

Norfolk Boreas Offshore Wind Farm Clarification Note Trenchless Crossings B1149 and Church Road, Colby (Version 2)

Applicant: Norfolk Boreas Limited
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Deadline 8

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Author: Royal HaskoningDHV

Photo: Ormonde Offshore Wind Farm

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Glossary of Acronyms

AAWT	Annual Average Weekly Traffic
ATC	Automatic Traffic Count
dDCO	Draft Development Consent Order
DMRB	Design Manual for Roads and Bridges
ES	Environmental Statement
HGV	Heavy Goods Vehicle
LWA db(A)	A-weighted sound power level in decibels
M	Metres
Mph	Miles per hour
NPL	Norfolk Partnership Laboratory
OLEMS	Outline Landscape and Ecological Management Strategy
TC	Trenchless Crossing Point
TEMPro	Trip End Model Presentation Programme

1 Introduction

1. Following Issue Specific Hearing 3 on Onshore Effects including the draft Development Consent Order held on Tuesday 21st January 2020, an action was identified by the Examining Authority for the Applicant to produce a Clarification Note to set out the reasons for and against trenchless crossings at B1149 and at Church Road, Colby, to include plans to an appropriate scale. This clarification note has been produced to address the request from the Examining Authority.
2. This clarification note has been updated at the suggestion of the Examining Authority following comments and responses to comments at Deadline 5 and Deadline 6 which provide further site specific details for the crossing of the B1149 and Church Road, Colby.

2 Comparison of open cut trenching and trenchless crossing of highways

3. Open cut trenching and trenchless crossing duct installation methods for the crossing of highways are detailed within Section 5.7.2.3.3 and Section 5.7.2.4 of Environmental Statement Chapter 5 Project Description [APP-218] respectively.
4. Crossing of highways for duct installation is required only in Scenario 2.
5. A comparison of open cut trenching and trenchless crossing methods is provided in Table 2.1 based on a range of parameters and with reference to the application documents.

Table 2.1 Comparison of open cut trench and trenchless crossing methods

Parameter	Open Cut Trench Crossing	Trenchless Crossing
Impacts to road users	Temporary impacts to road users (2 weeks at the B1149 crossing to allow for additional traffic management measures including temporary lane construction, but typically less than 1 week) which includes traffic management measures such as single lane closure.	No direct impacts to road users
Working hours	Consented normal construction hours: 07.00 – 19.00 Monday to Friday 07.00 – 13.00 Saturday No work on Sundays or public holidays. As set out in Requirement 26. Passive traffic management measures (traffic lights on single lane closure) will be required throughout the period of the open cut crossing, however no active construction works with associated impacts are required outside of normal construction hours. Active construction works outside of normal construction hours may be employed to	Consented normal construction hours: 07.00 – 19.00 Monday to Friday 07.00 – 13.00 Saturday No work on Sundays or public holidays. Trenchless crossings may require active construction works to extend outside of the consented hours (for technical reasons following commencement of drilling such as to maintain fluid pressures to minimise breakout risk), i.e. active construction works with associated impacts may extend into the evening or night time.

Parameter	Open Cut Trench Crossing	Trenchless Crossing
	<p>minimise the period of works, although this is not a requirement of the works. Should additional working hours be proposed beyond the consented hours then prior approval would be required from the relevant planning authority as set out in Requirement 26.</p>	<p>Should works be required to extend beyond the consented hours then prior approval would be required from the relevant planning authority as set out in Requirement 26.</p>
Works footprint	<p>No additional land requirements outside the Order limits. All works are conducted within the cable route working width using the same or similar equipment and contractors as open cut trenching in agricultural land.</p> <p>Access will be taken from the running track (via Mobilisation Areas) as part of the duct installation works.</p> <p>Additional temporary land of 303m² (within the Order limits) is required at the crossing of the B1149 to accommodate worst case temporary diversion lanes as illustrated in Appendix 3. The extent of these diversion lanes is included to safely accommodate Hornsea Project Three cable drum delivery by way of Abnormal Indivisible Loads (AIL) in the worst case event that the two week open cut trenching programme cannot be scheduled to avoid these movements. Norfolk Boreas Project in isolation would not require the diversion lanes and a relatively small 'overrun area' would be sufficient to accommodate 'standard' traffic movements. It is therefore implicit, that the Applicant's contractor will use their best endeavours to programme works to avoid the cumulative AIL scenario and minimise the additional temporary land use.</p>	<p>Additional temporary land requirements for laydown areas and facilities associated with additional trenchless crossing equipment and contractors is up to: 5,000m² drill reception site 7,500m² drill launch site As secured in Requirement 16(15) of the dDCO.</p> <p>However, no temporary works compounds have been included within the current Order limits as submitted for the DCO application. Therefore a bespoke design, with a single temporary works compound of 4,500m², retained within the Order limits could be considered.</p> <p>This bespoke design only accommodates the HDD trenchless crossing method (and no other trenchless crossing method) to minimise supporting construction compound requirements, such that the compound could be wholly contained within the current Order limits. Other trenchless crossing methods such as auger boring, pipe jacking and micro tunnelling could not practicably be employed here because additional temporary land adjacent to the launch and reception pits would be needed to support the plant and materials required to sink shallow shafts at both the launch and reception pit.</p> <p>At all other trenchless crossing locations flexibility is retained for all trenchless crossing methods so that the most appropriate solution can be employed following ground investigation, cable design (sizing) and detailed design of the trenchless crossing. To accommodate a HDD at these specific locations would be constraining the Project design prior to detailed design and investigations being conducted.</p>
Timescale	<p>2 weeks at the B1149 crossing to allow for additional traffic management measures including temporary lane construction, but typically less than 1 week to conduct the crossing, such as at Church Road, Colby, which is likely to be completed in days.</p>	<p>Up to 6 weeks to conduct the crossing, allowing for setup of temporary areas and additional equipment, period of drilling and subsequent demobilisation and removal of equipment and materials.</p>

Parameter	Open Cut Trench Crossing	Trenchless Crossing																																																												
Materials and Transport	<p>Limited additional materials required to be delivered compared to open cut trenching in agricultural land, with exception to traffic management and resurfacing materials..</p> <p>With reference to Appendix 24.20 [APP-635], approximately 8 HGV deliveries per notional 15m highways open cut trenched crossing, such as at Church Road, Colby.</p> <p>At the crossing of the B1149, a further 38 HGV deliveries would be required to construct and remove the worst case diversion lane widths as shown in Appendix 3 (to a depth of 0.42m as informed by the NCC laboratory report) including excavating, backfilling and providing new pavement materials for the two 1m x 1m x 15m trenches. The 38 HGV deliveries includes a 20% contingency for miscellaneous items.</p>	<p>Significant additional materials and associated traffic movements to establish and remove additional temporary works areas and drilling equipment to the location. With reference to Appendix 24.20 [APP-635], worst case additional deliveries of 450 HGVs per trenchless crossing to support additional temporary works areas (12,500m² to be 50% aggregated to a depth of 0.3m), excavated material from the drill arisings, drill rig, water supplies, geotextiles, fencing and mobilisation/demobilisation.</p> <p>A bespoke trenchless crossing at these locations, which is constrained to the existing Order limits, would require in the order of 220 HGV deliveries, reflecting the reduced compound requirements compared to the standard trenchless crossing.</p>																																																												
Equipment / plant and associated noise levels	<p>Negligible additional equipment for open cut trench crossing compared to open cut trenching in agricultural land.</p> <p>Noise levels provided for associated equipment.</p> <p>Duct installation (daytime)</p> <table border="1"> <thead> <tr> <th>Name</th> <th>LwA dB(A)*</th> <th>On time Correction**</th> </tr> </thead> <tbody> <tr> <td>Bulldozer</td> <td>108</td> <td>75%</td> </tr> <tr> <td>Dump Truck</td> <td>107</td> <td>75%</td> </tr> <tr> <td>Tracked Excavator</td> <td>107</td> <td>75%</td> </tr> <tr> <td>Generator</td> <td>105</td> <td>100%</td> </tr> <tr> <td>Water Pump</td> <td>93</td> <td>75%</td> </tr> <tr> <td>Dump Truck</td> <td>115</td> <td>15km/h</td> </tr> <tr> <td>Lorry</td> <td>108</td> <td>15km/h</td> </tr> </tbody> </table> <p>Evening / night-time activities No active construction works required.</p> <p>Traffic management measures (e.g. traffic lights) will be operational throughout the evening / night-time however do not represent an equipment noise source.</p>	Name	LwA dB(A)*	On time Correction**	Bulldozer	108	75%	Dump Truck	107	75%	Tracked Excavator	107	75%	Generator	105	100%	Water Pump	93	75%	Dump Truck	115	15km/h	Lorry	108	15km/h	<p>Additional specialist equipment for trenchless crossings required with associated noise.</p> <p>Noise levels provided for associated equipment.</p> <p>Trenchless crossing (daytime)</p> <table border="1"> <thead> <tr> <th>Name</th> <th>LwA dB(A)*</th> <th>On time Correction**</th> </tr> </thead> <tbody> <tr> <td>Tracked Excavator</td> <td>107</td> <td>50%</td> </tr> <tr> <td>Backhoe Loader</td> <td>96</td> <td>50%</td> </tr> <tr> <td>Bulldozer</td> <td>108</td> <td>50%</td> </tr> <tr> <td>Dumper</td> <td>101</td> <td>50%</td> </tr> <tr> <td>Mobile Crane</td> <td>106</td> <td>25%</td> </tr> <tr> <td>Cement Mixer</td> <td>103</td> <td>25%</td> </tr> <tr> <td>Concrete Pump</td> <td>108</td> <td>25%</td> </tr> <tr> <td>Piling</td> <td>118</td> <td>10%</td> </tr> <tr> <td>Drilling Rig</td> <td>105</td> <td>75%</td> </tr> <tr> <td>Water Pump</td> <td>93</td> <td>75%</td> </tr> <tr> <td>Generator</td> <td>105</td> <td>100%</td> </tr> </tbody> </table>	Name	LwA dB(A)*	On time Correction**	Tracked Excavator	107	50%	Backhoe Loader	96	50%	Bulldozer	108	50%	Dumper	101	50%	Mobile Crane	106	25%	Cement Mixer	103	25%	Concrete Pump	108	25%	Piling	118	10%	Drilling Rig	105	75%	Water Pump	93	75%	Generator	105	100%
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Parameter	Open Cut Trench Crossing	Trenchless Crossing		
		Trenchless crossing (evening / night-time)		
		Name	LwA dB(A)*	On time Correction**
		Backhoe Loader	96	50%
		Dumper	101	50%
		Drilling Rig	105	75%
		Water Pump	93	75%
		Generator	105	100%
* A-weighted sound power level in decibels				
** Percentage of assessment period that plant is expected to be in operation				

6. In summary, trenchless crossing methods mitigate direct impacts to the highway and highway users. However, the additional trenchless crossing equipment, associated materials and methodology requirements results in a number of additional wider impacts including an extended installation timescale, notable additional HGV deliveries of materials and additional temporary land requirements.
7. Conversely, open cut trench crossing methods do not require notable additional materials or equipment as the duct installation method is similar to that employed through the majority of the onshore cable route, including in agricultural land either side of the crossing. During the crossing works, impacts to highway users can be mitigated through the use of traffic management measures for the short installation period (typically less than 1 week or 2 weeks at the B1149 where temporary diversion lanes may be required) and additional impacts associated with trenchless crossing methods (e.g. additional equipment, materials, temporary land, HGV deliveries etc.) are fully mitigated.
8. The application of open cut trenching or trenchless crossing methods at highways crossings has been carefully considered, in consultation with the Highways Authority, acknowledging the benefits and drawbacks of each methodology. Where justification has been provided through an evidential basis that impacts to road users would be significant through the use of open cut trenching, the use of trenchless crossing methods has been committed to (and secured in Requirement 16 of the dDCO). Where assessments have illustrated that traffic management measures are sufficient to mitigate impacts to road users, the use of open cut trenching is proposed to limit additional indirect impacts associated with the onshore duct installation.

3 Considerations for the Proposed Open Cut Method at the B1149

9. Norfolk County Council raised concerns with the use of open cut trenching on the B1149 and an investigation was undertaken in response to the concerns raised, further details are provided below.

3.1 Road Network Disruption Review

10. The principal guidance for temporary traffic management situations in the UK is Chapter 8 of the Traffic Signs Manual (Department for Transport, 2009¹) ('Chapter 8'). Chapter 8 gives detailed specification for roadworks for a wide range of traffic situations.
11. Open cut trenching for the Project would be carried out by closing a lane of the carriageway and providing traffic signal control to safely introduce single file traffic (known as 'one-way working'). Paragraph D5.1.6 of Chapter 8 details the maximum vehicle flows at which significant delays would be experienced by traffic subjected to one-way working as follows:

'On roads where flows are very high, overload of the controlled area is possible and exceptional delays may result. This can occur with two-way flows as low as 1,300 vehicles per hour (for sites about 50m long)...' (Department for Transport, 2009)

12. Thus, the 1,300 vehicle per hour is adopted as the 'Chapter 8 thresholds' to determine if the open cut method would lead to significant network disruption at the B1149.

3.1.1 Traffic Flow Data

13. Baseline traffic flow data for the B1149 was captured via seven-day Automatic Traffic Counters (ATC) commissioned by Norfolk Vanguard Limited at a location approximately 65m north of the crossing point. Original ATC were captured as part of Chapter 24 of the Environmental Statement (ES), undertaken on the 19th April 2017 to 25th April 2017, and this data is provided in Appendix 1. The traffic count data is summarised in Table 3.1.
14. A review of the surveyed traffic data identifies network peak hours of 7:30am to 8:30am and 4:30pm to 5:30pm.
15. Within Table 3.1, the surveyed flows have been growthed to the forecast year of 2023 (the earliest start of construction for Norfolk Boreas – Scenario 2). Annual Average Weekly Traffic (AAWT) has been derived to reflect the Project's predominate weekday traffic demand. The growth factors for AAWT peak hours have been derived from the Department for Transport Trip End Model Presentation

¹ Department for Transport, 2009. Traffic and Signs Manual, Chapter 8.

Programme (TEMPro2) Version 7.2 with data set 72 for the Broadland (B1149) geographical area.

16. To account for daily fluctuations in traffic flows a 10% (-5%/+5%) daily fluctuation factor has been applied to the 2023 forecast flows.
17. In addition, the daily development flows (employees and HGVs) for both Norfolk Boreas and Hornsea Project Three have been taken from the respective examination documentation (and as presented in the cumulative impact assessment section 24.8 of ES Chapter 24 [APP-237] and added to the maximum (+5%) 2023 forecast flows.

The final 2023 forecast flows presented in

18. Table 3.1 Table 3.1 are considered to be the maximum worst case flows that the B1149 would experience during open cut trenching.

Table 3.1 Traffic Flow Data (two-way flows)

Time Periods		Surveyed Flows	TEMPro Growth Factors	2023 Daily Forecast Flows	2023 Forecast Daily Fluctuations		Norfolk Boreas 2023 Daily Development Flows		Hornsea Project 3 Daily Development Flows		Total 2023 Daily Forecast Flows with Developments
					Min (-5%)	Max (-5%)	Employee Vehicles	HGVs	Employee Vehicles	HGVs	
B1149											
24hr AAWT¹	24hrs	5,645	1.1324	6,292	6,072	6,712	173	212	232	162	7,491
Weekday am Peak	7:30am to 8:30am	513	1.1234	547	540	605	87	21.2	116	17	846
Weekday pm Peak	4:30am to 5:30pm	561	1.1261	631	600	663	87	21.2	116	17	904
¹ Annual Average Weekly Traffic											

3.1.2 Network Disruption Conclusion

19. As can be seen by Table 3.1, both the forecast 2023 AM (846) and PM (904) peak flows (for both Project alone and cumulative traffic flows) are well below the Chapter 8 thresholds of 1,300 two-way vehicle flows for one-way working.
20. Therefore, it is considered that one-way working remains appropriate for the B1149 and will not result in significant network disruption. It is noted that the B1149 is defined by Norfolk County Council as a traffic sensitive route and in accordance with this stipulation, all roadworks will be undertaken outside of the periods of 7:30am to 9am and 4pm to 7pm and the road would be open to two-way traffic thereafter.
21. With the combination of the identified low traffic flows and previously identified traffic mitigation measures in place, no more than a **minor adverse** residual impact

would be experienced on the B1149 during the open cut trench crossing works, which is not significant in Environmental Impact Assessment terms.

3.2 Long-Term Maintenance Liability Review

22. Norfolk County Council's concern was that the trench reinstatement would become a long term maintenance liability (after the mandatory 3 year maintenance period).
23. In response, Norfolk Vanguard Ltd. commissioned local pavement specialists, the Norfolk Partnership Laboratory (NPL) to investigate ground conditions at the B1149 and ascertain if an appropriate road reinstatement specification is feasible. NPL undertook four core sample ground investigations in the approximate location of the proposed open cut trench crossings on the B1149.
24. Appendix 2 contains the core testing results. In summary, the testing indicates that there is good load bearing subgrade (known as the California Bearing Ratio test) and accordingly the road can be suitably reinstated. A specification has been developed for the reinstatements to minimise the potential for future maintenance liability by minimising the risk of differential settlement and reflective cracking. Appendix 2 also contains the recommended pavement specification for each trench location. The specification uses readily available material and established trenching techniques and would be adopted by a suitably accredited contractor.
25. Based on the findings of the laboratory tests and the recommended reinstatement specification, it is concluded that adverse maintenance liability can be mitigated and therefore open cut trenching remains an appropriate method. The specification is secured in the Outline Traffic Management Plan (Version 4 submitted at Deadline 8).

3.3 Cumulative Traffic Management

26. Norfolk County Council has raised specific concerns relating to the cumulative interaction of the Project's and Hornsea Project Three's traffic. With regard to one-way working the specific concerns are:
 - 1) Accommodating the large volume of abnormal loads delivering cable drums to the Hornsea Project Three main compound at Oulton; and
 - 2) Ensuring the roadworks do not lead to 'blocking back' of the B1149/The Street, Oulton junction; or vehicles do not approach the back of a queue unsighted from the B1149 south, hump back bridge; and
 - 3) The need for a 1.2m wide safety zone.
27. Appendix 3 sets out the proposed one-way traffic management concept design for the B1149 (this is included in the Outline Traffic Management Plan (Version 4 submitted at Deadline 8)). The roadworks design incorporates a wide one way lane (4.5m) to accommodate the Hornsea Project Three abnormal loads and a 1.5m wide

safety zone within the current Order limits for Norfolk Boreas. It can also be observed from Appendix 3 that the road works terminate some 210m southeast of the B1149/The Street, Oulton junction ensuring that the risk of traffic blocking back to the B1149/The Street junction would be minimised. Furthermore, the roadworks terminate some 430m northwest of the hump back bridge ensuring the risk of queue length collision is minimised. The updated traffic management design was shared with Norfolk County Council at a meeting on the 15th January 2020 and it was confirmed that officers had “no technical objection” to the proposal.

28. The traffic management methodology employs single lane working controlled by traffic signals to enable the trench to be cut and reinstated in sections whilst maintaining the flow of traffic. In order to accommodate the required AIL and safety zone widths it is necessary to widen the carriageway to provide the requisite clearance. This widening will be temporary and will be reinstated following trench reinstatement, however to accommodate the traffic outlined it will be of robust construction and require some additional HGV movements. It is noted that the B1149 is designated a traffic sensitive route and therefore there may be restrictions on working during the hours of 07:30 to 09:00 and 16:00 to 19:00, Monday to Friday.
29. It is concluded that the specific cumulative traffic concerns have been designed out at the B1149 crossing.

3.4 Conclusion

30. An open cut trench crossing is deemed appropriate as there is no evidence to suggest that this form of crossing will cause significant adverse impacts or present a maintenance liability.
31. Conversely, the use of a trenchless crossing method would introduce alternate impacts, including up to 450 additional HGV deliveries (or 220 additional HGV deliveries if a bespoke solution with a temporary works compound constrained to the existing Order limits is employed) to support the method, extended installation timescales and the requirement for additional temporary land.
32. It should be noted that there are currently no temporary works areas in proximity to the B1149. A bespoke design has been considered which would retain additional temporary works areas to within the existing Order limits, although this would only accommodate a HDD solution, precluding the opportunity of using other trenchless methods and the greater suitability those methods could provide, constraining the Project design prior to detailed design and ground investigations being conducted. Irrespective, the evidence presented within this note demonstrates that that an open cut trench solution is appropriate for the B1149.

4 Considerations for the Proposed Open Cut Method at Church Road, Colby

33. The Environmental Statement Chapter 29 identifies that at Church Road, Colby localised trees are susceptible to significant effects. In these locations open trenching would be carefully sited so as to minimise the number of trees to be removed, targeting smaller specimens or by using existing gaps in the tree line. However, restrictions applied to planting over cable easements prevents trees from being replanted over the 13m easement and immediately either side. Therefore, a localised significant effect would occur in relation to the physical effect of the removal of trees owing to their good condition and that direct replacement planting would not be possible.
34. North Norfolk District Council identified in their Local Impact Report [REP2-087] that they believe that at this location the duct should be installed via a trenchless crossing technique so as to avoid the loss of trees at this location. As detailed above the ES considered the potential for localised tree loss at this location.

4.1 Additional Requirements

35. As detailed in section 2, the inclusion of a trenchless crossing of Church Road, Colby would require;
 - Additional laydown areas and facilities associated with additional trenchless crossing equipment not currently secured within the Order Limits;
 - Additional HGV movements;
 - Longer duration for duct installation; and
 - Additional equipment for trenchless crossings required with associated noise.
36. The prolonged works period and alternate construction methodology (compared to trenched installation) would result in additional construction impacts including noise, light, traffic, dust, vibration and land use which have not been assessed within the Environmental Statement.

4.2 Access Layout

37. At this location an access is required directly from the road to the cable route, in order to access works from MA8 (to the south-west) to TC11 (to the north-east). This is because TC11 is committed as a 'stop end' to mitigate direct impacts to Kings Beck (which is a sensitive watercourse), see ES Figure 5.4 Map 3 [APP-268]. Therefore, access either side of Church Road would be required to access the trenchless crossing at this location.
38. Appendix 4 details the general arrangement of the proposed access (AC58) and for context, Appendix 5 details the access layout overlaid on aerial photography.

39. It can be noted that (in accordance with HGV routing embedded mitigation) AC58 has been designed to accommodate HGV access from the north only. An assumed 30mph speed limit is applied (enforced by temporary traffic management) to minimise the required visibility splays and associated clearance of vegetation.
40. Notwithstanding these design relaxations, a significant area vegetation removal is required to implement safe access. As such, a trenchless crossing here would not remove the necessity to open a notable gap in the hedgerow and removal of any associated trees.

4.3 HGV Traffic Management

41. Noting the width of Church Road (single lane carriageway) a road closure may be required to implement an open cut trench. This would be a temporary closure lasting a few days during which traffic would be diverted round via the A140.
42. As set out in Table 2.1, a trenchless crossing generates in excess of 400+ HGVs above the relatively low demand generated by open cut trenching. For this volume of HGV traffic, mobile traffic management on Church Road would cause notable delays, frequently necessitating temporarily halting traffic and escorting HGVs to and from site. This would introduce disruption for the entire periods of drilling, lasting six weeks.

4.4 Conclusion

43. Considering the access layout and visibility splay for construction accessibility through the hedgerow/trees will be required for a trenchless crossing of Church Road, Colby the benefits of a trenchless crossing at this location are not realised.
44. Furthermore, HGV movements for trenchless crossing techniques will introduce disruption to the travelling public for a period of up to six weeks.
45. In comparison, the Applicant's use of a trenched method will minimise construction impacts, land requirements and timescales and will look to microsite so far as possible to minimise impacts to trees. The Applicant has committed to replacing all trees to ensure no net loss within North Norfolk and mitigate potential impacts by micro-siting of the cable to limit tree removal and to target smaller specimens for any tree removal required, as well as to maximise the opportunity for replacement trees to be planted within the Order limits, along with the replanting of the hedgerows (for further details please see the Position Statement Church Road, Colby, REP7-035).
46. If all replacement tree planting cannot be accommodated within the Order limits (subject to detailed design post-consent) then they will be replaced as close as practically possible, ideally further along Church Road to ensure no net loss of trees

on Church Road (subject to landowner consent outside of the Order limits). This has been secured in the Outline Landscape and Ecological Management Strategy (Version 4 submitted at Deadline 8). This commitment to replace trees as close as possible to the location where they are removed, combined with reinstatement of the hedgerow, will assist in minimising the identified impact.

Norfolk Boreas Offshore Wind Farm

Appendix 1 –

B1149

Automatic Traffic

Counters Data

Applicant: Norfolk Boreas Limited
Document Reference: ExA.AS-3.D4.V1
Deadline 4
Date: January 2020
Revision: Version 1

Virtual Day (7)																					
Time	Total	Classification												>PSL 60	>PSL% 60	>SL1 68 ACPO	>SL1% 68 ACPO	>SL2 75 DfT	>SL2% 75 DfT	Mean	Vpp 85
		1 MCL	2 SV	3 SVT	4 TB2	5 TB3	6 T4	7 ART3	8 ART4	9 ART5	10 ART6	11 BD	12 DRT								
0000	19	0	17	0	1	0	0	0	0	0	0	0	0	4	20.3	2	8.3	1	4.5	51.9	62.2
0100	8	0	6	0	1	0	0	0	0	0	0	0	0	2	19.3	1	8.8	1	8.8	52.2	-
0200	6	0	5	0	0	0	0	0	0	0	0	0	0	1	10	0	2.5	0	0	52.4	-
0300	7	0	5	0	1	0	0	0	0	0	0	0	0	1	10	0	6	0	2	49.7	-
0400	11	0	9	0	1	0	0	0	0	1	1	0	0	1	11.4	0	3.8	0	1.3	49.3	57.7
0500	54	0	45	0	5	0	0	0	1	2	1	0	0	10	18.6	2	3.1	1	1	51.8	61.3
0600	154	1	127	2	12	2	4	0	1	4	0	0	0	20	13.2	4	2.8	1	0.7	51.2	59.1
0700	385	2	326	7	33	5	2	0	2	1	6	0	0	18	4.7	3	0.7	1	0.1	47.6	55
0800	391	3	333	5	33	3	3	1	4	2	3	0	0	13	3.3	2	0.4	0	0	46.1	53.7
0900	347	2	297	5	27	3	3	0	2	2	5	0	0	8	2.4	2	0.5	0	0.1	46.1	53
1000	368	3	313	6	31	2	3	0	2	3	4	0	0	9	2.4	1	0.3	0	0.1	44.2	51.4
1100	355	3	306	5	28	3	4	0	3	1	3	0	0	7	2.1	2	0.4	0	0	44.4	51.4
1200	342	2	299	5	24	2	3	0	2	2	4	0	0	7	2	1	0.4	0	0.1	45.1	51.7
1300	345	4	298	6	27	2	2	0	2	1	3	0	0	9	2.6	2	0.5	0	0.1	45.6	52.6
1400	357	4	311	6	23	3	2	0	1	2	4	0	0	12	3.3	2	0.6	0	0.1	45.5	52.1
1500	376	3	335	5	26	1	1	0	1	1	2	0	0	10	2.8	2	0.5	0	0.1	46.2	52.8
1600	474	4	422	8	33	2	1	0	1	1	1	0	0	11	2.4	2	0.5	1	0.1	46.2	52.8
1700	470	5	434	3	20	5	1	0	0	1	0	0	0	19	4.1	5	1	1	0.2	47.4	53.9
1800	319	2	300	2	11	1	0	0	0	0	1	0	0	21	6.5	4	1.3	1	0.3	48.3	55.5
1900	170	2	162	1	5	0	0	0	0	0	0	0	0	18	10.4	3	1.5	1	0.5	50.3	57.5
2000	111	1	106	1	3	1	0	0	0	0	0	0	0	11	10.3	3	2.8	1	0.8	49.5	57.7
2100	86	0	84	0	2	0	0	0	0	0	0	0	0	10	12.1	2	2.5	1	0.7	49.7	58.2
2200	87	0	84	0	2	0	0	0	0	0	0	0	0	8	9	2	2	0	0.3	48.8	56.6
2300	31	0	29	0	1	0	0	0	0	0	0	0	0	5	16.4	1	3.2	0	1.4	51.1	60.4
1200	4528	38	3974	63	317	32	25	4	21	17	37	1	2	145	3.2	27	0.6	5	0.1	46.1	53.2
1215	5050	41	4451	67	339	35	29	4	22	18	41	1	2	205	4.1	39	0.8	8	0.2	46.5	53.9
1230	5169	42	4564	67	343	35	29	4	23	19	41	1	2	218	4.2	42	0.8	9	0.2	46.6	53.9
1245	5274	43	4651	68	351	36	29	5	24	22	43	1	2	236	4.5	47	0.9	12	0.2	46.7	54.1

Virtual Week (1)																					
Time	Total	Classification												>PSL 60	>PSL% 60	>SL1 68 ACPO	>SL1% 68 ACPO	>SL2 75 DfT	>SL2% 75 DfT	Mean	Vpp 85
		1 MCL	2 SV	3 SVT	4 TB2	5 TB3	6 T4	7 ART3	8 ART4	9 ART5	10 ART6	11 BD	12 DRT								
Mon	5258	27	4518	82	430	24	45	9	29	35	56	1	2	188	3.6	39	0.7	7	0.1	46.2	53.5
Tue	5451	26	4666	62	409	136	29	11	34	21	54	1	2	198	3.6	30	0.6	3	0.1	46.3	53.5
Wed	5811	54	5057	80	438	20	30	2	37	31	59	2	1	272	4.7	42	0.7	17	0.3	47.1	54.4
Thu	5702	30	4978	72	432	33	36	2	26	29	63	0	1	273	4.8	60	1.1	20	0.4	46.6	54.4
Fri	6005	35	5253	83	452	30	38	5	28	24	51	2	4	244	4.1	56	0.9	15	0.2	46.4	53.5
Sat	4649	52	4277	54	195	5	19	3	12	10	20	1	1	234	5	40	0.9	4	0.1	47	54.6
Sun	4045	78	3811	41	103	2	5	0	2	3	0	0	0	243	6	61	1.5	15	0.4	47.4	55
5 Day Ave.	5645	34	4894	76	432	49	36	6	31	28	57	1	2	235	4.2	45	0.8	12	0.2	46.5	53.9
7 Day Ave.	5274	43	4651	68	351	36	29	5	24	22	43	1	2	236	4.5	47	0.9	12	0.2	46.7	54.1
--	36921	302	32560	474	2459	250	202	32	168	153	303	7	11	1652	4.5	328	0.9	81	0.2	46.7	54.1

Summary Graphs



Norfolk Boreas Offshore Wind Farm

Appendix 2 –

B1149 Pavement

Testing Results

Applicant: Norfolk Boreas Limited
Document Reference: ExA.AS-3.D4.V1
Deadline 4
Date: January 2020
Revision: Version 1

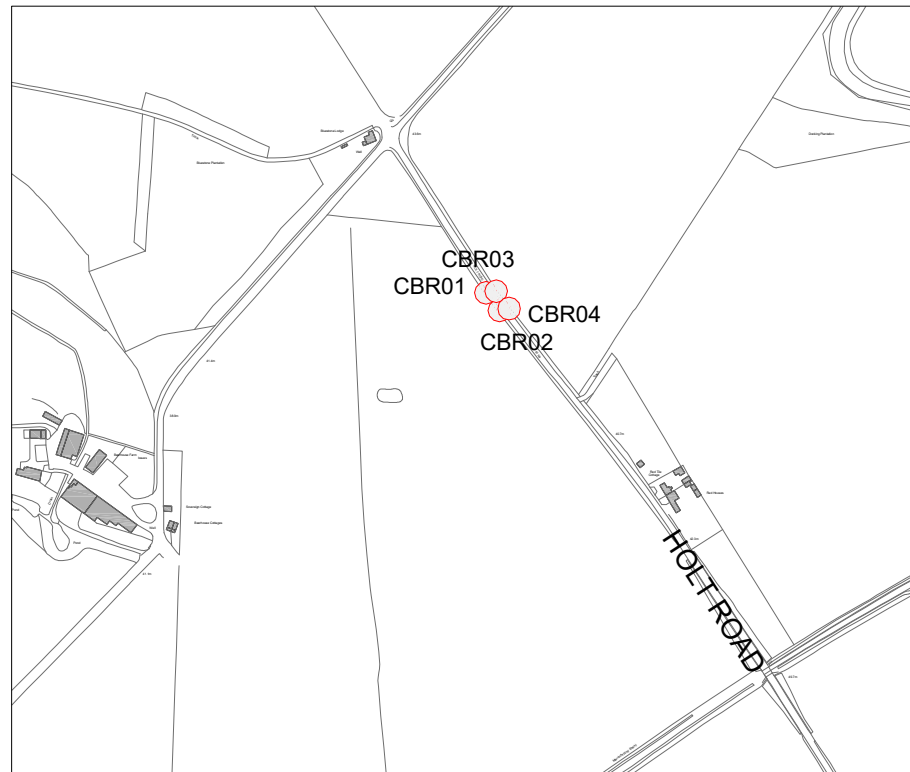
B1149 HOLT ROAD

○ CBR01

○ CBR03

○ CBR02

○ CBR04



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Tom McCabe
 Executive Director of
 Community and Environmental Services
 Norfolk County Council
 County Hall, Martineau Lane
 Norwich NR1 2SG

DRAWING TITLE
 CBR Location Plan
 Norfolk Vanguard

REV.	DESCRIPTION	DRAWN BY	CHECKED	DATE

SURVEYED BY	INITIALS	DATE	DRAWING No.
			ROHA0001/1
DESIGNED BY			PROJECT TITLE
			Norfolk Vanguard
DRAWN BY	GS	18/04/19	SCALE
			1:500 @ A4
CHECKED BY	MLB	18/04/19	FILE No.
			ROHA0001

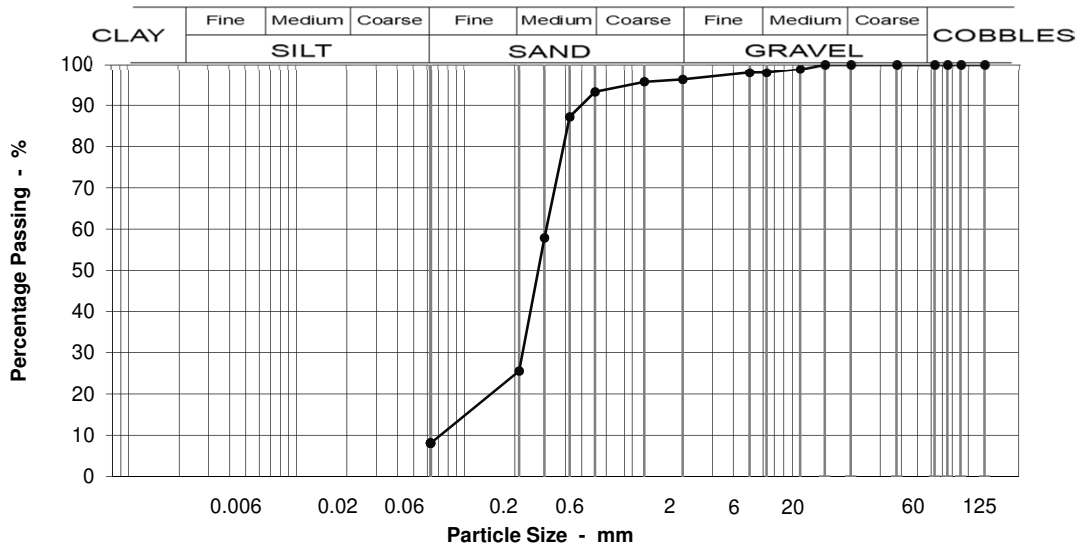
Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: **Norfolk Vanguard and Boreas**

Location: **CBR 1 @ 0.7m**

Location and orientation within sample not applicable

Bulk disturbed sample



Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	100
10	99
6.3	98
5	98
2	96
1.18	96
0.600	93
0.425	87
0.300	58
0.212	26
0.063	8

Specification for Highway Works Classification
Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6M.

Moisture content % **6**

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	2
Fine GRAVEL	2
Coarse SAND	3
Medium SAND	68
Fine SAND	17
Silt & Clay	8

Grading Analysis	
D100	10
D60	0.31
D10	0.08
Uniformity Coefficient	4

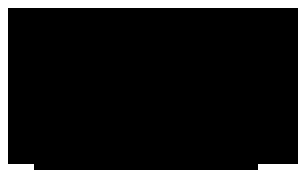
Description
Dark yellowish brown, slightly gravelly, medium SAND. Gravel is fine and medium, sub-angular flint.

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Test Code = 610



Peter Hardiment (Operations Manager)



FAO Ryan Eldon

Royal Haskoning
Rightwell House
Bretton
Peterborough
PE3 8DW

Our reference No. NCCL2019040210-610

Our Project No ROHA0001

Your Sample Ref 40210

Your Project or Order No.

Date Tested 03/04/2019

Date Report Issued 23-Apr-19

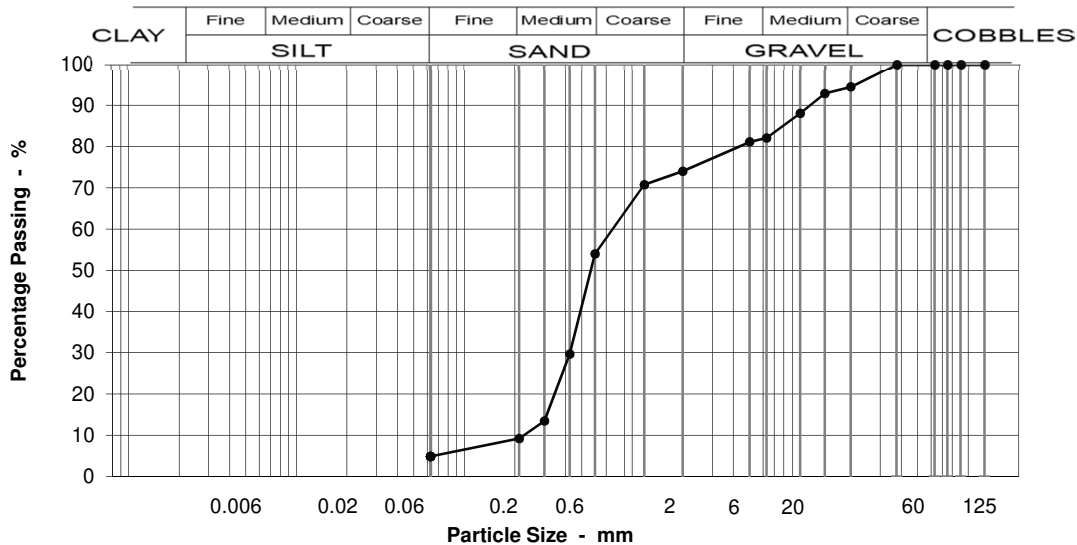
Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: Norfolk Vanguard and Boreas

Location: CBR 2 @ 0.2m

Location and orientation within sample not applicable

Bulk disturbed sample



Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	94
14	93
10	88
6.3	82
5	81
2	74
1.18	71
0.600	54
0.425	30
0.300	13
0.212	9
0.063	5

Specification for Highway Works Classification
Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6M.

Moisture content % 5

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	6
Medium GRAVEL	12
Fine GRAVEL	8
Coarse SAND	20
Medium SAND	45
Fine SAND	4
Silt & Clay	5

Grading Analysis	
D100	20
D60	0.81
D10	0.23
Uniformity Coefficient	4

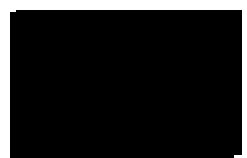
Description
Light brown and orangey brown, very gravelly, medium and coarse SAND. Gravel is fine, medium and coarse, sub-angular flint.

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Test Code = 610



Peter Hardiment (Operations Manager)



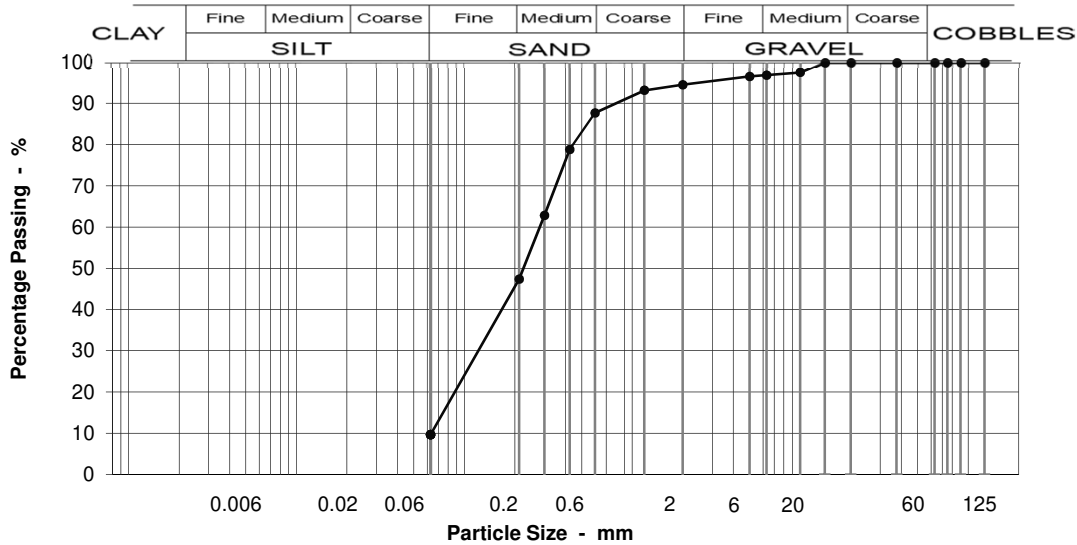
Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: Norfolk Vanguard and Boreas

Location: CBR 3 @ 0.2m

Location and orientation within sample not applicable

Bulk disturbed sample



Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	100
10	97
6.3	97
5	97
2	94
1.18	93
0.600	88
0.425	79
0.300	63
0.212	47
0.063	10

Specification for Highway Works Classification
Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6M.

Moisture content % 10

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	3
Fine GRAVEL	2
Coarse SAND	7
Medium SAND	40
Fine SAND	38
Silt & Clay	10

Grading Analysis	
D100	10
D60	0.28
D10	0.06
Uniformity Coefficient	4

Description
Light brown and orangey brown, slightly gravelly, fine and medium SAND. Gravel is fine and medium, sub-angular flint.

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Test Code = 610



Peter Hardiment (Operations Manager)



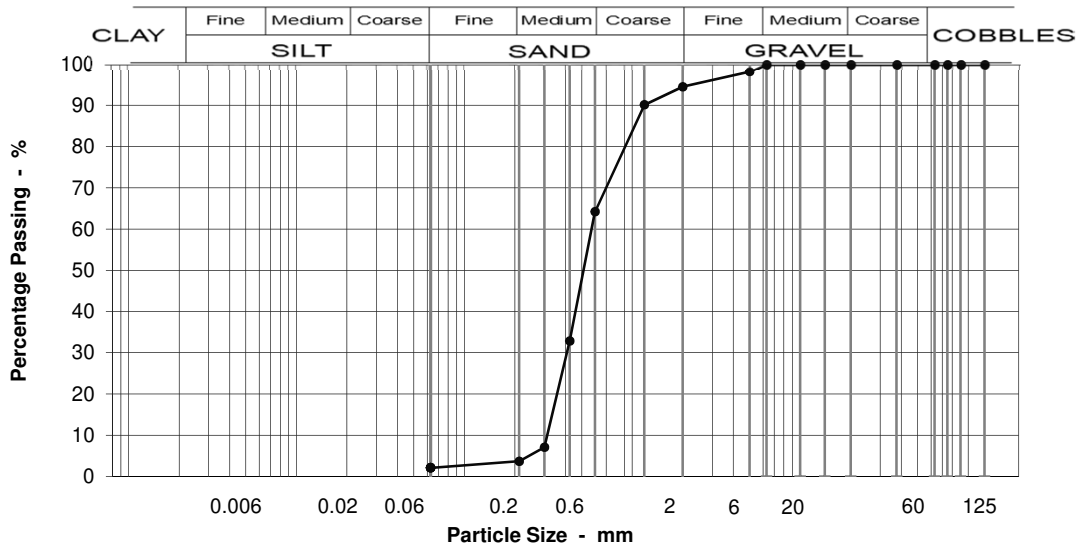
Particle Size Distribution to BS 1377 : Part 2 :1990 Section 9

Scheme: Norfolk Vanguard and Boreas

Location: CBR 4 @ 0.2m

Location and orientation within sample not applicable

Bulk disturbed sample



Sieving	
Particle Size mm	% Passing
125	100
90	100
75	100
63	100
37.5	100
20	100
14	100
10	100
6.3	100
5	98
2	94
1.18	90
0.600	64
0.425	33
0.300	7
0.212	4
0.063	2

Specification for Highway Works Classification
Table 6/2

This material complies with the following material classes 1B, 6E/6R, 6M.

Moisture content % 5

Sample Proportions	
BOULDERS	0
COBBLES	0
Coarse GRAVEL	0
Medium GRAVEL	0
Fine GRAVEL	6
Coarse SAND	30
Medium SAND	61
Fine SAND	2
Silt & Clay	2

Grading Analysis	
D100	5
D60	0.58
D10	0.31
Uniformity Coefficient	2

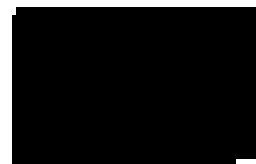
Description	
Orangey brown and yellowish brown, slightly gravelly, medium to coarse SAND. Gravel is fine, sub-angular flint.	

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Test Code = 610



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 Peterborough
 PE3 8DW

Our Project No ROHA0001
Our Report and sample No NCCL201904029-642
Your Sample Ref B4029
Your Project or Order No
Date Report Issued 23-Apr-19
Date Tested 08-Apr-19

Determination of the California Bearing Ratio to BS 1377 : PART 4 : 1990

Scheme	Norfolk Vanguard and Boreas		
Location	CBR 1 @ 0.7m		
Date sampled	27-Mar-19	Date received	29-Mar-19
Sample type	Bulk Disturbed	Sample Mass	18.955kg

If a sample certificate was provided it is available for inspection.
 The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil
Description	Dark yellowish brown, slightly gravelly, medium SAND. Gravel is fine and medium, sub-angular flint.

Supplier	Not applicable	Source	Ex site
-----------------	----------------	---------------	---------

		Test Specimen			
Location		Not applicable			
Orientation		Not applicable			
		Preparation Details			
Method of Division		Quartering			
Preparation Method		Sieving, Natural Moisture Content			
Condition		Unsoaked			
Retained 37.5mm	%	1			
Retained 20mm	%	2.1			
Number of layers		3	CBR Value Top	%	43.0
Blows per layer		N/A	CBR Value Bottom	%	104.0
BS Method		3.7, Vib.Hammer			
Bulk Density	Mg/m ³	2.07	Moisture Content Top	%	7.0
Dry Density	Mg/m ³	1.94	Moisture Cont. Bottom	%	7.0
Initial Moisture Content	%	6.6	Moisture Content Method	Oven dried @ 105-110°C	

Remarks

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Test Code = 642



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Our Project No ROHA0001
Our Report and sample No NCCL2019040210-642
Your Sample Ref B40210
Your Project or Order No
Date Report Issued 23-Apr-19
Date Tested 08-Apr-19

Determination of the California Bearing Ratio to BS 1377 : PART 4 : 1990

Scheme	Norfolk Vanguard and Boreas		
Location	CBR 2 @ 0.2m		
Date sampled	27-Mar-19	Date received	29-Mar-19
Sample type	Bulk Disturbed	Sample Mass	22.35kg

If a sample certificate was provided it is available for inspection.
 The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil		
Description	Light brown and orangey brown, very gravelly, medium and coarse SAND. Gravel is fine, medium and coarse, sub-angular flint.		

Supplier	Not applicable	Source	Ex site
-----------------	----------------	---------------	---------

Location	Test Specimen		
Orientation	Not applicable		
Method of Division	Preparation Details		
Preparation Method	Quartering		
Condition	Sieving, Natural Moisture Content		
	Unsoaked		
Retained 37.5mm	%	3	
Retained 20mm	%	7.2	
Number of layers		3	CBR Value Top % 46.0
Blows per layer		N/A	CBR Value Bottom % 133.0
BS Method	3.7, Vib.Hammer		
Bulk Density	Mg/m ³	2.10	Moisture Content Top % 5.3
Dry Density	Mg/m ³	2.00	Moisture Cont. Bottom % 5.5
Initial Moisture Content	%	5.4	Moisture Content Method Oven dried @ 105-110°C

Remarks

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Our Project No ROHA0001
Our Report and sample No NCCL2019040211-642
Your Sample Ref B40211
Your Project or Order No
Date Report Issued 23-Apr-19
Date Tested 08-Apr-19

Determination of the California Bearing Ratio to BS 1377 : PART 4 : 1990

Scheme	Norfolk Vanguard and Boreas		
Location	CBR 3 @ 0.2m		
Date sampled	27-Mar-19	Date received	29-Mar-19
Sample type	Bulk Disturbed	Sample Mass	20.95kg

If a sample certificate was provided it is available for inspection.
 The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil		
Description	Light brown and orangey brown, slightly gravelly, fine and medium SAND. Gravel is fine and medium, sub-angular flint.		
Supplier	Not applicable	Source	Ex site

Location	Not applicable		
Orientation	Not applicable		
Test Specimen			
Preparation Details			
Method of Division	Quartering		
Preparation Method	Sieving, Natural Moisture Content		
Condition	Unsoaked		
Retained 37.5mm	%	0	
Retained 20mm	%	0.6	
Number of layers		3	CBR Value Top % 15.0
Blows per layer		N/A	CBR Value Bottom % 12.0
BS Method	3.7, Vib.Hammer		
Bulk Density	Mg/m ³	2.22	Moisture Content Top % 11.0
Dry Density	Mg/m ³	2.01	Moisture Cont. Bottom % 9.7
Initial Moisture Content	%	11.0	Moisture Content Method Oven dried @ 105-110°C

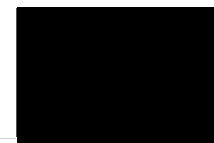
Remarks

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Test Code = 642



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Our Project No ROHA0001
Our Report and sample No NCCL2019040212-642
Your Sample Ref B40212
Your Project or Order No
Date Report Issued 23-Apr-19
Date Tested 08-Apr-19

Determination of the California Bearing Ratio to BS 1377 : PART 4 : 1990

Scheme	Norfolk Vanguard and Boreas		
Location	CBR 4 @ 0.2m		
Date sampled	27-Mar-19	Date received	29-Mar-19
Sample type	Bulk Disturbed	Sample Mass	19.9kg

If a sample certificate was provided it is available for inspection.
 The accuracy of information provided by third parties cannot be guaranteed.

Material	Soil		
Description	Orangey brown and yellowish brown, slightly gravelly, medium to coarse SAND. Gravel is fine, sub-angular flint.		
Supplier	Not applicable	Source	Ex site

Location	Not applicable		
Orientation	Not applicable		
Preparation Details			
Method of Division	Quartering		
Preparation Method	Sieving, Natural Moisture Content		
Condition	Unsoaked		
Retained 37.5mm	%	0	
Retained 20mm	%	1.1	
Number of layers		3	CBR Value Top % 32.0
Blows per layer		N/A	CBR Value Bottom % 64.0
BS Method	3.7, Vib.Hammer		
Bulk Density	Mg/m ³	1.90	Moisture Content Top % 5.4
Dry Density	Mg/m ³	1.80	Moisture Cont. Bottom % 5.5
Initial Moisture Content	%	5.5	Moisture Content Method Oven dried @ 105-110°C

Remarks

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Test Code = 642



Peter Hardiment (Operations Manager)



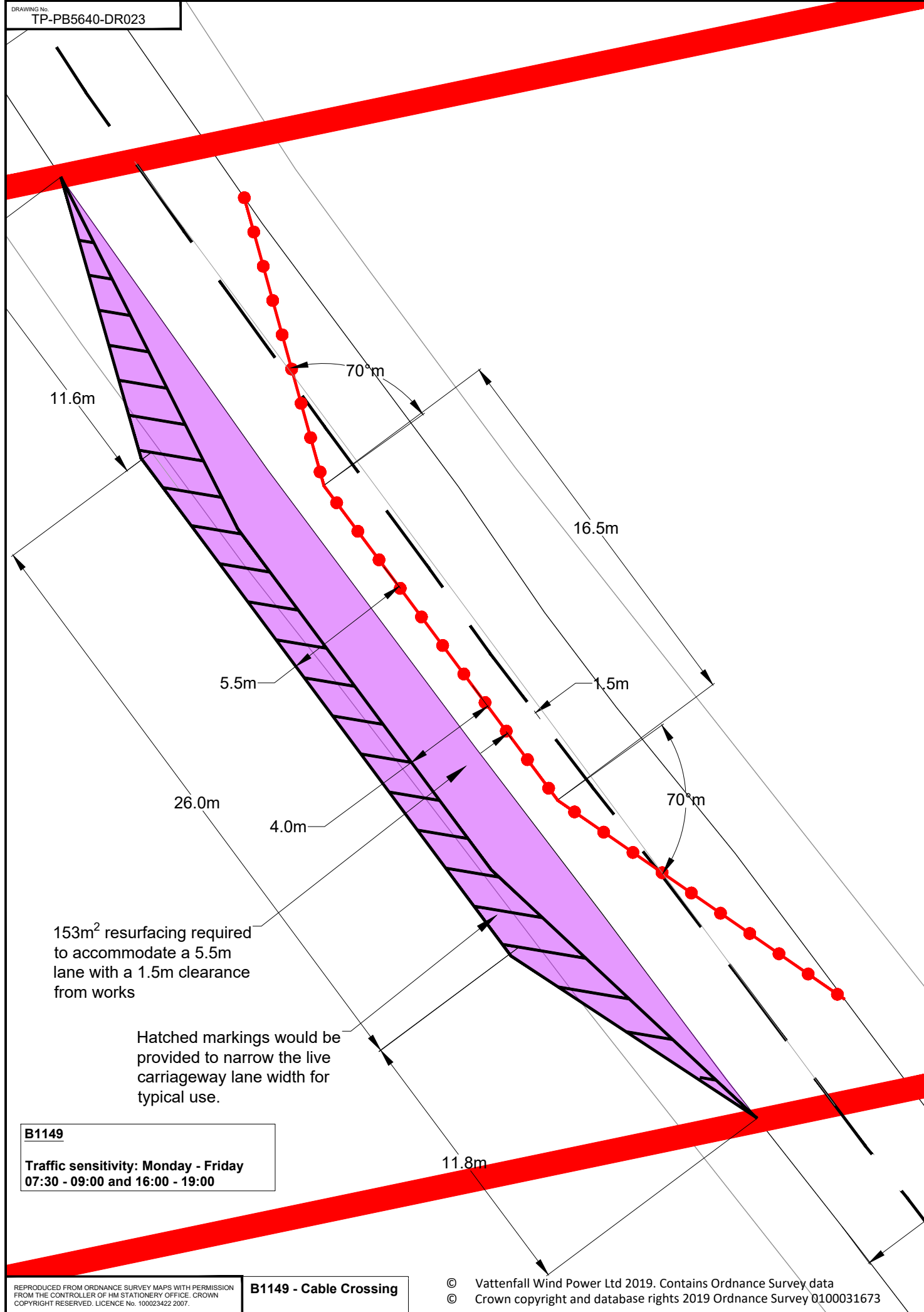
Norfolk Boreas Offshore Wind Farm

Appendix 3 - B1149

Traffic

Management Plans

Applicant: Norfolk Boreas Limited
Document Reference: ExA.AS-3.D4.V1
Deadline 4
Date: January 2020
Revision: Version 1



153m² resurfacing required to accommodate a 5.5m lane with a 1.5m clearance from works

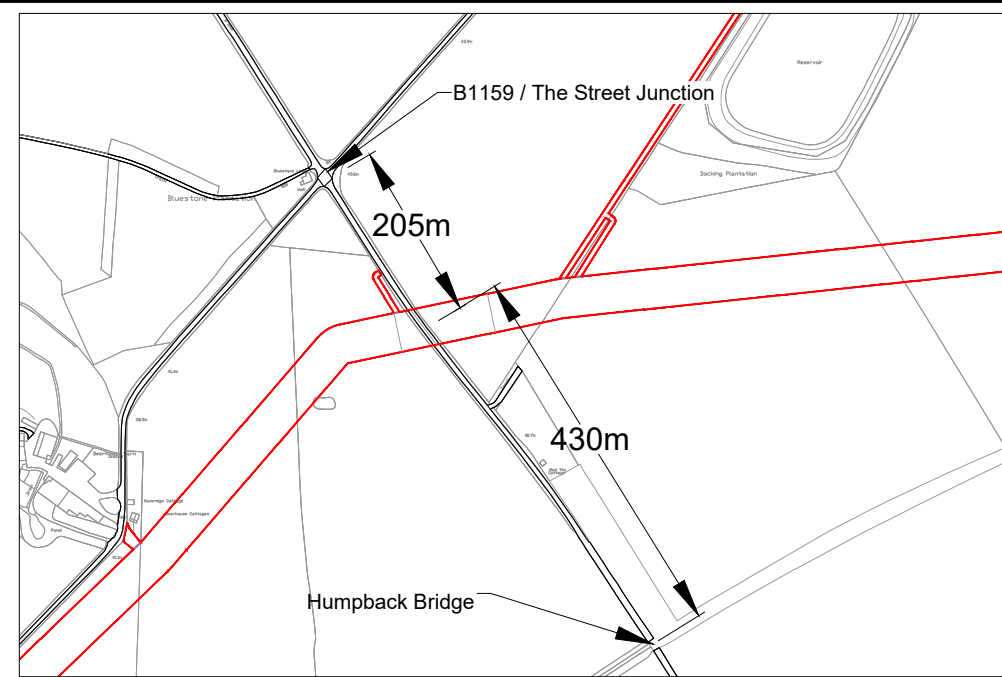
Hatched markings would be provided to narrow the live carriageway lane width for typical use.

B1149
Traffic sensitivity: Monday - Friday
07:30 - 09:00 and 16:00 - 19:00

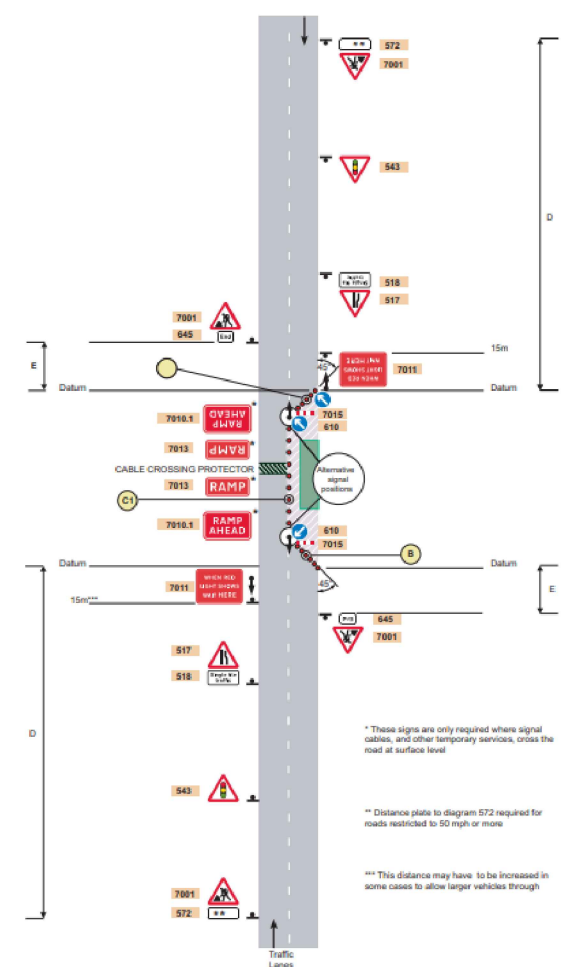
B1149 - Cable Crossing

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Plan SC7: Portable traffic signals on a two-lane single carriageway road



NOTE: Refer to Table 5.3 in Section D5.4 for recommended range of distances for dimensions D and E.

Table 5.3 Distances shown in plans in Sections D5.5 to D5.8 and D5.10

	Single carriageway road: Permanent speed limit			
	30mph or less	40mph	50mph	Unrestricted (60 mph)
Minimum and normal maximum stopping distance D of first sign in advance of lead-in taper in metres	20* - 45	45 - 110	275 - 450	275 - 450
Minimum longitudinal clearance L in metres	0.5	15	30	60
Length of taper T in metres:				
1	13	20	25	25
Width of hazard (metres) including safety zone S	2	26	40	50
3	39	60	75	75
4	52	80	100	100
5	65	100	125	125
Minimum lateral safety zone clearance	0.5	0.5	1.2	1.2
Distance E to "end of road works" sign	10 - 30	10 - 30	30 - 45	30 - 45

Extracts from Traffic Signs Manual (2009) Chapter 8 Part 1

NOTES
1. Do not scale from this drawing, all dimensions are in metres unless noted otherwise.
2. This drawing has been based upon Ordnance Survey Maps and Royal Haskoning can not guarantee the accuracy of data.
3. This drawing is an update to PB4476-DR033, first issued in the Norfolk Vanguard DCO application.

KEY
 DCO ORDER LIMITS
 REQUIRED RESURFACING
 INDICATIVE CONES

F1.0	FIRST ISSUE				
REV	DATE	DESCRIPTION	BY	CHK	APP

CLIENT

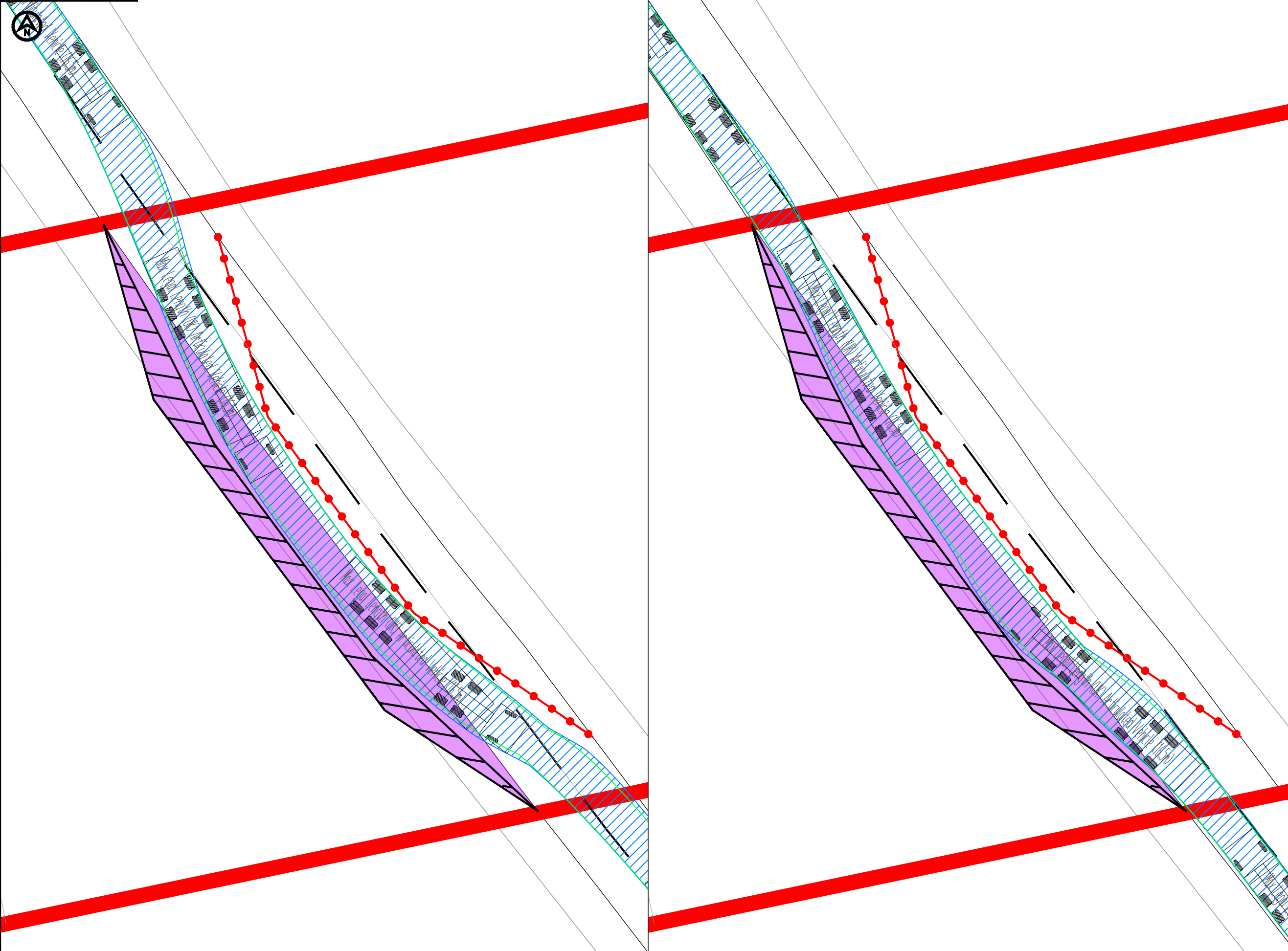
PROJECT
NORFOLK BOREAS OFFSHORE WIND FARM

TITLE
B1149 TRAFFIC MANAGEMENT (SOUTH WESTERN VERGE)

Royal HaskoningDHV
Enhancing Society Together

DRAWN	RNE	CHECKED	ADR	APPROVED	ADR
DATE	23.01.20	SCALE AT A1	1:250	CLIENTS REF.	
DRAWING No.	TP-PB5640-DR023				REVISION
					F1.0

DRAWING No. TP-PB4476-DR024



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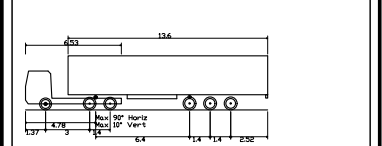
Southbound
SCALE - 1:250

Northbound
SCALE - 1:250

NOTES
 1. Do not scale from this drawing, all dimensions are in metres unless noted otherwise.
 2. This drawing has been based upon Ordnance Survey Maps and Royal Haskoning can not guarantee the accuracy of data.
 3. This drawing is an update to PB4476-DR034, first issued in the Norfolk Vanguard DCO application.

KEY
 ORDER LIMITS

VEHICLE TRACKING



Max Legal Length (UK) Articulated Vehicle (16.5m)
 Overall Length 16.500m
 Overall Width 2.550m
 Overall Body Height 3.281m
 Min Body Ground Clearance 0.41m
 Max Truck Width 2.500m
 Lock to lock time 6.70S
 Kerb to Kerb turning Radius 6.855m

VEHICLE BODY SWEEP PATH (FORWARD GEAR)
 VEHICLE CHASSIS SWEEP PATH
 REQUIRED RESURFACING
 INDICATIVE CONES

DRAFT - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY	CHK	APP
F1.0		FIRST ISSUE			

REVISIONS

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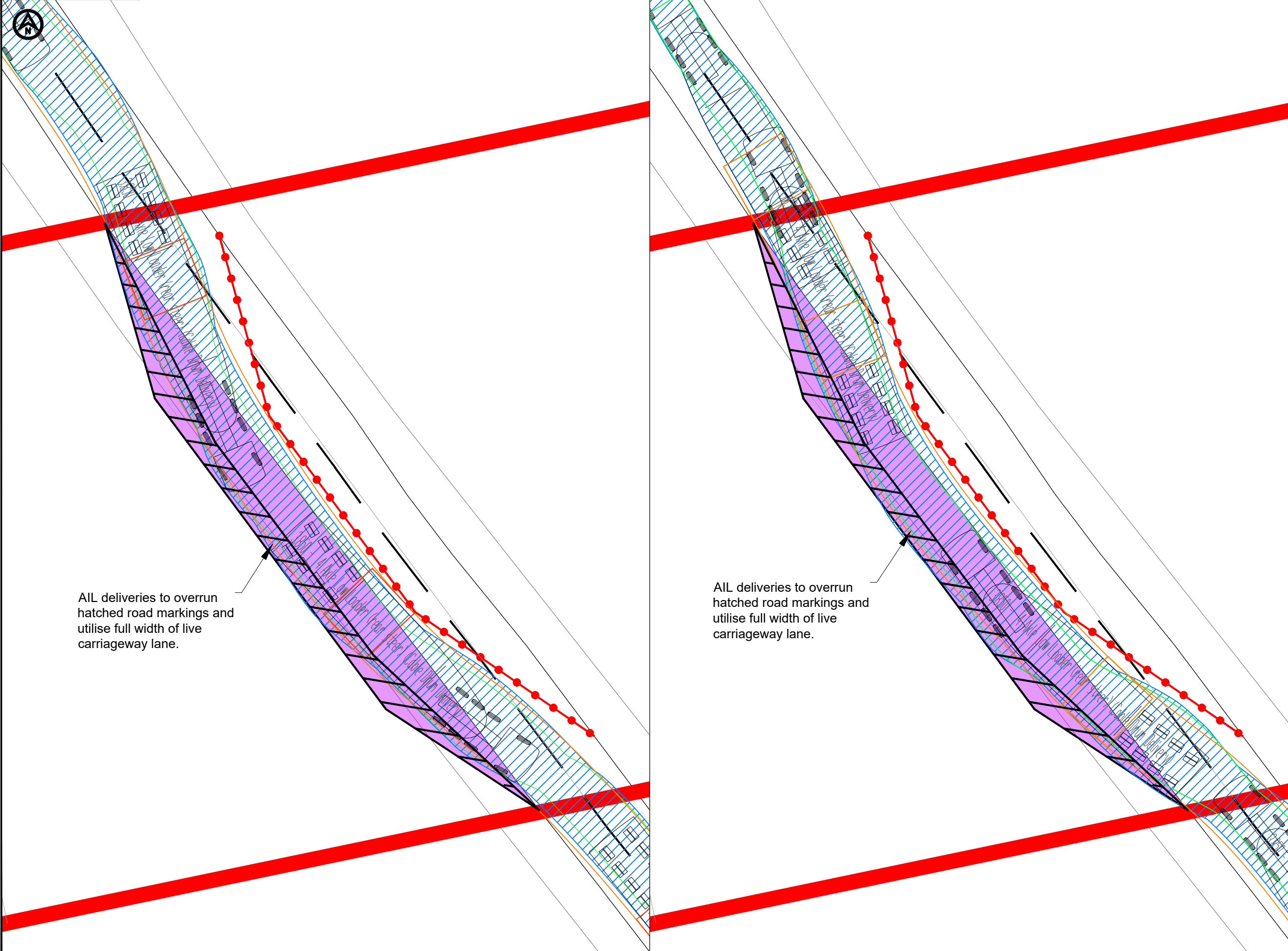


PROJECT
 NORFOLK BOREAS
 OFFSHORE WIND FARM

TITLE
 B1149 TRAFFIC MANAGEMENT
 ARTICULATED LORRY SWEEP
 PATH ANALYSIS
 (SOUTH WESTERN VERGE)



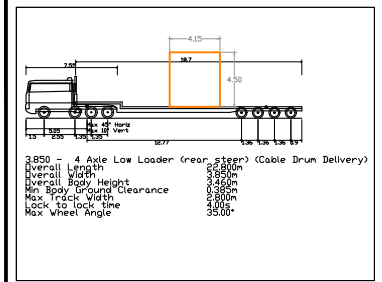
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DATE	23.01.20	SCALE AT A3	1:250	CLIENTS REF.	
DRAWING No.	TP-PB4476-DR024				REVISION
CLIENT DWG No.					F1.0



- NOTES**
1. Do not scale from this drawing, all dimensions are in metres unless noted otherwise.
 2. This drawing has been based upon Ordnance Survey Maps and Royal Haskoning can not guarantee the accuracy of data.
 3. This drawing is an update to PB4476-DR035, first issued in the Norfolk Vanguard DCO application.
 4. Cable drum dimensions taken from Hornsea 3 Offshore Wind Farm document 'Main Construction Compound Access Strategy' September 2018.
 5. Typical ALL vehicle used suitable for cable drum loadings.

KEY
 ORDER LIMITS

VEHICLE TRACKING



- VEHICLE BODY SWEEP PATH (FORWARD GEAR)
- VEHICLE CHASSIS SWEEP PATH
- INDICATIVE CABLE DRUM SWEEP PATH
- REQUIRED RESURFACING
- INDICATIVE CONES

DRAFT - NOT FOR CONSTRUCTION

ALL deliveries to overrun hatched road markings and utilise full width of live carriageway lane.

ALL deliveries to overrun hatched road markings and utilise full width of live carriageway lane.

D.01	FIRST ISSUE			
REV	DATE	DESCRIPTION	BY	CHK APP

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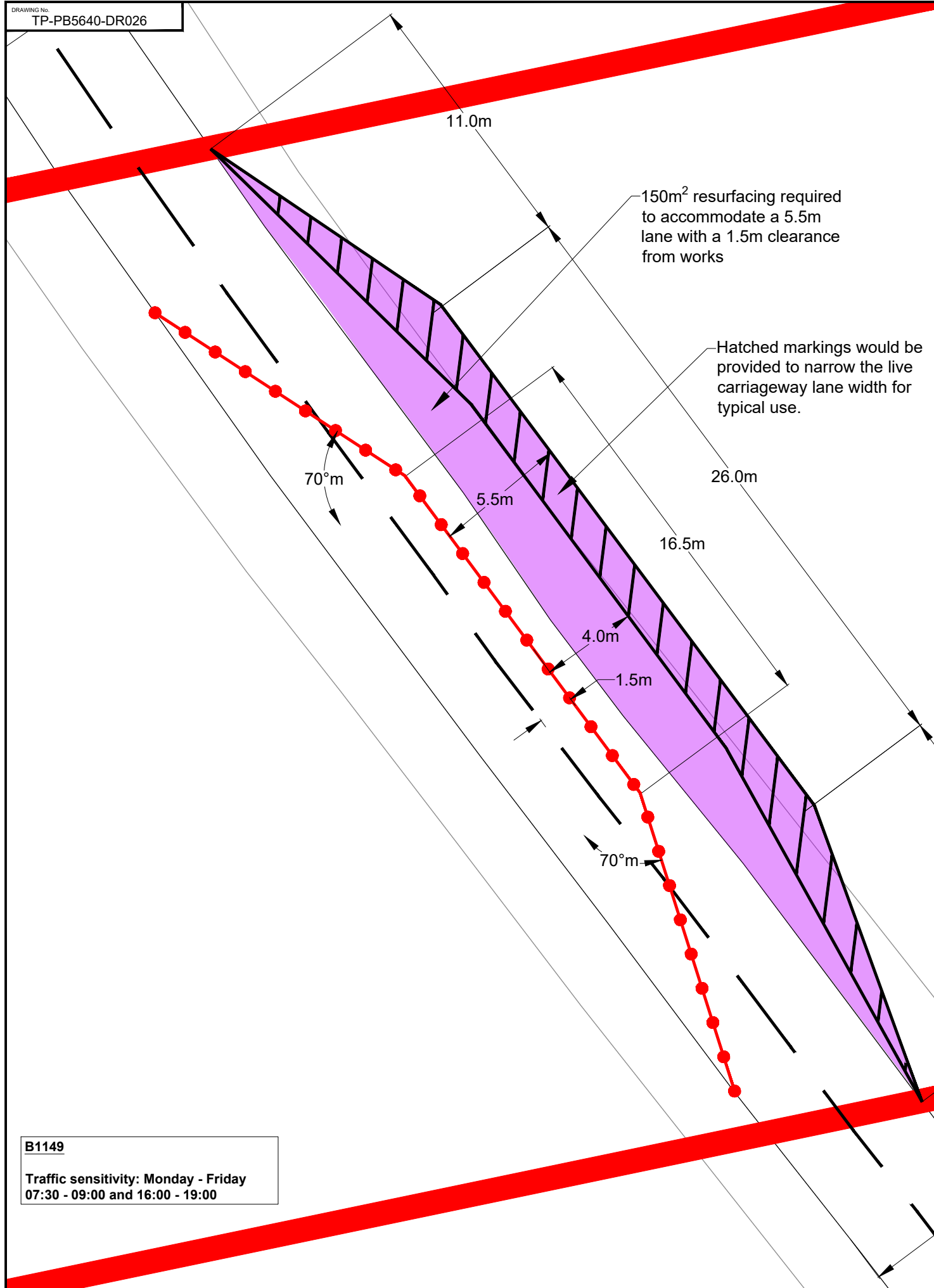


PROJECT
 NORFOLK BOREAS OFFSHORE WIND FARM

TITLE
 B1149 TRAFFIC MANAGEMENT
 TYPICAL AIL CABLE DRUM DELIVERY
 SWEEP PATH ANALYSIS
 (SOUTH WESTERN VERGE)



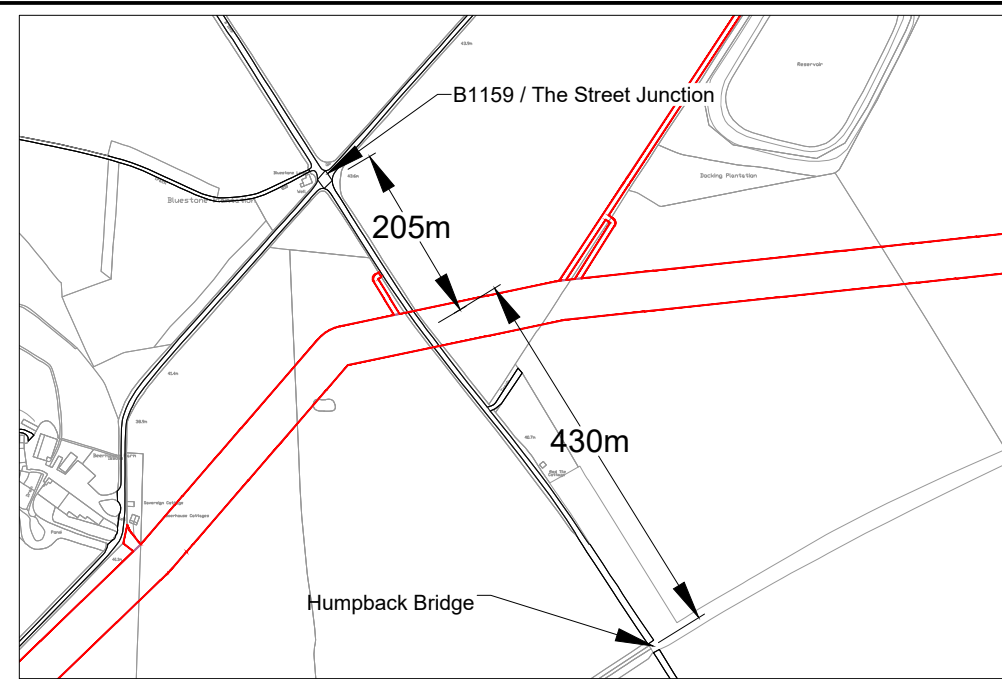
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DATE	23.01.20	SCALE AT A3	1:250	CLIENTS REF.	
DRAWING No.	TP-PB5640-DR025				REVISION
CLIENT DWG No.					F1.0



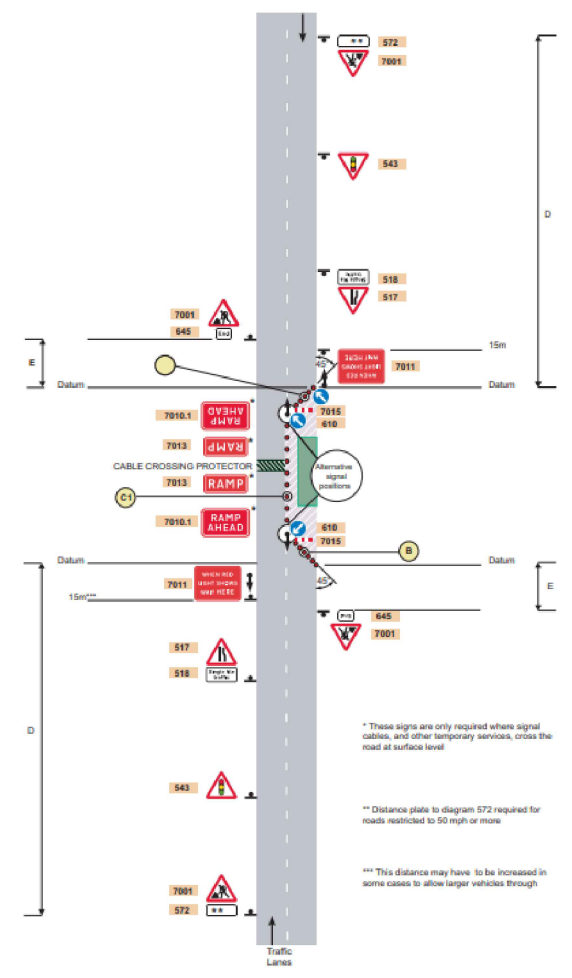
B1149
 Traffic sensitivity: Monday - Friday
 07:30 - 09:00 and 16:00 - 19:00

B1149 - Cable Crossing

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Plan SC7: Portable traffic signals on a two-lane single carriageway road



NOTE: Refer to Table 5.3 in Section D5.4 for recommended range of distances for dimensions D and E.

Table 5.3 Distances shown in plans in Sections D5.5 to D5.8 and D5.10

	Single carriageway road: Permanent speed limit			
	30mph or less	40mph	50mph	Unrestricted (60 mph)
Minimum and normal maximum siting distance D of first sign in advance of lead-in taper in metres	20 - 45	45 - 110	275 - 450	275 - 450
Minimum longitudinal clearance L in metres	0.5	15	30	60
Length of taper T in metres:				
1	13	20	25	25
2	26	40	50	50
3	39	60	75	75
4	52	80	100	100
5	65	100	125	125
Minimum lateral safety zone clearance	0.5	0.5	1.2	1.2
Distance E to 'end of road works' sign	10 - 30	10 - 30	30 - 45	30 - 45

Extracts from Traffic Signs Manual (2009) Chapter 8 Part 1

NOTES
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 3. This drawing is an update to PB4476-DR026, first issued in the Norfolk Vanguard DCO application.

KEY
 DCO ORDER LIMITS
 REQUIRED RESURFACING
 INDICATIVE CONES

REV	DATE	DESCRIPTION	BY	CHK	APP
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PROJECT
 NORFOLK BOREAS OFFSHORE WIND FARM

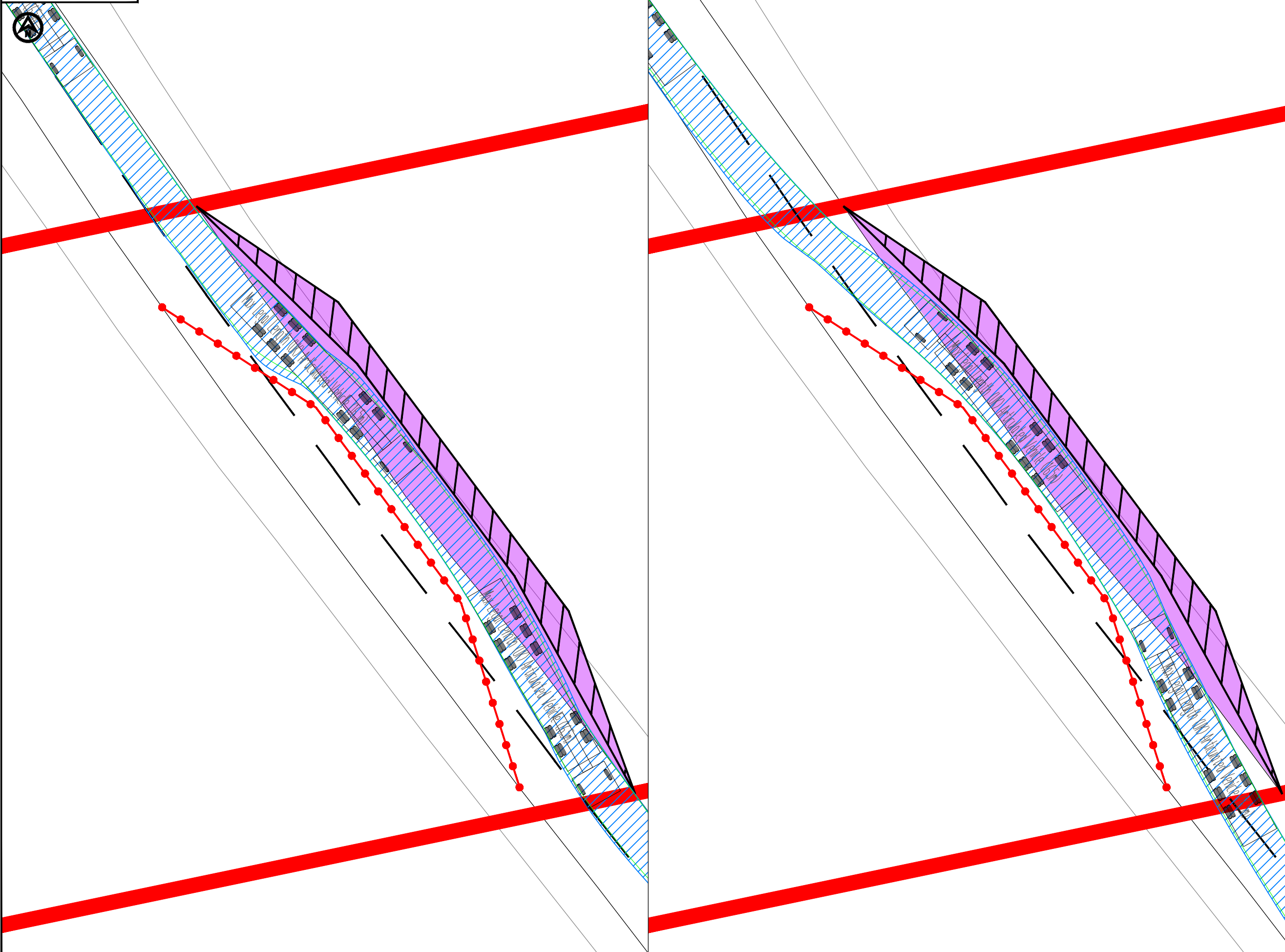
TITLE
 B1149 TRAFFIC MANAGEMENT (NORTH EASTERN VERGE)



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DRAWING No. TP-PB5640-DR026
 SCALE AT A1 1:250
 CLIENTS REF.
 REVISION F1.0

DRAWING No.
TP-PB5640-DR027

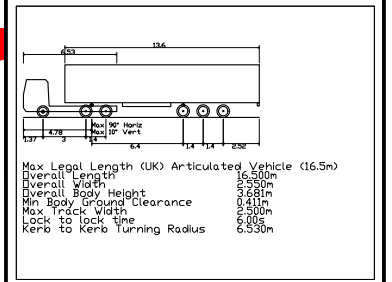


- NOTES**
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 2. This drawing has been based upon Ordnance Survey Maps and Royal Haskoning can not guarantee the accuracy of data.
 3. This drawing is an update to PB4476-DR037, first issued in the Norfolk Vanguard DCO application.

KEY

— ORDER LIMITS

VEHICLE TRACKING



- VEHICLE BODY SWEEP PATH (FORWARD GEAR)
- VEHICLE CHASSIS SWEEP PATH
- REQUIRED RESURFACING
- INDICATIVE CONES

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PROJECT
NORFOLK BOREAS OFFSHORE WIND FARM

TITLE
B1149 TRAFFIC MANAGEMENT ARTICULATED LORRY SWEEP PATH ANALYSIS (NORTH EASTERN VERGE)

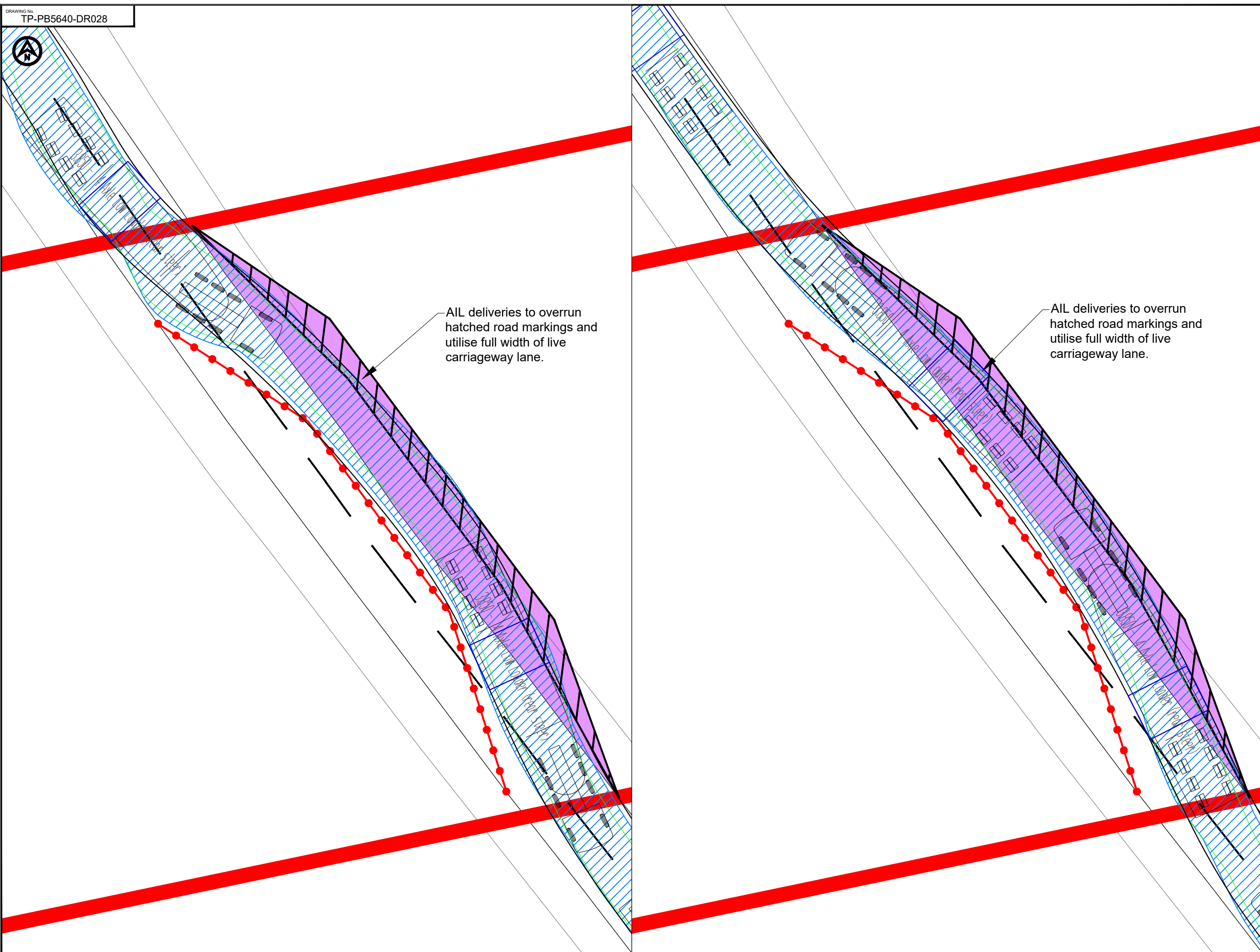


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DATE	23.01.20	SCALE AT A3	1:250	CLIENTS REF.	
DRAWING No.	TP-PB5640-DR027				REVISION
CLIENT DWG No.					F1.0

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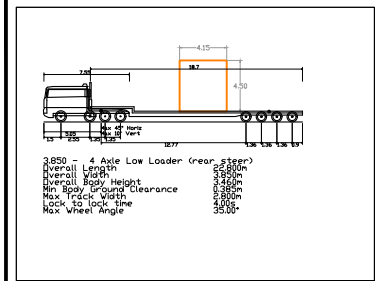
Southbound
SCALE - 1:250

Northbound
SCALE - 1:250



- NOTES**
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 3. This drawing is an update to PB4476-DR034, first issued in the Norfolk Vanguard DCO application.
 4. Cable drum dimensions taken from Hornsea 3 Offshore Wind Farm document 'Main Construction Compound Access Strategy' September 2018.
 5. Typical AIL vehicle used suitable for cable drum loadings.

KEY
 ORDER LIMITS
VEHICLE TRACKING



- VEHICLE BODY SWEEP PATH (FORWARD GEAR)
- VEHICLE CHASSIS SWEEP PATH
- INDICATIVE CABLE DRUM SWEEP PATH
- REQUIRED RESURFACING
- INDICATIVE CONES

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VATTENFALL

PROJECT
 NORFOLK BOREAS OFFSHORE WIND FARM

TITLE
 B1149 TRAFFIC MANAGEMENT
 TYPICAL AIL CABLE DRUM
 DELIVERY
 SWEEP PATH ANALYSIS
 (NORTH EASTERN VERGE)

Royal HaskoningDHV
 Enhancing Society Together

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RNE	ADR	ADR
DATE	SCALE AT A3	CLIENTS REF.
23.01.20	1:250	
DRAWING No.	TP-PB5640-DR028	REVISION
CLIENT DWG No.		F1.0

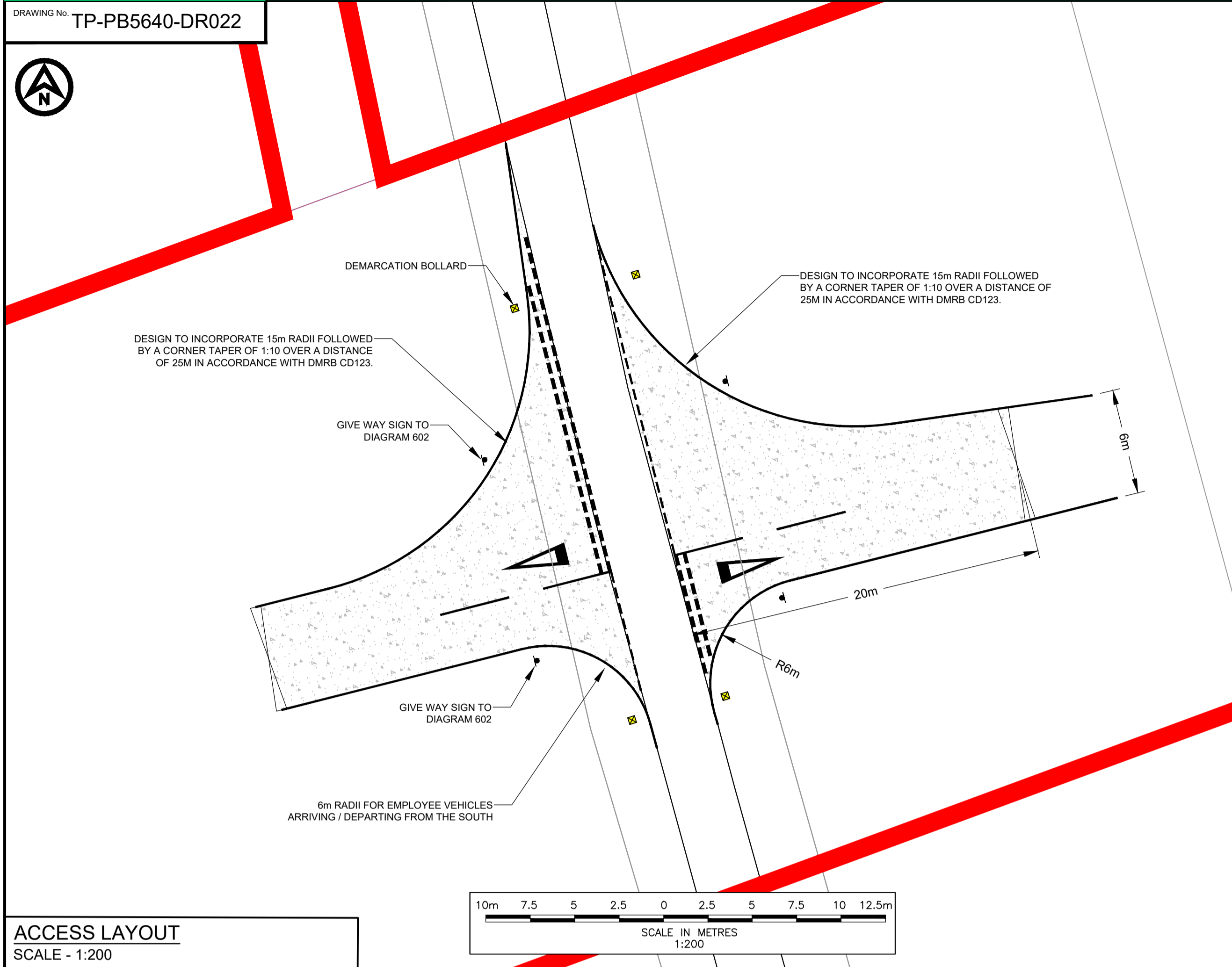
Norfolk Boreas Offshore Wind Farm

Appendix 4 –

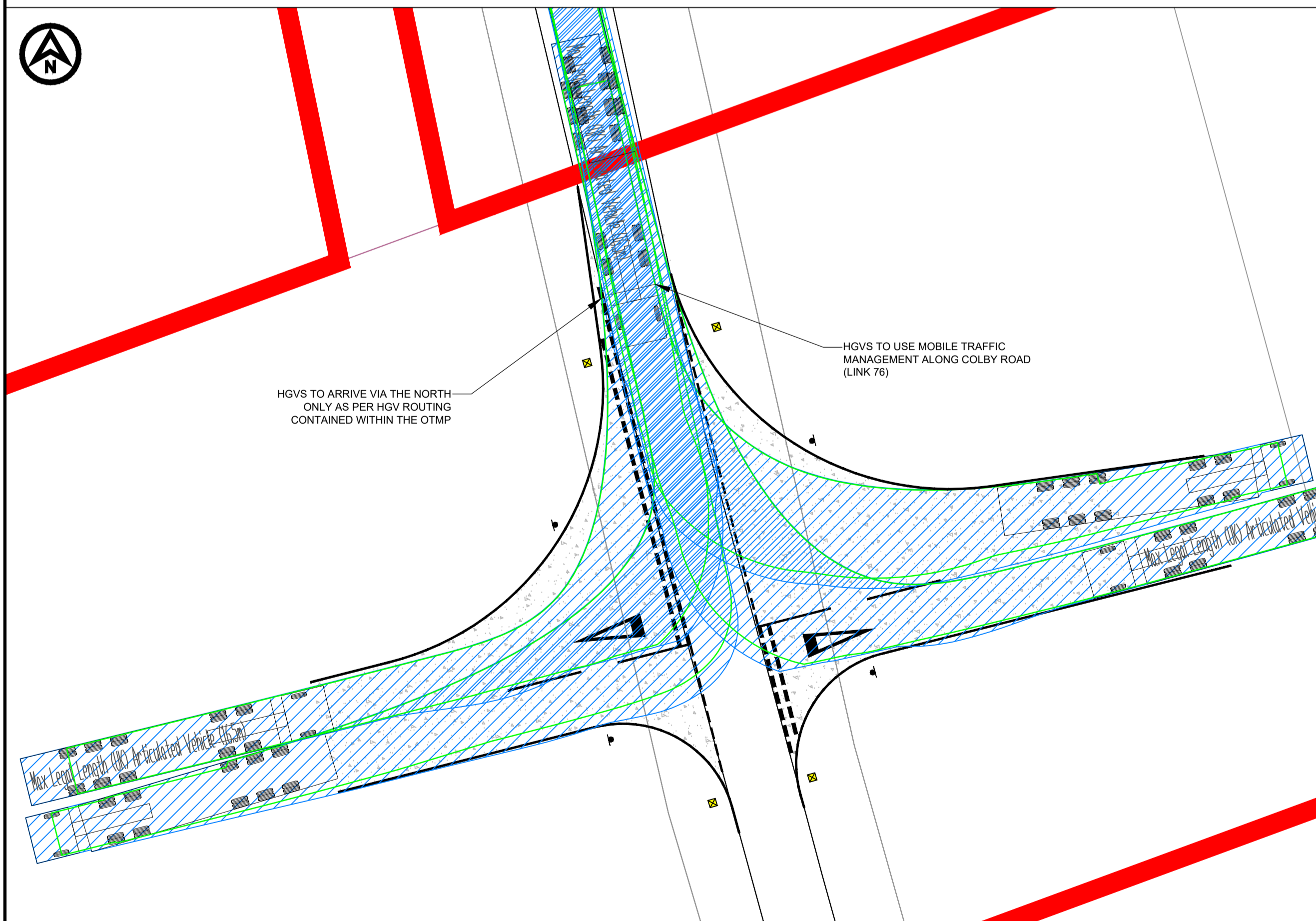
Church Road, Colby

Access Layout

Applicant: Norfolk Boreas Limited
Document Reference: ExA.AS-3.D4.V1
Deadline 4
Date: January 2020
Revision: Version 1

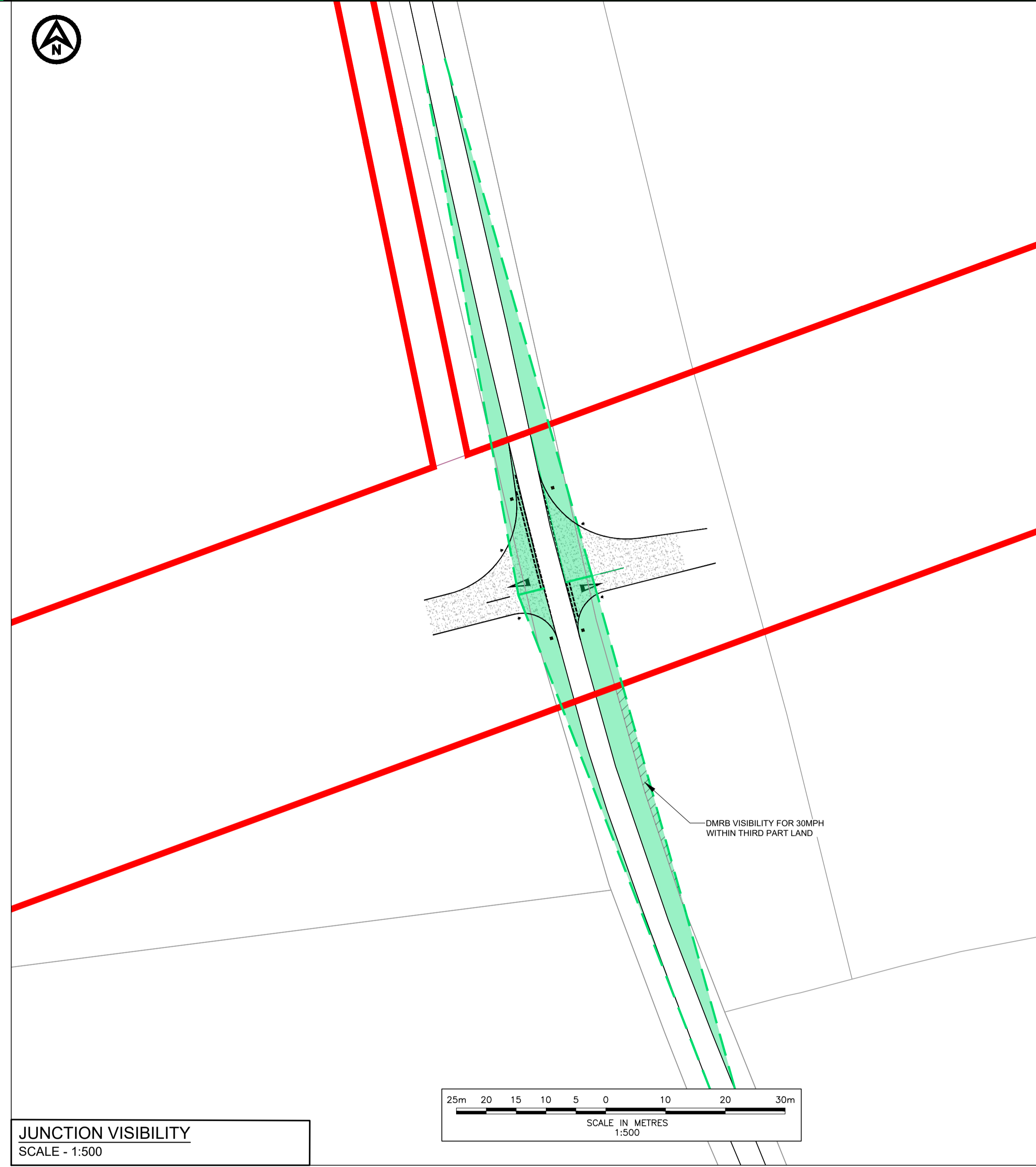


ACCESS LAYOUT
SCALE - 1:200



ARTICULATED VEHICLE SPA (AC58)
SCALE - 1:200

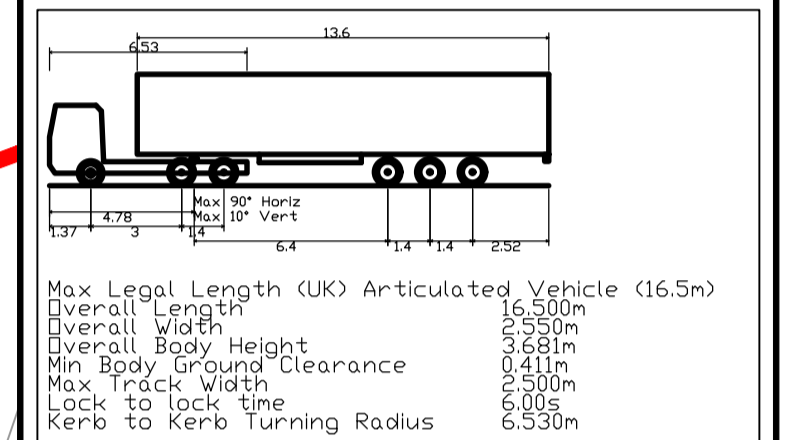
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JUNCTION VISIBILITY
SCALE - 1:500

- NOTES
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 - Road markings and road signs are to be in accordance with the SI document "Traffic Signs Regulations and General Directions, 2016".

- GENERAL KEY
- DEVELOPMENT CONSENT ORDER LIMITS
 - PROPOSED ACCESS BOUND MATERIAL
 - PROPOSED ACCESS BOUNDARY/ROAD MARKINGS
 - PROPOSED GATE
 - APPROXIMATE SIGN LOCATION
- VISIBILITY KEY
- 2.4m x 90m (DMRB) VISIBILITY SPYLA FOR A 30MPH SPEED LIMIT
 - DMRB CLEAR VISIBILITY ENVELOPE
 - DMRB VISIBILITY ENVELOPE WITHIN THIRD PARTY LAND
- SWEPT PATH ANALYSIS KEY
- VEHICLE BODY SWEEP PATH (FORWARD GEAR)
 - VEHICLE CHASSIS SWEEP PATH



FOR CONSULTATION

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PROJECT
NORFOLK BOREAS
OFFSHORE WIND FARM

TITLE
CHURCH ROAD - AC58 ACCESS



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DATE	23.01.2020	SCALE AT A1	1:500 UNO	CLIENTS REF.	
DRAWING No.	TP-PB5640-DR022	REVISION			
CLIENT DWG No.					F1.0

Norfolk Boreas Offshore Wind Farm

Appendix 5 –

Church Road, Colby

Access Aerial Image

Applicant: Norfolk Boreas Limited
Document Reference: ExA.AS-3.D4.V1
Deadline 4
Date: January 2020
Revision: Version 1



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- GENERAL KEY**
- DEVELOPMENT CONSENT ORDER LIMITS
 - PROPOSED ACCESS BOUNDARY/ROAD MARKINGS
- VISIBILITY KEY**
- - - 2.4m x 90m (DMRB) VISIBILITY SPLAY FOR A 30MPH SPEED LIMIT
 - DMRB CLEAR VISIBILITY ENVELOPE

FOR CONSULTATION

REV	DATE	DESCRIPTION	BY	CHK	APP

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PROJECT
NORFOLK BOREAS
OFFSHORE WIND FARM

TITLE
CHURCH ROAD - AC58 ACCESS



DRAWN	JL	CHECKED	SKT	APPROVED	ADR
DATE	28.01.2020	SCALE AT A1	1:250	CLIENTS REF.	

DRAWING No. TP-PB5640-DR037
CLIENT DWG No. F1.0