

Technical Appendix 1.6: Telecommunications Impact Assessment Report

Telecommunications Impact Assessment

Ramboll UK Limited
Ravengill Energy Park
May 2026

PLANNING SOLUTIONS FOR:

- Solar
 - Telecoms
 - Railways
- Defence
 - Buildings
 - Wind
- Airports
 - Radar
 - Mitigation

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ADMINISTRATION PAGE

Job Reference:	15246A1
Author:	Waqar Qureshi
Email:	waqar@pagerpower.com

Reviewed By:	Adam Hardie; Abdul Wadud
Email:	adam@pagerpower.com; abdul@pagerpower.com

Issue	Date	Detail of Changes
1	16 th December 2025	Initial issue
2	19 th December 2025	Administrative amendments
3	18 th May 2026	Administrative amendments
4	22 nd May 2026	Administrative amendments

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Pager Power Limited, Stour Valley Business Centre, Sudbury, CO10 7GB

T:01787 319001 E:info@pagerpower.com W:www.pagerpower.com

EXECUTIVE SUMMARY

Report Purpose

Pager Power has been commissioned to investigate the potential impact of a proposed wind development located approximately 3km south-west of Crawford, South Lanarkshire, Scotland, upon wireless communications infrastructure (point-to-point links) in the surrounding area. The proposed wind development comprises 21 wind turbines with a maximum tip height of 220 metres above ground level (AGL) and a maximum hub height of 135 metres AGL.

Consultation was undertaken directly with the most prevalent operators in order to obtain link details in November 2025 based on a previous turbine layout. Atkins, the Joint Radio Company (JRC), and Mobile Broadband Network Limited (MBNL) were reconsulted in February 2026 based on the current turbine layout.

Results

Arqiva, Atkins, British Telecoms (BT), Mobile Broadband Network Limited (MBNL), MLL Telecom, the Joint Radio Company (JRC), Virgin Media/O2, and Vodafone were consulted as per the process explained in Section 2.

Atkins, BT, MLL Telecom, Virgin Media/O2, and Vodafone have confirmed that they have no objections to the proposed development based on the previous turbine layout. No nearby links were identified, therefore it is assumed that there would be no objection to the latest turbine layout given the minor changes.

MBNL confirmed that there were potential interference issues based on the previous turbine layout. They have since confirmed that there are no issues with the latest turbine layout due to changes to turbine positions moving them outside of the relevant exclusion zones.

Arqiva and the JRC have confirmed that there are potential interference issues with nearby links based on the current turbine layout. T1 infringes the exclusion zone for the Arqiva link by 180.8m. This means that the turbine would need to move a minimum of 180.8 metres for it to be sited outside of the exclusion zone. T1, T2, and T5 infringe the exclusion zones of two JRC links.

Therefore, based on the currently proposed turbine layout, potential impacts upon wireless communications infrastructure (point-to-point links) are predicted. Mitigation is likely to be required for the proposed development to proceed as currently designed.

Recommendations and Mitigation

An overview of typical mitigation strategies has been provided for reference (see Sections 4.2 and 4.3).

Further consultation with the JRC is currently ongoing to understand the mitigation options available for the potential interference issues with their links.

A mitigation investigation has been undertaken for the Arqiva RBL link from the Black Hill main transmitter to the Leadhills relay transmitter. A solution is presented in Section 4.4, where the

Leadhills mast would be moved approximately 240 metres to the west. This has been evaluated on a first principles basis, however, Arqiva will need to be consulted to understand whether this mitigation option is feasible. Consultation is currently ongoing with Arqiva to understand the available mitigation options.

If any significant changes are made to the proposed development layout, then the consultees should be contacted again with the updated layout.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 63 countries internationally.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects;
- Building developments;
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable, and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 BACKGROUND

1.1 Introduction

Pager Power has been commissioned to investigate the potential impact of a proposed wind development located approximately 3km south-west of Crawford, South Lanarkshire, Scotland, upon wireless communications infrastructure (point-to-point links) in the surrounding area. The proposed wind development comprises 21 wind turbines with a maximum tip height of 220 metres above ground level (AGL) and a maximum hub height of 135 metres AGL.

Consultation was undertaken directly with the most prevalent operators in order to obtain link details in November 2025 based on a previous turbine layout. Atkins, the Joint Radio Company (JRC), and Mobile Broadband Network Limited (MBNL) were reconsulted in February 2026 based on the current turbine layout.

In detail, this report contains:

- Site description;
- Ofcom and stakeholder consultation to identify relevant link information;
- Technical assessment methodology;
- Analysis of identified telecommunications infrastructure;
- High-level overview of common mitigation options.

1.2 Proposed Development Layout

The proposed turbine locations are shown on aerial imagery in Figure 1 below.

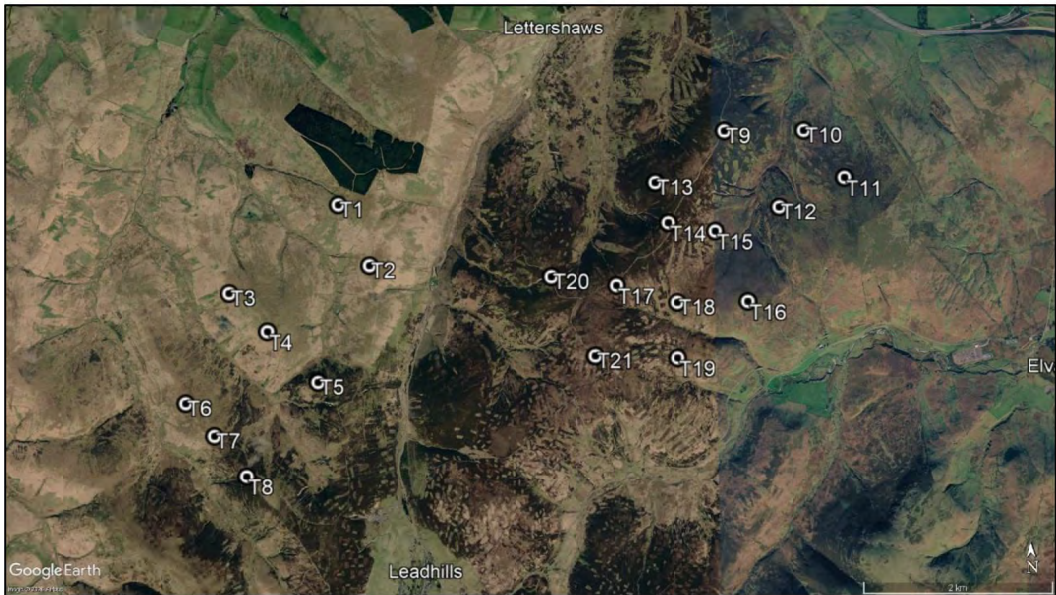


Figure 1 Proposed development shown on aerial imagery

1.3 Coordinate Data

The proposed turbine coordinates are shown in Table 1 below.

Turbine ID	Easting (British National Grid)	Northing (British National Grid)	Height
T1	287971	618974	Maximum tip height is 220 metres AGL. Maximum hub height is 135 metres AGL.
T2	288264	618355	
T3	286849	618133	
T4	287226	617738	
T5	287709	617214	
T6	286364	617049	
T7	286646	616715	
T8	286963	616303	
T9	291850	619544	
T10	292680	619542	
T11	293040	619047	
T12	292389	618783	
T13	291144	619062	
T14	291257	618660	
T15	291738	618565	
T16	292036	617853	
T17	290720	618062	
T18	291330	617871	
T19	291316	617317	
T20	290077	618173	
T21	290485	617374	

Table 1 Proposed turbine coordinates

2 TELECOMMUNICATIONS CONSULTATION SUMMARY

2.1 Process

Consultation was undertaken directly with the most prevalent operators¹ in order to obtain link details. At the time of writing, no further information from Ofcom has been made available.

2.2 Consultation Overview

Table 2 below and on the following page presents a summary of the consultation to date.

Stakeholder	Summary
Ofcom	Ofcom were not consulted as they are not currently responding to consultation requests. See https://www.pagerpower.com/news/uk-ofcom-suspends-microwave-link-consultation-due-to-gdpr/
Airwave (Motorola Solutions)	Airwave is a company that safeguards fixed communication links for the emergency services and does not provide link details due to confidentiality reasons. An Airwave assessment has not been progressed to date.
Arqiva	November 2025 – Pager Power consulted with Arqiva based on the previous turbine layout. December 2025 – Response received from Arqiva. <u>Arqiva identified potential issues with a nearby RBL (radio broadcast link) based on the previous turbine layout.</u> February 2026 – Pager Power consulted with Arqiva based on the latest turbine layout. February 2026 - Response received from Arqiva. <u>Arqiva confirmed that potential issues with the nearby RBL remained based on the current turbine layout. Further details are provided in Section 3 of this report.</u>

¹ Based on Pager Power’s experience and contacts database.

Stakeholder	Summary
Atkins	November 2025 – Pager Power consulted with Atkins based on the previous turbine layout. November 2025 – Response received. <u>No objection. No nearby links were identified, therefore it is assumed that there would be no objection to the latest turbine layout given the minor changes.</u>
British Telecoms (BT)	November 2025 – Pager Power consulted with BT based on the previous turbine layout. November 2025 – Response received. <u>No objection. No nearby links were identified, therefore it is assumed that there would be no objection to the latest turbine layout given the minor changes.</u>
Mobile Broadband Network Limited (MBNL)	November 2025 – Pager Power consulted with MBNL based on the previous turbine layout. November 2025 – Response received. <u>MBNL identified potential issues with two nearby microwave links based on the previous turbine layout. Further details are provided in Section 3 of this report.</u> February 2026 – Pager Power consulted with MBNL based on the latest turbine layout. February 2026 - Response received from MBNL. <u>No objection to the latest turbine layout due to the changes to turbine positions.</u>
MLL Telecom	November 2025 – Pager Power consulted with MLL Telecom based on the previous turbine layout. November 2025 – Response received. <u>No objection. No nearby links were identified, therefore it is assumed that there would be no objection to the latest turbine layout given the minor changes.</u>

Stakeholder	Summary
Joint Radio Company (JRC)	November 2025 – Pager Power consulted with the JRC based on the previous turbine layout. November 2025 – Response received. <u>The JRC identified potential issues with one nearby microwave link and one nearby UHF link based on the previous turbine layout.</u> February 2026 – Pager Power consulted with the JRC based on the latest turbine layout. February 2026 - Response received from the JRC. <u>The JRC provided Pager Power with a quote for further analysis.</u> March 2026 – Pager Power instructed the JRC to undertake further analysis. May 2026 – JRC further analysis report received. <u>The JRC confirmed that potential issues with one nearby microwave link and one nearby UHF link remain based on the current turbine layout. Further details are provided in Section 3 of this report.</u>
Virgin Media/O2	November 2025 – Pager Power consulted with VirginMedia/O2 based on the previous turbine layout. November 2025 – Response received. <u>No objection. No nearby links were identified, therefore it is assumed that there would be no objection to the latest turbine layout given the minor changes.</u>
Vodafone	17th November 2025 – Pager Power consulted with Vodafone based on the previous turbine layout. 17th November 2025 – Response received. <u>No objection. No nearby links were identified, therefore it is assumed that there would be no objection to the latest turbine layout given the minor changes.</u>

Table 2 Telecommunications stakeholder consultation

3 TECHNICAL ASSESSMENT

3.1 Methodology

Microwave and UHF (Ultra-High Frequency) wireless communication links are used to transmit information between two antennae via radio waves within a particular frequency band. The following subsections present an overview of the interference mechanisms and methodology.

3.1.1 Fresnel Zones

A Fresnel Zone takes the form of an ellipsoid surrounding a link path and represents the area in which obstructions should not be sited to avoid diffraction losses. The width of the zone at any point along the link path is determined by the Fresnel Zone number, the frequency of the link and the distance from each link end. The width is maximal at the midpoint of the link path.

3.1.2 Diffraction – Microwave and UHF Links

Obstructions such as wind developments which are sited in between two microwave link antennae can partially block the radio signal passing between them, thereby reducing the functionality of the link. This can occur even if the obstruction is not directly between the antennae but close to the link boresight². This kind of blocking is called ‘diffraction’.

There are various approaches to safeguarding microwave links against from obstruction via wind developments. The most common approaches are:

1. Implementation of a fixed stand-off distance around the link boresight;
2. Safeguarding the relevant Fresnel Zone (discussed below).

The first approach is used by many operators who request a set buffer distance. Set stand offs are occasionally conservative and produce a large exclusion zone distance. The second approach is to assess an obstruction on a case-by-case basis to calculate the most accurate exclusion zone. Pager Power considers the Second Fresnel zone when assessing the effect of a wind turbine upon microwave links and 60% of the First Fresnel zone when assessing UHF links.

3.1.3 Reflections – UHF Links

Obstructions can affect UHF links by reflecting the signal between transmitter and receiver. This is not a significant concern for microwave links because they are highly directional. Typically, diffraction effects are likely to be the most significant concern due to the greater abundance of microwave point-to-point links and because both microwave and UHF links are safeguarded against diffraction effects.

3.2 Identified Telecommunications Links

The information for the telecommunications links identified through the consultation process outlined in Section 2.2 of the report has been summarised in Table 3 on the following page.

² This is the straight line between the two antennae.

Link Reference	Type	Frequency (MHz)	A-End Reference	A-End Coordinates (BNG)	A-End Height (agl)	B-End Reference	B-End Coordinates (BNG)	B-End Height (agl)
JRC JESPV51 - JESPV04	UHF	460	Green Lowther	Unknown	Unknown	Douglas West SS	Unknown	Unknown
SPEN 1018453/1	Microwave	7606.5/7851.5	Coalburn SS	282520.04E 637358.526N	15 metres	Green Lowther RS	Unknown	20 metres
MBNL 9112929	Microwave	Assumed to be 1,000 (typical worst-case scenario for microwave links)	1497190	293886.2E 622190N	Unknown	1204144	290112.2E 612106N	Unknown
MBNL 9118702	Microwave	Assumed to be 1,000 (typical worst-case scenario for microwave links)	1557893	286506.1E 627624.2N	Unknown	1204144	290112E 612107N	Unknown
Arqiva Black Hill to Leadhills	UHF	470 - 694 (assumed to be 470 as this is more worst-case)	Black Hill (main TV Transmitter)	283110E 664560N	307 metres	Leadhills (relay TV transmitter)	288410 614900	12.8 metres

Table 3 Identified telecommunications links

3.3 Constraints maps

3.3.1 MBNL

Two exclusion zones have been constructed in Figure 3 on page 18:

1. The white zones follow the 2D clearance criteria that MBNL typically requires which is a distance greater than 100m from the link centre line to a blade tip (the zones are calculated as 100m plus the blade radius either side of the link boresight);
2. The dark blue exclusion zones follow the 2D exclusion zone used for diffraction effects (based on Ofcom-recommended methodology) that is defined by the second Fresnel zone radius³ and the rotor radius (Figure 2 on the following page shows a visual representation of the 2D analysis, and the relevant distances).

The 2D exclusion zones for diffraction effects are provided for reference purposes; however, in reality it is likely that MBNL will require any turbine layout to follow the more conservative 100m clearance from the link centre line to a blade tip criteria.

The centre lines of the MBNL microwave communications links are represented by the red lines.

Turbines placed outside of the white polygons would satisfy the 100m MBNL clearance criteria. Based on the turbine layout, all turbines meet the criteria.

³ For Microwave links

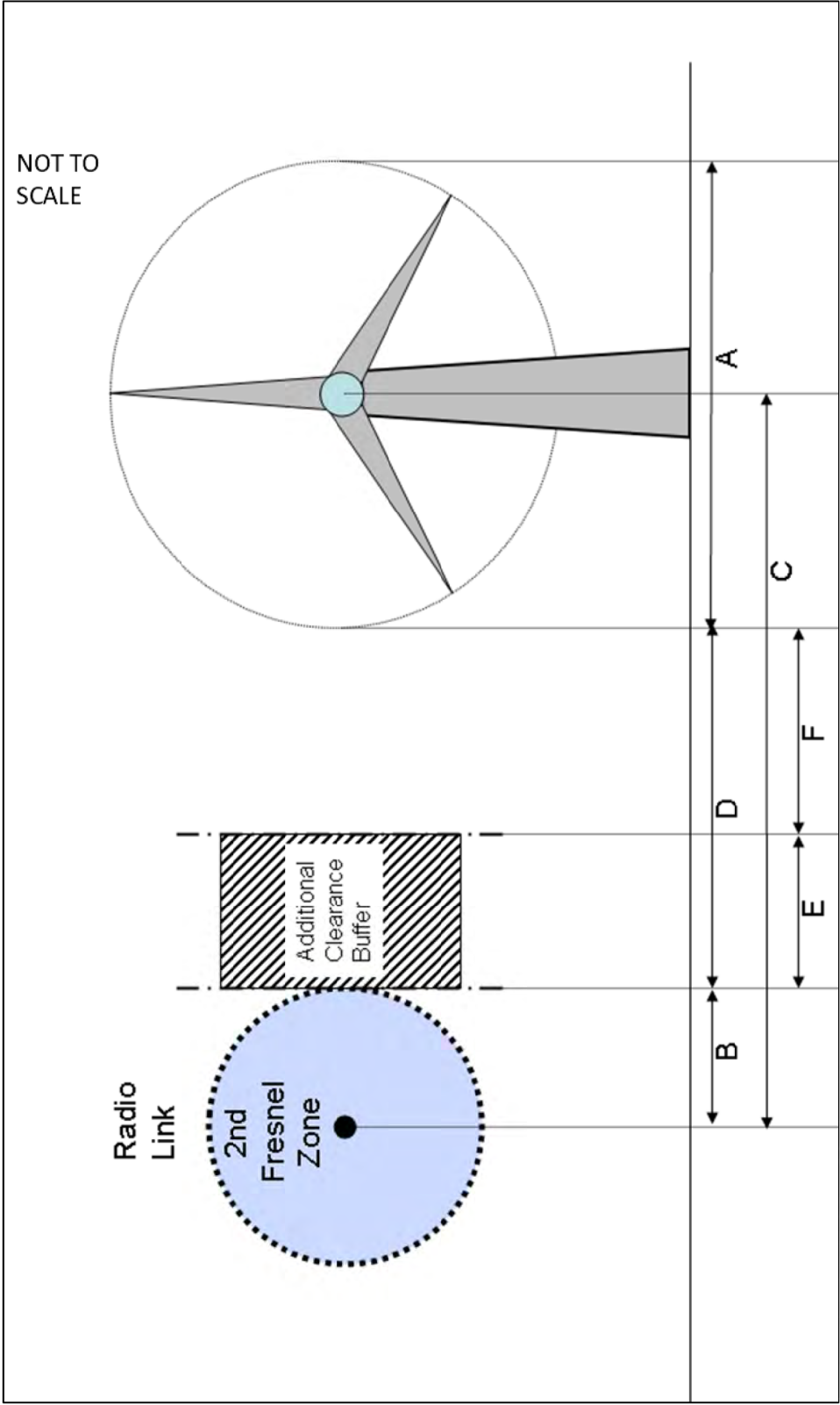


Figure 2 2D Exclusion Zones Visualisation
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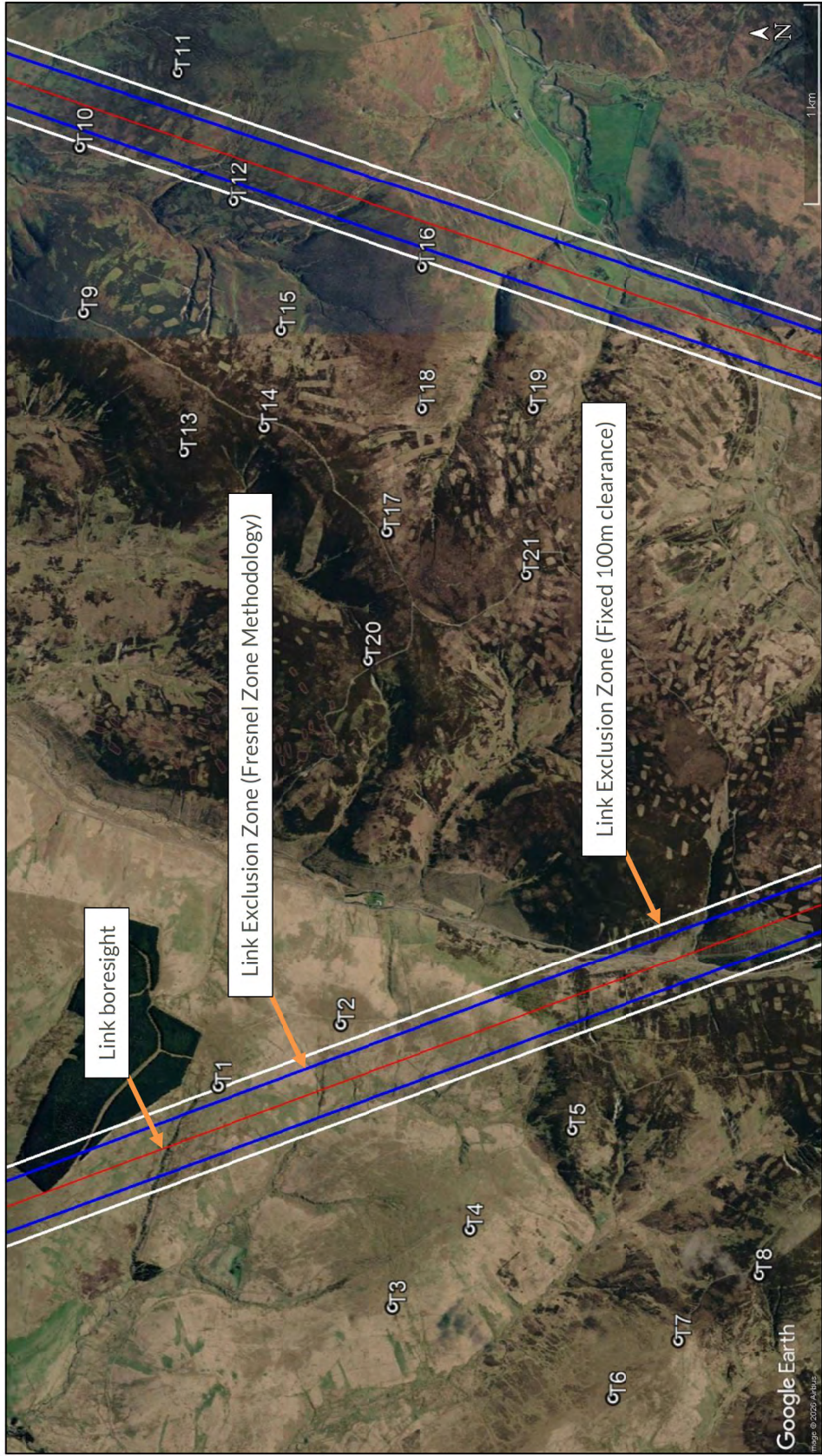


Figure 3 MBNL Constraints map (overview)
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Figure 4 MBNL Constraints map (zoomed in view of location of T1)

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Figure 5 MBNL Constraints map (zoomed in view of location of T10, T12, and T16)

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3.3.2 JRC

The JRC provided shapefiles of exclusion zones as part of their further analysis, these have been extracted to the light blue polygons in Figure 6 below. Turbines placed outside of the light blue polygons would satisfy the JRC clearance criteria.

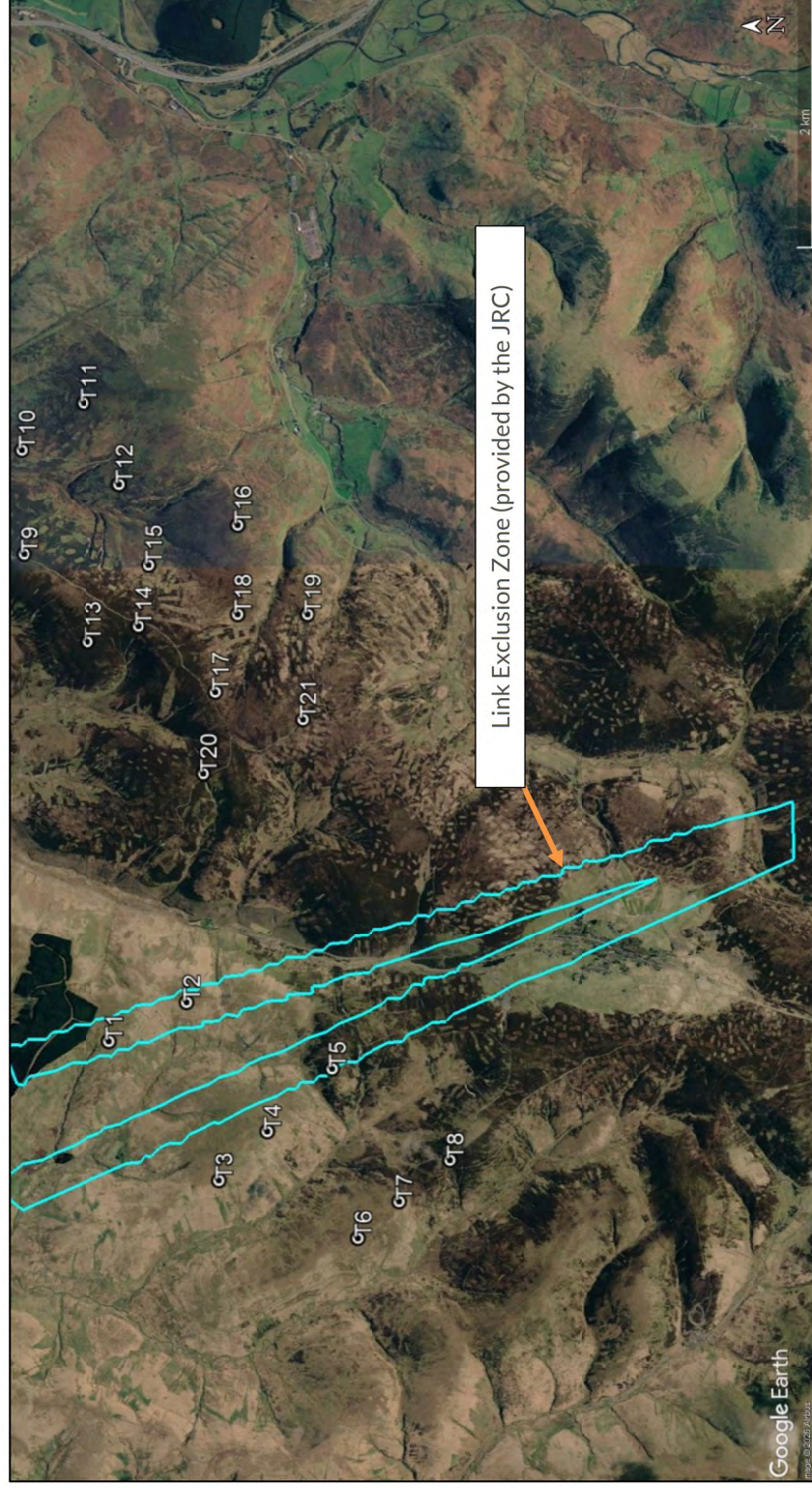


Figure 6 JRC Constraints map (overview)

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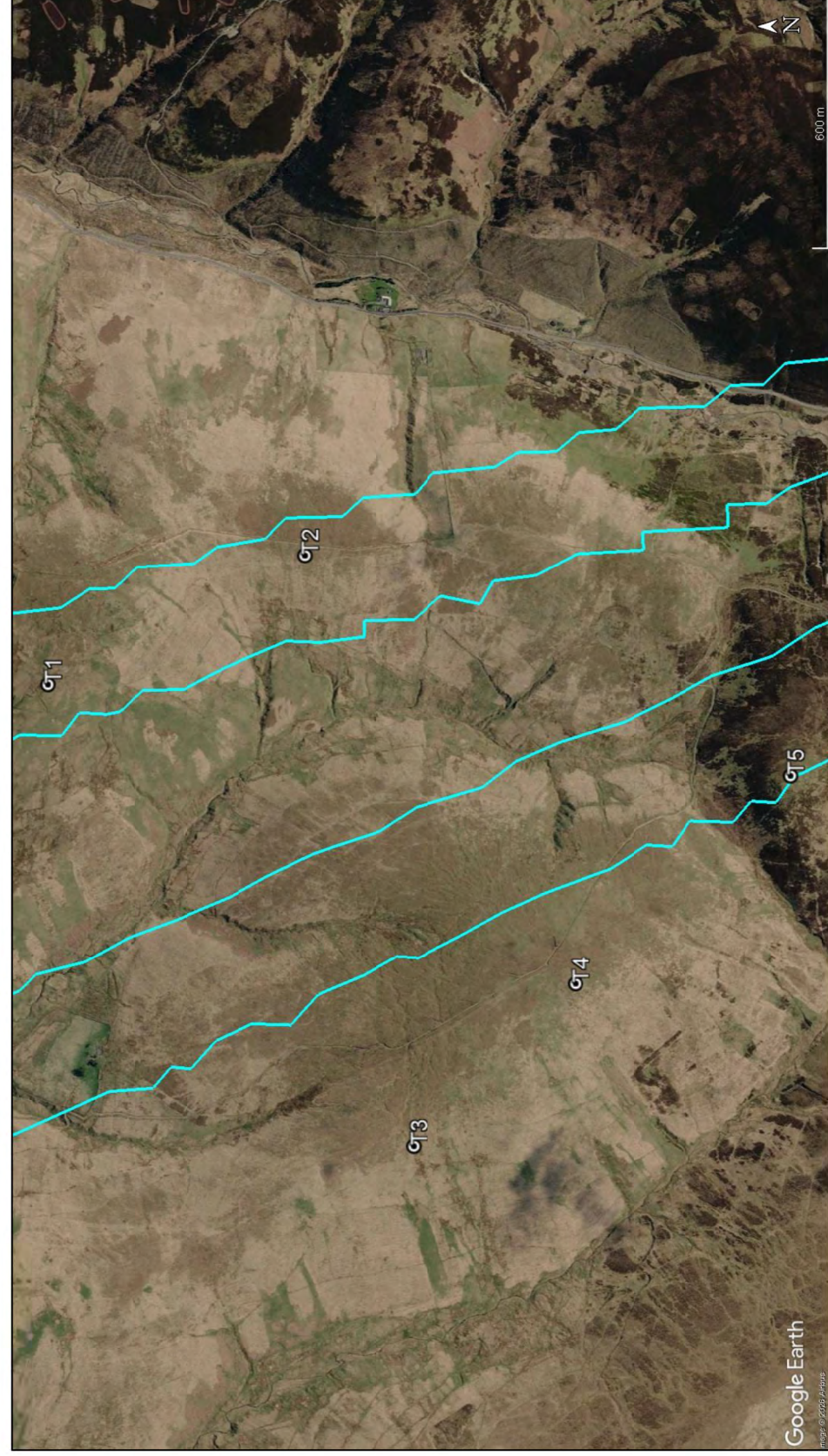


Figure 7 JRC Constraints map (zoomed in view of T1 to T5)

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3.3.3 Arqiva

The exclusion zone has been constructed in Figure 8 on the following page considering the 100m clearance criteria that Arqiva typically requires plus the rotor radius (green polygon). The centre line of the Arqiva microwave communications link is represented by the red line.

Turbines placed outside of the green polygon would satisfy the 100m Arqiva clearance criteria.

The 100m clearance criteria that Arqiva typically requires is more conservative than the exclusion zones based on diffraction effects, however, it is likely that Arqiva will require any turbine layout to follow this.

T1 infringes the exclusion zone for the Arqiva link by 180.8m. This means that the turbine would need to move a minimum of 180.8 metres for it to be sited outside of the exclusion zone.



Figure 8 Arqiva Constraints map (overview)

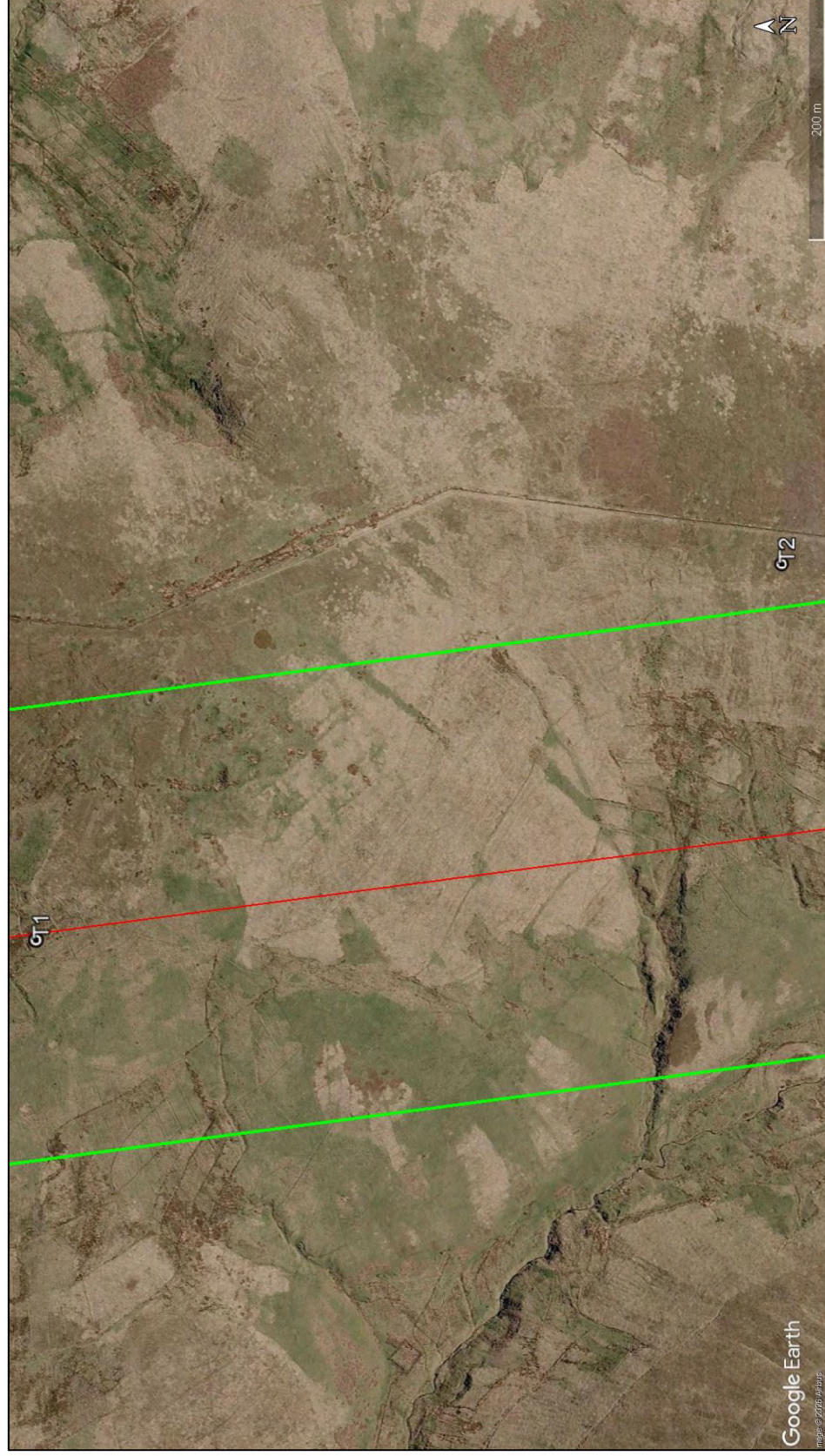


Figure 9 Arqiva Constraints map (zoomed in view of T1 and T2)

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3.3.4 Combined

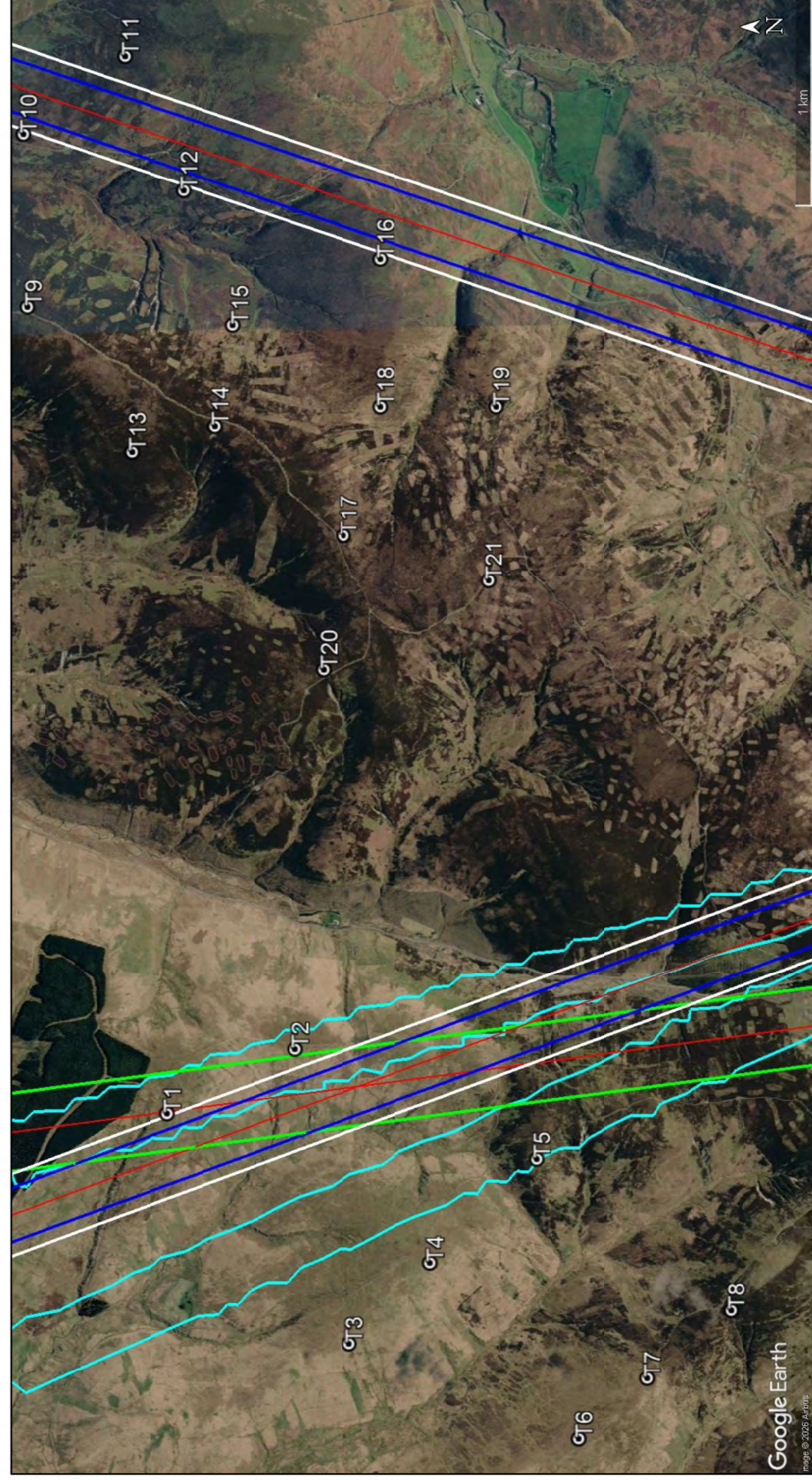


Figure 10 Constraints map (combined)

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