Technical Appendix 11.1a Abnormal Load Assessment - Southern Route This page is intentionally blank.

Hagshaw Energy Cluster – Western Expansion Reference number GB01T24G63/2001/ALA-South 17/03/2025

## **ABNORMAL LOADS ASSESSMENT**





## **HAGSHAW ENERGY CLUSTER – WESTERN EXPANSION**

ABNORMAL LOADS ASSESSMENT

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## APPROVAL

Version	Name		Position	Date	Modifications
	Author	A Spence	Senior Consultant	19/12/2023	
1	Checked	A DeVenny	Projects Director	19/12/2023	V1
	Approved	A DeVenny	Projects Director	19/12/2023	
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3	Author	T Foster	Consultant	10/03/2025	
	Checked	A DeVenny	Projects Director	10/03/2025	Updated ALA route
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4	Author	T Foster	Consultant	17/03/2025	
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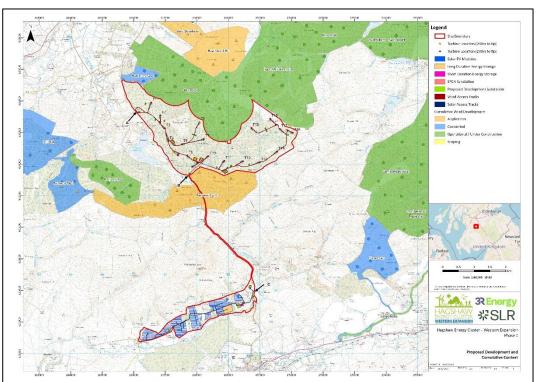
Hagshaw Energy Cluster – Western Expansion



## 1. INTRODUCTION

## 1.1 General

1.1.1 SYSTRA Ltd (SYSTRA) has been commissioned by 3R Energy to undertake an assessment of a potential abnormal loads route to the Hagshaw Energy Cluster Western Expansion, located approximately 6km north of Muirkirk, Ayrshire. The site location is indicated by **Figure 1** below.





1.1.2 SYSTRA has previously undertaken an Abnormal Loads Assessment (ALA) for the proposed wind farm, arriving at the site from the north. The purpose of this document is to explore an alternative route into the Hagshaw Energy Cluster Western Extension from the south.

Hagshaw Energy Cluster – Western Expansion



- 1.1.3 This assessment report assesses the route outlined below:
  - Via Junction 11 of the M74, through Douglas West / Hagshaw Hill / Galawhistle wind farms and Spireslack to meet with the A70 at the old opencast entrance which is used for the consented but not constructed Hare Craig wind farm going through Muirkirk then turning north into Forestry and Land Scotland (FLS) land. North of Muirkirk the route joins the B743 heading north to site access point A.
- 1.1.4 **Figure 2** below demonstrates the route to site from the M74 motorway through existing wind farms from the east, around Muirkirk and north on the B743 to site access point A.

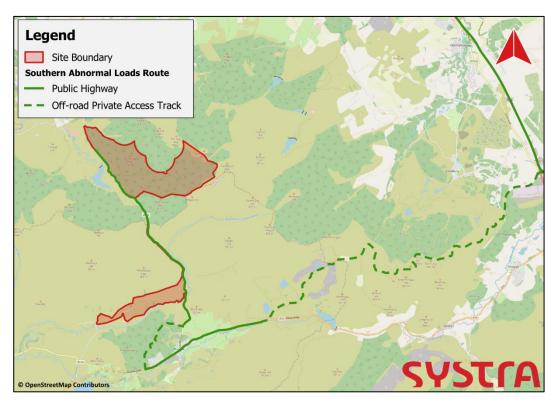


Figure 2. Proposed Southern Abnormal Loads Route

1.1.5 This ALA identifies pinch points, which are points of interest, i.e. bends, junctions etc that will need to be overcome in order to facilitate the safe and efficient movement of abnormal load vehicles. Swept path assessments have been undertaken based on the movement of the blade components to assess whether the route is feasible and to established the level of mitigation that may be required on the route.



### **1.2** Turbine Transport Requirements

- 1.2.1 The candidate turbine for the Hagshaw Energy Cluster Western Expansion has not yet been selection, but it is anticipated that the blades to be transported will be approximately 80.5m in length.
- 1.2.2 The turbine blades would be loaded onto a specialised blade trailer. For the purposes of assessment, it has been assumed that the Turbine Delivery Vehicle (TDV) would compose of a tractor unit and a "super wing" blade carrier.
- 1.2.3 The super wing carrier incorporates pendle axles which allow for a secondary rear wheel steering angle of up to 60 degrees. The super wing trailer can be extended to 64.3m in length. For this assessment is has been assumed that the trailer would be retracted by approximately 4m for a length of 60.5m. This assumption is based on the loading configuration of other wind turbine blade components. In total the TDV is ~63.6m in length. The turbine blade would overhang the end of the trailer by ~22m.
- 1.2.4 A drawing of the TDV is provided in **Appendix A** and at **Figure 2** below.

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25m with overhang         63.687m           verail Leight         2.691m           verail Body Height         2.691m           in Body Ground Clearance         0.442m           xx Track Wide         2.691m           xx Track Wide         2.691m           xx Lo tock time         1.00s           xx Wheel Angle         4.5.00°			
ax Wheel Angle 1.005			

Figure 3. Turbine Delivery Vehicle

- 1.2.5 At this stage in the design process, the haulier of the wind turbine components is not yet known, nor the exact specifics of the vehicles that they will use. However, from experience of previous developments, and from the details of the components to be moved, it is possible to estimate (with some degree of accuracy) the specifics of the design vehicles that will be used to allow a detailed and accurate route assessment to be undertaken.
- 1.2.6 SYSTRA has used the Autodesk (CAD) extension package AutoTrack to undertake swept path analysis (SPA) for the identified Pinch Points (PP) on the delivery route. The trailer units associated with the design vehicle for the transportation of the blades are extendable so on delivery of the abnormal load, the trailer can be reduced in length. In these circumstances, the AutoTracking and route assessment has only been undertaken for the delivery route to the site.



## 1.3 Swept Paths

- 1.3.1 The swept path plans are contained within **Appendix A**. The plans indicate areas of overrun and over-sail, as well as highlighting potential clashes with street furniture and requirements for third-party land.
- 1.3.2 **Table 2** summarises the findings at each location for the transportation of the blade component.

Hagshaw Energy Cluster – Western Expansion



#### Table 1. Pinch Point Summary – Blade Delivery Vehicle

SPA	LOCATION	STREET FURNITURE REMOVAL	TEMPORARY PAVING / GRADING WORKS	3RD PARTY LAND REQUIREMENTS
01	M74 Junction 11 Southbound Exit (Turn from public road onto private access tracks)	<ul> <li>3no. chevron signs</li> <li>2no. traffic signs</li> <li>2no. lighting columns</li> <li>1no. bollard</li> </ul>	<ul> <li>Hardstanding overrun areas required in roundabout islands</li> </ul>	<ul> <li>Yes – Over-sail into potential third-party land. Land checks required</li> </ul>
02	Exit from Private Access Tracks onto A70	• None	• None	<ul> <li>None anticipated – lands likely under option</li> </ul>
03 - 10	A70 Between open cast mine and east of Muirkirk	• None	• None	• None
11	"S"-bend east of Muirkirk	• Telephone line to be grounded	Transition ramp may be required to enable     TDV to mount kerb	None
12 – 13	A70 through Muirkirk	None	None	None
14	Right-hand turn into FLS land (turn-off to join private access route)	<ul><li> 2no. lighting column</li><li> 1no. road sign</li></ul>	<ul> <li>Hardstanding overrun area required to make turn</li> </ul>	<ul> <li>Yes – Overrun and oversail into third party land. Land checks required</li> </ul>
15	Left-hand turn onto B743 (turn from private access track back onto public road)	2no utility columns and lines	<ul> <li>Hardstanding overrun area required opposite turn to elevation change on inside of turn</li> </ul>	<ul> <li>Yes – Overrun and oversail into third party land. Land checks required</li> </ul>
16	Continuous left-hand bend in B743 north of Muirkirk	<ul><li>Utility columns and lines</li><li>Potential conflict with mature trees</li></ul>	Hardstanding required on outside of bend	<ul> <li>Yes – Overrun and oversail into third party land. Land checks required</li> </ul>
17 – 19	B743 north of Muirkirk	None	None	None
20	B743 north of large culvert	• Telephone line to be grounded	None	None
21	Bend in B743 south of farm access crossroads	None	• None	<ul> <li>Yes – Over-sail into potential third-party land. Land checks required</li> </ul>
22	Bends in B743 north of farm access crossroads	• None	• None	<ul> <li>Yes – Over-sail into potential third-party land. Land checks required</li> </ul>
23	Long continuous bend in B743 north of cattery	None	• None	<ul> <li>Yes – Over-sail into potential third-party land. Land checks required</li> </ul>
24	Left-hand bend in B743 at farm access	• None	• None	<ul> <li>Yes – Over-sail into potential third-party land. Land checks required</li> </ul>
25 - 26	B743 north of farm access	None	None	None
27	B743 at Dippal Lodge access track	• None	• None	<ul> <li>Yes – Over-sail into potential third-party land. Land checks required</li> </ul>
28	Series of bends in B743 north of Dippal Lodge access track	• None	• None	<ul> <li>Yes – Over-sail into potential third-party land. Land checks required</li> </ul>

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SPA	LOCATION	STREET FURNITURE REMOVAL	TEMPORARY PAVING / GRADING WORKS	3RD PARTY
29	Series of bends in B743 south of culvert	• None	None	• Yes – land.
30-31	B743 south of forestry	None	None	None
32	B743 at entrance to forestry	• None	None	• Yes – land.
33	B743 at forestry crossroad	None	None	• Yes – land.
34	B743 south of break in forestry	None	None	None
35	Left-hand bend in B743 at site access point B	Vegetation to be trimmed	None	Yes –     check
36	B743 north of site access point B	• None	None	• Yes – land.
37	B743 north of site access point B	• None	None	• None
38	B743 near layby	• None	None	• Yes – land.
39	Series of tight bends in B743	• None	None	Yes –     check
40	Series of bends in B743 east of reservoir dam	4no. chevron signs	None	• Yes – check
41 - 43	B743 north of reservoir	• None	None	See s     GB01

Hagshaw Energy Cluster – Western Expansion	
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e site access drawing 301T2463/2001/I/GL002 for details



## 2. ASSESSMENT OUTCOMES AND CONCLUSIONS

## 2.1 Horizontal Feasibility

2.1.1 The abnormal load assessment has identified that the route from the M74 to the site is technically feasible in terms of horizontal geometry, which is dependent upon third-party land agreements at a number of locations. It is noted that this report has focussed on the horizontal alignment of the route. No vertical checks have been undertaken at this point, but no major impediments have been identified at this stage and no weight restrictions have been identified on the route at this stage.

### 2.2 Summary

- 2.2.1 In the first instance, it is recommended that third-party land enquiries are made at the identified locations, and it is also recommended that further engagement is undertaken with the Clyde Port Authority, South Lanarkshire Council, East Ayrshire Council, Transport Scotland and AMEY (the M74 Trunk Road operator).
- 2.2.2 Additionally, the following points should also be considered:
  - If the necessary mitigation measures are achievable then the route can be navigated by vehicles carrying wind turbine components to the proposed site subject to confirmation of structural checks;
  - Police escort or Pilot car will be required to accompany abnormal loads in order to assist with traffic control and the control of oncoming traffic;
  - It is recommended to have adequate warning signs implemented to warn other road users at critical points along the route;
  - All hedges, shrubs, bushes, trees and overhanging branches along the nominated routes must be trimmed from within carriageway verges;
  - Specific street furniture has been nominated in this report for removal to facilitate over-sailed and 'swept' areas;
  - Full carriageway widths must be available along the entirety of the route. Measures to remove parked vehicles must therefore be in place;
  - Measures to assist the vehicle negotiating the kerbed changes in level at footways, roundabouts, pedestrian refuges etc. will be required; and
  - Steel road plates may be required at locations where the vehicle overruns utility boxes or footways.

Abnormal Loads Assessment

# **SYSTIA**

## Appendix A – TDV Drawing and Swept Path Assessment

Hagshaw Energy Cluster – Western Expansion

Abnormal Loads Assessment GB01T

GB01T24G63/2001/ALA-South

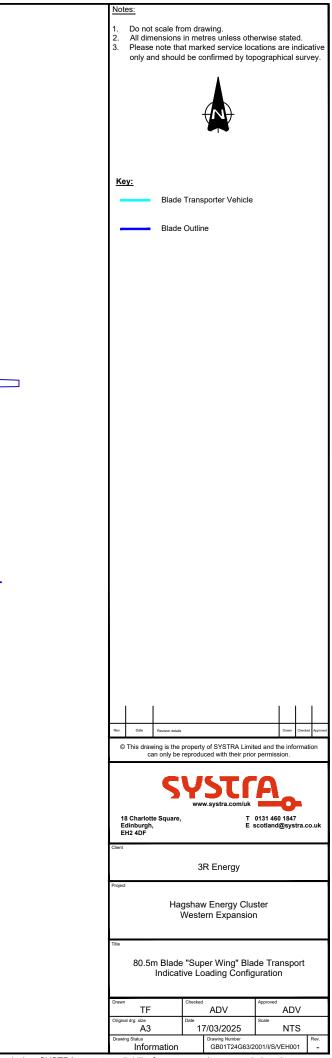
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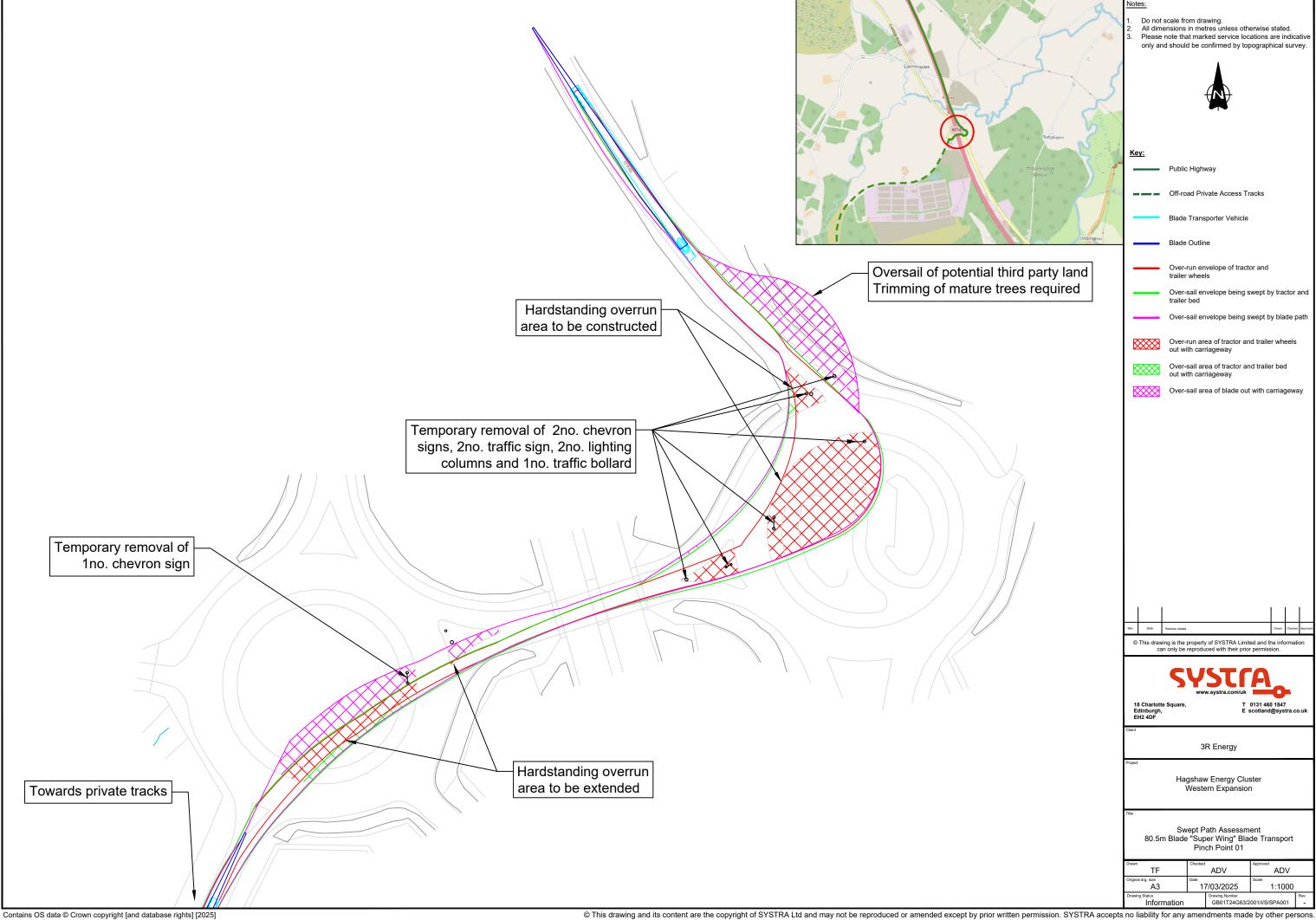


80.5m with overhang Overall Length Overall Width Overall Body Height Min Body Ground Clearance Max Track Width Lock to lock time Max Wheel Angle

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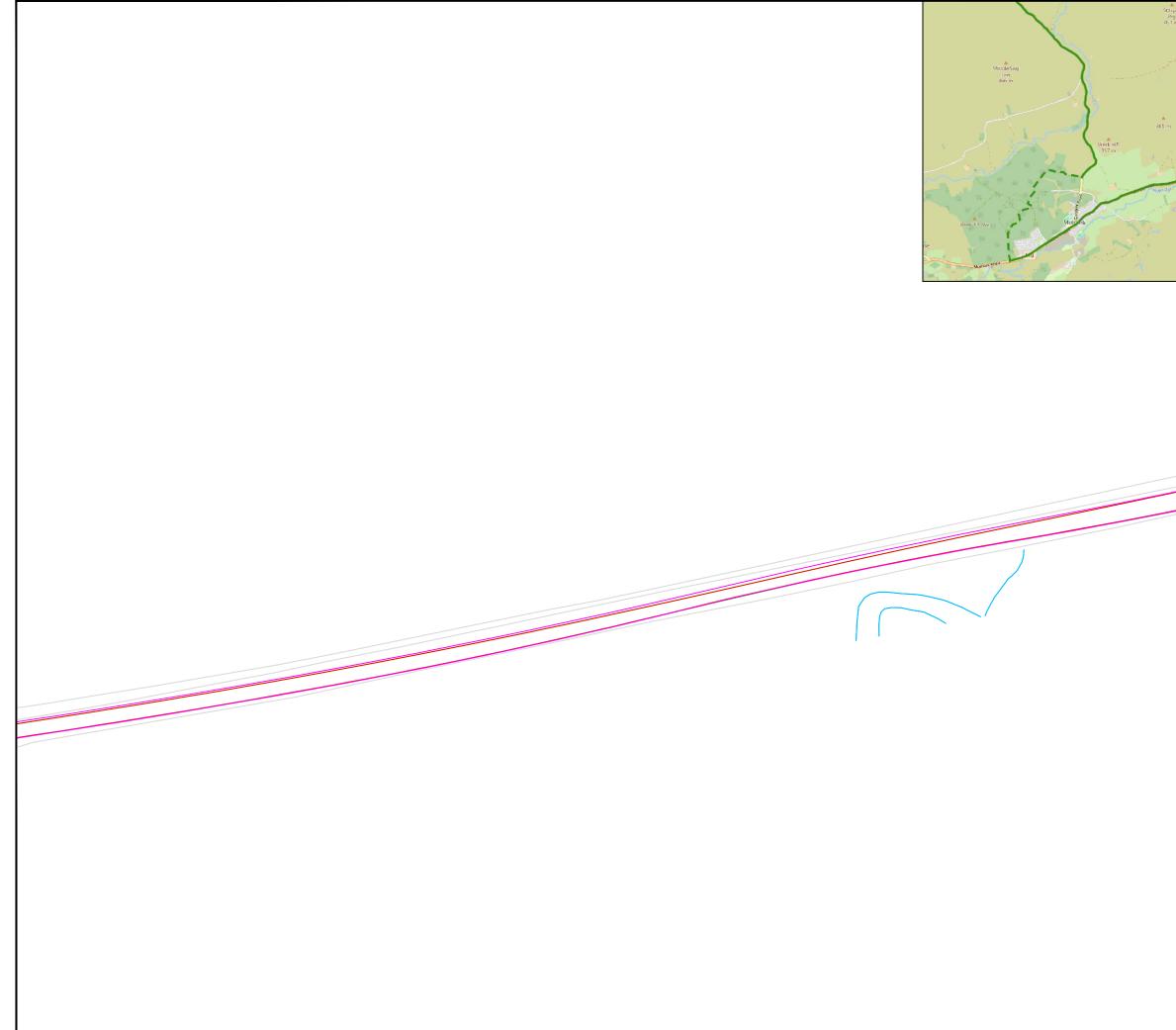




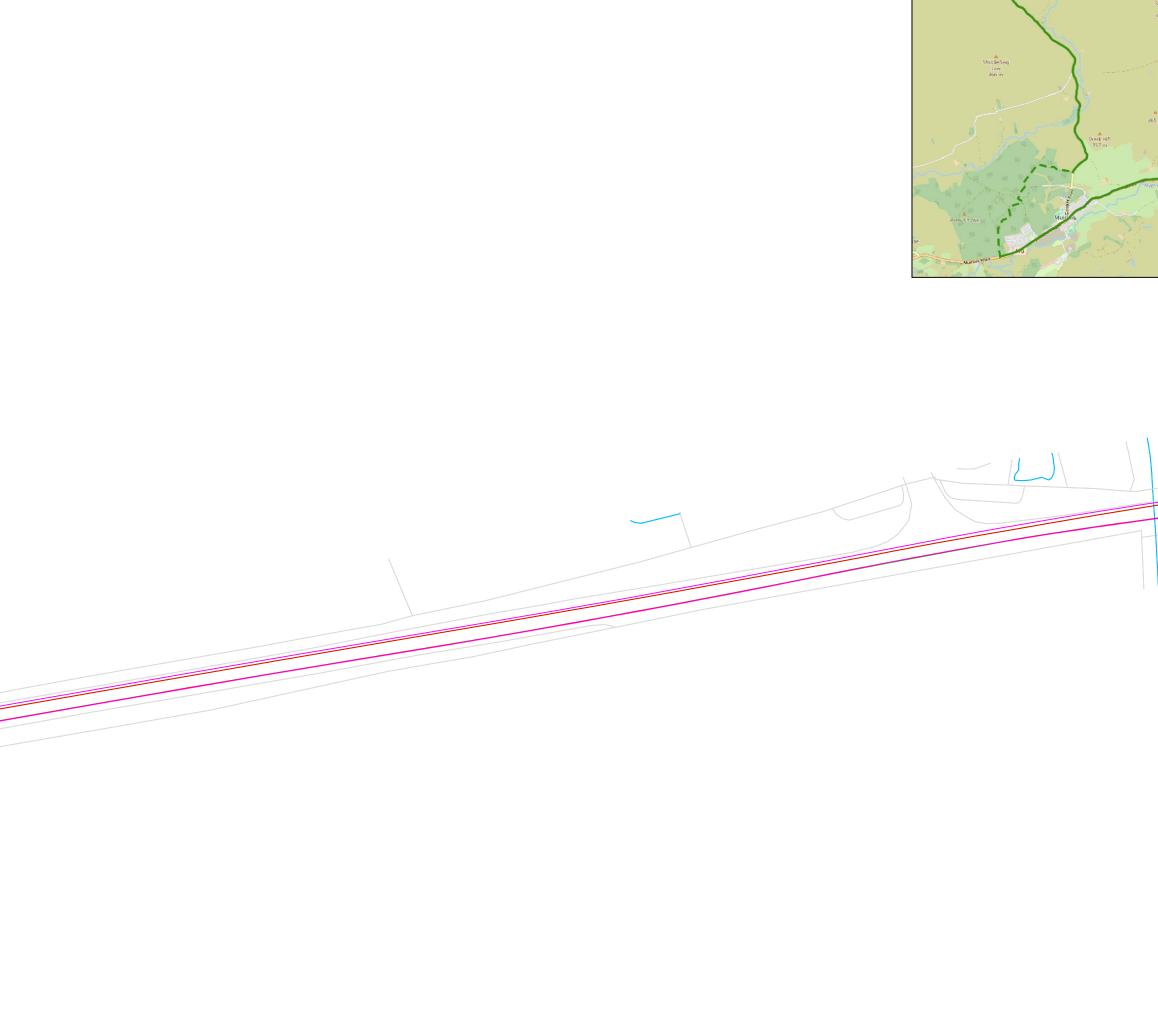




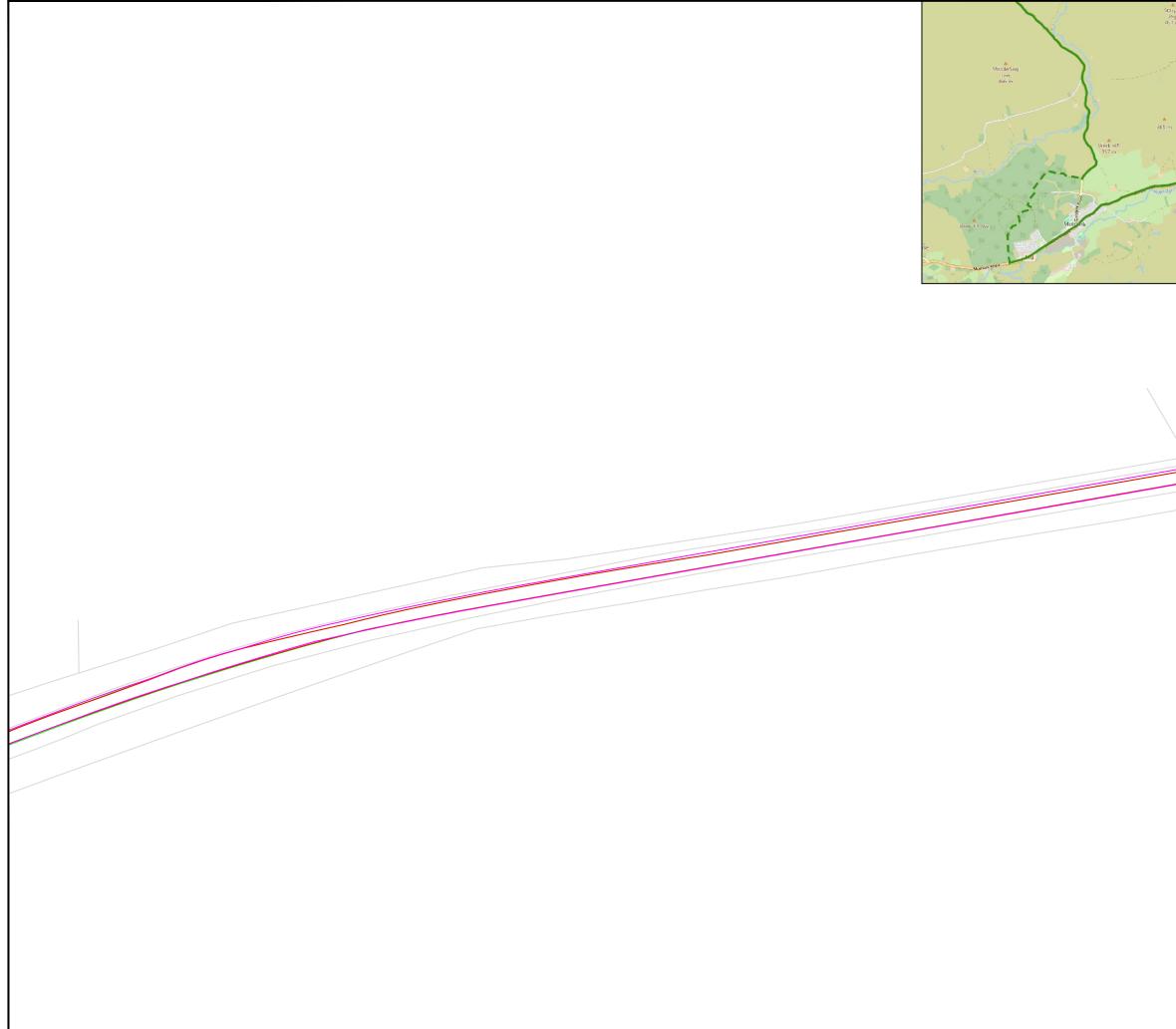
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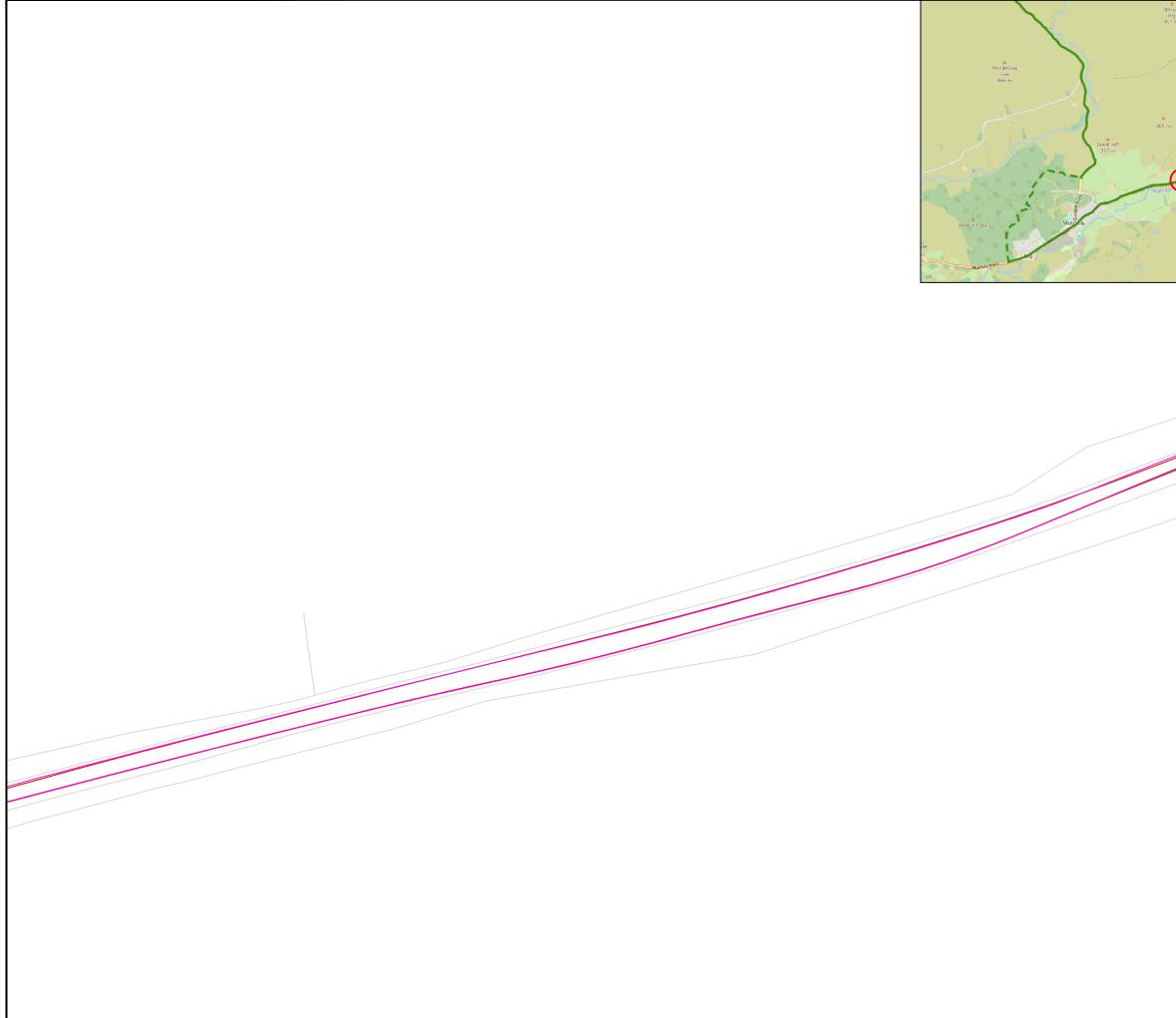
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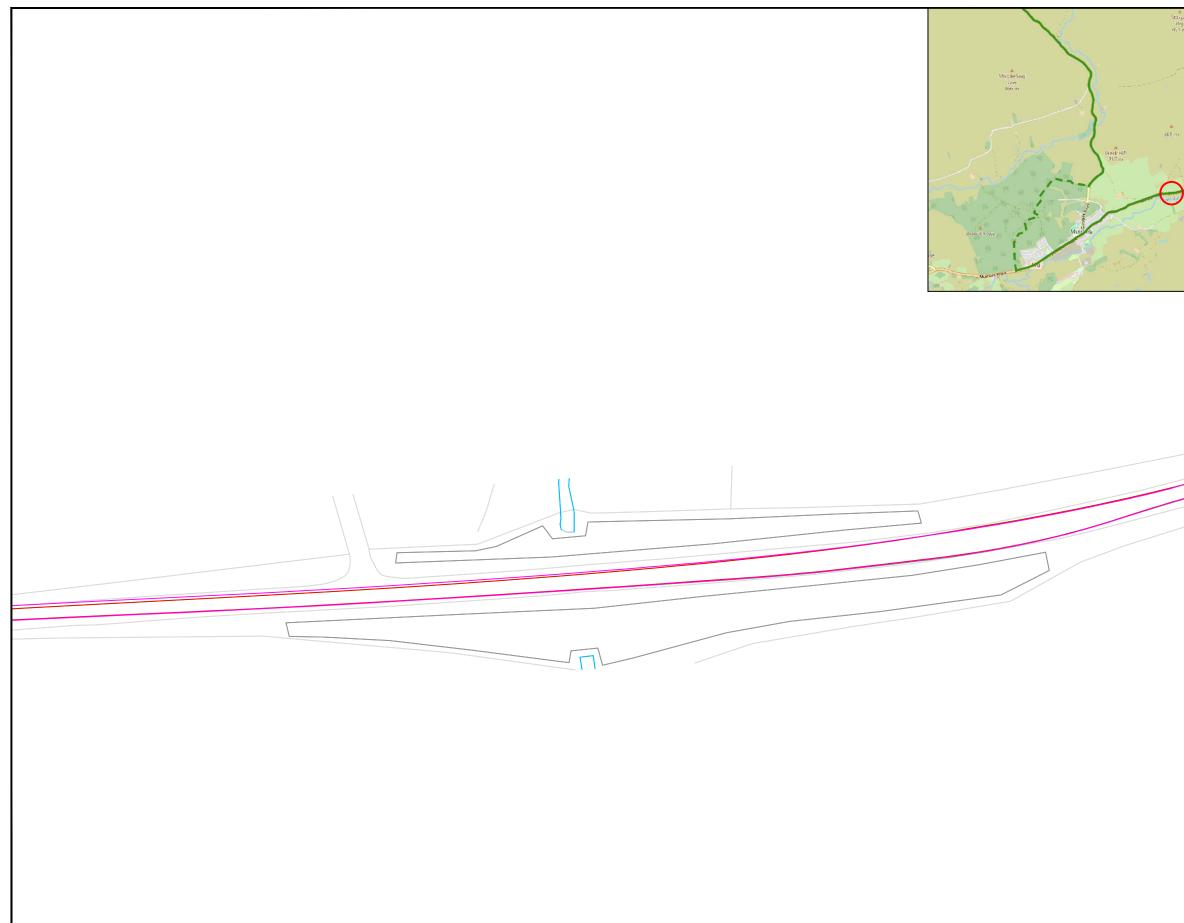
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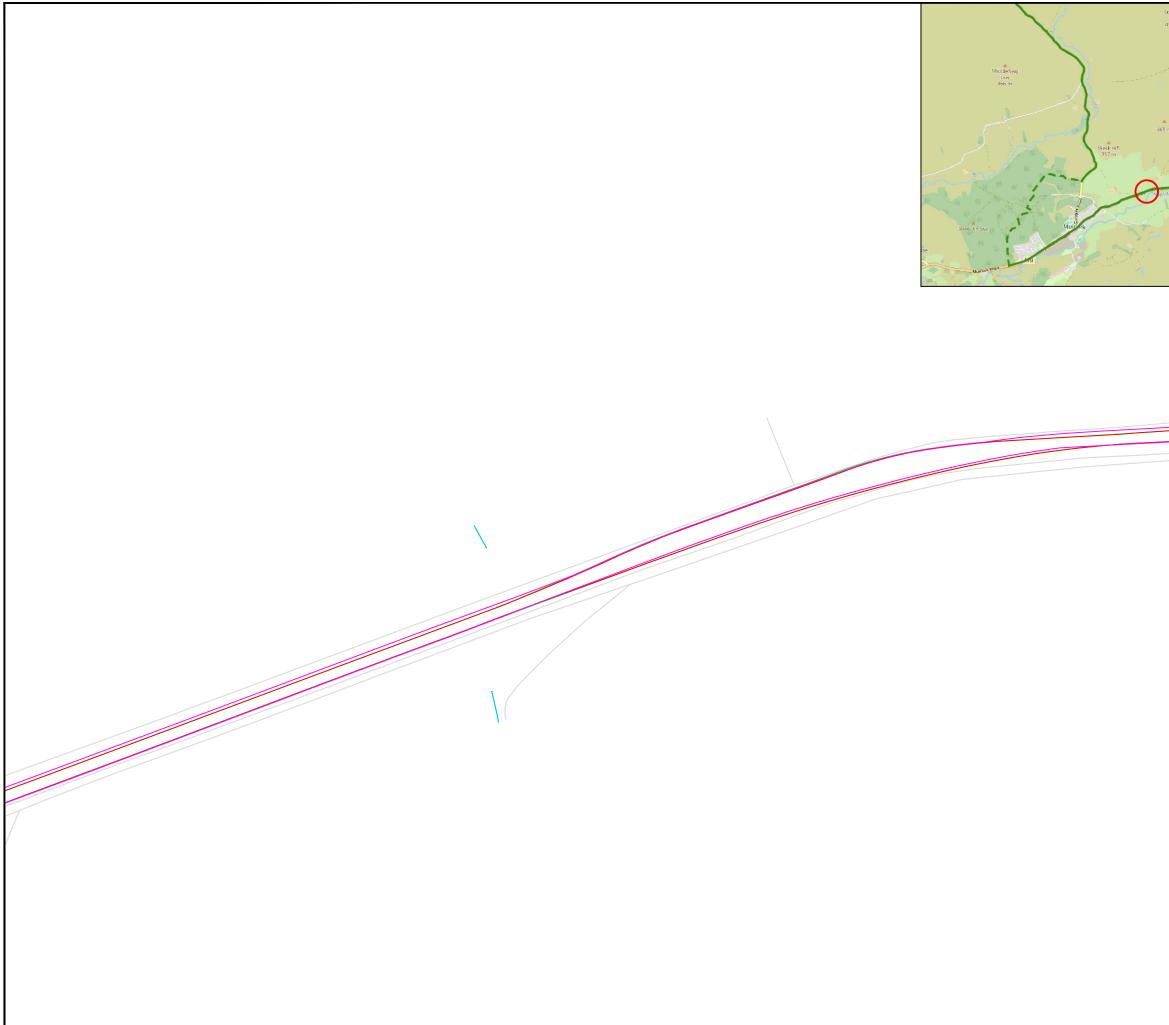
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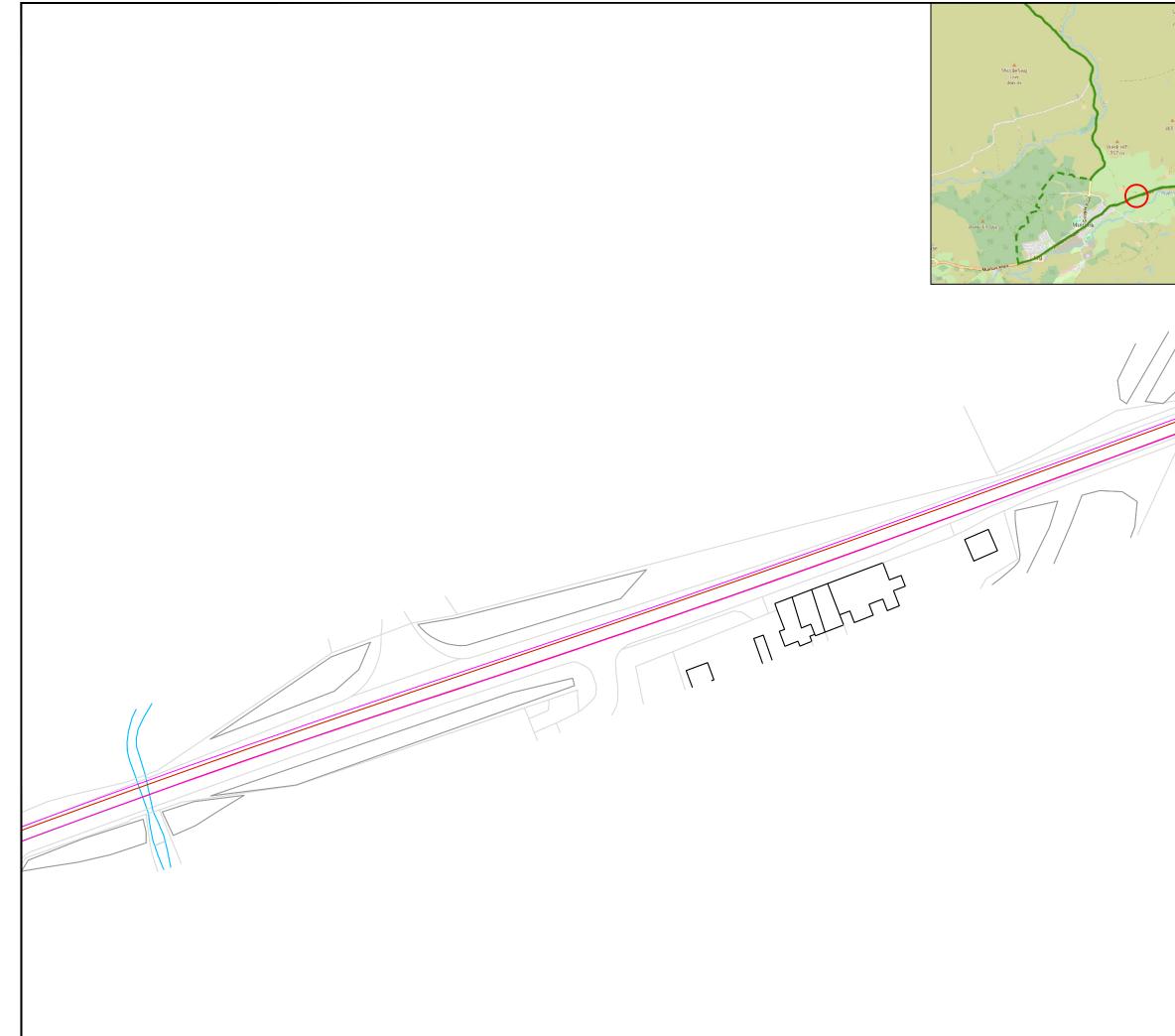
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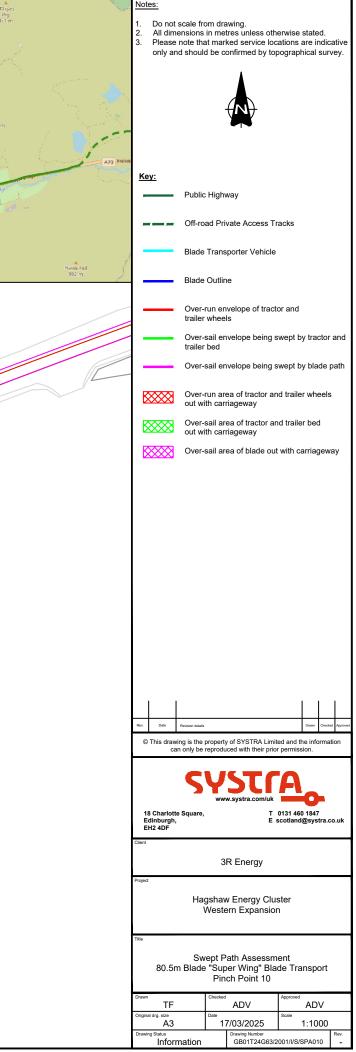


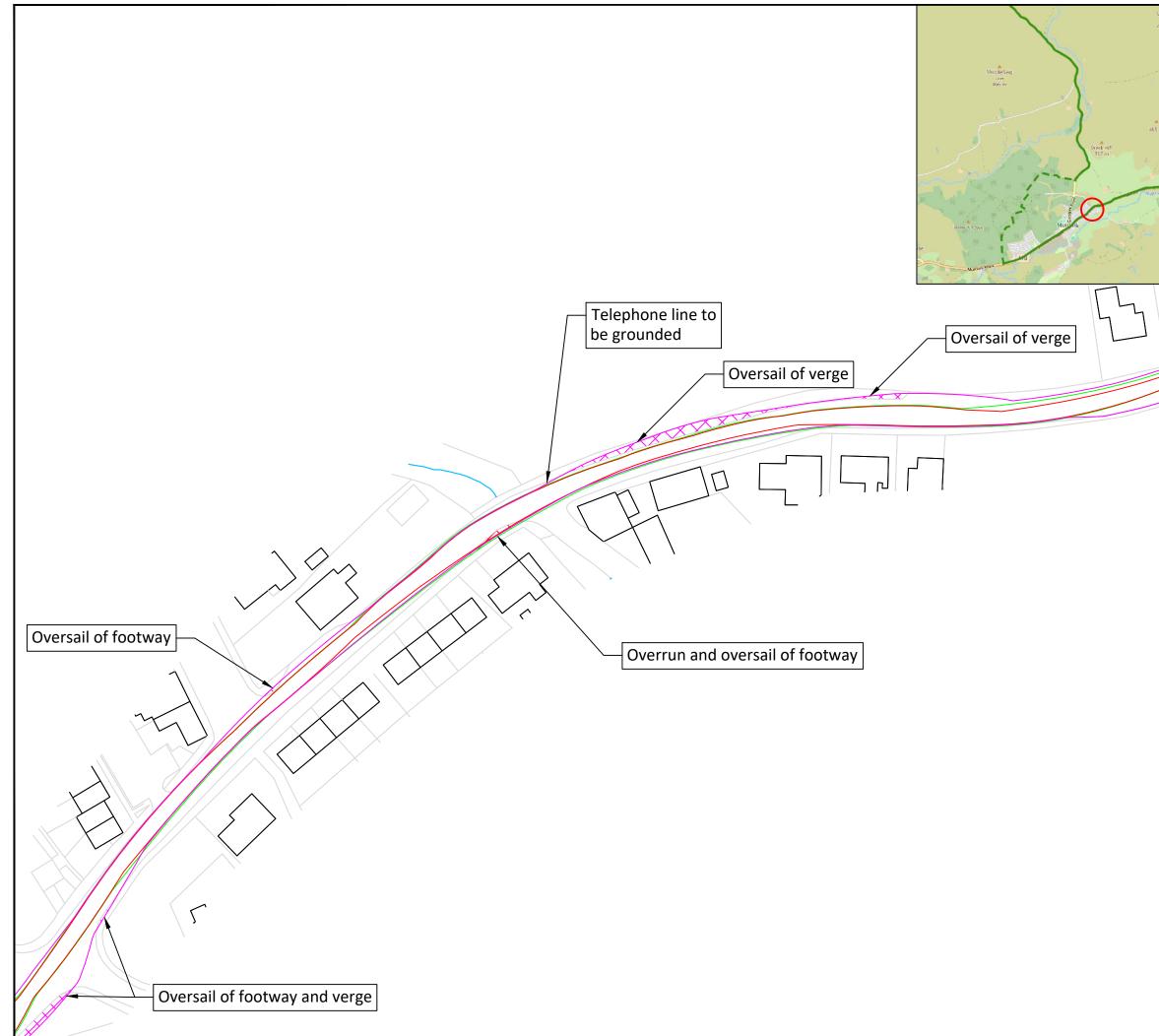
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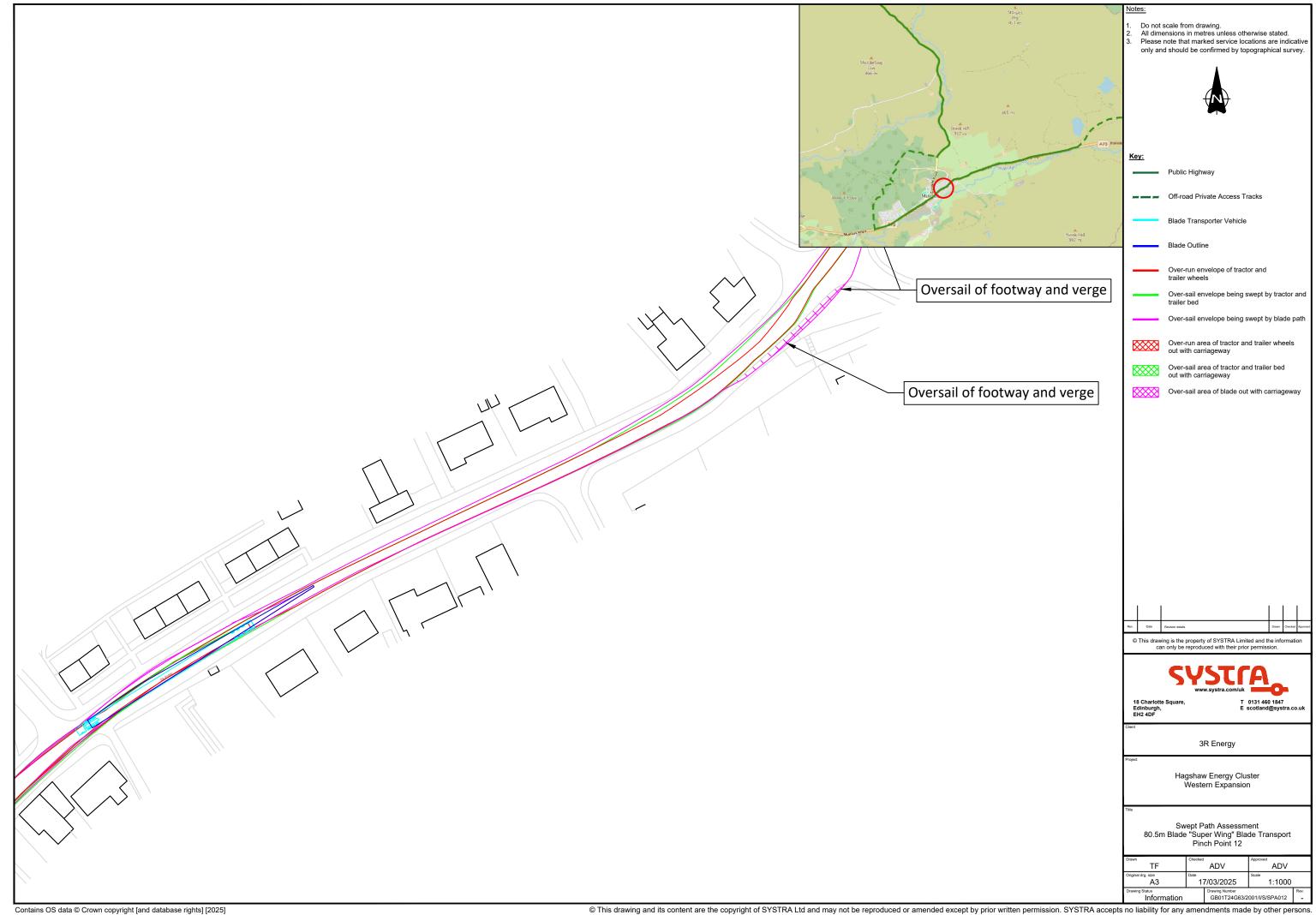
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45	Public Highway				
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	Plada Transporter Vahiala				
Hawk Hill 392 m	Blade Transporter Vehicle				
	Blade Outline				
. /	Over-run envelope of tractor and trailer wheels				
	Over-sail envelope being swept by tractor and trailer bed				
	Over-sail envelope being swept by blade path				
	Over-run area of tractor and trailer wheels				
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	Client				
	3R Energy				
	Hagshaw Energy Cluster				
	Western Expansion				
	Title				
	Swept Path Assessment 80.5m Blade "Super Wing" Blade Transport Pinch Point 09				
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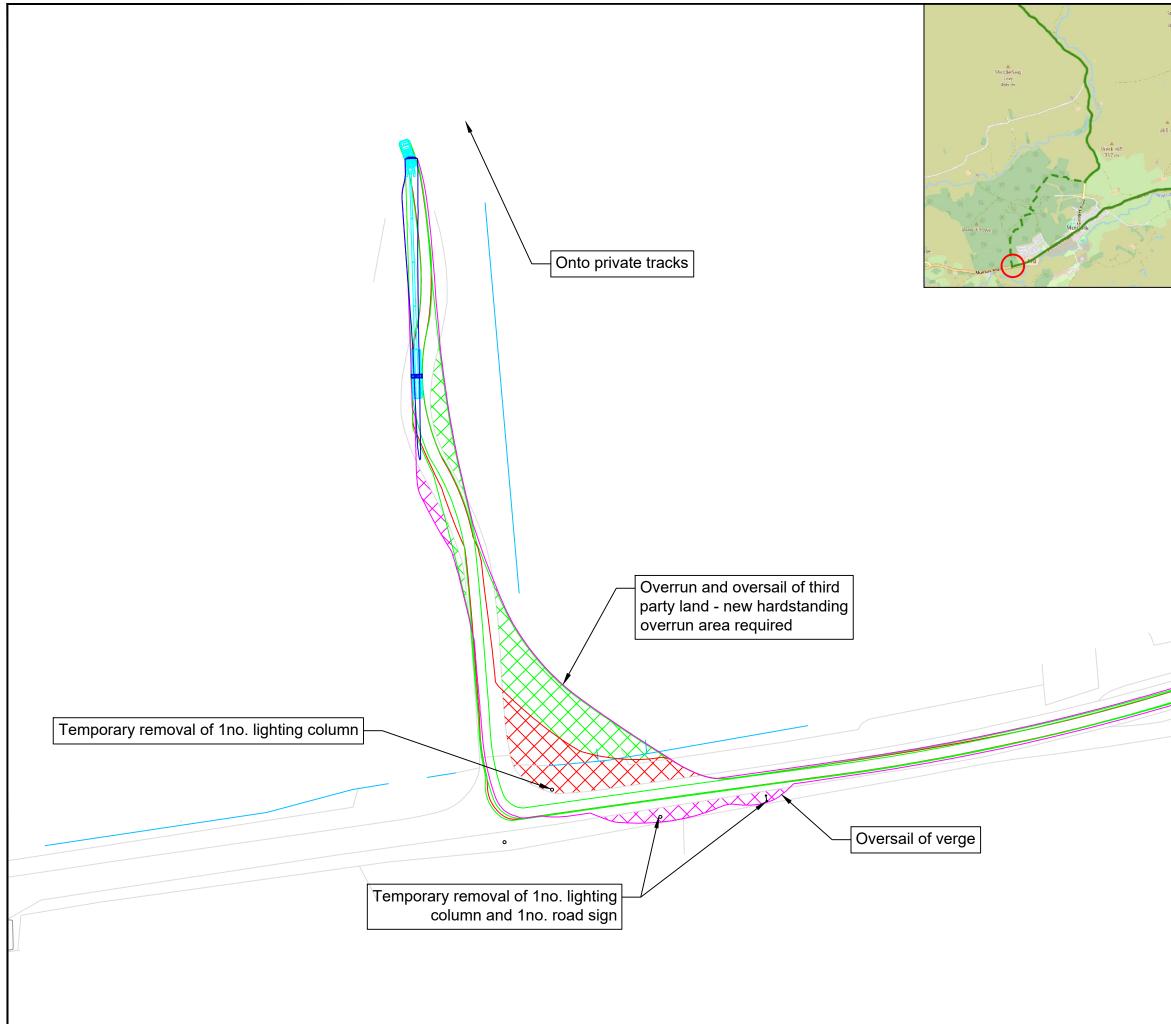




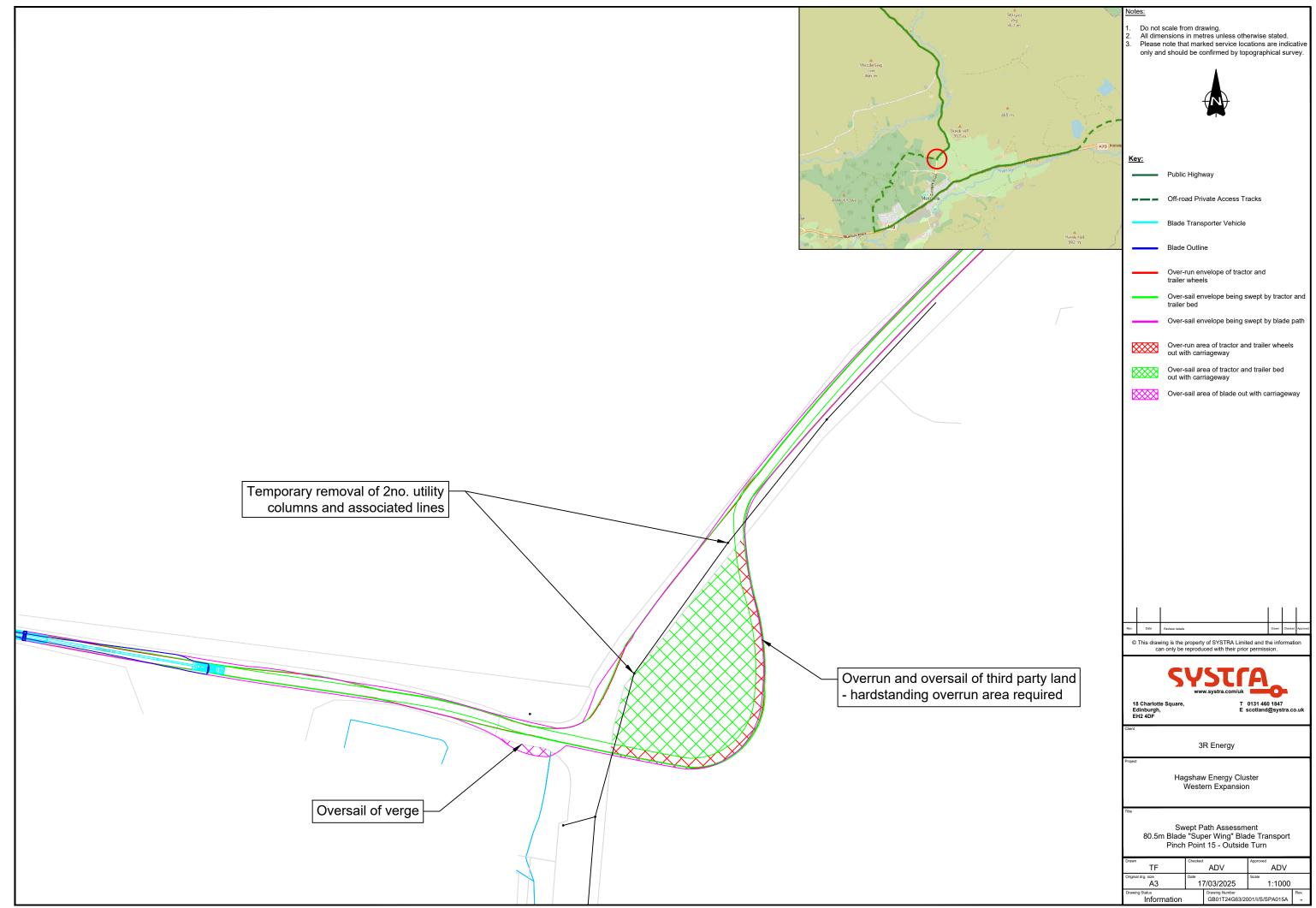
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Af	– Public Highway			
19 - C	Off-road Private Access Tracks			
Hawk Ha	Blade Transporter Vehicle			
Howk Hall 392.m	Blade Outline			
	Over-run envelope of tractor and trailer wheels			
	Over-sail envelope being swept by tractor and trailer bed			
	Over-sail envelope being swept by blade path			
	Over-run area of tractor and trailer wheels out with carriageway			
	Over-sail area of tractor and trailer bed out with carriageway			
	Over-sail area of blade out with carriageway			
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	<sup>Project</sup> Hagshaw Energy Cluster Western Expansion			
	™ Swept Path Assessment 80.5m Blade "Super Wing" Blade Transport Pinch Point 11			
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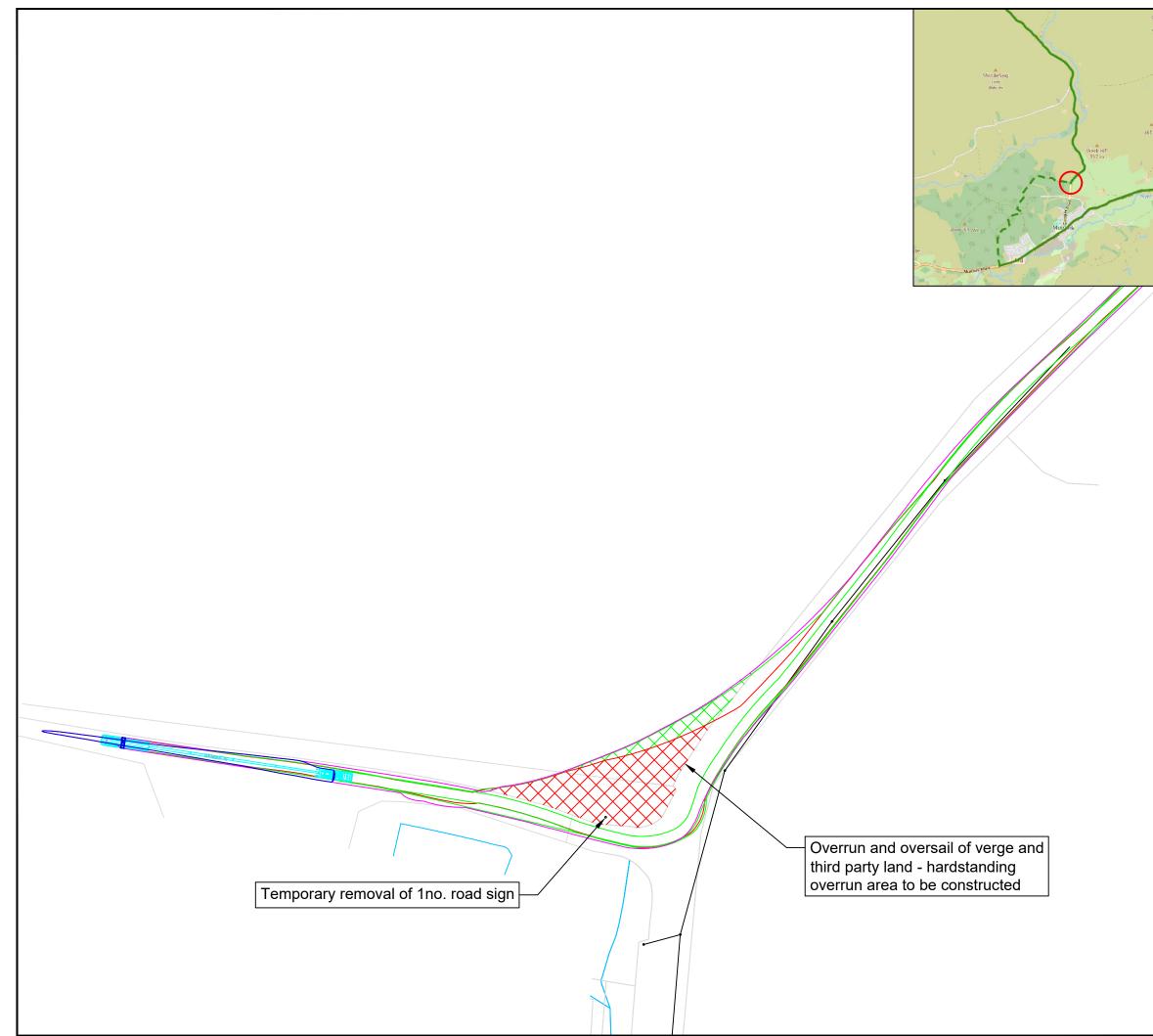




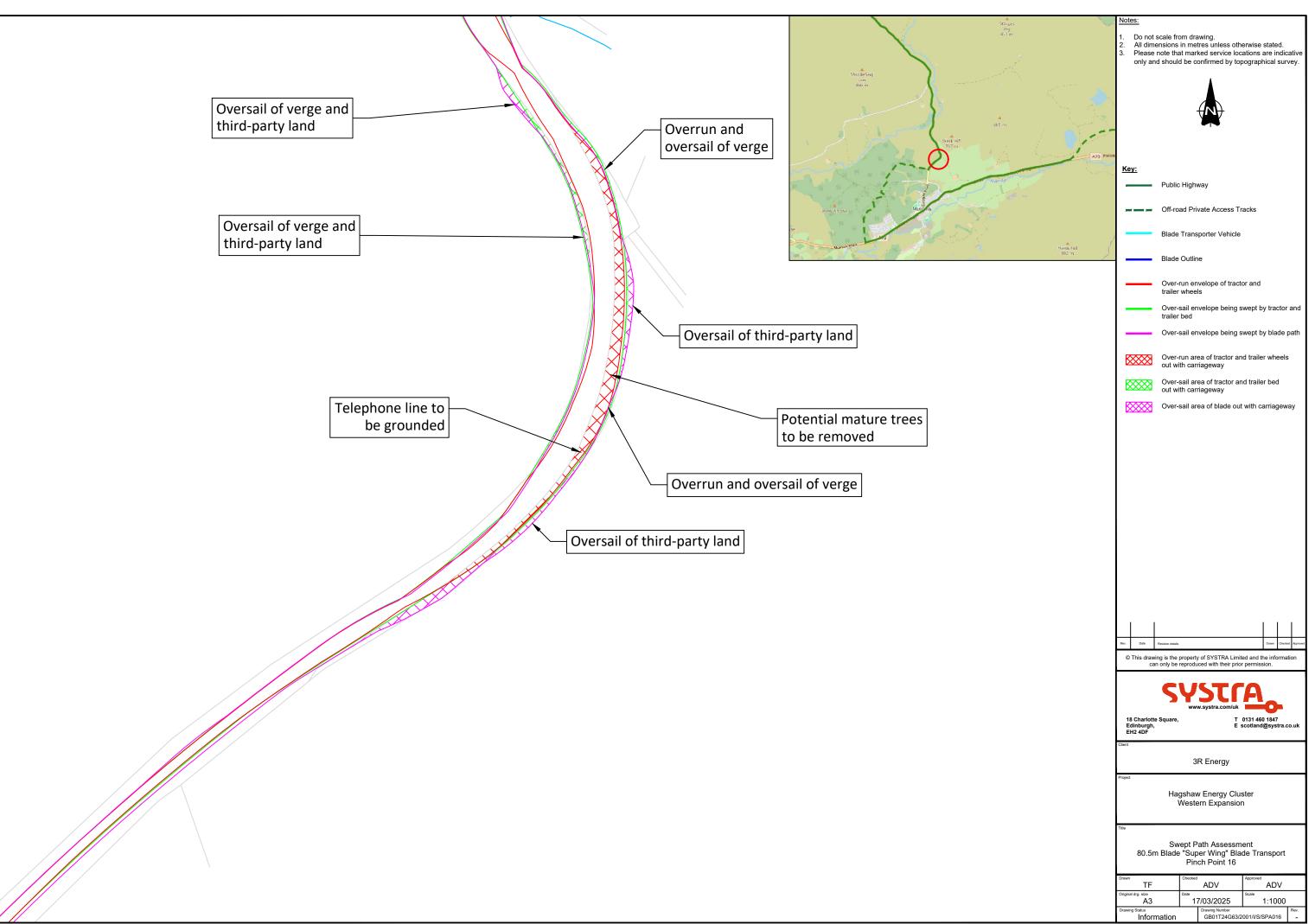


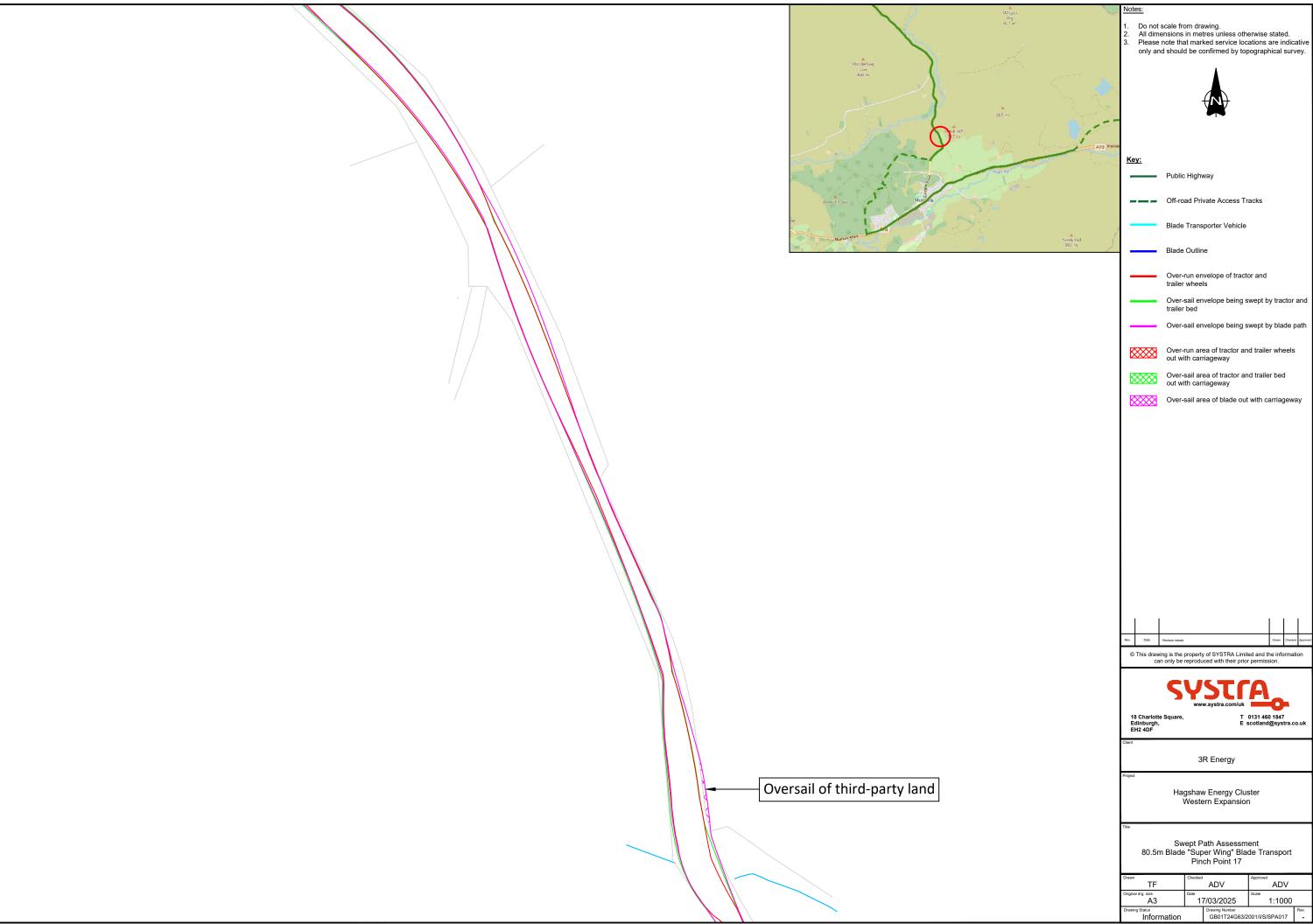
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Havik Hill 392 m		Blade	Transporter Vehicle		
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			www.systra.com/uk	<b></b>	
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	Client		3R Energy		
	Project				
	Hagshaw Energy Cluster Western Expansion				
	Title				
	Swept Path Assessment 80.5m Blade "Super Wing" Blade Transport Pinch Point 14				
	Drawn TF		Checked	Approved ADV	
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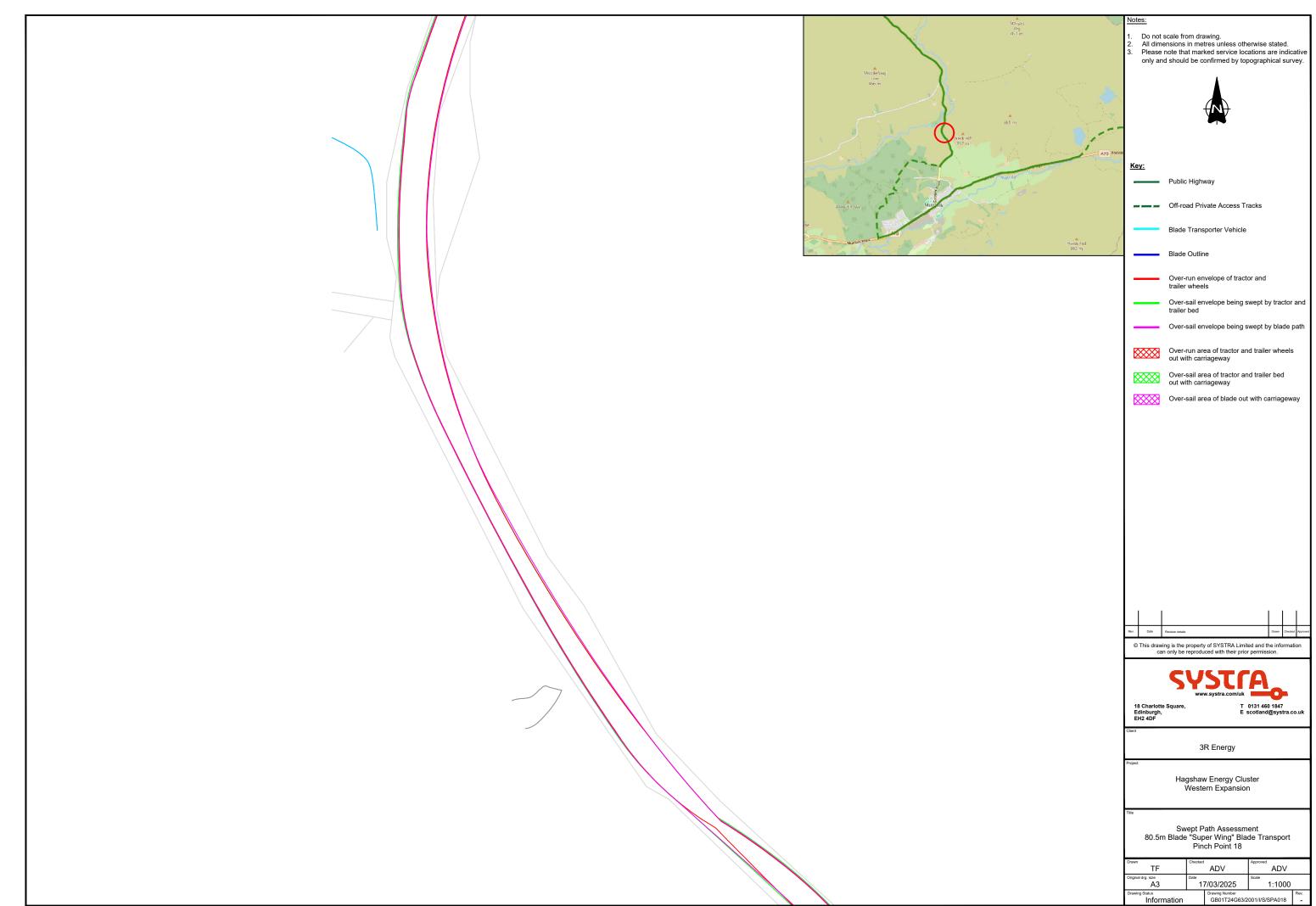


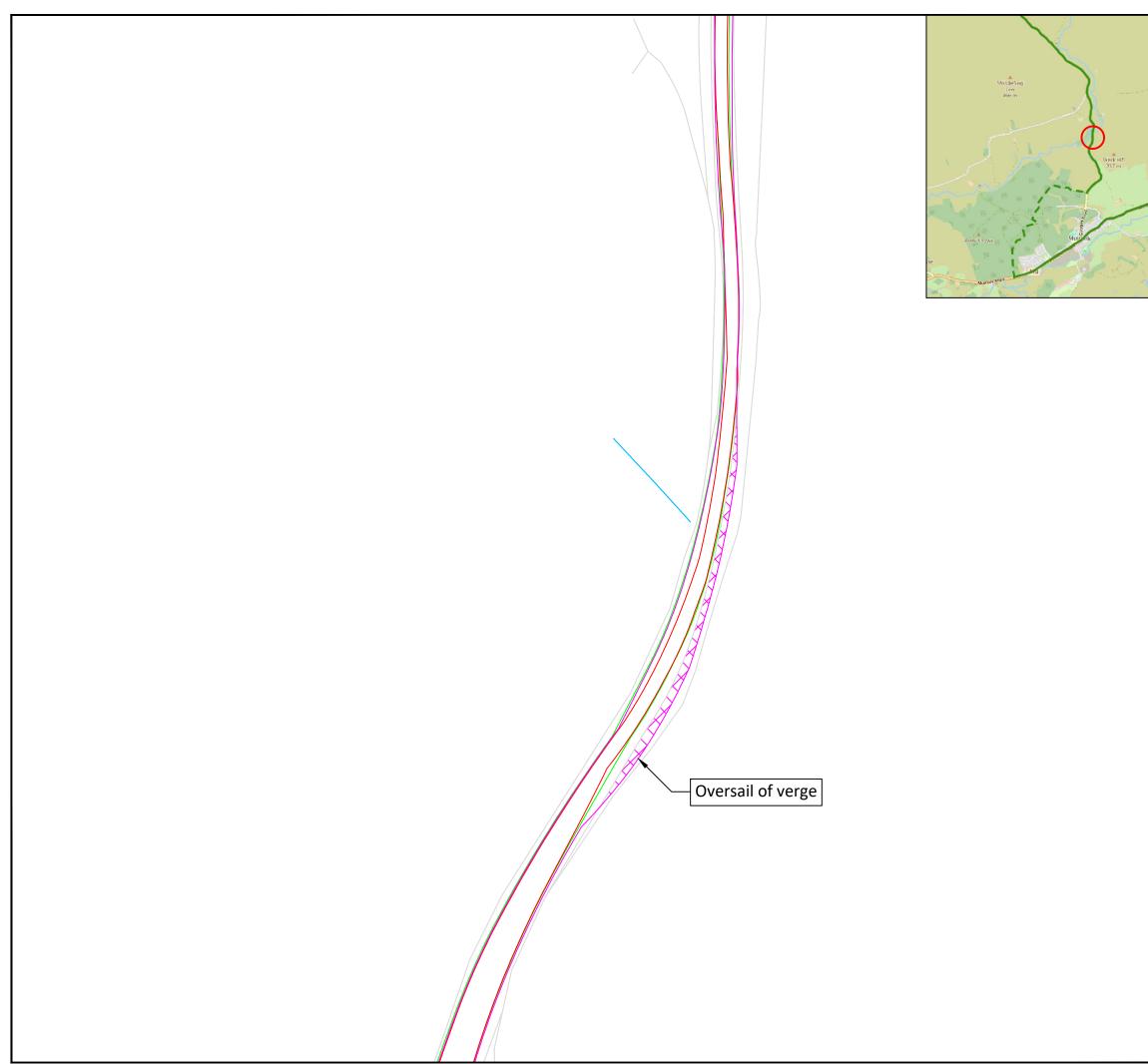


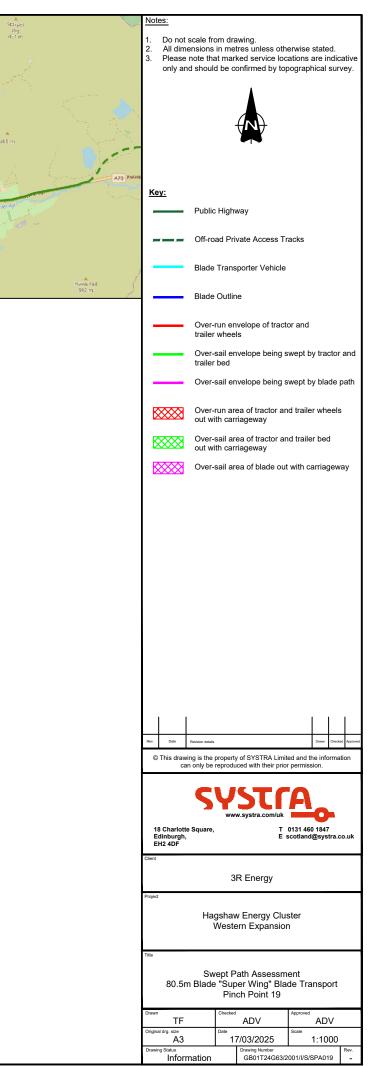
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	<u>Key:</u>				
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		3R Energy			
	Project		ator		
	Hagshaw Energy Cluster Western Expansion				
	Title				
	Swept Path Assessment 80.5m Blade "Super Wing" Blade Transport Pinch Point 15 - Inside Turn				
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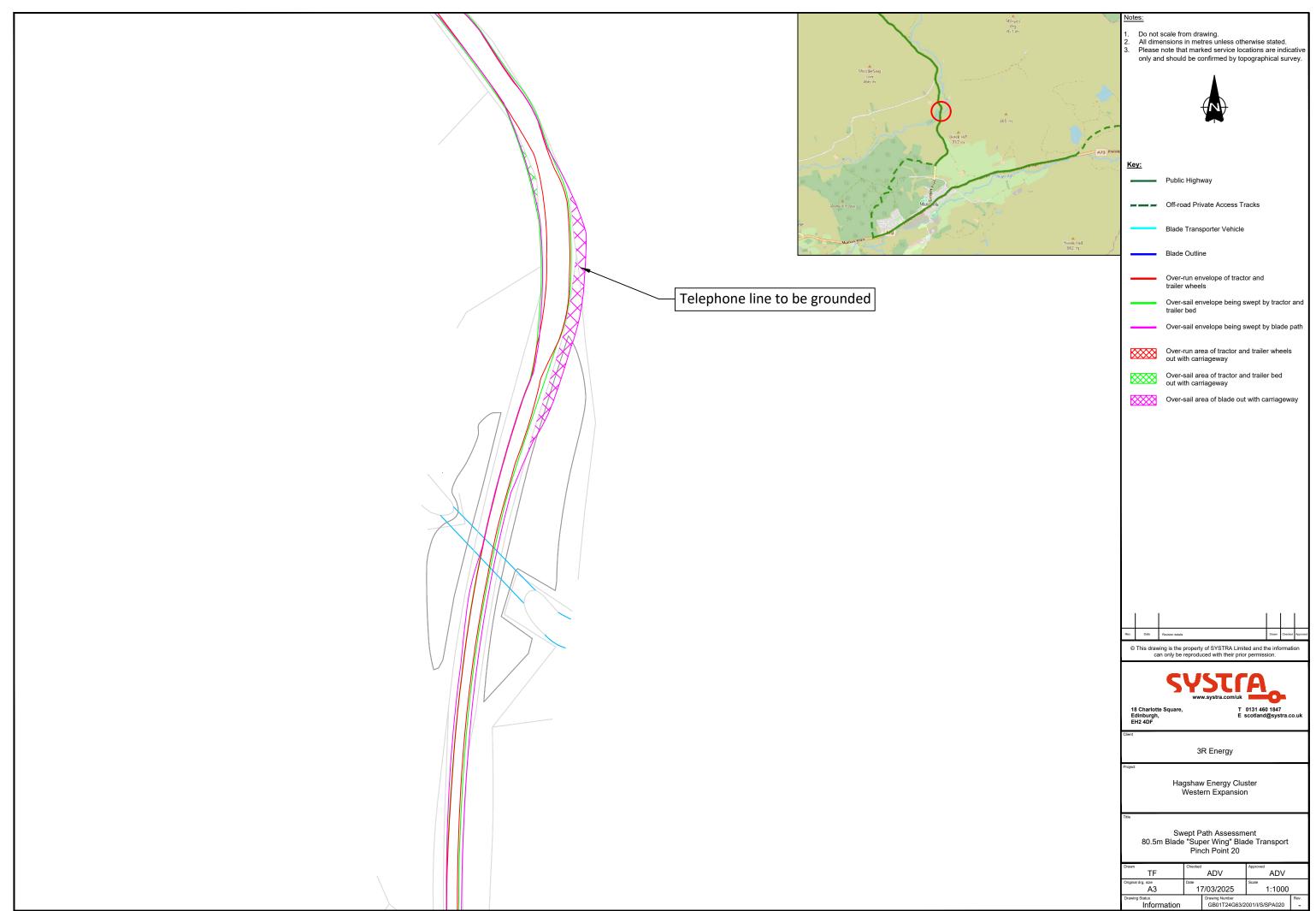


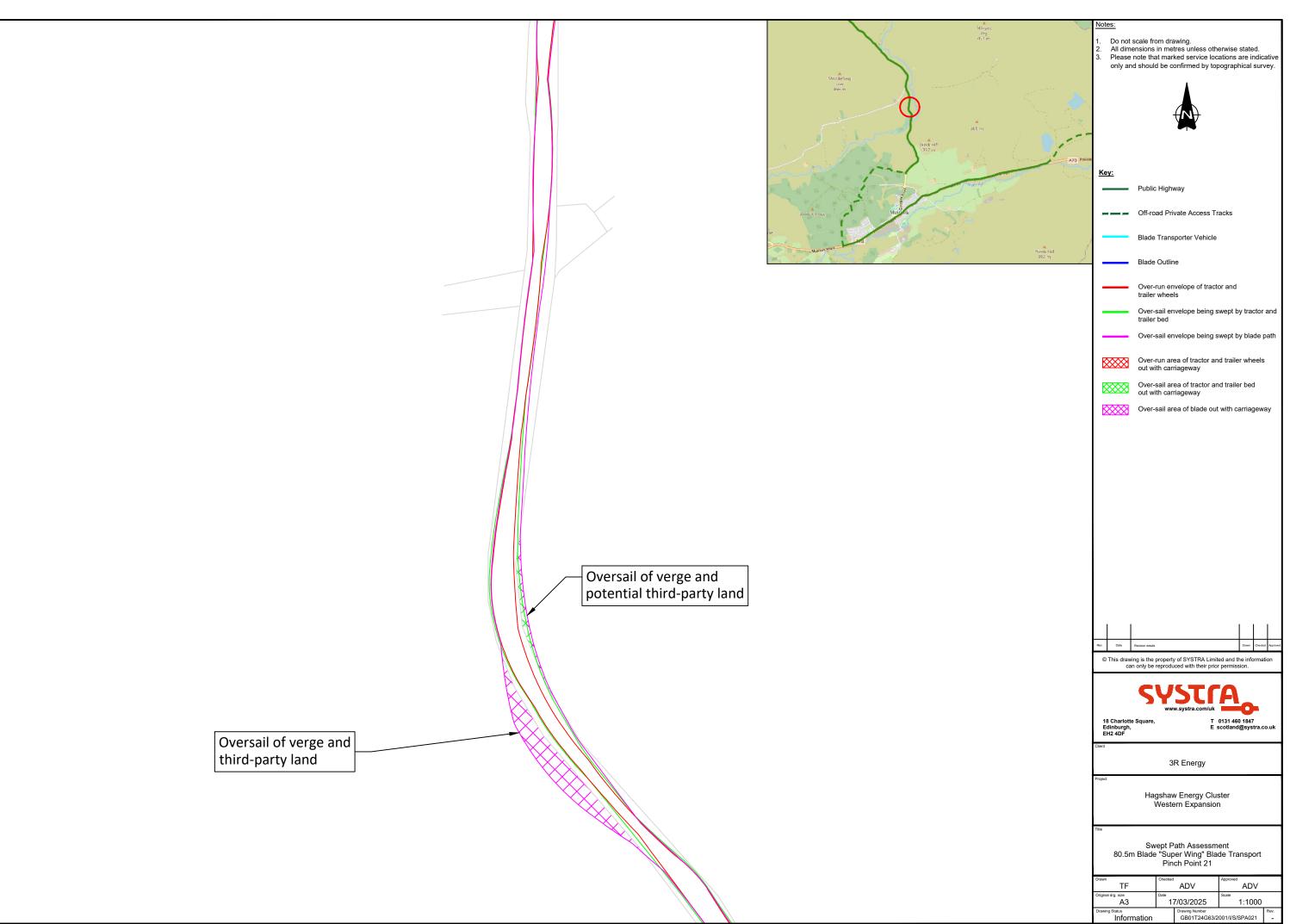


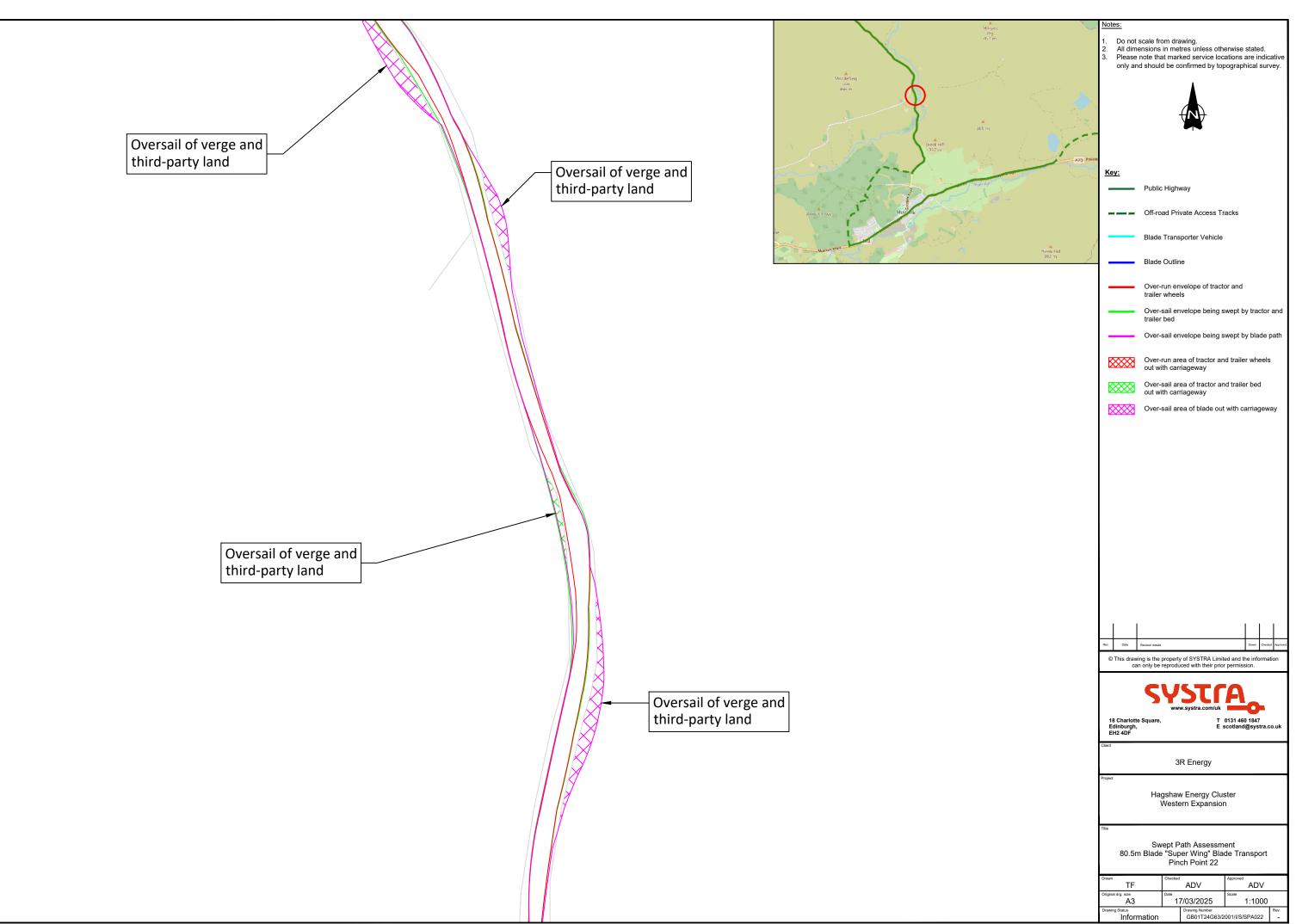


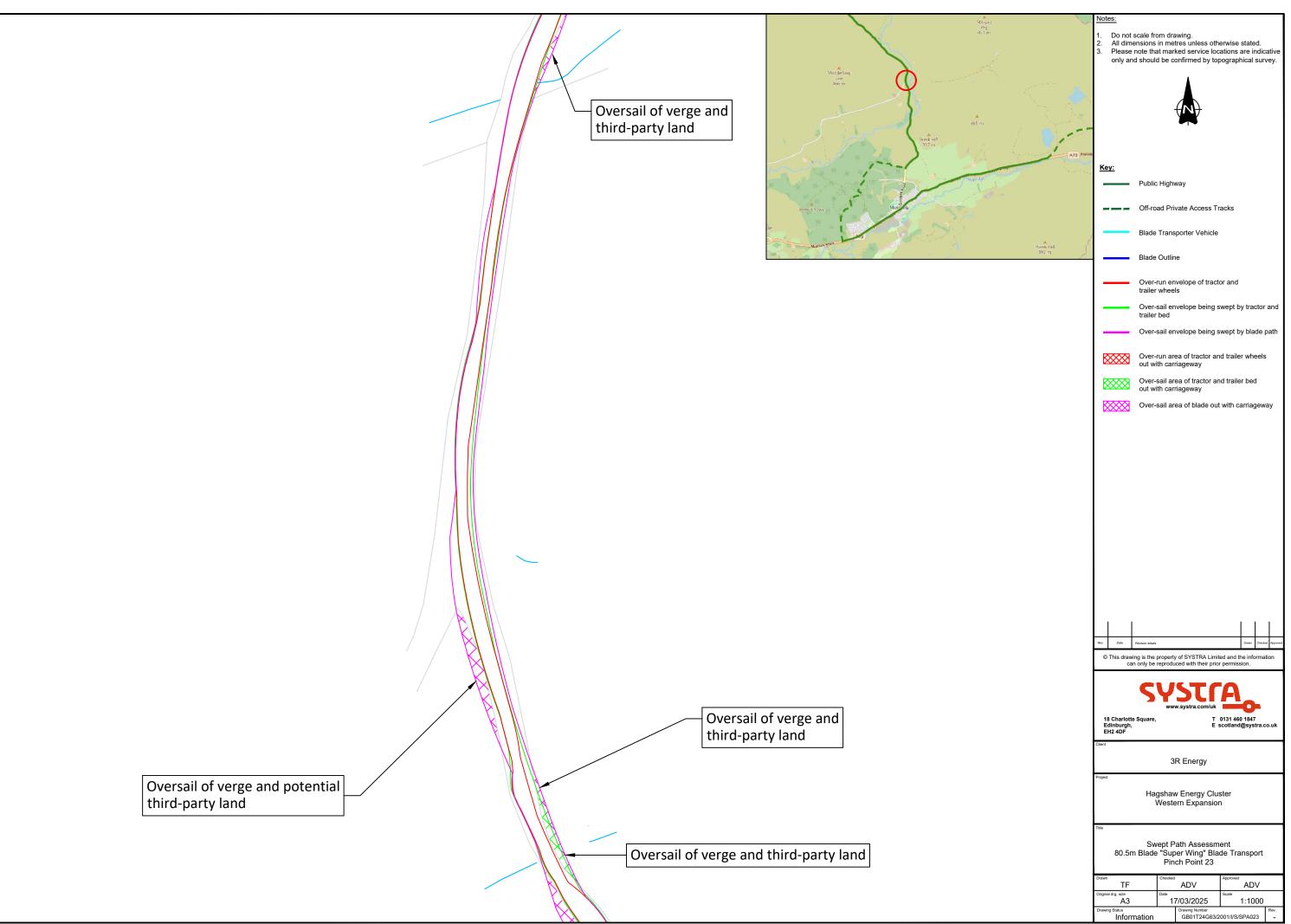


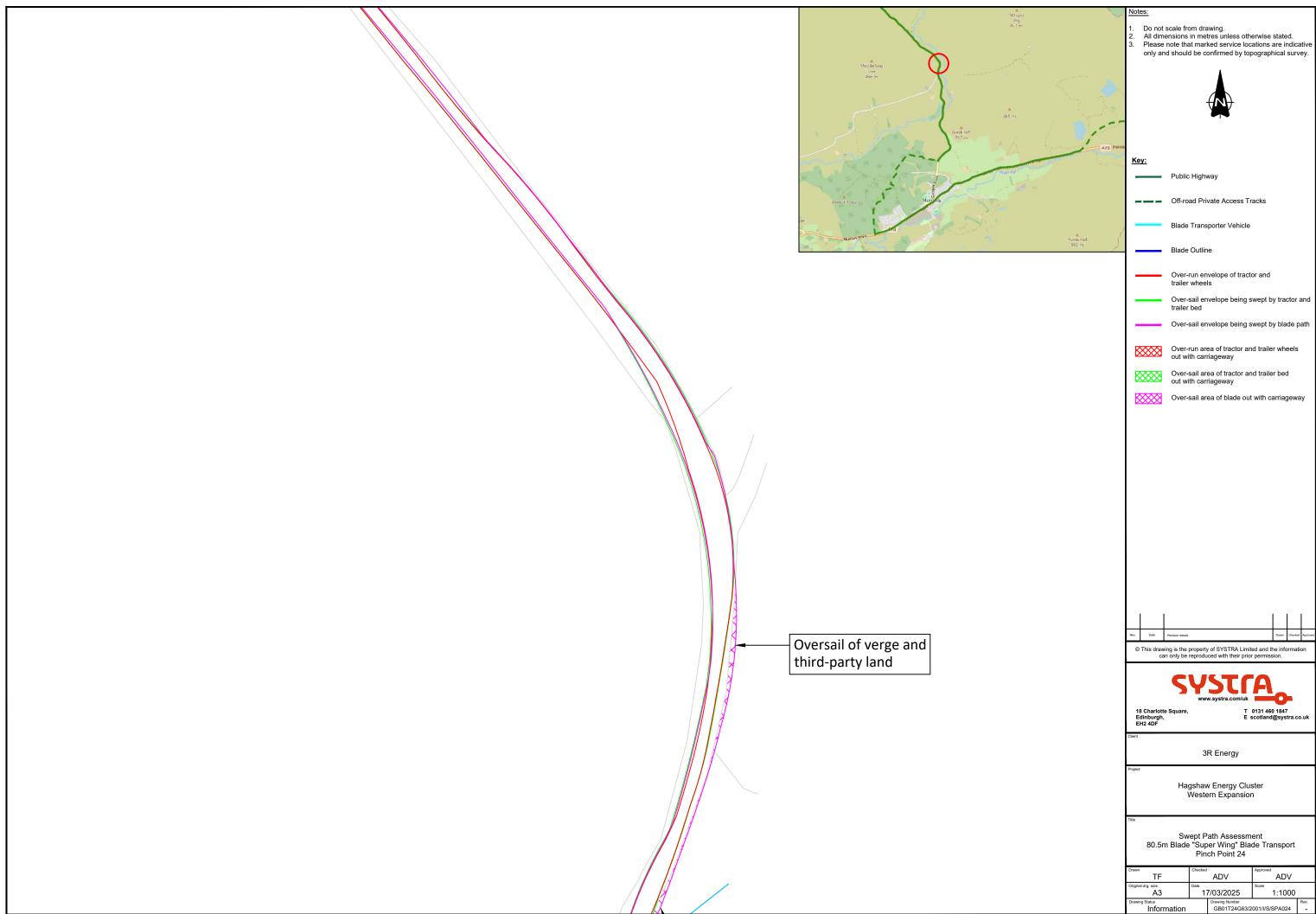


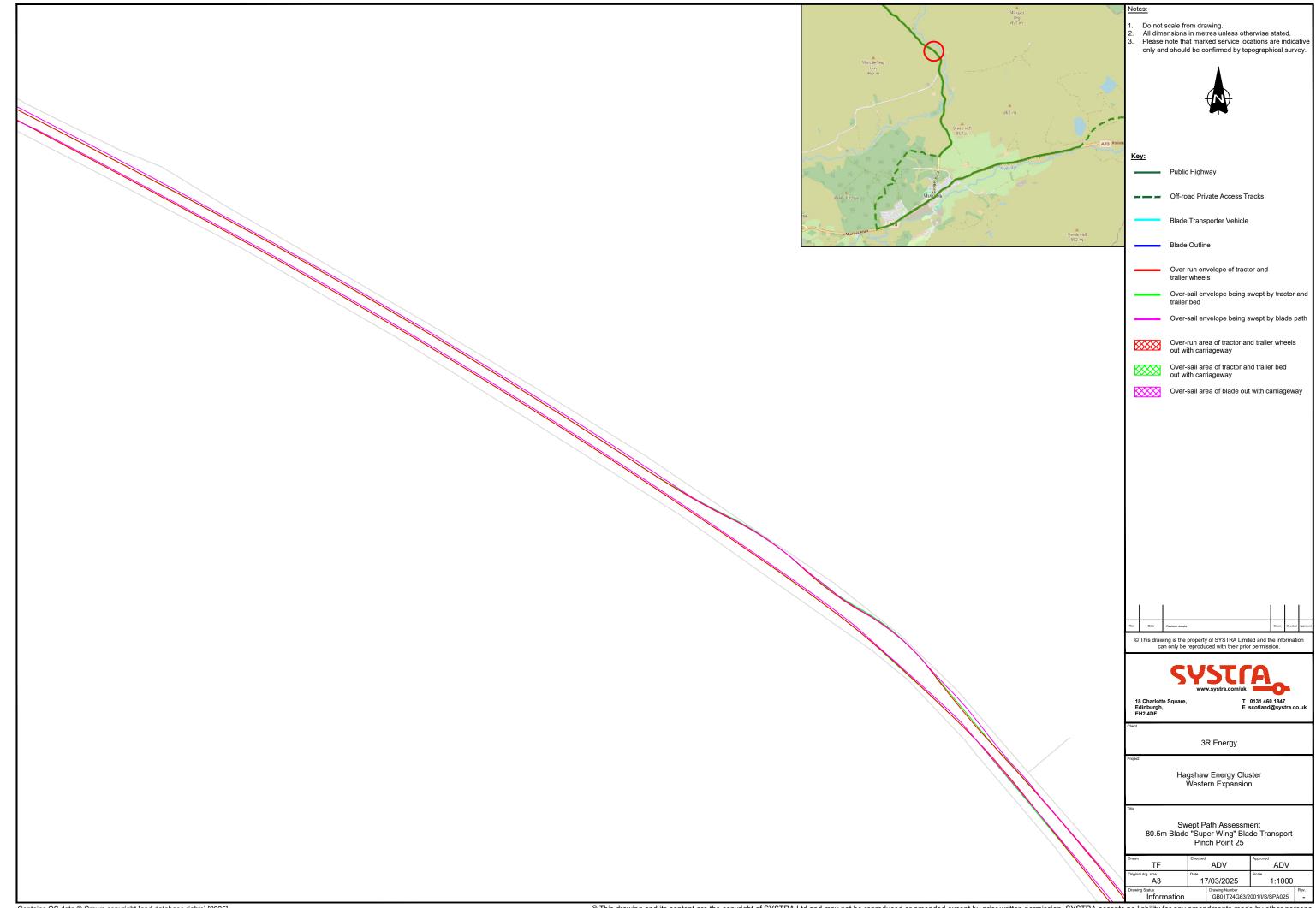


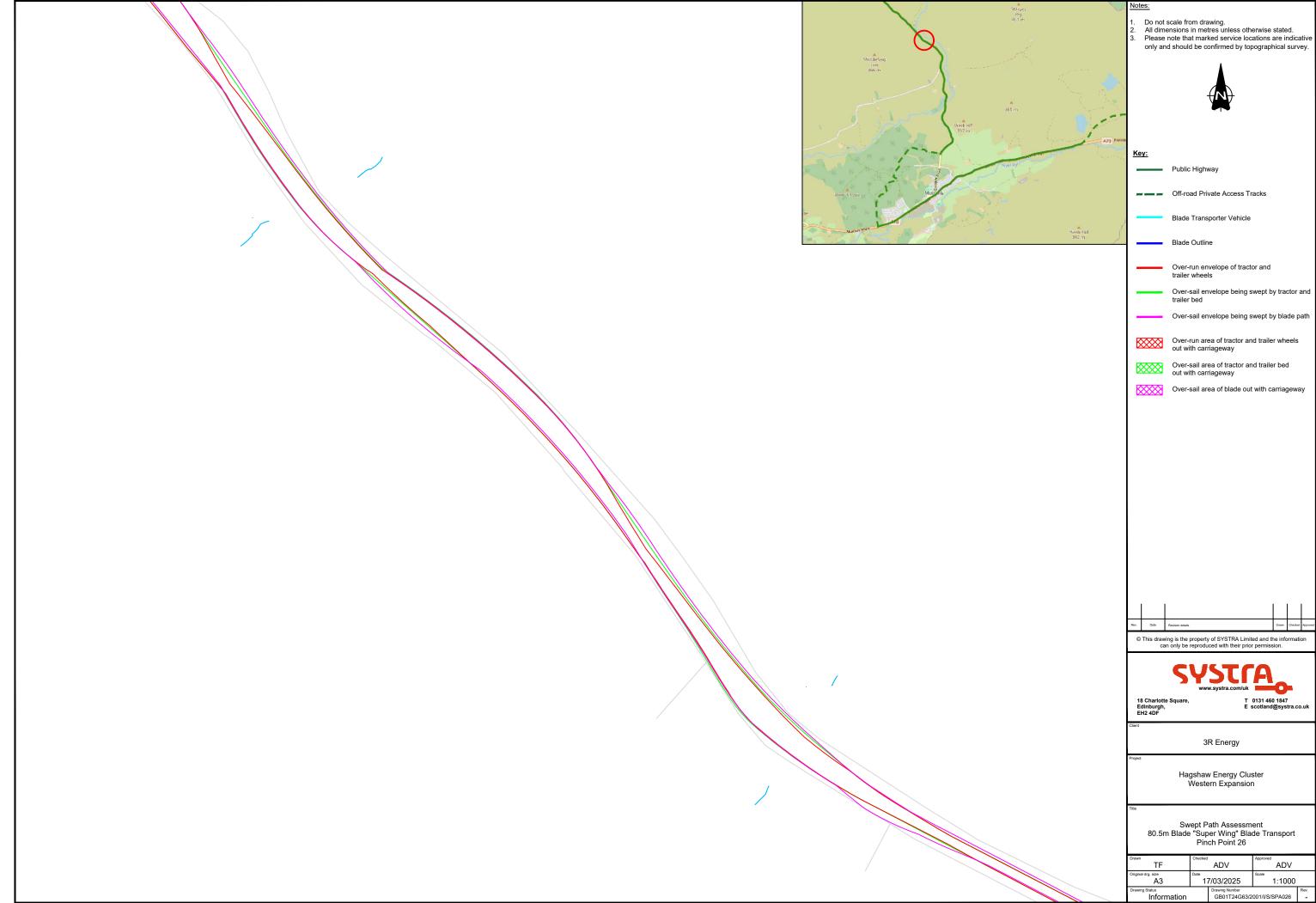


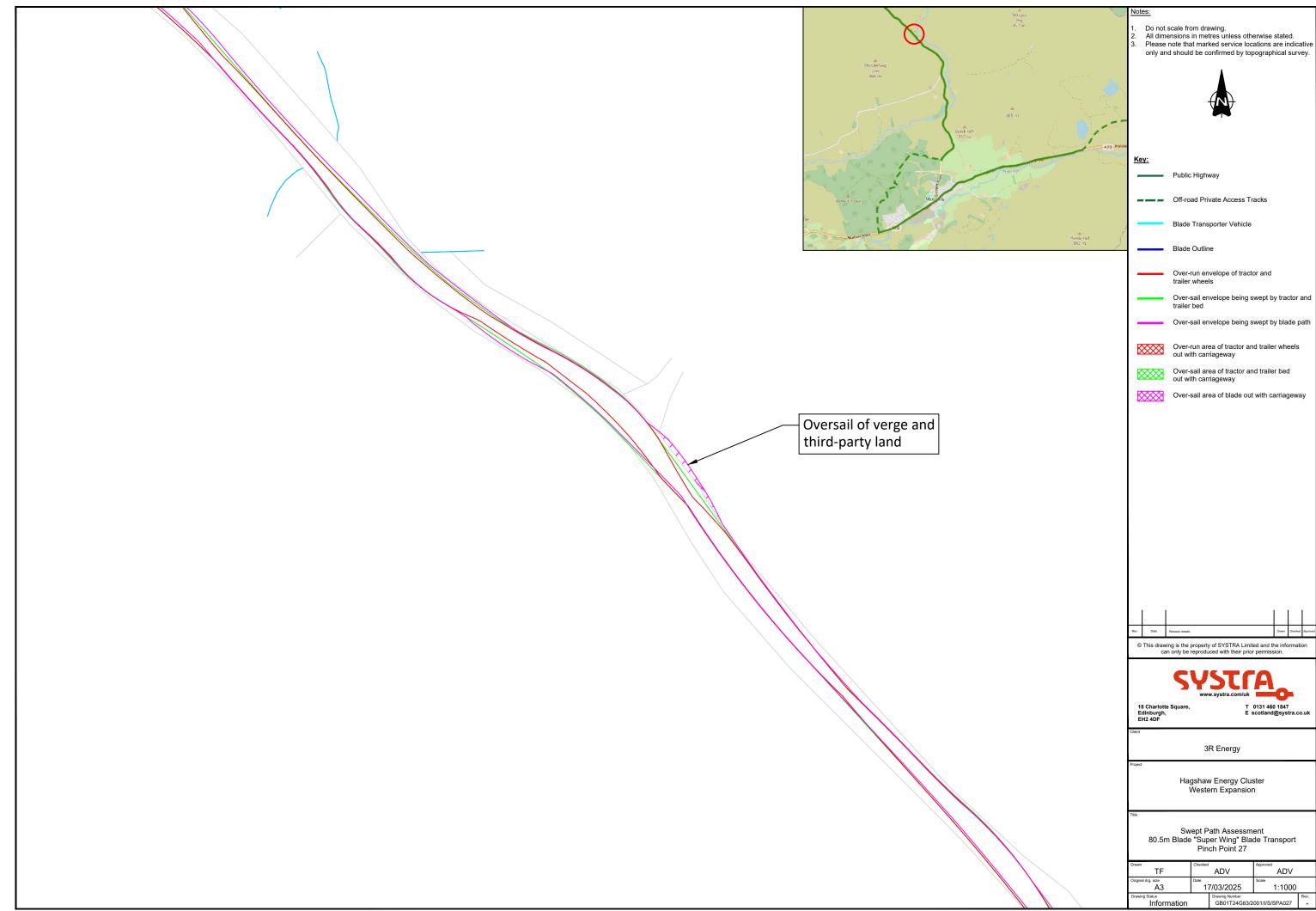


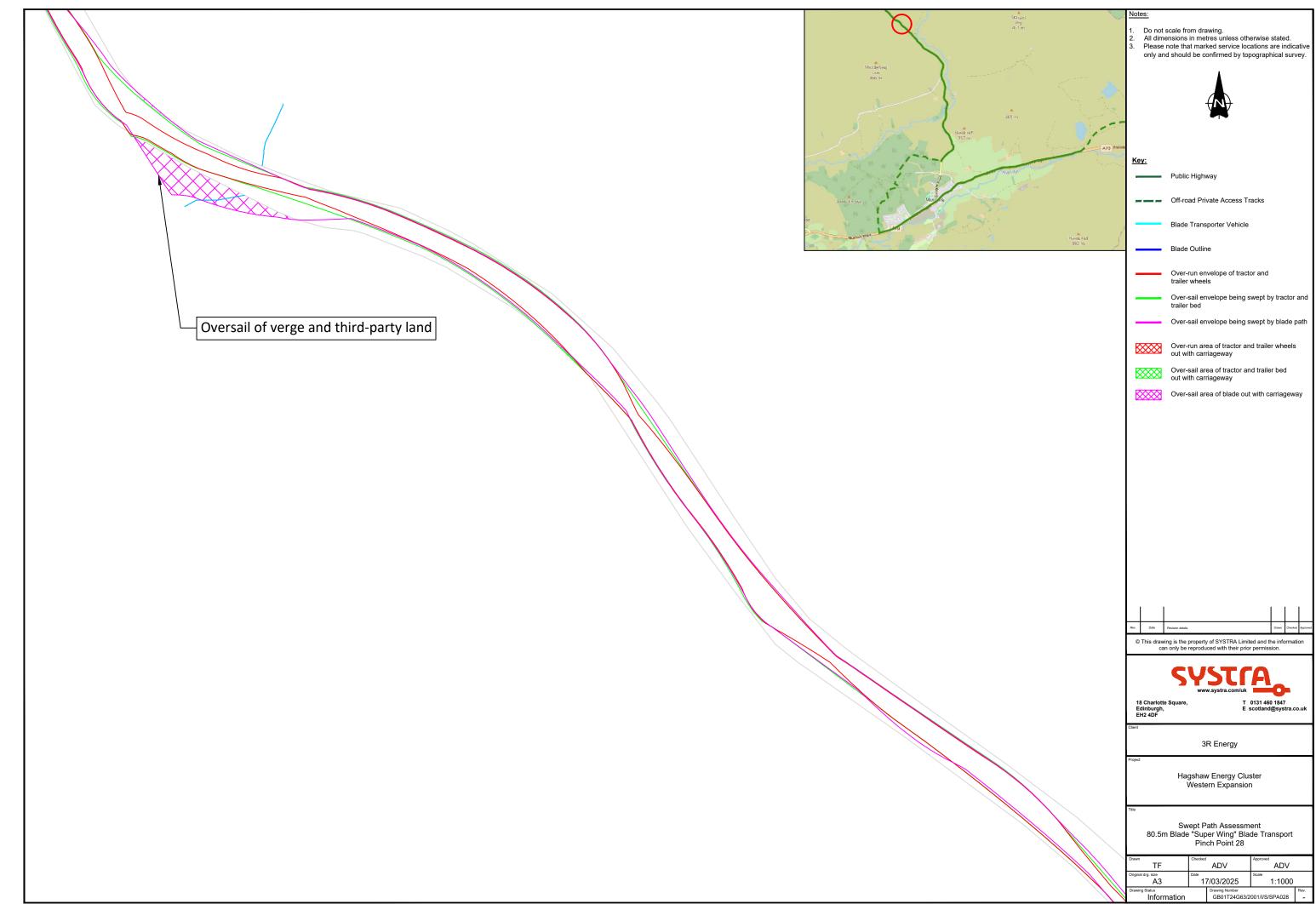


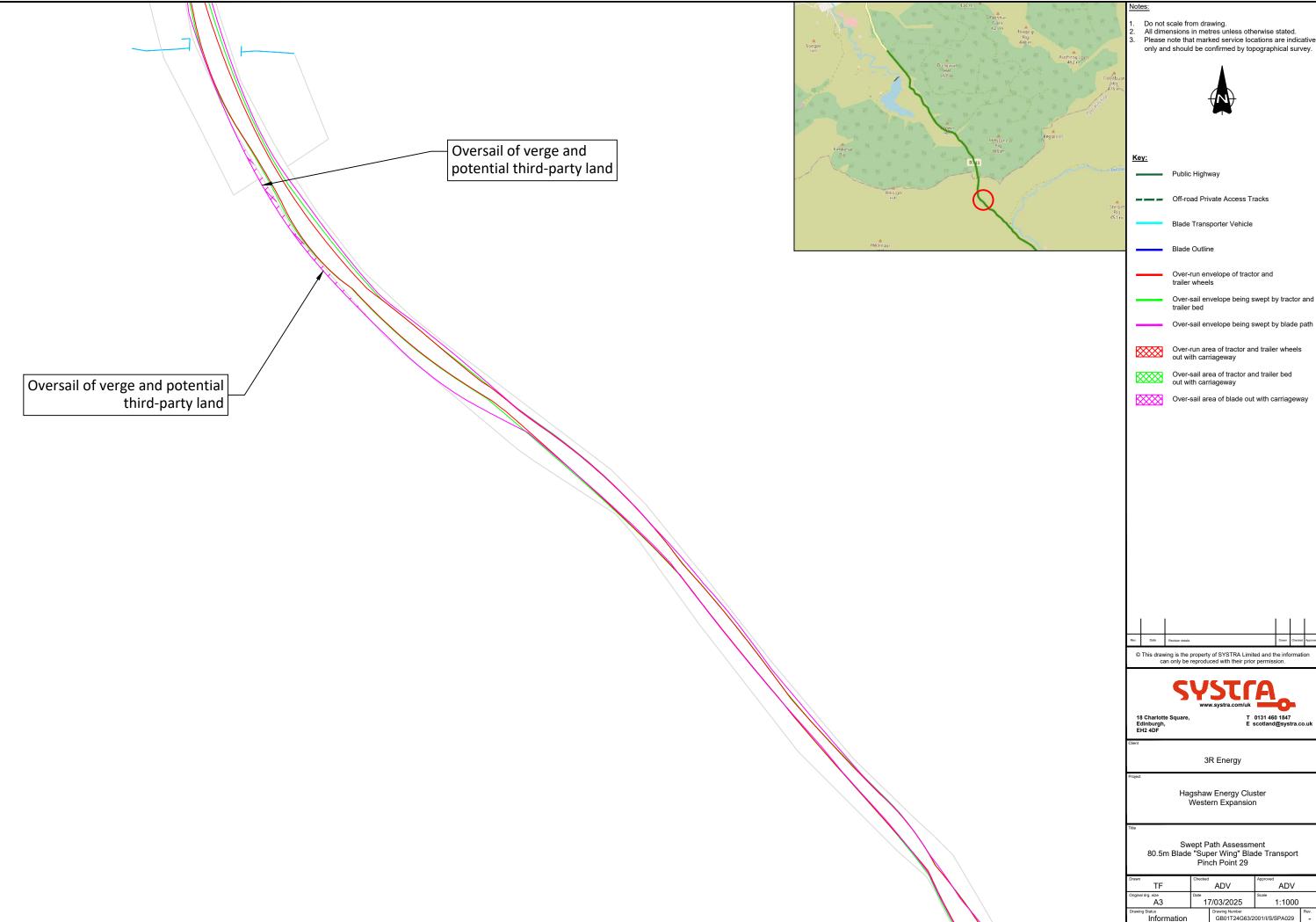


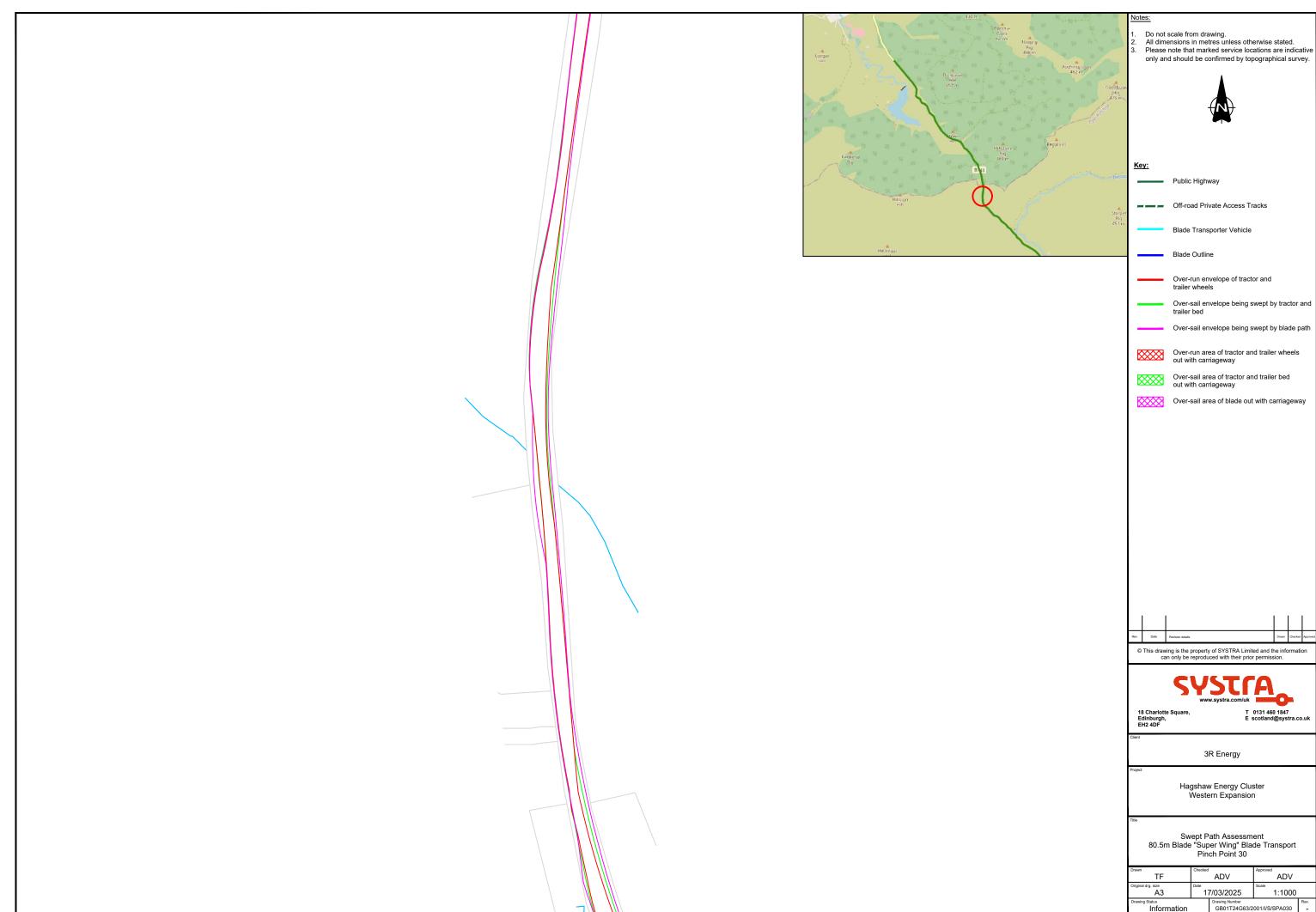


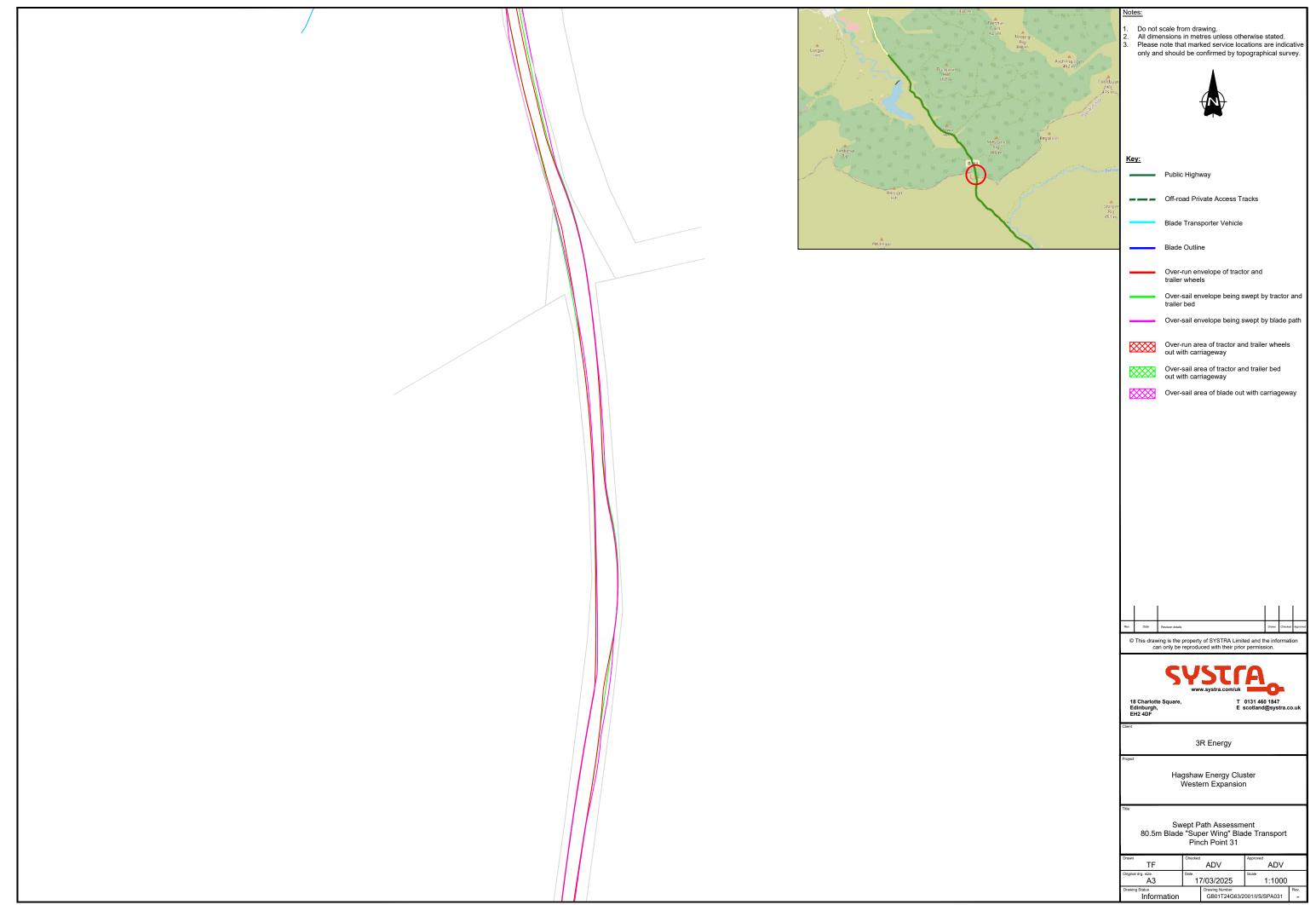




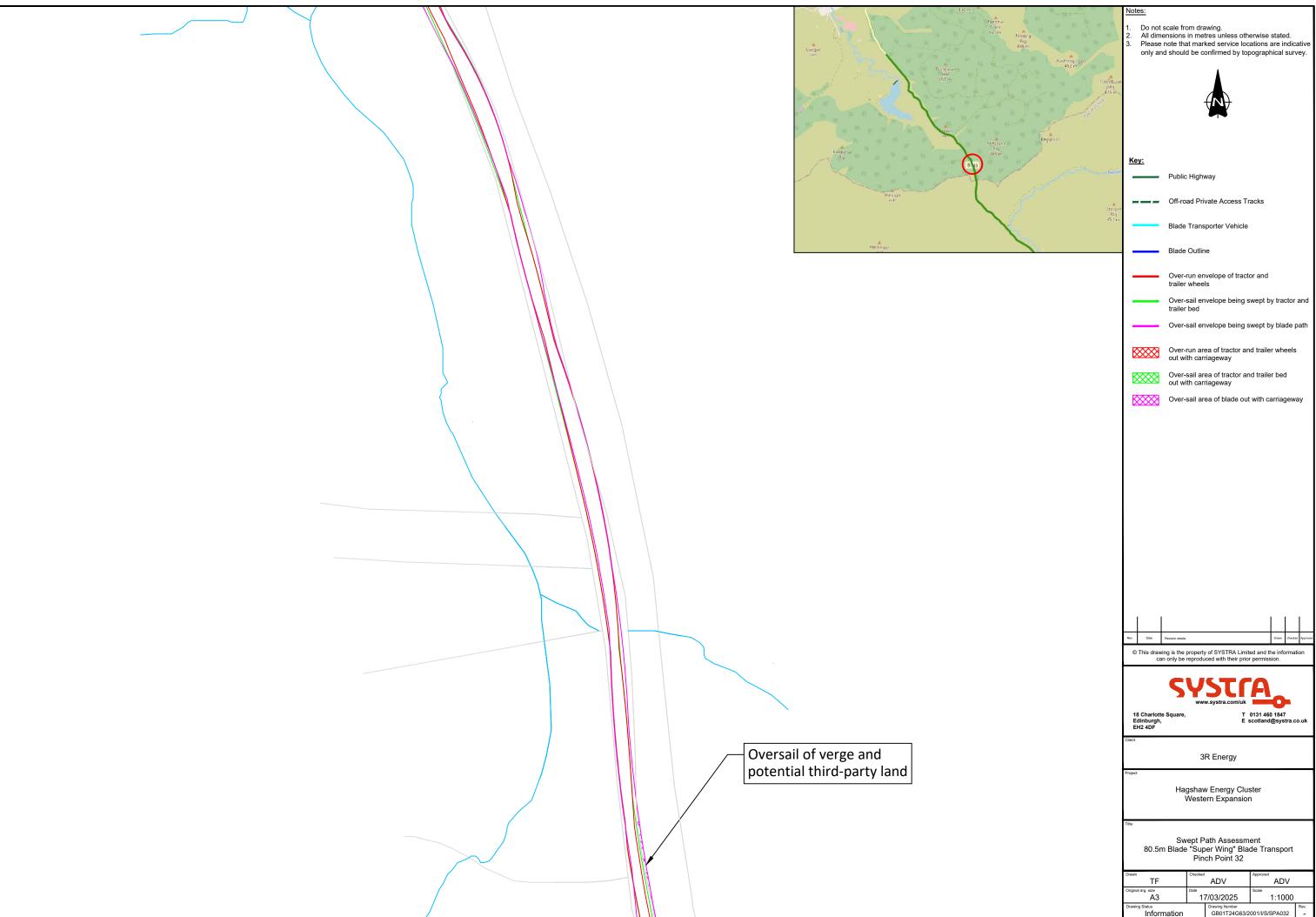


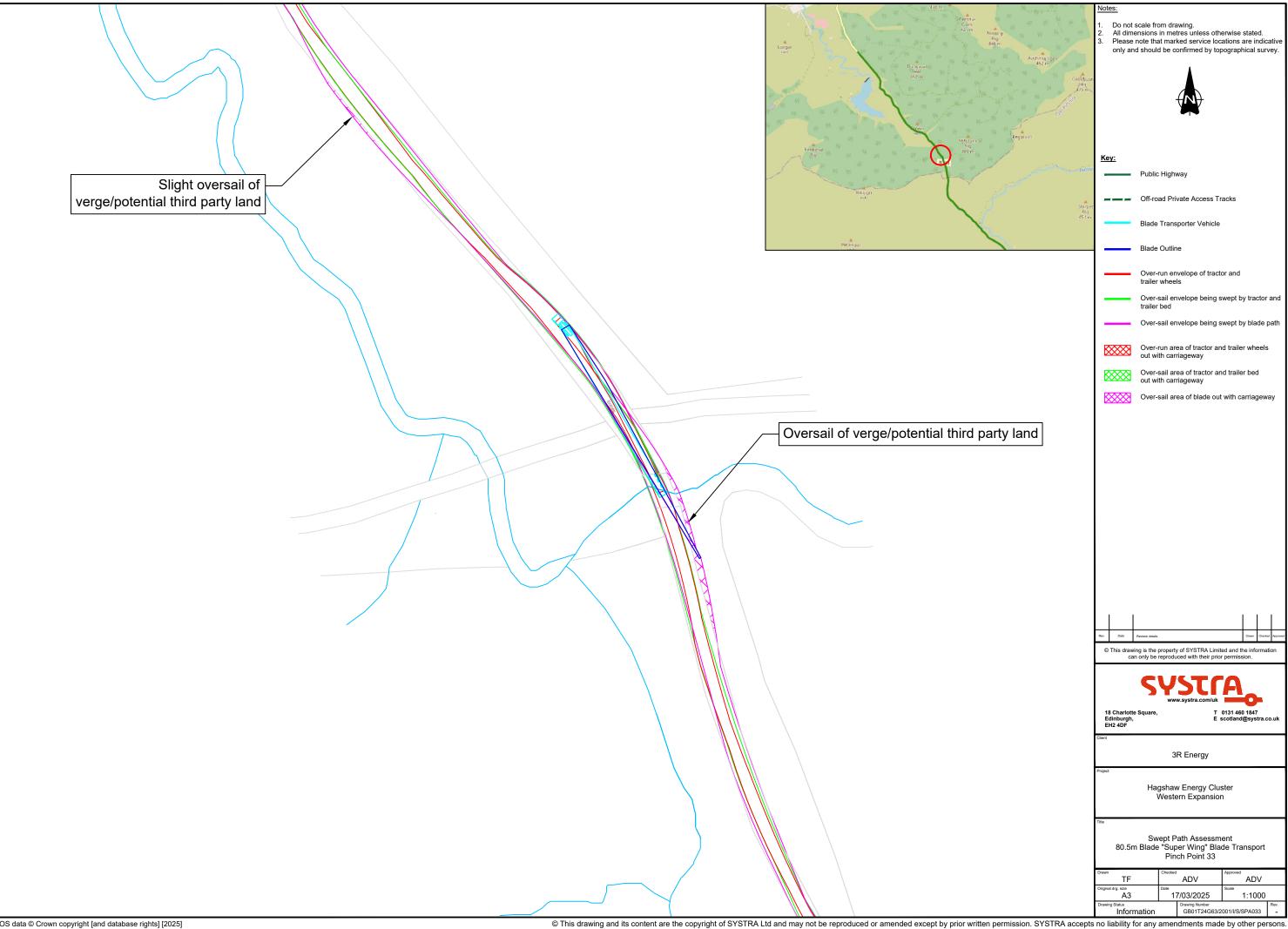


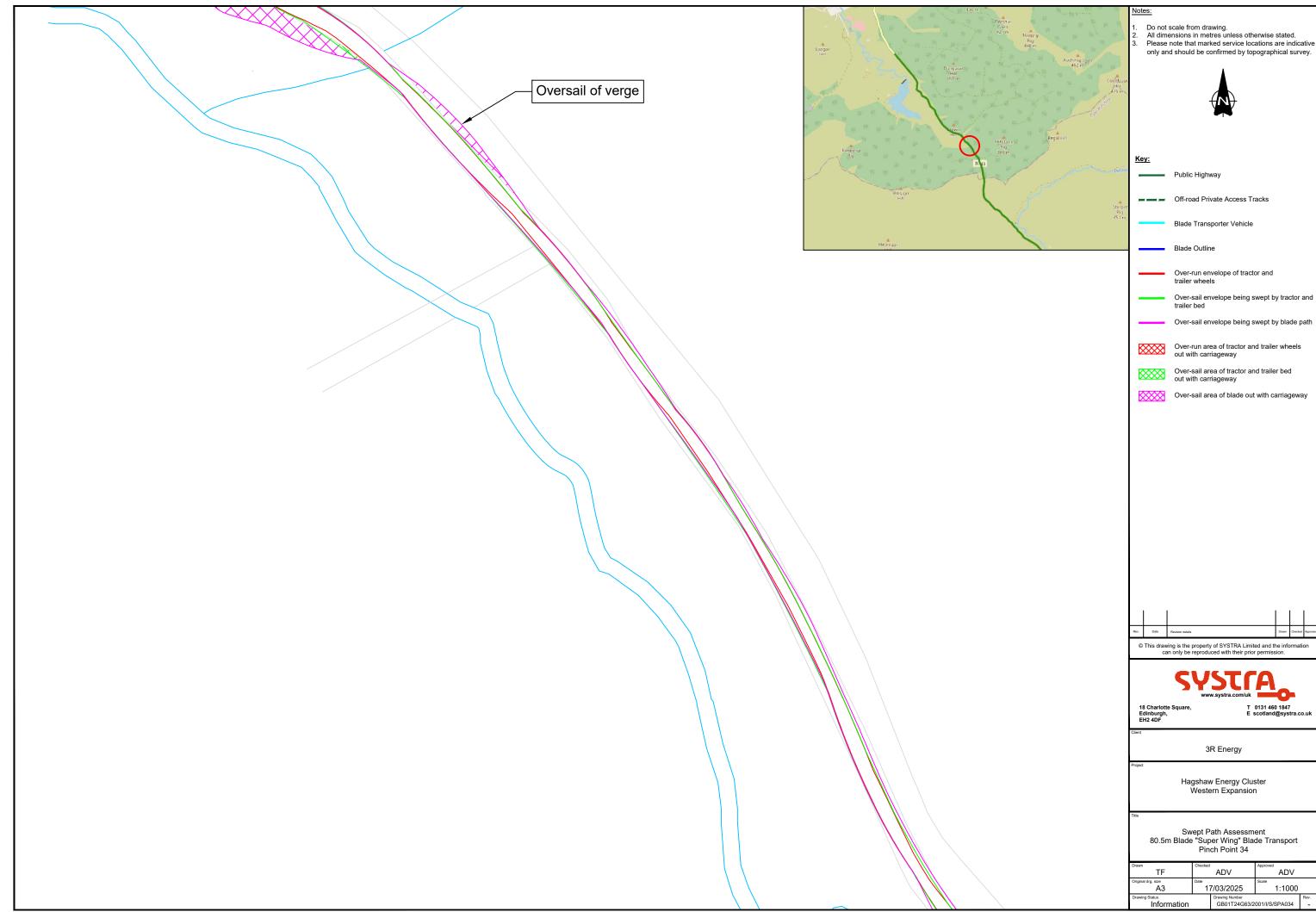




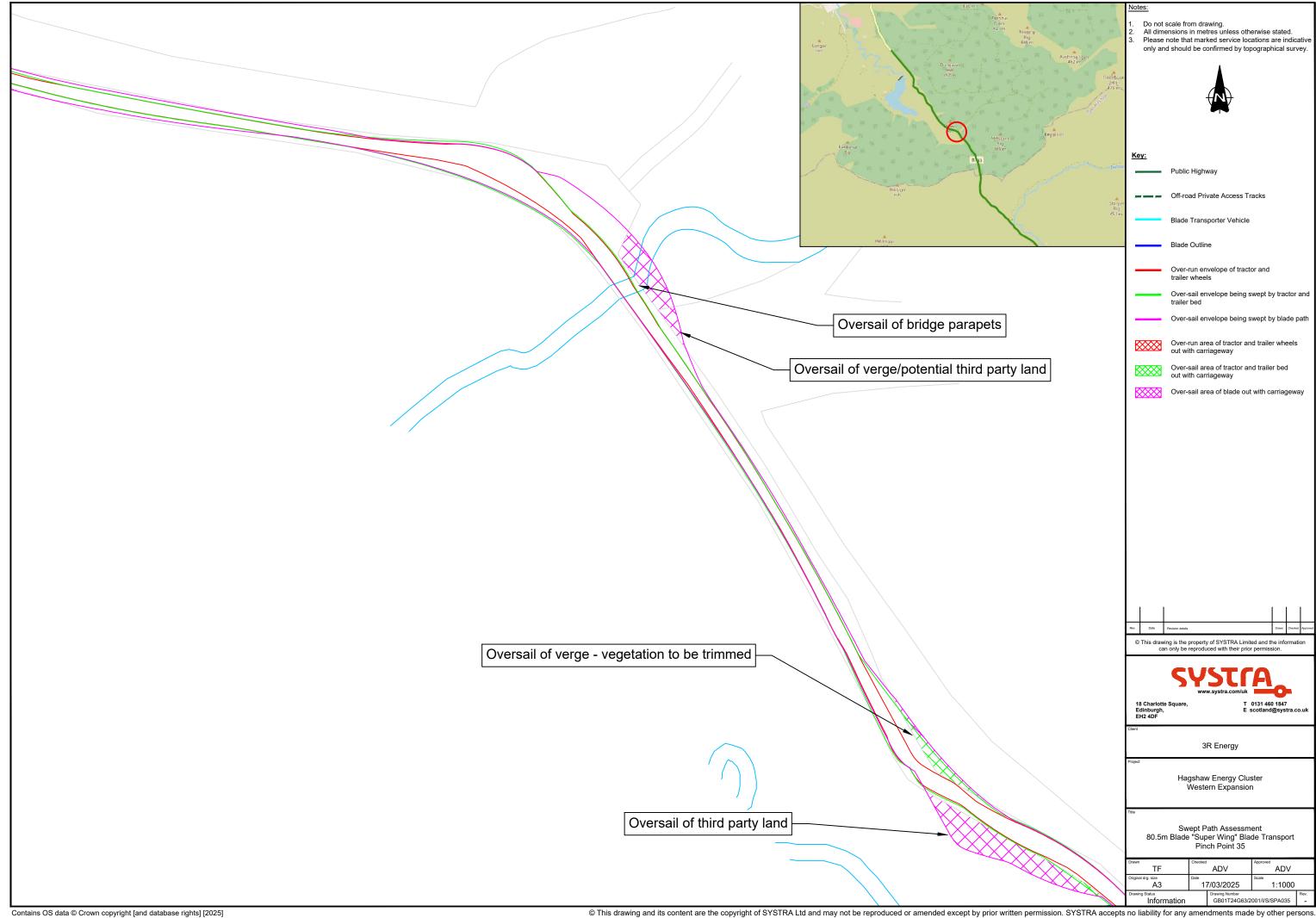


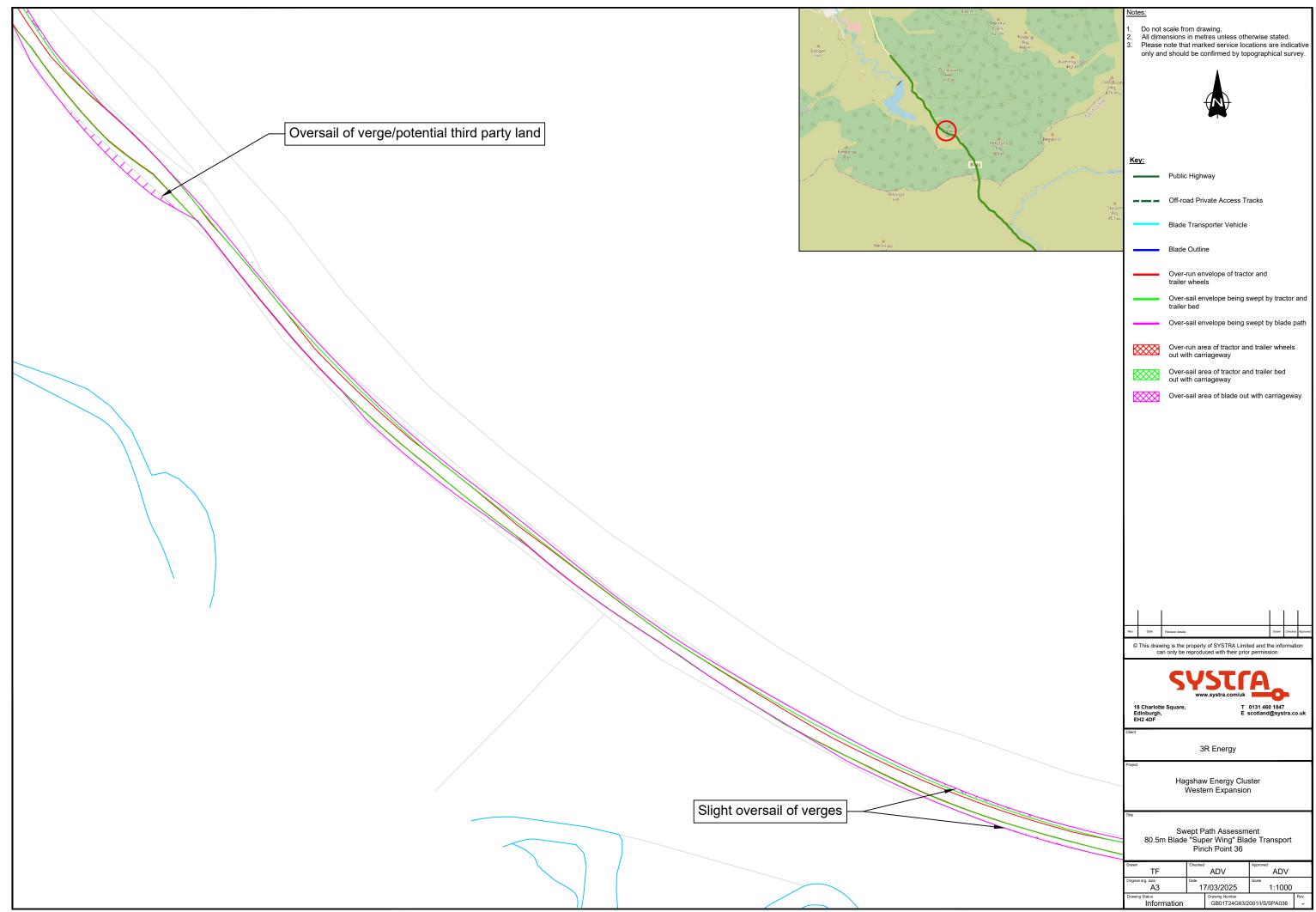


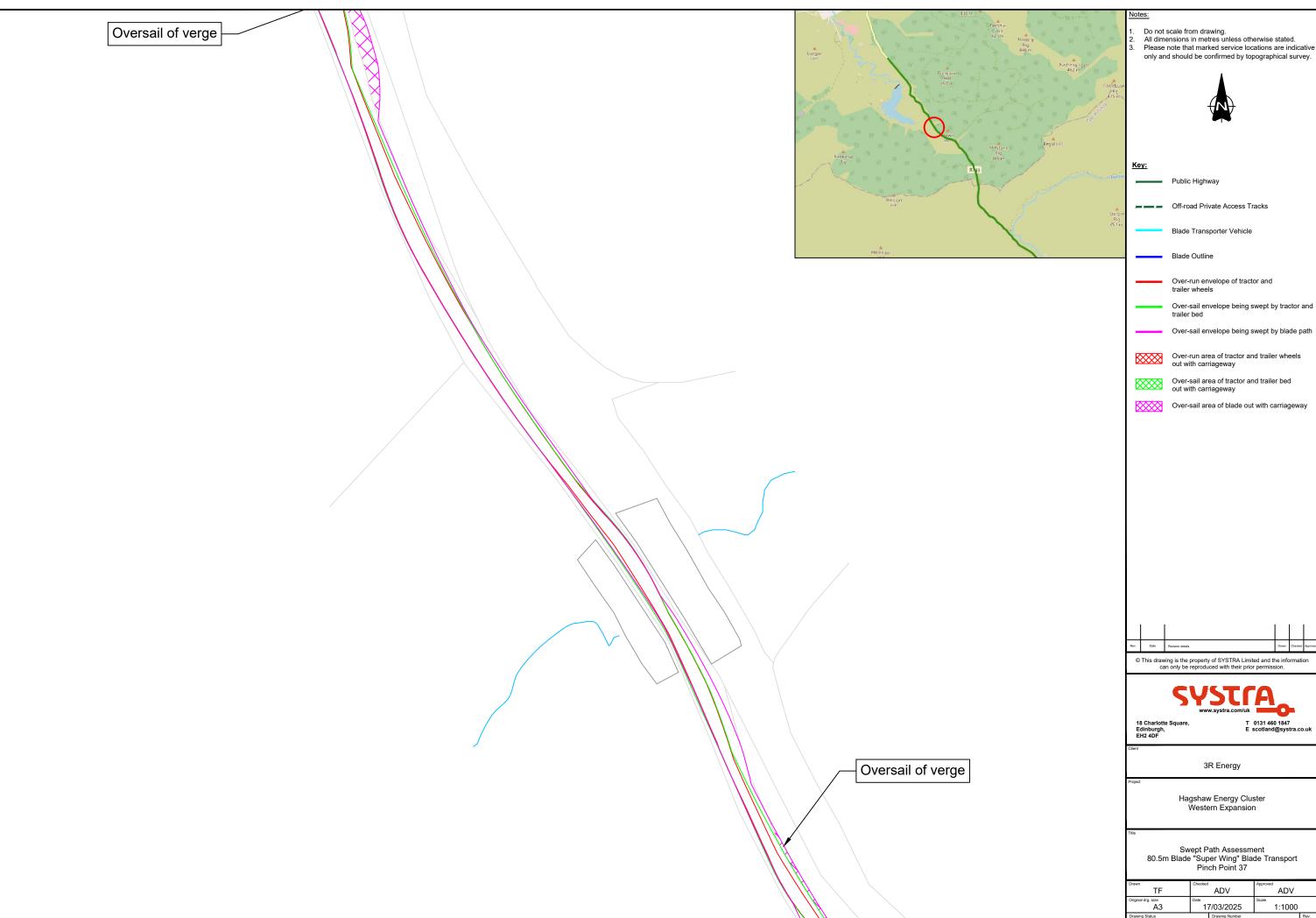




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Client			3R Energy				
Project Hagshaw Energy Cluster Western Expansion							
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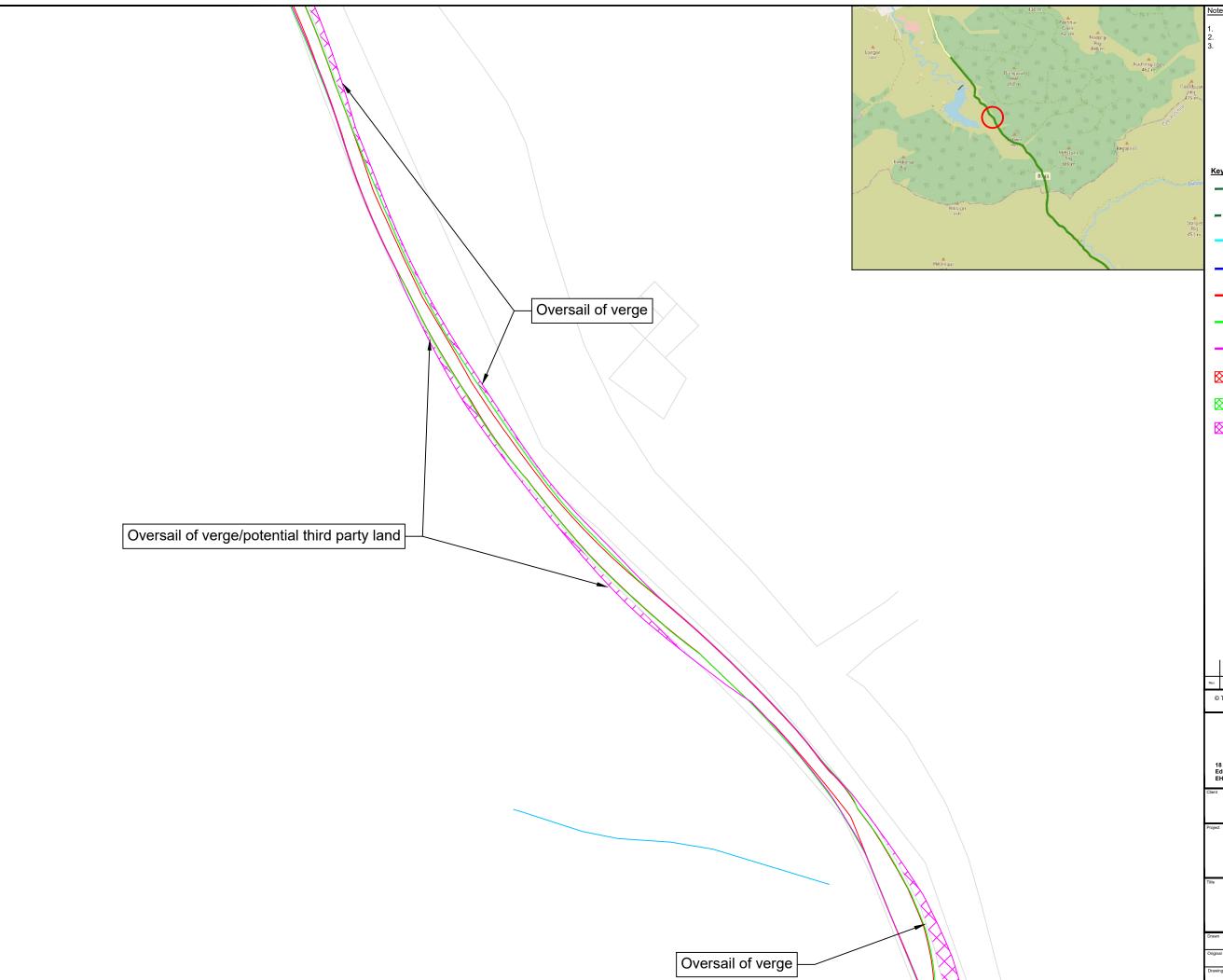






## - - Off-road Private Access Tracks Over-run envelope of tractor and trailer wheels Over-sail envelope being swept by tractor and Over-sail envelope being swept by blade path Over-run area of tractor and trailer wheels out with carriageway Over-sail area of tractor and trailer bed out with carriageway Over-sail area of blade out with carriageway

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lotes:

Do not scale from drawing. All dimensions in metres unless otherwise stated. Please note that marked service locations are indicative only and should be confirmed by topographical survey. Key: Public Highway Off-road Private Access Tracks Blade Transporter Vehicle

Blade Outline

trailer wheels

trailer bed

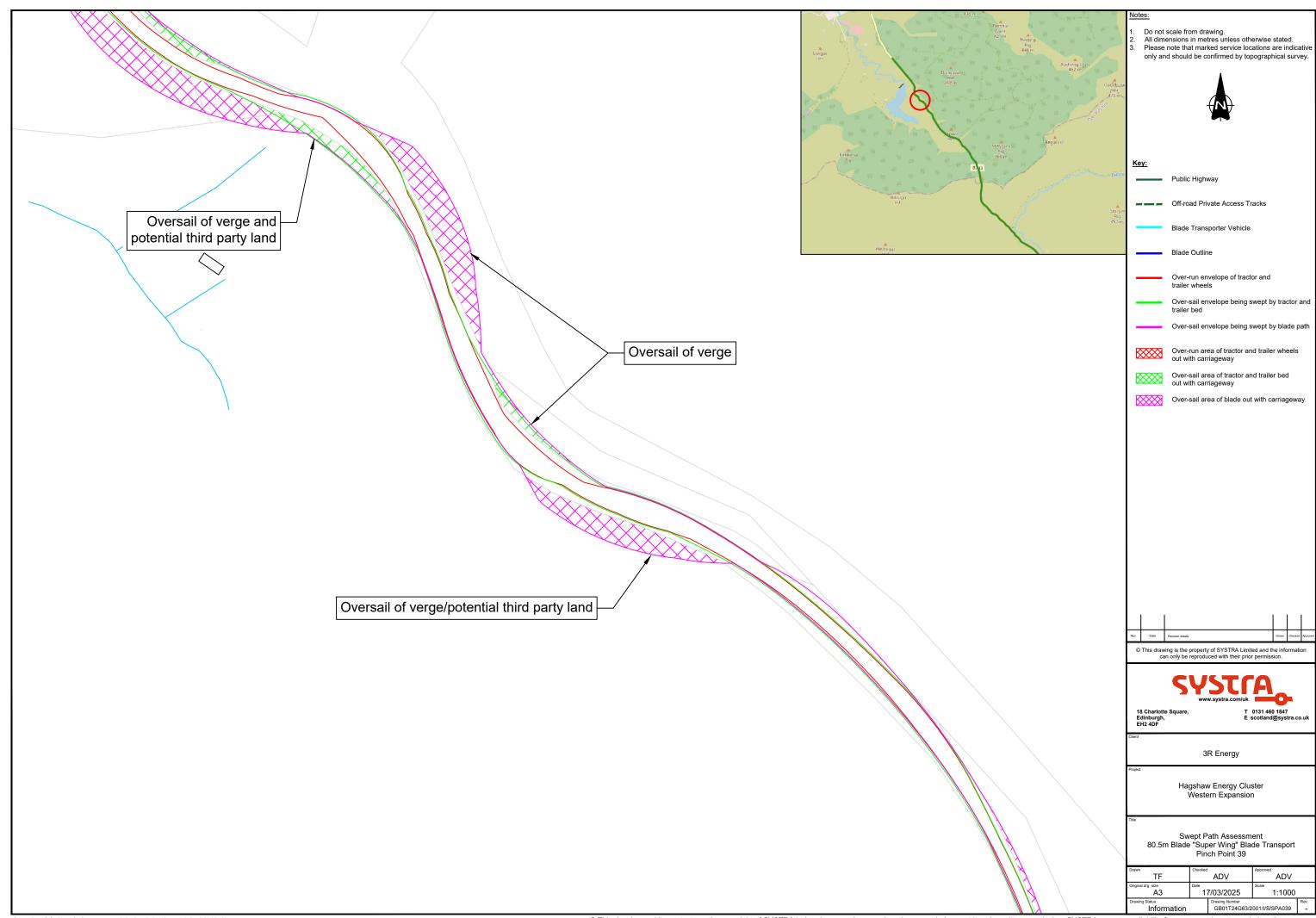
Over-run envelope of tractor and

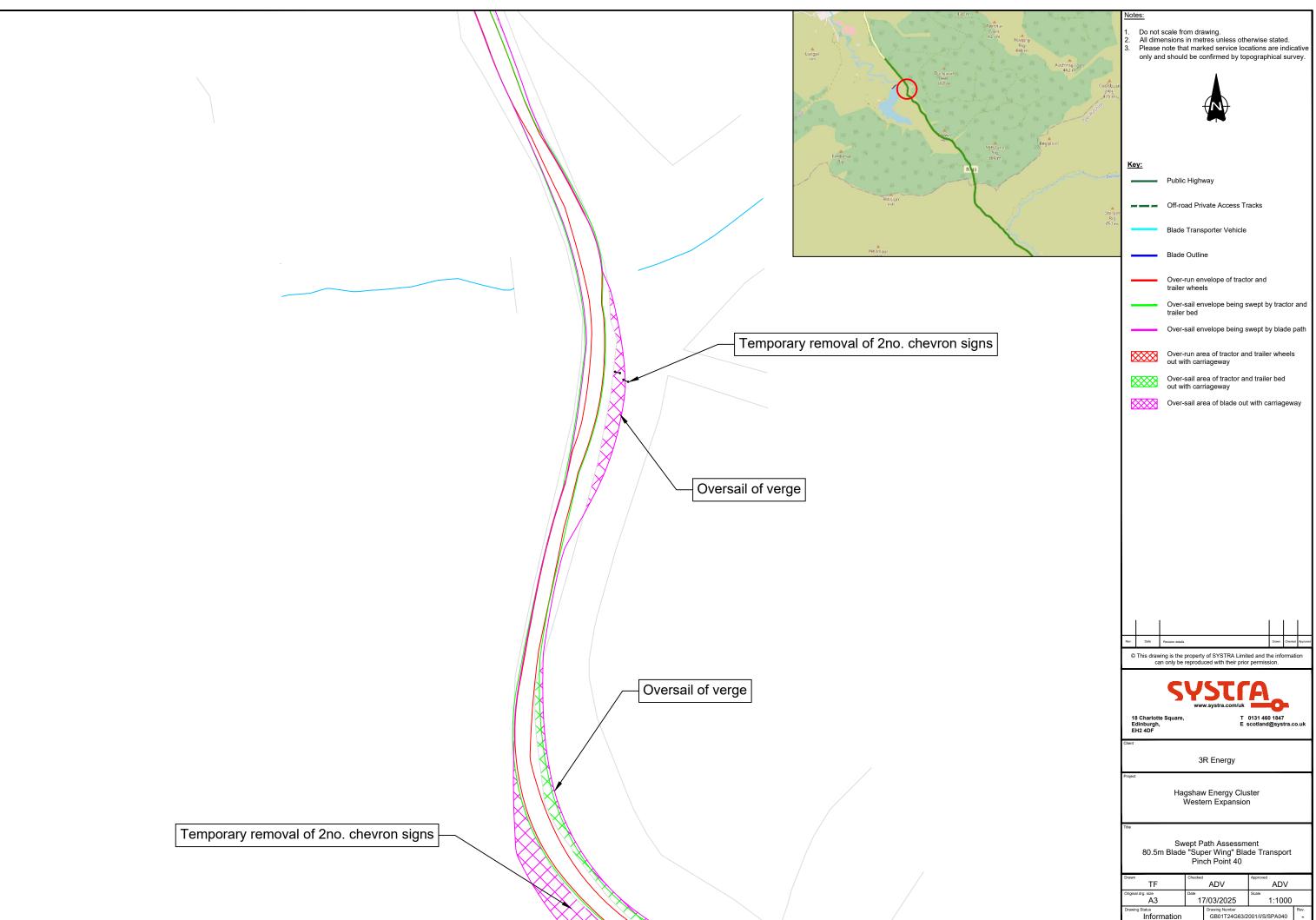
Over-sail envelope being swept by tractor and

Over-sail envelope being swept by blade path

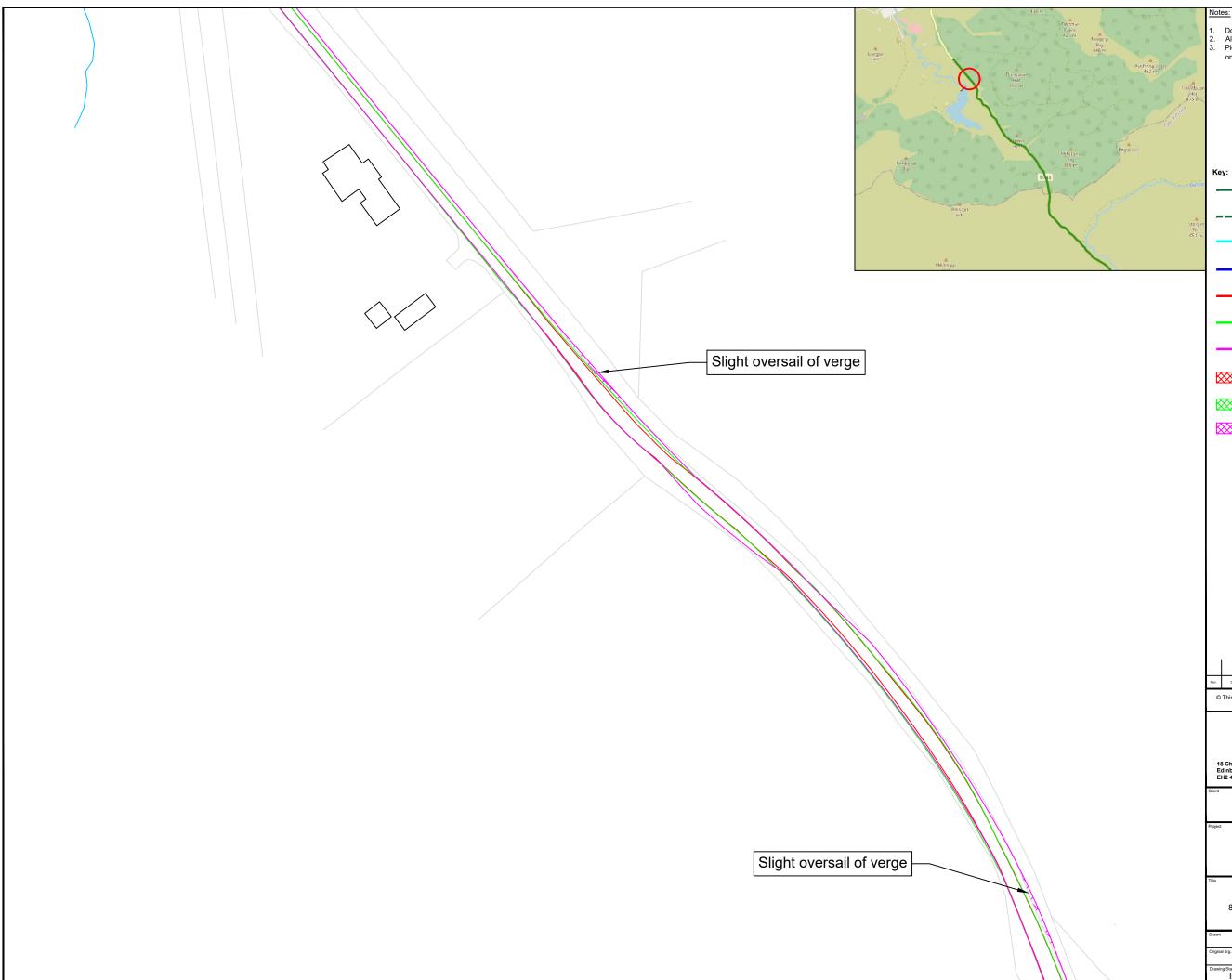
Over-run area of tractor and trailer wheels out with carriageway  $\times$ Over-sail area of tractor and trailer bed out with carriageway  $\times\!\!\times\!\!\times$ Over-sail area of blade out with carriageway Drawn Checked Approv © This drawing is the property of SYSTRA Limited and the information can only be reproduced with their prior permission. 74 18 Charlotte Square Edinburgh, EH2 4DF T 0131 460 1847 E scotland@systra.co.ul 3R Energy Hagshaw Energy Cluster Western Expansion

Swept Path Assessment 80.5m Blade "Super Wing" Blade Transport Pinch Point 38							
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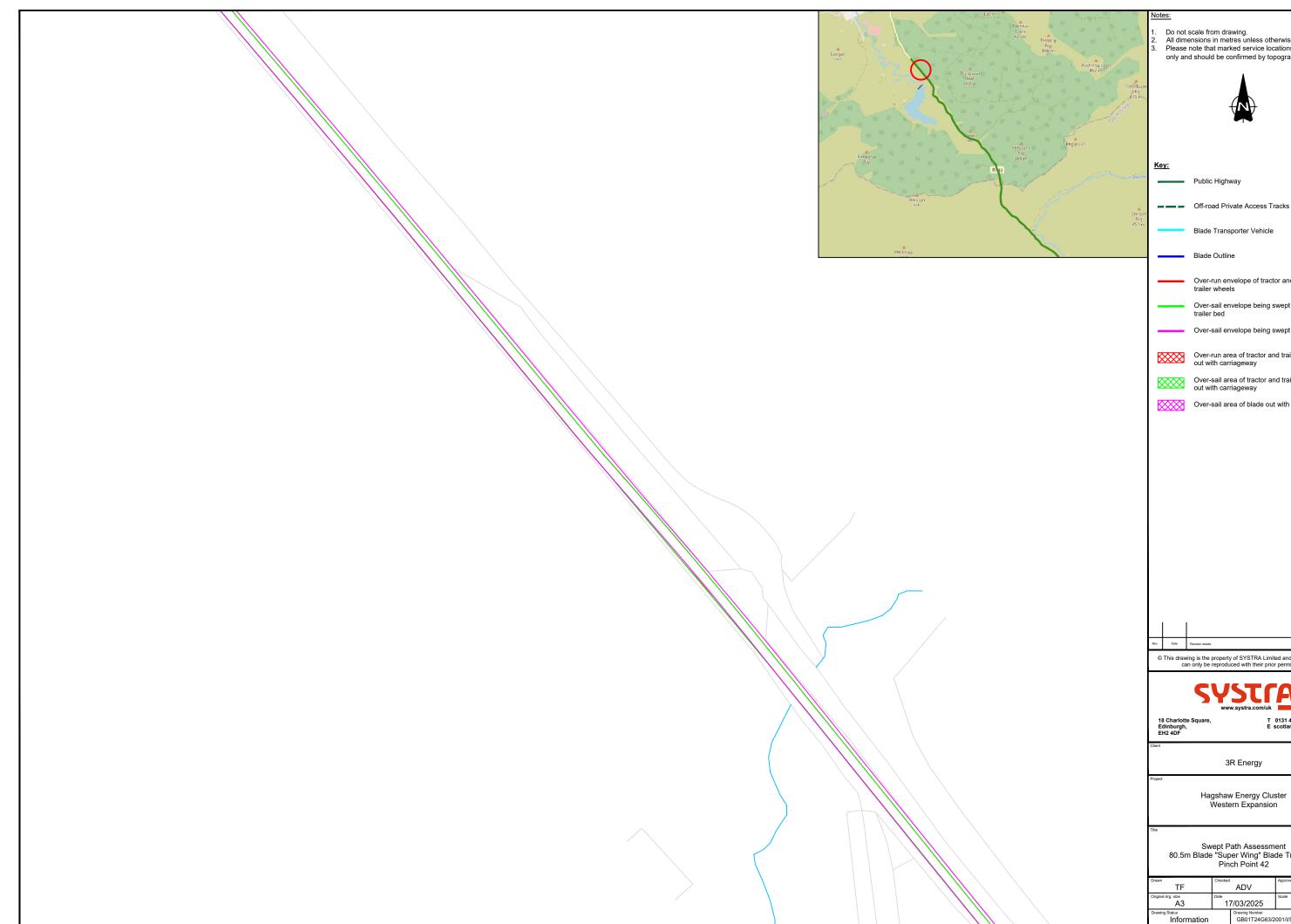
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### Public Highway Off-road Private Access Tracks Blade Transporter Vehicle Blade Outline Over-run envelope of tractor and trailer wheels Over-sail envelope being swept by tractor and trailer bed Over-sail envelope being swept by blade path Over-run area of tractor and trailer wheels out with carriageway Over-sail area of tractor and trailer bed out with carriageway $\times\!\!\times\!\!\times$ Over-sail area of blade out with carriageway

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### Notes:

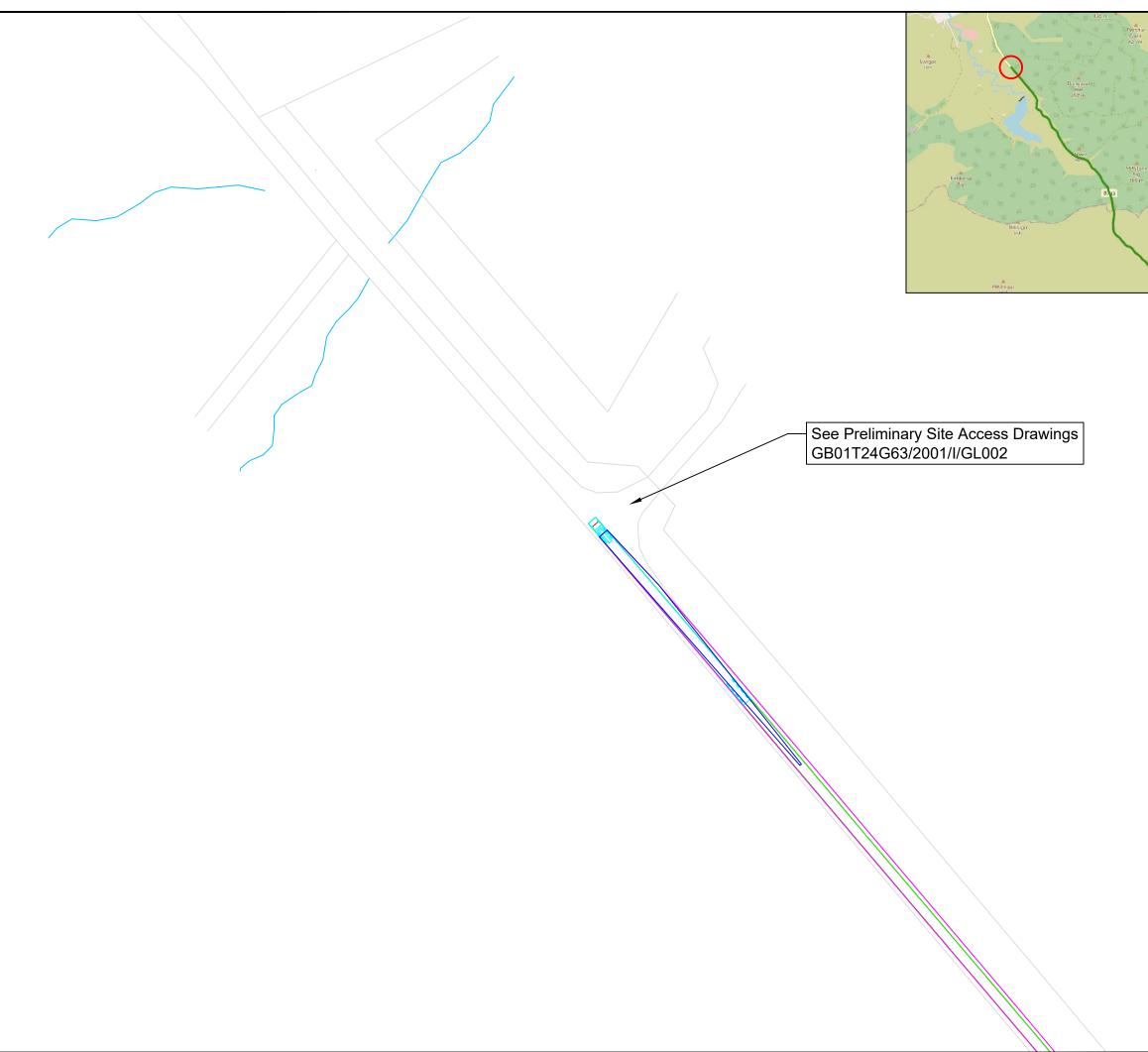
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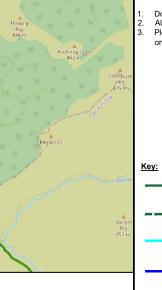


# Public Highway

- Blade Transporter Vehicle
- Blade Outline
- Over-run envelope of tractor and trailer wheels
- Over-sail envelope being swept by tractor and trailer bed
- Over-sail envelope being swept by blade path
- Over-run area of tractor and trailer wheels out with carriageway
- Over-sail area of tractor and trailer bed out with carriageway
- Over-sail area of blade out with carriageway
- Drawn Checked Approves Date © This drawing is the property of SYSTRA Limited and the information can only be reproduced with their prior permission. SYSTIA 18 Charlotte Square Edinburgh, EH2 4DF T 0131 460 1847 E scotland@systra.co.uk
- 3R Energy
- Hagshaw Energy Cluster Western Expansion
- Swept Path Assessment 80.5m Blade "Super Wing" Blade Transport Pinch Point 42

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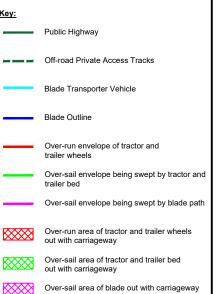




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Client			3R Energy						
Project			gshaw Energy Clus Nestern Expansior						
Title	80.5r	Sw n Blade	ept Path Assessm "Super Wing" Bla Pinch Point 43	ent de Tra	nsp	ort			
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