighted in pre-construction briefings and tool box talks that will be delivered to those involved in the works.

10 Abstractions and Private Water Supplies

72. Abstraction of water may be required for potable or non-potable supply or for use during site activities, such as concrete batching or washing. The appointed contractor will be responsible for obtaining from the Environment Agency, in advance of use, any permits for their use of abstracted water during the construction related activities and for monitoring and recording associated abstraction rates or other license requirements to demonstrate compliance.

73. In the event that abstracted water is required for potable supply, this will be undertaken in consultation with the Environmental Protection Team of Suffolk Coastal District Council to facilitate compliance with the Private Water Supplies Regulations 2009.

74. All Private Water Supplies or Abstractions will continue to be identified prior to construction, and the protection of any potentially affected water supplies will be maintained during construction works. Standard mitigation, where required, will include the development and application of risk management measures, pre and post-construction monitoring surveys of any particularly sensitive water supply (in liaison with the Local Authorities), and the preparation of alternative contingency supply arrangements.

10.1 Protection of Private Water Supplies

75. In the preparation of the Environmental Statement, a number of private water supplies were identified, close to the onshore works and further details on their precise location and use were collected from either the local authorities, or directly from the landowners. The majority of the excavation works required during the onshore cable installation works are relatively shallow and temporary and will be followed by relatively rapid reinstatement, to original ground levels. The subsequent assessment of impact on private supplies and abstractions in the area of the onshore cable route, conducted as a part of the original Environmental Statement (Volume 3 Chap 22: Onshore Water and Flood Risk RSK Environmental 2102), concluded that the significance of the impact and any likely residual impact resulting from the works to any of the identified private water supplies or abstractors was summarised as not significant. Appropriate water quality monitoring may be undertaken at any particularly sensitive sites, to ensure no negative impacts occur.

76. Landowners or users of private water supplies or abstractions will be provided with a suitable point of contact through the establishment of a Communications Protocol, should they experience any problems with their Private Water Supply. All complaints will be investigated thoroughly , following the Project Community and Public Relations Procedure

77. In the unlikely event that construction works lead to the temporary deterioration of a Private Water Supply, an alternative temporary supply of water will be provided (e.g. water tankered to property and/or provision of temporary drinking water storage tanks).

78. Mitigation and environmental controls will be put in place, as discussed in previous sections, to apply construction best practices and to follow the Environment Agency water pollution control guidelines to protect all aspects of water quality.

79. A Pollution Prevention and Emergency Incident Response Plan is in place to ensure there will be a prompt and effective response to any complaint that may have a perceived impact on any identified private water supplies, including the immediate cessation of associated water-sensitive construction activities.

80. During the construction phase, measures will be adopted by the contractor to prevent suspended silts from being carried into existing watercourses. These measures will be based on construction best practice and guidance provided by the Environment Agency and the Construction Industry Research and Information Association (CIRIA). Areas exposed, due to the removal of vegetation or top soil are more susceptible to erosion during heavy rainfall or rapid surface run-off, so these areas will be reinstated as soon as possible, to minimise this potential impact.

81. Surface water flows will be captured through a series of drainage ditches to prevent water entering excavations or eroding exposed surfaces. The flows and quality will be controlled through the use of settlement ponds, small dams, sediment traps

and other hydraulic features to reduce water velocity (thereby reducing erosive power), maximising infiltration and evaporation and to remove as much sediment as possible.

82. Where areas are being disturbed, a combination of the following measures will be implemented to minimise these effects:

- Ditches shall be provided adjacent to tracks and other operational areas, where practicable, and will primarily be used to hold water temporarily and to encourage infiltration/discharge into the ground locally to where the rainfall hits the ground.
- The level of silt in run-off during construction shall be regularly monitored and if it is excessive in any area this can be managed by providing straw bales locally around the problem areas. These will filter the run-off and trap silt
- Silt run-off from stockpiles and excavated spoil heaps can be contained through the placement of geotextile silt fences, mats or straw bales on the downhill side of the stockpile. Stockpiles will be covered with plastic sheeting or geotextile materials to prevent erosion through heavy rainfall.
- Any ditches or other water features will be regularly inspected and maintained to ensure their effectiveness. All excess silts will be removed and disposed of within site earthworks. Where check dams have become fully blocked with silt, they shall be replaced in accordance with the following procedure.
- Silt deposits to be removed.
- Removed silt to be disposed of by spreading in an area of the site where surface run-off will not convey silt deposits back to a watercourse.
- Ditches will remain in place to convey surface water flows during the operational life of the development. The ditches will therefore be seeded or turfed as soon as they have been formed to ensure their maximum effectiveness.

11 Monitoring and Reporting

11.1 Monitoring

83. The implementation and application of the appropriate mitigation measures for the protection of surface or ground water quality, described above, will be monitored by the Environmental representative of both the contractor responsible and the project Environmental Clerk of Works (EnCoW), throughout the construction phase. If any non-conformity with any of the mitigation measures is identified, it will be recorded during inspection or a site audit and appropriate remedial actions will be implemented. A record of inspections of mitigation measures and any required maintenance will be maintained.

84. Site location and water sensitivity will be taken into account when determining the appropriate level and frequency of any sampling. Regular site inspections and in field water quality monitoring and assessment will however be undertaken throughout the construction period. The contractor carrying out the construction activities will be responsible for the management and control of all surface water and any other water arising from the activity. Visual checks on water quality will be the most frequent to determine any localised impacts, or to highlight any potential for water quality risks. Inspection findings and site check analysis will be recorded and reported back through construction site management.

11.2 Reporting

85. A baseline water quality report was prepared for the ES, using the data collected in the baseline water quality monitoring programme. This provides details of any contamination concentrations recorded and will be used to describe the "background pollution levels" for the various locations. The results are be compared to the most relevant Environmental Quality Standards appropriate and to assess the status according to the Water Framework Directive (Appendix 1).

86. Any apparent environmental deterioration observed will be highlighted through ongoing checks and monitoring of water quality. In the event of a pollution incident or suspected deterioration, relevant monitoring points will be sampled to determine any impacts, in particular any relative to baseline data. A report detailing the findings will be prepared for any incident and recommendations provided for further monitoring and / or requisite mitigation measures.

87. All information recovered during the monitoring process will be collated and a routine assessment made regarding any impact to be reported on the surface and groundwater of the construction activities.

11.3 Personnel

All personnel taking samples or analysing and reporting water quality in the field will be suitably qualified. All laboratory analysis will be carried out using a suitably accredited laboratory.

Appendix 1 Water Framework Directive Assessment

East Anglia ONE
Offshore Windfarm

Water Framework Directive Assessment

SCOTTISHPOWER
RENEWABLES

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Figures

1 Introduction

1. ABP Marine Environmental Research Ltd (ABPmer) was commissioned by EAOL, to conduct a Water Framework Directive (WFD) assessment for the EA ONE onshore construction works. The conclusions of this assessment demonstrate that the onshore works will comply with the objectives of the WFD.

2. The WFD (2000/60/EC) came into force in the year 2000, establishing a framework for the protection and enhancement of inland water bodies, estuaries, coastal waters (out to one nautical mile from the low water mark) and ground waters. The WFD aims to ensure that all aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands meet 'good status' by 2015 or later, subject to appropriate reasons for derogation. To achieve this, the following eight objectives are set:

- Prevent deterioration of the status of waters.
- Protect, enhance and restore all bodies of surface waters and groundwaters.
- Promote sustainable water use (through effective pricing of water services).
- Progressively reduce discharges of priority substances and cease or phase discharges of priority hazardous substances for surface waters.
- Ensure progressive reduction of pollution of groundwater.
- Mitigate the effects of floods and droughts.
- Ensure sufficient supply of water.
- Protect the marine environment.

3. The WFD divides rivers, lakes, lagoons, estuaries, coastal waters, man-made docks and canals into a series of discrete surface water bodies. It sets ecological as well as chemical targets (objectives) for each surface water body. Ecological status is measured on a scale of high, good, moderate, poor and bad, while chemical status is measured as either good, or fail (i.e. failing to achieve good).

4. For a water body to be in overall 'good' status, the water body must be achieving good ecological status (GES) and good chemical status (GCS). The ecological status of surface waters is classified using information on the biological (e.g. fish, benthic invertebrates and macroalgae), physico-chemical (e.g. dissolved oxygen, salinity and thermal conditions) and hydromorphological (e.g. hydrological regime) quality of the body of water, as well as several specific pollutants (e.g. copper and zinc). Compliance with chemical status objectives is assessed in relation to environmental quality standards (EQSs) for a specified list of ‘priority’ and ‘priority hazardous’ substances. These substances were first established by the Priority Substances Directive (PSD) (2008/105/EC) which entered into force in 2009. The PSD set objectives, amongst other things, for the reduction of these substances through the cessation of discharges or emissions.

5. As required by the WFD and PSD, a proposal to revise the list of priority (hazardous) substances was submitted in 2012. Subsequently, an updated PSD (2013/39/EU) was published in 2013, identifying new priority substances, setting EQSs for those newly identified substances, revising the EQS for some existing substances in line with scientific progress and setting biota EQSs for some existing and newly identified priority substances. The ‘new’ PSD is transposed into UK legislation through the WFD (Standards and Classification) Directions (England and Wales) 2015, which entered into force in September 2015.

6. Each surface water body has a hydromorphological designation that describes how modified a water body is from its natural state. Water bodies are either undesignated (i.e. natural, unchanged), designated as a heavily modified water body (HMWB) or designated as an artificial water body (AWB). HMWBs are defined as bodies of water which, as a result of physical alteration by human activities (such as flood protection) are substantially changed in character and cannot therefore meet GES. AWBs are artificially created through human activity. The default target for HMWBs and AWBs under the WFD is to achieve good ecological potential (GEP); a status recognising the importance of their human use whilst ensuring ecology is protected as far as possible.

7. In addition to surface water bodies, the WFD also incorporates groundwater water bodies. Groundwaters are assessed against different criteria compared to surface water bodies, since they do not support ecological communities (i.e. it is not appropriate to consider ecological status). Therefore, groundwater water bodies are classified as good or poor quantitative

status in terms of their quantity (groundwater levels and flow directions) and quality (pollutant concentrations and conductivity), along with chemical (groundwater) status.

8. River Basin Management Plans (RBMPs) are a requirement of the WFD, setting out measures for each river basin district to improve water quality in surface and groundwater water bodies. In 2009, the Environment Agency published the first cycle of RBMPs (2009 to 2015) for England and Wales, reporting the status and objectives of each individual water body. The Environment Agency has subsequently published updated RBMPs as part of the second cycle (2015 to 2021), as well as providing water body classification results from 2015 via the Environment Agency *Catchment Data Explorer* (http://environment.data.gov.uk/catchment-planning). The export cable from the EA ONE is planned to make landfall and transit across the Anglian river basin district, reported in the Anglian RBMP (Environment Agency, 2016).

9. Consideration of the WFD is required for developments which have the potential to cause deterioration in ecological, quantitative and/or chemical status of a water body, or to compromise improvements that might otherwise lead to a water body failing to meet its WFD objectives. Therefore, it is necessary to consider the potential of the onshore cable route for EA ONE to impact WFD water bodies.

10. There is currently no formal guidance for conducting WFD compliance assessments for proposed developments/activities in UK freshwater/marine environments. However, the Environment Agency has produced guidance ("Clearing the Waters") to help establish whether marine dredging activities comply with the WFD. This outlines a process to screen (Environment Agency, 2012a), scope (Environment Agency, 2012b), assess (Environment Agency, 2012c) and identify/evaluate measures (Environment Agency, 2012d) when considering the potential impacts of dredging on WFD water bodies. These documents have been referred to in completing this assessment.

11. The approach taken for this assessment is as follows:

- Screening (Section 2) – identify and record relevant information for all surface and groundwater water bodies in the locality of the onshore cable route, including current status, objectives and mitigation measures, as well as protected areas.
- Scoping (Section 3) – consider the potential issues surrounding the cable installation, including review of construction techniques to be adopted.
- Assessment (Section 4) – evaluate the extent to which the installation of the export cables could influence WFD elements of screened in water bodies and protected areas.
- Additional measures (Section 5) – where necessary and feasible, determine further actions to mitigate impact of the works to ensure no deterioration in status and WFD objectives are achieved.

2 Screening

2.1 Potentially Affected Water Bodies

1. To determine which water bodies would potentially be affected by the proposed works, all surface and groundwater water bodies located within 2 km of the cable route (and surface water bodies downstream of this buffer) were recorded. Subsequently, connectivity (direct or indirect) between the cable route and each of these water bodies was considered to screen out those for which no possible interaction would occur. Connectivity was assumed as:

- cable route crossing a surface water body
- surface water body located downstream of a cable route crossing
- cable route overlaying a groundwater water body

2. Based on this approach, the following surface and groundwater water bodies were screened in (Figure 1):

- Riverine water bodies
  - Bucklesham Mill River
  - Fynn
  - Gipping (d/s Stowmarket)
  - Lark
  - Lark - Fynn (d/s confluence)
  - Somersham Watercourse
- Transitional water bodies
  - Deben
  - Orwell
- Coastal water bodies
  - Harwich Approaches
  - Suffolk
- Groundwater water bodies
  - Felixstowe Peninsula Crag and Chalk
  - Waveney and East Suffolk Chalk and Crag

3. Tables 1 to 12 provide a summary of each of these water bodies, including current water body status (overall, ecological/quantitative and chemical), parameters currently failing to achieve good and, where applicable, mitigation measures. It should be noted that mitigation measures for HMWBs and AWBs are based on Cycle 1 (2009) RBMPs as updated information is not available for the Cycle 2 (2015) RBMPs.

2.1.1 River Water Bodies

4. Tables 1 to 6 present Environment Agency classification information for riverine water bodies that are potentially affected by the onshore cable route.

Water Body Information	
Water Body Name	Bucklesham Mill River
Water Body ID	GB105035040280
Water Body Type	River
Hydromorphological Designation	Not Designated
Protected Area Designations	Drinking Water Protected Area; Natura 2000 (Habitats and/or Birds Directive); Nitrates Directive
Overall Status	Poor
Ecological Status	Poor

Chemical Status	Good
Objective	Poor by 2027
Parameters Not At Good Status	Fish (poor)
Mitigation Measures	n/a

Table 1: Bucklesham Mill River

Water Body Information	
Water Body Name	Fynn
Water Body ID	GB105035040330
Water Body Type	River
Hydromorphological Designation	Not Designated
Protected Area Designations	Nitrates Directive
Overall Status	Moderate
Ecological Status	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Fish (moderate); Phosphate (poor)
Mitigation Measures	n/a

Table 2: Fynn

Water Body Information	
Water Body Name	Gipping (d/s Stowmarket)
Water Body ID	GB105035046280
Water Body Type	River
Hydromorphological Designation	HMWB (Flood Protection)
Protected Area Designations	Drinking Water Protected Area; Nitrates Directive; Urban Waste Water Treatment Directive
Overall Status	Moderate
Ecological Potential	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Macrophytes and Phytobenthos Combined (moderate); Phosphate (moderate); Mitigation Measures Assessment (moderate or less)
Mitigation Measures	Appropriate channel maintenance strategies and techniques - minimise disturbance to channel bed and margins – *In Place*
	Sediment management strategies (develop and revise) – *In Place*
	Retain marginal aquatic and riparian habitats (channel alteration) – *In Place*
	Appropriate techniques (invasive species) – *In Place*
	Appropriate timing (vegetation control) – *In Place*
	Appropriate vegetation control technique – *In Place*
	Selective vegetation control regime – *In Place*
	Educate landowners on sensitive management practices (urbanisation) – *Not In Place*

	Appropriate techniques to align and attenuate flow to limit detrimental effects of these features (drainage) – *Not In Place*
	Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works – *Not In Place*
	Improve floodplain connectivity – *Not In Place*
	Set-back embankments – *Not In Place*
	Flood bunds (earth banks, in place of floodwalls) – *Not In Place*
	Increase in-channel morphological diversity – *Not In Place*
	Remove obsolete structure – *Not In Place*

Table 3: Gipping (d/s Stowmarket)

Water Body Information	
Water Body Name	Lark
Water Body ID	GB105035040360
Water Body Type	River
Hydromorphological Designation	Not Designated
Protected Area Designations	Nitrates Directive
Overall Status	Moderate
Ecological Status	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Fish (moderate); Phosphate (poor)
Mitigation measures	n/a

Table 4: Lark

Water Body Information	
Water Body Name	Lark - Fynn (d/s confluence)
Water Body ID	GB105035040300
Water Body Type	River
Hydromorphological Designation	HMWB (Flood Protection)
Protected Area Designations	Nitrates Directive; Natura 2000 (Habitats and/or Birds Directive)
Overall Status	Moderate
Ecological Status	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Fish (moderate); Phosphate (moderate); Mitigation Measures Assessment (moderate or less)
Mitigation Measures	Sediment management strategies (develop and revise) – *In Place*
	Retain marginal aquatic and riparian habitats (channel alteration) – *In Place*
	Appropriate techniques (invasive species) – *In Place*
	Appropriate timing (vegetation control) – *In Place*
	Appropriate vegetation control technique – *In Place*
	Selective vegetation control regime – *In Place*

	Appropriate channel maintenance strategies and techniques - minimise disturbance to channel bed and margins – *Not In Place*
	Operational and structural changes to locks, sluices, weirs, beach control, etc – *Not In Place*
	Structures or other mechanisms in place and managed to enable fish to access waters upstream and downstream of the impounding works – *Not In Place*
	Improve floodplain connectivity – *Not In Place*
	Set-back embankments – *Not In Place*
	Increase in-channel morphological diversity – *Not In Place*

Table 5: Lark - Fynn (d/s confluence)

Water Body Information	
Water Body Name	Somersham Watercourse
Water Body ID	GB105035040310
Water Body Type	River
Hydromorphological Designation	HMWB (Flood Protection)
Protected Area Designations	Nitrates Directive
Overall Status	Moderate
Ecological Status	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Phosphate (poor)
Mitigation Measures	Appropriate channel maintenance strategies and techniques - woody debris – *In Place*
	Appropriate channel maintenance strategies and techniques - minimise disturbance to channel bed and margins – *In Place*
	Appropriate techniques (invasive species) – *In Place*
	Appropriate timing (vegetation control) – *In Place*
	Appropriate vegetation control technique – *In Place*
	Selective vegetation control regime – *In Place*

Table 6: Somersham Watercourse

2.1.2 Transitional Water Bodies

5. Tables 7 and 8 present classification information for transitional (estuarine) water bodies that are potentially affected by the onshore cable route.

Water Body Information	
Water Body Name	Deben
Water Body ID	GB520503503900
Water Body Type	Transitional
Hydromorphological Designation	HMWB (Flood Protection)
Protected Area Designations	Natura 2000 (Habitats and/or Birds Directive); Nitrates Directive; Shellfish Directive
Overall Status	Moderate

Ecological Status	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Dissolved Inorganic Nitrogen (moderate); Mitigation Measures Assessment (Moderate or less)
Mitigation Measures	Preserve and where possible enhance ecological value of marginal aquatic habitat, banks and riparian zone – *In Place*
	Managed realignment of flood defence – *Not In Place*

Table 7: Deben

Water Body Information	
Water Body Name	Orwell
Water Body ID	GB520503613601
Water Body Type	Transitional
Hydromorphological Designation	HMWB (Flood Protection; Navigation)
Protected Area Designations	Natura 2000 (Habitats and/or Birds Directive); Nitrates Directive
Overall Status	Moderate
Ecological Status	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Angiosperms (moderate); Invertebrates (moderate); Dissolved Inorganic Nitrogen (moderate)
Mitigation Measures	Vessel Management – *In Place*
	Manage disturbance – *In Place*
	Site selection (dredged material disposal) (e.g. avoid sensitive sites) – *In Place*
	Sediment management – *In Place*
	Alter timing of dredging / disposal – *In Place*
	Reduce sediment resuspension – *In Place*
	Prepare a dredging / disposal strategy – *In Place*

Table 8: Orwell

2.1.3 Coastal Water Bodies

6. Tables 9 and 10 present classification information for coastal water bodies that are potentially affected by the onshore cable route.

Water Body Information	
Water Body Name	Harwich Approaches
Water Body ID	GB650503190000
Water Body Type	Coastal
Hydromorphological Designation	HMWB (Coastal Protection; Dredge Disposal; Navigation)
Protected Area Designations	Bathing Water Directive; Natura 2000 (Habitats and/or Birds Directive)
Overall Status	Moderate
Ecological Status	Moderate

Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Dissolved Inorganic Nitrogen (moderate)
Mitigation Measures	Sediment management – *In Place*
	Alter timing of dredging / disposal – *In Place*
	Reduce sediment resuspension – *In Place*
	Reduce impact of dredging – *In Place*
	Prepare a dredging / disposal strategy – *In Place*
	Avoid the need to dredge (e.g. minimise under-keel clearance; use fluid mud navigation; flow manipulation or training works) – *In Place*

Table 9: Harwich Approaches

Water Body Information	
Water Body Name	Suffolk
Water Body ID	GB650503520002
Water Body Type	Coastal
Hydromorphological Designation	HMWB (Coastal Protection; Flood Protection)
Protected Area Designations	Bathing Water Directive; Natura 2000 (Habitats and/or Birds Directive); Nitrates Directive
Overall Status	Moderate
Ecological Status	Moderate
Chemical Status	Good
Objective	Moderate by 2027
Parameters Not At Good Status	Dissolved Inorganic Nitrogen (moderate)
Mitigation Measures	None identified.

Table 10: Suffolk

2.1.4 Groundwater Water Bodies

7. Tables 11 and 12 present classification information for groundwater water bodies that are potentially affected by the onshore cable route.

Water Body Information	
Water Body Name	Felixstowe Peninsula Crag and Chalk
Water Body ID	GB40501G401800
Water Body Type	Groundwater
Protected Area Designations	Drinking Water Protected Area; Nitrates Directive
Overall Status	Poor
Quantitative Status	Good
Chemical (Groundwater) Status	Poor
Objective	Good by 2027
Parameters Not At Good Status	General Chemical Test

Table 11: Felixstowe Peninsula Crag and Chalk

Water Body Information	
Water Body Name	Waveney and East Suffolk Chalk and Crag
Water Body ID	GB40501G400600
Water Body Type	Groundwater
Protected Area Designations	Drinking Water Protected Area; Nitrates Directive
Overall Status	Poor
Quantitative Status	Poor
Chemical (Groundwater) Status	Poor
Objective	Good by 2027
Parameters Not At Good Status	Quantitative Water Balance; Chemical Drinking Water Protected Area; General Chemical Test

Table 12: Waveney and East Suffolk Chalk and Crag

2.2 Protected Areas

8. The WFD requires that activities are also in compliance with other relevant legislation, such as the Habitats Directive (92/43/EEC as amended), Birds Directive (2009/147/EC), Ramsar Convention, Bathing Water Directive (2006/7/EC), Nitrates Directive (91/676/EEC), Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC) and the provisions of the Shellfish Waters Directive (2006/113/EC).

2.2.1 Nature Conservations Designations

9. Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites known as Special Areas of Conservation (SACs) that will contribute to conserving habitat and species identified in Annexes I and II of the Directive. The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds). In accordance with Article 4 of the EC Birds Directive, Special Protection Areas (SPAs) are strictly protected sites classified for rare and vulnerable birds (Annex I of the Directive), and for regularly occurring migratory species. Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

10. The following international nature conservation designations are located within 2 km of the cable route:

- Alde-Ore Estuary Ramsar
- Alde-Ore Estuary SPA
- Deben Estuary Ramsar
- Deben Estuary SPA
- Orfordness-Shingle Street SAC

11. A European Marine Site (EMS) is the collective term used to refer to SACs and SPAs that are covered by tidal water and protect some of the most special marine and coastal habitats and species of European importance. They are defined by the Conservation of Habitats and Species Regulations 2010 (SI 2010/490), which transpose the Habitats and Birds Directives into UK national law. The Alde-Ore Estuary EMS (English Nature, 2001a) and Deben Estuary EMS (English Nature, 2001b) are located within 2 km of the cable route.

12. The cable route directly overlaps with the Deben Estuary Ramsar, Deben Estuary SPA and Deben Estuary EMS.

2.2.2 Bathing Water Directive

13. The Bathing Water Directive (76/160/EEC) establishes microbiological and physico-chemical standards to be met at identified bathing waters. To comply with these standards, bathing waters must not exceed values of 10,000 total coliforms per 100 ml and 2,000 faecal coliforms per 100 ml in 95% of samples collected during the bathing season.

14. The revised Bathing Water Directive (2006/7/EC) was adopted in March 2006, when the way in which water quality is measured was updated, focusing on fewer microbiological indicators, and setting different standards for inland and coastal bathing sites. Subsequently, the 'old' Directive was repealed at the end of 2014 and the first set of bathing water classifications using new parameters set under the revised Bathing Water Directive were published in 2015.

15. The Harwich Approaches and Suffolk coastal water bodies include bathing waters designated under the Bathing Water Directive, although there are no bathing waters situated within 2 km of the cable route. Felixstowe North is the closest bathing water to the cable route, approximately 7 km to the south. Consequently, the footprint of effect from the proposed works will not overlap with any designated bathing waters and this receptor is scoped out of further assessment.

2.2.3 Nitrates Directive

16. The Nitrates Directive aims to reduce water pollution from agricultural sources and to prevent such pollution occurring in the future (nitrogen is one of the nutrients that can affect plant growth). Under the Nitrates Directive, surface waters are identified if too much nitrogen has caused a change in plant growth which affects existing plants and animals and the use of the waterbody.

17. The Bucklesham Mill River, Gipping (d/s Stowmarket), Lark, Lark – Fynn (d/s confluence) and Somersham Watercourse riverine water bodies, Deben and Orwell transitional water bodies, Suffolk coastal water body and Felixstowe Peninsula Crag and Chalk and Waverly East Suffolk Chalk and Crag groundwater water bodies are designated under the Nitrates Directive. In addition, large areas surrounding Ipswich, thus including parts of the cable route, are designated as a Nitrate Vulnerable Zone (NVZ).

2.2.4 Urban Waste Water Treatment Directive

18. The UWWTD aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban waste water. Sensitive areas under the UWWTD are water bodies affected by eutrophication of elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

19. The River Gipping is designated as a "Sensitive Areas (Eutrophic)" under the UWWTD (Department for Environment, Food and Rural Affairs (Defra), 2012).

2.2.5 Shellfish Waters Directive

20. The Shellfish Waters Directive was due to be repealed in 2013 and subsumed within the WFD. The latest standards for the implementation of the WFD in England and Wales suggests '*Protected areas under WFD include shellfish waters and we are proposing to direct the Agencies to continue to endeavour to observe the microbial standard in shellfish waters, to contribute to a high quality shellfish product directly edible by humans*' (Defra, 2014). Therefore, the general objectives of the Shellfish Waters Directive are still applicable.

21. The aim of the Shellfish Waters Directive is to ensure a suitable environment for the growth of shellfisheries and to promote good water quality through mandatory compliance with imperative standards, as well as mandatory standards for metals and other contaminants. For example, it requires that dissolved oxygen, measured as the percentage of saturation, should exceed 70% (as a mean) and individual measurements may not be less than 60% unless there are no harmful consequences on the development of shellfish colonies. These standards are absolute, and compliance with them is an obligation for the UK. Similarly, a discharge affecting Shellfish Waters must not cause the suspended solid content of the water to exceed by more than 30% the content of waters not affected.

22. Sections of the Deben, situated within 2 km of the cable route, are designated as Shellfish Water Protected Areas.

2.2.6 Groundwater Protection Zones

23. Groundwater Source Protection Zones are designated by the Environment Agency to protect groundwaters around registered abstraction points from contamination. The cable route crosses a large area of Zone II (outer protection zone) and some isolated, but more sensitive Zone I (inner protection zone).

3 Scoping

3.1 Construction Methodology

24. EA ONE will include the installation of up to 14 cables and cable ducts. The cable route intersects a total of 45 water bodies, including numerous smaller watercourses and ditches. In addition, the cable route passes over two groundwater water bodies, and a further two surface water bodies located downstream of water crossings (Figure 1). To evaluate the potential issues surrounding EA ONE, and thus assess WFD elements which could be adversely affected, it is necessary to review the construction techniques which will be used to install the cables. The Code of Construction Practice (COCP) summarises the management measures which contractors will be required to adopt and implement for any onshore construction works, including water crossings. The two primary methods for water crossings, open cut and horizontal directional drilling (HDD), are detailed in the following sections.

25. Temporary bridges will be installed at some watercourse crossings (e.g. River Fynn) to facilitate haul road access along the cable route. Bridges would come as a prefabricated unit or in two pieces. Concrete platforms would be constructed on either side of the crossing to provide the required ground support conditions, and then the bridge sections would be lowered into place using a crane and then secured. The duration for the installation works for each of these bridges would be four weeks. Where required, flume pipes will be installed to enable continued flow in watercourses, or in some cases the use of temporary damming and over pumping may be used, whilst the crossings are made. Further details on the locations and the specific crossing methodology are included in the Watercourse Crossing Plan (Appendix 6 to the CoCP) and each crossing will be the subject of an application to the EA for the appropriate permission.

3.1.1 Open Cut

26. Minor watercourse crossings (e.g. ditches, drains) will be completed using conventional open cut trenching, using either dry or wet methodologies. Dry open cut techniques involve damming the watercourse upstream and downstream of the crossing, thus creating a dry area where the cable crosses. Water is then pumped from where it has been impounded upstream and discharged downstream of the crossing area. However, during wet open cut techniques, construction takes place within flowing water. The cable trench is typically constructed across the watercourse by equipment operating from either the banks or from flume pipes laid in the river to maintain flow and to provide an equipment crossover from one bank to the other. After the excavation of the trench across the watercourse, a section of ducting is placed into the trench.

3.1.2 Horizontal Directional Drilling

27. Where it is not appropriate to install export cables and cable ducts in open cut trenches, trenchless techniques will be employed. Trenchless techniques require the use of specialist equipment to install ducting, without the need for digging an open trench along the cable route. Based on ground investigations conducted in June 2016, all but one of the major watercourse crossings will be completed using HDD, including the following locations (see Figure 1):

- Landfall at Bawdsey (Suffolk coastal water body)
- River Deben (Deben transitional water body)
- Kirton Creek (Bucklesham Mill River riverine water body)
- Martlesham Creek (Lark - Fynn (d/s confluence) riverine water body)
- River Fynn (Fynn riverine water body)
- River Gipping (Gipping (d/s Stowmarket) riverine water body)
- Somersham Watercourse (Somersham Watercourse riverine water body)
- River Lark (Lark riverine water body) –This location is subject to further detailed review as ground conditions have been recently re-evaluated and an open trench crossing with damming and overpumping may now be a more practical solution. A specific methodology has yet to be confirmed and to be agreed with the EA..

28. A typical HDD operation involves drilling a pilot hole from the entry point toward the exit point, reaming (to make the hole larger), pulling a duct through the reamed hole, and then pulling the cable through the ducting either at that time or at a later stage. Drilling fluid is used to lubricate the drill during cutting and to help transport cuttings out of the larger diameter hole. This procedure is repeated until the drilled hole has reached the intended final diameter. The hole is typically cut to a size 1.5 times larger than the duct it has to carry, to facilitate the removal of soil cuttings and the insertion of the duct, allowing for

potential soil expansion during pulling. Drilling under a watercourse while using HDD will be to a minimum depth of 1.5 m below the river bed. Specific crossing details are included in the Watercourse Crossing Method statement submitted as Appendix 7 to the Code of Construction Practice (CoCP).

3.2 Potential Impacts

29. Based on the construction methodologies described above, there is potential for adverse impacts to the following WFD parameters:

- Hydrological regime – A reduction in flow could occur due to alterations in watercourse profile (open cut trenches and installation of temporary bridges); changes in flow could also impact other ecological parameters such as fish, invertebrates, macrophytes and dissolved oxygen
- Mitigation measures assessment – Disturbance of watercourses could impact mitigation measures already '*In Place*'
- Quantitative status (groundwaters) – Changes in flow patterns could influence the quality and quantity of groundwater
- Chemical status – Use of construction plant could lead to the accidental release of chemicals/pollutants into a watercourse, including surface and groundwater water bodies

30. In addition, the construction works could result in habitat disturbance, including habitats of internationally designated sites for nature conservation (e.g. SACs, SPAs and Ramsar), and impact on flood defences.

3.3 Embedded Design Mitigation

31. To minimise potential impacts on the environment, a number of mitigation measures are already agreed and embedded into the construction works, associated with the onshore cable route. Table 13 presents the embedded mitigation measures which are of key consideration in assessing potential impacts on WFD parameters.

Key Embedded Mitigation Measures
Protection of all habitats and species through careful micro-siting to minimise habitats affected.
All watercourses and ditches maintained in effective working condition for the duration of the works, to minimise change to surface water flow, or to any associated groundwater drainage patterns.
Any aquatic vegetation removed during the process to be retained on the adjacent banks for 24 hours, to allow the aquatic fauna to return to the water (prior to storage).
Restore watercourses to a condition at least as good as before the commencement of works.
Open cut crossings completed in the shortest time possible, indicative timings included in Watercourse Crossing Method statement.
No watercourses will be left dammed overnight.
The cable will be buried at sufficient depth below watercourses, at least 1.5 m, to prevent scour and to allow a natural substrate to develop.
HDD technique used to maintain integrity of installed flood defences.
Method statement for constructions works to be agreed with the Environment Agency in relation to impacts on fish populations and spawning grounds (e.g. rescue/release).
No storage of spoil directly on watercourse banks. Where possible, spoil set back 5 m from watercourses to prevent excessive loading on the watercourse banks and minimise risk of stored material entering watercourses.
Where practical, refuelling of mobile plant carried out a minimum of 30 m from any watercourse (and not on slopes leading to watercourses).
Bank and bed material stored separately to aid reinstatement. Topsoil, subsoil and bedrock stored separately and replaced in sequence as part of site restoration work.
Banks of watercourses reinstated following construction. Soft revetment materials used wherever possible to stabilise banks, where necessary.
Complete and effective restoration of drains and ditches and any identified land drainage connections.
Oil and fuel storage tanks to be robust, provide adequate secondary containment (bunded areas), located in designated

areas taking into account security, the location of sensitive receptors and pathways, such as drains and watercourses, providing safe access and egress for plant.

Table 13: Key embedded mitigation measures

32. In addition, to minimise potential impacts from the construction phase on land, surface water or groundwater receptors, contractors will be expected to adhere to relevant Environment Agency's Pollution Prevention Guidance (PPG) notes, as well as general good construction practice, including, :

- PPG01 – General guide to the prevention of water pollution
- PPG05 – Works near or liable to affect watercourses
- PPG06 – Working at construction and demolition sites
- PPG08 – Storage and disposal of used oils
- PPG11 – Preventing pollution at industrial sites
- PPG20 – Dewatering of underground ducts and chambers
- PPG 21: Pollution incident response planning
- Control of water pollution from construction sites – A guide to good practice
- The SUDS Manual, C753
- Site Handbook for the Construction of SUDS, C698
- CIRIA Report C502 Environmental Good Practice on Site
- CIRIA Report C532 Control of Water Pollution from Construction Sites
- CIRIA Report C648 Control of Pollution from Linear Construction Project Technical Guidance
- CIRIA Handbook C741 Environmental Good Practice on Site
- CIRIA Handbook C651 Environmental Good Practice on Site Checklist

4 Assessment

4.1 Assessment Results

1. Table 14 presents the results of the WFD compliance assessment. Construction, operation and decommissioning activities have been considered, although construction works are thought to present the worst case scenario in terms of potential affects at the water body level. The WFD assessment is based on expert judgement and impact assessments reported in the EA ONE Environmental Statement.

Water Body (Type)	Assessment
Bucklesham Mill River (Riverine)	The 2015 classification results show that this riverine water body is currently failing to achieve good status, due to the ecological parameter 'fish'. The use of HDD will ensure no physical disruption to this water body. Open cut trenching is not proposed upstream of this water body and, therefore, no significant effects are anticipated on WFD elements. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Fynn (Riverine)	The 2015 classification results show that this riverine water body is currently failing to achieve good status due to the ecological parameters 'fish' and 'phosphate'. The use of HDD will ensure no physical disruption to this water body. A specific method statement will be developed for the River Fynn, recognising the potential sensitivity due to the presence of naturalised brown trout and eels. Increased phosphate (nutrient) concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), while embedded mitigation measures are designed to reduce contaminants entering watercourses. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Gipping (d/s Stowmarket) (Riverine)	The 2015 classification results indicate that this riverine water body is currently failing to achieve good status due to the ecological parameters 'macrophytes and phytobenthos combined', 'phosphate' and 'mitigation measures assessment' (i.e. measures currently '*Not In Place*'). The use of HDD will ensure no physical disruption to this water body. Increased phosphate (nutrient) concentrations are not anticipated due to the construction works (more likely from surface run off from agricultural land), whilst embedded mitigation measures are designed to reduce contaminants entering watercourses. In addition, mitigation measures currently '*Not In Place*' for this water body will not be prevented from their implementation in the future. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Lark (Riverine)	The 2015 classification results indicate that this riverine water body is currently failing to achieve good status due to the ecological parameters 'fish' and 'phosphate'. The use of HDD will ensure no physical disruption to this water body. However due to a reinterpretation of the ground conditions at this crossing an option to cross using open cut methods, damming and overpumping is under consideration. A specific method statement will be developed for the River Lark, recognising the potential sensitivity due to the presence of naturalised brown trout and eels. Increased phosphate (nutrient) concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), whilst embedded mitigation measures are designed to reduce contaminants entering watercourses.

	Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Lark - Fynn (d/s confluence) (Riverine)	The 2015 classification results indicate that this riverine water body is currently failing to achieve good status due to the ecological parameters ‘fish’ and ‘phosphate’, as well as the ‘mitigation measures assessment’ (i.e. measures currently ‘*Not In Place*’). The use of HDD will ensure no physical disruption to this water body. As stated above, a specific method statement will be developed for both the River Lark and River Fynn, recognising their potential sensitivity due to the presence of naturalised brown trout and eels. Increased phosphate (nutrient) concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), while embedded mitigation measures are designed to reduce contaminants entering watercourses. In addition, mitigation measures currently ‘*Not In Place*’ for this water body will not be prevented from implementation in the future. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Somersham Watercourse (Riverine)	The 2015 classification results indicate that this riverine water body is currently failing to achieve good status due to the ecological parameter ‘phosphate’. The use of HDD will ensure no physical disruption to this water body. Increased phosphate (nutrient) concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), while embedded mitigation measures are designed to reduce contaminants entering watercourses. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Deben (Transitional)	The 2015 classification results indicate that this transitional water body is currently failing to achieve good status due to the ecological parameters ‘dissolved inorganic nitrogen’ and ‘mitigation measures assessment’. The use of HDD will ensure no physical disruption to this water body, including the installed flood defences. Increased dissolved inorganic nitrogen concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), while embedded mitigation measures are designed to reduce contaminants (such as zinc) entering watercourses. In addition, mitigation measures currently ‘*Not In Place*’ for this water body will not be prevented from implementation in the future. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Orwell (Transitional)	The 2015 classification results indicate that this transitional water body is currently failing to achieve good status due to the ecological parameters ‘angiosperms’, ‘invertebrates’, ‘and dissolved inorganic nitrogen’. The cable route does not intersect this water body; however, it is located downstream of the proposed crossing of the Somersham Watercourse water body. The use of HDD at the Somersham Watercourse will however ensure no physical disruption to this water body and so it is unlikely that the Orwell transitional water body will be affected. Increased dissolved inorganic nitrogen concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), while embedded mitigation measures are designed to reduce contaminants entering watercourses. The size of this water body (compared to the scale of the proposed works) and the distance from the proposed upstream water crossings suggests it is unlikely that significant effects causing deterioration in status will occur. Embedded mitigation measures ensure that no

	deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Harwich Approaches (Coastal)	The 2015 classification results indicate that this coastal water body is currently failing to achieve good status due to the ecological parameter 'dissolved inorganic nitrogen'. The cable route does not intersect this water body; however, it is located downstream of the proposed crossing of the Somersham Watercourse water body. The use of HDD at the Somersham Watercourse will ensure no physical disruption to this water body. Increased dissolved inorganic nitrogen concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), while embedded mitigation measures are designed to reduce contaminants entering watercourses. The size of this water body (compared to the scale of the proposed works) and the distance from the proposed upstream water crossings suggests it is unlikely that significant effects causing deterioration in status will occur. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Suffolk (Coastal)	The 2015 classification results indicate that this coastal water body is currently failing to achieve good status due to the ecological parameter 'dissolved inorganic nitrogen'. The use of HDD at the landfall will ensure no physical disruption to this water body. Increased dissolved inorganic nitrogen concentrations are not anticipated due to the construction works (more likely a result of surface run off from agricultural land), while embedded mitigation measures are designed to reduce contaminants entering watercourses. The size of this water body (compared to the scale of the proposed works) and the distance from the proposed upstream water crossings suggests it is unlikely that significant effects causing deterioration in status will occur. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Felixstowe Peninsula Crag and Chalk (Groundwater)	The 2015 classification results indicate that this groundwater water body is currently failing to achieve good status due to the chemical (groundwater) status parameter 'general chemical test'. There is the potential risk of accidental spillages from oil and fuel storage facilities associated with the construction works, as well as accidents relating to construction materials. If products are leached into groundwater, this could have detrimental effects. If these effects occur prior to the construction of the site drainage network then direct discharge to either a watercourses or to groundwater may be a consequence. The sensitivity of the surrounding groundwater, within Source Protection Zones I, are considered to be high; however, embedded mitigation measures such as the required use of impermeable surfaces, full bunding of fuel stores and following best practice in handling of materials would render a negligible magnitude of impact. Embedded mitigation measures ensure that no deterioration in status will occur in this water body and, therefore, impacts affecting future status objectives are not anticipated.
Waveney and East Suffolk Chalk and Crag (Groundwater)	The 2015 classification results indicate that this groundwater water body is currently failing to achieve good status due to the quantitative parameter 'quantitative water balance, as well as chemical (groundwater) status parameters 'chemical drinking water protected area' and 'general chemical test'. There are no predicted impacts associated with the works on quantitative elements of the groundwater. The proposed works will not impact upon the quantity of groundwater or groundwater flows, and will not affect connectivity between groundwaters and any groundwater-dependent terrestrial ecosystems. There is the potential risk of accidental spillages from oil and fuel storage facilities associated with the construction works, as well as accidents relating to construction materials. If a spilt product was leached into groundwater this could have detrimental effects. If these effects occur prior to the construction of the site drainage network then direct discharge to either a

	watercourse or groundwater may be a consequence. The sensitivity of the surrounding groundwaters, within Source Protection Zones, I are considered to be high; however, embedded mitigation measures such as the required use of impermeable surfaces, full bunding of fuel stores and following best practice handling of materials would render a negligible magnitude of impact. Embedded mitigation measures ensure that no deterioration in status will occur in this or connecting (downstream) water bodies and, therefore, impacts affecting future status objectives are not anticipated.
Protected Areas	The Habitats Regulations Assessment (HRA) concluded that the development, alone or in-combination with other reasonable foreseeable plans or projects, would have no significant impact on the integrity of any Natura 2000 site or its network. The cable route does not intersect designated bathing waters or shellfish water (nearest site >5 km from cable route) and, therefore, no impacts are anticipated. The construction works will not introduce nutrients (e.g. nitrates, phosphates) to the environment and, thus, will not influence the surrounding NVZ or contribute to eutrophic conditions.

Table 14: WFD Compliance Assessment

4.2 Additional Mitigation Measures

2. Based on the above assessment (Table 14), additional mitigation measures are not required to reduce the potential impact. The embedded mitigation measures (summarised in Section 3.3), are considered to be sufficient to ensure minimal impacts and associated effects on WFD water bodies and protected areas.

4.3 Contribution to Improvements in WFD Status

3. Whilst this WFD compliance assessment primarily aims to determine whether there will be an adverse effect at the water body level from the proposed works, there is also a requirement to consider whether the development could be designed in such a way as to contribute to the improvement in status of any failing WFD parameters. However, given the small scale of impact anticipated from the construction works along the cable route on relevant water bodies, primarily due to the use of HDD, it is considered unlikely that improvements to WFD status would be achievable as part of this development. In discussion and agreement with the Environment Agency, the local IDB's and land owners, for the various watercourse crossings required, any localised improvements that may be incorporated into the required reinstatement of the crossing locations would however be considered

5 Conclusion

1. It is concluded that the construction works associated with the EA ONE onshore works will have only a temporary (i.e. no permanent) effect on the status of WFD parameters that is significant at the water body level. The cable installation works are not predicted to cause deterioration to the current status of water bodies in the locality of the cable route or prevent these water bodies from achieving future status objectives/improvements.

6 References

1. Department for Environment, Food and Rural Affairs (Defra) (2012). Waste water treatment in the United Kingdom – 2012. Implementation of the European Union Urban Waste Water Treatment Directive – 91/271/EEC.

2. Department for Environment, Food and Rural Affairs (Defra) (2014). Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment. May 2014.

3. English Nature (2001a). Alde-Ore Estuary European marine site. English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994. Issued 25 May 2001.

4. English Nature (2001b). Deben Estuary European marine site. English Nature's advice given under Regulation 33(2) of the Conservation (Natural Habitats &c.) Regulations 1994. Issued 23 January 2001.

5. Environment Agency (2012a). Clearing the waters. A user guide for marine dredging activities – Stage one: the screening stage. May 2012.

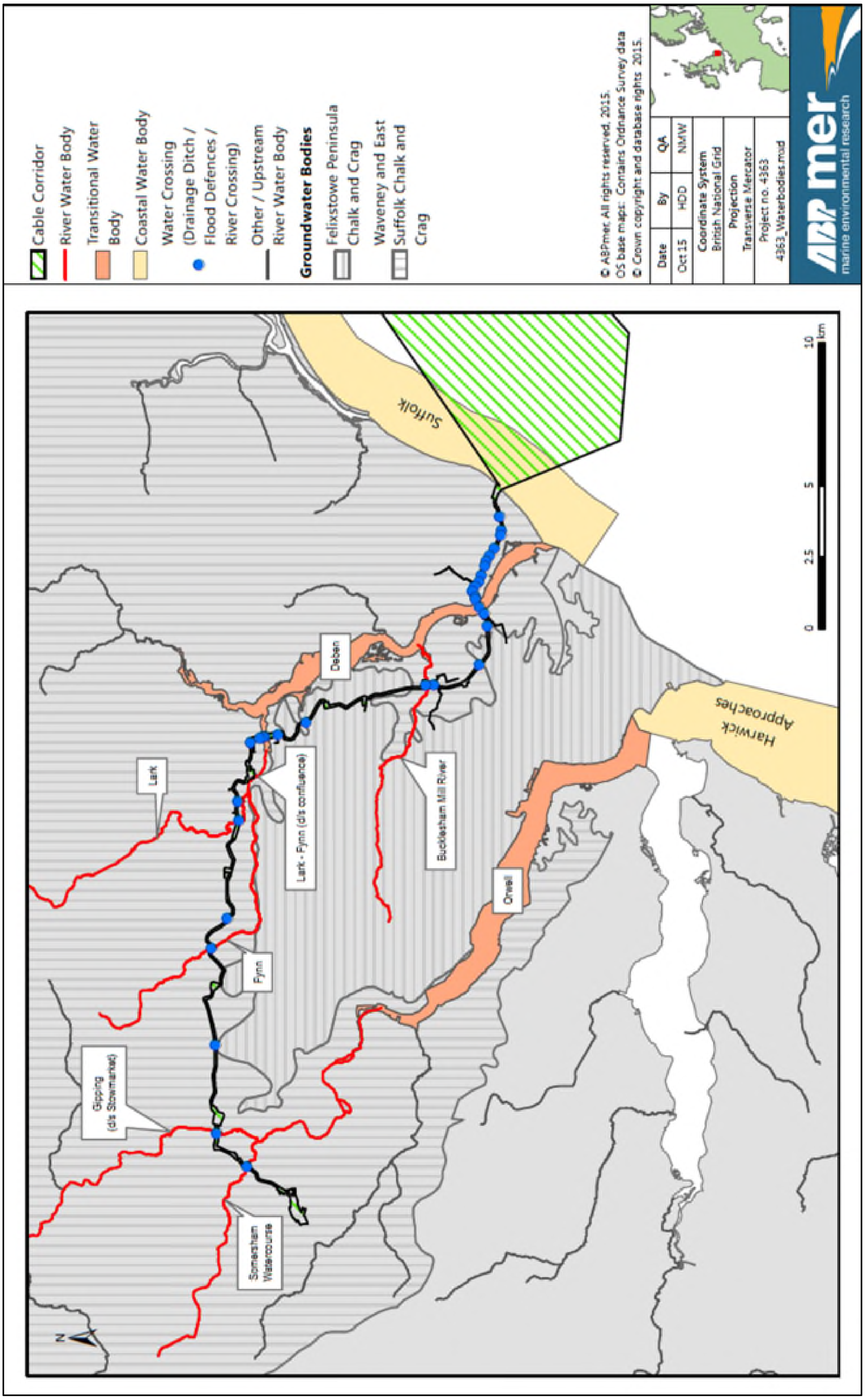
6. Environment Agency (2012b). Clearing the waters. A user guide for marine dredging activities – Stage two: new projects process. May 2012.

7. Environment Agency (2012c). Clearing the waters. A user guide for marine dredging activities – Stage three: assessment. May 2012.

8. Environment Agency (2012d). Clearing the waters. A user guide for marine dredging activities – Stage four: identification and evaluation of measures. May 2012.

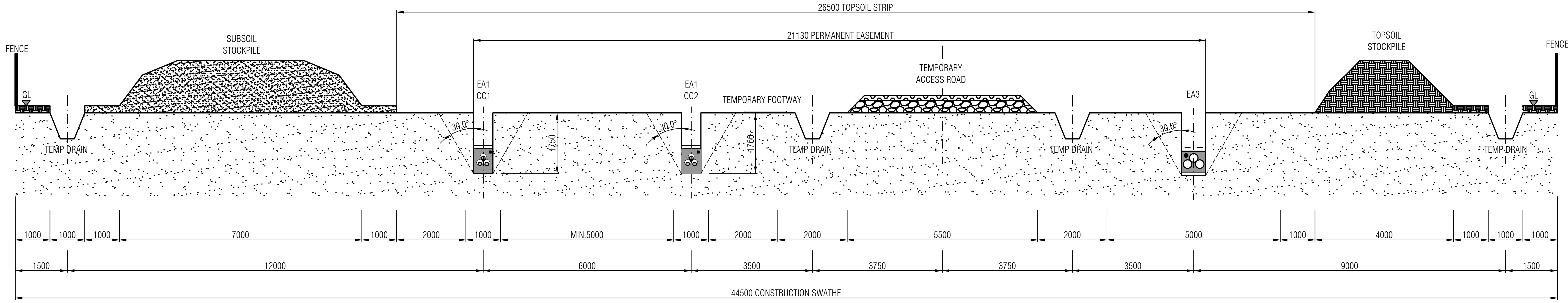
9. Environment Agency (2016). Anglian River Basin Management Plan (RBMP). Anglian River Basin District.

Figure 1 Screened Surface and Groundwater Water Bodies

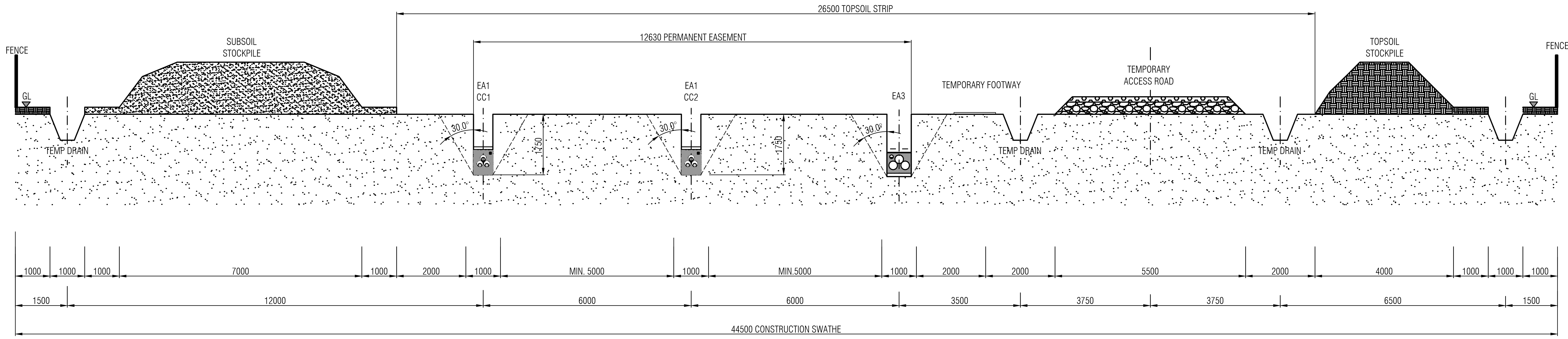


Appendix 2 Construction Swathe Indicative Cross Section

VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 1



VIEW FROM SHORE LANDING TOWARDS SUBSTATIONS OPTION 2



NOTES:
1- PASSING PLACES EACH 250 m.(FIG.1)
2- TURN ARROUND AREAS EACH 750m. (FIG.2)
3- "V" BUCKET MAY BE USED (SEE PHOTO)

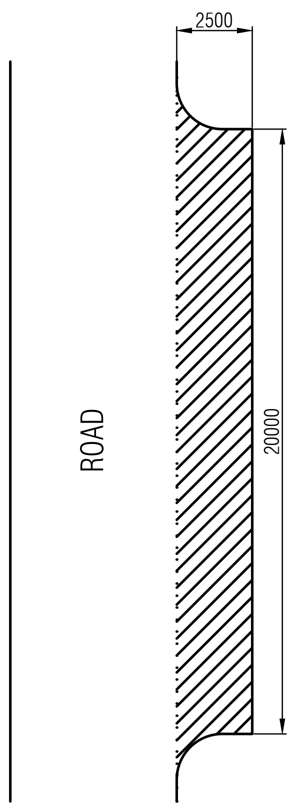


FIGURE 1

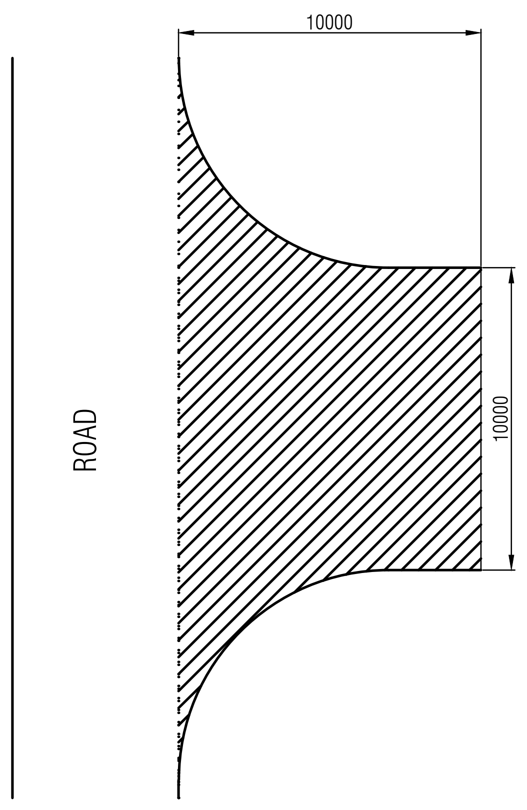


FIGURE 2

"V" BUCKET

Rev.	Date	Prepared	Reviewed	Approved	Reason / Description of changes.

IBERDROLA Engineering & Construction	Status Stamp:
Project:	EAST ANGLIA
Location:	BAWDSEY TO BRAMFORD
Contractor:	Status Stamp:
Drg. Title:	CONSTRUCTION SWATHE TYPICAL CROSS SECTION
Client: SCOTTISHPOWER RENEWABLES	Date of First Issue: 15-07-2016
Prepared / Reviewed / Approved	IMFE / GRAT / FEDO
Drg. No.:	EA1-GRD-E-IEC-007883
Contractors Drg. No. :	
Sheet:	1
Next:	-
Rev:	0
Scale:	1:100
Size:	A2

Appendix 6 Watercourse Crossing Method Statement

East Anglia ONE
Offshore Windfarm

East Anglia ONE Offshore Windfarm

Watercourse Crossing Method Statement Appendix 6 Code of Construction Practice Final for Approval

SCOTTISHPOWER RENEWABLES

www.scottishpowerrenewables.com

Table of contents

Appendices

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State for the Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE). The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. In February 2015 EAOL secured a Contract for Difference (CfD) award to build a 714MW project and ScottishPower Renewables announced its role in leading EA ONE towards construction. In April 2015 EAOL submitted a non-material change application to DECC to amend the consent from direct current (DC) technology to alternating current (AC). In March 2016, DECC authorised the proposed change application and issued a Corrections and Amendments Order.

3. This plan relates to the onshore construction works associated with EA ONE, which based on the AC technology with a capacity of 714MW, comprises;

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, approx. 37km in length.
- Up to four cable ducts for future East Anglia THREE project.
- An onshore substation located at Bramford next to existing National Grid infrastructure.

1.2 Purpose and Scope

4. This Watercourse Crossing Method Statement sets out the crossing methods which will to be applied to the construction of the EA ONE onshore construction works. This document forms an appendix to the Code of Construction Practice (CoCP) and fulfils DCO Requirement 20 (2) (b) which states:

> ***20.****—(2) The code of construction practice must include (...)*
> *(b) watercourse crossing method statement*

5. The document provides information on the watercourses to be crossed, the different types of crossing that will be used as part of the onshore construction works and details of proposed methods of crossing. It also details control measures which shall be implemented to safeguard surface water quality and ensure no adverse impact on local drainage, flood risks or fisheries.

6. The information contained herein shall be adhered to by EAOL and their appointed construction contractors and used by them to produce a detailed site specific method statement for each watercourse crossing in order to obtain the required water crossing consent, in consultation with the Environment Agency and / or Internal Drainage Board.

2 Watercourse Information

7. A total of 45 watercourse crossings have been identified along the 37km length of the EA ONE onshore cable route, which have been divided into categories based on their designation, size and key characteristics, which has identified the following:

- Two ‘main rivers’ in excess of 100m with flood defence embankments (River Deben and Martleshem Creek)
- Five ‘main rivers’ with no flood defence embankments (Kirton Creek, River Gipping, River Fynn, River Lark, Somersham Watercourse)
- 38 ‘ordinary watercourses

8. Specific details of each watercourse are presented on the crossing schedule presented in Table 8.1 in Section 8 and a plan showing the watercourse crossing locations is presented in Appendix 1.

3 Types of Watercourse Crossing

9. Each watercourse has the potential to require two types of crossing, a temporary crossing to allow construction vehicle access, and a permanent crossing under the watercourse for the purposes of installing the cable.

3.1 Permanent Cable Crossings

10. The cables are to be laid will be remain permanently in place for the lifetime of the cable connection. There are two basic watercourse crossings options for the purposes of the cable installation, these are:

- Horizontal Directional Drilling (HDD).
- Dry Open Cut Trenching.

3.2 Temporary Vehicle Crossings

11. Temporary access across each watercourse will be achieved through the installation of either a flume pipe(s) or bridge and construction of a temporary haul road to enable plant and machinery to cross the watercourse during construction, to minimise delay and impacts on local roads of construction plant and machinery. In all cases, construction plant and vehicles will be prohibited from driving through watercourses.

12. Once construction of the onshore cable route is completed, these temporary vehicle crossings will be removed and the watercourse / banks will be reinstated to their previous condition.

13. A description of each of the methods and control methods used to install each of these crossing types is provided in the following sections.

4 Horizontal Directional Drilling

4.1 Horizontal Directional Drilling Method

14. Where, due to the existence of obstacles, it is not possible to install the cable ducts using the open trench method, trenchless installation techniques shall be used, namely Horizontal Directional Drilling (HDD). This involves creating an access pit on either side of the obstacle to facilitate the installation of the drilling equipment and allow drilling under the obstacles, at an appropriate depth.

15. The trenchless options require the use of specialist drilling and pulling equipment to install the cable ducting, avoiding the need to dig an open trench. Two main categories of trenchless operation have been identified along the onshore cable route; Category 1 and Category 2.

16. Category 1 trenchless locations are to address those sites with major obstructions, corresponding to the locations identified in the DCO Requirement 10 and involve drill lengths greater than 100m. These include the River Deben, Kirton Creek, Martlesham Creek and the River Gipping. At each of these crossings the working corridor is wider (as defined by DCO Requirement 10 (6) (a)) to allow sufficient for a dedicated HDD compound.

17. Category 2 trenchless locations are crossings of lesser obstructions or to reduce disruption and are shorter in length to the Category 1 locations (less than 100m length). These works will take place within the standard cable corridor working width (up to 55m) and do not require any additional compounds. These include Rivers Fynn and Somersham and Queens Fleet ordinary watercourse.

18. An assessment was undertaken to establish the feasibility of HDD at the River Lark considering the sensitivity of the river. Ground investigations identified the presence of sand and gravels in this area which lead to a high degree of risk to ground collapse, drill failure and fluid leakage. Such a collapse or fluid leakage could lead to s significant environmental incident. Therefore the ground conditions are considered to be too high risk for HDD and therefore an open trench method will be employed at this location. This allows for the works to be undertaken in a more controlled manner and reduce the risk of significant environmental incident, with strict environmental control in place to manage the sensitivities at the location.

19. A typical HDD operation involves three distinct stages:

- Drilling a pilot hole from the entry point to the exit point.
- Reaming of the bore using special cutting heads, to enlarge the bore to the required diameter.
- Pulling a one or more ducts back through the reamed hole.

20. The addition of a drilling fluid, such as bentonite (a type of clay), is used to lubricate the drill head during cutting and also to assist in the removal of waste spoil out of the hole, as it is widened (reamed). This procedure is repeated until the drilled hole has reached the intended final diameter. The hole is typically cut to a size 1.5 times larger than the duct it has to carry. This additional diameter is to allow the easier removal of drill cuttings and the installation of the duct, allowing for any soil expansion that may occur during pulling. At each HDD site, the above process will be repeated until all of the required ducts are installed at the crossing.

21. Further details on the construction methodology is provided in Cable Method Statement (EA1-CON-R-OBR-021238), provided under separate cover.

4.2 Horizontal Directional Drilling Environmental Control Measures

22. Horizontal Directional Drilling, by its very nature is designed to ensure that there is no interaction between the excavation and the watercourse. The HDD trench will be drilled to a depth sufficient to ensure that there is no risk of interaction with the water environment, and will be a minimum of 1.5m below the hard bed of the watercourse and extend not less than 3m from the brink of the river bank before rising at a slope no greater than 1 vertical to 1.5 horizontal.

23. During the detailed design process for each HDD crossings drawings shall confirm the soffit levels (above Ordnance Datum) of the installation and the watercourse bed levels and ensure the integrity of any existing flood defence is not compromised by the cable installation. It is not anticipated that any ground investigation boreholes are required through any river beds

locations to determine the depths for the HDD, however should they be required then the Environment Agency shall be consulted at the earliest stage.

24. Permanent marker posts will be positioned on the bank of the rivers to indicate the owner of the apparatus, location of the under-crossing and the nature of the works. If the channel is less than 10m wide posts should be set in one bank. For channels greater than 10m wide, posts should be set in both banks.

25. The following measures will be implemented to minimise environmental impacts at HDD crossing locations:

- Construction methods will take into consideration plant and animal life, upstream and downstream of the crossing, and will be in accordance with the requirements of the Ecological Management Plan (EA1-CON-F-IBR-021237) provided for by DCO Requirement 19, specifically the mitigation for Schedule 1 Birds at the River Deben and Martlesham Creek.
- Care will be taken during the watercourse restoration to ensure that no unacceptable environmental harm occurs
- All works will be undertaken in accordance with relevant Environment Agency best practice guidelines
- Where practical refuelling of mobile plant will be carried out a minimum of 30m from any watercourse (and not on slopes leading to watercourses).
- Spill control measures will be employed, including drip trays, nozzles and absorbent pads as appropriate. The design of bowsers, hoses etc. will be checked to ensure that they are not vulnerable to rupture or leak, e.g. because of exposed pipe-work
- Adequate spill kits will be kept in all site vehicles and plant and staff will be trained in their use
- All spillages to ground or watercourses will be reported and recorded as part of incident notification procedures to the statutory authorities.
- Within floodplains gaps will be provided at intervals within soil or other material stockpiles to act as drainage pathways, to ensure that floodwater drainage is not hindered and flooding exacerbated.
- Within floodplains stockpiles will be constructed with a regular profile and the surface compacted to minimise the potential for erosion by flowing water.
- Any oils, fuels or chemicals stored within HDD compounds shall be in accordance with the measures stated in Section 10 (Storage and use of Oils and Chemicals) of the Code of Construction Practice.

5 Open Cut Trenching

5.1 Open Cut Trenching Method

26. The open cut trenching method will be used for the installation cables along the majority of the onshore cable route. The open cut trench method involves the excavation of a trench, installation of the cable ducts and then the backfilling of the trench. The ducts will be surrounded by a thermally stable backfill of cement bound sand (CBS) and backfilled with the excavated materials to the previous level. The ducts will be laid to a minimum depth to the top of the cables is 1.25m below ground level and at all main river crossings minimum of 1.5m below the hard bed of the watercourse and extend not less than 3m from the brink of the river bank before rising at a slope no greater than 1 vertical to 1.5 horizontal.

27. The cable and ducts for EA ONE will be installed in two parallel trenches, with a further trench containing the ducts for the EA THREE proposed project. For details on the construction methodology is provided in Cable Method Statement (EA1-CON-R-OBR-021238), provided under separate cover.

28. During the open cut trenching works the watercourse has be crossed using the dry open cut technique which creates a dry section of the river bed for the installation, temporarily diverting or containing flow from the channel. During the dry open cut works the flow could be controlled using two methods:

- A flume pipe technique
- An over-pumping technique

29. If streams are ephemeral and the ditch is dry at the time of the crossing the below measures will not be required, however best practice soil storage and separation techniques will still be employed.

5.1.1 Flume Pipe Technique

30. The first task will be to temporarily install one or more sections of flume pipe within the watercourse to allow uninterrupted flow of the water within the watercourse during installation. Flume pipes will be sized in accordance with expected flows and will be oversized to compensate for any expected high flows. Hydraulic analysis has been undertaken to inform the appropriate size of flumes, see Section 7 for further details.

31. The soil would then be stripped from the areas adjacent to the watercourse banks and grading the banks down to bed level. The stripped topsoil will then be stacked separately from subsoil within the working area.

32. The cable trench will then be excavated below the flume pipes. The trench excavation will be checked for sufficient depth of cover through the crossing. Spoil from the trench excavation will be stored in the working width areas next to the crossing or removed by dump truck along the working area. River bed material will be stored separately from the bank materials and replaced following installation of the ducting.

33. De-watering, using appropriate sediment control techniques and/or trench supports may be used to facilitate safe excavation. If pumps are used, the discharge hose will be directed through a filtering medium to remove silt, before the pumped water is allowed to percolate back into the watercourse.

34. Once the ducting is installed beneath the flume pipe the trench will be backfilled first with subsoil and secondly with the stored watercourse materials such that it is level with the rest of the bed of the watercourse. The watercourse banks will be reformed to their original profile with the excavated material and/or stone pitching and/or soil filled bags or other protection where necessary.

35. On completion of installation and backfilling, the flume pipes will be carefully removed to allow the river to flow over the excavated area as slowly as possible to minimise sediment generation.

5.1.2 Over-pumping Technique

36. In this method, a temporary dam will be constructed and the water will be pumped around the trench.

37. The watercourse will be dammed at both sides of the proposed excavation with sand bags and water will be pumped over the area to be excavated. To prevent overland flood-flow, the top of the sandbag dams will be set lower than the bank-top so that during the works, in the event of pump failure water would return to the channel downstream of the work. Straw bales or similar will be placed downstream to capture sediment, being replaced as required until reinstatement is complete.

38. The area of water between the dams will be inspected for fish and other aquatic life; any wildlife present will be carefully relocated to the other side of the dam (see Section 5.3). This area will then be pumped dry allowing the excavation to start in the dry river/ditch bed. Over pumping will require pumps with sufficient capacity for dealing with twice the volume of water should any sudden rise in the water level or flash flooding occur. Proposals for temporary dams will be subject to prior assessment of weather and water flow conditions. Hydrological flow analysis has been undertaken to inform over-pumping arrangements to understand the flow regimes of the subject watercourses under a range of flow conditions (from typical to larger, flood events), see Section 7 for further details. The detailed proposals for the pump capacity and temporary dams shall be agreed with the Environment Agency or Internal Drainage Board.

39. Pumps will be positioned at the maximum practicable distance from the watercourse. Standby pumps will also be provided where the pumps are operated continuously. Where relevant, in consultation with the Environment Agency/Internal Drainage Board, where required pumps will be fitted with grills to prevent fish entering them. The pumped water is filtered, where necessary, to remove sediment before being discharged back into the watercourse. Straw bales or similar will be used to catch sediment. Sediments, break tanks or similar will also be used, where necessary, to break the fall of the released water in order to minimise scouring or sediment generation.

40. Small crossings will be excavated using a single machine generally digging from one side to the other. The trench excavation will be checked for sufficient depth of cover through the crossing.

41. Spoil from the trench excavation will be stacked in the working width areas next to the crossing or removed by dump truck along the working area. Riverbed material will be stored separately and replaced following installation of the pipe. Once the ducting is installed the trench will be backfilled first with subsoil and secondly with the stored watercourse materials such that it is level with the rest of the bed of the watercourse.

42. The watercourse banks will be reformed to their original profile with the excavated material and/or stone pitching and/or soil filled bags or other protection where necessary. On completion of installation and backfilling, the pumps will be stopped and the dams carefully removed to allow the river to flow over the excavated area as slowly as possible to minimise sediment generation. The reinstated watercourse will be checked subsequently to ensure that flood flows have not caused damage.

43. It is proposed to use the over-pumping technique at the River Lark to minimise the impact on the river channel at this location. Over pump section will be no greater than 20m, the pump will be installed with fine mesh encasement or barrels with water inlets to prevent fish being drawn through pump unit. Works to be staged so no pumping activities to be undertaken overnight.

5.2 Open Cut Environmental Control Measures

44. The following measures will be implemented to minimise environmental impacts during all open cut crossings:

- The effect of sediment mobilisation into a watercourse will be monitored through regular dissolved oxygen readings (every 30 minutes). Work will be stopped if dissolved oxygen levels fall below 50%, and not recommenced until they rise above 50%.
- All watercourses and ditches will be maintained in effective working condition across the full working width for the duration of the works, and will be restored to a condition at least as good as before the commencement of the works.
- Where appropriate, any river channel habitat enhancement (e.g. profile modification or construction of channel features such as gravel riffles or berms) proposals will be discussed and agreed with the Environment Agency to ensure that they would not increase flood risk.

- Construction methods will take into consideration plant and animal life, upstream and downstream of the crossing, and will be in accordance with the requirements of the Ecological Management Plan (EA1-CON-F-IBR-021237) provided for by DCO Requirement 19.
- Bank-side vegetation would be retained, with trees and shrubs coppiced rather than grubbed-out where practicable. Any habitat removal required along banks would, where practicable, be restricted to the minimum working width of 35m
- Any aquatic vegetation removed during the process would be retained on the adjacent banks for 24 hours to allow the aquatic fauna to return to the water.
- Bank and bed material will be stored separately to aid reinstatement. Topsoil, subsoil and bedrock will be stored separately and replaced in sequence as part of site restoration work. Where possible spoil will be set back 5m from watercourses to minimise potential for silt run off from the working width, and outside Flood Zones 2 or 3 where possible. Where unavoidable, heaps will be placed as far away from the river as is possible and for the shortest time possible.
- Flume pipes will be in place for the duration of the construction period. Where possible at crossings a 5m strip of vegetation would be retained to act as a natural buffer. Full restoration of the site, including the dismantling of any flume pipes will be undertaken when the whole cable has been laid.
- Appropriate measures will be applied to match the individual circumstances of each watercourse or ditch crossing. The techniques used will aim to provide rapid reinstatement, bank stabilisation and cable protection. In all instances, banks will be re-profiled to match the existing bank. If necessary, additional measures will be taken to ensure that the banks remain stable. The size of the bank and flow rate in the channel will determine the techniques or combination of techniques to be used, and this will be discussed/agreed with the Environment Agency/Internal Drainage Board.
- Any gravels removed will be returned to the river in the location from which they were removed.
- Care will be taken during the watercourse restoration to ensure that no unacceptable environmental harm occurs.
- All works will be undertaken in accordance with relevant Environment Agency best practice guidelines.
- Where practical refuelling of mobile plant will be carried out a minimum of 30m from any watercourse (and not on slopes leading to watercourses).
- Spill control measures will be employed, including drip trays, nozzles and absorbent pads as appropriate. The design of bowsers, hoses etc. will be checked to ensure that they are not vulnerable to rupture or leak, e.g. because of exposed pipe-work.
- Mobile plant will be returned to the Construction Consolidation Sites each night.
- Adequate spill kits will be kept in all site vehicles and plant; additional stocks will be issued to watercourse crossing crews and the emergency crew(s) and staff will be trained in their use.
- All spillages to ground or watercourses will be reported and recorded as part of incident notification procedures to the statutory authorities.
- Within floodplains gaps will be provided at intervals within soil or other material stockpiles to act as drainage pathways, to ensure that floodwater drainage is not hindered and flooding exacerbated.
- Within floodplains stockpiles will be constructed with a regular profile and the surface compacted to minimise the potential for erosion by flowing water.
- No watercourses will be left dammed overnight.
- Consideration will be given to where, over time, the installed cables and ducting could become exposed and create an unnatural blockage in the river that could prevent fish passage and sediment transport. Where there is the potential for this to occur (eg locations with higher flows), a maintenance monitoring regime will be proposed and an undertaking given to carry out any remedial works.
- Fill material for sandbags will be selected to ensure that there can be no leeching of salt.

5.3 Protection of Fish during Open Cut Crossings

45. Where dry open cut techniques are employed the mitigation measures outlined below will be followed to ensure the protection of fish:

- All watercourses would be temporarily flumed (by installation of pipes) and ramps installed to allow uninterrupted flow of water within the watercourse.
- Any construction works in relation to watercourses (and therefore potentially impacting fish) will be subject to detailed method statement be agreed with the Environment Agency and / or Internal Drainage Board before the start of

construction. These method statements would detail the need for any fish rescue techniques and any mitigation measures to minimise sediment run off and pollution incidents in line with Environment Agency Pollution Prevention Guidance documents.

- The effect of sediment mobilisation into a watercourse will be monitored through regular dissolved oxygen readings (every 30 minutes). Work will be stopped if dissolved oxygen levels fall below 50%, and not recommenced until they rise above 50%.
- Consideration will be given to avoiding works in fish spawning seasons where required.
- Where required pumps will be fitted with grills to prevent fish entering them.

46. A specific method statement will be developed for the River Lark and agreed with the Environment Agency, recognising its sensitivity due to the presence of naturalised brown trout and eels. Suitable mitigation in the form of localised re-profiling of the river bed to create microhabitats could be considered within the DCO Order Limits.

47. Following the implementation of best practice techniques no significant impacts on fish and fish spawning habitats are anticipated as a result of the installation of the onshore cable route.

6 Temporary Vehicle Access

6.1 Flume Pipes

48. Flume pipe culverts are constructed by installing one or more sections of pipe in the watercourse ramped over to allow uninterrupted flow of water within the watercourse and a continuous running track for construction vehicles. These pipes are surrounded with sand bags before a temporary road is laid over the top. Additional sand bags are installed each side of the road to prevent mud falling over the side and temporary safety fencing erected where necessary. The sand bags shall ensure that flow over the deck can still occur if the pipes become blocked or an extreme flood event occurs. Access crossings will have temporary headwalls at both ends to reduce the risk of hardcore material making up the access track from collapsing into the watercourse.

49. Flume pipes shall be installed as per the methodology and control measures stated for flume technique in Section 5.

50. Flume pipes will be sized in accordance with expected flows and will be oversized to compensate for any unexpected high flows. Hydraulic analysis has been undertaken to inform the appropriate size of flumes, see Section 7 for further details. Monitoring will take place on a regular basis to ensure that no material from the running track over the temporary flumes enters the watercourse. If this does occur the material will be removed immediately.

51. These works shall not reduce the capacity or restrict the flow of the watercourse. Flume pipes will be in place for the duration of the construction period. Full restoration of the site, including the dismantling of any flume pipes will be undertaken when the whole cable has been laid.

52. A typical time frame for installing crossings using flumes ranges from 3-5 days with a maximum of approximately 10 days to install the flume at DRX-12 which runs through the HDD working area on the east of the Deben. Typical removal time frames to reinstate crossings would be in the range of 3-6 days.

6.2 Temporary Bridges

53. Temporary bridges will be installed to allow vehicle access across watercourses where flume pipes or culverts are not considered appropriate to be installed, that is at the River Fynn, Somersham Watercourse and Queens Fleet.

54. Bridges would come as prefabricated units. Concrete platforms would be constructed on either side of the crossing and then the bridge sections would be lowered and secured in place using a crane.

55. The temporary bridges would be installed for the duration of the crossing works and removed on completion. In order to ensure appropriate design of the bridge crossings hydraulic analysis has been undertaken to set the deck heights of temporary bridges.

56. For crossings where bridges are needed the abutments will be installed over 8 days. This will then need to be cured for 28 days and then the bridge installation can be completed in a final 1 day after this. Reinstatement would last 6 days with the bridge being removed over 1 day and the abutment removal taking 5 days.

7 Hydraulic Analysis

57. In order to ensure appropriate design of flume and bridge crossings and over-pumping arrangements understanding is required of the flow regimes of the subject watercourses under a range of flow conditions (from typical to larger, flood events). Hydraulic analysis is also required to size appropriate flumes and set the deck heights of temporary bridges.

58. The objectives of the assessments are therefore to:

- Quantify the typical and flood flow regimes of each watercourse in the crossing schedule that is to be crossed by open cut or temporary bridge.
- Undertake hydraulic calculations to size flumes and set appropriate bridge deck heights.

59. The assessment will be conducted utilising best practice hydrological and hydraulic modelling methodologies and software and in line with guidance provided by the CIRIA Culvert Design and Operation Guide (2010), the Environment Agency Flood Estimation Guidelines (2015) and the Flood Estimation Handbook (FEH).

7.1 Hydrological Flow Analysis

60. A hydrological assessment has been undertaken for each of the catchments draining 36 watercourse crossings locations, identified as WC1 to WC36, along the on shore cable route as indicated in Figure 1 below. All waterways are classified as Ordinary watercourses, with the exception of one Environment Agency designated Main River, the River Lark (WC36). The hydrological analysis was not undertaken at the locations which are to be crossed via HDD as there is no works proposed within the channel.

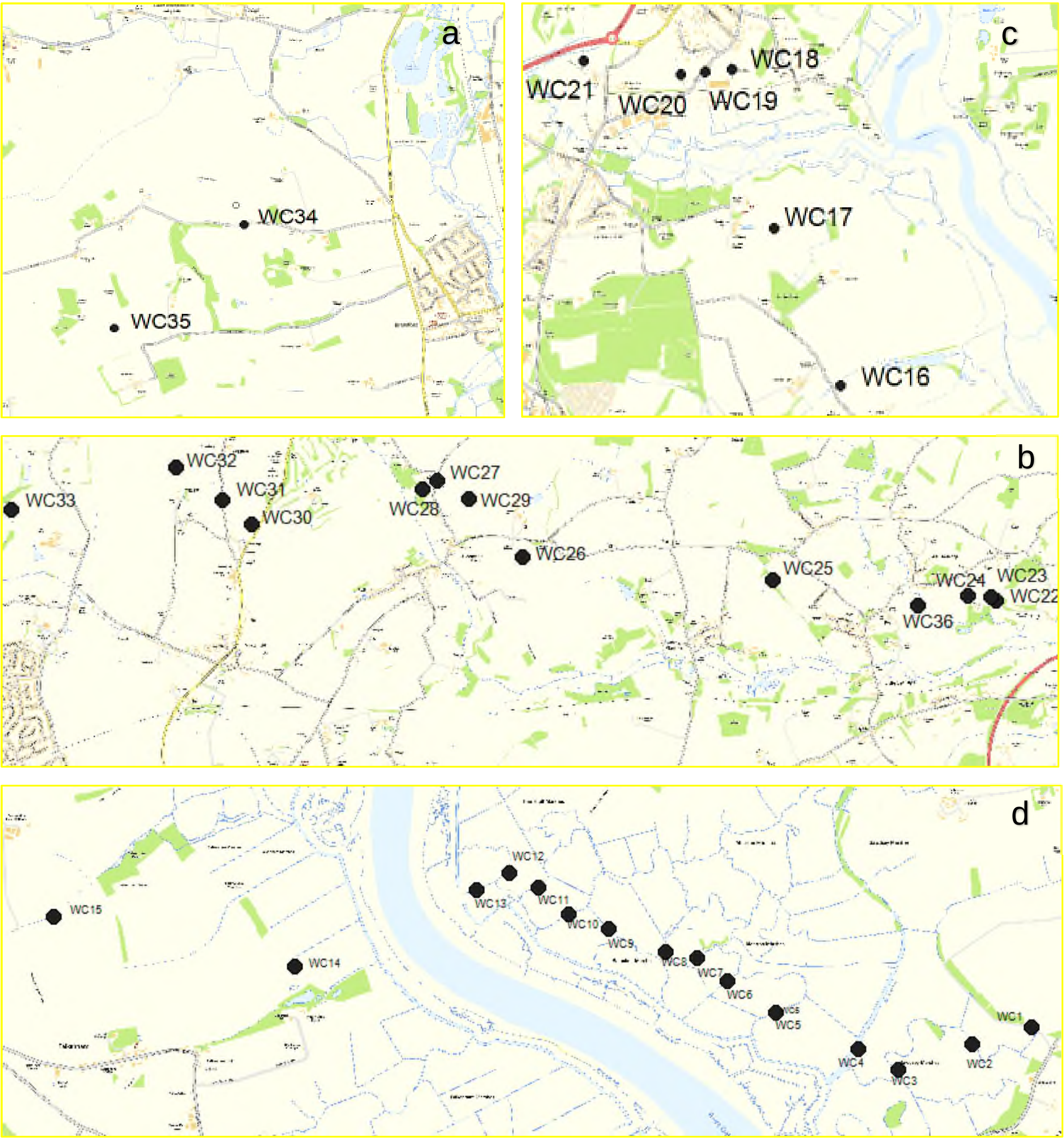


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Figure 1 Watercourse Crossing subject to Hydrological Assessment

61. The analysis outputs provide estimated watercourse flows that can be used in the design of temporary crossing flumes, over-pumping requirements and bridge deck heights for temporary access crossings.

62. Crossings WC1 to WC15 drain catchments that are heavily influenced by pumping regimes controlled by the operation of the Falkenham, Bawdsey and Kings Fleet pumping stations. Consultation with the East Suffolk Internal Drainage Board (IDB), has confirmed that there is insufficient data available to undertake flow estimation using the FEH methodologies. An alternate method of flow estimation agreed with the IDB has used channel geometry and photographic data obtained during site visits in July 2016 to use an empirical Manning's n equation to determine bank full flows. The bank full estimated flows are summarised in Table 7-1 below.

Table 7-1 Bank Full Estimated Flows WC1-WC15

Watercourse Crossing	Bank Full Flow Q (m^3/s)
WC1	0.002
WC2	0.013
WC3	0.100
WC4	0.057
WC5	0.026
WC6	0.01
WC7	0.03
WC8	0.02
WC9	0.04
WC10	0.11
WC11	0.01
WC12	0.02
WC13	0.01
WC14	0.01
WC15	0.01

63. The hydrological analysis for the crossings WC16 to WC36 has been undertaken using FEH methodologies and LowFlows software for the following flow conditions that could be expected to be experienced during the construction works:

- Typical 'summer' flow conditions – Q_{80} (flow equalled or exceeded for 80% of the time during a typical year)
- High flow conditions – Q_{MED} (equivalent to approximately the 1 in 2 year flow rate)

64. The estimated flows for each watercourse are summarised in Table 7-2 below.

Table 7-2 Bank Full Estimated Flows WC16-WC36

Watercourse Crossing (WC)	Q_{80} (m^3/s)	Q_{MED} (m^3/s)
WC16	0.006	0.100
WC17	0.001	0.010
WC18, WC19 and WC20 (Combined)	0.002	0.090
WC21	0.003	0.055
WC22	0.002	0.165
WC23	0.001	0.165
WC24	0.001	0.036
WC25	0.002	0.152
WC26	0.002	0.207
WC27	0.001	0.117
WC28	0.001	0.117

WC29	0.01	0.085
WC30	0.001	0.018
WC31	0.001	0.013
WC32	0.013	3.134
WC33	0.008	0.678
WC34	0.001	0.23
WC35	0.001	0.217
WC36 (River Lark)	0.0034	5.893

65. Further detail on hydrological assessment undertaken is contained in the Technical Memo 5001-UA008350-UU41, presented in Appendix 2.

7.2 Hydraulic Analysis

66. As discussed above, the crossings WC1 to WC15 drain catchments that are heavily influenced by the pumping regimes controlled by the operation of the Falkenham, Bawdsey and Kings Fleet pumping stations. It is recommended that during the works the flow capacity of the drains is maintained, where possible, by damming and temporary over pumping. Temporary over pumping capacity shall be provided to enable flows up to Bank Full Flow Q summarised in Table 7-1 above to be conveyed. If temporary over pumping is not possible, a flume/culvert that maintains the existing channel dimensions shall be installed for the duration of the works.

67. The hydraulic assessment of 19 crossings, WC16 to WC33 and WC36 (River Lark), has been undertaken. Table 7-3 below summarises the recommended flume or pumping arrangements based on the results of the indicative hydraulic assessment. Options for both fluming and pumping have been presented along with indicative minimum bridge soffit heights. Indicative flume diameters have been constrained by either the estimated channel depth or base width and do not include a freeboard allowance.

Table 7-3 Estimated Hydraulic Assessment Requirements

Watercourse Crossing	Indicative flume diameter (m) Q_{MED} (m^3/s)	Q_{80} (m^3/s)	Indicative pumping flow rate (m3/s)	Indicative Minimum Bridge height or deck (m) above channel bed	Comments
WC16	0.40	0.10	0.10	0.40	Base channel width has been assumed and needs to be confirmed.
WC17	0.20	0.10	0.01	0.20	
WC18	0.40	0.15	0.09	0.40	
WC19	0.40	0.15	0.09	0.40	
WC20	>0.30	0.15	0.09	0.40	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD or damming.
WC21	0.40	0.15	0.06	0.40	
WC22	0.55	0.15	0.17	0.55	Base channel width needs to be confirmed.
WC23	>0.50	0.10	0.17	0.60	Base channel width needs to be confirmed. Flume constrained by depth. Consider HDD.
WC24	>0.20	0.10	0.04	0.25	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD.

WC25	0.45	0.10	0.15	0.45	Base channel width needs to be confirmed.
WC26	0.45	0.10	0.21	0.45	
WC27	0.45	0.10	0.12	0.45	Channel depth needs to be confirmed.
WC28	0.40	0.10	0.12	0.40	Base channel width needs to be confirmed.
WC29	>0.40	0.10	0.09	0.45	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD.
WC30	0.20	0.10	0.02	0.20	Channel depth needs to be confirmed.
WC31	0.20	0.10	0.01	0.20	Base channel width needs to be confirmed.
WC32	>0.50	0.20	3.13	2.40	Channel depth and base width need to be confirmed. Flume constrained by depth and width. Consider HDD.
WC33	>0.40	0.15	0.68	0.80	Channel depth and base width need to be confirmed. Flume constrained by depth and width. Consider HDD.
WC36 (Lark)	>1.10	0.15	5.89	2.40	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD or damming.

68. Further detail on hydraulic assessment undertaken is contained in the Technical Memo 5001-UA008350-UU41, presented in Appendix 2.

69. Prior to construction further consultation will be held with the relevant permitting authorities (IDB/Local Authority or the Environment Agency) to confirm the design standards required for sizing the required flumes, pumping capacities and bridge deck levels.

8 Watercourse Crossing Schedule

70. Table 8.1 presents a schedule identifying which technique is to be used at each of the 45 watercourse crossing locations, considering the hydrological and hydraulic condition (assessed in Section 7), watercourse dimensions, required installation and any specific constraints.

71. Prior to construction further consultation will be held with the relevant permitting authorities (IDB/Local Authority or the Environment Agency) on all watercourse crossing locations and further detailed methods statements will be produced to accompany the permit/licence applications as required.

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
1	DRX – 01A	634380	239152	Ordinary watercourse	N	Open Cut	Extend existing flume pipe	Y	Temporary flume pipe(s)	450mm	Channel depth 1m, channel width at bank top 2m. Dry at time of survey. Shrub growth adjacent to hedge line.	
2	DRX - 01B	634208	239054	Ordinary watercourse	N	Open Cut	Install fence line to restrict access	N	N/A	N/A	Watercourse adjacent to work zone	Not Required
3	DRX – 01	634048	239058	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Narrow ditch course. Channel width 1.5m, channel depth 2m. In rural location with fields on both sides and low growing vegetation. Existing crossing approx. 100m North.	
4	DRX - 02	633560	238991	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Channel width 2m, channel depth 2m. In rural location with fields on both sides and low growing vegetation.	
5	DRX - 03	633403	239030	Ordinary watercourse (Queens Fleet)	N	HDD (HDD-17)	No works in watercourse	Y	Temporary Bridge	N/A	Channel width 3m, channel depth approx. 2.5m. In rural location with fields on both sides and low growing vegetation.	
6	DRX - 04	632934	239238	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Channel width 2m, channel depth approx. 2m. In rural location with fields on both sides and low growing vegetation.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
7	DRX - 05	632665	239416	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Ditch course 2.5m wide, channel depth 1.1m, dry at time of survey. In rural location with fields on both sides and low growing vegetation. Existing crossing approx. 100m South West.	
8	DRX - 06	632488	239546	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Narrow ditch course 2.2m wide, channel depth 1.6m, dry at time of survey. In rural location with fields on both sides and low growing vegetation. Existing crossing approx. 40m South.	
9	DRX - 07	632313	239579	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Ditch course 2.3m wide, channel depth 1.1m, dry at time of survey. In rural location with fields on both sides and low growing vegetation. Existing crossing approx. 10m North.	
10	DRX - 08	631992	239708	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Ditch course 3.2m wide, channel depth 1.6m, water depth 0.6m. In rural location with fields on both sides and low growing vegetation. Existing crossing approx. 130m North West.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
11	DRX - 09	631766	239788	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Ditch course 5.5m wide, channel depth 1.8m, water depth 0.15m. In rural location with fields on both sides and low growing vegetation.	
12	DRX - 10	631591	239944	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Narrow ditch course 1.9m wide, channel depth 1.2m, water depth 0.26m. In rural location with fields on both sides and low growing vegetation.	
13	DRX - 11	631429	240024	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	1000mm	Narrow ditch course 2.1m wide, channel depth 1.4m, water depth 0.26m. In rural location with fields on both sides and low growing vegetation. Existing crossing approx. 100m South.	
14	DRX - 12	631241	239928	Ordinary watercourse, within HDD working area	N	Open Cut	Flume pipes	Y	Temporary flume pipe(s)	600mm	Narrow ditch course 1.9m wide, channel depth 0.9m, water depth 0.12m. In rural location with fields on both sides and low growing vegetation. Existing crossing approx. 110m East.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
-	DRX – 13	631161	239901	Flood defence bund	N	HDD (HDD-16)	No works in watercourse	N	N/A	N/A	Flood defence bund approx. 15m wide, in rural location with fields to East and River Deben to West with low growing vegetation. Existing track along top of bund. Falkenham pump evacuation sluice located at TM 30754 39543, adjacent to the proposed route. Public footpath runs along the crest of the right embankment.	Not Required
15	RVX – 01	630878	239769	River Deben	Y	HDD (HDD-16)	No works in watercourse	N	N/A	N/A	River Deben approx. 480m wide at crossing point. Flood defence bund and then fields to each side of river.	
-	DRX – 14	630666	239607	Flood defence bund	N	HDD (HDD-16)	No works in watercourse	N	N/A	N/A	Flood defence bund approx. 20m wide, in rural location with fields to East and River Deben to West with low growing vegetation. Existing track along top of bund.	Not Required

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Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
16	DRX – 15	630215	239495	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	600mm	Ditch course 2.7m wide, channel depth 0.8m, dry at time of survey. In rural location with fields on both sides and low growing and mature vegetation and trees.	
17	DRX-21	628856	239779	Ditch	N	HDD (HDD-15)	No works in watercourse	Y	Temporary flume pipe(s)	600mm	Ditch course 2.3m wide, channel depth 1.0m, water depth 0.1m. In rural location with fields on both sides, low growing vegetation, trees and mature hedgerow nearby. Existing crossing approx. 190m West.	
18	STX – 01	628160	241359	Ordinary watercourse feeding into Kirton Creek & Mature Woodland	N	HDD (HDD-14)	No works in watercourse	N	N/A	N/A	Stream in wooded area with low growing vegetation. Bridge across stream adjacent to crossing site	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
19	RVX – 02	628174	241652	Kirton Creek (Mill River)	Y	HDD (HDD-14)	No works in watercourse	N	N/A	N/A	River in wooded area approx. 8m with low growing vegetation. Bridge across stream adjacent to crossing site	
20	DRX – 16	626857	245830	Ordinary watercourse	N	HDD (HDD-13)	No works in watercourse	Y	Temporary flume pipe(s)	450mm	Ditch course 1.5m wide, channel depth 1.3m, water depth 0.1m. In rural location with fields on both sides, low growing vegetation and trees nearby. Existing crossing approx. 250m East.	
21	DRX – 17	626428	246802	Ordinary watercourse & Farm Access Track	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Ditch course 2.8m wide, channel depth 1.7m, water depth 0.02m. In rural location with fields on both sides, low growing vegetation and mature hedgerow.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
22	RVX – 03	626359	247258	Martlesham Creek (including Flood Defences)	Y	HDD (HDD-11)	No works in watercourse	N	N/A	N/A	Martlesham Creek approx. 161m wide at crossing point. Rural location with fields adjacent, sewerage treatment works to North West of crossing, small harbour to west. Private outfall sluice on left bank located at TM 26488 47374 Anglian Water outfall from sewage works on left bank located at TM 25980 47288 Martlesham Sluice tidal control gate located at TM 25893 47214 Clay embankment flood defence on left bank	
-	DRX - 18	626343	247338	Flood defence bund	N	HDD (HDD-11)	No works in watercourse	N	N/A	N/A	Flood defence bund approx. 10m wide, in rural location with fields to North and Martlesham Creek to South.	Not Required
23	DRX - 19	626303	247449	Ordinary watercourse	N	HDD (HDD-11)	No works in watercourse	N	N/A	N/A	Ditch course 3.2m wide, channel depth 1.7m, dry at time of survey. In rural location with fields on both sides, low growing vegetation, trees and mature hedgerow nearby.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule													
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
24	DRX-22	626154	247782	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Ditch course 2.3m wide, channel depth 0.8m, dry at time of survey. In rural location on edge of Woodbridge town with fields on both sides. Low growing vegetation and mature trees nearby. Existing crossing approx. 100m South. Railway line approx. 120m South.	
25	DRX-23	625978	247769	Ordinary watercourse adjacent to highway	N	HDD (HDD-10)	No works in watercourse	Y	Temporary flume pipe(s)	450mm	Ditch course 1.4m wide, channel depth 1.3m, water depth 0.02m. Between road and hedgerow.	
26	DRX-24	625819	247751	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Ditch course 0.9m wide, channel depth 0.3m, water depth 0.03m. In rural location with fields on both sides.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
27	DRX-25	625189	247838	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Ditch course 0.8m wide, channel depth 0.4m, water depth 0.04m. In rural location with fields on both sides.	
28	DRX - 20	624098	248210	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	600mm	Ditch course 2.6m wide, channel depth 1.35m, water depth 0.06m. In rural location with fields on both sides, low growing vegetation, trees and mature hedgerow nearby. Existing crossing approx. 25m East.	
29	DRX-26	624060	248246	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	600mm	Ditch course 1.3m wide, channel depth 0.5m, water depth 0.04m. In rural location with fields on both sides.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
30	DRX-27	623854	248255	Ordinary watercourse adjacent to highway	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Ditch course 1.7m wide, channel depth 0.2m, water depth 0.02m. Between road and hedgerow.	
31	RVX – 04	623425	248170	River Lark	Y	Open Cut	Dam and over pump	N	N/A	N/A	Small river 2.8m wide, channel depth 1.1m, water depth 0.18m. In rural location with fields on both sides, low growing vegetation and mature hedgerow on both banks. There are no flood defences on this section of river. Great Bealing village approx. 150m upstream. Flood risk should not be increased to the properties.	
32	DRX-28	622168	248393	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Ditch course 3.4m wide, channel depth 1.2m, depth of water 0.02m. In rural location with fields on both sides.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
33	STX – 02	620005	248585	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Small stream approx. 2.3m wide, channel depth 1.6m deep, dry at time of survey. In rural location with fields on both sides, low growing vegetation, mature hedgerow and trees nearby. Existing crossing approx. 60m South.	
34	DRX-29A	619269	249259	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Ordinary watercourse off road side with connections from road drains. Channel width 1.9m, channel depth 0.5m, dry at time of survey.	
35	DRX-29	619146	249178	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Drain running down field. Channel width 0.6m, channel depth 1.0m, water depth 0.05m..	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
36	DRX-30	619538	249091	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Channel adjacent to hedge line. Channel width 1.7m, channel depth 0.4m, dry at time of survey.	
37	DRX-31	617670	248878	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Existing drainage outlets to be connected into Fline. Channel width 1.5m, channel depth 0.7m, dry at time of survey.	
38	DRX-32	617413	249086	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Road side Ordinary watercourse. Channel width 1.4m, channel depth 1.0m, dry at time of survey.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule													
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
39	DRX-33	617011	249366	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	600mm	Hedge line in close proximity. Channel width 1.9m, channel depth 0.8m, dry at time of survey.	
40	DRX-34	615587	249005	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Hedge line and bank in close proximity. Channel width 1.8m, channel depth 0.4m, depth of water 0.16m.	
41	DRX-35	610807	247064	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Hedge line and road in close proximity. Channel width 3m, channel depth 2m. Dry at the time of survey.	
42	DRX-36	609840	246235	Ordinary watercourse	N	Open Cut	Dam and over pump or flume pipes	Y	Temporary flume pipe(s)	450mm	Hedge line in close proximity. Channel width 1m, channel depth 0.6m. Dry at the time of survey. Refer to Note 6	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule													
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
43	RVX – 05	618968	249148	River Fynn	Y	HDD (HDD-06)	No works in watercourse	Y	Temporary Bridge	N/A	Small river 2.8m wide, channel depth 1.2m, water depth 0.1m. In rural location with fields on both sides, low growing vegetation with mature trees and bushes in local vicinity. There are no flood defences on this section of river.	
44	RVX – 06	612501	248954	River Gipping	Y	HDD (HDD-04)	No works in watercourse	N	N/A	N/A	River Gipping 18m wide, channel depth 1.5m, depth of water 1.5m. In rural location with fields on both sides, low growing vegetation with mature trees nearby. Railway line approx. 80m to West. Refer to notes 1, 4 and 5. This section is natural channel therefore no defences would be affected. No Environment Agency structures nearby.	

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Watercourse Crossing Schedule												
Watercourse Features						Cable Install		Haul Road		Flume	Additional Watercourse Crossing Information	
Crossing Reference Number	Feature Reference Number	Easting	Northing	Type of crossing	Main River? (Y?N)	Cable Install Method	Temporary Works for Cable Install	Haul Road Needed? (Y/N)	Temporary Works for Haul Road	Proposed Flume Pipe Diameter*	General Description of Watercourse and Control Measure	Site Photograph
45	STX – 03	611327	247898	Somershem Watercourse	Y	HDD (HDD-02)	No works in watercourse	Y	Temporary Bridge	N/A	Ditch course 8.0m wide, channel depth 2.2m, depth of water 0.4m. In rural location with fields on both sides, low growing vegetation and mature hedgerow. Overhead power lines run along ditch course. Existing crossing approx. 25m East. Somersham watercourse is prone to being very reactive during heavy rainfall; this must be considered when undertaking works. The flood risk to Somersham Village (TM 09826 48585) should not be increased. Flood risk should also not be increased to the properties in close proximity to the Open Cut site. No Environment Agency structures nearby.	

Notes:

1) As required by the Water Resources Act 1991, main river crossings will require an Environment Permit (formerly Flood Defence Consent) from Environment Agency under Section 109 of the Water Resources Act 1991, and the Anglian Land Drainage and Sea Defence Byelaws.

2) Under the Land Drainage Act 1991, local authorities have become responsible for issuing Flood Defence/Land Drainage consents for proposals affecting 'Ordinary Watercourse'.

3) Where the EA ONE crosses watercourses maintained by East Suffolk Internal Drainage Board (ESIDB). The East Suffolk Internal Drainage Board will be responsible for issuing Flood Defence/Land Drainage consents for proposals affecting 'Ordinary Watercourse'.

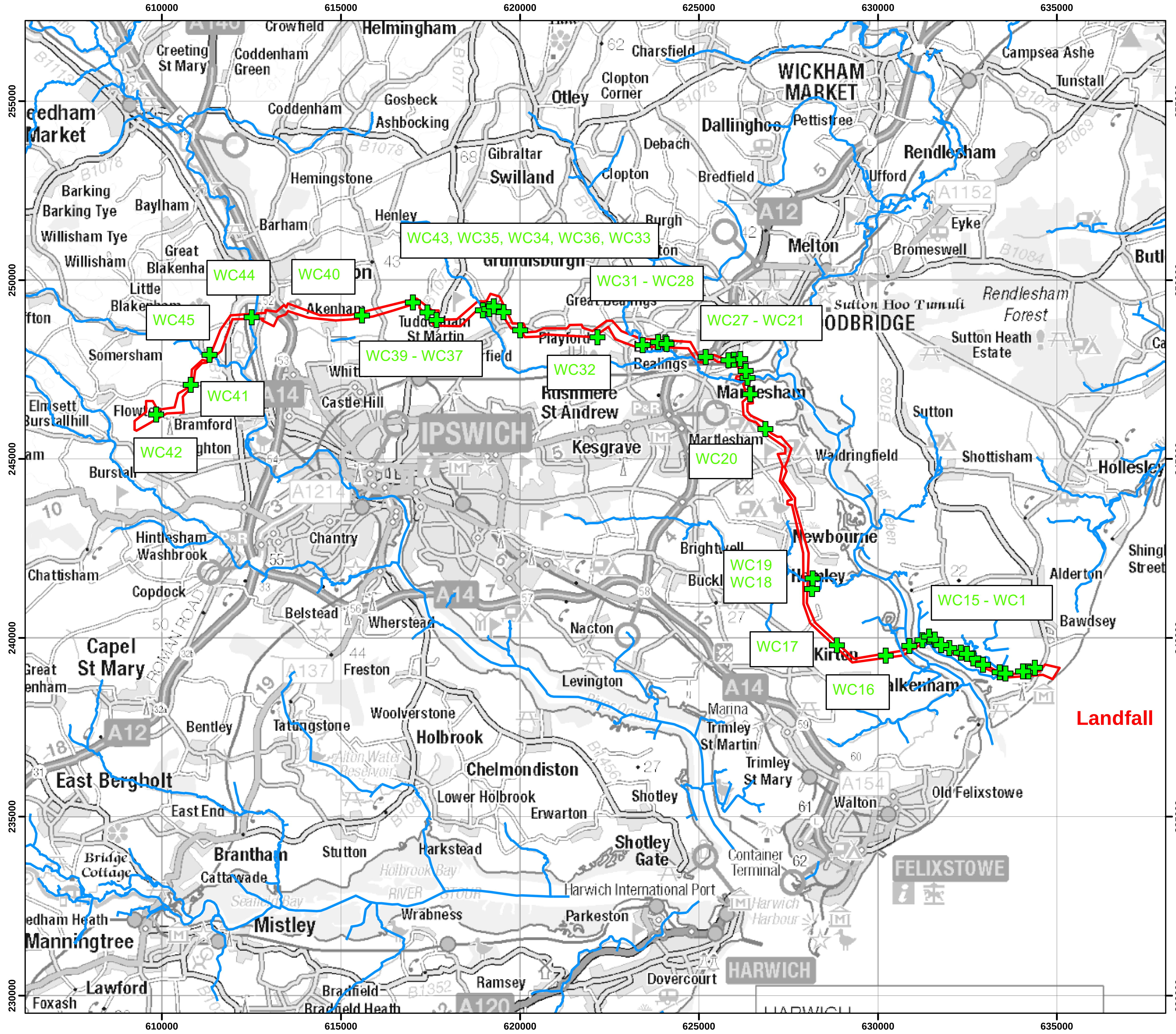
4) Main River information obtained from the Environment Agency Website www.gov.uk/government/organisations/environment-agency on October 9th 2015.

5) East Suffolk Internal Drainage Board information obtained from the Water Management Alliance website www.wlma.org.uk on October 9th 2015.

6) Crossing surveys carried out over 3 days 6-8th July 2016. Water levels stated in general description were measured at this time.

*Subject to consultation with Environment Agency/Internal Drainage Board/Local Authority

Appendix 1 Plan Showing Watercourse Crossing Locations



SCOTTISHPOWER RENEWABLES

Legend

- DCO Limits
- Watercourses
- Watercourse Crossing
- WC1 Watercourse Crossing Number

Where Crossings are shown as a range, these are listed from West to East and North to South.

Note: Not all watercourses that are crossed are shown at this scale of OS mapping.

DATE: 25/08/2016

Figure 1

Watercourse Crossing Locations

East Anglia ONE Offshore Windfarm

IBERDROLA Engineering & Construction

Appendix 2 Hydrological Flow and Hydraulic Analysis

MEMO

SUBJECT
Watercourse Crossings - Hydrological Assessment

DATE
12 August 2016

DEPARTMENT
Rivers, Marine & Coastal

COPIES TO
Simon Rimell
Leslie Walker

TO
Claire Davies

OUR REF
50002-UA008350-UU41R-01

PROJECT NUMBER
UA008350

FROM
Emma Coward
T 02920926726 E emma.coward@arcadis.com

East Anglia One Off-shore Windfarm

Hydrological Assessment of Watercourse Crossings

1. Overview

Arcadis Consulting UK Limited (Arcadis) has been commissioned by Iberdrola Engineering and Construction (IEC) to undertake a range of works to support the construction of the East Anglia One Off-shore Windfarm.

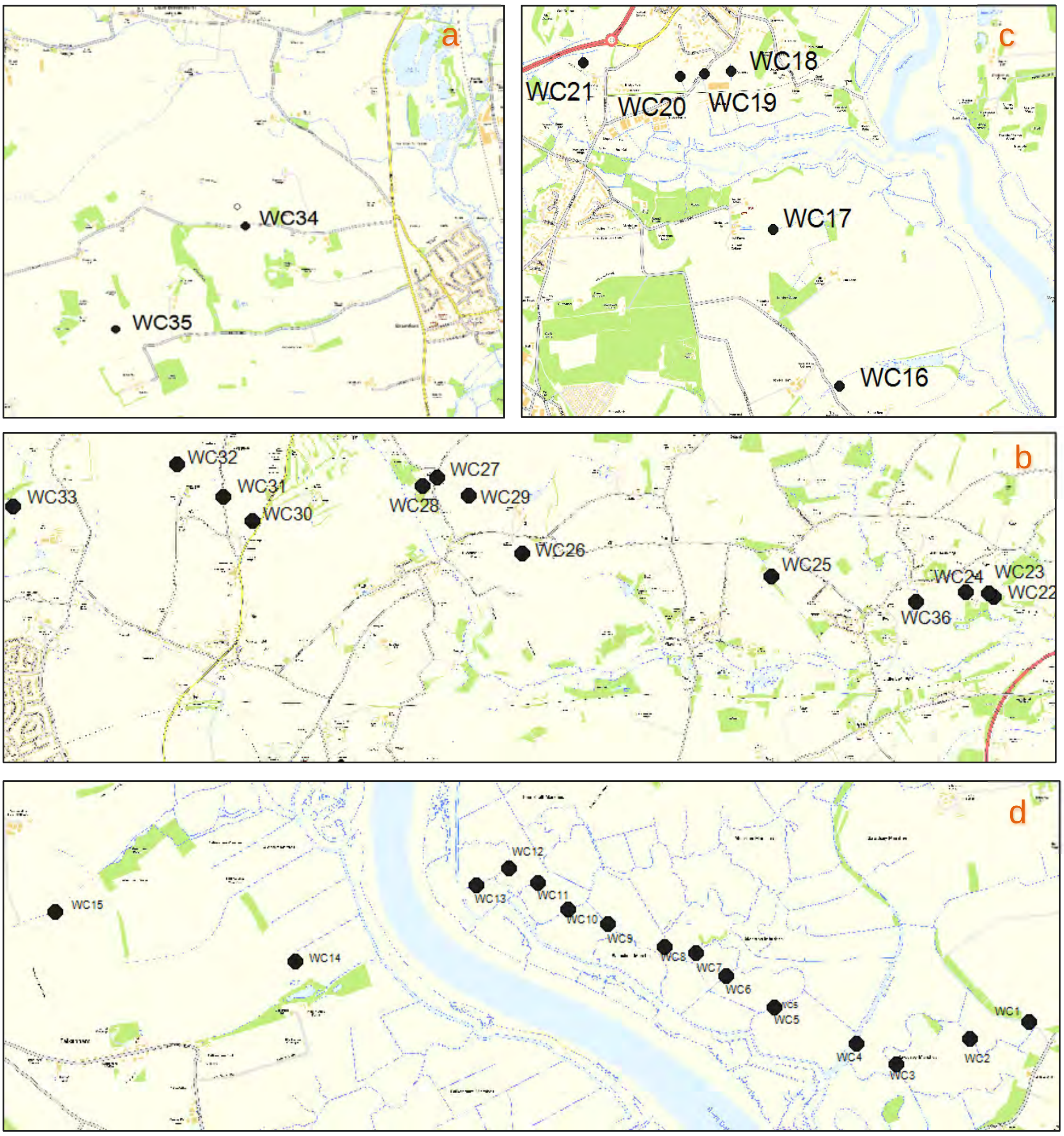
To facilitate construction of the on shore cable route component, hydrological and hydraulic assessment of a number of watercourses to be crossed by the cable route is required. The subject waterways are largely classified as Ordinary watercourses, with the exception of one Environment Agency (EA) designated Main River, the River Lark.

A number of crossing methodologies are proposed, including open-cut and trenchless/horizontal directional drill (HDD) routing methods.

This technical memo presents the results of the hydrological assessment of the catchments draining to 36 watercourse crossings, identified as WC1 to WC36 in Figure 1 below. The results have been used to inform the design of flumes, to make damming/over-pumping capacity recommendations and to guide the deck heights of temporary access crossings, where applicable, as outlined in the Hydraulic Assessment Memos (5001-UA008350-UU41R-01 and 5003-UA008350-UU41R-01).

Figure 1 Watercourse Crossing Locations

Ordnance Survey © Crown copyright and database 2011



2. Methodology

Flow estimates have been derived for 19 ordinary watercourses, identified as WC16 to WC35, in addition to the River Lark (WC36), using the latest Flood Estimation Handbook (FEH) methodologies for flood flow estimation and the industry standard LowFlows software package to quantify typical flow conditions. These watercourses are all gravity drained and are hydrologically suitable for the application of these methods.

No definitive guidance has been provided by IEC with regards to the design standard in terms of minimum or maximum capacity requirements for the flumes or pumps to create the temporary dry working areas needed.

Analysis has therefore been undertaken to define a range of flow conditions that could be expected to be experienced. Typical 'summer' flow conditions are represented by Q80, defined as the flow equalled or exceeded for 80% of the time during a typical year and high flow conditions have been quantified, represented by the median annual (1 in 2 year) flood flow.

Further consultations with the permitting authorities (IDB/Local Authority or the Environment Agency) are recommended to confirm the design standard that should be adopted for sizing the required flumes and pumping capacities.

Pumped Drainage Catchments

WC1 to WC15 drain catchments that are heavily influenced by a pumping regime, controlled by the operation of the Falkenham, Bawdsey and Kings Fleet pumping stations. Consultation with East Suffolk Internal Drainage Board (IDB), summarised in Table 1 below, has confirmed that insufficient data is available to inform flow estimation via FEH and LowFlows methods and an alternate method of flow estimation has been agreed.

This alternative method utilises channel geometry and photographic data obtained from a site visit conducted July 2016 to inform the Manning's n equation for estimating flow at bank full. Further details of this method are reported in Section 6.

Table 1 summarises the record of consultation with the East Suffolk IDB.

Table 1 Consultation – Information requested and provided

Date of Consultation	Information Requested/Provided
30/06/2016	The following information was requested: Direction of flow data for all drains Location of pumping stations Information on the pumped drainage regimes influencing the study area Outlines of the pumped drainage catchments Channel Geometry/cross-section data for watercourses being crossed (See Appendix A for full details)
04/08/2016	Consultation with IDB Catchment Engineer to determine the requirements for estimating flows pumped watercourses. IDB agreed that insufficient data is available to define catchments for purpose flow estimation Further survey works (including topographic data collection) would be required to inform flow estimates using FEH and LowFlows methods Additional site work required to determine the influence of the pumped regime on the

Date of Consultation	Information Requested/Provided
	watercourses IDB agreed that using the Manning's n equation is suitable for estimating bank full flow to inform watercourse crossing design. (See Appendix B for full details of correspondence)

3. Catchment Description

Catchment descriptors were extracted from FEH CD-ROM for each watercourse at the proposed crossing location. Catchment boundaries and areas were checked using OS contours and LiDAR data and updates were made where required. Parameters defining catchment soils and geology (SPRHOST and BFIHOST) for each catchment were also checked with reference to Sheet 4 of the Soil Survey of England and Wales 1:25k Mapping (Soil Survey of England and Wales, 1983).

No further changes to catchment characteristics were deemed necessary. Table 2 summarises the adopted catchment descriptors for WC16 to WC36[1].

Table 2 FEH Catchment Descriptors

Site code	AREA (KM^2)	FARL	PROPWET	BFIHOST	DPL BAR (km)	DPS BAR (m/km)	SAAR (mm)	SPR HOST	URBEXT 2000*	FPEXT
WC16	2.12	1.00	0.26	0.89	1.51	26.8	575	14.95	0.08	0.11
WC17	0.43	1.00	0.26	0.88	0.63	26.8	575	15.77	0	0.09
Combined (WC18, WC19 and WC20)[1]	0.61	1.00	0.26	0.89	0.77	16.0	582	15.44	0.24	0.05
WC21	1.06	1.00	0.26	0.79	1.03	39.0	580	21.02	0.02	0.02
WC22	0.82	1.00	0.26	0.44	0.90	20.0	590	40.45	0.02	0.09
WC23	0.82	0.99	0.26	0.44	0.90	20.0	590	40.45	0.02	0.09
WC24	39.74	0.99	0.26	0.44	7.52	28.0	590	40.45	0.02	0.09
WC25	1.22	1.00	0.26	0.64	1.12	11.0	585	28.55	0.01	0.11
WC26	1.42	0.99	0.26	0.59	1.22	8.0	583	30.13	0.003	0.04
WC27	0.36	1.00	0.28	0.50	0.57	31.25	588	36.59	0.02	0.08
WC28	0.36	1.00	0.28	0.50	0.57	31.25	588	36.59	0.02	0.08
WC29	0.27	1.00	0.28	0.50	0.48	18.75	588	36.59	0.02	0.08
WC30	0.31	1.00	0.28	0.83	0.53	7.00	583	12.62	0.04	0.15
WC31	0.21	1.00	0.28	0.83	0.43	4.00	583	12.62	0.04	0.15
WC32	14.86	1.00	0.28	0.36	4.39	20.50	590	44.59	0.01	0.09

[1] Note: the catchment descriptors for WC18, WC19 and WC20 have been combined for the purpose of deriving flows owing to the small sizes of the individual catchments.

Site code	AREA (KM^2)	FARL	PROPWET	BFIHOST	DPL BAR (km)	DPS BAR (m/km)	SAAR (mm)	SPR HOST	URBEXT 2000*	FPEXT
WC33	5.52	1.00	0.28	0.62	2.55	20.00	584	26.98	0.004	0.09
WC34	0.80	1.00	0.28	0.48	0.89	30.0	573	38.62	0	0.06
WC35	0.74	1.00	0.28	0.48	0.85	30.0	573	38.62	0	0.06
WC36	39.13	0.99	0.26	0.43	7.38	27.8	590	41.19	0.02	0.09

4. FEH Flow Estimates

Table 3 summarises the different FEH methods applied at each of the WCs (16 to 36) in order to derive high flow estimates for the 1 in 2-year return period event.

Table 3 Choice of FEH Methods

Watercourse Crossing	Choice of Method	Rationale
WC16, WC17, WC18, WC19, WC20, WC21, WC30 and WC31	FEH Statistical	The FEH Statistical method has been applied where the BFIHOST value for the corresponding catchment draining to each WC is >0.65. This is because the ReFH method is not considered appropriate for the purpose of deriving flow estimates above this value.
WC22, WC23, WC24, WC25, WC26, WC27, WC28, WC29, WC32, WC33, WC34, WC35 and WC36	Revitalised Flood Hydrograph (ReFH)	Given the catchments draining to these WCs have a BFIHOST of <0.65 then the ReFH method is considered appropriate, in line with best practice guidance

4.1 FEH Statistical Method

The method involves two stages. Firstly the median annual flood flow (QMED) is calculated, either from gauged flow records, or, where these are lacking, using an empirical equation based on the catchment descriptors tabulated above. A search for gauged data records for use in the analysis was undertaken and it was concluded that there are no suitable 'donor' gauge data records for use in refining empirical QMED estimates.

The second stage of the method involves defining a flood growth curve, by pooling records of gauged flow data from hydrologically similar catchments. This pooling process is carried out using WINFAP FEH software and following review, the final pooling group composition is provided in Table 4.

Table 4 Pooling Group Composition

Name of group	**Site code from whose descriptors group was derived**	**Subject site treated as gauged?** (enhanced single site analysis)	**Changes made to default pooling group, with reasons** Note also any sites that were investigated but retained in the group.	**Weighted average L-moments**, L-CV and L-skew, (before urban adjustment)
Pool_1	WC16	No	The default pooling group contains 17 stations and 523 station years. It is heterogeneous (H2 = 3.6220) and the WINFAP-FEH software reports that a review of the pooling group is desirable. Following review, these stations have been removed from the pooling group: **49006 Camel @ Camelford** – removed as station rating needs revision as gaugings show significant deviations which may account for the discordancy of the station. In addition, there is a short record of only 6 years of data. **91802 Allt Leachdach @ Intake** – HiFlows/FSR A2 rating. Use with caution. **47022 Tory Brook @ Newnham Park** – removed owing to impermeable nature of catchment compared to subject sites and the significance of the china clay mining in the catchment. **76011 Coal Burn @ Coalburn** – removed owing to drowning out and overtopping at the gauge. **28033 Dove @ Hollinsclough** – removed as the gauge underestimates flows. The following sites were added, based on the WINFAP distance weighting and suitability of the station characteristics: 49003 De Lank @ De Lank 27032 Hebden Beck @ Hebden Beck 22003 Usway Burn @ Shilmoor The modified pooling group contains 15 stations and 514 station years. The pooling group heterogeneous (H2 =2.3877), with a review still desirable. However, it is considered that there are no further reasonable modifications to the pooling group that should be made.	L-CV: 0.25 L-SKEW: 0.22

The resulting flow estimates, which are representative of a high flow condition, are summarised on Table 5.

Table 5 Flow estimates from the FEH Statistical method

Watercourse Crossing ID	1 in 2 year Flow (m^3/s)
WC16	0.100
WC17	0.010
WC18, WC19 and WC20 (Combined)	0.090
WC21	0.055
WC30	0.018
WC31	0.013

4.2 Revised Flood Hydrograph (ReFH)

This is a rainfall-runoff method that is similarly informed by the catchment descriptors reported in Table 2, the results of which are provided in Table 6.

Table 6 Flow estimates from the ReFH method

Watercourse Crossing ID	1 in 2 year Flow (m^3/s)
WC22	0.165
WC23	0.165
WC24	0.036
WC25	0.152
WC26	0.207
WC27	0.117
WC28	0.117
WC29	0.085
WC32	3.134
WC33	0.678

Watercourse Crossing ID	1 in 2 year Flow (m^3/s)
WC34	0.23
WC35	0.217
WC36 (River Lark)	5.893

5. Low Flow Analysis Results

More typical flow conditions, quantified using the LowFlows software tool are summarised in Table 7.

Table 7 Typical Flow (Q80) Results Summary

Watercourse Crossing ID	Q80 (m^3/s)	Watercourse Crossing ID	Q80 (m^3/s)
WC16	0.006	WC28	0.001
WC17	0.001	WC29	0.01
WC18, WC19 and WC20 (Combined)	0.002	WC30	0.001
WC21	0.003	WC31	0.001
WC22	0.002	WC32	0.013
WC23	0.001	WC33	0.008
WC24	0.001	WC34	0.001
WC25	0.002	WC35	0.001
WC26	0.002	WC36 (River Lark)	0.0034
WC27	0.001		

Note – analysis using this method is not appropriate for pumped drainage catchments (WC1 to WC15). Owing to the small size of the catchments draining to crossings WC18, WC19 and WC20, a combined flow was derived for these crossings.

6. Pumped Catchment Flow Estimates

As discussed in Section 2, the following equation has been utilised to approximate bank full flows at watercourse crossings WC1 to WC15 which are subject to a pumped drainage regime.

Figure 2 Manning's n Equation

$Q = A \times V$

Where Q is discharge (m^3/s)

A is cross-sectional Area

V is velocity

$$V = \frac{R^{2/3} \times S^{1/2}}{N}$$

Where R is Hydraulic Radius

S is Slope

n is Manning's n

$$R = \frac{A}{WP}$$

Where WP is Wetted Perimeter

$WP = 2h + w$

Where h is height of channel

W is width of channel

The information required for the Manning's n equation, has been sourced directly, or estimated using information provided in the Watercourse Master Record Sheet (updated by S. Rimell 10 August 2016) and the resulting estimates of bank full flow are provided in Table 8.

Table 8 Bank full flow estimates

Watercourse Crossing ID	Q (m^3/s)	Watercourse Crossing ID	Q (m3/s)
WC1*	0.002	WC8	0.02
WC2*	0.013	WC9	0.04
WC3*	0.100	WC10	0.11
WC4*	0.057	WC11	0.01
WC5*	0.026	WC12	0.02
WC6	0.01	WC13	0.01
WC7	0.03	WC14	0.01
		WC15	0.01

**Channel geometry data based on data provided by the site construction manager (February 2016)*

7. Assumptions, Limitations and Uncertainties

Catchment descriptors derived for the catchments draining to the watercourse crossings are suitably representative of the catchment conditions.

The catchments determined for WC16 to WC36 are considered not to be influenced by a pumped drainage regime.

The flows derived for WC1 to WC5 are based on channel geometry data interpreted from photographs provided by the construction team from a site visit in February 2016.

The flows derived for WC6 to WC15 are based on channel geometry observations noted during a site visit conducted in July 2016.

As outlined in Section 5, it was not possible to derive typical flow conditions (Q80) for all watercourses.

Whilst best practice has been adhered to for flow estimation, the flow estimates have not been informed by any records of hydrometric data therefore the uncertainty in the estimates presented is acknowledged.

MEMO

SUBJECT Hydraulic Assessment – Gravity Drained Watercourses	**TO** Claire Davies
DATE 30 August 2016	**OUR REF** 50001-UA008350-UU41R-02
DEPARTMENT Rivers, Marine & Coastal	**PROJECT NUMBER** UA008350
COPIES TO Simon Rimell Leslie Walker	**FROM** Liliana Rose E liliana.rose@arcadis.com

East Anglia One Off-shore Windfarm

Hydraulic Assessment of Watercourse Crossings - Gravity Drained Watercourse Results

1. Overview

Arcadis Consulting UK Limited (Arcadis) has been commissioned by Iberdrola Engineering and Construction (IEC) to undertake a range of works to support the construction of the East Anglia One Off-shore Windfarm. To facilitate construction of the on shore cable route a hydraulic assessment of a number of watercourses to be crossed by the cable is required. A range of crossing methodologies is proposed including open-cut and trenchless/horizontal directional drill (HDD) techniques and the subject waterways are largely classified as Ordinary watercourses, with one Main River (the River Lark).

Open-cut routing is performed by fluming the watercourse to create dry conditions in the channel. Alternatively, water is dammed either side of the cable trench with a pump installed to transfer upstream flow back to the channel downstream of the working area.

Trenchless routing consists of a HDD under the watercourse. Where this method is to be used there will be no changes to the watercourse channel or its existing flow regime. However, temporary vehicle access across the watercourses is required at a number of these crossings.

This technical memo presents the findings of the hydraulic assessment of 19 crossings, identified as WC16 to WC33 in Figure 1 below and the River Lark (WC36).

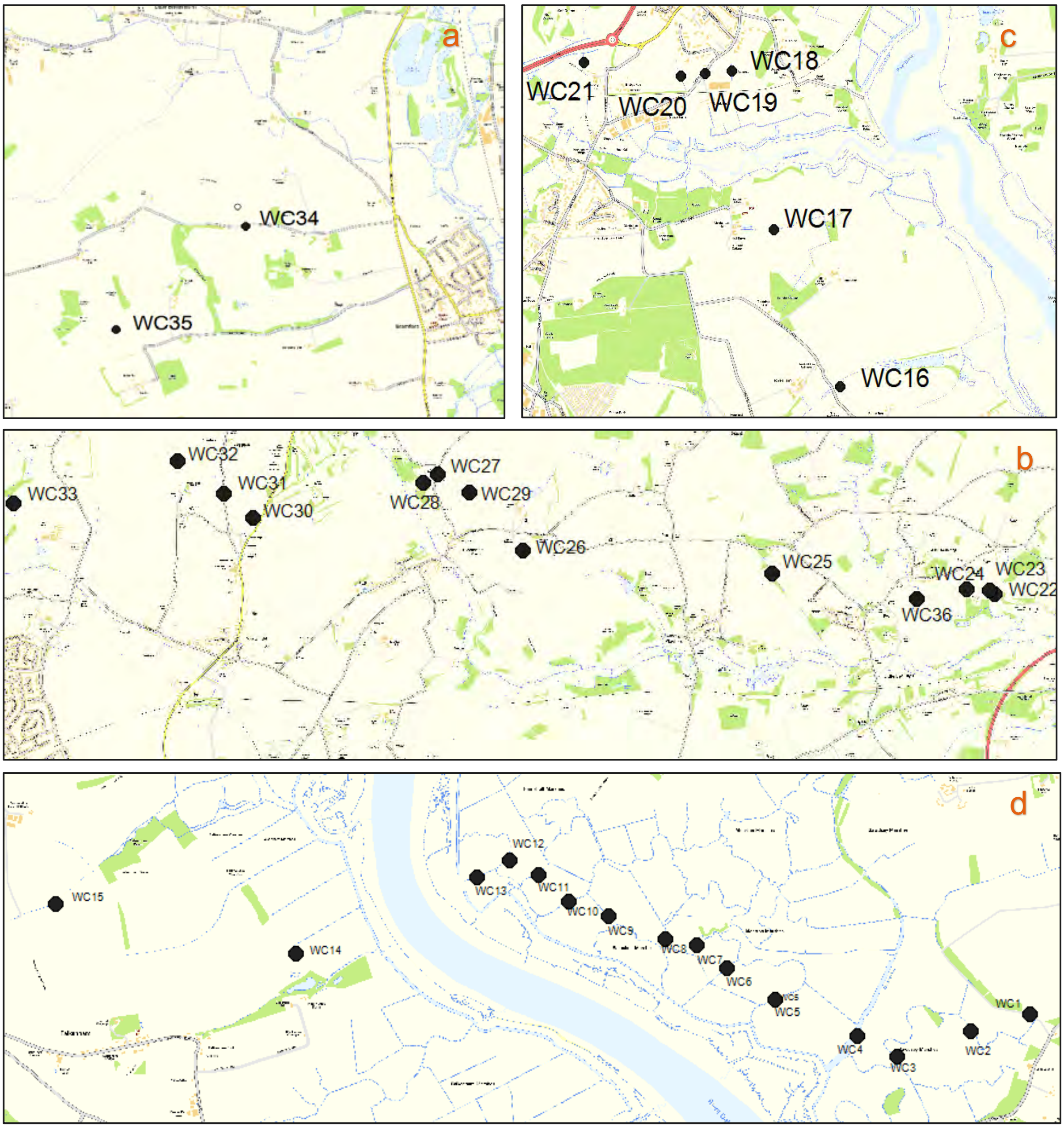


Figure 1 Watercourse Crossing Locations

All of these watercourses are gravity drained and flow estimates for their catchments to the crossing locations have been derived using Flood Estimation Handbook[1] (FEH) methods (as detailed in Technical Memo 50002-UA008350-UU41R-01 – Flow Analysis).

The remaining watercourses included in the scope of the hydraulic assessment (WC1 to WC15) are situated within pumped drainage catchments, managed by the East Suffolk Internal Drainage Board.

[1] http://www.ceh.ac.uk/services/flood-estimation-handbook

As reported in Technical Memo 50002-UA008350-UU41R-01 – Flow Analysis, extensive consultation with the IDB has been carried out and an alternative assessment methodology has recently been agreed for these watercourses. The hydraulic analysis of these crossings will therefore be reported in a stand-alone memorandum.

Of the gravity drained watercourses, two (WC34 and WC35) were not able to be inspected during a recent site walkover survey, due to a lack of safe access. The approximate channel dimension data recorded during the walkover, which has been used to inform the hydraulic analysis, is therefore not available at these two locations. Alternative sources of data have recently been provided by the construction site manager and therefore analysis results will be provided in the pumped drainage watercourse memorandum.

2. Hydraulic Analysis Requirements

Where open-cut routing using the fluming method is to be implemented, there is a need to estimate the minimum flume pipe sizes required to convey design peak flows. For the damming method there is a need to estimate the pump capacity required to transfer flow from upstream to downstream of the dry working area of channel.

At crossings for haul road access where open-cut routing using the fluming method is to be implemented, the flume pipe is to be designed to support the haul road. At crossings where trenchless routing is to be implemented a temporary bridge will be built and the minimum height of the bridge above the watercourse will be informed by the hydraulic assessment of peak water levels.

From the Watercourse Master Record Sheet (supplied by S Rimell, dated 15 July 2016) it is understood that at:

- 34 crossings - open-cut cable routing with temporary vehicle access is to be implemented. At these crossings, the minimum sizes of the flume pipe or the required damming/over-pumping capacity is to be estimated, together with the minimum height of the bridge deck above the watercourse. The choice between flume pipes or damming/over-pumping will be informed by the results of the hydraulic assessment.

- 2 crossings - trenchless HDD routing is to be implemented with temporary vehicle access. For these crossings the height of the bridge deck above the watercourse is to be estimated.

No definitive guidance has been obtained from IEC with regards to the design standard of the crossings, in terms of minimum or maximum capacity requirements for the flumes or pumps to create the temporary dry working areas needed.

Typical 'summer' flow conditions have therefore been represented for the purposes of this assessment by Q80 (20^{th} percentile), defined as the flow equalled or exceeded for 80% of the time during a typical year. A 'high flow' condition has also been assessed, represented by the median annual (1 in 2 year) flood flow. These two flows have therefore been used to size indicative minimum and maximum flume dimension and pump capacities. Further consultations with the permitting authorities (IDB/Local

Authority or the Environment Agency) are recommended to confirm the design standard that should be adopted for sizing the required flumes.

Section 4 provides further details of the methodology and assumptions adopted to carry out the analysis.

3. Data Available

- Watercourse Master Record Sheet, updated with approximate channel dimensions recorded during a site walkover survey in July 2016
- OS 50K mapping
- 2m LiDAR
- Photographs of watercourses at crossings locations
- Site construction manager channel geometry data

The Watercourse Master Record Sheet provides two sets of estimated channel dimensions for the subject watercourses. It is important to note that the two sets of dimensions, understood to originate from the site construction manager and from the July 2016 walkover survey, are very different. For this assessment the approximate channel dimensions recorded during the July walkover have been used.

4. Methodology

4.1. Flumes

Where flumes are proposed, a small HEC-RAS[2] model has been built and used to perform one-dimensional hydraulic calculations on an assumed short length of watercourse upstream and downstream of the proposed flume.

Indicative cross sections to define an open channel reach have been obtained from the Watercourse Master Record Sheet.

Owing to the absence of channel survey data, a bed slope of 0.001 has been assumed. For all runs and roughness Manning's values of 0.015 and 0.030 have been adopted for the pipe flume and open channel respectively. No downstream influence has been considered (i.e. free discharge conditions have been assumed).

4.2. Damming/Over-Pumping

Where damming/over-pumping is proposed, the peak flow corresponding to the 1 in 2 year (50% AEP) event has been assumed to represent the maximum flow rate required to be pumped. Further consultations with the permitting authorities (IDB/Local Authority or the Environment Agency) are

[2] http://www.hec.usace.army.mil/software/hec-ras/

recommended to confirm the design standard that should be adopted for sizing the required pumps.

4.3. Temporary Vehicle Access

It is understood that temporary vehicle access will be provided by installing temporary bridges or by extending the flume pipe and infilling the watercourse channel around the flume for the length required for the crossing.

Indicative minimum heights of the temporary bridge soffits have been estimated using water level results from the HEC-RAS models, based on the watercourse dimensions provided, through which the flows derived have been routed. The minimum height of the bridge soffit is determined by the water level above ground corresponding to the 1 in 2 (50% AEP) event.

At locations where the flume will be extended and closed, the minimum height of the deck corresponds to the indicative diameter of the flume required to accommodate the 1 in 2 (50% AEP) event.

Table 1 is an extract of the Watercourse Master Record Sheet and presents the approximate dimensions of the channel, the recommended flume length, the proposed crossing works and the 1 in 2 and Q80 flows estimated for all crossings. Where channel dimensions have not been provided, alternative values have been assumed. All channel dimensions and the associated hydraulic modelling will need to be revisited should channel survey data become available.

Table 1: Open channel dimensions, proposed works and flow for all crossings

Crossing Reference	Feature Reference Number	Open Channel			Flume Length (m)(4)	Flow	
		Top Width(1) (m)	Base Width(2) (m)	Depth(1) (m)		1 in 2 (m^3/s)	Q80 (m^3/s)
WC16	DRX – 16	1.5	0.6	1.3	10	0.10	0.0060
WC17	DRX – 17	2.8	1.0	1.7	35	0.01	0.0010
WC18	DRX-22	2.3	1.0	0.80	35	0.09	0.0030
WC19	DRX-23	1.4	1.0(3)	1.30	35	0.09	0.0030
WC20	DRX-24	0.9	0.5	0.30	35	0.09	0.0030
WC21	DRX-25	0.8	0.7	0.40	35	0.06	0.0030
WC22	DRX - 20	2.6	0.7	1.35	35	0.17	0.0020
WC23	DRX-26	1.3	0.4	0.50	35	0.17	0.0010
WC24	DRX-27	1.7	0.45	0.20(5)	35	0.04	0.0010
WC25	DRX-28	3.4	0.8	1.20	35	0.15	0.0020
WC26	STX – 02	2.3	0.5	1.60	35	0.21	0.0020
WC27	DRX-29A	1.9	0.6	0.50	35	0.12	0.0010
WC28	DRX-29	0.6	0.5	0.5(3)	35	0.12	0.0010
WC29	DRX-30	1.7	0.5	0.40	35	0.09	0.0010

Crossing Reference	Feature Reference Number	Open Channel			Flume Length (m)[4]	Flow	
		Top Width[1] (m)	Base Width[2] (m)	Depth[1] (m)		1 in 2 (m^3/s)	Q80 (m^3/s)
WC30	DRX-31	0.5	0.5[3]	0.70	35	0.02	0.0010
WC31	DRX-32	1.4	1.0	1.00	35	0.01	0.0010
WC32	DRX-33	1.9	0.5	0.80	35	3.13	0.0130
WC33	DRX-34	1.8	1.0	0.40	35	0.68	0.0080
Lark	RVX – 04	2.8	2.5	1.10	35	5.89	0.0034

(1) Top width and depth of channel obtained from Watercourse Master Record Sheet (columns W and X)

(2) Base width obtained from Watercourse Master Record Sheet (column Q) or assumed as marked on the table

(3) Assumed

(4) Culvert length obtained from Watercourse Master Record Sheet (column T)

(5) Unrealistic value

5. Indicative Flume/Pumping Requirements

Table 2 summarises the recommended flume or pumping arrangements based on the results of the indicative hydraulic assessment. Options for both fluming and pumping have been presented along with indicative minimum bridge soffit heights. Indicative flume diameters have been constrained by either the estimated channel depth or base width and do not include a freeboard allowance. All dimensions need to be revisited once survey data becomes available.

Table 2: Summary of hydraulic assessment results.

Watercourse Crossing	Feature Reference Number	Indicative flume diameter (m)		Indicative pumping flow rate (m^3/s)	Indicative Minimum Bridge height or deck (m) above channel bed	Comments
		Max (1 in 2 yr flow)	Min (Q80 flow)			
WC16	DRX – 16	0.40	0.10	0.10	0.40	Base channel width has been assumed and needs to be confirmed.
WC17	DRX – 17	0.20	0.10	0.01	0.20	
WC18	DRX-22	0.40	0.15	0.09	0.40	
WC19	DRX-23	0.40	0.15	0.09	0.40	
WC20	DRX-24	>0.30	0.15	0.09	0.40	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD or damming
WC21	DRX-25	0.40	0.15	0.06	0.40	
WC22	DRX - 20	0.55	0.15	0.17	0.55	Base channel width needs to be confirmed.
WC23	DRX-26	>0.50	0.10	0.17	0.60	Base channel width needs to be confirmed. Flume constrained by depth. Consider HDD.

Watercourse Crossing	Feature Reference Number	Indicative flume diameter (m)		Indicative pumping flow rate (m^3/s)	Indicative Minimum Bridge height or deck (m) above channel bed	Comments
		Max (1 in 2 yr flow)	Min (Q80 flow)			
WC24	DRX-27	>0.20	0.10	0.04	0.25	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD.
WC25	DRX-28	0.45	0.10	0.15	0.45	Base channel width needs to be confirmed.
WC26	STX – 02	0.45	0.10	0.21	0.45	
WC27	DRX-29A	0.45	0.10	0.12	0.45	Channel depth needs to be confirmed.
WC28	DRX-29	0.40	0.10	0.12	0.40	Base channel width needs to be confirmed.
WC29	DRX-30	>0.40	0.10	0.09	0.45	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD.
WC30	DRX-31	0.20	0.10	0.02	0.20	Channel depth needs to be confirmed.
WC31	DRX-32	0.20	0.10	0.01	0.20	Base channel width needs to be confirmed.
WC32	DRX-33	>0.50	0.20	3.13	2.40	Channel depth and base width need to be confirmed. Flume constrained by depth and width. Consider HDD.
WC33	DRX-34	>0.40	0.15	0.68	0.80	
Lark (WC36)	Lark	>1.10	0.15	5.89	2.40	Channel depth needs to be confirmed. Flume constrained by depth. Consider HDD or damming

6. Assessment Limitations

The accuracy of the hydraulic results and overall findings of the indicative assessment are limited by the absence of topographical survey data to accurately define channel dimensions and invert levels. In addition, design flow conditions have not yet been agreed with the permitted authorities.

7. Recommendations

The amount of water conveyed by the flume is limited by its capacity, which in turn is limited by the channel geometry and the requirements of a dry surface for cable routing. At crossings where the indicative flume diameter is constrained either by the channel depth or the width of its base (e.g. the flume will occupy the majority of the channel bed) it is recommended that an alternative routing method is explored (e.g. HDD) or pumping arrangements be implemented as the preferred method. Crossings where the indicative flume diameter is likely to be constrained includesWC20, WC23, WC24, WC29, WC32, WC33 and the River Lark (WC36).

At locations where fluming of the watercourse is to be adopted, it is recommended that a trash screen is installed at the upstream end. To minimise debris and sediment accumulation and it is recommended that inspection of the flume pipe for damage or blockage is carried out regularly and that blockages are cleared and damages repaired immediately.

The overall programme and design of the temporary works should also seek to minimise disruption to the free passage of fish and aquatic animals.

At temporary vehicle access points, it is important to prevent road run-off from entering watercourses, particularly silty or sediment laden run-off. To achieve this it is recommended that the deck is sealed or lined and that the access surface should be constructed on a slight gradient to ensure that surface water is not shed directly into the watercourse.

Appendix 7 Pollution Prevention & Emergency Incident Response Plan

East Anglia ONE
Offshore Windfarm

East Anglia ONE Offshore Windfarm

Pollution Prevention and Emergency Incident Response Plan Appendix 7 Code of Construction Practice

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SCOTTISHPOWER RENEWABLES

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1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL), was awarded Development Consent Order (DCO) by the Secretary of State Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE). The DCO granted consent for the development of a 1200MW offshore windfarm and associated infrastructure.

2. In February 2105, EAOL secured a Contract for Difference (CfD) award to build a 714MW project and Scottish Power Renewables announced its role in leading East Anglia ONE towards construction. In April 2015 EAOL submitted a non-material change application to DECC to amend the consent from direct current (DC) technology to alternating current (AC). In March 2016 DECC authorised the proposed change application and issued an Amendments Order.

3. This plan relates to the onshore construction works associated with EA ONE, which based on the AC technology with a capacity of 714MW, comprises;

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, approx. 37km in length.
- Up to four cable ducts for future East Anglia THREE project.
- An onshore substation located at Bramford next to existing National Grid infrastructure.

1.2 Purpose and Scope

1. This Pollution Prevention and Emergency Incident Response Plan (PP&EIRP) provides details of the pollution prevention controls which shall be in place and outline the procedures to respond to an environmental incident during the onshore construction work. This document forms an appendix to the Code of Construction Practice (CoCP) and fulfils DCO Requirement 20 (2) (h) which states:

> ***20.***—*(2) The code of construction practice must include (...)*
> *(b) a pollution prevention and emergency incident response plan*

2. This document provides the measures and procedures to be implemented with respect to pollution prevention and emergency response to potential pollution incidents, this information will be used by each contractor to inform their own Emergency Response Plan (ERP) and pollution prevention procedures.

1.3 Environmental Documents

3. The following documents will in place to cover the environmental management during the onshore construction works and include environmental documents that are related to pollution risk:

- Environmental Policy
- Project Environmental Management Plan
- Construction Environment Management Plans
- Project Emergency Response Plan
- Code of Construction Practise including:
  - Air Quality Monitoring Plan
  - Surface Water and Drainage Management Plan
  - Watercourse Crossing Method Statement
  - Flood Plan

1.3.1 Environmental Policy

4. EAOL is a wholly owned subsidiary of ScottishPower Renewables and forms part of the IBERDROLA Group (hereon referred to as IBERDROLA). IBERDROLA has an Environmental Policy, which sets out key principles. These principles have been cascaded down into the renewables business of IBERDROLA and are represented as follows:

- Pollution Prevention
- Legal Compliance
- Continual Improvement
- Communications
- Sustainability
- Training and Competence
- Suppliers and Contractors
- Consultation

5. Within the policy, it states that IBERDROLA will 'consume responsibly, by making sustainable use of resources and increasing consumption of renewable resources' and will use 'ongoing efforts to identify, assess, and reduce the adverse environmental effects of the activities'.

1.3.2 Environmental Management Plans

6. The Project Environmental Management Plan (PEMP), produced by EAOL, sets out how EA ONE intends to manage environmental risks associated with the development, including the onshore construction works and will set out specific control measures necessary to deliver the requirements and mitigation measures that have been committed to by EAOL that relate specifically to the construction phase of EAOL. The PEMP also includes the EAOL minimum requirements, for inclusion within Construction Environmental Management Plans (CEMPs) to be produced by contractors, and sets out guidance and best practice for their implementation at EA ONE construction sites.

7. This information will be communicated to the contractors in advance of construction (before contract award and discussed in kick off meetings) to allow method statements to be written and work activities planned in accordance with environmental constraints and conditions.

1.3.3 Project Emergency Response Plan

8. EA ONE will have a documented emergency response plan that will cover any potential Health Safety and Environments incidents. This PP&ERIP will be used to inform the project emergency plan will detail the role and responsibilities of personnel required to respond to an incident and who needs to be informed following the incident. In addition all appointed contractors will have their own emergency response plan relating to the activities they are undertaking.

1.3.4 Code of Construction Practice

9. This plan forms part of the CoCP, which sets out the management and control measures which EAOL will require its contractors to adopt and implement for any onshore construction works and related off-site activities. It includes a series of topic specific environmental plans and strategies for construction management, which include the following which are related to pollution risk:

- Air Quality Monitoring Plan (Appendix 2).
- Surface Water and Drainage Management Plan (Appendix 5).
- Watercourse Crossing Method Statement (Appendix 6).
- Flood Plan (Appendix 8).

10. The pollution preventions risk related to these topics are covered as part of this pollution risk assessment however for further details, please see specific appendices.

2 Pollution Prevention Management

2.1 Objectives

11. The key aim of this PP&EIRP is to ensure that pollution risks and control measures are identified, communicated to and accepted by the contractors and managed accordingly on site to minimise pollution risks and protect the environment during the onshore construction works. During the onshore construction works the Construction Manager in conjunction with the construction management team and the Environmental Clerk of Works (EnCoW) shall oversee all the construction activities to ensure that mitigation measures described in this PP&EIRP are put in place and all activities are carried out in such a manner so as to minimise or prevent effects on the surface water, groundwater and soils, and to prevent the accidental discharge of fuels, oils, lubricants, paint or solvents and other pollutants.

12. The PP&EIRP outlines the general pollution prevention measures to be implemented to limit the potential for contamination of both the ground and surface waters, during the onshore construction works. These measures are designed and implemented in line with current technical guidance and codes of practice as listed further into this plan.

13. The objectives are therefore:

- To identify controls required for hazardous or contaminated materials.
- To ensure the protection of watercourses during watercourse crossings.
- To ensure protection of aquatic flora and fauna, and their habitats, during open cut crossings.
- To comply with relevant legislation and good practice in terms of managing surface and foul water abstractions and discharges.
- To maintain and protect private water supplies during construction.
- To protect surface and groundwater by ensuring that appropriate measures are in place to prevent contaminants from entering the surrounding environment and in particular pathways that might lead to water receptors.

2.2 Guidance and Good Practice

14. The general provisions placed on all contractors are to minimise potential impacts from the onshore construction works on land, surface water or groundwater receptors, EAOL and contractors appointed to work on their behalf will follow relevant Environment Agency's Pollution Prevention Guidance (PPG) notes, as well as general good construction practice, including:

- PPG01 – General guide to the prevention of water pollution
- PPG05 – Works near or liable to affect watercourses
- PPG06 – Working at construction and demolition sites
- PPG08 – Storage and disposal of used oils
- PPG11 – Preventing pollution at industrial sites
- PPG20 – Dewatering of underground ducts and chambers
- PPG 21: Pollution incident response planning
- Control of water pollution from construction sites – A guide to good practice, CIRIA (2001)
- The SUDS Manual, C697, CIRIA (2007)
- Site Handbook for the Construction of SUDS, C698, CIRIA (2007)
- CIRIA Report C502 Environmental Good Practice on Site
- CIRIA Report C532 Control of Water Pollution from Construction Sites
- CIRIA Report C648 Control of Pollution from Linear Construction Project Technical Guidance
- CIRIA Handbook C692 Environmental Good Practice on Site
- CIRIA Handbook C651 Environmental Good Practice on Site Checklist.

2.3 Management and Compliance

15. All works carried out by contractors during the onshore construction will be conducted in accordance with this PP&EIRP and any accompanying contractor emergency response plan and method statements.

16. The EnCoW shall be entitled to cease works or instruct specific actions before works can procedure to ensure compliance with this PP&EIRP.

17. A series of method statements shall be prepared during the construction phase to supplement the information provided in this Plan. Separate method statements will be prepared for every construction task and/or any other operations that have the potential to give rise to pollution of surface water or groundwater or the accidental discharge of fuel, oil, lubricants, paint or solvents. Each method statement shall:

- Outline how the specific task will be carried out, including details of pollution mitigation measures.
- Provide a description of its location.
- Contain a detailed risk assessment of each task.
- Contain a list of pollution prevention and control equipment to be provided.
- Indicate the location at which this equipment will be stored.
- Identify communications procedures.

18. The contractors must demonstrate to the EnCoW that by working in accordance with the agreed method statements, any discharges and run-off will be suitably controlled and treated

3 Pollution Prevention Risks and Controls

19. The following identifies the pollution risks and controls for the key polluting activities associated with the onshore construction works.

3.1 Storage of Materials

20. Materials and waste will be stored in a manner that minimises risk to the water environment and reduces the potential for substances to enter any road side drains, natural drainage lines or water courses. The types of potentially polluting materials associated with these works and how and where they will be stored is given in the Table 3-1.

Table 3-1 Storage of Material Controls

TYPE OF MATERIAL & RELATED WORK ACTIVITY	CONTROLS	PREVENTION
TOPSOIL **Stripping from trenching activities/ substation excavations/ HDD excavations launch and reception pits**	To be stored beside the works to a height no greater than 3m. Topsoil will not be compacted but moulded and shaped to maintain the soils natural properties and structure. To be stored separately from subsoil. Topsoil must be stored at least 3 metres away from any trees and hedgerows. Care must be taken not to disturb soil within 1.5m of any growing tree, or 4 x the tree's circumference, whichever is greatest in line with the National Joint Utilities Group Guidelines. Nothing should be stored or left on the topsoil bund.	Preventing migration of silty water to the local water environment. Preventing damage to surrounding vegetation. Managing material to aid successful reinstatement.
SUBSOIL **Stripping from trenching activities/ substation excavations/ HDD excavations launch and reception pits**	To be stored beside the works to a height of no more than 5m. Do not over compact but mould and shape to maintain the soils natural properties and structure. To be stored separately from topsoil. Subsoil must be stored at least 3 metres away from any trees and hedgerows. Care must be taken not to disturb soil within 1.5m of any growing tree, or 4 x the tree's circumference, whichever is greatest in line with the National Joint Utilities Group guidelines.	Preventing migration of silty water to the local water environment. Preventing damage to surrounding vegetation. Managing material to aid successful reinstatement.
SAND/ STONE **Sand used in cable installation/ Stone used for the installation of the haul road and substation platform**	To be stockpiled in the allocated lay down area in the site compound in a way to minimise dust and wastage. Stone (Type 1 clean) will meet the standard requirements for use within the substation and haul road and will arrive on site with a minimum percentage of fines.	Preventing migration of fines and silty water to enter the local water environment

CEMENT **Cabling installation, substation construction foundations**	To be stored in the original packaging on pallets inside the Control of Substances Hazardous of Health (COSHH) stores. If cement is to be stored outside temporarily it should be stored off the ground on pallets, away from waterbodies (in excess of 5m) or heavily trafficked areas and covered with tarpaulin.	Preventing migration of fines to enter the local water environment. Preventing the ingress of high alkaline entering and changing the local pH altering the natural balance.
CONCRETE **Substation construction foundations**	An area of ground below the dispersing chute of the concrete wagon will be covered in visqueen to protect the underlying ground. Any amount that falls to unprotected ground will be removed immediately. If concrete wagons dispense directly into concrete bins, these bins will be sat on a layer of visqueen. A washout skip sat on visqueen will be provided for the wagon to wash into. The inside of this skip shall be lined with visqueen. Concrete which is poured directly into the work area will be washed out over the washout skip. Cement laden water that accumulates in the skip must under no circumstances be pumped into the surrounding environment. Instead the water must be collected in a container, clearly marked and left in the skip for disposal.	Preventing migration of fines to enter the local water environment. Preventing the ingress of high alkaline entering and changing the local pH altering the natural balance.
CHEMICALS, BITUMEN, PAINTS, SOLVENTS, GREASE **Cabling installation/ substation construction**	To be stored in the original packaging inside a drip tray. All chemicals should be stored in COSHH store. COSHH data sheets will always be consulted and followed to the details of particular requirements.	Preventing migration of hazardous toxic material to enter the natural environment to ground of water bodies.
INERT WASTE **Sand/ Spoil/ Stone** **Cabling installation, Haul road removal, substation construction**	To be kept separate from non-hazardous and hazardous waste in a clearly designated area/ skip (labelled) located on a hard standing where possible. Storage are to be located away from sensitive boundaries and watercourses.	To reduce to volume of hazardous and no-hazardous waste by segragation. Preventing migration of fines to enter the local water environment.
NON-HAZARDOUS WASTE **Cabling installation, Haul road removal, substation construction**	To be kept separately from inert and hazardous waste. To be segregated into its component streams and kept in clearly labelled containers/ skips, labelled. Containers/ skips to be in good condition, sat on visqueen (to act as a visual aid if skips are ruptured and leaking as opposed to a bund) enclosed if necessary (plastic/paper/cardboard/general) and located on hard standing. Containers/ skips to be located away from sensitive boundaries and watercourses	To reduce to volume of hazardous and no-hazardous waste by segregation. Preventing migration of fines and waste materials to enter the local water environment.

	Containers/ skips to be screened from external receptors if possible.	
HAZARDOUS WASTE **Cabling installation, Haul road removal, substation construction**	To be kept separately from inert and non-hazardous waste. To be segregated into its component streams and kept in clearly labelled containers. Containers/ skip to be in good condition enclosed and located on hard standing. Containers/ skips to be located away from sensitive boundaries and watercourses.	To reduce to volume of hazardous waste by segregation. Preventing migration of toxic material waste materials to enter the local water environment.

31. Sediment release or siltation can cause long term damage to river ecology and can accumulate to cause flooding events. Waters containing silt should never be pumped or allowed to flow directly into surface water features. Discharge of silty water into surface water features must have Environment Agency approval in advance of construction. Suitable treatment will be required, such as the use of a lagoon, tank or grassed area where solids can settle.

32. Where possible prevent water from entering excavations. Use cut off ditches to prevent entry of surface water and well point dewatering or cut-off walls for groundwater. Use the corner of the excavation as a pump sump and avoid disturbing that corner. Do not allow personnel or plant to disturb water in the excavation.

33. Fresh concrete and cement are very alkaline and corrosive and can cause serious pollution in watercourses. It is essential to ensure the use of wet concrete and cement in or close to any watercourse is carefully controlled so as to minimise the risk of any material entering the water, particularly from shuttered structures or the washing of equipment

34. Each area of works will be assessed individually to determine whether there is sufficient buffering capacity to settle solids and suspended silt prior to entry of run-off into the water course. Buffering capacity will generally depend on the topography and vegetation type and sensitivity. If sufficient buffering is not available silt filtration measures should be scaled up to ensure run-off entering the watercourses remains as clean as possible.

3.2 Fuel and Oil Storage

35. Fuel and oils will be stored in accordance with legislation to minimise the risk of pollution. In brief, secondary containment will be provided for all oil and diesel tanks:

- For a single tank, the secondary containment will be at least 110% of the maximum storage capacity.
- For two or more tanks in one secondary containment system, the secondary containment will be at least 110% of the biggest tank's maximum storage capacity or 25% of the total maximum storage capacity of all the tanks, whichever is the greatest.

36. It is a requirement that storage of static generator(s) and associated fuel tank(s), which are separate with inter-connecting hoses require to be located within a covered impermeable bund – where these will be located on-site for the "duration of the works" e.g. at construction compounds. Bunds shall be constructed from concrete block work or similar (e.g. a walled containment facility). Prevent rainwater from accumulating in bunds as this will compromise the containment. If required, drainage of these areas shall be via an Oil Separator.

37. Further controls with respect to fuel and oil storage are detailed in Table 3-2.

Table 3-2 Fuel and Oil Storage Controls

TYPE OF MATERIAL & RELATED WORK ACTIVITY	CONTROLS	PREVENTION
DIESEL **Cabling installation, haul road construction, HDD operations, substation construction**	To be stored in bunded tanks or double walled bowsers. Fuel tanks and mobile bowsers must be kept locked when not in use and overnight. Spill kit and granules will be stored near the bunded area. Jerry cans are to be used for hand carrying of fuel around the site. These must be clearly marked. Where practicable, only restricted hand carrying of fuel should be allowed on the site. Any fuel containers must be stored in a bund or drip tray/plant nappy when not in use within a ventilated lockable COSHH store. Ensure any fuel container is appropriately labelled. Place plant nappies/drip trays under equipment containing fuel/oil in areas without permanent bunding and ensure their use when handling fuels or oils. This includes for mobile generators which are used out on site.	Preventing the release of diesel entering the natural environment
OIL **Cabling installation, haul road construction, HDD operations, substation construction**	To be stored in original container or in an appropriate container designed for the storage of oils. Metal jerry cans are to be used for hand carrying of oil around the site. Where practicable, only restricted hand carrying of fuel should be allowed on the site. Containers must be stored in a bund or drip tray/plant nappy when not in use within a ventilated lockable COSHH store. Ensure the container is appropriately labelled.	Preventing the release of oil entering the natural environment.
PETROL **Cabling installation, haul road construction, HDD operations, substation construction**	To be stored in an appropriate container designed for the storage of petrol i.e. plastic jerry can. Plastic jerry cans are to be used for hand carrying of fuel around the site. Where practicable, only restricted hand carrying of fuel should be allowed on the site. Place plant nappies/drip trays under equipment containing fuel/oil in areas without permanent bunding and ensure their use when handling fuels or oils. This includes for mobile generators and metal jerry cans which are used out on site. Ensure any fuel container is appropriately labelled. Any fuel containers must be stored in a bund or drip	Preventing the release of petrol entering the natural environment.

	tray/plant nappy when not in use within a ventilated lockable COSHH store. Ensure the container is appropriately labelled.	

38. For onshore works, it is a requirement that storage of static generator(s) and associated fuel tank(s), which are separate with inter-connecting hoses require to be located within a covered impermeable bund – where these will be located on-site for the "duration of the works" e.g. at construction compounds. Bunds shall be constructed from concrete block work or similar (e.g. a walled containment facility). Prevent rainwater from accumulating in bunds as this will compromise the containment. If required, drainage of these areas shall be via an Oil Separator.

3.3 Vehicle Movements

39. The onshore construction works will require a significant volume of vehicle movements which have the potential to cause pollution. The procedures for control pollution risks associated with this activity are provided in the Table 3-1.

Table 3-3 Vehicle Movement Control Procedures

ACTIVITY	CONTROL PROCEDURE	FREQUENCY / TIMESCALE
Maintenance	All vehicles and plant to be inspected for signs of fuel/oil leaks or drips. Vehicles leaking fluids shall be denied entry to the site.	Prior to entry on site.
	All on-site vehicles and plant to be subject to visual inspection for signs of fuel/oil leaks or drips.	Daily.
	Any vehicles leaking fluids shall be contained or removed from site for repair.	As required.
	Maintenance of all mobile plant and vehicles to be carried out in suitable location agreed with EnCoW.	On-going during construction
	Wastes arising during vehicle maintenance to be collected in marked containers for disposal off site.	On-going during construction. Waste to be removed from site as required
Parking	All mobile plant and vehicles to be parked in suitable locations.	Every working day.
Plant	All static operational plant to be fitted with drip trays to prevent oil and fuel leaks causing pollution.	On-going during construction.
	All operational plant and vehicles to carry a suitable spill kit.	On-going during construction
Refuelling	Refuelling procedures and locations to be outlined within method statement to be submitted to EnCoW for approval. Where possible designated refuelling area to be on impermeable surface, away from watercourses and drainage ditches.	Prior to construction.
	Where possible refuelling of vehicles and machinery to be undertaken on designated area with impermeable surface, away from watercourses and drainage ditches. Contractors also need to be aware of any prevailing weather conditions to ensure that any bunded area is not left in a condition that could result in an overflow.	On-going during construction.
	Suitable spill kits to be located at every refuelling point.	On-going during construction.
	Standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution.	On-going during construction.

40. The risk of spilling fuel is at its greatest during refuelling of plant. Where possible, refuel mobile plant in a designated area, preferably on an impermeable surface well away from any drains or watercourses. Keep a spill kit available at all times. Diesel pumps should be placed on drip trays to collect minor spillages or leaks. These should be checked regularly and any accumulated oil removed for appropriate disposal.

3.3 Hazardous Substances

41. It is the responsibility of the Contractor to have in place controls for the delivery, storage and use of hazardous materials required to be used during the onshore construction works. Control of Substances Hazardous to Health (COSHH), environmental risk assessments and method statements shall be used to determine the necessary controls required to protect human health and the environment.

42. It shall be a requirement for all appointed contractors to hold and maintain an inventory of any chemicals and wastes that are held on site and to maintain, manage and inspect the COSHH store.

43. Table 3-3 details the control measures which all contractors shall employ for the management of hazardous substances.

Table 3-3 Hazardous Substances

MANAGEMENT OF HAZARDOUS SUBSTANCES
• Ensure that Fuels, Oils and Chemicals are only ordered in manageable quantities and stored responsibly i.e. in a bunded area able to contain 110% of the volume or in a suitable container/storage area within designated areas and in accordance with relevant legislation.
• Store fuel, oil and chemical in areas that are secure with suitable built in containment such as bund walls or drip tray. Containment must be structurally sound and strong enough to prevent leakage. They must be locked and secured when not in use.
• Ensure that containers must be labelled with details of contents and spillage kits or portable bund kits must be available at or near the delivery point for emergencies.
• Chemicals, oils and hazardous materials will be stored securely away from watercourses.
• Place plant nappies/drip trays to be used when handling all chemicals, fuels or oils.
• Where this arrangement is for a short duration such as 6 months or less alternative containment options can be considered, subject to site sensitivities and duration e.g. such as containment of inter-connecting hoses using a plant nappy
• Where external storage is required on shore locations these should be sited at appropriate distances from watercourses, possible routes to watercourses and drains. Storage areas should be located in areas free from vehicle movements to minimise the risk of collision damage.

3.4 Watercourse Crossings

44. Watercourse crossings will be required at 45 locations along the cable corridor (see Watercourse Crossing Method Statement, Appendix 6 of CoCP for further details). Construction of these structures presents potential risks to the environment. These include:

- Interference with fish migration and spawning, mammal movement, rare plants and their habitats and with riparian and linear wildlife corridors.
- Loss of aquatic and riparian habitats.
- Alternation of the flow regimes.
- Harmful discharges during construction and operation.
- Interference with angling or obstruction of angler’s movement along the channel.

45. These impacts can be minimised by applying sound design principles to the structures, following best working practices and communicating this through a detailed method statement (see Watercourse Crossing Method Statement) during their construction. The general provisions as listed in Table 3-4 should be referred and adhered to, all watercourse crossings will require some level of consent either by the Environment Agency (EA), Internal Drainage Board (IDB) or Local Authority (LA) the consent conditions associated with each crossing should be strictly followed.

Table 3-4 Watercourse Crossings

CONTRACTOR CHECK LIST FOR WATERCOURSE CROSSINGS
• Ensure all necessary consent conditions from EA/ IDB/ LA are in place.
• Comply with all consent conditions from EA/ IDB/ LA for watercourse crossings.
• Ensure all required pre-construction ecological surveys have been completed before starting works.
• Take account of activities of other users of the water environment in planning works.
• Have access constructed of suitable material and in a manner that will not give rise to rutting, ponding and silt run-off.
• All construction machinery operating in-stream should be mechanically sound to avoid leaks of oils, hydraulic fluid. Where practicable plant for in stream works should contained with bio- fuel and biodegradable hydraulic oils.
• Ensure oil absorbent booms are in place downstream from where the culvert will be installed before the work commences.
• All in-stream works must be carried out in accordance with an approved method statement.
• Check if there are any timing restrictions to works because of protected species (e.g. spawning salmonids, otter, water vole etc) or landowner commitments

3.5 Working In or Near to Watercourses

46. Construction activities in or near water have the potential to cause serious pollution or impact on the bed and banks of a watercourse and on the quality and quantity of the water. Most pollution incidents are avoidable. With careful planning the risk of site work causing pollution can be reduced. Many measures needed to prevent pollution cost very little, especially if they are included at the planning stage of any activity. Major causes of environmental harm associated with working in or near watercourses include:

- Silt - disturbance of river bed or bank, dewatering and pumping of excavations, runoff from exposed ground, plant washing, roads and river crossings.
- Cement and concrete – which is very alkaline and corrosive and can cause serious pollution
- Chemicals and solvents – oil storage, refuelling, vehicle and plant washing, trade materials etc.
- Waste materials (including special waste) e.g. oily wastes, spent acids and solvents.

Most activities with the potential for affecting watercourses or groundwater will require an authorisation from the EA. Any abstractions of water over 50m^3 per day used for construction will require authorisation from EA. The general provisions as listed in Table 3-5 should be referred and adhered to when working in or near watercourses.

Table 3-5 Working In or Near Watercourses

CONTRACTOR CHECK LIST FOR WORKING IN OR NEAR WATER
• Identify all activities that will be undertaken in or near watercourses.
• Communicate risks associated with working in or near watercourses to all personnel.
• Identify all activities that will require a consent, are obtained. Comply with all conditions.
• Undertake necessary risk assessments in advance of activities.
• Communicate method statements to all relevant personnel through activity plans.
• Monitor the success of all measures and re-design if necessary.
• Give staff regular tool box talks about the risks of working near water and the potential to cause pollution.
• Undertake regular checks on site to ensure that pollution prevention measures are in place and are successful.
• Be vigilant about any works with cement/ concrete near water.
• Store cement and other pollutants in a secure location.
• Ensure plant and vehicles are not washed within 30m of a watercourse or waterbody.
• Ensure that oil and fuels are used and stored in accordance with best practice.

3.6 Construction of the Haul Road

47. The contractor will be responsible for ensuring the mitigation measures in Table 3-6 will be implemented as part of the road construction process to limit the amount of silt migrating from the construction areas into surrounding watercourses. Drainage engineering along with environmental mitigation will be determined in sections along the haul road in consultation with the EnCoW. The following are best practise mitigation methods that are best used in combination with one another to create a series of points to attenuate and manage runoff. A more detailed plan of where these methods will be installed will be required prior to construction and will be checked by the EnCoW.

Table 3-6 Construction of Haul Road

MITIGATION TYPE	MITIGATION DESCRIPTION
Silt traps	Silt traps are a simple and effective method of controlling sediment laden run-off, but are limited by capacity of what the expected flows are likely to be. These can be installed either on the inlet or outlet side of culverts, but require to be robust enough to allow for frequent clearing out of collected sediments. Silt traps are also useful in reducing the amount of silt transported along longer drainage channels with a lower gradient.
Silt fencing	This system involves the installation of some semi-permeable geotextile fabric, vertically held on simple timber posts, and is used primarily as an additional means of filtering out sediments from run-off water. The fences can be installed alongside any sensitive areas e.g. watercourses, large areas of stripped materials, or downstream from outlets. Silt fences are generally more suitable in a situation where sheet flow could result in the migration of silt from areas further up the slope or where the water in areas prone to sheet flow need to be interrupted to stop the formation of erosion gulleys. They should be used with caution in narrow channels prone to strong flow during wet periods where they can easily block the water and either cause flooding of the surrounding area, or be destroyed in the process.
Straw bales	Straw bales can be used to filter out sediments from normal flows in drainage ditches, but their installation positions require to be carefully considered, and should allow for potential overtopping in periods of high flow. Under no circumstances should they be used in natural drainage channels. Instead, they should be used along constructed road-side drains where they can easily be reached by machinery for regular replacement. Care must be taken to ensure that the top of the bale is always lower than the height of the channel's banks.
Settlement Lagoons	Any proposed site for large capacity settlement lagoons requires careful planning and a good awareness of the expected volumes of flows that they will be required to cope with. Lagoons are particularly effective where a large run-off volume is expected and suitable small scale dispersal to existing vegetation would not be successful. Care is required to ensure that the sidewalls are strong enough to withstand any potential loadings as an uncontrolled discharge could have serious environmental consequences.
Surface Cross-drains	On sections of tracks that have particularly long gradients, surface erosion can be prevalent following periods of persistent rainfall. Surface water tends to run down the roadline, accumulating as it nears the lower sections and eventually flowing into watercourses carrying with it all the silt scoured from the road surface along the way. To alleviate this issue, it is recommended to install a series of surface cross-drains to intercept these flows, and divert then into the side ditches, preventing the build-up of flow. These cross drains can be constructed with channels of various materials but should be strong enough to withstand the expected traffic loadings.
Flocculent dosing	Where all other possibilities of sediment control have been considered, tried, or discounted, another method to increase the rate of settlement would be by the introduction of liquid, or solid dosed flocculants. These work by pulling together finer suspended solids, into larger and therefore heavier particles that settle out quicker. The use of flocculent agents should be considered where there are limits on available space. Liquid flocculants can be dosed into settlement lagoons, and solid flocculent blocks can be set in flowing water to slowly dissolve, thereby giving a 'dose" to the suspended sediments in the run-off. Some specialist assistance should be sought if this option is being considered. And approvals from the statutory agencies will be required.

3.7 Spill Response Plans

48. As listed in the above sections there are numerous materials that will be present on site and various activities that could cause an incident if not managed appropriately, it is therefore required of each contractor to produce an emergency response and spill plan and in the event of any spill on site can react in a compliant manner, the following aspects will form part of the contractors Emergency Response and Spill Plans:

- Assessment of safety of site operatives/ employees.
- Location, access to and content of spill kits / response materials, there will be Emergency Lockers at regular intervals along the haul road containing spill and response materials, each Emergency Locker will have a unique reference to make it simple to identify the location of an incident.
- EAOL has the following minimum requirements in regards to spill response. Spill kits to be provided in/with the following:
    - In all heavy plant, 4x4 and commercial vehicles.
    - With all refuelling bowsers.
    - During all refuelling operations, associated transportation and storage.
    - With all static fuel tanks.
- Provisions for stopping and containing the spillage/leakage/hazard, please see figure 2 'Stop, Contain, Notify' flowchart.
- Notification procedures (including reporting to the relevant external stakeholders, environmental regulatory bodies and EAOL where the severity of the incident deems such notifications).
- Clean up and waste management including method for handling the waste, bagging and handing over to the relevant waste contractors whose contact details will be listed.
- Spill response materials replenishment, the Emergency Locker will be replenished each time the kits are used.
- Spill response competency, Toolbox talks will be issued by the environmental clerk of works to demonstrate the deployed of spill kits in the event of an incident. A spill drill will be conducted, documented and signed by all in attendance on an annual basis.

4 Site Layout

49. There will be nine Construction Consolidation Sites (CCSs) these are construction compounds which will be utilised for welfare, site staff accommodation, parking, as well as providing secure storage for materials, plant and equipment. The CCSs are categorised as Primary and Secondary, there are two Primary CCSs; CCS B will be a designated storage and delivery facility and the main administrative compound and CCS E will be a designated storage and delivery facility with designated office space. The remaining seven Secondary CCSs shall be for the purpose of access, storage and deliveries. The locations of the CCSs and their category are presented in Table 4-1.

Table 4-1 Construction Consolidation Site Locations

CCS Ref	CCS Type	Address
A	Secondary	Bullen Lane, Bramford, Ipswich, Suffolk IP8
B	Primary	Paper Mill Lane, Claydon, Ipswich, Suffolk IP6 0AP
C	Secondary	Witnesham Road, Ipswich, Suffolk IP6
D	Secondary	Church Road, Ipswich, Suffolk IP6 9DS
E	Primary	Top Street, Martlesham, Suffolk IP12
F	Secondary	Woodbridge Road, Newbourne, Woodbridge, Suffolk IP12 4PA
G	Secondary	Park Lane, Ipswich, Suffolk IP10
H	Secondary	Sheepgate Lane, Ipswich, Suffolk IP10 0QZ
I	Secondary	Ferry Road, Woodbridge, Suffolk IP12 3AS

50. CCSs will comprise a permeable crushed stone or aggregate surface laid on a geotextile membrane, which will allow some direct infiltration of rainfall run-off, at the same time as trapping and filtering any sediment and contaminates. Where hard surfacing is considered for utilisation in potentially high risk areas of the construction compound, positive surface water collection systems for the management of rainfall-run-off to prevent the pollution of ground water will be considered where appropriate

- Any wheel washes used in site compounds will operate where practical on a closed cycle basis and have self-contained water and silt collection systems. Where systems require a discharge these will be subject to consultation and in accordance with Environment Agency requirements. Waste silts and sludges will be removed in accordance with Duty of Care requirements.
- Oil, water and silt separators will be used where applicable on construction compound surface water management systems to remove oils and fuels accidentally spilled/accumulated during construction. These will be maintained in accordance with the manufacturer's instructions to ensure they remain efficient.
- The length of time excavations are kept open will be minimised to reduce the potential for dewatering.
- The filtration of all run-off using mitigation measures such as straw bales, check dams, filter strips, silt fences or settling tanks/ponds prior to release, or the discharge of clean surface water run-off to land to allow natural percolation wherever possible (no discharge of water will take place directly into a watercourse).
- The separate storage of topsoil and excavated materials, to prevent mixing of sub-soil and topsoil, thus improving reinstatement.
- The minimisation of excavation volumes and disturbance to the surrounding areas, together with the replacement of any soils inadvertently disturbed during excavations in general accordance with their original structure and location
- The setting of vehicular speeds along the construction access routes to minimise soil trafficking.
- The use of pollution control measures to reduce sediment run-off entering any watercourses or surface water drainage systems during construction activities, with reference to the relevant EA Pollution Prevention Guidelines.
- Regular cleaning and maintenance of plant to ensure potential pollutants are not released e.g. from fuel spills and leaks.
- The maintenance of a register of fuel volumes stored on site, and the location of fuel storage and refuelling points in designated areas, a minimum of 20m from watercourses.

- Regular inspection of facilities storing hazardous materials, which will be locked and made secure when not in use (see Section 3 above).
- Best environmental practices will be followed, reducing the potential for release of contaminants to ground to a minimal level. Appropriate spill and leak containment systems will be incorporated into the construction procedures to ensure no uncontrolled releases of contaminants occur.
- Any materials to be removed from site will be subject to the appropriate waste management licensing regulations. Care will be taken to manage any stockpiles of materials in order to reduce runoff from exposed surfaces.

51. It will be the contractors responsibility to provide a site layout plan of each CCS and should include a marked up drawing indicating surface, foul and combined drains, and risk assessed with appropriate exclusion areas/ mitigation/ identification for any watercourses and other features of environmental importance within the yard and immediate surroundings.

5 Emergency Incident Response Procedure

52. The information below sets out the procedures to be put in place to respond to different potential emergency environmental incidents. The contractors' emergency response plan should provide more detail relating to types of incidents, hazards, response procedures and emergency contact telephone numbers. The contractors will be responsible for producing their own Emergency Response Plan (ERP).The following environmental emergency response procedures should be used as a basis for the development of the contractors ERP which shall also include:

- Identification of responsibility and authority.
- Location plan.
- Identification of hazards.
- Emergency contact details.
- Emergency response arrangements.
- Emergency reporting arrangements.
- Emergency evacuation arrangements.
- Details of emergency response team.

53. Each contractor will declare the specialist sub-contractor they would use in the event of an environmental emergency event, this contractor must be available 24/7 and their response time to site should also be declared in contractor documents and site briefings.

5.1 Unconsented Discharge to Land or Water

54. No discharges can be made to land or water without a discharge consent being in place. In the event of a fuel or chemical spillage the following procedure must be employed:

- **ASSESS** the situation. Determine the source, composition and approximate quantity of the spill and determine whether you have the appropriate equipment, PPE and training to tackle the spill.
- Get the HELP you require to deal with the spill safely. Inform the Works Manager/ site engineer of the spill. They will contact a spill contractor if required.
- If the spill is located adjacent to the site on one of the roads/pathways used by members of the public, **PREVENT** pedestrians and traffic passing through the spill. Contact police headquarters if the spill prevents a risk to traffic.
- **STOP** the source of the spill.
- **CONTAIN** the spillage using either a spill kit or a suitable inert material e.g. sand. DO NOT allow the spill to enter the local drainage system or watercourses. Cover any drains, and use spill socks to prevent run off to watercourses
- **REMOVE** the spillage. Small spills can be removed using spill mats and/or granules; larger spills may require a pump from a specialist contractor.
- **DISPOSE** of the waste material. Used spill kit should be placed in a designated bin separate from all other types of waste. Do not put used spill kit material in any of the skips. Material which has been pumped may be stored in empty oil drums or other suitable container prior to removal by a registered special waste contractor.
- **REPORT** the incident immediately to the Site Supervisor and to the Environmental Advisor. EA must be informed in the event of pollution to a surface water drain; Anglian Water and the Local Authority must be contacted should pollution from site enter the surface water or foul drainage system.
- **REVIEW** event to determine any actions required to prevent the incident from recurring. Review the effectiveness of the response plan and make any changes necessary.

55. See Figure 1 which shows the 'Stop, Contain' Notify' procedure.

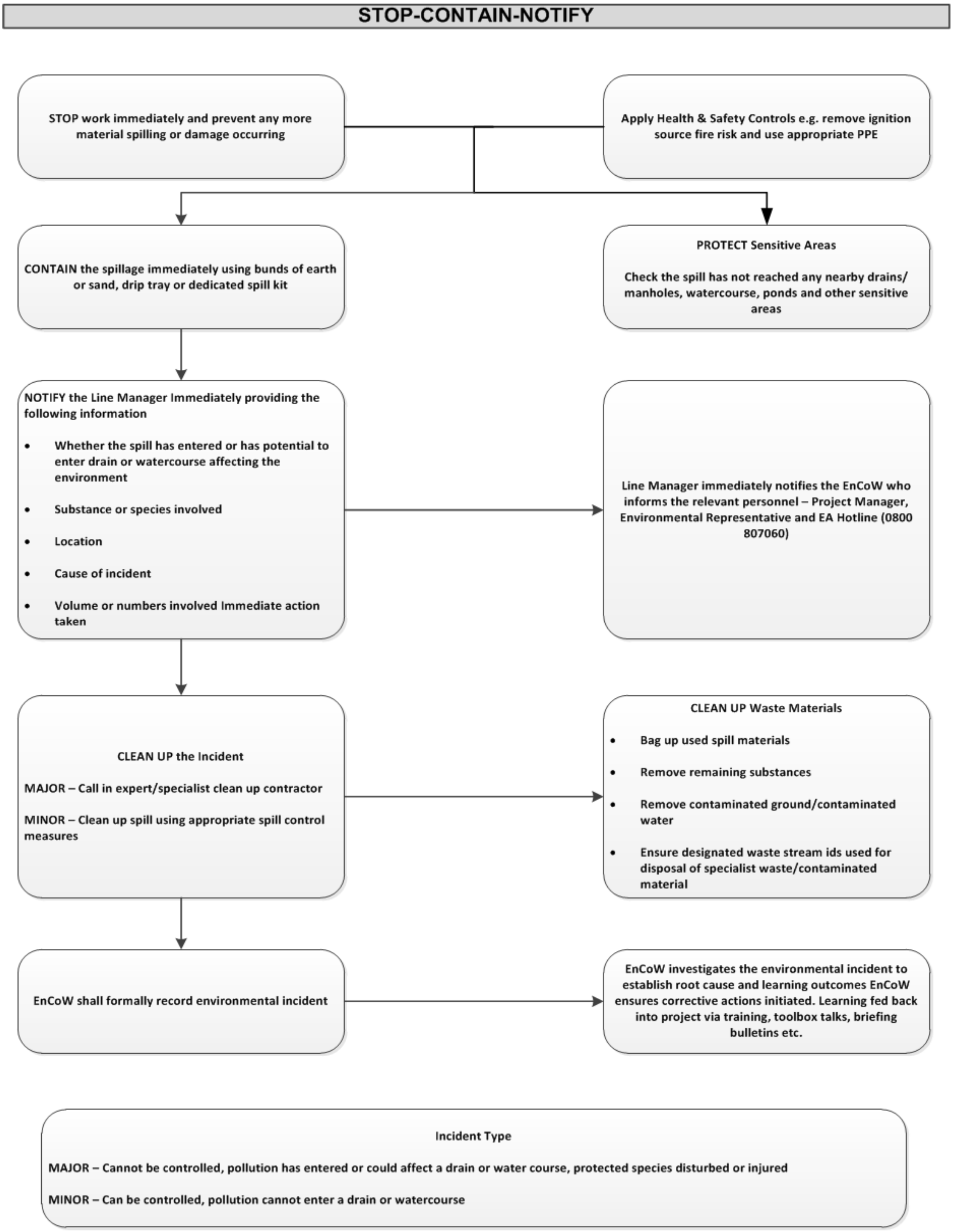

Figure 1 ‘Stop Contain Notify’ Procedure

5.2 Release of Silt

56. In the event of a release of silt the following procedure must be employed:

- **CHECK** watercourses during periods of high rainfall or construction activities with potential for significant run-off.
- Get the HELP you require to deal with the situation safely and inform Site Manager of the silting.
- Implement mitigation measures immediately. **TRACE** back to the source where possible. Consider whether the site activity should be halted.
- **PREVENT** further spread of sediment downstream by implementing straw bales, silt screens etc. to help control sediment immediately. If already in place check for signs of damage.
- **MONITOR** the effectiveness of protection measures daily and re-plan as necessary.
- **MAINTAIN** silt bales/screens etc. regularly so they do not make problems worse.
- **REPORT** the incident immediately to the Site Supervisor and to the EnCoW. EA must be informed in the event of pollution to a surface water drain; Anglian Water and the Local Authority must be contacted should pollution from site enter the surface water or foul drainage system. EAOL team must be informed as soon as is reasonably practicable if a regulatory body has been informed of an incident.
- **REVIEW** event to determine any actions required to prevent the incident from recurring. Review the effectiveness of the response plan and make any changes necessary.

5.3 Emergency Pollution Event to Air

57. In the event of a pollution release to air the following procedure must be employed:

- **LOCATE** the source of the air pollution.
- If safe to do so, **STOP** the source of the pollution for example by turning off faulty equipment. Do not expose yourself to any dust or vapours without the appropriate PPE.
- **STOP** any works which are in the vicinity of the pollution event, make sure all site staff and members of pubic are diverted away from the pollution event.
- **SUPPRESS** particulate air pollution with water but only if you can control the run off such that the water will not enter any drains or watercourses.
- **REPORT** the incident to the works manager and site engineer who will then determine if the event is serious enough to require notification to the Local Authority. Report the incident to EnCoW.
- **REVIEW** the cause of the pollution event to determine any actions required to prevent the incident from recurring. Review the effectiveness of the response plan and make any changes necessary.

5.4 Flooding

58. A separate Flood Plan has been prepared as in presented as Appendix 8 to the CoCP, this sets out the procedure to be followed in the event of a flood emergency.

5.5 Extreme Weather

59. In the event of an extreme weather event the following procedure must be employed, see Figure 2 for wet weather decision making matrix.

- Ensure the current and forecast weather conditions are reviewed daily as part of the daily site risk assessment.
- When extreme weather closes in – stop work, make safe and secure and ensure all loose items are recovered and correctly stored.
- If safe to do so, use site vehicles to leave site along approved routes.
- In the event egress is denied, all site personnel are to remain together as a group and make their way to the nearest welfare unit / safe location.
- Site Supervisor to ensure all personnel are accounted for at all times.
- Site Supervisor to report the incident to Site Manager / Construction Manager who will decide the appropriate action to be carried out.
- Remain in the welfare unit / safe location until rescue arrives or weather conditions improve.
- Remain in telephone contact with the Site Manager and report in every 30 minutes to ensure real time updates can be provided both on the weather and any rescue attempt.

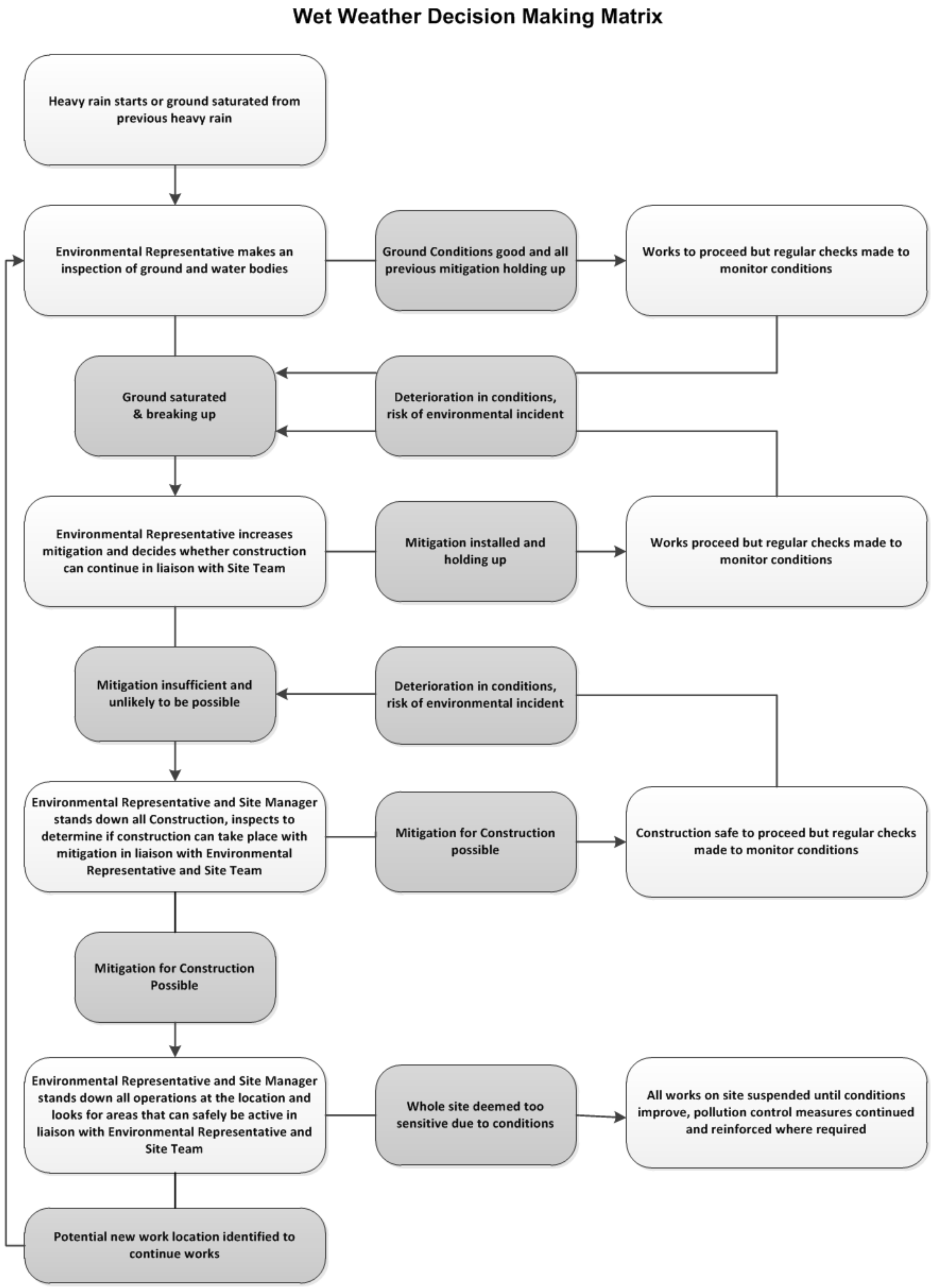

Figure 2 Wet Weather Decision Making Matrix

6 Key Site and Emergency Contact List

60. Emergency contacts shall be communicated to all site personnel via a briefing in relation to emergency response. The following key site emergency contacts will be completed prior to construction for the onshore cable route and the onshore substation and made available to all site personnel.

EMERGENCY CONTACTS				
Project Name:			Project No:	
Address:			Tel No:	TBC
CONTACT NUMBERS TO BE USED IN THE EVENT OF A SERIOUS ACCIDENT, DANGEROUS OCCURRENCE, FIRE OR ENVIRONMENTAL INCIDENT				
EMERGENCY SERVICES	AMBULANCE	999 or	Tel No:	
	FIRE		Tel No:	
	POLICE		Tel No:	
HOSPITAL	Address:	Accident and Emergency Ipswich Hospital Heath Road, Ipswich, Suffolk, IP4 5PD		
	Tel No:	01473 712233		
UTILITY COMPANY CONTACT	Gas	TBC	Tel No:	-
	Electric	TBC	Tel No:	-
	Water	TBC	Tel No:	-
	Telecoms.	TBC	Tel No:	-
CONSTRUCTION TEAM CONTACT NUMBERS	Construction / Site Manager		Tel No:	
	Alternative Contact		Tel No:	
ENVIRONMENTAL INCIDENT CONTACT INFORMATION	Regulatory Body	Environment Agency	Tel No:	0800 80 70 60
	Waste Disposal Company	TBC	Tel No:	TBC
Third party environmental emergency response company 24/7 response				

*TBC fields to be populated prior to construction by appropriate contractor

7 Staff Training

61. All Contractors must ensure they are aware of the requirements of this PP&EIRP and that the requirements are communicated to all their staff on site. As part of the site induction, any contractor working on site will be briefed on the applicable emergency response procedures. Each member of the Emergency Response Team shall be appropriately trained in the areas to which they are appointed. Confirmation of contractor staff training shall be supplied by the contractor and maintained as part of training records.

62. An annual drill shall be carried out by the contractor that produced the ERP for each potential emergency situation that can have a major impact on the environment. The details of the drill shall be documented with signatures of attendees.

Weekly environmental toolbox talks will be briefed to site personnel by the contractor's environmental advisor/ EnCoW on various topics that are appropriate to the work activities. In relation to pollution prevention the following toolbox talks are advised however this list is not exhaustive:

- Storage of materials
- Use of Bentonite
- Chemicals
- Hazardous substances
- Pollution Prevention
- Pollution Incident Response
- Pollution Incident Reporting
- Spill kit Use – physical display of how to use the kit
- Fuels and Oils (Pollution Prevention)
- Cement/ Concrete – Water Pollution Prevention

8 Testing and Review

63. All Emergency Response Plans produced by contractors will be reviewed on the following basis:

- Monthly, in line with review of identified Aspects / Hazards for the Location.
- In line with any consultation with local emergency services.
- When any requirement of this ERP is changed.
- When any corrective and preventive actions are identified following completion of the Emergency Report.

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Appendix 8 Flood Plan

East Anglia ONE
Offshore Windfarm

East Anglia ONE Offshore Wind Farm

Flood Plan
Appendix 8 Code of Construction Practice
Final for Approval

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SCOTTISHPOWER RENEWABLES

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Abbreviations

AC - Alternating Current
AEP - Annual Exceedance Probability
AOD – Above Ordnance Datum
CoCP - Code of Construction Practice
CfD - Contract for Difference
DCO - Development Consent Order
DECC - Department for Energy and Climate Change
EA – Environment Agency
EAOL - East Anglia One Limited
EA ONE - East Anglia ONE Offshore Wind Farm
FRA - Flood Risk Assessment
FWEP - Flood Warning and Evacuation Procedure
HDD - Horizontal Directional Drilling
MW – Megawatts
NGR – National Grid Reference
NPPF - National Planning Policy Framework

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Energy and Climate Change (DECC) on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE).

2. This document relates the onshore construction works associated with EA ONE, comprising;

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, approx. 37km in length.
- Up to four cable ducts, for the future East Anglia THREE project.
- An onshore substation located at Bramford, next to existing National Grid infrastructure.

1.2 Purpose and Scope

3. This Flood Plan identifies the flood risk areas and sets outs the procedures to be followed in the unlikely event of a flood emergency during the construction of the EA ONE onshore construction works. This document forms an appendix to the Code of Construction Practice (CoCP) and fulfils DCO Requirement 20 (2) (b) which states:

> ***20.***—*(2) The code of construction practice must include (...)*
> *(b) a flood plan*

4. The onshore construction works originate from the landfall location at Bawdsey and extends approximately 37km to the new onshore substation, at Bramford, illustrated in Drawing 1 in Appendix 1.

5. Ordnance Survey mapping shows that the ground elevation along the cable route varies between approximately 0m and 56m AOD, with the gradient of the land generally sloping from the west to the east i.e. falling towards the coast, with some local variations.

6. This Flood Plan contains information on flood emergency response actions and concerns the onshore construction works. This Plan has been informed by a Flood Risk Assessment (FRA) (RSK Environment, 2012), which demonstrates that EA ONE meets the requirements of the National Planning Policy Framework (NPPF) and flood data from the Environment Agency (EA) that was received in November 2015.

7. The Flood Warning and Evacuation Procedure detailed in this plan will continue to be updated and reviewed during the onshore construction works. As such, it has been necessary to include areas within the document where additional information will continue to be added as the document remains live throughout the works.

1.3 Terminology

8. Flood risk is a product of both the likelihood and consequence of flooding. Throughout this plan, flood events are defined according to their likelihood of occurrence. Floods are described according to an 'annual chance', meaning the chance of a particular flood occurring in any one year. This is directly linked to the probability of a flood. For example, a flood with an annual chance of 1 in 100 (a 1 in 100 chance of occurring in any one year on average), has an annual exceedance probability (AEP) of 1%.

2 Flood Risk Identification

2.1 Aim and Objectives

9. The key aim of this Plan is to provide the contractors during the onshore constructions works clear indicators confirming when the construction works area should be evacuated in the unlikely event of a flood emergency. The Plan also provides key information for planning and responding to an evacuation.

2.2 Background

10. The majority of the onshore cable route, illustrated in Drawing 1 (Appendix 1), is currently used as agricultural, greenfield land and is located in Flood Zone 1. The cable route crosses seven main rivers as designated by the Environment Agency (EA), which are shown in Drawing 1 (Appendix 1). These main rivers are: the River Deben, Kirkton Brook/Creek, Martleham Creek, River Lark, River Fynn, River Gipping and Somersham watercourse.

11. Based on the EA Flood Zone map the majority of the cable route is located in Flood Zone 1 (land defined as having less than 1 in 1000 annual probability of flooding from rivers or the sea). However, there are eight sections of the cable route that encroach into Flood Zone 2 (land having between 1 in 1000 and 1 in 100 annual probability of flooding from rivers or the sea) and Flood Zone 3 (greater than 1 in 100 annual probability of flooding). These areas are shown on Drawing 1 (Appendix 1) and include:

- Where the cable route crosses a small watercourse near Sycambe Farm (approximate NGR 611282, 247949).
- Where the cable route crosses the River Gipping near Mockbeggars Farm (approximate NGR 612507, 248982).
- Where the cable route crosses a small watercourse near Hill Farm (approximate NGR 615567, 249021).
- Where the cable route crosses a small watercourse near Larks Hill (approximate NGR 618962, 249118).
- Where the cable route crosses a small watercourse just south of Great Bealings (approximate NGR 623412, 248270).
- Where the cable route crosses a small watercourse near Martlesham Creek (approximate NGR 626432, 247287).
- Where the cable route crosses a small watercourse south of Hemley, near Sluice Farm (approximate NGR 628182, 241624).
- Where the cable route crosses the River Derben near Falken Creek (approximate NGR 631102, 239831) down to its outfall by Bawdsey Hall (approximate NGR 635182, 239228).

12. Based on the EA Flood Zone map the substation is located fully within Flood Zone 1 (land having less than a 1 in 1000 year annual probability of flooding from rivers or the sea).

13. In order to manage flood risk during the onshore construction works, this Flood Plan has been developed to ensure the preparedness of construction site personnel, in the event of a flood emergency, during construction.

2.3 Environment Agency Flood Data

14. The EA has provided flood data for the River Gipping and the Deben Estuary for flood scenarios ranging from the 1 in 20 (5% AEP) to 1 in 1000 (0.1% AEP) year events. These modelled scenarios also incorporate the likely future effects of climate change for 1 in 20 (5% AEP) and 1 in 100 (1% AEP) year events for the River Gipping and the 1 in 20 (5% AEP), 1 in 200 (0.5% AEP) and 1 in 1000 (0.1% AEP) year events for the Deben Estuary. All scenarios are modelled to account for the effects of flood defences and the undefended situation.

15. The EA model node locations are such that they provide a comprehensive coverage of the Flood Zone 3 areas associated with the Rivers Gipping and Deben that intersect or are in close proximity to the cable route. An overview of the model node locations are shown in Drawing 2A, with further details on the River Gipping and the River Deben shown in Drawings 2B and 2C, respectively (presented in Appendix 1).

16. The data supplied by the EA at each of these locations comprises water levels relative to Ordnance Survey datum (i.e. m AOD). To calculate flood water depths, these levels have been compared against ground level information extracted from LiDAR. Flood level calculations have been completed for areas where Flood Zone 3 is crossed by the cable route corridor. At these sites, ground elevation has been compared against flood data from the nearest EA model node. The selection of the nearest model node has been conducted using a simplified nearest neighbour analysis. Where there are small catchments with multiple nodes nearby modelled data has been averaged. The flood polygons and their nearest nodes are shown in Drawing 3 (Appendix 1).

17. In Drawing 3, the stars denote EA model node locations and the colour scheme used matches that in Drawing 3. To calculate the likely flood water depths within the cable corridor, the EA flood level data has been compared against ground elevation, specifically focussing on the areas where the cable corridor insects with Flood Zone 3.

18. Table 2-1 below identifies the probability of the flood event that will result in flooding of the construction sites, with a range of resulting floodwater depths reported, based on minimum, average and maximum ground levels. Data from model runs incorporating allowances for climate change has not been utilised in this assessment due to the temporary duration of the construction phase that this Flood Plan informs.

19. To undertake this calculation first, areas where the cable corridor crosses Flood Zone 3 were identified and the model node closest to this area was identified. A polygon was then drawn over an area bounded by either the red line boundary of the pipeline corridor or by the point where the distance is equal between model nodes. The polygons have been colour-coded to demonstrate which node is the closest and utilising the colour-scheme in Drawing 3 in Appendix 1.

20. Where polygons are small and several nodes are located in the near vicinity, EA data has been taken from all nearby nodes. This applies in particular to the River Gipping polygons where the light blue polygon's topography has been compared against EA nodes SOMS_1290, SOMS_1000 and SOMS_1200 and the dark blue polygon has been compared against GIPP_9200, GIPP_9400d and GIPP_9000. The results of this analysis are summarised on Table 2-1.

Table 2-1 Summary of Floodwater Depths

Polygon	Nearest Node	Average Ground Elevation (mAOD)	Maximum Ground Elevation (mAOD)	Floodwater Depth (5% AEP) (m)	Floodwater Depth (1.3%AEP) (m)
Deben Estuary					
1 Brown	634387	0.26	1.17	N/A	N/A
2 Purple	633187	0.14	1.71	N/A	0.48 – 0
3 Pink	632437	0.17	0.52	N/A	0.39 – 0.04
4 Dark Blue	631387	0.29	3.78	N/A	0.38 – 0
5 Light Blue	630187	0.57	7.55	N/A	N/A
6 Green	628087 627937	3.95	15.83	0	0
7 Orange	626437	0.13	3.46	3.23 - 0	3.47 – 0.14
8 Red	626137	0.31	3.66	3.05 – 0	3.30 – 0
River Gipping					
1 Dark Blue	GIPP_9200 GIPP_9400d GIPP_9000	9.14	11.77	0.69 – 0	0.90 - 0
2 Light Blue	SOMS_1290 SOMS_1000 SOMS_1200	12.48	18.25	0	0

21. Table 2-1 shows the average and maximum ground elevations within the defined assessment polygons and the estimated floodwater depths during the 1 in 20 (5% AEP) and 1 in 75 (1.3% AEP) year flood events, taking into account the effect of existing flood defences. Where a floodwater depth of N/A is reported, flood defences protect against flooding within the pipeline corridor during a flood event of this probability. Table 2-2 shows the annual exceedance probability of flooding to inundate the lowest, average and higher ground of polygons.

Table 2-2 Flood Polygon Exceedance Likelihoods

Polygon	Annual Exceedance Probability of Flooding to Inundate the Lowest, Average and Higher Ground of Polygons					
	Undefended			Defended		
	Lowest	Average	Highest	Lowest	Average	Highest
Deben Estuary						
1 Brown	5%	5%	5%	0.1%	0.1%	0.1%
2 Purple	5%	5%	5%	1.3%	1.3%	0.1%
3 Pink	5%	5%	5%	2%	2%	1.3%
4 Dark Blue	5%	5%	5%CC	2%	2%	0.1%
5 Light Blue	5%	5%	None	0.5%	0.5%	None
6 Green	5%	0.5%CC	None	5%	0.1%	None
7 Orange	5%	5%	0.1%	5%	5%	1.3%
8 Red	5%	5%	0.1%	5%	5%	0.5%
River Gipping						
1 Dark Blue	5%	5%	None	5%	5%	None
2 Light Blue	5%	None	None	5%	None	None

22. Comparing Tables 2-1 and 2-2, the data analysis shows that, for the undefended scenarios, the lowest areas of ground within the cable route corridor at the locations assessed would be vulnerable to inundation during high probability (5% AEP) flood events. Areas of the construction sites at higher ground elevations are also vulnerable. For Polygon 5, where the cable route crosses an area of floodplain associated with the Deben Estuary and both construction sites in the River Gipping floodplain, the maximum ground elevations are well above the modelled flood levels and therefore parts of these sites are not vulnerable to flooding.

23. For the Deben Estuary when the effects of existing flood defences are accounted for which is a more realistic scenario, the degree of flood risk identified at the majority of the construction sites within the floodplain is lower than in the undefended scenario. Generally the lowest ground at construction sites would be vulnerable to inundation during flood events with an annual chance of 2% (1 in 50) or less. The exceptions to this is at Polygons 7 and 8, where flood risk to all but the highest areas of ground is the same as in the undefended scenario.

24. There is no difference in flooding exceedance probability between defended and undefended scenarios for the River Gipping polygons. This is because there is less than 0.05m difference in the predicted flood water levels for these scenarios.

3 Flood Warning and Evacuation Procedure

3.1 Evacuation Triggers

25. EA Flood Warnings have been used to set evacuation triggers. Two stages have been identified, namely to place staff on a green alert (state of readiness) and implement a review of the Emergency Plan procedures, or issue a red alert (triggering site evacuation).

26. During construction all construction workers, as part of their Site Induction, should be made aware of the sections of the cable route which are located in Flood Zones 2 and 3 (eight locations listed in Section 2.2 and 3.11) and of the evacuation process from those locations in the event of a flood, as set out in Table 3-7. Where possible stockpiles should be located outside of the floodplain, to minimise loss of flood storage and impediment to floodplain flows in the event of a flood and to minimise a rise in silt in surrounding watercourses. Where this is not possible, all stockpiles will be situated no closer than 5m to the top of bank of any watercourse and measures put in place to stabilise/contain the stockpiles to minimise the potential for wash out to nearby watercourses.

27. All contractors will be required to sign up to the EA's flood warning service so that when the EA issue a flood alert or warning, the service will send an automated warning message to nominated person/persons.

3.2 Structure

28. This Flood Warning and Evacuation Procedure (FWEP) is broken down into the following sections:

- Section 3 - outlines the key 'pre-occupation' actions that the contractors should complete to implement the procedure. As well as providing details of key contacts and information and outlines the triggers for action and recommended evacutation procedures.
  This section presents details and tables which will be used by all contractors to document key actions and details. Each contractor will be required to complete and duplicate these sections in their Emergency Response Plan.
- Section 4- outlines the monitoring and review process for the prcoedure.

3.3 Pre-Occupation Actions

29. Prior to the commencement of onshore construction works it will be the responsibility of the contractors, monitored by the EAOL, to ensure that all actions outlined in Table 3-1 are completed.

Table 3-1 Pre-Occupation Actions

No	Action	Further Information	Completion Date and Signature
1	Undertake a review of the Flood Warning and Evacuation Procedure and make updates to take into account new or additional information.	Flood Warning and Evacuation Procedure to be incorporated into contractor Emergency Response Plan.	
2	Register with the EA Floodline Warnings Direct service.	Floodline Warnings Direct can be signed up to using the following link https://fwd.environment-agency.gov.uk/app/olr/register or by calling Floodline on 0345 988 1188	
3	Ensure all construction personnel are aware of the Flood Warning and Evacuation Procedure and are trained sufficiently to implement the procedures set out in the Plan.	Include as part of the Site Induction training	
4	Contractor to develop an emergency access and egress plan for their elements of works.	During site inductions, all staff will need to be made aware of the emergency	

		access and egress arrangements.	
5	Contractor to identify an appropriate designated evacuation point from the sections of onshore construction works located in Flood Zone 3.	The designated point should be located on public land within Flood Zone 1.	

3.4 Key Contacts and Information

30. Table 3-2 lists contact numbers for personnel and Agencies that have key roles during a flooding emergency. This table will be completed by all contractors. This table will be periodically reviewed, and if necessary updated, by the contractors, with this review process monitored by EAOL.

Table 3-2 Contact numbers

Position	Name	Role	Contact number
Project Manager	TBC	Ensure that the Flood Warning and Evacuation Procedure has been put in place and monitor to ensure that periodic updates are made to the procedure as necessary. Ensure sufficient resources (people, time and money) are provided to implement the procdure.	TBC
Construction Manager	TBC	The Contractors role is to ensure all the Pre-Occupation Actions (Table 3-1) have been completed as well as to ensure that the Emergency Plan is reviewed and updated when deemed appropriate.	TBC
Site Manager	TBC	Once flood warning alerts have been received it is the Site Manager's responsibility to disseminate flood alerts to all members of staff. When severe flood warnings have been issued it is the Site Manager's responsibility to contact the Emergency Services and EA to confirm that the construction works sites and compounds are being closed due to potential flooding. It is also the Construction Site Manager's responsibility to operate emergency electrical shut off switches that terminate electricity supply to the works sites. The Construction Manager should direct the evacuation of the works sites and help other members of staff to move to the designated evacuation point(s) located in Flood Zone 1. The Construction Site Manager should also take a register to ensure all staff are accounted for and provide an update to any on-site emergency services confirming that the site has been evacuated.	TBC
EA Floodline Contact	TBC	The EA will issue a flood warning to nominated construction management personnel.	0345 9881188

Note: TBC fields to be completed prior to construction start

3.5 Emergency Contacts

31. Table 3-3 provides contact numbers for relevant Emergency Services.

32. ***In an emergency where there is a real and immediate threat to life or property always dial 999.***

Table 3-3 Contact numbers for relevant Emergency services

Body	Contact Number
Suffolk Fire & Rescue Service	01473 260588
Suffolk Police	01473 613500
Environment Agency	0345 988 1188

33. If medical attention is required within the workplace, First Aiders should be in attendance and a record of the individual affected and the circumstances relating to the incident should be kept.

34. The closest hospital to the onshore construction works with an Accident and Emergency Department is the Ipswich Hospital. ***The Hospital can be contacted on 01473 712233 The address is: Heath Road, Ipswich, Suffolk, IP4 5PD***

3.6 Other Useful Numbers

35. Table 3-4 provides a list of other useful numbers. This table will be completed by all contractors. This table will be periodically reviewed, and if necessary updated, during the onshore construction works.

Table 3-4 Other useful numbers

Body	Name	Contact Number
Electricity Provider	TBC	TBC
Gas Provider	TBC	TBC
Water Company	Anglian Water	03457 145 145
Telephone Provider	TBC	TBC
Local Authority	Ipswich Borough Council	01473 432000
Local Radio Station	BBC Radio Suffolk Radio Now	01473 250000
Local TV Stations	BBC – Suffolk	01473 250000

Note: TBC fields to be completed prior to construction start

3.7 Insurance Details

36. Table 3-5 provides Insurance details for the onshore construction works. This table will be completed by the all contractors.

Table 3-5 Insurance Details

Insurance Company	Policy Number	Contact Number
TBC		
TBC		
TBC		
TBC		

Note: TBC fields to be completed prior to construction start

3.8 Location of services

37. Table 3-6 provides details of the locations of cut offs and valves for key services. This table will be completed by all contractors. This table should be periodically reviewed, and if necessary updated, during the onshore construction works.

Table 3-6 Location of Services

Service	Location of Cut Off and Valves
Electricity	TBC
Gas	TBC
Water	TBC

Note: TBC fields to be completed prior to construction start

3.9 Flood Warning and Evacuation Procedures

38. An overview of the Flood Warning and Evacuation Procedures is illustrated in Figure 1. This figure shows the three trigger levels and the corresponding actions that will need to be implemented.

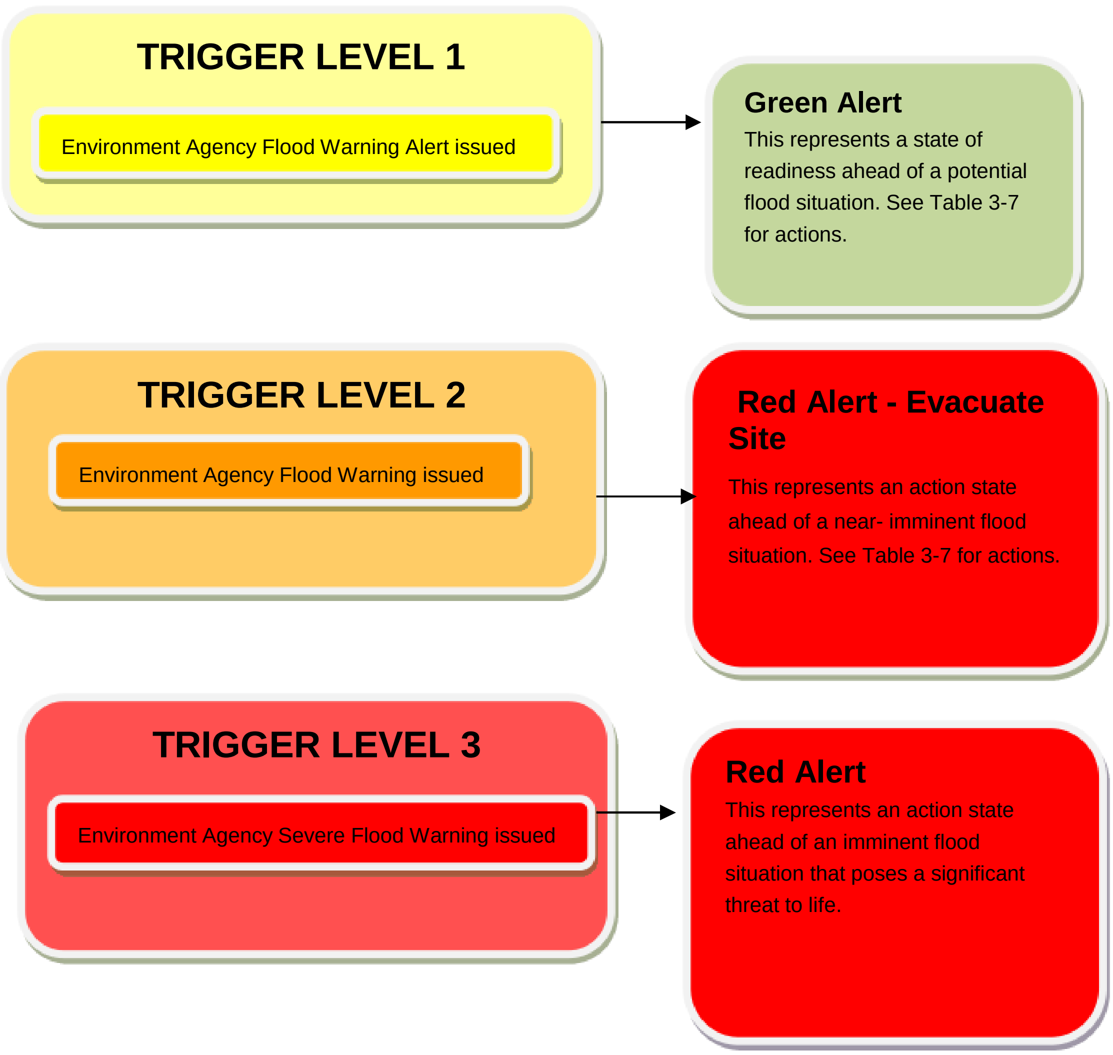


Figure 1 Trigger Levels and Actions

39. Flood evacuation procedures are outlined in Table 3-7.

Table 3-7 Flood Evacuation Procedures

Warning Triggers	Procedures
Trigger Level 1 EA Flood Alert	Place Staff on Green Alert and review Flood Warning and Evacuation Plan Procedures. Check that all equipment can be accessed, is available and in good condition for use, with specific reference to - closed road signs, torches (check battery life/spares), high visibility jackets for all staff. Secure construction compounds and relocate vulnerable plant/machinery/stores to Flood Zone 1 if possible. Allow for handover should shift change occur before the warning is lowered. Check staff registers are complete and available to ensure all staff are accounted for post- evacuation
Trigger Level 2 EA Flood Warning	Place staff on Red Alert and begin evacuation of construction work sites and compounds (Trigger Fire Alarm at compounds). Use allocated evacuation route to facilitate / direct the safe evacuation of all personnel. A register should be taken to ensure all staff are accounted for. Contact the Emergency Services and EA to confirm that the work sites and compounds are being closed due to the risk of flooding. The Contractor's Construction Site Manager shall operate the emergency electrical shut off switches terminating the electricity supply and all power supplies to construction works sites/compounds if safe to do so.
Trigger Level 3 EA Severe Flood Warning	Immediately start evacuation of construction work sites and compounds if not actioned on receipt of the Flood Warning (Trigger Fire Alarm at compounds). Use allocated evacuation route to facilitate / direct the safe evacuation of all personnel. A register should be taken to ensure all staff are accounted for. Contact the Emergency Services and EA to confirm that the works sites and compounds are being closed due to the risk of flooding. The Contractor's Site Manager shall operate the emergency electrical shut off switches terminating the electricity supply and all power supplies to construction works sites/compounds, if safe to do so.

40. Flooding is very complex and is controlled by a large number of highly variable physical factors such as the volume and intensity of rainfall, wave heights and surge. Therefore, accurate predictions for the sequence of potential flooding of the onshore construction work should be investigated. Further data on the likely flood conditions (floodwater depths) along the cable route have been received from the EA and built into this FWEP. However it is recommended that the contractors consult with the EA to gain understanding how much time is likely to be available between receiving a flood alert and flood waters first affecting the onshore construction works.

3.10 Environment Agency Flood Warning Service

41. All areas of the onshore construction works located in Flood Zone 3 are linked to the EA's flood warning service so that when the EA issues a flood alert or warning, the service would send an automated warning message to the nominated construction management personnel.

42. It should be noted that the areas of the onshore construction works located in Flood Zone 3 are in a larger geographical area where the EA provides a general early Flood Alert notification for possible flooding. Therefore, the Flood Alert may not specifically apply to the application site itself and its immediate neighbourhood.

43. Upon receipt of an EA Flood Warning the Contractor's Site Manager would notify staff of the Red Alert and begin evacuation of the site, including ensuring the necessary protection for works sites and construction compounds ahead of a potential flood situation.

Table 3-8 The EA flood warnings as outlined in Figure 1

Symbol	Risk	Status	When it is used	What to do
	High Risk	**Severe Flood Warning** Severe flooding. Danger to life.	When flooding poses a significant threat to life.	-Stay in a safe place with a means of escape. -Be ready should you need to evacuate. -Co-operate with the emergency services. -Call 999 if you are in immediate danger.
	Medium Risk	**Flood Warning** Flooding is expected. Immediate action required.	Half an hour to one day in advance of flooding.	-Stay in a safe place with a means of escape. - Be ready should you need to evacuate. -Turn off gas, electricity and water supplies if safe to do so. -Put flood protection equipment in place if safe to do so. -Co-operate with the emergency services. Call 999 if you are in immediate danger.
	Low Risk	**Flood Alert** Flooding is possible. Be prepared.	Two hours to two days in advance of flooding.	-Be prepared to act on your flood plan. - Turn off gas, electricity and water supplies if safe to do so. Put flood protection equipment in place if safe to do so. -Prepare a flood kit of essential items. -Monitor local water levels, weather reports and the flood forecast on the EA website.
Text	Very Low Risk	**Warnings no longer in force** No further flooding is currently expected in your area.	When river or sea conditions begin to return to normal.	-Be careful. Flood water may still be around for several days. -If you've been flooded, ring your insurance company as soon as possible.

3.11 Evacuation Route and Designed Evacuation Point

44. There will be separate evacuation routes from each area of the onshore construction works area located in Flood Zone 3. These routes will be agreed and documented by the Contractor's Site Manager below. All construction site personnel will be informed of these evacuation routes during their Induction training.

When the cable route crosses a small watercourse near Sycambe Farm the designated evacuation point is located..

When the cable route crosses the River Gipping watercourse near Mockbeggars the designated evacuation point is located..

When the cable route crosses a small watercourse near Hill Farm the designated evacuation point is located..

When the cable route crosses a small watercourse near Larks Hill the designated evacuation point is located..

When the cable route crosses a small watercourse south of Great Bealings the designated evacuation point is located..

When the cable route crosses a small watercourse near Martlesham creek (approximate the designated evacuation point is located..

When the cable route crosses a small watercourse south of Hemley near Sluice Farm the designated evacuation point is located..

When the cable route crosses the River Derben near Falken creek (approximate NGR 631102, 239831) down to its outfall by Bawdsey Hall (approximate NGR 635182, 239228) the designated evacuation point is located..

3.12 Water Level Falling

45. As detailed, the EA Flood Warnings identify a 'potential' rather than 'actual' threat. It should be noted that not all events would result in an automatic progression from one warning to another with the end result being flooding and evacuation of the application site. It is possible for smaller events to trigger initial warnings with water levels subsequently falling before flooding occurs.

46. Should water levels within the watercourse/s thought to be at risk of flooding or tide levels exhibit a sustained fall at any point during the event, this will be identified by the EA Flood Warning Service and an automatic notification sent to the Contractor's Site Manager via phone and email.

47. On receipt of such a notification the Contractor's Site Manager can downgrade the trigger level response as appropriate.

4 Monitoring and Review

48. During the construction a Flood Coordinator will be appointed by the contractors. The Flood Coordinator would ensure that all construction personnel are aware of the potential flood risk and of how to respond in the event of a flooding emergency. The training for construction personnel as a minimum, will cover:

- Requirements of the Flood Warning and Evacuation Procedure (detailed in Section 3).
- Confirmation of Key Roles, clearly identifying positions held, responsibilities, communication and chain of command.
- Staff duties.
- Evacuation Routes.
- Staff safety during a flood event.
- Electrical systems emergency shut off procedures.
- Operation of communications systems, signage and traffic management systems.
- All construction staff will be trained as part of the site induction process

49. All training completed will be documented and recorded. Staff will also be made aware of any updates to the Procedure through appropriate internal staff briefings or tool box talks.

50. The Flood Warning and Evacuation Procedure will be subject to update / review:

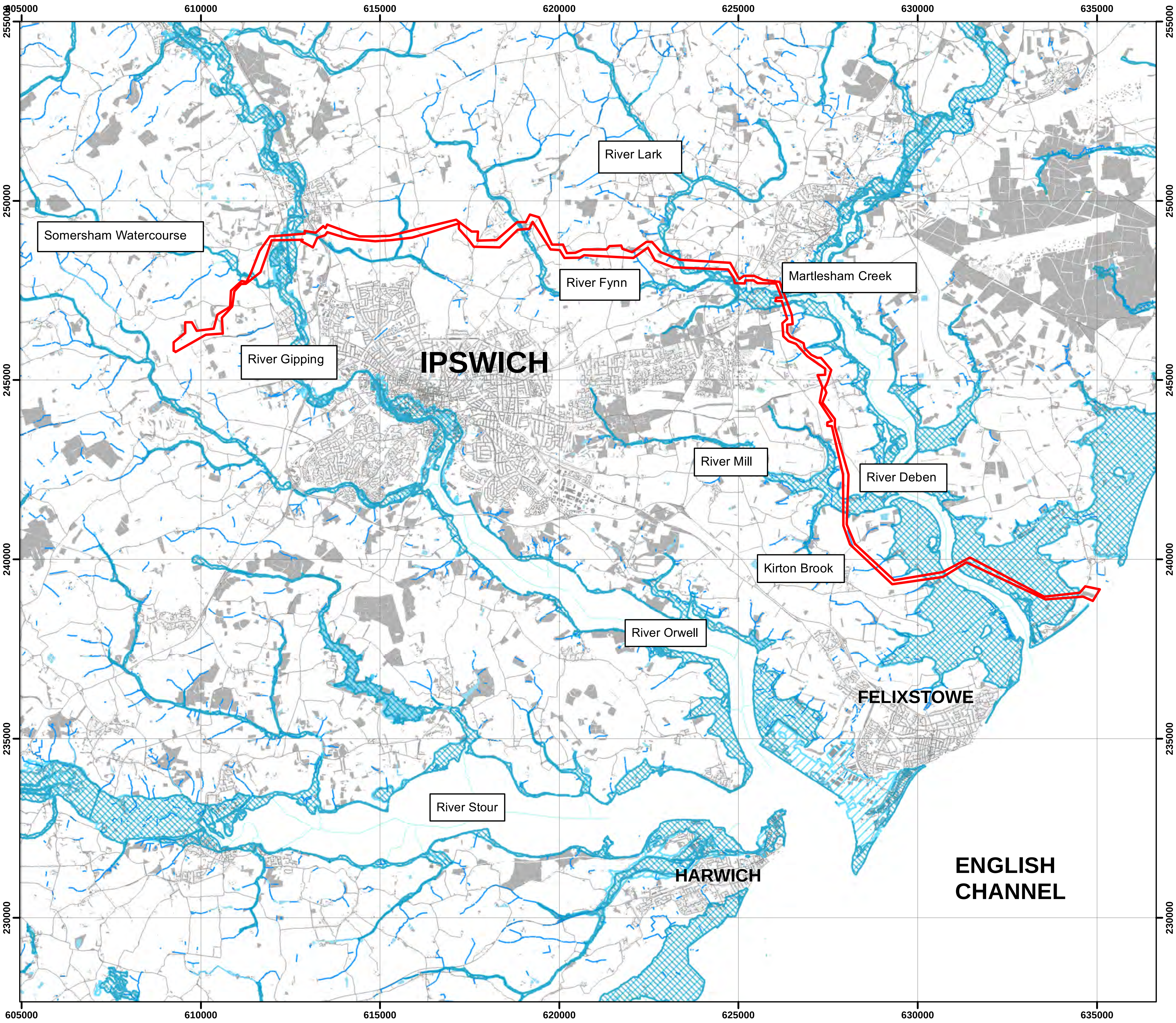
- Whenever there are changes to any of the contact numbers, names or roles held within the Procedure.
- All updates / reviews shall be documented and recorded.
- The Contractor's Site Manager will ensure an up-to-date version of the Procedure is available at all times during the construction phase.

51. When the Procedure is updated a document control record, as presented in Table 4-1, will be completed for document control and to understand why changes were needed.

Table 4-1 Flood Plan Evacuation Procedures Document Control

Version	Date	Prepared by	Checked by	Approved by	Reasons for Revision

Appendix 1 - Drawings



SCOTTISHPOWER RENEWABLES

Legend

- DCO Limits
- Flood Zone 3
- Flood Zone 2
- Surface Water

1:100,000
SCALE @ A3

0 1,500 3,000 Meters

DATE: 19/07/2016

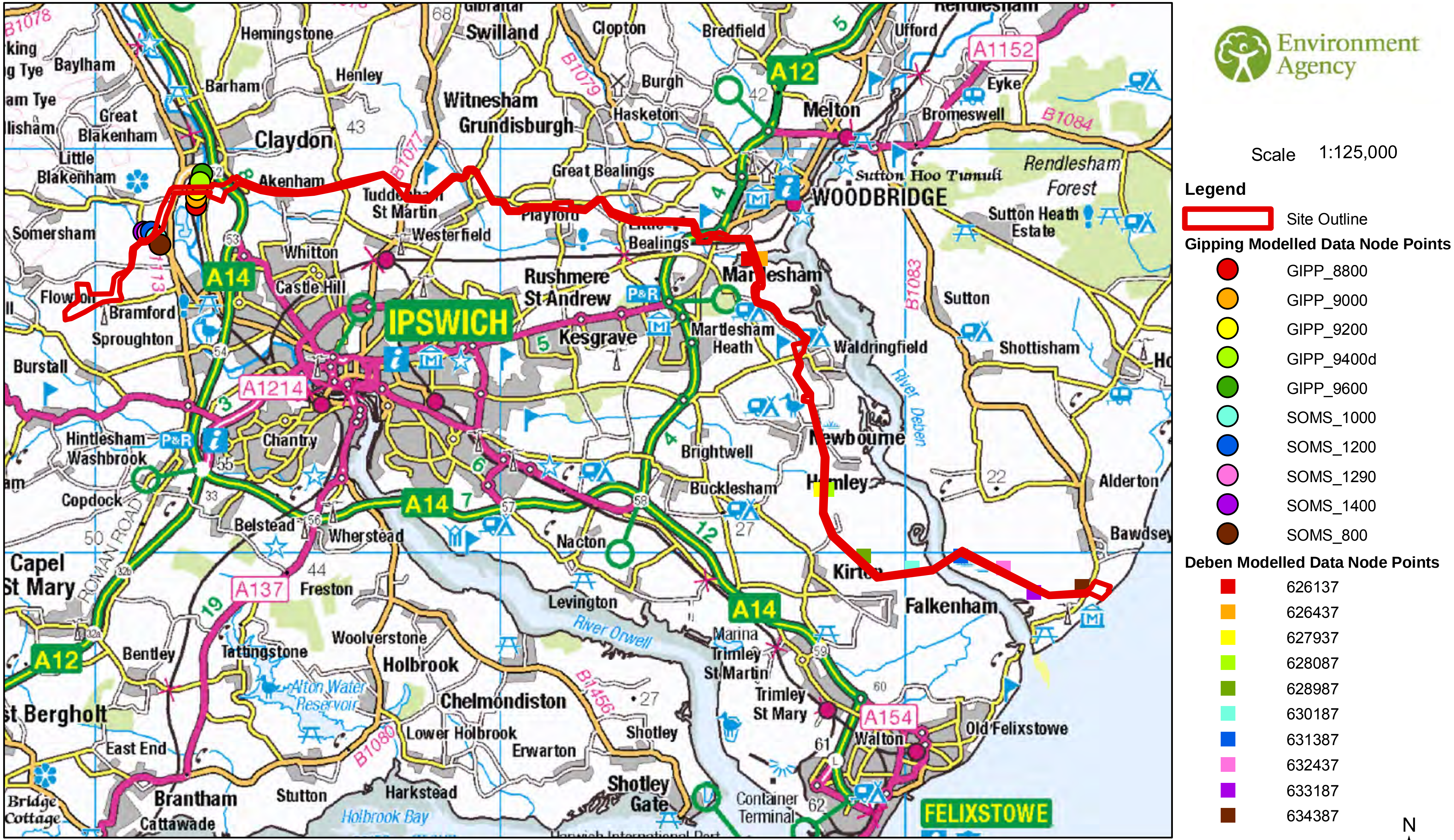
Drawing 1:
Flood Plan Main River Watercourses
and EA Flood Zones

East Anglia ONE Offshore Windfarm

IBERDROLA
Engineering & Construction

Drawing 2A

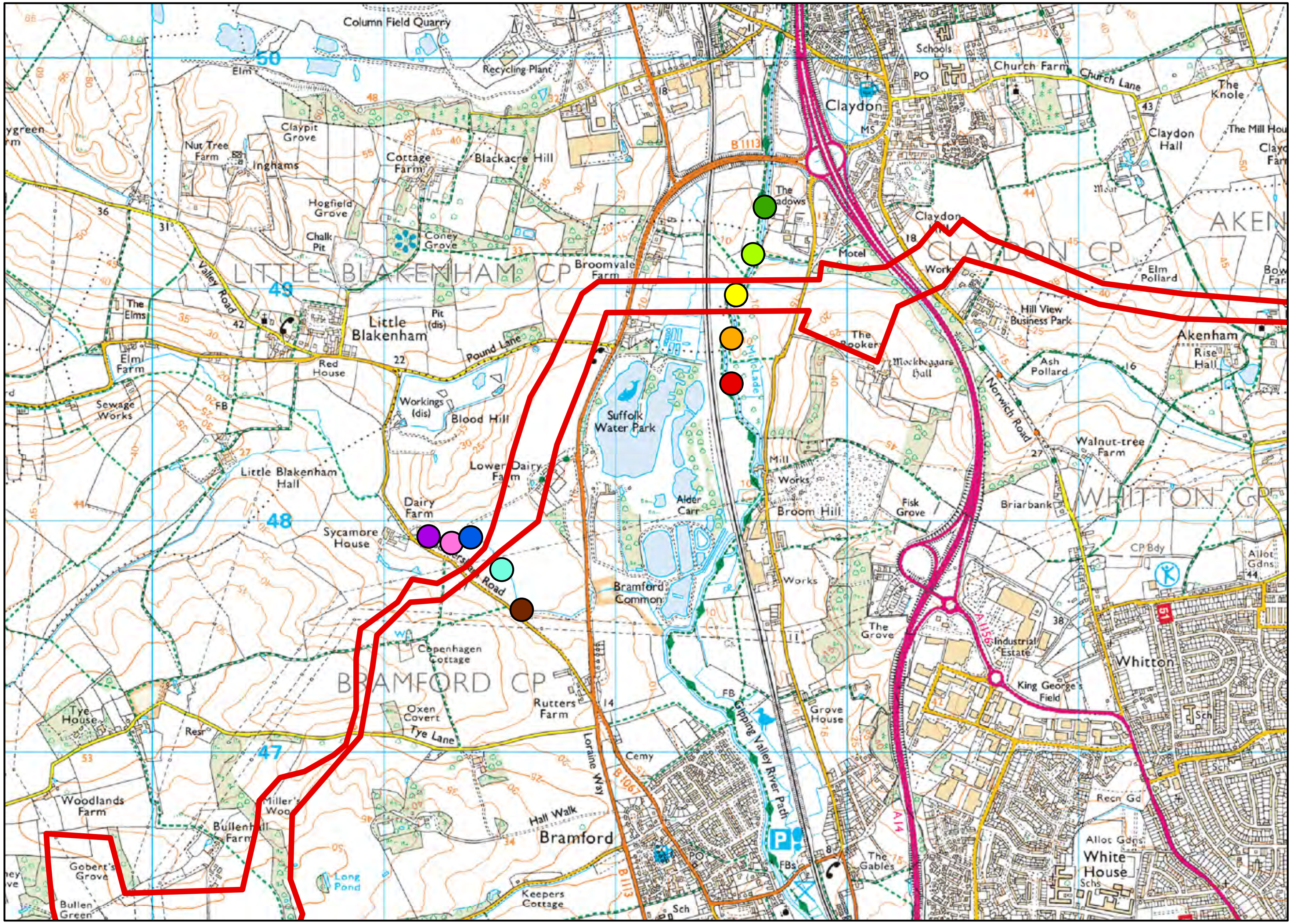
Overview Modelled Flood Level Location Map centred on Ipswich
Created 11th of November 2015 - CCE/2015/56118



Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Drawing 2B

Gipping Modelled Flood Level Location Map centred on Ipswich
Created 11th of November 2015 - CCE/2015/56118



Environment Agency

Scale 1:24,000

Legend

Site Outline

Gipping Modelled Data Node Points

- GIPP_8800
- GIPP_9000
- GIPP_9200
- GIPP_9400d
- GIPP_9600
- SOMS_1000
- SOMS_1200
- SOMS_1290
- SOMS_1400
- SOMS_800

N

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Drawing 2C

Deben Modelled Flood Level Location Map centred on Ipswich
Created 11th of November 2015 - CCE/2015/56118

Environment Agency

Scale 1:60,000

Legend

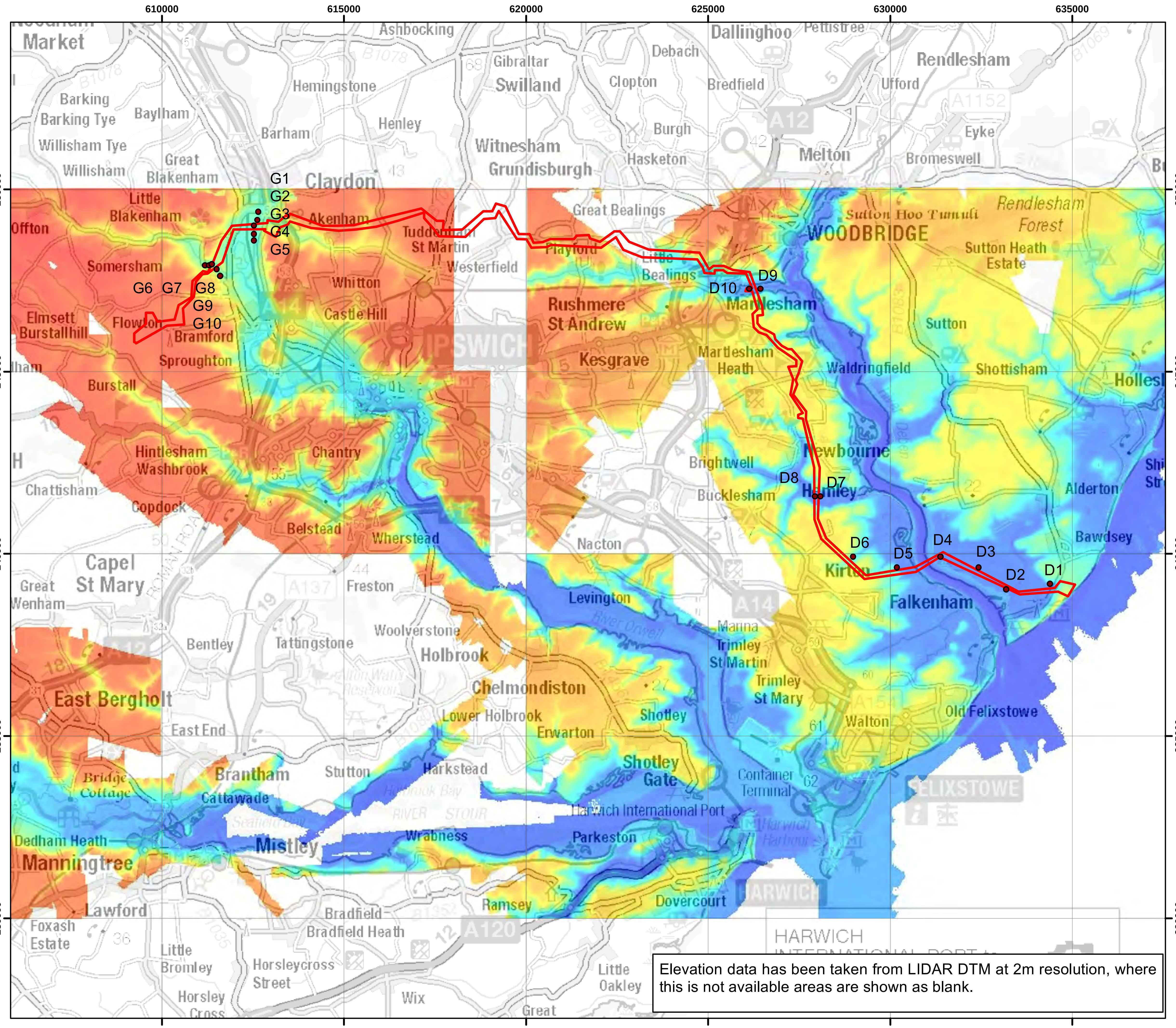
Site Outline

Deben Modelled Data Node Points

626137
626437
627937
628087
628987
630187
631387
632437
633187
634387

N

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk



Elevation data has been taken from LIDAR DTM at 2m resolution, where this is not available areas are shown as blank.

SCOTTISHPOWER RENEWABLES

Legend

DCO Limits

Model Node Locations

Deben Estuary:

D1	634387
D2	633187
D3	632437
D4	631387
D5	630187
D6	628987
D7	628087
D8	627937
D9	626437
D10	626137

River Gipping:

G1	GIPP_9600
G2	GIPP_9400d
G3	GIPP_9200
G4	GIPP_9000
G5	GIPP_8800
G6	SOMS_1400
G7	SOMS_1290
G8	SOMS_1200
G9	SOMS_1000
G10	SOMS_800

Elevation (AOD):
- Less than 5m
- 5-15m
- 15-25m
- 25-35m
- 35-45m
- Greater than 45m

1:100,000
SCALE @ A3

DATE: 19/08/2016

Drawing 3

Flood Polygon Locations

East Anglia ONE Offshore Windfarm

IBERDROLA
Engineering & Construction

Appendix 9 Community Liaison and Public Relations Procedure

East Anglia ONE
Offshore Windfarm

East Anglia ONE offshore Windfarm

Community Liaison and Public Relations Procedure

Appendix 9 Code of Construction Practice

Final for Discharge

www.scottishpowerrenewables.com

SCOTTISHPOWER RENEWABLES

Table of Contents

Appendices

Abbreviations

AC - Alternating Current
CoCP - Code of Construction Practice
CfD - Contract for Difference
DCO - Development Consent Order
DECC - Department for Energy and Climate Change
EADT - East Anglian Daily Times
EAOL - East Anglia One Limited
EA ONE - East Anglia ONE Offshore Wind Farm
IEC – Iberdrola Engineering and Construction
LPA – Local Planning Authority
MW – Megawatts
PID – Public Information Days
SCC – Suffolk County Council
SPR – ScottishPower Renewables

1 Introduction

1.1 Project Overview

1. East Anglia ONE Limited (EAOL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Energy and Climate Change (DECC), on June 17th 2014 for East Anglia ONE Offshore Wind Farm (EA ONE).

2. This procedure relates to the onshore construction works associated with EA ONE which, based on the AC technology with a capacity of 714MW and a transmission connection of 680MW, comprises:

- A landfall site at Bawdsey, Suffolk.
- Up to six underground cables, approximately 37km in length.
- Up to four cable ducts for the East Anglia THREE project.
- An onshore substation located at Bramford next to the existing National Grid infrastructure.

1.2 Purpose and Scope

3. This Community Liaison and Public Relations Procedure sets out communication processes to be applied during the onshore construction works associated with EA ONE. This document is submitted as an Appendix to the Code of Construction Practice (CoCP) to fulfil Requirement 20 (2) (i) of the DCO which states:

> ***20**.— (2) The code of construction practice shall include— ....*
> *(i) a project community and public relations procedure.*

4. It aims to ensure that the onshore construction works are fully communicated to interested parties and that procedures comply with DCO conditions and construction best practice as set out in the CoCP.

5. The term ‘Project’ in this document refers to the onshore construction works associated with EA ONE, as described in Section 1.1.

6. It sets out the communication measures which EAOL will be required to adopt and implement during any onshore construction works. Therefore, the purpose of the plan will be:

- To ensure a clear understanding and consistent approach across the project and by contractors.
- To reduce the likelihood that conflicts will occur between projects in terms of external relationships and internal resource.
- To maximise and take advantage of potential synergies in consultation/communication.
- To ensure a clear understanding and consistent approach across all the SPR East Anglia projects.
- To provide a record of communication activity for EA ONE onshore construction works.

7. Where works require a Temporary Traffic Regulation Order (TTRO), such as a road closure or other traffic restrictions, applications and consultation will be undertaken in accordance with SCC Highways Authority requirements. Such consultation will be in addition to that which is stated in this document. Further details are presented Traffic Management Plan (EA1-CON-R-IBR-009583) and are not included within this document.

2 Community Information Service

2.1 Communication Roles

8. Communication with the public will be undertaken using a variety of methods including face-to-face contact, telephone, email and public exhibitions, all of which are defined in this section.

9. Key personnel will also be in place to ensure that general and specific queries from the public and other stakeholders can be answered appropriately. They include:

- A Stakeholder Manager to oversee all engagement with communities and those with an interest in the project.
- A Community Liaison Officer who will be based on site and who will deal with day-to-day queries and keep a log of issues (see Section 2.2 on the Community Liaison Officer role).
- A Land Manager who will manage all landowner-related issues and concerns.
- A Consent Compliance Manager to ensure that all activities comply with what has been consented in the project's Development Consent Order (DCO).
- A Communications Manager to oversee all communication relating to the project. This individual will work closely with the project's Public Relations (PR) agency and they will co-ordinate public exhibitions, a company newsletter, and other materials to update local communities and the media.

10. The onshore construction works will be managed by Iberdrola Construction and Engineering (IEC) on behalf of EAOL. This construction team includes a number of key roles. They include:

- Project Managers, who are in place to manage the different elements of the construction works.
- A Construction Manager to ensure that construction is undertaken on schedule and to the agreed specification.
- A Site Manager who will oversee activities on site during the construction works.

2.2 Community Liaison Officer

11. A Community Liaison Officer will be in post for 2.5 days a week, a minimum of 2 months in advance of the start of the onshore construction works (job specification presented in Appendix 1). The position will become full time when the onshore construction works commence. The individual will be based at Construction Consolidation Site B (CCS B) at Claydon, but will travel frequently along the cable route. They will manage and respond to any public concerns, queries or complaints and will maintain a record of all correspondence.

12. They will also review contractors' programmes to identify potential community concerns, identify a solution where appropriate and ensure such solutions are followed through.

13. In addition, they will be aware of activities taking place on other proposed ScottishPower Renewables (SPR) projects in the area, to ensure consistency of messaging and that synergies between projects can be maximised.

14. Internally, the Community Liaison Officer will work closely with the:

- Stakeholder Manager.
- IEC Construction Team.
- Land Manager.
- EA ONE Project Team.
- Onshore Contractors and Subcontractors.
- Agricultural, Aboricultural and Ecological Clerk of Works etc.

15. Externally, the Community Liaison Officer will work closely with the:

- Emergency Services.
- Suffolk County Council (SCC) Highways Authority.
- Local Planning Authorities (LPAs).

- Local Communities and Organisations.

2.3 Code of Construction Practice

16. To ensure that local communities are fully informed with regard to construction procedures for the EA ONE onshore construction works the Code of Construction Practice will be circulated to interested parties. It should be noted that the CoCP is a substantial document and for that reason it will be sent, without its appendices. It is hoped that the main document will provide adequate detail on the processes and procedures that will be undertaken during construction. However, if interested parties require further details, the document identifies which appendices should be referred to with regard to related issues and all of the appendices will be made available, in full, on the SPR website.

17. The Stakeholder Manager will send the Code of Construction Practice (CoCP), excluding its appendices, to:

- Parish councils along the cable route;
- County and Borough/District Councillors from divisions and wards along the cable route; and
- Interested parties.

18. The Land Manager will send the CoCP, excluding its appendices, to landowners with an interest in the project.

19. The Communications team will publish the CoCP with its Appendices, on the EA ONE section of the SPR Website.

2.4 ScottishPower Renewables Website

20. The Communications team will ensure that information about onshore construction works is available on the EA ONE website. This will include information on what the works' comprise, their location, a timetable for their undertaking and a link to the CoCP and related appendices.

21. In addition, there will be regular updates on traffic calming measures and road closures, any disruptions to services and contact information.

22. Furthermore, the website will provide information on other SPR projects proposed for the southern half of the East Anglia Zone. This will ensure that readers are aware that other activities are taking place in addition to the works for EA ONE.

23. Contact details for the Community Liaison Officer and Stakeholder Manager will be available on the site.

2.5 Emails and Notices

24. Four weeks prior to the commencement of construction works and in addition to the required statutory obligations, the following communications will take place:

- The Construction Team will contact the Highways Officers at Suffolk County Council to confirm start dates and timings of works and provide details about any public exhibitions and drop-in events.
- The Stakeholder Manager will send e-mails to the Local Planning Authorities (LPAs) informing them of dates and timings of works and providing details about any public exhibitions and drop-in events.
- The Stakeholder Manager will send e-mails to relevant parish councils, cable corridor councillors and interested parties, informing them of dates and timings of works and providing details about any public exhibitions and drop-in events.
- The Land Manager will send e-mails to landowners, informing them of dates and timings of works and providing details about any planned mobile exhibitions and drop-in events.
- The SPR Senior Government Affairs Manager will send e-mails to local MPs, informing them of dates and timings of works and providing details about any planned mobile exhibitions and drop-in events.
- The Community Liaison Officer will email/telephone the emergency services in the area, informing them of dates and timings of works.
- The Community Liaison Officer will email/telephone passenger service/bus services in the area, informing them of dates and timings of works.
- Information notices will be placed along the cable route, on village notice boards and on the perimeter fencing.

    i. The Stakeholder Manager will inform parish councils that the notices are to be put up and will seek permission for the notices to be put on village notice boards (by the parish clerks).
    ii. The Construction Team and the SPR Land Manager will arrange for information notices to be put up on the perimeter fencing by the contractors/land agents.
    iii. It is recommended that photographs are taken when information notices are put up, as evidence that this has been done.
- The Communications Team will publish the information notices on the EA ONE website.

2.6 Adverts/Articles

25. Four weeks prior to the commencement of construction works, adverts/articles concerning the works will be placed in the local press - The *East Anglian Daily Times (EADT)* and *Ipswich Star*. These adverts/articles will also give information about planned public exhibitions, where they are to be located, together with drop-in event times. The Project's PR agency will produce adverts/articles and co-ordinate publication with the local press.

2.7 Letters

26. Three weeks prior to the commencement of construction works, EAOL will send letters to individual addresses in the vicinity of the works.

2.8 Exhibitions/Public Information Days

27. Two weeks prior to the commencement of construction works, Public Information Days (PIDs) will take place in the vicinity of the works.

28. Suggested locations would be village halls or set locations at each end, and in the middle, of the cable route. Previous PIDs have been held at Bramford, Burstall, Bawdsey Village Hall and at Woodbridge Library.

29. These will last at least three days and could thereafter remain in situ, unmanned, for a further week, with monitoring by the Community Liaison Officer. If village halls cannot remain open, then it is suggested that boards are situated in local libraries. Previous unmanned exhibitions have been held at Hadleigh, Woodbridge and Ipswich Library.

30. The Stakeholder Manager will contact parish councils to arrange bookings in village halls and at libraries. The Stakeholder Manager will liaise with IEC construction managers, to establish times when the IEC Construction Managers will be available to attend PIDs. It is proposed that managers are available at lunchtime and from 5pm – 7pm in the evening in a rota based system.

31. It should be noted that if consultation is required for any of the other proposed projects in the area, consideration will be given to combining the two projects in one exhibition to maximise synergies and reduce consultation fatigue among local communities.

2.9 Exhibition Boards

32. Exhibition boards will be produced by EA ONE's marketing agency ready for placement at agreed PID/exhibition venues.

33. The boards will provide information on what the works comprise of, their location, duration and schedule of hours.

34. There will be an explanation as to why the works are being carried out, with an emphasis on safety and mitigation for local residents and with regard to construction – some key points on how dust, noise, pollution etc., will be minimised.

35. Contact details for the Community Liaison Officer will also be provided.

2.10 Parish Magazines

36. The Communications Manager and the developer's marketing agency to have a list of deadline dates for parish magazines so that notices, adverts and articles can be published in these publications as necessary.

2.11 Parish Council Meetings and special engagements

37. Parish councils requesting a meeting and events requesting a speaker, will be honoured as far as possible.

2.12 Newsletter

38. An SPR Newsletter will be published at least twice a year. This will be produced by the EA ONE's marketing agency and will contain information about both the onshore and offshore works, as well as details about other proposed projects.

2.13 Enquiries/issues

39. All enquiries relating to the onshore works should be directed to the Community Liaison Officer in the first instance. The Community Liaison Officer will keep a record of all issues raised. Any matters requiring action or consideration will be raised with the LPAs at the monthly steering group meetings as well as the regular meetings with SCC Highways Authority. In addition, these meetings will allow the LPAs to raise any issues in turn with the project.

40. Contact details for the Community Liaison Officer will be made available on the website and in any communications nearer to the start of the works.

41. Queries can also be directed to the SPR Stakeholder Manager, Joanna Young. Tel: 01502 509 236; Mob: 07738 063 259; jyoung@scottishpower.com.

2.14 Review

42. This Procedure will be reviewed every six months during the duration of the onshore construction works and updated as required.

Appendix 1 Community Liaison Officer Specification

Role details	
Position title	Community Liaison Officer
Geographic Location	East Anglia
Project	East Anglia ONE Offshore Windfarm
Start date	October 2/5 days per week with FTE role Jan 2017 onwards

Scope of the role

To support the East Anglia ONE Offshore Windfarm project with community engagement during construction of the onshore cable route.

The core aspects of this role will be:

- Preparing and implementing a community engagement strategy addressing how the officer and project will:

  - Maintain a record of all communication with community members
  - Answer requests from the public and community for information about the project
  - Create a complaints procedure with monthly reporting and feedback to ensure issues are resolved in a timely and appropriate manner
  - Create a procedure for responding to situations efficiently and effectively and liaise and discuss actions/issues for resolution with the relevant teams
  - Identify community groups and build working relationships
  - Facilitate and co-ordinate public information events as and when required
  - Working closely with the appointed contractors carrying out onshore works and review their programme of works to assess the likelihood of community concerns, identify solutions and take responsibility for ensuring these are in place

The role should be carried out in accordance with National Standards for Community Engagement http://www.scdc.org.uk/what/national-standards/. The Community Engagement Officer will take ownership and responsibility for ensuring these standards are met in all aspects of community engagement and will promote these standards amongst the East Anglia ONE team and their sub-contractors.

Communication tools will be made available to the Community Engagement Officer. These will include:

- The SPR East Anglia ONE project website
- The SPR East Anglia Offshore Wind Community Newsletter
- Landowner contact database

The Community Engagement Officer will also be expected to familiarise him or herself with:

- The consultation history with parish councils and community members dating back to 2010
- The consultation reports for East Anglia ONE and THREE Offshore Windfarms

Teams the appointed persons will work with are:

- Iberdrola Engineering Consultancy
- The appointed onshore construction contractor and their subcontractors
- Any other appointed contractors carrying out onshore works
- The appointed agricultural liaison and landowner engagement officer
- ScottishPower Renewables
- East Anglia Offshore Wind Stakeholder Manager
- East Anglia ONE Project Staff