Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects

Environmental Statement

Volume 3

Appendix 24.2 - Abnormal Indivisible Load (AIL) Study

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Abnormal Indivisible Load Access Study
Transportation of a 224 te Transformer to Dudgeon and Sheringham Extension Substation

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Executive Summary

The contents of this report include transport feasibility investigations into achieving access to the Sheringham Shoal (SEP) and Dudgeon Offshore (DEP) Wind Farm Extension Project onshore substation connections that are proposed to be located at land adjacent to the National Grid Norwich Main Substation in Norfolk. These projects are being developed by Equinor New Energy Limited (the Applicant).

The delivery of substation transformers will require Special Order movements of above 150te gross loads as part of a substation development scheme. The weight considered in these investigations is 224 te nett, which is advised by the applicant, to be the potential transport weight of the new transformers required at the new substation.

The National Highways (NH) Abnormal Loads Team has provided an Agreement in Principle (AIP) for the existing Norwich Main Substation from Kings Lynn and this report works on the assumption that access for the applicants schemes will follow similar principles and the report details the status of the preferred route from Kings Lynn. National Highways East Region have in the past advised that the River Yare Viaduct on the A47 is not able to accommodate the proposed loads on the Route from Great Yarmouth and the route should not be considered further.

Kings Lynn is an established heavy load delivery port and a variety of solutions for delivery of transformers is available including the use of mobile cranes and coastal vessels and roll-on/roll-off (ro/ro). Heavy lift ships however are more difficult to facilitate at Kings Lynn due to the small size of the port entry locks and quay space.

National Highways East Region have advised the route from Kings Lynn is not currently structurally acceptable as there are two structures of concern. Scarning Bridge has been advised as between 45-50% overcapacity for the loads currently proposed and it is unlikely to obtain a pass even if a more refined analysis was undertaken. The formal report from Atkins, working on behalf National Highways East Region, remains outstanding at the time of issue of this report and it has not been possible to determine if this initial failure has been confirmed by National Highways own structural engineers and whether alternative trailer arrangements or remedial measures could be considered in order for AILs to remain on the A47 trunk road.

The A47 would remain the preferred route of the applicant if a solution to this restriction can be found and this remains under discussion with Atkins and National Highways East Region.

A diversion route has been proposed which avoids this problem structure in the event that a solution to the issue at Scarning Bridge cannot be identified and this has been approved in terms of structures by Norfolk County Council.

The second concern to is West Binley no. 1 culvert, located between Kings Lynn and Swaffham at approximate OS Ref TF 7139 1542 which Atkins have advised that there is not enough information within the internal National Highways database to allow for a proper analysis to be carried out. This remains under review. This structure is only 1.5 span and as such is not expected to be a significant problem to resolve although discussions remain ongoing with National Highways East Region on this matter.

The route from Kings Lynn is negotiable for the proposed trailer configurations with street furniture removal, although 20 axle girder frame trailers and larger will require confirmatory Swept Path Assessments (SPA) to confirm negotiability at the left turn from the A140 to Mangreen Lane and from Mangreen Lane to the existing National Grid Norwich Main Substation access road. The diversion route to avoid Scarning Bridge is also considered negotiable for 20 axle trailers within the highway. 24 axle trailers will not be able to negotiate the right turn from Dereham Road to Draytonhall Lane without the need to remove a telegraph pole and interfere with third party fence lines.

The Applicant is still examining the potential access options and it is not confirmed that National Grid will allow them to use the existing access road to Norwich Main Substation, from where access to the new substation compound could be developed. Alternative options for access are being considered and this could be to create a new access road to the west of the National Grid Substation access road from Mangreen Lane following road widening on Mangreen Lane or to utilise the Tarmac Quarry facility to the north of Mangreen Lane which is also accessed from the A140. This would then involve transport through the quarry and crossing over Mangreen Lane into a new substation access road to the development area.

No review of on-site access handling and installation within the substation compound has been undertaken as part of this report.

The report is intended to be a summary of the Abnormal Indivisible Load (AIL) route access at the current time and is not a guarantee that the route will be cleared in the future. Specific movements will need to be assessed at the time on an individual basis. If any further information is required, it is available on request.

1. Introduction

1.1. The contents of this report include transport feasibility investigations into achieving access to the Sheringham Shoal (SEP) and Dudgeon Offshore (DEP) Wind Farm Extension Project onshore substation connections that are proposed to be located at land adjacent to the National Grid Norwich Main Substation in Norfolk. These projects are being developed by Equinor New Energy Limited (the Applicant).

1.2. The transformer transport weight considered in these investigations is 224 te nett which is advised to be the potential weight of the new transformers required at the substation at some point between 2025 and 2027 depending on the overall project timescales.

1.3. This report is a summary of the status of the current AIL access investigations to the proposed substation and seeks to present the situation as it currently stands. The issues highlighted in this report as risks to achieving AIL access in the future will need to be revisited and progressed as the scheme develops.

1.4. This investigation considers the possible land transport route from the Port of Kings Lynn. Formal movement applications will be necessary upon appointment of a haulage contractor by the transformer manufacturer.

1.5. A detailed appraisal of the technical requirements for handling transformers on site will be required as the scheme develops in the future.

1.6. The report is intended to be a summary of the AIL route access at the current time and is not a guarantee that the route will be cleared in the future. Specific movements will need to be assessed at the time on an individual basis. If any further information is required, it is available on request.

1.7. The report considers access to the proposed SEP and DEP onshore substation in terms of AIL transportation of the main transformer tank only.

2. National Highways Agreement in Principle and Legislative Requirements

2.1. *Definition of Abnormal Indivisible Load (AIL)*

2.1.1. The Department for Transport, of which National Highways (NH), formally Highways England, is a government-owned company with responsibility for managing the core road network in England, state that the strict definition of an AIL refers to a load which cannot, without undue expense or risk of damage, be divided into two or more loads for the purpose of carriage on roads and which, owing to its dimensions or weight, cannot be carried on a vehicle which complies in all respects with the 'standard vehicle regulations' these are:

- The Road Vehicles (Construction and Use) Regulations 1986 (as amended)
- The Road Vehicles (Authorised Weight) Regulations 1998 (as amended)
- The Road Vehicles Lighting Regulations 1989 (as amended).

2.1.2. All equipment should be stripped of their ancillaries before they are transported. NH will only accept that further dismantling is not required where it cannot be economically achieved due to the requirement for its construction within specific factory environments or where extremely high tolerances have to be maintained.

2.2. *Legislation*

2.2.1. Conventional heavy goods vehicles have an operating weight limit of 44 tonnes. The category known as abnormal indivisible loads (AIL) covers those vehicles where the gross weight exceeds 44 tonnes. An Abnormal Load is defined as that which cannot be carried under Construction and Use (C&U) Regulations. Items which, when loaded on the load carrying vehicle exceed the weights encompassed by the C&U Regulations, but do not exceed Special Order Permission Limits, are governed by Special Types General Order (STGO) categories 1 to 3 depending on size. Where dimensions exceed 6.1m in width, 30m in rigid length or 150 tonnes gross weight, Special Order from NH is required.

2.2.2. Special Order category AIL movements are authorised by the NH Abnormal Loads team, based in Birmingham. This is further discussed in section 2.3.

2.3. *Water Preferred Policy Requirements*

2.3.1. The Department for Transport has adopted a 'water-preferred' policy for the transport of AILs. This means that, where an application is sought for the movement of a Special Order or VR1 category load (more than 5.0m width) by road, the Department, via NH, will turn down the application where it is feasible for a coastal or inland waterway route to be used instead of road. HE advise that this decision is based on a number of factors including whether the load is divisible, the availability of a suitable route, the amount of traffic congestion that is likely to be caused and the justification for the load to be moved. The NH Abnormal Loads Team is the department responsible for the authorisation of Special Order AIL's and government policy is that the closest available port of access should be used for the delivery of such oversize items.

2.3.2. In consideration of the water-preferred policy to maximise the use of water for the movement of Special Order (Above 150te gross) AIL's wherever practicable, Wynns are aware from previous works for the adjacent National Grid Norwich Main Substation that the port of access required to be utilised for the delivery of transformers would be expected to be Kings Lynn.

2.3.3. National Highways East Region have in the past advised that the River Yare Viaduct on the A47 is not able to accommodate the proposed loads on the Route from Great Yarmouth and the route should not be considered further even though it is lower in miles than that from Kings Lynn.

2.3.4. The route considered in the structural checks has been subject to formal Special Order consultations via the NH Abnormal Loads Team in Birmingham who have confirmed that they will consider access from Kings Lynn and this is discussed in Section 7.2.

3. Abnormal Indivisible Load Movements - Highways Act 1980

3.1. *Recovery of Excessive Maintenance Costs - Section 59 Agreements*

3.1.1. Section 59 of the Highways Act 1980 allows the highways authority to raise a charge against a user of the highway to cover repair works necessitated by excessively heavy or unusual loads being carried on the road by that user. This provision is typically used where the passage of heavy lorries to and from industrial premises or building sites causes excessive damage to the road, requiring expensive remedial works by the Council. Under Section 59, the Council may charge on such costs to the organisation responsible for the damage, the amount payable being calculated as the excess cost of repair compared to normal maintenance costs for the road. Rather than wait to be charged such excessive repair costs, the Council and the third party may enter into an agreement under Section 59 whereby the third party accepts liability and makes payment of an agreed sum to the Council to cover the excessive repair costs.

3.2. *The Removal and Replacement of Street Furniture*

3.2.1. Where the removal and replacement of street furniture is required for the mobilisation of out of gauge vehicles into existing sites then these are generally managed under TTRO and Street Works Legislation. These are normally, but not necessarily, organised by the haulage contractor. These requirements are generally to ensure that the supervisors and operatives are competent and that the works will be carried out to a prescribe standard with the appropriate traffic management in place. In some circumstance the Highway Authority or LA will insist that their preferred contractors will carry out such work.

4. Transport Configurations

4.1. Based on the information available to date the transformer considered within this report is assumed to be 224 te nett weight.

4.2. Due to the size of the components it is not possible to transport them under the regulations governing Construction and Use (C&U) vehicles (44 tonne gross, 18.65m long and 2.9m wide). It is also not possible to transport within the Special Types General Order (STGO) regulations as the gross load will be in excess of 150te. It will therefore be necessary to comply with legislation regarding Special Order movements.

4.3. As stated the movement of abnormal indivisible loads is controlled by the requirements of the Department for Transport (DfT) who stipulate varying notice procedures and notice period's dependent upon overall dimensions.

4.4. Based on information currently available it is assumed that the road transport configuration required for routes from the Port of Kings Lynn would consist of 2 ballast tractors, 1 pulling and 1 pushing a 20-24 axle frame trailer with axle loads in the region of 15.5 te to 17.5 te over a track width of a minimum of 3m.

4.5. There are only three haulage contractors currently operating girder frame trailers of sufficient capacity for the proposed 224 te unit in the UK electricity supply industry with equipment able to carry a transformer of this weight and with the knowledge to position the unit correctly on the plinth. These are Allelys Heavy Haulage Ltd, Mammoet, and Collett & Sons Heavy Haulage.

4.6. The girder frame trailer arrangements as provided by Colletts, Allelys and Mammoet have been submitted to NH by way of a formal BE16 Special Order application in order for the structural authorities for comment in terms of their suitability on the potential access route from the Port of Kings Lynn. The responses to these investigations are discussed in Section 7.

4.7. The specific trailer details are not included in this report due to the information being commercially sensitive to each haulage contractor and thus it is recommended it is not forwarded to other parties. However, specific trailer information can be made available under separate cover if required.

5. Marine Access

5.1. *Port of Kings Lynn*

5.1.1. Kings Lynn is an established heavy load delivery port and no specific works have been undertaken in terms of marine delivery requirements as part of these specific investigations.

5.1.2. The Port is operated by ABP Ports ([redacted]) and took delivery of a new Gas Turbine of in excess of 300te nett weight for the Kings Lynn Power Station in 2018 so no significant issues with heavy load delivery are expected from a marine perspective although the exact requirements will need to be confirmed with the port at the time of requirement.

5.1.3. A variety of solutions for delivery of transformers is available including the use of mobile cranes and coastal vessels and self-geared heavy lift ships.

5.1.4. A summary of the current published dimensions for the ports quay areas is shown below in Figure 1 as extracted from the ABP Website.

			Normal acceptance dimension of vessels			
Dock, Jetty or Quay	**Quay length**	**Depth of Water**	**Length**	**Beam**	**Draught**	**Approx. dwt**
Alexandra Dock	350m	5.3m	119m	13.85m	5.5m	4,000
Bentinck Dock	800m	5.3m	119m	13.85m	5.5m	4,000
Riverside Quay	220m	Tidal	140m	20.0m	6.0m	5,500

Figure 1. Kings Lynn Publish Quay dimensions.

6. Historical Information

6.1. Records indicate that the last recorded Special Order AIL movement (in excess of 150te gross) to Norwich Main Substation which is adjacent to the new substation sites being considered by the applicant was in 2010. This was a movement of a 225te gross load on a 16-axle girder frame trailer from Port of Kings Lynn. The weight of the new transformers is therefore considerably heavier than any previous loads transported to the site.

6.2. This historical information has been used as the basis for the investigations from Kings Lynn discussed in Section 7.

7. Structural Route Information

7.1. *General Information*

7.1.1. The route considered in the structural checks the proposed substation is shown below in Section 7.2. The route is illustrated in the maps appended to this report and were subject to formal Special Order consultations via the NH Abnormal Loads Team in Birmingham.

7.1.2. The original consultation was submitted in December 2020 and it has unfortunately taken several months for National Highways East Region to formally respond to enquires. This has been partly due to a significant reorganisation within NH as to how they manage this area of the road network and they have in turn had to subcontract elements of the consultation works to Atkins, as their appointed structural engineers.

7.2. *Route 1 from Kings Lynn*

Proposed Route 1 from Kings Lynn (Special Order Reference WYNL/35/S1)
Exit ABP Kings Lynn at Cross Bank Road,
Turn left onto A1078
Continue A148
Turn right A149
Turn left A47
Turn right A140
Turn right unclassified at approximate OS Ref TG 2225 0300 (north of rail bridge)
Turn left Norwich Main Substation access road

7.2.1. National Highways East Region have advised during series of emails and conference calls during the last year that the route from Kings Lynn is not currently structurally acceptable. This is despite the fact it was cleared during 2020 for loads to the existing National Grid Substation at a smaller weight of 178 te. National Highways East Region have advised that there are two structures presenting concern. This information has been presented in a series of meetings with respect to various projects in the area which Wynns are working on and despite promises of a formal report to clarify the matters arising being issued by early 2022 in specific regard to this movement requirement this has not been forthcoming to date.

7.2.2. The structure of most concern is Scarning Bridge (Reference STR 7650), which has been advised as between 45-50% overcapacity for the loads currently proposed by National Highways East Region. This has been obtained following a grillage analysis, which means it is unlikely to obtain a pass even if a more refined analysis was undertaken. Scarning

Bridge is located to the west of Dereham and is a 26m span structure over Dereham Road at approximate OS Ref TF 9640 1255.

7.2.3. The formal report from Atkins, working on behalf National Highways East Region, remains outstanding at the time of issue of this report it has not been possible to determine if this initial failure has been confirmed by National Highways own structural engineers and whether alternative trailer arrangements or remedial measures could be considered in order for AILs to remain on the A47 trunk road. The A47 would remain the preferred route of the applicant if a solution to this restriction can be found and this remains under discussion with Atkins and National Highways East Region.

7.2.4. A diversion route has been proposed which avoids this problem structure in the event that a solution to the issue at Scarning Bridge cannot be identified as below:

Proposed Diversion Route 1
Exit A47 at Greenbanks Hotel, approximate OS Reference TF 9206 1301, turning right towards Scarning
Continue to Scarning
Pass under A47
Turn right Draytonhall Lane
Turn left A47 and rejoin original route

7.2.5. This involves crossing over two structures within the ownership of Norfolk County Council who have advised that the route is structurally acceptable subject to a full caution being applied when crossing Wendling Hall Bridge west of Wending at approximate OS Grid Reference TF 9326 1269. This structure is 4m span and the caution required is shown below:

> *"CAUTION ALL CARRIAGEWAYS - the vehicle may ONLY cross such bridges if ALL other traffic is EXCLUDED from the structure (ALL CARRIAGEWAYS - NO EXCEPTIONS) and the vehicle proceeds at LOW SPEED using the CENTRE of the carriageway, whilst the Police or any escorting vehicles should remain behind until the vehicle has crossed the entire Structure"*

7.2.6. The negotiability of the diversion route to avoid Scarning Bridge is discussed in Section 8.2 in terms of physical negotiability.

7.2.7. The second concern to National Highways East Region is a culvert known as West Binley no. 1 (Reference STR 1292) located at approximate OS Ref TF 7139 1542. Atkins have advised that there is not enough information within the internal National Highways database to allow for a proper analysis to be carried out, and therefore Atkins are not able to comment on its capacity at the moment. This remains under review and, on other similar situations in the area for other sites being considered by Wynns, National Highways regional team have instructed inspections to clarify missing information to enable further clarification to be made. This structure is only 1.5 span and as such is not expected to be a significant problem to resolve although discussions remain ongoing with National Highways East Region on this matter. The results of these discussions will be reported when they are available.

7.2.8. In the event that it continues to be a concern, the overall span of 1.5 m could be expected to be able to be crossed by temporary bridging or plating subject to further agreement with National Highways East Region. Such operations would also require careful consideration of associated traffic management.

7.2.9. As the final report by Atkins into the status of the A47 from Kings Lynn remains outstanding it has not been possible to ascertain whether one particular trailer arrangement is any better/worse than others for example which could impact on future use of the route and these discussions remain ongoing and will be reported under separate cover when a final report has been provided by Atkins/National Highways East Region.

7.2.10. The route has been structurally cleared on 20 and 24 axle girder frame trailers by the following additional structural authorities who are statutory consultees on the route from Kings Lynn:

- Network Rail
- Canals & Rivers Trust
- National Highways England Historic Railways Estate
- Norfolk County Council

7.2.11. Norfolk and Suffolk Police have advised that route will require assessment for laybys in order to release traffic at regular intervals and they will require a detailed route report for which itemises all street furniture removal and special manoeuvres in the Special Order once structural clearance has been approved by all agencies. This is further discussed in Section 8.1. The exact movement plans and escort arrangements will be agreed with the appointed haulage contractor close to the time of requirement.

8. Route Negotiability Information

8.1. *Route from Kings Lynn*

8.1.1. Route surveys were undertaken during February 2020 on the route via the A47 and the below notes and photographs highlight any negotiability issues. Most of the route is on the A47 and no significant negotiability issues are expected. There are several laybys available along the A47 in both directions, should the transport be required to lay up to decrease general traffic congestion. This is expected to be a requirement of Norfolk Police following initial consultations and the appointed haulage contractor will be required to agree any specific escort and layup areas in more detail when final movement dates and trailer arrangements are known.

8.1.2. The route out of the Port of Kings Lynn is established for port traffic. There are several traffic calming measures and centre island bollards for pedestrian passage, these will need consideration by the haulier for overall transport width and which may require removal depending on final transport configuration.

Photograph 1
Exit from Port of Kings Lynn. Looking West on Cross Bank Road back towards port gates.

Photograph 2
Left turn out of Cross Bank Road. Vehicle moves away from camera, turning left on to Edward Benefer Way. Negotiable.

Photograph 3
Reverse view of the left turn out of Kings Lynn Port. Vehicle moves towards camera on Edward Benefer Way. Negotiable.

Photograph 4
North East on A1078 Edward Benefer Way. Traffic lights at junction with St. Nicholas Retail Park. Vehicle moves away from camera continuing straight. Negotiable.

Photograph 5
North on A1078 Edward Benefer Way. Vehicle moves away from camera, continuing straight on A1078 past the junction with Estuary Road. Centre island bollards and traffic lights will require removal depending on final transport configuration.

Photograph 6
East on Edward Benefer Way. Vehicle moves away from camera, continuing straight on Low Road. Note centre island bollards.

8.1.3. There are several places along Edward Benefer Way and the A148 with centre island bollards or traffic lights. The appointed haulier will need to confirm negotiability against chosen transport configuration to confirm exact street furniture removal requirements depending on the final width of the transformer and transport arrangement selected for the development.

Photograph 7
East on A148 Grimston Road. Vehicle moves away from camera. Street furniture removal required.

Photograph 8
East on A148 Grimston Road. Vehicle moves away from camera. Negotiable although centre island bollards could be removed if needed.

Photograph 9
East on A148, approaching roundabout with A149. Vehicle moves away from camera, turning right on the A149. Negotiable.

Photograph 10
A148/A149 Roundabout. Vehicle moves away from camera, travelling around roundabout to exit A149. Negotiable.

Photograph 11
A149 roundabout. Vehicle moves away from camera continuing A149. No negotiability issues foreseen.

Photograph 12
A149/Greenyard Way roundabout. Vehicle moves away from camera continuing A149. Negotiable.

Photograph 13
A47 entry slip road roundabout from A149. Vehicle moves away from camera, turning left on to A47. Negotiable.

Photograph 14
East on A47. Vehicle moves away from camera. Possible lay up area on the right.

Photograph 15
A47 Lynn Road through Middleton. Vehicle moves away from camera. Full occupation of the carriageway required. Traffic management to be considered.

Photograph 16
A47 approaching West Bilney. Vehicle moves away from camera.

Photograph 17
A47 north east of Narborough. Bridge over the River Nar. Vehicle moves away from camera.

Photograph 18

South on A47 near Narborough. Vehicle moves away from camera. This is one of several laybys on the A47 which could be used for potential lay up areas for the loads to use subject to agreement with National Highways East Region. Norfolk Police have highlighted the need to consider use of laybys to enable traffic to pass the load.

Photograph 19

East on A47 approaching A47/Silver Drift Roundabout. Vehicle moves away from camera continuing A47. Negotiable.

Photograph 20

East on A47 approaching Norwich Road/A47 roundabout. Vehicle moves away from camera continuing A47. Negotiable subject to swept path assessments to confirm street furniture removal for 20 axle trailer arrangements.

Photograph 21
East on the A47 passing another potential lay up area.

Photograph 22
East on the A47. There are many laybys to use as a potential lay-up area to assist with management of traffic congestion.

Photograph 23
Traffic calming measures on the A47 at Necton where central island furniture will need to be removed. Vehicle moves away from camera.

Photograph 24
More traffic calming measures on the A47 between Necton and Little Fransham. Vehicle moves away from camera.

Photograph 25
A47/Norwich Road roundabout. Vehicle moves away from camera, continuing straight on A47. Overrun of kerb on left side of road may be necessary to avoid conflict with centre island depending on the final transport configuration selected for movement.

Photograph 26
A47/Church Lane roundabout. Vehicle moves away from camera, continuing east on A47. Overrun of kerb on left side of road may be necessary to avoid conflict with centre island depending on the final transport configuration selected for movement.

Photograph 27
A47 exit roundabout at Norwich on to A140 Ipswich Road. Vehicle moves away from camera, turning right on to A140 Ipswich Road. Negotiable.

Photograph 28
A47/Ipswich Road roundabout exit. Vehicle moves away from camera, exiting centre photo on to A140/Ipswich Road.

Photograph 29
South on A140 Ipswich Road. Vehicle moves away from camera, turning right on to Mangreen Road. Swept Path Assessment (SPA) will be necessary to confirm negotiability requirements for 20 axle girder frame trailers and larger. The site was accessed by a 16 axle trailer in 2010. Potential requirement for pruning of trees and vegetation.

Photograph 30

Mangreen Road looking back on to A140 Ipswich Road. Vehicle turns right from A140 Ipswich Road on to Mangreen Road exiting behind camera. Potential requirement for pruning of trees and vegetation.

Photograph 31

Mangreen Road looking toward Norwich Main substation access road. Vehicle moves away from camera, turning left on to the National Grid access road to the existing Norwich Main Substation. Oversail will be necessary to negotiate turn and caution with fence and sign required. Swept Path Assessment (SPA) will be necessary to confirm negotiability requirements for 20 axle girder frame trailers and larger. Alternative option for new site access road (see 8.2) would continue away from camera and require road widening.

Photograph 32
Norwich Main Access Road. Fence and sign on left may require removal depending on final width of load. Potential requirement for pruning of trees and vegetation also.
It is assumed that National Grid are the landowner for the final turn in to site.

8.2. *Alternative Site Access to the south of the current Norwich Main Substation*

8.2.1. As highlighted above, the Applicant is still examining the potential access options and it is not confirmed that National Grid will allow them to use the existing access to Norwich Main Substation, from where access to the new substation compound could be developed.

8.2.2. Alternative options for access are being considered and this could be to create a new access to the west of the National Grid Substation access road from Mangreen Lane following road widening on Mangreen Lane or to utilise the Tarmac Quarry facility to the north of Mangreen Lane which is also accessed from the A140. This would then involve transport through the quarry and crossing over Mangreen Lane into a new substation access road to the development area.

Photograph 33 (source Google)
Tarmac Quarry entrance from A140. Expected to be negotiable with street furniture removal, contraflow will aid access and traffic management will need to be considered especially with any live quarry activities.

8.2.3. No discussions or site visit have been undertaken with Tarmac by Wynns and further review of access through the quarry would be necessary if this solution is to be considered further in terms of technical requirements outside of any discussions on legal third party and commercial access agreements with the landowners.

8.3. *Diversion Route to avoid A47 Scanning Bridge Structural Restriction*

8.3.1. Due to the Scanning Bridge structural issue discussed in Section 7.2 an additional route survey was were undertaken during February 2022 on the potential diversion route and the notes and photographs below highlight the negotiability of the diversion.

Photograph 34
A47 approaching Dereham Road, vehicle moves away from the camera, turning right.

Photograph 35
A47 Dereham Road turning, vehicle moves away from the camera, turning right. Negotiable

Photograph 36
Dereham Road turning, vehicle moves away from the camera, negotiable.

Photograph 37
Dereham Road, vehicle moves away from the camera, negotiable

Photograph 38
Dereham Road, vehicle moves away from the camera, negotiable. Tree pruning may be required depending on growth at the time of movement.

Photograph 39
Dereham Road, A47 Scarning Bridge, vehicle moves away from the camera, negotiable. Note this is the bridge which is currently advised as unsuitable by National Highways East Region and the reason the diversion needs to be considered.

Photograph 40
Dereham Road, vehicle moves away from the camera, negotiable.

8.3.2. The most restrictive turn on the diversion route is the right turn from Dereham Road to Draytonhall Lane as shown below in photographs 41 and 42. This has been drawn out by way of a Swept Path Assessment (SPA) showing a 20 and a 24 axle girder frame trailer in Drawing Numbers 20-1027.SPA01 and 20-1027.SPA02.

8.3.3. These show that the diversion route to avoid Scarning Bridge is considered negotiable for 20 axle trailers within the highway although overrun of the pavement and oversail will be required beyond the kerb to the outside of the turn along but conflict is not expected with any items of street furniture. Temporary plating and timber protection will be required to accommodate the vehicle track beyond the kerb. Full occupation of the carriageway will be required throughout the junction with the necessary traffic control measures in place.

8.3.4. 24 axle trailers will not be able to negotiate the right turn from Dereham Road to Draytonhall Lane without the need to remove a telegraph pole and interfere with third party fence lines. This is due to the oversail required by the girder frame. A road sign would also need to be removed although this in itself is not as disruptive as removing telegraph poles and impacting on third party land where permission from landowners would be required to enable access.

Photograph 41

Dereham Road approaching Draytonhall Lane, load moves away from the camera. Negotiable for 20 axles. 24 axles will require removal and relocation of a telegraph pole and would impact on third party fence on the inside of the turn. See Drawing Numbers 20-1027.SPA01 and 20-1027.SPA02.

Photograph 42

Dereham Road/Draytonhall Lane turning, vehicle approaches camera and exits to the left of the photo. Negotiable for 20 axles. 24 axles will require removal and relocation of a telegraph pole and would impact on third party fence on the inside of the turn. See Drawing Numbers 20-1027.SPA01 and 20-1027.SPA02.

8.3.5. Trailer selection will therefore be important if the diversion route is required due to the previously highlighted structural issue at Scarning Bridge not being resolved to the satisfaction of National Highways East Region.

Photograph 43
B1146, Draytonhall Lane, vehicle moves away from the camera, negotiable.

Photograph 44
Draytonhall Lane, A47 turning, vehicle moves away from the camera and turns left. Negotiable with street furniture removal.

Photograph 45
Draytonhill Lane, A47 turn, street furniture removal required, vehicle moves from junction towards the camera.

9. Summary and Conclusions

9.1. The port of Kings Lynn is an established heavy load delivery port and remains available for transformer delivery.

9.2. National Highways East Region have advised the route from Kings Lynn is not currently structurally acceptable as there are two structures of concern. Scarning Bridge has been advised as between 45-50% overcapacity for the loads currently proposed and it is unlikely to obtain a pass even if a more refined analysis was undertaken. The formal report from Atkins, working on behalf National Highways East Region, remains outstanding at the time of issue of this report it has not been possible to determine if this initial failure has been confirmed by National Highways own structural engineers and whether alternative trailer arrangements or remedial measures could be considered in order for AILs to remain on the A47 trunk road.

9.3. The A47 would remain the preferred route of the applicant if a solution to this restriction can be found and this remains under discussion with Atkins and National Highways East Region.

9.4. A diversion route has been proposed which avoids this problem structure in the event that a solution to the issue at Scarning Bridge cannot be identified and this has been approved in terms of structures by Norfolk County Council.

9.5. The second concern to is West Binley no. 1 culvert which Atkins have advised that there is not enough information within the internal National Highways database to allow for a proper analysis to be carried out. This remains under review. This structure is only 1.5 span and as such is not expected to be a significant problem to resolve although discussions remain ongoing with National Highways East Region on this matter.

9.6. As the final report by Atkins into the status of the A47 from Kings Lynn remains outstanding it has not been possible to ascertain whether one particular trailer arrangement is any better/worse than others for example which could impact on future

use of the route and these discussions remain ongoing and will be reported under separate cover when a final report has been provided by Atkins/National Highways East Region.

9.7. The route from Kings Lynn via the A47, and the diversion to avoid Scarning Bridge has been structurally cleared by the remaining authorities.

9.8. The route from Kings Lynn via the A47 is considered negotiable for 20 axle girder frame trailers subject to street furniture removal where highlighted. A confirmatory SPA is recommended 20 axle trailers at the turn from the A140 Ipswich Road into Mangreen Lane and also at the left turn into the existing National Grid Norwich Main Substation access road. These are confirmatory only and access is expected to be feasible with some pruning of trees and vegetation.

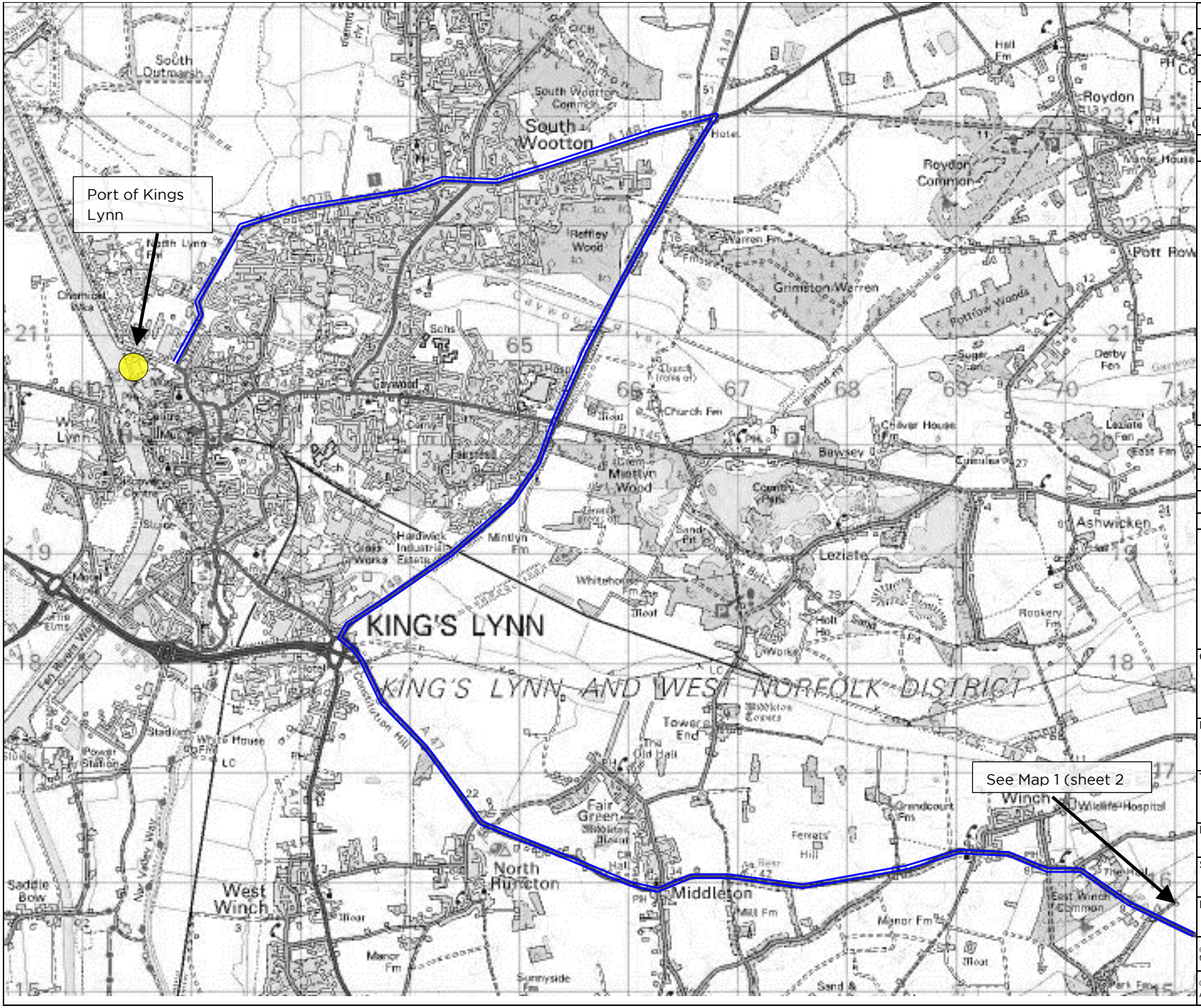
9.9. In terms of physical negotiability the diversion route to avoid Scarning Bridge has been inspected and this is considered negotiable for 20 axle trailers within the highway. 24 axle trailers will not be able to negotiate the right turn from Dereham Road to Draytonhall Lane without the need to remove a telegraph pole and interfere with third party fence lines.

9.10. Norfolk and Suffolk Police have advised that route will require assessment for laybys in order to release traffic at regular intervals and they will require a detailed route report for which itemises all street furniture removal and special manoeuvres in the Special Order once structural clearance has been approved by all agencies. The exact movement plans and escort arrangements will be agreed with the appointed haulage contractor closer to the time of requirement.

9.11. No specific review of site access has been considered within this report.

Appendix 1

Maps



Key

	Route 1 from Kings Lynn
	Point of Interest
	Dudgeon & Sheringham Substation

Rev	Date	Amendments:
B		
A	28.02.22	Second Issue
0	24.03.21	First Issue

Revisions

Wynns Ltd.
Independent Transportation Consultants.

Shaftesbury House, 2 High Street, Eccleshall, Stafford, ST21 6BZ. Tel: (01785) 850411

Client:
equinor
Equinor New Energy Limited

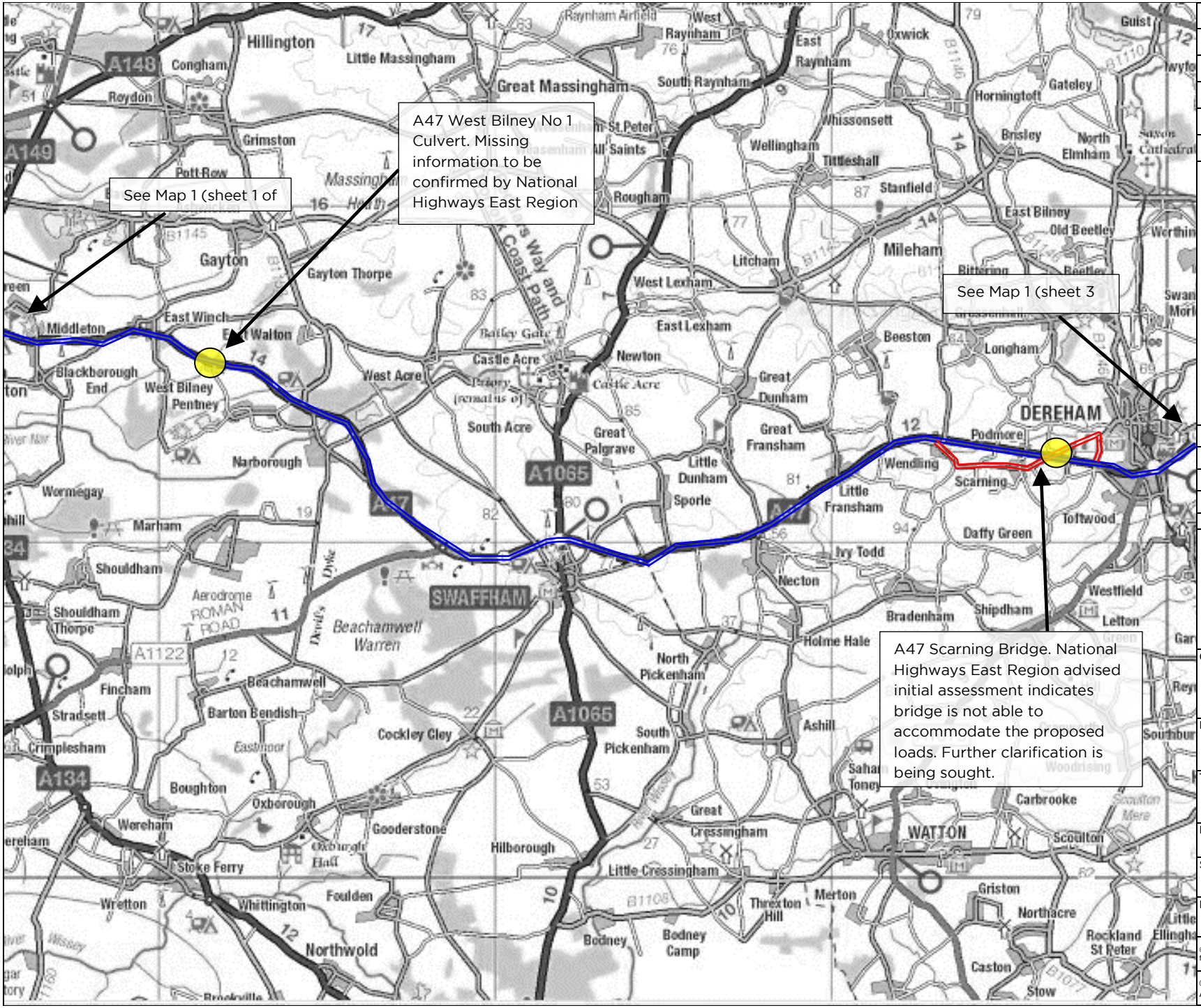
Project:
Dudgeon & Sheringham Substation

Title:
Map 1 – Route from Kings Lynn

Drawing Status:
Final Report

Scale (A4):	Drawn by:	Checked by:
NTS	DMG	ARP

Ref No.:	Sheet:	Rev.:
20.1027.Map1	1 of 4	0



Key

	Route 1 from Kings Lynn
	Diversion route to avoid A47 Scanning Bridge
	Point of Interest
	Dudgeon & Sheringham Substation

Rev	Date	Amendments:
B		
A	24.02.22	Second Issue
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Revisions

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Client:
equinor
Equinor New Energy Limited

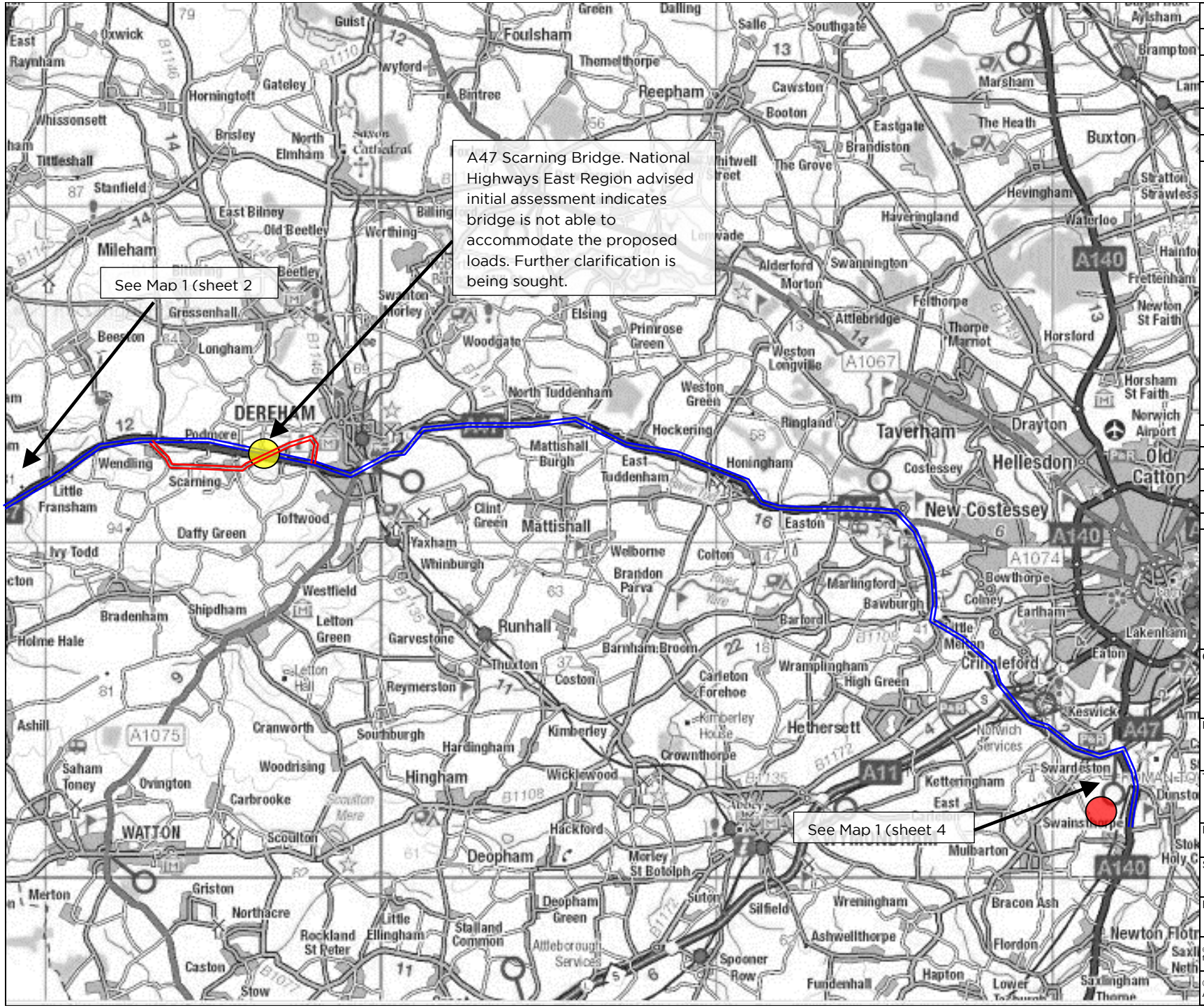
Project:
Dudgeon & Sheringham Substation

Title:
Map 1 – Routes from Kings Lynn

Drawing Status:
Final Report

Scale (A4):	Drawn by:	Checked by:
NTS	HW	ARP

Ref No.:	Sheet:	Rev.:
20.1027. .Map1	2 of 4	0



Key

	Route 1 from Kings Lynn
	Diversion route to avoid A47 Scanning Bridge
	Point of Interest
	Dudgeon & Sheringham Substation

Rev	Date	Amendments:
B		
A	24.02.22	Second Issue
0	24.03.21	First Issue

Revisions

Wynns Ltd.
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Client:
equinor
Equinor New Energy Limited

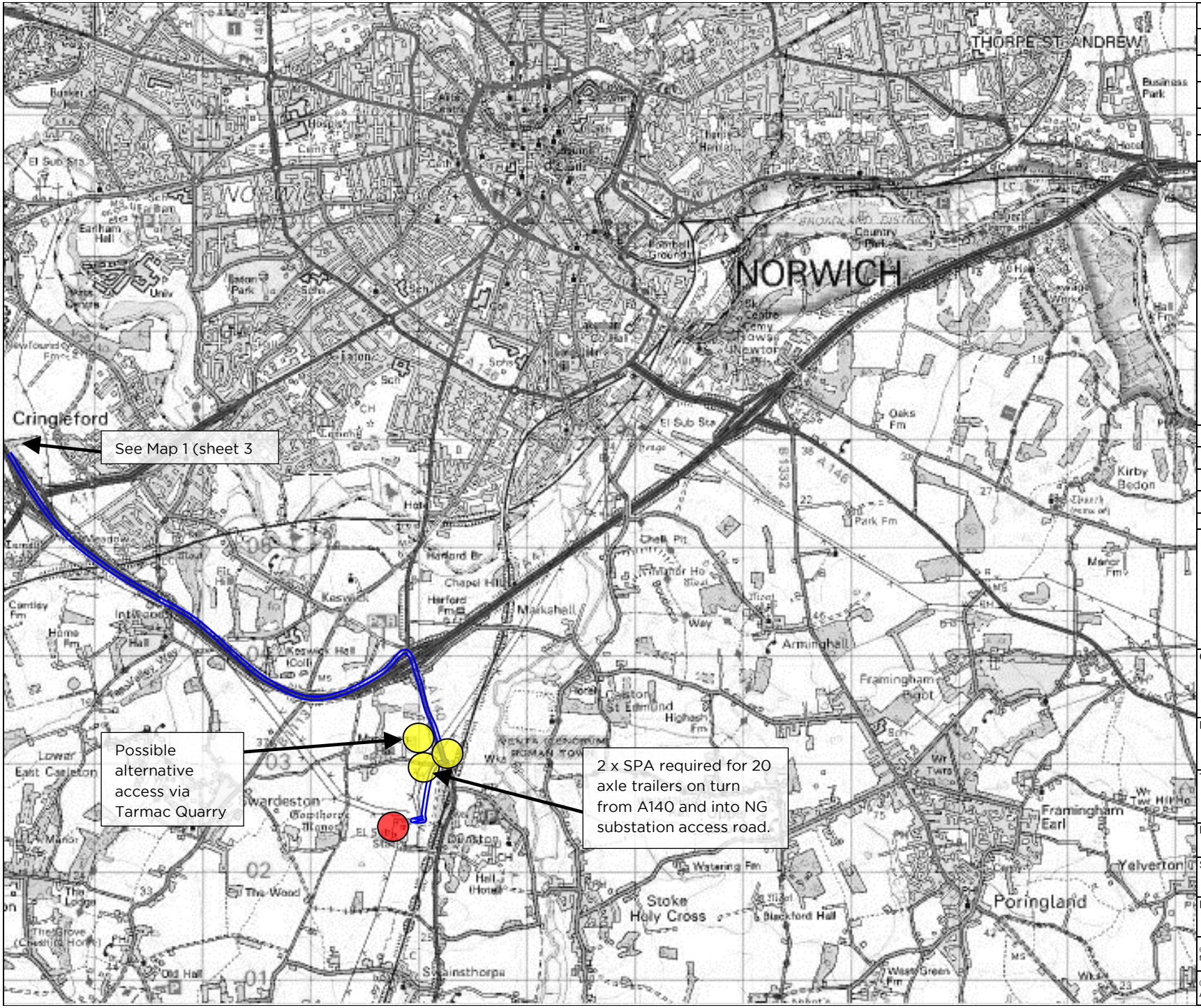
Project:
Dudgeon & Sheringham Substation

Title:
Map 1 – Routes from Kings Lynn

Drawing Status:
Final Report

Scale (A4):	Drawn by:	Checked by:
NTS	HW	ARP

Ref No.:	Sheet:	Rev.:
20.1027.Map1	3 of 4	0



Key

Route 1 from Kings Lynn	
Point of Interest	
Dudgeon & Sheringham Substation	

Rev	Date	Amendments:
B		
A	28.02.22	Second Issue
0	24.03.21	First Issue

Revisions

Wynns Ltd.
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Client:
equinor
Equinor New Energy Limited

Project:
Dudgeon & Sheringham Substation

Title:
Map 1 – Routes from Kings Lynn

Drawing Status:
Final Report

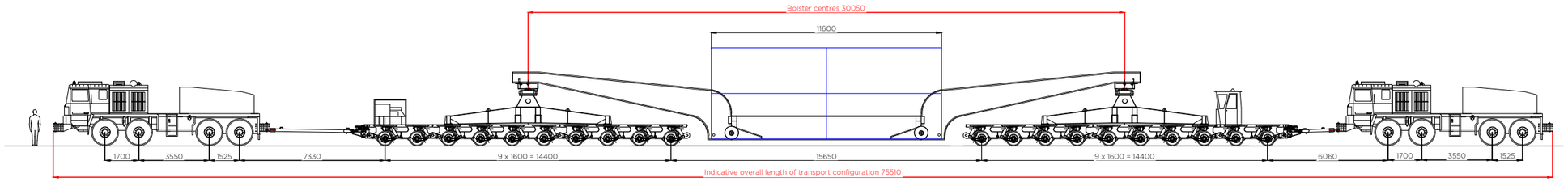
Scale (A4):	Drawn by:	Checked by:
NTS	DMG	ARP

Ref No.:	Sheet:	Rev.:
20.1027. Map 1	4 of 4	0

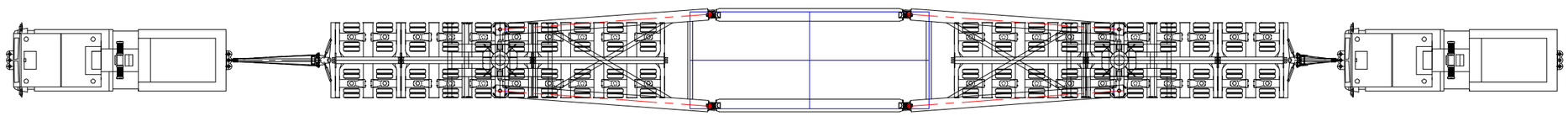
Appendix 2

Drawings

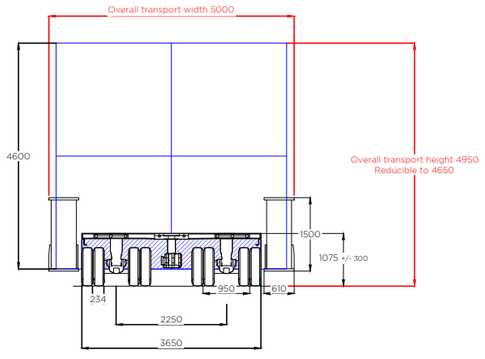
[redacted]



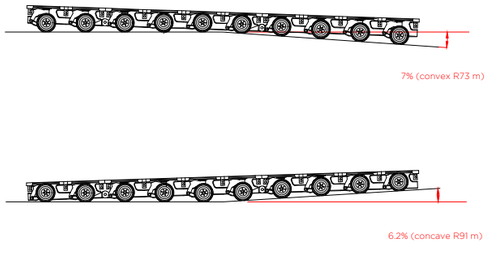
Elevation view - 20 axle girder frame trailer - concept model only
Indicative 224 te transformer
Scale 1:250



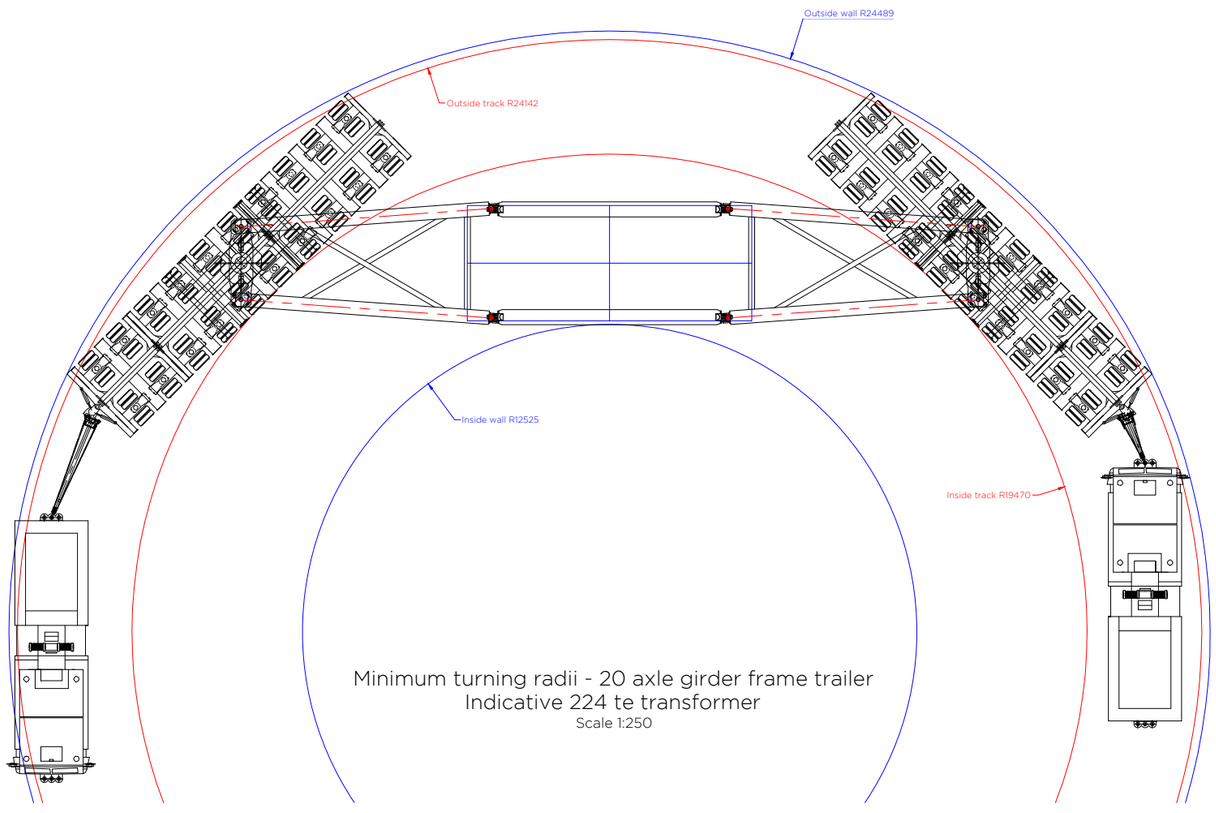
Plan view - 20 axle girder frame trailer - concept model only
Indicative 224 te transformer
Scale 1:250



Profile view
Scale 1:125



Vertical curve negotiability information
based on manufacturers literature
Scale 1:250



Minimum turning radii - 20 axle girder frame trailer
Indicative 224 te transformer
Scale 1:250

Load table	
20 axle girder frame trailer	
Self weight of transformer	224.0 te
Self weight of trailer	127.0 te
Total combined weight	351.0 te
Load per trailer	175.5 te
Load per axle line	17.55 te
Load per axle	8.78 te
Load per wheel (4 per axle)	2.19 te
Overall ground bearing pressure	3.34 te/m²
Tractor(s) (48 te)	
Front axle	8.0 te
Second steer	8.0 te
Rear axle	16.0 te
Rear axle	16.0 te

Notes:
[1] The figures shown above are representative of the transport configuration portrayed. However, as tractor and trailer arrangements vary then the loads and dimensions indicated should be treated as probable values.

[2] Actual dimensions, including axle spacing and mean running height, may vary slightly depending on manufacturer of trailer deployed.

[3] All linear measures in millimetres unless stated otherwise.

[4] Transformer drawing indicative only. Main tank and transport lug details will be critical for transport configuration.

Rev.	Date	Amendments
1		
0	01.03.22	Issued for comment

Revisions

Prepared By:
Shaftesbury House, 2 High Street,
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Tel: (01785) 850411
Independent Transportation Engineers

Client: equinor

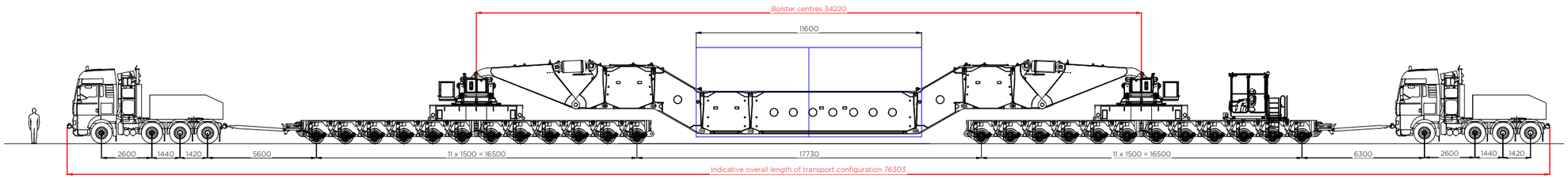
Project:
Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects (SEP and DEP)

Title:
Indicative transport configuration
Conceptual 224 te transformer carried within 20 axle girder frame trailer
showing minimum turning radii

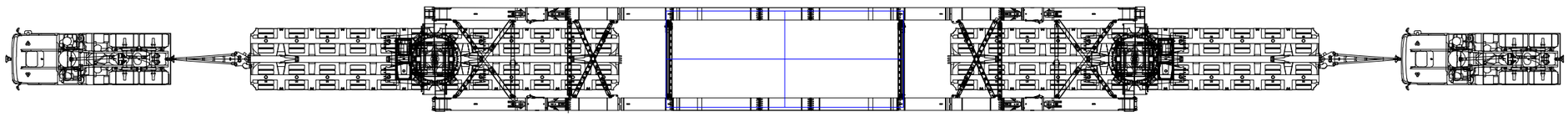
Drawing status:
Final report

Scale (A3):	Drawn by:	Checked by:
As shown	SJW	ARP
DWG. no:	Sheet:	Rev:
20-1027.TC02	1 of 1	0

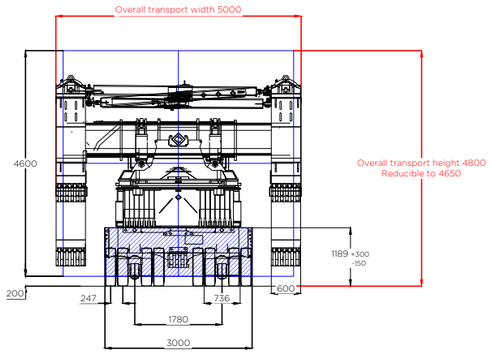
P:\Clients\Existing Clients\Royal Haskoning\20-1027 Norwich (Dudgeon and Sheringham Extension)\Transport configurations\20-1027.TC02 SEP and DEP 224 te transformer 20 axle frame R0.dwg



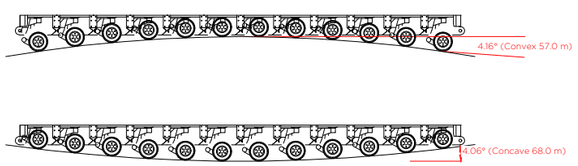
Elevation view - 24 axle girder frame trailer - concept model only
Indicative 224 te transformer
Scale 1:250



Plan view - 24 axle girder frame trailer - concept model only
Indicative 224 te transformer
Scale 1:250



Profile view
Scale 1:125



Vertical curve negotiability information based on
hauliers literature
Scale 1:250

Minimum turning radii - 24 axle girder frame trailer
Indicative 224 te transformer
Scale 1:250

Load table	
24 axle girder frame trailer	
Self weight of transformer	224.0 te
Self weight of trailer	152.6 te
Total combined weight	376.6 te
Load per trailer	188.3 te
Load per axle line	15.69 te
Load per axle	7.85 te
Load per wheel (4 per axle)	1.96 te
Overall ground bearing pressure	3.80 te/m²
Tractor(s) (42 te)	
Front axle	8.0 te
Second steer	10.0 te
Rear axle	12.0 te
Rear axle	12.0 te

Notes:
[1] The figures shown above are representative of the transport configuration portrayed. However, as tractor and trailer arrangements vary then the loads and dimensions indicated should be treated as probable values.

[2] Actual dimensions, including axle spacing and mean running height, may vary slightly depending on manufacturer of trailer deployed.

[3] All linear measures in millimetres unless stated otherwise.

[4] Transformer drawing indicative only. Main tank and transport lug details will be critical for transport configuration.

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1		
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Revisions

Prepared By:
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Client: equinor

Project:
Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects (SEP and DEP)

Title:
Indicative transport configuration
Conceptual 224 te transformer carried within 24 axle girder frame trailer
showing minimum turning radii

Drawing status:
Final report

Scale (A3):	Drawn by:	Checked by:
As shown	SJW	ARP
DWG. no:	Sheet:	Rev:
20-1027.TC01	1 of 1	0

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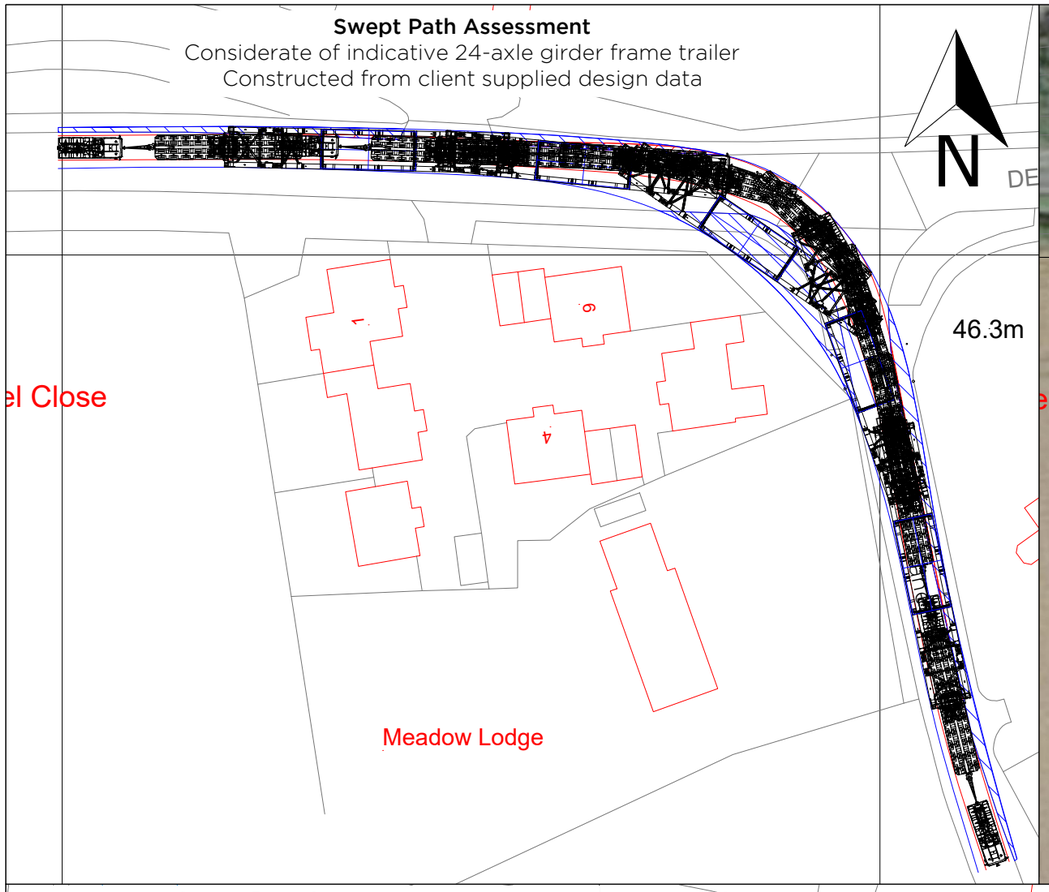
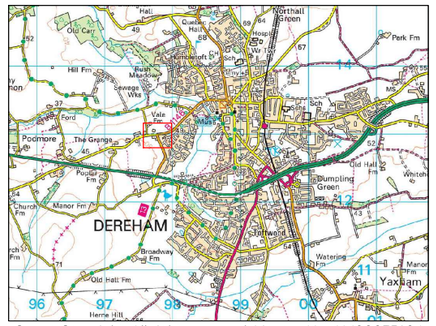
Swept Path Assessment
Considerate of indicative 24-axle girder frame trailer
Constructed from client supplied design data



Indicative Swept Path Assessment
Considerate of indicative 24-axle girder frame trailer
Google Licence Ref: JCPM2Z11CKENWEQ

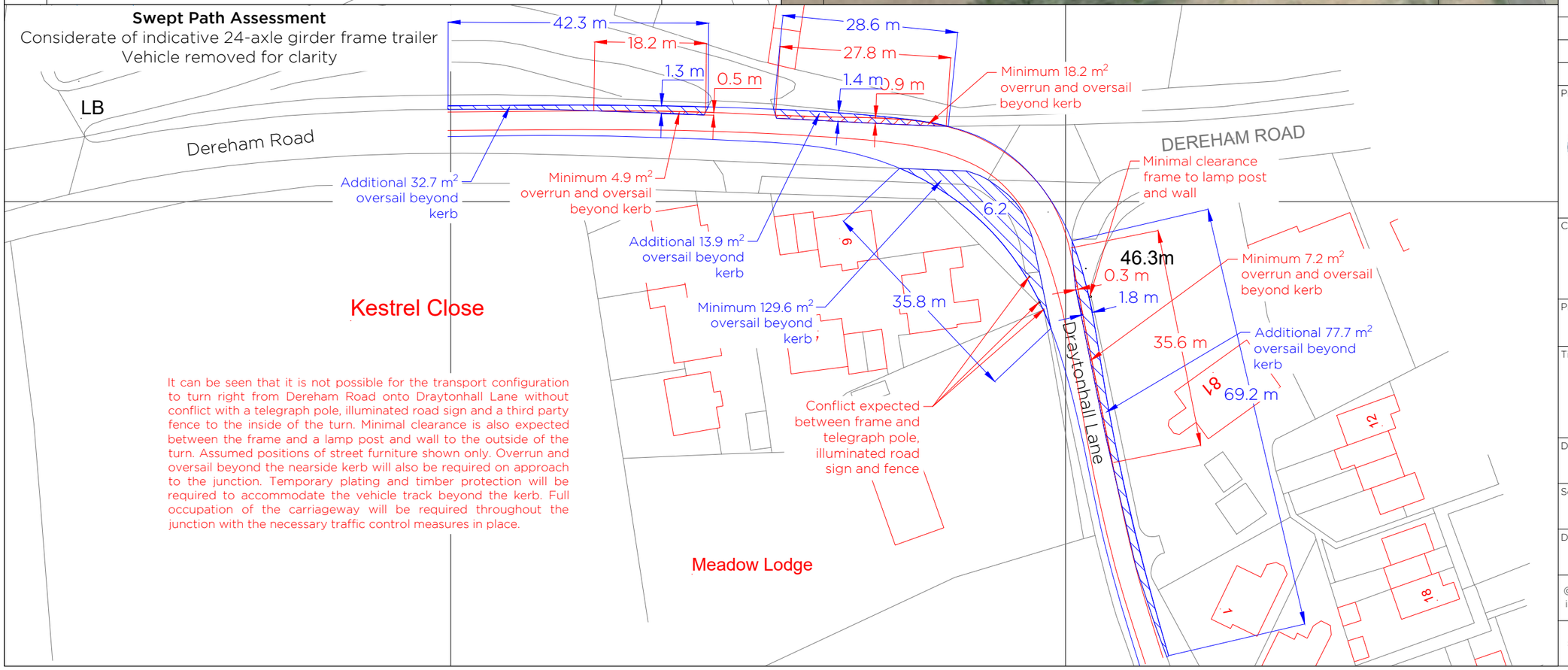
Location Plan



Legend:

- 24-axle girder frame trailer minimum turning arrangements Drawing ref. 20-1027.TC01
- Extent of vehicle track
- Extent of oversail
- Overrun and oversail beyond kerb
- Overrun beyond
- Oversail beyond kerb

Swept Path Assessment
Considerate of indicative 24-axle girder frame trailer
Vehicle removed for clarity



It can be seen that it is not possible for the transport configuration to turn right from Dereham Road onto Draytonhall Lane without conflict with a telegraph pole, illuminated road sign and a third party fence to the inside of the turn. Minimal clearance is also expected between the frame and a lamp post and wall to the outside of the turn. Assumed positions of street furniture shown only. Overrun and oversail beyond the nearside kerb will also be required on approach to the junction. Temporary plating and timber protection will be required to accommodate the vehicle track beyond the kerb. Full occupation of the carriageway will be required throughout the junction with the necessary traffic control measures in place.

Rev.	Date	Amendments
1		
0	03.03.22	Issued for comment

Revisions

Prepared by:
Shaftesbury House, 2 High Street, Eccleshall, Stafford, ST21 6BZ
Tel: (01785) 850411
Independent Transportation Engineers

Client: equinor

Project:
Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects (SEP and DEP)

Title:
Swept Path Assessment
Negotiability of right turn from Dereham Road onto Draytonhall Lane considerate of indicative 224 te transformer transported on 24-axle girder frame trailer
Approximate OS Grid Reference TF 978 130

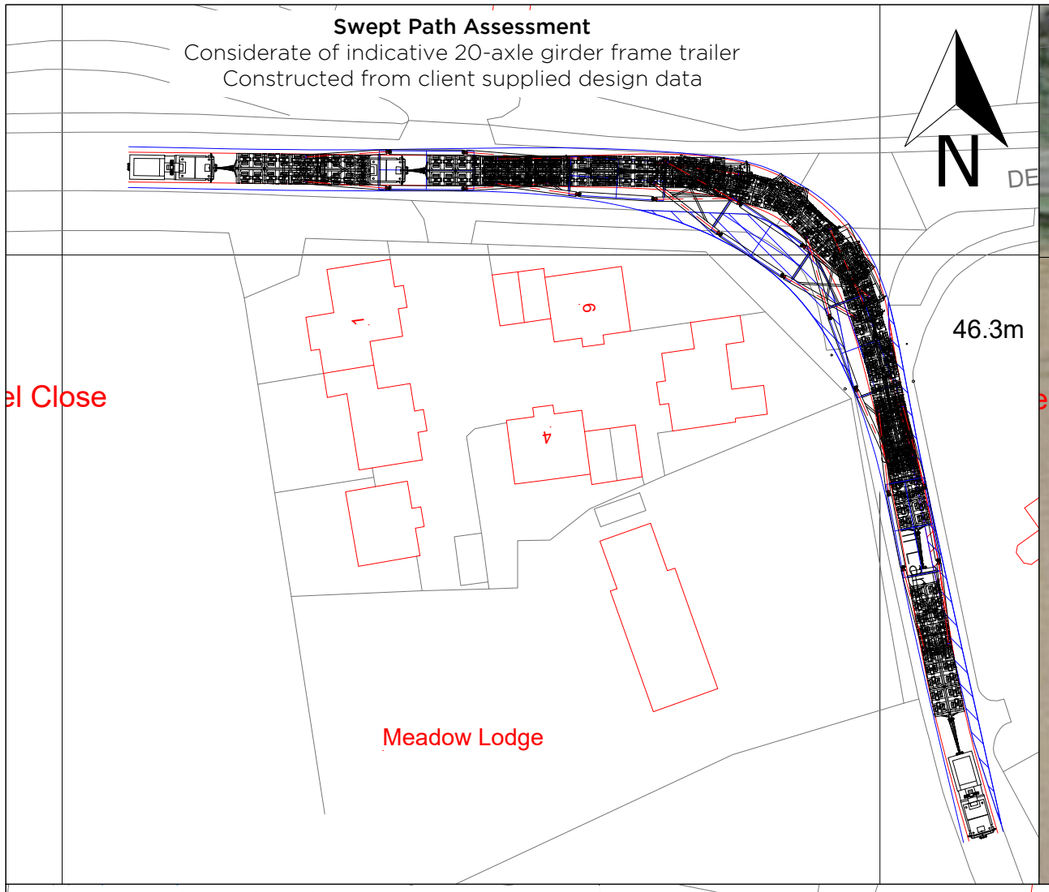
Drawing status:
Final report

Scale (A3):	Drawn by:	Checked by:
1:750	SJW	ARP

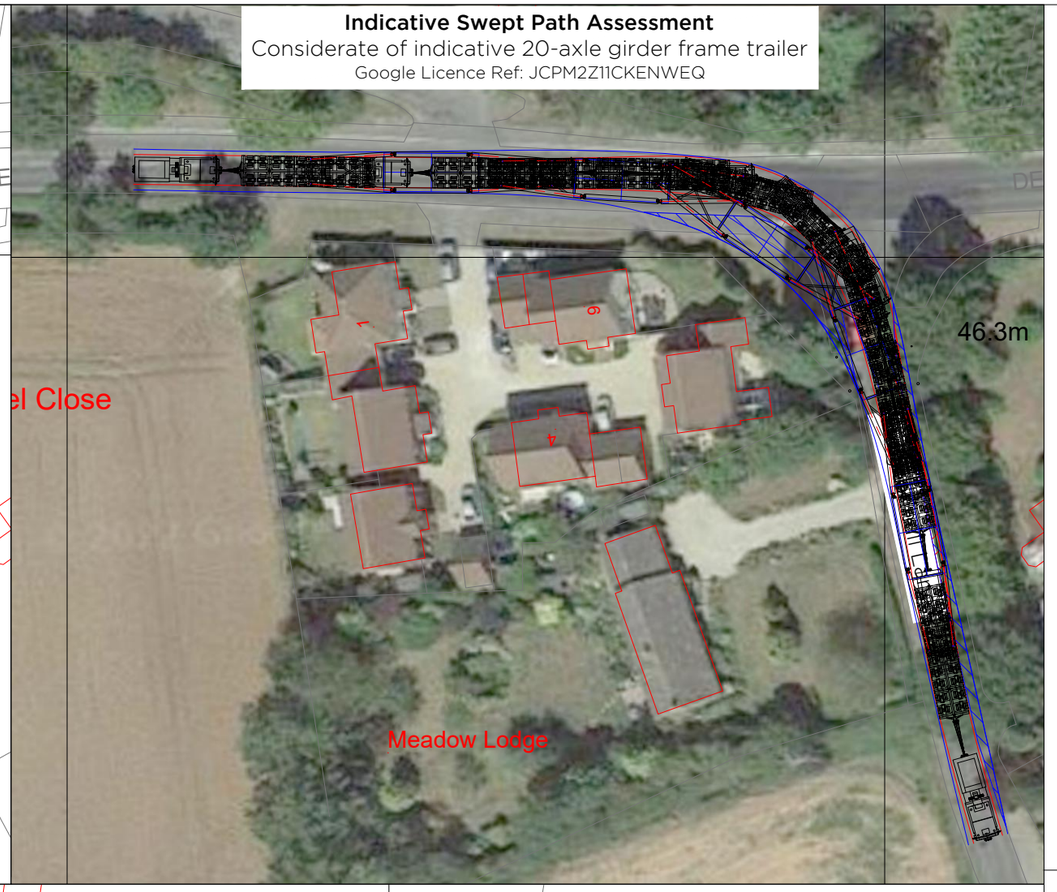
Dwg. no:	Sheet:	Rev:
20-1027.SPA01	1 of 1	0

P:\Clients\Existing Clients\Royal Haskoning\20-1027 Norwich (Dudgeon and Sheringham Extension)\Swept path analysis\20-1027.SPA01 SEP and DEP 24 axle frame Dereham Road Draytonhall Lane right turn R0.dwg

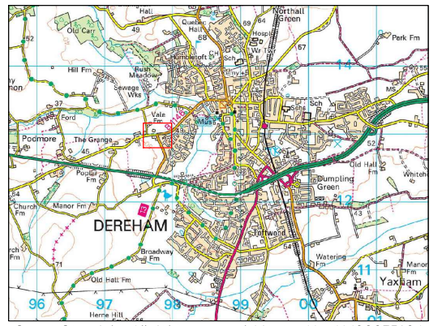
Swept Path Assessment
Considerate of indicative 20-axle girder frame trailer
Constructed from client supplied design data



Indicative Swept Path Assessment
Considerate of indicative 20-axle girder frame trailer
Google Licence Ref: JCPM2Z11CKENWEQ



Location Plan



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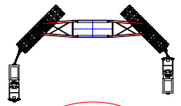


20-axle girder frame trailer minimum turning arrangements Drawing ref. 20-1027.TC02

Extent of vehicle track

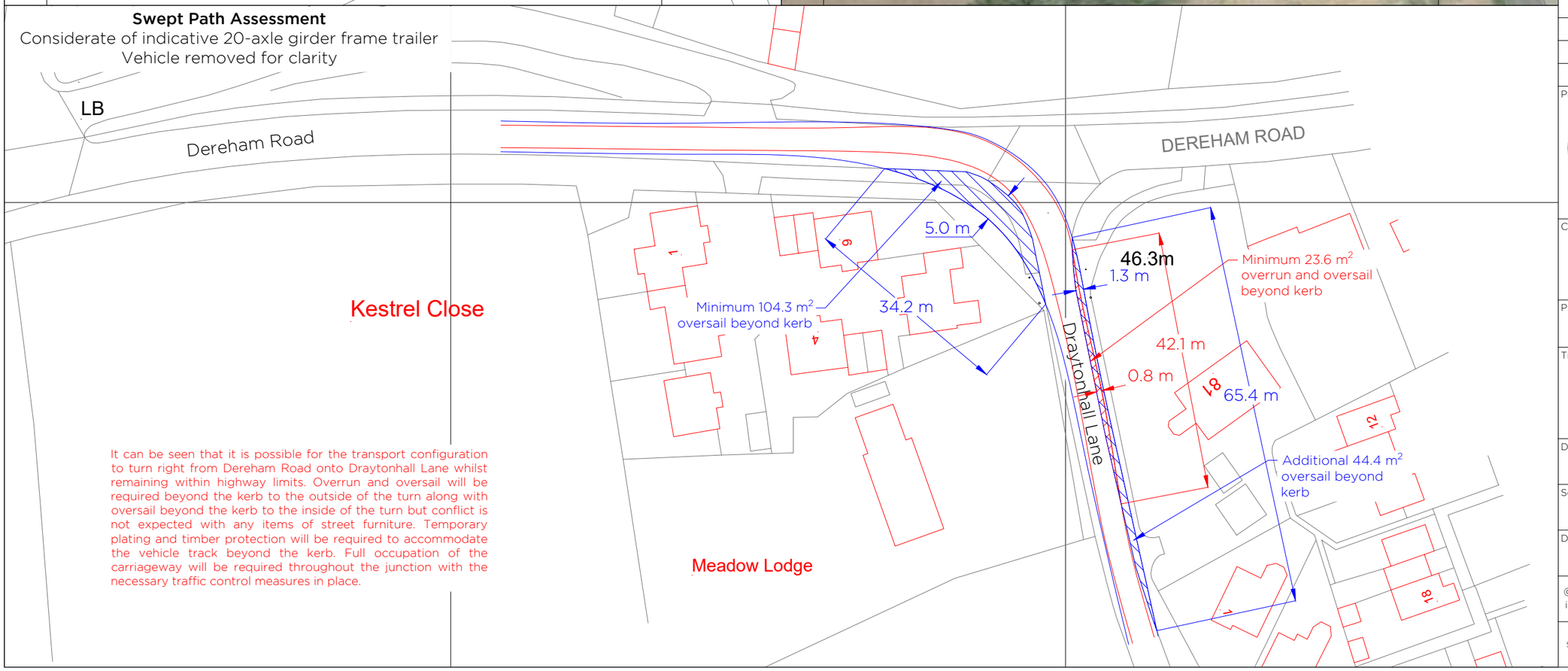
Extent of oversail

Overrun and oversail beyond kerb

Overrun beyond

Oversail beyond kerb

Swept Path Assessment
Considerate of indicative 20-axle girder frame trailer
Vehicle removed for clarity



It can be seen that it is possible for the transport configuration to turn right from Dereham Road onto Draytonhall Lane whilst remaining within highway limits. Overrun and oversail will be required beyond the kerb to the outside of the turn along with oversail beyond the kerb to the inside of the turn but conflict is not expected with any items of street furniture. Temporary plating and timber protection will be required to accommodate the vehicle track beyond the kerb. Full occupation of the carriageway will be required throughout the junction with the necessary traffic control measures in place.

Rev.	Date	Amendments
1		
0	03.03.22	Issued for comment

Revisions

Prepared by:
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Tel: (01785) 850411
Independent Transportation Engineers

Client: equinor

Project:
Sheringham Shoal and Dudgeon Offshore Wind Farm Extension Projects (SEP and DEP)

Title:
Swept Path Assessment
Negotiability of right turn from Dereham Road onto Draytonhall Lane considerate of indicative 224 te transformer transported on 20-axle girder frame trailer
Approximate OS Grid Reference TF 978 130

Drawing status: Final report

Scale (A3):	Drawn by:	Checked by:
1:750	SJW	ARP
Dwg. no: 20-1027.SPA02	Sheet: 1 of 1	Rev: 0

P:\Clients\Existing Clients\Royal Haskoning\20-1027 Norwich (Dudgeon and Sheringham Extension)\Swept path analysis\20-1027.SPA02 SEP and DEP 20 axle frame Dereham Road Draytonhall Lane right turn R0.dwg