

Corkey Windfarm Repowering

Abnormal Load Assessment Technical Appendix 12.1

Appendix - Volume 3 June 2019





CORKEY WIND FARM REPOWERING

ABNORMAL LOAD ROUTE ASSESSMENT

MARCH 2019

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INTRODUCTION

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1 INTRODUCTION

Corkey Wind Farm is an operational wind farm of ten wind turbines located approximately 18km north of Ballymena in Co. Antrim, Northern Ireland. This Abnormal Load Route Assessment (ALRA) provides an assessment of land based routes to the existing wind farm site for the delivery of new wind turbine components to enable repowering of the wind farm.

2 METHODOLOGY

This ALRA is a desk based study which uses publically available Ordnance Survey Northern Ireland (OSNI) mapping to conduct swept path analysis of points of constraint (PCs) on the proposed delivery route. Swept path analysis is conducted in AutoCAD using the Vehicle Tracking software and a bespoke set of delivery vehicles developed for this ALRA.

2.1 Mapping

OSNI Vector Mapping was used to conduct swept path analysis along the proposed delivery route. This mapping is two-dimensional and therefore the assessment only considers the horizontal geometry of pinch points on the route. Topographical surveys may be required in order to undertake an assessment of vertical constraints.

The OSNI mapping used during this assessment was the most up to date mapping available at the time the assessment was undertaken, however a number of locations where this appeared to be out of date were identified. At one location where recent junction improvement works have been undertaken, preliminary design drawings of a new roundabout were acquired from the Department for Infrastructure and are used in this ALRA.

In other locations inaccuracies in mapping have been identified and noted, however no alternative mapping was available. In general the extents of road and verges are noted as being inaccurate. Topographical surveys are recommended to be used as the basis for detailed design of all improvements works.

2.2 Site Visit

A site visit and route drive over was undertaken in October 2017 by an Arcus Engineer in order to verify results of an initial swept path analysis. During this drive over the locations of identified constraints were confirmed in order to verify the accuracy of the OS mapping. A number of additional points of constraint (PCs), and locations where OS mapping was out of date or inaccurate, were identified during this drive over.

2.3 Delivery Vehicle Specifications

Several candidate wind turbines are being considered for repowering the wind farm. In order to provide a robust assessment this ALRA considered the worst case wind turbine blade and the worst case tower section dimensions from the candidate turbines.

Vehicle data sheets are included in Appendix A. Dimensions of the worst case turbine components and corresponding delivery vehicle specifications are provided in the following tables.

Table 2.1: Candidate Turbine Data	а
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	Data Used in Assessment	
Blade	Length 58.7m	

a Used in Assessmen
gth 22.6m neter 4.5m

Table 2.2: Assumed delivery vehicles for Candidate Turbine

	Data	Source
Blade Trailer	Vehicle length – 63.5m Blade overhang – 10.5m	Volvo Cab / TSR Trailer
Tower	Total vehicle length – 40.3m Vehicle width - 4.5m	Volvo Cab / Tower Clamp & Nooteboom

2.4 Route to Site

Two possible ports of entry were considered during this assessment, Larne and Belfast. A route to the site from each port was considered. **Figure 1** included in appendix B shows the assessed route to site from each port and the location of each PC identified in the study. An overview of each route is provided below.

Route A:

- Larne Harbour;
- A8;
- A36;
- M2;
- A26;
- A44;
- Lagge Road;
- Coolkeeran Road;
- Glenbush Road;
- Altnahinch Road;
- Reservoir Road; and
 Site Entrance

Route B:

- Airport Road West;
- A2;
- M3;
- M2;
 A26;
- M2;
- A26;
- M2;
- A44;
- Lagge Road;
- Coolkeeran Road;
- Glenbush Road;
- Altnahinch Road;
- Reservoir Road; and
- Site Entrance

Abnormal Load Route Assessment Corkey Wind Farm Repowering

2.5 Assumptions

In order to keep the results of assessment as concise as possible the following assumptions have been made at each PC:

- During transit, delivery vehicles will be accompanied by an escort vehicle and a police escort if required.
- At all locations where the delivery vehicle occupies the full road width, or is required to contraflow a junction, appropriate traffic management procedures will be implemented by the escort. This will usually involve temporary closure of the road or junction whilst the vehicle passes.
- A detailed traffic management plan will be prepared prior to delivery to inform all relevant stakeholders of road closures and other procedures to be implemented during delivery.

2.6 Classification of Points of Constraint

Each PC identified in this assessment has been classified according to its risk. The criteria used to assign risk are as follows:

- 'High Risk': Where additional land is required to undertake manoeuvre.
- 'Medium Risk': Where construction works to enable vehicle overrun are required within the highway boundary. Additional land is not required; and
- 'Low Risk': Where no construction works are required. Street furniture may require removal, vegetation clearance may be required or no mitigation may be required.

3 RESULTS OF ASSESSMENT

Based on swept path analysis of all PCs identified on the proposed delivery routes, outcomes and mitigation requirements have been defined and are summarised in Table 3.1.

At each PC both the wind turbine blade vehicle and tower section vehicle were tracked. Swept path analysis drawings for each PC are included in Appendix C. At each PC the vehicle shown is the one with the most severe mitigation requirements.

Table 3.1: Assessment of Constraints

Ref	Location	Assessment Outcome	Mitigation	Risk	Notes	
PC/01 - I	01 – PC/09 Refer to Route A from Larne Harbour					
PC/01	Larne Harbour Roundabout	Trailer to overrun outside bend of roundabout within verge. Blade tip to oversail roundabout outside bend and island. Trailer to oversail island and conflict with road sign.	Load bearing surface to be laid in overrun area. Road sign to be mounted on demountable support.	Low	Sheet 1 of 21	
PC/02	The Harbour Hwy Roundabout	Vehicle can negotiate junction with no conflict.	No further mitigation required	Low	Sheet 2 of 21	
PC/03	Milbrook Roundabout A8	Blade tip to oversail northern footway and central reservation. Potential conflict with pedestrian guard rail on A8/Ballymena Rd. Blade tip to oversail roundabout outside bend. Trailer to overrun A8 central reservation and raised roundabout central island.	Load bearing surfaces to be laid in overrun areas, roundabout level likely to require lowering. Blade height to be considered against pedestrian guard rail height. Road sign to be mounted on demountable support. Topographic survey recommended to confirm extent of central island hedge and wall sculpture.	Medium	Sheet 3 of 21	
PC/04	A8/Shanes Roundabout	Vehicle required to contraflow roundabout. Blade tip to oversail approach arm outside bend. Trailer to oversail roundabout central island and conflict with road sign (north of Browndod Rd). Blade tip to oversail the roundabout. Trailer to oversail the roundabout. Trailer to oversail roundabout central island and conflict with lamp post (south of Drumahoe Rd). Trailer to oversail western pavement on Drumahoe Rd.	Load bearing surfaces to be laid in overrun areas. Topographic survey recommended to establish conflict with lamp post. Road sign/eastern lamp post to be removed/relocated as appropriate. Roundabout to be contraflowed.	Medium	Sheet 4 of 21	
PC/05	A36/Shanes Hill Rd at Kilwaughter	Vehicle can negotiate bend with no conflict.	No further mitigation required	Low	Sheet 5 of 21	
PC/06	A36/Shanes Hill Rd at Upper Ballyboley Road	Vehicle can negotiate bend with no conflict.	No further mitigation required	Low	Sheet 6 of 21	

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Abnormal Load Route Assessment Corkey Wind Farm Repowering

Ref	Location	Assessment Outcome	Mitigation	Risk	Notes
PC/07	Shanes Hill Rd	Vehicle can negotiate bend with no conflict.	No further mitigation required	Low	Sheet 7 of 21
PC/08	A36/Moorfields Rd at Kilgad Rd	Vehicle can negotiate bend with no conflict.	No further mitigation required	Low	Sheet 8 of 21
PC/09	Larne Rd Roundabout A36/M2	Vehicle can negotiate junction with no conflict.	No further mitigation required	Low	Sheet 9 of 21
PC/10 -	PC/14 Refer to Route B from Belfast				
PC/10	Airport Rd W Unnamed Roundabout	Vehicle to overrun roundabout central island within existing overrun area. Vehicle to overrun exit arm central island.	Load bearing surfaces to be laid in overrun area.	Medium	Sheet 10 of 21
PC/11	Airport Rd W Unnamed Roundabout	Trailer to overrun approach arm central island and conflict with road sign. Load to oversail inside bend with no conflict identified.	Load bearing surfaces to be laid in overrun area, steel plating may be sufficient. Road sign to be mounted on demountable supports.	Medium	Sheet 11 of 21
PC/12	Airport Rd/A2 On-Slip	Blade tip to oversail outside bend over bollard and conflict with lighting columns and vegetation. Trailer to overrun inside bend within verge.	Load bearing surfaces to be laid in overrun areas. Clearance height of blade above bollard to be checked. Lighting columns to be relocated as required. Signposts to be relocated or mounted on demountable supports. Vegetation to be suitably cut back.	Medium	Sheet 12 of 21
PC/13	M2/ Lisnevanagh Road (A26) Roundabout	Blade tip to oversail on the outside bend on approach arm and over roundabout central island, no conflict identified. Trailer to oversail inside bend above roundabout central island, no conflict identified.	No further mitigation required.	Low	Sheet 13 of 21



Ref	Location	Assessment Outcome	Mitigation	Risk	Notes
PC/14	Ballee Roundabout (A26)	Blade tip to oversail, and trailer to overrun, approach arm outside bend and conflict with lighting column. Trailer to oversail approach arm inside bend. Blade tip to oversail outside of roundabout. Trailer to oversail roundabout central Island. Trailer to oversail exit arm inside edge. Potential conflict with lighting column.	Load bearing surface to be laid in overrun area within verge. Lighting columns to be relocated.	Medium	Sheet 14 of 21
PC/15 -	PC/20 are common to both Route A	and Route B			
PC/15	A26/A44 Roundabout	Assessment based on scaled PDF of preliminary design drawings. Roundabout to be contra-flowed. Blade tip to oversail roundabout central island. Vehicle to overrun exit arm central island and conflict with road sign. Trailer to oversail exit arm inside bend.	Topographical information of actual roundabout will be required to allow robust assessment. Vehicles to cross A26 central reservation. Load bearing surface to be laid in overrun area of exit arm central island, steel plating may be sufficient. Roundabout to be contraflowed. Road sign to be mounted on demountable support	Medium	Sheet 15 of 21
PC/16	A44/Lagge Road Junction	Blade tip to oversail additional land and fence on west side of A44. Trailer to overrun within highway boundary on west of A44. Trailer to overrun and oversail inside bend to south of Lagge Road into additional land. Trailer to conflict with road sign and telegraph post on inside bend.	Load bearing surfaces to be laid in overrun areas in additional land south of Lagge Road, post and wire fence to be relocated behind overrun area. Load bearing surface to be laid within verge to the west of Lagge Road. Permission to oversail additional land to west of A44 required. Height of fence to be checked for clearance for blade tip oversail. Road sign and telegraph post to be relocated as required.	High	Sheet 16 of 21
PC/17	Lagge Road/Cookeeran Road - Crossroads	Vehicle can negotiate junction with no conflict. Gradient change through junction could destabilise load.	Dry run to investigate the effect of gradient change.	Low	Sheet 17 of 21

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Abnormal Load Poute Assessment
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Corkey Wind Farm Repowering

Ref	Location	Assessment Outcome	Mitigation	Risk	Notes
PC/18	Coolkeeran Road/ Glenbush Road Junction	Mapping incomplete. Position of road edge has been estimated. Vehicle to overrun and blade tip to oversail west verge of Coolkeeran Road within verge, possibly conflicting with vegetation. Vehicle to overrun and trailer to oversail inside bend within verge. Cab to overrun south verge of Glenbush Road into additional land and conflict with telegraph post and fence.	Updated mapping or topographical survey may be required to accurately fix position of road edge, although unlikely to change outcome of assessment. Load bearing surfaces to be laid in overrun areas, including in additional land south of Glenbush Road. Fence to be relocated behind overrun area. Telegraph posts to be relocated and signposts to be mounted on demountable supports.	High	Sheet 18 of 21
PC/19	Glenbush Road/Altnahinch Road	Mapping does not correspond to site observations. Position of new fence estimated based upon site observations. Overrun beyond additional fence required on inside bend, south of Glenbush Road and conflict with telegraph pole.	More recent mapping or topographical survey may be required to allow accurate assessment. Landownership boundary to be established. Additional fence to be relocated and load bearing surface to be laid in overrun area. Telegraph pole to be relocated from overrun area.	High	Sheet 19 of 21
PC/20	Altnahinch Road/ Reservoir Road	Mapping does not correspond to site observations, fenceline to north east of Altnahinch Road appeared to be further from road edge. Outside of bend was selected as advised by client due to additional land requirements. Vehicle to significantly overrun additional land north east of Altnahinch Road. Conflict with existing public access gate. Levels of overrun area higher than road level. Ditch on north east side of Altnahinch Road to be crossed.	Load bearing surface to be laid in overrun area within additional land. Public access gate to be relocated. Topographical survey may be required to determine cut requirements within overrun area. Culvert on north east side of Altnahinch Road required to maintain ditch.	High	Sheet 20 of 21
PC/21	Site Entrance Junction, Reservoir Road	New site entrance junction to be formed, watercourse required to be crossed. All works required for junction within red line boundary of Development.	Load bearing surfaces to be laid in junction and ALR overrun area. Culvert section required to maintain watercourse through junction.	Low	Sheet 21 of 21

4 CONCLUSION

4.1 Summary

Each delivery route was assessed for the candidate wind turbine blade and tower section vehicles.

Route A from Larne identified 16 PCs (which includes 7 PCs which are common to both routes). Swept path analysis was conducted at each. Eight 'low risk' PCs were identified where significant works are not required. Three 'medium risk' PCs were identified where significant works may be required within the public road boundary. Four 'high risk' PCs were identified where more extensive works are required.

Route B from Belfast identified 12 PCs (which includes 7 PCs common to both routes). Three were considered 'low risk', five 'medium risk' and four 'low risk'.

Both routes are considered viable for delivery, subject all necessary approvals being secured to undertake the improvement works.

4.2 Recommendations for Further Work

At PC/14 scaled PDF design drawings were used as a basis for assessment as no mapping was available. This will provide a general indication of required works, however more accurate as built digital data or topographic will be required to confirm the viability of this proposal.

At PC/19 the location of the fence indicated on the mapping does not correspond with site observations. Confirmation of landownership boundaries and the extent of the highway verge at this PC is required.

A topographical survey or as built drawings issued in digital format should be acquired at PC/15 to confirm this solution.

Structural surveys may need to be undertaken at structures along the route in order to establish weight limits. An abnormal indivisible loads application should be submitted to the relevant authority which will initiate consultations with all relevant parties and identify areas where further review is required.

A trial run may be considered prior to delivery once identified improvement works have been designed and built.

APPENDIX A – VEHICLE DATA SHEET



	■22.1m	1.5m 1.5m 1
a. Tower ance dius	Trailer 40.336m 4.500m 5.810m 0.620m 2.520m 6.00s 9.800m	
	Arcus 4 Axle Platform Trailer 58.7m Blade	

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APPENDIX B – ROUTE TO SITE



P:\Projects\2606 Corkey Windfarm Repowering\2606 Corkey Windfarm Repowering.aprx\2606-REP-068 Pinch Point Locations







- High Risk Point of Constraint
- Medium Risk Point of Constraint
- Low Risk Point of Constraint
- Delivery Route A
- Delivery Route B

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Port Location

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Point of Constraint Location Plan Figure 1

Corkey Windfarm Repowering Abnormal Load Route Assessment

APPENDIX C – SWEPT PATH ANALYSIS DRAWINGS

LEGEND: VEHICLE _____ VEHICLE WHEEL TRACK VEHICLE OVERHANG LOAD LOAD OVERHANG ADDITIONAL LAND INDICATIVE EXTENT OF VEHICLE OVER-RUN INDICATIVE EXTENT OF LOAD OVERHANG NOTES: 1. MANUAL REAR STEERING HAS BEEN UTILISED FOR THIS SWEPT PATH ANALYSIS. 2. ANALYSIS HAS NOT CONSIDERED VERTICAL GROUND CLEARANCE OF THE VEHICLE AND LOAD. 3. FURTHER INVESTIGATION WORKS WILL BE REQUIRED IN ORDER TO IDENTIFY THE IMPROVEMENT WORKS REQUIRED INCLUDING BUT NOT LIMITED TO CARRIAGEWAY WIDENING, EARTHWORKS, DRAINAGE, SERVICES, PEDESTRIAN FACILITIES AND TRAFFIC MANAGEMENT. 4. ANALYSIS BASED ON 58.7m BLADE DELIVERY VEHICLE AND 22.1m TOWER SECTION. MOST SEVERE VEHICLE SHOWN ON DRAWING. 5. ANALYSIS BASED ON OSNI VECTOR MAPPING. WHERE REQUIRED TOPOGRAPHICAL SURVEY TO BE UNDERTAKEN AND USED AS A BASIS FOR DETAILED DESIGN. Purpose of issue Client FOR INFORMATION THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT. SCOTTISHPOWER RENEWABLES SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX TAT 13/03/19 1 Plot File Revised for 58.7m Blade Vehicle By Date Rev **Revision Details** Check

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Project Title

CORKEY WINDFARM REPOWERING SWEPT PATH ANALYSIS

PC/02 THE HARBOUR HWY ROUNDABOUT SHEET 2 OF 21

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- 5. ANALYSIS BASED ON OSNI VECTOR MAPPING. WHERE REQUIRED TOPOGRAPHICAL SURVEY TO BE UNDERTAKEN AND USED AS A BASIS FOR DETAILED DESIGN.

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THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE PROJECT HEALTH & SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS. CORKEY WINDFARM REPOWERING SWEPT PATH ANALYSIS N BOX

LEGEND:	
	VEHICLE
	VEHICLE WHEEL TRACK
	VEHICLE OVERHANG
	LOAD
	LOAD OVERHANG
	ADDITIONAL LAND
	INDICATIVE EXTENT OF VEHICLE OVER-RUN
	INDICATIVE EXTENT OF LOAD OVERHANG

NOTES:

- 1. MANUAL REAR STEERING HAS BEEN UTILISED FOR THIS SWEPT PATH ANALYSIS. 2. ANALYSIS HAS NOT CONSIDERED VERTICAL GROUND CLEARANCE OF THE VEHICLE AND
- LOAD. 3. FURTHER INVESTIGATION WORKS WILL BE REQUIRED IN ORDER TO IDENTIFY THE IMPROVEMENT WORKS REQUIRED INCLUDING BUT NOT LIMITED TO CARRIAGEWAY WIDENING, EARTHWORKS, DRAINAGE, SERVICES, PEDESTRIAN FACILITIES AND TRAFFIC MANAGEMENT.
- 4. ANALYSIS BASED ON 58.7m BLADE DELIVERY VEHICLE AND 22.1m TOWER SECTION. MOST SEVERE VEHICLE SHOWN ON DRAWING.
- 5. ANALYSIS BASED ON OSNI VECTOR MAPPING. WHERE REQUIRED TOPOGRAPHICAL SURVEY TO BE UNDERTAKEN AND USED AS A BASIS FOR DETAILED DESIGN.

APPROXIMATE LOCATION OF LIGHTING COLUMN TO BE RELOCATED

COLUMN TO BE RELOCATED

APPROXIMATE LOCATION OF LIGHTING

LOAD BEARING SURFACE TO BE LAID IN -OVERRUN AREA

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: 16 May						THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.
Plot Date File Name	Revised for 58.7m Blade Vehicle	KL TAT	13/03/19	1	SCOTTISHPOWER RENEWABLES	SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX
	Revision Details	By Check	Date	Rev		

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File Name : P:/PROJECTS/2606_CORKEY WINDFARM REPOWERING/CAD/01-WORKING/01_01-DRAWINGS/2606_DR_ALR_0001-0020-P1 Plot Date : 16 May 2019 16:58:15

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					THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT.
				SCOTTISHPOWER	SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION BOX
Revised for 58.7m Blade Vehicle	KL TAT	13/03/19	1	RENEWABLES	

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SAFETY FILE FOR ANY IDENTIFIED POTENTIAL RISKS.

Project Title

CORKEY WINDFARM REPOWERING SWEPT PATH ANALYSIS Drawing Title

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LOCATION OF ROAD EDGE		
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LOCATION OF ROAD EDGE		

signed -	Drawn RL	Checked Approved TAT FM		Arcus Consultancy Services	6		
cus Internal Project No. 506		Date 12/03/2019		144 West George Street Glasgow, G2 2HG			
ale @ A1 250				Tel: +44 (0)141 221 9997 Fax: +44 (0)141 221 5610 www.arcusconsulting.co.uk	ARCUS		
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esigned Drawn L KL rcus Internal Project No.	Checked TAT Date	Approved TAT	Arcus Consultancy Services 7th Floor 144 West George Street Glasoow, G2 2HG	5
606	1	16/05/10		