

Debbie Flaherty
Consents Manager
Energy Consents Unit
The Scottish Government
By Email Only: Debbie.flaherty@gov.scot

11th October 2022

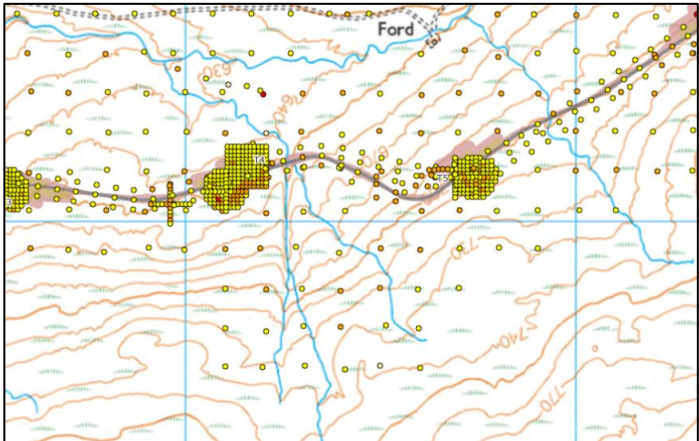
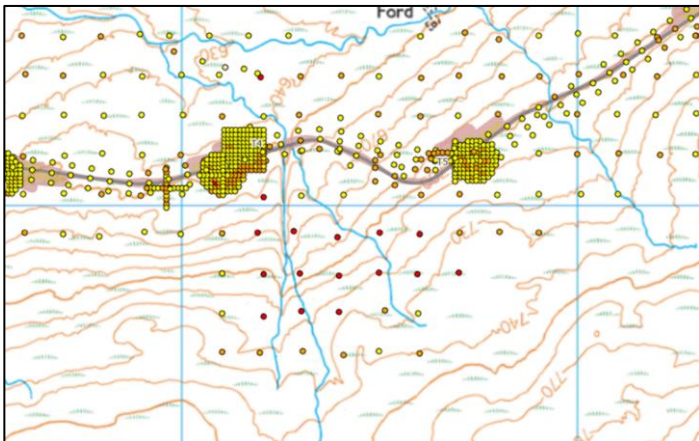
Dear Ms Flaherty,

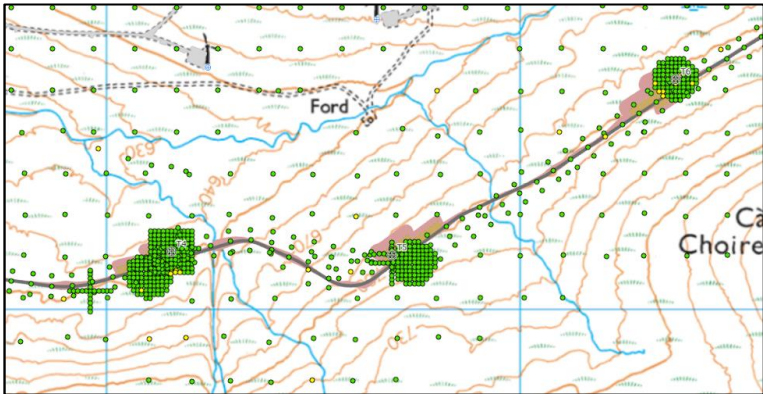
ECU00002175: Proposed Corriegarth 2 Wind Farm Supplementary Environmental Information (SEI): Response to Ironside Farrar Stage 1 Checking Report – Review of Peat Slide Risk Assessment

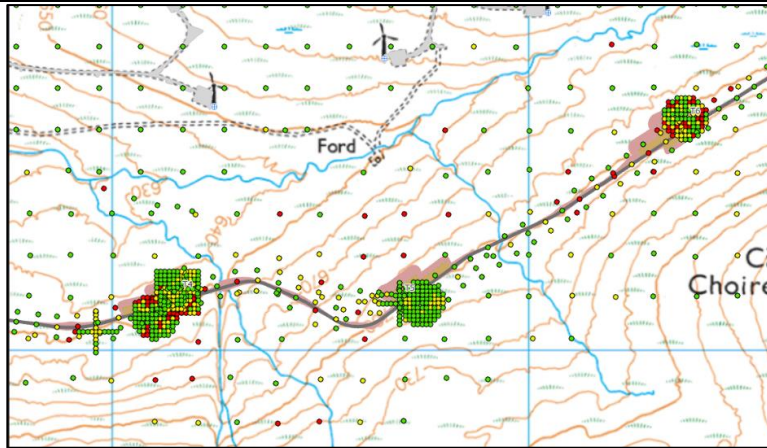
In reference to the above project, Arcus Consultancy Services Ltd (Arcus) has prepared this clarification letter in response to the Ironside Farrar Ltd Stage 1 Checking Report (the Checking Report) dated August 2022. This response supersedes the previous 'draft' version circulated on 28th September, and has been informed by discussion with Ironside Farrar and the Energy Consents Unit (ECU) on 30th September 2022.

The Checking Report was submitted in response to the Section 36 application for Corriegarth 2 Wind Farm ('the Development') SEI submitted to the Energy Consents Unit (ECU) in April 2022. The Checking Report provided comment on the Peat Slide Risk Assessment (PSRA) included as Technical Appendix 13.1 within the SEI. The Ironside Farrar recommendations and subsequent Arcus clarifications are summarised in the table below.

IF Recommendation (requiring response)	Arcus Response
<i>Deviations from the 2017 Peatland Survey Guidance require justification, particularly the track to T16 which appears to be in a higher likelihood area.</i>	The vast majority of the site has been probed in full accordance with the 2017 Peatland Survey Guidance. The deviation from the guidance is limited solely to the section of track at T16 track, and is a surveying oversight (due to the survey focus on new SEI infrastructure and areas identified as lacking from the EIA checking report). There was probing within this area but not to the extent stated within the guidance. To address this, a conservative approach has been taken and the area zoned as a conservative higher likelihood and the track proposed as floating due to the peat depths and permissible gradients. This approach ensures the avoidance of peat excavation, which in turn reduces the risk of slide. It is noted the majority of probes within the zone were recorded as Low peat slide risk. Pre-construction intrusive ground investigations will take place which will provide gather further data in the areas of T16 track and will inform any potential additional mitigation designed during the detailed design stage. Further detail on mitigation is outlined below.

<i>Geomorphology mapping to be updated in line with ECUBPG 4.4.1.</i>	Figure 13.1.4 of the SEI presents the geomorphology mapping. Geomorphology mapping illustrates top and bottom of key slopes, watercourses and polygon extents of haggings/cracks due to the extensive nature of such features. Clarification Figure 1 appended to this letter presents the geomorphology mapping within the site with the addition of existing drainage features now included. Clarification Figure 1 also presents locations of the potential historical slide referenced in the PSRA report submitted with the SEI. Clarification Figure 1 has been prepared based on documented site survey details and aerial photography.
<i>Confirmation on why "slip material" has not been used in any of the calculations despite it being encountered south of the site.</i>	Underlying substrate estimates were used in the calculations. The consistent nature of the cracks and hags is indicative of areas of extensive erosion/haggings/bare peat rather than slip material. The 'slip material' referenced in the PSRA report was out with the footprint of the proposed infrastructure area by distances between 200m and 300m respectively, therefore the closest probes directly beneath the development took precedent over the wider area in terms of the substrate values used. The use of slip material value has been assessed for the relevant probes in further analysis to ascertain the potential changes this could have on hazard assessment. This was the only part of the site that this approach was relevant for as no other possible historic slides were noted across the wider site, and the likelihood is that it was due to the local steepness given the steep topography and surrounding ground/surface conditions to the south of T4 and T5 and associated tracks. The extracts below present the 'without' and 'with' ratings. Plate 1a: Without 'Slip Material' Substrate Value – Extract at T4 and T5  Plate 1b: With 'Slip Material' Substrate Value – Extract at T4 and T5 

	The probes within the vicinity of the possible historical slip materials presented high risk when the 'slip material' substrate value was used in the analysis. However, this area is upslope of the development footprint, approximately 240 m from the nearest element of infrastructure, and no works are proposed in these areas associated with the wind farm construction. In addition, the southern site area is well drained by watercourses, as apparent from the above map, and the topography is sloping, from south to north, with peat coring recording low-medium Von Post values also. It is also proposed that the area be fenced off to ensure that there will be no inadvertent excavation or access. While the potential for peat slide is greater in the area of the 'possible historical slide', the potential human activities representative of triggering factors for slide will be reduced through mitigation. The mitigation will include 'no stockpile zones'; limiting the movement of heavy plant/tracking; installation of pre-drainage ditches; and preventing access to areas of high risk peat slide which are located out with the footprint but upslope of the development. The construction drainage measures will remain in place and will continue to provide mitigation long term, throughout the operational period. A mitigation plan has been developed to illustrate the mitigation approach to be adopted during construction; these measures are illustrated in Clarification Figure 3 (and 3a – 3d) in Appendix A of this letter.
<i>FoS analysis has not used the most conservative literature values, it has also only considered a drained analysis. Mapping does not show elevated risk at the south of the site where potential historic slips are noted. Therefore, comment is requested on why more conservative values haven't been used and whether sensitivity analysis using the undrained equation, including loading, would represent a realistic worst case scenario for the floating track sections.</i>	Following the analysis and review of the comments from Ironside Farrar, the focus of the response was the southern site area, in the vicinity of T3 to T6, where the PSRA hazard zones were presented as medium risk areas. Given the extent of erosion, drainage and ditches, and sloping conditions in the south of the site, the peat was assessed as being relatively well drained. Coring in the southern site area suggested that only the deepest peat close to the substrate interface was of moderate to strong decomposition (Von Post Scale of H7-H8) with the top 1.0m largely recording Von Post scale of H3 to H4; very slightly and slightly decomposed. The peat cores obtained in this area also held their form and did not represent a slurry state. The evidence from coring and site conditions informed the use of a mean value for friction and cohesion as opposed to the worst case scenario. However, a sensitivity analysis has been undertaken using the most conservative literature values to assess the difference in the FoS assessment values. Generally, the sensitivity analysis indicated that the use of the lower conservative values would present localised High risk areas, which were largely concentrated to the southern turbines specifically T4 and T6, and some sections of track. Plate 2a: FoS using mean literature Cohesion and Friction Values – Extract at T4 to T6  Plate 2b: FoS sensitivity analysis using conservative literature Cohesion and Friction Values – Extract at T4 to T6



It should be noted however that these high risk probes are still a minority within a highly populated low and locally moderate factor of safety.

Overall the high risk probes lie within areas already conservatively zoned as Medium Hazard Risk Zones and would therefore be subject to both the detailed mitigation during construction, the use of best practices, and enhanced/location specific mitigation in line with PSRA and this letter (and associated Clarification Figure 3 (and 3a to 3d). 3

The above extracts illustrate an example of the highest-risk area within the site. The remainder of the site has been evaluated to determine if there is potential for any difference in the FoS assessment values, however no further areas of concern were identified.

The remainder of the site presents a majority of Low risk FoS points, even when utilising the conservative friction and cohesion values from literature, as opposed to the values used in the PSRA. The coring records for Von post collected throughout the survey works supported the use of a middle range friction and cohesion values, with no Von post estimation being greater than H8, although more generally were H3-H5 in the top 1.0m.

The physical observations and site survey information gathered demonstrates that the analysis and calculations used to present the zoned medium risk areas to be appropriate, and in most cases, the extent of medium risk presenting a cautious and more onerous conclusion to the assessment.

Therefore, there is no change to the conclusions of the PSRA with provision of the justification contained within this clarification letter for queries on the analysis and assessment.

The mitigation provided in Table 15 is considered generic and not specifically targeted to the risks identified in the risk assessment. Further detail / clarification of practices is required particularly in the case of medium risk zones in order to satisfy the ECUBPG.

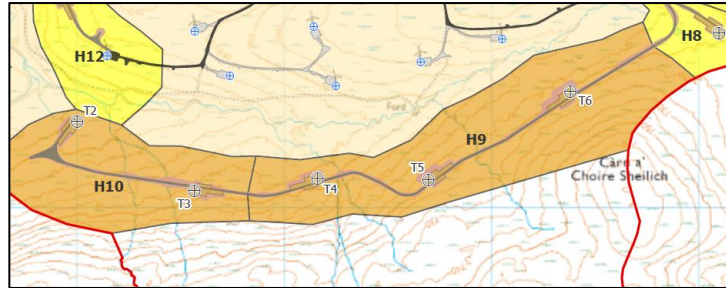
Further clarity is sought in the definition of medium risk areas displayed in figure 13.1.10, are these medium risk areas extrapolated from smaller pockets of medium risk to

Review of the hazard rank zones and hazard rank points illustrated that the medium risk zones presented in the SEI are wider than the Development footprint, and there are a number of distinctive medium risk points considered during analysis which lay within a greater population of low risk points, demonstrated in the below extracts as 'Potentially Reduced Extent of Risk Areas'. The following example extracts in Plates 3a-d illustrate how the hazard zones are an overall conservative approach with the majority of points in the 'medium risk' areas actually recorded as Low risk. The key areas for consideration were the extensively zoned medium risk areas in the south of the site, between T3 and T6 (where topography was generally steep) and a localised section at T16 (where probing was limited). The hazard zonation points across the remainder of the proposed development were almost entirely Low or negligible risk, with exception of sparsely located occasional medium risk.

Clarification Figure 2 is appended to this letter to illustrate how the zonation presents a more conservative approach against the individual point ratings where the majority of point specific ratings are Low.

display a worse case scenario? If so, more specific mitigation should be provided for infrastructure specific locations in order to satisfy the guidance.

Plate 3a: SEI Hazard Zonation Extract



SEI Hazard Points Overlaying Zonation and Potentially Reduced Extent of Risk Areas (Shown Pink Outline)

Plate 3b: T4 & T5 and Tracks

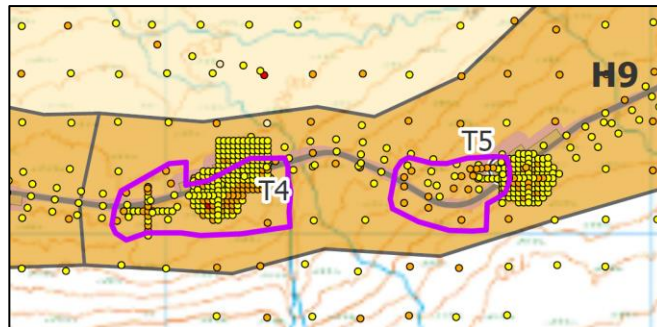


Plate 3c: T6 and Tracks

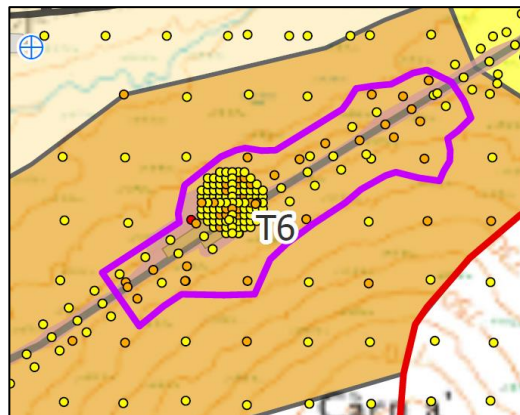
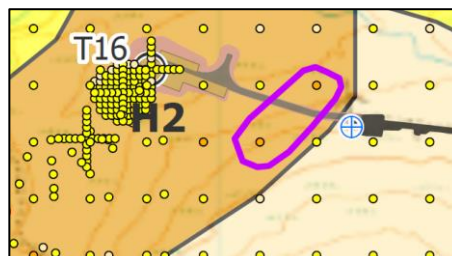


Plate 3d: T16 Tracks



Proposed mitigation is illustrated on Clarification Figure 3 (and Figure 3a to 3d) included in Appendix A of this letter. These measures presented on Clarification Figure 3 are the minimum proposals that will be in place during construction, however intrusive geotechnical investigation and detailed design will inform the

final extent of necessary drainage (catch walls or ditches) and restricted areas. It is highlighted that no temporary peat stockpiles are proposed in the south of the site. Excavation and ground disturbance works within the medium risk slide areas should be postponed during, and for a period after, heavy rainfall events, details of which will be determined in a post-consent Construction Environmental Management Plan (CEMP).

Rainfall data was presented as part of the EIA application in November 2020 within the Chapter 12 Hydrology. Long-term average rainfall data (1981 to 2010) obtained by the Meteorological Office at the Fort Augustus gauging station, located approximately 15 km to the south-west of the Development. The data is replicated in the table below.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	187.3	129.8	127.9	64.1	63.5	62.6	66.6	83.0	112.3	144.6	137.8	156.9

Weather data will be monitored throughout the construction period, as would snowfall and its impacts given the site location and elevations. Should a 'weather event' (as defined in the construction contract) occur, the contractor will stop excavation works within the medium risk areas from a health and safety, construction risk, environmental and commercial perspectives.

Specific mitigation in the areas of medium risk hazard as identified on Clarification Figure 3 (and Figure 3a to 3d) includes the following:

- Areas of medium peat slide risk will be clearly demarcated. Excavation of the ridge to form the access tracks and crane pads would take place in a controlled manner from the proposed access track route and would involve mechanical excavation only.
- Work in medium risk areas would be under supervision of the Geotechnical Clerk of Works (GCoW) and Environmental Clerk of Works (ECoW).
- Stockpiling and side casting will be prohibited in the 'no stockpile zones' within the medium risk peat slide areas as identified on Clarification Figure 3;
- Areas of stockpiling will be agreed with the GCoW and ECoW in addition to a location specific PLHRA undertaken by the Contractors design team.
- Peat storage areas will be designed to ensure they maintain the integrity of the deposited peat and do not present a risk of peat slide;
- Discharge of water from excavations on to peat, particularly to the head of peat covered slopes, will be avoided.
- Upslope of the turbine excavation/base and crane pads, peat grips and drainage ditches will be constructed to divert flows to a purpose built drainage network in order to maintain flows and prevent upslope ponding.
- Adequate drainage will be designed to cater for expected heavy rainfall events such that there is no possibility of water ponding upslope.
- No unnecessary tracking of heavy plant permitted within medium peat slide risk areas and no access within the 'No-Access' zones identified on Figure 13.1.11.
- 'No-Access' zones delineated by fencing around areas of high risk (which exist out with the footprint of the proposed development)
- Excavation and ground disturbance works within the medium risk slide areas will be suspended during and after heavy rainfall events, until it is agreed in conjunction with the GCoW and ECoW that it is appropriate to continue.
- A scheme of ground investigation will be developed at a pre-construction stage. The scope of the Site Investigation will include any additional requirements to inform peat risk mitigation measures.

The commentary from ECU / Ironside Farrer and the subsequent discussion has been useful to provide a focus on areas where additional information may be beneficial. In general, our approach to the peat analysis aligns with physical experience on site; where it does not, we have worked on the basis of a more conservative approach. We have included a number of additional mitigation measures, which will require further detailing as the investigation and design develop, but the measures detailed within this response and accompanying figures demonstrate that a solution is available to adequately mitigate peat risk.

I trust our submission addresses Ironside Farrar's comments within the Checking Report and we would welcome confirmation that this response is sufficient. If you have any further queries, please do not hesitate to contact us.

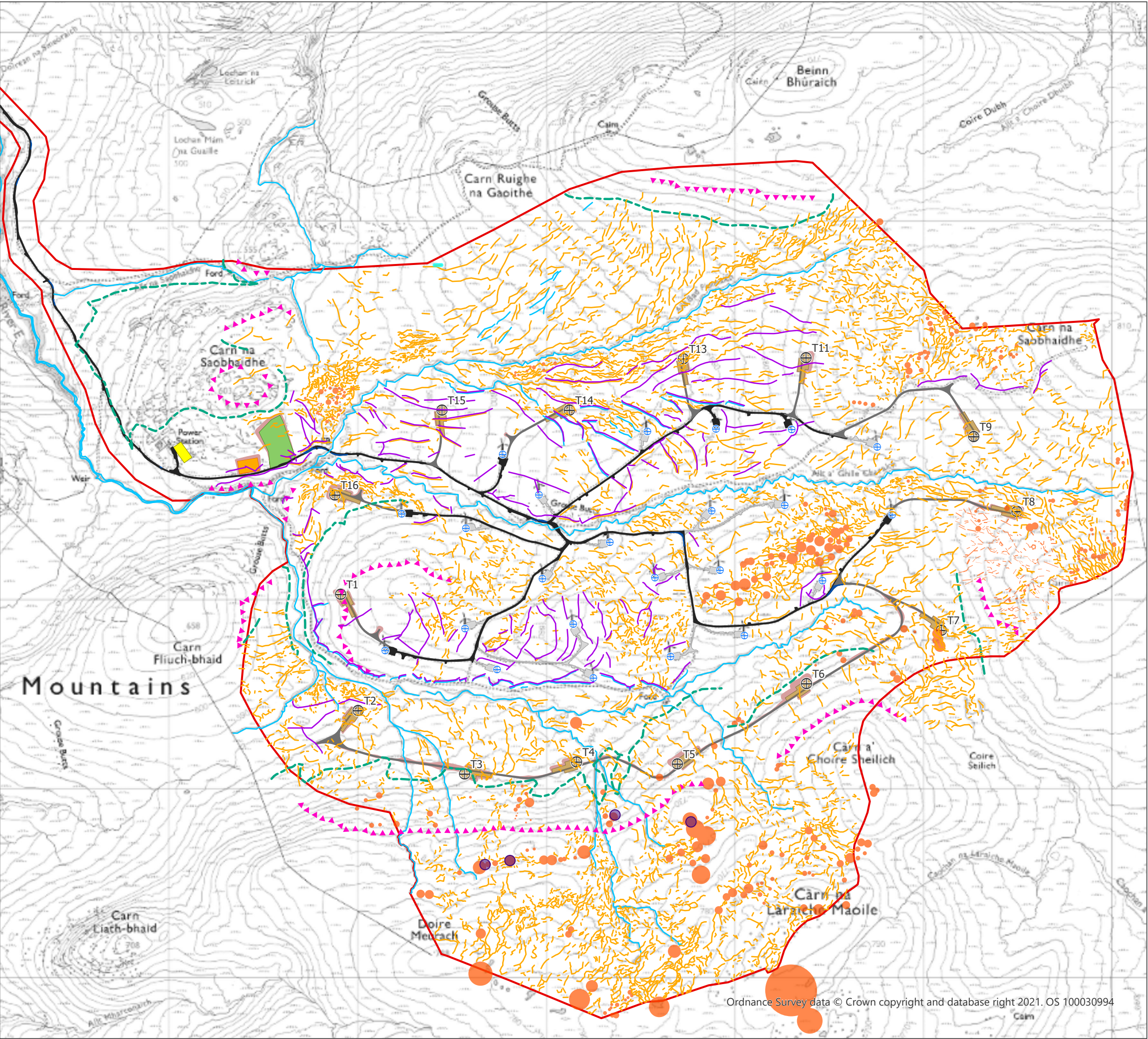
Yours sincerely,

A handwritten signature in black ink, appearing to read 'David Ballentyne', written in a cursive style.

David Ballentyne
Principal Engineer

APPENDIX A - FIGURES

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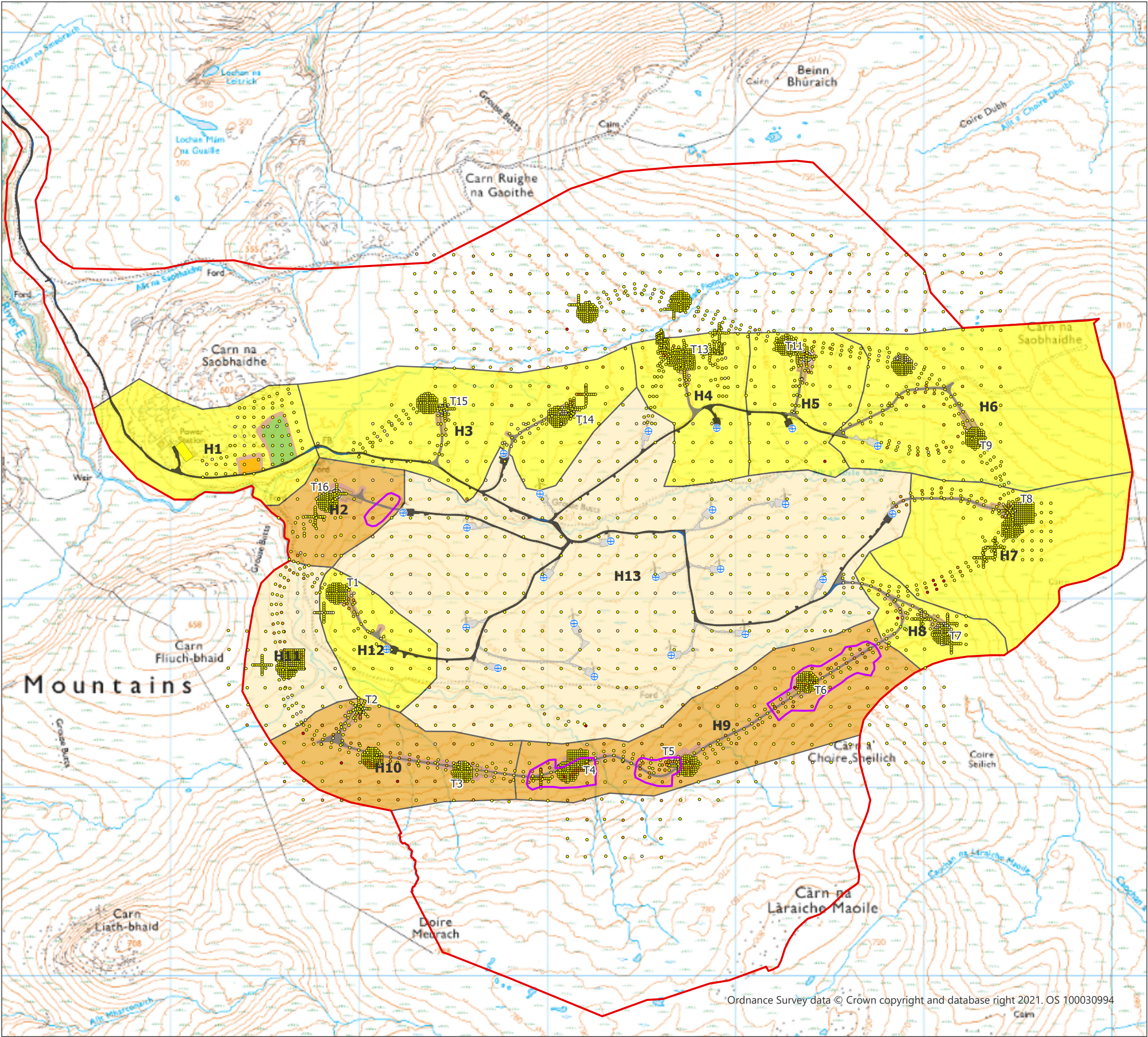
- Site Boundary
- Proposed Turbine Location
- Operational Corriegarth Wind Turbines
- Crane Hardstanding
- Access Tracks
- Existing Tracks to be Utilised
- Track Widening Area
- Construction Compound
- Existing Wind Farm Tracks
- Earthworks
- Borrow Pit
- Substation Compound
- Top of Slope
- Bottom of Slope
- Natural Watercourses
- Notable Peat Hags
- Large Areas of Exposed Peat
- Existing Drainage
- Possible Historical Slide

1:20,000 Scale @ A3
0 0.5 1 Km NORTH

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Geomorphological Map with Drainage Clarification Figure 1

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- Site Boundary
- Proposed Turbine Location
- Operational Corriegarth Wind Turbines

- Site Infrastructure
- Crane Hardstanding
 - Access Tracks
 - Existing Tracks to be Utilised
 - Track Widening Area
 - Construction Compound
 - Existing Wind Farm Tracks
 - Earthworks
 - Borrow Pit
 - Substation Compound
 - Potentially Reduced Extent of Risk Area

- Hazard Rank Points
- Negligible
 - Low
 - Medium
 - High

- Hazard Risk Zones
- Negligible
 - Low
 - Medium

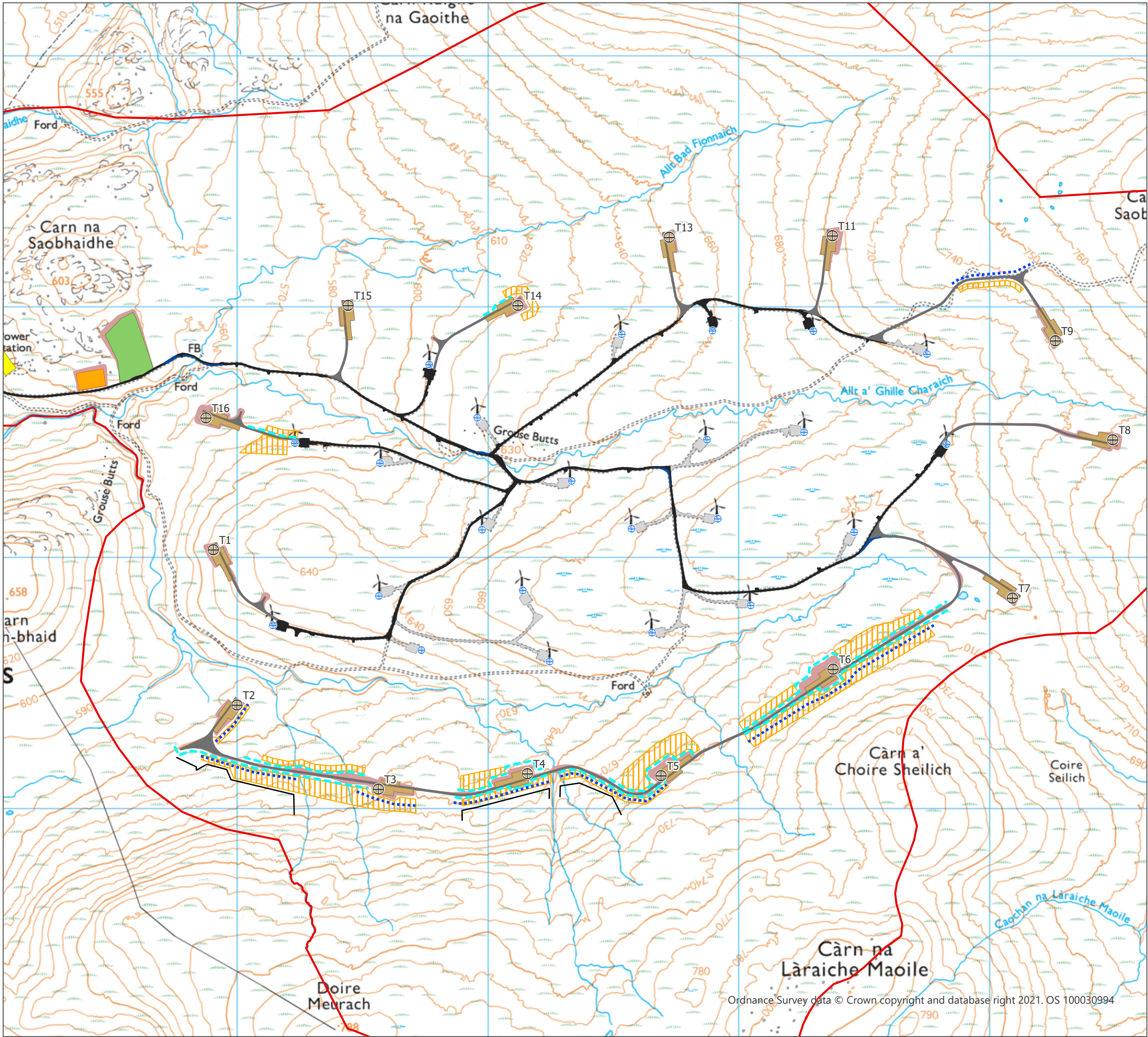


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Hazard Zonation Plan
(with Hazard Rank Points)
Clarification Figure 2

Corriegarth 2 Wind Farm
Ironsides Farrar Clarification Letter

Y:\GIS\Engineering\Projects\4643 Corriegarth 2 SEI\4643 Corriegarth 2 SEI.aprx\4643-REP-054 Fig03 Outline Mitigation Within Medium Risk Zones



- Site Boundary
- Proposed Turbine Location
- Operational Corriegarth Wind Turbines
- Delineation Fencing – No Access to High Risk Areas
- Pre-Construction Drainage
- Construction Phase Drainage*
- No Stockpile Zones
- Site Infrastructure
 - Crane Hardstanding
 - Access Tracks
 - Existing Tracks to be Utilised
 - Track Widening Area
 - Construction Compound
 - Existing Wind Farm Tracks
 - Earthworks
 - Borrow Pit
 - Substation Compound

*Construction Phase Drainage will out fall to adjacent watercourse subject to appropriate treatment

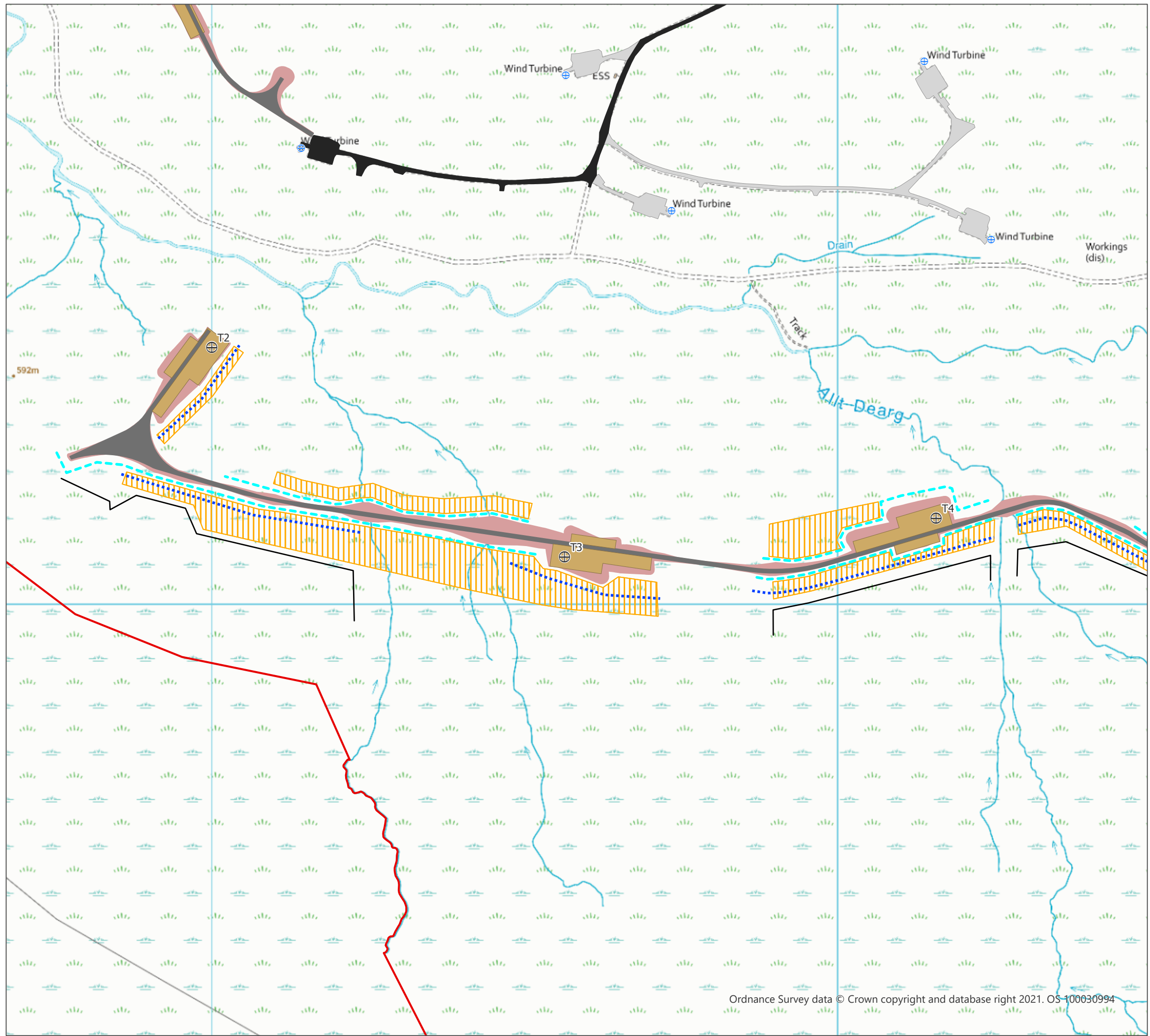


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Outline Mitigation Within Medium Risk Zones
Clarification Figure 3

Corriegarth 2 Wind Farm
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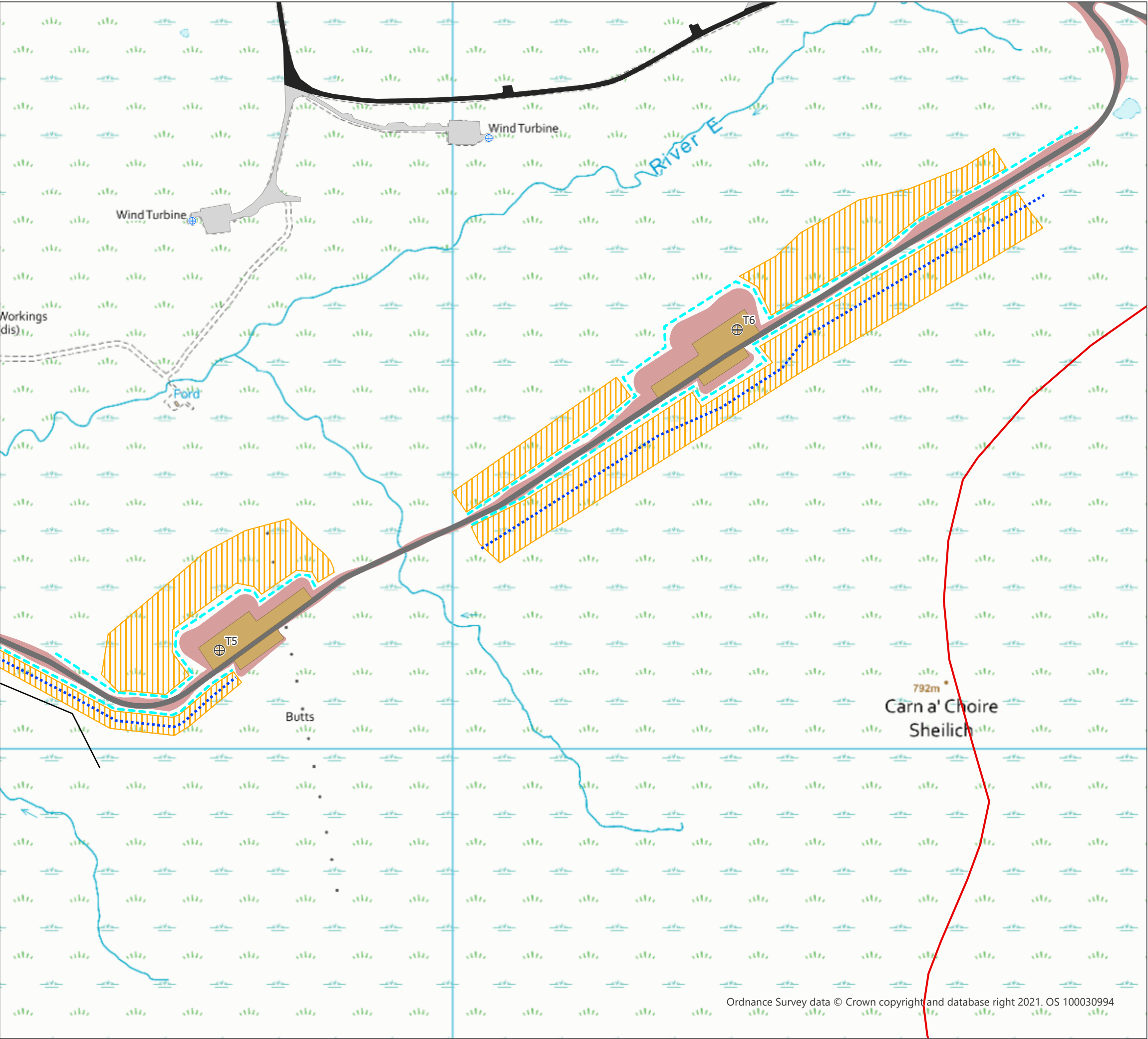


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Outline Mitigation Within Medium Risk Zones
Clarification Figure 3a

Corriegarth 2 Wind Farm
Ironsides Farrar Clarification Letter

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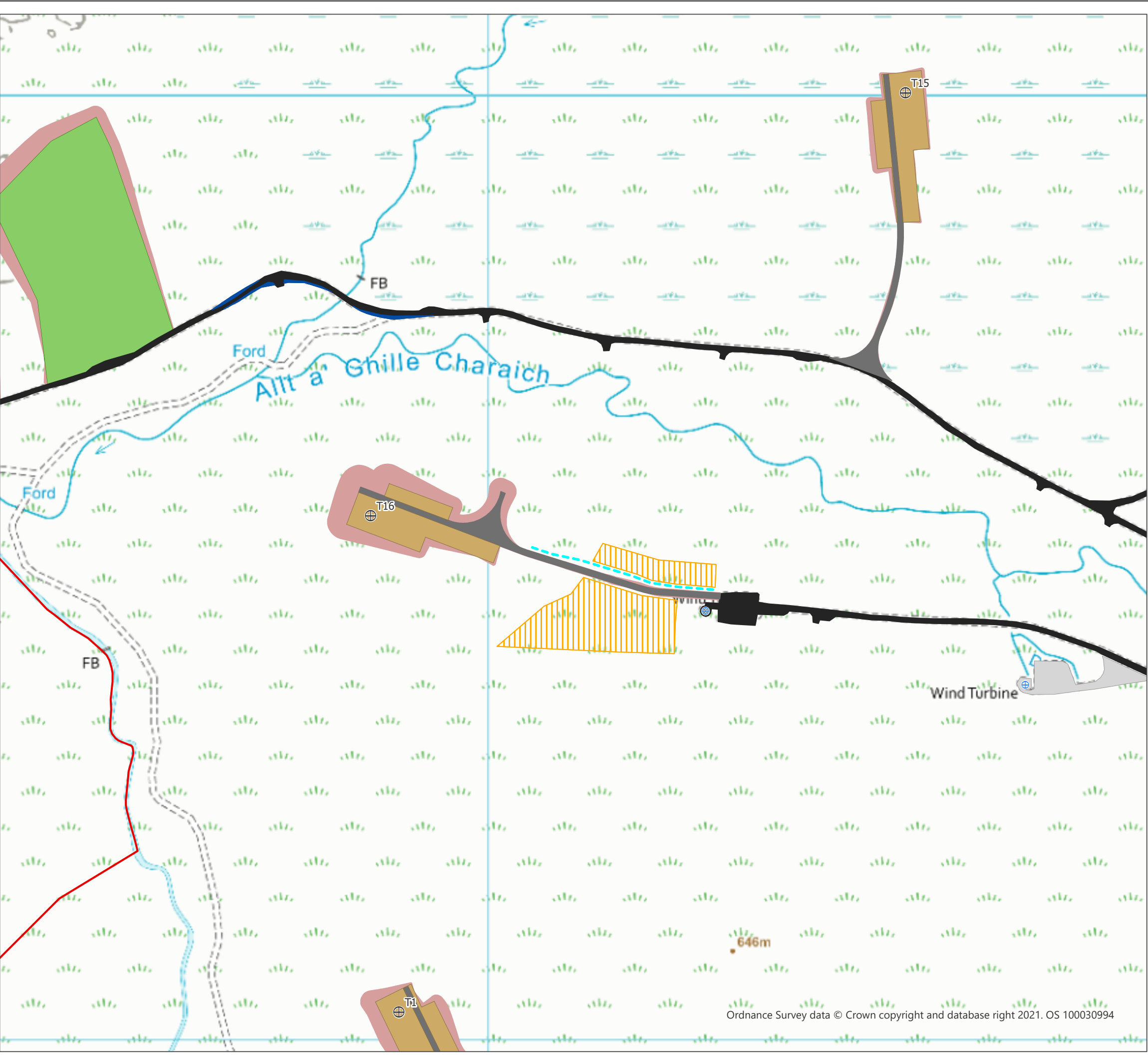


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Outline Mitigation Within Medium Risk Zones
Clarification Figure 3b

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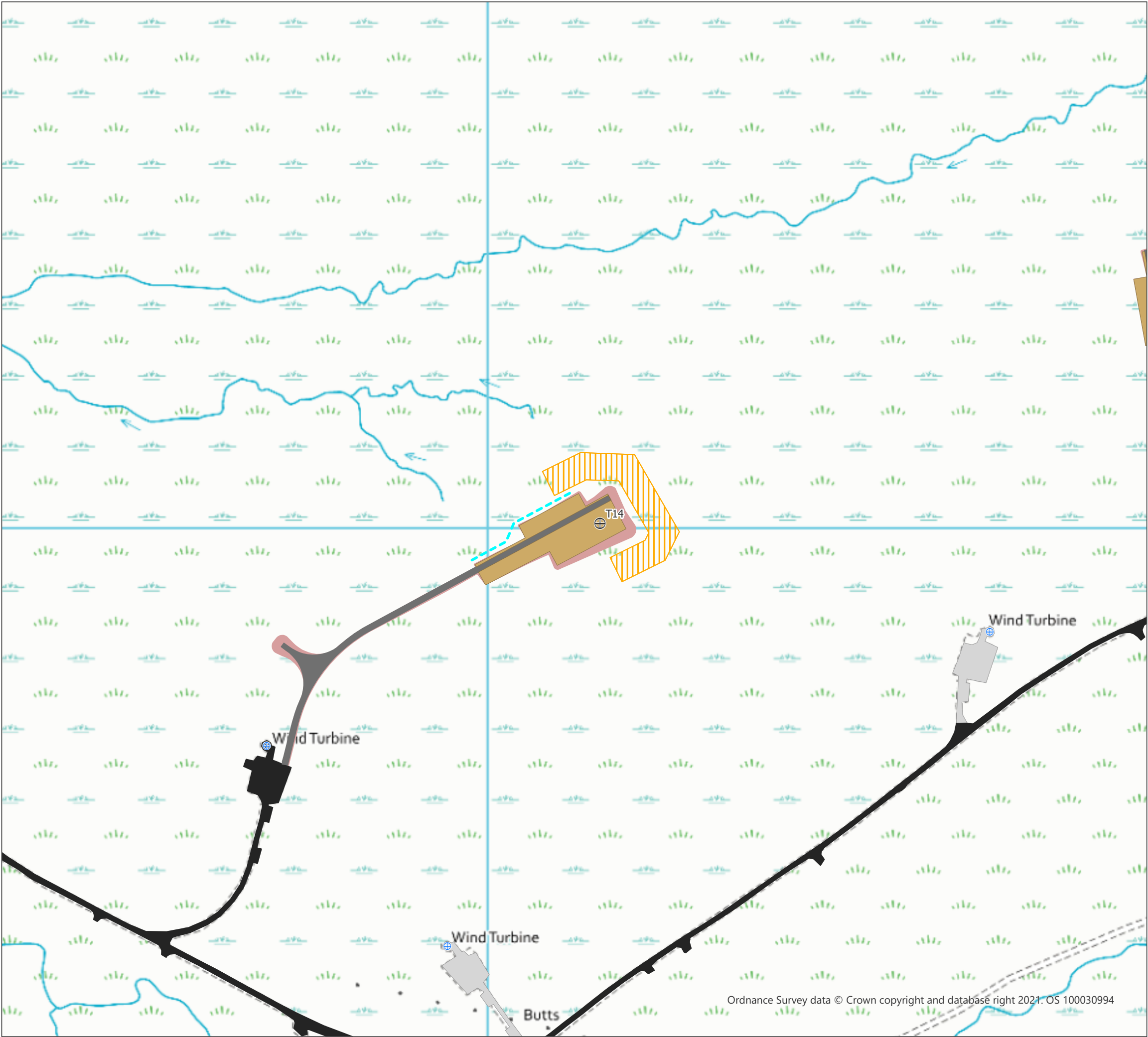


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Outline Mitigation Within Medium Risk Zones
Clarification Figure 3c

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Outline Mitigation Within Medium Risk Zones Clarification Figure 3d

Corriegarth 2 Wind Farm Ironside Farrar Clarification Letter