

Onshore Converter Station

Construction Noise and Vibration Management Scheme

DCO Requirement 24

(Applicable to Work Numbers 62 to 69)

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Revision Summary				
Rev	Date	Prepared by	Checked by	Approved by
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2	11/01/22	Trevor Olver	Phil Williamson Rew-	Gareth Mills
3	21/03/22	James Burchell	Phil Williamson Rew-	Gareth Mills

Description of Revisions			
Rev	Page	Section	Description
1	ALL	ALL	New Document
2	ALL	ALL	Amended following comments from MSDC (23/03/21) and input of design information from Converter Station Principal Contractor
3	ALL	ALL	Finalised for discharge

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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 & 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 1200MW 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 1400MW and transmission connection of 1320MW. 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 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

1. This Construction Noise and Vibration Management Scheme (CNVMS) sets out the mitigation and control measures to be applied to the construction of the EA THREE onshore converter station to minimise potential noise and vibration impacts on nearby residents and other sensitive receptors during construction. This plan has been produced to fulfil DCO Requirement 22 (2) and 24 (1) & (2)) and which state:

22.— (2) The code of construction practice must include -

(d) a written scheme for noise and vibration management during construction

24.—(1) No stage of the connection works may commence until a noise and vibration management scheme for construction of that stage (which must accord with the written scheme for noise and vibration management contained in the outline code of construction practice) has been submitted to and approved by the relevant planning authority. The scheme for noise and vibration management must form part of the code of construction practice.

(2) The scheme must set out the particulars of—

(a) the construction works, and the method by which they are to be carried out;

(b) the noise attenuation measures to be taken to minimise noise resulting from the construction works, including any noise limits; and

(c) a scheme for monitoring the noise during the construction works to ensure compliance with the noise limits and effectiveness of the attenuation measures.

2. The scope of this document relates to the CNVMS associated with the construction of the onshore converter station works comprising Work No.s 62 to 69, located to the north of the existing NG substation and adjacent to the EA ONE Substation (Figure 1 Site Context Plan). CNVMS have been produced for each stage of the onshore connection works and are provided under separate cover. In addition, an Operational Noise Insulation Scheme (ONIS)(EA3-GRD-CON-PLN-IBR-000114) has been prepared for the converter station to set out the mitigation measures to be applied to the operational EA THREE onshore converter station (Work No. 67).
3. Construction works at the Converter Station will be some of the first onshore connection works to commence. The access track and temporary laydown will be constructed in Summer 2022 with the remaining works being undertaken from Q2 2023.
4. The purpose of this CNVMS is to ensure that the construction works for the EA THREE onshore converter station comply with relevant UK legislation, DCO Requirements, environmental commitments as set out in the Environmental Statement (ES), and environmental and construction best practice.
5. The measures contained herein shall be adhered to by the Principal Contractor (and their subcontractors) and the implementation and compliance will be monitored by the Construction Management Team. These measures will only be revised with the agreement of Mid Suffolk District Council (MSDC).

2. ABBREVIATIONS

BPM	Best practice measures
CCS	Consolidated Construction Site
CNVMS	Construction Noise and Vibration Management Scheme
CLO	Community Liaison Officer
CoPA	Control of Pollution Act 1974
DBEIS	Department of Business, Energy and Industrial Strategy
DC	Direct Current
DCO	Development Consent Order
EA ONE	East Anglia ONE Offshore Windfarm
EA THREE	East Anglia THREE Offshore Windfarm
EATL	East Anglia THREE Limited
EHO	Environmental Health Officer
EnvCoW	Environmental Clerk of Works
ES	Environmental Statement
HVDC	High Voltage Direct Current
MSDC	Mid Suffolk District Council
MW	Megawatt
NG	National Grid

NPS – EN1	Overarching National Policy Statement for Energy EN-1
ONIS	Operational Noise Insulation Scheme
PPV	Particle peak velocity
PRoW	Public Rights of Way
SCC	Suffolk County Council
SLM	Sound level meter

3. CONSTRUCTION DETAILS

3.1. Enabling Works

6. The onshore construction works will commence with the enabling works, which comprises the establishment of the temporary laydown area (Work No 65) and the access to this from the existing EA ONE access road. The temporary laydown area will be directly northeast of the converter station and will include temporary offices, welfare, car parking, materials and equipment storage. At the start of the works the onshore converter station compound and temporary laydown area will be temporarily fenced in accordance with the Fencing and Enclosures Plan (EA3-GRD-CON-PLN-IBR-000106) and a security cabin will be installed at the main access gate.
7. Following any necessary ecological mitigation, topsoil will be stripped from the access road and temporary laydown area and stored at specific storage locations as to avoid cross contamination with other materials. Topsoil storage and management will be compliant with the recommendations and requirements set out in the Onshore Converter Station Landscape Management Plan (EA3- EA3-GRD-CON-PLN-IBR-000103). Topsoil will be stored to one side of the working area, in such a way that it is not mixed with any subsoil. Typically this would be stored as an earth bund of a maximum height of two metres, to avoid compaction from the weight of the soil. Storage time will be kept to a minimum, to prevent the soil deteriorating in quality and the topsoil bunds seeded to prevent windblow. Topsoil stripped from different fields will be stored separately, as would soil from specific hedgerow banks or woodland strips.
8. The construction of an access road typically involves the placement of suitable graded imported stone material onto a suitable subgrade, potentially with a reinforcing geogrid and/or a geotextile, however other methods such as soil stabilisation may be used if considered appropriate. Following the initial topsoil stripping, the on-site access road will be installed for a width of 6m.
9. The enabling works will also include installation of surface water drainage for the access road and temporary laydown area, in accordance with the Surface Water and Drainage Management Plan (EA3-GRD-CON-PLN-IBR-000107). Foul water drainage during this initial period will be via portable welfare facilities, with a tank that will be emptied on a weekly or bi-weekly basis.

3.2. Construction

10. The EA THREE onshore converter station will be located within a fenced compound (maximum 157m by 186m) (Work No. 67), immediately to the east of the East Anglia ONE Substation and to the north of the existing NG Bramford Substation. The converter station will contain electrical equipment including power transformers, switchgear, reactive compensation equipment, harmonic filters, cables, lightning protection masts, control buildings, communications masts, backup generators, access, fencing and other associated equipment, structures or buildings. The converter station will have a compact layout, with the majority of the equipment contained in buildings not incongruous to their setting.
11. The construction of the converter station will comprise a number of key stages, including: platform upfill to finished level (approx. 54m AOD) foundations and building construction and equipment installation and commissioning.
12. The main site access has already been constructed as part of the EA ONE works, however, an internal service road from this will require installation.
13. The enabling works will include grading and earthworks to remove any unsuitable materials from the converter station area and to build up with suitable fill material to establish a formation level for the converter station construction. The materials excavated will be reused on site as engineering fill or landscaping depending on material properties.
14. Following the completion of the site grading, works will commence with the excavations for ducting and the foundations for the buildings and external plant. The building will largely comprise steel, concrete or masonry and cladding materials. The structural

steelwork will be fabricated and prepared off site and delivered to site for erection activities using cranes. The composite or cassette cladding panels (e.g. Kingspan) will be delivered to site ready to erect and be fixed to the steelwork.

15. The civil works will be followed by the installation and commissioning of the electrical equipment. The large transformers will be filled on site. The smaller electrical components will be constructed on site using small mobile plant and lifting apparatus.

3.3. Cable Installation

16. Works Nos 63 and 66 will comprise the installation in open trenches of cables to connect the Converter Station to the nearby National Grid Bramford Substation. Construction activities for the installation of the cable in open trenches will be undertaken within a temporarily fenced strip of land, referred to as the working width.
17. The cable route into the Converter Station from Work No. 64 through Work No 63 was not known at the time of the preparation of the Environmental Statement and it was considered at that time that this may also be installed using open trenches. The ducts have now, however, been installed during the construction works for EA ONE to end within Work No. 67 (the converter station site). There will, therefore, be no requirement, as originally anticipated, to open trench these through Work no. 63 to the Converter Station.
18. Works in Work No. 62 will also include the installation of haul road to reach a jointing bay in the adjacent Work No. 58 (not part of this stage) to the east. This will follow the route of the EA ONE haul road as shown in Figure 2.
19. In addition, all ducts to be used for EA THREE, which were installed during the EA ONE construction works, will require to be 'proved' to ensure that they are intact and free of debris. This will generally be undertaken by the use of foam pigs driven under pressure from jointing bay to jointing bay. Each stretch of duct that was installed using HDD will, however, require duct-proving excavations at each end to allow the use of different diameter foam pigs, due to a difference in the diameter of these compared to the ducting installed using open trench techniques.

3.4. Schedule and Working Hours

20. It is proposed that an initial phase of construction at the Converter Station stage will commence in July 2022 and is expected to be of 5 months duration. These works will comprise construction of temporary laydown and access; construction of the converter station platform including earth movement and re-profiling of land within Work Numbers 65 and 69 (in accordance with the Landscape Management Scheme (EA3-OND-CNS-REP-IBR-000002)) and installation of the SUDS drainage system and pond. The main construction phase at the Converter Station will then commence in summer 2023 and take approximately 18 months to complete. The works associated with the installation of the cable within Work Number 62, 63 and 64 will be undertaken in 2024.
21. DCO Requirement 25 defines the construction working hours as follows:
- 25.—(1) Construction work for the connection works must only take place between 0700 hours and 1900 hours Monday to Saturday, with no activity on Sundays or bank holidays, except as specified in paragraph (2).*
- (2) Outside the hours specified in paragraph (1), construction work may be undertaken for essential and non-intrusive activities including but not limited to:*
- (a) continuous periods of operation that are required as assessed in the environmental statement, such as concrete pouring;*
- (b) fitting out works associated with the onshore substation(s) comprised within Work No. 67;*
- (c) delivery to the connection works of abnormal loads that may cause congestion on the local road network;*
- (d) connection works carried out on the foreshore;*
- (e) daily start up or shut down;*
- (f) electrical installation; and*
- (g) non-destructive testing.*
- (3) All construction work undertaken in accordance with paragraph (2)(a) to (d) must be agreed with the relevant planning authority in writing in advance, and must be carried out within the agreed time.*

22. It has been agreed with MSDC, that for the purposes of Requirement 25, 'essential and non-intrusive' will also include the following activities, which can therefore be undertaken outside of the above working hours without prior notification to MSDC.

- Fuelling of generator servicing pumping equipment etc, where the need for this was not known during normal working hours and fuelling is required to enable the continued operation of the equipment
- Response to failure of the following to enable return of service:
 - Electrical Generator to Welfare Facilities
 - Site LAN/WAN
 - Utility Power Supply
- Security patrols and response to unauthorised access
- Response to incident on site e.g. inclement weather damage
- Non scheduled maintenance of fencing and access points, where the need for this was not known during normal working hours and immediate attention is required.¹

23. Further information is provided in Section 5.5 of the Code of Construction Practice (EA3-OND-CNS-REP-IBR-000005).

4. LEGISLATION AND GUIDELINES

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

- Noise and Statutory Nuisance Act 1993;
- Environmental Protection Act 1990;
- Control of Pollution Act 1974 (CoPA);
- Overarching National Policy Statement for Energy (EN-1). Department of Energy and Climate Change (July 2011);
- National Planning Policy Framework (NPPF). Department for Communities and Local Government (February 2019);
- BS7445-1:2003: Description and Measurement of Environmental Noise. Guide to quantities and procedures;
- BS5228-1:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 1: Noise; and
- BS5228-2:2009+A1:2014: Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration.

5. CONSTRUCTION NOISE AND VIBRATION MANAGEMENT SCHEME GOVERNANCE

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

6. LOCAL COMMUNITY LIAISON

26. EATL is committed to providing clear communication to local residents and will manage public relations with local residents and businesses. Proactive community liaison will be maintained, keeping local residents informed of the type and timing of the works involved. As outlined in the Code of Construction Practice (EA3-OND-CNS-REP-IBR-000005), a combination of communication mechanisms such as posters, notices, exhibitions, letters, newsletters, website updates and parish council meetings will be employed to keep local residents and businesses informed.

27. A designated EA THREE Community Liaison Officer (CLO) will manage and respond to any public concerns, queries or complaints in a professional and diligent manner as set out in the Community Liaison and Public Relations Procedure contained within the Code of Construction Practice (EA3-OND-CNS-REP-IBR-000005). The Complaints Procedure will be publicised and complaints will be directed to the EATL Community Liaison Officer. All enquiries will be logged, investigated and rectifying actions taken when deemed appropriate. Enquiries will be dealt with in an expedient and courteous manner. Details of complaints will be reported to MSDC and SCC within 48 hours.

28. Parish Councils, District Councillors, (including ward members and portfolio holders) and County Councillors in the area and the local liaison group will be contacted (in writing) in advance of the proposed works and ahead of key milestones in order to advise them of

¹ Where out of hours work associated with maintenance of fencing and access points has been required, MSDC will be notified of these works the following working day

the ongoing works. The information provided will include a timetable of works, a schedule of working hours, the extent of the works, and a contact name, address and telephone number in case of complaint or query.

7. BASELINE CONDITIONS

29. As the East Anglia THREE converter station will be adjacent to the East Anglia ONE substation, it was deemed appropriate in the ES, to use the baseline data obtained in support of the East Anglia ONE ES. Volume 3, Chapter 26 Noise and Vibration of the EA THREE ES notes that noise measurements were carried out in sensitive receptors in the surroundings of the onshore converter station.
30. Attended measurements were conducted at three sensitive receptors during the day of the 29th September 2011 and early morning on the 30th September 2011. The closest sensitive receptors identified are isolated houses separated from the site by agricultural land. The three receptors chosen for noise monitoring, and agreed with the local Environmental Health Department, (the nearest three properties) are presented in Table 7-1 and Figure 2 Sensitive Receptors. These receptors remain the closest to the converter station.

Table 7-1 Noise Sensitive Receptors – Onshore Converter Station

Receptor	Co-ordinates	
	Easting	Northing
MP1 Bullenhall Farm	367553	577415
MP2 Hill Farm House	366275	5770453
MP3 Burstall Hall	367393	5769843

31. Measurements were undertaken at a height of 1.5m and in free-field conditions i.e. >3.5m from a reflective surface using a Norsonic 118 type 1 sound level meter (SLM) (serial no. 31677) with pre-amplifier and microphone protected by foam windshield and a Norsonic type 1251 acoustic calibrator (serial no. 32194).
32. The calibration of the SLMs was checked before and after the measurements using the acoustic calibrator, with no drift being observed. The SLMs conform to BS EN 61672-1:2003 Electroacoustics - Sound level meters, and the calibrator conforms to BS EN 60942:2003 Electroacoustics - Sound calibrators. The equipment used has a calibration history that is traceable to a certified calibration institution.
33. Table 7-2 presents the results of the background noise measurements for Day-time and Night-time:

Table 7-2 2011 Background Noise Measurements

ID	Date	Start	Duration (hr:min)	L _{Aeq}	L _{AF(max)}	L _{A10}	L _{A90}
Day-time (dB(A))							
MP1	29/09/2011	13:25 0	01:00	44.0	70.2	45.3	32.4
MP2	29/09/2011	16:10 0	01:00	45.2	68.2	47.8	35.8
MP3	29/09/2011	14:48 0	01:00	41.3	64.2	44.1	37.4
Night-time (dB(A))							
MP1	30/09/2011	02:27	01:00	32.6	68.2	33.2	26.3
MP2	30/09/2011	03:34	01:00	26.9	61.7	28.5	21.6

ID	Date	Start	Duration (hr:min)	L _{Aeq}	L _{AF(max)}	L _{A10}	L _{A90}
MP3	30/09/2011	03:28	01:00	35.7	67.0	37.6	27.7

34. A further noise survey was undertaken in 2017 to update the noise levels and characterise the noise environment for the construction of the EA ONE Substation (EA ONE Ltd, 2017). Monitoring was completed at each of the above identified locations during the daytime and at MP1 during the night-time.

35. Measurements were undertaken at a height of 1.5m and in free-field conditions i.e. >3.5m from a reflective surface using a Rion NL-32 type 1 SLM (serial no. 01182973 and 01121392) with pre-amplifier and microphone protected by foam windshield and a Cirrus CR:151E acoustic calibrator (serial no. 41950). The calibration of the SLMs was checked before and after the measurements using the acoustic calibrator, with no drift being observed. The SLMs conform to BS EN 61672-1:2003 Electroacoustics - Sound level meters, and the calibrator conforms to BS EN 60942:2003 Electroacoustics - Sound calibrators. The equipment used has a calibration history that is traceable to a certified calibration institution.

36. Table 7-3 presents the results of the background noise measurements for day-time and night-time:

Table 7-3 2017 Background Noise Measurements

ID	Date	Start	Duration (hr:min)	L _{Aeq}	L _{AF(max)}	L _{A10}	L _{A90}
Day-time (dB(A))							
MP1	29/08/2017	14:18	01:00	40	69	42	33
MP2	29/08/2017	15:38	01:00	49	68	53	32
MP3	31/08/2017	13:04	01:00	60	85	59	37
Night-time (dB(A))							
MP1	30/08/2017	00:30	01:00	32	61	33	27

37. A more recent noise survey has now been undertaken in 2021 to confirm the previous monitoring results and to categorise the construction noise assessment in accordance with the ABC method as detailed in BS5228. The Environmental Protection Officer at MSDC was consulted prior to the monitoring to agree the methodology. Monitoring over a 1-hour period was completed at each of the above identified locations during the daytime and night-time period.

38. Measurements were undertaken at a height of 1.5m and in free-field conditions i.e. >3.5m from a reflective surface. The monitoring equipment used for the survey is detailed in Table 7-4.

Table 7-4 2021 Monitoring Equipment

ID	Period	Equipment Details	Serial Number
MP1	Daytime	Norsonic Nor140 Type 1 Sound Level Meter	1403010
		Norsonic 1251 Acoustic Calibrator	31875
	Night-time	Norsonic Nor140 Type 1 Sound Level Meter	1403010

ID	Period	Equipment Details	Serial Number
		Norsonic 1251 Acoustic Calibrator	31875
MP2	Daytime	Norsonic Nor140 Type 1 Sound Level Meter	1403010
		Norsonic 1251 Acoustic Calibrator	31875
	Night-time	Rion NL-52 Type 1 Sound Level Meter	00331823
		Rion NC-74 Acoustic Calibrator	34336013
MP3	Daytime	Norsonic Nor140 Type 1 Sound Level Meter	1403010
		Norsonic 1251 Acoustic Calibrator	31875
	Night-time	Cirrus CR:171B Type 1 Sound Level Meter	G080284
		Cirrus CR:515 Acoustic Calibrator	83164

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

40. Table 7-5 presents the results of the 2021 background noise measurements for day-time and night-time:

Table 7-5 2021 Background Noise Measurements

ID	Date	Start	Duration (hr:min)	L _{Aeq}	L _{AF(max)}	L _{A10}	L _{A90}
Day-time (dB(A))							
MP1	20/10/2021	11:15	01:00	52	84	50	42
MP2	20/10/2021	08:54	01:00	57	81	56	38
MP3	20/10/2021	10:02	01:00	51	78	46	39
Night-time (dB(A))							
MP1	09/11/2021	02:49	01:00	34	39	35	33
MP2	09/11/2021	03:02	01:00	45	65	47	43
MP3	09/11/2021	03:11	01:00	26	51	25	21

41. It should be noted that the daytime monitoring was completed during unsettled weather conditions with wind induced noise resulting in higher ambient sound levels than the locations would generally be subject to. However, based on the ABC method for construction noise assessments this did not increase the threshold values.

42. During the night-time period it was noted that noise from the electricity pylons was the dominant source and resulted in consistent noise levels throughout. Therefore, as a precautionary measure it is considered reasonable to assume Category A Threshold values at all locations during the night-time period.

8. NOISE AND VIBRATION CRITERIA

43. Noise levels generated by construction activities are deemed to be significant if they exceed the threshold values as derived in accordance with the ABC Method detailed in BS5228-1.
44. The ABC method is based on the measured ambient noise levels (rounded to 5 dBA) in the area and the advice in Table E1 of BS 5228, as shown here in Table 8-1. It is considered that if the site noise level exceeds the appropriate category at the most noise-sensitive receptors then a potential significant effect has been indicated. This will depend upon (as set out in BS 5228) "other project-specific factors, such as the number of receptors affected and the duration and character of the impact."

Table 8-1 Threshold of Potential Significant Effect at Dwellings

Assessment Category and Threshold Value Period	Threshold value, dB LAeq, T		
	Category A	Category B	Category C
Daytime (07:00 – 23:00) and Saturday (07:00 – 13:00)	65	70	75
Weekdays (19:00 – 23:00), Saturdays (13:00 – 23:00) and Sundays (07:00 – 23:00)	55	60	65
Night time (23:00 – 07:00)	45	50	55

45. The assessment category and associated threshold value would apply to the relevant working period where required (Daytime, Saturday, Sunday, Weekdays (19:00 – 23:00) and Night time).
46. If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total LAeq, T noise level for the period increases by more than 3 dB due to site noise.
47. Annex E of BS 5228-1 also provides criteria for providing sound insulation at affected receptors. Exceedance of identified levels trigger a responsibility on the developer to provide noise insulation or a scheme to facilitate temporary rehousing.
48. The standard suggests that noise insulation should be provided, in spite of mitigation measures, in the following cases:
- where noise levels exceed the noise insulation trigger level, presented in Table 8-2; or
 - the total noise (pre-construction ambient plus construction noise) is 5 dB above the existing airborne noise level for the corresponding times of day, whichever is the higher; and
 - for a period of ten or more days of working in any fifteen consecutive days or for a total of days exceeding 40 in any 6 month period.

Table 8.2 Time Periods, Averaging Times and Noise Levels Applicable to Assessing Eligibility for Noise Insulation BS 5228-1:2009 (Annex E).

Time	Relevant Time Period	Averaging time, T	Noise trigger level dB LAeq,T
Monday to Friday	07.00-08.00	1 h	70
	08.00-18.00	10 h	75
	18.00-19.00	1 h	70
	19.00-22.00	3 h	65
	22.00-07.00	1 h	55

Time	Relevant Time Period	Averaging time, T	Noise trigger level dB LAeq,T
Saturday	07.00-08.00	1 h	70
	08.00-13.00	5 h	75
	13.00-14.00	1 h	70
	14.00-22.00	3 h	65
	22.00-07.00	1 h	55
Sunday & Public Holidays	07.00-21.00	1 h	65
	21.00-07.00	1 h	55
Note 1) Equivalent continuous A-weighted noise level predicted or measured at a point in front of the most exposed windows or doors leading directly to a habitable room (living room or bedroom) in an eligible dwelling			

49. BS5228-2 provides guidance on the control of vibration from construction sites and response limits for cosmetic damage in buildings as reproduced in Table 8-3. Table 8-3 shows the limits at which the vibration level (measured as a peak particle velocity) would result in cosmetic damage at a range of vibration frequency levels.

Table 8-3 Transient Vibration Guide for Cosmetic Damage (from BS 5228-2:2009)

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

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

9. NOISE AND VIBRATION ASSESSMENT

9.1. Noise Assessment

51. In undertaking the Environmental Impact Assessment for EA THREE, a noise and vibration assessment was completed to identify and assess the potential activities associated with the proposed onshore construction works that could lead to noise and vibration impacts on receptors (Environmental Statement Volume 1, Chapter 26 Noise and Vibration). The Environmental Statement (ES) was undertaken by Royal HaskoningDHV in November 2015.
52. The noise and vibration assessment was undertaken in accordance with the requirements stated in the Sections 5.11.4 to 5.11.7 of the National Policy Statement EN-1 (NPS EN-1). In this sense, the NPS EN-1 states that, "where noise impacts are likely to arise, the applicant should include:

- a description of the noise generating aspects of the development proposal leading to noise impacts including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise;

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

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

- The methods within BS 5228-1 and BS 5228-2 were used to assess noise and vibration from the onshore construction works.
- In order to assess the noise from road traffic, the method CRTN (Calculation of Road Traffic Noise) produced by the Department of Transport / Welsh Office and the guidance provided by the Highways Agency (Design Manual for Roads and Bridges. Volume 11, Section 3, Part 7 Had 213/11 Noise and Vibration) were taken into account.
- Converter Station Construction Activities

54. The noise levels of the equipment to be used for construction of the onshore converter station are shown in Table 9-1 (taken from Annex C and D of BS 5228-1: 2009+A1:2014).

Table 9-1 Assumed construction equipment and noise emissions used for noise calculations (BS 5228-1:2009+A1:2014)

Assumed construction equipment	Noise emissions (dB(A) at 10m from source)
30T Excavator	75
Dozer	86
9T Dumper	77
Backactor Excavator	75
Road Roller	80
Telehandler	78
Mobile Crane	78
Static Crane	78
3T Dumper	77
Scissor Lift	67
Concrete Pump	78
Hydraulic Hammer Piling	89
All sound pressure levels are given at a distance of 10m from the measured plant.	

55. In addition to the above, depending on result of the not yet finalized soil investigations it might be necessary to put some or all structures on piles. These could either be Auger Flight Piles or Driven Piles. Depending on chosen piling method and amount of piles the related works on site should not last longer than 8 – 12 weeks. An assessment of piling and any necessary mitigation measures will be undertaken once more information is known (most likely Q4 2022) about the number and type of piles required and will be discussed and agreed with MSDC.

56. It was assumed that the majority of construction works would be restricted to daytime working hours. The exceptions to this are limited and include concrete pours (see Section 3.3).

57. The ES derived a construction noise daytime lower impact threshold of 65dB L_{Aeq} 12hr on the basis of Annex E of BS5228, which proposes this value as a potential daytime construction noise limit, where the existing ambient (L_{Aeq}) noise level is itself below 65dB L_{Aeq} 12hr, as is the case here, as confirmed by the 2021 survey results (see Tables 7-2, 7-3 and 7-5). The distance from the construction works at which this threshold would be met was calculated using a distance propagation calculation and was found to be 200m from the converter station. The ES concluded that any receptors outside this distance would experience a negligible effect, in accordance with BS 5228:2009 + A1:2014.

58. An initial screening exercise was then undertaken to establish the presence of any residential receptors within this buffer distance. The ES concluded that there are no properties within the construction noise impact buffer around the converter station and, therefore, on-site construction works were predicted to result in an effect of negligible magnitude and a negligible impact.

9.1.1. Off-site Construction Traffic

59. Following the methodology contained in Design Manual for Roads and Bridges (DMRB) (Volume 11, Section 3, Chapter 3)(Highways Agency,2011)² an initial screening assessment was undertaken to assess whether there would be any significant changes in traffic volumes as a result of the development. An increase in traffic volume of 25% corresponds to a 1dB(A) change in noise level over an 18 hour period on the relevant road link. A change in noise level of less than 1dB(A) is regarded as imperceptible and therefore negligible with regard to impact significance. If there is no increase greater than 25%, then the guidance indicates that no further assessment needs to be conducted (Highways Agency 2011).
60. For all road links associated with the onshore converter station, except Bullen Lane, an increase in total traffic or HGV flows of less than 25% is predicted and, therefore, the associated noise impacts would be negligible.
61. For Bullen Lane, existing flows are negligible therefore absolute noise levels for construction traffic have been considered. Based on a worst-case hour with 13 HGV movements and 87 car movements, a noise level at a 5m nominal receptor has been calculated as 49.6dB, significantly below the Category A Threshold of 65dB and, therefore, the associated noise impacts would be negligible.

9.2. Vibration Assessment

62. Ground borne vibration from construction activities was scoped out of detailed assessment in the ES on the basis of separation distance from construction activities and any sensitive receptors (i.e. for the converter station 330m to Woodlands Farm) residential properties) and the generally relatively low levels of vibration due to the proposed construction activities.
63. Discontinuities (e.g. potholes) on the roads adjacent to sensitive receptors have the potential to result in vibration levels that exceed the minimum peak particle velocity (PPV) as specified in BS5288-2. The majority of buildings would be resilient to the worst case vibration levels anticipated. However, a precautionary approach has been considered for listed buildings and non-earthwork related scheduled ancient monuments as these are considered of high sensitivity. Archaeological sites and listed buildings have been identified (Appendix 1)within 10m of the designated construction HGV routes (see Converter Station Traffic Management Plan (EA3-GRD-CON-PLN-IBR-000105)). 10m is considered the largest distance from the road at which there is potential for vibration impacts from HGV along roads, with a distance of 5m considered as a distance for a potentially significant effect. A review of the scheduled ancient monuments found no archaeological sites within 10m of the proposed HGV route to and from the converter station site.
64. Listed buildings have been assessed based on distance to the proposed HGV route to the converter station and also the extent of current use by HGV along these roads using the Suffolk Lorry Route Network. Listed buildings on the existing lorry route would not be subjected to higher vibration levels than are already within the baseline environment. There are no listed buildings within 5m of the road and on a route not designated on the Suffolk Lorry Route Network. In addition the new access to the converter station and internal access roads are not located within 5m of any listed buildings and there is, therefore, no requirement to monitor their condition with respect to potential vibration impacts.

10. NOISE AND VIBRATION CONTROLS

65. EA THREE onshore construction works will comply with the recommendations set out in BS 5228-1 and BS5228-2 and in the ES.
66. Best Practice Measures (BPM) and attenuation measures will be applied during construction works to minimise noise and vibration at neighbouring residential properties and other sensitive receptors arising from construction activities.
67. BPM are defined in Section 72 of the Control of Pollution Act 1974 and Section 79 of the Environmental Protection Act 1990, as those measures which are *'reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to financial implications'*.

² The DMRB has since been updated by document Highways England document LA111 Noise and Vibration May 2020, however, it is considered that the scoping assessment still holds true.

68. At this time the BPM and mitigation measures described in Table 10-1 will be implemented to minimise noise during the onshore construction works. Following receipt of a justified complaint these measures would be reviewed to confirm they have been adopted and are being utilised.

Table 10-1 Best Practice and Mitigation Measures

Construction Best Practice Mitigation Measures
<ul style="list-style-type: none"> Consideration of noise levels when selecting construction methods and equipment used. Management of construction operating hours (in accordance with those specified within the DCO). Training of construction workers on site to ensure noise is considered through all stages. Implementation of traffic management measures such as agreed routes for construction traffic. Use of modern, fit for purpose, well maintained plant and equipment to minimise noise generation. Plant and vehicles will be fitted with mufflers / silencers maintained in good working order. Use of silenced equipment, as far as possible and low impact type compressors and generators fitted with lined and sealed acoustic covers. Doors and covers housing noise emitting plant will be kept closed when machines are in use. The positioning and specification of any generators used close to residential properties shall be positioned so as to ensure compliance with the assessed noise guidance thresholds. Where reasonably practicable, vibrating and noisy equipment should be located as far from sensitive premises as possible, and, if on a structure, not on one which is continuous with that of the sensitive premises; contractors and subcontractors should be trained to employ appropriate techniques to keep site noise to a minimum, and should be effectively supervised to ensure that best working practice in respect of noise and vibration reduction are followed. Minimise drop height of materials. Construction site layout to minimise or avoid reversing with use of banksmen where appropriate. Output noise from reversing alarms set at levels for health and safety compliance. Start-up plant, equipment and vehicles sequentially rather than all together. No working during night hours except for specific activities which have been agreed with MSDC and should be discouraged as much as possible. Radios (other than two-way radios used for the purposes of communication related to the works) and other forms of audio equipment (other than associated with safety mechanisms (such as reversing beepers) shall not be operated during construction activities. Construction activities with the potential for significant impacts should be discouraged if possible, during night hours. Avoid shouting and minimise talking loudly and slamming vehicle doors. Ensuring engines are switched off when machines are idle. Noise and vibration should be controlled at source and the spread of noise and vibration should be limited. Use screens and noise barriers / acoustics screens where deemed necessary. Regular communication with site neighbours to inform them of the construction schedule, and when noisy activities are likely to occur. All residents who are likely to be affected by constructional noise that exceeds 64dB(A) expressed as a 1 hour L(A)eq value shall be notified at least 24 Hours in advance of the works and given an estimate of how long the elevated noise levels will continue If it is deemed by MSDC that during construction monitoring of construction noise is necessary, then the locations for such monitoring will be agreed in advance with MSDC.

69. The above table is not an exhaustive list of BPM and should additional, more appropriate, measures be deduced then they should be included as reasonable steps to minimise noise.
70. To ensure that excessive vibration levels on the road network are not caused by HGVs travelling over discontinuities in the road, visual checks should be made of roads adjacent to the buildings listed in Appendix 1 (to follow) by contractors, the construction management team and EnvCoW.

11. NOISE AND VIBRATION MONITORING

11.1. Noise Monitoring

71. A scheme of noise monitoring will be implemented and maintained during construction in order to ensure compliance with the noise limits and to verify the effectiveness of the best practice and mitigation measures identified in Section 10. The frequency will be

flexible (weekly during initial stages and monthly once compliance with levels established) and should cover all construction activities and stages. Monitoring will also be undertaken, as required, when working near sensitive receptors, or in response to complaints.

72. The purpose of the noise monitoring is to facilitate data acquisition to demonstrate that the EA THREE converter station is being constructed within the noise criteria set out in accordance with the BS 5228-1 and in such a manner to minimise the noise impacts at nearby sensitive receptors.
73. The monitoring locations stated in the ES (see Section 4) will be used. A review of these locations may be considered if changes or updates are observed.
74. Short term attended noise measurements shall be taken by a suitably qualified acoustician in the vicinity of the property in order to assess the fulfilment of the noise criteria stated in Section 8. Where access to a property is not granted to undertake such measurements, measurements shall be undertaken at a location that is considered by the suitably qualified acoustician, to be representative of noise levels at the property or properties in question.
75. The noise measurement sample duration at each location for both day and night-time monitoring will be no less than 30 minutes. Data collected for the identified receptors will include at least the following parameters: L_{A1} , L_{A5} , L_{A10} , L_{A50} , L_{A90} , L_{A95} , L_{A99} , L_{Aeq} , L_{Amax} and L_{Amin} .
76. Type 1 integrating averaging SLM and Class 1 Sound Calibrators will be used. SLM and Calibrators must fulfil the requirements established in the following British and European standards:
- BS EN 61672-1:2003. Electroacoustics. Sound level meters. Specifications;
 - BS EN 61672-2:2003. Electroacoustics. Sound level meters. Pattern evaluation tests;
 - BS EN 61672-3:2006. Electroacoustics. Sound level meters. Periodic tests;
 - BS 7580-1:1997. Specification for the verification of sound level meters. Comprehensive procedure; and
 - BS EN 60942:2003. Electroacoustics. Sound calibrators.
77. SLM and calibrators shall be calibrated to a traceable standard by a UKAS-accredited laboratory, within a 24- month period before the survey for SLMs and 12-month period for calibrators. The SLMs shall be field-calibrated before and after monitoring using an acoustic calibrator.
78. The SLM shall be positioned such that the microphone is located 1.5m above ground level in free-field conditions (at least 3.5m from the nearest vertical reflecting surface), at all receptors. A note of the prevailing weather conditions shall be made at the time of the measurements.

11.2. Vibration Monitoring

79. It is not anticipated that vibration monitoring will be required during the normal course of construction works. Vibration monitoring would only be adopted upon receiving a complaint or a specific directive from MSDC.
80. Where required vibration monitoring instrumentation will be deployed as close to the sensitive buildings as possible.
81. The instrumentation will be installed, operated and maintained by suitable qualified personnel. Vibration levels shall be measured using instrumentation calibrated to a traceable standard by a UKAS-accredited laboratory according with BS 5228- 2:2009.

12. REPORTING

12.1. Noise Report

82. On completion of each noise survey a report shall be prepared in a format suitable submission to MSDC. The report shall be submitted within seven working days of the scheduled date.
83. The report shall contain at least:
- the results of the noise survey;

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

12.2. Vibration Report

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

85. The report shall contain at least:

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

13. NOISE AND VIBRATION ENVIRONMENTAL INCIDENT

86. The following situations represent potential noise and vibration environmental incidents and as such will be subject to the relevant controls, including review of control measures to ensure that BPM are being utilised:

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

14. NON-COMPLIANCE WITH NOISE LIMITS

87. If the noise criteria levels set out Section 8 are exceeded during the noise and vibration surveys as a result of construction works or a complaint is received by the contractor, EATL or MSDC, from a local resident, an investigation shall be instigated by the Contractor to identify the cause of the noncompliance. In the event that the contractor or EATL receives the complaint they shall notify MSDC's EHO within 48 hours.

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

89. Where noise or vibration monitoring is required this will be undertaken as soon as possible, in accordance with the methodology set out in Section 11.1. Following the monitoring a report shall be prepared and submitted to MSDC within 5 days. Following the report, if required noise mitigation measures will be agreed with MSDC and implemented. In the event that a further complaint is made further monitoring may be undertaken in agreement with MSDC.

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

15. TRAINING

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

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

- the proper use and maintenance of tools and equipment;

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

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

16. REFERENCES

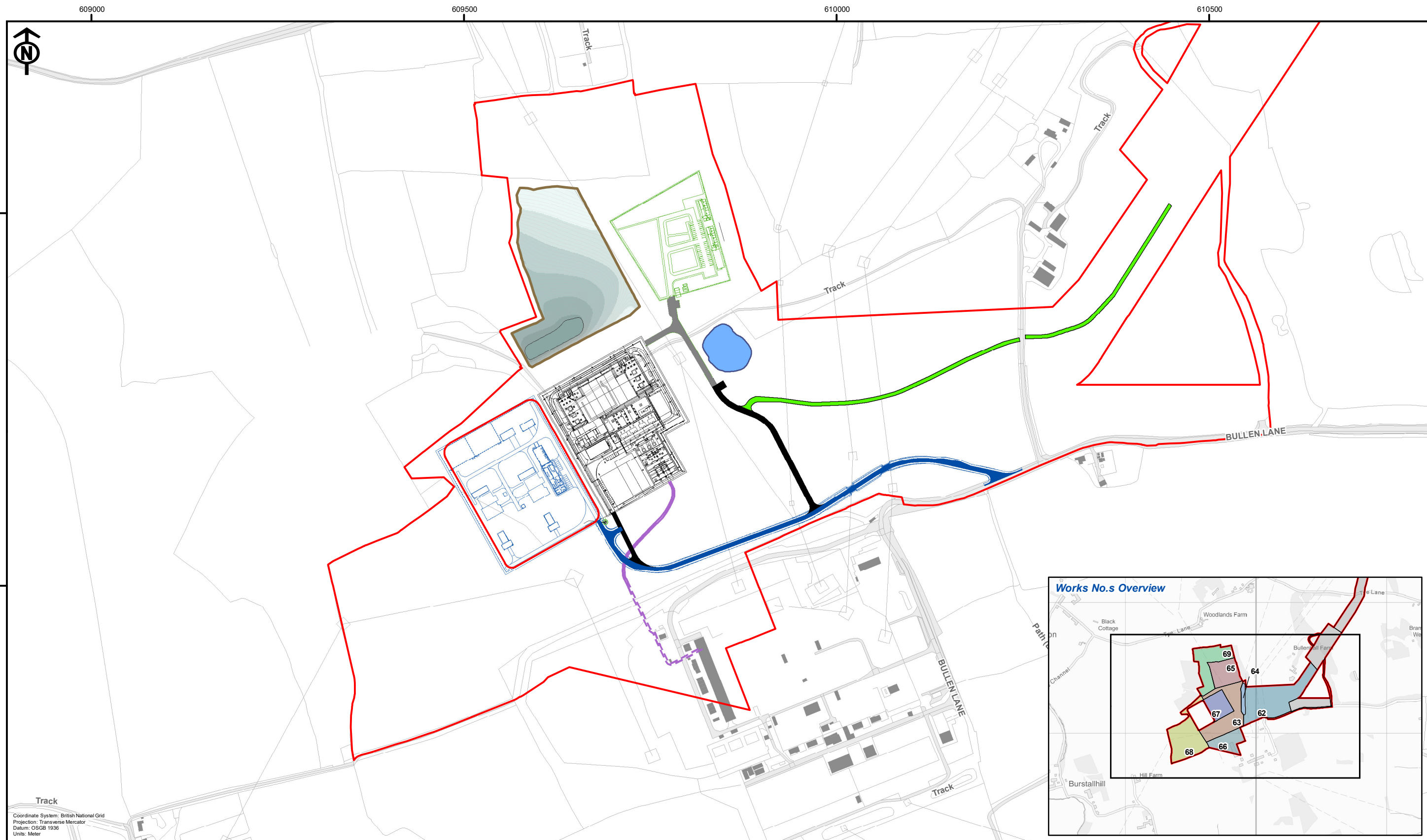
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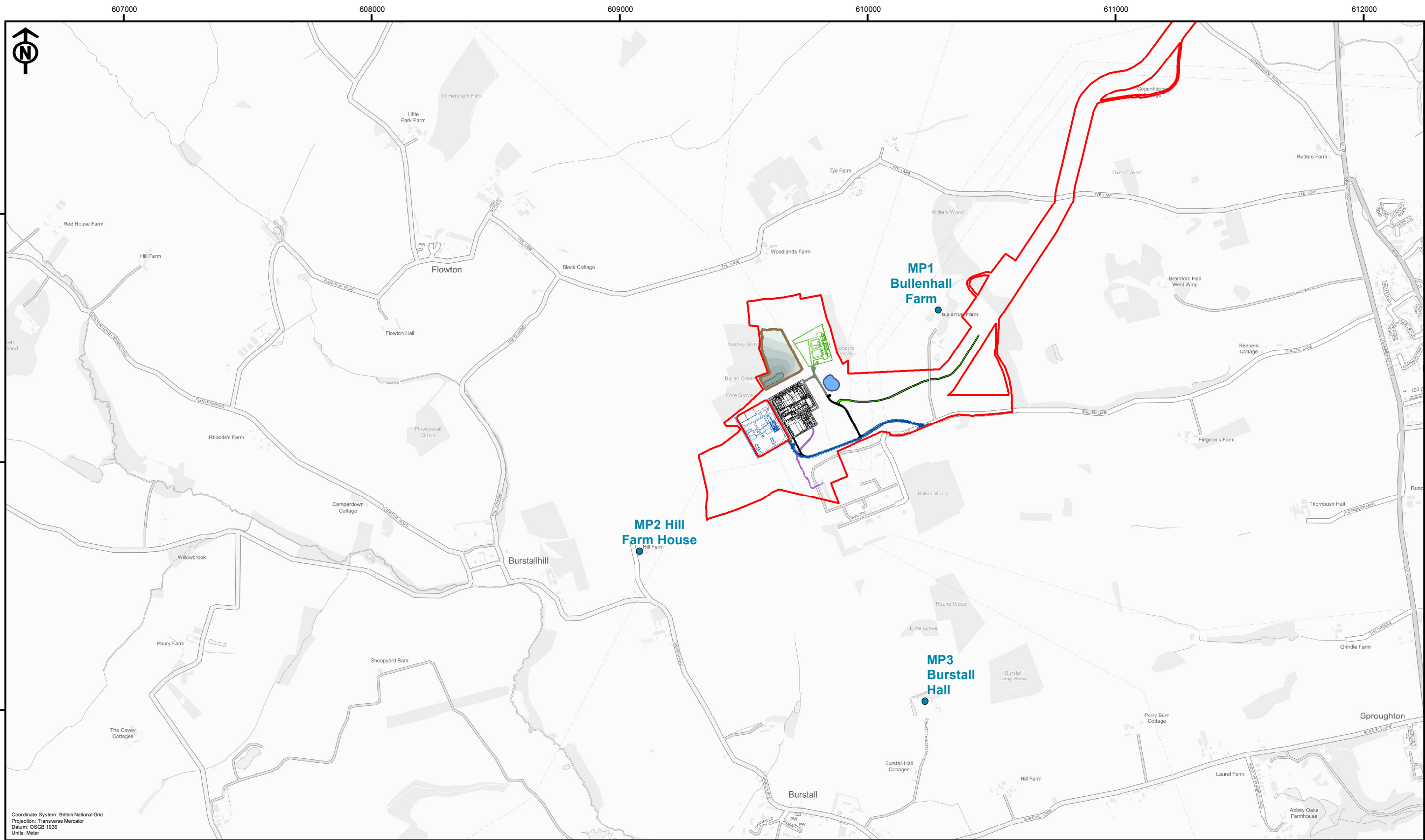
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<div><div></div>EA THREE DCO Corridor</div> <div><div></div>EA THREE Onshore Converter Station Layout Detail</div> <div><div></div>EA THREE Onshore Converter Station Temporary Site Facilities Detail</div>	<div><div></div>EA THREE Converter Substation to National Grid Substation Cable Route</div> <div><div></div>400kV AC Cable - Open Cut Section</div> <div><div></div>400kV AC Cable - Ducted Section</div>	<div><div></div>EA THREE Onshore Converter Station Access Roads</div> <div><div></div>Permanent</div> <div><div></div>Temporary</div>	<div><div></div>EA THREE Cable Access Road</div> <div><div></div>Haul Road</div> <div><div></div>EA THREE Onshore Converter Station SUDs Pond</div> <div><div></div>EA THREE Area to be Reprofiling</div>	<div><div></div>EA ONE Onshore Converter Station Access Road</div>	<div><div></div>Works No.s</div> <div><div></div>62</div> <div><div></div>63</div> <div><div></div>64</div> <div><div></div>65</div> <div><div></div>66</div> <div><div></div>67</div> <div><div></div>68</div> <div><div></div>69</div>
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					<div>Original A3 Plot Scale 1:5,000</div> <div><div>0100200Metres</div></div> <div>© Crown copyright. All rights reserved. 2021 Licence number 0100031673. © British Crown and SeaZone Solutions Limited. All rights reserved. Products Licence No. 082010.001. This product has been derived in part from material obtained from the UK Hydrographic Office with the permission of the Controller of Her Majesty's Stationery Office and the UK Hydrographic Office (www.ukho.gov.uk). NOT TO BE USED FOR NAVIGATION.</div>	<div>Onshore Converter Station Stage</div> <div>Figure 1: Site Context Plan</div>	Drg No	05356.00006.12.0001.1 ONCS Site Context Plan	
	B	04/04/2022	PW	Second Issue		Rev	2		
	A	31/03/2022	JRS	First Issue		Date	04/04/2022		
	Rev	Date	By	Comment		Layout	N/A		



EA THREE DCO Corridor

EA THREE Onshore Converter Station Layout Detail

EA THREE Onshore Converter Station Temporary Site Facilities Detail

EA THREE Converter Substation to National Grid Substation Cable Route

400kV AC Cable - Open Cut Section

400kV AC Cable - Ducted Section

EA THREE Onshore Converter Station Access Roads

Permanent

Temporary

EA THREE Cable Access Road

Haul Road

EA THREE Area to be Reprofiled

EA THREE Onshore Converter Station SUDs Pond

EA ONE Onshore Converter Station Access Road

Monitoring Point Locations

A	07/04/2022	PW	First Issue
Rev	Date	By	Comment

Original A3 Plot Scale 1:15,000

0 300 600 Metres

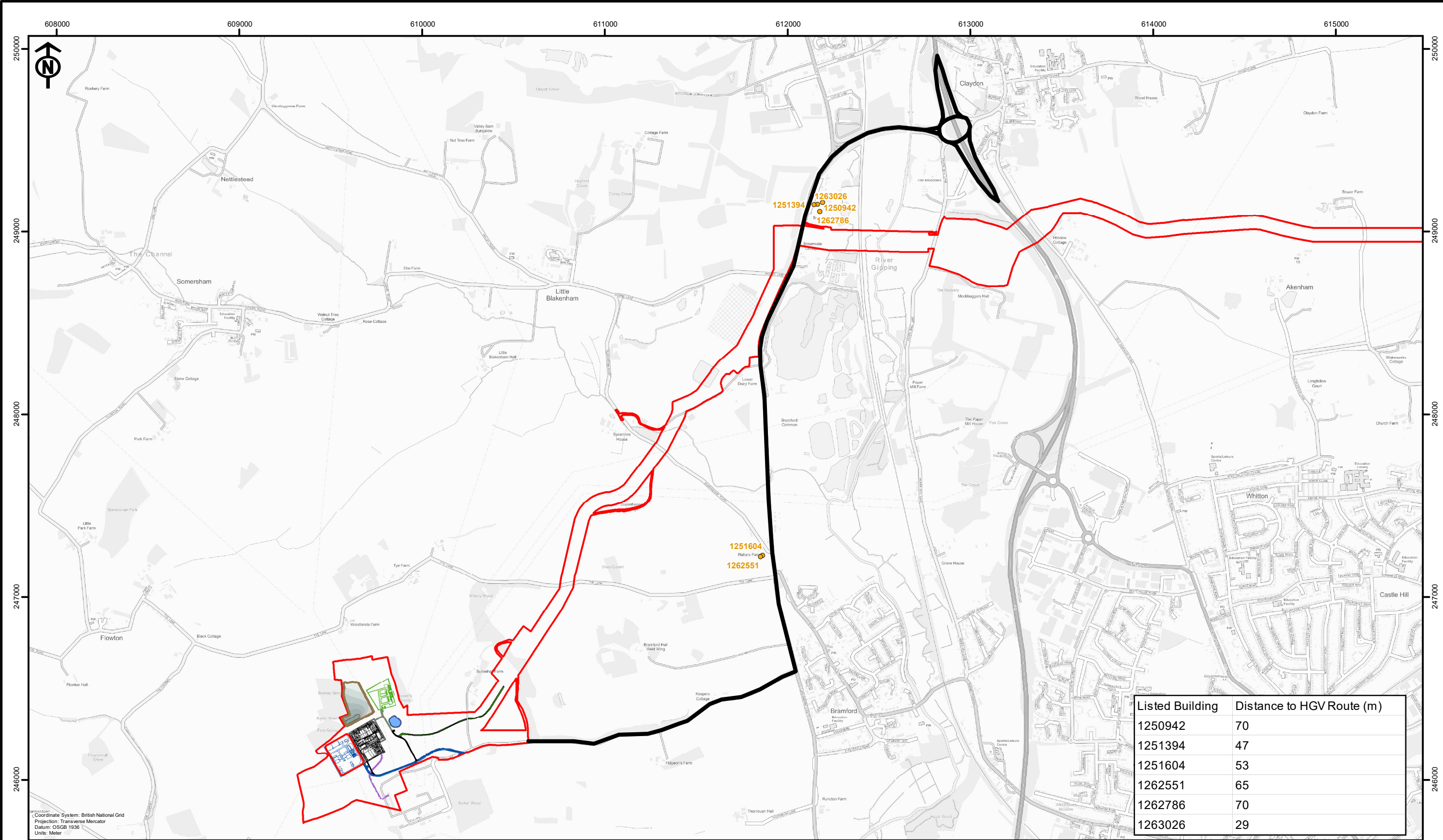
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Onshore Converter Station Stage

Figure 2: Construction Noise Sensitive Receptors

Drg No	05356.00006.12.00055.0 Sensitive Receptors NMP
Rev	1
Date	07/04/2022
Layout	N/A

Document Path: P:\05356 - GoBe Consultants Ltd\00006 East Anglia Three\Tech\GIS\Drawings\EA3\Onshore Substation\Doc Ref EA3-GRD-CON-PLN-IBR-000113\05356.00006.12.00055.3 Sensitive Receptors Construction.mxd



EA THREE DCO Corridor

EA THREE Onshore Converter Station Layout Detail

EA THREE Onshore Converter Station Temporary Site Facilities Detail

EA THREE Converter Substation to National Grid Substation Cable Route

400kV AC Cable - Open Cut Section

400kV AC Cable - Ducted Section

EA THREE Onshore Converter Station Access Roads

Permanent

Temporary

EA THREE Cable Access Road

Haul Road

EA THREE Area to be Reprofled

EA THREE Onshore Converter Station SUDs Pond

EA ONE Onshore Converter Station Access Road

HGV Route to A14

Listed Buildings within 100m of HGV Route

Grade II Listed Building

Note: There are no Archaeological Sites within 100m of the Designated Construction HGV Route

A	07/04/2022	PW	First Issue
Rev	Date	By	Comment

Original A3 Plot Scale 1:20,000

0 380 760 Metres

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Onshore Converter Station Stage

Figure 3: Archaeological Sites and Listed Buildings Within 100m of the Designated Construction HGV Route

Drg No	05356.00006.12.00056.0 HGV Route
Rev	1
Date	07/04/2022
Layout	N/A

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