East Anglia ONE North Offshore Windfarm

Design and Access Statement

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Table of Contents

The Design and Access Statement is supported by the figures listed in the table below.

Figure Number	Title
Figure 1	East Anglia ONE North and East Anglia TWO Onshore Development Area
Figure 2 (a – j)	East Anglia ONE North and East Anglia TWO Permanent (Operational) Plans

Glossary of Acronyms

AIS	Air Insulated Switchgear
AONB	Area of Outstanding Natural Beauty
CABE	Commission for the Architecture and Built Environment
CCS	Construction Consolidation Sites
COCP	Code of Construction Practice
DAS	Design and Access Statement
DCO	Development Consent Order
DTS	Distributed Temperature Sensing
EIA	Environmental Impact Assessment
ES	Environmental Statement
ETG	Expert Topic Group
FO	Fibre Optic
HDD	Horizontal Directional Drilling
HGV	Heavy Goods Vehicle
HVAC	High Voltage Alternating Current
GIS	Gas Insulated Switchgear
LAT	Lowest Astronomical Tide
NPS	National Policy Statement
OLEMS	Outline Landscape and Ecological Management Strategy
O&M	Operation and Maintenance
PEIR	Preliminary Environmental Information Report
PID	Public Information Day
PRoW	Public Right of Way
SF6	Sulphur hexafloride
SPA	Special Protection Area
SR	Scoping Report
SSSI	Site of Special Scientific Interest

Glossary of Terminology

Applicant	East Anglia ONE North Limited.
Cable sealing end compound	A compound which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Cable sealing end (with circuit breaker) compound	A compound (which includes a circuit breaker) which allows the safe transition of cables between the overhead lines and underground cables which connect to the National Grid substation.
Construction consolidation sites	Compounds associated with the onshore works which may include elements such as hard standings, lay down and storage areas for construction materials and equipment, areas for vehicular parking, welfare facilities, wheel washing facilities, workshop facilities and temporary fencing or other means of enclosure.
Development area	The area comprising the onshore development area and the offshore development area (described as the 'order limits' within the Development Consent Order).
East Anglia ONE North project	The proposed project consisting of up to 67 wind turbines, up to four offshore electrical platforms, up to one construction, operation and maintenance platform, inter-array cables, platform link cables, up to one operational meteorological mast, up to two offshore export cables, fibre optic cables, landfall infrastructure, onshore cables and ducts, onshore substation, and National Grid infrastructure.
East Anglia ONE North windfarm site	The offshore area within which wind turbines and offshore platforms will be located.
European site	Sites designated for nature conservation under the Habitats Directive and Birds Directive, as defined in regulation 8 of the Conservation of Habitats and Species Regulations 2017 and regulation 18 of the Conservation of Offshore Marine Habitats and Species Regulations 2017. These include candidate Special Areas of Conservation, Sites of Community Importance, Special Areas of Conservation and Special Protection Areas.
Horizontal directional drilling (HDD)	A method of cable installation where the cable is drilled beneath a feature without the need for trenching.
HDD temporary working area	Temporary compounds which will contain laydown, storage and work areas for HDD drilling works.
Jointing bay	Underground structures constructed at intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts.
Landfall	The area (from Mean Low Water Springs) where the offshore export cables would make contact with land, and connect to the onshore cables.
Link boxes	Underground chambers within the onshore cable route housing electrical earthing links.
Mitigation areas	Areas captured within the onshore Development Area specifically for mitigating expected or anticipated impacts.

National electricity grid	The high voltage electricity transmission network in England and Wales owned and maintained by National Grid Electricity Transmission
National Grid infrastructure	A National Grid substation, cable sealing end compounds, cable sealing end (with circuit breaker) compound, underground cabling and National Grid overhead line realignment works to facilitate connection to the national electricity grid, all of which will be consented as part of the proposed East Anglia ONE North project Development Consent Order but will be National Grid owned assets.
National Grid overhead line realignment works	Works required to upgrade the existing electricity pylons and overhead lines (including cable sealing end compounds and cable sealing end (with circuit breaker) compound) to transport electricity from the National Grid substation to the national electricity grid.
National Grid overhead line realignment works area	The proposed area for National Grid overhead line realignment works.
National Grid substation	The substation (including all of the electrical equipment within it) necessary to connect the electricity generated by the proposed East Anglia ONE North project to the national electricity grid which will be owned by National Grid but is being consented as part of the proposed East Anglia ONE North project Development Consent Order.
National Grid substation location	The proposed location of the National Grid substation.
Natura 2000 site	A site forming part of the network of sites made up of Special Areas of Conservation and Special Protection Areas designated respectively under the Habitats Directive and Birds Directive.
Onshore cable corridor	The corridor within which the onshore cable route will be located.
Onshore cable route	This is the construction swathe within the onshore cable corridor which would contain onshore cables as well as temporary ground required for construction which includes cable trenches, haul road and spoil storage areas.
Onshore cables	The cables which would bring electricity from landfall to the onshore substation. The onshore cable is comprised of up to six power cables (which may be laid directly within a trench, or laid in cable ducts or protective covers), up to two fibre optic cables and up to two distributed temperature sensing cables.
Onshore development area	The area in which the landfall, onshore cable corridor, onshore substation, landscaping and ecological mitigation areas, temporary construction facilities (such as access roads and construction consolidation sites), and the National Grid Infrastructure will be located.
Onshore infrastructure	The combined name for all of the onshore infrastructure associated with the proposed East Anglia ONE North project from landfall to the connection to the national electricity grid.
Onshore preparation works	Activities to be undertaken prior to formal commencement of onshore construction such as pre–planting of landscaping works, archaeological

	investigations, environmental and engineering surveys, diversion and laying of services, and highway alterations.
Onshore substation	The East Anglia ONE North substation and all of the electrical equipment within the onshore substation and connecting to the National Grid infrastructure.
Onshore substation location	The proposed location of the onshore substation for the proposed East Anglia ONE North project.
Transition bay	Underground structures at the landfall that house the joints between the offshore export cables and the onshore cables.

Design and Access Statement

1 Introduction

1.1 Background

1. This Design and Access Statement (DAS) relates to the above ground operational onshore infrastructure of the proposed East Anglia ONE North project (the onshore substation and National Grid infrastructure).

2. The DAS forms part of a set of documents that supports the Environmental Statement (ES) (document reference 6.1) submitted by the Applicant as part of the Development Consent Order (DCO) application.

3. This DAS outlines commitments made in the ES. It should be noted that this DAS should be read in conjunction with the Onshore Substation and National Grid Substation Design Principles (document reference 8.8).

4. It should be noted that the East Anglia TWO offshore windfarm project (the proposed East Anglia TWO project) is also in the application stage. The proposed East Anglia TWO project has a separate DCO process which has been submitted at the same time as the proposed East Anglia ONE North project. The two projects share the same landfall location and onshore cable corridor and the two onshore substations are co-located, and connect into the same National Grid substation.

5. The site selection process and consideration of alternatives for the proposed East Anglia ONE North project (***section 5.1***) included consideration of the proposed East Anglia TWO project and the onshore development area has been developed to allow for the construction of both the proposed East Anglia ONE North and East Anglia TWO projects. The proposed East Anglia TWO project will submit a separate DAS as part of the proposed East Anglia TWO project DCO application.

2 Legislation and Planning Policy

6. This DAS has been prepared pursuant to Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009 to assist in the determination of the DCO application. The purpose of this DAS is to demonstrate the design process that has been followed during the development of the onshore infrastructure. National Policy Statements (NPSs) form primary planning policy documents that are specifically provided for by the Planning Act 2008 to guide decision making on NSIP applications. The DCO application for

the proposed East Anglia ONE North project will be determined in accordance with relevant NPSs.

7. Existing policy set out within Overarching National Policy Statement for Energy (NPS EN-1) makes clear the requirements for good design in energy projects. The DAS explains the principles and concepts that have influenced the form and appearance of the above ground onshore infrastructure and provides a tool to communicate how the requirements for good design and access provision have been considered.

8. In the absence of any specific guidance relating to the preparation and reporting of a DAS for Nationally Significant Infrastructure Projects (NSIPs), the DAS has been prepared in line with national guidance on the subject, specifically:

- Design and Access Statement: How to Read, Write and Use Them, produced by Chartered Association of Building Engineers (CABE) (2007); and
- Guidance on Information Requirements and Validation, published by the Department for Communities and Local Government (2010).

9. The bullet points below set out the key parameters outlined in the CABE guidelines (2007):

- Use – the purpose of the onshore substation and how it will fit within the surrounding environment;
- Amount – size and volume of the onshore substation and its constitute elements;
- Layout – the relationship between the onshore substation and the surrounding buildings;
- Scale – the physical size and shape of the onshore substation development;
- Appearance – the physical look of the onshore substation specifically the design and materials;
- Landscaping – how mitigation proposals will be applied to screen the development from wider views; and
- Access – inclusive of construction and operational traffic and how crossings over roads and watercourses will be achieved.

10. These parameters are discussed in turn for each of the elements of the onshore infrastructure in ***section 6*** of this DAS.

3 Description of the Development

11. The proposed East Anglia ONE North project would consist of up to 67 wind turbines. The maximum wind turbine tip height used would be 300m (above Lowest Astronomical Tide (LAT)).

12. A construction, Operation and Maintenance (O&M) platform may be installed within the East Anglia ONE North windfarm site which would provide accommodation for the construction and maintenance work force. There is also potential for the installation of one meteorological mast of maximum height 175m above LAT.

13. Offshore electrical platforms would be installed offshore and would collect electricity from the wind turbines through a network of inter-array cables to then transport it to shore via up to two offshore export cables (each buried within a separate trench). All of the offshore cables would also include Fibre Optic (FO) cables either within the cables themselves or secured to the outside.

14. Once the offshore export cables enter the underground transition bay at the landfall, they will be joined to the onshore cables. There will be up to six single core onshore cables and up to two FO cables and up to two Distributed Temperature Sensing (DTS) cables.

15. From the landfall, onshore cables will be routed underground to an onshore substation, which will in turn connect into the national electricity grid via a National Grid substation and cable sealing end compounds. National Grid infrastructure will be owned and operated by National Grid and will connect into the existing overhead pylons. In addition, there will be a requirement to undertake upgrades to three existing pylons within the National Grid overhead line realignment works area. This will require the installation of one additional pylon to allow connection to the electricity transmission network via new cable sealing ends.

16. The key onshore components of the proposed East Anglia ONE North project, including infrastructure required by National Grid to connect the proposed East Anglia ONE North project to the national electricity grid, will comprise:

    - The landfall site with up to two transition bays to connect the onshore and offshore cables;
    - Up to six onshore cables, up to two FO cables and up to two DTS cables installed underground (some or all of which will be installed in ducts) and associated jointing bays installed underground;
    - Onshore substation;

- Electrical cable connection between onshore substation and National Grid substation;
- National Grid substation;
- Cable sealing end compound and sealing end compound (with circuit breaker); and
- Realignment of the existing overhead lines; consisting of reconstruction or replacement of up to three existing overhead pylons in proximity to the National Grid substation, the addition of up to one new pylon in close proximity to existing overhead pylons.

17. The location of the onshore infrastructure (i.e. the landfall, onshore cable corridor, onshore substation and National Grid substation locations) for the proposed East Anglia ONE North project is shown in ***Figure 1***.

18. ***Table 3.1*** provides a list of key parameters and their associated characteristics for the proposed East Anglia ONE North project.

Table 3.1 Onshore Key Parameters

Parameter	Characteristic
Landfall	
Landfall Location	North of Thorpeness Village
Method for crossing intertidal	Horizontal Directional Drilling (HDD)
Number of underground transition bays	2
Onshore Cable Route	
Onshore cable route length	Approximately 9km long
Number of onshore cable trenches	4
Number of onshore cables	Up to six onshore cables, up to two FO cables, up to two DTS cables installed underground (some or all of which will be in ducts) and associated jointing bays installed underground
Number of ducts	4
Jointing bays	Up to 38 jointing bays installed at intervals along the onshore cable route. The precise location of the jointing bays will be determined during detailed design. Each has an operational volume of 227m^3
Onshore Substation	
Number of onshore substations	1
Onshore substation area (m x m)	Up to 190 x 190

Parameter	Characteristic
Onshore substation tallest building (m)	15
Onshore substation maximum height external electrical equipment (m)	18
National Grid Infrastructure	
Number of National Grid substations	1
National Grid substation area (m x m)	310 x 145 (AIS) 140 x 120 (GIS)
National Grid substation tallest building (m)	6m (AIS) 16m (GIS)
National Grid substation tallest electrical infrastructure (m)	16m (AIS) 16m (AIS)
Cable sealing end compounds	Up to 3
Overhead Line Realignment Works	
Overhead lines	Realignment of the overhead lines consisting of reconstruction or replacement of up to three existing overhead pylons in proximity to the National Grid substation, and the addition of up to one new pylon in close proximity to the existing overhead pylons

19. Further details of onshore parameters are provided in ***ES Chapter 6 Project Description***.

4 Design Principles

20. As the onshore works comprise a range of specific components with specific features and characteristics, specific design principles and recommendations are required for these different components. The potential impacts of the landfall location and onshore cable route would be very different from the potential impacts of the onshore substation and National Grid infrastructure which is reflected in the differing design principles presented in ***sections 4.1*** and ***4.2***.

4.1 Landfall Location and Onshore Cable Route

21. The key principles in the design of the landfall location and onshore cable route are outlined as follows:

- To keep the components concentrated in a localised area in order to minimise the geographical extent of their impact;

- To minimise the distance from landfall to the connection to the national electricity gird whilst avoiding key sensitive areas where possible;
- To locate infrastructure at field boundaries where possible; and
- To use existing woodland, hedgerows and landscape features to screen and, therefore, reduce the potential impacts of the temporary construction haul roads and Construction Consolidation Sites (CCSs).

22. The potential impact of the landfall location and onshore cable route has been greatly reduced by the use of HDD at the landfall and the pull through method for the installation of cables.

4.2 Onshore Substation and National Grid Infrastructure

23. The final design of the onshore substation and National Grid infrastructure are subject to detailed design post-consent. In order to minimise visual impacts as far as possible, the appropriate building design and materials will be considered, to ensure blending with the local environment and minimisation of impacts as far as possible.

24. Design principles are outlined as follows:

- Continue to engage relevant authorities on detailed design and landscaping proposals as detailed design progresses;
- Actively seek appropriate building design and materials (e.g. building materials, shape, layout, coloration and finishes);
- The design of the onshore substation will be within the parameters set out in the draft DCO;
- The design of the National Grid substation will be within the parameters set out in the draft DCO;
- Landscaping to minimise the visual impacts and response to local landscape character and biodiversity will be undertaken and considered with building design and layout of ancillary structures. Delivery of this principle will be guided by implementation of the Outline Landscape and Ecological Management Scheme (OLEMS) (document reference 8.7); and
- A detailed sustainable drainage strategy (SuDS) will be developed.

5 Design Considerations

25. In relation to the proposed East Anglia ONE North project, and the specific components of the proposed East Anglia ONE North project, the key design considerations are as follows:

- Site selection and consideration of alternatives;
- Design of components;
- Integration of components into local site context;
- Mitigation of potential impacts; and
- Bassline characteristics and design opportunities.

26. This section discusses the key design considerations as listed above.

5.1 Site Selection Process

27. The siting, design and refinement of the proposed East Anglia ONE North project has followed a site selection process, taking account of environmental, physical, technical, commercial and social considerations and opportunities as well as engineering requirements, with the aim of identifying sites that will be environmentally acceptable, are deliverable and consentable, whilst also enabling, in the long term, benefits of the lowest energy cost to be passed onto the consumer. A multi-disciplinary design team was formed to undertake the site selection process which included a team of specialists comprising engineers and EIA consultants whose expertise were drawn upon throughout the site selection process.

28. The site selection process is shown in ***Plate 5.1***, and outlined in more detail in the ES ***Chapter 4 Site Selection and Assessment of Alternatives***. Each stage of the site selection process forms part of an iterative design process undertaken to identify the most suitable locations and configuration, based on criteria outlined above for the proposed East Anglia ONE North project onshore infrastructure. The framework for the site selection process is based upon a set of design principles and engineering requirements for the proposed East Anglia ONE North project infrastructure.

29. As project design is an iterative process, and takes a multidisciplinary approach, alternatives have been considered incorporating engineering, buildability, cost, environmental, landowner, community, and stakeholder considerations to inform the design presented with this DCO application. A similarly iterative process will be taken post-consent when producing the final detailed design of the onshore infrastructure.

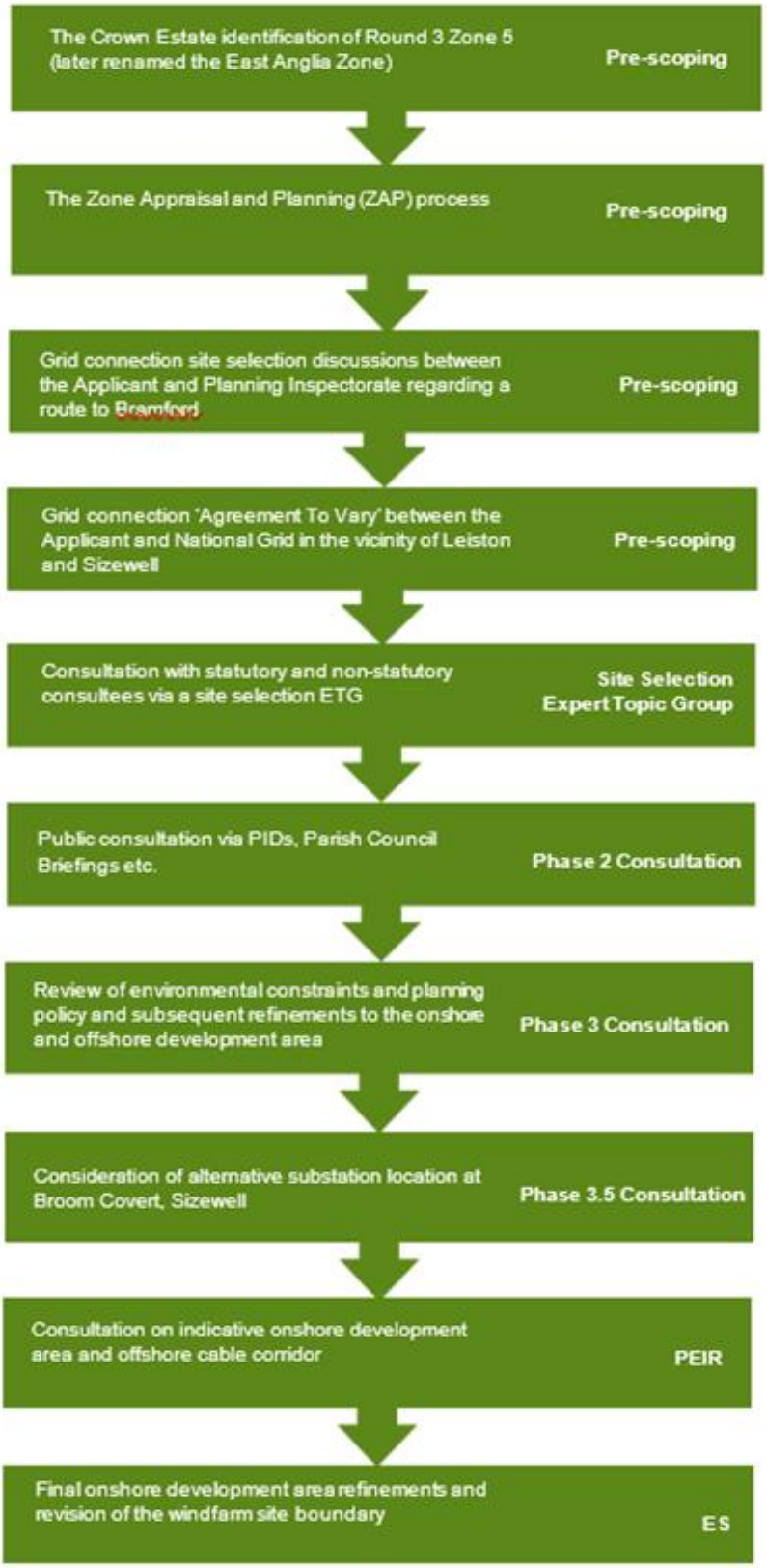

Plate 5.1. Site Selection Refinement for the Proposed East Anglia ONE North Project (and East Anglia TWO) by Work Phase or Consultation Phase

5.1.1 Consideration of Alternatives

30. A number of strategic-level project design alternatives have been considered as part of the site selection and project design decision-making process. The strategic consideration of alternatives which fed directly into the proposed East Anglia ONE North project's site selection process from the outset are detailed in ***Table 5.1***.

Table 5.1 Strategic-Level Project Design Alternatives Considered

Alternatives Considered	Decision	Main Environmental Benefits
Strategic approach to delivering the proposed East Anglia ONE North project and the proposed East Anglia TWO project within the same timeframe. OR No elements of the proposed East Anglia TWO project considered within the design envelope for the proposed East Anglia ONE North project.	To take a strategic approach to delivering the proposed East Anglia ONE North project and the proposed East Anglia TWO project within the same timeframe.	Co-location of onshore substations (i.e. the proposed East Anglia ONE North onshore substation, the proposed East Anglia TWO onshore substation and the National Grid substation) will keep these developments contained within a localised area and, in so doing, will contain the extent of potential impacts.
Overhead lines along the onshore cable route from landfall to grid connection location. OR Buried onshore cables along the onshore cable route from landfall to grid connection location.	Buried onshore cables	The environmental benefits of burying cables as opposed to overhead lines and pylons is the minimisation of visual impacts.
HDD of the onshore cables from offshore to onshore at landfall OR Open trench cut and direct lay of offshore cables from offshore to onshore at landfall.	HDD of the offshore cables from offshore to onshore	The environmental benefit of HDD at the landfall removes any possible interaction with the Sizewell Beach SSSI and reduces potential risks associated with coastal cliff erosion in the Thorpeness area – an area with high cliff instability.
Onshore cable route takes shortest direct route through Sandlings SPA (shorter onshore cable route but through longer section of SPA) OR Onshore cable route crosses at narrowest section of Sandlings SPA (longer onshore cable	Onshore cable route crosses at narrowest section of Sandlings SPA (longer onshore cable route but through shorter section of SPA)	The environmental benefit of crossing the Sandlings SPA at its narrowest section reduces the potential impacts to habitats within, and disturbance to, species using the SPA.

Alternatives Considered	Decision	Main Environmental Benefits
route but through shorter section of SPA)		
Selection of GIS transformer technology for the onshore substation. OR Selection of AIS transformer technology for the onshore substation.	Selection of GIS transformer technology for the onshore substation	Environmental benefit of the GIS transformer technology is that it allows for a lower building height within the onshore substation, minimising the visual impacts.

5.1.2 Site Selection Consultation

31. The Applicant has undertaken extensive pre-application engagement with stakeholders, communities and landowners in order to both seek input to refine the proposed East Anglia ONE North project design, and to communicate decisions on refinements. Statutory consultation on refinements to the proposed East Anglia ONE North project's site selection, layout and configurations has been undertaken through the informal and formal pre-application stages, including the formal submission of the Scoping Report (SPR 2017) in November 2017 and the Preliminary Environmental Information Report (PEIR) in February 2019 (SPR 2019). Feedback received has been taken into consideration throughout, through a range of forums including (but not exclusively limited to) Public Information days (PIDs), parish council meetings, newsletters, a dedicated website and direct discussions with landowners via the Applicant's land agents.

32. Technical consultation has been undertaken through the means of a Site Selection Expert Topic Group (ETG) comprising Suffolk County Council, Suffolk Coastal and Waveney District Councils (now East Suffolk Council), Natural England, Historic England, the Suffolk Coast and Heaths area of Outstanding Natural Beauty (AONB), the Environment Agency and National Grid Electricity Transmission. The Applicant has engaged in site selection discussions regarding the onshore and National Grid substation locations via meetings, site visits and workshops with the ETG throughout 2017 and 2018. Further details are provided in the ES ***Chapter 4 Site Selection and Assessment of Alternatives***.

5.2 Design of Components

33. As the majority of the components would be designed in more detail and procured post-consent, their exact dimensions and appearance are unknown at this stage in the proposed East Anglia ONE North project. The EIA presented in the ES has been undertaken based on assumptions made about the components based on a worst-case scenario to ensure that all potentially significant effects are reported. Further detail is provided in ES ***Chapter 5 EIA Methodology*** and ES ***Chapter 6 Project Description***.

34. The general premise in the design and selection of components would be to minimise the potential impacts by reducing the size and scale of the components as far as practicable.

5.3 Integration of Components into Local Site Context

35. Consideration of the more detailed location of the components and how they sit in relation to existing landform and other landscape features, most notably trees and hedgerows, has been considered in the design of the layout and will be considered further in the refinement of the layout once the dimensions of the specific components are fixed.

36. The general premise in the detailed layout of components would be to use natural landform and existing tree and hedgerow cover to screen the components of the proposed East Anglia ONE North project, where possible. This can work in two ways, with either landform and vegetation providing close range screening of the components, or landform and vegetation providing medium range screening of the components to visual receptors. Ensuring the colour of above ground operational infrastructure is subtle, blending in with the natural colours of the rural context. This would reduce the prominence of these components and in so doing reduce their potential impact.

5.4 Mitigation of Potential Impacts

37. The design process has considered the following embedded mitigation measures, further outlined in the ES:

- Use of buried cables to avoid above ground infrastructure;
- Avoidance of sensitive or protected ecological and landscape features, sites and habitats where possible;
- Use of most appropriate crossing methods at landfall to minimise direct footprint on coastal habitat;
- Careful siting of the onshore substation and National Grid substation to the west and south of existing woodland blocks to gain maximum benefit from existing screening;
- Careful siting of the onshore substation and National Grid substation in close proximity to the existing overhead lines to reduce additional cabling requirements and to minimise proliferation of infrastructure; and
- Proposing a range of mitigation planting surrounding the onshore substation and National Grid substation locations, as detailed further in the OLEMS submitted with this DCO application.

5.5 Baseline Characteristics and Design Opportunities

38. The majority of the landscape throughout the onshore development area is agricultural, with intensive arable production being the main type of farming. While the majority of the landscape has been modified by agricultural practices, there are a number of areas where the special qualities of the natural landscape are evident. A key feature of the Suffolk landscape is the extent of mature woodland and hedgerow cover. This comes in the form of woodland blocks, copses, tree belts and hedgerows. This creates a pattern of enclosure across much of the landscape and contributes to the intimate and enclosed character of the countryside. These features in the local baseline have been taken into consideration throughout the design of the proposed East Anglia ONE North project onshore infrastructure.

6 Onshore Proposed East Anglia ONE North Project Design

6.1 Landfall Location and Onshore Cable Route Design

39. There will be no above ground operational infrastructure associated with the landfall and onshore cable route. Therefore, this infrastructure is not considered further within the DAS.

6.2 Onshore Substation and National Grid Substation Design

6.2.1 Use

40. The onshore substation and National Grid substations will be sited adjacent to one another. The National Grid Substation is discussed in ***section 6.3*** below.

41. The onshore substation converts the High Voltage Alternating Current (HVAC) electrical power from the East Anglia ONE North export cables to the appropriate voltage for connection to the National Grid substation to connect into the electricity transmission network.

42. The uses associated with the onshore substation are dictated by the functional requirement of the operations that will be undertaken. The design and engineering processes have identified the need for electrical plant and equipment control and facilitate the export of electricity from the windfarm to the national electricity grid.

6.2.2 Amount and Scale

43. The onshore substation will be located within a single compound.

44. The onshore substation will be a GIS. Within a GIS equipment is designed to be insulated and cooled by a pressurised gas (e.g. sulphur hexafluoride (SF6)). In addition to the main GIS building, the onshore substation compound would contain electrical equipment including power transformers, switchgear reactive compensation equipment, harmonic filters, cables, lightning protection masts, control buildings, communications masts, back up generators, fencing and other associated equipment, structures or buildings.

45. The maximum building height will be 15m, with the maximum height of external electrical equipment 18m. The substation compound dimensions will be up to a maximum of 190m wide x 190m in length.

46. The onshore substation CCS will be located adjacent to the onshore substation footprint and would be up to 17,100m^2 in area and located within agricultural land. The onshore substation CCS may be split into smaller CCSs although the cumulative footprint of these CCSs will remain within the maximum onshore substation CCS size of 17,100m^2. The precise location of the CCSs will be selected with due consideration to avoid existing watercourses, hedgerows and other known infrastructure / constraints where practicable. The onshore substation footprint could be used as a site establishment and laydown area during the construction phase of the proposed East Anglia ONE North project.

6.2.3 Layout

47. The onshore substation would have a compact layout, with the majority of equipment contained in agricultural style buildings. The onshore substation would be connected to the National Grid substation by means of HVAC underground cables.

48. Temporary fences would be erected along the boundaries of the onshore substation for the duration of the construction period.

49. The operational onshore substation would be enclosed by a fence surrounding the external equipment outlined above. Other infrastructure and equipment will be included within the compound such as interconnecting cables, access tracks, hard standing, car parking, water tanks, communications mast, diesel generators and welfare facilities.

50. The indicative permanent (operational) plans are shown in ***Figure 2***. An example layout is provided in ***Plate 6.1***, which shows the layout of the East Anglia ONE substation as an example of the arrangement of buildings.

Plate 6.1 Example Layout of the Onshore Substation (example taken from construction of East Anglia ONE substation)

6.2.4 Access

51. A temporary haul road would be installed along the onshore cable route between access points onto the local road network to facilitate construction access to the onshore substation location. This would run from Access ID 10 at Snape Road, across Cross ID 11 and Crossing ID 12 at Grove Road, shown on in ***Figure 26.2*** within ES ***Chapter 26 Traffic and Transport***, and proceed into the onshore substation location. The onshore substation construction access road would be up to 9m wide to facilitate two-lane construction traffic.

52. Road modifications would be required to facilitate the safe ingress and egress from the public highway to the onshore substation during operation. A substation operational access road will be constructed from Access ID 13, shown on in ***Figure 26.2*** within ES ***Chapter 26 Traffic and Transport***. The permanent operational access road would be up to 8m in width, and up to 1,700m in length.

53. Traffic and transport assessments have identified the location for this permanent access, and its final design post-consent will allow micro-siting of the onshore substation operational access road. The onshore substation operational access road will be used for all operational vehicle access, including Abnormal Indivisible Load (AILs) access (during construction and operation), and potentially (once available) for construction personnel movements. HGVs will not use the substation operational access road during construction.

54. An Outline Access Management Plan (OAMP), Outline Construction Traffic Management Plan (OCTMP) and Outline Travel Plan (OTP) have been submitted with this DCO application and outline access and traffic management strategies in relation to the onshore substation. Final versions of these plans will be produced post-consent to discharge the requirements of the draft DCO.

55. It should be noted that the onshore substation has been designed as an industrial development and it is not accessible by the public.

6.2.5 Appearance and Landscaping

56. The proposed building substructures are typically predominantly composed of steel and cladding materials. The structural steelwork would be fabricated and prepared off site and delivered to site for erection activities. The steelwork would be erected with the use of cranes. Smaller buildings may be pre-fabricated.

57. Cladding panels (typically composite) would also be delivered to site ready to erect and be fixed to the steelwork. ***Plate 6.2*** shows an example of the dark grey composite cladding used on an office building during the construction of the East Anglia ONE substation. A variety of means would be used to install the cladding, depending on the area being accessed. The control building would include the construction of brick/blockwork partitions and would include a number of follow-on trades for plumbing, plastering, and low voltage mechanical/electrical installations.

58. The onshore substation would be connected to the National Grid substation by means of up to two buried cables. These will be installed directly underground or within concrete troughs.

Plate 6.2 Example of dark grey composite cladding used on a substation office building (example taken from construction of East Anglia ONE substation)

59. The onshore substation site benefits from existing hedgerows and woodland blocks within the local area which provide elements of existing screening. Additional planting and landscape bunding at the onshore substation location will further screen the area surrounding the onshore substation.

60. The mitigation planting will be designed to comprise a mix of faster growing 'nurse' species and slower growing 'core' species. The core species would comprise a mix of preferred native and of local provenance, canopy species that would outlive the nurse species and characterise the woodland structure over the longer term. In locations where it is possible to achieve advanced planting, this will be undertaken in consultation with the Local Planning Authority to allow growth prior to completion of construction and commencement of operation. A planting strategy is detailed further within the OLEMS submitted with this DCO application.

6.2.6 Lighting

61. Security has been a key consideration during the initial design phase of the onshore substation. With this in mind, operational lighting requirements at the onshore substation site would entail:

- Motion sensored security lighting around perimeter fence of compound, to allow CCTV coverage;
- Car park lighting - as per standard car park lighting, possibly motion sensitive; and
- Repair/maintenance – task related flood lighting may be required.

62. No additional lighting is proposed along Grove Road or along the additional access roads within the onshore substation location.

63. Whilst the above lighting is provided, the onshore substation would not normally be lit during hours of darkness. Lighting sensitive to bats would be incorporated according to guidance in Bats and Artificial Lighting in the UK (Bat Conservation Trust (BCT) and Institute of Lighting Engineers (ILE) 2018).

6.3 National Grid Infrastructure

6.3.1 Use

64. A new National Grid substation and National Grid overhead line realignment works (together referred to as the National Grid infrastructure) are required to connect the onshore substation to the national electricity grid. The National Grid substation will be located to the north of the onshore substation, and the modifications to the existing overhead lines will take place within the National Grid overhead line realignment works area.

65. Up to three cable sealing end compounds are required to connect the National Grid substation to each of the overhead line circuits. The third cable sealing end compound (referred to as a cable sealing end (with circuit breaker) compound) will include a circuit breaker, disconnectors and current / voltage transformers for

protection purposes (i.e. to ensure safe operation and isolation / earthing of the circuit during periods of maintenance and to isolate relevant sections of the circuit during operation).

6.3.2 Amount and Scale

66. The National Grid substation will either be an 'air insulated switchgear' (AIS) or a GIS substation depending on the switchgear technology employed. Within an AIS substation, equipment is designed to be left open to the elements and cooled by ambient air temperature. Within a GIS substation, equipment is designed to be insulated and cooled by a pressurised gas (e.g.SF6).

67. The maximum footprint of the National Grid substation utilising AIS technology when operational is 44,950m^2 and would be up to 145m (wide) x 310m (long). The maximum footprint of the National Grid substation utilising GIS technology is 16,800m^2 and would be up to 140m (wide) x 120m (long). The size of the National Grid substation is dictated by electrical safety clearances and the switchgear technology used.

68. The maximum height of permanent outdoor equipment within the National Grid substation is up to 16m above finished ground level for both AIS and GIS technologies. The maximum height of buildings within the National Grid substation is 6m (for AIS technology) or 16m (for GIS technology).

69. Two cable sealing end compounds will have a maximum permanent footprint of up to 2,500m^2 each. The third cable sealing end (with circuit breaker) compound will also include circuit breakers and a small modular building no greater than 3.5m in height and up to 3m x 5m in footprint, housing electrical protection and control equipment.

6.3.3 Layout

70. The final location of the cable sealing end compounds will be identified during post consent detail design and will be influenced by the overhead line realignment final design and constraints such as residential properties and existing vegetation. Where possible, subject to electrical engineering design considerations, cable sealing end compounds will be positioned close to field boundaries.

6.3.4 Access

71. The main access road to the National Grid substation will come from the onshore substation access road, detailed in ***section 6.2.4***. An additional new permanent access track (tarmac covered) up to 3.7m in width will be required to each cable sealing end compound for maintenance and operational purposes which would be accessed via the onshore substation operational access road.

6.3.5 Appearance and Landscaping

72. The appearance and landscaping of the National Grid infrastructure follow the same principles as outlined in ***section 6.2.5***. A security fence will surround the National Grid substation. Surface water drainage requirements for the National Grid substation will be influenced by the final design of the National Grid substation.

6.3.6 Lighting

73. External lighting would also be installed at the National Grid substation which would entail:

- Motion sensored general lighting around the perimeter fence and within the National Grid substation for the purposes of security and to provide adequate lighting levels for access and inspection of equipment; and
- Task related flood lighting within the National Grid substation which will be necessary from time to time during repair/maintenance activities.

74. Whilst the above lighting is provided, the National Grid substation would not normally be lit during hours of darkness. Lighting sensitive to bats would be incorporated according to guidance in Bats and Artificial Lighting in the UK (Bat Conservation Trust (BCT) and Institute of Lighting Engineers (ILE) 2018).

7 Summary

75. This DAS forms part of the suite of documents submitted as part of the DCO application for the proposed East Anglia ONE North project, and sets out the various principles, concepts and considerations incorporated into the design of the onshore infrastructure.

76. The design of the proposed East Anglia ONE North project is part of an ongoing process in which the Applicant is committed to optimising the quality of the design. The design development process has been informed by consultation particularly in relation to site selection, design evolution and accessibility considerations.

77. Although indicative at this stage, the design for the onshore substation and National Grid substation will set out to achieve a high standard of design whilst at the same time balancing the operational requirements of the facility with the character and appearance of the existing environment.

78. There will be no requirement for public access to the onshore substation or National Grid substation, and appropriate security measures will be installed to prevent unauthorised access to the operational onshore infrastructure.

79. Integration of the onshore substation and National Grid substation buildings into the local landscape will be further assisted by detailed landscape design including planting using a selection of appropriate indigenous species to increase site biodiversity.

8 References

Bat Conservation Trust (BCT) and Institute of Lighting Engineers (ILE) 2018. Bats and Artificial Lighting in the UK. Available: https://cdn.bats.org.uk/pdf/Resources/ilp-guidance-note-8-bats-and-artificial-lighting-compressed.pdf?mtime=20181113114229 [accessed September 2019]

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Department of Energy and Climate Change (DECC) (2011c). National Policy Statement for Renewable Energy Infrastructure (EN-3) July 2011, DECC Publications.

ScottishPower Renewables (SPR), (2017). East Anglia ONE North Offshore Windfarm Scoping Report.

ScottishPower Renewables (SPR), (2019 East Anglia ONE North Offshore Windfarm Preliminary Environmental Information Report (PEIR).

Annex 1: Supporting Figures

Legend

- East Anglia ONE North Onshore Development Area
- Landfall
- Section 1
- Section 2
- Section 3
- Section 4
- Onshore Substation and National Grid Infrastructure

SCOTTISHPOWER RENEWABLES

Rev	Date	By	Comment
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East Anglia ONE North

East Anglia ONE North (and East Anglia TWO) Onshore Development Area

Drg No	EA1N-DEV-DRG-IBR-00091063
Rev	1
Date	23/09/19
Figure	1

Coordinate System: BNG Datum: OSGB36

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N

Shellpits Cottages

Drain

Margaret Wood

Alexander Wood

Drain

Track

Track

Track

Wood

Common

12m

Thorpe Ness

Path

11m

Track

Track

Thorpeness Common

Path

Aldeburgh Bay

Partables Farm

Pavilion

Recreation Ground

Golf Course

13m

B1353

B1353

9m

Golf Course

Car Park

Thorpeness

Allot Gdns

NORTH END AVENUE

OLD HOMES ROAD

WHINLANDS

RCH ROAD

14m

Tk

Tk

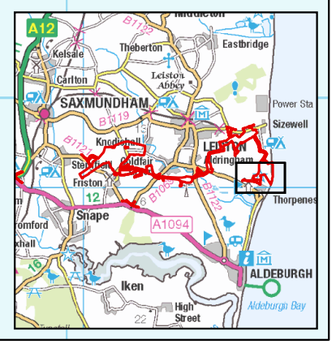
Tk

Track

Legend

- East Anglia ONE North Onshore Development Area
- Landfall HDD Underground Cabling Area
- Transition Bay Area of Search

The detail shown within the proposed onshore development area is illustrative only and is shown to provide context of the likely extents of construction areas. All indicative and illustrative plans are subject to change.



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East Anglia ONE North

Indicative Permanent (Operational) Plans - Landfall

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 a

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N

The Walks

Reservoir

Square Covert

Corporals' Belts

Aldringham Common

Rye Grass Walks Wood

Thorpe Vent Wood

Butts (dis)

Shellpits Cottages

Drain

Dismantled Railway

Track

12m

8m

White Cottages

Ivy Cottages

Cottages

Sizewell Cliff

Path

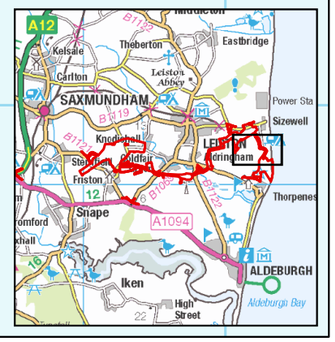
Dower House

Ness House

Legend

- East Anglia ONE North Onshore Development Area
- Landfall HDD Underground Cabling Area
- Transition Bay Area of Search
- HDD Underground Cabling
- Ecological Mitigation Area

The detail shown within the proposed onshore development area is illustrative only and is shown to provide context of the likely extents of construction areas. All indicative and illustrative plans are subject to change.



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East Anglia ONE North

Indicative Permanent (Operational) Plans - Cable Route Section 1

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 b

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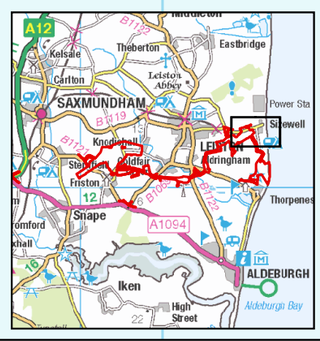
N

Sizewell
Track
4m
CG
Lookout
3m
GAP
SIZEWELL
PH
Coastguard
Cottages
Path
El Sub Sta
Sandy Lane (Track)
4m
3m
Mean High Water
Mean Low Water
Home
Farm
Path
Cliff House
Beach View
Holiday Park
Path
12m
Halfway Cottages
Track
Track
Path
Path
Sizewell Common
Sizewell
Hall
Path
12m
Pebble
Cottages
White
Cottages
Ivy
Cottages
Track
12m
Sizewell Cliff
Path
12m



Legend

- East Anglia ONE North Onshore Development Area
- HDD Underground Cabling

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East Anglia ONE North

Indicative Permanent (Operational) Plans - Cable Route Section 1

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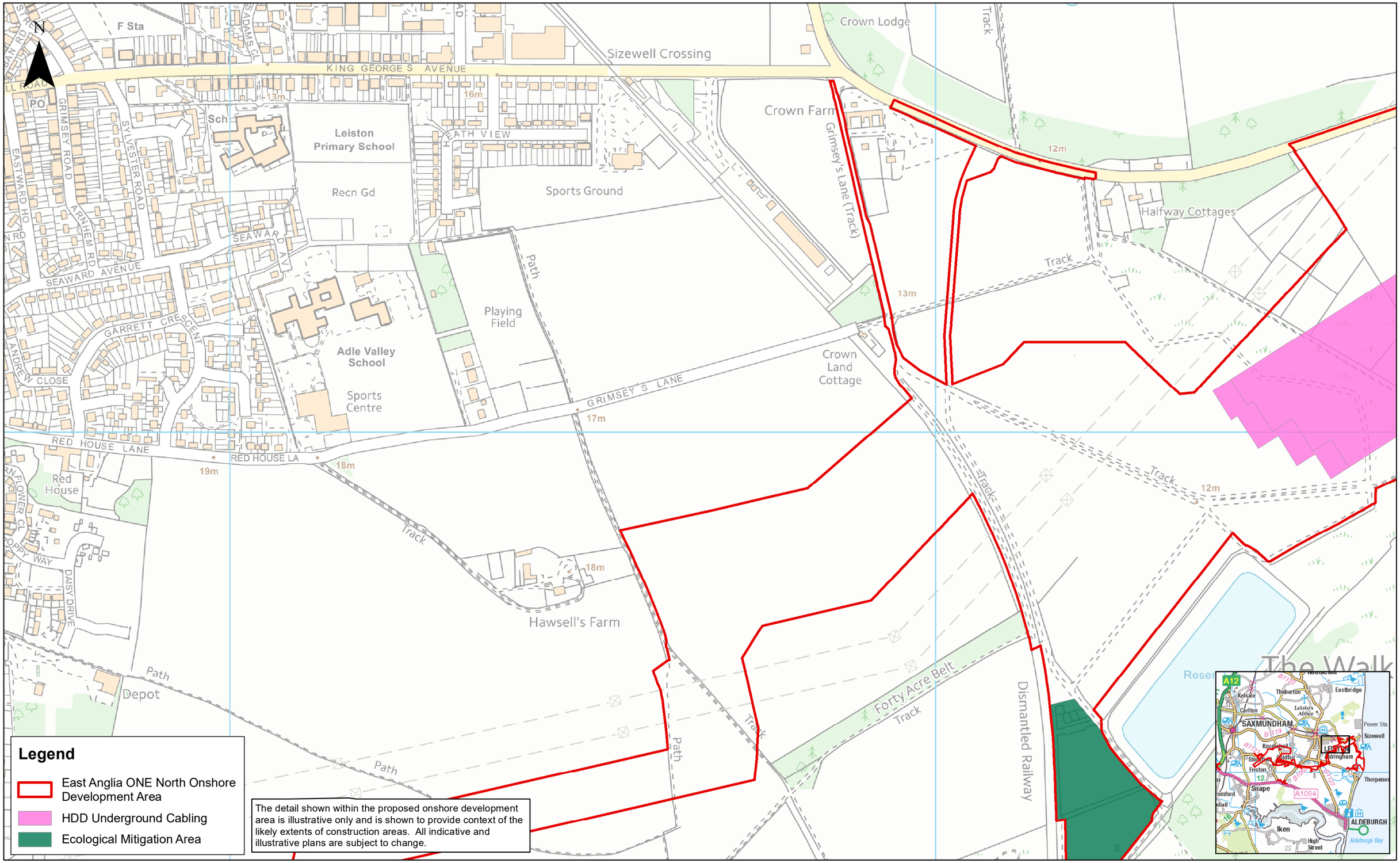

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East Anglia ONE North

Indicative Permanent (Operational) Plans - Cable Route Section 2

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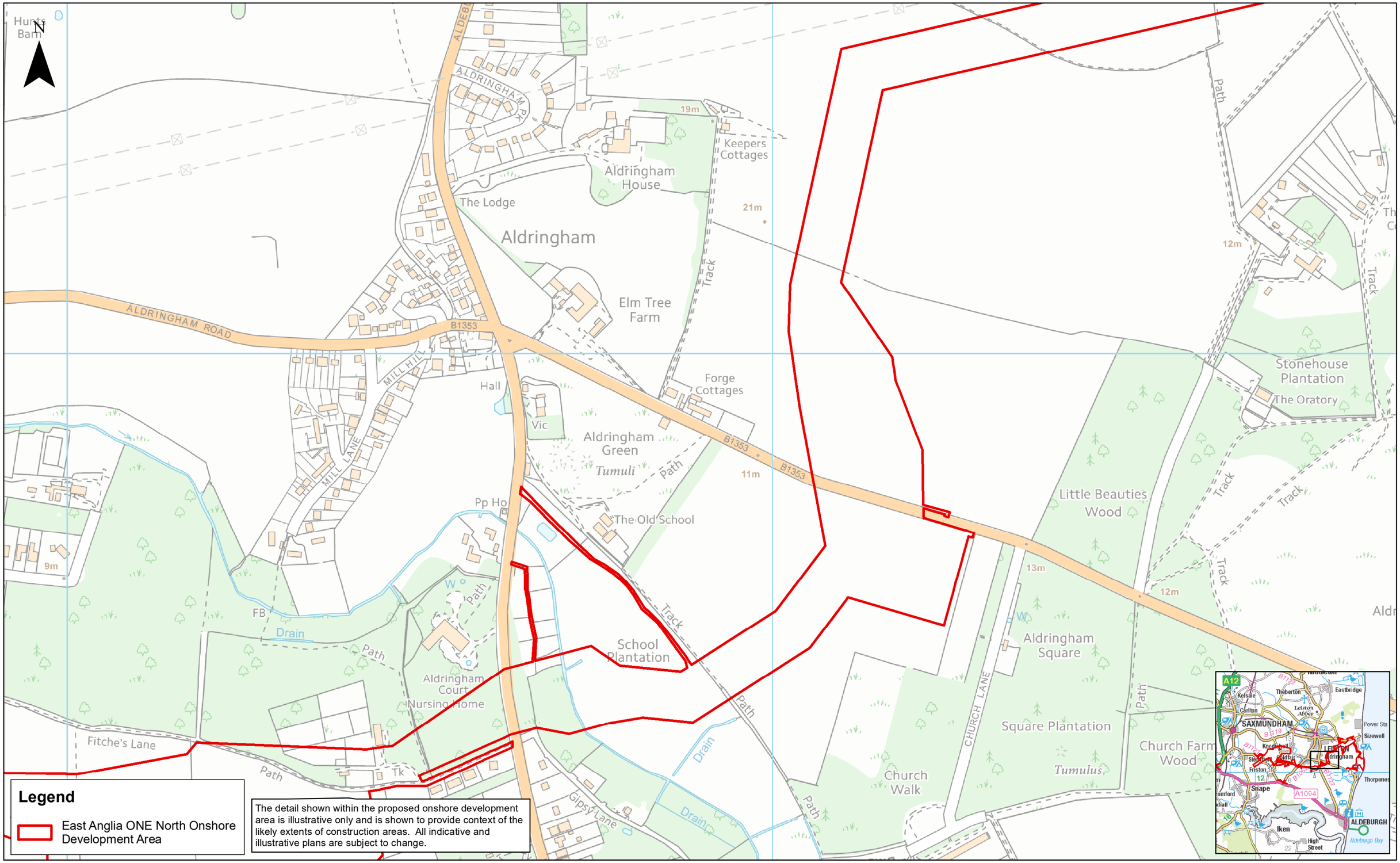

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East Anglia ONE North

Indicative Permanent (Operational) Plans - Cable Route Section 2

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Date	16/07/19
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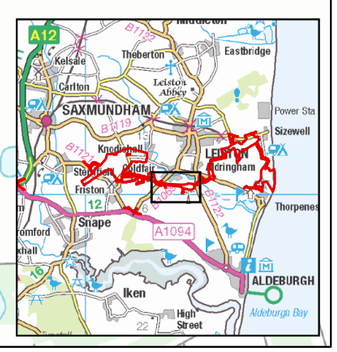
N

Knodishall Common
Path
Track
FB
Sewage Works
JUDITH AVENUE
PW
W
THE FITCHES
Track
School
BUXLOW CL
HAWTHORN CL
9m
MILL LANE
Pp Ho
W
Path
FB
Drain
Path
Aldringham Court Nursing Home
Fitche's Lane
Path
Tk
SNAPE ROAD
SLOE LANE
Billeaford Hall
Pit (dis)
Crackland's Pit
Path
Tk
9m
Hazelwood Farm
Bulls Hall Cottages
22m
Track
Crackland's Covert
Long Covert
Track
Nuttery Spong
Track
Track
Four Acre Covert
Jay's Covert
Darkrow Covert
Darkrow Covert
Jay's Covert
Track
Nuttery Spong
Four Acre Covert
Nuttery Lane (Track)
22m
Foxburrow Covert
Tk
Five Acre Pickle
Portobella Covert
Round Covert



Legend

- East Anglia ONE North Onshore Development Area
- Ecological Mitigation Area

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East Anglia ONE North

Indicative Permanent (Operational) Plans - Cable Route Section 3

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N

Grove Wood

Path

Woodside Farm

Watch Walk Whin

Track

Playing Field

Path

CHURCH ROAD

PW

War Meml

Church Farm

Path

Long Covert

Pit (dis)

Bull's Hall

SNAPE ROAD

Track

Wind Turbine

Bulls Hall Cottages

Jay's Covert

Jay's Covert

Track

23m

B1069

B1069

17m

Legend

- East Anglia ONE North Onshore Development Area
- East Anglia ONE North Onshore Substation
- Permanent PRoW Diversions
- Ecological Mitigation Area
- Hedgerow Tree Planting
- Substation Landscaping (hedgerow)
- Post-Construction Woodland Planting
- Pre-Construction Woodland Planting
- Sustainable Drainage System (SuDS) Basins

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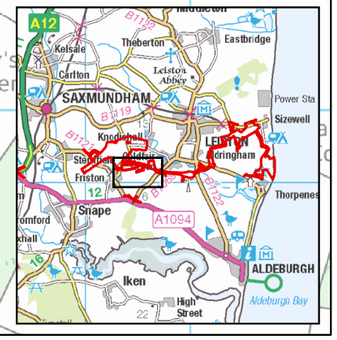

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East Anglia ONE North

Indicative Permanent (Operational) Plans - Cable Route Section 4

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N

Drain

Drain

Track

Knodishall

Knodishall Hall

PW

War Meml

The Old Rectory

CHURCH ROAD

Track

Hall Cottages

Fareacres

Little Moor Farm

Peartree Farm

Davenport

SCHOOL ROAD

The Old School

Hill Farm House

Path

Laurel Covert

Manor Farm

Old World Wood

Woodside Cottages

Path

Grove Wood

Legend

- East Anglia ONE North Onshore Development Area
- East Anglia ONE North Onshore Substation
- East Anglia TWO Onshore Substation
- National Grid Substation
- Cable Sealing End Compound
- Relocated / Reconstructed pylon
- Substation Operational Access Road
- Permanent PRoW Diversions
- Ecological Mitigation Area
- Substation Landscaping (hedgerow)
- Post-Construction Woodland Planting
- Pre-Construction Woodland Planting
- Sustainable Drainage System (SuDS) Basins

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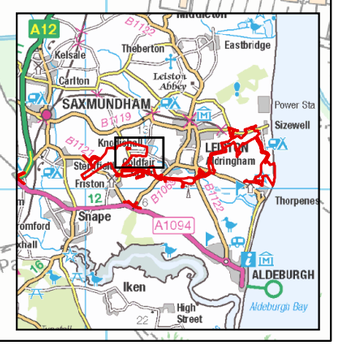

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Metres 0 100 200

East Anglia ONE North

Indicative Permanent (Operational) Plans - Substations and National Grid Infrastructure (1)

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 h

Coordinate System: BNG Datum: OSGB36

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N

Redhouse Farm

Owl's Hole

Baldrys Cottage

Track

Drain

Fristonmoor

Fristonmoor Covert

Little Moor Farm

Fareacres

Pond House

Moor Farm

The Lindens

SAXMUNDHAM ROAD

Track

Laurel Covert

Path

Grove Wood

Legend

- East Anglia ONE North Onshore Development Area
- East Anglia ONE North Onshore Substation
- East Anglia TWO Onshore Substation
- National Grid Substation
- Cable Sealing End Compound
- Cable Sealing End (with circuit breaker) Compound
- New pylon
- Relocated / Reconstructed pylon
- Substation Operational Access Road
- Permanent PRoW Diversions
- Ecological Mitigation Area
- Hedgerow Tree Planting
- Substation Landscaping (hedgerow)
- Post-Construction Woodland Planting
- Pre-Construction Woodland Planting
- Sustainable Drainage System (SuDS) Basins

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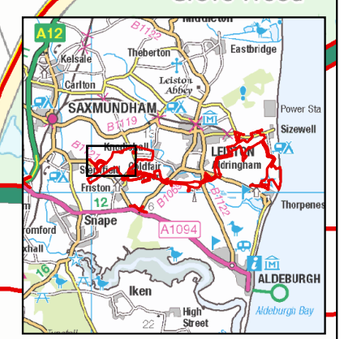

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0 100 200 Metres

East Anglia ONE North

Indicative Permanent (Operational) Plans - Substations and National Grid Infrastructure (2)

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 i
Coordinate System:	BNG
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N

Pond House

Moor Farm

Mill Mount

KILN LANE

24m

Rudley's Grove

Track

REDBARN LANE

New Covert

The Lindens

SAXMUNDHAM ROAD

Friston House

Track

Friston House Wood

Woodside Farm

Track

CHURCH ROAD

23m

Friston Hall Cottages

Redbarn Lane (Track)

Friston Hall

Track

Path

Track

Friston Hall Cottages

MILL

Legend

- East Anglia ONE North Onshore Development Area
- East Anglia ONE North Onshore Substation
- National Grid Substation
- Relocated / Reconstructed pylon
- Substation Operational Access Road
- Permanent PRoW Diversions
- Hedgerow Tree Planting
- Substation Landscaping (hedgerow)
- Post-Construction Woodland Planting
- Pre-Construction Woodland Planting
- Sustainable Drainage System (SuDS) Basins

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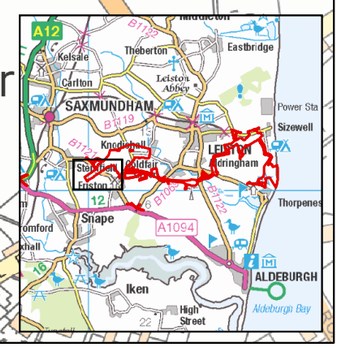

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0 100 200 Metres

East Anglia ONE North

Indicative Permanent (Operational) Plans - Substations and National Grid Infrastructure (3)

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 j

Coordinate System: BNG Datum: OSGB36

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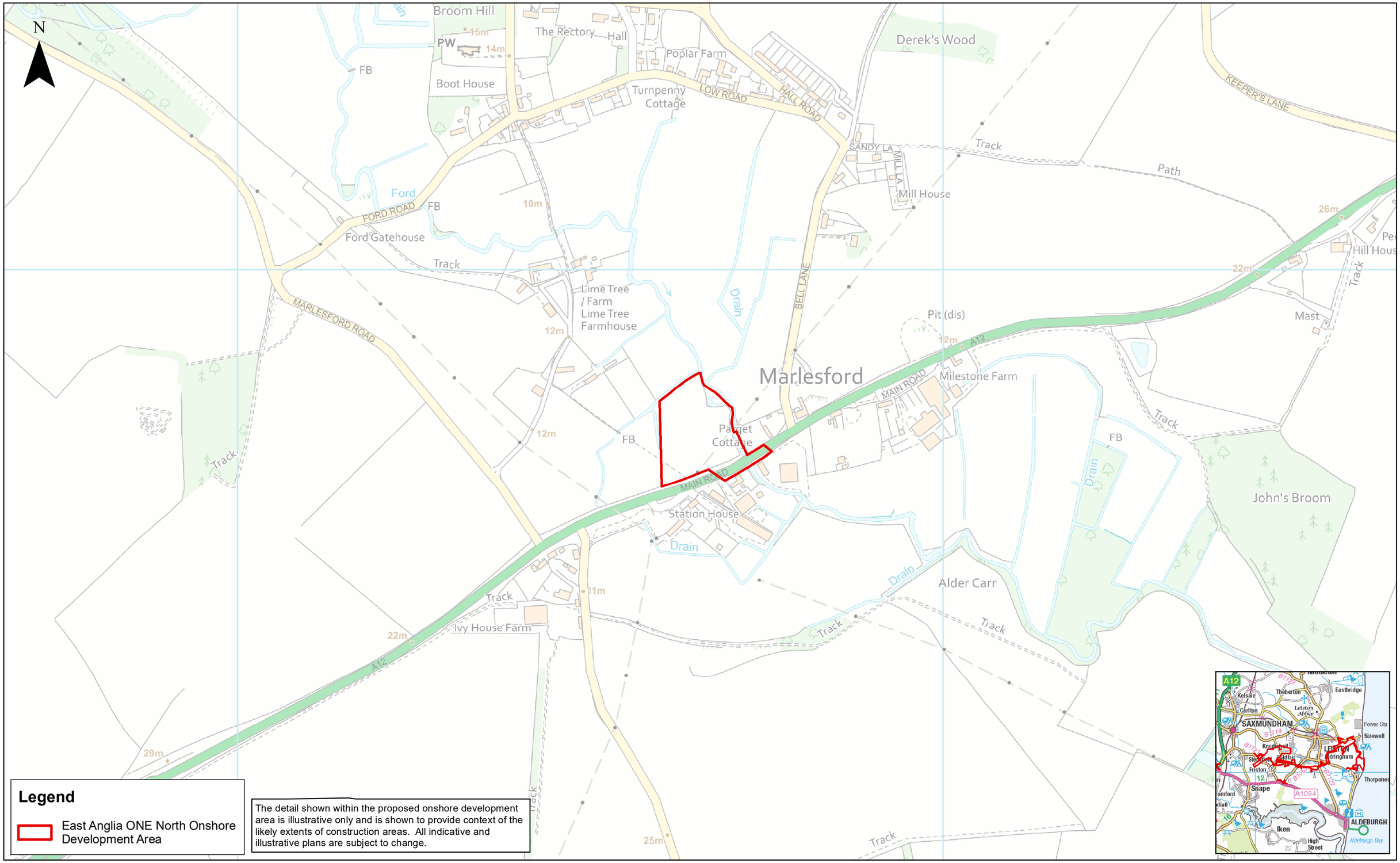

Rev	Date	By	Comment
1	16/07/2019	AB	First Issue.

Prepared: AB
Checked: PW
Approved: AH

1:5,000 Scale @ A3

Metres 0 100 200

East Anglia ONE North

Indicative Permanent (Operational) Plans - Marlesford

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 k

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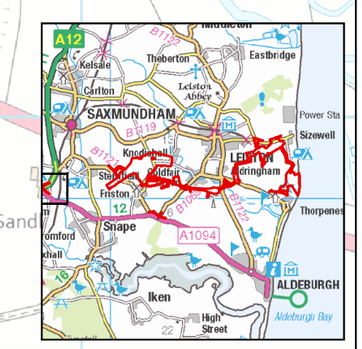
N

Butcher's Hole
Harrow Corner
Pit (dis)
Track
HARROW LANE
Path
The Heater
Benhall Lodge
18m
Track
10m
FB
The Canal
Whitearch Park
Honey Pot Lodge
ALDECAR LANE
PARK ROAD
A12
Sewage Works
Track
Track
24m
A12
The Old Police House
Path
18m
THE STREET
Pit (dis)
Track
17m
Track
Friday Street Farm
12m
Track
Mast
Track
Rosehill Cottages
FB
Manor Farm House
Moat
Drain
Mollett's Farm
Elm Tree Farm
Path
9m
16m
Hall Cottages
Palant's Grove
Rose Hill House
16m
A1094
15m
Friday Street
Monks Valley House
Pit (dis)
Sand



Legend

East Anglia ONE North Onshore Development Area

The detail shown within the proposed onshore development area is illustrative only and is shown to provide context of the likely extents of construction areas. All indicative and illustrative plans are subject to change.

SCOTTISHPOWER RENEWABLES

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				Prepared:	AB
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Metres 0 100 200

East Anglia ONE North

Indicative Permanent (Operational) Plans - Friday Street

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 I

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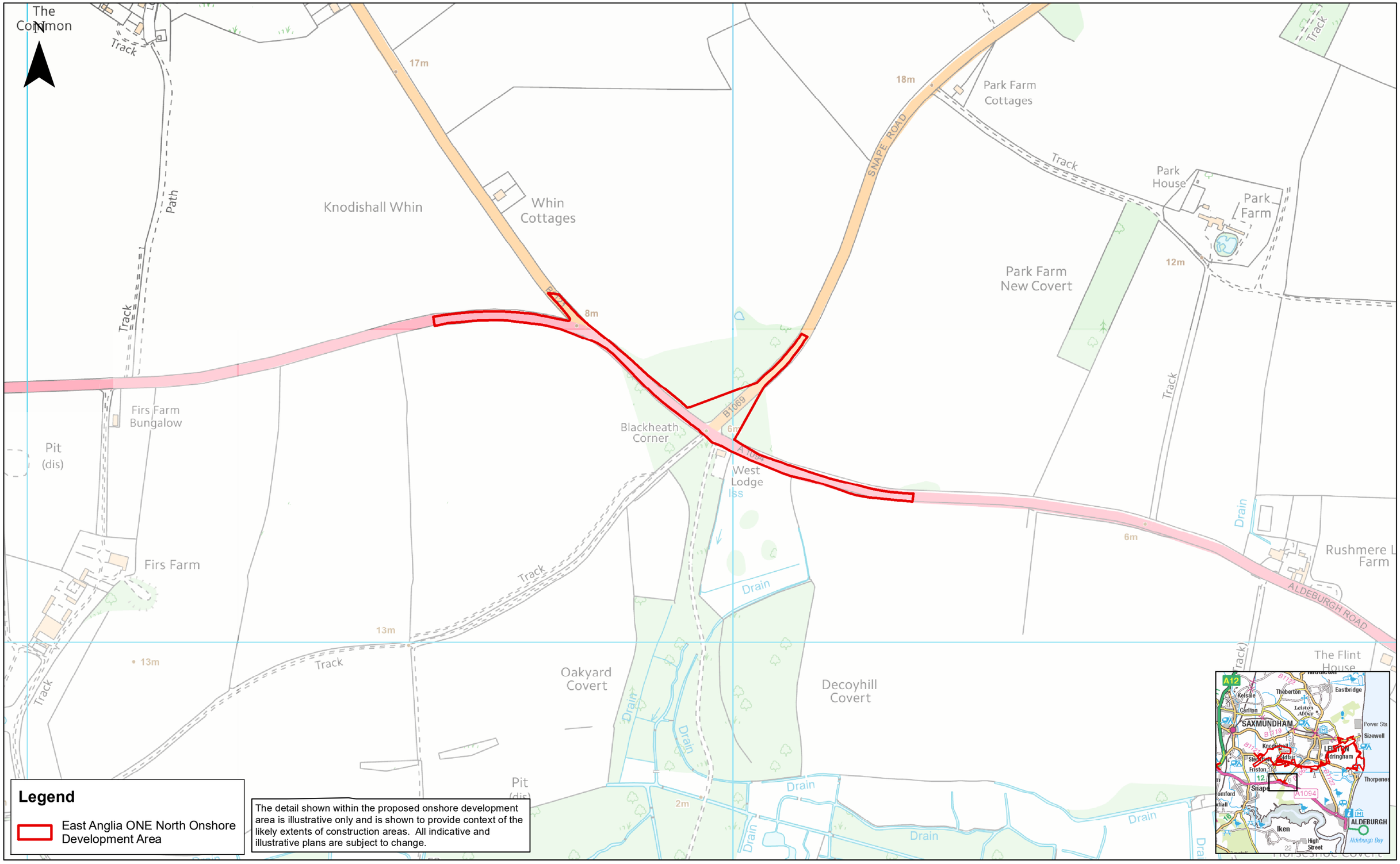

Legend

East Anglia ONE North Onshore Development Area

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0 100 200 Metres

East Anglia ONE North

Indicative Permanent (Operational) Plans - Snape Road

Drg No	EA1N-DEV-DRG-IBR-000915
Rev	1
Date	16/07/19
Figure	2 m

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