Norfolk Boreas Offshore Wind Farm

Appendix 20.1

Flood Risk Assessment

Environmental Statement

Volume 3

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Glossary of Acronyms

AEP	Annual Exceedance Probability
AStGWF	Areas Susceptible to Groundwater Flooding
BGS	British Geological Survey
CDA	Critical Drainage Areas
CFMP	Catchment Flood Management Plan
CoCP	Code of Construction Practice
DECC	Department of Energy and Climate Change
FRA	Flood Risk Assessment
HDD	Horizontal Directional Drill
IDB	Internal Drainage Board
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
mAOD	Metres Above Ordnance Datum
NPPF	National Planning Policy Framework
NPS	National Policy Statement
PEIR	Preliminary Environmental Impact Report
PFRA	Preliminary Flood Risk Assessment
PPG	Planning Policy Guidance
SAC	Special Area of Conservation
SFRA	Strategic Flood Risk Assessment
SMP	Shoreline Management Plan
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems

Glossary of Terminology

Cable pulling	Installation of cables within pre-installed ducts from jointing pits located along the onshore cable route.
Ducts	A duct is a length of underground piping, which is used to house electrical and communication cables.
Jointing pit	Underground structures constructed at regular intervals along the onshore cable route to join sections of cable and facilitate installation of the cables into the buried ducts
Landfall	Where the offshore cables come ashore at Happisburgh South.
Mobilisation area	Areas approx. 100 x 100m used as access points to the running track for duct installation. Required to store equipment and provide welfare facilities. Located adjacent to the onshore cable route, accessible from local highways network suitable for the delivery of heavy and oversized materials and equipment.
National Grid substation extension	The permanent footprint of the National Grid substation extension.

Necton National Grid substation	The grid connection location for Norfolk Boreas and Norfolk Vanguard.
Onshore 400kV cable route	Buried high-voltage cables linking the onshore project substation to the Necton National Grid substation.
Onshore cable route	The up to 35m working width within a 45m wide corridor which will contain the buried export cables as well as the temporary running track, topsoil storage and excavated material during construction.
Onshore cables	The cables which take power and communications from landfall to the onshore project substation.
Onshore project area	The area of the onshore infrastructure (landfall, onshore cable route, accesses, trenchless crossing zones and mobilisation areas; onshore project substation and extension to the Necton National Grid substation and overhead line modifications).
Onshore project substation	A compound containing electrical equipment to enable connection to the National Grid. The substation will convert the exported power from HVDC to HVAC, to 400kV (grid voltage). This also contains equipment to help maintain stable grid voltage.
Running track	The track along the onshore cable route which the construction traffic would use to access workfronts.
The project	Norfolk Boreas Wind Farm including the onshore and offshore infrastructure.
Transition pit	Underground structures that house the joints between the offshore export cables and the onshore cables.
Workfront	A length of onshore cable route within which duct installation works will occur, approximately 150m.

1 Introduction

1.1 Background

1. This Flood Risk Assessment (FRA) has been prepared to accompany the Norfolk Boreas Environmental Statement (ES) and is included as Appendix 20.1.

2. The overall aim of this FRA is to provide sufficient justification to regulators and other stakeholders that the Norfolk Boreas Offshore Wind Farm project (herein the 'project') is appropriate and in line with planning and national policy requirements regarding flood risk.

3. The purpose of this FRA is:

   - To provide information required to support the ES in terms of flooding, supported by the application of the Sequential and, where appropriate, the Exception Test;
   - To establish whether the project is likely to be affected by current or future flooding from any source and whether it will increase flood risk elsewhere;
   - To inform potential mitigation options; and
   - To provide recommendations on potential measures required to reduce flood risk, if applicable.

4. As described in Chapter 5 Project Description, Norfolk Boreas is the sister project to Norfolk Vanguard. Vattenfall Wind Power Limited (the parent company of Norfolk Boreas Limited) is developing the two projects in tandem and is planning to co-locate the export infrastructure for both projects in order to minimise overall impacts. However, there is a possibility that Norfolk Vanguard would not be constructed. In order for Norfolk Boreas to stand up as an independent project, this scenario must be provided for within the Norfolk Boreas DCO.

5. The FRA has therefore been undertaken using the following two alternative scenarios:

   - **Scenario 1** – Norfolk Vanguard proceeds to construction and installs ducts and other shared enabling works for Norfolk Boreas.
   - **Scenario 2** – Norfolk Vanguard does not proceed to construction and Norfolk Boreas proceeds alone. Norfolk Boreas undertakes all works required as an independent project

6. For further details on the two scenarios please refer to Chapter 5 Project Description.

1.2 Approach and Method

7. This FRA has been prepared in accordance with EN-1 Overarching National Policy Statement (NPS) for Energy, National Planning Policy Framework (NPPF), Planning Practice Guidance (PPG) for Flood Risk and Coastal Change (Department of Energy and Climate Change, 2014), and the Environment Agency's Climate Change Allowance guidance (Environment Agency, 2016).

8. The Climate Change Allowance guidance sets out the Environment Agency's recommended climate change allowances for development when considering flood risk and coastal change for planning purposes. The principal aim of these policies and guidance documents is to avoid inappropriate development in areas at risk of flooding and, wherever possible, to direct development away from areas at highest flood risk.

9. The Environment Agency Product 4 and 8 data packages[1] were requested to support the FRA for the sister project, Norfolk Vanguard. Product 4 data was provided at key locations related to strategic watercourse crossings and the landfall in June 2017. Data locations can be seen in Figure 20.1.1 in Annex 1. Further Product 4 data related to the onshore project substation and the National Grid substation extension was provided by the Environment Agency in April 2018. No Product 8 data has been provided, and it is confirmed through consultation with the Environment Agency that no breach analysis has been undertaken within, or in proximity to, the onshore project area. This information has not been updated since it was received for Norfolk Vanguard, and has therefore been used to support this FRA for Norfolk Boreas[2].

10. Due to the size and nature of the onshore project area, and the varying flood risk, the potential sources of flood risk are considered within the following key sections of this document:

- Section 4.1 – Landfall;
- Section 4.2 – Onshore cable route including access routes and mobilisation areas;
- Section 4.3 – Onshore project substation; and
- Section 4.4 – National Grid substation extension and overhead line modifications.

[1] Product 4: Detailed Flood Risk Assessment Map, including flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from our computer river models. Product 8: Flood Defence Breach Hazard Map including, maximum flood depth, maximum flood velocity, maximum flood hazard.
[2] The data supplied by the Environment Agency for Norfolk Vanguard covers the entire assessment area for Norfolk Boreas and is therefore the most up to date and complete source of data for Norfolk Boreas at the time of this FRA.

11. This FRA is structured to first give a high-level overview of the existing flood risk within the project area. It then highlights all relevant polices and guidance for FRAs, before evaluating the risk of flooding to each of the four elements as set out in the above paragraph.

12. The analysis of flood risk dictates the discussions within sections 5 to 8, which explores how the identified risks will be mitigated both during temporary construction works, and throughout the full design life of the project for both scenarios.

2 Baseline Environment

2.1 Existing surface water drainage system

13. The onshore project area will largely be located on rural, agricultural land where there are limited existing formal surface water drainage systems; however, there are a large number of agricultural land drains and ordinary watercourses, especially along the onshore cable route (see Chapter 21 Land Use and Agriculture for more information).

14. More formal surface water drainage systems may be present in locations where the onshore project area passes in proximity to settlements or highways. These are explored in more detail in section 48 (Definition of Flood Hazard).

15. The existing Necton National Grid substation has a formalised surface water drainage system; however, this will be incorporated into the National Grid substation extension as part of the drainage design and appropriate surface water attenuation and mitigation measures incorporated.

2.2 Geology and hydrogeology

16. The British Geological Survey (BGS) solid and superficial geology maps identify the bedrock underlying the onshore project area as Chalk to the west and Neogene and Quaternary Rocks to the east, overlain by superficial deposits of till (diamicton), glacial sand and gravel, clay, silt and sand alluvium, and Crag Group (sand and gravel) throughout.

17. Regionally, the principal groundwater body underlying the majority of the onshore project area is the Broadland Rivers Chalk and Crag. The chalk bedrock is designated as a Principal Aquifer. These are layers of rock that have high intergranular and/or fracture permeability meaning they usually provide a high level of water storage. A number of Source Protection Zones (SPZs) are identified within the onshore project area, with both inner and outer zones of the SPZ areas extending across the eastern section of the onshore cable route. The superficial deposits within the area are

predominantly classified as secondary aquifers, deemed to be formed of permeable layers capable of supporting local water supplies.

18. There are small sections of the onshore project area close to the coast, north of North Walsham underlain by the North Norfolk Chalk groundwater body; and to the far west of the onshore project area that are underlain by the North Norfolk Chalk and North West Norfolk Chalk groundwater bodies.

2.3 Surface hydrology

19. The onshore project area is located within three surface water hydrological catchments (Figure 20.2 Chapter 20 Water Resources and Flood Risk):

- The River Bure and several of its tributaries would be crossed by the onshore cable route. The river rises near Briston, from where it flows in an easterly direction until it reaches Aylsham. From here, it continues to flow to the south east until it enters the sea at Great Yarmouth. The downstream reaches of the river include a wide range of wetland features, including Hoveton Great Broad and Marshes, Woodbastwick Fens and Marshes, Bure Marshes and the Norfolk Broads. The two most significant tributaries of the Bure are the King's Beck which rises in Roughton and joins the River Bure in Buxton, and the North Walsham and Dilham Canal (formerly the River Ant), which rises in Antingham and joins the Bure at Horning.
- The River Wensum and several of its tributaries would be crossed by the onshore cable route. The river rises near Whissonsett, from where it flows north towards Fakenham before continuing in a broadly south easterly direction towards Norwich. The River Wensum is designated as a Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI). Significant tributaries of the River Wensum include Wendling Beck and the Blackwater Drain, rising west and east of the Wensum respectively.
- The River Wissey, the headwaters of which are close to the grid connection at the Necton National Grid substation and the onshore project substation. The Wissey rises to the east of Bradenham and drains in a westerly direction towards Necton before eventually joining the River Great Ouse at Denver Sluice, near Downham Market.

20. All three of the above surface water hydrological catchments will be considered during the assessment of both Scenario 1 and Scenario 2.

3 Policy, Guidance and Consultation

3.1 National Planning Policy Framework (NPPF)

21. The NPPF PPG (Planning Practice Guidance) for Flood Risk and Coastal Change (Department of Energy and Climate Change (DECC), 2014) and Climate Change Allowance Guidance (Environment Agency, 2016) provide direction on how flood risk should be considered at all stages of the planning and development process. The planning system should ensure that new development is safe and not exposed unnecessarily to the risks associated with flooding. This FRA sets out the planning and wider context within which the project needs to be considered along with the flood risk to the onshore project area under each scenario.

3.2 Probability of Flooding – Flood Zones

22. Table 3.1 outlines the definitions of each flood zone and associated probability, taken from Table 1 of the NPPF PPG (DECC, 2014). The NPPF through the application of the Sequential Test aims to steer development towards areas at lowest risk of flooding (Flood Zone 1) and away from medium and high flood risk areas (Flood Zones 2 and 3).

Table 3.1 Summary of Flood Zone Definitions

Flood zone	Probability of flooding	Return periods
1	Low	Land having a less than 1 in 1,000 annual probability of river or sea flooding.
2	Medium	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
3a	High	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
3b	High – Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

23. Flood Zones are informed by the extent of the modelling undertaken by the Environment Agency. This includes all designated Main Rivers. Some of the larger ordinary watercourses can also be included in the modelling and therefore are included within the extent of the Flood Zone datasets.

24. Any watercourse that is not classified as a Main River is referred to as an ordinary watercourse. This covers any streams, drains, ditches and passages through which water flows that do not form the network of main rivers.

25. This means that small agricultural drainage ditches, often only seasonally wet, are also categorised as ordinary watercourses. Whilst acknowledged in terms of flood risk, their potential impacts are discussed within the surface water flooding sections throughout this document.

3.3 Local Authorities

26. The onshore project area is located within the authority area of Norfolk County Council. Three District Councils cover the development area:

- Breckland Council;
- Broadland District Council; and
- North Norfolk District Council.

27. Norfolk County Council is the Lead Local Flood Authority (LLFA) covering the onshore project area. Under the Flood and Water Management Act (2010) LLFAs are responsible for managing flooding from surface water, groundwater and ordinary watercourses. Among other responsibilities they are required to deliver a strategy for local flood risk management in their areas, to investigate flooding and to maintain a register of flood risk assets.

3.4 Preliminary Flood Risk Assessment

28. The most recent Preliminary Flood Risk Assessment (PFRA) for the county was produced by Norfolk County Council in July 2011 (Norfolk County Council, 2011).

29. The PFRA provides a high level overview of the potential risk of flooding from local sources and identifies areas at flood risk which may require more detailed studies. The PFRA is used to inform the Local Flood Risk Management Strategy.

3.5 Strategic Flood Risk Assessment

30. Level 1 Strategic Flood Risk Assessments (SFRA) were produced for North Norfolk District Council (North Norfolk District Council, 2017) and Broadland District Council (Greater Norwich Partnership, 2017) in consortium with other Norfolk Local Planning Authorities in 2017.

31. An updated SFRA was produced in 2017 for Breckland Council (Breckland Council, 2017) entitled Breckland District Council Level 1 Strategic Flood Risk Assessment Update.

32. The SFRAs are high level strategic documents carried out by local planning authorities to assess the risk to an area from flooding, at present and into the future, taking into consideration the impacts of climate change and to assess the impact that land use changes and development will have on flood risk. The SFRA informs the Local Plan for development.

3.6 Local Flood Risk Management Strategy (LFRMS)

33. Norfolk County Council produced the Norfolk Local Flood Risk Management Strategy (LFRMS) in 2015 (Norfolk County Council, 2015), which outlines the aims and objectives of the Council as the LLFA and provides policies based on these aims.

34. Critical Drainage Areas (CDAs) are defined in the Town and Country Planning (General Development Procedure) (Amendment) (No. 2) (England) Order 2006, as 'an area within Flood Zone 1 which has critical drainage problems'. Consideration of CDAs is necessary to inform key flood risk priorities. The LFRMS did not identify any locations within the onshore project area that are designated as CDAs.

3.7 Catchment Flood Management Plan (CFMP)

35. Catchment Flood Management Plans (CFMPs) consider all types of inland flooding including from rivers, groundwater, surface water and tidal flooding. Flooding directly from the sea (coastal flooding) is covered in Shoreline Management Plans (SMPs), which are addressed later in this FRA. CFMPs consider the likely impacts of climate change, the effects of how we manage the land and how areas can be developed sustainably.

36. The onshore project area is covered by three CFMPs:

- North Norfolk CFMP (Environment Agency, 2009a);
- Broadland Rivers CFMP (Environment Agency, 2009b); and
- Great Ouse CFMP (Environment Agency, 2011).

37. The Broadland Rivers CFMP covers the majority of the onshore project area. The CFMP identifies that the main sources of flood risk in the area are river flooding from the River Bure, tidal flooding, tide locking, failure of pumping stations and breaching of embankments. The North Norfolk CFMP and Great Ouse CFMP do not identify any of the onshore project area to be at significant risk of flooding from any sources.

3.8 Shoreline Management Plan (SMP)

38. Shoreline Management Plans (SMPs) are non-statutory plans for coastal defence management planning. They aim to identify the best ways to manage flood and erosion risk and develop an 'intent of management' for the shoreline.

39. The onshore project area is covered within SMP6; Kelling Hard to Lowestoft (Aecom, 2012). Specifically, Happisburgh is located within Policy Unit 6.12: Ostend to Eccles.

40. A review of the SMP found that the landfall is to the south of the most active length of coastline from East of Cromer extending to Happisburgh. The erosion in this section is necessary to allow beaches to build and help avoid accelerated erosion of the shoreline both within the section and further along the coast. As such, Policy Unit 6.12 outlines a plan of managed coastal retreat. Indicative erosion zones provided within the SMP show this will not affect the landfall compound.

41. Appendix 4.5 of Chapter 4 Site Selection and Assessment of Alternatives provides a study on coastal erosion in the area and this has informed the site selection and design of the landfall works.

3.9 Flood Risk Stakeholders and Consultation

3.9.1 Key flood risk stakeholders

42. The onshore project area crosses multiple channels that are managed by the Norfolk Rivers Internal Drainage Board (IDB).

43. The Environment Agency is also considered a key flood risk stakeholder in this project, due to their management of the Main Rivers that the onshore project area will cross.

44. Other stakeholders and consultees include Norfolk County Council and other IDBs within the Water Management Alliance as well as key communities.

45. Any works, either temporary or permanent, which will change the flow of water along a watercourse or require the erection of a culvert, bridge or modification to the channel require consent from the relevant authorities. Upon identification of all Main Rivers and ordinary watercourses to be crossed, application consents shall be made to the appropriate authority, including the Environment Agency, Norfolk County Council and the IDB.

3.9.2 Consultation

46. Statutory consultees were consulted in relation to the project with key responses received from stakeholders such as, but not limited to, the Environment Agency, Norfolk County Council and Norfolk Rivers IDB.

47. Comments relevant to flood risk centred around the following themes:

- Local sources of flooding not accounted for by the Environment Agency Flood Map for Planning including but not limited to water table level, poorly draining soils, local topography;

- Historical flooding of Necton, Ivy Todd and West End;
- Removal and / or alteration of existing land drains; and
- Increased surface water runoff from the onshore project substation.

48. This FRA aims to consider all the stakeholder comments in terms of the impact of the project on potential flood risk and drainage issues. Consultation responses and how they have been addressed are provided in Chapter 20 Water Resources and Flood Risk, Chapter 7 Technical Consultation and the Consultation Report (document reference 5.1).

4 Definition of Flood Hazard

49. This chapter explores the risk of flooding to each of the four key project elements (landfall, onshore cable route, onshore project substation and National Grid substation extension), as outlined in section 1.2. Where flood risk is identified, appropriate mitigation methods are discussed within section 8.

4.1 Landfall

4.1.1 Overview of Proposed Activities

50. The landfall is situated to the south of Happisburgh and is comprised of a stretch of coastline approximately 1.5km from Beach Road in the north to Cart Gap Road in the south. The landfall (the area where the location for the drilling compound would be located) extends inland between 0.2 and 0.7km. The landfall site consists of agricultural land.

51. Both Scenario 1 and Scenario 2 will require construction works to be carried out at the landfall. Therefore, all assessments of the flood risk to the landfall, presented in the subsequent sections, are considered to apply equally to both Scenario 1 and Scenario 2.

4.1.2 Historic Flooding

52. The Product 4 data package provided by the Environment Agency in June 2017 shows the landfall (marked as Site 7 on Figure 20.1.1 in Annex 1) to have been unaffected by historical tidal or fluvial flood events.

4.1.3 Flooding from Rivers

53. The landfall is located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning (Environment Agency, undated) (Figure 20.1.2 in Annex 1) and confirmed by the Product 4 data package obtained in June 2017.

54. The placement of the landfall within Flood Zone 1 ensures that a sequential, risk based approach has been applied in determining this location. The sequential

approach, which in decision-making requires the application of the Sequential Test, aims to locate any development within the lowest flood risk areas possible which helps ensure that development can be safely and sustainably delivered.

55. The North Norfolk SFRA (North Norfolk District Council, 2017) focussed on fluvial flood risk in existing urban areas only. No analysis of potential flood risk from rivers was included for the landfall. Therefore, the landfall is at low risk of flooding from fluvial sources.

4.1.4 Flooding from Ordinary Watercourses

56. A review of the Ordnance Survey mapping identifies that the landfall does not intersect and is not located within the vicinity of any ordinary watercourses.

57. The landfall is located outside of the Norfolk Rivers IDB catchment boundary. However, it is noted that small ditches may drain into the adjacent Broads IDB catchment, which begins approximately 750m to the south of the landfall (Figure 20.4 Chapter 20 Water Resources and Flood Risk).

58. Given the absence of ordinary watercourses at the landfall site, there is a low risk of flooding from ordinary watercourses.

4.1.5 Flooding from the Sea

59. The landfall is located within Flood Zone 1, as defined by the Environment Agency online Flood Map for Planning (Environment Agency, undated) (Figure 20.1.2 in Annex 1) and confirmed by the Product 4 data package obtained in June 2017.

60. The Environment Agency Product 4 data package also identified the presence of the Happisburgh to Winterton Concrete Sea Wall, immediately to the south of the landfall, which has a crest level of 7.5mAOD and provides a 1 in 1,000 year standard of protection. However, these formal defences do not extend northward within the landfall.

61. A review of Light Detection and Ranging (LiDAR) data within the landfall identified the typical ground elevation along the top of beach line as varying between approximately 6mAOD at the minimum elevation, and over 12mAOD at the highest elevation.

62. The North Norfolk SFRA (North Norfolk District Council, 2017) contains limited information on the risk of tidal flooding. No analysis of potential flood risk from tidal sources was included for the landfall.

63. Still water levels have been provided for a number of offshore nodes from the Extreme Sea Levels Flood Risk Study (2008), the most relevant of which shows maximum water levels of 3.81mAOD during the 1 in 200 year (0.5% AEP) event and

4.22mAOD during the extreme 1 in 1,000 year (0.1% AEP) event. Based on the ground elevations along the top of beach line within and adjacent to the landfall and the maximum still water levels during an extreme event, the site is afforded considerable protection on account of the natural ground elevations. This does not account for wave action during an extreme event.

64. As discussed in section 3.8, the landfall compound falls outside of the indicative erosion zones. Therefore, it is likely that predicted coastal erosion will not affect the landfall in terms of increased flood risk. As such, the landfall is considered to be at low risk of flooding from tidal sources.

4.1.6 Flooding from Groundwater

65. The landfall is located over bedrock designated as a Principal Aquifer, typically providing a high level of water storage. Further information is provided in section 2.2.

66. The North Norfolk SFRA (North Norfolk District Council, 2017) contains limited information on the risk of flooding from groundwater sources. Isolated low-lying valley areas may be subject to local groundwater flooding; however, details of such areas are unknown. As the landfall includes below ground works there is a risk that groundwater flooding could affect the project, primarily during construction; however, the effect the landfall shall have on groundwater flows once operational is likely to be minimal due to the relatively shallow depth of the construction. As such, the landfall is at low risk of flooding from groundwater flooding.

4.1.7 Flooding from Surface Water

67. The Environment Agency's Long Term Flood Risk Information map (Environment Agency, undated) (Figure 20.1.3 in Annex 1) shows the landfall to be located in an area predominantly at very low risk of surface water flooding, i.e. primarily outside the extent of the 1 in 1,000 year surface water flooding event.

68. There are small areas of low to medium flood risk from surface water along the western boundary of the landfall. A review of the aerial imagery indicates that the low to medium flood risk areas appear to be associated with existing agricultural land drains or ditches. As such, the landfall is at low risk of flooding from surface water.

4.1.8 Flooding from Sewers

69. The North Norfolk SFRA (North Norfolk District Council, 2017) did not report any flooding from sewers within the landfall. The landfall is located within existing agricultural land and it is likely that there is no foul sewer network within proximity of this location. As such, there is a low risk of flooding from sewer sources.

4.1.9 Flooding from Reservoirs

70. The Environment Agency's Long Term Flood Risk Information map (Environment Agency, undated) shows the landfall is located outside the maximum extent of flooding from reservoirs. As such, there is a low risk of flooding from reservoirs.

4.1.10 Flooding from Canals and Other Artificial Sources

71. A review of the Norfolk Rivers and Broads IDB area maps indicates there are no IDB pumping stations in proximity to the landfall, relating to surface water drainage. As such, there is currently no risk of flooding from failure of a pumping station.

72. The landfall is located away from canals and other artificial sources. As such, there is no risk of flooding from these sources.

4.1.11 Summary of Flooding Sources

73. The landfall is located within Flood Zone 1, at low flood risk from fluvial or tidal sources. The landfall compound is sufficiently inland that the managed coastline retreat proposed for this area as outlined by the SMP6; Kelling Hard to Lowestoft (Aecom, 2012), will not affect the landfall in terms of flood risk from the sea.

74. There has been no history of flooding identified as part of this FRA for the immediate landfall; however, this does not mean that flooding has not occurred in the past.

75. The overall risk of flooding from all sources to the landfall is deemed to be low.

4.2 Onshore Cable Route and Associated Project Infrastructure

4.2.1 Overview of Proposed Activities

76. Under Scenario 1, the onshore cables ducts and associated works will have been installed by Norfolk Vanguard. As such construction activities in the River Bure and River Wensum catchments will be limited to installation of cables in the pre-installed ducts, the construction of joint pits (each with an area of 90m^2) and the reinstatement of limited areas of running track. Although construction activities for Scenario 1 will be relatively limited and temporary in nature (i.e. for the duration of the cable pulling activities only) in comparison with those required for Scenario 2, there is still the potential for them to be affected by flooding.

77. On this basis, the assessment of flood risk relating to the onshore cable route and associated project infrastructure has been considered for both Scenario 1 and Scenario 2.

4.2.1.1 Watercourse crossings (Scenario 1 and Scenario 2)

78. The onshore cable route crosses several 'Main Rivers' (as designated by the Environment Agency), a number of IDB channels, and a large number of ordinary watercourses (Figure 20.1.4 in Annex 1). These crossings are detailed in the Watercourse Crossing Schedule (Appendix 20.4).

79. Within this FRA, the definition of the flood hazard to the onshore cable route has been considered within each hydrological catchment (Figure 20.2 Chapter 20 Water Resources and Flood Risk). The number of watercourse crossings including 'Main Rivers', ordinary watercourse crossings, IDB crossings within each hydrological catchment have been assessed for both Scenario 1 and Scenario 2. The temporary watercourse crossings associated with Scenario 1 can be seen in Table 4.1 and the watercourse crossings associated with Scenario 2 can be seen in Table 4.2In addition, there is a network of smaller land drains or agricultural ditches, not easily identifiable from mapping and which may be only seasonally wet, likely to be crossed by the onshore cable route. Under Scenario 2 the presence of mobilisations areas and trenchless crossing compounds have also been assessed.

Table 4.1 Temporary watercourse crossings in surface water catchments (Scenario 1)

Catchment	Number of temporary crossings
River Bure	10
River Wensum	5
River Wissey	1

Table 4.2 The number of mobilisation areas and watercourses crossed by the onshore cable route (Scenario 2)

Catchment	Number of Mobilisation Areas	Number of Trenchless Crossing Compounds	Main River Crossings	Watercourse Crossings	IDB Crossings
River Bure	5	18	2	17	5
River Wensum	7	18	4	18	7
River Wissey	0	0	0	4	0

80. There is a watercourse crossing, relevant to Scenario 1 and Scenario 2, within the Wissey catchment which lies between the onshore project substation and the National Grid extension (Figure 20.2 Chapter 20 Water Resources and Flood Risk), which is considered within Section 4.3.

4.2.1.2 Mobilisation Areas (Scenario 2 only)

81. Mobilisation areas, required to store equipment and provide welfare facilities, will be present throughout duct installation along the onshore cable route. These areas will be hardstanding comprised of permeable gravel aggregate underlain by

geotextile or other suitable material to allow safe movement of vehicles and maintain required drainage.

82. Mobilisation areas will remain in place for the duration of the onshore duct installation activities, proposed as two years. Following installation of the ducts, the mobilisation areas will be removed and the land reinstated.

83. The mobilisation areas are primarily located within Flood Zone 1 (Figure 20.1.2 in Annex 1). Those located within proximity to Flood Zone 3 are associated with river crossings and are over 150m away from the Flood Zone 3 extent.

84. Environment Agency Product 4 data obtained in June 2017 and April 2018 confirms that the mobilisation areas in proximity to Flood Zone 3 are associated with river crossings. The Environment Agency has confirmed that there is no indication of historical flood events affecting the locations of the mobilisation areas.

4.2.1.3 Trenchless Crossing Compounds (Scenario 2 only)

85. Trenchless crossing compounds will be present for shorter durations than the mobilisation areas i.e. they are anticipated to be in place for weeks as opposed to months (see section 20.7.2 in Chapter 20 Water Resources and Flood Risk for details), as the onshore cable route is installed (via trenchless techniques e.g. HDD) under key watercourses and infrastructure. These compounds will be hardstanding comprised of permeable gravel aggregate underlain by geotextile or other suitable material to allow safe movement of vehicles and maintain required drainage.

86. Where possible, the compounds are located within Flood Zone 1. However, two are located within Flood Zone 2 and four within Flood Zone 3, due to the associated river crossings (Figure 20.1.2 in Annex 1). Two compounds are also at risk from surface water flood risk, due to proximity to the River Wensum.

87. The compounds are identified as being at medium / high risk of flooding due to proximity to the watercourses.

4.2.1.4 Access Routes (Scenario 1 and 2)

88. Access routes shall be used during the cable pulling phase of the project, as well as during operation to provide vehicular access. Access routes will either be aggregate running tracks or temporary track such as bog mats. The routes are split into the following two categories:

- Construction access routes: These will be temporary access routes used during cable pulling and removed following completion of the construction phase; and
- Operational access routes: These are rights of access over existing field access routes to allow continued vehicular access for required maintenance.

89. Under Scenario 2 a number of access routes will need to cross existing watercourses, with environmental permits and consents likely to be required for each crossing point. The methodology to be used for any temporary construction at crossing points over existing ditches and watercourses shall be agreed with the Environment Agency and relevant Local Authority and IDB as part of the Environmental Permitting (Amendment) Regulations 2018 process or as an Ordinary Watercourse Consent application.

90. The access route adjoining Swanton Road, Dereham may be at increased risk of surface water flooding. As discussed in section 4.2.3.7, the Breckland District Council SFRA (Breckland Council, 2017) identified that Swanton Road has previously been subject to surface water flooding. This risk will need to be considered during construction and mitigation measures will be included within the Code of Construction Practice (CoCP).

91. Access routes located within or near to Flood Zones 2 or 3 are at greatest risk of fluvial flooding. The locations of these routes are associated with river crossings and design of the access routes will replicate, wherever possible, the existing ground levels to limit the impact of flood risk into the future.

92. Additionally, there are three locations with increased flood risk where the permanent access routes are proposed to connect the wider road network to the onshore project substation related to the existing surface water flood extent (Figures 20.1.3b and 20.1.3c in in Annex 1).

4.2.2 River Bure Catchment (Scenario 1 and Scenario 2)

93. Within the River Bure catchment, the onshore cable route intersects two key crossing points; the River Bure and the North Walsham and Dilham Canal. There are a number of other watercourses including Mermaid Stream, King's Beck and East Ruston Stream that are crossed. In addition, there are a number of minor watercourses, land drains and ditches that are not named (Figure 20.4 Chapter 20 Water Resources and Flood Risk).

94. There are five IDB channels within the Bure catchment that are crossed. These include: BG1301 Hundred Stream, AG1216, Boundary Farm Spur (19a) and Low Level Drain - Colby to Suffield Hall (18). The other IDB channels are not named and therefore have not been listed individually.

4.2.2.1 Historic Flooding

95. The Product 4 data package provided by the Environment Agency (June 2017) shows that the onshore cable route does not intersect any locations within the Bure Catchment affected by a historic flood event.

4.2.2.2 Flooding from Rivers

96. The majority of the onshore cable route throughout the River Bure catchment is located within Flood Zone 1 as defined by the Environment Agency online Flood Map for Planning (Figure 20.1.2 in Annex 1) and confirmed by the Product 4 data package.

97. There are a number of locations at which the onshore cable route intersects areas of Flood Zone 2 and 3. No Flood Zones follow the onshore cable route in a linear fashion; rather, the onshore cable route intersects these increased areas of flood risk. These areas of increased flood risk are associated with the watercourse crossings as identified previously.

98. Environment Agency Product 4 data was obtained for the two key crossing points identified as Sites 5 and 6. The locations of these points can be viewed in Figure 20.1.1 in Annex 1 and details of the proposed crossing type shown in Figure 20.1.4 in Annex 1. A summary of the Product 4 data provided by the Environment Agency (June 2017) is provided in Table 4.3. Site 5 is located within the Broads River Bure model and Site 6 within the North Norfolk (Ant) model. Where multiple node points were provided for a Site within the onshore cable route the most upstream in-channel node within the boundary was used.

Table 4.3 Environment Agency Product 4 data summary (Bure catchment)

Site	Watercourse	Model	Node	Modelled Water Levels (mAOD)	
				1:100 (1% AEP)	1:1,000 (0.1% AEP)
5	River Bure	Broads River Bure Flood Risk Study (2014)	BURE_17903	11.57	11.75
6	North Walsham and Dilham Canal	North Norfolk (Ant) Flood Risk Study (2006)	ANT12000	13.25	14.38

99. The modelled water levels for extreme rainfall events relevant to the appropriate watercourse have been used when determining flood risk in the context of the location of any structures, including temporary infrastructure, along the onshore cable route and during the development of the detailed design.

4.2.2.3 Flooding from Ordinary Watercourses

100. As detailed in section 4.2.1.1, there are a number of smaller land drains or agricultural ditches, not easily identifiable from mapping and which may be only seasonally wet, which are likely to be crossed by the onshore cable route. However, these are seen to pose a minimal fluvial flood risk, and are more likely to affect the cable route from a surface water perspective during times of heavy or prolonged rainfall (section 4.2.2.6).

4.2.2.4 Flooding from the Sea

101. The majority of the onshore cable route is located away from the coast and as such the risk associated with tidal flooding is limited to the landfall and the extent of the onshore cable route that connects with it.

102. The Broadland Rivers CFMP (Environment Agency, 2009b) indicates that the areas along the onshore cable route are most at risk from fluvial flooding. As such, there is a low risk of flooding from tidal sources.

4.2.2.5 Flooding from Groundwater

103. The River Bure catchment is located over bedrock designated as a Principal Aquifer, usually providing a high level of water storage. Further information can be found in section 2.2.

104. Knowledge of the risk of flooding from groundwater in the Bure catchment is limited. The North Norfolk SFRA (North Norfolk District Council, 2017) contains limited information on the risk of flooding from groundwater sources.

105. The effect the onshore cable route shall have on groundwater flows both during construction and once operational is likely to be minimal should the cable duct be located at relatively shallow depths, in a minimally sized waterproof duct. Embedded mitigation measures related to the construction phase of the cable excavation, as set out in Chapter 19 Ground Conditions and Contamination, have been incorporated in the design to limit the impact of the onshore cable route on groundwater disturbance and to limit the impact on the hydraulic connectivity between groundwater and surface water. This would be applicable to the construction of the temporary joint pits in Scenario 1 and the wider construction activities in Scenario 2.

4.2.2.6 Flooding from Surface Water

106. The Environment Agency's Long Term Flood Risk Information map (Environment Agency, undated) (Figure 20.1.3 in Annex 1) indicates that surface water flooding within proximity of the onshore cable route in the Bure catchment is largely contained within watercourses and ditches. There are small areas at risk of flooding from surface water within topographically low-lying areas of the route.

107. The Norfolk LFRMS (Norfolk County Council, 2015) indicates that North Walsham and Aylsham are within the top 20 settlements most likely to be affected by surface water flooding. North Walsham and Aylsham at their nearest extents are approximately 0.2 and 1km respectively, south of the onshore cable route. There is no further information regarding the precise locations of the risk of surface flooding.

108. The North Norfolk SFRA (North Norfolk District Council, 2017) includes details of a small flood in 2013 at Whimpwell Street, caused due to low capacity systems being overwhelmed and exceeded in heavy rainfall. The precise location of the flooding

has not been identified, however the onshore cable route crosses Whimpwell Street approximately 0.5km from landfall.

109. Where trenchless techniques (e.g. Horizontal Directional Drill (HDD)) are proposed and the onshore cables will pass beneath watercourses in low-lying areas, the risk of flooding from surface water is low.

110. Existing small ordinary watercourses, such as localised agricultural / land drains running alongside and / or crossing through the onshore cable route have the potential to cause flooding to the onshore cable route, as well as there being a potential off-site impact as a result of the proposed works. A pre-construction Surface Water and Drainage plan will be developed, agreed with regulators and implemented to minimise water within the cable trench and other working areas and ensure ongoing drainage of surrounding land.

4.2.2.7 Flooding from Sewers

111. The majority of the onshore cable route in the Bure catchment is contained in rural, agricultural land and as such the risk of flooding from sewers is likely to be low in these areas.

112. The risk of flooding from sewer sources increases in areas where the onshore cable route passes through small urban areas such as Silvergate, and where it passes in proximity to larger urban areas such as Aylsham and North Walsham and / or as it crosses highway infrastructure.

4.2.2.8 Flooding from Reservoirs

113. The onshore cable route crosses a number of small areas shown to be within the maximum extent of flooding from reservoir sources. These extents are limited to locations within proximity of existing watercourses such as Blackwater Beck and the River Bure and other IDB managed drains. The flood risk from reservoirs whilst significant in consequence should it occur is unlikely due to the extensive legislation that governs the maintenance and operation of these structures.

4.2.2.9 Flooding from Canals and Other Artificial Sources

114. The onshore cable route crosses the North Walsham and Dilham Canal (Site 6 in the Environment Agency Product 4 data package), however the canal is designated as an Environment Agency Main River and forms part of the River Ant watercourse network. As a result, the risk of flooding from the canal is deemed to be fluvial in nature and has been described in section 4.2.2.2 above.

115. A review of the Norfolk Rivers IDB area maps indicates no pumping stations in proximity to the onshore cable route. As such, there is currently no risk of flooding from failure of a pumping station. Therefore, it is assumed there is no risk of flooding from these sources.

4.2.2.10 Summary of Flooding Sources

116. Based on the information presented above the onshore cable route, as part of Scenario 2 only, located within the Bure catchment is at low risk of flooding from all potential sources.

117. The majority of the onshore cable route within the Bure catchment is located within Flood Zone 1. Areas located within Flood Zones 2 and 3 are associated with watercourse crossings or topographically low-lying areas.

118. There is an increased risk of surface water flooding and flooding from sewers, as the onshore cable route passes in proximity to larger settlements in particular North Walsham and Aylsham.

119. In addition, there is a risk of surface water flooding affecting the onshore cable route in the vicinity of existing smaller ordinary watercourses such as agricultural land drains. A pre-construction Surface Water and Drainage Plan (SWDP) will be developed, agreed with regulators and implemented to minimise water within the cable trench and other working areas and ensure ongoing drainage of surrounding land. Design measures, including multiple interceptor ditches, will be implemented to limit the potential risk to the onshore cable route as a result of surface water flooding.

4.2.3 River Wensum Catchment (Scenario 1 and Scenario 2)

120. Within the River Wensum catchment, the onshore cable route crosses three Main Rivers at key crossing points; Wendling Beck, the River Wensum and Blackwater Drain. There are several other watercourses, land drains and agricultural ditches that are not named, but are crossed by the onshore cable route.

121. The onshore cable route also crosses seven IDB channels including MN 16 – Reepham, MN 25 – Bylaugh Meadows, MN 12 – Swanton Morley and MN26 – Pennyspot Farm. The other IDB channels are not named and therefore have not been listed individually.

4.2.3.1 Historic Flooding

122. The Environment Agency Product 4 data (June 2017) shows one record of historical flooding close to where the onshore cable route intersects the River Wensum; however, the mapped historic flood extent is outside the boundary of the onshore cable route. This was a fluvial event which occurred in 1993 along the River Wensum, to the north west of Elsing. Further details of this flood event have not been provided by the Environment Agency.

123. The Breckland Council SFRA (Mott MacDonald, 2008), confirms that the flood of October 1993 was fluvial flooding and confirms that 22 properties were affected around the River Wensum and Wendling Beck.

4.2.3.2 Flooding from Rivers

124. The majority of the onshore cable route in the River Wensum catchment is located in Flood Zone 1 as defined by the Environment Agency online Flood Map for Planning (Environment Agency, undated) (Figure 20.1.2 in Annex 1).

125. There are a number of locations at which the onshore cable route intersects areas of Flood Zone 2 and 3. These are associated with proposed watercourse crossings. There is one location, 1.4km north of Elsing, where the Flood Zone 3 extent runs parallel to the cable corridor for approximately 2km. At the nearest point, there is 0.1km between the onshore cable route and the maximum extent of Flood Zone 3.

126. Environment Agency Product 4 data has been obtained for four of the key crossing points within the Wensum catchment. Figure 20.1.1 in Annex 1 shows the locations of the Environment Agency data points associated with key crossing points and identified as Sites 1 to 4. Details of the proposed crossing type is shown in Figure 20.4, Chapter 20 Water Resources and Flood Risk.

127. Sites 1 to 4 are located within the Broads Upper Wensum Flood Model. A summary of the Product 4 data provided by the Environment Agency (June 2017) is shown in Table 4.4. Where multiple node points were provided for a Site within the onshore cable route boundary the most upstream in-channel node within the boundary was used.

Table 4.4 Environment Agency Product 4 data summary (Wensum catchment)

Site	Watercourse	Model	Node	Modelled Water Levels (mAOD)	
				1:100 (1% AEP)	1:1,000 (0.1% AEP)
1	Wendling Beck	Broads Upper Wensum Flood Risk Study (2009)	WEND1_13700	41.34	41.65
2			WEND1_8570	31.43	31.67
3	River Wensum		WENF2_36250u	18.04	18.34
4	(Unnamed)		WHIT1_5250	24.23	24.44

128. The modelled water levels for extreme rainfall events relevant to the appropriate watercourse have been used when determining flood risk in the context of the location of any structures, including temporary infrastructure, along the onshore cable route and during the development of the design.

129. The River Wensum Restoration Strategy (2009) developed by Natural England, Environment Agency and Water Management Alliance is a strategy to restore 70km of the River Wensum. The project aims in part to reconnect the floodplain and improve the retention of water, which was previously lost through over-widening

and straightening. It is believed that the rehabilitation of the Upper Wensum could potentially reduce flood risk in the urban areas downstream in the long term, including Lyng which is in proximity to the onshore cable route.

4.2.3.3 Flooding from Ordinary Watercourses

130. As detailed in section 4.2.1.1, there are a number of smaller land drains or agricultural ditches, not easily identifiable from mapping and which may be only seasonally wet, which are likely to be crossed by the onshore cable route. However, these are seen to pose a minimal fluvial flood risk, and are more likely to affect the cable route from a surface water perspective during times of heavy or prolonged rainfall (section 4.2.3.6).

4.2.3.4 Flooding from the Sea

131. The onshore cable route, passing through the River Wensum catchment is inland and located a minimum of 20km from the coast. As such there is anticipated to be no risk of coastal or tidal flooding to the onshore cable route through this length.

4.2.3.5 Flooding from Groundwater

132. The River Wensum catchment is located over bedrock designated as a Principal Aquifer, usually providing a high level of water storage. Further information can be found in section 2.3.

133. The Breckland District Council SFRA (Breckland Council, 2017) acknowledges that there is limited understanding of the risk of groundwater flooding in the district, however there have been some occurrences of flooding associated with high groundwater levels following significant rainfall in 2012.

134. The SFRA (Breckland Council, 2017) provides the Environment Agency Areas Susceptible to Groundwater Flooding (AStGWF) dataset, in the form of a local map. The map indicates that the onshore cable route is located within land shown to have an increased susceptibility to groundwater flooding, with a number of small 1km^2 areas showing a >=75% susceptibility to groundwater flooding.

135. The effect the onshore cable route shall have on groundwater flows both during construction and once operational is likely to be minimal, should the cable duct be located at relatively shallow depths, in a minimally sized waterproof duct. Embedded mitigation measures related to the construction phase of the onshore cable route, as set out in Chapter 19 Ground Conditions and Contamination, have been incorporated in the design to limit the impact of the onshore cable route on groundwater disturbance and to limit the impact on the hydraulic connectivity between groundwater and surface water. This would be applicable to the construction of the jointing pits in Scenario 1 and the wider construction activities in Scenario 2.

4.2.3.6 Flooding from Surface Water

136. Flooding from surface water along the onshore cable route (Figure 20.1.3 in Annex 1), as depicted by the Environment Agency's Long Term Flood Risk Information map (Environment Agency, undated) is largely contained within watercourses and ditches, with small areas shown to be at risk of flooding from this source within topographically low-lying areas of the route.

137. The Breckland District Council SFRA (Breckland Council, 2017) outlines two surface water flood events that occurred in proximity to the onshore cable route. These were at Swanton Road, Dereham and Toftwood, Dereham. There are no exact locations identified, therefore precise distances from the onshore cable route cannot be determined. As an estimation, Toftwood, Dereham is located approximately 3km to the south-east of the onshore cable route.

138. The onshore cable route passes under Swanton Road, Dereham and runs adjacent to it for approximately 0.75km. The exact location of the previous flood has not been identified, however information provided by Norfolk County Council (2013) would suggest that the flood is likely to have occurred at the southern end of the road and therefore away from the crossing point. At the furthest distance, Swanton Road is approximately 1.5km from the onshore cable route.

139. Dereham is listed as one of the top five settlements likely to be affected by surface water flooding in the Norfolk LFRMS (Norfolk County Council, 2015). Exact locations at increased risk of surface water flooding are not identified, however the onshore cable route is situated approximately 1.3km away from the most northern extent of Dereham.

140. The surface water flood risk mapping from the Environment Agency (Figure 20.1.3 in Annex 1) shows surface water flood risk is largely contained within watercourses and ditches, and there has only been one recorded flood in a location that the onshore cable route interacts with, the risk of flooding from surface water is deemed to be low. Where trenchless techniques (e.g. HDD) are proposed and the onshore cables will pass beneath watercourses in low-lying areas, the risk of flooding from surface water is low. This is also the case where the onshore cable route crosses Swanton Road, Dereham.

141. In addition, there are a large number of small ordinary watercourses, such as agricultural land drains that may be only seasonally wet and there is a risk of surface water flooding from these and / or the flow routes into them being affected by the onshore cable route. A pre-construction SWDP will be developed as part of the Code of Construction Practice (DCO Requirement 20(2)(i)) and agreed with regulators and implemented to minimise water within the cable trench and other working areas and ensure ongoing drainage of surrounding land.

4.2.3.7 Flooding from Sewers

142. The onshore cable route within the Wensum catchment is located mainly within agricultural land and as such the risk of flooding from sewers is likely to be low in these areas.

143. The risk of flooding from sewer sources is likely to increase in areas where the onshore cable route passes through small urban areas such as Reepham and Swanton Morley and where it passes in proximity to larger urban areas such as Dereham.

144. The Breckland District Council SFRA (Breckland Council, 2017) identifies that Dereham is a 'hotspot' for sewer flooding, having occurred at several roads within approximately 3.5km of the onshore cable route, including Swanton Road. The information provided in the SFRA suggests that sewer flooding occurs almost exclusively within the town centre of Dereham and not in proximity to the proposed onshore cable route where it crosses Swanton Road. As such, the risk of flooding from sewers is still deemed to be low.

4.2.3.8 Flooding from Reservoirs

145. The onshore cable route within the River Wensum catchment does not intersect any areas shown to be within the maximum extent of flooding from reservoirs and therefore there is likely to be no risk of flooding from this source.

4.2.3.9 Flooding from Canals and Other Artificial Sources

146. A review of the Norfolk Rivers and Broads IDB area maps, as well as Ordnance Survey mapping, identifies the onshore cable route is not located near to any canals or other artificial sources within the River Wensum catchment. As such there is a low risk of flooding from these sources.

4.2.3.10 Summary of Flooding Sources

147. Based on the information presented above it is deemed that the onshore cable route located within the Wensum catchment is at low risk of flooding from all potential sources.

148. Within the Wensum catchment, the majority of the onshore cable route is situated within Flood Zone 1. Locations where the onshore cable route passes through Flood Zones 2 and 3 are areas associated with proposed watercourse crossings.

149. Surface water flood risk extents are largely located within proximity to watercourses and drains (Figure 20.1.3 in Annex 1). However, small areas of increased surface water flood risk are also located within isolated low-lying areas.

150. In addition, there is a risk of surface water flooding affecting the onshore cable route in the vicinity of existing smaller ordinary watercourses such as agricultural land

drains. A pre-construction SWDP will be developed, agreed with regulators and implemented to minimise water within the cable trench and other working areas and ensure ongoing drainage of surrounding land. Design measures, including multiple interceptor ditches, will be implemented to limit the potential risk to the onshore cable route as a result of surface water flooding.

Given the information presented above, it is believed that the key risk of flooding to the onshore cable route within the River Wensum catchment is from fluvial and surface water sources.

4.3 Onshore Project Substation

4.3.1 Overview of Proposed Activities

151. The onshore project substation will consist of a High Voltage Direct Current (HDVC) substation and ancillary infrastructure. The location of the substation under Scenario 1 is located within the footprint illustrated in Figure 5.5 (Chapter 5 Project Description). Under Scenario 2 the onshore project substation is located within the footprint illustrated in Figure 5.6 (Chapter 5, Project Description) and will include other ancillary infrastructure such as the permanent access route. The site is located approximately 5km to the south-west of the first strategic crossing point (Site 1).

152. Both Scenario 1 and Scenario 2 involve the construction of the onshore project substation. Therefore, all assessment below is relevant to both scenarios.

4.3.2 Historic Flooding

153. The Product 4 data package received in April 2018, does not indicate any historic flooding in proximity to the onshore project substation.

154. The Breckland District Council SFRA (Breckland Council, 2017) does not outline any historic floods in proximity to the onshore project substation.

4.3.3 Flooding from Rivers

155. The Environment Agency Product 4 data obtained in April 2018 (Figure 20.1.1 in Annex 1) indicates that the onshore project substation is in Flood Zone 1 (Figure 20.1.2 in Annex 1). The site is located approximately 2km to the north of the Main River. The upstream location of the onshore project substation and the elevated topography of the area would suggest it is unlikely to be affected by flooding from rivers. The risk of fluvial flooding to the onshore project substation is therefore deemed to be low.

4.3.4 Flooding from Ordinary Watercourses

156. A number of ordinary watercourses are identified within the onshore project substation and associated infrastructure boundary (Figure 20.4, Chapter 20 Water Resources and Flood Risk). Three small drainage ditches are identified within the onshore project substation boundary; with a more prominent watercourse intersecting the onshore 400kV cable route that connects the onshore project substation to the National Grid substation extension.

157. Review of aerial imagery and topographic data shows the small watercourses drain the agricultural land surrounding the onshore project substation. As such, they are discussed regarding risk of flooding from surface water (see section 4.3.7).

158. The Environment Agency Long Term Flood Risk Information map (Environment Agency, undated) indicates that there is an area of medium to high flood risk from rivers which the onshore 400kV cable route intersects. This is confirmed by anecdotal information indicating past records of flooding associated with this watercourse.

159. The risk of fluvial flooding from ordinary watercourses to the onshore project substation is low. However, the risk to the cable route between the onshore project substation and the National Grid substation extension is classified as medium / high, due to known historic records of flooding in the vicinity.

4.3.5 Flooding from the Sea

160. The onshore project substation is located approximately 60km inland and therefore there is no risk of flooding from the sea.

4.3.6 Flooding from Groundwater

161. The Breckland District Council SFRA (Breckland Council, 2017) provides details from the Environment Agency's Areas Susceptible to Groundwater Flooding map. This map indicated that the onshore project substation would be located on land with up to 50% susceptibility to groundwater flooding.

162. The Norfolk LFRMS (Norfolk County Council, 2015) identifies that following significant rainfall in 2012, there have been some instances of flooding associated with high groundwater levels. However, there is limited understanding of the risk of groundwater flooding in Breckland, and limited information on historical flood events as a result of groundwater. As the onshore project substation includes below ground works there is a risk that groundwater flooding could affect the development, primarily during construction. However, mitigation measures will be incorporated into the design and the onshore project substation is therefore at low risk of groundwater flooding.

4.3.7 Flooding from Surface Water

163. The Environment Agency Long Term Flood Risk Information map (Environment Agency, undated) (Figure 20.1.3 in Annex 1) shows an area of low flood risk along the northern perimeter of the site. This is likely to be due to localised agricultural and land drainage issues, as highlighted by local knowledge.

164. Although the onshore project substation is located within Flood Zone 1 the onshore 400kV cable route which runs between the onshore project substation and the National Grid substation extension, intersects an area of medium to high flood risk from surface water (Figure 20.1.3 and Figure 20.1.4 in Annex 1). Review of aerial imagery indicates that the area of increased flood risk is associated with the existing watercourse. Design mitigation measures to address this flood risk are discussed in section 6.

4.3.8 Flooding from Sewers

165. The onshore project substation is to be located on existing agricultural land, and therefore there is a low risk of flooding from sewers.

4.3.9 Flooding from Reservoirs

166. The Environment Agency's Long Term Flood Risk Information map (Environment Agency, undated) indicates that the onshore project substation is located outside of the maximum extent of flooding from reservoirs. Therefore, there is no risk of flooding from this source.

4.3.10 Flooding from Canals and Other Artificial Sources

167. There are no canals or other artificial sources of flooding located near to the onshore project area, as such there is no risk of flooding from these sources.

4.3.11 Summary of Flooding Sources

168. The onshore project substation is identified by the Environment Agency to be located within Flood Zone 1. Considering the information presented above, the risk of flooding from the majority of sources is deemed to be low.

169. Flooding from surface water poses the greatest risk to and from the site, however this risk will be addressed through the adoption of appropriate management techniques, as discussed in section 5.

4.4 National Grid Substation Extension and Overhead Line Modifications

4.4.1 Overview of Proposed Activities

170. Under both Scenario 1 and Scenario 2, the existing Necton National Grid substation will require an extension to accommodate the Norfolk Boreas connection points. Under Scenario 1, extension works to Necton National Grid substation would be in an easterly direction (as a result of the extension works which would have been completed by Norfolk Vanguard) and under Scenario 2 would be in a westerly direction (see Chapter 5 Project Description or Figure 20.1.3 in Annex 1 for further details). Therefore, the assessment below is applicable to both scenarios for the extension of the existing Necton National Grid substation.

171. Under Scenario 1, modifications to the existing overhead line structures adjacent to the substation would have been completed by Norfolk Vanguard to accommodate both projects and no further works would be required. There would therefore be no change in flood risk under Scenario 1.

172. Under Scenario 2, modifications to the existing overhead lines would be carried out in parallel to the National Grid substation extension. Overhead line modifications under Scenario 2 are therefore considered in the assessment presented in the sections below.

4.4.2 Historic Flooding

173. The Environment Agency Product 4 data obtained in April 2018 does not indicate any historic flood events in proximity to the National Grid substation extension.

174. The Breckland District Council SFRA (Breckland Council, 2017) does not outline any historic flood events that have occurred within proximity of the National Grid substation extension and overhead line modifications.

4.4.3 Flooding from Rivers

175. The Environment Agency Product 4 data obtained in April 2018 indicates that the National Grid substation extension and overhead line modifications are in Flood Zone 1. The site is located approximately 2km to the north of the Main River. The upstream location of the National Grid substation extension and the elevated topography of the area would suggest it is unlikely to be affected by flooding from rivers.

176. The extension of the Necton National Grid substation under Scenario 1, and the substation extension and overhead line modifications under Scenario 2, are located within Flood Zone 1 as defined by the Environment Agency online Flood Map for Planning (Environment Agency, undated).

177. The Breckland District Council SFRA (Breckland Council, 2017) identifies that Chantry Lane, Necton has flooded many times because of Necton Brook. At Chantry Lane, situated approximately 1.1km from the proposed substation extension, Necton Brook runs through a culvert which is described as undersized. Necton Brook is a hydrologically separate watercourse to that which passes between the onshore project substation and the National Grid substation extension.

178. The risk of fluvial flooding to the National Grid substation extension and overhead line modifications is therefore deemed to be low.

4.4.4 Flooding from Ordinary Watercourses

179. The National Grid substation extension and overhead line modifications appear to include three ordinary watercourses within their boundary.

180. Review of aerial imagery and topographic data show that two of these watercourses are small drainage ditches, serving either agricultural land, or part of the existing Necton National Grid substation. As such, they are discussed in terms of the risk of flooding from surface water runoff (see section 4.4.7).

181. To the north east of the overhead lines temporary works area (required under Scenario 2 only) (Figure 20.4c, Chapter 20 Water Resources and Flood Risk), a watercourse runs through a section of the site. This watercourse is known to have flooded in the past, and is therefore more significant than most of the smaller drainage ditches in the area. However, this area is limited to temporary works during the construction phase. Appropriate management techniques as discussed in section 6 should be adopted to reduce this risk during construction.

182. The risk of fluvial flooding from ordinary watercourses to the National Grid substation extension and overhead line modifications is therefore deemed to be low.

4.4.5 Flooding from the Sea

183. The National Grid substation extension and overhead line modifications are approximately 60km inland and therefore there is no risk of flooding from the sea.

4.4.6 Flooding from Groundwater

184. The Breckland District Council SFRA (Breckland Council, 2017) provides details from the Environment Agency's Areas Susceptible to Groundwater Flooding map. This map indicated that the National Grid substation extension and overhead line modifications would be located on land with up to 50% susceptibility to groundwater flooding.

185. The Norfolk LFRMS (Norfolk County Council, 2015) identifies that following significant rainfall in 2012, there have been some instances of flooding associated

with high groundwater levels. However, there is limited understanding of the risk of groundwater flooding in the Breckland District, and limited information on historic flood events as a result of groundwater.

4.4.7 Flooding from Surface Water

186. The Environment Agency Long Term Flood Risk Information map (Environment Agency, undated) shows an area of medium to high flood risk along the northern perimeter of the site (Figure 20.1.3 in Annex 1). Upon review of aerial imagery of the site, this is confirmed as being linked to the existing land drains and watercourses in the area.

187. The Breckland District Council SFRA (Breckland Council, 2017) highlights that surface water flooding occurred in 2004 on the A47 to the north of Necton, as reported by the Highways Agency. The precise location of this flood event is not identified, however the A47 is situated less than 0.2km from the National Grid substation extension and overhead line modifications and so flood risk from surface water is deemed to be moderate.

4.4.8 Flooding from Sewers

188. The National Grid substation extension and overhead line modifications will be located on agricultural land and therefore there is a low risk of flooding from sewers.

4.4.9 Flooding from Reservoirs

189. The Environment Agency's Long Term Flood Risk Information map (Environment Agency, undated) indicates that the National Grid substation extension and overhead line modifications are located outside of the maximum extent of flooding from reservoirs. Therefore, there is likely to be no risk of flooding from this source.

4.4.10 Flooding from Canals and Artificial Sources

190. The National Grid substation extension and overhead line modifications are not located near to any canals or other artificial sources and therefore there is no risk of flooding from these sources.

4.4.11 Summary of Flooding Sources

191. The National Grid substation extension and overhead line modifications are located within Flood Zone 1. The risk of flooding from all other potential sources is deemed to be low. Considering the information presented above, under both Scenario 1 and Scenario 2, the greatest potential source of flooding to the National Grid substation extension is from surface water (Figure 20.1.3 in Annex 1). Appropriate management techniques as discussed in section 5 should reduce this risk. Flood Risk Vulnerability

192. As this section relates to permanent onshore infrastructure such as the cable ducting, onshore project substation and National Grid substation extension, this is applicable to both Scenario 1 and Scenario 2.

4.5 Background to Sequential and Exception Test

193. The aim of the NPPF PPG Sequential Test is to ensure that a sequential approach is adopted to steer new development to areas with the lowest probability of flooding, i.e. Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, the local authority can consider reasonably available sites in Flood Zone 2. Only where there are no reasonably available sites for development in Flood Zone 1 or 2, should the suitability of sites in Flood Zone 3 be considered.

194. Following application of the Sequential Test, if it is not possible for the project to be located in zones with a lower probability of flooding, consistent with wider sustainability objectives, the Exception Test can be applied if appropriate.

195. For the Exception Test to be passed, the following two elements must be passed for development to be allocated or permitted:

- It must be demonstrated that the project provides wider sustainability benefits to the community that outweigh flood risk, informed by an SFRA where one has been prepared;
- A site-specific FRA must demonstrate that the project will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and where possible will reduce flood risk overall.

196. Within each flood zone, surface water and other sources of flooding also need to be considered when applying the sequential approach to the location of the project.

4.6 Vulnerability Classification

197. Under the NPPF PPG Flood Risk and Coastal Change, the project is considered as 'Essential Infrastructure', which is defined as:

- Essential transport infrastructure (including mass evacuation routes), which must cross the area at risk;
- Essential utility infrastructure which must be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood; and
- Wind turbines.

4.7 Application of the Sequential Test and Exception Test

198. The onshore project area is located within Flood Zones 1, 2 and 3, as defined by the Environment Agency's online Flood Map for Planning (Environment Agency, undated) (Figure 20.1.2 in Annex 1). The Sequential Test has been considered in accordance with the NPPF PPG. Table 4.5 shows that the 'Essential Infrastructure' development located within Flood Zones 1 and 2 is deemed acceptable, and that development located within Flood Zone 3 is required to pass the Exception Test.

Table 4.5 Flood risk vulnerability and flood zone 'compatibility'

Flood Zones	Flood Risk Vulnerability Classification				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
1	✓	✓	✓	✓	✓
2	✓	Exception test required	✓	✓	✓
3a	Exception test required	X	Exception test required	✓	✓
3b	Exception test required	X	X	X	✓

199. Parts of the onshore project area located within Flood Zone 3 are required to pass the Exception Test, by demonstrating that the project provides wider sustainability benefits to the community which outweigh flood risk, and that the project will be safe for its lifetime without increasing flood risk elsewhere.

200. The project has been sequentially located wherever possible. Above ground compounds / structures are located within Flood Zone 1, and subterranean development is located primarily in Flood Zone 1, with some locations in Flood Zone 2 and 3 where it is required to pass under existing watercourses. Access routes are primarily located within Flood Zone 1, with a small number potentially passing through Flood Zones 2 and 3.

201. Subterranean development will only be at potential risk of flooding during the construction phase. Once operational, the flood risk will have been mitigated as the cables will be wholly located underground with no interaction with the above ground Flood Zone.

202. The access routes are for temporary access during the construction phase. Following construction, the access routes will be removed and returned to their present state. On this basis, it is considered that the Exception Test is not applicable to the nature of the project.

203. The final decision regarding the application of the Sequential Test and Exception Test is for the planning authority to confirm whether they agree that the project satisfactorily passes both tests. However, we believe that the sequential approach adopted and the wider benefits associated with the provision of renewable energy ensures that the project is in accordance with the guidance related to the Sequential and Exception Test.

5 Climate Change

204. The risk of flooding from potential sources will be amplified as a result of the predicted increase in rainfall associated with climate change. Given the potential sources of flooding identified in this FRA, there are two main aspects of climate change which are likely to impact the project. These are an increase in peak river flows and an increase in the duration and intensity of rainfall events likely to increase the magnitude of surface water flooding.

205. Current guidance on climate change allowances (Environment Agency, 2016 and amended February 2017), states 'Essential Infrastructure' developments within Flood Zone 3 should use the 'Upper End' climate change allowance and 'Essential Infrastructure' within Flood Zone 2 should consider the 'Higher Central' and 'Upper End' allowances when considering impacts on fluvial flood risk due to climate change. If a site is located within Flood Zone 1 then guidance states that the 'Central' allowance should be used for 'Essential Infrastructure'.

206. The onshore project area is located within the Anglian river basin. Assuming construction commences between 2020 and 2026, the peak river flow climate change allowance would comprise an additional 20% or 35% in Flood Zone 2 and an additional 35% in Flood Zone 3 assuming 30 years of operation. In Flood Zone 1 the peak river flow climate change allowance would comprise an additional 15% assuming 30 years of operation, these are shown in Table 5.1.

Table 5.1 Peak river flow allowances for Anglian river basin district (uses 1961 to 1990 baseline)

River basin district	Allowance Category	Total potential change anticipated for '2020s' (2015 – 2039)	Total potential change anticipated for '2050s' (2040 – 2069)	Total potential change anticipated for '2080s' (2070 – 2115)
Anglian	Upper End	25%	35%	65%
	Higher Central	15%	20%	35%
	Central	10%	15%	25%

207. The above climate change allowance related to peak river flow and fluvial flooding is only likely to be relevant to the National Grid substation extension and the onshore project substation as all other elements of the project will be below ground once constructed. As the National Grid substation extension and the project substation are located within Flood Zone 1 it is recommended that a climate change allowance equivalent to a 15% increase in peak river flows be considered.

208. When considering surface water flood risk, the guidance also predicts an increase in peak rainfall intensity of up to 20% assuming 30 years of operation with construction commencing between 2020 and 2026. Design of surface water management measures and the drainage system for above ground structures will include the above allowance as a minimum, to take into account the potential increase in surface water flood risk resulting from climate change.

6 Surface Water Drainage

6.1 Pre-Construction Work

209. Prior to commencement of the construction works, a number of surveys and studies will be undertaken to inform the development of the final design including ecological surveys, geotechnical investigations and drainage assessments.

210. Surface water drainage requirements for the onshore project substation will be detailed in an Operational Drainage Plan (ODP) (DCO Requirement 32), an outline ODP (document reference 8.22) has been produced and submitted as part of the DCO application. The drainage strategy will be designed to meet the requirements of the NPPF, NPS EN-1,NPS EN-5 and the CIRA SuDs Manual C753 (CIRA, 2015) with runoff limited where feasible, through the use of infiltration techniques which can be accommodated within the area of the development.

211. The drainage strategy will be developed according to the principles of the SuDS discharge hierarchy. Generally, the aim will be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

i) into the ground (infiltration);
ii) to a surface water body;
iii) to a surface water sewer, highway drain or another drainage system; or
iv) to a combined sewer.

212. It is proposed that surface water drainage will be discharged via infiltration or to an adjacent surface water body (including an attenuation pond at the onshore project substation) and therefore there will be no requirement to connect to the surface water sewer network.

213. The ODP will assess the current and proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site. It will also contain maintenance and management plans detailing who will be responsible for the ongoing maintenance of the surface water drainage features for the lifetime of the development. This will be applicable to proposed works under both Scenario 1 and Scenario 2.Temporary Works.

214. A pre-construction SWDP as part of the CoCP will be developed, agreed with regulators and implemented to minimise water within the working areas, ensure ongoing drainage of surrounding land and that there is no increase in surface water flood risk.

215. Aspects of the temporary works relating to the construction of the onshore cable route are primarily applicable to Scenario 2 where Norfolk Vanguard does not proceed and all construction works are undertaken by Norfolk Boreas. However, under Scenario 1, temporary construction access will be required both to pull the cable through the pre-installed ducts as well as to provide access for maintenance work. Therefore, both maintenance and cable pulling activities are applicable in both scenarios.

216. A local specialised drainage contractor will undertake surveys, locate drains, create drawings pre- and post-construction, and ensure appropriate reinstatement. The pre-construction SWDP will include provisions to minimise flood risk within the working area and ensure ongoing drainage of surrounding land.

6.1.1 Scenario 1 and Scenario 2

217. Access routes comprise existing tracks which will be protected using either stone running tracks or bog mats, whichever is appropriate. As such it is anticipated that there will be no change to drainage from these elements.

218. The onshore cable route is required to cross a number of watercourses (Figure 20.1.4 in Annex 1) and a variety of construction methods have been proposed, linked to the significance / sensitivity of the watercourse.

219. Trenchless crossings are to be used at key watercourse crossing locations as detailed in sections 20.7.1 and 20.7.4.1 of Chapter 20 Water Resources and Flood Risk. In these locations, there will be no impact on flood risk as all proposed elements are below ground.

220. At other crossing locations, it is proposed that open cut techniques are utilised to cross the watercourse. In these locations, it will be necessary to ensure that flow along the watercourse is maintained and there is no increase in flood risk as a result of the temporary works. The methodology to be used for any temporary

construction at crossing points over existing ditches and watercourses shall be agreed with the Environment Agency and relevant Local Authority as part of the Environmental Permitting (Amendment) Regulations 2018 process or as an Ordinary Watercourse Consent application.

221. During construction works there are a large number of smaller agricultural land drains and watercourses, along the onshore cable route, that may be only seasonally wet. There is a risk of surface water flooding from these and / or the flow routes into them being affected by the onshore cable route. Embedded mitigation measures to intercept and collect flow will be implemented along the onshore cable route to ensure there is no increase in flood risk to off-site receptors. This will typically include the temporary installation of interceptor drainage ditches parallel to the trenches and soil storage areas to provide interception of surface water runoff and the use of pumps to remove water from the trenches during duct installation.

222. The sectionalised duct installation method (excavate, lay and reinstate approximately 150m/week) is designed to minimise water ingress to the trenches. Any pumps, flumes or channels will be designed to have sufficient capacity to convey the required range of flows at each location. Depending upon the precise location, water from the channels will be infiltrated or discharged into the drainage network.

6.1.2 Scenario 2 only

223. Temporary mobilisation areas are likely to be hardstanding comprising permeable gravel underlain by geotextile or other suitable material to allow safe storage and movement of vehicles within the area and maintain the current drainage regime.

224. Trenchless crossings are to be a minimum of 2m below the bed of the channel and are proposed for all Main River crossings.

6.2 Post-Construction

6.2.1 Scenario 1 and Scenario 2

225. Following construction of the onshore cable route there will be no permanent above ground elements, other than the link boxes (worst case dimensions will be 1.5m x 1.5m) which will have a negligible impact on flood risk. Additionally, it is proposed that drainage will be reinstated to match the existing baseline condition. As such there would be no impact on surface water drainage. Temporary works and all access route surfacing, with the exception of the permanent access for the onshore project substation, shall be removed and would have no operational use.

226. The backfilling of material, within both construction drainage channels and along the onshore cable route itself will prevent a conduit from forming and ensure there are

no changes to the local flow rates due to permeability changes. This will be dictated by the Surface Water and Drainage Strategy as part of the CoCP.

227. Existing land drains along the onshore cable route and at the onshore project substation will be reinstated following construction, for more details on this see Chapter 21 Land Use and Agriculture. A local specialised drainage contractor will undertake surveys, locate drains, create drawings pre-and post-construction, and ensure appropriate reinstatement. The pre-construction SWDP will include provisions to minimise water within the working area and ensure ongoing drainage of surrounding land.

228. The surface water drainage requirements for the National Grid substation extension and onshore project substation will be dictated by the final Surface Water Drainage Strategy and will be designed to meet the requirements of the NPPF, NPS EN-1 and NPS EN-5. Changes in surface water runoff as a result of the increase in impermeable area from the onshore project substation and National Grid substation extension will be attenuated and discharged at a controlled rate, as outlined below, in consultation with the LLFA and Environment Agency.

229. The controlled runoff rate will be equivalent to the greenfield runoff rate. The resultant storage / attenuation volume provided will be sufficient to ensure that during the 1 in 100 year event plus an allowance for climate change there will be no increase in runoff from the site. Depending on the lifetime of the development (approximately 30 years) this will include an allowance for an increase of up to 20% to allow for future climate change. Within the outline drainage design a more conservative allowance of 40% for climate change has been included and therefore additional storage volume is likely to be available.

230. High level studies and outline calculations have identified the required volume for the attenuation pond at the onshore project substation to provide sufficient attenuation prior to discharge at greenfield runoff rates into the closest watercourse or sewer connection. The full specification for the attenuation pond and Surface Water Drainage Strategy will be addressed as part of detailed design.

231. Allowance for increased attenuation of surface water drainage (an extension to the existing pond or a new pond in proximity to the existing pond) at the Necton National Grid Substation will also be included to accommodate additional impermeable ground associated with the National Grid substation extension.

232. Additionally, due to the potential presence of a large number of land / agricultural drains in the vicinity of the onshore project substation, there will be a need to intercept any water flowing through these and collecting prior to a controlled

discharge to limit the potential displacement or redirection of water, such that there is no increase in flood risk to off-site receptors.

233. Furthermore, planting has been incorporated into the design for the onshore project substation to aid in attenuating surface water runoff.

7 Flood Risk Management Measures

234. There is always a potential for there to be a residual flood risk to people and property due to the failure of systems and defences. Residual risk will remain after flood management or mitigation measures have been installed. Therefore, the FRA has considered residual flood risk and measures to manage residual flood risk where appropriate.

7.1 Design Mitigation

7.1.1 Scenario 2 only

235. The onshore project area is primarily located within Flood Zone 1, at low risk of flooding from fluvial or tidal sources, and as such the sequential approach has been used in the location of the above ground structures.

236. The onshore cable would be buried a minimum of 1.5m beneath the bed of any watercourse along the route (and a minimum of 2m below any trenchless crossing). Therefore, any flood risk to this element of the project would comprise a residual risk of groundwater flooding to the underground cable. Cable ducts shall be designed to be resilient to groundwater ingress to ensure this potential flood risk is mitigated.

237. During construction, the cable route will be bounded by drainage channels (one on each side) to intercept drainage from within the working corridor. Additional drainage channels will be installed to intercept water from the cable trench.

238. Where water enters the trenches during installation, this would be pumped via settling tanks or ponds to remove sediment, before being discharged at a controlled rate into local ditches or drains via temporary interceptor drains. Depending upon the precise location, water from the channels will be infiltrated or discharged into the drainage network.

7.1.2 Scenario 1 and Scenario 2

239. Access routes are primarily to be located where there is an existing track or access route. The adoption of this additional design measure aims to limit the potential for an increase in the risk associated with surface water flooding through the use of permeable surfaces and existing routes.

240. Flood risk from surface water to the onshore project substation and off-site as a result of the proposed project will be addressed through the development of a detailed drainage design. Existing land drains will need to be sympathetically reinstated to deliver improvements to in-channel habitats where appropriate, with at least the same capacity as the pre-construction channel to prevent impacts on flood risk.

7.2 Flood Resilient and Resistant Design

7.2.1 Scenario 2 only

241. Where small watercourses, shallower than 1.5m, are to be crossed during duct installation, temporary damming and diverting of the watercourse is proposed. To ensure flood risk is not increased during this phase of work the capacity of the water pipe, or pumping system shall need to be suitable to maintain the original flow volumes and velocity of each watercourse. Post construction, channels would be reinstated to pre-construction depths, as far as possible, to ensure flood risk is not increased elsewhere following development.

242. Where open cut trenching methods are not suitable due to the crossing width, trenchless crossing techniques (e.g. HDD) are proposed. During boring it is important that potential flood risks are taken into consideration, with plant and materials either raised above modelled flood levels or protected with flood barriers or similar construction.

7.3 Flood Warning and Evacuation Plan

7.3.1 Scenario 1 and Scenario 2

243. A flood warning and evacuation plan is a list of steps to be taken in case of a flood, although it can also include steps such as taking out the relevant insurance or using recommended flood mitigation products.

244. Specific flood warning and evacuation plans should be produced, and an operational flood plan completed for both the onshore project substation and the onshore cable route, specifically related to construction works at watercourse crossing locations where personnel or materials may be located, albeit temporarily, within Flood Zones 2 and 3 (Figure 20.1.4 in Annex 1).

245. All personnel using the access routes should be made aware of those access routes which are located within Flood Zones 2 and 3 and any flood warnings issued for those areas should result in the relevant access routes being cleared of all project personnel and, where possible, all project plant / materials.

246. A site specific flood warning and evacuation plan should include practical steps for protecting the project, be easy to communicate and consider delegated responsibility, or whether personnel are likely to require additional support during a flood event.

247. The Environment Agency has produced a 'Personal Flood Plan' template (Environment Agency, 2009c), as well as guidance for 'Preparing Businesses for Flooding' (Environment Agency, 2015). These provide check lists and supporting guidance for preparing for a flood event. Whilst the project is not of the same scale as those considered within these documents, it is anticipated that the project will require a comprehensive Flood Warning and Evacuation Plan including elements of this guidance which should form the foundation of any flood plan considerations. The following aspects need to be considered:

- A list of important contacts, including Floodline, utilities companies and insurance providers;
- A description or map showing locations of service shut-off points;
- Basic strategies for protecting property, including moving assets to safety where possible, turning off / isolating services and moving to safety; and
- Safe access and egress routes.

248. During construction, contractors and management should liaise with the LLFA and the Environment Agency so they are aware of when heavy rainfall is due, and to issue a flood warning when necessary to allow work to stop, especially in areas in close proximity to key watercourses. Additional precautions should be put in place and the site cleared of all personnel in this instance.

7.4 Access and Egress

7.4.1 Scenario 1 and Scenario 2

249. Both the onshore project substation and the National Grid substation extension have been located within Flood Zone 1 and as such any personnel accessing these compounds shall be at low risk of flooding from rivers or the sea.

250. The proposed operational access routes to the north of Little London Rd and from A1067 at Sparham appear to cross Flood Zones 2 and 3; however, the access routes are for a temporary and transient use and therefore users would not be anticipated to use these during times of potential flooding. All other access routes are located in Flood Zone 1.

251. A small number of access routes cross areas with a surface water flood risk.

252. The surrounding area primarily comprises Flood Zone 1 and therefore access can be maintained to the wider area for the efficient access and egress of personnel.

8 Conclusions

253. Under Scenario 1 Norfolk Vanguard will have installed the cable ducts and associated works on behalf of Norfolk Boreas. Therefore, the consideration of potential flood risk under Scenario 1 for Norfolk Boreas is limited to the landfall, temporary joint pits for cable pulling along the cable route, onshore project substation and extension to the National Grid substation.

254. Under Scenario 2 Norfolk Boreas would undertake all the works required for the standalone project. Therefore, the assessment of potential flood risk is associated with proposed works at the landfall, duct installation and cable pulling along the onshore cable route, the onshore project substation as well as the National Grid substation extension and overhead line modifications.

8.1.1 Scenario 1 and Scenario 2

255. The landfall is located within Flood Zone 1, at low risk of flooding from fluvial or tidal sources. The landfall compound is also located sufficiently inland such that indicative erosion zones provided within the SMP (related to potential future risk) show this will not affect the landfall compound and therefore there is a low risk of flooding from the sea.

256. The onshore project substation is located within Flood Zone 1, at low risk of flooding from fluvial sources. The onshore project substation is located within areas of very low and low surface water flood risk (Figure 20.1.3 in Annex 1). An area of high surface water flood risk, which appears to be linked to the existing agricultural and land drain network is located to the north of the onshore project substation (Figure 20.1.3 in Annex 1).

257. A pre-construction SWDP as part of the CoCP will be developed, agreed with regulators and implemented to minimise water within the working areas, ensure ongoing drainage of surrounding land and that there is no increase in surface water flood risk. This will assess the current and proposed runoff rates, volume of storage required and the proposed approach for discharge of water from the site. The controlled runoff rate will be equivalent to the greenfield runoff rate. The resultant storage / attenuation volume provided will be sufficient to ensure that during the 1 in 100 year event plus an allowance for climate change there will be no increase in runoff from the site.

258. Under Scenario 1, construction-stage activities will be limited to pulling of cables through pre-installed ducts, the construction of joint pits (each with an area of 90m^2) and the reinstatement of limited areas of running track. Although construction activities for Scenario 1 will be relatively limited and temporary in nature i.e. for the duration of the cable pulling activities only, compared with those required for

Scenario 2, there is still the potential for them to be affected by flooding. On this basis, the assessment of flood risk relating to the onshore cable route and associated project infrastructure has been considered for both Scenario 1 and Scenario 2.

8.1.2 Scenario 2 only

259. The onshore cable route duct installation will pass primarily through Flood Zone 1, with some locations in Flood Zone 2 and 3. Whilst undertaking watercourse crossings the construction areas may be at risk of flooding, as well as posing a potential risk of increased flooding elsewhere. Therefore, the design related to temporary crossing has been developed to limit this risk. Once operational there will be no flood risk posed to the onshore cable route from fluvial, tidal, surface or sewer flooding. A residual risk of flooding from groundwater shall be mitigated through the use of suitable waterproofing of the cable duct.

260. Mobilisation areas for use during construction are located within Flood Zone 1, with good transport links away from areas of increased fluvial or tidal flood risk.

261. Mitigation of the existing flood risk at key crossing points during the construction phase of the project will be managed. Any construction work located within Flood Zone 2 or 3, or within proximity to a watercourse will undertake suitable risk assessments, including the formation of site specific evacuation routes into areas of low flood risk and the location of plant above modelled flood levels. Any temporary plant which can be removed from a site at flood risk during construction, should there be a heavy rainfall event forecast, will be relocated to Flood Zone 1 and outside of an area with a potential surface water flood risk (Figure 20.1.3 in Annex 1).

262. During the construction works any temporary damming and re-routing of watercourses along the onshore cable route will be designed such that the original flow volumes and rates are maintained to ensure flood risk is not increased.

263. Post-construction, watercourses will be reinstated to pre-construction depths wherever possible to ensure flood risk is not affected.

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10 Annex 1 Figures

590000 600000 610000 620000 630000 640000

340000 330000 320000 310000 300000

N

Site 1
Site 2
Site 3
Site 4
Site 5
Site 6
Site 7
MA3
MA6
MA8
Substation

0 5 10 km

Legend:

Norfolk Boreas onshore red line boundary

Environment Agency Product 4 Data Locations[1]

- April 2018
- June 2017

[1] Environment Agency, 2017/2018.

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency Product 4 data location points

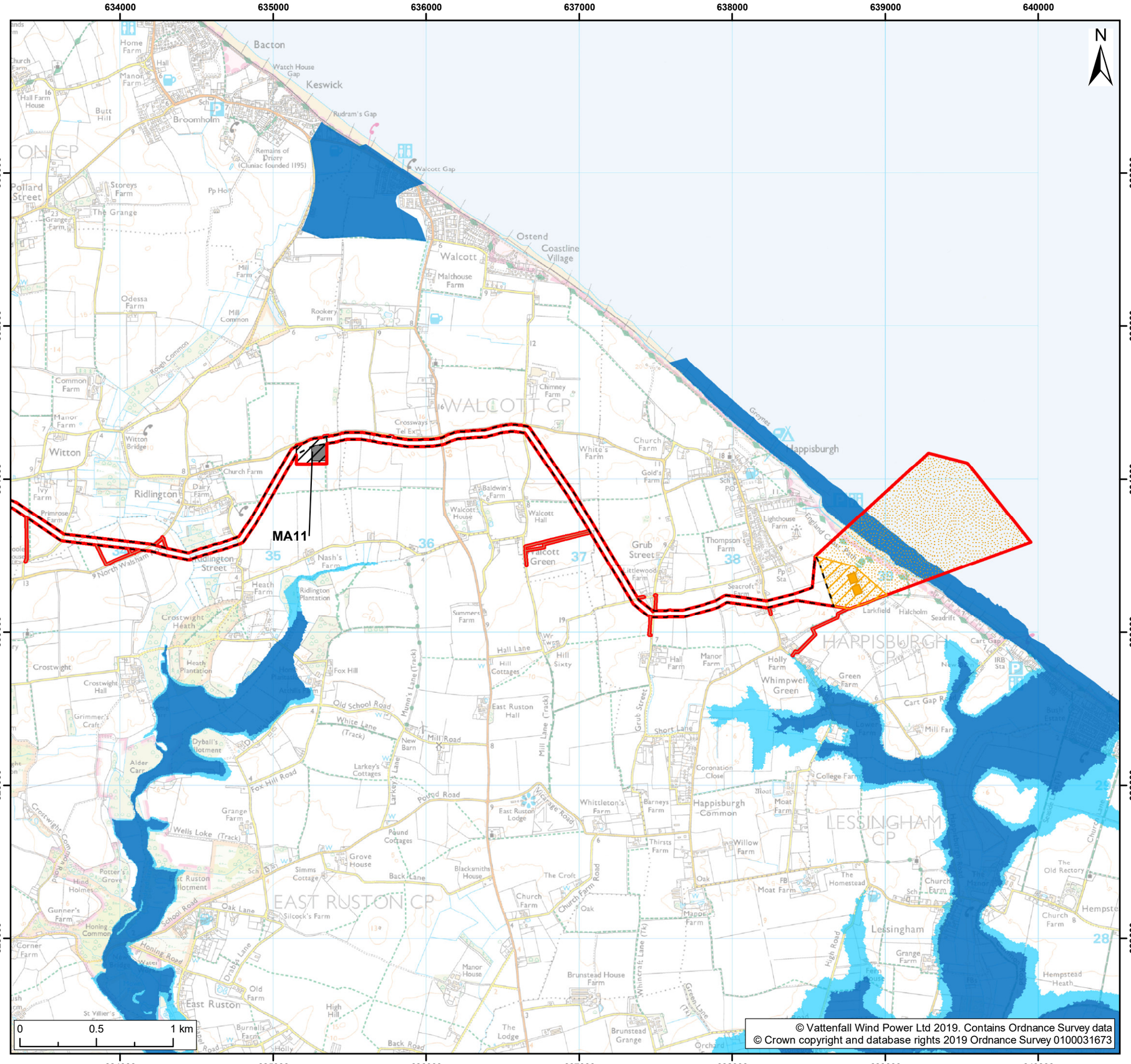
Figure: 20.1.1 | Drawing No: PB5640-006-0201-001

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:200,000

Co-ordinate system: British National Grid **EPSG:** 27700

VATTENFALL

Royal HaskoningDHV
Enhancing Society Together



Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Landfall zone
- Landfall compound zone
- Indicative landfall compound
- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 1 of 9)

Figure:	Drawing No:
20.1.2a	PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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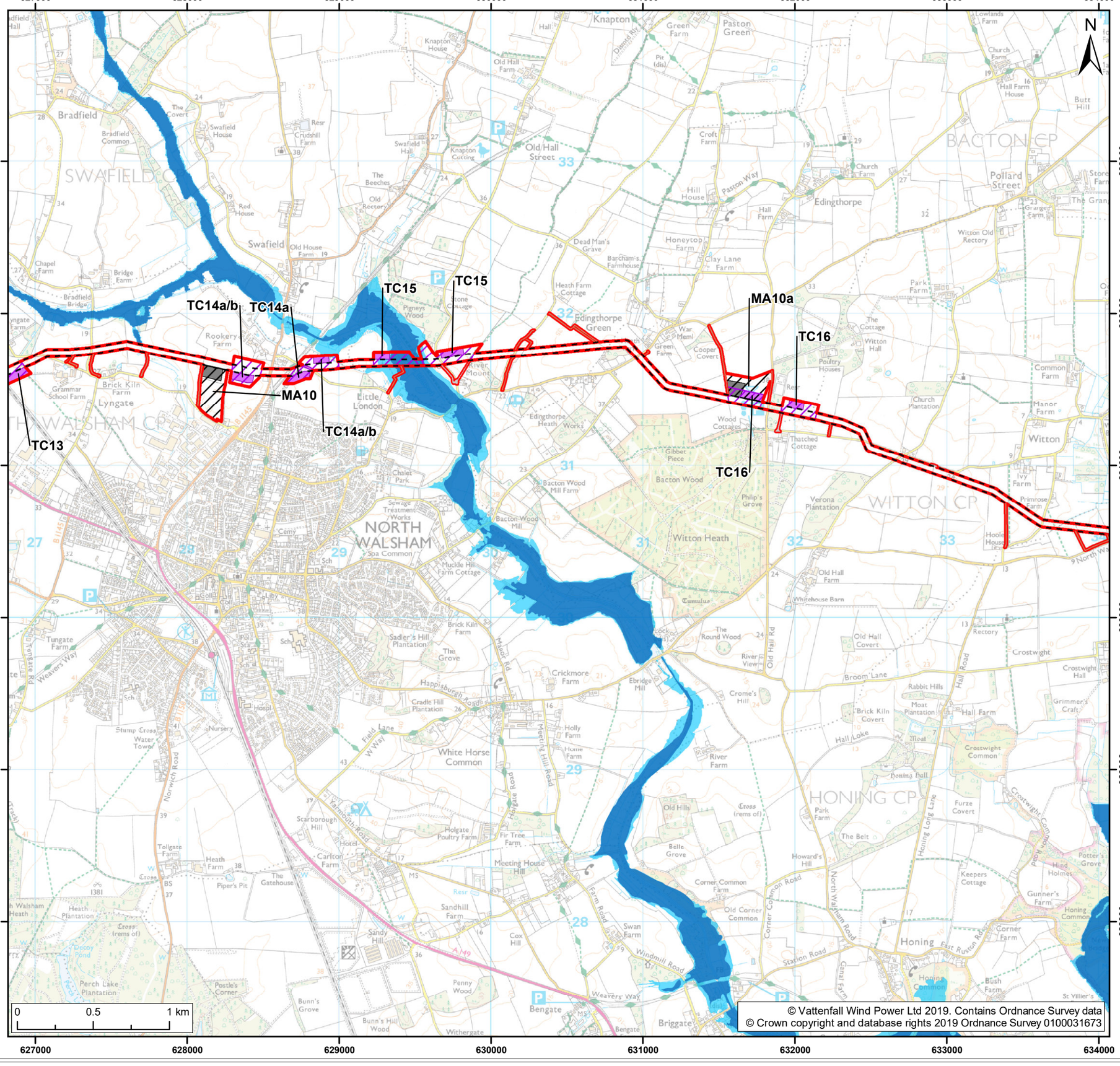

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 2 of 9)

Figure:	Drawing No:
20.1.2a	PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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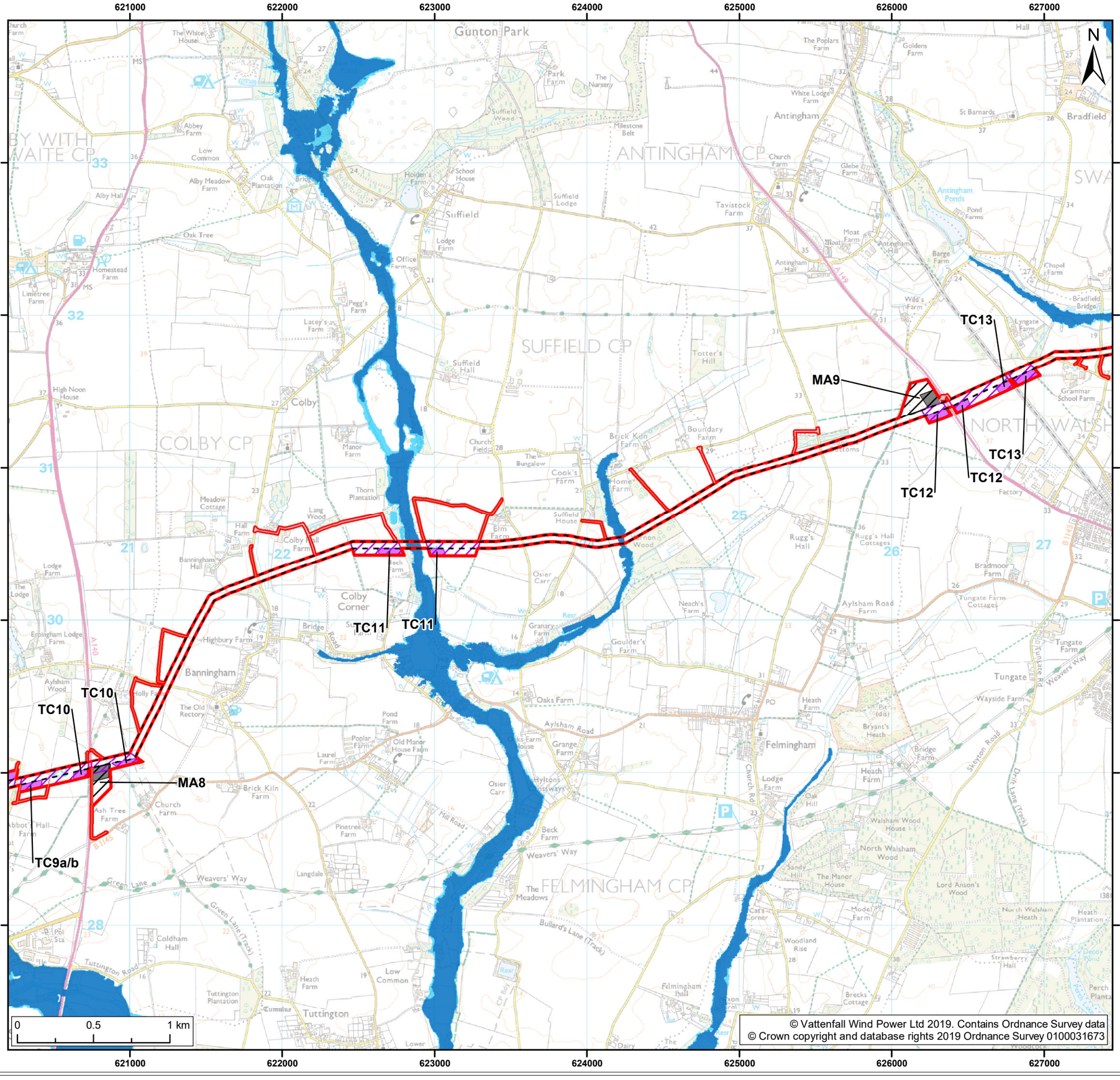

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 3 of 9)

Figure: 20.1.2a | Drawing No: PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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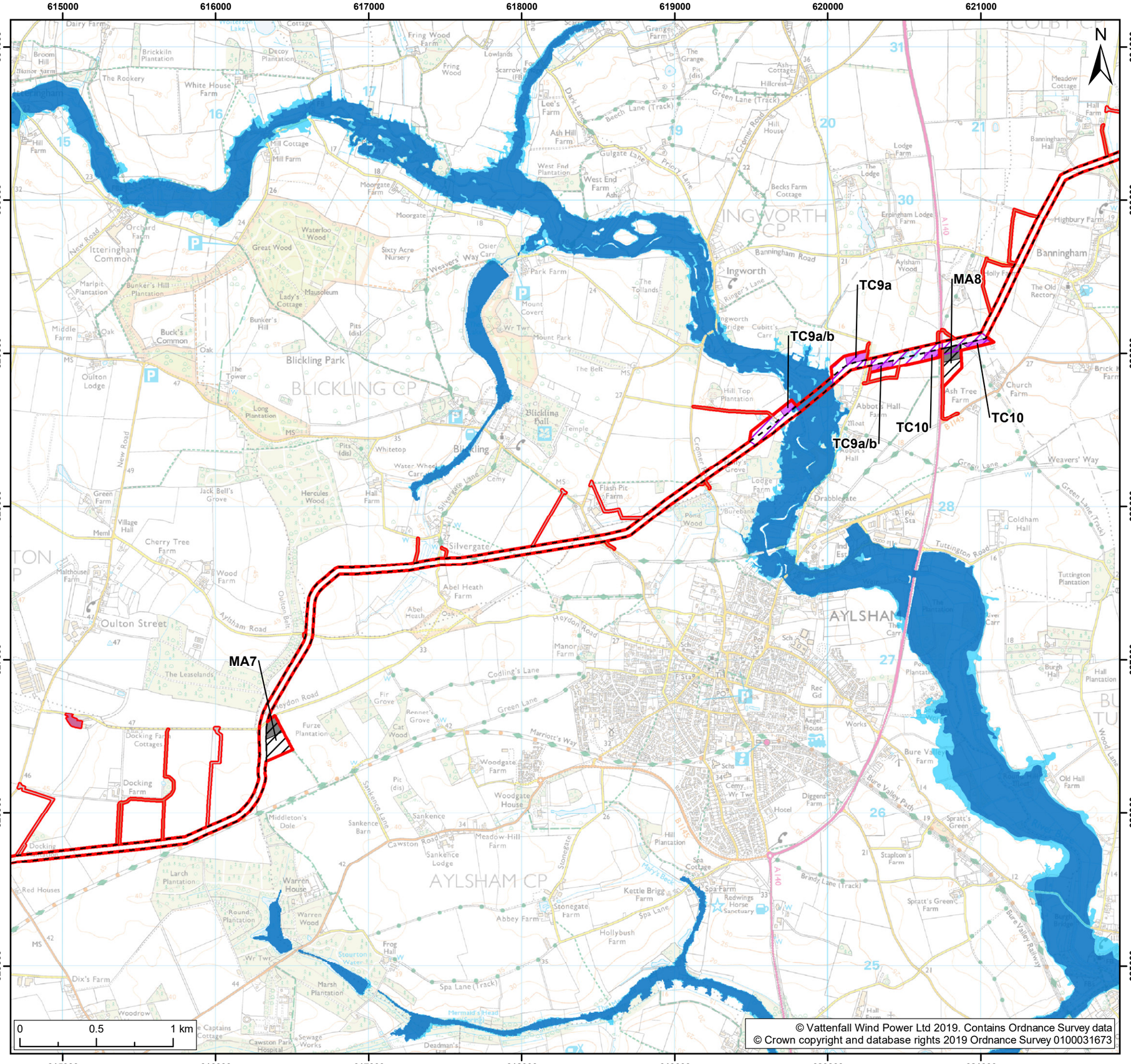

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Cable logistics area
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 4 of 9)

Figure:	Drawing No:
20.1.2a	PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid **EPSG:** 27700

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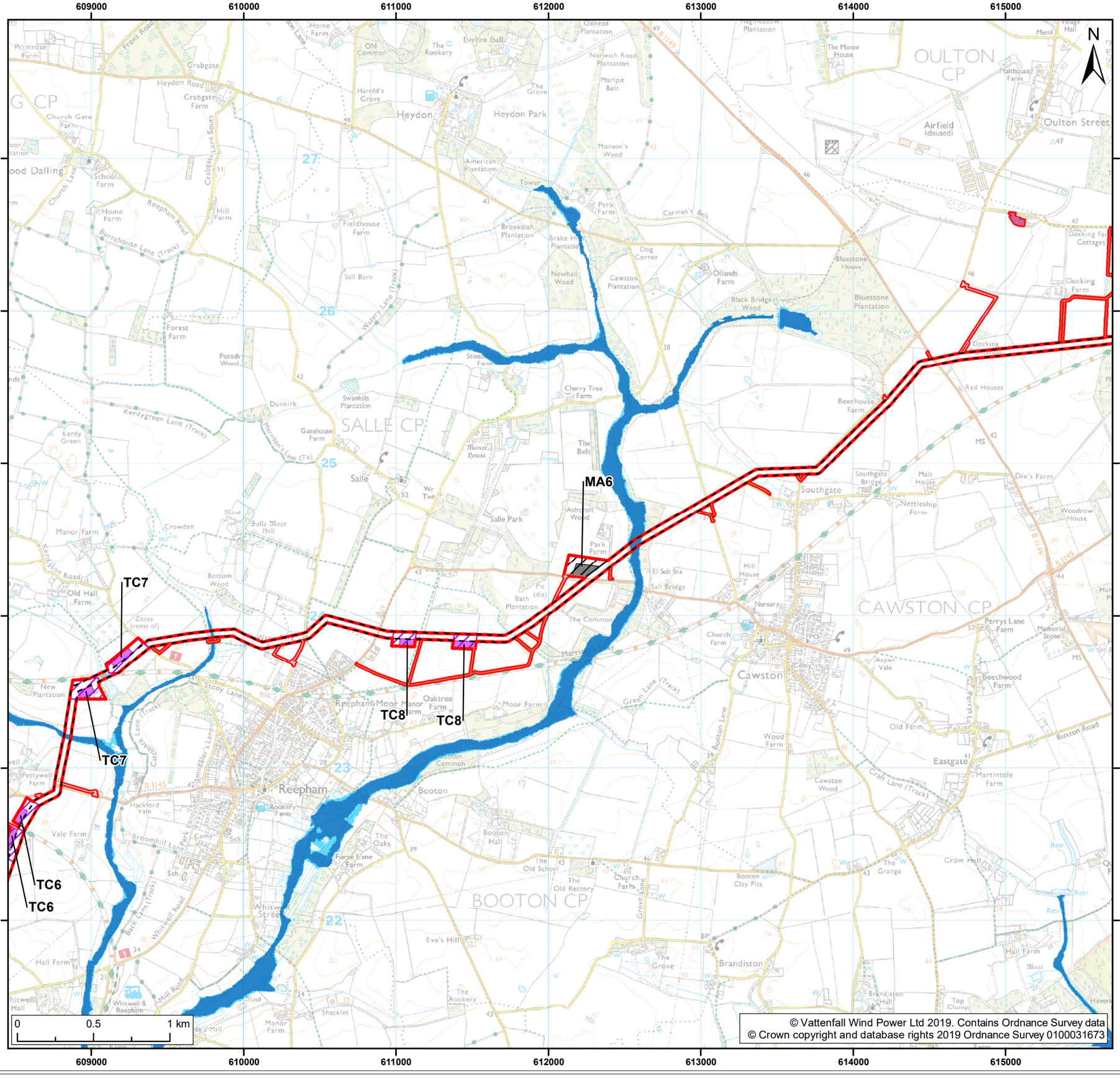

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Cable logistics area
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 5 of 9)

Figure:	Drawing No:
20.1.2a	PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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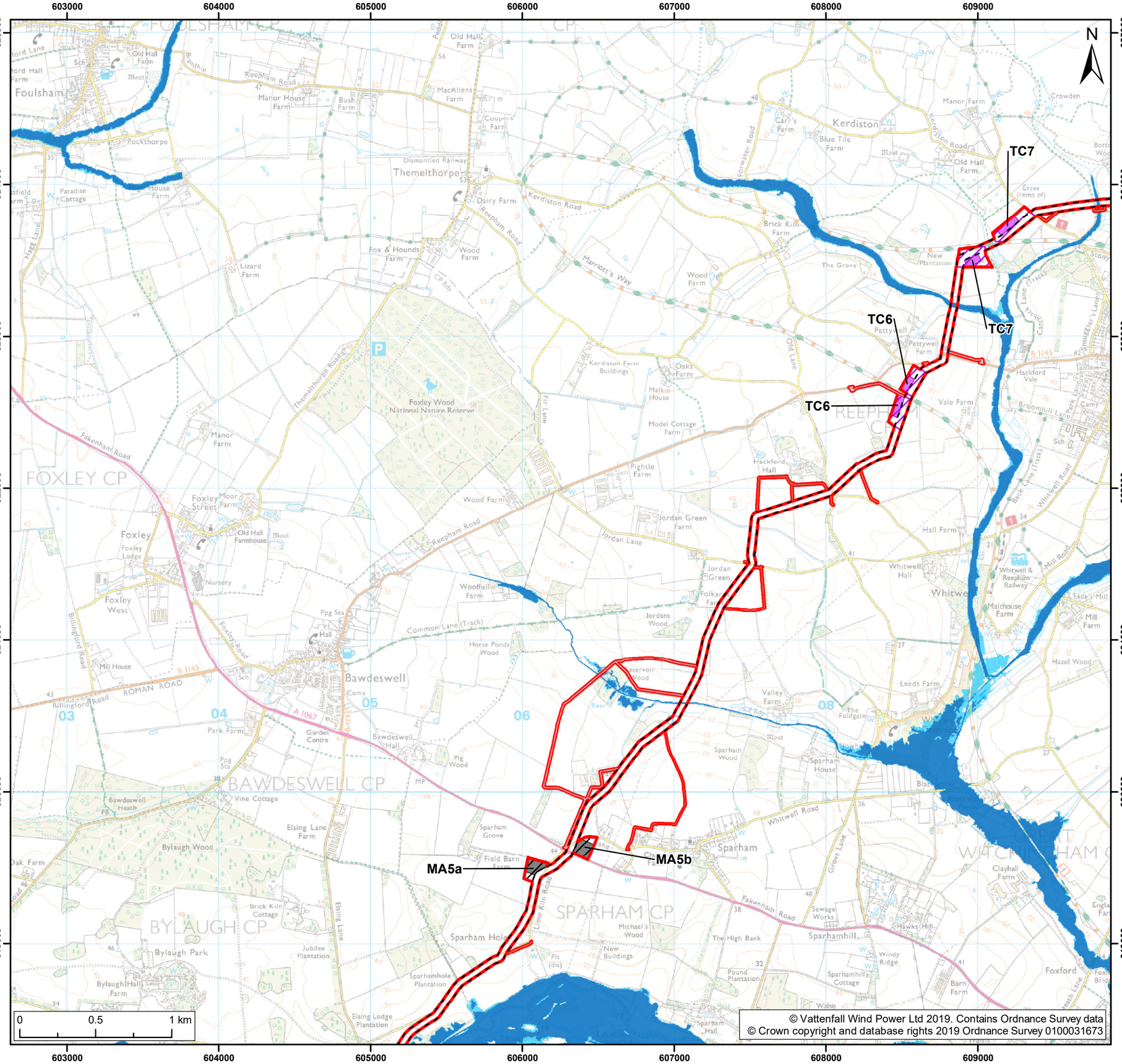

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 6 of 9)

Figure:	Drawing No:
20.1.2a	PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid **EPSG:** 27700

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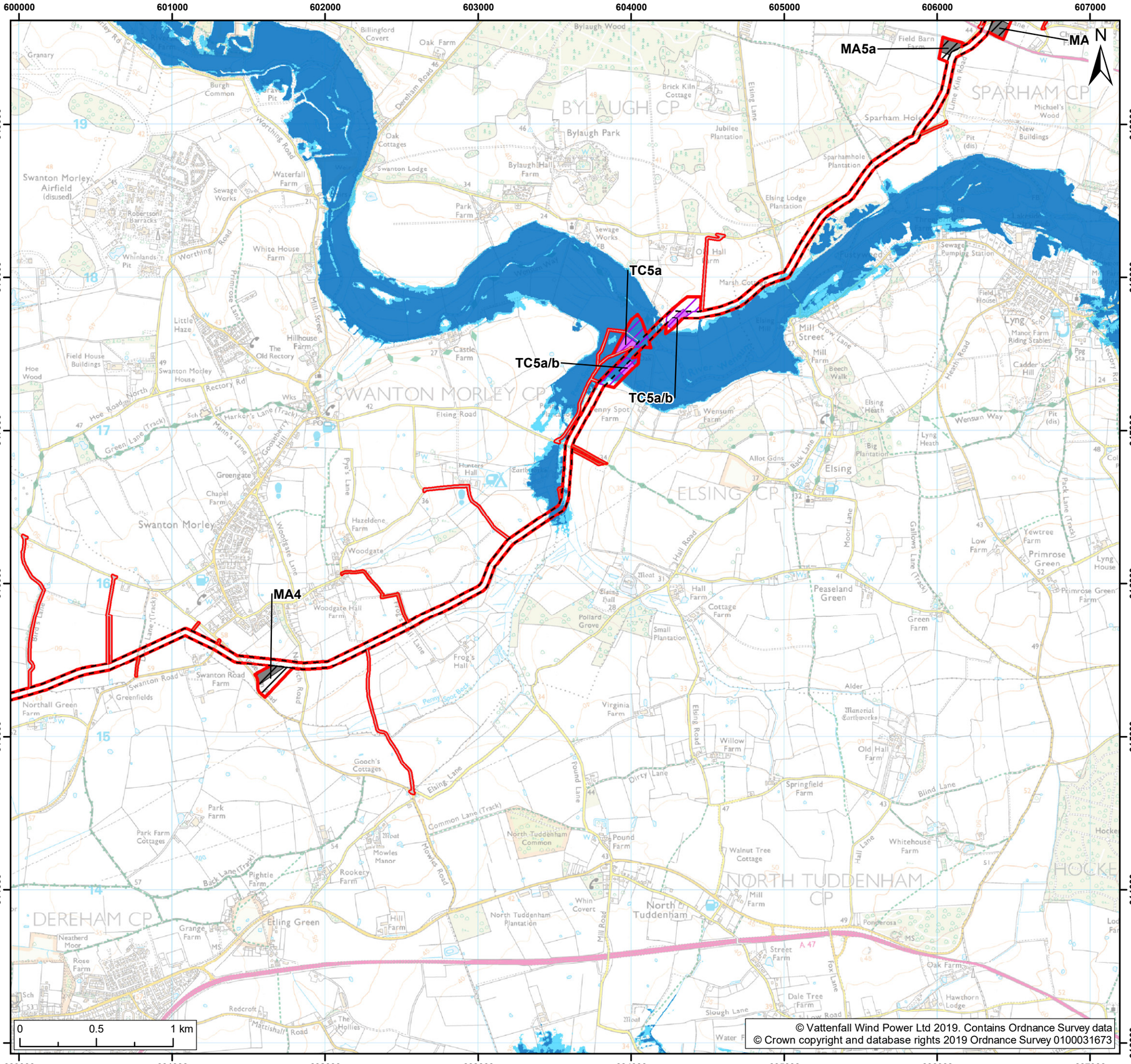

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 7 of 9)

Figure:	Drawing No:
20.1.2a	PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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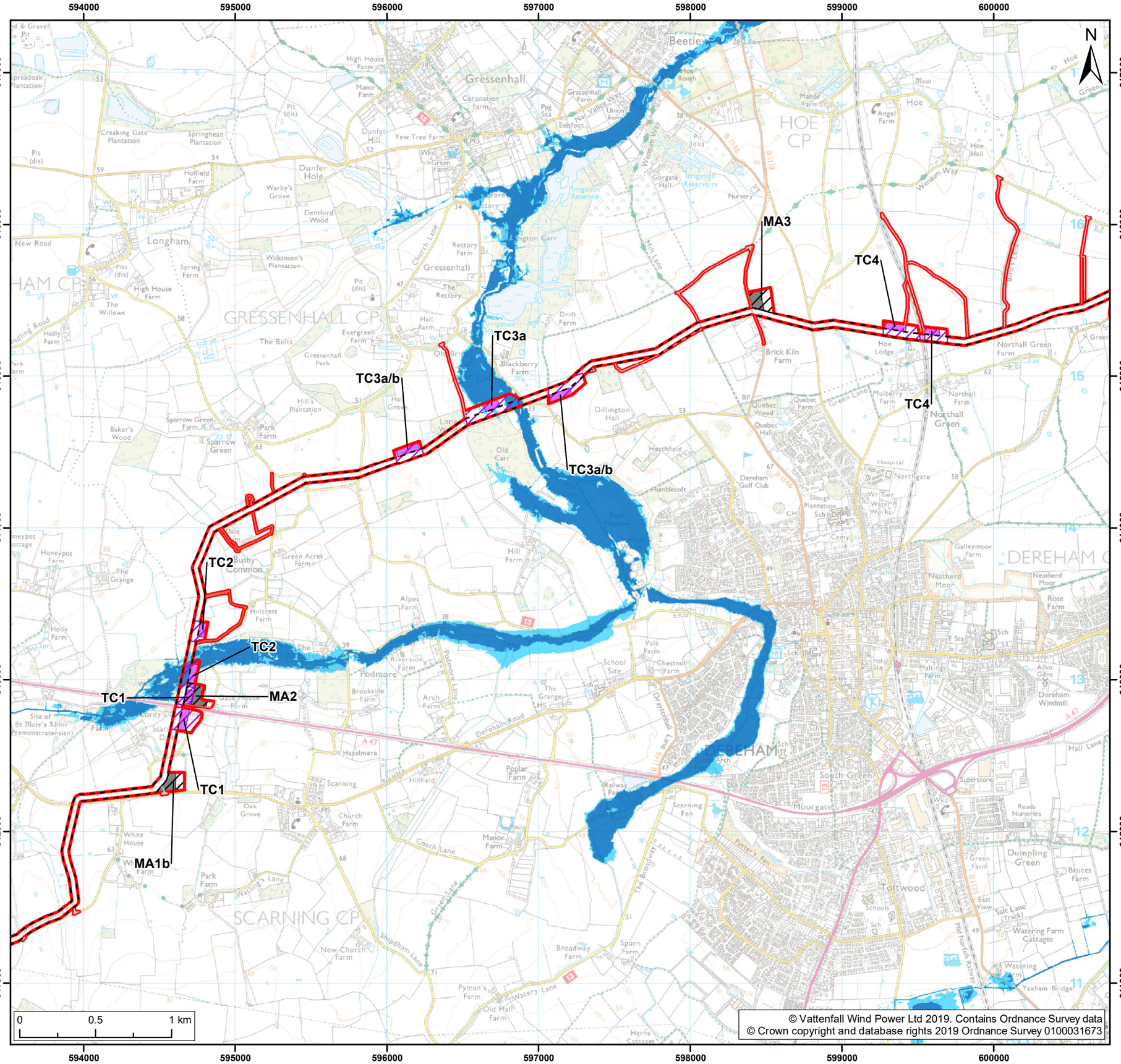

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 8 of 9)

Figure: 20.1.2a | Drawing No: PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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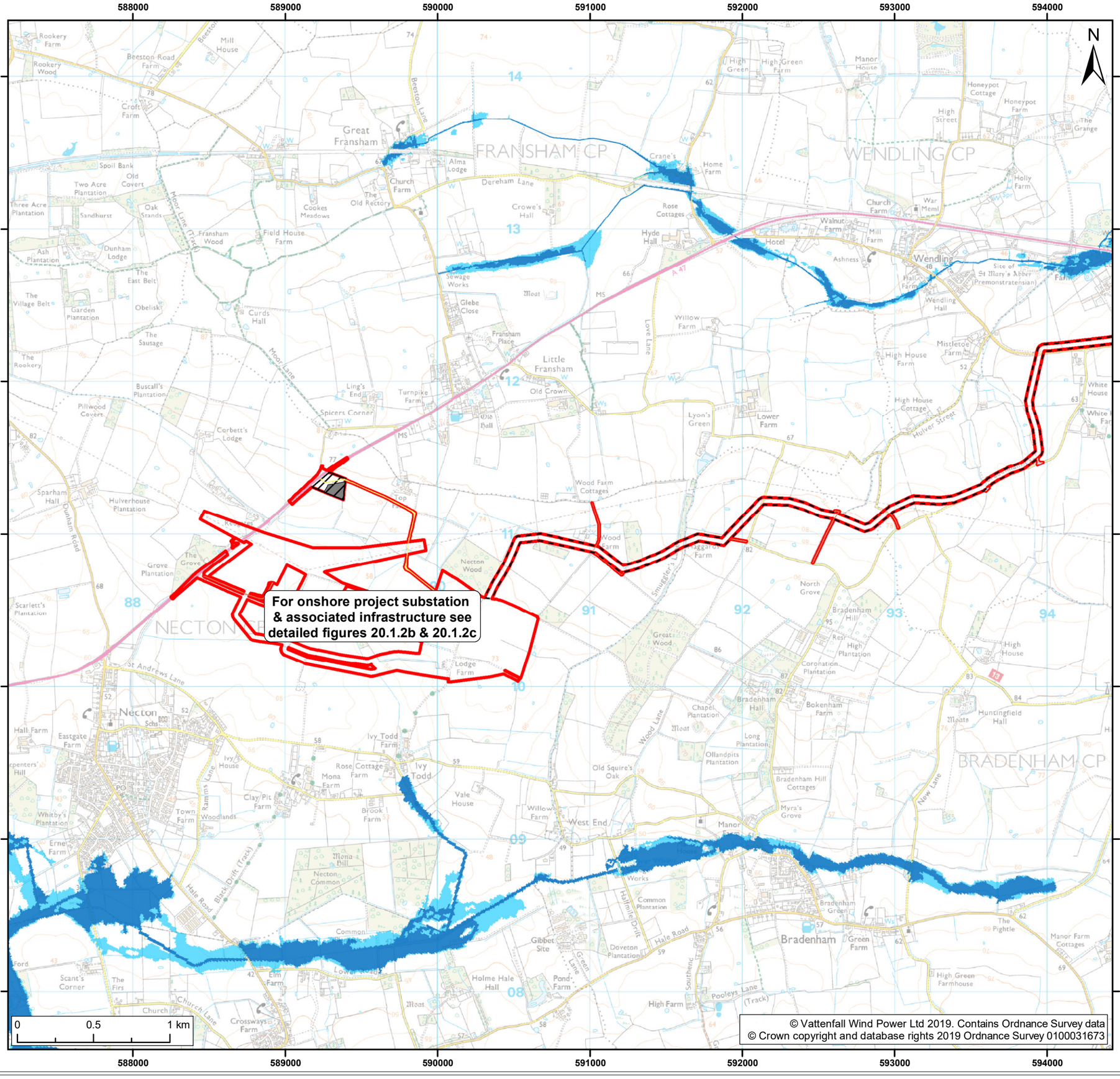

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Construction access
- Operational access
- Permanent access

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Environment Agency flood zones map
(Map 9 of 9)

Figure: 20.1.2a | Drawing No: PB5640-006-0201-002a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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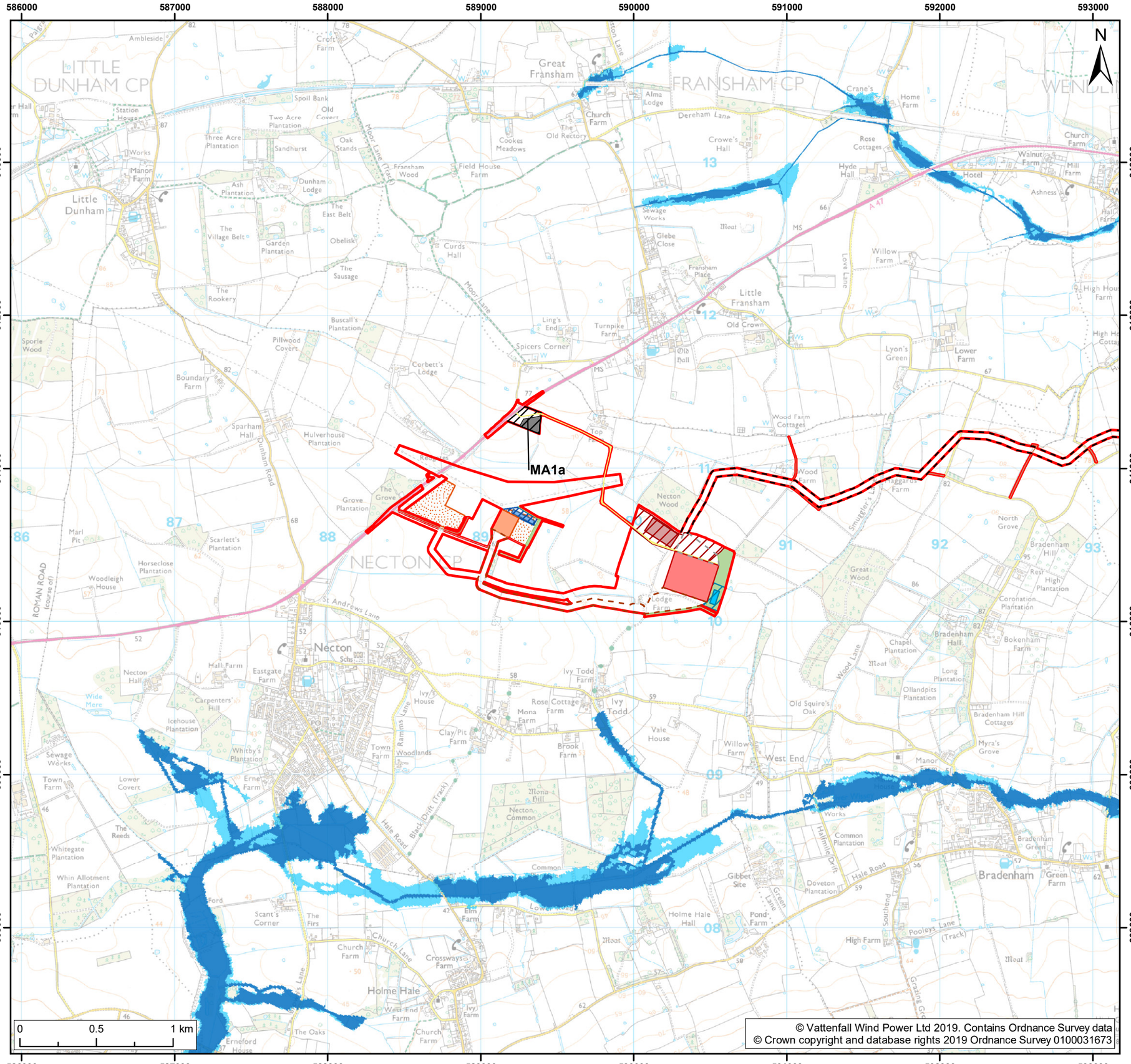

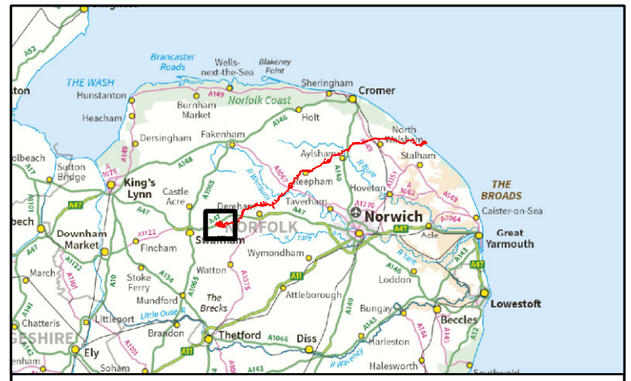

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1)

- Onshore cable route
- Cable route entry to substation
- Onshore 400kV cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Construction access
- Operational access
- Permanent access
- Onshore project substation
- Onshore project substation temporary construction compound zone
- Indicative onshore project substation temporary construction compound
- Attenuation pond zone
- Indicative attenuation pond
- Indicative mitigation planting
- National Grid substation extension
- National Grid temporary works
- National Grid attenuation pond location search area
- Indicative National Grid attenuation pond

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Environment Agency flood zones map

Figure: 20.1.2b | Drawing No: PB5640-006-0201-002b

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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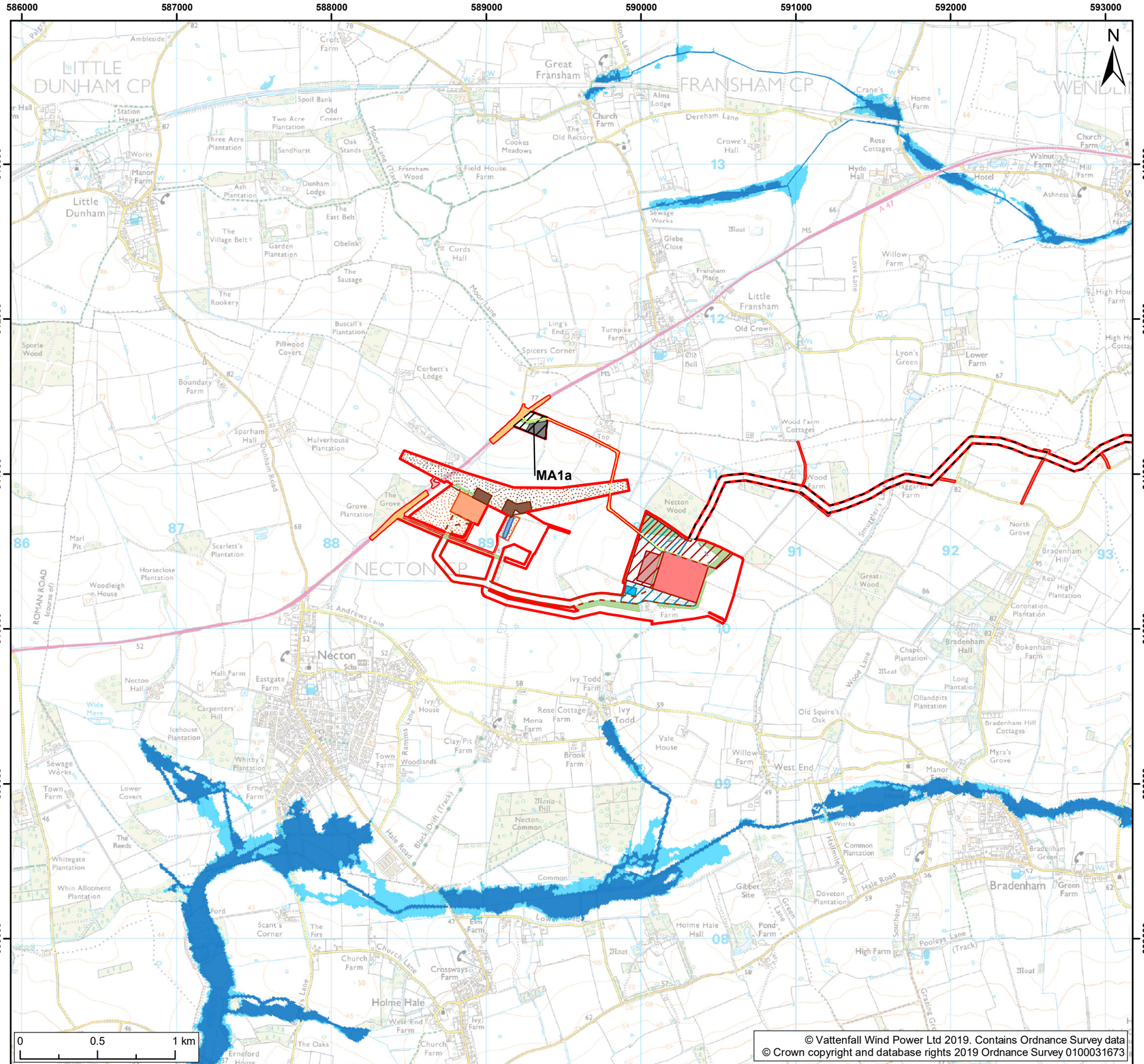

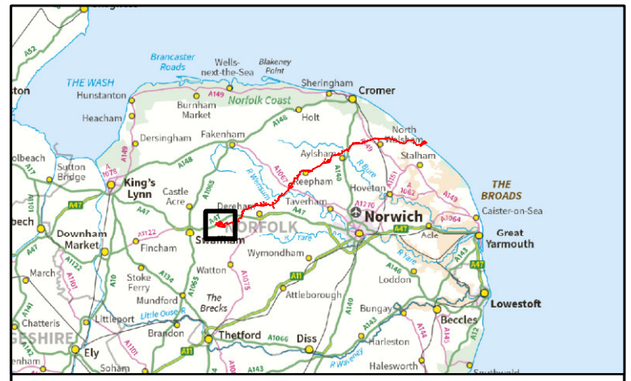

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Onshore cable route
- Cable route entry to substation
- Onshore 400kV cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Highways temporary works area
- Construction access
- Operational access
- Permanent access
- Onshore project substation
- Onshore project substation temporary construction compound zone
- Indicative onshore project substation temporary construction compound
- Attenuation pond zone
- Indicative attenuation pond
- Indicative mitigation planting
- National Grid substation extension
- National Grid new / replacement OHL tower search area
- National Grid temporary works
- Overhead line temporary works
- National Grid attenuation pond

Flood Zone[1]

- EA Flood Zone 2
- EA Flood Zone 3

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Environment Agency flood zones map

Figure: 20.1.2c | Drawing No: PB5640-006-0201-002c

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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638000 638500 639000 639500 640000 640500

331500 331000 330500 330000 329500 329000

N

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Landfall zone
- Landfall compound zone
- Indicative landfall compound
- Onshore cable route
- Operational access

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 1 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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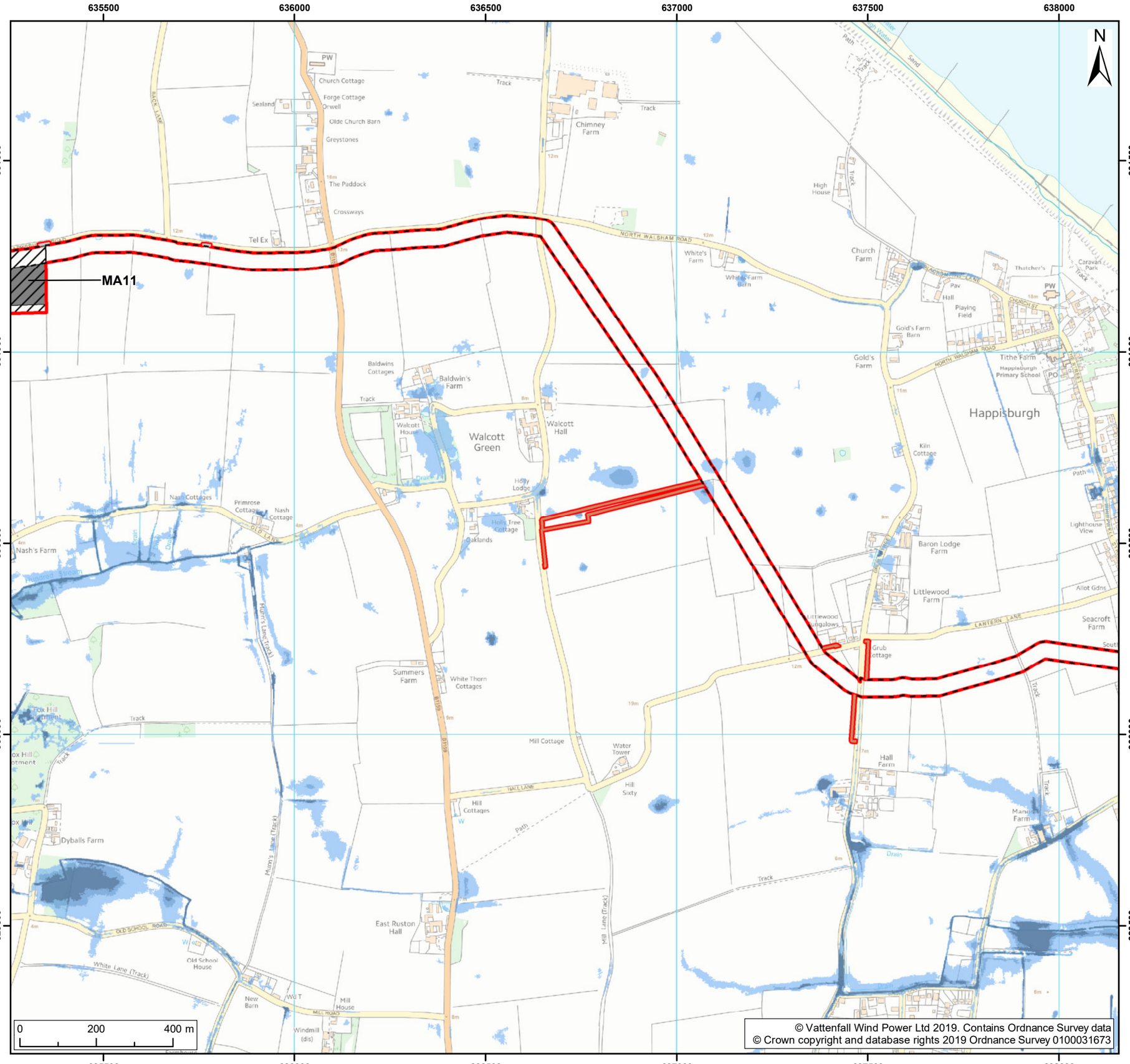
0 200 400 m



Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 2 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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633500 634000 634500 635000 635500 636000

332000 331500 331000 330500 330000

N

MA11

0 200 400 m

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 3 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid **EPSG:** 27700

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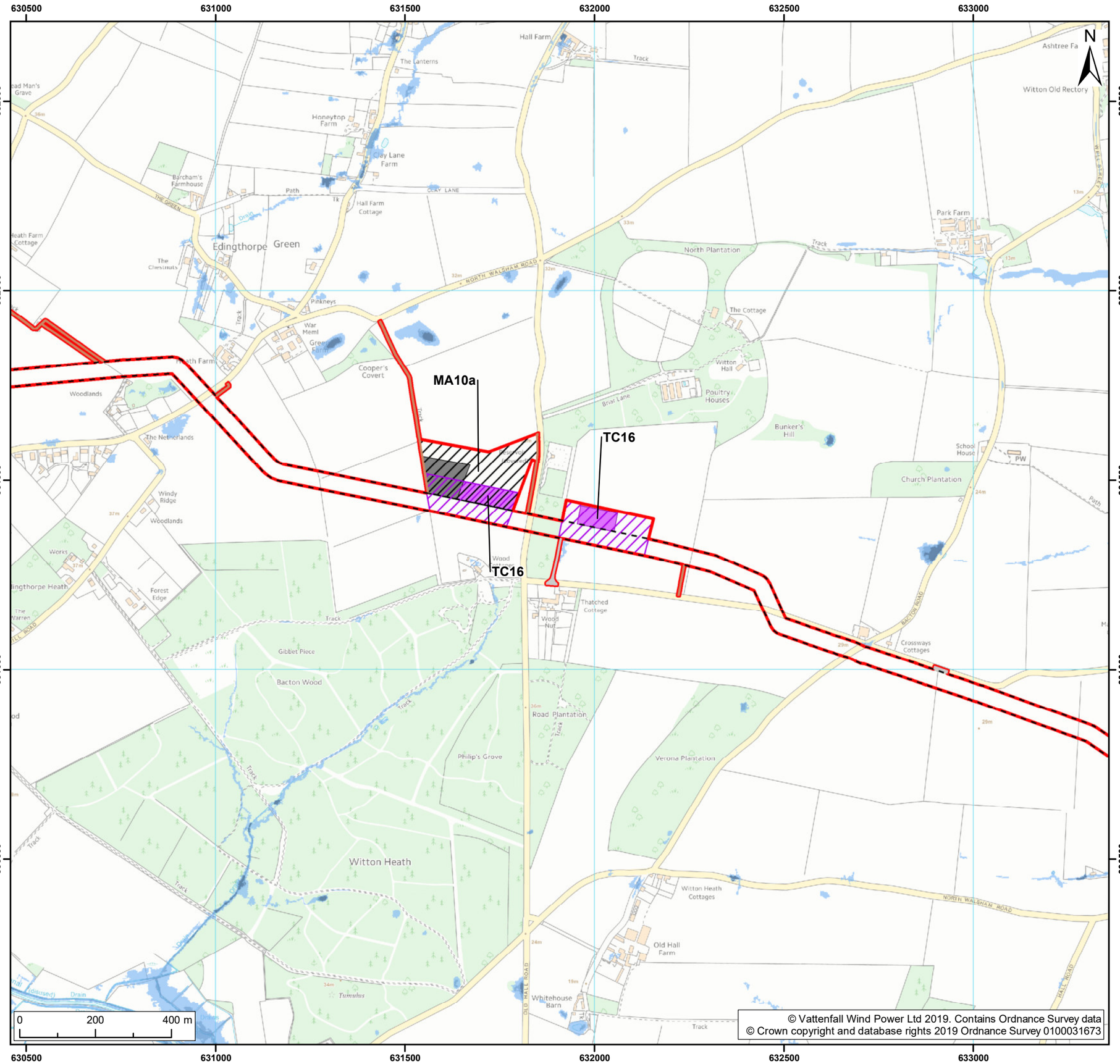

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 4 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid **EPSG:** 27700

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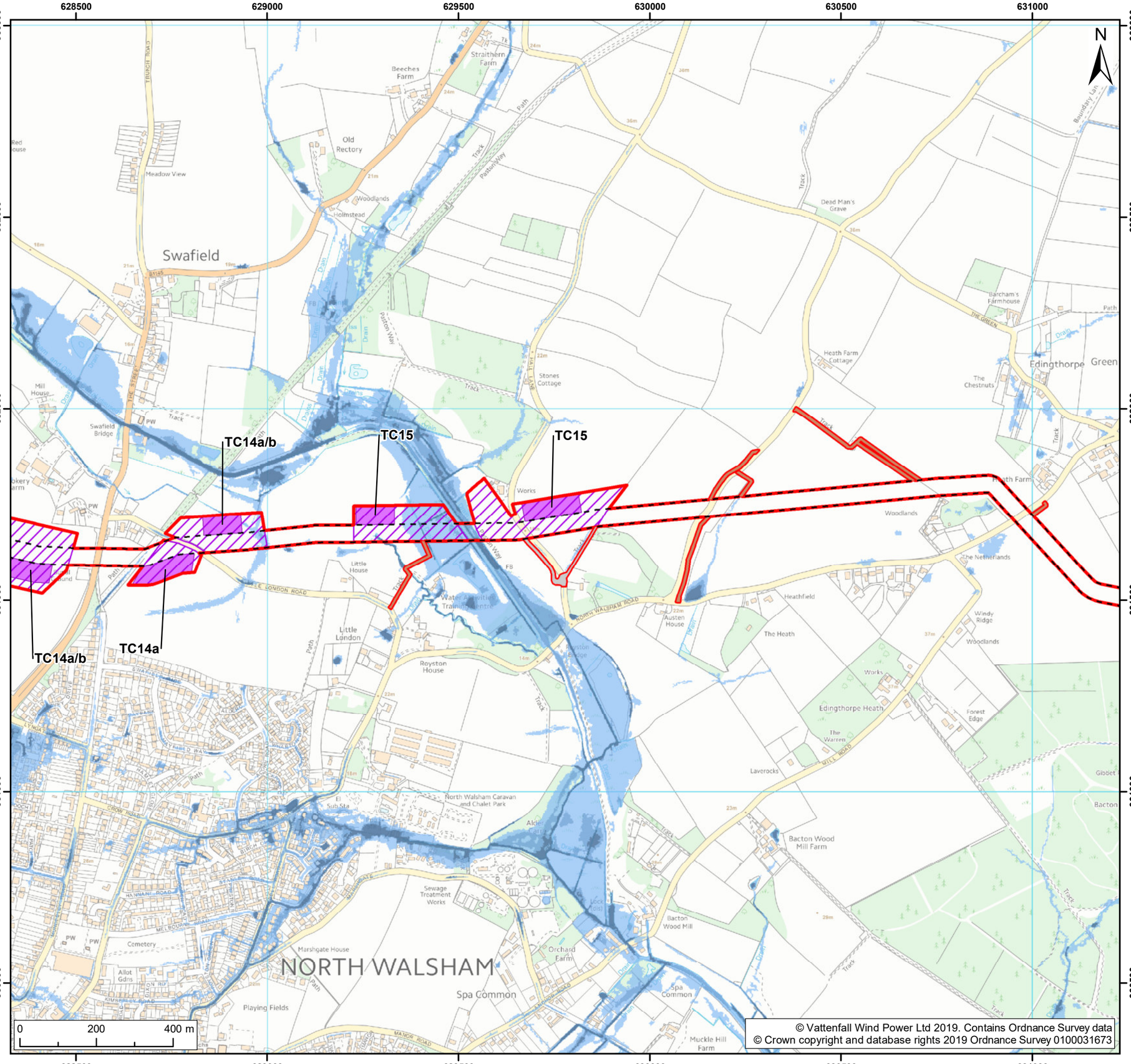

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 5 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid **EPSG:** 27700

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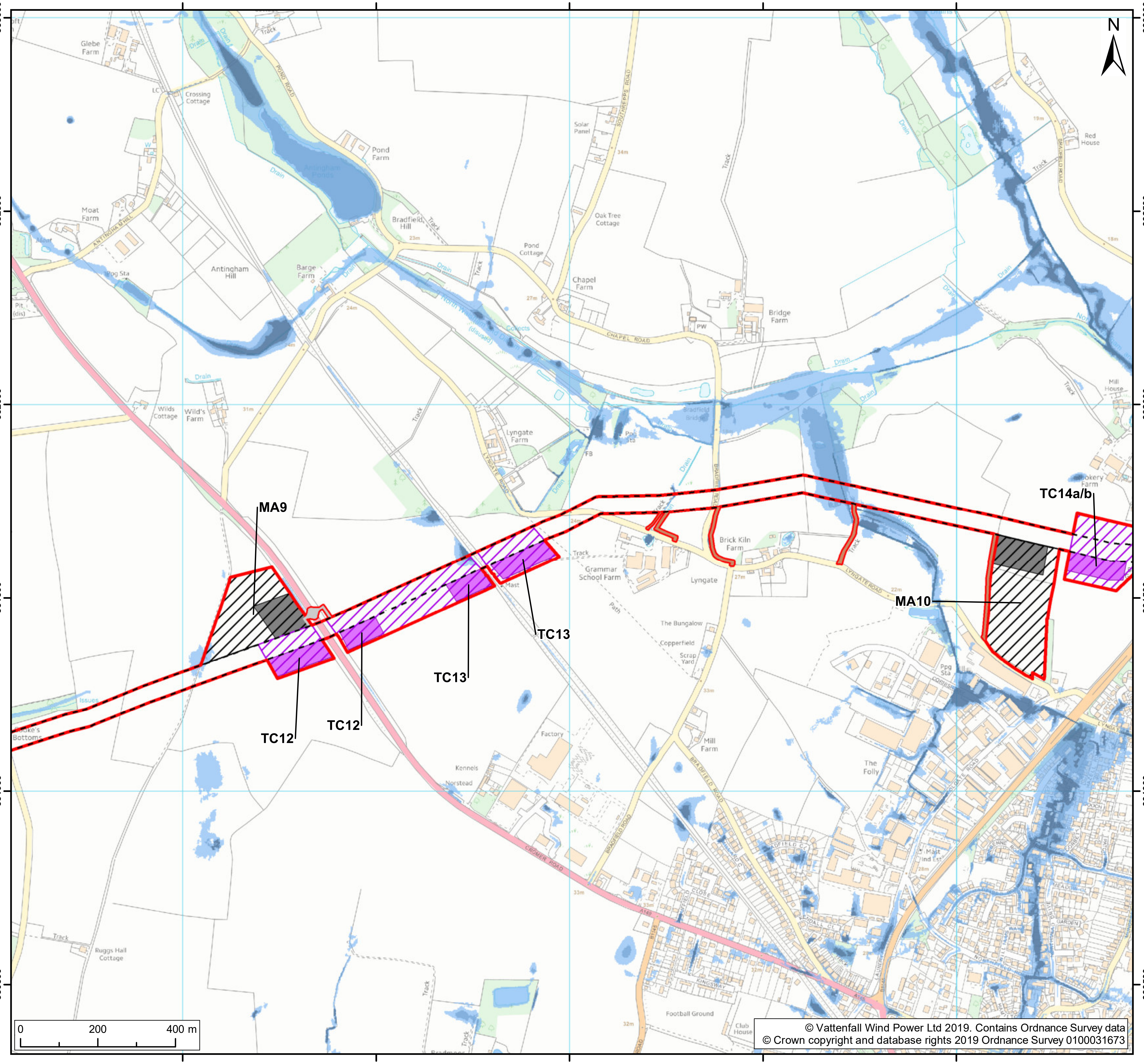

Legend:

Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

Onshore cable route

Construction access

Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

Trenchless crossing zone (e.g. HDD)

Indicative trenchless crossing compound

Mobilisation zone

Indicative mobilisation area compound

Surface Water Flooding Extent[1]

1 in 30

1 in 100

1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 6 of 22)

Figure: 20.1.3a Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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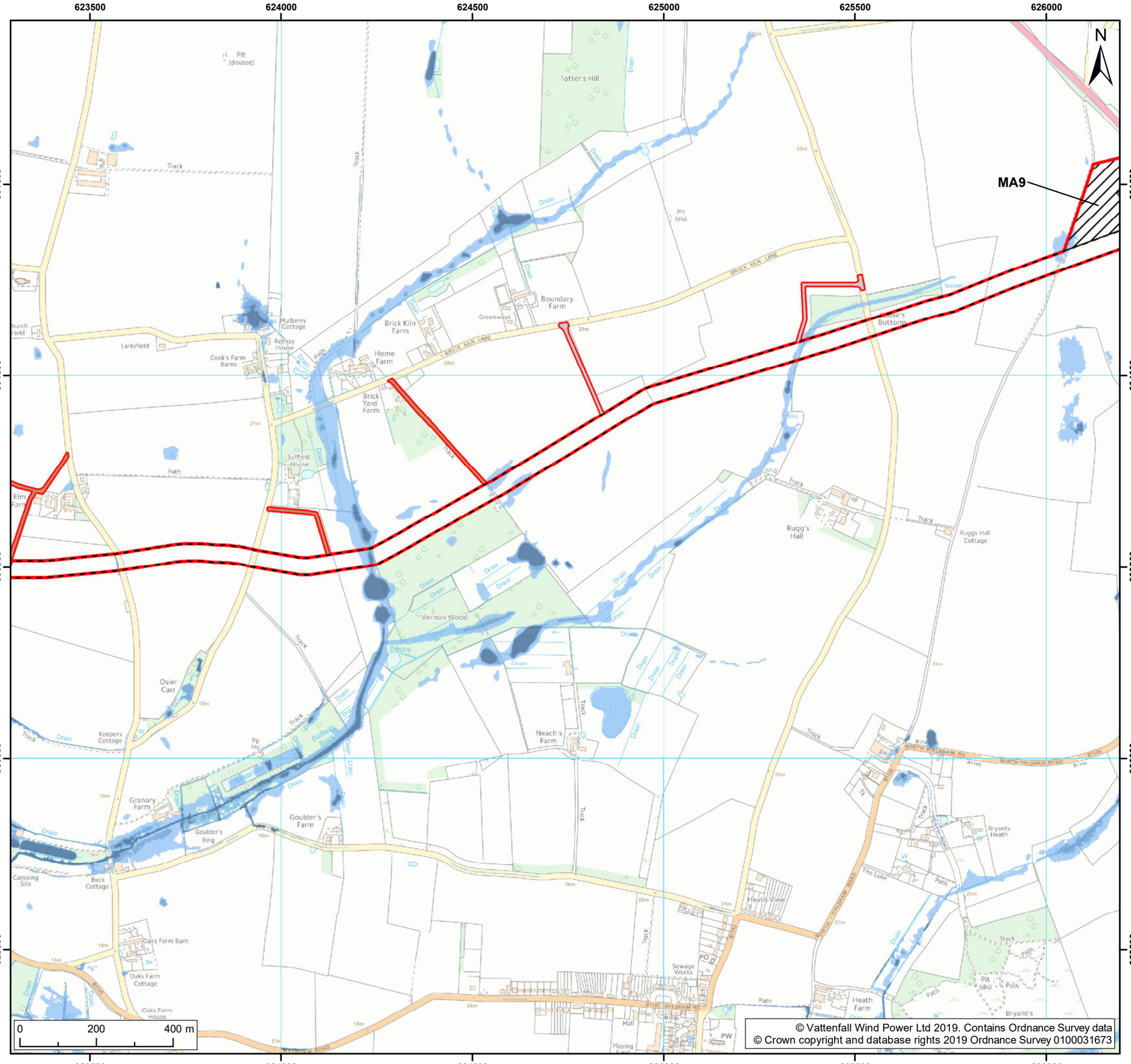

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 7 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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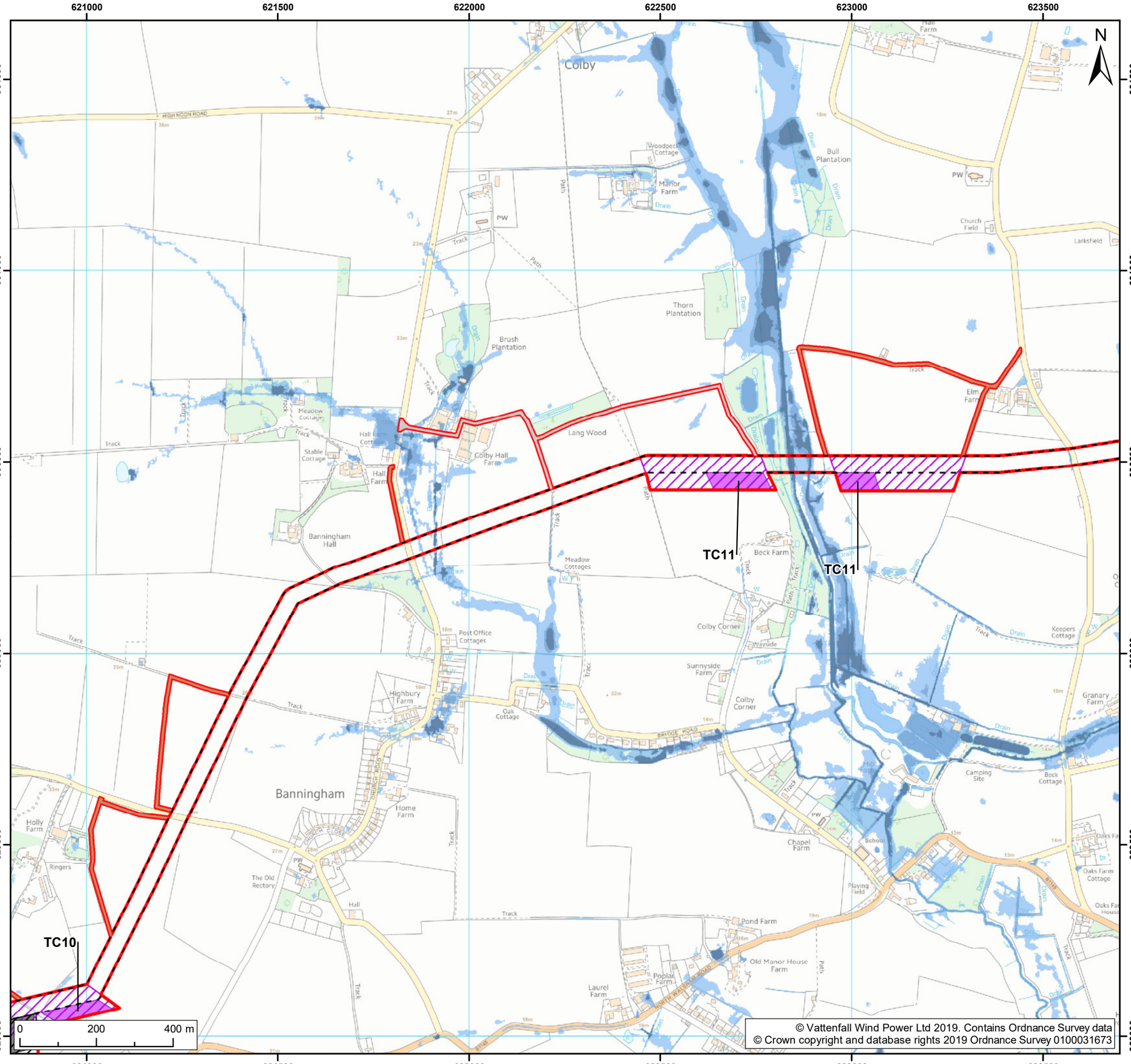

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 8 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid **EPSG:** 27700

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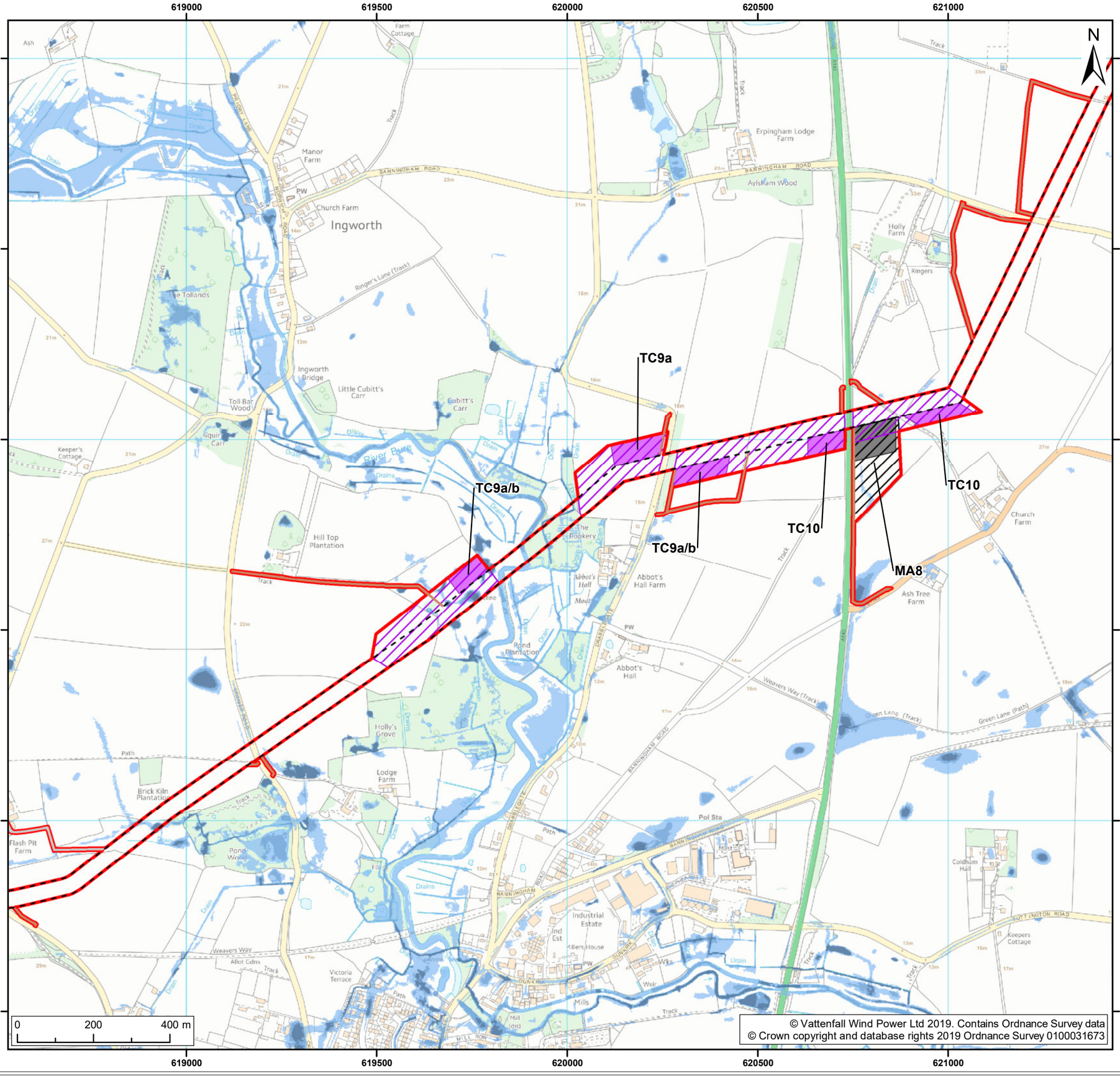

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 9 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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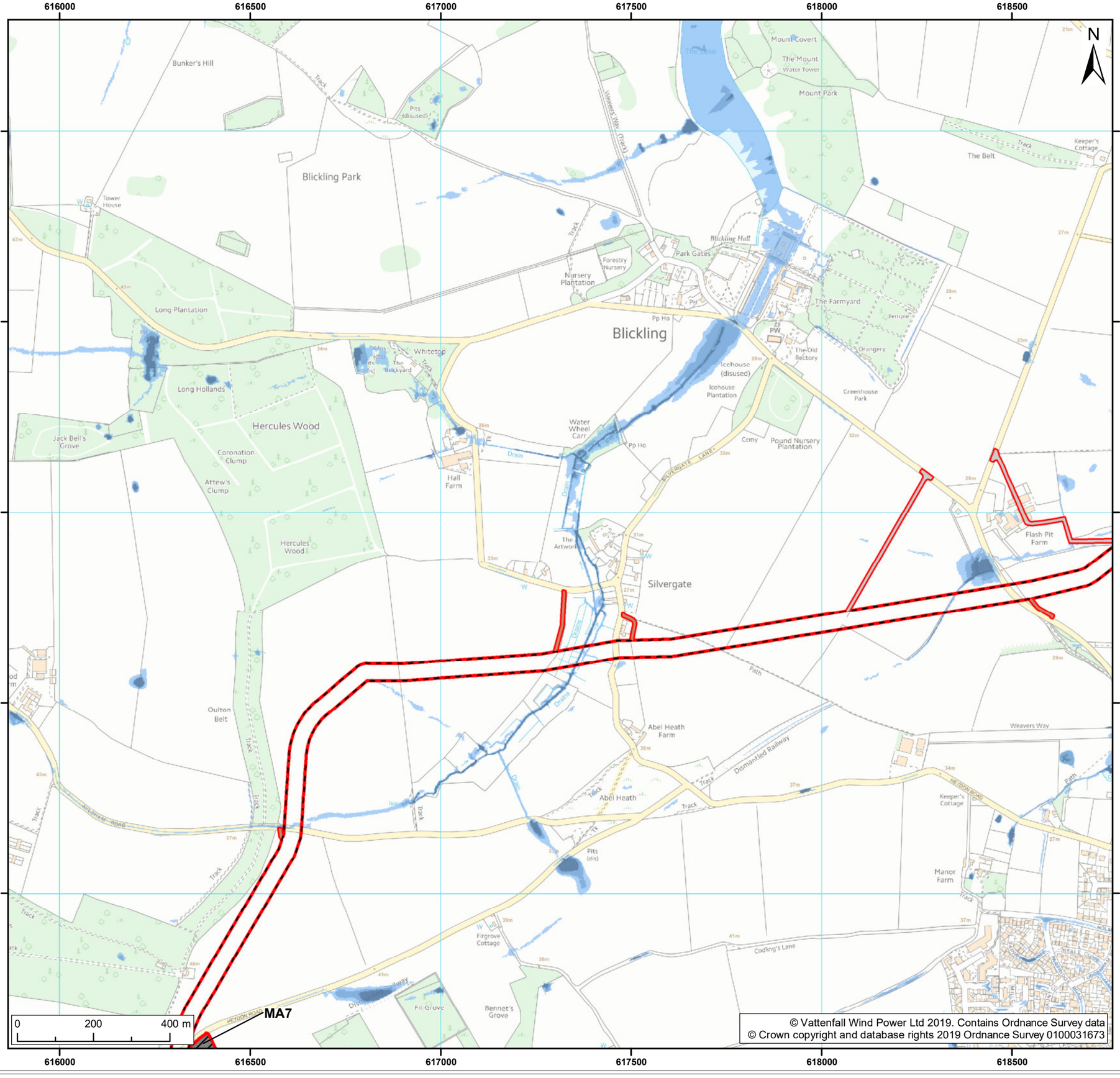

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 10 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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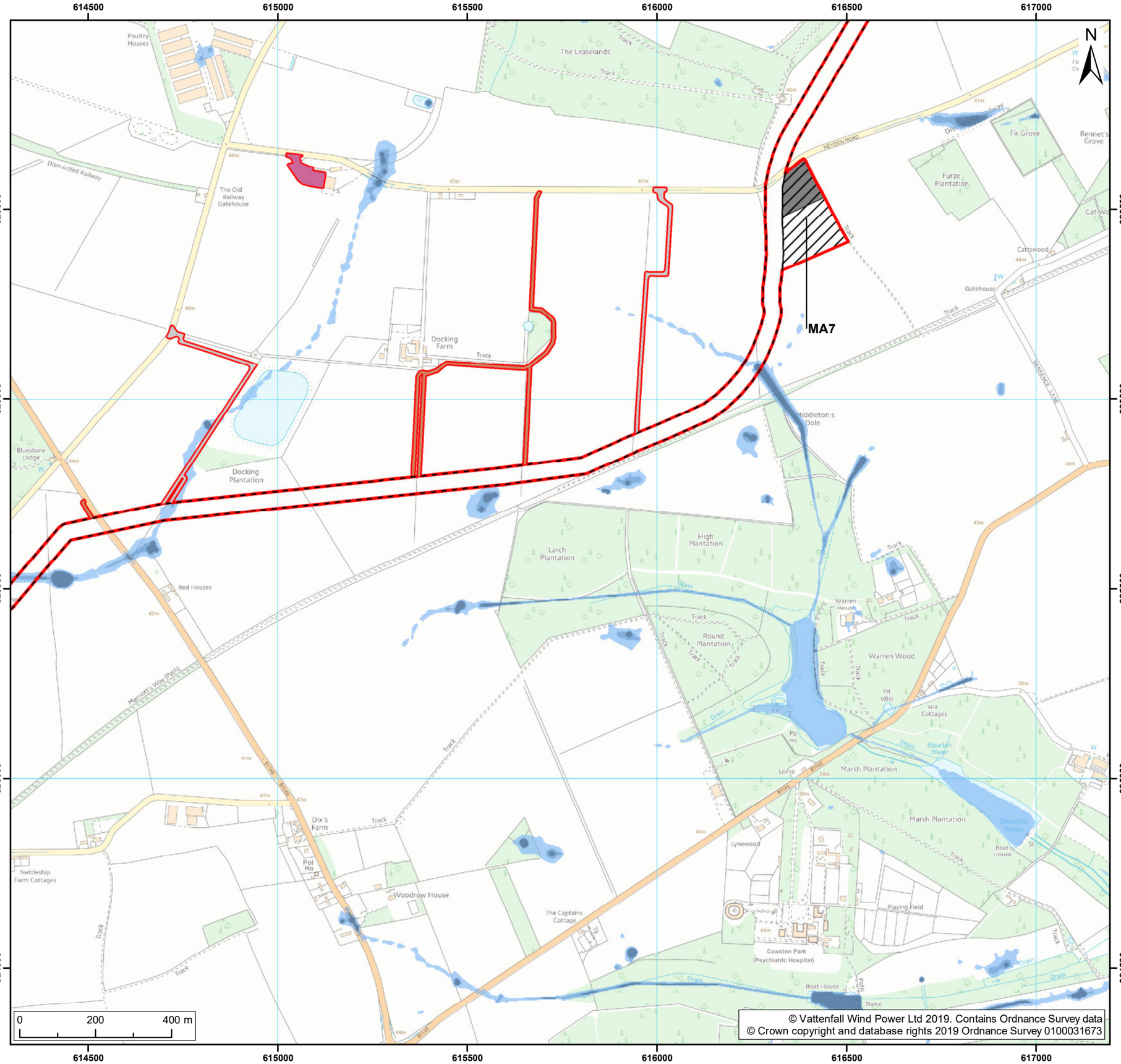

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Cable logistics area
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 11 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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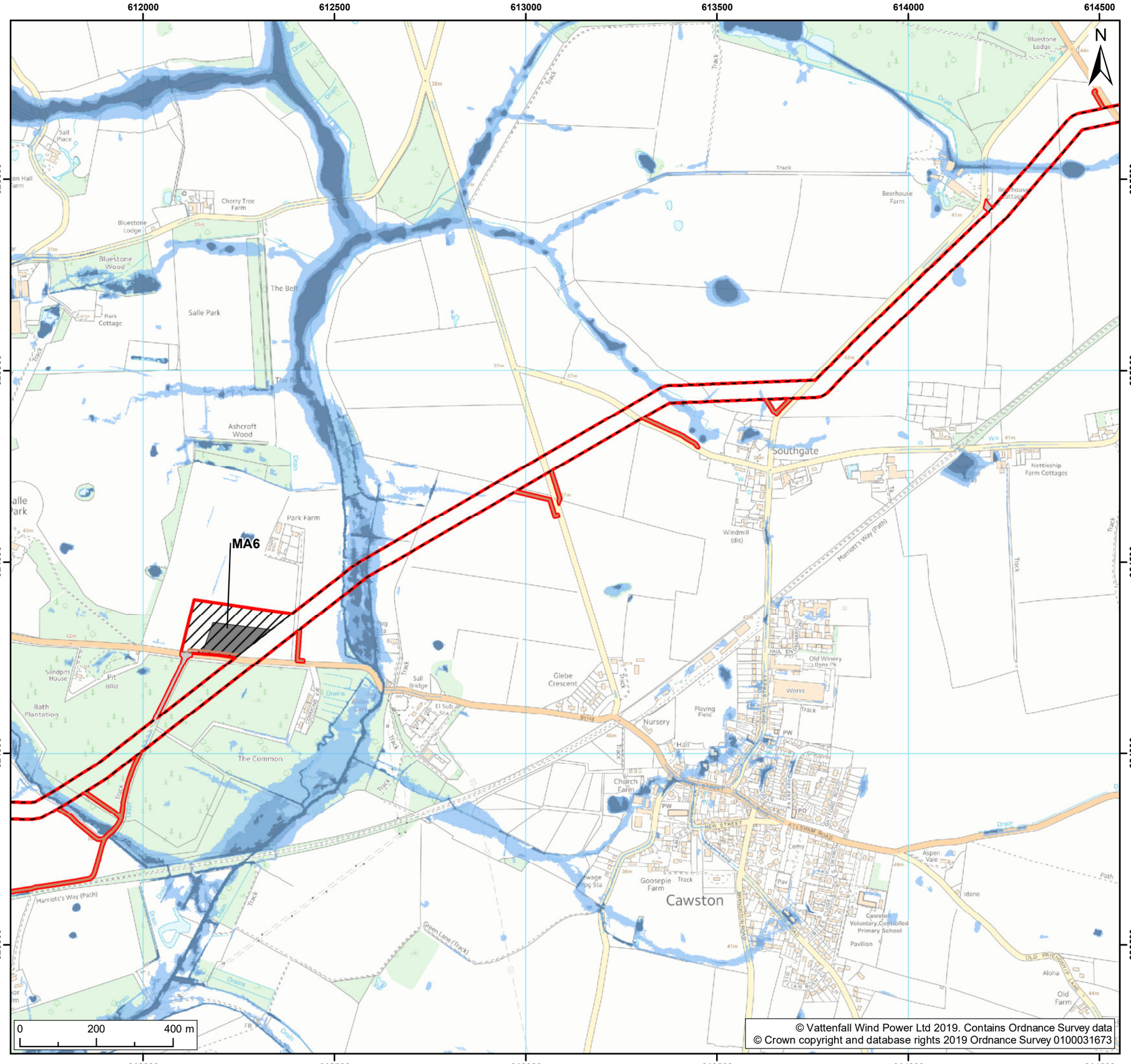

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 12 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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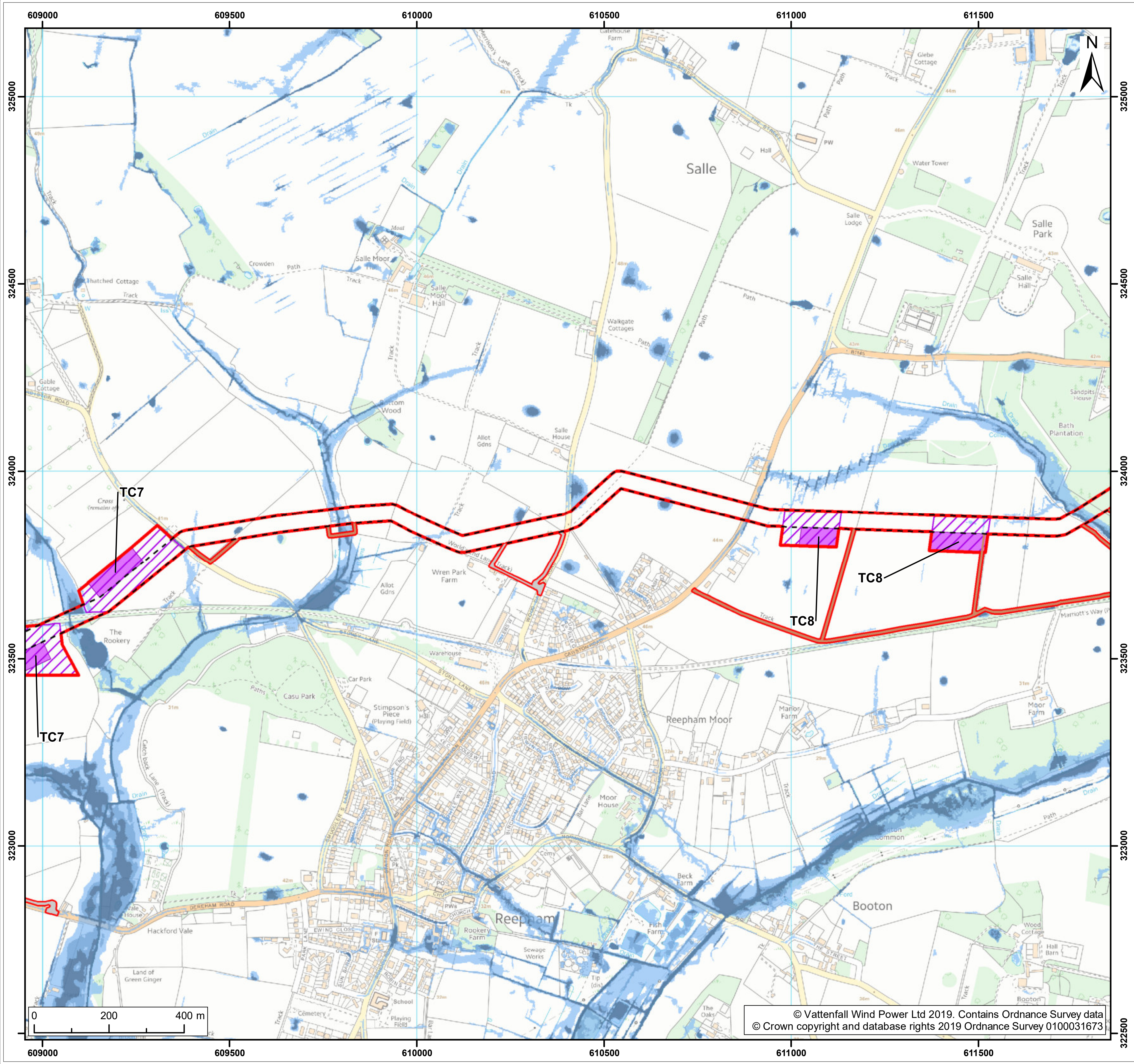

Legend:

Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

Onshore cable route

Construction access

Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

Trenchless crossing zone (e.g. HDD)

Indicative trenchless crossing compound

Surface Water Flooding Extent[1]

1 in 30

1 in 100

1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 13 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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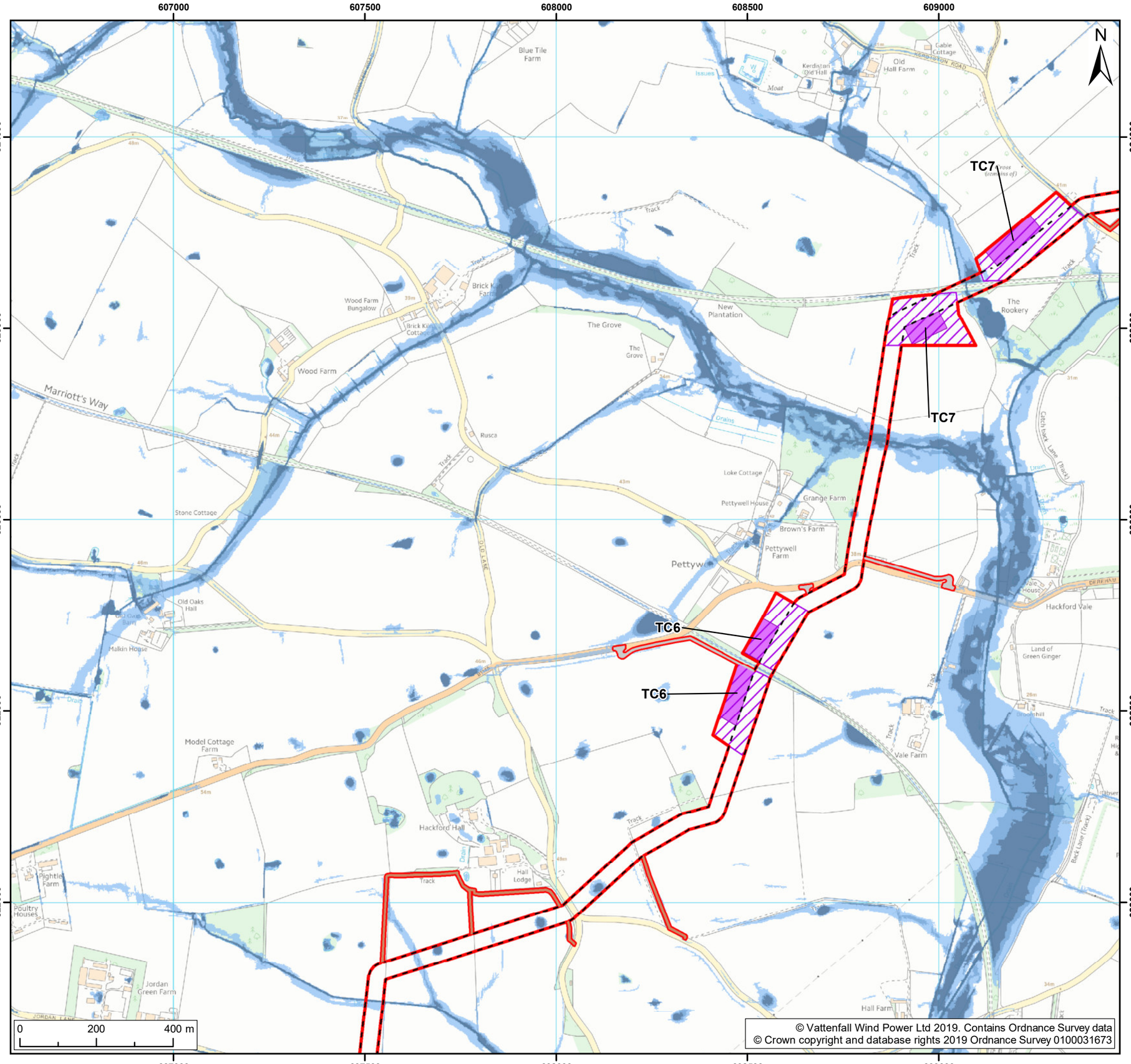

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 14 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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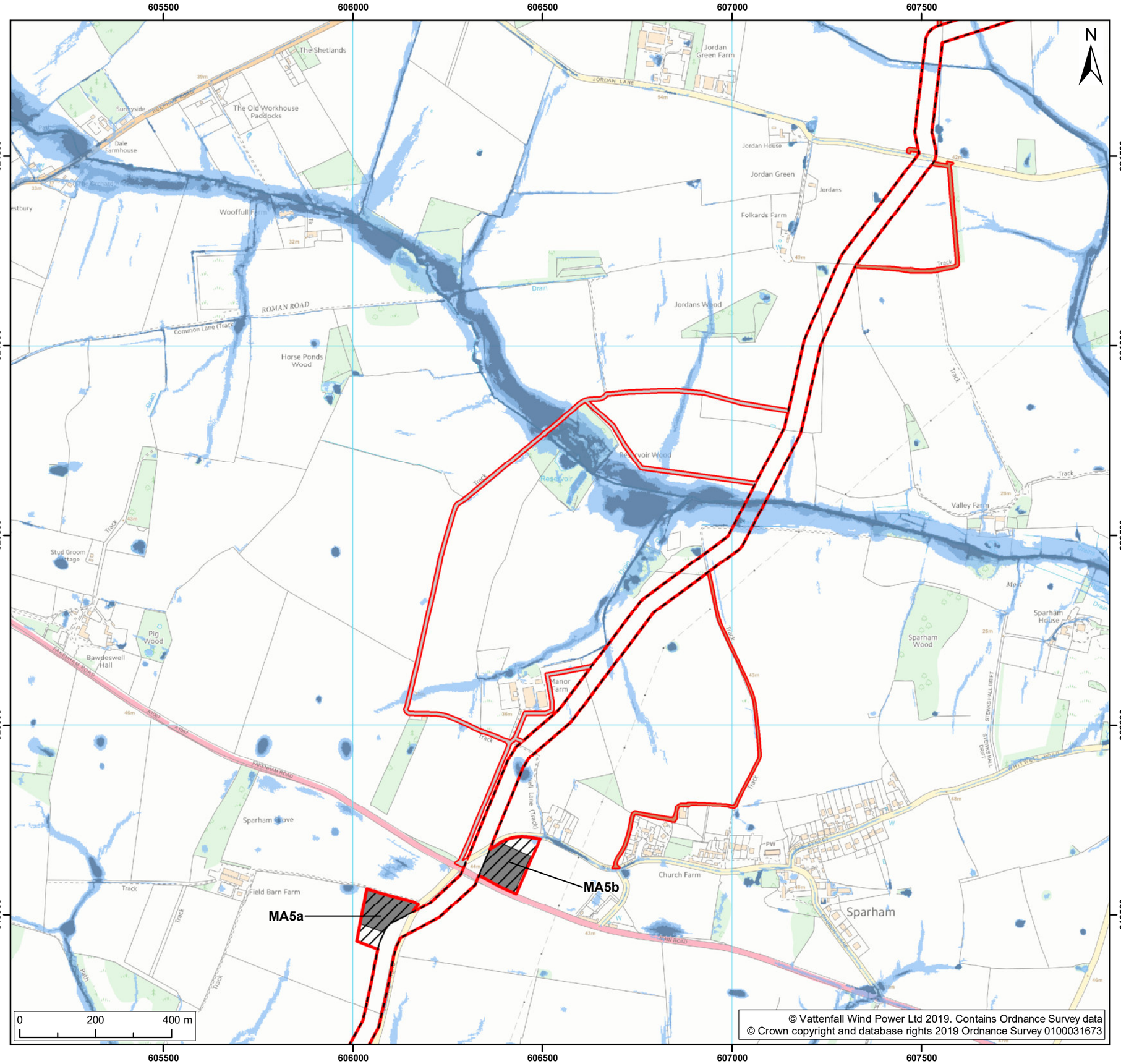

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 15 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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603500 604000 604500 605000 605500 606000

319500 319000 318500 318000 317500 317000

MA5a

MA5b

TC5a

TC5a/b

TC5a/b

Bylaugh Park

Bylaugh Hall

Jubilee Plantation

Sparhamhole Plantation

Sparham Hole

Elsing Lodge Plantation

Field Barn Farm

Old Heath House

Old Hall Farm

Penny Spot Plantation

Penny Spot Farm

Wensum Farm

Three Bridges Farm

Mill Street

Beech Walk

The Old Rectory

Lyng Heath

Sewage Works

Pipeline

Abattoir

Mill Farm

0 200 400 m

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 16 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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601500 602000 602500 603000 603500 604000

317000 316500 316000 315500 315000 314500

N

Greengate
Swanton Morley
Chapel Farm
Greengate House Farm
Hazeldene Farm
Woodgate
Woodgate
Hospital Farm
Woodgate Hall Farm
Lincoln House
Park Farm
Penny Spot Plantation
Penny Spot Farm
Barnworks
Pollard Grove
Frog's Hall
Three Ways
Virginia Farm
Bothany Bay
Gooch's Cottages
Wiggs Barn
Dirty Lane (Track)
MA4

0 200 400 m

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 17 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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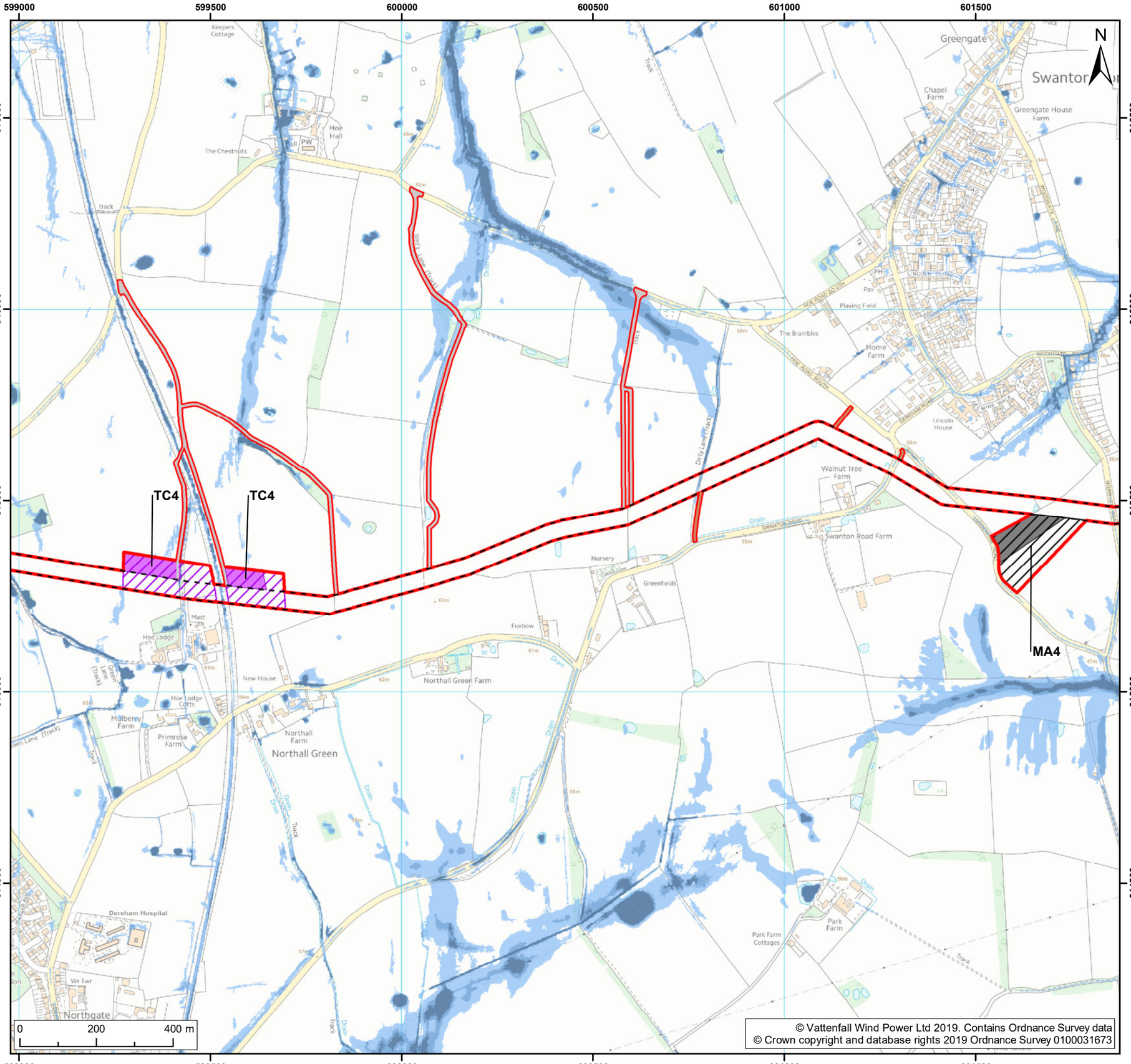

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 18 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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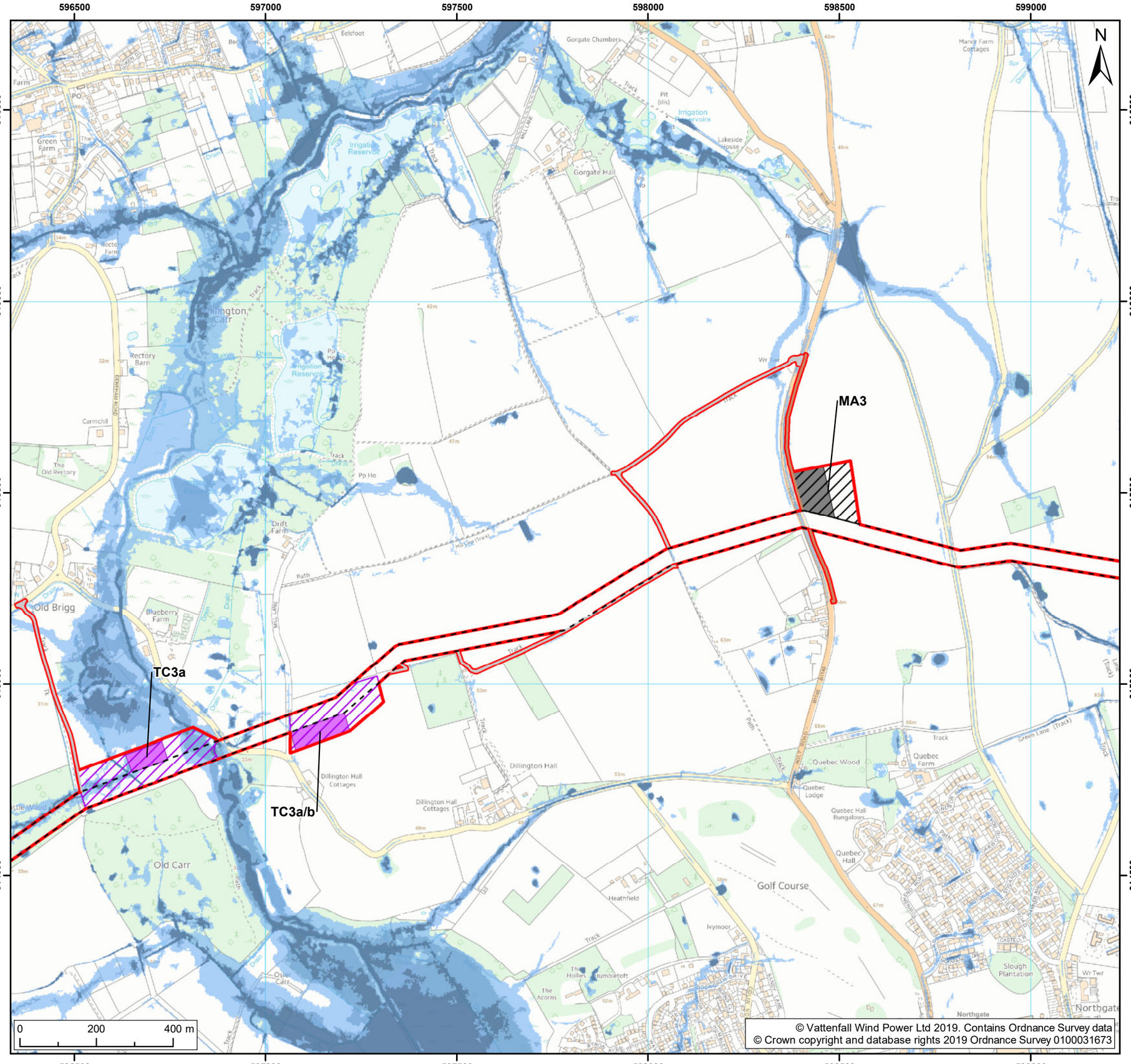

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 19 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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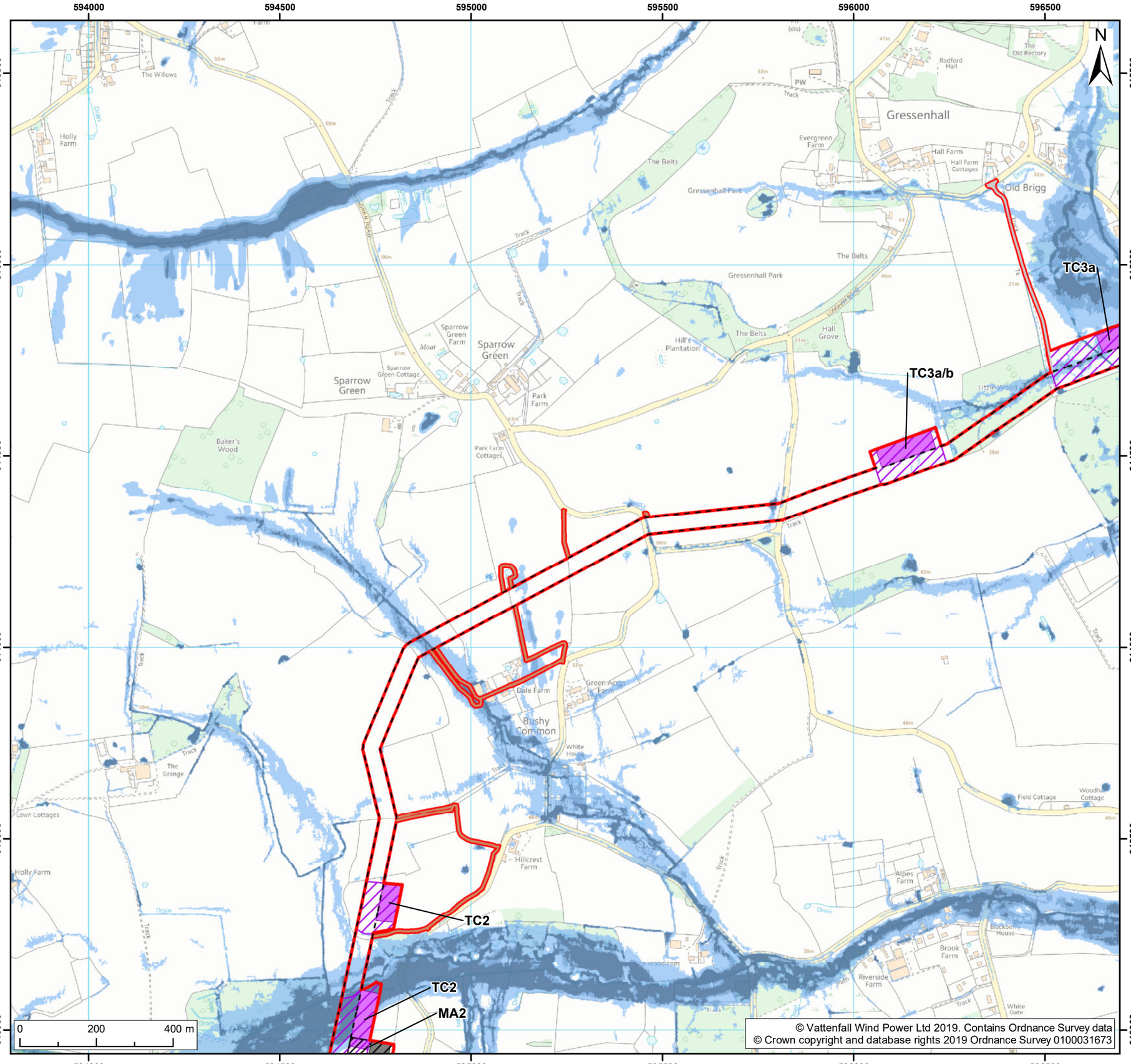

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 20 of 22)

Figure:	Drawing No:
20.1.3a	PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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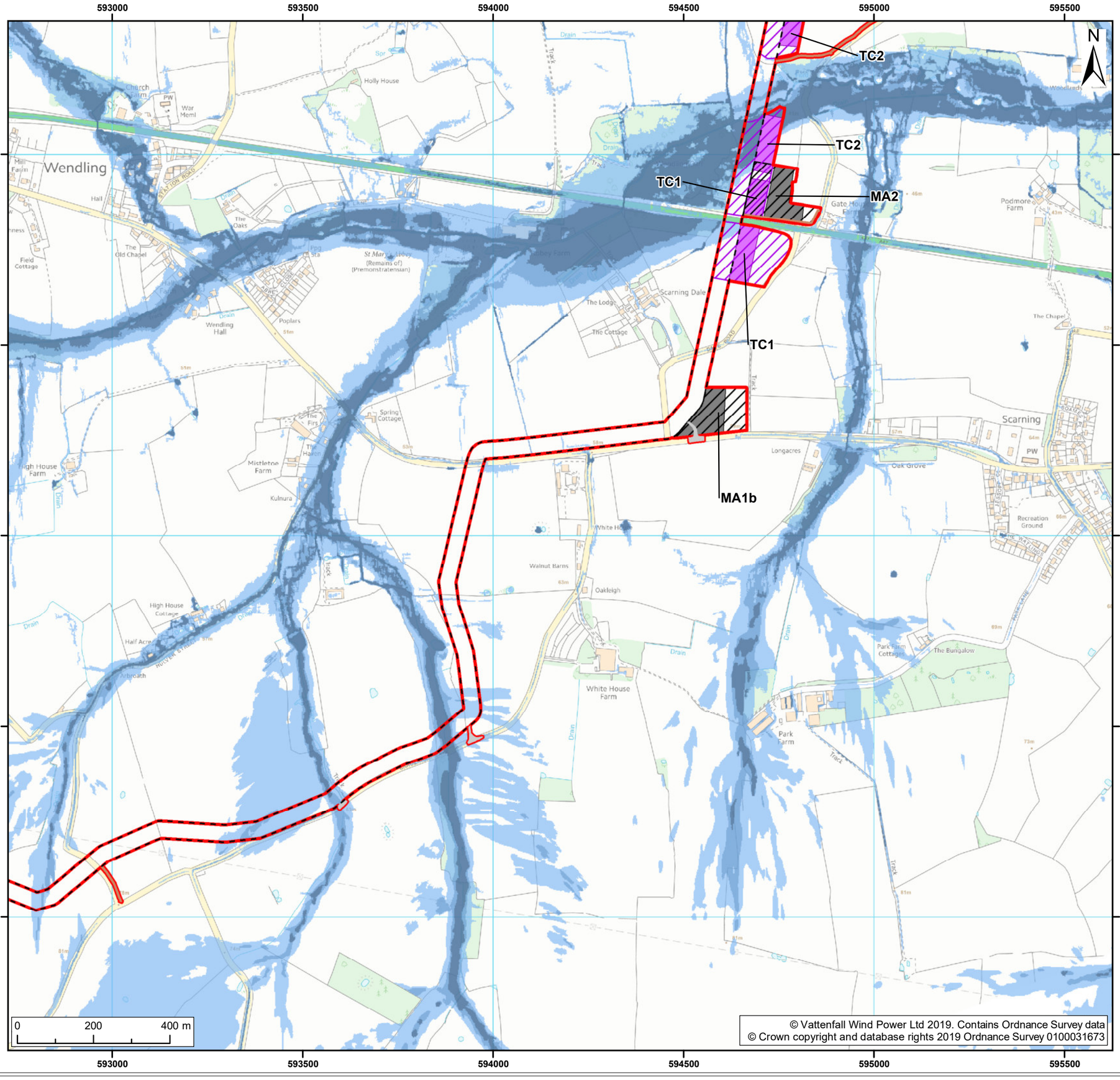

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 21 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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590500 591000 591500 592000 592500 593000

312000 311500 311000 310500 310000 309500

N

For onshore project substation & associated infrastructure see detailed figures 20.1.3b & 20.1.3c

0 200 400 m

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Operational access

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Surface Water Flood Risk
(Map 22 of 22)

Figure: 20.1.3a | Drawing No: PB5640-006-0201-003a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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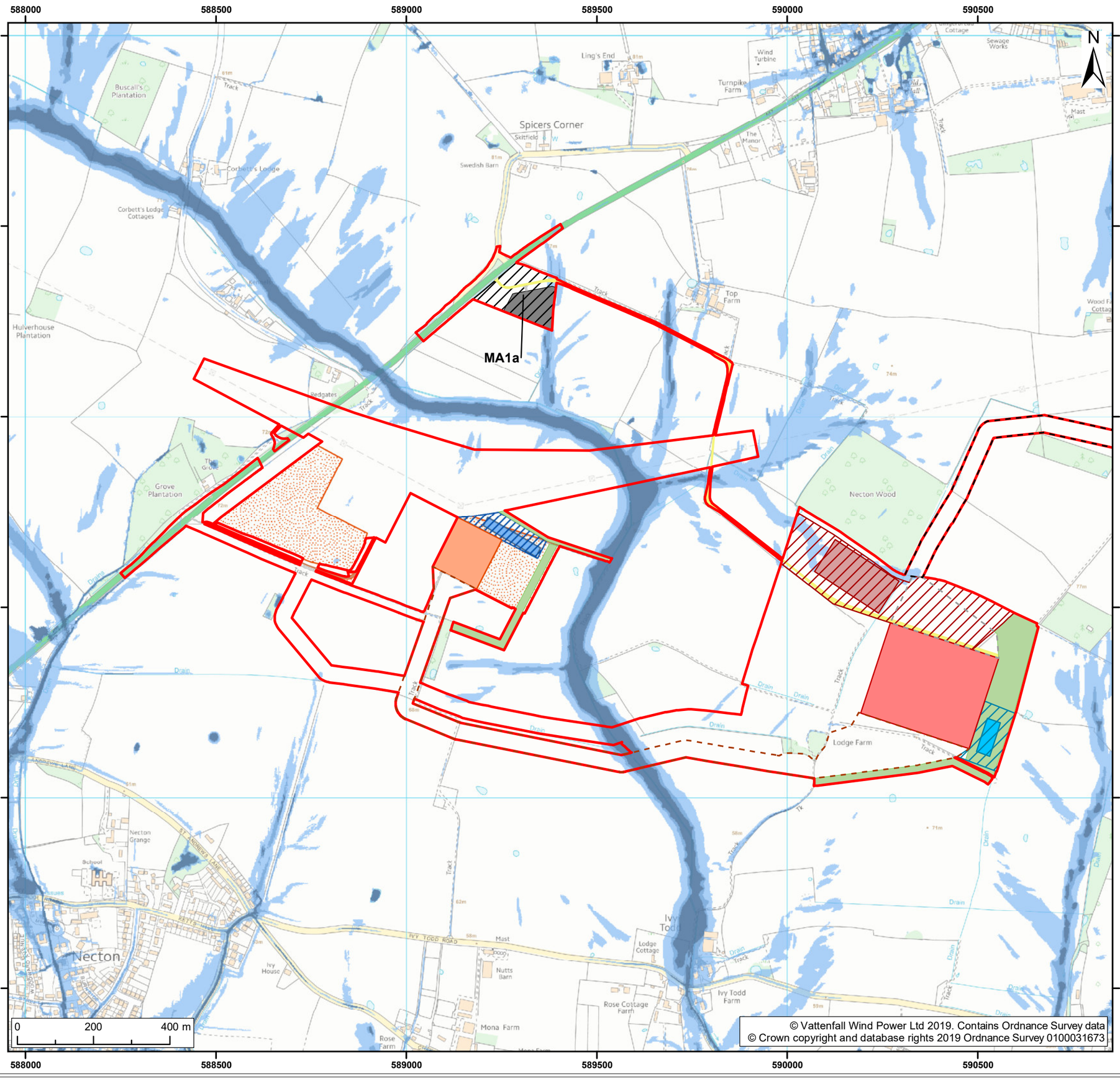

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1)

- Onshore cable route
- Cable route entry to substation
- Onshore 400kV cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Construction access
- Operational access
- Permanent access
- Onshore project substation
- Onshore project substation temporary construction compound zone
- Indicative onshore project substation temporary construction compound
- Attenuation pond zone
- Indicative attenuation pond
- Indicative mitigation planting
- National Grid substation extension
- National Grid temporary works
- National Grid attenuation pond location search area
- Indicative National Grid attenuation pond

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Surface Water Flood Risk

Figure: 20.1.3b | Drawing No: PB5640-006-0201-003b

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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Co-ordinate system: British National Grid **EPSG:** 27700

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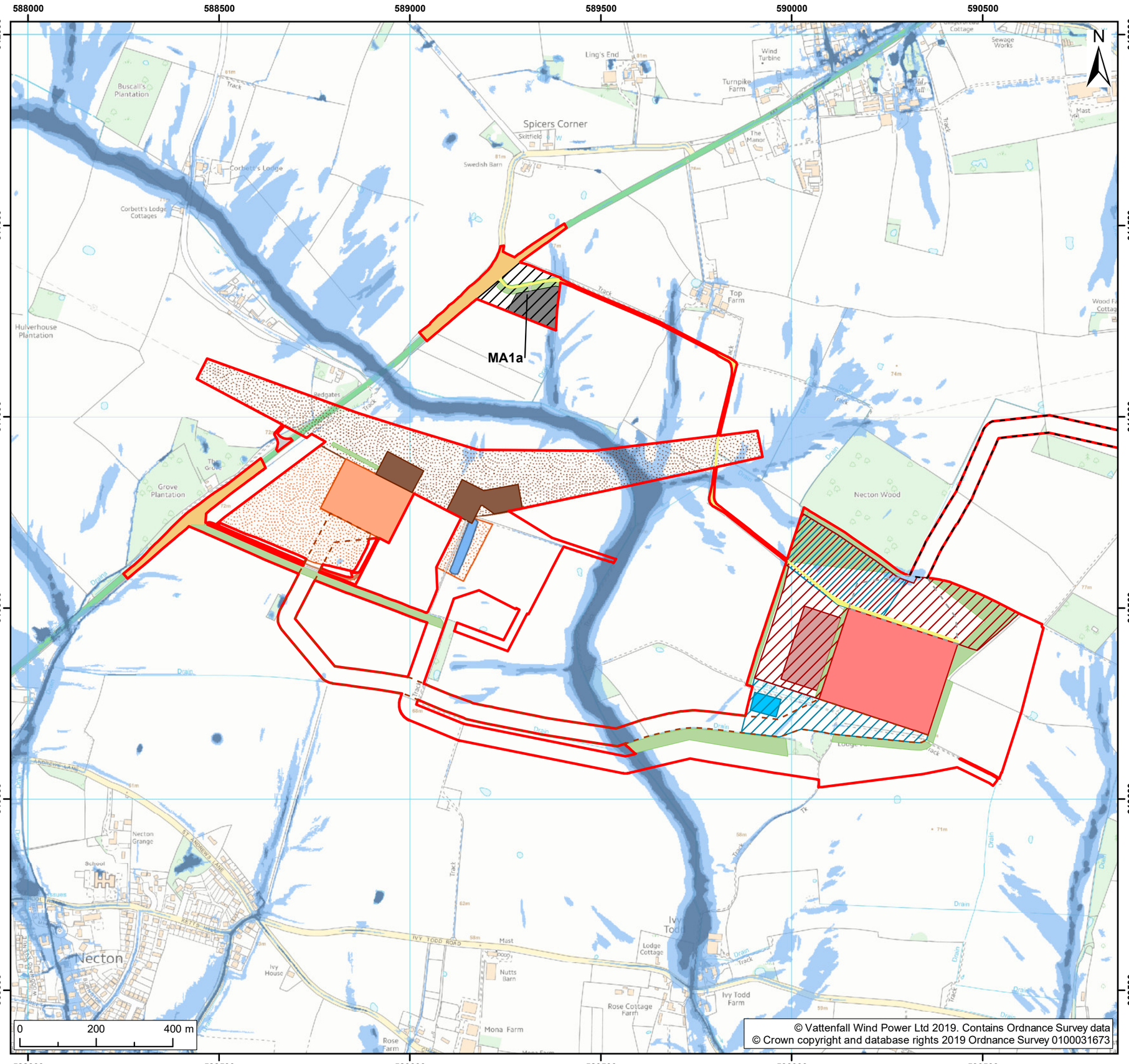

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Onshore cable route
- Cable route entry to substation
- Onshore 400kV cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Highways temporary works area
- Construction access
- Operational access
- Permanent access
- Onshore project substation
- National Grid temporary works
- Overhead line temporary works
- National Grid attenuation pond
- Onshore project substation temporary construction compound zone
- Indicative onshore project substation temporary construction compound
- Attenuation pond zone
- Indicative attenuation pond
- Indicative mitigation planting
- National Grid substation extension
- National Grid new / replacement OHL tower search area

Surface Water Flooding Extent[1]

- 1 in 30
- 1 in 100
- 1 in 1000

[1] Enviornment Agency, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Surface Water Flood Risk

Figure: 20.1.3c | Drawing No: PB5640-006-0201-003c

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	15/02/2019	JT	CD	A3	1:10,000

Co-ordinate system: British National Grid **EPSG:** 27700

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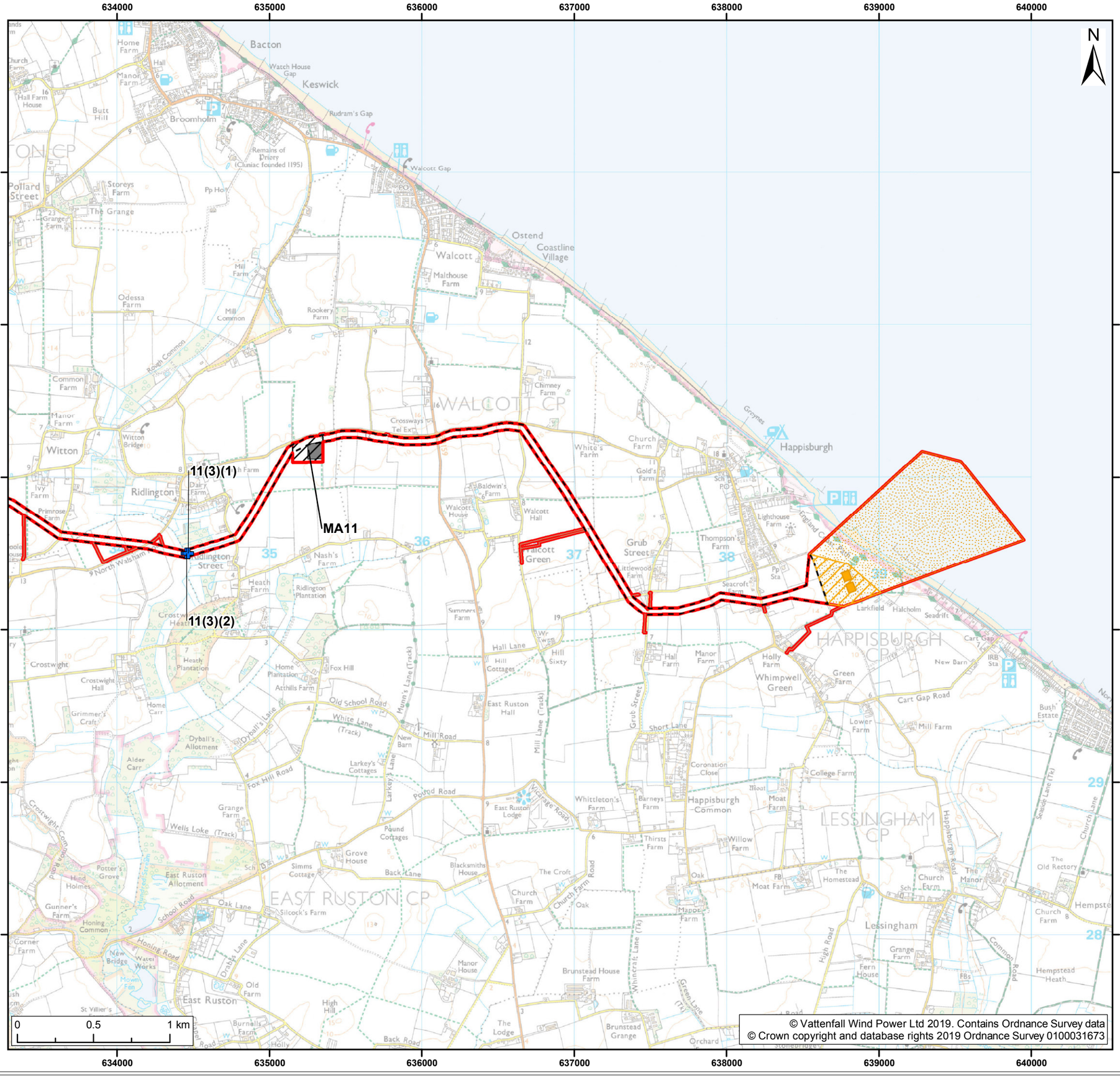

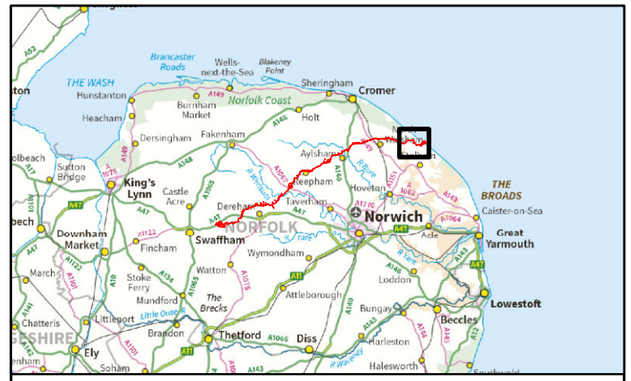

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Landfall zone
- Landfall compound zone
- Indicative landfall compound
- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 1 & 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Crossing locations
(Map 1 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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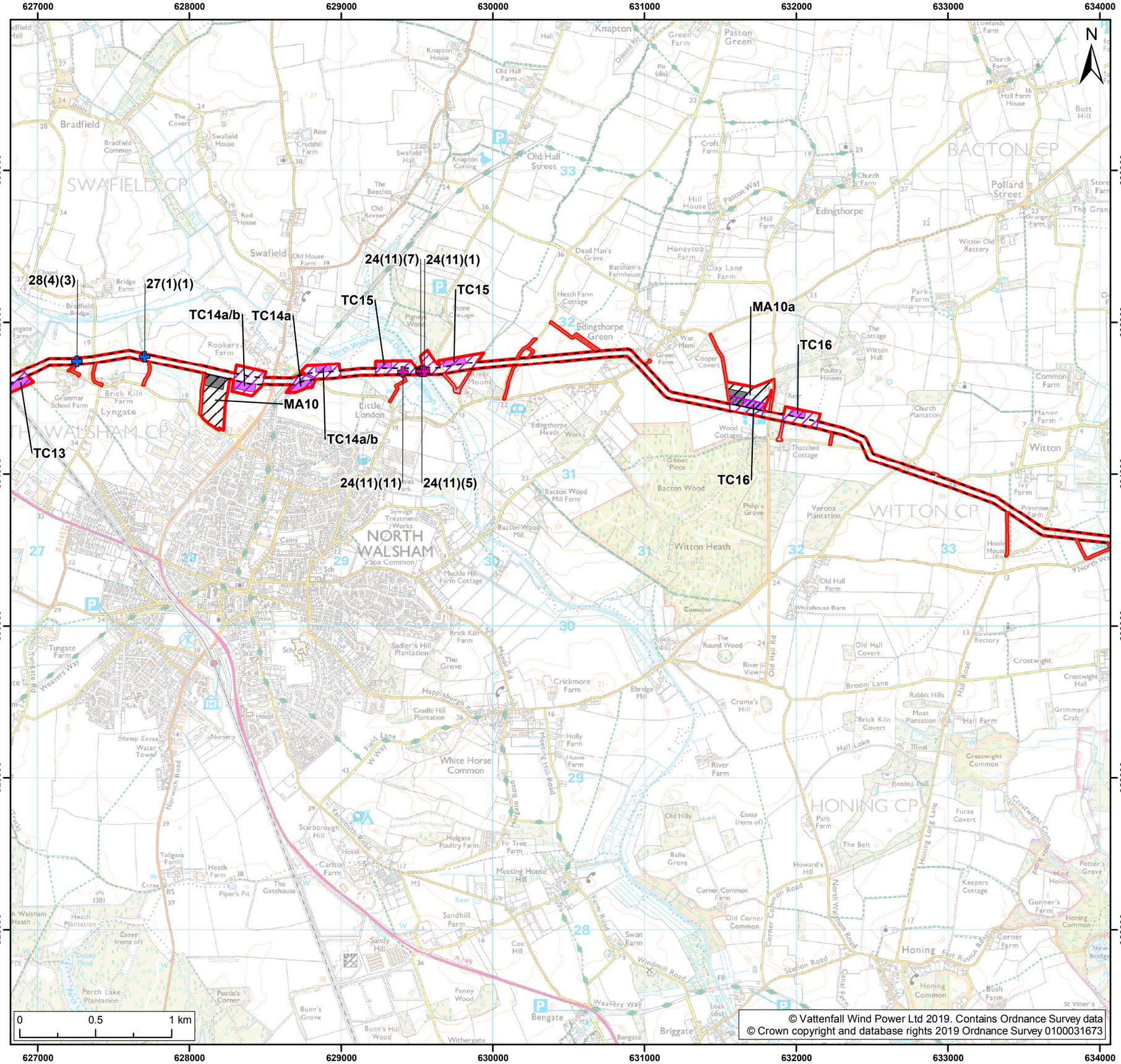

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 1 & 2
- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Crossing locations
(Map 2 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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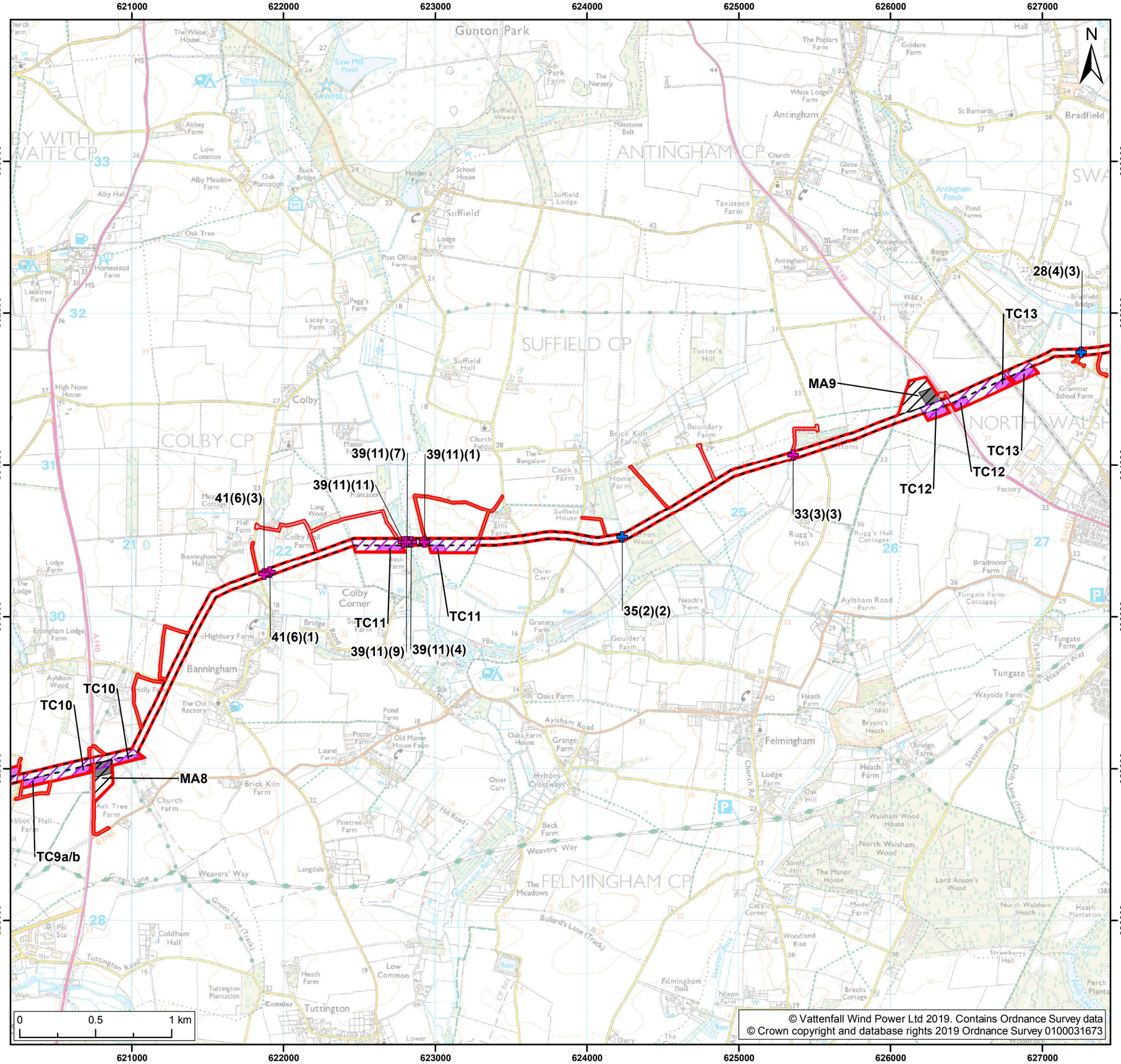

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 1 & 2
- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Crossing locations
(Map 3 of 9)

Figure:	Drawing No:
20.1.4a	PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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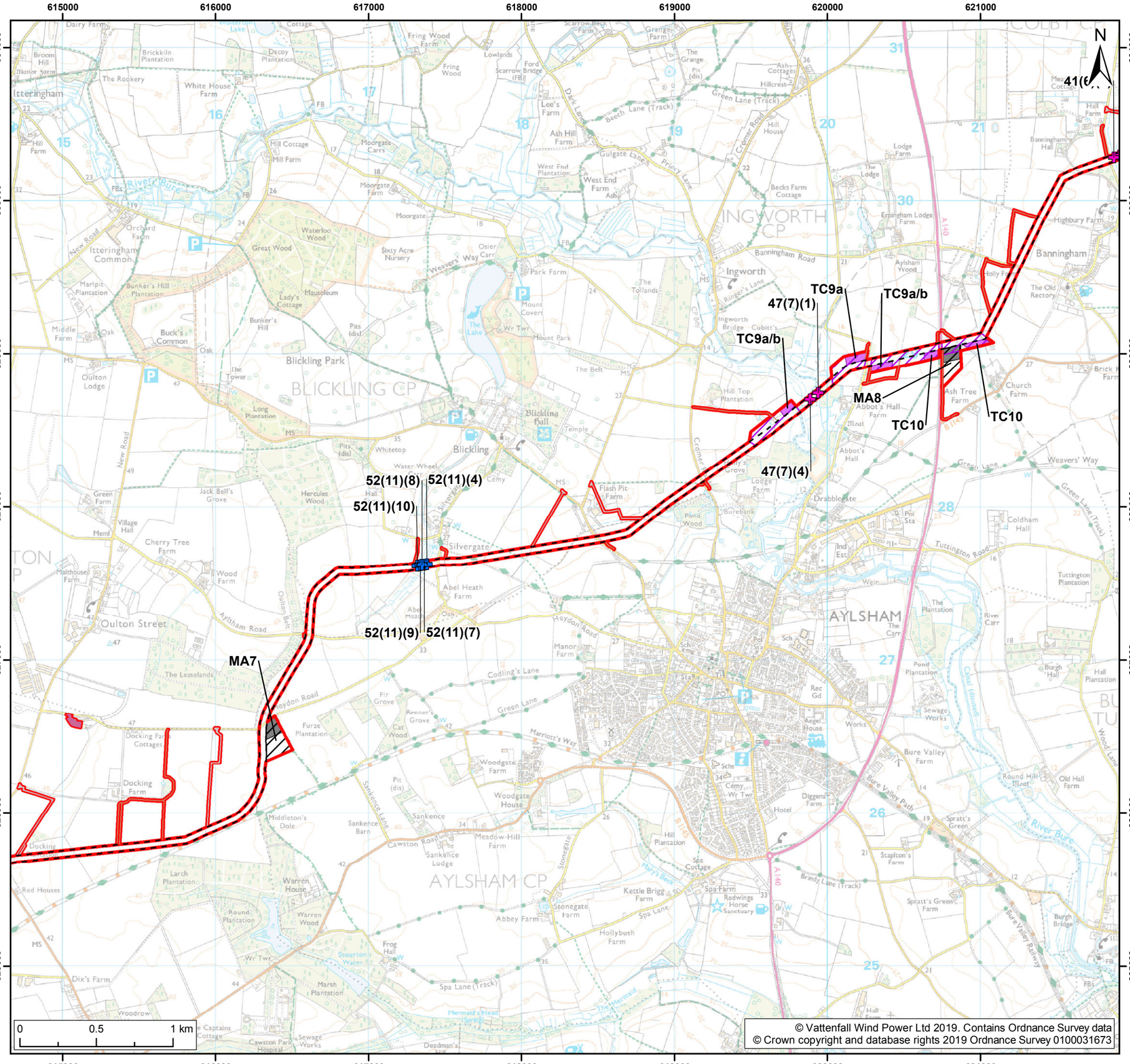

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Cable logistics area
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 1 & 2
- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Crossing locations
(Map 4 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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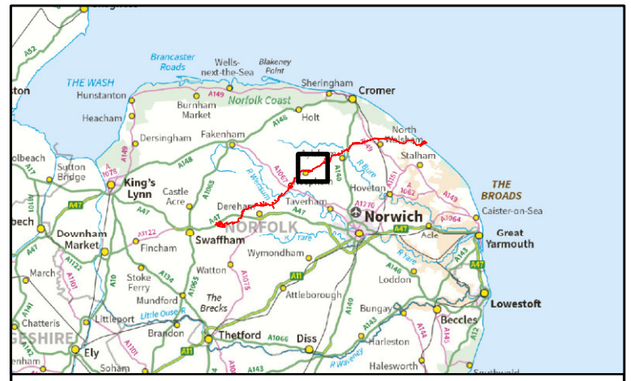
609000 610000 611000 612000 613000 614000 615000

327000 326000 325000 324000 323000 322000

N

59(3)(1)
MA6
61(8)(3)
65(1)(1)
61(8)(4)
64(2)(1)
70(3)(1)
TC7
72(3)(3)
(4)(1)
TC6
TC7
TC8
TC8
TC6

0 0.5 1 km



Legend:

Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Cable logistics area
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Crossing locations (Map 5 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
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Co-ordinate system: British National Grid **EPSG:** 27700

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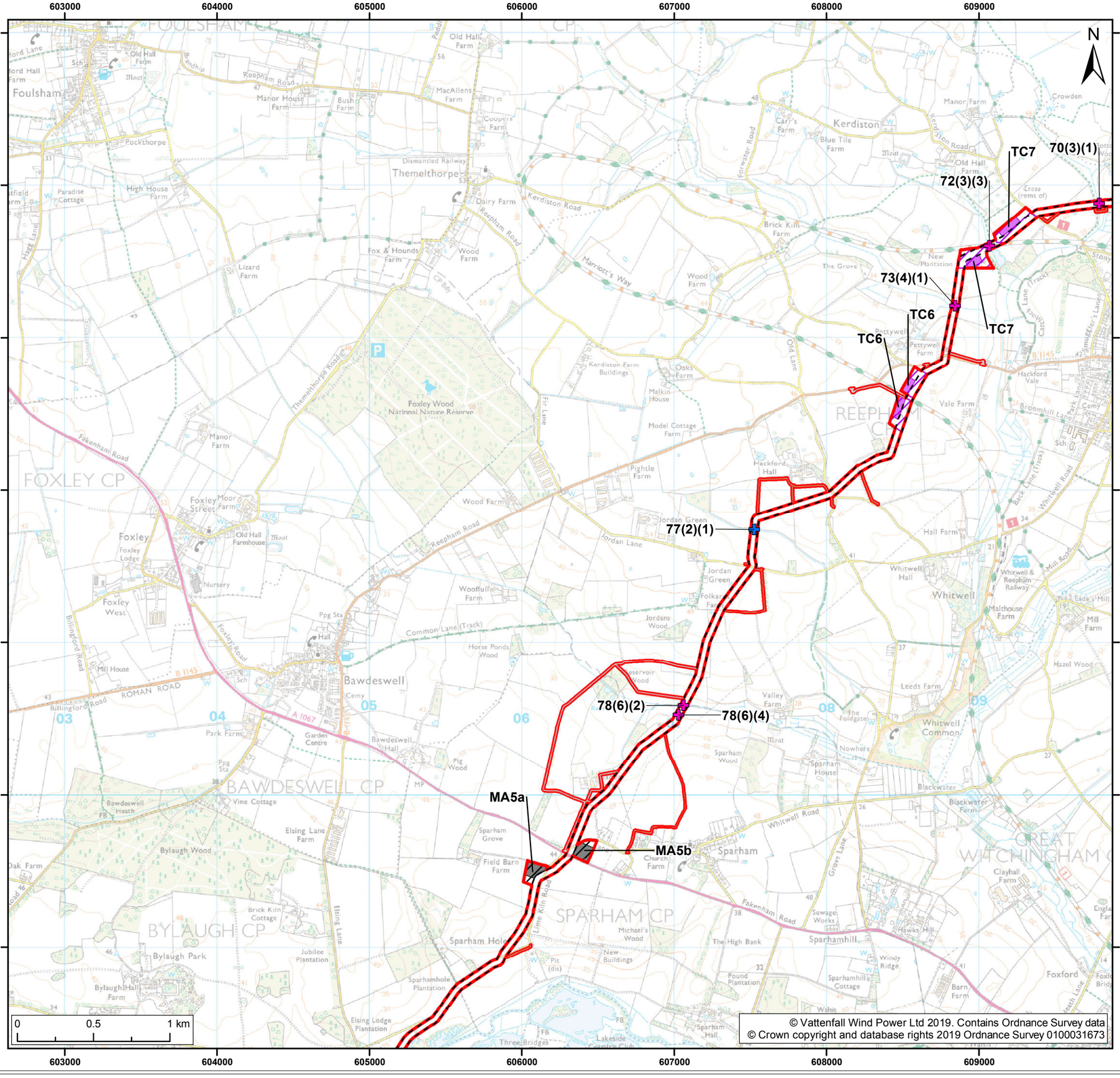

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 1 & 2
- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Crossing locations (Map 6 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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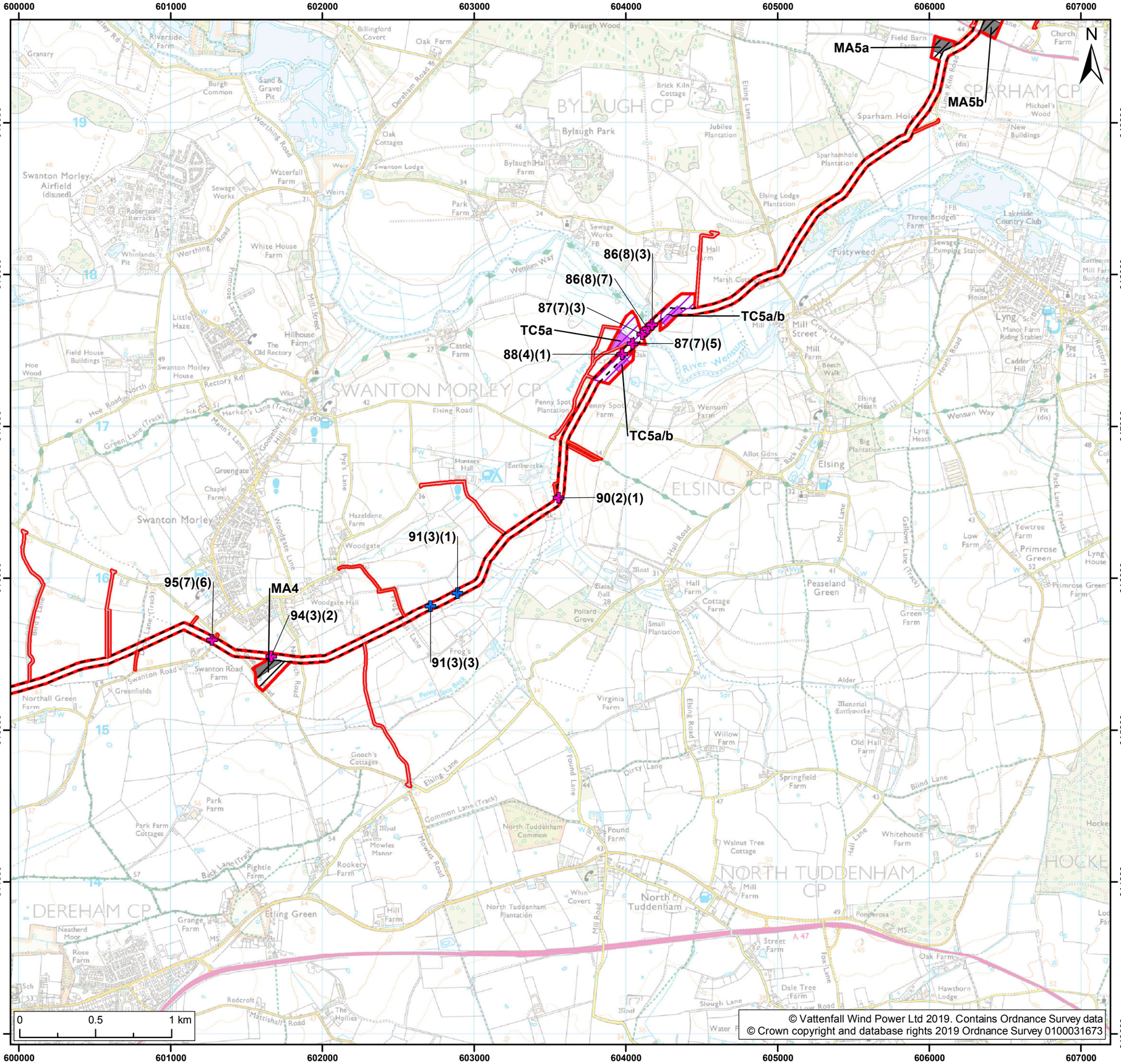

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 1 & 2
- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Crossing locations
(Map 7 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
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02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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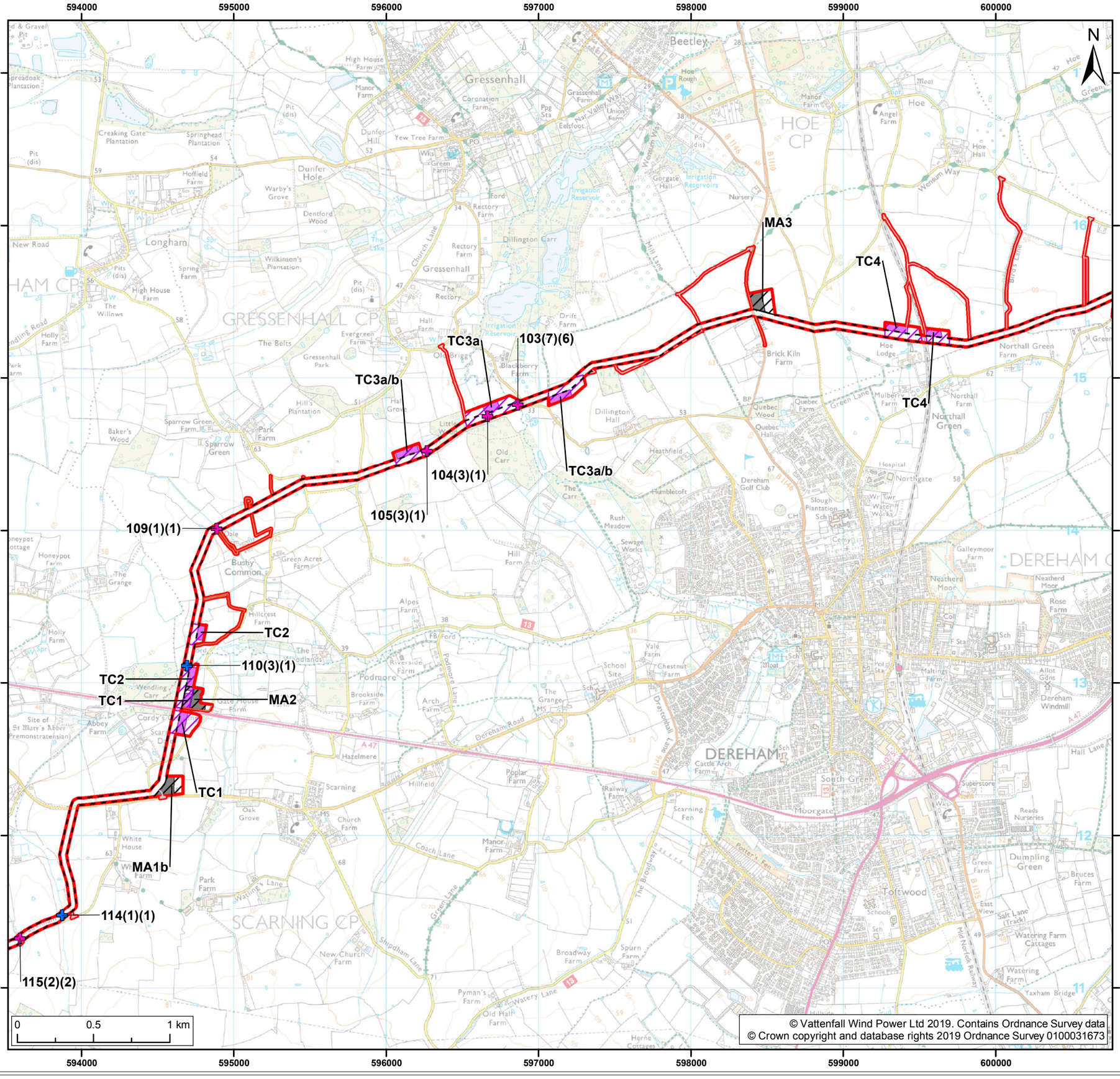

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Construction access
- Operational access

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Trenchless crossing zone (e.g. HDD)
- Indicative trenchless crossing compound
- Mobilisation zone
- Indicative mobilisation area compound

Water crossing location[1]

- Under scenario 1 & 2
- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Crossing locations
(Map 8 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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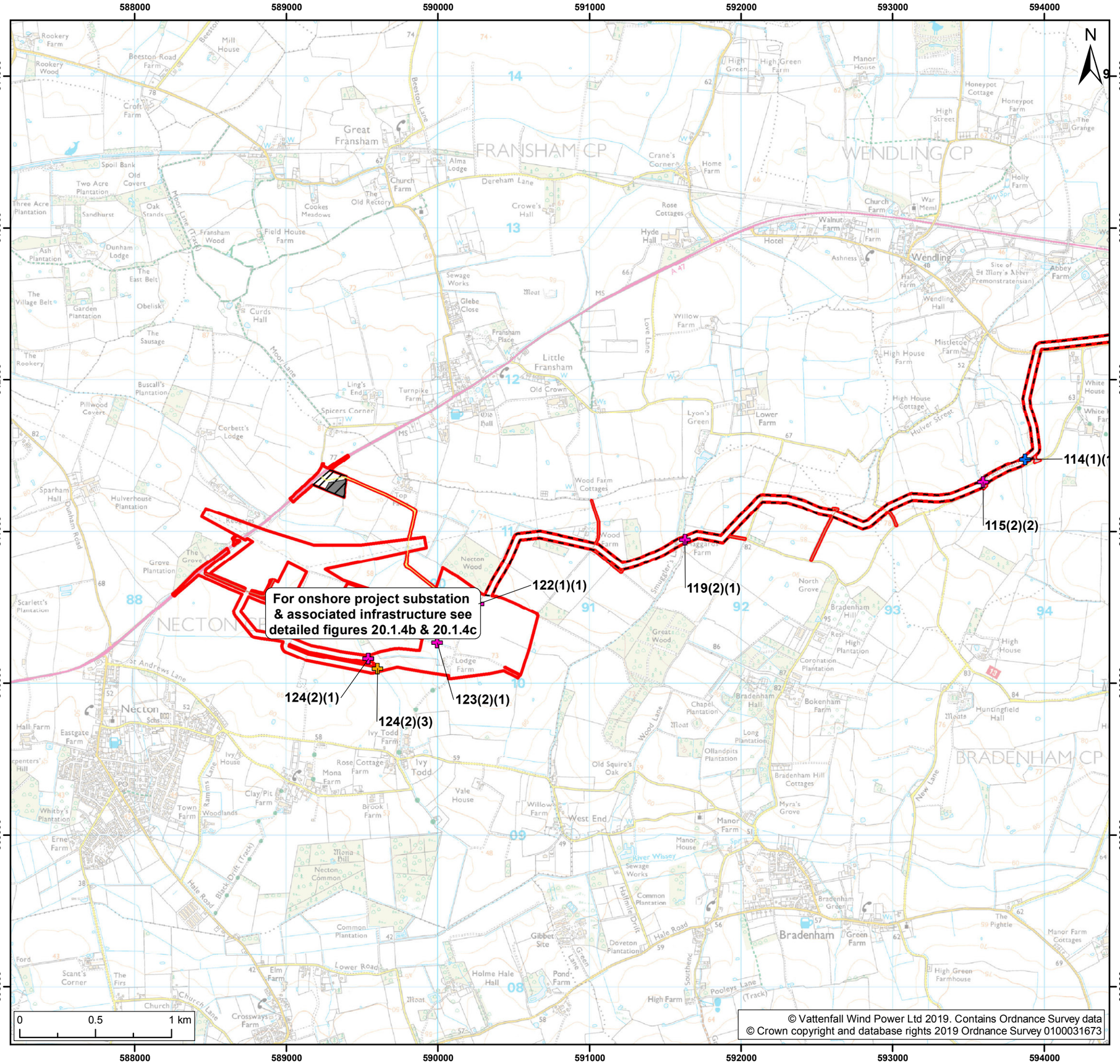

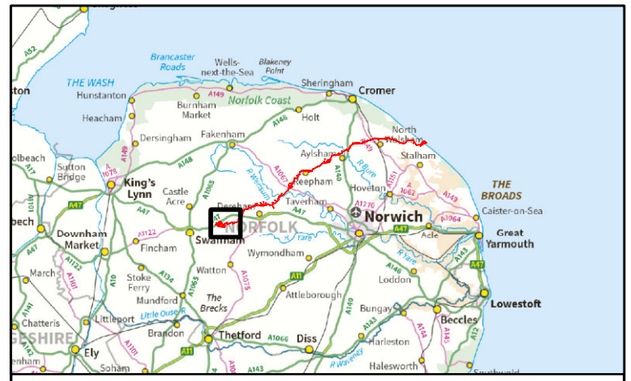

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 1 & 2)

- Onshore cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Construction access
- Operational access
- Permanent access

Water crossing location[1]

- Under scenario 1
- Under scenario 1 & 2
- Under scenario 2

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title:

Crossing locations
(Map 9 of 9)

Figure: 20.1.4a | Drawing No: PB5640-006-0201-004a

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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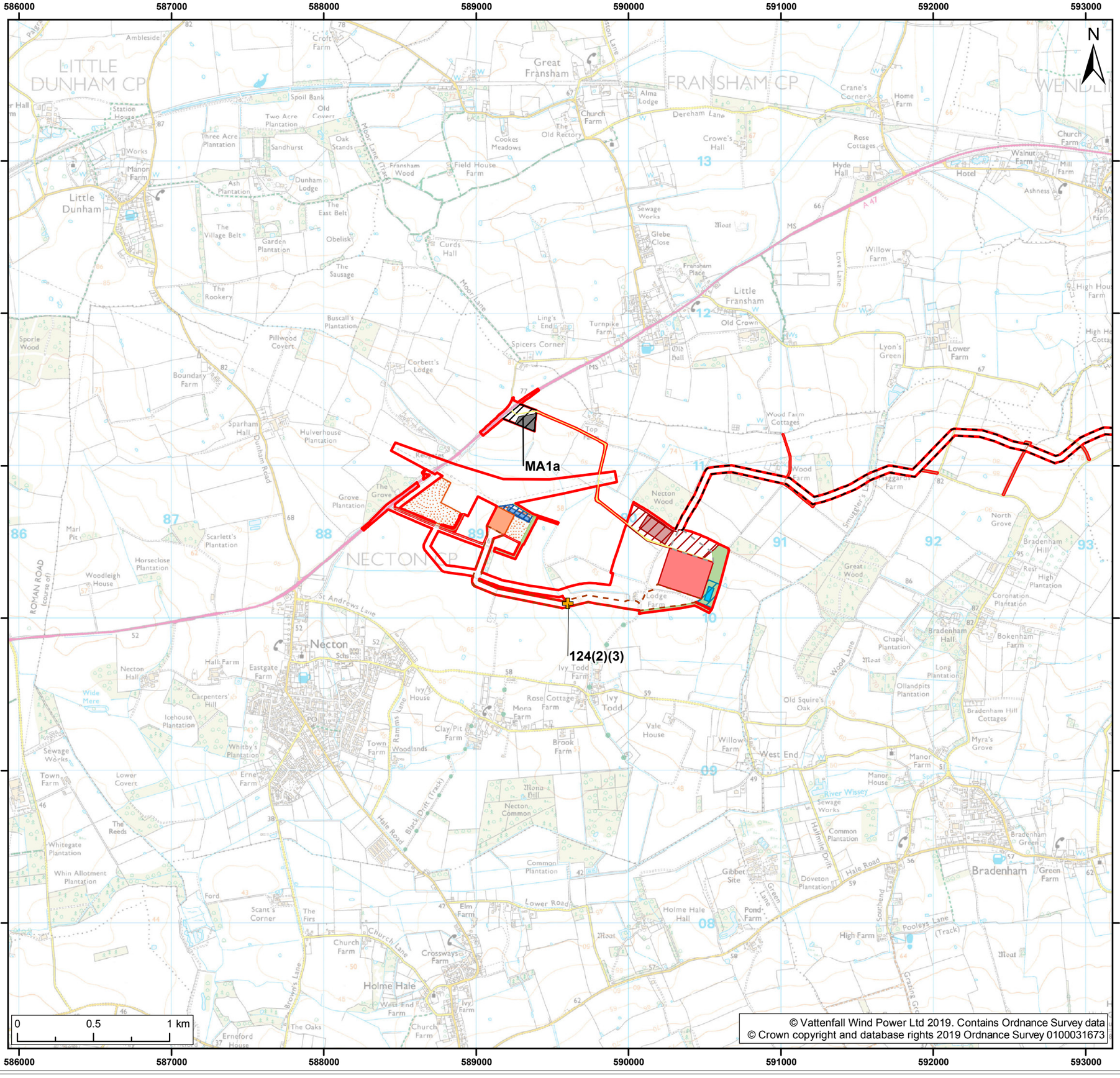

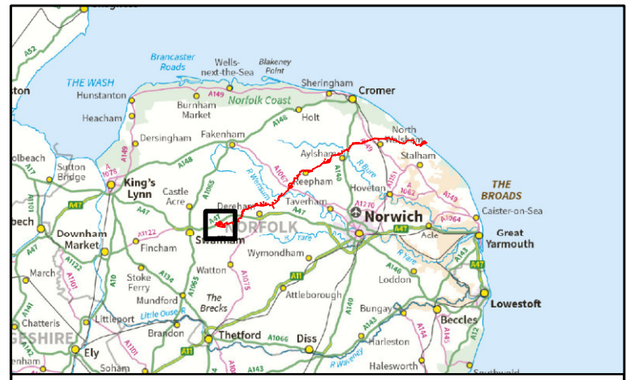

Legend:

- Norfolk Boreas red line boundary
- **Norfolk Boreas Onshore Project Infrastructure (Scenario 1)**
- Onshore cable route
- Cable route entry to substation
- Onshore 400kV cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Construction access
- Operational access
- Permanent access
- Onshore project substation
- Onshore project substation temporary construction compound zone
- Indicative onshore project substation temporary construction compound
- Attenuation pond zone
- Indicative attenuation pond
- Indicative mitigation planting
- National Grid substation extension
- National Grid temporary works
- National Grid attenuation pond location search area
- Indicative National Grid attenuation pond
- Water crossing location[1]

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Crossing locations

Figure: 20.1.4b | Drawing No: PB5640-006-0201-004b

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
02	20/03/2019	LB	CD	A3	1:25,000
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Co-ordinate system: British National Grid **EPSG:** 27700

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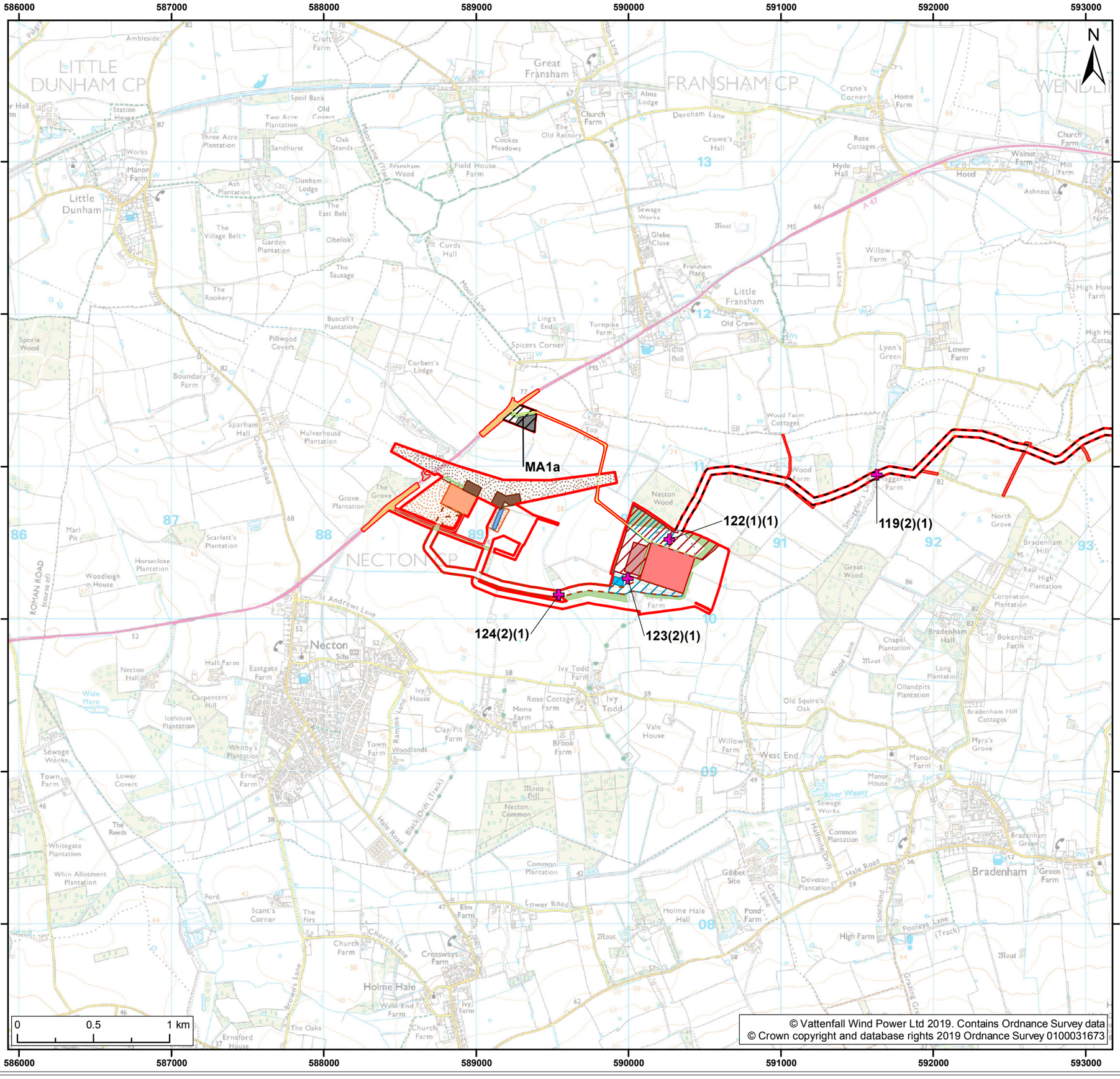

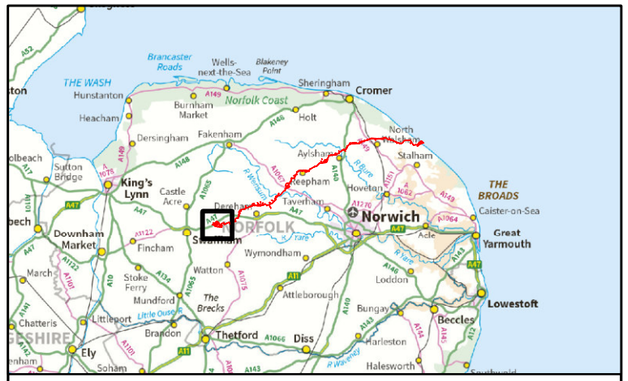

Legend:

- Norfolk Boreas red line boundary

Norfolk Boreas Onshore Project Infrastructure (Scenario 2)

- Onshore cable route
- Cable route entry to substation
- Onshore 400kV cable route
- Mobilisation zone
- Indicative mobilisation area compound
- Highways temporary works area
- Construction access
- Operational access
- Permanent access
- Onshore project substation
- Onshore project substation temporary construction compound zone
- Indicative onshore project substation temporary construction compound
- Attenuation pond zone
- Indicative attenuation pond
- Indicative mitigation planting
- National Grid substation extension
- National Grid new / replacement OHL tower search area
- National Grid temporary works
- Overhead line temporary works
- National Grid attenuation pond
- Water crossing location[1]

[1] GHD, 2018

Project:	Report:
Norfolk Boreas	Flood Risk Assessment

Title: Crossing locations

Figure: 20.1.4c | Drawing No: PB5640-006-0201-004c

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
03	20/03/2019	LB	CD	A3	1:25,000
02	19/02/2019	JT	CD	A3	1:25,000

Co-ordinate system: British National Grid **EPSG:** 27700

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