Clappits Works

Surface and Foul Water Drainage Management Plan

Requirement 18 (1) to (2) & 22 (1) to (2(a))

(Applicable to Work Numbers 21 to 24)

Prepared by:	Checked by:	Approved by:
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Revision Summary				
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1	07/09/21	Kay Griffin	Phil Rew-Williamson	Catherine Sibley
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Description of Revisions			
Rev	**Page**	**Section**	**Description**
1	ALL	ALL	New Document
2	ALL	ALL	Document amended in accordnace with consultee comments: ESC (26/10/21), SCC (21/10/21), Environment Agency (14/10/21), East Suffolk Internal Drainage Board (18/10/21)
3	ALL	ALL	Document amended in accordance with consultee comments: ESC (04/03/22) and Environment Agency (09/02/22)

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1. INTRODUCTION AND SCOPE

1.1. Project Overview

1. East Anglia Three Limited (EATL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Business, Energy and Industrial Strategy (DBEIS) on 7 August 2017 for the East Anglia THREE Offshore Windfarm (EA THREE). The DCO granted consent for the development of a 1,200MW offshore windfarm and associated infrastructure and is live until 28 August 2022. The DCO has now been subject to three non-material variations:

- In March 2019 EATL submitted a non-material change application to DBEIS to amend the consent to increase the maximum generating capacity from 1,200MW to 1,400MW and to limit the maximum number of gravity base foundations to 100. In June 2019 DBEIS authorised the proposed change application and issued an Amendments Order.
- In July 2020 EATL submitted a second non-material change application to DBEIS to amend the parameters of its offshore substations (reducing the number of these to one) and wind turbines (a decrease in the number of turbines and an increase in their hub height and rotor radius). On 15 April 2021 DBEIS authorised this proposed change application and issued an Amendments Order.
- In August 2021 EATL submitted a third non-material change application to DBEIS to amend the consent to remove the maximum generating capacity of 1,400MW and to amend the parameters of its wind turbines (a decrease in the number of turbines and an increase in their hub height and rotor radius). The application is currently in the consultation phase.

2. The onshore construction works associated with EA THREE will have a capacity of 1,400MW and transmission connection of 1,320MW. The construction works will be spread across a 37km corridor between the Suffolk coast at Bawdsey and the converter station at Bramford, passing the northern side of Ipswich. As a result of the strategic approach taken, the cables will be pulled through pre-installed ducts laid during the onshore works for East Anglia ONE Offshore Windfarm (EA ONE), thereby substantially reducing the impacts of connecting to the National Grid (NG) at the same location. The infrastructure to be installed for EA THREE, therefore, comprises:

- The landfall site with one associated transition bay location with two transition bays containing the connection between the offshore and onshore cables;
- Two onshore electrical cables (single core);
- Up to 62 jointing bay locations each with up to two jointing bays;
- One onshore converter station, adjacent to the EA ONE Substation;
- Three cables to link the converter station to the National Grid Bramford Substation;
- Up to three onshore fibre optic cables; and
- Landscaping and tree planting around the onshore converter station location.

3. Since the granting of the DCO, the decision has been made that the electrical connection for EA THREE will comprise a high voltage direct current (HVDC) cable rather than a high voltage alternating current cable and, therefore, the type of substation that will be required is a HVDC converter station. The substation will, therefore, be referred to here as a 'converter station' and this amended terminology has been agreed with the relevant authorities on 15 October 2020. It has also been determined that only one converter station will be constructed rather than two and that the converter station will be installed in a single construction phase.

1.2. Purpose and Scope

4. This Surface and Foul Water Drainage Management Plan (SFWDMP) focuses on the procedures for managing the drainage with respect to the Clappits Works Stage of the EA THREE construction works. This document has been produced to fulfil DCO Requirement 18 which states:

> **Surface and foul water drainage**
> ***18.-—(****1) No stage of the connection works may commence 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.*
> *(2) The details agreed in paragraph (1) must accord with the proposals for a surface water and drainage management plan contained in the outline code of construction practice and include a surface water drainage scheme for Work No. 67, which is based on sustainable drainage principles and an assessment of the hydrological and hydrogeological context of the development.*

(3) The surface and foul water drainage system for the relevant stage must be constructed in accordance with the approved details.

5. This document also fulfils part of DCO Requirement 22 which also requires a surface water and drainage management plan:

Code of construction practice
22.- *(1) No stage of the connection works may commence until for that stage a code of construction practice (which must accord with the outline code of construction practice) has been submitted to and approved by the relevant local planning authority, in consultation with the relevant highway authority.*
(2) The code of construction practice must include—
(a) a surface water and drainage management plan;

6. The scope of this document relates to the SFWDMP associated with the construction of the Clappits Works. Works in this stage comprise (Work No.s 21 to 24, as part of the onshore cable route running from the landfall location at Bawdsey to the Converter Station works located near Bramford, Suffolk (Figure 1 Overview Plan and Figure 2 Site Context Plan). SFWDMPs have been produced for each stage of the onshore connection works and are provided under separate cover.

7. The Clappits Works will be some of the first works to be undertaken along the cable route. These works have been designated as a stage in their own right to allow the works to commence at this location prior to works commencing along the cable route as a whole (i.e. the main cable works construction phase). The access and Construction Consolidation Site (CCS) will be constructed in Summer 2022 and the jointing bay installation, cable pull through and reinstatement will be undertaken as part of the main cable works construction phase.

8. With respect to Clappits Works, it is East Suffolk Council (ESC) who are the relevant planning authority. However, EATL has acknowledged from an early stage that Suffolk County Council (SCC) (as the Lead Local Flood Authority), the East Suffolk Internal Drainage Board, and the Environment Agency are important consultees in the process for the SFWDMP.

9. The purpose of the document is to describe the basis of the drainage scheme and management of water during construction of the works, in order to meet the following objectives:

- 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. The Project Environmental Management Plan (EA3-LDC-CNS-REP-IBR-000010) also deals with controls for hazardous materials;
- To comply with relevant legislation and good practice in terms of managing surface and foul water abstractions and discharges; and
- To maintain and protect private water supplies during construction.

10. The measures contained herein shall be adhered to by the Principal Contractor and the implementation and compliance will be monitored by the Construction Management Team. These measures will only be revised with the agreement of ESC.

11. This plan should be read in conjunction with the Code of Construction Practice (CoCP) (EA3-LDC-CNS-REP-IBR-00061) and in particular the following:

- Project Environmental Management Plan (Appendix 10)
- Pollution Prevention and Emergency Incident Response Plan (Appendix 7)
- Flood Plan (Appendix 2)
- Section 14 Protection of Surface and Groundwater and also Section 14.5 Licences.

12. In addition, a Restoration Plan will be prepared to the approval of ESC in conjunction with SCC as Local Highway Authority, in accordance with Requirement 30 of the DCO. This Plan will set out how land that has been used temporarily for the EA THREE construction works will be reinstated within 12 months of the completion of that stage.

2. ABBREVIATIONS

CBS	Cement Bound Sand
CCS	Construction Consolidation Site
Chapter 8	Guidelines for (Public) Highways signing, lighting and guarding
CoCP	Code of Construction Practice
DBEIS	Department of Business, Energy and Industrial Strategy
DC	Direct Current
DCO	Development Consent Order
DMRB	Design Manual for Roads and Bridges
EA	Environment Agency
EA ONE	East Anglia ONE
EA THREE	East Anglia THREE
EATL	East Anglia THREE Limited
EnvCoW	Environmental Clerk of Works
ESC	East Suffolk Council
ES	Environmental Statement
GWD	Groundwater Directive (2006/118/EC, including amendments to Annex II detailed under
HVDC	High voltage direct current
LLFA	Lead Local Flood Authorities
MW	Megawatt
NG	National Grid Plc
NPPF	National Planning Policy Framework
PPG	Pollution Prevention Guideline
RPS	Regulatory Position Statement
SCC	Suffolk County Council
SPP	Suffolk SuDS Palette
SuDS	Sustainable Drainage System
WFD	Water Framework Directive (2000/60/EC)

3. CONSTRUCTION DETAILS

3.1. Cable Works – Overview

13. The construction works will be spread across a 37km corridor between the Suffolk coast at Bawdsey and the Converter Station at Bramford, passing the northern side of Ipswich. The cables will be pulled through pre-installed ducts laid during the onshore works for East Anglia ONE. The construction activity within each section along the onshore cable route will be as follows:

- Any minor temporary modifications to the public road network;
- Establish the Construction Consolidation Sites (CCSs);
- Establish accesses to, and temporary haul road to, the jointing bay locations;
- Establish temporary jointing bay compounds;
- Excavate jointing bay pit to locate the existing ducts at each of the compounds;
- Construct jointing bay;
- Transport of cables to site, pull cables through ducts and undertake jointing;
- Topsoil replacement and seeding;
- Remove temporary compounds (jointing bays and CCS); and
- Reinstate all disturbed land and permanent fences and hedges.

14. Some temporary modification of the existing road networks may be required such as localised widening, temporary widening or socketing of street signs and temporary moving of street furniture in order to allow larger vehicles than normal to access the jointing bays. This will be completed prior to the start of the main construction works within relevant sections of the cable corridor route.

15. EATL will require up to seven temporary construction compounds to aid in the construction of the proposed East Anglia THREE project. These have been designated as 'Primary Construction Consolidation Site' (PCCS) and 'Secondary Construction Consolidation Site' (SCCS) depending on their uses. Two PCCS and up to five SCCS will be installed, which will all be temporary and will be removed once construction is complete.

Table 3-1 – Construction Consolidation Site Locations

CCS Type	ID	Address
Secondary	A	Bullen Lane, Bramford, Ipswich, Suffolk IP8
Primary	B	Paper Mill Lane, Claydon, Ipswich, Suffolk IP6 0AP
Secondary	C	Witnesham Road, Ipswich, Suffolk IP6
Secondary	D	Playford Corner, Playford Mount, Ipswich, Suffolk IP6 9DS
Primary	E	Top Street, Martlesham, Suffolk IP12
Secondary	F	Clappits, Woodbridge Road, Newbourne, Woodbridge, Suffolk IP12 4PA
Secondary	G	Park Lane, Ipswich, Suffolk IP10

16. The PCCSs will:

- Form the main point of access onto the linear construction site;
- Provide areas for the storage of materials and equipment;
- House site administration and welfare facilities for the labour resources;
- Form an interchange hub for deliveries of material, equipment and resources; and
- Allow HGVs to park prior to entering the local road network during peak hours.

17. The SCCSs will act as hubs for the delivery of materials, equipment and resources along the route and will enable access to the cable route for construction. They will be of sufficient size to accommodate limited storage of materials, equipment and labour welfare facilities.

18. It is anticipated that 29 jointing bays will be required along the 37km cable route, in addition to a transition bay at the landfall. Each jointing bay will comprise a concrete box 10m long by 3m wide by 1.5m high buried so that the base is 2.5m below ground level. A jointing bay construction compound will be required adjacent to each jointing bay and will have hardstanding areas of up to 900m^2 within the compound which would typically measure 24m x 115m i.e. 2,760m^2.(in accordance with Requirement 12(11) which stipulates that the footprint must not exceed 3,740m^2). The compounds will have hardstanding and accommodate containers, drum trailer movement, parking, and welfare. A typical layout is shown in Figure 2 of the Code of Construction Practice (EA3-LDC-CNS-REP-IBR-000061).

19. Existing accesses and farm tracks will be upgraded and used where possible to access the jointing bay locations. Once these accesses reach the cable corridor, the routes to connect to the jointing bays are referred to as 'haul road'. The length of haul road for the cable route is limited by Requirement 12(12) of the DCO to 18.05km.

20. In addition, the ducts to be used for EA THREE, which were installed during the EA ONE project construction works, will require to be 'proved' to ensure that they are intact and free of debris. This will be undertaken by the use of foam pigs which will be driven under pressure from jointing bay to jointing bay. Each stretch of duct that was installed using Horizontal Direct Drilling (HDD) will, however, require duct-proving excavations at each end of the HDD, to allow the use of different size foam pigs, due to a difference in the diameter of these compared to the ducting installed using open trench techniques.

3.2. Clappits Works

21. Clappits Works comprise a stage of the onshore connection works and cover Work No.s 21 to 24. The infrastructure within these Work No.s comprises:

- The Clappits SCCS (CCS F) in Work No. 22;
- Three Jointing Bays (20 to 22) in Work No. 21;
- Two improved accesses with the public roads as follows:

- Access AP-H (Work No. 23) eastwards from Woodbridge Road, to access the Clappits SCCS and Jointing Bays 21 and 22 in Work No. 21; and
- Access AP-I (Work No. 24) eastwards from Newbourne Road, to access Jointing Bay 20 in Work No. 21; and

- A crossing of The Street (CR01 and CR02); and
- The access tracks/haul roads required to access Clappits SCCS and jointing bays 20 to 22.

22. These are shown on Figure 2.

3.2.1. Accesses AP-H and AP-I, the Crossing Point, Access Tracks and Haul Roads

23. Clappits SCCS will be accessed from Woodbridge Road using Access AP-H. This junction was used for the EA ONE project (Access AX-14) but was fully reinstated following the EA ONE works and will need to be constructed under the EA THREE DCO. The vehicular access track from the access to the Clappits SCCS that was installed as part of the EA ONE construction works remains in situ as it was agreed with ESC that restoration would be environmentally more damaging than leaving the improved track in place. A new temporary vehicular access track of 160m length and 5.5m width will be used to link this existing track and the Clappits SCCS to reach the edge of the cable corridor (Work No. 21), where 610m of 5.5m wide haul road will link to road crossing CR02, and a further 1,520m from road crossing CR01 to Jointing Bays 20 and 21. The amount of temporary haul road required to access these jointing bays will be 2.13km.

24. Access AP-I will be constructed from Newbourne Road, along with 400m of 5.5m wide access track to link to the edge of the cable corridor which will access directly onto the compound of Jointing Bay 20. This access was not used as part of the EA ONE construction works.

25. A crossing of The Street (CR01 and CR02) will be required. This will be in the same location as that used for EA ONE.

26. No watercourse crossings will be required for the Clappits Works.

27. The construction methodologies associated with the accesses, access track and haul roads are typically as follows:

- Set out the access and track/haul road with the use of Global Positioning Systems (GPS) Real Time Kinematic (RTK) equipment;
- Locate, divert and cap any existing field drains;
- Set out and install drainage features the length of track to be constructed;
- Remove vegetation, then remove and locally store topsoil material over the working width; seeding topsoil if it is to be stored for longer than 6 months;
- Excavate to formation level and store any excess material;
- Under-track drainage will be installed where necessary and in accordance with drainage requirements;
- Place a geotextile onto existing subsoil to improve the bearing capacity of the sub-soil, depending on ground conditions, programme and landowner requirements; and
- Place imported stone in accordance with the design to form the track structure.

3.2.2. Secondary Construction Consolidation Site (Work No. 22)

28. The Clappits SCCS will be a hub for the delivery of materials, equipment and resources. The dimensions of the Clappits SCCS will be 60m long by 20m wide covering a surface area of 1,200m^2, this is in accordance with Requirement 12(9)(a) of the DCO which limits the size of each SCCS to 1,200m^2. The Clappits SCCS will also be within the area previously used for the EA ONE SCCS in this location.

29. The construction of the SCCSs involves stripping of topsoil, importing and laying stone for the compound base and installing cabins and welfare facilities. Construction of the Clappits SCCS will take approximately 3 weeks and the methodology will be as follows:

- The extent of SCCS will be marked out with the use of GPS RTK equipment;
- Any existing field drains will be located, diverted and capped;
- Drainage features will be set out and installed as required;
- Security fencing will be erected around the perimeter of the SCCS;
- Once vegetation has been removed, topsoil material over the SCCS area will be removed and locally stored and seeded if it is to be stored for longer than 6 months;
- Any excess material will be excavated to formation level and stored; and
- Imported stone will be placed in accordance with the design of the SCCS base structure.

30. The SCCS will be constructed first, with the duct proving, jointing bays and cable pull through occurring at a later date (anticipated in 2024). It is intended that the SCCS will provide an early onsite presence for the onshore cable construction works and will be used as a base for mitigation and survey works being undertaken as well as for the construction team to visit site during the later stages of the planning and design process. It may also be used for stakeholder and other site meetings.

31. The Clappits SCCS will remain in situ for the duration of the onshore cable works, prior to being restored as described in Section 3.2.5.

3.2.3. Jointing Bays 20 to 21 (Work No. 21)

32. The three jointing bays in Work No. 21 will be located as follows:

- Jointing Bay 20 – 340m to the east of Newbourne Road and to the southwest of Waldringfield (Grid Ref 627520 244187);
- Jointing Bay 21 – 45m to the west of Mill Road, to the east of Newbourne (Grid Ref 627881 243040); and
- Jointing Bay 22 – 240m to the north of Kirton Creek and 190m to the southeast of White Horse Wood, to the southeast of Newbourne (Grid Ref 628065 241862).

33. Once the location of each jointing bay compound has been established (using GPS RTK equipment), creation of the compound will commence with erection of temporary security fencing, removal of topsoil layer and installation of hardstanding areas.

34. The jointing bay will then be excavated to a depth of up to 2.5m with adequate slope batter or shoring on all sides of the excavation to prevent the soil from collapse. The existing ducts will be uncovered and concrete slabs constructed to provide a level working area. Two sump pits will be included to facilitate drainage and dewatering and water will be treated, where necessary, before being discharged. Installation and jointing of the cables will then take place, along with installation of earthing link boxes and fibre optic cable chambers, before the area is back filled with subsoil.

35. The creation of each jointing bay compound and excavation of each jointing bay will take a week each.

3.2.4. Cable Installation

36. The electrical transmission cables will be delivered to the Clappits SCCS where they will be transferred to the jointing bay compounds when needed. The cable drums will comprise abnormal loads and their delivery will be managed as set out in the Traffic Management Plan (EA3-LDC-CNS-REP-IBR-000053). Two cable lengths of approximately 1,260m will be required to pull through between each pair of jointing bays. The cable ducts will be proved before the cable is pulled through. Once the cables are received at the jointing bay compound, they will be temporarily stored on the hardstanding area prior to installation in the pre-installed ducts.

37. Installation of the cables into the ducts between the jointing bays will begin with a cable pulling system being installed into the bay. A steel bond and winching system with free spinning rollers will be installed along the bottom of the bay. Hydraulic jacks will raise the cable drum off the ground and a winch will be used to pull in cable using a pulling rope. A dynamometer will ensure the maximum pulling tension is not exceeded. Tension on the cable will be reduced using a biodegradable water-based lubricant. This process will be repeated for the second cable being installed in the duct. The cables will then be jointed once 2 cable sections (4 cables) have been installed.

38. It is expected that pulling and jointing operations at each location would take approximately 2.5 weeks typically spread over a three to four week period, with approximately five workers for each jointing bay. These works will then be repeated to install the cables between all the jointing bays.

3.2.5. Reinstatement

39. Following installation and jointing of the cables, the jointing bays, compound, accesses and haul roads will be reinstated with the stored topsoil and subsoil following trenching. If necessary, the subsoil will be 'ripped' prior to placement if compaction had occurred. Topsoil will be spread in such a way as to ensure that it does not become compacted. The topsoil will then be cultivated and reseeded (if required) and suitable hedgerow species replanted during the first appropriate planting season, in accordance with the Landscape Management Pan (EA3-LDC-CNS-REP-IBR-000056). Temporary fencing around any new planting would be removed once reinstatement was established.

40. The Clappits SCCS will remain in situ for the duration of the cable works and will then be removed and reinstated.

4. SITE DETAIL

4.1. Hydrological and Hydrogeological Context

41. Figure 3 provides an overview of the Clappits Works site and local water features (based on 1:25,000 scale OS mapping). The site at Clappits is approximately 3.2km in length and extends south from Waldringfield past Newbourne, ending just north of Kirton. The site was previously used for the construction of the EA ONE CCS, haul road and cable installation works.

42. Topography at the site generally ranges from 15m AOD to 25m AOD, with much of the site situated on ground higher than 21m AOD, with a number of topographical depressions dominated by the local hydrology. The prevailing slopes on the site are to the west.

43. There are no surface water features present on the site however a tributary of Mill River flows from north to south parallel and around 300m to the west of the site. A series of small springs and drains are present between the site and the main flowing channel and will pick up surface runoff from much of the site area. The main channel of this system is designated as a Main River by the Environment Agency and drains an approximate upstream catchment of 7.1km^2 at the point where it discharges into Mill River to the southwest of the site.

44. At its closest Mill River is located around 50m to the south of the of the Clappits Works area. This larger watercourse, which drains an upstream catchment of approximately 45km^2, flows from west to east towards the Deben Estuary.

45. The Deben Estuary is located approximately 1km east of the site at its closest point and is tidal in nature adjacent to the site. The estuary drains an upstream fluvial catchment area of in excess of 185km^2.

46. No land drains were encountered during the EA ONE construction works within the Clappits Works area.

47. The site is underlain by Red Crag Formation (Sand), which is designated by the Environment Agency as a Principal Aquifer. This is almost wholly overlain by superficial deposits of the Kesgrave Group – Sand and Gravel, which are designated as a Secondary A Aquifer. These designations are applied to more permeable units that are likely to be important for water resources and supply of baseflows to local watercourses. It is considered likely that groundwater flows from the deposits beneath the site drain westwards and contribute to flows in the springs and channel present to the west between the site and the tributary of the Mill River.

48. The site is not located within a Source Protection Zone.

49. While there are no licensed surface water abstractions in close proximity of the Clappits site, there are two licensed groundwater abstraction noted in very close proximity to the site boundary, less than 50m to the east of the site near Waldringfield and also within 200m of the northern boundary. Both of these abstractions draw from groundwater within the Chalk for spray irrigation purposes. There is a further private water abstraction in close proximity to the licensed abstraction c.200m north of the site. Although likely to draw from the Chalk it is unknown what aquifer(s) the private abstraction draws from.

50. The closest surface water abstraction (License No. 7/35/10/*S/0059) utilises a small pond in close proximity to the River Deben for spray irrigation c.500m east of the central part of the site.

4.2. Risk of Flooding

51. A Flood Risk Assessment was conducted in 2015 by Royal HaskoningDHV and the findings of this were included in the Environmental Statement (Vol 3 Chapter 21 as Appendix 21.2). Reference was made to the Environment Agency (EA) Flood Zone Map, which was used to identify the flood risk potential along the route of the cable works.

52. The EA Flood Map identifies three categories of Flood Zones, which reflect the risk of an area being affected by flooding from either rivers or the sea, where there are no flood defences. The zones are described as follows:

- Flood Zone 1: land defined as having less than a 1 in 1000 annual probability of flooding from rivers or the sea);
- Flood Zone 2: land having between a 1 in 1000 and a 1 in 100 annual probability of flooding from rivers or between a 1 in 1000 and a 1 in 200 annual probability of flooding from the sea; and
- Flood Zone 3: land having greater than a 1 in 100 annual probability of flooding from rivers or greater than 1 in 200 annual probability from the sea.

53. Based on the EA Flood Zone Map (Figure 21.5 of the ES), the report confirmed that the Clappits Works site is located within Flood Zone 1 (i.e. a less than 1 in 1000 year annual probability of flooding from rivers or the sea) and therefore (according to EA criteria) is considered to have a 'Very Low' risk of flooding from these sources. Current UK flood mapping[1] indicates that this remains the case. The site is not in a location that qualifies for Flood Alerts or Flood Warnings from the Environment Agency.

54. The points of access to Clappits Works (Woodbridge Road and Newbourne Road) are not located within Environment Agency Flood Zones, nor in areas that receive Flood Alerts or Flood Warnings. Nevertheless, a Flood Plan has been prepared (Appendix 12 of the Code of Construction Practice and information regarding flood and weather alerts is include in Section 8.5 of this plan.

5. SURFACE AND FOUL WATER DRAINAGE MANAGEMENT PLAN GOVERNANCE

55. Prior to the commencement of construction, an Environmental Clerk of Works (EnvCoW) will be appointed by the Principal Contractor to manage *inter alia* the implementation of the SFWMDP. Contact details for the EnvCoW will be submitted to stakeholders for their records prior to commencement of construction.

56. The EnvCoW will be responsible for ensuring that effective surface water drainage management measures are in place for each relevant stage of construction and ensure that the relevant contractor also has in place a plan and appropriate means to respond to unforeseen events. This forward planning and implementation is critical to the effective management of surface water during construction and is a key lesson learnt from the construction of the East Anglia ONE project.

57. Prior to commencement of construction, the Principal Contractor will also submit details of their Accreditation (e.g. ISO) and Environmental Policies to the relevant stakeholders along with the following details for each key role relating to this plan:

- Role;
- Contact;
- Company Name and Address;
- Contact number and email; and
- Key responsibilities.

6. RELEVANT STANDARDS AND LEGISLATION

58. The Clappits Works drainage strategy has been developed in accordance with the following relevant standards and guidance.

6.1. British Standards / Eurocodes

- BS EN 858-1:2002 Separator Systems for Light Liquids (e.g. Oil & Petrol)
- BS 8582:2013 Code of practice for surface water management for development sites

6.2. Legislation and Planning Policy

- The Water Framework Directive (2000/60/EC) (WFD)
- The Groundwater Directive (2006/118/EC, including amendments to Annex II detailed under Directive 2014/80/EU) (GWD)
- The Floods Directive (2007/60/EC)
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 which transposes the WFD and aspects of the GWD into UK legislation
- The Groundwater (England and Wales) Regulations 2009 which implements in England and Wales Article 6 of the GWD which details measures to prevent or limit inputs of pollutants into groundwater The Flood Risk Regulations 2009 transposes the EU Floods Directive into UK legislation and sets out requirements of the Environment Agency and local authorities in preparing assessments and mapping of flood risk for each river basin district in England and Wales
- Flood and Water Management Act 2010 includes provisions for the management of risk in connection with flooding and sets out requirements for Lead Local Flood Authorities (LLFA) in preparing strategies for local flood risk management
- The Land Drainage Act 1991 and 1994
- The Environment Act 1995

[1] https://flood-map-for-planning.service.gov.uk/

- The Environmental Permitting (England and Wales) Regulations 2016 consolidate and replace the Environmental Permitting (England and Wales) Regulations 2010, which have been amended 15 times to date. The 2010 Regulations are still in force and are the main implementing regulations for the environmental permitting regime
- National Planning Policy Framework (NPPF), July 2021
- Sustainable Drainage Systems - Non-statutory technical standards for sustainable drainage systems, March 2015, Department for Environment, Food and Rural Affairs.
- The Water Abstraction and Impounding (Exemptions) Regulations 2017.

6.3. CIRIA Guidance

- CIRIA C532 Control of Water Pollution from Construction Sites (2001)
- CIRIA C502 Environmental Good Practice on Site (2015)
- CIRIA C753 SuDS Manual (Dec 2015)
- CIRIA C762 Environmental Good Practice on Site (4th Edition 2016)
- CIRIA 648 Control of Water Pollution from Linear Construction Projects – Technical Guidance (2006)
- CIRIA 649 Control of Water Pollution from Linear Construction Projects – Site Guide (2006)
- CIRIA SP156 - Control of water pollution from construction sites - guide to good practice, (2002)

6.4. Local Guidance

- Suffolk Coastal and Waveney District, Strategic Flood Risk Assessment, Main Report, February 2008, Scott Wilson on behalf of Suffolk Coastal District Council (now ESC)
- Suffolk Coastal and Waveney District Councils Level 1 Strategic Flood Risk Assessment 2018
- Suffolk Coastal and Waveney District Strategic Flood Risk Assessment, Appendix B – Suffolk Coastal District Council Report January 2009, Scott Wilson on behalf of Suffolk Coastal District Council
- Sustainable Drainage Systems (SuDS) a Local Design Guide, Appendix A to the Suffolk Flood Risk Management Strategy, Suffolk Flood Risk Management Partnership, May 2018
- Suffolk SuDS Palette (SPP) – Guidance, Suffolk County Council

6.5. Design Manual for Roads & Bridges

- Design Manual for Roads & Bridges (DMRB): *CD 529 Design of outfall and culvert details*
- DMRB: CD 522 Drainage of runoff from natural catchments

6.6. Environment Agency Guidance Notes[2]

- Pollution Prevention Guidelines (PPG) General Guide to the Prevention of Water Pollution
- PPG3 Use and Design of Oil Separators in Surface Water Systems
- PPG4 Disposal of Sewage where no Mains Drainage is Available
- PPG5 Works in, or liable to affect Watercourses
- PPG6 Working at construction and demolition sites;
- PPG8 Storage and disposal of used oils;
- PPG20 Dewatering of underground ducts and chambers;
- PPG21 Pollution incident response planning;
- The Environment Agency's approach to groundwater protection (version 1.2 February 2018)
- Pollution Prevention for Business, (DEFRA and Environment Agency) May 2019

6.7. Regulatory Position Statements

- Treating and using water that contains concrete and silt at construction sites: RPS 235, November 2020
- Temporary dewatering from excavations to surface water, Environment Agency, April 2021

[2] The Environment Agency no longer provides 'good practice' guidance in the form of PPG and these documents were withdrawn in December 2015. The Environment Agency will be reviewing the validity of the archived documents as part of the government 'smarter guidance' project. While this process is concluded, the archived PPG documents are found at: https://www.gov.uk/government/collections/pollution-prevention-guidance-ppg

7. WATER FRAMEWORK DIRECTIVE

59. It has been agreed with the Environment Agency (14/10/21) that a Water Framework Directive (WFD) Assessment is not necessary for the Clappits Works due to the mitigation measures outlined in this Surface Water and Drainage Management Plan and also the Code of Construction Practice (EA3-LDC-CNS-REP-IBR-000061).

8. SURFACE WATER DRAINAGE STRATEGY

8.1. Introduction

60. The requirement for a SFWDMP is based on the duty to ensure that surface water quality and quantity is managed throughout the construction process to mitigate impacts off site. It will also play a role in protecting the quality of soils on site by preventing loss of composition and nutrients. Surface water runoff is a risk to the quality of all controlled water bodies and a nuisance to adjacent landowners. Surface water flooding can also delay works activities and become a risk to human health.

61. The impacts of the installation of the EA THREE onshore cables as a whole on surface water have been minimised by the strategic decision to install the ducts for the project as part of the EA ONE construction works. The EA THREE cables will, therefore, be pulled through these pre-installed ducts rather than requiring open trenching across the route. The existing ducts are located underground / below riverbed to minimise potential impacts to flood risk receptors. Furthermore, the locations of the jointing bays are at least 10m from watercourses and at a maximum depth of 2.5m and have been designed to avoid the known area of contamination at Tuddenham St Martin (i.e. Work No. 41). There will, therefore, be no excavations or works within this area. The initial routing of the cable corridor was designed to also avoid mineral extraction areas.

62. A CoCP (EA3-LDC-CNS-REP-IBR-000047) has been prepared and agreed with ESC and SCC and includes best practice measures for the protection of surface waters. A Pollution Prevention and Emergency Incident Response Plan (Appendix 8 to the CoCP) has been prepared and includes a description of the general requirements in place to identify and manage likely sources of pollution from the construction activities. Pollution prevention measures will be implemented in accordance with Environment Agency guidance (see Section 6). Procedures and contingency plans will be put in place at each work site to deal with the clean-up of small spillages and any emergency incidents. 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 facility.

63. Detailed evaluation of each section of the works will be undertaken prior to construction works commencing and selection of the most appropriate mitigation measures for each area will be applied. Such evaluation will consider, but not be limited to, extent of work areas, topography of the site, geology and soil conditions, hydrology and surrounding receptors.

64. 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 Requirements of the DCO, environmental best practice and the approved Method Statements.

65. The workforce will receive “toolbox” talks outlining the aims of the water management strategy and its importance in maintaining a safe working environment and protecting water features along the route.

66. All necessary permits will be obtained by the Principal Contactor prior to commencement of these works. In accordance with the Land Drainage Act 1991 and local byelaws, where required written consent will be sought from the East Suffolk Internal Drainage Board on the final methodology for any temporary or permanent works associated with or any discharge to Ordinary Watercourses within the East Suffolk Internal Drainage District. Written consent from the SCC (the lead Local Flood Authority)) will be obtained for the final methodology for any temporary or permanent works associated with Ordinary Watercourse crossings outside of the East Suffolk Internal Drainage District (pursuant the Land Drainage Act 1991). No such works with respect to ordinary watercourses are, however, currently envisaged for the Clappits Works.

8.2. Existing Drainage

67. Existing land drainage systems will be maintained during construction, where possible, and reinstated on completion. Consultation with landowners and occupiers will be undertaken to establish existing drainage arrangements, the location of drains and any other relevant information. Further mitigation will include the use of a specialist, local drainage contractor to undertake surveys to locate drains and create drawings both pre- and post-construction and ensure appropriate reinstatement. Where drains are shallower than

1.5m, temporary culverting or diverting may be employed. Where possible, these will be cut off and capped inside the works area, to prevent silt leaving site and new field drains will be installed on the site boundary. Following construction, field drainage systems and ditches will be fully reinstated where possible in consultation with landowners / occupiers.

68. Where construction operations may impact the wider drainage regime, the work will be undertaken in consultation and agreement with the East Suffolk Internal Drainage Board and/or SCC as relevant. During the construction phase, local drainage will only be interrupted for the shortest possible period and will be reinstated as soon as practicable to minimise any effect on local drainage or soil moisture content.

8.3. Drainage Design

69. Once completed the cable will be a below ground structure and restoration will be undertaken to return the disturbed areas to their greenfield state with all original drainage connections restored. The drainage for the completed works will therefore comply with the Non-Statutory Technical Standards for Sustainable Drainage Systems (SuDS), specifically paragraphs S2[3] and S4[4], and will achieve Greenfield Runoff Rates for all storms. This will thereby ensure that flood risk is not increased (required as per paragraph 163 of the National Planning Policy Framework).

70. The surface water systems to be used during the construction of the onshore cable works will comprise Option 2 in the SCC Construction Surface Water Management Plan Template i.e. install, use and remove a temporary surface water drainage system. Where works are undertaken in proximity to sensitive receptors (watercourses and built development) this construction drainage will also be specified and implemented in line with the Non-Statutory Technical Standards for Sustainable Drainage Systems (SuDS) attenuating flows to the Greenfield Runoff Rates for all event up to the 1 in 100 annual probability storm. Elsewhere (i.e. crossing agricultural fields remote from surface watercourses) construction drainage arrangements will be designed to accommodate and control flows to Greenfield Runoff Rates for all storm up to the 1 in 10 annual probability event. This lower standard reflects both the temporary nature of the works and the minimal consequences of an exceedance event in these areas (i.e. localised ponding in fields).

71. Where appropriate, the principles of SuDS will be applied in order for the surface water discharge from the construction works to mimic natural drainage as far as is practicable. The key principles that influence the planning and design process, therefore, comprise:

- Storing runoff and releasing it slowly (attenuation);
- Allowing water to soak into the ground (infiltration);
- Slowly transporting (conveying) water on the surface;
- Filtering out pollutants; and
- Allowing sediments to settle out by controlling the flow of the water.

72. Prior to undertaking the groundworks for any stage, a Preconstruction Water Management Plan will be developed and implemented to prepare the area of works and to prevent the contamination of both ground and surface water. The Preconstruction Water Management Plan will account for any existing land drainage, hydrological features, ground and surface water. Preconstruction drainage is an essential element in maintaining a suitable working area, reducing the potential for pooling water and preventing contaminated runoff into watercourses.

73. In addition, prior to commencing construction works, a Construction Water Management Plan will be prepared following the SCC Construction Surface Water Management Plan Template and this document will be agreed with ESC and SCC. This Construction Water Management Plan will be implemented during the construction works and will set out the practical steps required to manage drainage. The catchment area(s) for the CCS, jointing bay and access and the watercourse to which the treated water will thereafter be discharged will be identified.

74. Without appropriate controls, the excavation works could provide alternative routes for surface water runoff to follow within the catchment. Drainage systems to be put in place will be designed to prevent any permanent alterations to existing drainage patterns

[3] For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event

[4] Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event should never exceed the greenfield runoff volume for the same event

and, at the same time, prevent contamination during temporary rerouting of natural runoff, during construction. The techniques used will be designed to discourage any long-term changes to surface and groundwater movements. Existing drainage systems encountered during excavation, along with natural flow paths, will be fully reinstated, wherever practicable, as the route is progressed (see Section 8.2).

75. As part of the enabling works, shallow ditches will be installed in parallel to and downslope of any excavations and soil bunds to intercept surface water run-off from actively worked / disturbed ground or unconsolidated storage areas. 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 at Greenfield Runoff Rates (see Section 9.1).

76. The Construction Water Management Plan will identify the location of temporary attenuation ponds of sufficient size for sediment to settle out. This water can be retained for use in construction activities requiring a supply of water such as dust suppression, taking into consideration RPS 235 (Treating and using water that contains concrete and silt at construction sites) and the need to ensure capacity is provided within the surface water drainage system to accommodate future rainfall events. The Construction Water Management Plan will also outline the preferred surface water management strategy and identify the actions, timescales and responsibilities of individuals. The Construction Water Management Plan will identify sensitive receptors at risk from water runoff and the mitigation to be installed.

77. Wherever practical, jointing bays will be backfilled with arisings, in the order they were originally present to minimise alterations to the drainage pattern once construction and restoration have been completed. The reinstatement materials placed within the jointing bay's floor and sides will be at least as erosion-resistant as the original bed material but where appropriate may also be formed from a low- permeability material (e.g. a 'clay plug') to ensure that no preferential drainage pathways are created). Existing ditches and field drains in close proximity to the jointing bay site will be maintained and kept free from potential obstruction.

8.4. Dewatering of Jointing Bay Excavations

78. Jointing bays are reasonably large excavations which often go to a depth below that of the ground water level and therefore can require dewatering. Generally water will be removed from the excavation through the use of a standard surface water pump.

79. The Water Abstraction and Impounding (Exemptions) Regulations 2017 state that no more than 50m^3/day is permitted to be dewatered if within 250m of a well used to supply water for lawful use or within 500m of a nature conservation site. If there is no (legal) well/spring/borehole or conservation site nearby then this can be increased to 100m^3/day. Abstraction under the Exemption conditions is to last less than 6 consecutive months. In the large majority of cases jointing bay excavations will be completed within a period of six months and a discharge rate of 100 m3/d (or 50 m3/d if within 500m of a conservation site or within 250m of a spring, well or borehole used to supply water) will be more than sufficient to keep the excavation dry. In the event that the excavation needs to be kept open and dry for a longer period, or higher rates of dewatering are required, either a separate permit for the works would be sought or works would be rescheduled for the summer when ground conditions are drier.

80. Where needed in, sheet piles may be used to minimise groundwater ingress and/or well points may be installed around the excavation to abstract the water from the ground before it could enter the excavation. The requirement for well points/sheet piles will be identified prior to commencing the works using filtration rate data.

81. Where the quality of the water allows, the extracted water will be pumped via soakaways, settling tanks, sediment basins or mobile treatment facilities to remove sediment, before being discharged, if required, into local ditches or drains via temporary interceptor in line with either an approved permit or exemption for discharge to surface waters. Subject to water volumes and the implementation of sufficient measures to remove any suspended solids for example, small volumes of water may be pumped straight to a soakaway within the works area. This process will be implemented in order to prevent increases in fine sediment supply to the watercourses. Treatment of high pH water (due to the presence of Cement Bound Sand) is considered in Section 9.2.

82. It is recognised that the generators required to power the pumps used to dewater excavation can be a source of noise disturbance to nearby residential properties. Construction noise will be controlled in accordance with Best Practicable Means as set out in the Construction Noise and Vibration Management Scheme (EA3-LDC-CNS-REP-IBR-00012). This requires the use of low impact type generators fitted with lined and sealed acoustic covers.

8.5. Flood and Weather Alert

8.5.1. Flood Alert

83. A Flood Plan has been prepared for the construction works and included as Appendix 2 of the CoCP (EA3-LDC-CNS-REP-IBR-000061). The Principal Contractor will sign up to the Environment Agency's flood warning system and the Met Office severe weather warning system. The Flood Plan sets out the actions and responsibilities for the three trigger levels and the all clear as shown in Table 8-1. The contact details of the person(s) responsible for each of these actions (Flood Coordinator and Site Manager) will be submitted to stakeholders for their records prior to commencement of construction.

Table 8-1 Flood Evacuation Procedures

Warning Triggers	General Procedures	Specific Actions
Trigger Level 1	General actions include: • Communicate risk to all staff • Make sure you know who is on site • Take basic measures to prepare for flooding • Stay in a safe place with a means of escape. • Be ready should you need to evacuate.	• Place Staff on Green Alert • Check access and availability to, and condition of equipment: closed road signs, torches (check battery life/spares), high visibility jackets for all staff • 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 • Speak to construction teams and request implementation of active measures to reduce the mobilisation fo sediment and other pollutants in storm water runoff. This is likley to take the form of bringing forward basic house keeping measures such a road sweeping and clearance of intercept ditches. • Reschedule (if reasonably possible and will not make situation worse) all engineering works which are liable to generate turbid runoff. This should include all earthworks. • Review active work programme and associated temporary drainage arrangements and confirm that these are all in place and functional. • Undertake survey of all active storm water drainage arranagments to check for damage, blockages or other problems which could impair their correct function and, in the event that defincienciies are identfied, action urgent remedial works.
Trigger Level 2	• Stay away from high risk areas • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place if safe to do so. • Cooperate with the emergency services. • Call 999 if you are in immediate danger. • Evacuate site in an orderly and controlled way.	• Stop active work on the site and communicate change in flood status to all staff. • If reasonably possible within a short timeframe (1hr) remove plant and equipment and relocate to elevated area that is away from potential flooding. • Place staff on Red Alert and begin evacuation of jointing bay compound/CCS (Trigger Fire Alarm) • Operate the emergency electrical shut off switches terminating the electricity supply and all power supplies to construction works sites/compounds, but only if safe to do so. • Direct staff toward the flood rendezvous location avoiding any areas that are flooded. • Take register to ensure all staff are accounted for. • Direct all staff to depart the area using the agreed

Warning Triggers	General Procedures	Specific Actions
		flood evacuation route. • Contact the Emergency Services and EA to confirm that the work sites are being closed due to the risk of flooding
Trigger Level 3	• Evacuate site as quickly as can be safely achieved. • Account for all personnel • Leave the area	• Immediately start evacuation of jointing bay compound and CCS if not actioned on receipt of the Flood Warning (Trigger Fire Alarm at compounds) • Direct staff toward the flood rendezvous location avoiding any areas that are flooded. • Take register to ensure all staff are accounted for. • Direct all staff to depart the area using the agreed flood evacuation route. • Contact the Emergency Services and EA to confirm that the work sites are being closed due to the risk of flooding
All Clear	• Be careful. Flood water may still be around for several days. • If you've been flooded, ring your insurance company as soon as possible.	Where the preceeding event related to rainfall or resulted in flood water entering or passing through the site storm water management systems, the Principal Contractor will: • Undertake a survey of all active storm water drainage arranagments to check for damage, blockages or other problems resulting from the storm / flood. • Remedial works should be urgently undertaken on deficient drainage equipment. • Signficiant pollution of any surface waterbody should be reported to the Environment Agency.

9. MITIGATION MEASURES

84. The most common pollutants present in water from a construction site are:

- Sediment (as suspended solids).
- Concrete and cementitious products.
- Hydrocarbons, such as fuel oils and lubricants.
- Pollutants arising from mobilisation of existing contaminated land or groundwater.
- Organic waste (sewage and effluent from welfare facilities).

9.1. Sediment

85. Contamination of surface water runoff is the highest potential risk of pollution during the construction works at Clappits. The main source of contamination of the surface water runoff will be sediment. Sediment includes all suspended solids mobilised by the exposure of stored and stripped area of soils to rainfall and are picked up as the surface or groundwater on site flows through, or over, the soil. 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.

86. The construction work will be designed to minimise the production of runoff containing elevated levels of suspended solids. The design for achieving this will be refined depending on the local requirements.

87. The measures used for minimising the generation of sediment laden runoff will include a combination of the following measures, with the precise solution varying depending upon the nature and location of the works:-

- On-site retention of sediment will be maximised by routing all drainage through the site drainage systems. Additionally, where required, soil bunds will be created along the edge of the working area to contain any overland flow paths and prevent sediment from being washed outside the working area.
- Containment of 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). Additional silt fences will be included in parts of the working area that are in proximity to surface drainage channels to manage water flow and encourage silt settlement.
- Diversion of clean water away from working areas to reduce volumes of dirty water generation. Where significant surface flows are considered possible this will involve the installation of drainage ditches (to divert flows around construction) upgradient of the soil storage areas, running parallel to the trenches and bunds to intercept water that otherwise may flow either into work areas from off-site.
- Appropriate silt traps would be proactively installed where their use is deemed effective to minimise sediment build up within basins or ditches.
- Temporary haul road/access tracks constructed with clean road stone material preventing excessive ground damage from vehicles. Haul road/access tracks to have drainage ditches on either side and also under-track drainage, where necessary and in accordance with the drainage requirements.
- Avoidance of excessive vehicle or plant tracking directly over topsoil stripped areas and the setting of vehicular speeds to minimise soil dispersal. Use of trackmat, or similar, where temporary off road access is required for excavator or other plant.
- Soil stored locally to excavation to minimise handling and exposure. Soil to be bunded and sealed when stored for prolonged periods in order to shed rainfall and reduce silt laden runoff.
- Covering or seeding of stored topsoil bunds at first opportunity, to reduce surface erosion.
- Strips of undisturbed vegetation will be retained on the edge of the working area where possible.
- Once the topsoil strip has occurred, the 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.
- CCS will generally comprise a permeable crushed stone or aggregate surface laid on a geotextile membrane which will allow 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.
- Early consideration will be given to the types of activities undertaken and materials stored in the laydown area. Any high pollution risk areas will be considered at the outset of the strategy and activities and storage of material in these areas would be restricted.
- All excavated soils will be stored at least 10m 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 Section 11 of the CoCP (EA3-LDC-CNS-REP-IBR-000061).
- Traffic movement would be restricted to minimise the potential for surface disturbance.
- 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.
- The minimisation of excavation volumes and disturbance to the surrounding areas, together with the replacement and reseeding, as required, of any soils inadvertently disturbed during excavations in general accordance with their original structure and location.
- The length of time excavations are kept open will be minimised to reduce the requirement for dewatering; any localised dewatering will have appropriate treatment and disposal applied before being discharged.

- The CCS 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 facility with self-contained water and silt collection systems. Collected silts/sludge will be regularly removed and the water topped up to retain function of the wheel wash. Its use, operation and maintenance will be monitored on site. Regular road-sweeping on the highway will also be undertaken to prevent sediment being washed into nearby watercourses.

88. 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.

89. When removing and working with topsoil or otherwise undertaking major earthworks some disturbance of sediment and generation of sediment laden runoff is inevitable even given the implementation of the control measures outlined above. The exposed subsoil is liable to both surface erosion and erosion via existing land drains, which can lead to silt contaminated water drainage/run-off entering local watercourses.

90. To manage this any potential for the generation of silt laden runoff will be identified and measures put in place to capture and hold these flows upstream of local discharge points. Suitable pollution control measures will then be put in place to ensure all captured flows are treated to a level that can be considered as uncontaminated prior to discharge. If necessary this will involve the use of a Siltbuster® or similar water treatment units. Areas for holding and controlling storm flows will be designed to both assist in the removal of sediment through settlement and in holding and attenuating any excess runoff from compacted ground or areas where vegetation has been removed. Discharge rates from these construction areas will therefore be limited to Greenfield Runoff Rates.

91. To establish the best method of treatment for any particular location, local characteristics including the topography, geology and drainage pathways through the area will be reviewed. Based on this one or 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.

9.2. Concrete and Cementitious Products

92. Cement, concrete and grouts are highly alkaline and corrosive and can cause serious pollution to the ground and watercourses. Concrete and cementitious products will, therefore, be prevented from entering the water at source. The construction works will require the delivery of ready mixed concrete for use, for example for use in the jointing bay. Cement polluted water will be generated from concrete washout, concreting operations and any cement grouting. The extent and location of the treatment facilities to be provided will depend on the frequency and volume of washout and the availability on site.

93. Concrete and cement mixing and washing areas will be situated at least 10m away from the nearest watercourse. These will incorporate settlement and recirculation systems to allow water to be re-used. All washing out of equipment will be undertaken in a contained area.

94. Where a suitable sewer exists, and subject to an appropriate trade effluent consent from the sewerage undertaker, any excess water contaminated with cement would be treated and discharged to sewer. The treatment provided will remove suspended solids in the effluent, using lined settlement basins, enclosed skips or proprietary treatment equipment (Siltbuster® or similar) and will include pH adjustment to an acceptable range. In accordance with, Regulatory Position Statement 235, water that contains concrete will not be discharged to a watercourse or soakaway, even after treatment. If no suitable sewer exists such excess water would be tankered from the site for treatment and disposal at an appropriately licenced facility. Any accumulated solid cement wastes would be removed, in accordance with the Contractor's waste Duty of Care and the requirements of the Site Waste Management Plan (included as Appendix 6 of the CoCP), if necessary, to an appropriately licenced facility for disposal.

95. Dry mix concrete will not be laid in saturated conditions to minimise the potential for leaching of alkaline water. If required in saturated areas the excavation will be dewatered for a sufficient time to lay and cure all concrete.

96. Wet mix pouring will be subject to rigorous controls (shuttering, stand offs, bunding etc) to prevent discharge of cementitious material into drainage features and watercourses. Where practicable and design allows, the Principal Contractor may utilise a pre cast solution during construction to mitigate any of the concerns with pouring wet concrete.

97. Cement bound sand (CBS) was installed directly around the underground cable ducts and jointing bays during the EA ONE works. Groundwater may travel along the CBS, with potential ingress into the cable ducts. Water from the ducts/CBS may then discharge into the jointing bays during excavation and this is likely to continue throughout the period of time that the jointing bays remain open. When water comes in contact with CBS, the pH can rise to pH 12 or greater because of the release of alkaline hydroxide (OH^-) ions and this water will therefore require treatment before discharge. This water will be treated (Siltbuster® or similar)on site before disposal or will be removed to an appropriately licenced offsite treatment facility.

98. Discharge of treated concrete wash water and also treated water from jointing bay excavations may require an Environmental Permit from the Environment Agency.

9.3. Fuel Oils and Lubricants

99. 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.

100. 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, water and silt separators will be used where applicable on construction compound surface water management systems just prior to any outfall from site, 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. This level of capture and treatment will be applicable to main refuelling areas in the CCS where bulk storage will be contained.
- All fuels, oils, lubricants and other chemicals will be stored in an impermeable bund with at least 110% of the stored capacity. Any facilities installed shall be in accordance with the Control of Pollution (Oil Storage) (England) Regulations 2001. Facilities storing hazardous materials will be locked and made secure when not in use. Damaged containers will be removed from site. A register of fuel volumes stored on each site will be maintained.
- All refuelling will take place in a dedicated impermeable area, using a bunded bowser.
- Fuel storage and refuelling will be a minimum of 30m from watercourses.
- 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.
- Use of drip trays or plant "nappy" pads under plant and equipment when static and during refuelling.
- Safe storage and handling procedures.
- Regular inspection and maintenance procedure for plant and equipment and storage facilities. All oil/fuel bunds should be monitored on a daily basis to ensure that any rainwater that has collected is removed.
- Any contaminated rainwater in the bunds may need to be removed as hazardous waste.
- Removal and suitable licenced disposal of ground accidentally contaminated.
- Biodegradable oils will be used where possible.

9.4. Contaminated Land

101. Excavations through ground in locations that have been subject to previous contamination can result in pollutants, including total and soluble heavy metals, being transferred to the surface water and groundwater. This water can 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 11 of the CoCP (EA3-LDC-CNS-REP-IBR-000061) summarises the approach to the encountering of unknown contaminated land.

9.5. Sewage and Organic Waste

102. Whilst it is preferable for sewage generated by site welfare units to be disposed of to a foul sewer, there are currently no foul sewers available at the Clappits Works site. Sewage and other foul water from welfare and accommodation units will therefore be discharged to sealed tanks. From these tanks it will be routinely collected by tanker, for disposal at a licenced facility by a suitably licensed and registered waste carrier in accordance with Duty of Care requirements, with details and records maintained in accordance with the Site Waste Management Plan (Appendix 6 of the CoCP (EA3-LDC-CNS-REP-IBR-00028).

10. DISPOSAL OPTIONS AND TEMPORARY OUTFALLS

103. 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 comprised of runoff from construction activities and excavations to surface water (e.g. pumping clean 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.

104. The RPS guidance 'Temporary dewatering from excavations to surface water, April 2021' 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.
- Not contain any chemical dosing agents or treated or untreated concrete / cementitious washout water.
- Have a method statement that outlines the task and minimises the risk of pollution.

105. There are restrictions to this exemption that will be adhered to when deciding locations that are suitable for discharge from the onshore construction works.

106. No discharge must be located within, or less than 500m 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); or
- Local wildlife sites (i.e. sites with high local value for wildlife.

107. The RPS guidance 'Treating and using water that contains concrete and silt at construction sites: RPS 235' also includes criteria with respect to storing and treating water containing concrete or silt , including the following prohibitions:

- Storage of more than 30m^3 of water containing concrete or silt at any time in any single location on the construction site
- Carrying out of activities associated with treating or using water that contains concrete or silt within 10m of any watercourse
- Carrying out of activities associated with treating or using water that contains concrete or silt within less than 50m of:
    - SSSIs
    - SACs
    - SPAs

- candidate SACs, possible SACs, potential SPAs and sites of community importance
- Ramsar sites
- other nature conservation sites, such as ancient woodlands and local and national nature reserves
- local wildlife sites

- Use of any water that contains concrete to suppress dust
- Use of more water than necessary to suppress dust
- Use of treated waste water to suppress dust within a groundwater source protection zone, or within 50m of a private drinking water supply
- Use of water from excavations at sites contaminated by oil, metals, hydrocarbons, solvents, pesticides or other polluting substances.

108. The above features have all been identified in the Environmental Statement and none are located within 50m downstream of the Clappits Works. However, a review of the Natural England Magic Map webpage indicates that there is one potential water dependent ecological site within a 500m radius of the site. This is the Newbourne Springs SSSI which is located circa 250m to the west southwest. The SSSI comprises mixed habitats including lowland acid grassland; broadleaved, mixed and Yew woodland; and fen, marsh and swamp.

109. 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.

11. ABSTRACTIONS AND PRIVATE WATER SUPPLIES

110. Figure 3 shows the locations of all current abstraction licences, domestic abstractions and protected rights within 250m of the Clappits Works.

11.1. Abstractions

111. No abstraction of water will be undertaken for consumptive use, either for potable use or for use during site activities, such as concrete batching or washing. Potentially in some situations, dewatering of excavations, may require permitting. Where these abstractions are temporary (less than 6 months) a permit would be sought if the maximum daily abstraction volume is likely to exceeded 100m^3 (or 50m^3 in locations less than 500m from a designated nature conservation site, or 250m or less from a spring, well or borehole used to supply water). Where these abstractions are not temporary (greater than 6 months) a permit would be sought if the maximum daily abstraction volume is likely to exceed 20m^3. The Principal Contractor will be responsible for obtaining from the Environment Agency any permits and for monitoring and recording associated abstraction rates or other license requirements to demonstrate compliance.

112. Where required however, surface water run-off will be retained for use. This will only occur where runoff from the land is stored isolated from inland waters (i.e. streams, ditches, lakes etc) and groundwater and which can therefore be classified as harvested rainwater under the definition within the Environment Agency's 'Rainwater harvesting: Regulatory Position Statement'. Such usage would not require an abstraction licence.

113. In the event that abstracted water is required for potable supply, this will be undertaken in consultation with the Environmental Protection Team of ESC to facilitate compliance with the Private Water Supplies Regulations 2016.

114. All existing 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.

11.2. Protection of Private Water Supplies

115. While there are no licensed surface water abstractions in close proximity of the Clappits site, there are two licensed groundwater abstraction noted in very close proximity to the site boundary, less than 50m to the east of the site near Waldringfield and also within 200m of the northern boundary. Both of these abstractions draw from groundwater within the Chalk for spray irrigation purposes. There is a further private water abstraction in close proximity to the licensed abstraction c.200m north of the site. Although likely to draw from the Chalk it is unknown what aquifer(s) the private abstraction draws from.

116. A Hydrogeological Risk Assessment has been prepared and is included as Appendix 1. The assessment indicates that as the works involve only shallow excavations, which are likely to be above the regional groundwater table, the potential impact on groundwater levels and flow is low, and even in the event that groundwater is encountered the potential impact on down-stream receptors (such as private abstractions) will be negligible to low. The works will be undertaken in accordance with relevant mitigation which will have been agreed with the Environment Agency, SCC and ESC and with appropriate best practice, which will ensure that there is no adverse impact on groundwater quality and in turn no impact on surface water quality.

117. Baseline water quality sampling will be undertaken with the permission of the landowners and following consultation with ESC. Sampling may be undertaken throughout the works to ensure no negative impacts occur. Sampling results will be provided to ESC subject to landowner permission.

118. .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. Regular progress updates will be provided to inform residents when works are likely to be undertaken in their Private Water Supply catchment area.

119. An Emergency Plan shall be put in place to ensure prompt response to any complaint of perceived impact on private water supplies, including monitoring of the water supply in question and the immediate cessation of associated water-sensitive construction activities. IIn 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). Damaged filters will be replaced in the unlikely event that a Private Water Supply becomes contaminated with sediments.

120. 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.

121. A Pollution Prevention and Emergency Incident Response Plan (Appendix 7 of the CoCP) will be 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.

122. During the construction phase, measures will be adopted by the Principal 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) (as set out in Section 9.1).

12. MONITORING AND REPORTING

12.1. Monitoring

123. 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 EnvCoW, 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. Monitoring to include, but not be limited to, noting evidence of silt ingress, bank condition, and pH monitoring.

124. 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.

12.2. Reporting

125. 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 were compared to the most relevant Environmental Quality Standards appropriate and to assess the status according to the Water Framework Directive.

126. 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, the incident will be immediately reported to the Environment Agency's 24/7 incident hotline and also ESC. 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.

127. 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.

12.3. Personnel

128. 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 including written analysis.

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APPENDIX 1 CLAPPITS WORKS HYDROGEOLOGICAL RISK ASSESSMENT

Clappits Works

Hydrogeological Risk Assessment

Appendix 1 to the Surface and Foul Water Drainage Management Plan

(Applicable to Work Numbers 21 to 24)

Revision Summary				
Rev	**Date**	**Prepared by**	**Checked by**	**Approved by**
1	12/01/22	Stephen Muggeridge	Phil Rew-Williamson	Gareth Mills
2	19/04/22	Kay Griffin	Phil Rew-Williamson	Gareth Mills

Description of Revisions			
Rev	**Page**	**Section**	**Description**
1	ALL	ALL	New document
2	ALL	ALL	Amendment of Commencement Works‘ to Works Minor changes to site layouts‘

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FIGURES

1. INTRODUCTION AND SCOPE

1.1. Project Overview

1. East Anglia Three Limited (EATL) was awarded a Development Consent Order (DCO) by the Secretary of State, Department of Business, Energy and Industrial Strategy (DBEIS) on 7 August 2017 for the East Anglia THREE Offshore Windfarm (EA THREE). The DCO granted consent for the development of a 1,200MW offshore windfarm and associated infrastructure and is live until 28 August 2022. The DCO has now been subject to three non-material variations:

- In March 2019 EATL submitted a non-material change application to DBEIS to amend the consent to increase the maximum generating capacity from 1,200MW to 1,400MW and to limit the maximum number of gravity base foundations to 100. In June 2019 DBEIS authorised the proposed change application and issued an Amendments Order.
- In July 2020 EATL submitted a second non-material change application to DBEIS to amend the parameters of its offshore substations (reducing the number of these to one) and wind turbines (a decrease in the number of turbines and an increase in their hub height and rotor radius). On 15 April 2021 DBEIS authorised this proposed change application and issued an Amendments Order.
- In August 2021 EATL submitted a third non-material change application to DBEIS to amend the consent to remove the maximum generating capacity of 1,400MW and to amend the parameters of its wind turbines (a decrease in the number of turbines and an increase in their hub height and rotor radius). The application is currently in the consultation phase.

2. The onshore construction works associated with EA THREE will have a capacity of 1,400MW and transmission connection of 1,320MW. The construction works will be spread across a 37km corridor between the Suffolk coast at Bawdsey and the converter station at Bramford, passing the northern side of Ipswich. As a result of the strategic approach taken, the cables will be pulled through pre-installed ducts laid during the onshore works for East Anglia ONE Offshore Windfarm (EA ONE), thereby substantially reducing the impacts of connecting to the National Grid (NG) at the same location. The infrastructure to be installed for EA THREE, therefore, comprises:

- The landfall site with one associated transition bay location with two transition bays containing the connection between the offshore and onshore cables;
- Two onshore electrical cables (single core);
- Up to 62 jointing bay locations each with up to two jointing bays;
- One onshore converter station, adjacent to the EA ONE Substation;
- Three cables to link the converter station to the National Grid Bramford Substation;
- Up to three onshore fibre optic cables; and
- Landscaping and tree planting around the onshore converter station location.

1.2. Purpose and Scope

3. SLR Consulting Ltd (SLR) has been appointed by EATL to provide a Hydrogeological Risk Assessment (HRA) for the Clappits Works for the EA THREE onshore construction works. The works in this stage comprise Work Numbers 21 to 24.

4. The Environment Agency (EA) have requested that an HRA is undertaken before works commence for any groundwater abstractions and groundwater dependent water features (e.g. ponds, springs) within 250m that are vulnerable to adverse impacts in terms of both levels and water quality. In addition, it is noted that the draft pre-commencement requirements for EA ONE North and EA TWO Offshore Windfarms have requested that an HRA is completed prior to commencement of any construction activity that could cause changes to aquifer flow or affect water quality within 500m of any groundwater dependent habitats within ecological sites.

An initial scoping exercise has therefore been completed based on the same search radii on the Clappits site, as presented on Figures 4 and 5. These present the locations of all ecological sites, groundwater abstractions and groundwater source protection zones within a 500m radius of the site. The figures indicate that the site is not located within a Groundwater Source Protection Zone (SPZ) however there are two private and three licensed abstractions located within a 250m radius of the site in addition to numerous potential springs along the route of several ordinary watercourses.

5. The site is also located within a 500m radius of the Newbourne Springs Site of Special Scientific Interest (SSSI), located to the west of Clappits Secondary Construction Consolidation Site (SCCS), and Deben Estuary SSSI / Ramsar / Special Protection Area (SPA) located c.150m to the east. As shown on the plan in Appendix 1 and set out in Section 3 of the Surface and Foul Water Drainage Management Plan, the infrastructure within the Clappits Works will include:

- The Clappits SCCS in Work No. 22;
- Three Jointing Bays (20 to 22) in Work No. 21;
- Two improved accesses with the public roads as follows:
  - Access H (Work No. 23) eastwards from Woodbridge Road, to access the SCCS, Jointing Bays 21 and 22 and HDD-14 ducts in Work No. 21
  - Access I (Work No. 24) eastwards from Newbourne Road, to access Jointing Bay 20 in Work No 21;
- A crossing of The Street (CR01 and CR02); and;
- The access tracks/haul roads required to access the SCCS and jointing bays.

6. This HRA has been prepared as an appendix to the Surface and Foul Water Drainage Management Plan for Clappits Works and includes a desktop review of the site's baseline geology, hydrogeology and hydrology in order to develop a conceptual site model (CSM). This CSM is then used to assess the potential impact of the works on identified hydrogeological or hydrological receptors and to outline any mitigation which will be required to ensure the works do not adversely impact identified receptors.

2. ABBREVIATIONS

BEIS	Business, Energy and Industrial Strategy
BGS	British Geological Survey
CCS	Construction Consolidation Site
CEMP	Contractor Environmental Management Plan
CSM	Conceptual Site Model
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
EA	Environment Agency
ESC	East Suffolk Council
EA THREE	East Anglia Three Offshore Windfarm
EATL	East Anglia Three Limited
GPP	Guidance for Pollution Prevention
HRA	Hydrogeological Risk Assessment
HIA	Hydrogeological Impact Assessment
MSDC	Mid Suffolk District Council
NG	National Grid
NGR	National Grid Reference
PPG	Pollution Prevention Guidance
SCC	Suffolk County Council
SCCS	Secondary Construction Consolidation Site
SPZ	Groundwater Source Protection Zone

3. METHODOLOGY

7. This HRA has been developed in accordance with relevant EA guidance on completion of groundwater risk assessments[1] and Hydrogeological Impact Appraisals (HIA)[2] and includes the following stages:

- Section 5 provides a baseline assessment of the site. This includes a summary of the site geology and hydrogeology including information on ground conditions, groundwater levels and flows, groundwater quality and the location of potential receptors which could be impacted as a result of construction activities at the site. Finally, a CSM of the current hydrogeological regime is provided.
- Section 6 provides an assessment of the potential impact that the works could have upon the identified receptors and regional hydrogeology and hydrology. Appropriate mitigation measures are outlined where required.
- Section 7 provides a summary of the overall impact that the works could have upon the local hydrogeology and any identified receptors.

8. A qualitative risk assessment methodology has been used to assess the potential significance of impact associated with the development works. Two factors are considered using this approach: the sensitivity of the receiving environment and the magnitude of any potential impact. This approach provides a mechanism for identifying where additional mitigation measures are potentially required to reduce the risk to groundwater or surface water receptors.

4. SOURCES OF INFORMATION

9. The following sources of information have been consulted to characterise the geology, hydrogeology and hydrology of the area within and surrounding the site:

- British Geological Survey (BGS) online maps (https://www.bgs.ac.uk/map-viewers/geoindex-onshore/) for details of geology and borehole logs;
- Hydrogeological map of Southern East Anglia, sourced from the BGS website (https://largeimages.bgs.ac.uk/iip/hydromaps.html?id=southern-east-anglia.jp2);
- National Soils Resource Institute Website for details on soils (https://www.landis.org.uk/soilscapes/);
- Defra Magic Map Website (https://magic.defra.gov.uk/) for details on groundwater classifications, source protection zones and groundwater and surface water dependent designated ecological sites;
- Groundwater and surface water quality and status as presented in the EA catchment planning datasets (https://environment.data.gov.uk/catchment-planning/); and
- Details of the site layout, development, and other site details provided by the client.

5. CONCEPTUAL SITE MODEL

10. The geological and hydrogeological regime of the Clappits site and the surrounding area is considered under the following headings: location and topography; geological setting; and hydrogeological setting, all of which have been used to develop a CSM.

5.1. Location and Topography

11. The site at Clappits, centred on (NGR) TM 27807 43463, is approximately 3.2km in length and extends north-south from Waldringfield past Newbourne, ending just north of Kirton. Access is afforded off Woodbridge Road and Newbourne Road. The corridor runs through arable fields throughout its extent, and main areas of work are located at Waldringfield and Newbourne.

12. Topography at the site generally ranges from 15m above Ordnance Datum (AOD) to 25mAOD, with much of the site situated on ground higher than 21maOD and few topographical depressions dominated by the local hydrology.

[1] Available from Groundwater risk assessment for your environmental permit - GOV.UK (www.gov.uk) [Accessed November 2021]
[2] Environment Agency (April 2007) *Hydrogeological Impact Appraisal for Dewatering Abstractions*, Science Report – SC040020/SR1

13. The route between Jointing Bay 20 in the north and 22 in the south follows a ridgeline at an elevation of 20-25mAOD between the valleys of the Mill River and Newbourne Stream to the west / south-west at an elevation of around 5mAOD and the River Deben to the east at an elevation of c.0mAOD.

14. The layout of the works is provided as Appendix 1.

5.2. Geology

5.2.1. Soil, Superficial Deposits and Bedrock Geology

15. The Cranfield Soilscapes online soil map viewer indicates that the soils across the Clappits Works site consist of freely draining, slightly acidic, sandy soils.

16. BGS historic borehole logs, as presented in Appendix 2, indicate that topsoil in the area varies in thickness from c.0.2 to 0.8m, averaging c.0.4m.

5.2.2. Superficial Geology

17. A geological map showing the regional superficial geology as plotted on the BGS online mapping service Geoindex Onshore is provided as Figure 1.

18. The north of the site is almost wholly underlain by sand and gravel superficial deposits of the Kesgrave Catchment Subgroup. These sand and gravel deposits are effectively an extension of extensive deposits of this nature found to cover the majority of the local area westwards of the site. Bodies of cross-bedded and massive, moderately sorted sand and gravel are typical of this Catchment Subgroup.

19. The central and southern part of the site is also mostly underlain by Kesgrave Group sand and gravel deposits. However, the lateral width of the Kesgrave Group deposits is thinner here and there is an area void of superficial deposits approaching 0.7km in lateral width westwards of the site's western boundary in the vicinity of Newbourne.

20. Sand and gravels of the Kesgrave group typically extend for several hundred metres east of the site. Once again there is then another area void of superficial deposits, typically several hundreds of metres in width, before superficial deposits in the vicinity and underlying the Deben Estuary are encountered.

21. The Kesgrave group deposits are typically present across the high ground between the various river valleys to the west/south-west and east respectively. Sands and gravels are present above an elevation of c.20mAOD, whilst within the valleys of the Newbourne Stream and Mill River to the west/south-west and River Deben to the east superficial deposits are typically absent along the valley sides with areas of Alluvium and/or tidal flat deposits present within the base of the channels.

22. The Deben Estuary is underlain by tidal flat deposits and due to the channel size, these are typically several hundred metres in lateral width. Tidal flat deposits are typically deposited on extensive nearly horizontal marshy land in the intertidal zone that is alternately covered and uncovered by the rise and fall of the tide. They typically consist of unconsolidated sediment, mainly mud and/or sand, normally a consolidated soft silty clay, with layers of sand, gravel and peat.

23. Disconnected deposits of sand and gravel from the Lowestoft Formation and River Terrance Deposits are found in the vicinity of the western edge of the estuary. These sand and gravel deposits are also limited in lateral extent.

24. Historic borehole logs compiled from the BGS Geoindex website, as presented in Appendix 2, indicate that superficial sand and gravel deposits in the local area, where present, are of variable thickness. Glacial sand and gravel deposits have been determined in these historic logs as ranging from 1m in thickness to approaching 8m. However, typically they have been recorded as c.2.5-5m in thickness.

5.2.3. Bedrock Geology

25. A geological map showing the regional bedrock geology as plotted on the BGS online mapping service Geoindex Onshore is provided as Figure 2.

26. BGS Geoindex indicates that the site is wholly underlain by Sand of the Red Crag Formation. This formation is described as typically coarse-grained, poorly sorted, cross-bedded, abundantly shelly sands that are dark green and glauconitic when unoxidised, but typically oxidised to yellow or reddish brown with ferruginous concretions (iron pan), with a basal bed of rounded flint pebbles.

27. The Red Crag Formation is the dominant bedrock first encountered beneath the entire length of the Clappits Works corridor. The Red Crag is underlain by clays, silts and sands of the Thames Group deposits (formerly London Clay Group). The Thames group deposits outcrop to the east beneath the Deben Estuary and south-west where the channels of the Mil River and Newbourne Stream have eroded the overlying Red Crag and superficials.

28. The Thames Group is composed of mainly silty clays and clays, some sandy or gravelly, with some silts, sands, gravels and calcareous mudstones. These were deposited in environments ranging from marine shoreface ranging out to outer marine shelf.

29. Historic BGS geological logs (see Appendix 2) indicate that Red Crag bedrock deposits at the site are likely to be typically first encountered at depths of c.3-5m and are typically in the region of 10m in thickness. However, historic BGS logs indicate that locally they are encountered at shallower depths, sometimes less than 0.5m below ground where overlying superficial deposits are sparse or absent. This is likely the case in the central part of the site (Clappits SCCS) where the lateral extent of superficial deposits is limited.

30. Historic BGS logs also indicate that Thames Group deposits which underly the overlying Red Crag Formation in the local area are at least 4-13m in thickness. They also indicate that Chalk in the local area is first encountered between 19 – 48mbgl, and typically in the region of 37.5mbgl.

5.3. Hydrogeology

5.3.1. Recharge Mechanisms

31. The Met Office climate summary (1991 – 2010) for Levington (52.0118, 1.266), located c.5km southwest from the centre of the Clappits site, indicates that the average annual rainfall for the site is 569mm.

32. Climate averages for Levington are provided in Table 5-1.

Table 5-1 Met Office Climate Averages for Levington (1991 – 2010)

Month	Max. Temp. (°C)	Min. Temp. (°C)	Rainfall (mm)	Days of Rainfall ≥ 1mm
January	7.58	2.47	47.12	11.14
February	7.98	2.21	42.05	9.58
March	10.50	3.45	37.29	8.41
April	13.76	4.91	34.78	8.03
May	16.96	8.12	39.21	7.24
June	19.92	10.91	50.51	7.90
July	22.69	13.34	49.26	8.93
August	22.54	13.19	47.93	7.96
September	19.41	11.21	48.68	8.27
October	15.17	8.60	59.87	10.17
November	10.81	5.10	55.45	11.00
December	8.05	2.77	56.75	11.24
Annual	14.65	7.22	568.90	109.87

33. Recharge regionally will be variable depending upon the localised superficial geology. It is expected that as sand and gravel superficial drift underlies most of the site, and with consideration also to the limited thickness and the typically freely draining properties of topsoil, that recharge will be relatively high.

5.3.2. Aquifer Characteristics and Groundwater Vulnerability

34. The aquifer characteristics and EA aquifer designation of the strata within the immediate vicinity of the works are summarised in Table 5-2.

Table 5-2 Aquifer Designations

Deposit Type	Formation	Aquifer Designation
Superficial	Kesgrave Catchment Subgroup – Sand & Gravel	Secondary A
	Tidal Flat Deposits	Unproductive
Bedrock	Red Crag Formation - Sand	Principal
	Thames Group	Unproductive

35. The various classifications are described by the EA as follows:

- Principal Aquifer: *layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.*
- Secondary A Aquifer: *permeable layers that can support local water supplies, and may form an important source of base flow to rivers.*
- Secondary B Aquifer: *lower permeability layers that may store and yield limited amounts of groundwater through characteristics like thin fissures and opening or eroded layers.*
- Secondary (undifferentiated): *where it is not possible to apply either a Secondary A or B definition because of the variable characteristics of the rock type. These have only a minor value.*
- Unproductive Strata: *strata that are largely unable to provide usable water supplies and are unlikely to have surface water and wetlands ecosystems dependent on them.*

36. As outlined above the site is entirely underlain by the Red Crag Formation which is classified as a principal aquifer and is considered to be a significant aquifer which provides both significant abstractions for potable water but also significant baseflow to watercourses.

37. Sand and gravels of the Kesgrave Catchment Subgroup also have the potential to contain permeable layers that can support local water supplies and may form an important source of base flow to rivers. It is likely that groundwater within the Red Crag Formation and Kesgrave deposits will be in hydraulic continuity.

38. Both the tidal flats and Thames Group bedrock deposit are unlikely to support useable water supplies.

39. Chalk deposits at depth are unlikely to be in direct hydraulic continuity with the site as the overlying Thames Group deposits are typically very low permeability and designated as unproductive. The Chalk is therefore not considered a potential receptor.

5.3.3. Groundwater Levels and Flow

40. An extract of the 1981 Hydrogeological map of Southern East Anglia is presented as Figure 3 and indicates that the potentiometric surface of the groundwater surface in the Crag Formation in the vicinity of the site is 10mAOD or lower. Historic BGS borehole logs also indicate that groundwater within the underlying Red Crag and sand and gravels have historically typically been struck at similar levels. There is the potential, however, for deeper or shallower water strikes, potentially perched, within the superficial drift deposits depending on localised aquifer conditions, the amount of recharge, and also the topography.

41. Groundwater flow within the Red Crag appears to be flowing in a predominantly southerly or south-easterly direction across the site and is likely to be influenced by the valleys associated with the Newbourne Stream and Mill River to the west/south-west and River Deben to the east. Along the routes of main rivers the Red Crag has been eroded, exposing the underlying Thames Group deposits at or close to the surface. A series of springs form along the boundary between the Red Crag and Thames Group, as presented on Figure 4. Review of the OS mapping indicates that these are routinely located at between 5mAOD and 10mAOD and will act as a control for water levels within the Red Crag and overlying superficial sands and gravels.

42. Notable discharges are noted within the Newbourne Springs which are in close proximity to the centre of the site, as discussed in further detail in Section 5.3.6.

43. As outlined in Section 5.1, ground elevations along the Clappits Works corridor range between c.15-25maOD, indicating an unsaturated zone of potentially between 5m and 15m, although all of the works areas are located at elevations in excess of 20mAOD suggesting a likely unsaturated zone of >10m.

44. The extract from the 1981 Hydrogeological map of Southern East Anglia also indicates the potentiometric surface of groundwater within the Chalk underlying the site is likely to be at or below 0mAOD, with groundwater flow in a predominantly south-easterly direction towards the Deben Estuary. Consequently, groundwater within the Chalk is likely to be confined at the site by the overlying Thames Group deposits and typically over 15mbgl.

45. There have been water strikes in historic local BGS borehole logs noted at c.15-25mbgl, which would be consistent with the hydrogeological mapping potentiometric groundwater surface for Chalk with an overlying confining layer of the Thames Group.

46. Due to the underlying Thames Group bedrock, groundwater within superficial drift deposits and / or the Red Crag is unlikely to be in hydraulic continuity with the underlying Chalk aquifer. There is likely to be a high degree of hydraulic continuity between the sand and gravel superficial drift deposits and the Red Crag Formation.

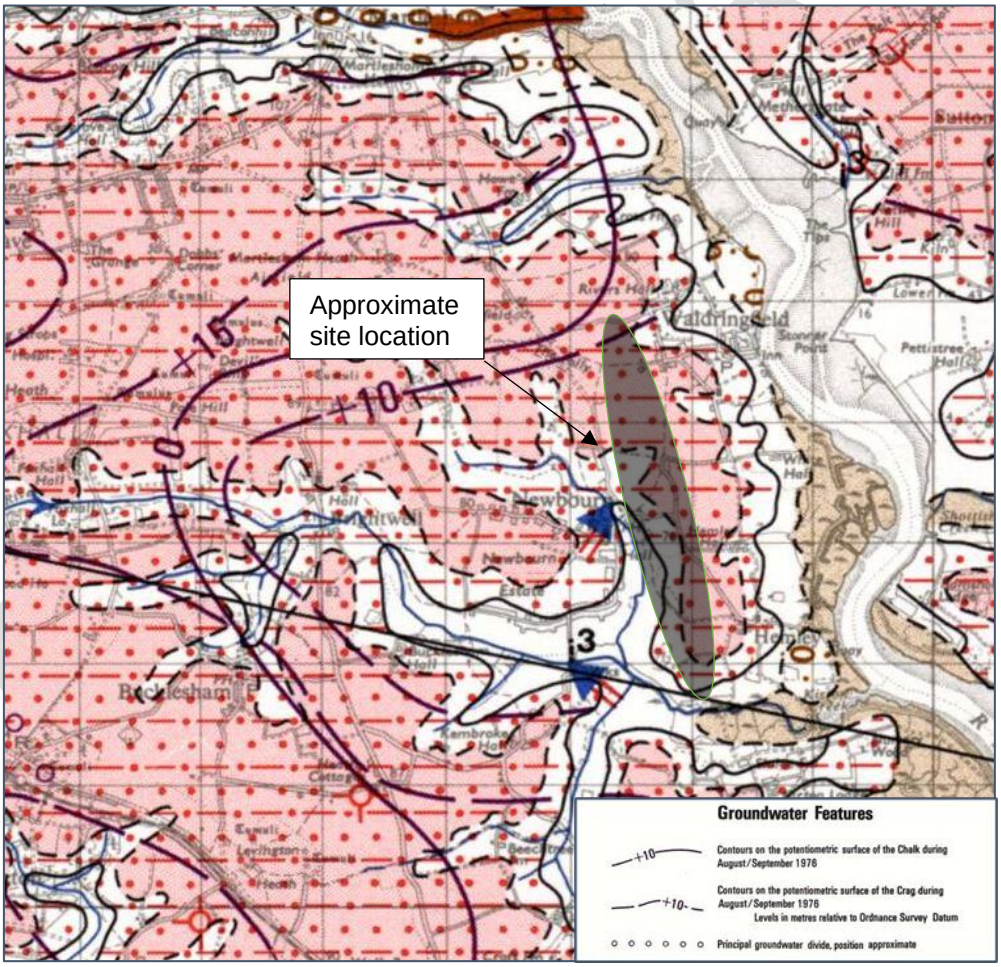

Figure 3 Extract from Regional Hydrogeological Mapping

5.3.4. Groundwater Abstractions and Source Protection Zones

47. Defra's Magic Map website indicates the site is not within a Groundwater Source Protection Zone (SPZ). The closest SPZ is located c.3.25km to the northwest of the site.

48. There are two licensed groundwater abstraction noted in very close proximity to the site boundary, less than 50m to the east of the site near Waldringfield and also within 200m of the northern boundary. Both of these abstractions draw from groundwater within the Chalk for spray irrigation purposes. There is a further private water abstraction in close proximity to the licensed abstraction c.200m north of the site. Although likely to draw from the Chalk, it is unknown what aquifer(s) the private abstraction draws from.

49. The closest licensed surface water abstraction (License No. 7/35/10/*S/0059) utilises a small pond in close proximity to the River Deben for spray irrigation c.500m eastwards of the central part of the site.

50. A number of springs are recorded on OS mapping within the headwaters of the Newbourne stream, north and east of the village of Newbourne, which are associated with the outflows from the Red Crag aquifer where the Crag has been eroded and the Thames Group deposits are present at the surface. These are located <500m to the south-west of the Clappits SCCS and c.250m west of Jointing Bay 21. Numerous other drains and water issues are also observed along this valley and to the east towards the Deben Estuary, these are also considered to be potential groundwater springs.

51. There are also two private water abstractions westwards of the site less than 500m from the site boundary in the vicinity of Newbourne. These potentially source water from springs or groundwater in the vicinity of the springs outlined above.

52. Details of the licensed abstractions within 500m of the site are provided in Table 5-3 and locations licensed and private abstractions along with known and potential springs are presented on Figure 4.

Table 5-3 Licensed Abstraction Details

License No.	Use	Max Daily Quantity (m^3)	Max Annual Quantity (m^3)	Source Type and Unit	Distance from Site
7/35/10/*G/0016	Spray Irrigation - Direct	455	36,300	Groundwater from Chalk	<200m North
7/35/10/*G/0051	Spray Irrigation - Direct	327	24,548	Groundwater from Chalk	c.50m East
7/35/10/*S/0059	Spray Irrigation - Direct	464	59,100	Surface Water	c.500m East

5.3.5. Groundwater Quality

53. With reference to EA catchment planning and assessments website, the northern and southern parts of the site encroach upon the Waveney and East Suffolk Chalk & Crag Water Body. The stretch of the River Deben to the east of the site also falls within this operational catchment. This catchment is 1455km^2 in area.

54. The most recent assessment[3] in 2019 determined that the Waveney and East Suffolk Chalk & Crag Water Body has 'poor overall status' due to a 'poor' overall quality and quantity status. A list of individual parameters of recent Waveney and East Suffolk Chalk & Crag Water Body classification criteria is presented in Appendix 3. Pollution from poor livestock management is indicated as a source of contaminants.

[3] Environment Agency (n.d.) *Catchment Data Explorer*. [online] Available at: https://environment.data.gov.uk/catchment-planning/ [Accessed November 2021].

55. However, the majority of the site is indicated to be within Felixstowe Peninsula Crag and Chalk Water Body. The catchment area for this water body extends for numerous kilometres westwards of the site and is 122km^2 in area.

56. The most recent assessment in 2019 determined that the Felixstowe Peninsula Crag and Chalk Water Body has 'poor overall status' due to a 'poor' overall quality and quantity status. Pollution from poor livestock management, poor nutrient management and farm / site infrastructure are indicated as a source of contaminants leading to deterioration in the groundwater quality of this water body.

5.3.6. Hydrology

57. The Clappits Works corridor between jointing bays 20 and 22 follows a ridgeline between the catchment of the Mill River to the west/south-west and the Deben Estuary to the east. Review of OS mapping suggests that whilst largely following close to the top of this ridge, any run-off generated from the various works would drain in a westerly direction towards the Mill River Catchment.

58. The Mill River rises from a series of ponds and springs on the eastern edge of Ipswich, approximately 8km to the west of the Clappits Works. The river flows in a predominantly easterly direction, flowing to the South of Hemley (approximately 300m south of Jointing Bay 22 at its closest) prior to its confluence with the River Debem, c.1.2km to the south-east of Jointing Bay 22.

59. An unnamed tributary of the Mill River, referred to as the Newbourne Stream in this report, rises from a reservoir and series of springs approximately 500m to the west of the Clappits SCCS. This watercourse flows in a southerly direction, parallel to the Clappits Works corridor and approximately 250m to the west at its closest. The watercourse joins the Mill River approximately 2km south of its source. There are a number of springs along the northern and eastern side of the Newbourne valley, these are protected as a SSSI.

60. These springs are groundwater discharges from the Red Crag with many diffuse and discrete issues at, or just above, the junction with the underlying Thames Group. The porous nature of the Crag supports predominately intergranular flow and can store water for a reliable perennial discharge with modest seasonal variation.

61. The main channel of the Newbourne Stream is designated as a Main River by the EA and drains an approximate upstream catchment of 7.1km^2 at the point where it discharges into Mill River to the southwest of the site. Significant baseflow into the channel is likely to be provided by groundwater flow issuing through the network of springs.

62. There are further potential springs and drain issue points out with the area denoted as SSSI in closer proximity to the site boundary and also feeding into the tributary of the Mill River. The closest of these is c.100m west of the site.

63. The Deben Estuary is located approximately 1km east of the site at its closest point and is tidal in nature adjacent to the site. The estuary drains an upstream fluvial catchment area of in excess of 185km^2.

64. Water features and potential springs are plotted on Figure 4.

5.3.7. Surface Water Quality

65. With reference to EA catchment planning and assessments, the Clappits Works corridor is located within the catchment area of the Bucklesham Mill River Water Body. This catchment is 46.3km^2 in area, relates to a river water body, and extends between the eastern part of Ipswich and to the south of Hemley.

66. The most recent assessment in 2019 determined that the catchment has 'Good Ecological Status' but a chemical status of 'Fail'. A list of individual parameters of recent Bucklesham Mill River Water Body classification criteria is presented in Appendix 4. The priority hazardous substances of Mercury and Polybrominated Diphenyl Ethers were recorded as failures with respect to 2019 water quality assessments. A range of specific pollutants were also recorded as 'High': Arsenic, Chromium (VI), Copper, Iron, Phenol and Zinc. Physico-Chemical quality was assessed as 'High' overall with Acid Neutralising Capacity, Ammonia, Dissolved Oxygen, Phosphate and pH all recorded as 'High'.

5.3.8. Water-Dependent Ecological Sites

67. A review of the Natural England Magic Map webpage indicates that there is one potential water dependent ecological site within a 500m radius of the site. Ecological sites within a 2km radius of the site, are summarised in Table 5-4 and locations are presented in Figure 5.

Table 5-4 Summary of Water-Dependent Ecological Sites within a 2km Radius

Site Name	Designation(s)	Reason for Designation	Distance from Site Boundary	In Hydraulic Connection?
Deben Estuary	Ramsar, SSSI, SPA	A sheltered estuary with areas of saltmarsh and intertidal mudflats displaying the most complete range of saltmarsh community types in Britain. The site supports nationally and internationally important flora and fauna. Important numbers of the Dark-bellied Brent Goose winter at the site. Human activities include large-scale commercial fishing and small-scale recreation, hunting, and livestock grazing.	c.0.7km East	Limited
Newbourne Springs	SSSI	Mixed habitats including lowland acid grassland; broadleaved, mixed and Yew woodland; and fen, marsh and swamp.	c.0.25km West-Southwest	Yes

69. The Newbourne Springs are considered to be a major receptor from the site as these are fed from groundwater flow within the Red Crag principal aquifer which underlies the entire DCO corridor route.

70. The Deben estuary is not considered to be in direct hydraulic connection with the site, although as discussed above there are potentially some groundwater springs from the Red Crag along the western slope of the valley however these will provide a negligible proportion of flow along the River Deben given the large up-stream catchment (>185km^2) and tidal nature.

71. The site is also within the Suffolk Coast and Heaths designated Area of Natural Beauty (AONB).

5.4. Conceptual Site Model

72. The assessment of the baseline conditions of the site indicates that the site is underlain by Sand of the Red Crag Formation, which is a principal aquifer. The Red Crag Formation at the site is also predominately overlain by superficial sand and gravel deposits, which are expected to also have moderately high permeability and water bearing capacity and be in hydraulic continuity with the Crag Formation.

73. Groundwater in the Red Crag Formation is considered as the primary receptor, especially due to its hydraulic connection with the nearby Newbourne Springs SSSI.

74. Available groundwater level data indicate that groundwater levels within the Red Crag are at c.10mAOD and are likely to be controlled by the elevations of the springs along the valley of the Newbourne Stream at c.5-10mAOD. This suggests an unsaturated zone beneath the SCCS and Jointing Bays 20-22 of c.5m – 15m.

75. Groundwater within the Chalk is considered to be hydraulically separate from the site due to the presence of Thames Group deposits underneath the Red Crag Formation.

76. There are no further Main Rivers or other notable surface water features present within the works areas. However, it is likely that parts of the site provide surface water flow to the water channel fed by the Newbourne Springs.

77. Water quality assessments indicates that the surrounding groundwater quality is poor. Surface water quality in the catchment area also has notably high concentrations of a range of pollutants.

78. There are no licensed surface water or groundwater abstractions within the site boundary. Groundwater abstractions within a 250m radius of the site are noted to draw from the Chalk aquifer and therefore are unlikely to be in hydraulic continuity with the site. There is a further private abstraction, however, within 250 of the site's northern boundary of which it is unknown which aquifer source it draws from.

There are a series of springs within the valley of the Newbourne Stream, these springs are designated as a SSSI and receive groundwater flow from the Red Crag aquifer at the junction with the low permeability Thames Group deposits. These springs and the associated SSSI are considered the primary receptor of concern.

6. HYDROGEOLOGICAL & HYDROLOGICAL IMPACT ASSESSMENT

6.1. Development

79. Clappits Works comprise a stage of the onshore connection works and cover Work No.s 21 to 24. The infrastructure within these areas will include:

- The Clappits SCCS in Work No. 22;
- Three Jointing Bays (20 to 22) in Work No. 21;
- Two improved accesses with the public roads as follows:
  - Access H (Work No. 23) eastwards from Woodbridge Road, to access the SCCS, Jointing Bays 21 and 22 and HDD-14 ducts in Work No. 21
  - Access I (Work No. 24) eastwards from Newbourne Road, to access Jointing Bay 20 in Work No 21;
- A crossing of The Street (CR01 and CR02); and;
- The access tracks/haul roads required to access the SCCS and jointing bays.

80. The Clappits works are shown in Appendix 1.

81. The deepest excavation would be 2.5m at each of the jointing bay locations. At the SCCS only topsoil will be stripped so that hardstanding can be put down. Topsoil will be stripped for the access tracks and haul road.

6.2. Assessment of Impact

82. The potential impact of the Clappits Works on groundwater and surface water receptors are outlined in Section 6.2.1 using qualitative risk assessment methodology based on the sensitivity of the receptor and likelihood of impact occurring. Impacts assessed as moderate or high are considered to require further mitigation.

6.2.1. Potential Effects

83. Without appropriate design and controls, construction of the Clappits Works has the potential to impair local hydrology (water flow and quality) and hydrogeology (groundwater levels, flow and quality), such as:

- The use of machinery and the movement of soils has the potential to generate suspended solids in run-off and/or introduce oils or hydrocarbons to the water environment;
- Existing groundwater flow paths could be disturbed or altered, impacting on nearby groundwater springs and subsequently surface water flows.

84. Standard construction techniques and best practices are to be used to avoid or reduce these potential impacts. Details are given in the following section.

6.2.2. Embedded Mitigation

85. Best practice construction techniques and procedures that have been developed through a series of management plans for approval by the EA, East Suffolk Council (ESC) and Suffolk County Council (SCC), in accordance with the requirements of the DCO. These include:

- Clappits Works Surface Water and Drainage Management Plan (EA3-LDC-CNS-REP-IBR-000051)
- Clappits Works Code of Construction Practice (EA3-LDC-CNS-REP-IBR-000061) including:
  - Pollution Prevention and Emergency Incident Response Plan; and
  - Project Environmental Management Plan.

86. The construction works will also be undertaken in accordance with good practice guidance within the following documents:

- CIRIA SP156 Control of Water Pollution from Construction Sites - Guide to Good Practice, 2002;
- CIRIA C502 Environmental Good Practice on Site C741, CIRIA 2015;

87. The Pollution Prevention Guidelines (PPGs) (which are progressively being replaced with Guidance for Pollution Prevention (GPPs)) provide environmental good practice for the whole of the UK and relevant PPGs/GPPs will be followed, including:

- GPP01: Understanding your environmental responsibilities – good environmental practices (Oct 2020)
- GPP02: Above Ground Oil Storage Tanks (Jan 2018);
- GPP04: Treatment and Disposal of wastewater where there is no connection to the public sewer (Nov 2017);
- PPG6: Working at construction and demolition sites (2012);
- GPP08: Safe storage and disposal of used oils (July 2017);
- GPP13: Vehicle Washing and Cleansing (April 2017);
- PPG18: Managing fire water and major spillages (June 2000);
- GPP21: Pollution incident response planning (June 2021);
- GPP22: Dealing with Spills (Oct 2018);

6.2.3. Impact upon Groundwater Levels and Flow Regimes

88. There will be no excavations deeper than 2.5m and the SCCS will not require any excavation other than site levelling and removal of topsoil. As outlined in Section 5.3.3, groundwater levels within the Red Crag are estimated at around 10mAOD. Review of the locations of the three joining bays indicates that ground levels are approximately 25mAOD at Jointing Bay 20, 23mAOD at Jointing Bay 21 and 22mAOD and Jointing Bay 22. This suggests a likely unsaturated zone of 10-15m beneath these works and therefore the likelihood of encountering groundwater during these works is considered low.

89. It is noted that there is uncertainty as to the exact water table within the Red Crag and overlying superficial sands and gravels and there is the potential for groundwater levels to be higher than indicated on the hydrogeological mapping or for shallow perched groundwater within the superficial deposits and therefore encountering groundwater cannot be ruled out.

90. In the event that groundwater is encountered within the excavations, these will be dewatered and discharged back to ground, following treatment if necessary. Given the shallow depths of working, any dewatering will not impact the springs as these are located between 5-10mAOD, at least 7.5m below the minimum base of excavation. The potential impact on the springs along the Newbourne Valley is therefore assessed as **'negligible'**.

91. Given the shallow depth of excavations, any water volume pumped is likely to be low and will be discharged back to ground as close to the abstraction point as feasible ensuring that there will be no significant impact on either flows or levels.

92. The potential impact of the works on groundwater levels and flows is therefore assessed as ***'low'*** and given the measures outlined above no additional mitigation is required.

6.2.4. Impact upon Surface Water Flow Regime

93. As outlined above the potential impact on flows to the springs along the Newbourne Valley has been assessed as negligible. Given that the works will not impact flows to these springs it is also considered that there will be no impact on the surface water flow regime.

6.2.5. Impact on Groundwater Quality

94. The construction works at the site will inevitably give rise to suspended solids which if not managed could pollute surface waters and groundwaters. The construction works will also involve the use of mobile plant which could give rise to fuel spills which could potentially contaminate surface waters and groundwaters.

95. The SCCS and jointing bay construction will be undertaken in accordance with the management plans outlined in Section 6.2.2 which provide details of how construction will be completed in an environmentally safe manner and minimise the potential for spillages.

96. Best practice techniques will be incorporated within the management procedures for construction activities onsite in order to protect the water environment from pollution incidents. Key mitigation measures, as set out in the management plans, can be summarised as follows:

- during operation there will be heavy machinery required onsite and, as a result, it is appropriate to adopt best working practices and measures to protect the water environment, including those set out in the EA's Guidance for Pollution Prevention (GPP1);
- in accordance with GPP2 all above ground onsite fuel and chemical storage will be bunded;
- an emergency spill response kit will be maintained onsite;
- a vehicle management system will be put in place wherever necessary to reduce the potential conflicts between vehicles and thereby reduce the risk of collision;
- a speed limit will be imposed on site to reduce the likelihood and significance of any collisions;
- in accordance with GPP5 the amount of time stripped ground and soil stockpiles being exposed will be minimised and vegetation will only be removed from the area that needs to be exposed in the near future.
- plant and wheel washing will be carried out in a designated area of hard standing at least 10 metres from any watercourse or surface water drain or rock outcrop (hard rock at surface).

97. Given the embedded mitigation in place, the potential risk during construction to groundwater quality in the Red Crag and subsequently surface water quality of any down-stream watercourses in hydraulic continuity with the Red Crag is assessed as **'negligible'** to **'low'**.

98. No additional mitigation beyond that outlined above is considered necessary.

6.2.6. Impact upon Ecological Sites

99. As outlined within Section 5.3.8 the Newbourne Springs are considered to be in hydraulic connection with groundwater within the Red Crag which underlies the works areas, however as discussed in Section 6.2.3 the risk of encountering groundwater within any of the excavations is considered low and even in the event that shallow groundwater is encountered this will be significantly above the elevations of the springs so will not materially impact spring flow.

100. The best practice measures outlined in section 6.2.5 will also ensure that the potential impact on groundwater quality, and therefore the quality of the springs, will not be impacted.

The potential impact on the SSSI is therefore assessed as **'negligible'** to **'low'** and no further mitigation is required.

7. CONCLUSION

101. A hydrogeological and hydrological impact assessment has been undertaken to assess the potential impact upon the local hydrogeological and hydrological regime of the Clappits Works.

102. The assessment has identified that the Newbourne Springs SSSI are a potential receptor for any adverse impact from the works. These are fed by groundwater flow within the Red Crag principal aquifer which underlies all of the work areas.

103. The two licensed abstractions within 250m of the site abstract groundwater from the regional Chalk aquifer which is not considered to be in hydraulic connection with the site. It is expected that the private water abstraction within 250m of the site's northern

boundary is also abstracting from the Chalk, although the private abstractions to the west are potential receptors and are likely to be spring fed as per the Newbourne Springs.

104. An assessment of the potential impact of the works on groundwater levels, groundwater quality, surface water flows and surface water quality has been undertaken. The assessment indicates that as the works involve only shallow excavations, which are likely to be above the regional groundwater table, the potential impact on groundwater levels and flow is low, and even in the event that groundwater is encountered the potential impact on down-stream receptors (Newbourne Spring and private abstractions) will be negligible to low. The works will be undertaken in accordance with relevant management plans which will have been agreed with the EA, SCC and ESC and with appropriate best practice, this embedded mitigation will ensure that there is no adverse impact on groundwater quality and in turn no impact on surface water quality.

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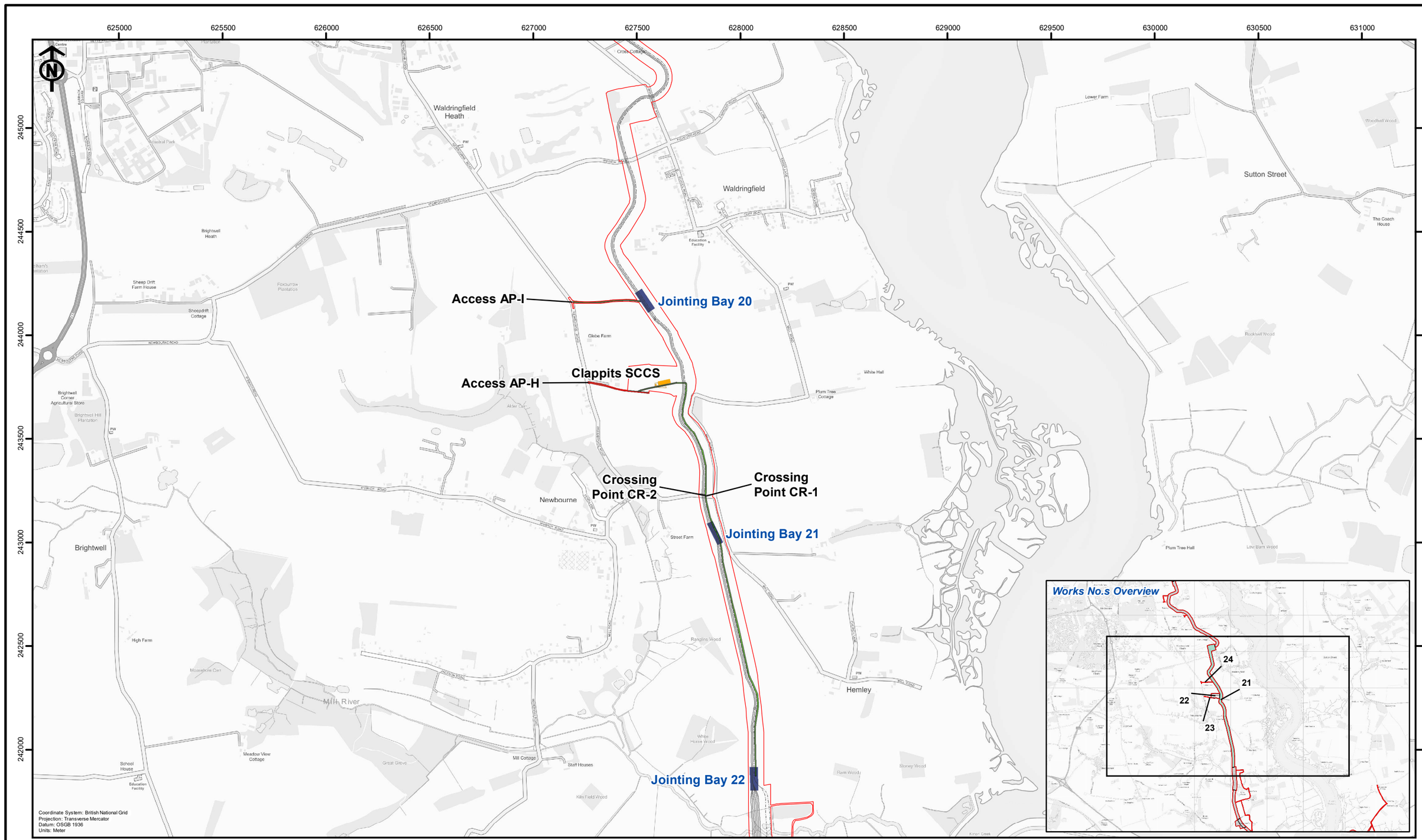
APPENDIX 1 INDICATIVE LAYOUT



EA THREE DCO Corridor
Secondary Construction Consolidation Site
Jointing Bay Compound
Top Soil
Access Track
Haul Road
Existing Track
EA THREE Existing Cable Ducts
EA ONE Existing Cable Ducts

Works No.s
24
21
22
23

GoBe consultants

Rev	Date	By	Comment
B	05/04/2022	PW	Second Issue
A	31/03/2022	JRS	First Issue

Original A3 Plot Scale 1:17,500

0 360 720 Metres

Clappits Works Stage

Overview Plan

Drg No	05356.00006.12.0021.1 Site Context Plan
Rev	2
Date	05/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\ONCS and Commencement Master\5356.00006.12.0021.1 Works Site Context.mxd

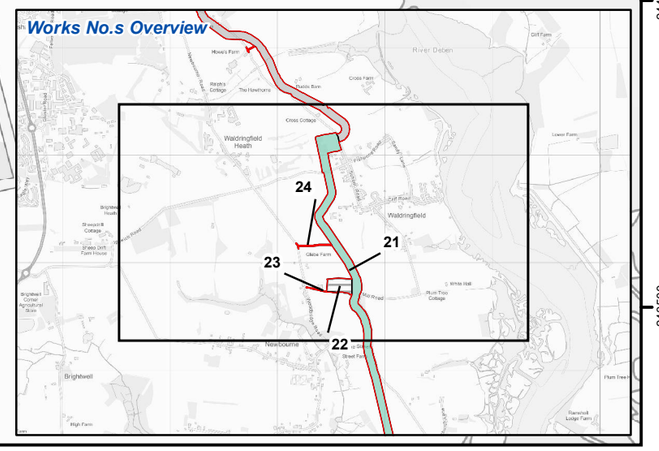
626000 626500 627000 627500 628000 628500 629000

245000 244500 244000 243500

GRUNDISBURGH ROAD
NEWBOURNE ROAD
Waldringfield Heath
PW
IPSWICH ROAD
Cross Cottage
WOODBRIDGE ROAD
FISHPOND ROAD
SANDY LANE
STULLIVAN PLACE
SCHOOL ROAD
SUNN YARD
VILLAGE WAY
CLIFF ROAD
DEBEN LANE
Waldringfield
Education Facility
Foxburrow Plantation
Jointing Bay 20
Access AP-I
Glebe Farm
Access AP-H
Clappits SCCS
Alder Carr
MILL ROAD

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Works No.s Overview



- EA THREE DCO Corridor
- Secondary Construction Consolidation Site
- Jointing Bay Compound
- Top Soil
- Access Track
- Haul Road
- Existing Track
- EA THREE Existing Cable Ducts
- EA ONE Existing Cable Ducts

Works No.s
- 24
- 21
- 22
- 23

GoBe consultants

Rev	Date	By	Comment
B	05/04/2022	PW	Second Issue
A	31/03/2022	JRS	First Issue

Original A3 Plot Scale 1:10,000

0 200 400 Metres

Clappits Works Stage

Site Context Plan (North)

Drg No	05356.00006.12.0021.1 Site Context Plan
Rev	2
Date	05/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\ONCS and Commencement Master\5356.00006.12.0021.1 Works Site Context.mxd

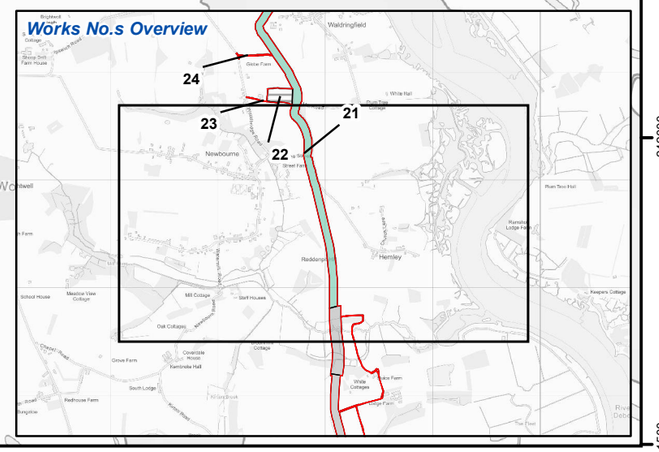
626500 627000 627500 628000 628500 629000 629500

243500 243000 242500 242000 241500

Alder Carr
WOODBRIDGE ROAD
IPSWICH ROAD
Newbourne
FENN LANE
THE STREET
PW
Street Farm
MILL ROAD
Crossing Point CR-1
Crossing Point CR-2
Jointing Bay 21
Ranglins Wood
CHURCH LANE
Hemley
Lodge Plantation
JACKSON ROAD
River
WATERMILL ROAD
White Horse Wood
Jointing Bay 22
Ram Wood
Great Grove
Mill Cottage
Staff Houses
Kiln Field Wood
Oak Cottages

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Works No.s Overview



EA THREE DCO Corridor
Jointing Bay Compound
Haul Road
EA THREE Existing Cable Ducts
EA ONE Existing Cable Ducts

Works No.s
24
21
22
23

GoBe consultants

Rev	Date	By	Comment
B	05/04/2022	PW	Second Issue
A	31/03/2022	JRS	First Issue

Original A3 Plot Scale 1:10,000

0 200 400 Metres

Clappits Works Stage

Site Context Plan (South)

Drg No	05356.00006.12.0021.1 Site Context Plan
Rev	2
Date	05/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\ONCS and Commencement Master\5356.00006.12.0021.1 Works Site Context.mxd

APPENDIX 2 HISTORIC BGS BOREHOLE LOGS

BGS BOREHOLE REFERENCE: TM24NE18

Easting: 627000
Northing: 245080
Date: 1966
Length: 12.50m

TM 24 NE 18 2700 4508 Martlesham, Suffolk

Surface level (+ 25.3 m) + 83 ft
Water struck at (+ 14.0 m) + 46 ft
Shell and auger, 6 inch diameter
October 1966

Overburden (0.3 m) 1 ft
Mineral (11.0 m) 36 ft
Bedrock (1.2 m +) 4 ft +

			Thickness (m)	Thickness ft	Depth (m)	Depth ft
		Soil.	(0.3)	1	(0.3)	1
Glacial Sand	(a)	Pebbly Sand. Sand, mainly medium, yellow to brown, with gravel.	(5.8)	19	(6.1)	20
Red Crag	(b)	Sand. Sand, brown.	(0.6)	2	(6.7)	22
		Sand, yellow to brown, shelly.	(4.6)	15	(11.3)	37
London Clay		Brown to blue-grey clay.	(1.2+)	4+	(12.5)	41

				%	Depth below surface (ft)	Fines	Sand			Gravel	
						−1/16	+1/16−1/4	+1/4−1	+1−4	+4−16	+16
(a)	Gravel	13%	+16 mm :	3	1 - 5	10	11	56	12	7	4
			−16 +4 :	10	5 - 10	5	15	51	17	10	2
					10 - 15	5	14	53	16	9	3
	Sand	81%	−4 +1 :	16	15 - 20	5	14	46	20	13	2
			−1 +1/4 :	51							
			−1/4 +1/16 :	14							
	Fines	6%	−1/16 :	6	20 - 25	8	42	43	6	1	0
(b)	Gravel	1%	+16 mm :	0	20 - 25	8	42	43	6	1	0
			−16 +4 :	1	25 - 30	No grading available					
					30 - 35	7	21	59	12	1	0
	Sand	92%	−4 +1 :	9	35 - 37	No grading available					
			−1 +1/4 :	52							
			−1/4 +1/16 :	31							
	Fines	7%	−1/16 :	7		Means (b) based on 2 samples only					

Institute of Geological Sciences

Mineral Assessment Unit

Sand and Gravel Survey

BOREHOLE RECORD SHEET

Borehole Reg. No.: Tm 24 NE 18

Temporary designation: M.H. No 20

Nat. Grid Ref.: 2700 ~~4517~~ 4508

Locality: Waldingfield

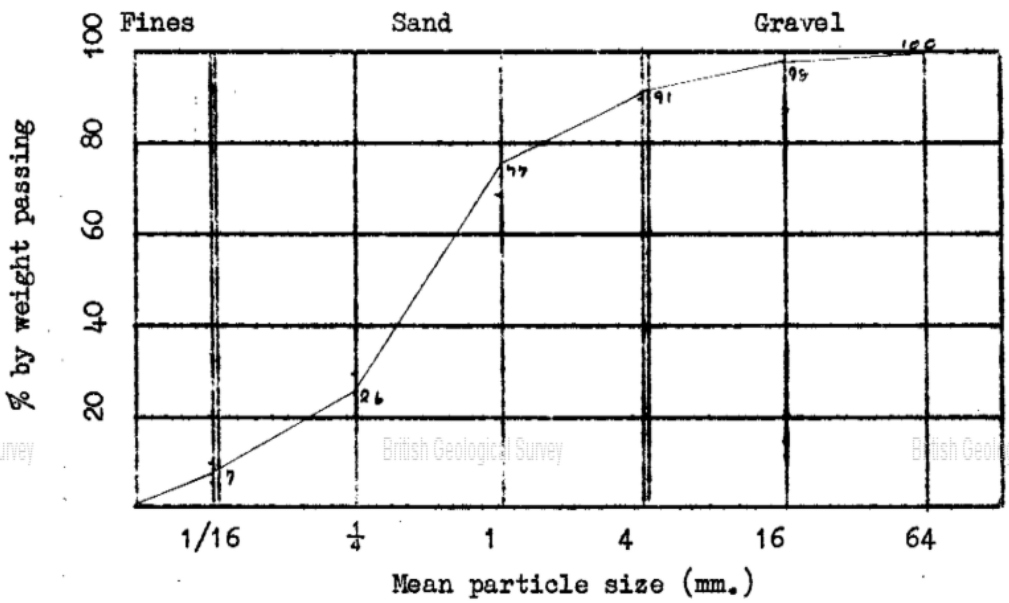
Date: Oct '66

Recorded by:

Drilled by:	Horizon	Thickn. m	Thickn. ft.	Nature
Drill Type:				
Hole diameter:	Overburden	0·3	1	
Ground level (O.D.): 83	Mineral	5·5	18	Glacial sand and gravel.
Water struck at (O.D.):		5·5	18	Crag sand and gravel.
	Baserock	1·2	4+	London Clay.

Remarks: Water at 34' below surface.

Grading Curve (from Sampling Analysis Sheet)	Grading percentages:	Fines	Sand	Gravel
		7	84	9



	Description of Strata	Depth to base ft.	Thickn. ft.	Sample Nos.
GLACIAL	Top soil	1	1	
	Yellow/light brown sand with traces of gravel. Gravel coarser towards base.	20	19	(440) – (443)
CRAG	Brown sand.	22	3	in (443) (444)
	Yellow sand, slightly shelly	25	3	in (444)
	Yellow shelly sand with layers of brown silty sand	29	4	(445)
	Coarse brown shelly sand.	35	6	in (445) (446)
	Dark brown sand	36	1	(447)
	Light brown sand with traces of clay	37	1	in (447)
	London Clay	41	4+	(448)

Glacial Sand and Gravel

GEOLOGICAL SURVEY OF GREAT BRITAIN

RECORD OF SHAFT OR BORE FOR MINERALS

(For Survey use only)

6-inch Map Registered No. TM 24 NE /18

Name of Shaft or Bore given by Geological Survey: Martlesham Heath No. 20

Name and Number given by owner:

Nat. Grid Reference 2700 4508 (4517)

For whom made I.G.S.

Town or Village Waldringfield County Suffolk

Exact site ... Attach a tracing from a map, or a sketch-map, if possible.

1"N.S. Map No.	1"O.S. Map No.	Confidential or not
207		YES

Purpose for which made

Ground Level at shaft bore relative to O.D. ... If not ground level give O.D. of beginning of shaft bore ...

Made by Ministry of Public Building and Works Date of sinking Oct. 1966

Information from ... Date received ...

Examined by ...

SPECIMEN NUMBERS AND ADDITIONAL NOTES

Specimens 440-8

Water level 37 ft

(For Survey use only) Geological Classification	Description of Strata	Thickness Ft	Thickness In.	Depth Ft	Depth In.
Topsoil	Brown sand	1	-	1	-
	Yellow sand and stones				
	Bag 440			5	-
	Light brown sand with small gravel				
	Bag 441			10	-
Glacial Sand and Gravel	Light brown sand with small gravel				
	Bag 442			15	-
	Light brown sand and small gravel			16	-
	Light brown sand with more and larger gravel	18	-	19	-
	Brown sand				
	Bag 443			20	-
Ferruginous Crag	Dark brown sand	2	-	22	-
	Yellow sand and small shell				
	Bag 444			25	-
	Yellow sands and shell with layers of brown silty sand			29	-
Shelly Crag	Coarse brown sand with shell				
	Bag 445			30	-
	Coarse brown sand with shell				

Name of Shaft or Bore given by Geological Survey:
Martlesham Heath No. 20

6-inch Map Registered No. TM 24 NE/18

Geological Classification	Description of Strata	Thickness Ft	Thickness In.	Depth Ft	Depth In.
	Brought forward			38	-
London Clay	Stiff blue clay				
	Bag 448			41	-

BGS BOREHOLE REFERENCE: TM24NE20

Easting: 627470
Northing: 245480
Date: -
Length: 10.10m

TM 24 NE 20 2747 4548 Martlesham, Suffolk

Surface level (+ 23.5 m) + 77 ft
Water struck at (+ 15.2 m) + 50 ft
Wirth B1, 8 inch diameter
January 1969

Overburden (0.3 m) 1 ft
Mineral (9.1 m) 30 ft
Bedrock (0.6 m +) 2 ft +

			Thickness (m)	Thickness ft	Depth (m)	Depth ft
		Soil.	(0.3)	1	(0.3)	1
Glacial Sand and Gravel	(a)	Pebbly Sand. Sand ; pale brown to brown, mainly medium. Gravel : subrounded to angular flints, up to (100 mm) 4 ins with subrounded to rounded quartz and quartzite.	(4.6)	15	(4.9)	16
Red Crag	(b)	Pebbly Sand. Sand : brown to dark brown or red-brown, mainly fine to medium. Occasional pebbles.	(3.4)	11	(8.3)	27
		Sand : brown, fine to medium, with shell fragments. Occasional pebbles.	(1.2)	4	(9.5)	31
London Clay		Blue-grey clay.	(0.6+)	2+	(10.1)	33

				%
(a)	Gravel	20%	+16 mm :	8
			−16 +4 :	12
	Sand	75%	−4 +1 :	13
			−1 +¼ :	45
			−¼ +1/16 :	17
	Fines	5%	−1/16 :	5
(b)	Gravel	5%	+16 mm :	1
			−16 +4 :	4
	Sand	86%	−4 +1 :	8
			−1 +¼ :	36
			−¼ +1/16 :	42
	Fines	9%	−1/16 :	9

Depth below surface (ft)	Percentages Fines −1/16	Sand +1/16−¼	Sand +¼−1	Sand +1−4	Gravel +4−16	Gravel +16
1 - 4	4	36	40	10	5	5
4 - 7	5	15	45	15	13	7
7 - 10	5	10	53	13	14	5
10 - 13	6	9	37	16	22	10
13 - 16	5	15	49	10	8	13
16 - 19	4	76	14	3	3	0
19 - 21	9	34	45	7	2	1
21 - 24	9	35	42	6	5	3
24 - 27	15	12	58	10	4	1
27 - 29	5	45	35	10	4	1
29 - 31	10	47	28	10	5	0

Institute of Geological Sciences

Mineral Assessment Unit

Sand and Gravel Survey

BOREHOLE RECORD SHEET

Borehole Reg. No.: TM 2H NE 20

Temporary designation:

Nat. Grid Ref.: 27474548

Locality: Mattlesham, E. Suffolk.

Date: Jan 1969.

Recorded by: S.E. Hollyer.

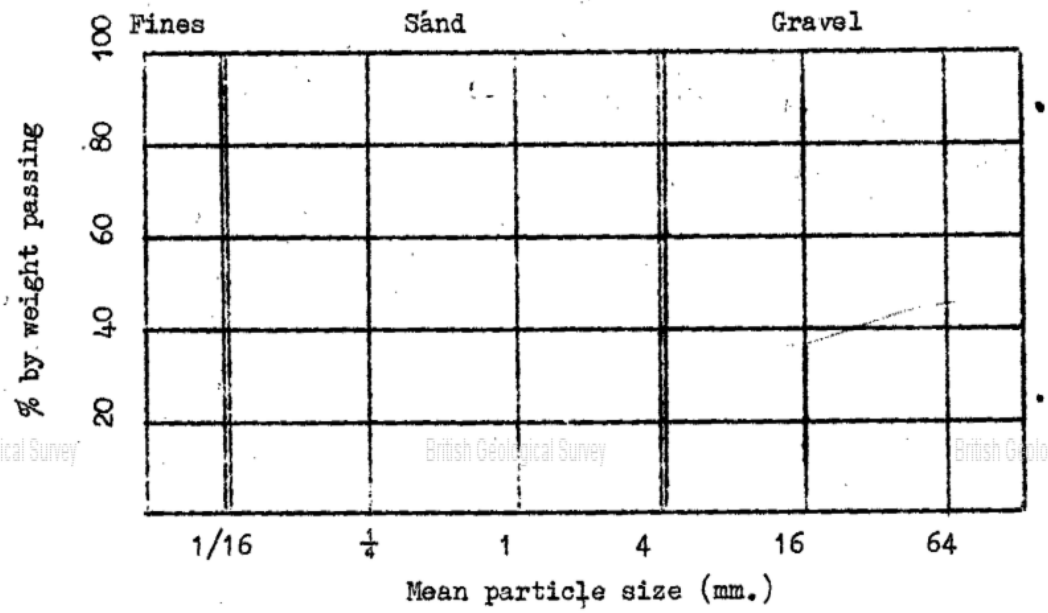
Drilled by: Elmat Ltd.
Drill Type: Wilke B1.
Hole diameter: 8"
Ground level (O.D.): 47
Water struck at (O.D.): 50

Horizon	Thickn. m	Thickn. ft.	Nature
Overburden	0.3	1	
Mineral	9.1	30'	Chalk S. + G.
Baserock	0.6	2+	London Clay.

Remarks Water at 24' below surface.

Grading Curve (from Sampling Analysis Sheet)

Grading percentages:	Fines	Sand	Gravel



Description of Strata	Depth to base ft.	Thickn. ft.	Sample Nos.
Top. Soil	1	1	
Fine light red/brown sandy silt with gravel (10%) Gravel coarse S.R. to A flint. L.P.S. 2"	4	3	IP754
Med to coarse light brown sand with gravel (10%) Gravel fine to med with occasional cobble. S.R. to A. quartz + flint.	7	3	IP755
Med light brown sand, no gravel	7'6"	6"	IP756
Coarse sand, brown, with gravel (5-10%) Gravel med, S.R. to A, flint + qtz.	10'	2'6"	IP756
Coarse sand, brown with gravel (30%) Gravel med to coarse S.R. to A flint + qtz.	13	3	IP757
Med r/brown sand with gravel (15%) Gravel coarse with occasional cobble. L.P.S. 4"	16	3	IP758
Fine sand, brown with occasional pebble and iron concretions.	18'6"	2'6"	IP759 IP760
Fine to med sand with occasional pebble.	21'	2'6"	IP760

Institute of Geological Sciences

Mineral Assessment Unit

Sand and Gravel Survey

Grading Analysis Sheet

Borehole No.: TM 24 NE 20

Grading Laboratory: Ground Engineering

Sheet entered by: R. Allender

Date: Sept 1970

Remarks Red Crag.

	Sample No.	Thickness	Weighting W	+64 mm. P	+64 mm. PW	−64 + 16 P	−64 + 16 ~~PW~~	−16 + 4 P	−16 + 4 ~~PW~~	−4 + 1 P	−4 + 1 ~~PW~~	−1 + ¼ P	−1 + ¼ ~~PW~~	−¼ + 1/16 P	−¼ + 1/16 ~~PW~~	− 1/16 mm. P	− 1/16 mm. ~~PW~~
a) GSG	754					100	5	95	5	90	10	80	40	40	36	4	4
	755					100	7	93	13	80	15	65	45	20	15	5	5
	756					100	5	95	14	81	13	68	53	15	10	5	5
	757					100	10	90	22	68	16	52	37	15	9	6	6
	758					100	13	87	8	79	10	69	49	20	15	5	5
b) RED CRAG	759					100	0	100	3	97	3	94	14	80	76	4	4
	760					100	1	99	2	97	7	90	45	45	34	9	9
	761					100	3	97	5	92	6	86	42	44	35	9	9
	762					100	1	99	4	95	10	85	58	27	12	15	15
	763					100	1	99	4	95	10	85	35	50	45	5	5
	764					100	0	100	5	95	10	85	28	57	47	10	10
a)							8		12		13		45		17		5
							20						75				5
b)							1		4		8		36		42		9
							5						86				
	Totals					1100		1054		969		859		413		77	
	Averages				x		x		x		x		x		x		x

Cumulative %	+ 64 mm	− 64	− 16	− 4	− 1	− ¼	− 1/16 mm
		100	96	88	78	37	7

Combined (a) and (b): 4 8 10 41 30 7

Gravel 12 — Sand 81 — Fines 7

BGS BOREHOLE REFERENCE: TM24NE139

Easting: 627840
Northing: 245060
Date: 2007
Length: 55.00m

Acc NO 46567

TM24/10B

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL
ANGLIA EA

INFORMATION MANAGEMENT PROGRAMME

207

TM24NE/139

A SITE DETAILS

26

Borehole drilled for: DOMESTIC PURPOSES

Location: RIVERS HALL, WALDRINGFIELD, SUFFOLK

NGR (8 figures): TM 2784 4506

Ground Level (if known): Please attach site plan

Drilling Company: A. G BROWN, HAVERHILL

Date of Drilling: Commenced /FEB/2007 Completed /MARCH/ 2007

B CONSTRUCTION DETAILS

Borehole Datum (if not ground level) _____ above / m below GL

(point from which all measurements of depth are taken e.g. flange, edge of chamber, etc.)

Borehole drilled diameter	200	mm from	GL	to	7.0 m/depth
	150	mm from	7.0	to	55 m/depth
		mm from		to	m/depth
Casing material diameter (and type (e.g. if plain steel, plastic slotted)		mm from		to	m/depth
Casing material PLAIN STEEL diameter	150	mm from	GL	to	34.5 m/depth
Casing material diameter		mm from		to	m/depth
Casing material diameter		mm from		to	m/depth

Grouting details

Water struck at 2.7 m m (depth below datum - mbd)

_____ m (depth below datum - mbd)

Rest water level on completion 15.2 mbd

C TEST PUMPING SUMMARY (Please supply full details on Forms WR-39)

Test Pumping Datum (if different from borehole datum) _____ m above / below borehole datum (mbd)

Pump Suction depth BALE TEST mbd

Water Level (Start of Test) 16.45 mbd

Water Level (End of Test) 15.2 mbd

Pumping rate 5454 L/H m^3/d:l/s

for _____ days/hours

Recovery to 15.2 mbd in 1 mins: ~~hrs: days~~
(from end of pumping)

Date(s) of measurements 10th MARCH 2007

Please supply chemical Analysis if available

TM24/103

D STRATA LOG

Geological Classification (BGS only)	Description of strata	Thickness m	Depth m
	TOP SOIL	0.2	GL
	SANDY BROWN CLAY	1.3	0.2
	ORANGE BROWN SAND	0.3	1.5
	ORANGE CRAG	1.0	1.8
	IRON STONE	0.2	2.8
	FIRM BROWN CLAY	0.3	3.0
	LONDON CLAY	12.7	3.3
	WOOLWICH & READING BEDS	12.5	16.0
	BLACK STONES WITH FLINT	.25	28.5
	CHALK WITH FLINT BANDS.	26.25	28.75
			55m
	(continue on separate page if necessary)		

Other comments (e.g. gas encountered, saline water intercepted, etc.)

FOR OFFICIAL USE ONLY

FILE | CONSENT NO | NGS REF NO:

LIC NO: | PURPOSE: | EA REF NO:

DATE REC: | COPY TO: | ENTERED BY:

BGS BOREHOLE REFERENCE: TM24SE6

Easting: 628070
Northing: 244120
Date: 1966
Length: 12.20m

TM 24 SE 6 2807 4412 Martlesham, Suffolk

Surface level (+ 18.0 m) + 59 ft
Water struck at (+ 8.8 m) + 29 ft
Shell and auger, 6 inch diameter
September 1966

Overburden (0.5 m) 1.5 ft
Mineral (10.9 m) 36.0 ft
Bedrock (0.8 m +) 2.5 ft +

			Thickness (m)	Thickness ft	Depth (m)	Depth ft
		Soil.	(0.5)	1.5	(0.5)	1.5
Glacial Sand and Gravel	(a)	Pebbly Sand. Sand, with gravel.	(1.0)	3.5	(1.5)	5
Red Crag	(b)	Sand. Sand, brown.	(4.3)	14	(5.8)	19
		Sand, brown, shelly with a little gravel.	(5.6)	18.5	(11.4)	37.5
London Clay		Blue-grey clay.	(0.8+)	2.5	(12.2)	40

(a) One sample only

(b) Gravel 2% +16 mm : 0
-16 +4 : 2

Sand 94% -4 +1 : 18
-1 +¼ : 59
-¼ +1/16 : 17

Fines 4% -1/16 : 4

Depth below surface (ft)	Fines % -1/16	Fines % +1/16-¼	Sand % +¼-1	Sand % +1-4	Gravel % +4-16	Gravel % +16
1 - 5	2	8	57	21	10	2
5 - 10	2	21	55	21	1	0
10 - 15	5	12	71	12	0	0
15 - 20	10	16	59	14	1	0
20 - 25	No grading available					
25 - 30	8	23	54	18	2	0
30 - 35	No grading available					
35 - 37.5	3	11	53	27	6	2

BGS BOREHOLE REFERENCE: TM24SE7

Easting: 627000
Northing: 244000
Date: 1966
Length: 20.60m

TM 24 SE 7 2700 4400 Waldringfield, Suffolk

Surface level (+ 25.0 m) + 82 ft
Water struck at (+ 8.5 m) + 28 ft
Shell and auger, 6 inch diameter
September 1966

Overburden (0.5 m) 1.5 ft
Mineral (20.1 m +) 66 ft +

			Thickness (m)	Thickness ft	Depth (m)	Depth ft
		Soil.	(0.5)	1.5	(0.5)	1.5
Glacial Sand and Gravel	(a)	Pebbly Sand. Sand, mainly fine to medium, silty in upper (1.1 m) 3.5 ft, gravel mainly in lower part.	(3.5)	11.5	(4.0)	13
Red Crag	(b)	Sand. Sand, brown.	(9.1)	30	(13.1)	43
		Sand, shelly, with coprolites at base.	(7.5+)	24.5+	(20.6)	67.5

				%
(a)	Gravel	8%	+16 mm	1
			−16 +4	7
	Sand	85%	−4 +1	13
			−1 +¼	56
			−¼ +1/16	16
	Fines	7%	−1/16	7
(b)	Gravel	2%	+16 mm	0
			−16 +4	2
	Sand	94%	−4 +1	15
			−1 +¼	57
			−¼ +1/16	22
	Fines	4%	−1/16	4

Depth below surface (ft)	Percentages Fines −1/16	Sand +1/16−¼	Sand +¼−1	Sand +1−4	Gravel +4−16	Gravel +16
1 - 5	13	29	49	7	2	0
5 - 10	2	15	55	20	7	1
10 - 15	7	14	54	13	9	3
15 - 20	7	38	46	7	1	0
25 - 30	No grading available					
30 - 35	5	20	66	9	0	0
35 - 40	No grading available					
40 - 45	9	14	62	13	0	0
45 - 55	No grading available					
55 - 60	1	10	44	21	8	1
60 - 67.5	0	24	47	24	2	0

Means (b) based on 5 samples only

BGS BOREHOLE REFERENCE: TM24SE16

Easting: 626830
Northing: 242690
Date: 1968
Length: 13.40m

TM 24 SE 16 2683 4269 Newbourn, Suffolk

Surface level (+ 22.3 m) + 73 ft
Groundwater conditions not recorded
Wirth B1, 6 inch diameter
November 1968

Overburden (0.6 m) 2 ft
Mineral (11.9 m) 39 ft
Bedrock (0.9 m +) 3 ft +

			Thickness (m)	Thickness ft	Depth (m)	Depth ft
		Soil	(0.6)	2	(0.6)	2
? Glacial Sand and Gravel	(a)	Sand. Sand, fine-medium, yellow to pale brown, with a little clay. Occasional flint pebbles.	(2.8)	9	(3.4)	11
Red Crag	(b)	Sand. Sand, predominantly medium, brown to red-brown, with a trace of gravel.	(7.9)	26	(11.3)	37
		Sand, medium, shelly.	(1.2)	4	(12.5)	41
London Clay		Blue-grey clay.	(0.9+)	3+	(13.4)	44

(a) Insufficient gradings to calculate means

(b)

				%
Gravel	1%	+16 mm	:	0
		−16 +4	:	1
Sand	98%	−4 +1	:	20
		−1 +¼	:	60
		−¼ +1/16	:	18
Fines	1%	−1/16	:	1

Depth below surface (ft)	Percentages Fines −1/16	Sand +1/16−¼	Sand +¼−1	Sand +1−4	Gravel +4−16	Gravel +16
2 - 5	0	49	24	25	2	0
5 - 8	No gradings available					
8 - 11	1	21	67	11	0	0
11 - 14	0	17	68	15	0	0
14 - 17	0	36	60	4	0	0
17 - 20	No grading available					
20 - 23	2	17	61	18	2	0
23 - 26	0	20	49	29	2	0
26 - 29	0	42	47	9	2	0
29 - 32	1	9	65	24	1	0
32 - 35	1	7	62	29	1	0
35 - 38	3	4	61	32	0	0
38 - 41	3	7	61	27	2	0

BGS BOREHOLE REFERENCE: TM24SE19

Easting: 627770
Northing: 243730
Date: 1968
Length: 17.10m

TM 24 SE 19 2777 4873 Waldringfield, Suffolk

Surface level (+ 22.6 m) + 74 ft
Water struck at (+ 7.3 m) + 24 ft
Wirth B1, 8 inch diameter
November 1968

Overburden (0.6 m) 2 ft
Mineral (16.5 m) 54 ft
Bedrock just touched

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
	Soil.	(0.6)	2	(0.6)	2
Red Crag	Sand.				
	Sand, fine-medium, pale brown, occasional pebbles	(5.4)	17	(6.0)	19
	Sand, fine- medium in top (1.8 m) 6 ft, then mainly medium to coarse. Shell fragments abundant, also iron concretions. Fine gravel present throughout, mainly subrounded flint. Black phosphatic pebbles at base.	(11.1)	37	(17.1)	56
London Clay	Blue-grey clay.		Just touched.		

			%
Gravel 2%	+16 mm	:	0
	−16 +4	:	2
Sand 97%	−4 +1	:	22
	−1 +¼	:	51
	−¼ +1/16	:	24
Fines 1%	−1/16	:	1

Depth below surface (ft)	Fines	Sand			Gravel	
	−1/16	+1/16−¼	+¼−1	+1−4	+4−16	+16
2 - 5	0	42	56	2	0	0
5 - 8	1	48	48	3	0	0
8 - 11	No grading available					
11 - 14	0	18	69	12	1	0
14 - 17	2	44	46	8	0	0
17 - 20	0	52	35	12	1	0
20 - 23	0	33	54	12	1	0
23 - 26	1	31	48	17	3	0
26 - 29	2	10	36	48	4	0
29 - 32	0	18	52	24	6	0
32 - 35	0	9	47	41	3	0
35 - 38	1	8	62	28	1	0
38 - 41	0	8	64	28	0	0
41 - 44	0	15	52	29	3	1
44 - 47	1	10	38	48	3	0
47 - 50	2	16	44	30	7	1
50 - 53	0	29	61	9	1	0
53 - 56	0	27	47	23	2	1

BGS BOREHOLE REFERENCE: TM24SE23

Easting: 628380
Northing: 243270
Date: 1968
Length: 9.40m

TM 24 SE 23 2838 4327 Hemley, Suffolk

Surface level (+ 21.0 m) + 69 ft
Water not struck
Wirth B1, 8 inch diameter
November 1968

Overburden (0.6 m) 2 ft
Mineral (8.2 m) 27 ft
Bedrock (0.6 m +) 2 ft +

			Thickness (m)	Thickness ft	Depth (m)	Depth ft
		Soil.	(0.6)	2	(0.6)	2
Glacial Sand and Gravel	(a)	Pebbly Sand. Sand, medium to coarse; gravel mainly angular to subrounded flints, occasional quartz.	(2.7)	9	(3.3)	11
Red Crag	(b)	Sand. Sand, mainly fine to medium, light brown, ochreous, or dark red-brown. Occasional gravel.	(3.7)	12	(7.0)	23
		Sand, medium-coarse, red-brown. Shelly. Rounded flints at base.	(1.8)	6	(8.8)	29
London Clay		Blue-grey clay.	(0.6+)	2+	(9.4)	31

				%
(a)	Gravel	15%	+16 mm :	4
			−16 +4 :	11
	Sand	85%	−4 +1 :	29
			−1 +¼ :	49
			−¼ +1/16 :	7
	Fines	0%	−1/16 :	0
(b)	Gravel	4%	+16 mm :	1
			−16 +4 :	3
	Sand	95%	−4 +1 :	22
			−1 +¼ :	51
			−¼ +1/16 :	22
	Fines	1%	−1/16 :	1

Depth below surface (ft)	Percentages Fines −1/16	Sand +1/16−¼	Sand +¼−1	Sand +1−4	Gravel +4−16	Gravel +16
2 - 5	0	4	43	30	16	7
5 - 8	1	1	68	21	7	2
8 - 11	0	15	36	37	9	3
11 - 14	2	34	53	9	2	0
14 - 17	0	37	38	17	6	2
17 - 20	0	24	54	21	1	0
20 - 23	0	7	50	41	2	0
23 - 26	2	14	55	27	2	0
26 - 29	2	16	49	24	6	3

BGS BOREHOLE REFERENCE: TM24SE24

Easting: 628330
Northing: 242370
Date: 1968
Length: 8.80m

TM 24 SE 24 2833 4237 Hemley, Suffolk

Surface level (+ 21.9 m) + 72 ft
Water struck at (+ 15.5 m) + 51 ft
Wirth B1, 8 inch diameter
November 1968

Overburden (0.3 m) 1 ft
Mineral (7.3 m) 24 ft
Bedrock (1.2 m +) 4 ft +

			Thickness (m)	Thickness ft	Depth (m)	Depth ft
		Soil.	(0.3)	1	(0.3)	1
Glacial Sand and Gravel	(a)	Pebbly Sand. Sand, mainly medium, pale brown. Gravel mainly subrounded flint with a little quartz.	(2.7)	9	(3.0)	10
Red Crag	(b)	Pebbly Sand. Sand, medium, red-brown, with occasional pebbles.	(3.7)	12	(6.7)	22
		Sand, red-brown, shelly.	(0.9)	3	(7.6)	25
London Clay		Blue-grey clay.	(1.2+)	4+	(8.8)	29

				%
(a)	Gravel	16%	+16 mm :	5
			−16 +4 :	11
	Sand	83%	−4 +1 :	23
			−1 +¼ :	53
			−¼ +1/16 :	7
	Fines	1%	−1/16 :	1
(b)	Gravel	5%	+16 mm :	1
			−16 +4 :	4
	Sand	91%	−4 +1 :	17
			−1 +¼ :	60
			−¼ +1/16 :	14
	Fines	4%	−1/16 :	4

Depth below surface (ft)	Fines −1/16	+1/16−¼	Sand +¼−1	+1−4	Gravel +4−16	+16
1 - 4	0	2	43	31	15	9
4 - 7	0	4	63	21	9	3
7 - 10	2	16	54	17	9	2
10 - 13	No grading available					
13 - 16	0	22	58	16	3	1
16 - 19	1	10	64	23	1	1
19 - 22	No grading available					
22 - 25	11	11	55	13	7	2

Means (b) based on three samples only.

BGS BOREHOLE REFERENCE: TM24SE26

Easting: 629000
Northing: 242040
Date: 1968
Length: 3.00m

TM 24 SE 26 2900 4204 Hemley, Suffolk

Surface level (+ 9.4 m) + 31 ft
Water struck at (+ 7.9 m) + 26 ft
Wirth B1, 8 inch diameter
November 1968

Overburden (0.6 m) 2 ft
Mineral (1.5 m) 5 ft
Bedrock (0.9 m +) 3 ft +

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
	Soil.	(0.6)	2	(0.6)	2
Red Crag	Sand.				
	Sand, fine, silty, red-brown.	(1.2)	4	(1.8)	6
	Silt and sand with clay.	(0.3)	1	(2.1)	7
London Clay	Brown weathered clay.	(0.9+)	3+	(3.0)	10

Depth below surface (ft)	Percentages Fines	Sand			Gravel	
	$-\frac{1}{16}$	$+\frac{1}{16}-\frac{1}{4}$	$+\frac{1}{4}-1$	+1–4	+4–16	+16
2 - 6	7	35	42	15	1	0

One sample only

BGS BOREHOLE REFERENCE: TM24SE32

Easting: 626650
Northing: 244990
Date: 1965
Length: 70.10m

TM 24 SE/32
NGR. 2665·4499
1" : 207.

RECORD OF WELL

For Survey use only Licence No. N.12346

207/847

At The Heath,

Town or Village WALDRINGFIELD.

County Suffolk.

EXACT SITE OF WELL

Six-inch sheet 76SE/E. Six-inch National Grid sheet TM2666 4499

For A. G. Clarke, Esq., State whether owner, tenant, builder, contractor, consultant, etc.:— OWNER.

Address (if different from above) —

* DELETE WHICHEVER IS INAPPLICABLE

Level of ground surface above sea level (O.D.) 7+ ft. If well top is not at ground level, state how far { above:* / below: } — ft.

SHAFT — ft.; diameter — ft.; HEADINGS (please attach details—dimensions and directions)

BORE 230 ft.; diameter of bore: at top 4" in.; at bottom 4" in.

Full details of permanent lining tubes (position, length, diameter, plain, slotted etc.)

157 feet 4" Heavyweight Mild Steel Lining Tube coated with Bitumastic Solution inside and out screwed and socketed to butt joints.

Water struck at depths of 165 - 190 - 210 ft. below well top.

TEST CONDITIONS

Rest level of water 78½ ft. ~~above~~ below well top. Suction at 100 ft. Yield on 8 hours'* ~~days'~~ test pumping at 480 galls. per hour with ~~depression~~ to 78½ ft. below well top.

Recovery to rest level in No depression mins.* hours Capacity of pump 500 g.p.h. Date of measurements 12/12/6

NORMAL CONDITIONS

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

Make and/or type Sumo Submersible 12BP2 Motive power Electric motor ¾ H.P.

Capacity 400 galls. per hour. Suction at 100 ft. below well top.

Amount pumped 500 galls. per day. Estimated consumption 4,500 galls. per week.

Well made by Messrs. J.R. Brown & Co. Ltd., Date of sinking December/65

Information from above.

ADDITIONAL NOTES ANALYSIS (please attach copy if available)

For Survey use only

Date Received 12.1.66

Section 6 .....

Pumping test .....

Observ. well .....

1

For Survey use only Licence No.

N.12346

RECORD OF WELL

207/847

TM24/2

At The Heath,

Town or Village WALDRINGFIELD.

County Suffolk.

EXACT SITE OF WELL

Six-inch sheet 76 SE/E Six-inch National Grid sheet TM2646449

For A. G. Clarke, Esq., State whether owner, tenant, builder, contractor, consultant, etc.:— OWNER.

Address (if different from above) —

* DELETE WHICHEVER IS INAPPLICABLE

Level of ground surface above sea ~~level~~ (O.D.) 74 ft. If well top is not at ground level, state how far } above:* / below:* — ft.

SHAFT — ft.; diameter — ft.; HEADINGS (please attach details—dimensions and directions)

BORE 230 ft.; diameter of bore: at top 4" in.; at bottom 4" in.

Full details of permanent lining tubes (position, length, diameter, plain, slotted etc.)

157 feet 4" Heavyweight Mild Steel Lining Tube coated with Bitumastic Solution inside and out screwed and socketed to butt joints.

Water struck at depths of 165 - 190 - 210 ft. below well top.

TEST CONDITIONS

Rest level of water 78½ ft. ~~above~~ / below well top. Suction at 100 ft. Yield on 8 hours'* ~~duty~~ test pumping at 480 galls. per hour with ~~depression~~ to 78½ ft. below well top.

Recovery to rest level in No depression. mins.* / hours Capacity of pump 500 g.p.h. Date of measurements 10/12/65

NORMAL CONDITIONS

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

Make and/or type Sumo Submersible 12BP2 Motive power Electric motor ¾ H.P.

Capacity 400 galls. per hour. Suction at 100 ft. below well top.

Amount pumped 600, galls. per day. Estimated consumption 4,500 galls. per week.

Well made by Messrs. J.R. Brown & Co. Ltd., Date of sinking December/65

Information from above.

ADDITIONAL NOTES ANALYSIS (please attach copy if available)

For Survey use only

Date Received 12.1.66

Section 6

Pumping test

Observ. well

Recorder

E.R. log

Site marked on

1" map O

6" map O 17.1.66. (use symbol)

1/60 M.P.Ltd. G.722

(For Survey use only) GEOLOGICAL CLASSIFICATION	2 NATURE OF STRATA If measurements start below ground surface, state how far	THICKNESS Feet	THICKNESS Inches	DEPTH Feet	DEPTH Inches
	Topsoil	1	-		
? Red brag with fossil pebble bed ("Box Stone")	Hard Dry Sand	25	-	26	-
	Hard Dry Grag	30	-	56	-
	Flints & Clay	1	-	57	-
London Clay	London Clay	18	-	75	-
	Clay stone & Shells	1	6	76	6
	London Clay	20	-	96	6
Woolwich & Reading Beds.	Mottle Clay	16	-	112	6
	Woolwich & Reading Beds	26	-	138	6
	Black Silty Clay	6	-	144	6
Basal Tertiary Bull Head Bed	Green Sand		6	145	-
	Black Flints	1	-	146	-
upper Chalk	Chalk	84	-	230	-
R.G.T. 31.1.66 (Reclassified)					
	DATA BANK.				

BGS BOREHOLE REFERENCE: TM24SE39

Easting: 628400
Northing: 244600
Date: 1881
Length: 38.10m

NGRC

BOREHOLE RECORDS

ADJUSTMENT FORM

QUARTER SHEET Tm 24 SE

BH REGISTRATION NUMBER 39 - 42

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

TM 24/6

208/1 Formerly Cement Works, Waldingfield. Site not determined.
(Filled in) TM 284 446

W.S.Sk. p. 116. Surface +c.8. Shaft 9; rest bore. Ck -c.55. R.W.L. +c.1.
Yield excellent. *Bennett, 1881.*

? Drift)				
? LC)	...	...	63	63
WRB)				
UCk	...	...	62	125

? Drift / ? LC / WRB 63 / UCk 62

[?Alluvium] Depth of [old] well		9	9
[London Clay?] Light-coloured loam		2	11
Brown clay		18	29
[Reading beds] Dark loam		2	31
Blue clay		9	40
Mottled		2	42
Green sand		6	48
Clay		8	56
Light Coloured loamy sand		1	57
Clay		5	62
Green clay & brown flints		1	63
Chalk		62	125

RA

208.

TM 24/6

Waldringfield (CEMENT WORKS, by the River Deben, just N. of the Bush Inn. 1881.).
(Ordn. Map 208, N.S. ; Geol. Map 48 N.E.)
About 8 feet above Ordnance Datum.
Sunk and communicated by Messrs. BENNETT, of Ipswich.
An excellent supply of good water, rising to within 7 feet of the surface.

		Thickness.	Depth.
		Ft.	Ft.
[? Alluvium]	Depth of [old] well	9	9
[London Clay ?]	Light-coloured loam	2	11
	Brown clay	18	29
	Dark loam	2	31
	Blue clay	9	40
	Mottled clay	2	42
[Reading Beds]	Green sand	6	48
	Clay	8	56
	Light-coloured loamy sand	1	57
	Clay	5	62
	Green clay and brown flints	1	63
Chalk		62	125

It is difficult to make out the division between the London Clay and the Reading Beds.

? Drift
? LC
WRB
63
U Ck 62
RA/

These works have not been in operation for over 30 years + as all the buildings have been pulled down + the plant removed we do not think it would be possible to trace the site of the boring which was made for the water supply; it is certainly not in use + the well head has been filled in.

Inf. fr: A. Mason Esq., in letter dated 28.iii.41 in 9509/208

AHOW
16.iv.41

'Cement Works' △ on Suffolk 76 SE/E

208/1

SUFFOLK 76 SE/E
6" = 1 mile.

BGS BOREHOLE REFERENCE: TM24SE40

Easting: 627990
Northing: 244600
Date: 1927
Length: 62.67m

NGRC

BOREHOLE RECORDS

ADJUSTMENT FORM

QUARTER SHEET Tm 24 SE

BH REGISTRATION NUMBER 39 - 42

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

208/38 Arrochar, Waldingfield TM24/72

TM 2799 4460

Surface +74. Lining tubes: 142 x 3 in; 50 x 2 in. Ck -81½. R.W.L. -6.

Smith, F., Mar. 1927.

Handpump. *Apr. 1960.*

Sand and Gravel) Crag)	...	...	66	66
LC) WRB)	...	...	89½	155½
UCk	...	...	50	205½

Glacial Sand & Gravel 66	Soil	2.6	2/6
	Loose dry Sand	15.0	17.6
	Hard " "	30 6	48
	Running Sand	18	66
London Clay + Woolwich & Reading Beds 89½	London clay	12	78
	Hard grey Stone	1.6	79.6
	Silty clay	55	134.6
	Mottled "	10	144.6
	Silty "	3	147.6
U Chalk 50	Green Sand	8	155.6
	Chalk	50	205.6

AWW

8/8/64

RB

RECORD OF WELL (SHAFT OR BORE)

TM 24/72
208
Ref.

At Waldringfield

Town or Village ____ County Suffolk Six-inch quarter sh[eet] 38

Exact site ____ (A r[ough] sketch-map or a tr[acing] from a map if [ver]y desirable)

____ in parish of ____

Level of ground surface above sea-level (O.D.) ____ ft. If well starts below ground surface, state how far ____ ft.

Shaft ____ ft., diameter ____ ft. Bore ____ ft. Diameter of bore: at top ____ ins.; at bottom ____ ins.

Details of permanent lining tubes (internal diameters preferred) 142 ft. x 3 in.; 50 ft. x 2 in

Water struck at depths of (feet) ____

Rest-level of water ~~below~~ above top of well 80 feet. Suction at ____ feet. Yield on ____ hours' / days' test ____ gallons per ____ (with pump of capacity ____ g.p.h.); depressing water level to ____ feet below top. Time of recovery ____ hrs. Amount normally pumped daily ____ g.p.h. for ____ hours.

Quality (attach copy of analysis if available) ____

Sunk by F. Smith & Son, Grimsby for Mr. H. Warner & Son, Lion St., Ipswich Date of well March 1927

Information from Do

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA (and any additional remarks).	THICKNESS Feet.	THICKNESS Inches.	DEPTH Feet.	DEPTH Inches.
	Soil	2	6	2	6
Glacial Sand and Crag 66	Loose dry sand	15		17	6
	Hard dry sand	30	6	48	
	Running sand	18		59	
London Clay + Woolwich and Reading Beds 89½	London clay	12		71	
	Hard grey stone	1	6	72	6
	Silty clay	55		127	
	Mottled clay	10		137	
	Silty clay	3		140	
	Green sand	8		148	165½
Chalk 50	Chalk	50		205½	

KWS 8/8/41

VRA

No. W. Bateman. "ARROCHAR"
Handpump supplying bungalow.
O.D. 74'. Sited by reading a 8-figure 76 SE/E.

AHB 10.xi.41.

House new on mains. Force pumps, still in use for garden

FLS 4/60

DATA Bank

BGS BOREHOLE REFERENCE: TM24SE42

Easting: 628670
Northing: 240970
Date: 1956
Length: 70.10m

NGRC

BOREHOLE RECORDS

ADJUSTMENT FORM

QUARTER SHEET Tm 24 SE

BH REGISTRATION NUMBER 39 - 42

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

A TM 290 407
B TM 2867 4097

TM24/7 A & B

208/84 Kirton Lodge, Kirton

(a) (Filled in). Surface +52. Shaft 32 × 3½. Lined with concrete cylinders. R.W.L. +27. P.W.L. +26. Recovered to +27 in 2 min. Suction +24. Yield 500 g.p.h. (8 h. test). Suction +26. Electric pump. *Gosling, Dec. 1952.*

(b) Surface +60. Lining tubes: 175 × 4 in. Ck -96. R.W.L. -3½. P.W.L. -3½. Yield 500 g.p.h. (8 h. test). *Brown, Apr. 1956.* Electric pump. *1960.*

(b)? Sand and Gravel	27	27
? Crag	48	75
LC	41	116
WRB	40	156
UCk	74	230

(b)

? Sand & Gravel	Soil	2	2
	Sand & Gravel	25	27
? Crag 48	Dark clay	48	75
LC 41	London "	19	94
	Clay stone	— 10	94 · 10
	London clay	5	97 · 10
	Clay stone	— 8	98 · 6
	London clay	4 · 6	103
	Clay stone	- 8	103 · 8
	London Clay	6 · 4	110
	Clay stone	- 8	110 · 8
	London Clay	5 · 7	116
WRB 40	Woolwich & Reading Beds	40 · [illegible]	156 · [illegible]
UCk.	Chalk	74 · 0	230

RA

208

N.7452
TM24/7B

LOCATION
LODGE FARM
KIRTON,
Nr, IPSWICH
SUFFOLK.

STRATA RECORD

Phone: IPSWICH 2073.

J. R. BROWN & Co., Ltd.,

ARTESIAN WELL ENGINEERS,

28-34 BURRELL ROAD,
IPSWICH.

Name Stuart Paul & Sons, *Address* 47, Key Street, Ipswich, Suffolk.

Bore Dia. 4" *Total Depth* 230 feet *Water Level* 63½ feet.

Lining Dia. 4" *Lining Depth* 175. *Date* 6th April, 1956

	STRATA.	THICKNESS Ft.	THICKNESS In.	DEPTH. Ft.	DEPTH. In.
? Sand & gravel 27	Soil:-	2	-	2	-
	Sand & Gravel:-	25	-	27	-
? Crag 48	Dark Clay:-	48	-	75	-
	London Clay:-	19	-	94	-
	Clay Stone:-	-	10	-	10
	London Clay:-	3	-	97	10
	Clay Stone:-	-	8	98	6
LC 41	London Clay:-	4	6	103	0
	Clay Stone:-		8	103	8
	London Clay:-	6	4	110	0
	Clay Stone:-		8	110	8
	London Clay:-	5	4	116	-
40 WRB	Woolwich & Reading Beds:-	40	-	156	-
U Ck	CHALK:-	74	-	230	-

RA

PUMPING TEST.
one 8 hour continuous pumping test yield 900 Gallons per hour, with no depression below rest level of water.

Sited by ⊙ on 6" map Suffolk 83 NE/E.
Mbh 4/5/56

In use, elec pump. Supplies farm for all purposes.
O.D. c+60
Jls 1960

Rec'd 10.4.56.

APPENDIX 3 WAVENEY AND EAST SUFFOLK CHALK AND CRAG WATER BODY CLASSIFICATION CRITERIA & FELIXSTOWE PENINSULA CRAG AND CHALK WATER BODY CLASSIFICATION CRITERIA

Waveney and East Suffolk Chalk & Crag Water Body: Poor overall status
Water Body ID GB40501G400600
Classifications

Classification Item	2013	2014	2015	2016	2019
Overall Water Body	Poor	Poor	Poor	Poor	Poor
Quantitative	Poor	Poor	Poor	Poor	Poor
Quantitative Status element	Poor	Poor	Poor	Poor	Poor
Quantitative Dependent Surface Water Body Status	Good	Good	Good	Good	Poor
Quantitative GWDTEs test	Good	Good	Good	Good	Good
Quantitative Saline Intrusion	Good	Good	Good	Good	Good
Quantitative Water Balance	Poor	Poor	Poor	Poor	Good
Chemical (GW)	Poor	Poor	Poor	Poor	Poor
Chemical Status element	Poor	Poor	Poor	Poor	Poor
Chemical Dependent Surface Water Body Status	Good	Good	Good	Good	Good
Chemical Drinking Water Protected Area	Poor	Poor	Poor	Poor	Poor
Chemical GWDTEs test	Good	Good	Good	Good	Good
Chemical Saline Intrusion	Good	Good	Good	Good	Good
General Chemical Test	Poor	Poor	Poor	Poor	Poor
Supporting elements (Groundwater)					
Prevent and Limit Objective	Active				Active
Trend Assessment	Upward trend	Upward trend	Upward trend	Upward trend	Upward trend

Felixstowe Peninsula Crag and ChalkWater Body: Poor overall status
Water Body ID GB40501G401800
Classifications

Classification Item	2013	2014	2015	2016	2019
Overall Water Body	Poor	Poor	Poor	Poor	Poor
Quantitative	Good	Good	Good	Good	Poor
Quantitative Status element	Good	Good	Good	Good	Poor
Quantitative Dependent Surface Water Body Status	Good	Good	Good	Good	Good
Quantitative GWDTEs test	Good	Good	Good	Good	Good
Quantitative Saline Intrusion	Good	Good	Good	Good	Good
Quantitative Water Balance	Good	Good	Good	Good	Poor
Chemical (GW)	Poor	Poor	Poor	Poor	Poor
Chemical Status element	Poor	Poor	Poor	Poor	Poor
Chemical Dependent Surface Water Body Status	Good	Good	Good	Good	Good
Chemical Drinking Water Protected Area	Good	Good	Good	Good	Good
Chemical GWDTEs test	Good	Good	Good	Good	Poor
Chemical Saline Intrusion	Good	Good	Good	Good	Good
General Chemical Test	Poor	Poor	Poor	Poor	Poor
Supporting elements (Groundwater)					
Prevent and Limit Objective	Active				Active
Trend Assessment	No trend	No trend	No trend	No trend	Upward trend

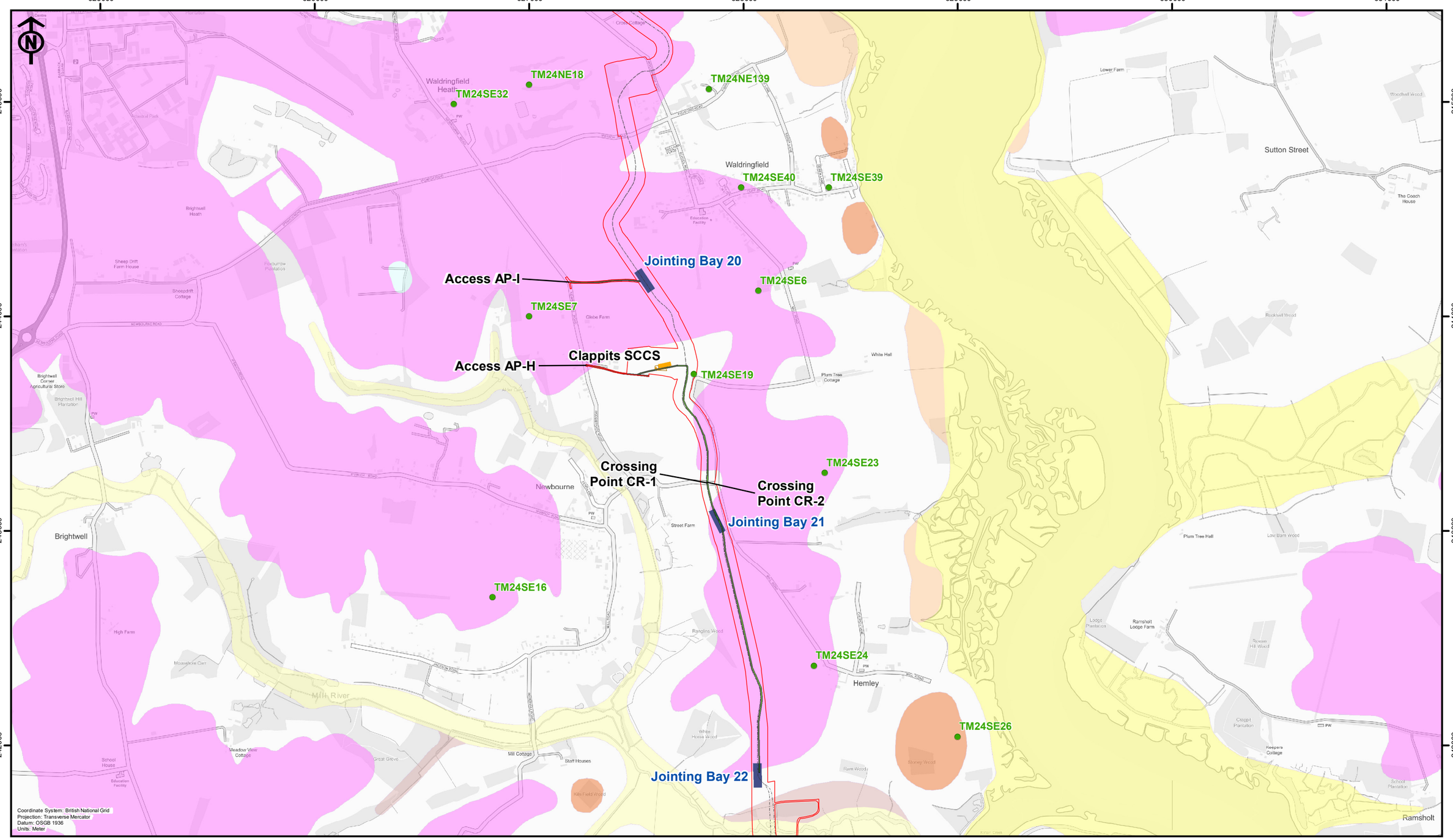
APPENDIX 4 BUCKLESHAM MILL RIVER WATER BODY CLASSIFICATION CRITERIA

Bucklesham Mill River Water Body: Good ecological status
Water Body ID GB105035040280
Classifications

Classification Item	2013	2014	2015	2016	2019
Ecological	Poor	Poor	Poor	Poor	Good
Biological quality elements	Poor	Poor	Poor	Poor	Good
Fish	Poor	Poor	Poor	Poor	Good
Invertebrates	High	High	High	High	Good
Macrophytes and Phytobenthos Combined		Good	Good	Good	Good
Physico-chemical quality elements	High	High	Good	Good	High
Acid Neutralising Capacity		High	High	High	High
Ammonia (Phys-Chem)	High	High	High	High	High
Biochemical Oxygen Demand (BOD)	High	High	High	High	
Dissolved oxygen	High	High	Good	Good	High
Phosphate		High	High	High	High
Temperature	High	High	High	High	High
pH	High	High	High	High	High
Hydromorphological Supporting Elements	Supports good	Supports good	Supports good	Supports good	Supports good
Hydrological Regime	Does not support good	Does not support good	Does not support good	Does not support good	Does not support good
Morphology	Supports good	Supports good	Supports good	Supports good	Supports good
Specific pollutants	High	High	High	High	High
Arsenic	High	High	High	High	High
Chromium (VI)					High
Copper	High	High	High	High	High
Iron			High	High	High
Phenol			High	High	High
Triclosan	High	High			
Zinc	High	High		High	High
Chemical	Good	Fail	Good	Good	Fail
Priority hazardous substances	Good	Good	Good	Good	Fail
Benzo(a)pyrene					Good
Cadmium and Its Compounds	Good	Good	Good	Good	Good
Di(2-ethylhexyl)phthalate (Priority hazardous)	Good	Good			
Dioxins and dioxin-like compounds					Good
Heptachlor and cis-Heptachlor epoxide					Good
Hexabromocyclododecane (HBCDD)					Good
Hexachlorobenzene					Good
Hexachlorobutadiene					Good
Mercury and Its Compounds			Good	Good	Fail
Nonylphenol	Good	Good			

Bucklesham Mill River Water Body: Good ecological status
Water Body ID GB105035040280
Classifications

Classification Item	2013	2014	2015	2016	2019
Perfluorooctane sulphonate (PFOS)					Good
Polybrominated diphenyl ethers (PBDE)					Fail
Tributyltin Compounds	Good	Good			
Priority substances	Good	Fail	Good	Good	Good
Cypermethrin (Priority hazardous)					Good
Fluoranthene					Good
Lead and Its Compounds	Good	Good	Good	Good	Good
Nickel and Its Compounds	Good	Fail	Good	Good	Good
Other Pollutants	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment	Does not require assessment



- EA THREE DCO Corridor
- Secondary Construction Consolidation Site
- Jointing Bay Compound
- Access Track
- Haul Road
- Existing Track
- Top Soil
- EA THREE Existing Cable Ducts
- Historic BGS Geological Logs

Superficial Geology

- Alluvium - Clay and Silt
- Alluvium - Clay, Silt, Sand and Gravel
- Head - Clay, Silt, Sand and Gravel
- Head - Diamicton
- Kesgrave Catchment Subgrouo - Sand and Gravel
- Lowestoft Formation - Sand and Gravel
- River Terrace Deposits, 2 - Sand and Gravel
- Tidal Flat Deposits - Clay and Silt

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Rev	Date	By	Comment
B	14/04/2022	PW	Second Issue
A	13/01/2022	JRS	First Issue

Original A3 Plot Scale 1:17,500

0 350 700 Metres

Clappits Works Stage

Figure 1: Superficial Geology

Drg No	05356.00006.12.0019.1 Superficial Geology
Rev	2
Date	14/04/2022
Layout	N/A

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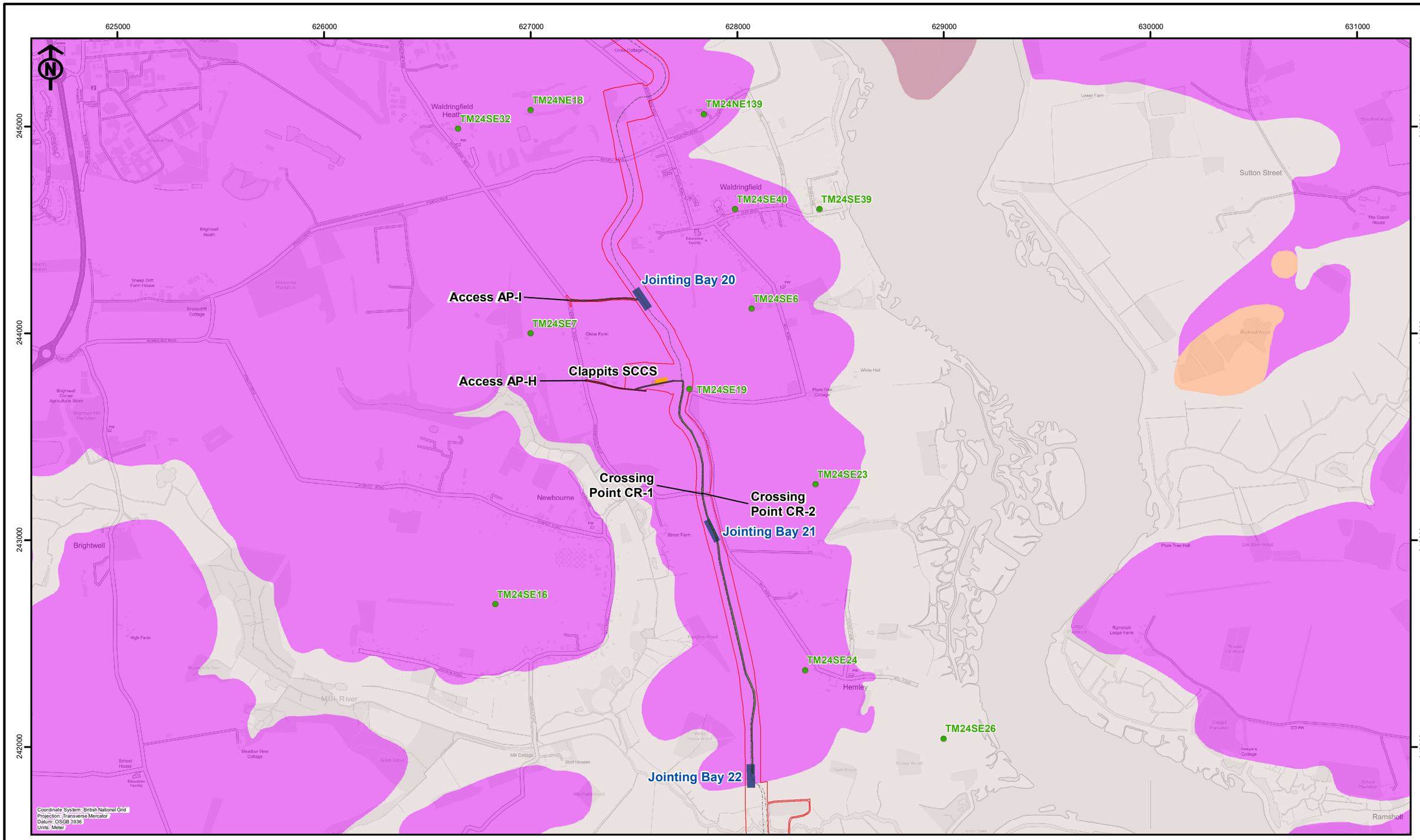

EA THREE DCO Corridor
Secondary Construction Consolidation Site
Jointing Bay Compound
Access Track
Haul Road
Existing Track
Top Soil
EA THREE Existing Cable Ducts
Historic BGS Geological Logs

Bedrock Geology

Coralline Crag Formation - Calcarenite (Quaternary)
Red Crag Formation - Sand (Quaternary)
Thames Group - Clay, Silt And Sand (Paleogene)
Thanet Formation And Lambeth Group (Undifferentiated) - Clay And Sand (Paleogene)

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Rev	Date	By	Comment
B	14/04/2022	PW	Second Issue
A	13/01/2022	JRS	First Issue

Original A3 Plot Scale 1:17,500

0 350 700 Metres

Clappits Works Stage

Figure 2: Bedrock Geology

Drg No	05356.00006.12.0018.1 Bedrock Geology
Rev	2
Date	14/04/2022
Layout	N/A

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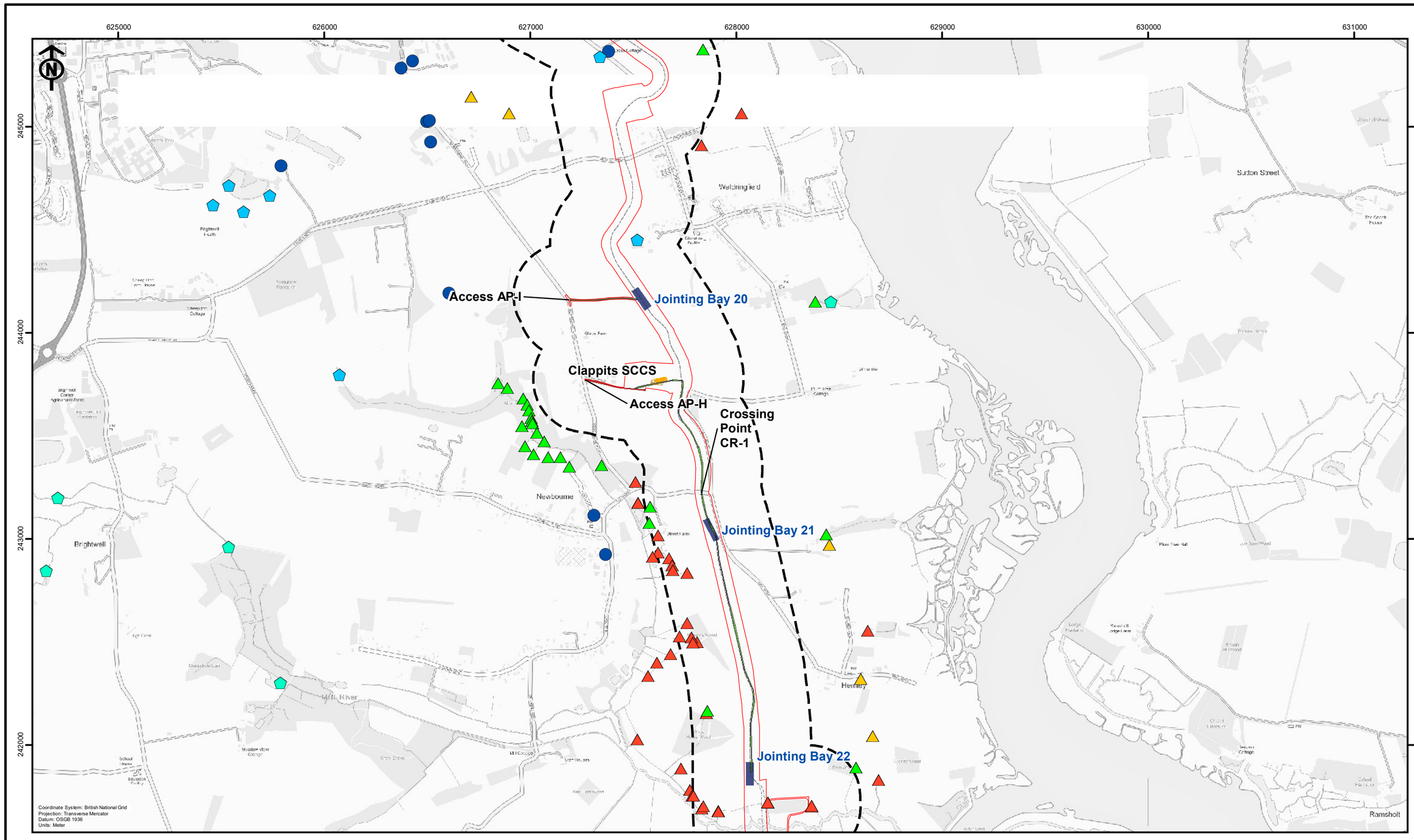

EA THREE DCO Corridor
Secondary Construction Consolidation Site
Jointing Bay Compound
Access Track
Haul Road
Existing Track
EA THREE Existing Cable Ducts
Top Soil
Commencement Works Area 250m Buffer
Private Abstractions
Licensed Ground Water Abstractions
Licensed Surface Water Abstractions
Depression Subject to Groundwater Inflow

Springs

Water Issue (Potential Spring)
Drain (Potential Spring)

There are no Source Protection Zones in the Displayed Area

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B	14/04/2022	PW	Second Issue
A	13/01/2022	PW	First Issue

Original A3 Plot Scale 1:17,500

0 350 700 Metres

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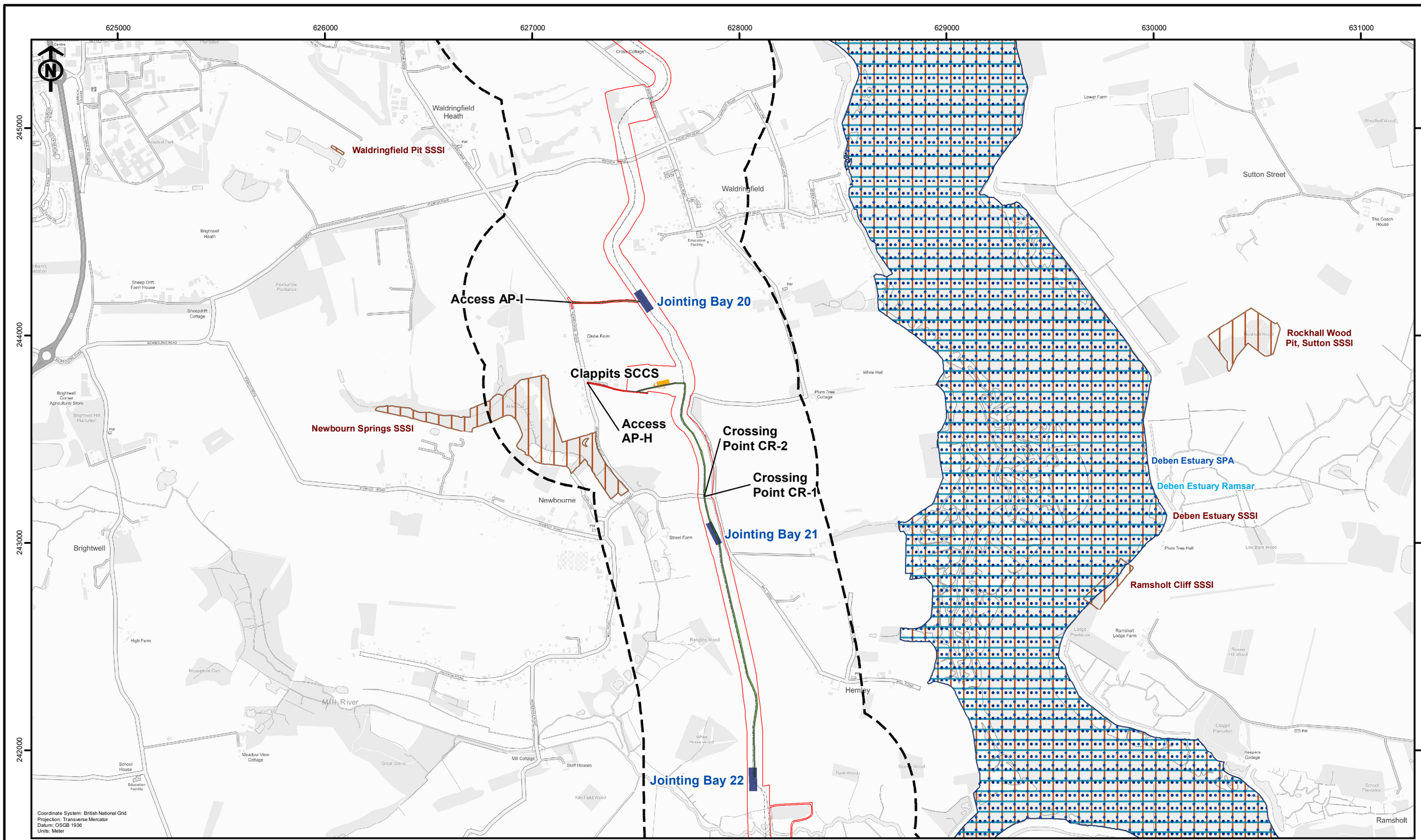
Figure 4: Location of all Current Abstraction Licences, Private Abstractions and Source Protection Zones

Drg No	05356.00006.12.0009.1 SPZ and Abstractions
Rev	2
Date	14/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\Doc Ref EA3-GRD-CON-PLN-IBR-000107\5356.00006.12.0009.1 EA3 SPZ and Abstractions.mxd



EA THREE DCO Corridor
Secondary Construction Consolidation Site
Jointing Bay Compound
Access Track
Haul Road
Existing Track
Top Soil
EA THREE Existing Cable Ducts
Commencement Works Area 500m Buffer
Ecology Designations
Special Protection Area (SPA)
Ramsar
Site of Special Scientific Interest (SSSI)

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B	14/04/2022	PW	Second Issue
A	13/01/2022	PW	First Issue

Original A3 Plot Scale 1:17,500

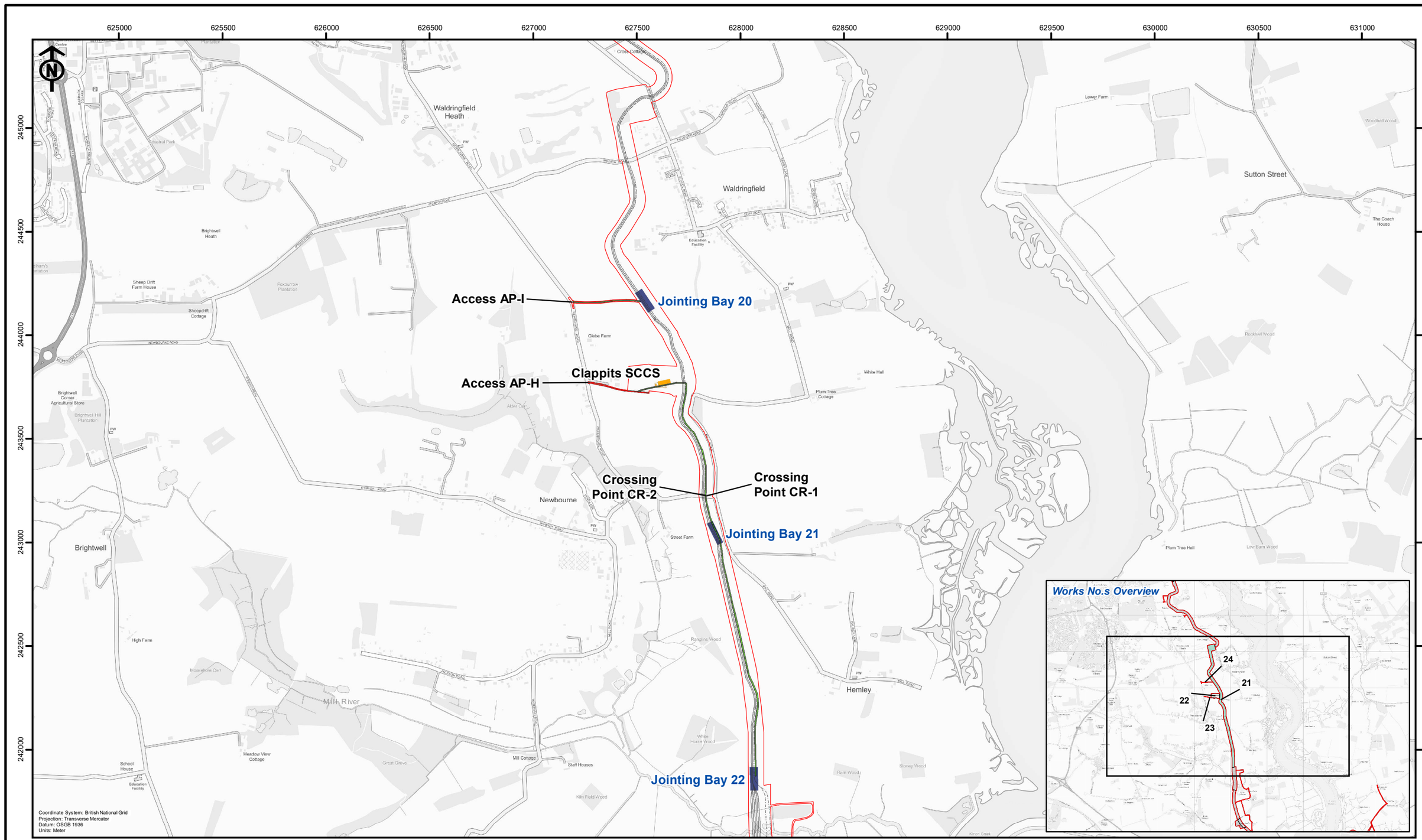
0 350 700 Metres

Clappits Works Stage

Figure 5: Ecological Sites

Drg No	05356.00006.12.0012.1 Ecological Sites
Rev	2
Date	14/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\Doc Ref EA3-GRD-CON-PLN-IBR-000107\5356.00006.12.0011.1 EA3 Ecological Sites.mxd



EA THREE DCO Corridor
Secondary Construction Consolidation Site
Jointing Bay Compound
Top Soil
Access Track
Haul Road
Existing Track
EA THREE Existing Cable Ducts
EA ONE Existing Cable Ducts

Works No.s
24
21
22
23

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Rev	Date	By	Comment
B	05/04/2022	PW	Second Issue
A	31/03/2022	JRS	First Issue

Original A3 Plot Scale 1:17,500

0 360 720 Metres

Clappits Works Stage

Figure 1: Overview Plan

Drg No	05356.00006.12.0021.1 Site Context Plan
Rev	2
Date	05/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\ONCS and Commencement Master\5356.00006.12.0021.1 Works Site Context.mxd

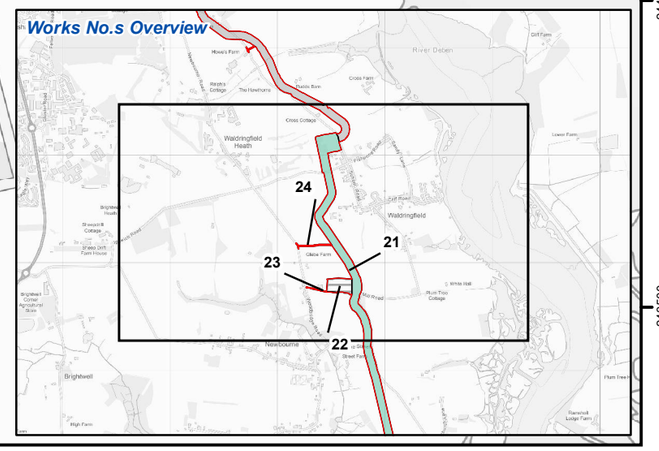
626000 626500 627000 627500 628000 628500 629000

245000 244500 244000 243500

GRUNDISBURGH ROAD
NEWBOURNE ROAD
Waldringfield Heath
PW
IPSWICH ROAD
Cross Cottage
WOODBRIDGE ROAD
FISHPOND ROAD
SANDY LANE
STULLIVAN PLACE
SCHOOL ROAD
SUNN YARD
VILLAGE WAY
CLIFF ROAD
DEBEN LANE
Waldringfield
Education Facility
Foxburrow Plantation
Jointing Bay 20
Access AP-I
Glebe Farm
Access AP-H
Clappits SCCS
Alder Carr
MILL ROAD

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Works No.s Overview



- EA THREE DCO Corridor
- Secondary Construction Consolidation Site
- Jointing Bay Compound
- Top Soil
- Access Track
- Haul Road
- Existing Track
- EA THREE Existing Cable Ducts
- EA ONE Existing Cable Ducts

Works No.s
- 24
- 21
- 22
- 23

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Rev	Date	By	Comment
B	05/04/2022	PW	Second Issue
A	31/03/2022	JRS	First Issue

Original A3 Plot Scale 1:10,000

0 200 400 Metres

Clappits Works Stage

Figure 2a: Site Context Plan (North)

Drg No	05356.00006.12.0021.1 Site Context Plan
Rev	2
Date	05/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\ONCS and Commencement Master\5356.00006.12.0021.1 Works Site Context.mxd

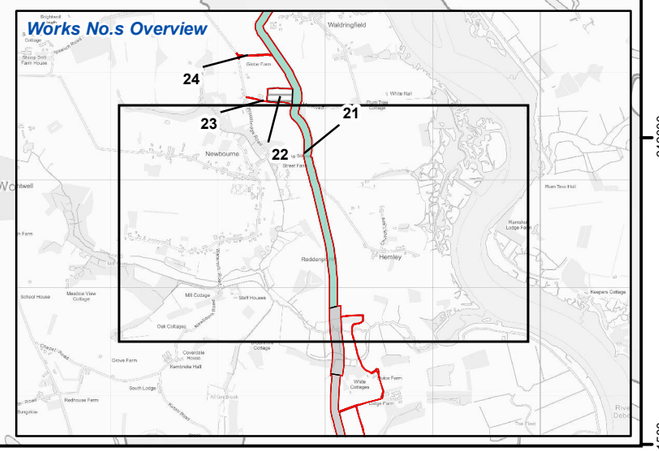
626500 627000 627500 628000 628500 629000 629500

243500 243000 242500 242000 241500

Alder Carr
Woodbridge Road
Mill Road
Crossing Point CR-1
Crossing Point CR-2
Ipswich Road
Newbourne
Fenn Lane
The Street
PW
Street Farm
Jointing Bay 21
Mill Road
Church Lane
Ranglins Wood
Lodge Plantation
Ramsho
Lodge Fa
Jackson Road
River
Waterhill Road
Hemley
PW
Mill Road
White Horse Wood
Jointing Bay 22
Great Grove
Mill Cottage
Staff Houses
Ram Wood
Stoney Wo
Kiln Field Wood
Oak Cottages

Coordinate System: British National Grid
Projection: Transverse Mercator
Datum: OSGB 1936
Units: Meter

Works No.s Overview



EA THREE DCO Corridor
Jointing Bay Compound
Haul Road
EA THREE Existing Cable Ducts
EA ONE Existing Cable Ducts

Works No.s
24
21
22
23

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Rev	Date	By	Comment
B	05/04/2022	PW	Second Issue
A	31/03/2022	JRS	First Issue

Original A3 Plot Scale 1:10,000

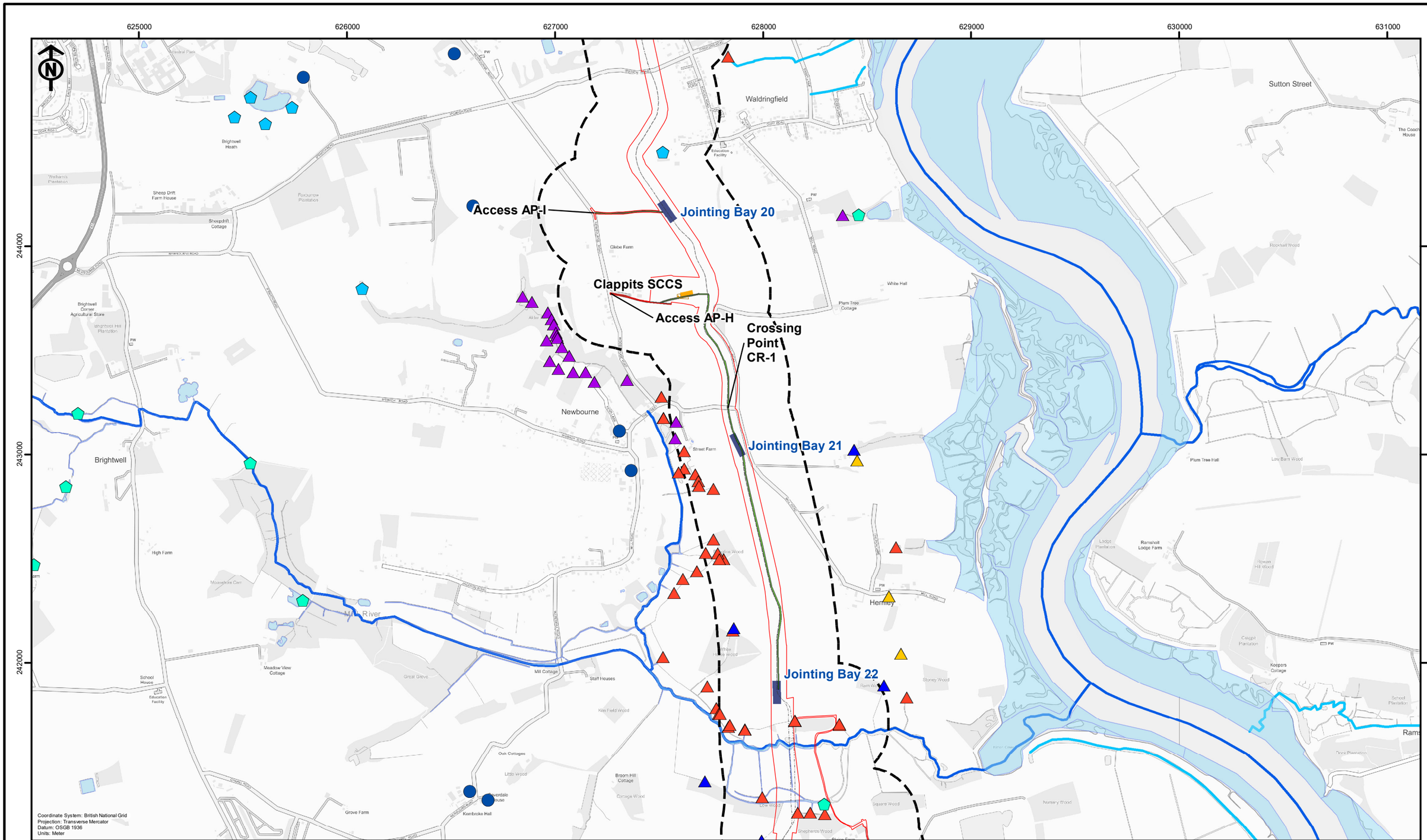
0 200 400 Metres

Clappits Works Stage

Figure 2b: Site Context Plan (South)

Drg No	05356.00006.12.0021.1 Site Context Plan
Rev	2
Date	05/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Dwgs\Wking\EA3\Onshore Substation\ONCS and Commencement Master\5356.00006.12.0021.1 Works Site Context.mxd



EA THREE DCO Corridor
Secondary Construction Consolidation Site
Jointing Bay Compound
Access Track
Haul Road
Existing Track
EA THREE Existing Cable Ducts
Commencement Works Area 250m Buffer
Top Soil
Private Abstractions
Licensed Ground Water Abstraction
Licensed Surface Water Abstraction
Spring
Depression Subject to Groundwater Inflow
Drain ((Potential Spring)
Spring
Water Issue (Potential Spring)
Surface Water Area
Statutory Main River
Ordinary Watercourse

Note: There are no Source Protection Zones in the Displayed Area

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Rev	Date	By	Comment
B	19/04/2022	PW	Second Issue
A	11/01/2022	PW	First Issue

Original A3 Plot Scale 1:17,500

0 340 680 Metres

Clappits Works Stage

Figure 3 Hydrological and Hydrogeological Features

Drg No	05356.00006.12.00063.1 SPZ and Abstractions
Rev	2
Date	19/04/2022
Layout	N/A

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