

## Appendix 15-3- Swept Path analysis - Abnormal Indivisible Load (AIL)



# Pell Frischmann

Derryadd Wind Farm

Abnormal Indivisible Load Route Survey

December 2023

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<b>Report Ref.</b>		<b>14122023 Derryadd RSR V3.Docx</b>				
<b>File Path</b>		<a href="https://pellf.sharepoint.com/sites/EdinburghOfficeTeam/Shared Documents/General/Projects/10109097 Bord na Mona Derryad SPA/01 - WIP/Reports/14122023 Derryadd RSR v3.docx">https://pellf.sharepoint.com/sites/EdinburghOfficeTeam/Shared Documents/General/Projects/10109097 Bord na Mona Derryad SPA/01 - WIP/Reports/14122023 Derryadd RSR v3.docx</a>				
<b>Rev</b>	<b>Suit</b>	<b>Description</b>	<b>Date</b>	<b>Originator</b>	<b>Checker</b>	<b>Approver</b>
01		Draft	30-May-21	G Buchan	T Lockett	G Buchan
02		Issue	16-June-21	G Buchan	T Lockett	G Buchan
03		Issue	09-May-23	T Lockett	G Buchan	G Buchan
04		Final	14-Dec-23	T Lockett	G Buchan	G Buchan
Ref. reference. Rev revision. Suit suitability.						

**Prepared for**

**Bord na Móna PowerGen**

Main Street  
Newbridge  
Co. Kildare  
Ireland

**Prepared by**

**Pell Frischmann**

93 George Street  
Edinburgh  
EH2 3ES

**Bord na Móna**

**Pell Frischmann**

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# 1 Introduction

## 1.1 Purpose of the Report

Pell Frischmann (PF) has been commissioned by Bord na Móna PowerGen (Bord na Móna) to undertake a study of the delivery route for wind turbine Abnormal Indivisible Loads (AIL) associated with the construction and development of Derryadd Wind Farm, located to the east and southeast of Lanesborough in County Longford.

The Route Survey Report (RSR) has been prepared to help inform Bord na Móna on the likely issues associated with the development of the site with regards to off-site transport and access for AIL traffic. This report is based upon a desk top review of topographical surveys and identifies the key issues associated with AIL deliveries and notes that remedial works, either in the form of physical works or as traffic management interventions will be required to accommodate the predicted loads. A detailed site visit would still be required to fully assess the impact on the study area road network.

The detailed assessment and subsequent designs of any remedial works are beyond the agreed scope of works between PF and Bord na Móna at this point in time.

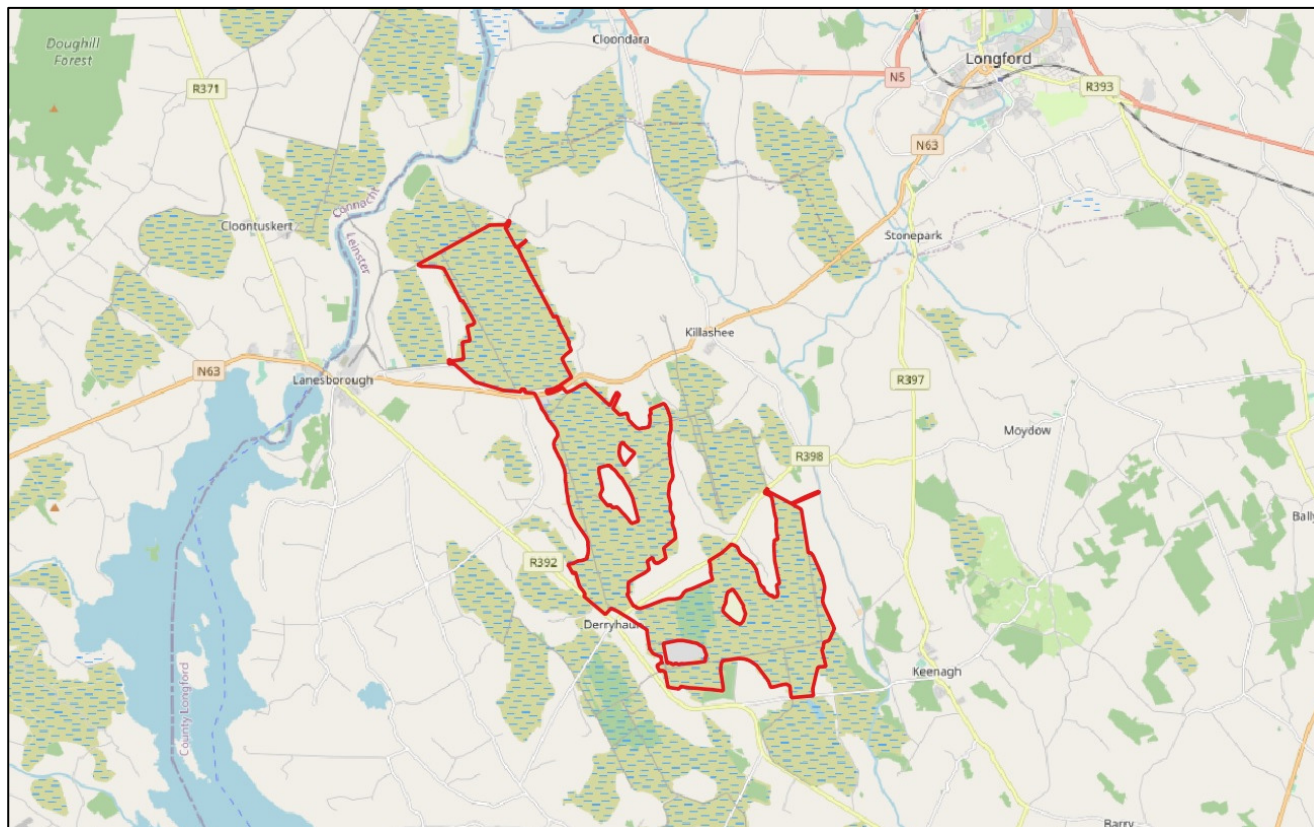
It is the responsibility of the wind turbine supplier to ensure that the entirety of the proposed access route is suitable and meets with their satisfaction. The turbine supplier will be responsible for ensuring that the finalised proposals meet with the appropriate levels of health and safety consideration for all road users and in accordance with the relevant legislation at the time of delivery.

## 2 Site Background

### 2.1 Site Location

The development site is located to the east and southeast of Lanesborough. Figure 1 illustrates the general site location.

**Figure 1: Site Location Plan**



### 2.2 Candidate Turbine

The turbine model used will be subject to a competitive procurement process so exact dimensions are as such unknown. However, Bord na Mona are applying for planning permission for a turbine with a rotor diameter of 165m. Examining similar turbine types in this range an 81m turbine blade length is assumed. The following dimensions have been used for this assessment as listed in Table 1 below. Details of these are included in Table 1 below.

**Table 1: Turbine Size Summary**

Component	Length (m)	Width (m)	Height / Min Diameter (m)
Blade	81.100	4.500	4.000
Tower	28.560	4.794	4.102

### 2.3 Proposed Delivery Equipment

To provide a robust assessment scenario based upon the known issues along the access route, it has been assumed that all blades would be carried on a Superwing Carrier trailer to reduce the need for mitigation in constrained sections of the route.



The base and mid towers would be carried on a 4+7 clamp trailer. The hub, nacelle housing, and top towers would be carried on a six-axle step frame trailer. The worst case loads for these sections will be considered in a further study.

**Figure 2: Superwing Carrier Trailer**



**Figure 3: Tower Trailer**



## 3 Access Route Review

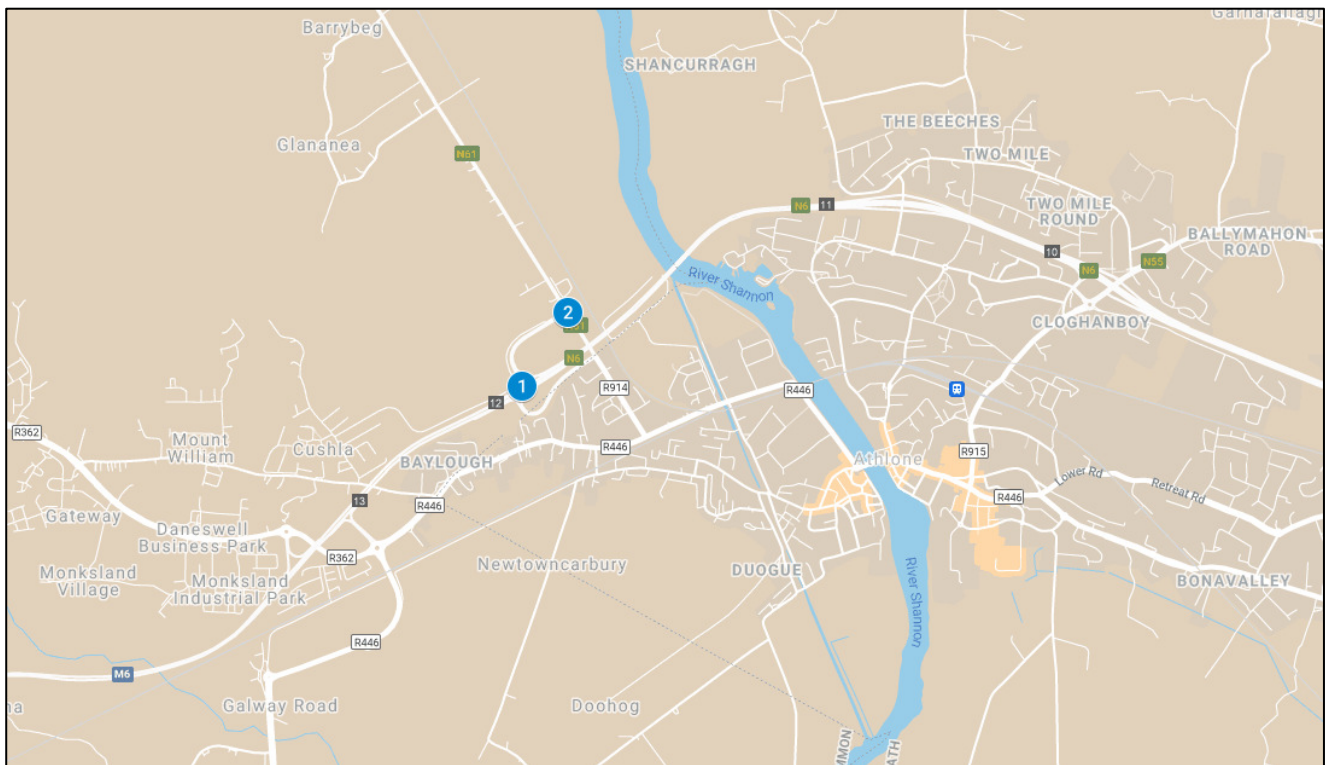
### 3.1 Proposed Access Route

This study has focussed on five locations identified by Bord na Móna for the proposed loads. The locations under consideration are as follows and are illustrated in the attached plans below.

- N6, Junction 12 Eastbound Slip Road;
- N6 / N61 Roundabout at Athlone;
- N61 / N63 Roundabout at Roscommon;
- N61 Roscommon Arts Centre Roundabout;
- N61 / N63 Roundabout, Northeast of Roscommon; and
- Site Entrance on R392.

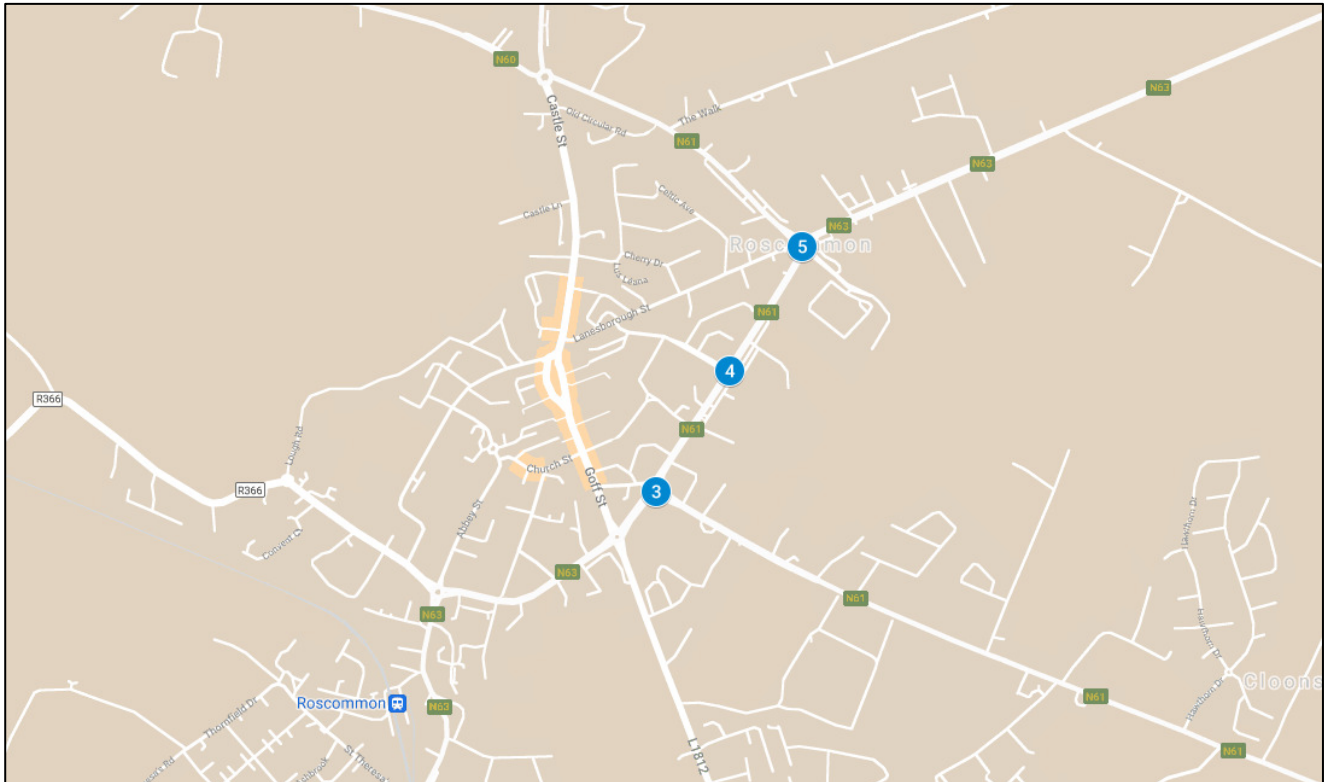
The proposed northern access option is illustrated in Figure 4.

**Figure 4: Points of Interest (POI) at Athlone**

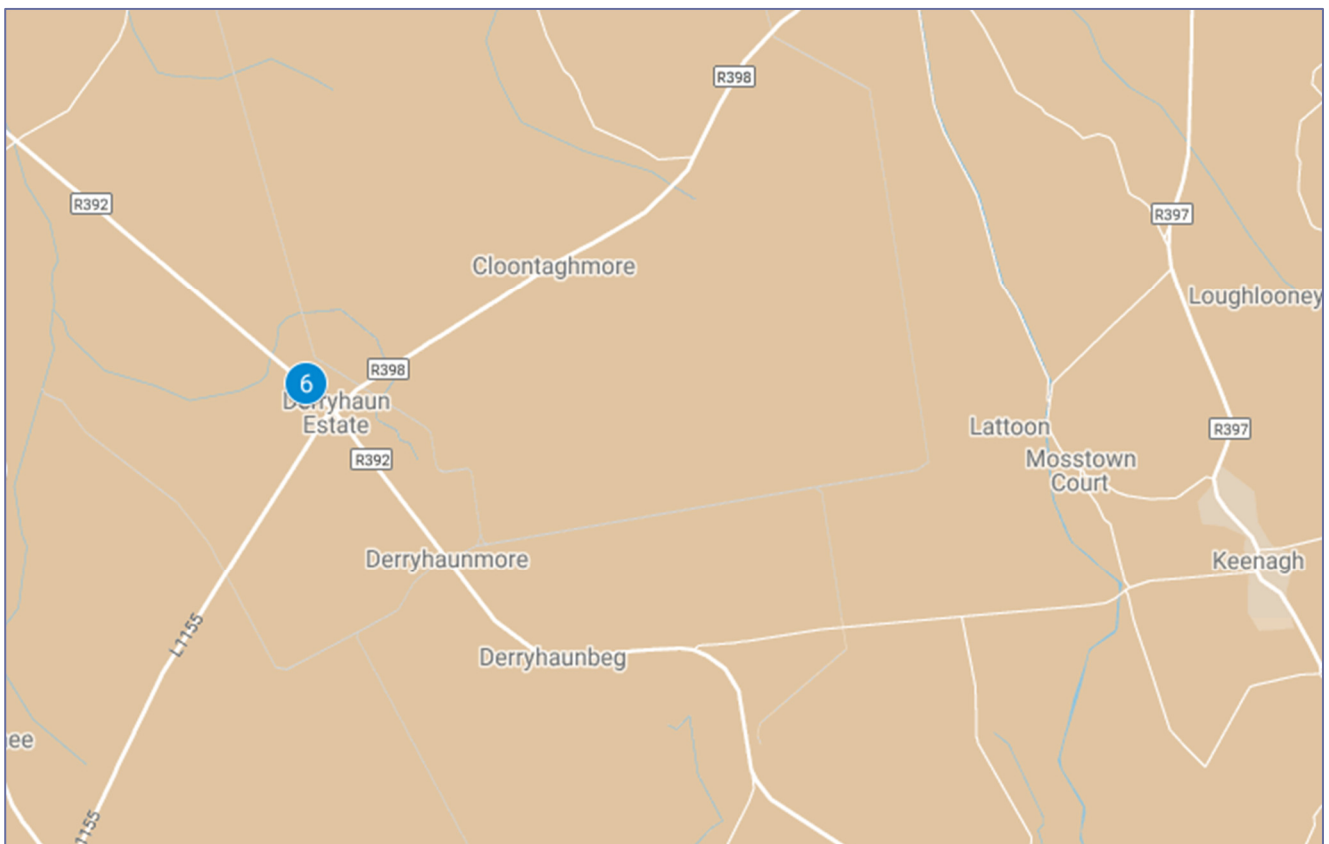




**Figure 5: Points of Interest (POI) at Roscommon**





**Figure 6: Points of Interest (POI) Site Entrance**




## 3.2 Route Constraints



The POI junctions are detailed in Table 2 with a summary of the swept path assessments. Copies of the swept path assessment drawings for the 81m blade are attached in Appendix A.

**Table 2: Constraint Points and Details**


POI	Constraint	Details
1	<b>N6 Eastbound Slip Road</b> 	<p>Loads would depart the N6 at Junction 12 Eastbound.</p> <p>The swept path assessment indicates that load bearing surfaces will be required on both sides of the slip road. On the inside of the bend, one road sign and one tree should be removed and third party land may be necessary.</p> <p>On the outside of the bend, six chevron signs, bollard posts, one speed sign and one direction sign will need to be removed.</p> <p>The blade tip will oversail the central reserve of the N6, however the blade tip will not cross into incoming traffic.</p> <p>Loads will straddle the centre the centre line of the slip road and all marker post bollards will need to be removed. This should be done up to POI 2.</p>
2	<b>N6 / N61 Roundabout at Athlone</b> 	<p>Loads will take the first exit at the roundabout, turning left onto the N61.</p> <p>Loads will oversail the southern verge where one road sign and one lighting column should be removed.</p> <p>On the inside of the turn at the junction, five road signs, one lighting column and two posts should be removed. A review of land ownership boundaries should be undertaken.</p> <p>The splitter island on the approach arm should have an oversail surface provided and two road signs removed.</p> <p>The splitter island on the exit arm will also require an overrunning surface provided and two signs removed. One chevron sign should be removed from the central island of the junction.</p>

POI	Constraint	Details
3	<p><b>N61 / N63 Roundabout at Roscommon</b></p> 	<p>Loads will take the third exit at the roundabout, turning onto the N61.</p> <p>Loads will require third party land to the southern verge, with loads oversailing the car park of the retail park. This will require the removal two utility poles and one lighting column.</p> <p>Loads will then take a contraflow transit of the junction. This will require the provision of a load bearing surface on the entry splitter island and the central island of the junction. Two road signs and one bollard on the splitter island and the removal of one sign and trees on the central island will be necessary. The ground level of the central island will need to be lowered over the overrun area.</p> <p>On the exit arm, two road signs and one utility pole should be removed and an overrun surface required.</p> <p>A load bearing surface should be laid in the north western kerb and the kerb should be protected. All parking should be suspended.</p> <p>An additional set of drawings is provided in Appendix B which shows the proposed future road upgrade works as part of Part 8 Application by Roscommon County Council</p>



POI	Constraint	Details
4	<b>N61 Roscommon Arts Centre Roundabout</b> 	<p>Loads will proceed through ahead on the N61, passing the physical central reserve and then taking the second exit at the Arts Centre roundabout.</p> <p>Loads will oversail the central island where two road signs should be removed.</p> <p>Loads will oversail the western verge on approach to the roundabout where two road signs should be removed. Loads will oversail the north western edge of the roundabout island where two road signs and two trees should be removed.</p> <p>On exiting the roundabout, loads will oversail the splitter island where one road sign should be removed.</p> <p>An additional set of drawings is provided in Appendix B which shows the proposed future road upgrade works as part of Part 8 Application by Roscommon County Council</p>
5	<b>N61 / N63 Roundabout, Northeast of Roscommon</b> 	<p>Loads would take the third exit at the roundabout, continuing onto the N63. To reduce the scale of the mitigation works, a contraflow transit of the junction would be undertaken.</p> <p>Loads will overrun the entry splitter island where two signs and one bollard should be removed and a load bearing surface provided.</p> <p>Loads will overrun the central island of the junction, where the ground level should be lowered and two signs and one tree removed. A load bearing overrun surface will be required.</p> <p>Loads will oversail the exit splitter island where two road signs and one bollard should be removed.</p> <p>The tree canopy of the northern verge should be trimmed back.</p> <p>An additional set of drawings is provided in Appendix B which shows the proposed future road upgrade works as part of Part 8 Application by Roscommon County Council</p>



POI	Constraint	Details
6	<b>Proposed R392 Site Entrance</b> 	<p>Loads will turn left into a new access junction from the R392.</p> <p>The junction should be constructed to meet turbine manufacturer and road authority standards.</p>

### 3.3 N6 Westbound Slip Road Option

A sensitivity review has been undertaken for the possibility of loads departing the N6 westbound. This option is considered theoretical as access from the east of Ireland is constrained due to the Port of Dublin having a moratorium on the delivery of turbine sections through the port.

The only other available ports within the Republic of Ireland on the east coast are Greenore or Rosslaire, neither of which are considered suitable for the proposed size of turbine. It is therefore assumed that the port of entry will be either Foynes or Galway on the west coast, both of which have experience of accommodating similar turbine sizes.

The exit from the N6 westbound requires a constrained turn from the N6 and then a right angle turn onto the R914. Loads would then need to turn underneath the N6, where the N6 overbridge abutments are located in close proximity to the slip road junction.

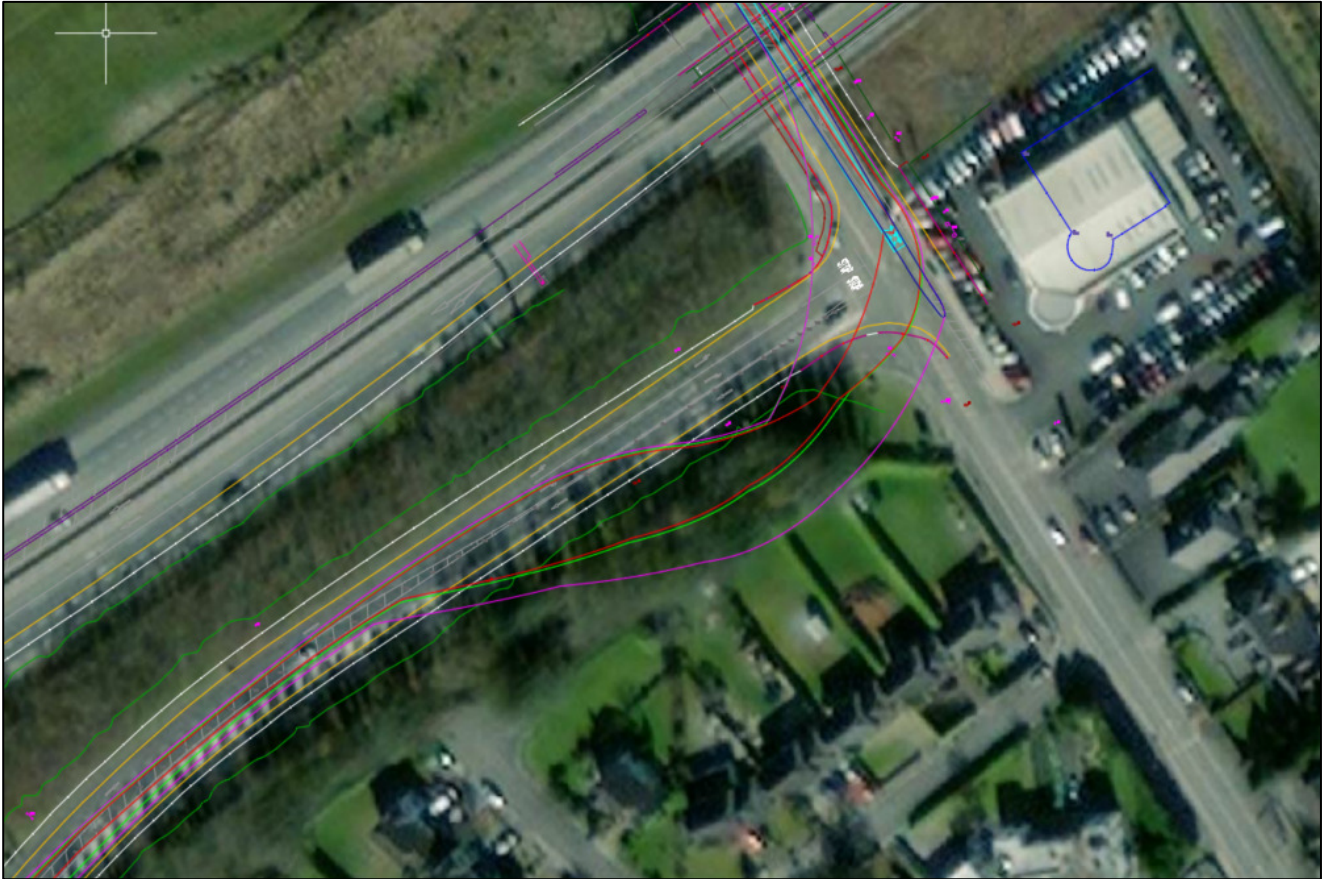
The slip road and left turn onto the N914 are illustrated in Figure 6.

**Figure 7: Slip Road and R914 Junction**



The junction is highly constrained and would require significant areas of third party land to form a load bearing surface on the southern verge and into residential gardens. A high level swept path assessment has been undertaken at this location for the 81m blade and is illustrated in Figure 7. The manoeuvre is not considered feasible given the over-run areas required on the north and the significant oversail areas required.

**Figure 8: Slip Road and R914 Junction Swept Path Assessment**



No further assessment of this set of manoeuvres has been undertaken and no further assessment or consideration of this option are recommended.

### 3.4 Swept Path Assessment Results and Summary

The detailed swept path drawings for the locations assessed are provided in Appendix A for review. The drawings illustrate tracking undertaken for the worst case loads at each location.

The colours illustrated on the swept paths are:

- Grey / Black – OS / Topographical Base Mapping;
- Green – Vehicle body outline (body swept path);
- Red – Tracked pathway of the wheels (wheel swept path); and
- Purple – The over-sail tracked path of the load where it encroaches outwith the trailer (load swept path).

Where mitigation works are required, the extents of over-run and over-sail areas are illustrated on the swept path drawings.

Where provided by the client, topographical data has been utilised. Please note that PF cannot accept liability for errors on the data source, be that OSI base mapping or client supplied data.

### 3.5 Land Ownership

The limits of road adoption can vary depending upon the location of the site and the history of the road agencies involved. The adopted area is generally defined as land contained within a defined boundary where the road agency holds the maintenance rights for the land. In urban areas, this usually defined as the area from the edge of the footway across the road to the opposing footway back edge.



In rural areas the area of adoption can be open to greater interpretation as defined boundaries may not be readily visible.

### 3.6 Summary Issues

It is strongly suggested that following a review of the RSR, Bord na Móna should undertake the following prior to the delivery of the first abnormal loads, to ensure load and road user safety:

- Undertake a detailed site visit to confirm the desk top survey details;
- A review of axle loading on structures along the entire access route with the various road agencies is undertaken immediately prior to the loads being transported in case of last minute changes to structures;
- A review of clear heights with utility providers and the transport agencies along the route to ensure that there is sufficient space to allow for loads plus sufficient flashover protection (to electrical installations);
- That any verge vegetation and tree canopies which may foul loads is trimmed prior to loads moving;
- That a review of potential roadworks and or closures is undertaken once the delivery schedule is established in draft form;
- That a test run is completed to confirm the route and review any vertical clearance issues; and
- That a condition survey is undertaken to ascertain the extents of road defects prior to loads commencing to protect the developer from spurious damage claims.

## 4 Summary

### 4.1 Summary of Access Review

PF has been commissioned by Bord na Móna to prepare a desktop Route Survey Report to examine the issues associated with the transport of AIL turbine components to Derryadd Wind Farm at six points of interest.

This report identifies the key points and issues associated with the selected junctions and outlines the issues that will need to be considered for successful delivery of components.

The report is presented for consideration to Bord na Móna. Various road modifications, structural reviews and interventions are required to successfully access the site. If these are undertaken, access to the proposed wind farm site is considered feasible.

### 4.2 Further Actions

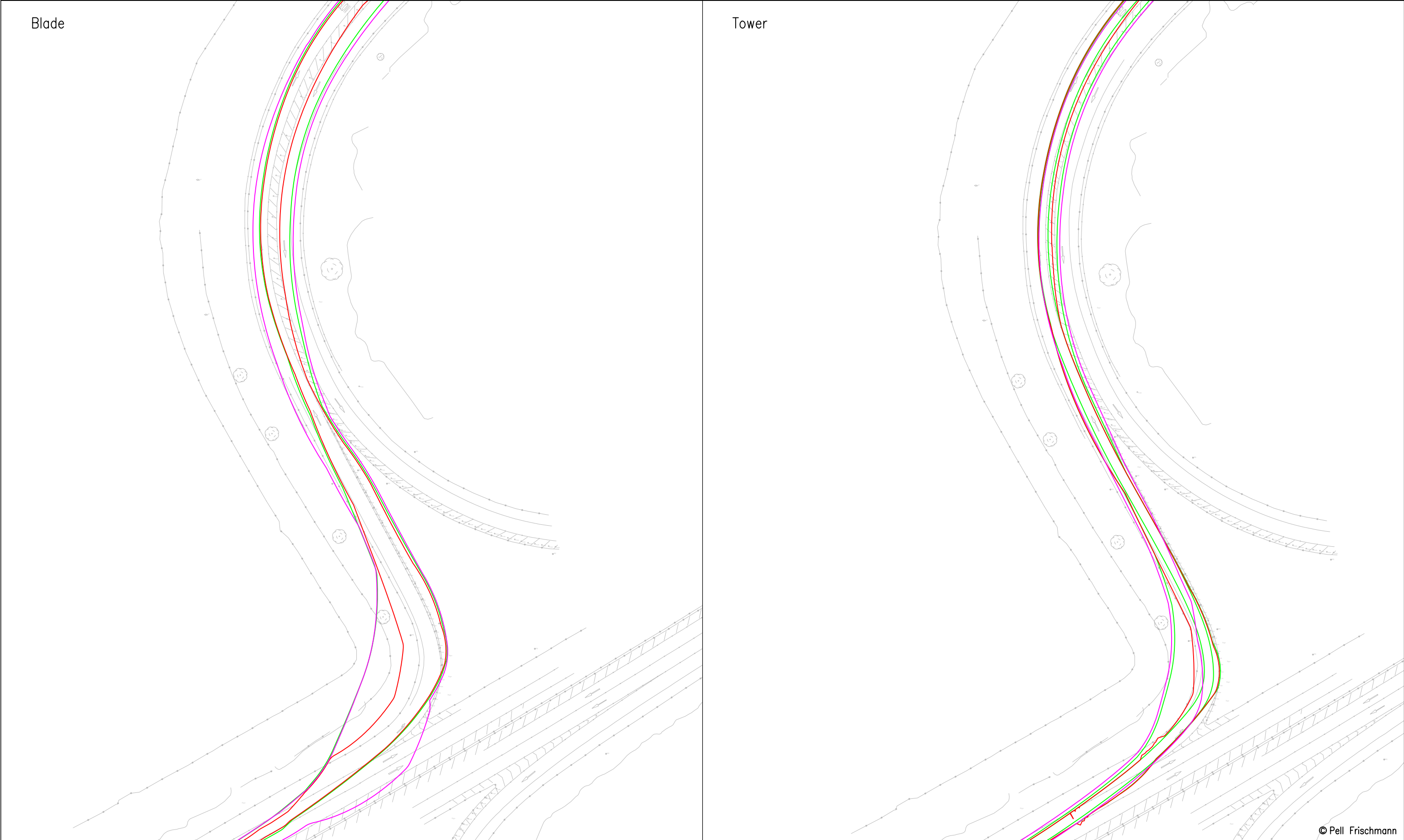
The following actions are recommended to pursue the transport and access issues further:

- Prepare detailed mitigation design proposals to help inform the land option / consultee discussions;
- Obtain the necessary land options;
- Undertake discussion with the affected utility providers and roads agencies;
- Obtain the necessary statutory licences to enable the mitigation measures; and
- Develop a detailed operational Transport Management Plan to assist in transporting the proposed loads.

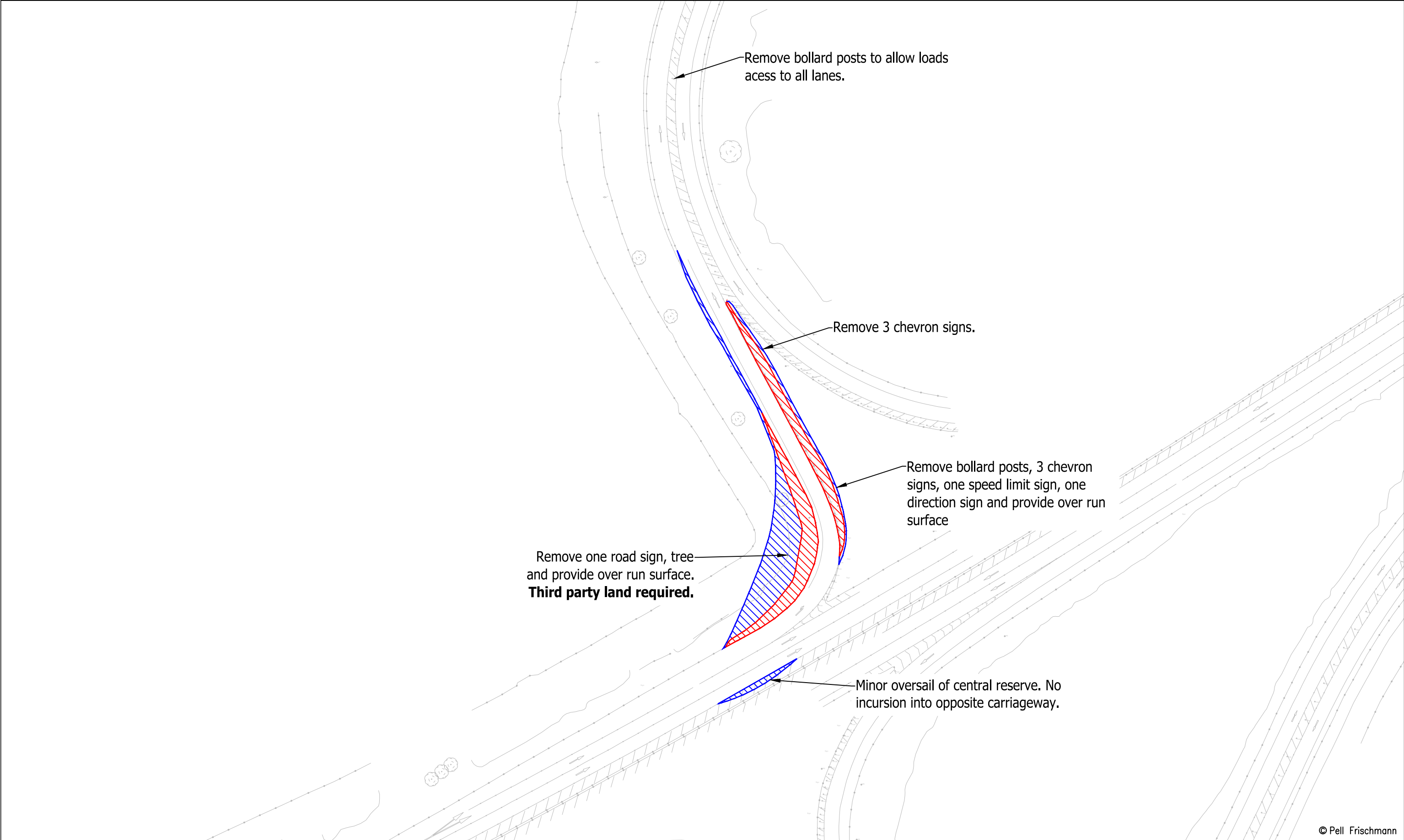
## Appendix A 81m Swept Path Assessment Drawings

Blade

Tower



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									Drawing No.		Notes:		Revision						
Key							SPA Location			SK01		1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.		1					
							81m Blade & Tower Section												
							N6 Junction 12 (Eastbound)												



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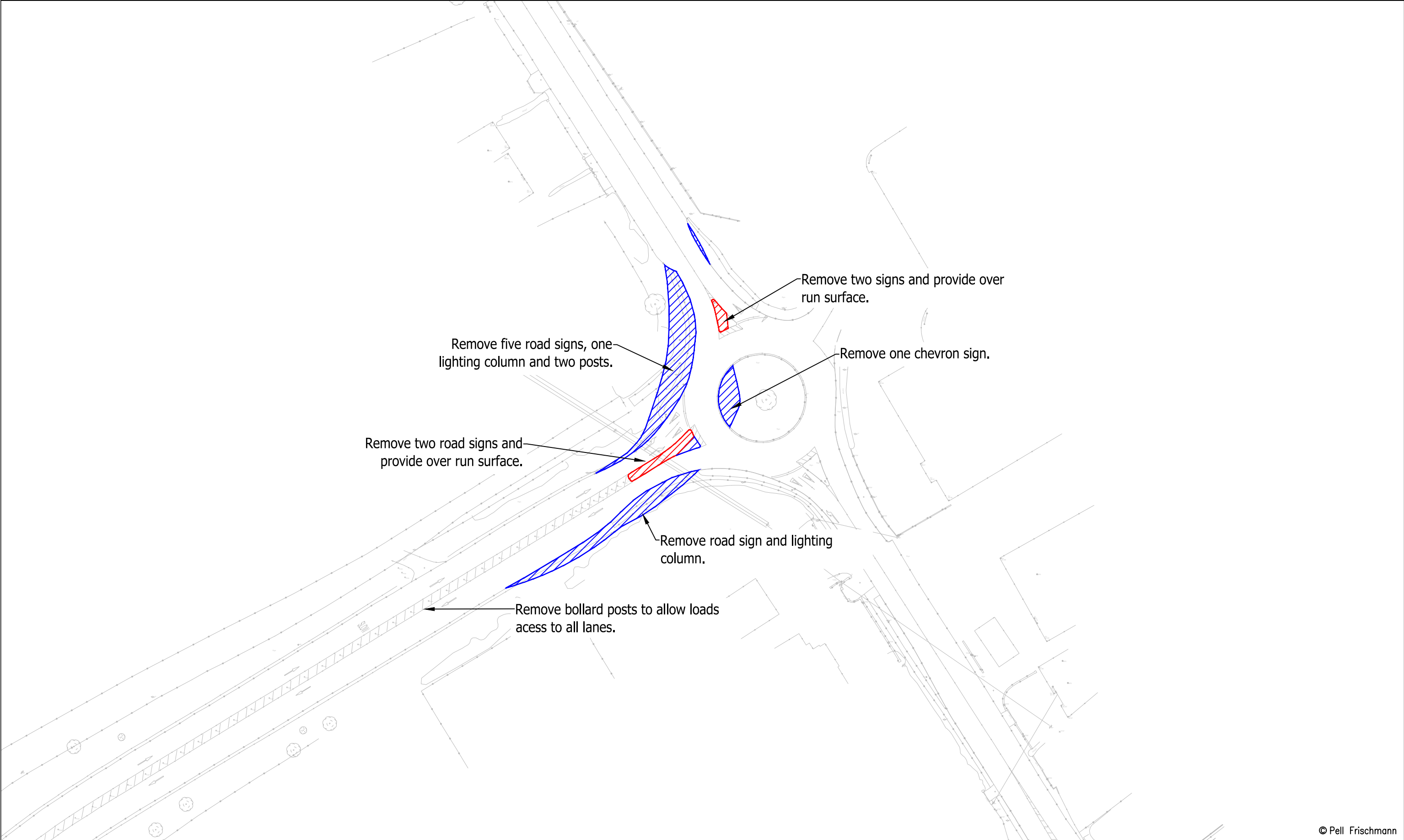
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	Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail		

Blade  
Option 2



Tower  
Option 2



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Load bearing surface to be laid. Kerb to be protected. Parking to be suspended.

Remove two road signs and one utility pole.

Lower ground level on central island and load bearing surface to be laid. Trees and one set of chevron signs to be removed.

Load bearing surface to be laid. Remove two road signs and one bollard.

Two utility posts and one lighting column to be relocated.  
**Third party land required.**

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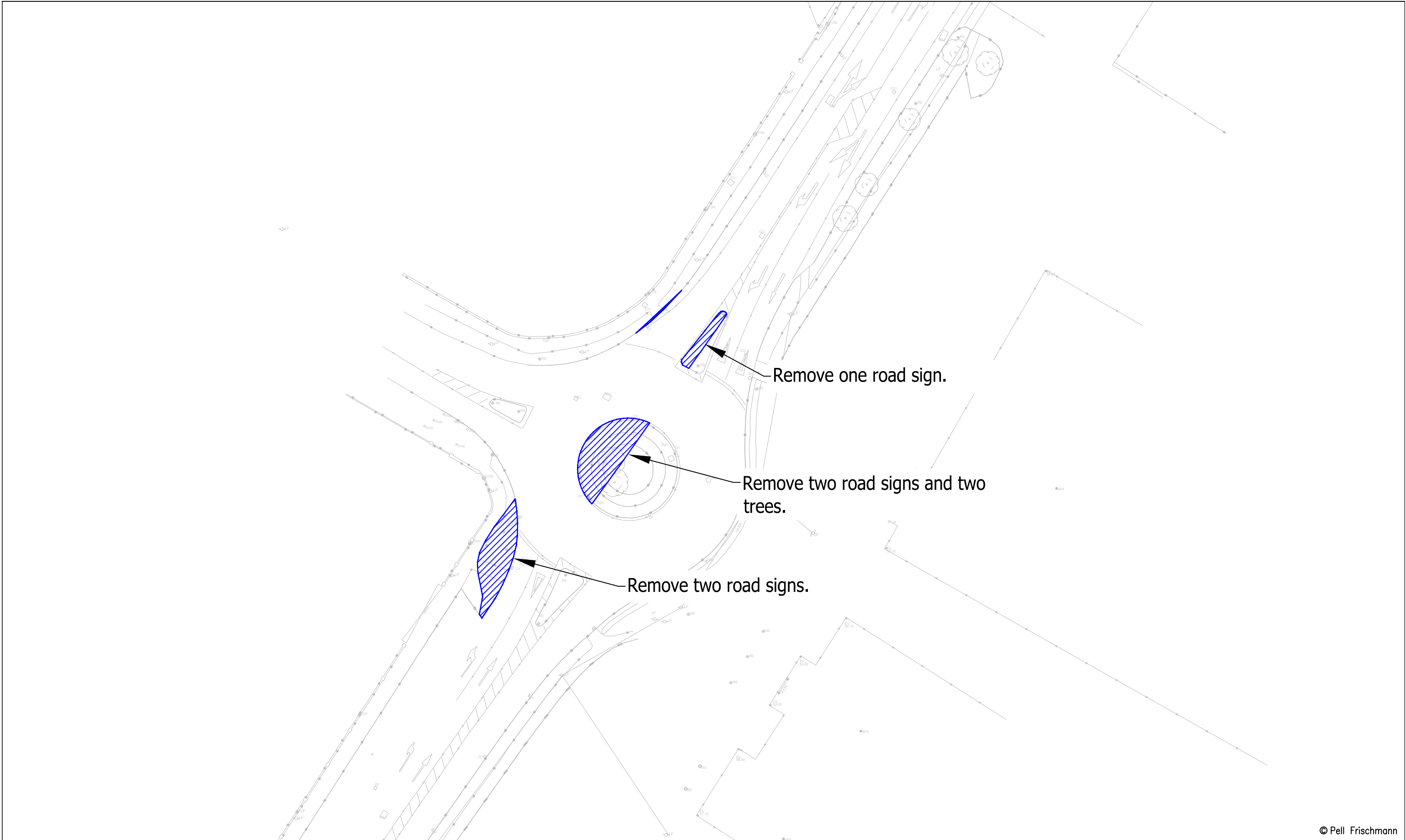


Blade

Tower

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<div><div>Client</div><div>Bord na Mona</div></div> <div><div>Drawing Title</div><div>81m Blade &amp; Tower Section</div></div> <div><div>Point of Interest</div><div>4</div></div> <div><div>Drawing No.</div><div>SK04</div></div> <div><div>Notes:</div><div>1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.</div></div> <div><div>Revision</div><div>1</div></div>												
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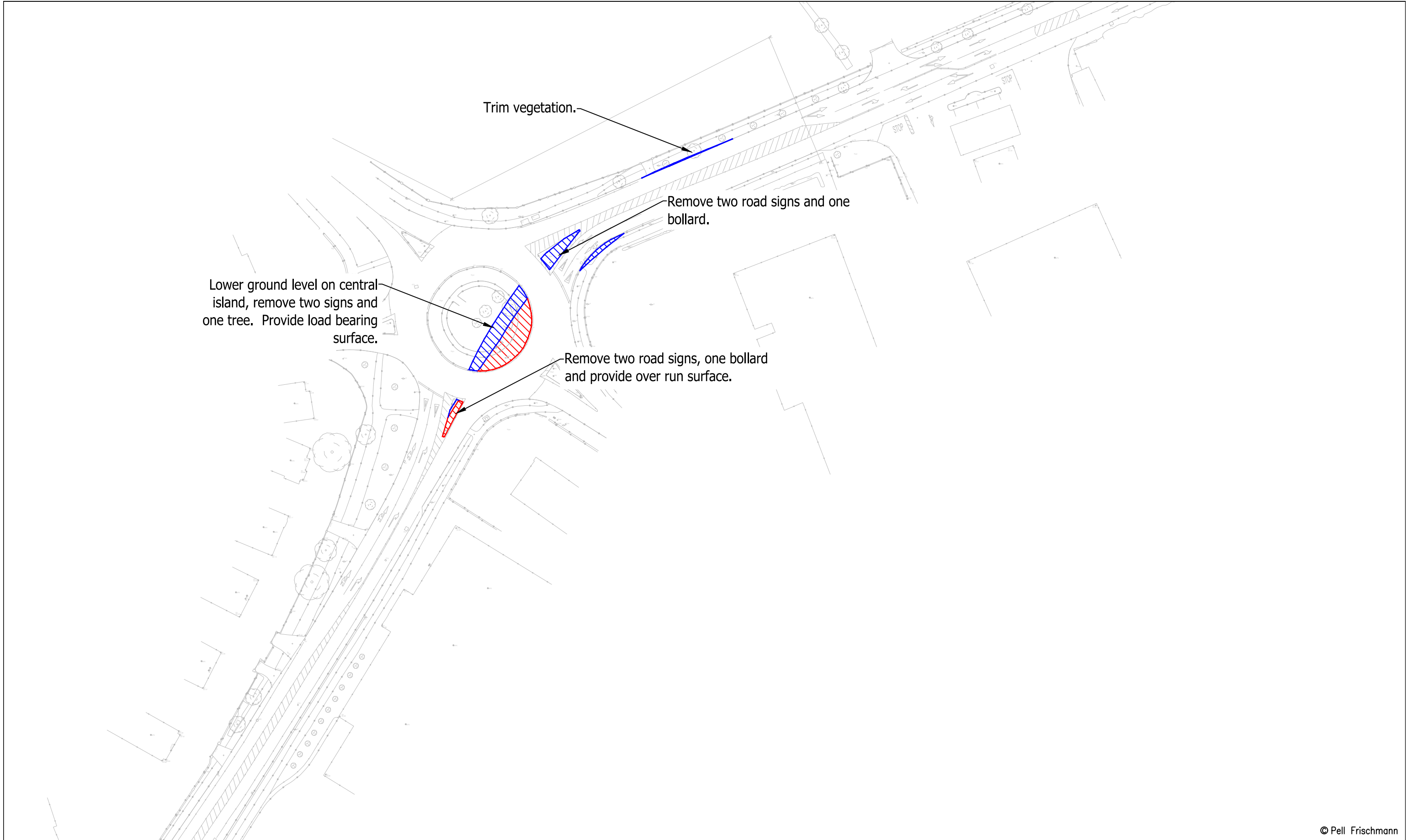


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Client <div>Bord na Mona</div>	Drawing Title <div>81m Blade &amp; Tower Section</div>	Point of Interest		4	Draft
		Drawing No. SK04A			
Key <div><div></div>Wheel SPA<div></div>Body SPA<div></div>Load SPA<div></div>Indicative<div></div>Over-run<div></div>Over-sail</div>	SPA Location <div>N61 Roscommon Arts Centre Roundabout</div>	Notes: <div>1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.</div>			
		Revision 1			



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							Drawing Title			81m Blade & Tower Section			Drawn	GB	09/05/2023	File No. 09052023 BnM Derryadd v3.dwg			
													Designed	TL	09/05/2023				
													Checked	GB	28/05/2021	Drawing Status		Draft	
Client							Bord na Mona			Point of Interest			4						
Key							SPA Location			Drawing No.	Notes:	Revision							
	Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail				SK05	1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.								
							N61 / N63 Roundabout												



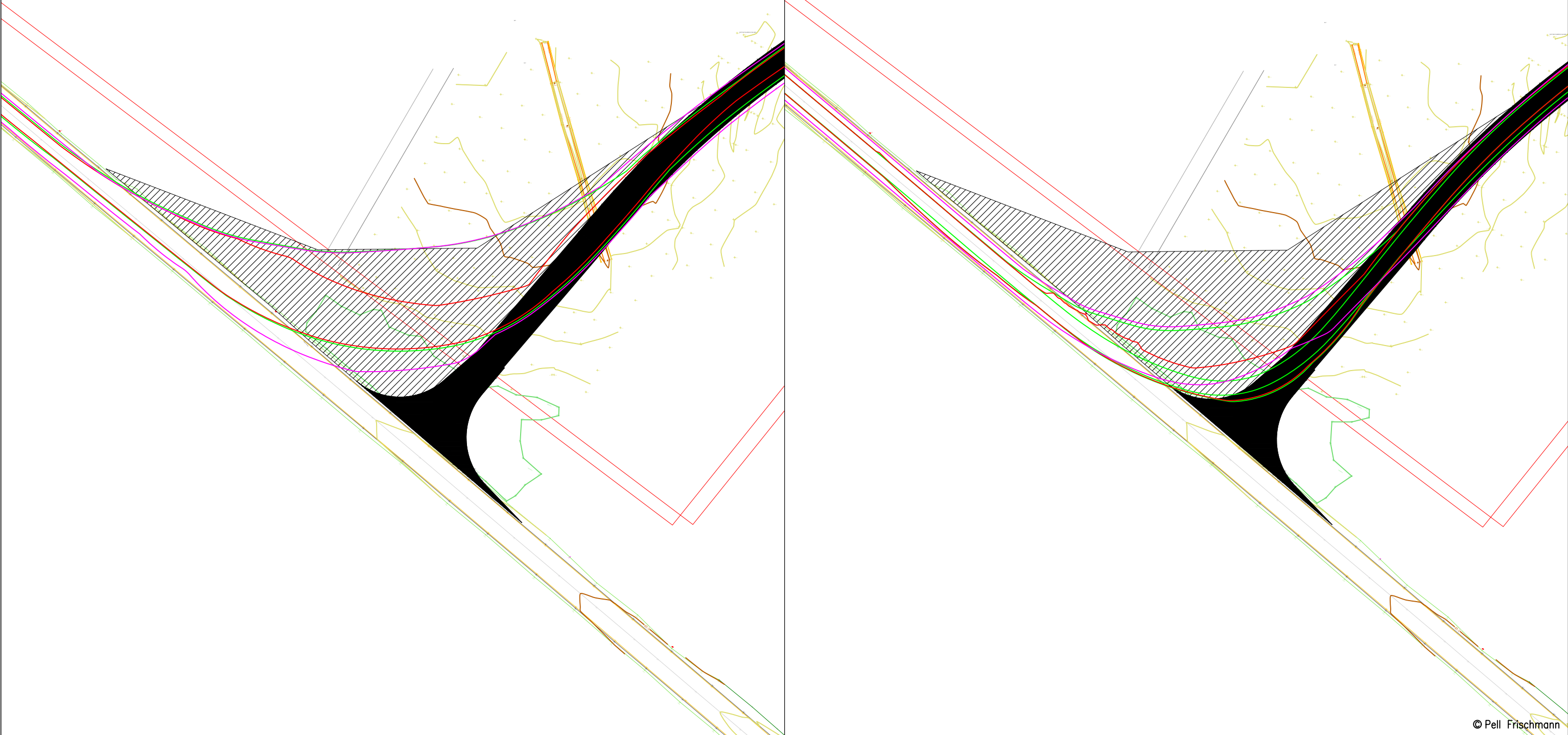
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							Derryadd Wind Farm			GB	09/05/2023	1:1_1 @ A3					
														TL	09/05/2023	File No. 09052023 BnM Derryadd v3.dwg	
														GB	28/05/2021	Drawing Status	
Client							Drawing Title			Point of Interest		5	Draft				
Bord na Mona							81m Blade & Tower Section			Drawing No.		Notes:		Revision			
Key							SPA Location			SK05A		1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.		1			
Wheel SPA							Body SPA			Load SPA		Indicative		Over-run			
Over-sail																	



Blade

Tower



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											Drawn	GB	09/05/2023	File No. 09052023 BnM Derryadd v3.dwg	
											Designed	TL	09/05/2023		
											Checked	GB	28/05/2021	Drawing Status Draft	
Client Bord na Mona							Drawing Title  81m Blade & Tower Section				Point of Interest 6		Revision 1		
Key											Drawing No. SK06	Notes: 1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.			
	Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail									
SPA Location Proposed Site Access															

Detailed design required for site access junction.  
Load bearing surface to be laid. Trees and  
vegetation to be cleared. Utility posts to be  
relocated. Land under control of the developer.

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							Derryadd Wind Farm							Drawn		GB		09/05/2023		1:750 @ A3							
														Designed		TL		09/05/2023		File No. 09052023 BnM Derryadd v3.dwg							
														Checked		GB		28/05/2021		Drawing Status							
Client							Bord na Mona							Drawing Title							Point of Interest		6		Draft		
							81m Blade & Tower Section							Drawing No.		Notes:							Revision				
Key							SPA Location							SK06A		1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.							1				
Wheel SPA		Body SPA		Load SPA		Indicative		Over-run		Over-sail																	
							Proposed Site Access																				

## Appendix B Proposed future road upgrade works as part of Part 8 Application by Roscommon County Council

Blade  
Option 2



Tower  
Option 2



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							Drawn		GB	14/12/2023	File No. 231023 BnM Derryadd v4.dwg										
							Designed		TL	14/12/2023											
							Checked		GB	28/05/2021	Drawing Status			Draft							
							Point of Interest		3												
Client							Bord na Mona			Drawing Title			81m Blade & Tower Section			Drawing No.		Notes:		Revision	
Key							SPA Location							SK03D	1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.					2	
	Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail															
							N61 / N63 Roundabout – Potential Future Road Layout														





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							Derryadd Wind Farm							Drawn		GB		14/12/2023		1:1_1 @ A3		
														Designed		TL		14/12/2023		File No. 231023 BnM Derryadd v4.dwg		
														Checked		GB		28/05/2021		Drawing Status		
Client							Drawing Title					Point of Interest		3		Draft						
Bord na Mona							81m Blade & Tower Section					Drawing No.		Notes:		Revision						
Key												SK03E		1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.		2						
							SPA Location															
							N61 / N63 Roundabout – Potential Future Road Layout															
												</										



Blade  
Option 2









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									Drawn		GB		14/12/2023		File No.		231023 BnM Derryadd v4.dwg										
									Designed		TL		14/12/2023														
									Checked		GB		28/05/2021		Drawing Status		Draft										
Client							Bord na Mona							Drawing Title		81m Blade & Tower Section											
														Point of Interest		4											
														Drawing No.		Notes:							Revision				
														SK04B		1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.							2				
Key							<div><div></div><div></div><div></div><div></div><div></div><div></div></div>							SPA Location							N61 Roscommon Arts Centre Roundabout – Potential Future Road Layout						
							<div><div>Wheel SPA</div><div>Body SPA</div><div>Load SPA</div><div>Indicative</div><div>Over–run</div><div>Over–sail</div></div>																				





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							Drawing Title				81m Blade & Tower Section		Drawn	GB	14/12/2023	File No. 231023 BnM Derryadd v4.dwg				
													Designed	TL	14/12/2023					
													Checked	GB	28/05/2021					
Client							Bord na Mona							Drawing Status		Draft				
Key							SPA Location		N61 Roscommon Arts Centre Roundabout – Potential Future Road Layout							Drawing No.	SK04C	Notes:	Revision	
	Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail										1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.		2		





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		Drawing Title		81m Blade & Tower Section		Drawn		GB	14/12/2023
		SPA Location		N61 Roscommon Arts Centre Roundabout – Potential Future Road Layout		Designed		TL	14/12/2023
						Checked		GB	28/05/2021
Client		Bord na Mona		Point of Interest		4		Drawing Status	
								Revision	
Key						Drawing No.		Notes:	
						SK04D		1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.	
								2	



Blade  
Option 2



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Client							Bord na Mona		Drawing Title		81m Blade & Tower Section		Point of Interest		5	Draft																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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Tower  
Option 2



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		Derryadd Wind Farm		Drawn		GB	14/12/2023	1:1_1 @ A3						
				Designed		TL	14/12/2023	File No. 231023 BnM Derryadd v4.dwg						
				Checked		GB	28/05/2021	Drawing Status						
Client		Bord na Mona		Drawing Title		Point of Interest		Draft						
				81m Blade & Tower Section										
Key							Notes:		Revision					
	Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail	1. All mitigation is subject to confirmation through a test run. 2. This is not a construction drawing and is intended for illustration purposes only. 3. Where indicative road edges are provided, mitigation should be confirmed through a test run or topographical survey.		2					
				SPA Location		Drawing No. SK05C								
				N61 / N63 Roundabout – Potential Future Road Layout										

Key						
	Wheel SPA	Body SPA	Load SPA	Indicative	Over-run	Over-sail

