

KILLEAN WIND FARM

ABNORMAL LOADS ROUTE ASSESSMENT (ALRA)

Prepared on behalf of Renewable
Energy Systems Ltd

MAY 2024

MEINHARDT



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01

INTRODUCTION

BACKGROUND

Meinhardt (UK) Ltd (MHT) has been commissioned by Renewable Energy Systems Limited (RES) to undertake an Abnormal Loads Route Assessment (ALRA) to support feasibility studies and a subsequent planning application for the proposed Killean Wind Farm (KWF) located approximately 25km north of Campbeltown, Argyll and Bute. The ALRA focusses on abnormal load vehicle movements only and does not consider general construction traffic.

KWF is currently proposed to include a total of 9 wind turbines with a maximum tip height of 180m. The candidate turbine considered within this ALRA is the Siemens SG155 turbine.

SITE LOCATION

The KWF site (the site) is located off of the A83 Trunk Road (T) approximately 25km to the north of Campbeltown, Argyll and Bute. The site is accessed from the A83 (T) via a private access track. For planning purposes the red line boundary includes the private access track and a 10m buffer on both sides to allow for track widening and vegetation clearance if required.

The site location is shown in Figure 1, which includes the private access track from the A83 (T).

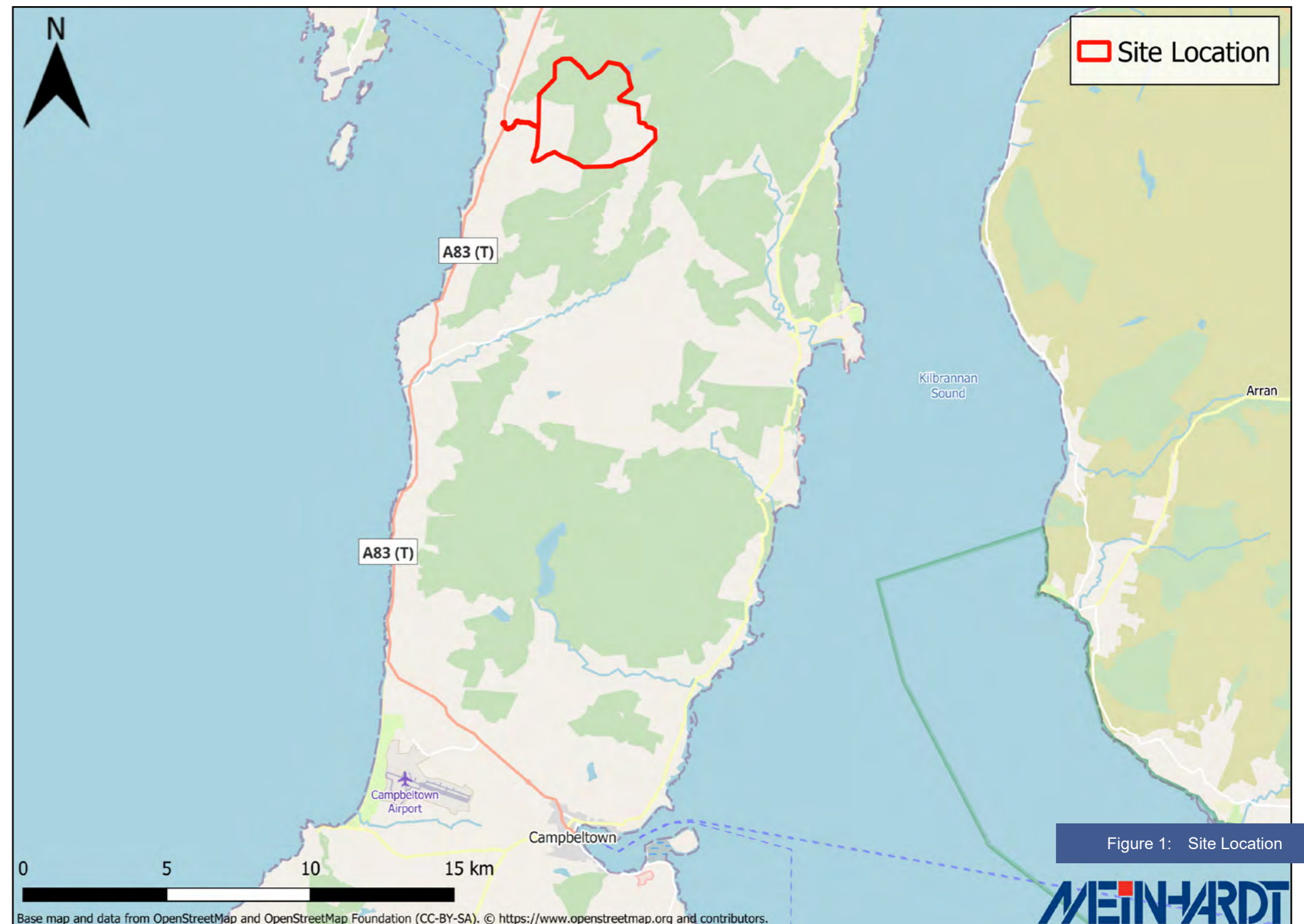


Figure 1: Site Location

Base map and data from OpenStreetMap and OpenStreetMap Foundation (CC-BY-SA). © <https://www.openstreetmap.org> and contributors.

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ABNORMAL LOADS ROUTE

The proposed abnormal loads route has been established through:

- desktop study using publicly available information including online mapping and previously submitted planning applications in the area;
- a physical route drive through which took place on Friday 9th June 2023; and
- OS Mastermap and topographical survey data along the abnormal loads route.

The route commences at Campbeltown Harbour in Argyll and Bute. This was highlighted by RES at the outset of the project as the preferred Port of Entry (PoE) for deliveries and is in-keeping with previous planning applications for wind farm development in the area. The Harbour Master at Campbeltown Harbour has confirmed that turbine components of the scale associated with the Siemens SG155 can be accommodated at Campbeltown Harbour.

Following delivery to the harbour, the turbine components can be stored at Macrihanish Airbase until an appropriate delivery time is scheduled to the site.

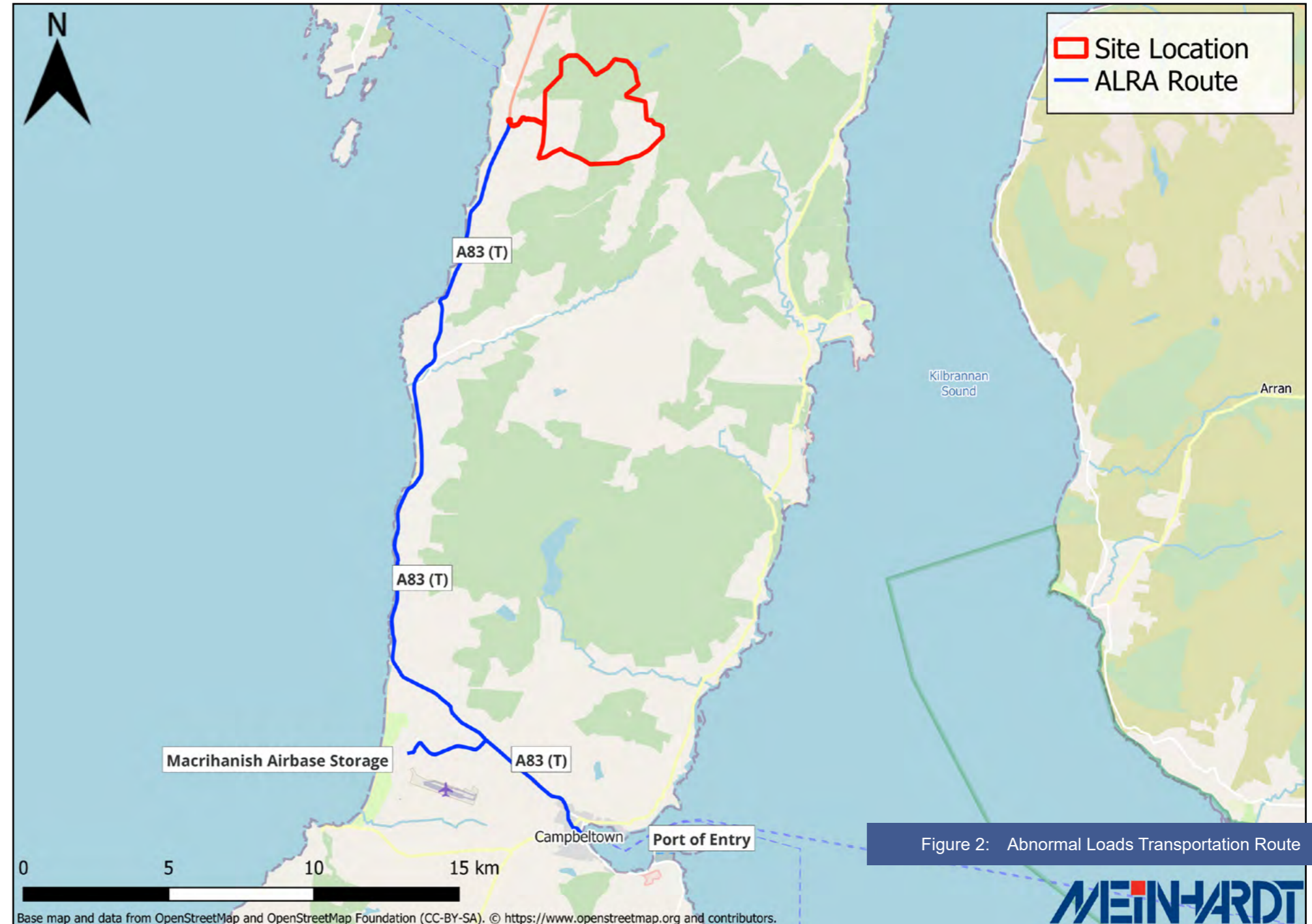
From the Harbour, abnormal load vehicles would travel through the town of Campbeltown, travelling along Hall Street before joining the A83 (T) at Kinloch Road and Millknowe Road. Approximately 3km northwest of Campbeltown the vehicles would take a left turn and travel towards the storage area set out at the airport.

At scheduled site delivery times, the vehicles would then return from the storage area along the local roads, and take a left to join the A83 (T). From here the route continues on the A83 (T) northbound towards the site which is accessed via a private access road off the A83 (T). The route is shown in its entirety in Figure 2

For the purposes of this ALRA, Transport Scotland (TS) have confirmed that only the transport of the blade component is required to be assessed at planning stage, but that assessment of the tower and nacelle components will be required prior to any deliveries.

OTHER DEVELOPMENTS

MHT are aware that other wind farms have been consented or are in the process of planning in close proximity to the site. Abnormal load deliveries for these sites are understood to follow a similar delivery route as that proposed for KWF. Depending on programme it may be that the route is upgraded by another developer prior to the construction of KWF however this assessment is based on no change to the existing road network as described in this ALRA.



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ALRA METHODOLOGY

INTRODUCTION

This section will outline the methodology which has been adopted to undertake the ALRA. This includes:

- Site visit and route drive through;
- Height restrictions;
- Candidate turbine specifications, vehicle model build and dimensions;
- Identification of horizontal pinch points; and
- Exclusions from the assessment.

SITE VISIT AND ROUTE DRIVE THROUGH

A site visit which included a full drive through of the route from Campbeltown Harbour to the site via the A83 (T) and private access track was undertaken on Friday 9th June 2023. On the day of the site visit weather conditions were clear and dry.

Dash camera footage and photographs were collected detailing the abnormal load delivery route.

HEIGHT RESTRICTIONS

Unless otherwise stated a minimum clearance of 5.03m over every part of the carriageway has been presumed. This height limit applies to structures, gantries and Overhead Lines (OHLs) on UK roads and has been extracted from the Health and Safety Executive publication for vertical clearance.

No concerns over vertical clearance have been identified other than the clearance of vegetation.

CANDIDATE TURBINE SPECIFICATIONS, VEHICLE MODEL BUILD AND DIMENSIONS

At the commencement of the project RES confirmed a preferred tip height of 180m and a candidate turbine to be considered as the Siemens SG155.

In order to undertake a fully robust assessment, the dimensions of the candidate turbine have been considered in relation to typical abnormal load components of the blade.

Along with the turbine blade component specifications, typical horizontal vehicles used for abnormal load transportation in the UK have also been utilised to produce vehicle models in AUTOCAD Vehicle Tracking Software. These are then used to prepare Swept Path Analysis (SPA) as part of the ALRA for the blade component.

IDENTIFICATION OF PINCH POINTS

Pinch points are defined as constraints on the road network which may impact the successful delivery of turbine components and therefore warrant further investigation. Examples include road narrowing, structures, junctions and street furniture / landscaping. For the purposes of this ALRA, only horizontal pinch points are taken forward for SPA in Section 3 of this report.

Initially horizontal pinch points have been identified through three approaches:

1. The use of geospatial information, which has been used to identify a presumed highway boundary (either 3m from the carriageway or to the first fence / wall line)
2. Site visit drive through
3. Desktop review

The use of geospatial information has been considered to create a simplified vehicle model to run along the route. This simplified vehicle model incorporated the blade only, as the most robust turbine component in terms of length. The simplified blade model does not incorporate rear steer and therefore creates a robust version of the detailed model used for SPA, included in Section 3. The simplified model has been run along the centreline of the delivery route to identify where clashes with the highway boundary occur. This highlights a potential horizontal pinch point along the route. This is then considered further via information gained through the site visit and desktop review to determine if each horizontal pinch point identified using the simplified blade model is valid.

Through this process a total of 23 horizontal pinch points locations have been identified on the public road network as requiring SPA to confirm suitability and potential requirement for mitigation to accommodate abnormal loads associated with the project. Six of these pinch points are located along the route between the A83 (T) and Macrihanish Airbase, and are therefore covered once in each direction (29 total pinch points to be assessed). These are shown in Figure 3 and Figure 4.

The SPA demonstrates an abnormal load vehicle transporting the blade manoeuvring at each identified pinch point to show if any oversail or overrun of the road carriageway and presumed highway boundary occurs.

Potential vertical pinch points have been considered through desk top study and the site visit undertaken. At this stage, no detailed vertical assessment has been undertaken as per the scope of this ALRA. There are no signposted road gradient warning signs along the entire route. As such it is presumed that there are no gradient issues to contend with on the public road network.

EXCLUSIONS FROM ASSESSMENT

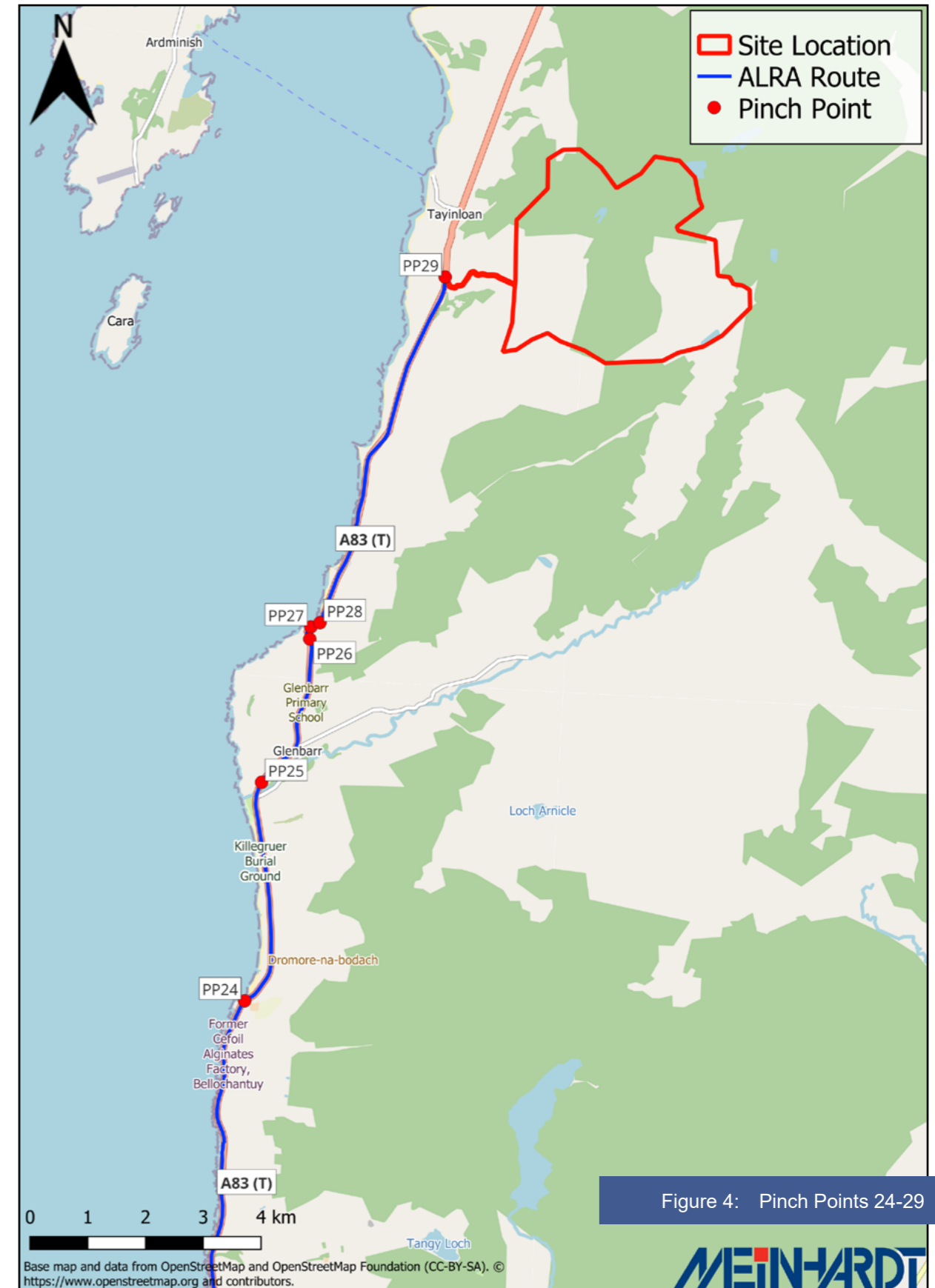
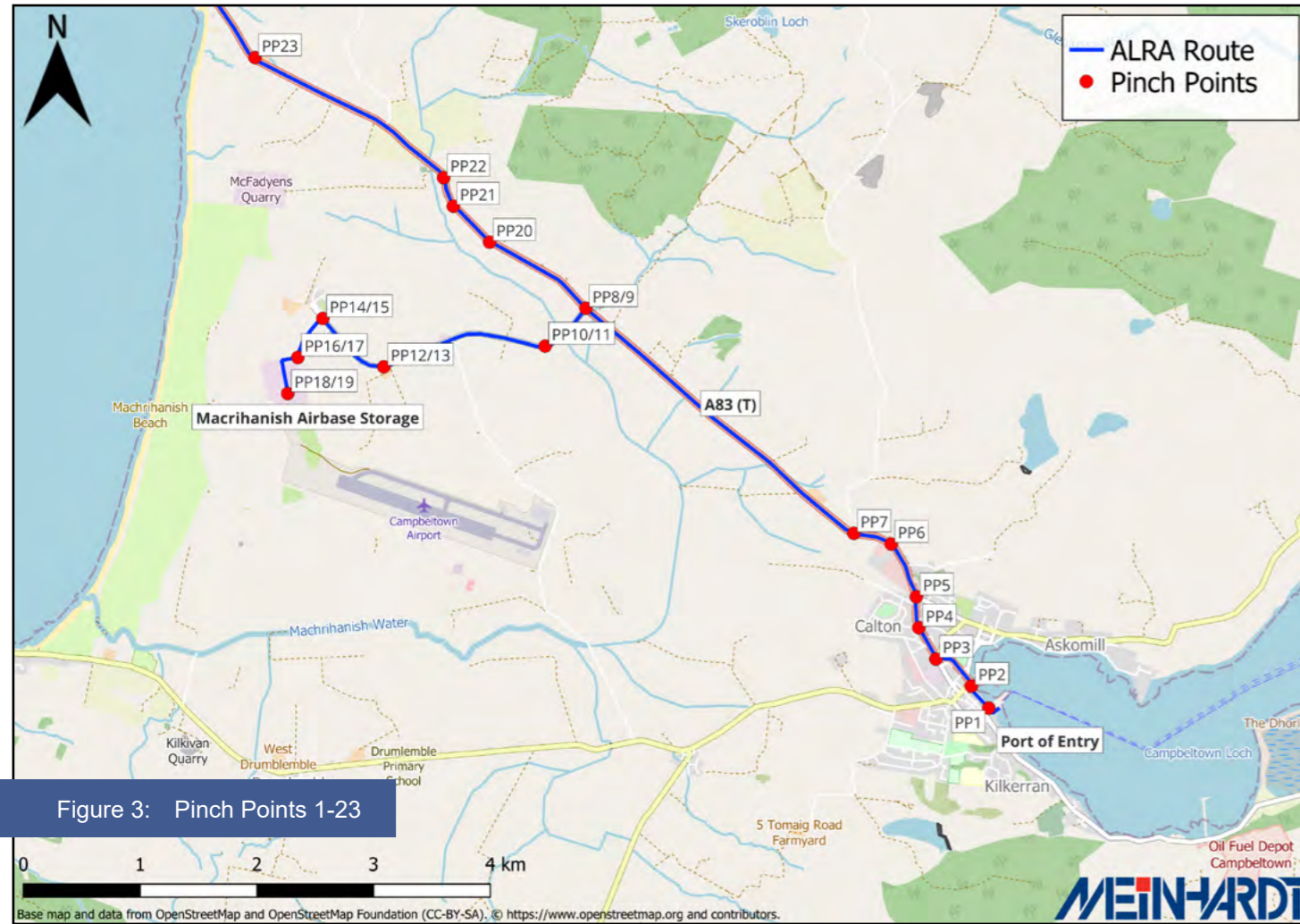
Whilst this ALRA provides a high level review of feasibility of the transportation of Siemens SG155 blade to the KWF site, there are a number of aspects which would require further consideration at a detailed level. These aspects, alongside the work contained within this ALRA, would require to be agreed by an eventual appointed haulier who would undertake the transportation of abnormal loads to site.

Exclusions include:

- No load capacity assessments have been undertaken on bridges or structures along the primary route nor on the road pavement itself.
- No dry run of the route has been undertaken by a haulier.
- No engagement with stakeholders has been undertaken specific to this ALRA other than with Campbeltown Harbour master.

The above tasks require to be undertaken at the next stage of the KWF project.





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ALRA RESULTS

INTRODUCTION

This section of the ALRA provides the results of the SPA exercise carried out and forms the main basis of the report conclusions. SPA of abnormal load transfer has been undertaken by RES Engineering Team with results reviewed by MHT. As identified in Chapter 2, a total of 29 horizontal pinch points have been considered on the adopted road network (23 individual locations). Drawings demonstrating the results of the SPA are included in Appendix A of this report.

RISK RATING

A Red / Amber / Green risk rating is applied to each horizontal pinch point to provide a simple method of categorising the risk at each pinch point. The risk ratings are defined as below:

- Green (Low Risk): Component can get past the obstacle with no need for land take, modification or street furniture removal. Manual (rear) steering may be required. Oversail within presumed highway boundary is acceptable;
- Amber (Medium Risk): Minor works required – street furniture removal, vegetation trimming, over run on highway boundary etc;
- Red (High Risk): Action required – 3rd party land required, modification of road network or other infrastructure required, the component cant make it past the obstacle without significant mitigation.
- Black (Severe Risk): Major risk to project - Potential damage to property or demolition requirement. Health and safety risk

Table 1 provides a summary of the risk rating applied to each turbine component at each horizontal pinch point.

Table 1: Risk Rating Summary

Pinch Point	Description	Blade
1	Campbeltown Harbour	Amber
2	Campbeltown Market Cross	Amber
3	Kinloch Road to Millknowe Road	Red
4	Millknowe Road	Amber
5	Millknowe Road to Tarbert Road	Amber
6	Left Bend A83 (T) North of Campbeltown	Green
7	Right Bend A83 (T) North of Campbeltown	Green
8	Left Turn A83 (T) to Macrihanish Airbase	Red
9	Left Turn Macrihanish Airbase to A83 (T) (Reverse PP8)	Red
10	Right Bend Macrihanish Airbase 500m from A83 (T)	Green

Pinch Point	Description	Blade
11	Left Bend Macrihanish Airbase 500m from A83 (T) (Reverse PP10)	Green
12	Right Bend Macrihanish Airbase 2,000m from A83 (T)	Green
13	Left Bend Macrihanish Airbase 2,000m from A83 (T) (Reverse PP12)	Green
14	Left Turn into Macrihanish Airbase Storage Area	Red
15	Right Turn from Macrihanish Airbase Storage Area (Reverse PP14)	Red
16	Right Turn entering Macrihanish Airbase Storage Area	Green
17	Left Turn exiting Macrihanish Airbase Storage Area (Reverse PP16)	Green
18	Entering Storage Bay in Macrihanish Airbase	Green
19	Exiting Storage Bay in Macrihanish Airbase	Green
20	Right Bend A83 (T) North of Glencraigs	Green



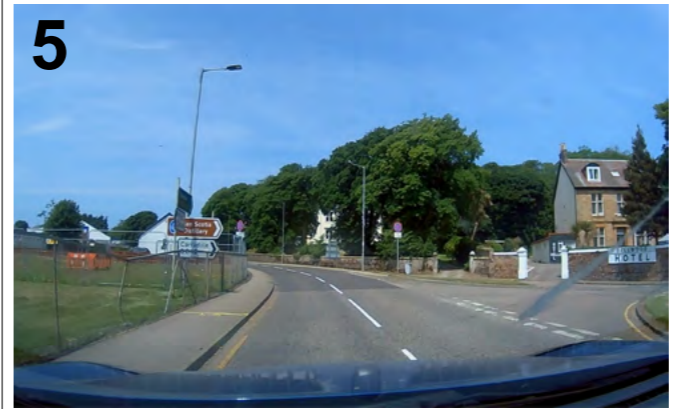
Pinch Point	Description	Blade
21	Right Bend A83 (T) South of Kilchenzie	Green
22	Left Bend A83 (T) South of Kilchenzie	Orange
23	Right Bend A83 (T) South of Westport	Red
24	Right Bend A83 (T) at Bellochantuy	Green
25	Right Bend A83 (T) South of Glenbarr	Green
26	Left Bend A83 (T) North of Glenbarr	Orange
27	Right Bend A83 (T) South of Muasdale	Red
28	Left Bend A83 (T) South of Muasdale	Green
29	Right Turn from A83 (T) to Private Access Track	Red




ALRA RESULTS




SPA has been undertaken at the identified pinch points to establish the feasibility of transporting each Siemens SG155 blade through each pinch point. SPA considers horizontal alignment predominantly and has been undertaken using OS mapping which typically has an accuracy of plus / minus 1 metre. The full SPA results, including mitigation measures recommended, are included in drawings provided in Appendix A and summarised in Table 2. Note, RES have also utilised topographical survey data at a total of five of the identified pinch points. Where topographical survey data has been provided this has been used in favour of OS mapping due to the greater degree of accuracy provided. The pinch points which have been analysed over topographical survey data are pinch point numbers 3, 22, 23, 26 and 27.




Table 2: ALRA SPA Results Summary




Pinch Point	Turbine Component
	Blade
	Removal of street furniture: Street Lighting, Railing
	Removal of street furniture: Street Lighting, Bench, Bollards

Pinch Point	Turbine Component
	Blade
	Load bearing surface to be laid. Removal of street furniture: Street Lighting, Signage, Railing
	Load bearing surface to be laid on grass verge. Removal of street furniture: Street Lighting, Signage
	Removal of street furniture: Street Lighting, Bench




Pinch Point	Turbine Component
	Blade
<p>6</p> 	
<p>7</p> 	
<p>8</p> 	<p>Oversail 3rd party land. Access gate to be removed.</p>




Pinch Point	Turbine Component
	Blade
<p>9</p> 	<p>Load bearing surface to be laid. Access gate to be removed.</p>
<p>10</p> 	
<p>11</p> 	


Pinch Point	Turbine Component
	Blade
<p>12</p> 	
<p>13</p> 	
<p>14</p> 	<p>Load bearing surface to be laid on grass verge. Fence post to be removed.</p>

Pinch Point	Turbine Component
	Blade
<p>15</p> 	<p>Load bearing surface to be laid on grass verge. Fence post to be removed. Street lighting to be removed.</p>
<p>16</p> 	
<p>17</p> 	

Pinch Point	Turbine Component
	Blade
<p>18</p> <p>Within Machrhanish Airbase</p>	
<p>19</p> <p>Within Machrhanish Airbase</p>	
 <p>20</p>	

Pinch Point	Turbine Component
	Blade
 <p>21</p>	
 <p>22</p>	<p>Vegetation to be cleared. Street signage to be removed.</p>
 <p>23</p>	<p>Removal of stone wall and fence. Load bearing surface to be laid.</p>

Pinch Point	Turbine Component
	Blade
 <p>24</p>	
 <p>25</p>	
 <p>26</p>	Vegetation to be cleared.

Pinch Point	Turbine Component
	Blade
 <p>27</p>	Load bearing surface to be laid. Land reprofiling and ditch culverting required.
 <p>28</p>	
 <p>29</p>	Load bearing surface to be laid. Land reprofiling required.

CONCLUSIONS

The results of the SPA highlight that parts of the abnormal load access route are feasible either with no mitigation required, or with only minimal levels of mitigation required. These pinch points are 1 and 2, 4 to 7, 10 to 13, 16 to 22, 24 to 26, and 28.

Pinch point numbers 3, 8 and 9, 14 and 15, 23, 27 and 29 are identified as high risk due to the requirement to oversail or overrun assumed 3rd party land. The applicant is currently undergoing stakeholder engagement in relation to these landtake requirements.

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CONCLUSIONS AND NEXT STEPS

SUMMARY AND CONCLUSIONS

This Abnormal Loads Route Assessment (ALRA) has been prepared to support a forthcoming planning application and provide a feasibility review of the transportation of the Siemens SG155 to Killean Wind Farm (KWF), located 25km to the north of Campbeltown, Argyll and Bute. One abnormal loads route has been reviewed from Campbeltown Harbour along the A83 (T) via Machrihanish Airbase to the site access.

Meinhardt (MHT) are aware that another wind farm has been consented in close proximity to the site. Abnormal load deliveries for the consented site are understood to follow a similar delivery route as that proposed for KWF. Depending on programme it may be that the route is upgraded by another developer prior to the construction of KWF. This ALRA is based on no change to the existing road network.

The ALRA methodology includes:

- A site visit and route drive through carried out on 9th June 2023;
- A review of height restrictions along the route;
- Candidate turbine specifications, vehicle model build methodology and vehicle and turbine dimensions; and
- Identification of horizontal pinch points based on the site visit and drive through, publicly available information and through the use of an automated vehicle model run on the route centre line.

It has been identified that a total of 23 pinch points would require to be traversed along the abnormal load access route on the adopted road network and access to a storage area at Machrihanish Airbase. Six of these pinch points are located along the access to road to the Airbase, and as such have also tracked in the opposite direction (29 total pinch points).

Following the identification of horizontal pinch points, Swept Path Analysis (SPA) has been undertaken at each using vehicle models of the blade component mounted on the vehicles which would typically be used to carry them by a specialist haulier.

The results of the SPA highlight that parts of the abnormal load access route are feasible either with no mitigation required, or with only minimal levels of mitigation required. These pinch points are 1 and 2, 4 to 7, 10 to 13, 16 to 22, 24 to 26, and 28.

Pinch point numbers 3, 8 and 9, 14 and 15, 23, 27 and 29 are identified as high risk due to the requirement to oversail or overrun assumed 3rd party land. The applicant is currently undergoing stakeholder engagement in relation to these landtake requirements

APPENDIX A

**SWEPT PATH
ANALYSIS**



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