REFERENCE DOCUMENTS for PROPOSED LARGER TURBINES AND MET MASTS AT UPPERCHURCH WINDFARM for EIAR 2021 and AA 2021

REFERENCE DOCUMENT 11 of 36

This document contains the following:

UWF Related Works (LA ref. 18/600913, ABP ref. ABP-303634-19)

- **2019 UWF Related Works Revised EIA Report - Volume C4: Revised EIAR Appendices (Part 3 of 3)**
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  - Appendix 10.1 – Consented Upperchurch Windfarm Site Investigations
  - Appendix 11.1 – Survey of Existing and Proposed Watercourse Crossing Locations
  - Appendix 11.2 – Surface Water Sampling Results
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  - Appendix 12.2 – Noise Modelling & Background Noise Measurement
  - Appendix 12.3 – Explanation and Modelling of EMF
  - Appendix 13.1 – Chapter 13 has no appendices
  - Appendix 14.1 – Location of Built Services within the Study Area
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  - Appendix 16.4 – Field Walking Description
  - Appendix 17.1 – Contextual Photographs and Theoretical Visibility within the Study Areas
  - Appendix 18.1 – Chapter 18 has no appendices
  - Appendix 19.1 – Chapter 19 has no appendices
  - Appendix 20.1 – Chapter 20 has no appendices
- **2019 UWF Related Works Revised EIA Report - Volume C3: Revised EIAR Figures**

Upperchurch Windfarm Related Works (UWF Related Works)

UWF Related Works Revised EIA Report (EIAR)

VOLUME C4: REVISED EIAR APPENDICES

(Part 3 of 3)

EIA Report Authors:

EIAR Coordinator:

January 2019

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Appendix to Chapter 9: Land

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Appendix to Chapter 10: Soils

Appendix 10.1: Consented Upperchurch Windfarm Site Investigations

The data and descriptions in this appendix have informed Chapter 10: Soils of the Revised EIA Report, in relation to the Lower River Shannon SAC and Local Soils, Subsoils & Bedrock.

The information presented in this Appendix 10.1 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 10.1 Section	Section Heading	Relevant Individual Project Element
A10.1	Consented Upperchurch Windfarm Site Investigation Data	UWF Related Works Upperchurch Windfarm

APPENDIX 10.1
to EIAR Chapter 10: Soils

Trial Pit Log

Project:	Wind Farm Development		**Trial Pit ID**			T01		
Location:	Upperchurch, Thurles, County Tipperary		**ING Coordinates**			E: 194902 N: 158932		
Client:	Ecopower Ltd., Sion Road, Kilkenny		**Elevation:**			unknown		
Date:	28 October 2011		**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**			
					Type	**Depth**	**Result**
Organic soil		0.30					
Soft brown stony CLAY, stone size typically less than100mm		0.80					
Weathered SILTSTONE becoming more solid with depth		2.00					
End of trial pit at siltstone bedrock							
Remarks: No groundwater encountered at 2m depth							

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T02			
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 195261 N: 159221			
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown			
Date:	28 October 2011	**Logged by:**			S. Doyle			
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**			
					Type	**Depth**	**Result**	
Organic soil		0.30						
Soft brown stony CLAY, stone size typically less than100mm		1.20						
Heavily weathered SILTSTONE		2.60						
End of trial pit at siltstone bedrock								
Remarks: No groundwater encountered at 2.60m depth								

T02 - Photograph 1

T02 - Photograph 2

T02 - Photograph 3

T02 - Photograph 4

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T03		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 195574 N: 159410		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	28 October 2011	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**		
					Type	**Depth**	**Result**
Organic soil		0.20					
Soft stony CLAY, progressively more stony with depth		1.80					
End of trial pit at SILTSTONE bedrock							

Remarks:
No groundwater encountered at 1.80m depth

T03 - Photograph 1

T03 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development		**Trial Pit ID**			T04		
Location:	Upperchurch, Thurles, County Tipperary		**ING Coordinates**			E: 195988 N: 159620		
Client:	Ecopower Ltd., Sion Road, Kilkenny		**Elevation:**			unknown		
Date:	28 October 2011		**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**			
					Type	**Depth**	**Result**
Organic soil		0.20					
Soft light brown/orange CLAY		0.50					
Soft brown/grey stony CLAY		1.50					
Very loose weathered SILTSTONE (trial pit sides unstable)		2.90					
End of trial pit at solid siltstone							

Remarks:
No groundwater encountered at 2.90m depth
Clay sample taken

T04 - Photograph 1

T04 - Photograph 2

T04 - Photograph 3

T04 - Photograph 4

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T06		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196450 N: 160319		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	28 October 2011	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**		
					Type	**Depth**	**Result**
Organic soil		0.20					
Loose brown stony CLAY		1.00					
Hard weathered SILTSTONE (progressively harder with depth)		2.30					
End of trial pit at siltstone bedrock							

Remarks:
No groundwater encountered at 2.30m depth

T06 - Photograph 1

T06 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T07		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 195989 N: 160428		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**		
					Type	**Depth**	**Result**
Organic soil		0.15					
Soft grey CLAY with some organic content		0.45					
Stiff stony grey CLAY		1.00					
Stiff stony yellow CLAY		2.70					
End of trial pit within clay stratum							

Remarks:
Clay is very dry.
No water in excavation.

T07 - Photograph 1

T07 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T08		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 195598 N: 160397		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.15					
Soft grey CLAY with some organic content		0.45					
Soft stony grey CLAY		2.00					
End of trial pit at SILTSTONE bedrock							

Remarks:
Siltstone bedrock is very hard.
No water in excavation.

T08 - Photograph 1

T08 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T09		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196117 N: 161662		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.15					
Soft stony yellow CLAY		1.70					
Weathered SHALE		2.00					
SHALE		2.80					
End of trial pit within shale stratum							

Remarks:
Shale rock is competent at 2.00m depth below the surface.
No water in excavation.

T09 - Photograph 1

T09 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T10		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196539 N: 161601		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.20					
Soft stony yellow CLAY		1.00					
Weathered SILTSTONE		1.80					
End of trial pit at siltstone bedrock							

Remarks:
Siltstone bedrock is very hard.
No water in excavation.

T10 - Photograph 1

T10 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T11		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196417 N: 161965		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			Unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.30					
		0.80					
Weathered SILTSTONE		1.70					
End of trial pit at siltstone bedrock							
Remarks: No water in excavation.							

T11 - Photograph 1

T11 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T12		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196253 N: 162314		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.20					
Soft brown CLAY		1.20					
Weathered SHALE		3.00					

Remarks:
Shale rock is competent at 2.00m below the surface.
No water in excavation.

T12 - Photograph 1

T12 - Photograph 2

T12 - Photograph 3

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T13		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 196716 N: 162269		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**		
					Type	**Depth**	**Result**
Organic soil		0.15					
Soft stony yellow CLAY		0.70					
Weathered SILTSTONE		1.60					
End of trial pit at siltstone bedrock							
Remarks: No water in excavation							

T13 - Photograph 1

T13 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T15		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 197132 N: 162393		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	11 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**		
					Type	**Depth**	**Result**
Organic soil		0.15					
Soft brown/yellow CLAY		1.10					
Weathered SILTSTONE		2.10					
End of trial pit at siltstone bedrock							
Remarks: Siltstone bedrock is very hard. No water in excavation.							

T15 - Photograph 1

T15 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T16		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 197224 N: 162824		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	10 May 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.15					
Soft grey CLAY		0.60					
Soft yellow CLAY		1.60					
Weathered SHALE		2.60					
End of excavation at SILTSTONE bedrock							
Remarks: No groundwater encountered.							

T16 - Photograph 1

T16 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T17		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 193559 N: 162081		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	12 April 2012	**Logged by:**			S. Doyle		
					Samples /Tests		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Type**	**Depth**	**Result**
Organic PEAT		0.10					
Soft yellow stony CLAY		0.40					
Weathered SILTSTONE with some clay content		1.20					
End of trial pit at siltstone bedrock							
Remarks: No groundwater encountered.							

T17 - Photograph 1

T17 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T18		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 193534 N: 161809		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	12 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Organic soil		0.15					
Soft orange/yellow CLAY		0.45					
Soft stony yellow CLAY with angular cobbles		1.40					
Weathered SILTSTONE with some clay content		2.20					
End of trial pit at siltstone bedrock							
Remarks: Minor ingress of groundwater into the excavation after 20 minutes.							

T18 - Photograph 1

T18 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T19		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 193430 N: 161039		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	12 April 2012	**Logged by:**			S. Doyle		
					Samples /Tests		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Type**	**Depth**	**Result**
Organic soil		0.15					
Soft yellow stony CLAY		1.10					
Weathered SILTSTONE		1.70					
End of trial pit at siltstone bedrock							

Remarks:
Siltstone is hard at 1.70m below the surface.
No groundwater infiltration.

T19 - Photograph 1

T19 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T20		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 193367 N: 160612		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	12 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests**		
					Type	**Depth**	**Result**
Organic soil		0.15					
Soft yellow stony CLAY		1.10					
Weathered SILTSTONE		1.70					
End of trial pit at siltstone bedrock							

Remarks:
Siltstone is hard at 1.70m below the surface.
No groundwater infiltration.

T20 - Photograph 1

T20 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T21		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 192992 N: 160336		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	10 May 2012	**Logged by:**			S. Doyle		
					Samples /Tests		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Type**	**Depth**	**Result**
Organic soil		0.15					
Soft brown CLAY		0.45					
Heavily weathered SILTSTONE		1.50					
End of trial pit at siltstone bedrock							

Remarks:
Siltstone is hard at 1.50m below the surface.
No groundwater infiltration.

T21 - Photograph 1

T21 - Photograph 2

Trial Pit Log

Project:	Wind Farm Development	**Trial Pit ID**			T22		
Location:	Upperchurch, Thurles, County Tipperary	**ING Coordinates**			E: 194754 N: 160387		
Client:	Ecopower Ltd., Sion Road, Kilkenny	**Elevation:**			unknown		
Date:	12 April 2012	**Logged by:**			S. Doyle		
Strata Description		**Depth (m)**	**OD level**	**Water depth**	**Samples /Tests** Type	Depth	Result
Peaty organic soil		0.30					
Stiff stony grey CLAY		1.50					
Stiff stony yellow CLAY		2.20					
End of trial pit within clay stratum							
Remarks: No groundwater infiltration.							

T22 - Photograph 1

T22 - Photograph 2

Appendix to Chapter 11: Water

The data and descriptions in this appendix have informed Chapter 11: Water of the EIA Report.

The information presented in these Appendices 11 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 11 Section	Section Heading	Relevant Individual Project Element
A11.1	Survey of Existing and Proposed Watercourse Crossing Locations	UWF Related Works UWF Grid Connection
A11.2	Surface Water Sampling Results	UWF Related Works UWF Grid Connection
A11.3	Flood Risk Assessment	UWF Related Works UWF Grid Connection

Appendix 11.1: Survey of Existing and Proposed Watercourse Crossing Locations

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A11.1.1 Classification for UWF Grid Connection Watercourses

Table 1: Watercourse Classification, Colour Code and Inventory

Watercourse Classification	UWF Related Works	RW - Instream works	UWF Grid Connection	GC - Instream works
EPA Blue Linen - Fisheries Value	1	1	10	2
EPA Blue Line Equivalent - Fisheries Value	5	4	3	3
Sub-Optimal - Low Fisheries Value	2	2	25	8
Drain - No Fisheries Value	24	18	25	18
	32	**25**	**63**	**31**

Watercourse crossings are colour coded in table 2 and table 3 below with the same colours as those in the above table 1 for the relevant watercourse classification.

A11.1.2 Survey of Existing and Proposed Watercourse Crossing Locations

Table 2: Survey Results for the UWF Related Works Crossings WW1 – WW32

WC_No	Riffle %	Glide %	Pool %	Bed rock %	Cobble %	Gravel %	Boulder %	Sand /Silt %	Bank Stability	Canopy/ Tunnelling %	Riparian Vegetation (Fossitt)	Fisheries Suitability Assessment	Crossing Method
WW1	N/A	N/A	N/A	0	0	80	0	20	No active erosion	0	HH1/GS4 /WD4	Near dry drain, heavily vegetated, No fisheries suitability	BPM 2 - Flume / Pipe
WW2	80	0	20	0	0	60	0	40	No active erosion	0	GS4/WS1	Stream, deepened and resectioned, Existing culvert under access track d/s, Barrier to migration, heavily vegetated, Low fisheries suitability	Permanent Clear Span Bridge
WW3	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1/BL2	Dry field drain, heavily vegetated, No fisheries suitability	VPM 1 - Over Pump
WW4	100	0	0	0	40	30	20	10	Evidence of erosion	0	GS4/WD 4	Near dry stream, evidence of previous high flows/erosion, c. 1.5 m cascade barrier to migration, No fisheries suitability	BPM 2 - Flume / Pipe
WW5	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GS4/WD 4	Near dry field drain, heavily vegetated, No fisheries suitability	BPM 2 - Flume / Pipe
WW6	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1/GS4	Dry field drain, heavily vegetated, No fisheries suitability	No-Instream Works
WW7	80	0	20	0	10	70	0	30	No active erosion	0	GA1/GS4	Stream, steady flow to 15 cm deep with wetted width of c. 75 cm. Nice gravel bed. High fisheries suitability.	BPM 2 - Flume / Pipe
WW8	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1	Dry field drain, heavily vegetated, No fisheries suitability	BPM 2 - Flume / Pipe
WW9	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1	Dry field drain, heavily vegetated, No fisheries suitability	BPM 1 - Over Pump
WW10	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1	Dry field drain, heavily vegetated, No fisheries suitability	BPM 1 - Over Pump
WW11	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1/GS4	Near dry field drain, heavily vegetated, No fisheries suitability	No-Instream Works
WW12	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	WL1/BL2 /GA1	Near dry drain culverted under road joining small slow flowing drain on downstream side. No fisheries suitability	BPM 4 – Replace Culvert – silt fence or Over

													Pump if flow is high
WW13	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1	Dry field drain, heavily vegetated, No fisheries suitability	BPM 2 - Flume / Pipe
WW14	80	0	20	0	10	70	0	20	No active erosion	0	GA1	Slow flowing, shallow drain, heavily vegetated, Low fisheries potential	BPM 2 - Flume / Pipe
WW15	0	0	100	0	0	0	0	100	Evidence of erosion	0	GA1	Near stagnant drain, heavily poached and cow dung in stream, Vegetated, No fisheries suitability	BPM 2 - Flume / Pipe
WW16	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1/WD4	Dry field drain, heavily vegetated, No fisheries suitability	BPM 1 - Over Pump
WW17	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1	Near dry field drain, heavily vegetated, No fisheries suitability	BPM 1 - Over Pump
WW18	0	100	0	0	0	50	0	50	No active erosion	0	GA1	Slow flowing, shallow drain. Deepened and resectioned, heavily vegetated, Low fisheries potential	BPM 1 - Over Pump
WW19	30	40	30	0	10	70	0	20	No active erosion	0	GA1/GS4	Stream, steady flow up to 10 cm deep with wetted width c. 1.0 m, Nice gravel/cobble bed. High fisheries suitability	BMP1 or BMP2 - Flume / Pipe or Over Pump if flow very low
WW20	N/A	N/A	N/A	0	30	50	10	10	No active erosion	0	GA1	Dry drain with culvert under road	BPM 1 - Over Pump
WW21	0	0	100	0	0	0	0	100	No active erosion	0	GA1/BL2	Stagnant field drain, No fisheries suitability	BPM 4 – Replace Culvert – silt fence or Over Pump if flow is high
WW22	60	10	30	0	20	40	10	30	No active erosion	50	WD4/GS2	Stream, steady flow to to 20 cm deep with wetted width of c. 1 m. Nice gravel bed. High fisheries suitability.	BPM 2 - Flume / Pipe
WW23	N/A	N/A	N/A	0	0	80	0	20	No active erosion	0	GA1/BL3/WL1	Dry field drain, No fisheries suitability	No-Instream Works
WW24	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1/ED2	Dry field drain, heavily vegetated, No fisheries suitability	BPM 2 - Flume / Pipe
WW25	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	BL2/GS4	Dry field drain, heavily vegetated, No fisheries suitability	BPM 2 - Flume / Pipe

WW26	N/A	N/A	N/A	0	0	0	0	100	No active erosion	100	WL1	Dry field drain, willlows creating full tunnelling, No fisheries suitability	BPM 1 - Over Pump
WW27	N/A	N/A	N/A	0	0	0	0	100	No active erosion	0	GA1/BL2	Dry field drain, heavily vegetated, No fisheries suitability	BPM 2 - Flume / Pipe
WW28	25	25	50	0	25	70	0	15	No active erosion	0	GS4	Stream, nice gravel/cobble bed, steady flow up to 15 cm deep with wetted width c. 1.0 m. Good fisheries suitability	BMP1 or BMP2 - Flume / Pipe or Over Pump if flow very low
WW29	0	0	100	0	0	0	0	100	No active erosion	0	BL2/GS4	Stagnant, silted up field/forestry drain with existing culvert under track. No fisheries suitability.	No-Instream Works
WW30	0	0	100	0	0	0	0	100	No active erosion	0	BL2/GS4	Stagnant drain, existing culvert. No fisheries suitability	No-Instream Works
WW31	0	0	100	0	0	0	0	100	No active erosion	0	BL2/GS4	Drain culverted under road joining small slow flowing drain on downstream side. No fisheries suitability	BPM 4 – Replace Culvert – silt fence or Over Pump if flow is high
WW32	0	0	100	0	0	0	0	100	No active erosion	0	BL2/GS4	Near dry drain culverted under road joining small slow flowing drain on downstream side. No fisheries suitability	No-Instream Works

Table 3: Survey Results for the UWF Grid Connection W1 – W63

WC_No	E_ITM	N_ITM	Watercourse Description	Watercourse Characterisation	Fisheries Evaluation
W1	572323	664478	Stream, 1st Order	c. 2 m wide, c. 10 cm deep, gravel (70), cobbles (5), boulders (5), sands/silts (20)	Optimal
W2	572555	664581	Drain	c. 0.5 m wide, c. 10 cm deep, silts/muds (100)	Sub-Optimal
W3	572658	664566	Stream, 1st Order	c. 1 m wide, c. 10 cm deep, cobbles (20), gravels (40), sands/silts (40)	Optimal
W4	572510	662301	River	Boulder cobble, sand, moderate gradient, riffle / glide. Downstream pool	Optimal
W5	574524	661294	Stream, 1st Order	deep, drained, flow	Sub-Optimal
W6	575525	660651	Stream	c. 1 m wide, c. 20 cm deep,	Sub-Optimal
W7	576074	660060	Drain	c. 0.8m wide, c. 15 cm deep,	Poor
W8	576444	659881	Stream, 1st Order	No Fisheries Potential	Poor
W9	576619	659895	Stream, 1st Order	steep gradient, cobble/gravel. 100% shade	Optimal
W10	576903	659957	Stream, 1st Order	No Fisheries Potential	Sub-Optimal
W11	576988	659988	Drain	No Fisheries Potential	Poor
W12	577105	660063	Stream, 1st Order	No Fisheries Potential steep,	Sub-Optimal
W13	577225	660132	Stream, 2nd Order	steep, boulder cobble pool riffle. Downstream 100% shade, steep gradient	Optimal
W14	577339	660172	Drain	No Fisheries Potential	Poor

W15	577760	660301	Drain	No Fisheries Potential 100% shade downstream	Poor
W16	577846	660328	Stream, 1st Order	No Fisheries Potential 100% shade downstream	Sub-Optimal
W17	578135	660411	Stream, 1st Order	steep/cascade	Sub-Optimal
W18	578303	660457	Stream	No Fisheries Potential Upstream 100% shade. Minor steep cascades Downstream: 100% shade	Sub-Optimal
W19	578495	660490	Stream, 1st Order	No Fisheries Potential	Sub-Optimal
W20	578576	660502	Stream, 1st Order	No Fisheries Potential Steep gradient	Sub-Optimal
W21	578689	660518	Stream, 1st Order	No Fisheries Potential Steep gradient	Sub-Optimal
W22	578832	660539	Stream, 1st Order	No Fisheries Potential Steep gradient	Sub-Optimal
W23	579115	660603	Stream	No Fisheries Value Upstream: steep/cascade Boulder/cobble Downstream: 100% shade.	Sub-Optimal
W24	579439	660716	Stream	No Fisheries Value 100% cover, steep gradient. Boulder cascade.	Sub-Optimal
W25	579691	660757	Drain	No Fisheries Value	Poor
W26	580029	660792	Stream, 1st Order	No Fisheries Value Steep gradient,	Sub-Optimal
W27	580180	660810	minor stream,	No Fisheries Value	Sub-Optimal
W28	580528	660767	Stream	cobble substrate, drained, channelised, riffle/glide	Optimal
W29	580869	660617	Drain	No Fisheries Value	Poor
W30	580922	660590	Drain	No Fisheries Value	Poor

W31	581396	660262	River	c. 5 m wide, c. 100cm deep,	Optimal
W32	581838	659906	Stream, 1st Order	No Fisheries Value	Sub-Optimal
W33	581946	659793	Stream, 1st Order	c. 0.7 m wide, c. 140cm deep,	Optimal
W34	582790	659248	Stream, 2nd Order	c. 0.6 m wide, c. 100cm deep,	Optimal
W35	583812	659483	Drain	No Fisheries Value	Poor
W36	584371	659327	Stream, 1st Order	Downstream:, cobble gravel substrate, riffle, steep banks	Sub-Optimal
W37	584950	659105	Stream, 1st Order	No Fisheries Potential	Sub-Optimal
W38	585273	659014	Stream, 1st Order	cobble gravel substrate, riffle, steep banks	Sub-Optimal
W39	585486	658934	Stream, 1st Order	cobble gravel substrate, riffle, steep banks	Sub-Optimal
W40	586010	658701	Stream, 1st Order	Riffle / glide, cobble substrate, channelised	Optimal
W41	586233	658545	Drain	No Fisheries Value	Poor
W42	586605	658203	Drain	No Fisheries Value	Poor
W43	586893	658278	Drain	No Fisheries Value	Poor
W44	587423	658557	River	Cobble/gravel, channelised, riffle..	Optimal
W45	587699	658489	Stream, 1st Order	No Fisheries Value Very steep gradient, in gorge, 100% cover.	Sub-Optimal
W46	587893	658498	Stream, 1st Order	No Fisheries Value Very steep gradient, in gorge, 100% cover.	Sub-Optimal
W47	588326	658578	Stream, 1st Order	No Fisheries Value steep, drained	Sub-Optimal
W48	588920	658727	River	U/s: riffle, glide channelized, cobble gravel, sand.	Optimal
W49	589305	658621	Drain	No Fisheries Value	Poor

REFERENCE DOCUMENTS

W50	589660	658460	Drain	No Fisheries Value	Poor
W51	589836	658491	Drain	No Fisheries Value some flow	Sub-Optimal
W52	590060	658536	Drain	No Fisheries Value	Poor
W53	590581	658611	Drain	No Fisheries Value	Poor
W54	590819	658751	Upstream: Drain Downstream: Stream, 1st Order	No Fisheries Value Downstream: flow, through forestry	Poor
W55	591090	658848	Drain	No Fisheries Value	Poor
W56	592458	659714	Drain	No Fisheries Value	Poor
W57	593241	659975	Drain	No Fisheries Value	Poor
W58	593651	660262	Drain	No Fisheries Value	Poor
W59	593940	660564	Drain	No Fisheries Value	Poor
W60	594023	660693	Stream	Steady flow to 20 cm deep with wetted width of c. 1 m. gravel bed.	Optimal
W61	594278	660789	Drain	No Fisheries Value	Poor
W62	594612	660623	Drain	c. 0.5 m wide, 10 cm deep	Poor
W63	594860	660609	Drain	No Fisheries Value, Slow flowing,	Poor

Appendix 11.2: Surface Water Sampling Results

List of Tables

Table 1: Surface Water Sampling Results – UWF Related Works and UWF Replacement Forestry

Sample ID	Water Crossing Number	Sampling Date	Ammonical Nitrogen (mg/L)	BOD (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Nitrate (mg/L)	Nitrite (mg/L)	Ortho-Phosphate (mg/L)	pH (pH Units)	Suspended Solids (mg/L)	Total Phosphorous (mg/L)	Total Nitrogen (mg/L)
			≤0.065 (mean) or ≤0.140 (95%ile)	≤1.5 (mean) ≤2.6 (95%ile)					≤0.035 (mean) or ≤0.075 (95%ile)	**6 - 9**			
WW19	RW	26-09-2017	<0.08	<2	12	248	4	<0.20	<1	7.9	<1	<0.05	1
WW20	RW	10-08-2017	<0.08	<2	7	168	1	<0.20	<1	8.1	20	0.07	3
WW20	RW	26-09-2017	<0.08	<2	9	181	2	<0.20	<1	7.7	<1	<0.05	2
WW28	RW/RF	10-08-2017	<0.08	<2	12	331	2	<0.20	<1	7.9	<1	<0.05	2
WW28	RW/RF	26-09-2017	<0.08	<2	8	195	1	<0.20	<1	8.0	<1	<0.05	2
Downstream WW15	RW	15-11-2018	0.038	<1	9.81	107	<0.1	<0.005	<0.01	6.8	5	<0.05	-
Downstream WW1 – WW2	RW	15-11-2018	0.017	<1	12	130	0.9	<0.005	<0.01	7.4	2	<0.05	-
Downstream T1 – T3	RW	15-11-2018	0.02	<1	12.4	139	2.4	<0.005	0.01	7.3	<2	<0.05	-
Downstream WW3-WW32 (excl WW15/WW23)	RW/RF	15-11-2018	0.012	<1	9.63	73.2	1	<0.005	<0.01	7.1	<2	<0.05	-
Downstream T21	RW	15-11-2018	0.022	<1	10.2	107	0.5	<0.005	<0.01	7.5	<2	<0.05	-
Downstream WW23	RW	15-11-2018	0.016	<1	10.3	244	2	<0.005	0.03	7.8	3	<0.05	-

RW – UWF Related Works RF – Replacement Forestry T – Upperchurch Wind Turbine

Table 2: Surface Water Sampling Results – UWF Related Works and UWF Replacement Forestry Max, Min & Average

	Ammonical Nitrogen (mg/L)	BOD (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Nitrate (mg/L)	Nitrite (mg/L)	Ortho-Phosphate (mg/L)	pH (pH Units)	Suspended Solids (mg/L)	Total Phosphorous (mg/L)	Total Nitrogen (mg/L)
MAXIMUM	<0.08	<2	12.4	331	4	<0.20	<1	8.1	20	0.07	3
MINIMUM	<0.08	<1	7	168	<0.1	<0.20	<0.01	6.8	<1	<0.05	1
AVERAGE	<0.08	<2	10.2	174	1.5	<0.005	<1	7.6	4	<0.05	2

Table 3: Surface Water Sampling Results – UWF Grid Connection

Sample ID	Water Crossing Number	Sampling Date	Ammonical Nitrogen (mg/L)	BOD (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Nitrate (mg/L)	Nitrite (mg/L)	Ortho-Phosphate (mg/L)	pH (pH Units)	Suspended Solids (mg/L)	Total Phosphorous (mg/L)	Total Nitrogen (mg/L)
			≤0.065 (mean) or ≤0.140 (95%ile)	≤1.5 (mean) ≤2.6 (95%ile)					≤0.035 (mean) or ≤0.075 (95%ile)	6 - 9			
U2GES01	W1	22-01-2019	0.019	<1	16.8	238	2.4	<0.005	0.053	7.7	<2	0.06	2.62
U2GES02	W4	22-01-2019	0.006	<1	11.9	149	0.532	<0.005	0.019	7.8	<2	<0.05	1.00
U2GES03	W5	22-01-2019	0.005	<1	24.3	331	1.39	<0.005	0.022	7.8	334	0.26	1.12
U2GES04	W6	22-01-2019	0.009	<1	16.5	167	0.691	<0.005	0.038	7.5	57	<0.05	0.541
U2GES05	W13	22-01-2019	0.022	<1	16.7	71.6	<0.1	<0.005	0.015	5.0	10	<0.05	0.701
U2GES06	W23	22-01-2019	0.01	<1	10.7	57.9	<0.1	<0.005	0.014	6.6	5	<0.05	<0.5
U2GES07	W28	22-01-2019	0.007	<1	13.1	79.0	0.321	<0.005	<0.01	6.8	2	<0.05	<0.5
U2GES08	W31	17-01-2019	<0.005	<1	11.1	102	0.348	<0.005	<0.01	6.4	5	<0.05	0.593
U2GES09	W33	17-01-2019	0.007	<1	9.14	86.4	0.203	<0.005	<0.01	6.4	4	<0.05	0.573
U2GES10	W36	17-01-2019	0.006	<1	9.88	161	1.3	<0.005	<0.01	6.8	<2	<0.05	1.03
U2GES11	W38	17-01-2019	0.009	<1	10.8	144	1.19	<0.005	<0.01	6.5	7	<0.05	0.988
U2GES12	W40	17-01-2019	0.013	<1	12.5	116	0.532	<0.005	<0.01	6.5	15	<0.05	0.597
U2GES13	W44	17-01-2019	0.006	<1	10.6	110	0.768	<0.005	<0.01	6.5	<2	<0.05	0.663
U2GES14	W48	17-01-2019	0.014	<1	10.7	125	0.683	<0.005	<0.01	6.6	11	<0.05	0.699
U2GES15	W52	17-01-2019	0.203	<1	14.5	177	0.772	0.008	0.03	6.8	<2	0.06	1.23
U2GES16	W54	17-01-2019	0.041	<1	13.2	180	0.902	<0.005	<0.01	6.7	3	<0.05	1.06
U2GES17	W56	22-01-2019	0.01	<1	15.6	290	2.65	<0.005	0.023	7.5	7	<0.05	2.32
U2GES18	W59	22-01-2019	0.007	<1	9.53	241	2.24	<0.005	0.012	7.2	94	0.08	1.83
U2GES19	W60	22-01-2019	0.007	<1	9.87	222	1.7	<0.005	0.011	7.4	9	<0.05	1.40
U2GES20	Downstream W1-W4	22-01-2019	<0.005	1	12.4	161	0.637	<0.005	0.014	7.7	4	<0.05	0.778
U2GES21	Downstream W5-W34	22-01-2019	<0.005	1	12.9	126	0.509	<0.005	0.011	7.5	2	<0.05	0.632
U2GES22	Downstream W22-W34	22-01-2019	0.008	<1	12.3	108	0.36	<0.005	0.011	7.4	6	<0.05	<0.5
U2GES23	Downstream W22-W34	22-01-2019	0.01	<1	11.7	108	0.412	<0.005	0.012	7.2	3	<0.05	<0.5
U2GES24	Downstream W34	22-01-2019	0.012	<1	10.2	115	0.409	<0.005	0.01	7.2	2	<0.05	<0.5

U2GES25	Downstream W35-W58	22-01-2019	0.01	<1	11.5	147	0.879	<0.005	0.011	7.6	11	<0.05	0.833
U2GES26	Downstream W35-W58	22-01-2019	0.01	<1	11.5	174	0.79	<0.005	0.014	7.8	<2	<0.05	0.900

Table 4: Surface Water Sampling Results – – UWF Grid Connection Max, Min & Average

	Ammonical Nitrogen (mg/L)	BOD (mg/L)	Chloride (mg/L)	Electrical Conductivity (uS/cm)	Nitrate (mg/L)	Nitrite (mg/L)	Ortho-Phosphate (mg/L)	pH (pH Units)	Suspended Solids (mg/L)	Total Phosphorous (mg/L)	Total Nitrogen (mg/L)
MAXIMUM	0.20	1	24.3	331	2.65	0.008	0.053	7.8	334	0.26	2.62
MINIMUM	0.01	<1	9.1	58	<0.1	<0.005	<0.01	5.0	<2	<0.05	<0.5
AVERAGE	0.02	<1	12.7	153	0.87	<0.005	0.014	7.0	23	<0.05	0.908

Appendix to Chapter 11: Water

Appendix 11.3: Flood Risk Assessment

The data and descriptions in this appendix have informed Chapter 11: Water of the EIA Report. The information presented in this Appendix 11.3 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix	Title	Relevant EIAR
A.11.3	Flood Risk Assessment	UWF Related Works

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APPENDIX 11.3

FLOOD RISK ASSESSMENT

UWF RELATED WORKS, CO. TIPPERARY

FLOOD RISK ASSESSMENT
FINAL REPORT

Prepared for:
Ecopower Developments Ltd

Prepared by:
Hydro-Environmental Services

DOCUMENT INFORMATION

DOCUMENT TITLE:	**UPPERCHURCH WINDFARM UWF RELATED WORKS, CO. TIPPERARY** **FLOOD RISK ASSESSMENT**
ISSUE DATE:	**31ST JANUARY 2019**
PROJECT NUMBER:	**P1.3** **99-2**
PROJECT REPORTING HISTORY:	**NONE**
CURRENT REVISION NO:	**P1299-2_FINAL R0**
AUTHOR(S):	**MICHAEL GILL** **DAVID BRODERICK** **BRIAN COFFEY**
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Disclaimer:
This report has been prepared by HES with all reasonable skill, care and diligence within the terms of the contract with the client, incorporating our terms and conditions and taking account of the resources devoted to it by agreement with the client. We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above. The flood risk assessment undertaken as part of this study is site-specific and the report findings cannot be applied to other sites outside of the survey area which is defined by the site boundary. This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

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A11.3.1. INTRODUCTION

A11.3.1.1 BACKGROUND

Hydro-Environmental Services (HES) were requested by the Promoter to undertake a Flood Risk Assessment (FRA) for the proposed Upperchurch Windfarm (UWF) UWF Related Works and the UWF Replacement Forestry, Co. Tipperary. A site location map is shown below as **Figure A**.

This FRA is carried out in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (DoEHLG, 2009).

The UWF Related Works comprises the following main elements:

- Internal Windfarm Cabling,
- Realigned Windfarm Roads,
- Haul Route Works
- Telecoms Relay Pole
- Ancillary UWF Related Works

The UWF Replacement Forestry at Foilnaman near the Upperchurch Windfarm will fulfil the replanting obligation which will arise from the felling of forestry at UWF Related Works and Upperchurch Windfarm locations.

Each element is discussed in more detail below.

A11.3.1.2 KEY OBJECTIVES

The primary objective of this FRA is to identify areas potentially prone to fluvial and pluvial flooding in the UWF Related Works areas with a focus being on residual risk to permanent infrastructure that will be present during the operational phase of the development.

The second objective of this FRA is to assess whether these projects have the potential to increase flood risk locally or downstream of the development.

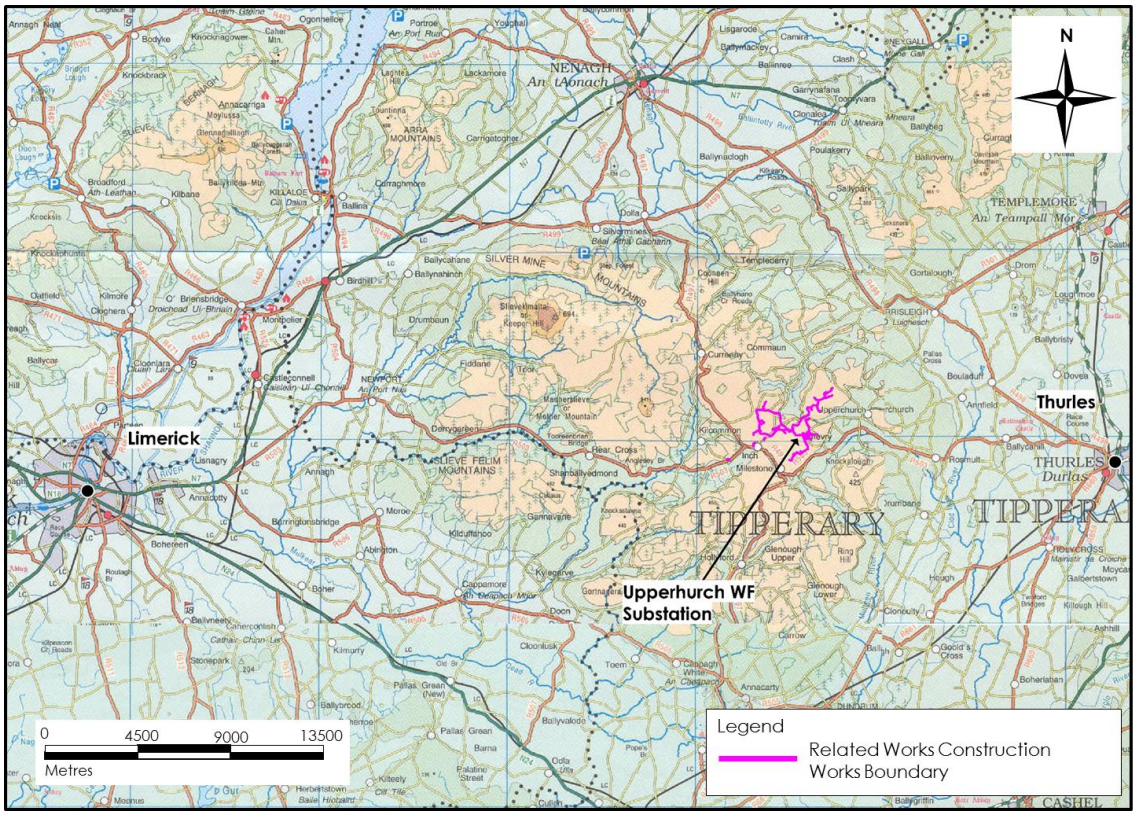


Figure A: Site Location Map

A11.3.1.3 STATEMENT OF EXPERIENCE

Hydro-Environmental Services ("HES") are a specialist hydrological, hydrogeological and environmental practice which delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford.

Our core area of expertise and experience is hydrology and hydrogeology, including flooding assessment and surface water modelling. We routinely work on surface water monitoring and modelling, and prepare flood risk assessment reports.

Michael Gill is an Environmental Engineer with 17 years environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological assessments for various developments across Ireland. Michael has significant experience in surface water drainage issues, SUDs design, and flood risk assessment.

David Broderick is a hydrogeologist with over 12 years environmental consultancy experience across Ireland. David has completed numerous Flood Risk Assessments for all types of developments, and he regularly uses HEC-RAS and FlowMaster modelling software.

A11.3.1.4 REPORT LAYOUT & METHODOLOGY

This FRA report has the following format:

- Section 2 describes the proposed development setting and details of the proposed development;
- Section 3 outlines the hydrological and geological characteristics of the local surface water catchments in the vicinity of the proposed development;
- Section 4 deals with a site-specific flood risk assessment (FRA) undertaken for the proposed development which was carried out in accordance with the above-mentioned guidelines;
- Section 5 provides commentary in relation to the Justification Test; and,
- Section 6 presents the FRA report conclusions.

As stated above this FRA is carried out in accordance with 'The Planning System and Flood Risk Management Guidelines for Planning Authorities' (DoEHLG, 2009). The assessment methodology involves researching and collating flood related information from the following data sources:

- Base maps – Ordnance Survey of Ireland;
- Flood Hazard Maps and flooding information for Ireland, www.floodmaps.ie;
- Office of Public Works (OPW);
- Geological Survey of Ireland (GSI) maps on superficial deposits;
- EPA hydrology maps;
- Preliminary Flood Risk Assessment (PFRA) Maps, and CFRAM maps and studies where available; and,
- Site walkover surveys (undertaken during the winters of 2016, 2017 and 2018.

A11.3.2. BACKGROUND INFORMATION

A11.3.2.1 INTRODUCTION

This section provides a general overview of the proposed developments along with a description of the local setting and topography.

A11.3.2.2 PROPOSED DEVELOPMENT DETAILS

A11.3.2.2.1 UWF Related Works

The UWF Related Works, which are generally located at or in the area of Upperchurch Windfarm site, will consist of UWF Internal Windfarm Cabling, UWF Realigned Windfarm Roads, UWF Haul Route Works, a Telecom Relay Pole and UWF Ancillary Works.

The total length of the internal windfarm cabling is approximately 17.9km and 11.1km of this will be laid within the Upperchurch Windfarm access roads. There are approximately 32 no. watercourse crossings along the windfarm internal cabling and these watercourses range from drains / small headwater streams to larger 1st - 2nd order streams. There will be a requirement to construct 8 no. permanent watercourse crossing structures at the UWF Related Works areas.

A11.3.2.2.2 UWF Replacement Forestry

The UWF Replacement Forestry currently comprises 6ha of grassland which exists just north of Upperchurch Windfarm.

A11.3.2.3 PROJECT LOCATION AND TOPOGRAPHY

The UWF Related Works are spread across a number of hills in the area of the Upperchurch Windfarm. The elevation ranges between approximately 360 and 410m OD and the hills are generally at heights of 100m above the intervening valleys. The main landuse is agriculture with some commercial forestry.

The UWF Replacement Forestry at Foilnaman is currently grassland.

A11.3.3. EXISTING ENVIRONMENT AND CATCHMENT CHARACTERISTICS

A11.3.3.1 INTRODUCTION

This section gives an overview of the hydrological and geological characteristics in the area of the UWF Related works and UWF Replacement Forestry.

A11.3.3.2 BASELINE HYDROLOGY

A11.3.3.2.1 Regional and Local Hydrology

UWF Related Works

The majority of the UWF Related Works areas (16.2km of Internal Windfarm Cabling, all Realigned Windfarm Roads and the Telecom Relay Pole) are located in the River Suir catchment with the remainder (c 1.7km of Internal Windfarm Cabling and some of the Haul Route Works) in the River Shannon catchment.

Within the River Suir catchment, of the 16.2km of the Internal Windfarm Cabling within the River Suir catchment, 11.6km exists within the Clodiagh River catchment, 3.8km within the Owenbeg River catchment and 0.8km within the Turraheen River catchment.

As shown in Table **A** below there are a total of 32 no. watercourse crossings required for the UWF Related Works and there are largely required for the Internal Windfarm Cabling (24 of 32 no.). The majority of the watercourse crossings are located within Clodiagh River catchment (26 no. of 32 no. crossings). There is only 1 no. watercourse crossing in the River Shannon catchment.

Due to the elevated nature of the location of the construction works associated with the UWF Related Works, the majority of the watercourse crossings relate to forestry drains or agricultural drains.

Table A: Summary of Watercourse Crossings at the UWF Related Works

Regional Catchment	Sub-catchment	Internal Cable (km)	No. Watercourse Crossings
Suir	Turraheen	0.88	0
	Clodiagh Upper	11.44	26
	Owenbeg Upper	3.8	5
Shannon	Bilboa	1.74	1

UWF Replacement Forestry

All of the UWF Replacement Forestry is located within the Clodiagh River catchment (Clodiagh_010), which is part of the River Suir Catchment. The UWF Replacement Forestry site is located in the townland of Foilnaman to the northwest of the Upperchurch Windfarm. The lands to be planted comprise two agricultural landholdings that are separated by a watercourse. The watercourse is a headwater stream of the Clodiagh River and flows in an easterly direction through the UWF Replacement Forestry site. There will be no new crossing of this stream during replanting works.

A11.3.3.2.2 Rainfall and Evaporation

The SAAR (Standard Average Annual Rainfall) recorded at Silvermine Mountains (Curreeny) (station no: 4819), which is located approximately 4.2km north of the 110kV UGC, is 1,713mm. The average potential evapotranspiration (PE) at Shannon Airport is taken to be 543mm and

AE is calculated to be 516mm. Using the above figures the ER for the area is calculated to be 1,197mm.

A11.3.3.3 GEOLOGY

The superficial geology (*i.e.* overburden) at the UWF Related Works areas, and also within the UWF Replacement Forestry, comprises mainly mineral or organic topsoil over glacial tills.

The UWF Related Works areas and the UWF Replacement Forestry areas are exclusively underlain by Silurian meta-sediments.

A11.3.4. SITE SPECIFIC FLOOD RISK ASSESSMENT

A11.3.4.1 INTRODUCTION

The following assessment is carried out in accordance with '*The Planning System and Flood Risk Management Guidelines for Planning Authorities*' (DoEHLG, 2009). The basic objectives of these guidelines are to:

- Avoid inappropriate development in areas at risk of flooding;
- Avoid new developments increasing flood risk elsewhere, including that which may arise from surface water run-off;
- Ensure effective management of residual risks for development permitted in floodplains;
- Avoid unnecessary restriction of national, regional or local economic and social growth;
- Improve the understanding of flood risk among relevant stakeholders; and,
- Ensure that the requirements of EU and national law in relation to the natural environment and nature conservation are complied with at all stages of flood risk management.

A stage 1 assessment of flood risk requires an understanding of where the water comes from (*i.e.* the source), how and where it flows (*i.e.* the pathways) and the people and assets affected by it (*i.e.* the receptors). It is necessary to identify whether there may be any flooding or surface water management issues related to the proposed site that may warrant further detailed investigation.

As per the guidance (DOEHLG, 2009), the stages of a flood risk assessment are:

- *Flood risk identification* – identify whether there are surface water flooding issues at a site; and,
- *Initial flood risk assessment* - confirm sources of flooding that may affect a proposed development.

Further to this, a stage 2 assessment involves the confirmation of sources of flooding, appraising the adequacy of existing information and determining what surveys and modelling approach may be required for further assessment.

A11.3.4.2 FLOOD ZONE MAPPING

Flood zones are geographical areas within which the likelihood of flooding is in a particular range. There are three types or levels of flood zones defined for the purposes of according to OPW guidelines:

- Flood Zone A – where the probability of flooding from rivers and the sea is highest (greater than 1% or 1 in 100 for river flooding or 0.5% or 1 in 200 for coastal flooding);
- Flood Zone B – where the probability of flooding from rivers and the sea is moderate (between 0.1% or 1 in 1000 and 1% or 1 in 100 for river flooding and between 0.1% or 1 in 1000 year and 0.5% or 1 in 200 for coastal flooding); and,
- Flood Zone C – where the probability of flooding from rivers and the sea is low (less than 0.1% or 1 in 1000 for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

A11.3.4.3 FLOOD RISK IDENTIFICATION

A11.3.4.3.1 Soils Maps – Fluvial Maps

A review of the soil types in the vicinity of the site was undertaken as soils can be a good indicator of past flooding in an area. Due to past flooding of rivers deposits of transported silts/clays referred to as alluvium build up within the flood plain and hence the presence of these soils is a good indicator of potentially flood prone areas.

Soils maps, however, tend to be generalised and therefore are not definitive, and further analysis is required as outlined below.

A11.3.4.3.2 Historical Mapping

There is no text on local available historical 6" or 25" mapping for the development that identify areas that are "*prone to flooding*".

A11.3.4.3.3 OPW National Flood Hazard Mapping

The OPW Indicative Flood Maps have no records of recurring flood incidences in the UWF Related Works or UWF Replacement Forestry areas or immediately downstream of them (**Figure B** below refers).

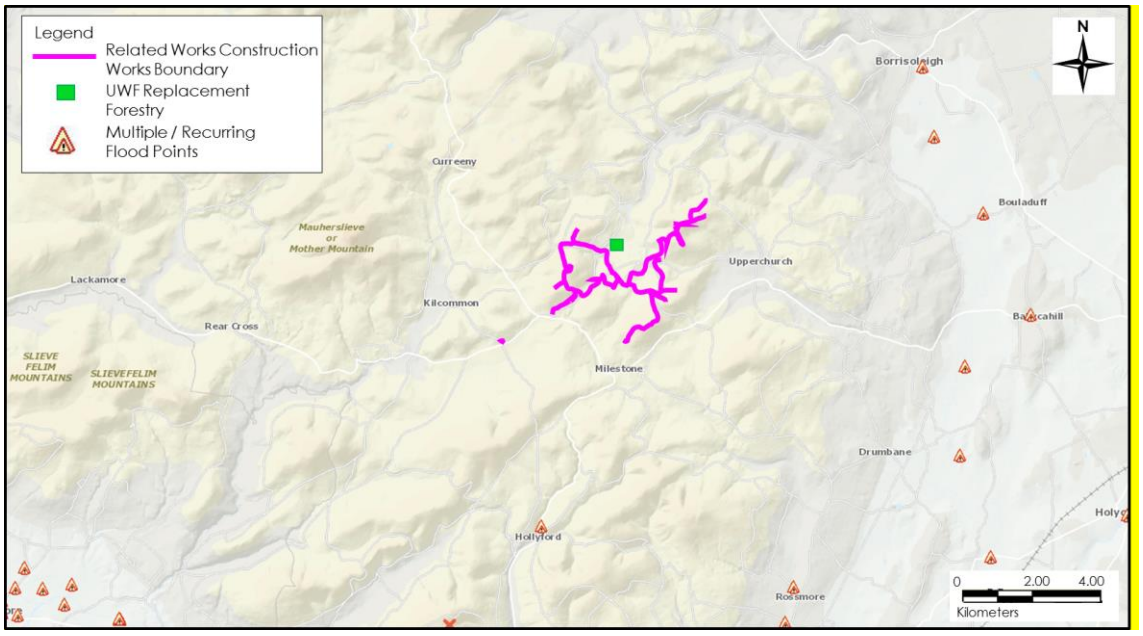


Figure B: OPW Flood Hazard Mapping **(www.floods.ie)**

A11.3.4.3.4 Preliminary Flood Risk Assessment Maps – Fluvial and Pluvial Flooding

UWF Related Works
There are no mapped pluvial or fluvial flood zones in the area of the UWF Related Works. Due to the elevated and hilly nature of the topography in the area of the UWF Related Works no significant fluvial or pluvial flooding would be expected.

UWF Replacement Forestry
A section of the UWF Replacement Forestry site at Foilnaman is within a mapped fluvial flood zone. However, there is no new permanent infrastructure associated with this afforestation site.

PFRA flood mapping for the area of the proposed development are shown attached below as **Figure 2** to **Figure 5**.

A11.3.4.3.5 CFRAM Maps – Fluvial and Coastal Flooding

Where complete the Catchment Flood Risk Assessment and Management (CFRAM)[1] OPW Flood Risk Assessment Maps are now the primary reference for flood risk planning in Ireland and supersede the Preliminary Flood Risk Assessment Maps (PFRA) maps. CFRAM mapping is not currently available for the area of the UWF Related Works or UWF Replacement Forestry.

A11.3.4.3.6 Summary – Flood Risk Identification

UWF Related Works
Based on the information gained through the flood identification process, it appears that there are no mapped fluvial or pluvial flood zones at the UWF Related Works areas which includes the watercourse crossing locations. The works will therefore have no potential to cause increased flood risk.

UWF Replacement Forestry
A section of the UWF Replacement Forestry site at Foilnaman is within a mapped fluvial flood zone. However, there is no new permanent infrastructure associated with this afforestation site.

This is discussed further in **Section 4.4** below where a site-specific flood risk assessment was carried out to further assess the risk of potential flooding at the proposed development sites.

[1] *CFRAM is Catchment Flood Risk Assessment and Management. The national CFRAM programme commenced in Ireland in 2011, and is managed by the OPW. The CFRAM Programme is central to the medium to long-term strategy for the reduction and management of flood risk in Ireland.*

A11.3.4.4 INITIAL FLOOD RISK ASSESSMENT

A11.3.4.4.1 Site Survey

A detailed survey of all watercourse for UWF Related Works was completed as part of this assessment. The walkover surveys were completed in the winter months of 2016, 2017 and 2018 and therefore streams and rivers were seen in medium to high flow conditions.

Due to the upland nature of the majority of the UWF Related Works areas, many of the watercourses in proximity of the works area are small headwater streams or drains. A summary of the watercourse types intercepted by the UWF Related Works are shown in **Table B** below. No new river or stream crossings are required within the UWF Replacement Forestry area.

Due to the elevated nature of the UWF Related Works area, the watercourse crossings comprise mainly drains along with several headwater streams (1st – 2nd order).

Table B: Watercourse Crossing Types at UWF Related Works areas

Type	Watercourse Description	Total No.
1	EPA mapped blue line, major river or stream	1
2	Headwater Stream, equivalent to EPA blue line but not mapped	5
3	Ephemeral watercourse, heavily vegetated with low or no flow during dry periods	2
4	Manmade Drain	24
	Total	**32**

A11.3.4.4.2 Hydrological Flood Conceptual Model

Potential flooding in the vicinity of the proposed development can be described using the Source – Pathway – Receptor Model ("S-P-R"). The primary potential source of flooding in this area, and the one with most consequence for the proposed site, is fluvial.

The primary potential pathway would be overbank flooding of the various larger watercourses intersected by the UWF Related Works infrastructure during significant rainfall events. The potential receptors in the area are infrastructure and land as outlined below.

A11.3.4.4.3 Summary – Initial Flood Risk Assessment

Based on the information gained through the flood identification process and Initial Flood Risk Assessment process the sources of flood risk for the site are outlined and assessed in Table **C**.

Table C: S-P-R Assessment of Flood Sources for the site

Source	Pathway	Receptor	Comment
Tidal	Not applicable	Land and infrastructure.	The UWF Related Works is at least 48km from the coast and there is no risk of coastal flooding.
Fluvial	Overbank flooding of the various watercourses in the area of UWF Related Works and UWF Replacement Forestry	Land and infrastructure.	There are no mapped fluvial flood zones in the area of the UWF Related Works. A section of the UWF Replacement Forestry site at Foilnaman is within a mapped fluvial flood zone. However, there is no new

			permanent infrastructure associated with this afforestation site.
Pluvial	Ponding of rainwater / surface water	Land and infrastructure.	There is no significant risk of pluvial flooding at the proposed development areas as the topography is elevated and sufficiently sloped to adequately convey waters during heavy rainfall events.
Surface water	Surface ponding/ Overflow	Land and infrastructure	Same as above (pluvial).
Groundwater	Rising groundwater levels	Land and infrastructure.	Based on local hydrogeological regime, elevated nature of the majority of the development and PFRA mapping, there is no apparent risk from groundwater flooding.

A11.3.4.5 DEVELOPMENT INFRASTRUCTURE AND FLOOD RISK

A11.3.4.5.1 Introduction

The proposed development largely involves the installation of underground cables for UWF Related Works internal wind farm cabling. These elements of the development have no potential to increase flood risk due to their subsurface nature. The ground will be reinstated back to its natural condition after the works are completed.

There are certain elements of the permanent infrastructure that will be above ground level and these are looked at below in terms of flood risk.

A11.3.4.5.2 New Permanent Watercourse Crossing Culverts

New permanent culverts / bridges will be required at the following watercourse crossing locations (8 no.) at the UWF Related Works areas: WW1, WW13, WW24 and WW25 (Type 4 watercourse), also WW14 (Type 3 watercourse), also WW4 and WW22 (Type 2 watercourse), and also WW15 (Type 1 watercourse).

The following measures are proposed to ensure that there is no increased flood risk locally:

- All permanent culverts/bridges will be sized to cope with a minimum 100-year flood event;
- A freeboard of 300mm will be kept below the crossing structure during a 100-year flood event;
- At a minimum, all new pipe culverts will be 900mm in diameter regardless of the anticipated flood flow (i.e. minimum 900mm culvert will be used in Type 3/Type 4 watercourses regardless of flows);
- There will be consultation with the OPW to determine if a Section 50 application is required for new crossings and upgrades. A Section 50 application requires the submission of a hydraulic assessment of the proposed culvert / culvert upgrade to ensure it adequacy from a flood prevent perspective ; and,
- Culvert design and construction will adhere to best practise and conform to the OPW (2013) guidance document "Construction, Replacement or Alteration of Bridges and Culverts

There will be no requirement for new permanent culverts/bridges at the UWF Replacement Forestry site.

A11.3.4.5.3 Permanent Hardstanding Areas

Permanent infrastructure associated with the UWF Related Works will be limited to 0.6km of realigned windfarm access roads.

This permanent infrastructure is not expected to increase flood risk for the following reasons:

- It is proposed that the permanent access roads will have permanent road side drains in place which will include check dams for reduction of runoff rates; and,

There will be no requirement for new permanent infrastructure at the UWF Replacement Forestry site.

A11.3.5. PLANNING POLICY AND JUSTIFICATION TEST

A11.3.5.1 PLANNING POLICY AND THE NORTH TIPPERARY COUNTY DEVELOPMENT PLAN

The following policies in Table D below are defined in North Tipperary County Development Plan (CDP) 2010-2016 in respect of flooding, and we have outlined in the column to the right how these policies are provided for within the proposed developments design.

Table D: North Tipperary CDP Policies and Project Responses

No.	Policy	Development Design Response
CEF8	**Management of Flood Risk** It is the policy of the Council to apply a sequential approach to the assessment of developments in areas of flood risk. Developments on lands identified as being at risk of flooding shall be subject to a Flood Risk Assessment in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, (DEHLG 2009) and any amendment thereof*, and shall include a Justification Test and have regard to non-vulnerable uses. *Flood Risk Assessments will be required, as appropriate, in areas identified to be of risk of flooding.	This site-specific FRA is consistent with the DoEHLG/OPW guidelines and its accompanying technical appendix.
TI9	**Storm Water Disposal** It is the policy of the Council to require the implementation of Sustainable Drainage Systems (SuDS) as an integral part of the design of new developments to reduce the generation of storm water run-off, and to ensure that all storm water generated is disposed of on-site or is attenuated and treated prior to discharge to an approved storm water system.	All drainage proposals for permanent infrastructure will be consistent with SUDs principles and best practice SUDs drainage design.

A11.3.5.2 REQUIREMENT FOR A JUSTIFICATION TEST

The matrix of vulnerability versus flood zone to illustrate appropriate development and that required to meet the Justification Test[2] is shown in **Table E** below.

It may be considered that the proposed developments is a 'Highly Vulnerable Development – utilities distribution'. However there are no mapped pluvial or fluvial flood zones in the area of the UWF Related Works. Due to the elevated and hilly nature of the topography in the area of the UWF Related Works no significant fluvial or pluvial flooding would be expected.

Notwithstanding this and in the interest of being conservative, a justification test for UWF Related Works is presented as illustrated in **Table E** below.

Although a section of the UWF Replacement Forestry site at Foilnaman is within a mapped fluvial flood zone a Justification Test is not completed for the UWF Replacement Forestry as there is no new permanent infrastructure associated with this afforestation site, and the proposed works are considered Less Vulnerable Development.

[2] *A 'Justification Test' is an assessment process designed to rigorously assess the appropriateness, or otherwise, of particular developments that are being considered in areas of moderate or high flood risk, (DoEHLG, 2009).*

Table E: Matrix of Vulnerability versus Flood Zone

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification test	Justification test	**Appropriate**
Less vulnerable development	Justification test	Appropriate	Appropriate
Water Compatible development	Appropriate	Appropriate	Appropriate

Note: Taken from Table 3.2 (DoEHLG, 2009)
Bold: *Applies to this project.*

Box 5.1 of "The Planning System and Flood Risk Management Guidelines" (PSFRM Guidelines) outlines the criteria required to complete the "Justification Test".

Table F: Format of Justification Test for Development Management

Box 5.1 Justification Test for Development Management (to be submitted by the applicant)
When considering proposals for development, which may be vulnerable to flooding, and that would generally be inappropriate as set out in Table 3.2, the following criteria must be satisfied: 1. The subject lands have been zoned or otherwise designated for the particular use or form of development in an operative development plan, which has been adopted or varied taking account of these Guidelines. 2. The proposal has been subject to an appropriate flood risk assessment that demonstrates: i. The development proposed will not increase flood risk elsewhere and, if practicable, will reduce overall flood risk; ii. The development proposal includes measures to minimise flood risk to people, property, the economy and the environment as far as reasonably possible; iii. The development proposed includes measures to ensure that residual risks to the area and/or development can be managed to an acceptable level as regards the adequacy of existing flood protection measures or the design, implementation and funding of any future flood risk management measures and provisions for emergency services access; and iv. The development proposed addresses the above in a manner that is also compatible with the achievement of wider planning objectives in relation to development of good urban design and vibrant and active streetscapes. The acceptability or otherwise of levels of residual risk should be made with consideration of the type and foreseen use of the development and the local development context.

Note: *this table has been adapted from Box 5.1 of "The Planning System and Flood Risk Management Guidelines", (2009).*

- Related Works involves the installation of underground cables for the internal wind farm cabling which have no potential to increase flood risk;
- Where new permanent watercourse crossings culverts are required, the hydraulic capacity of the culvert will be suitably designed for peak flood flows.
- The nature of the proposed developments means there will be no flood risk to people, property, the economy or the environment during extreme flood events

  a. The proposed developments have no potential to increase flood risk for the reasons outlined above; and

b. There will be no residual risks to the area and to the proposed developments during extreme flood events.
c. The proposed developments largely involve the installation of underground cables for the internal wind farm cabling and therefore there will be no residual risk;
d. Where new permanent watercourse crossings culverts are required, the hydraulic capacity of the culvert will be suitably designed for peak flood flows.

- The proposed development is compatible with the wider planning objectives of the area.

    a. The proposed development will serve the Upperchurch Windfarm which has been granted permission. The Upperchurch Windfarm is consistent with the County Development Plan on renewable energy.

A11.3.6. CONCLUSIONS

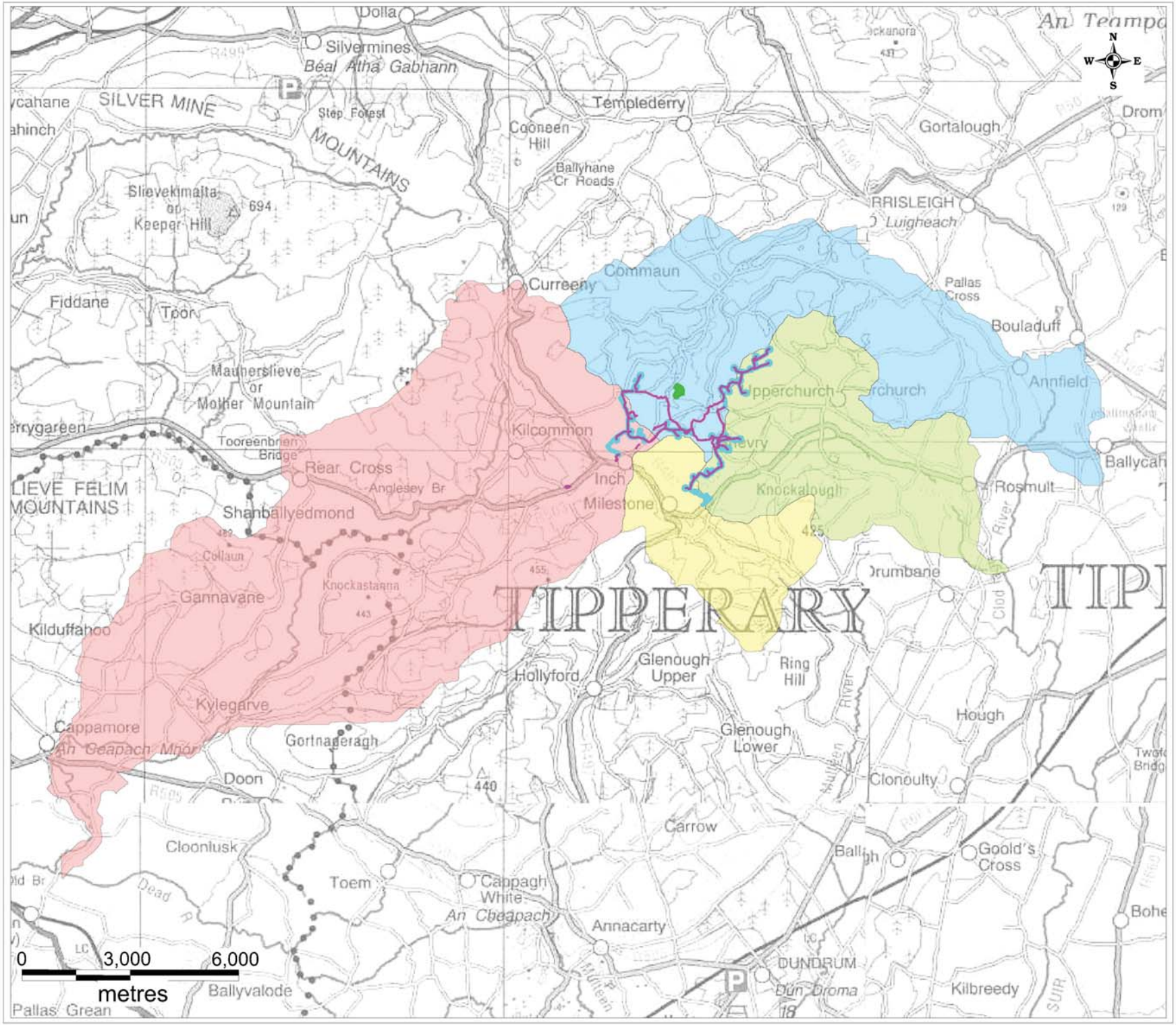
- A flood risk identification study was conducted to identify potential flood risks associated with the proposed UWF Related Works and UWF Replacement Forestry for the Upperchurch Wind Farm, Co. Tipperary. From this study:
    - No instances of historical flooding were identified in historic OS maps;
    - No instances of recurring flooding were identified on OPW maps at UWF Related Works; and,
    - Sections of the UWF Replacement Forestry were identified with the PFRA Flood Zones as described.
- The available Preliminary Flood Risk Assessment (PFRA) mapping indicates that there is a section of the UWF Replacement Forestry site located in the fluvial Flood Zone A (100-year flood zone). However, there is no new permanent infrastructure associated with this afforestation site;
- As outlined in Section A11.3.5 above, the proposed developments are consistent with the relevant planning objectives and policies from the North Tipperary County Development Plan;
- No impacts on the proposed developments are expected as a result of potential flooding. Also, there will be no potential of increased local flood risk as a result of the proposed developments as the majority of UWF Related Works is underground and the footprint of the over ground permanent infrastructure is minimal. Also, there is no new permanent infrastructure associated with this afforestation site; and,
- Where new permanent watercourse crossings culverts are required, the hydraulic capacity of the culvert will be suitably designed for peak flood flows of the watercourse.

* *

A11.3.7. REFERENCES

AGMET	1996	Agroclimatic Atlas of Ireland.
DOEHLG	2009	The Planning System and Flood Risk Management.
Met Eireann	1996	Monthly and Annual Averages of Rainfall for Ireland 1961-1990.

A11.3.8. FIGURES



REFERENCE DOCUMENTS

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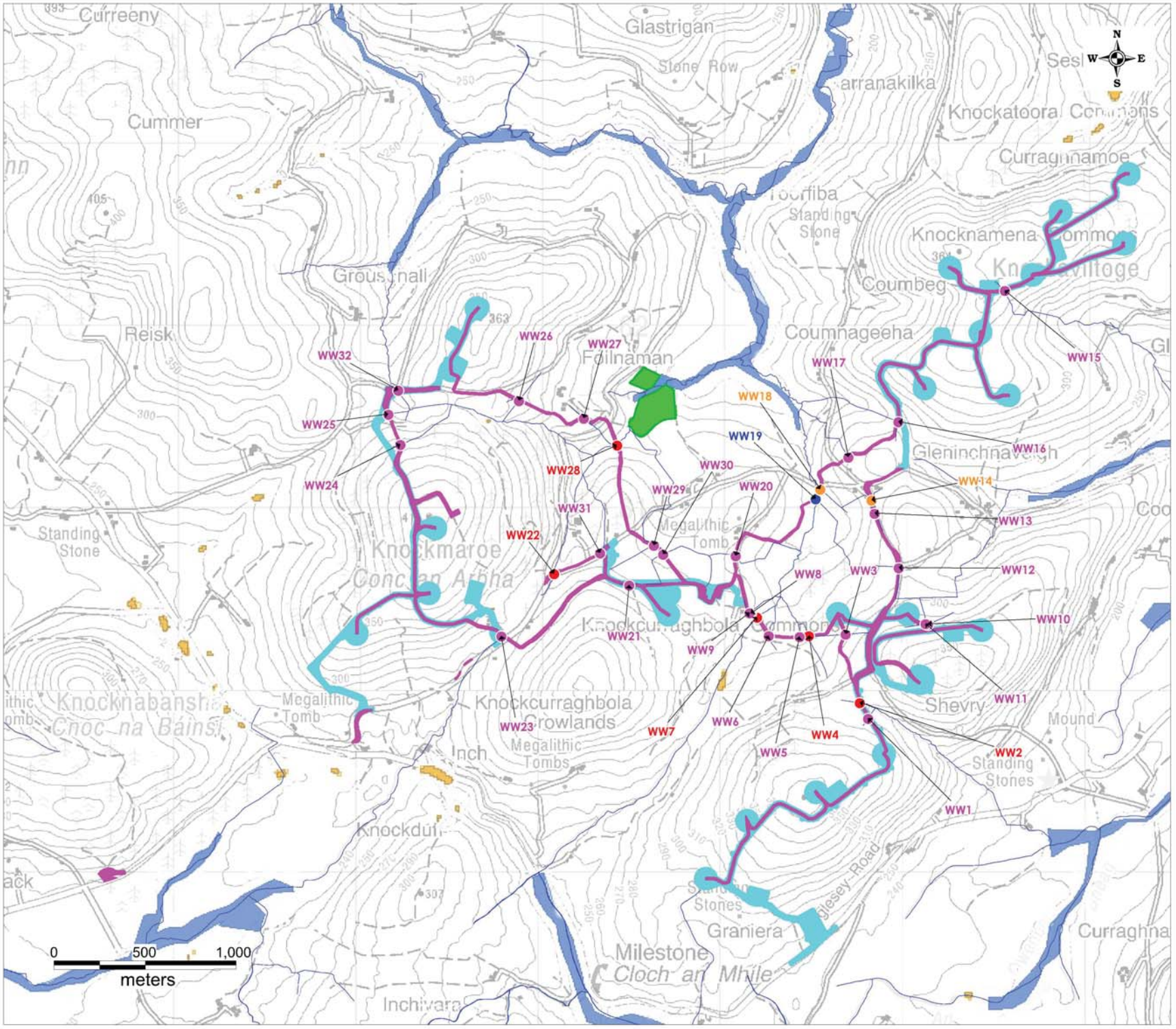
Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Hydrology Map	
Figure No: Figure 1	
Drawing No: P1299-4-0119-Fig-1-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:100,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



Legend

- Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary
- Replacement Forestry Border
- Watercourse
- Fluvial - 1% AEP Event
- Fluvial - Extreme Event
- Pluvial - 1% AEP Event
- Pluvial - Extreme Event

Watercourse Crossing Class Type

- Class 1_EPA Blueline
- Class 2_EPA Blueline Equivalent
- Class 3_Sub Optimal/Ephemeral
- Class 4_Drainage Ditch

*Note: WW - Related Works Watercourse Crossing

REFERENCE DOCUMENTS

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: PFRA Flood Mapping	
Figure No: Figure 2	
Drawing No: P1299-4-0119-Fig-2-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 30/01/2019	Checked By: MG

Appendix to Chapter 12: Air

The data and descriptions in this appendix have informed Chapter 12: Air of the EIA Report, in relation to air quality levels in the existing environment.

Appendix 12.1 Section	Section Heading	Relevant Individual Project Element
A12.1	Air Quality Monitoring and Standards	UWF Related Works & UWF Grid Connection
A12.2	Noise Modelling & Background Noise Measurement	UWF Related Works & UWF Grid Connection
A12.3	Explanation and Modelling of EMF	UWF Related Works & UWF Grid Connection Consented UWF

Appendix 12.1: Air Quality Monitoring & Standards

Appendix 12.1.1: Baseline Air Quality

Appendix 12.1 Section	Section Heading	Relevant Individual Project Element
A12.1.1	Baseline Air Quality	UWF Related Works & UWF Grid Connection
A12.1.2	Air Quality Standards	UWF Related Works & UWF Grid Connection Consented UWF

A12.1.1 EPA Monitoring Programme Results

The EPA and Local Authorities have undertaken air quality monitoring programmes in recent years. They have divided the country into various Air Quality Zones[1]. Zone A is defined as Dublin and its environs, Zone B is defined as Cork City, Zone C is defined as 23 urban areas with a population greater than 15,000 and Zone D is defined as the remainder of the country. The Whole UWF Project is within Zone D. The most recent annual report on air quality "*Air Quality Monitoring Report 2015*"[2], details the range and scope of monitoring undertaken throughout Ireland.

Long-term PM_{10} monitoring is carried out at two rural Zone D locations (EPA 2016). The average concentration measured at these sites in 2013 and 2014 were 13 and 10.3 µg/m^3 respectively. Long-term PM_{10} measurements carried out at a rural Zone D location in 2015 gave an average level of 10.7 µg/m^3[2]. Hence long-term average PM_{10} concentrations measured at these locations were significantly lower than the annual average limit value of 40 µg/m^3.

Based on the above information an estimate of the 2018 background PM_{10} concentration for the region of the Whole UWF Project is 10 µg/m^3.

The results of $PM_{2.5}$ monitoring at a Zone D site in 2015[2] indicated an average $PM_{2.5}/PM_{10}$ ratio of 0.6. Long-term average $PM_{2.5}$ concentrations measured at these locations were significantly lower than the annual average limit value of 25 µg/m^3. Based on this information, the conservative ratio of 0.6 was used to generate a rural background $PM_{2.5}$ concentration in 2018 of 6 µg/m^3.

Long-term NO_2 monitoring was carried out at the three rural Zone D locations in Ireland[2]. The NO_2 annual average in 2015 across all three sites was 4.3 µg/m^3. The NO_2 annual average in 2015 and 2014 at the three rural Zone D sites was 4.7 and 6.3 µg/m^3 respectively. Hence long-term average concentrations measured at these locations were substantially lower than the annual average limit value of 40 µg/m^3. Based on the above information, a conservative estimate of the background NO_2 concentration, for the region of the Whole Windfarm Project is 5 µg/m^3.

In summary, existing baseline levels of PM_{10}, $PM_{2.5}$ and NO_2 based on extensive long-term data from the EPA are well below ambient air quality limit values in the vicinity of the Whole Windfarm Project. There is no monitoring of baseline dust concentrations (PM greater than 10 microns) but these are also predicted to be low.

[1] EPA (2017) Air Monitoring Data (http://www.epa.ie/whatwedo/monitoring/air/)

[2] EPA (2016) Air Quality Monitoring Report 2015 (& previous annual reports 2009 – 2014)

A12.1.2 Air Quality Standards

Air Quality Standards were established under EU Directive 2008/50/EC which sets limit values for certain air pollutants in order to protect against human health and ecological impacts. These limit values or "Air Quality Standards" are health or environmental-based levels for which additional factors, such as natural background levels, environmental conditions and socio-economic factors, may be considered.

The limit values are presented in Table 1 below.

Table 1: Air Quality Standards Regulations 2011

Pollutant	Regulation[3]	Limit Type	Value
Particulate Matter (as PM_{10})	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m^3 PM_{10}
		Annual limit for protection of human health	40 µg/m^3 PM_{10}
$PM_{2.5}$	2008/50/EC	Annual limit for protection of human health	25 µg/m^3 $PM_{2.5}$
Nitrogen Dioxide	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m^3 NO_2
		Annual limit for protection of human health	40 µg/m^3 NO_2
		Critical Load for protection of vegetation	30 µg/m^3 NO + NO_2

[3] Based on EU Directive 2008/50/EC

Appendix to Chapter 12: Air

Appendix 12.2: Noise Modelling & Background Noise Measurement

The data and descriptions in this appendix have informed Chapter 12: Air of the EIA Report, in relation to noise emissions. The information presented in this Appendix 12.1 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 12.2 Section	Section Heading	Relevant Individual Project Element
A-12.2.1	Construction Stage Noise Modelling	UWF Related Works & UWF Grid Connection
A-12.2.2	Mountphilips 110kV Substation – Operational Noise	UWF Grid Connection
A-12.2.2.1	Quiet Area Screening	UWF Grid Connection
A-12.2.2.2	Low Background Noise Area Screening	UWF Grid Connection
A-12.2.2.3	Mountphilips 110kV Substation Noise Emissions	UWF Grid Connection

The surveys and modelling described in this appendix has been undertaken in accordance with the reference documents as appropriate in Section 12.1.6 of Chapter 12.

A-12.2.1 Construction Stage Noise Modelling

There are no extraordinary sources of noise amongst the equipment to be used. The works will proceeded quickly and during normal working hours.

The main item of plant which will be used for the excavation of the trench will be a tracked or wheeled excavator. This is a piece of machinery with similar noise emissions to an agricultural tractor, which are commonplace in the area. Noise emissions for a 30 to 50 tonne tracked excavator is 79dB at 10m. This data is sourced from the British Standard 5228, Code of Practice for noise and vibration control on construction and open sites.

Table 1 below is a typical list of plant and machinery involved in substation construction activities. The noise levels from the equipment identified above have been sourced from BS5228 Noise Database for Noise and Vibration Control on Construction and Open Site 1& 2: 2014+A1.

Table 1 Typical Construction Plant and Machinery which will be used during the Construction Stage

Plant and Machinery	Octave Banding (Hz)								Sound Power Level dB(A)	Sound Pressure Level @10mdB(A)
	63	125	250	500	1k	2k	4k	8k		
Telescopic Handler	86.8	86.9	85.4	92.8	98	96.2	88	78.9	102	71
Mobile Crane	84.8	90.9	93.4	90.8	95.0	95.2	88.0	79.9	101	70
30-50T Excavator	89.8	92.9	99.4	104.8	104	103.2	100	92.9	110	79
15-30T Excavator	99.8	98.9	104.1	100.8	101	100.2	96	86.9	109	78
12T Roller	94.8	98.9	99.4	108.8	104	100.2	97	90.9	111	80
Dump truck	89.8	94.9	99.4	98.8	105	102.2	97	87.9	109	78
Tractor & Trailer	97.8	100.9	98.4	103.8	104	104.2	96	88.9	110	79
15-20T Rubber Tired Excavator	78.8	80.9	86.4	91.8	94	92.2	91	79.9	99	68
3-10T mini digger	85.8	86.9	90.4	90	95.0	90	92	84.9	100	69
Diesel Generator	84.8	88.9	79.4	81.8	84	80.2	77	66.9	92	61

The decibel sum of all of the items of plant listed above totals 86 dBA at 10 metres.

The construction works will be sequenced and all the noise sources presented in Table 7 will not be in operation continuously for the duration of the construction phase, and likely noise levels will be in the order of the excavator, i.e. 79dB at 10m.

Using the inverse square law rule (In decibel terms a doubling (or halving) of sound intensity corresponds to an increase (or reduction) of 6dB), the sound pressure level, or magnitude of noise impact for both the Worst Case Noise levels (all plant in operation in the same location at the same time) and the Realistic Noise Levels, can be determined. The results are presented in Table 2, at increasing distances from the works. The appropriate construction noise threshold levels (as per NRA *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (2004), are also included in Table 2.

Table 2 Determining Worst-Case and Realistic-Case Noise Levels

Distance from noise source	Worst Case Scenario	Realistic Scenario	NRA Guidance Levels
10m	86 dB	79 dB	65 dB
20m	80 dB	73 dB	65 dB
40m	74 dB	67 dB	65 dB
80m	68 dB	61 dB	65 dB
160m	62 dB	55 dB	65 dB
320m	56 dB	49 dB	65 dB

It is expected that the 65dB threshold will not be exceeded at distances of 120m and 60m, under worst-case and realistic scenarios, respectively.

A-12.2.2 Mountphilips 110kV Substation – Operational Noise

A-12.2.2.1 Quiet Area Screening

As the Mountphilips Substation will be a permanent fixture with noise emissions a Quite Area screening was carried out for the location of the substation. The criteria for a 'Quiet Area' classification, as per the EPA NG4 Guidance Note, are listed in the first column of Table 2, and the results of the screening are outlined in the second column.

Table 3 Quiet Area Screening – location criteria

'Quiet Area' screening criteria	**Screening Results: Context in relation to the Mountphilips 110kV Substation**
At least 3 km from urban areas with a population >1,000 people	Criteria **not** met: Newport with a population of approximately 1,800 is approximately 2 km south of the substation site
At least 10 km from any urban areas with a population >5,000 people	Criteria met Annacotty and Castletroy is approximately 11 to 12 km from the site.
At least 15 km from any urban areas with a population >10,000 people	Criteria met: Limerick city, with a population of 190,000 is approximately 16 km south west of the site
At least 3 km from any local industry	Criteria **not** met: Newport Memorials is approximately 1 km east of the site.
At least 10 km from any major industry centre	Criteria **not** met: Annacotty Business Park is 9.6 km south west of the site.
At least 5 km from any National Primary Route, and	Criteria **not** met: The R504 is approximately 500m west of the substation site.
At least 7.5 km from any Motorway or Dual Carriageway	Criteria **not** met: M7 motorway is approximately 2 km west of the site

As all criteria in Table 2 are not met, **the area is not classed as a 'Quiet Area'**.

A-12.2.2.2 Low Background Noise Area Screening

As **all** of the criteria in Table 2 are not met, then screening was carried out to see if the area met the criteria for a low background noise area, as per the EPA NG4 Guidance Note. This criteria is outlined in Table 3.

Table 4: Low Background Noise Area Screening

'Low Background Noise Area' screening criteria
Average Daytime Background Noise Level ≤40dB LAF90, and;
Average Evening Background Noise Level ≤35dB LAF90, and;
Average Night-time Background Noise Level ≤30dB LAF90

A-12.1.2.2.1 Background Noise Measurement

To facilitate the screening exercise, existing background noise levels were measured during an environmental noise survey. As the Mountphilips Substation will operate throughout each 24 hour period, day, evening and night time noise surveys were carried out.

A site visit was undertaken on the 24th April 2017 and baseline environmental noise survey was undertaken between the 28th April and 2nd May 2017. This included weekend and weekday periods, both day and night. The survey was conducted adjacent to the nearest noise sensitive receptor which is a local residence approximately 385m east on the L2166-0 of the Mountphilips Substation location (See Plate 1).

The measurements were made using a Bruel & Kjaer type 2250 Light Logging integrating Sound Level Meter. This instrument is a Type 1 instrument in accordance with IEC 651 regulations. The Time Weighting used was Fast and the Frequency Weighting was A-weighted as per IEC 651. A frequency analysis was also undertaken. The calibration certificate and serial number for the sound level meters and calibrator used during the survey work are attached at the end of this Appendix 12.1.

Several parameters were measured in order to be able to interpret the noise levels correctly. These included the;

- L_{Aeq} Time-averaged A weighted noise level.
- L_{A90} Noise level exceeded for 90% of measurement period (steady underlying noise level).
- L_{A10} Noise level exceeded for 10 % of measurement period.
- L_{Amax} Maximum A weighted noise level measured.

The noise monitoring location and set up can be seen in Plate 1 and Plate 2 below.

The results of the baseline survey are presented in full in Table 4.

Plate 1 Noise Monitoring Location and Set Up

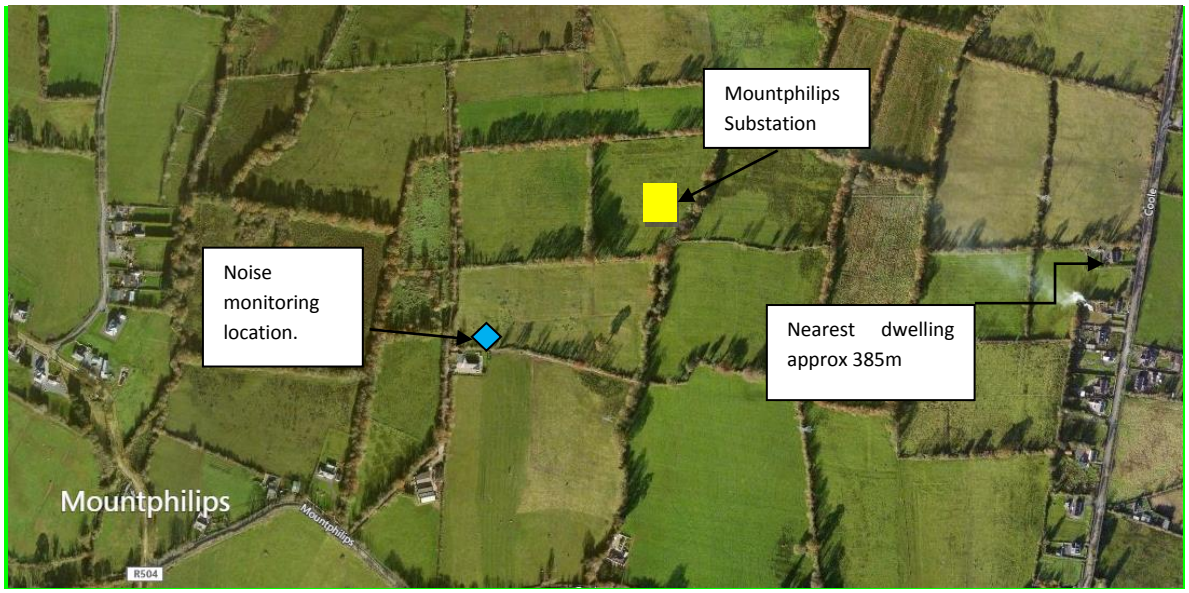

Plate 2 Baseline Noise Monitoring Location and Nearest Dwelling

The area is rural in nature and there are many mature hedgerows and trees in the vicinity of the nearest house (see Plate 2). There was blustery weather on Saturday and this is reflected in the higher background noise levels recorded in Table 4.

The noise monitoring location while not exactly at the nearest property is at a location adjacent and representative. The noise levels would be similar and this proxy location has the added advantage of not being impacted by cars in the driveway and occupier activity.

Table 5: Results of Baseline Noise Survey at Mountphilips

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
Friday 11 am to 7 pm				
28/04/2017 11:00	42	31	68	27
28/04/2017 11:30	44	33	67	28
28/04/2017 12:00	46	32	65	27
28/04/2017 12:30	47	33	64	29
28/04/2017 13:00	47	34	68	27
28/04/2017 13:30	38	32	56	28
28/04/2017 14:00	42	33	61	29
28/04/2017 14:30	47	33	63	28
28/04/2017 15:00	47	32	68	28
28/04/2017 15:30	39	31	56	28
28/04/2017 16:00	47	33	72	29
28/04/2017 16:30	43	33	67	30
28/04/2017 17:00	39	32	61	29
28/04/2017 17:30	46	33	66	28
28/04/2017 18:00	39	34	59	30
28/04/2017 18:30	47	34	67	30
28/04/2017 19:00	48	35	70	32
Average	**44**	**33**	**65**	**29**
Friday Evening 7 pm to 11 pm				
28/04/2017 19:30	45	35	63	31
28/04/2017 20:00	44	34	68	30
28/04/2017 20:30	51	34	71	31
28/04/2017 21:00	42	34	70	30
28/04/2017 21:30	42	33	76	30
28/04/2017 22:00	44	33	77	29
28/04/2017 22:30	35	31	55	27
28/04/2017 23:00	34	30	57	27
Average	**42**	**33**	**67**	**29**
Friday Night 11 pm to 7 am				
28/04/2017 23:30	36	32	58	30
29/04/2017	38	31	65	28
29/04/2017 00:30	36	31	46	28
29/04/2017 01:00	35	32	45	28
29/04/2017 01:30	39	31	50	27
29/04/2017 02:00	42	35	53	32
29/04/2017 02:30	41	36	54	32
29/04/2017 03:00	32	25	44	21
29/04/2017 03:30	32	24	49	21
29/04/2017 04:00	39	29	50	24
29/04/2017 04:30	35	27	44	24
29/04/2017 05:00	45	36	61	31
29/04/2017 05:30	58	36	81	29
29/04/2017 06:00	50	34	75	28
29/04/2017 06:30	43	36	62	31
Average	**40**	**32**	**56**	**28**
Saturday 7 am to 7 pm				
29/04/2017 07:00	44	38	59	33
29/04/2017 07:30	45	40	61	37

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
29/04/2017 08:00	46	37	66	33
29/04/2017 08:30	47	40	63	35
29/04/2017 09:00	45	39	71	35
29/04/2017 09:30	50	41	75	36
29/04/2017 10:00	52	45	66	37
29/04/2017 10:30	54	44	74	39
29/04/2017 11:00	58	49	82	42
29/04/2017 11:30	56	48	74	43
29/04/2017 12:00	59	49	81	41
29/04/2017 12:30	55	46	71	42
29/04/2017 13:00	57	48	70	43
29/04/2017 13:30	56	48	65	43
29/04/2017 14:00	57	49	77	44
29/04/2017 14:30	59	52	72	46
29/04/2017 15:00	59	47	86	42
29/04/2017 15:30	55	47	67	41
29/04/2017 16:00	51	44	69	40
29/04/2017 16:30	48	42	66	38
29/04/2017 17:00	50	41	75	36
29/04/2017 17:30	52	45	68	41
29/04/2017 18:00	52	44	67	40
29/04/2017 18:30	50	42	63	38
Average	**52**	**44**	**70**	**39**
Saturday evening 7 pm to 11 pm				
29/04/2017 19:00	49	42	66	37
29/04/2017 19:30	49	39	69	35
29/04/2017 20:00	46	35	61	31
29/04/2017 20:30	50	38	69	31
29/04/2017 21:00	52	47	64	43
29/04/2017 21:30	49	42	61	35
29/04/2017 22:00	52	45	70	41
29/04/2017 22:30	50	43	62	38
Average	**50**	**41**	**65**	**37**
Saturday night 11 pm to 7 am				
29/04/2017 23:00	46	39	60	34
29/04/2017 23:30	43	36	56	30
30/04/2017	46	38	62	31
30/04/2017 00:30	48	40	57	33
30/04/2017 01:00	46	38	60	32
30/04/2017 01:30	47	38	61	34
30/04/2017 02:00	50	41	64	37
30/04/2017 02:30	53	44	74	39
30/04/2017 03:00	50	43	62	40
30/04/2017 03:30	54	46	67	42
30/04/2017 04:00	53	46	64	40
30/04/2017 04:30	50	42	63	37
30/04/2017 05:00	50	44	63	40
30/04/2017 05:30	50	44	63	37
30/04/2017 06:00	47	41	63	37
30/04/2017 06:30	53	44	64	39
Average	**49**	**41**	**63**	**36**

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
Sunday 7 am to 7 pm				
30/04/2017 07:00	51	40	70	35
30/04/2017 07:30	54	47	68	40
30/04/2017 08:00	56	46	69	39
30/04/2017 08:30	56	49	67	44
30/04/2017 09:00	51	44	62	40
30/04/2017 09:30	53	44	67	39
30/04/2017 10:00	52	42	73	37
30/04/2017 10:30	50	38	74	33
30/04/2017 11:00	47	37	65	33
30/04/2017 11:30	44	38	60	34
30/04/2017 12:00	47	39	69	34
30/04/2017 12:30	48	39	70	30
30/04/2017 13:00	47	39	67	35
30/04/2017 13:30	49	39	67	33
30/04/2017 14:00	44	37	64	32
30/04/2017 14:30	46	37	71	33
30/04/2017 15:00	44	37	64	32
30/04/2017 15:30	48	41	71	35
30/04/2017 16:00	53	38	74	34
30/04/2017 16:30	50	42	70	38
30/04/2017 17:00	47	40	67	34
30/04/2017 17:30	43	36	61	33
30/04/2017 18:00	47	39	69	34
30/04/2017 18:30	47	36	66	32
30/04/2017 19:00	54	38	74	31
30/04/2017 19:30	49	36	71	31
30/04/2017 20:00	44	33	61	28
30/04/2017 20:30	43	31	65	27
30/04/2017 21:00	44	29	69	26
30/04/2017 21:30	48	25	68	22
30/04/2017 22:00	26	22	46	20
30/04/2017 22:30	38	22	72	20
Average	**48**	**38**	**67**	**33**
Sunday night 11 pm to 7 am				
30/04/2017 23:00	29	23	61	21
30/04/2017 23:30	25	23	38	21
01/05/2017	25	21	44	19
01/05/2017 00:30	28	24	36	21
01/05/2017 01:00	29	23	38	20
01/05/2017 01:30	29	24	38	21
01/05/2017 02:00	21	18	33	17
01/05/2017 02:30	24	20	39	18
01/05/2017 03:00	25	20	44	18
01/05/2017 03:30	23	19	37	18
01/05/2017 04:00	26	18	61	17
01/05/2017 04:30	26	19	39	18
01/05/2017 05:00	57	27	84	22
01/05/2017 05:30	46	37	72	31
01/05/2017 06:00	41	33	65	28
01/05/2017 06:30	45	34	66	29

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
Average	**31**	**24**	**50**	**21**
Bank Holiday Monday 7 am to 7 pm				
01/05/2017 07:00	45	36	64	32
01/05/2017 07:30	46	35	69	30
01/05/2017 08:00	42	35	66	30
01/05/2017 08:30	45	34	61	29
01/05/2017 09:00	51	33	78	28
01/05/2017 09:30	43	32	63	27
01/05/2017 10:00	43	33	60	28
01/05/2017 10:30	46	32	67	28
01/05/2017 11:00	40	33	59	30
01/05/2017 11:30	44	32	72	28
01/05/2017 12:00	53	33	87	30
01/05/2017 12:30	43	32	68	30
01/05/2017 13:00	40	33	63	30
01/05/2017 13:30	46	32	65	28
01/05/2017 14:00	45	33	68	30
01/05/2017 14:30	49	32	74	29
01/05/2017 15:00	42	33	64	29
01/05/2017 15:30	48	32	68	27
01/05/2017 16:00	40	29	62	26
01/05/2017 16:30	48	33	78	27
01/05/2017 17:00	43	33	64	28
01/05/2017 17:30	47	33	77	29
01/05/2017 18:00	38	33	61	29
01/05/2017 18:30	44	32	67	28
Average	**45**	**33**	**68**	**29**
Bank Holiday Monday evening 7 pm to 11 pm				
01/05/2017 19:00	50	31	74	26
01/05/2017 19:30	43	31	61	27
01/05/2017 20:00	42	33	69	29
01/05/2017 20:30	46	34	64	29
01/05/2017 21:00	41	34	66	29
01/05/2017 21:30	46	30	69	27
01/05/2017 22:00	41	27	72	25
01/05/2017 22:30	30	23	51	20
Average	**42**	**30**	**66**	**27**
Bank Holiday Monday night 11 pm to 7 am				
01/05/2017 23:00	23	20	40	19
01/05/2017 23:30	34	20	55	18
02/05/2017	24	21	40	19
02/05/2017 00:30	29	20	52	19
02/05/2017 01:00	40	22	67	20
02/05/2017 01:30	30	20	52	18
02/05/2017 02:00	23	20	42	19
02/05/2017 02:30	22	20	43	19
02/05/2017 03:00	25	21	51	18
02/05/2017 03:30	29	20	54	19
02/05/2017 04:00	34	20	56	18
02/05/2017 04:30	28	22	48	19

Start Time	LAeq	LAF90.0	LAFmax	LAFmin
02/05/2017 05:00	54	34	83	29
02/05/2017 05:30	48	36	72	31
02/05/2017 06:00	46	35	68	30
02/05/2017 06:30	43	36	75	30
Average	**33**	**24**	**56**	**22**
Tuesday 7 am to 11 am				
02/05/2017 07:00	46	36	71	32
02/05/2017 07:30	49	37	75	33
02/05/2017 08:00	44	36	73	32
02/05/2017 08:30	45	35	77	31
02/05/2017 09:00	44	32	68	28
02/05/2017 09:30	45	32	71	28
02/05/2017 10:00	45	32	66	28
02/05/2017 10:30	46	32	65	28
02/05/2017 11:00	50	31	66	29
Average	**46**	**34**	**70**	**30**

The results were then evaluated against the criteria for an area of low background noise (see Table 3), whether or not the existing background noise measurements meet the criteria is provided in Table 5.

Table 6: Determination of Low Background Noise Area near Mountphilips substation locations

Time Period 28th April to 2nd May	Average Background Noise Level LA dB	Low Background Noise Criteria	Do the results meet the screening criteria for a Low Background Noise Area? Yes/No, and Comments
Friday	33	≤40	Yes, meets Low Background Noise Area Criteria
Friday Evening	33	≤35	Yes, meets Low Background Noise Area Criteria
Friday Night	32	≤30	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Saturday	44	≤40	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Saturday Evening	41	≤35	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Saturday Night	41	≤30	No, does not meet Low Background Noise Area criteria.
Sunday	40	≤40	No, does not meet Low Background Noise Area criteria. Windy Weather increasing noise levels.
Sunday Evening	38	≤35	No, does not meet Low Background Noise Area criteria.
Sunday Night	24	≤30	Yes, meets Low Background Noise Area Criteria
Monday	33	≤40	Yes, meets Low Background Noise Area Criteria
Monday Evening	30	≤35	Yes, meets Low Background Noise Area Criteria
Monday Night	24	≤30	Yes, meets Low Background Noise Area Criteria
Tuesday	24	≤40	Meets Quiet Area Criteria

The results show, when averaged for each of the day, evening and night time periods that the noise monitoring location can be considered an area of low background noise, during calm weather at least.

As per the EPA NG4 Guidance Notes, where all three of the criteria for Low Background Noise Areas are met (See Table5), then those locations are deemed to be in areas of low background noise, and the reduced noise limits, detailed in Table 6, are applicable to the operational Mountphilips Substation.

Table 7: Low Background Noise - Limit Criteria at Nearest Dwelling (EPA NG 4)

Scenario	Daytime Noise Limit, dB (LAr, T) (07:00 to 19:00hrs)	Evening Noise Limit, dB (LAr, T) (19:00 to 23:00hrs)	Night Noise Limit dB (LAr, T) (23:00 to 07:00hrs)
Area of Low Background Noise	45dB	40 dB	35dB

A-12.2.2.3 Mountphilips 110kV Substation – Operational Noise

In order to determine the noise emissions from the operational Mountphilips Substation, a noise measurement was taken from a representative substation, in Kerry. The representative substation was considered a worst case scenario and was of similar size and scale to the proposed Mountphilips Substation.

A noise level of 60 dB(A) was measured at a distance of 5m from the representative substation. Using the inverse square law rule, which means a 6 dB decrease in noise levels per doubling of distance from a point source, as per:

- 60 dB at 5 m distance
- 54 dB at – 10 m distance
- 48 dB at – 20 m distance
- 42 dB at – 40 m distance
- 36 dB at – 80 m distance
- 30 dB at – 160 m distance
- 24 dB at – 320 m distance
- 18 dB at – 640 m distance

Worse case noise emission levels from the operational substation, at the closest house (which is 385m distance) will be just under 24dB, and will be well below EPA noise limit criteria for areas of low background noise and most likely will also be below the existing background noise levels.

A-12.2.3 Sound Meter – Serial Number & Calibration Certificate

CERTIFICATE OF CALIBRATION

Issued by: **MTS Calibration Ltd.**

Laboratory address: 17 Elvington Close, Billingham TS23 3YS, England

Telephone: +44 (0)1642 876 410

Please note delivery address below

UKAS CALIBRATION 0607

Date of Issue: 05 July 2017 **Certificate Number:** 30463U

Sound Calibrator

Client: Environmental Measurements
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

Brüel & Kjær **Model 4231** **Serial Number 2665058**

A Reference Calibrator, calibrated by a National Standards Laboratory, was used to establish the sensitivity of the measurement chain. The same measurement chain is then used to determine the output level of the Object Calibrator by the difference between its output and that of the nominated Reference Calibrator. Four independent measurements of the third-octave band sound pressure levels produced by the Reference Calibrators and the Object Calibrator are averaged to minimise uncertainties of the calibration. The measurement chain consists of a calibrated, Reference Microphone, Reference Preamplifier and Reference Analyser.

As well as providing a traceable measurement of the sound pressure level in the cavity of the Object Calibrator, the Calibrator's frequency and total harmonic distortion are also measured. Frequency is determined from the average of four independent measurements using a multimeter with a current UKAS-accredited calibration. The total harmonic distortion is measured from the average of three independent measurements by third octave analysis, subtracting the level of the fundamental frequency from the sum of the combined harmonics in the frequency band to 20kHz. The complete procedure is detailed in the MTS Calibration Ltd work procedure WP01.

The sound pressure level generated by the calibrator in its WS2 configuration was measured by reference to B&K Model 4133 Microphone and referance Sound Calibrator as shown in the Test Equipment section below.

The measured values were:

Output Level 1:	94.04	dB re 20µPa	+/- 0.16 dB (k= 2.00)
Fundamental Frequency 1:	999.96	Hz	+/- 0.11 Hz (k= 2.00)
Total Harmonic Distortion 1:	0.581	%	+/- 0.015 % (k= 2.00)
Output Level 2:	114.11	dB re 20µPa	+/- 0.19 dB (k= 2.05)
Fundamental Frequency 2:	999.97	Hz	+/- 0.11 Hz (k= 2.00)
Total Harmonic Distortion 2:	0.393	%	+/- 0.015 % (k= 2.00)

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k (individually calculated as above), providing a coverage probability of approximately 95%. The uncertainty evaluation has been calculated in accordance with the current version of UKAS publication M3003. The uncertainty quoted for the Distortion Measurement is the Distortion Percentage as measured, multiplied by our Uncertainty as calculated for the individual measurement or our BMC, whichever is the larger.

Measurement Conditions:

Temperature	24	°C	± 1 °C
Atmospheric Pressure	1019	mBar	± 2 mBar
Relative Humidity	45	%	± 5 %

This measurement is valid only for the above device configured for calibration of a WS-2 microphone under the above environmental conditions. For deviation of prevailing conditions, the manufacturer's literature for the calibrator should be referred to.

Test Equipment:

Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Calibration Due
Reference Calibrator	Brüel & Kjær	4231	2343058	TE 133	Aug-19
Multimeter	Agilent	34401A	US36106159	TE 202	Sep-17
Signal Generator (set 2)	Agilent	33120A	MY40007806	TE 160	Sep-17
Real-Time Analyser (set 1)	Larson Davis	2900	0492	TE 108	Nov-17

Date of Receipt: 30 June 2017
Date of Measurement: 05 July 2017

Approved Signatory: Tony Sherris

Page 1 of 1

This certificate is issued in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service. It provides traceability of measurement to recognised national standards and to units of measurement realised at a recognised national standards laboratories. This Certificate may not be reproduced other than in full, except with the prior written approval of the issuing laboratory.

PLEASE SEND ALL DELIVERIES TO:

MTS Calibration Ltd

Company Registration Number: 06588525 England and Wales

The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG, England

Telephone: 0044 1642 876410 E-Mail: dmarsh@slmcal.co.uk or tsherris@slmcal.co.uk http\\www.slmcal.co.uk

CERTIFICATE OF CALIBRATION

Issued by: **MTS Calibration Ltd**

Laboratory address: 17 Elvington Close
Billingham TS23 3YS
England

Telephone: +44 (0)1642 876 410

Please note delivery address below

Date of Issue: 28 June 2017 **Certificate Number:** 30446

Sound Level Meter Periodic Tests to BS EN 61672-3: 2006 Class 1

Client: Environmental Measurements on behalf of Malachy Walsh
Unit 12, Tallaght Business Centre
Whitestown Business Park
Co.Dublin 24, Ireland

Instrument Make:	Brüel & Kjær	*Microphone Make:*	Brüel & Kjær
Instrument Model:	2250	*Microphone Model:*	4950
Serial Number:	2654709	*Serial Number:*	1657422
Preamplifier Make:	Bruel & Kjaer	*Calibrator Make:*	Bruel & Kjaer
Preamplifier Model:	ZC0032	*Calibrator Model:*	4231
Serial Number:	10489	*Calibrator Serial Number:*	2343058
		Calibrator Adaptor:	UC0210
		Calibrator Certification Ref:	S6718

Other Accessories supplied: none

MTS Calibration Ltd has obtained evidence which is generally available to the public that an independent testing organisation responsible for pattern approvals has demonstrated that this model of sound level meter has successfully completed the pattern evaluation tests of IEC 61672-2: 2003. This instrument, which was constructed to the requirements of BS EN 61672-1:2002 Class 1, has been tested using the procedures for periodic testing as specified in BS EN 61672-3: 2006.

The sound level meter submitted for testing has successfully completed the Class 1 periodic tests of IEC 61672-3: 2006 for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organisation responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2: 2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1: 2002, the sound level meter submitted for testing conforms to the Class 1 requirements of IEC 61672-1: 2002

In conducting these measurements, it was necessary to use manufacturer's data. This was taken from the instruction manual of the instrument. BE 1712-16

The instrument was within the above specification as received - no modifications were made

Ambient Temperature at Calibration (deg C ± 1)	23.9	Calibration check frequency (Hz)	1000.0
Ambient Pressure at Calibration (mPa ± 2)	1000.4	Reference Sound Pressure Level (dBA)	94.0
Ambient Relative Humidity at Calibration (% ± 5)	50.05	Reference Level Range dB	Single Range

Test Equipment:

Equipment	Manufacturer	Model	Serial No.	Traceability Ref.	Cal. Due
Condenser Microphone	Larson Davis	2541	7300	TE 157	Oct-17
Acoustic Calibrator 1kHz	Brüel & Kjær	4231	2343058	TE 132	Aug-19
Acoustic Calibrator	Brüel & Kjær	4226	2141963	TE 206	Oct-17
Signal Generator (set 2)	Agilent	33120A	MY40007806	TE 160	Sep-17
Real-Time Frequency Analyser (set 3)	Larson Davis	2900	0510	TE 165	Oct-17

Authorised signatory:

Date of Receipt: 26 June 2017
Date of Periodic Test 28 June 2017
Date of Certificate: 28 June 2017

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Tony Sherris

MTS Calibration Ltd
The Grange Business Centre, Belasis Avenue, Billingham TS23 1LG
Telephone: 01642 876410 **Fax:** 01642 876411 **E-Mail:** dmarsh@slmcal.co.uk **or** tsherris@slmcal.co.uk

Appendix to Chapter 12: Air

Appendix 12.3: Explanation and Modelling of EMF

The data and descriptions in this appendix have informed Chapter 12: Air of the EIA Report, in relation to noise emissions. The information presented in this Appendix 12.3 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 12.3 Section	Section Heading	Relevant Individual Project Element
A-12.3.1	Explanation of Electric Fields and Magnetic Fields	
A-12.3.2	Typical Electric and Magnetic Fields in Residential and Working Environments	UWF Related Works UWF Grid Connection Upperchurch Windfarm
A-12.3.3	Criteria for Modelling Theoretical Worst-Case Effects	UWF Related Works UWF Grid Connection Upperchurch Windfarm
A-12.3.4	Worst Case EMF Emissions from the UWF Related Works	UWF Related Works
A-12.3.5	Worst Case EMF Emissions from the UWF Grid Connection	UWF Grid Connection
A-12.3.6	Worst Case EMF Emissions from the Upperchurch Windfarm	Upperchurch Windfarm
A-12.3.7	Worst Case EMF Emissions from Other Projects - Castlewaller Windfarm - Killonan to Nenagh 110kV OHL - Shannonbridge to Killonan 220kV OHL	UWF Grid Connection

The surveys and modelling described in this appendix has been undertaken in accordance with the reference documents as appropriate in 12.1.6 of Chapter 12.

A-12.3.1 Explanation of Electric Fields and Magnetic Fields

Electrical objects and anything connected to them produce two types of fields - electric fields and magnetic fields. The term "field" is used to describe the way an object influences its surrounding area. A temperature field, for example, surrounds a warm object, such as a space heater. EMF's surround any object that is generating, transmitting or using electricity, including appliances, wiring, office equipment, generators, batteries and any other electrical devices. EMFs are invisible and they cannot be felt or heard.

Electric fields occur as a result of the electric potential (or voltage) on these objects, and magnetic fields occur as a result of electric current flowing through these objects. Just like a temperature field, electric and magnetic fields can be measured and their levels depend on, among other things:

- Characteristics of the source of the field (voltage, current, cable configuration and formation; and
- Distance from the source of the field.

The Electric Field is measured in volts per metre (V/m) or (kV/m). Magnetic Fields are measured in microtesla (µT). Electric Fields and Magnetic Fields are highest closest to the source and their level reduces quickly with distance from the source. This is similar to the way that the heat from a candle or campfire weakens as you move farther away. Although ordinary objects do not block magnetic fields, electric fields can be easily blocked by objects such as trees and buildings.

A-12.3.1.1 Electromagnetic Fields in the Natural Environment

Both electric and magnetic fields occur naturally in our environment and even in our own bodies as part of the normal functioning of our cardiac and nervous systems. There is a natural electric field at the earth's surface that is created by electric charges in the upper atmosphere, also known as the ionosphere. During fair weather, these electric field levels vary between 100 and 150 volts per meter (V/m) over flat surfaces. During stormy weather, on the other hand, storm clouds often contain large quantities of electric charge, and the electric field may reach intensities up to 20,000 V/m over flat surfaces and can be considerably higher above hillocks or near the tops of objects such as trees. The Earth's magnetic field, which is due mainly to currents circulating in the outer layer of the Earth's core, extents from the Earth's core out into space. Its magnitude at the Earth's surface varies between about 30 µT (microTesla) at the equator and about 60 µT at the poles.

Such naturally occurring electric and magnetic fields do not change direction and are, therefore, referred to as static or direct current (DC) fields. Naturally occurring electric and magnetic fields differ from the extremely low frequency electromagnetic Fields (ELF-EMF) produced by the power system, which fluctuate at a fixed frequency and are referred to as alternating current (AC) fields. For this reason, the existing levels of naturally occurring static EMF fields are not taken into account in this EIA Report chapter.

A-12.3.1.2 Electromagnetic Fields in the Built Environment

In the built environment, man-made sources of EMF include the power system and communication networks. In Ireland, the AC electric and magnetic fields produced by the power system vary at a frequency of 50-Hertz (Hz) (i.e. the fields alternate direction and intensity back and forth 50 times each second). Electric and magnetic fields are produced in all residential and working environments as a result of nearby electrical wiring, appliances, power lines and telecommunication masts, among other things. A comparison of electric and magnetic fields from 110kV electrical power system infrastructure with the typical electric and magnetic fields emitted by common household appliances is included in **Section A-12.2.2.** In summary this comparison demonstrates that in many cases, residential electrical appliances and tools can generate higher magnetic and electric fields in their close proximity (30cm) than at either the fence of an 110kV substation compound or directly above 110kV underground cables.

In a recent study of homes in the UK, most of homes had average magnetic field levels in the range 0.2µT to 0.4µT which were attributed to low voltage sources (i.e., wiring, appliances, and distribution circuits) (Mastanyi et al, 2007). Electric field measurements in residential environments, average exposures were found to be less than 10 V/m (Bracken et al, 1990)

A-12.3.2 Typical Electric and Magnetic Fields in Residential and Working Environments

Field measurements, carried out by CEI, of the electric fields and magnetic fields near 110kV substations and underground cables are shown below in Table 1 and Table 2.

Table 1: Electric Fields measured from electrical power system infrastructure

Electrical power system	0 meter distance[1] (V/m)	30 meters distance (V/m)	100 meters distance (V/m)	ICNIRP Limit
110kV Substation	40	20	Less than 1	5000 V/m
110kV Underground Cables[2]	n/a	n/a	n/a	5000 V/m

Table 2: Magnetic Fields measured from electrical power system infrastructure

Electrical power system	0 meter distance (µT)	30 meters distance (µT)	100 meters distance (µT)	ICNIRP Limit
110kV Substation	1	0.4	Less than 0.01	100µT
110kV Underground Cables	10 (See footnote 3)	Less than 0.1	Less than 0.05	100µT

Measurements of the typical electric and magnetic fields near domestic appliances are shown in Table 3 and Table 4 below.

Table 3: Typical Electric Fields Household Appliances

Electric appliance	Electric field strength (V/m) at 30cm	ICNIRP Limit
Stereo receiver	180	**5000 V/m**
Iron	120	**5000 V/m**
Refrigerator	120	**5000 V/m**
Mixer	100	**5000 V/m**
Toaster	80	**5000 V/m**
Hair dryer	80	**5000 V/m**
Colour TV	60	**5000 V/m**
Coffee machine	60	**5000 V/m**
Vacuum cleaner	50	**5000 V/m**
Electric oven	8	**5000 V/m**
Light bulb	5	**5000 V/m**

[1] A distance of 0 m corresponds to the central point above the underground cable, or at the substation fence.

[2] There is no electric field above ground level for underground cables, as the soil, earth materials and metallic sheath, which surrounds each cable, removes the potential for electric fields outside the cable.

3 Scaled to reflect similar level expected based on the maximum MVA load 155MW for the grid connection.

Table 4 Typical Magnetic Fields Household Appliances

Electric appliance	3 cm distance (μT)	30 cm distance (μT)	1 m distance (μT)	ICNIRP Limit
Hair dryer	6 – 2000	0.01 – 7	0.01 – 0.03	**100μT**
Electric shaver	15 – 1500	0.08 – 9	0.01 – 0.03	**100μT**
Vacuum cleaner	200 – 800	2 – 20	0.13 – 2	**100μT**
Fluorescent light	40 – 400	0.5 – 2	0.02 – 0.25	**100μT**
Microwave oven	73 – 200	4 – 8	0.25 – 0.6	**100μT**
Electric oven	1 – 50	0.15 – 0.5	0.01 – 0.04	**100μT**

The ICNIRP limit[3] for EMF exposure for electric fields is 5000 V/m. As can be seen from Table 3, the typical exposure levels from common household appliances are below and in compliance with the ICNIRP limits in close proximity to the appliance. For example, an operational refrigerator can expose the user or resident to 120 V/m at a distance of 30cm from the appliance. Any exposure to electric fields at this level is typically for momentary or brief periods at any one time.

The ICNIRP limit[4] for EMF exposure for magnetic fields is 100μT. Low voltage sources, such as home appliances, contribute significantly to our overall exposure to magnetic fields. In a recent study of homes in the UK, for example, 77% of homes had average magnetic field levels above 0.2 μT and 57% of homes had average magnetic field levels above 0.4 μT which were attributed to low voltage sources (i.e., wiring, appliances, and distribution circuits) (Mastanyi et al, 2007). The typical[5] magnetic fields which people can be exposed to, at various distances from electrical equipment and appliances, in residential and public premises are presented in Table 4. As can be seen from Table 4, the use of a vacuum cleaner can expose the user to 200μT at a distance of 3cm and up to 20μT at a 30cm distance from the appliance.

While the comparison between operational 110kV substations or underground cables and domestic appliances provides valuable perspective, and indeed demonstrate that some common household appliances breaches the ICNIRP limit at very close proximity, it is limited by several differences between power lines and appliances. First, electric and magnetic fields are only associated with appliances for the duration that the appliance or tool is in use, while power lines are typically in service at all times. Furthermore, the field levels from appliances drop off at a faster rate with distance, compared to electricity transmission networks.

[3] http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf
[4] http://www.icnirp.org/cms/upload/publications/ICNIRPemfgdl.pdf
[5] Source: http://www.who.int/peh-emf/about/WhatisEMF/en/index3.html

A-12.3.3 Criteria for Modelling Theoretical Worst-Case Effects

In order to categorically demonstrate that the maximum possible power load of the electric cables and equipment associated with the UWF Related Works, UWF Grid Connection and the Upperchurch Windfarm (in order to facilitate a cumulative evaluation), will comply with the EU EMF Exposure Recommendations and the ICNIRP limits, the theoretical worst-case contribution of the various electrical plant to EMF levels in the environment is evaluated in this report. The worst-case levels of EMF have been modeled using the criteria outlined in Table 5, the results of the modelling are summarized in Table 6 and provided in full in Sections A-12.3.5 to A-12.3.7.

Table 5: Criteria for modelling theoretical worst-case effects

Whole UWF Project Element	Worse-Case Scenario Criteria
UWF RELATED WORKS	
Internal Windfarm Cables	The maximum capacity possible of the electricity which a 33kV wind turbine cable will be capable of delivering – i.e. 32 MW, and the associated electrical current of 280 Amps. And at the Consent Windfarm Substation there are two cable sets routed adjacent to each other, into the Substation, with a combined maximum of 64MW. It should be noted that this is the maximum possible power load for the electrical cables and has been modelled to demonstrate categorically compliance with the EU EMF Exposure Recommendation. The configuration of the cable design is the trefoil configuration. The minimum distance between the cables and the ground surface using this flat formation – i.e. 0.8m.
UWF GRID CONNECTION	
Mountphilips Substation	The closest piece of electrical apparatus from the Substation Compound perimeter fence is 5m. The worst case scenario EMF from the equipment in the compound is modelled from the perimeter fence, and is referred to throughout this report as the measurement of EMF at '0 meters'
Mountphilips Substation Compound – End Masts Underground Cables	EMF from the underground 110kV cables which will loop the Mountphilips 110kV Substation onto the existing OHL, via the 2 No. End Masts, was modelled using: an electrical current of 1149 Amps based on the maximum possible power load, which is the winter power load of 219 MVA and 120 kV maximum voltage variation as specified by EirGrid.
Mountphilips – Upperchurch 110kV Underground Cables (UWF Grid Connection)	The maximum capacity possible of the electricity which the 110kV Mountphilips – Upperchurch UWF Grid Connection will be capable of delivering – i.e. 155 MW, and the associated electrical current of 856 Amps. It should be noted that this is the maximum possible power load for the electrical cables and has been modelled to demonstrate categorically compliance with the EU EMF Exposure Recommendation. The configuration of the cable design is the worst case flat configuration where the cable passes over existing services, which is a flat formation cable design (rather than trefoil formation), and therefore less cancelation of magnetic fields between cables. The minimum distance between the cables and the ground surface using this flat formation – i.e. 0.6m.
UPPERCHURCH WINDFARM	
Consented UWF Substation	The closest piece of electrical apparatus from the Substation Compound perimeter fence is 5m. The worst case scenario EMF from the equipment in the compound is modelled from the perimeter fence, and is referred to throughout this report as the measurement of EMF at '0 meters'
Consented UWF Turbines	The closest distance of a member of the public to electrical parts – i.e. at ground level, right beside the turbines (0m distance)

The results of this modelling (see Table 6 and Sections A-12.3.5 to A-12.3.7) demonstrate that the electric field and magnetic field emissions from the Mountphilips 110kV Substation, 110kV UWF Grid Connection, Internal Windfarm Cables, Consented UWF Turbines and Consented UWF Substation will be at a level **substantially less the ICNIRP limit of 5000 V/m and 100µT respectively.** Furthermore, the magnetic field levels will rapidly dissipate with increasing distance from the source.

A-12.3.3.1 Summary of Modelling Results

Table 6: Summary of Worst-case Scenario EMF Modelling Results

Whole UWF Project Elements	Electric Fields	Magnetic Fields
Internal Windfarm Cables	The electric fields generated by the underground cables will be *completely screened* by the earth materials such as soil and a metallic sheath which will surround each cable, and **no electric fields** will be emitted above ground.	Directly above the Internal Windfarm Cables, the maximum level of the magnetic fields, generated by the underground cables, will be **7.6µT**
Mountphilips 110kV Substation	Electric fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the **worst-case EMF** from the substation are expected to be **40 V/m.**	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the **worst-case EMF** from the substation are expected to be **1µT**
Mountphilips – Upperchurch 110kV UWF Grid Connection (UWF GC)	The electric fields generated by the underground cables will be *completely screened* by the earth materials such as soil and a metallic sheath which will surround each cable, and **no electric fields** will be emitted above ground.	Directly above the UWF Grid Connection, the **maximum possible level** of the magnetic fields, generated by the underground cables, will be **54 µT**
Consented UWF Turbines	The electric field generated by the transformer, generator and cables are screened internally by the housing over the generator, and by the steel turbine tower. The turbine's transformer and generator are also at a substantial height above ground level and **will not contribute to the ambient electric field levels**.	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include turbine housings and steelwork. The turbine and transformer are also at a substantial height about ground level. Right beside the turbine, worst case EMF are expected to be **0.2µT**[6]
Consented UWF Substation	Electric fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be **40 V/m.**	Magnetic fields will be very low due to the shielding which will be provided by the extensive metalwork within the substation compound, which will include electrical equipment housings, steelwork, the control building and metal palisade perimeter fence. Immediately outside the perimeter fence, the worst-case EMF from the substation are expected to be **1µT.**

[6] https://www.ncbi.nlm.nih.gov/pubmed/24529028

A-12.3.4 Worst Case EMF emissions from the UWF Related Works

The electric fields and magnetic fields were modelled, at various distances from UWF Related Works electrical plant, using worst-case scenario criteria outlined in Table 5. The results of the modelling in relation to the Internal Windfarm Cabling are presented in Table 7 (electric fields) and Table 8 (magnetic fields).

Table 7: Contribution to ambient electric fields (worst case scenario) by the UWF Related Works

UWF Related Works Relevant Electrical Plant	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m)	Worst Case Electric Field Contribution from the Internal Windfarm Cabling (V/m)	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m)	ICNIRP Guideline Limit (V/m)
Internal Windfarm Cabling	0m	less than 1	None	No increase	5000
Internal Windfarm Cabling	30m	less than 1	None	No increase	5000
Internal Windfarm Cabling	100m	less than 1	None	No increase	5000

Table 8: Contribution to ambient magnetic fields (worst case scenario) by the UWF Related Works

UWF Related Works Relevant Electrical Plant	Distance from operational electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (µT)	Worst Case EMF Contribution from the Internal Windfarm Cabling (µT)	Predicted Worst Case Ambient EMF levels during the operation stage (µT)	ICNIRP Guideline Limit (µT)
Internal Windfarm Cabling	0m	0.2	7.6	7.8	100
Internal Windfarm Cabling	30m	0.2	0.03	0.23	100
Internal Windfarm Cabling	100m	0.2	0.003	0.203	100

The worst case scenario magnetic field from the Internal Windfarm Cabling is illustrated on Plate 1.

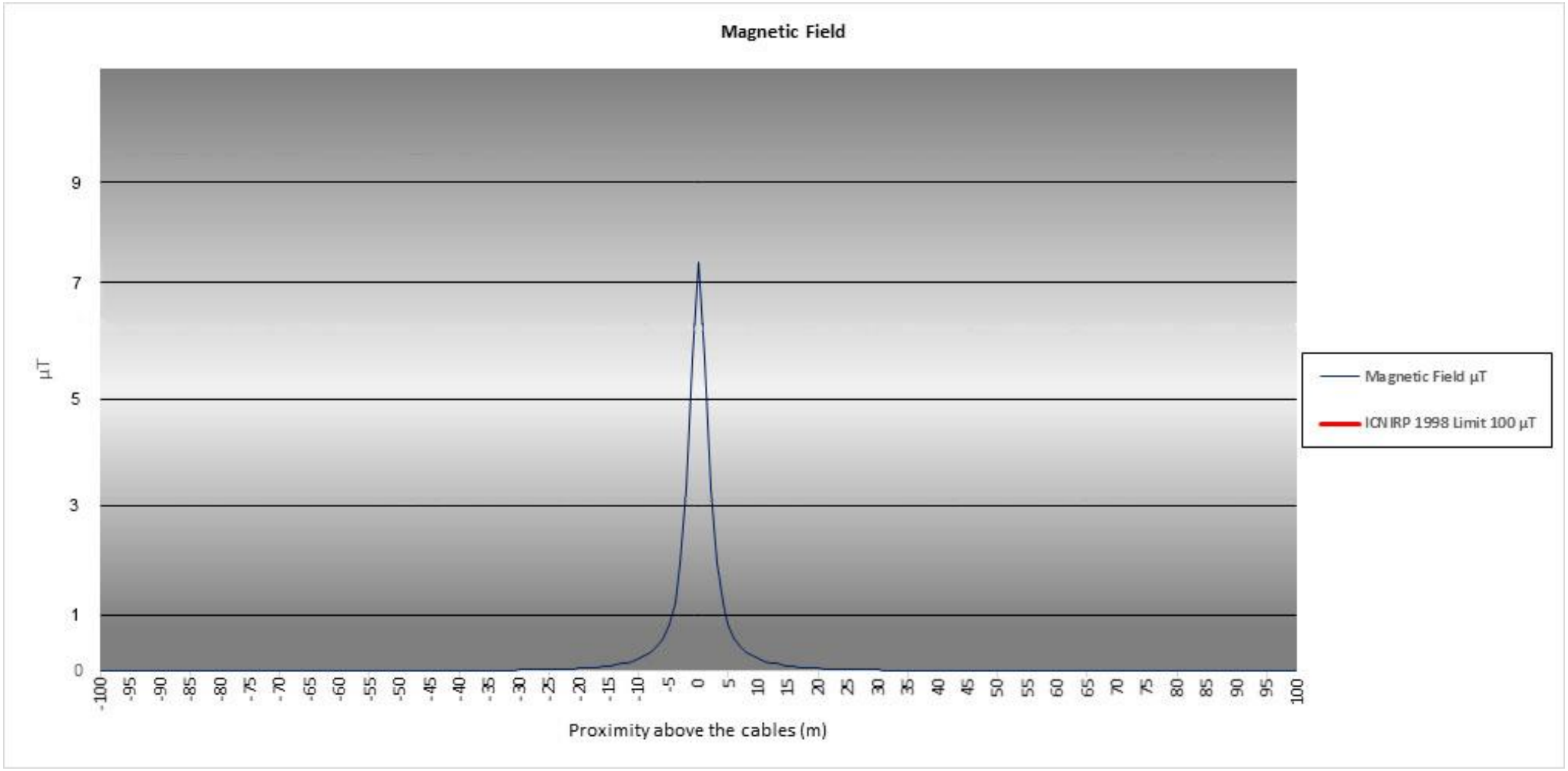


Plate 1: Maximum Possible Magnetic Field from the Internal Windfarm Cabling (UWF Related Works)

A-12.3.5 Worst Case EMF emissions from the UWF Grid Connection

The electric fields and magnetic fields were modelled, at various distances from electrical plant, using worst-case scenario criteria outlined in Table 5 and Table 6. The results of the modelling in relation to the 110kV Mountphilips Substation and the 110kV UWF Grid Connection are presented in Table 9 (electric fields) and Table 10 (magnetic fields), and Plate 2.

Table 9: Contribution to ambient electric fields (worst case scenario) by the UWF Grid Connection

UWF Grid Connection	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m)[7]	Worst Case Electric Field Contribution from the UWF Grid Connection (V/m)	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m)[8]	ICNIRP Guideline Limit (V/m)
Substation Compound	0m	less than 1	40	41	5000
Substation Compound	30m	less than10	20	30	5000
Substation Compound	100m	less than 20	less than 1	21	5000
Cables on End Masts	0m	less than 20	1,040	1060	5000
Cables on End Masts	30m	less than 50	50	100	5000
Cables on End Masts	100m	less than 100	less than 10	110	5000
Mountphilips to Upperchurch 110kV GC	0m	less than 1	None	No increase	5000
Mountphilips to Upperchurch 110kV GC	30m	less than 1	None	No increase	5000
Mountphilips to Upperchurch 110kV GC	100m	less than 1	None	No increase	5000

Table 10: Contribution to ambient magnetic fields (worst case scenario) by the UWF Grid Connection

UWF Grid Connection	Distance from operational electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (µT)[9]	Worst Case EMF Contribution from the UWF Grid Connection (µT)	Predicted Worst Case Ambient EMF levels during the operation stage (µT)	ICNIRP Guideline Limit (µT)
Substation Compound	0m	0.05	1	1.05	100
Substation Compound	30m	0.02	0.4	0.42	100
Substation Compound	100m	0.07	0.16	0.23	100
Cables on End Masts	0m	0.01	35	35.01	100
Cables on End Masts	30m	0.04	1.3	1.34	100
Cables on End Masts	100m	0.1	0.1	42	100
Mountphilips to Upperchurch 110kV GC	0m	0.2	54	54.2	100
Mountphilips to Upperchurch 110kV GC	30m	0.2	0.13	0.33	100
Mountphilips to Upperchurch 110kV GC	100m	0.2	0.01	0.21	100

[7] Assumption: Information based on distances approaching the existing 110 kV OHL to the west of the proposed substation

[8] Assumption: Electric fields are cumulative which is unlikely

[9] Assumption: Information based on distances approaching the existing 110 kV OHL to the west of the proposed substation

The worst case scenario magnetic field from the UWF Grid Connection is illustrated on Plate 2 below.

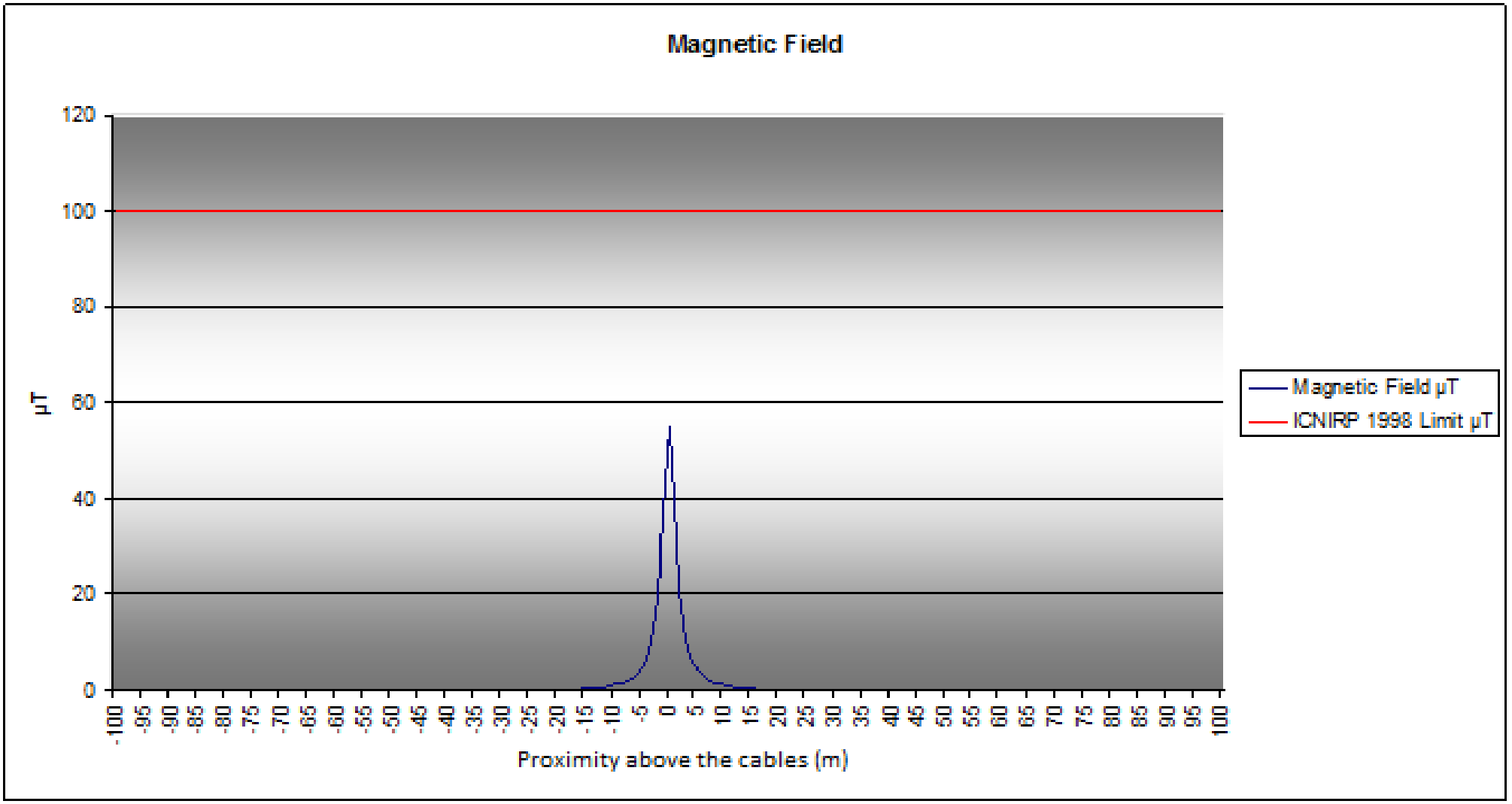


Plate 2: Maximum Possible Magnetic Field from the Mountphilips – Upperchurch 110kV UWF Grid Connection (modelled at 155 MW)

A-12.3.6 Worst Case EMF emissions from the Upperchurch Windfarm

In order to facilitate a cumulative evaluation of the Whole UWF Project, the electric fields and magnetic fields were modelled, at various distances from Upperchurch Windfarm electrical plant, using worst-case scenario criteria outlined in Table 5. The results of the modelling in relation to the Consented UWF Substation and the Consented UWF Turbines are presented in Table 11 (electric fields) and Table 12 (magnetic fields).

Table 11: Contribution to ambient electric fields (worst case scenario) by the Upperchurch Windfarm

Upperchurch Windfarm part	Distance from operational electrical apparatus or cables (m)	Existing Ambient Electric Fields (V/m)	Worst Case Electric Field Contribution from the Upperchurch Windfarm (V/m) [10]	Predicted Worst Case Ambient Electric Field levels during the operation stage (V/m)	ICNIRP Guideline Limit (V/m)
Consented UWF Substation (compound)	0m	less than 1	40	41	5000
Consented UWF Substation (compound)	30m	less than10	20	30	5000
Consented UWF Substation (compound)	100m	less than 20	less than 1	21	5000
Consented UWF Turbines	0m	less than 1	none	less than 1	5000
Consented UWF Turbines	30m	less than 1	none	less than 1	5000
Consented UWF Turbines	100m	less than 1	none	less than 1	5000

Table 12: Contribution to ambient magnetic fields (worst case scenario) by the Upperchurch Windfarm

Upperchurch Windfarm part	Distance from operational electrical apparatus or cables (m)	Existing Ambient Magnetic Fields (µT)	Worst Case EMF Contribution from the Upperchurch Windfarm (µT)[11]	Predicted Worst Case Ambient EMF levels during the operation stage (µT)	ICNIRP Guideline Limit (µT)
Consented UWF Substation (compound)	0m	0.05	1	1.05	100
Consented UWF Substation (compound)	30m	0.02	0.4	0.42	100
Consented UWF Substation (compound)	100m	0.07	0.16	0.23	100
Consented UWF Turbines	0m	0.2	0.2	0.4	100
Consented UWF Turbines	30m	0.2	0.07	0.207	100
Consented UWF Turbines	100m	0.2	0.07	0.207	100

[10] The electric field generated by turbine's transformer and generator are screened by the housing and are also at a substantial height above ground level so will not contribute to the ambient electric field levels.

[11] Scaled to reflect similar level expected based on the expected MVA load from the Consented UWF Turbines.

A-12.3.7 Worst Case EMF emissions from Other Projects

In order to facilitate a cumulative assessment of the UWF Related Works with Other UWF Projects/Activities in the area, the existing Killonan to Nenagh 110kV Overhead Line, and the Shannonbridge to Killonan 220kV Overhead Line.

The worst case scenario electric fields and worst case magnetic fields associated with these three projects are illustrated on Plates 2, 3, 4, 5 and 6 below.

A-12.3.7.1 Worst Case EMF emissions from Killonan – Nenagh 110kV Overhead Line

Worst Case Magnetic Fields - Killonan – Nenagh 110kV Overhead Line:

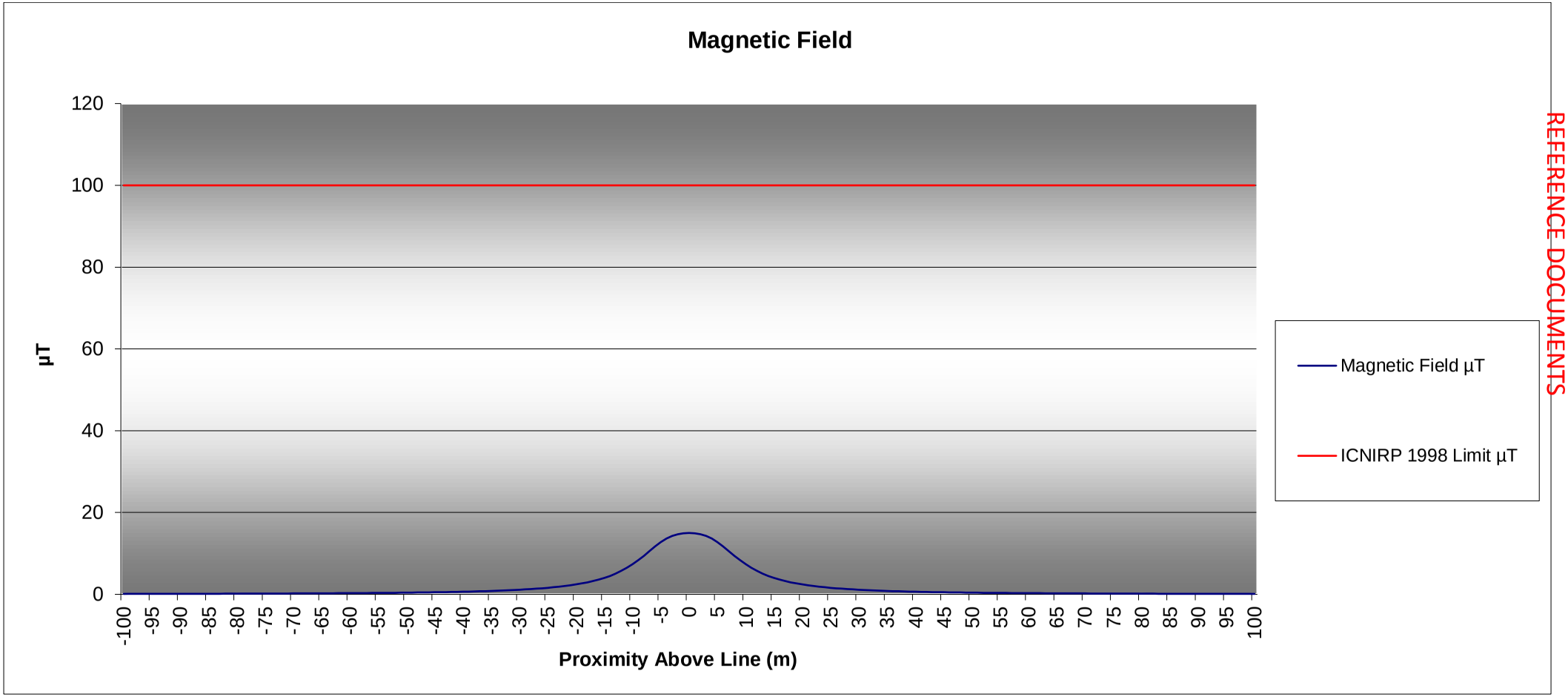


Plate 3: Maximum Possible Magnetic Field from the 110 kV OHL Cables (modelled at 127 MW)

Worst Case Electric Fields - Killonan – Nenagh 110kV Overhead Line:

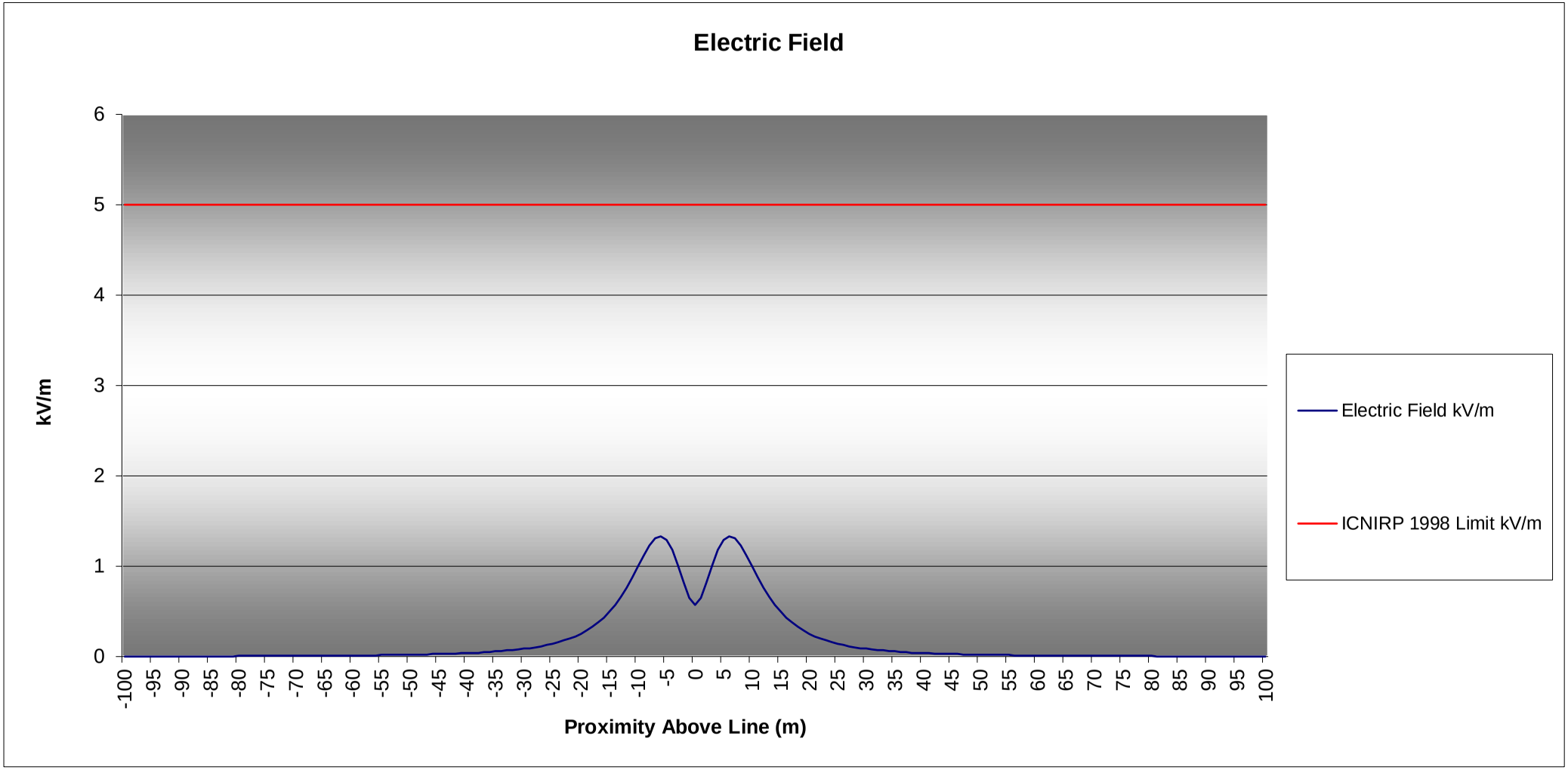


Plate 4: **Maximum Possible Electric Field from the 110 kV OHL Cables (modelled at 127 MW)**

A-12.3.7.2 Worst Case EMF emissions from Shannonbridge to Killonan 220kV Overhead Line

Worst Case Magnetic Fields - Shannonbridge to Killonan 220kV Overhead Line:

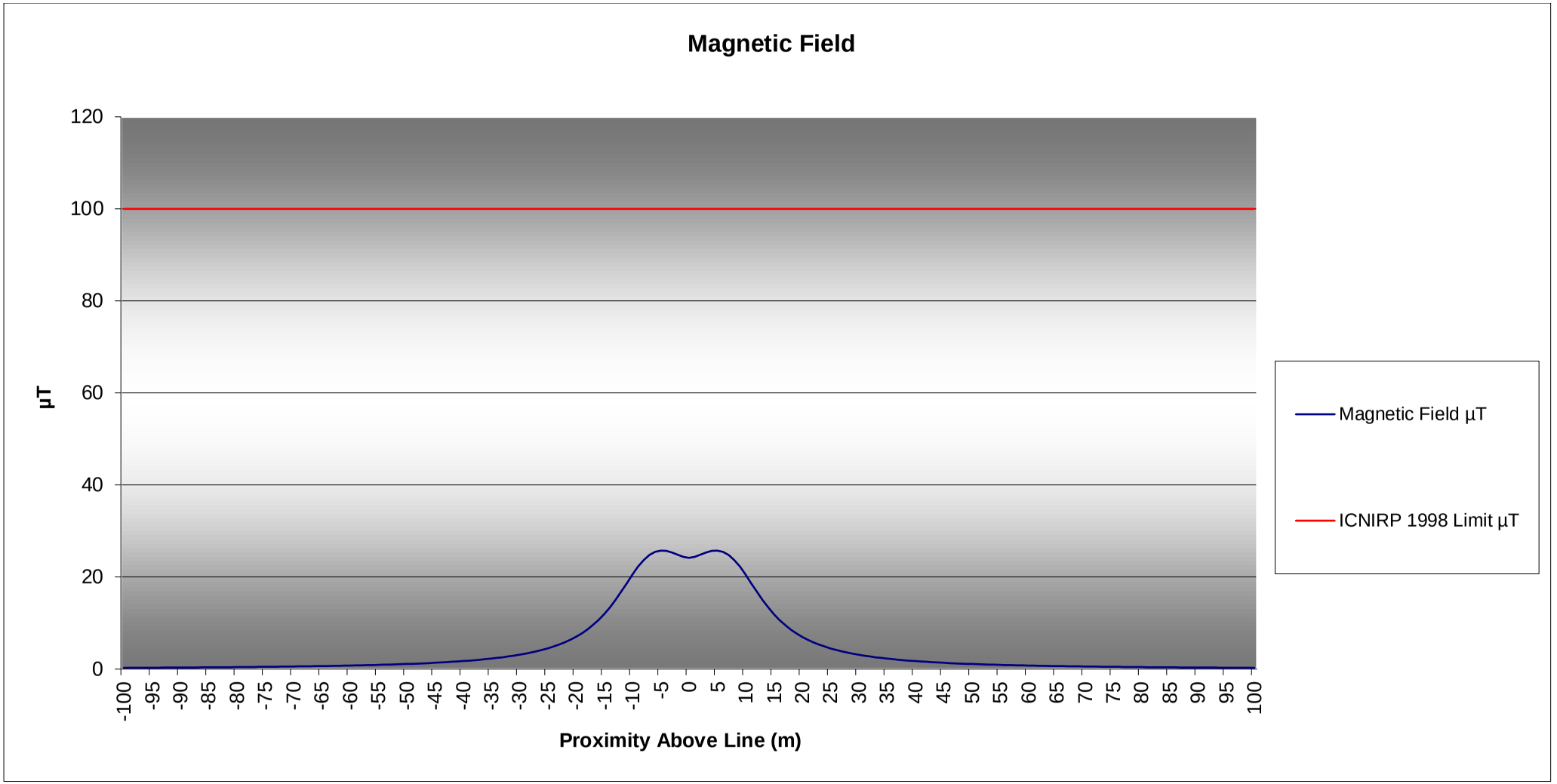


Plate 5: Maximum Possible Magnetic Field from the 220 kV OHL Cables (modelled at 376 MW)

Worst Case Electric Fields - Shannonbridge to Killonan 220kV Overhead Line:

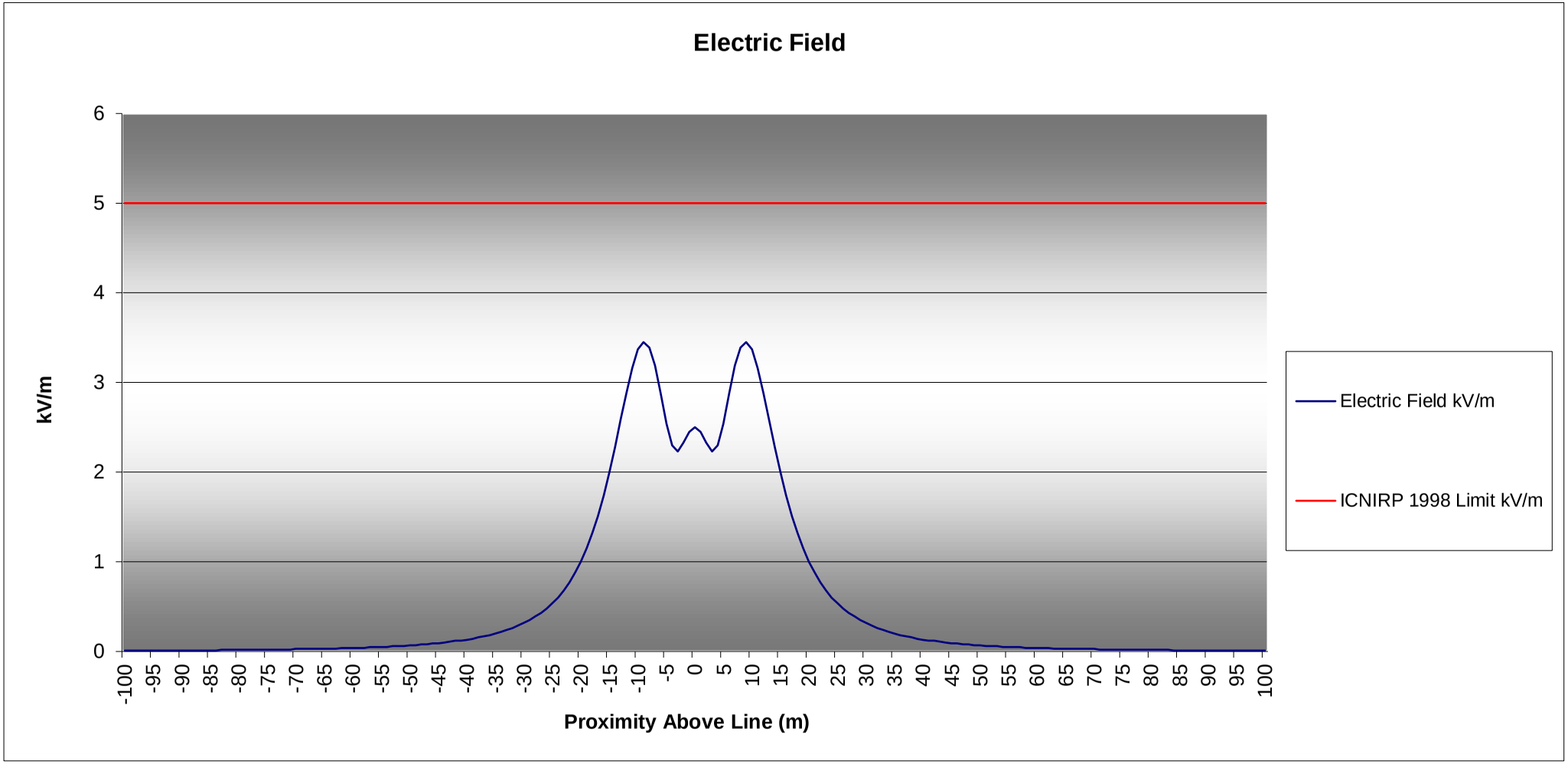


Plate 6: Maximum Possible Electric Field from the 220 kV OHL Cables (modelled at 376 MW)

Appendix to Chapter 13: Climate

No Appendices for Chapter 13

Appendix to Chapter 14: Material Assets (Built Services)

Appendix 14.1: Location of Built Services within the Study Area

The data and descriptions in this appendix have informed Chapter 14: Material Assets (Built Services) of the EIA Report, in relation to the location of built services in the study area and the number of users connected to these services. .

Appendix 14.1 Section	Section Heading	Relevant Individual Project Element
A-14.1	Location of Built Services within the Study Area	UWF Related Works UWF Grid Connection Upperchurch Windfarm

The information presented in this Appendix 14.1 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 14.1.1 Section	Section Heading	Relevant Individual Project Element
A-14.1.1	Built Services located within the UWF Related Works Study Area	UWF Related Works
A-14.1.2	Built Services within the UWF Grid Connection Study Area	UWF Grid Connection
A-14.1.3	Built Services located within the Upperchurch Windfarm Study Area	Upperchurch Windfarm

A-14.1.1 Built Services within the UWF Related Works Study Area

Road ID	Irish Water Mains		ESB overhead lines/underground cables		EIR overhead lines/underground cables	
	Infrastructure	**No. Users**	**Infrastructure**	**No. Users**	**Infrastructure**	**No. Users**
L-4139-0 (HW1 – HW4 on Figure RW 5.2)	None	0	None		Haul Route Works (HW1 - 4) are parallel to Telephone Over Head Line along the L-4139-0. This Over Head Lines is broken in places.	0
L-4138-12 (HW5 - HW6 on Figure RW 5.2)	None	0	Low Voltage Over Head Lines: Haul Route Works HW5 runs adjacent to Over Head Lines. Medium Voltage Over Head Lines: Haul Route Works HW6 runs adjacent to Over Head Lines.	5	Haul Route Works (HW6) are parallel to Telephone Over Head Lines along the L-4138-12.	12
L-4139-16 (RW2 on Figure RW 5.2)	None	0	Medium Voltage Over Head Lines: Internal Windfarm Cable runs perpendicular to Over Head Lines in field west of RW2.	2	Haul Route Works (HW12) are parallel Internal Windfarm Cable runs perpendicular to Over Head Line at RW3 and W9.	5
L-61880-0 (RW3 on Figure RW 5.2)	None	0	Medium Voltage Over Head Lines: Internal Windfarm Cable runs parallel to Over Head Lines along a forestry firebreak south of the RW3 crossing location and again adjacent to lines along the L-61880-0.	10	Internal Windfarm Cable runs perpendicular to Over Head Line at RW2.	8
R-503 (HW7 on Figure RW 5.2)	None	0	None	0	None	0
L-2264-50 (HW8-HW11 on Figure RW 5.2)	Yes: Haul Route Works (HW8-HW11) are adjacent to water main which is in the road carriageway.	19	Medium Voltage Over Head Lines: Internal Windfarm Cables run perpendicular to Over Head Line in field east of the L-2264-50 crossing.	27	Haul Route Works (HW8-HW11) are parallel and Internal Windfarm Cables (RW6) are perpendicular to Telephone Over Head Lines along the L-2264-50.	19

Road ID	Irish Water Mains		ESB overhead lines/underground cables		EIR overhead lines/underground cables	
	Infrastructure	**No. Users**	**Infrastructure**	**No. Users**	**Infrastructure**	**No. Users**
L-6188-0 (HW11-HW12: and RW6	Haul Route Works (HW11-HW12) are adjacent to water main which is in the road carriageway.	6	Medium Voltage Over Head Lines: Haul Route Works HW12 runs adjacent to Over Head Lines.	27	Haul Route Works (HW11-HW12) are parallel to Telephone Over Head Lines along the L-6188-0	3
RW9 on Figure RW 5.2)	Internal Windfarm Cables run perpendicular to water main at RW9 crossing location		Medium Voltage Over Head Lines: Internal Windfarm Cables run perpendicular to Over Head Lines in field north of the L-6188-0 crossing.	18 (0 of above 27)	None	0
L-6185-13 (RWR2 Fields south of L-6185-13	None	0	Medium Voltage OHL: Realigned Windfarm Road (RWR2) runs perpendicular to Over Head Lines in fields south of the L-6185-13.	1	None	0
HW13	None		None		Haul Route Works (HW13) are parallel to Telephone OHL along the L-6185-13.	6
RW7 on Figure RW 5.2)	None		None		Internal Windfarm Cables run perpendicular and parallel to Telephone Over Head Lines along the L-6185-13 at the RW7 crossing location.	1 (1 of above 6)
L-2264-34 (RW8 on Figure RW 5.2)	None	0	Medium Voltage Over Head Lines: Internal Windfarm Cable runs perpendicular to Over Head Lines north of the RW8 crossing location.	2	Internal Windfarm Cables run perpendicular Telephone OHL north of the RW8 crossing location.	3
			Medium Voltage Over Head Lines: Internal Windfarm Cable runs perpendicular to underground electricity cables suppling 1 No. dwelling house.			
L-2264-0 Replacement Forestry Entrance	None	0	None	0	None	0

A-14.1.2 Built Services within the UWF Grid Connection Study Area

Road ID	Irish Water Mains		ESB overhead lines/underground cables		EIR overhead lines/underground cables	
	Infrastructure	**No. Users**	**Infrastructure**	**No. Users**	**Infrastructure**	**No. Users**
L-2166-0 Between Coole and Newport	Construction works to run parallel to water mains within road carriageway. And on adjacent public roads.	43 36	220kV Over Head Lines: Construction works to run perpendicular to Over Head Lines in field west of the L-2166-0 entrance. Medium Voltage Over Head Lines: Construction works to run parallel to Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses along the public road or on adjacent public roads.	95	Construction works are parallel to Telephone Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses.	34
L-2166-0 / R503 Newport Town and environs	Construction works to run adjacent to water mains within road carriageway.	600	Medium Voltage Over Head Lines: Construction works to run parallel to Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses along the public road or on adjacent public roads. Medium Voltage Underground network generally in Newport estates, some Underground network along public road used by the construction works. Construction works to run adjacent to this network within road carriageway	820	Construction works are through Newport, which has an Underground network along public roads	600
R503 Between Newport – Rear Cross	Construction works to run parallel to water mains within road carriageway And on adjacent public roads	109 6	Medium Voltage Over Head Lines: Construction works to run parallel to Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses along the public road or on adjacent public	131	Construction works are parallel to Telephone Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the	102

Road ID	Irish Water Mains		ESB overhead lines/underground cables		EIR overhead lines/underground cables	
	Infrastructure	**No. Users**	**Infrastructure**	**No. Users**	**Infrastructure**	**No. Users**
			roads. A few sections of Underground network crossing public road to service local houses. Construction works to run perpendicular to this network within road carriageway.		public road in places to service local houses.	
R503 Rear Cross Village and environs	Construction works to run adjacent to water mains within road carriageway	81	Medium Voltage Over Head Lines: Construction works to run parallel to Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses along the public road or on adjacent public roads. A few short sections of Underground network in Rear Cross village crossing the public road to service local houses. Construction works to run perpendicular to this network within road carriageway	143	Construction works are through Rear Cross, which has an Underground network along public roads	66
R503 Between Rear Cross and Knockmaroe	Construction works to run parallel to water mains within road carriageway And on adjacent public roads	83 82	Medium Voltage Over Head Lines: Construction works to run parallel to Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses. Construction works to run perpendicular to this network within road carriageway. Over Head Line network south of the R503 servicing houses in Knockshanbrittas. Over Head Line network north of the R503 servicing houses in Kilcommon area. Over Head Line network north of the R503 servicing houses in Reisk area.	 123 17 67 31	Construction works are parallel to Telephone Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses. A section of Over Head Line runs north to Kilcommon Village A section of Over Head Line runs north along the R497 There is a section of	 112 46 7 5

Road ID	Irish Water Mains		ESB overhead lines/underground cables		EIR overhead lines/underground cables	
	Infrastructure	**No. Users**	**Infrastructure**	**No. Users**	**Infrastructure**	**No. Users**
			Over Head Lines network south of the R503 servicing houses in Knockmaroe area.	25	Underground network along the R503 at Kilcommon which is in the public road.	
L-2264-50 Knockmaroe	Construction works to run parallel to water mains within road carriageway And on adjacent public roads	19 5	Medium Voltage Over Head Lines: Construction works to run parallel to Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses along the public road or on adjacent public roads.	27	There is a section of Underground network at the R503 and L2264-50 junction. Construction works are parallel to Telephone Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses.	1 19
L6188-0 Knockmaroe	Construction works to run parallel to water mains within road carriageway And on adjacent public roads	3 13	Medium Voltage Over Head Lines: Construction works to run parallel to Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses along the public road or on adjacent public roads.	21	Construction works are parallel to Telephone Over Head Lines which run along the roadside boundary or in fields adjacent to the public roads and cross the public road in places to service local houses.	4

Road ID	Gas Mains			
	Infrastructure	**No. Users**		
L-2166-0 / R503 Newport Town and environs	Underground low pressure network in Newport town and environs. The construction works runs adjacent to gas mains within road carriageway. Underground medium pressure network in housing estates to the south west of Newport. Construction works not adjacent to this network.	615 85		
	Gas Network not present in the rest of the study area.			

A-14.1.3 Built Services within the Upperchurch Windfarm Study Area

Road ID	Irish Water Mains		ESB overhead lines/underground cables		EIR overhead lines/underground cables	
	Infrastructure	**No. Users**	**Infrastructure**	**No. Users**	**Infrastructure**	**No. Users**
R-2264-50: Site Entrance No.8 and No.9	Water main at Site Entrance No.8 and No.9	19	None	0	Telephone Over Head Lines at Site Entrance No.8 and No.9	30
L-6188-0: Site Entrance No.7	Water main at Site Entrance No.7	6	None	0	Telephone Over Head Lines at Site Entrance No.7	4
South of L-6185-13.	None	0	Medium Voltage Over Head Lines: Consented Windfarm Road runs perpendicular to Over Head Lines in fields south of the L-6185-13.	1	None	
L-6185-13: Site Entrance No.10 and No.11	None	0	None	0	Telephone Over Head Lines at Site Entrance No.10 and No.11	6

Appendix to Chapter 15: Material Assets (Roads)

Appendix 15.1: Traffic and Transportation Assessment Report

The data and descriptions in this appendix have informed Chapter 15: Material Assets (Roads) of the EIA Report.

The information presented in this Appendix 15 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 15.1 Section	Section Heading	Relevant Individual Project Element
A-15.1	Traffic and Transportation Assessment Report	UWF Related Works UWF Grid Connection Consented UWF
A-15.2	FWD Analysis on UWF Related Works Local Roads	UWF Related Works
A-15.3	Site Photographs	UWF Related Works UWF Grid Connection

APPENDIX TO CHAPTER 15: MATERIAL ASSETS (ROADS)

APPENDIX 15.1: TRAFFIC AND TRANSPORATION ASSESSMENT REPORT

The data and descriptions in this appendix have informed Chapter 15: Material Assets (Roads) of the EIA Report. The information presented in this Appendix 11.1 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix	Title	Relevant EIAR
A.15.1	Traffic and Transportation Assessment	UWF Related Works UWF Grid Connection Upperchurch Windfarm

A15.1 TRAFFIC AND TRANSPORTATION ASSESSMENT REPORT

Appendix 15.1 Section	Section Heading	Relevant Individual Project Element
A-15.1.1	Non-Technical Summary	All
A-15.1.2	Introduction to the Traffic & Transportation Assessment Report	All
A-15.1.3	Existing conditions	All
A-15.1.4	Traffic forecasting	All
A-15.1.5	Description of the individual project elements	All
A-15.1.6	Trip generation, assignment & distribution	UWF Grid Connection UWF Related Works Upperchurch Windfarm
A-15.1.7	Impact assessment	UWF Grid Connection UWF Related Works Upperchurch Windfarm
A-15.1.9	Requirement for mitigation measures	UWF Grid Connection UWF Related Works Upperchurch Windfarm

A15.1.1 EXECUTIVE SUMMARY – (NON-TECHNICAL)

This Traffic & Transport Assessment Report assesses the cumulative impact of the subject development in addition to all other elements of the whole Upperchurch Windfarm Project.

The whole UWF project consists of a series of related supporting projects associated with the consented Upperchurch Windfarm (identified herein within Section A15.1.5). The whole project, when built, will involve the export of the renewable electricity generated at the permitted Upperchurch Windfarm to the national grid.

This report has been prepared in accordance with Transport Infrastructure Ireland's Traffic & Transportation Assessment Guidelines and addresses the worst case vehicular traffic impact of the Whole UWF Project, for both the construction and operational phases. The adequacy of the road network to safely and appropriately accommodate the worst-case Transportation demands of the development are addressed.

A comprehensive classified traffic survey (counts) of the road network in the vicinity of the projects was undertaken and this information, together with observation of the performance of the road network, forms the basis for this assessment. Traffic Data was collected using temporary Automatic Traffic Counters known as 'ATC tube counters', and these allowed full vehicle classification and traffic speeds to be measured and recorded.

The assessment included a photographic condition survey of the existing roads and associated affected structures. For UWF Related Works, Falling Weight Deflectometer (FWD) testing was carried out in order to determine the strength of the affected local roads. It is proposed to undertake a condition survey following the works in order to confirm that no adverse impact has occurred.

The construction programme and plans prepared for the Whole UWF Project allowed the associated daily traffic volumes to be calculated. The worst case daily traffic associated with each element of the works was assigned to the roads in accordance with industry guidelines for an assumed commencement year of 2020. The impact of the traffic has been assessed and quantified.

The Report sets out the temporary and permanent traffic management measures which are to be put in place at the construction and operational access points in order to ensure the continued operation of the roads in a safe manner and without any impact upon capacity in order to ameliorate and minimise impact upon road users.

Based on our studies, we believe that, with some checks and balances in place in the form of temporary Traffic Management and road condition surveys, there will be no adverse traffic/transportation capacity or road safety issues associated with the construction or operation of the Whole UWF Project.

A15.1.2 INTRODUCTION TO THE TRAFFIC & TRANSPORTATION ASSESSMENT

This Traffic and Transportation Assessment (TTA) has been prepared by NRB Consulting Engineers Ltd and addresses the Traffic/Transportation and Construction/Operational Access issues arising from the development of the Whole UWF Project.

Evaluations contained within this Transportation Assessment are based upon site visits, observations of operational performance of the existing road network, a comprehensive classified interval movement and speed survey, a comprehensive Falling Weight Deflectometer (FWD) Test, and our experience in assessing and designing for developments of this nature.

The Report has been prepared following consultation with Tipperary County Council Roads Department and Transport Infrastructure Ireland. Further details on these consultations are included in Appendix 3.1 in Volume C4 of the EIA Report.

The Report has been prepared broadly in accordance the following information and industry accepted practices:

- Transport Infrastructure Ireland's (TII) Traffic and Transport Assessment Guidelines (2014)
- TII Design Manual for Roads and Bridges
- The Department for Transport Traffic Signs Manual (2010),
- TII Specification for the Reinstatement of Openings in National Roads (2013).

A15.1.3 EXISTING CONDITIONS

The existing roads environment consists for the most part of lightly trafficked section of Regional Roads, mainly the R503, along with a mix of local roads which are generally rural in nature and lightly trafficked and used for local residential access, forestry access and farming access purposes.

A15.1.3.1 ROADS

The affected roads include those subject to road works associated with cable laying or temporary road widening; roads with temporary or permanent site access points, and roads along the concentrated haulage routes.

All of these roads are 2-way roads, with the trafficked pavement varying in width from 2.5 to 8.3m, with narrow verges, and are generally bounded by low level earthen embankments or hedgerows along either side.

The roads relevant to the UWF Grid Connection and the UWF Related Works elements of the Whole UWF Project are listed in Table 1, and identified on Figure GC 15.2 and Figure RW 15.2. The subject development figure is at Tab 15 of Volume C3: EIA Report Figures. The other element figure is in Volume E: Reference Documents to the Planning Application. These figures are also available on **www.upperchurchwindfarm.ie**. Any roads marked with an asterisk appear on both lists. It should also be noted that the roads associated with the UWF Related Works will also be used for access to the Consented Upperchurch Windfarm. The UWF Replacement Forestry entrance is located off the L2264-34, (also indicated on Figure RW 15.2).

Table 1: Roads affected by the UWF Related Works and the UWF Grid Connection

UWF Related Works	UWF Grid Connection UWF Related Works
R503*	R503*
L4139-0	L2166-0
L4138-12	L2264-50*
L4139-16	L6188-0*
L6188-0*	
L61881-0	
L2264-50*	
L6185-13	
L2264-34	

A15.1.3.1.1 Road Pavements

The road pavements consist of traditional surface-dressed flexible pavement ('tar and chippings'), with narrow verges and road surface water drained to open drains, generally running along each of the roadsides.

Falling Weight Deflectometer (FWD) Testing: In order to accurately determine the load bearing capacity of the affected UWF Related Works local roads, a comprehensive FWD Test of the affected local road network was undertaken by specialist supplier, Milestone Pavement Technologies Ltd. The FWD is a non-destructive test which determines the load bearing capacity of a pavement structure. The FWD drops a known mass from a pre-defined height onto a loading plate. The load pulse generated is similar to the dynamic load pulse generated by a moving wheel of a heavy goods vehicle travelling at normal traffic speed. Measurements of the pavement deflection in response to the load provides information on the overall bearing capacity of the pavement. The extent of the testing and the results are included as Appendix 15.2.

In summary, the FWD testing shows that there is stiff to moderate subgrade support under the roads, and while the local road surfaces were observed during site investigations to be generally in good condition with few potholes, the FWD testing indicates that the pavements themselves are weak.

A15.1.3.1.2 Buried Structures

At UWF Related Works locations, there are 3 No. buried structures under affected roads; concrete culverts routing storm water under the L6188-0 at WW31 and under the L4139-0 at WW12 and a square masonry culvert routing a small stream under the L6185-13 road at WW32. All three structures have been inspected by Wind Prospect Ireland (civil engineer) who found that the structures are in good condition and are not subject to vehicular weight restrictions, therefore it is considered that these structures will not be affected by either the 1m extension to the two concrete culverts or the additional construction traffic associated with the UWF Related Works and the Consented Upperchurch Windfarm.

There are 63 No. existing buried road structures which are located in roads at road works locations, 3 No. structures at locations associated with UWF Related Works road widening works at Haul Route Works locations along the L4139-0, L6188-0 and L6185-13. 60 no. structures at locations associated with UWF Grid Connection cable trenching for the 110kV UGC along the R503, L2264-50 and L6188-0. The location of these buried structures is identified on Figure GC 15.2 and Figure RW 15.2.

On the route of the 110kV UGC (UWF Grid Connection), there are 55 No. buried structures under the R503 road, comprising 43 No. concrete/stone culverts and 12 No bridges; there are 3 No. buried structures under the L2264-50, comprising 3 No. concrete culverts; and there are 2 No. buried structures under the L6188-0, comprising 2 No. concrete culverts. These structures were visually inspected by TLI Group (civil engineer) during site investigations. Photographs of these structures are included in Appendix 15.3.

A15.1.3.1.3 Current Weight Restrictions

There are no vehicle weight restrictions in place along any of the roads affected by the works. This provides a useful guide to the acceptability of the roads and buried structures and their adequacy to facilitate the movement of HGV vehicle types, subject to the normal legally allowable axle loading on Irish Roads.

A15.1.3.1.4 Road Boundaries

Road boundaries consist of a mix of hedgerows and simple mounded embankments, which are aligned beyond drainage channels that occur in many roadside verges.

A15.1.3.2 TRAFFIC

A15.1.3.2.1 Existing Traffic Volumes

7-day classified 'ATC Tube Counts' surveys were carried out at on each of the affected roads in order to establish background traffic conditions, in terms of volume and ambient speed. All vehicles recorded during the traffic survey are expressed in terms of “Passenger Car Units” (PCUs), sometimes referred to as “Car Equivalents”. This is the methodology which has been employed here (with for example specific industry standard conversion factors to convert HGVs, Skip Lorries, Cars/Trailers and Bin Lorries to PCUs). The conversion factors used are in accordance with industry-standard recommendations.

The existing traffic conditions of the affected roads, as recorded during the surveys, are presented in Table 2 and Table 3. The Electoral Districts in which each of the affected roads are located, are also identified in the Table, for ease of reference to the CSO data in Table 4. In summary, it is clear from Tables 2 to 6, that the roads in the area are generally very lightly trafficked, reflecting the rural nature of the study area.

Table 2: Summary of Existing Traffic Conditions for the UWF Related Works

Road ID	Electoral District	85% ile Traffic Design Speed Km/Hr	24Hr 2-Way AADT (PCUs)	% HGVs	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
R503 at Knockmaroe	Foilnaman	61.7	709	1.9%	66	87
L4139-0	Foilnaman / Upperchurch	49	64	0.0%	19	23
L4138-12	Foilnaman	58	92	0.0%	7	7
L4139-16	Foilnaman	50	42	0.0%	4	2
L61881-0	Foilnaman	48	17	0.0%	3	0
L6185-13	Foilnaman	46	13	0.0%	0	1
L2264-34	Foilnaman	53	147	0.7%	3	11

Table 3: Summary of Existing Traffic Conditions for the UWF Grid Connection

Road ID	Electoral District	85% ile Traffic Design Speed Km/Hr	24Hr 2-Way AADT (PCUs)	% HGVs	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
L-2166-0 at Coole	Kilcomenty	84	721	0.5%	94	66
L2166-0 at Newport	Newport	58.6	2109	0.3%	278	206
R503 at Newport	Newport	76.5	2862	0.7%	260	288
R503 at Rear Cross	Abington	69.5	950	1.6%	80	110
R503 at Knockmaroe	Foilnaman	61.7	709	1.9%	66	87
L2264-50	Foilnaman	70.4	183	0.8%	19	23
L6188-0	Foilnaman	54	76	0.6%	7	7

Survey results indicate that for UWF Related Works roads, on average 98.2% of traffic counted comprised cars or vans, 0.4% comprises heavy vehicles which would include buses, articulated and rigid trucks, and 1.4% comprises bicycles or motorcycles. Survey results indicate that for UWF Grid Connection roads, on average 98.8% of traffic counted comprised cars or vans, 0.9% comprises heavy vehicles which would include buses, articulated and rigid trucks, and 0.3% comprises bicycles or motorcycles.

The traffic count survey, in addition to observations during site investigations, confirms that the affected roads have low traffic volumes and are not congested roads.

A15.1.3.2.2 CSO Data

The POWSCAR 2016 Census, outlined in Table 4 and Table 5, shows a high usage of cars and a very low usage of bicycles and walking as modes of transport in the Electoral Districts associated with the UWF Related Works (Foilnaman and Upperchurch) and the UWF Grid Connection (Kilcomenty, Newport, Kilnarath, Killoscully, Abington, Foilnaman).

Table 4: Extract from CSO 2016 POWSCAR data – for both UWF Related Works and UWF Grid Connection.
Please note – The Electoral Districts associated with UWF Related Works are Foilnaman and Upperchurch

POWSCAR 2016 - Theme 11 Commuting	Kilcomenty	Newport	Killoscully	Kilnarath	Abington	Foilnaman	Upperchurch
Commuting to Work							
On foot - Work	3	39	1	1	2	2	4
Bicycle - Work	0	7	0	0	0	0	0
Bus, minibus or coach - Work	2	11	2	0	4	0	0
Train, DART or LUAS - Work	0	1	1	0	1	1	1
Motorcycle or scooter - Work	0	2	0	1	0	1	0
Car driver - Work	232	868	158	113	158	88	86
Car passenger - Work	7	61	5	1	4	4	0
Van - Work	30	86	16	17	26	16	10
Other (incl. lorry) - Work	3	7	0	2	7	4	1
Work mainly at or from home - Work	22	42	19	12	26	21	27
Not stated - Work	5	30	8	6	6	4	11
Total – Commuting to Work	**304**	**1154**	**210**	**153**	**234**	**141**	**140**
Commuting to School or College							
On foot - School or college	15	189	0	2	14	5	4
Bicycle - School or college	0	3	0	1	0	0	0
Bus, minibus or coach - School or college	19	36	57	23	47	31	33
Train, DART or LUAS - School or college	1	0	0	0	0	0	2
Motorcycle or scooter - School or college	0	0	0	0	0	0	0
Car driver - School or college	14	39	7	5	9	2	4
Car passenger - School or college	150	473	53	41	61	39	21
Van - School or college	2	3	0	1	0	0	0
Other (incl. lorry) - School or college	0	0	0	0	0	0	0
Work mainly at or from home - School or college	4	0	0	0	0	0	0
Not stated - School or college	3	22	4	4	4	3	3
Total – Commuting to School or College	**208**	**765**	**121**	**77**	**135**	**80**	**67**
Total per Mode of Transport							
On foot - Total	18	228	1	3	16	7	8
Bicycle - Total	0	10	0	1	0	0	0
Bus, minibus or coach - Total	21	47	59	23	51	31	33
Train, DART or LUAS - Total	1	1	1	0	1	1	3
Motorcycle or scooter - Total	0	2	0	1	0	1	0

POWSCAR 2016 - Theme 11 Commuting	Kilcomenty	Newport	Killoscully	Kilnarath	Abington	Foilnaman	Upperchurch
Car driver - Total	246	907	165	118	167	90	90
Car passenger - Total	157	534	58	42	65	43	21
Van - Total	32	89	16	18	26	16	10
Other (incl. lorry) - Total	3	7	0	2	7	4	1
Work mainly at or from home - Total	26	42	19	12	26	21	27
Not stated - Total	8	52	12	10	10	7	14
Total per ED	**512**	**1919**	**331**	**230**	**369**	**221**	**207**

A15.1.3.2.3 Tourist/Walking/Cycling Routes

Both the R497 and the R503 are designated scenic routes in Tipperary North County Development Plan. The waymarked walking routes that exist in the area consist of the Slievefelim Way, Eamon a Chnoic Loop and the Ormond Way walking route, (this walk is currently being developed). There is also a waymarked cycle route, the Ormond Way Cycle, part of which is routed along the L2264-50 and L2264-34 (locally called the Borrisoleigh Road) through Knockmaroe and Foilnaman. These walks and cycle route are identified on Figure GC 6.3 *or* Figure RW 6.3 in Tab 6 of Volume C3 EIA Report Figures

All of these trails include public road sections to some degree; the Slievefelim Way is routed along the R503 for c. 1.3km just outside Rearcross village; part of the Ormond Way walking route (currently being developed) is along the L4139-0; and all of the Ormond Way Cycle route is along public roads, starting in Milestone and ending in Portumna.

Both the CSO data and the traffic count surveys show a very low usage of the road network by cyclists. A very low usage of the local roads by cyclists was recorded during 2017 traffic count surveys, with no cyclists recorded on half of the roads, and one or two trips on the vast majority of the remaining roads. The exception to this low usage was on the R503 in Newport where 54 cycle trips were recorded at one location and 36 cycle trips were recorded at a second location over separate 1 week periods in January 2019, which would correspond to the CSO data. There were also 2 groups of 4 cyclists, recorded on the L2264-34 and the eastern extent of the R503 in the study area during July 2017, the use of the L2264-34 road corresponds with it being a waymarked cycle route (Ormond Way Cycle). This road was surveyed again, for a one week period in November 2017, only one cyclist was recorded.

A15.1.3.3 Road Safety

A15.1.3.3.1 Recorded Traffic Speeds

The traffic data collected confirmed that the traffic speeds are generally maintained well within the posted speed limits (i.e. less than 80kph which is generally the speed limit on the affected roads) – See Table 4 and Table 5.

Table 5: Summary of 85th percentile speeds at Permanent and Temporary Site Entrances for UWF Related Works

Road ID	Entrance ID	24Hr 2-Way AADT (PCUs)	85% ile Traffic Design Speed Km/Hr	% HGVs	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
R503 at Knockmaroe	EW18	709	61.7	1.9%	66	87
L2264-50	EW19, EW20 & EW21	183	70.4	0.8%	19	23
L6188-0	EW5, EW6, EW16, EW17 & EW22	76	54	0.6%	7	7
L4139-0	EW1	64	49	0.0%	5	2
L4138-12	EW2	92	58	0.0%	4	9
L4139-16	EW3 & EW4	42	50	0.0%	4	2
L61881-0	EW7, EW8, EW9 & EW10	17	48	0.0%	3	0
L6185-13	EW11 & EW12	13	46	0.0%	0	1
L2264-34	EW13, EW14 & EW15	147	53	0.7%	3	11

Table 6: Summary of 85th percentile speeds at points along the UWF Grid Connection

Road ID	Entrance ID	24Hr 2-Way AADT (PCUs)	85% ile Traffic Design Speed Km/Hr	% HGVs	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)
L-2166-0 at Coole	E1 (Mountphilips Substation)	721	84	0.5%	94	66
L2166-0 at Newport	N/A	2109	58.6	0.3%	278	206
R503 at Newport	N/A	2862	76.5	0.7%	260	288
R503 at Rear Cross	N/A	950	69.5	1.6%	80	110
R503 at Knockmaroe	N/A	709	61.7	1.9%	66	87
L2264-50	N/A	183	70.4	0.8%	19	23
L6188-0	N/A	76	54	0.6%	7	7

A15.1.3.3.2 RSA Online Collision Database

A review of the Road Safety Authority (RSA) online collision database indicates that there is no record of any significant collision proximate to the site, between 2005-2013 inclusive (save for some mostly single vehicle accidents which are classified as 'minor' on the database).

The RSA collision statistics demonstrate that the local and regional roads in the study area do not have a significant history of accidents.

The Data from the RSA on-line tool is reproduced below as *Plate 1* to Plate 5 below.

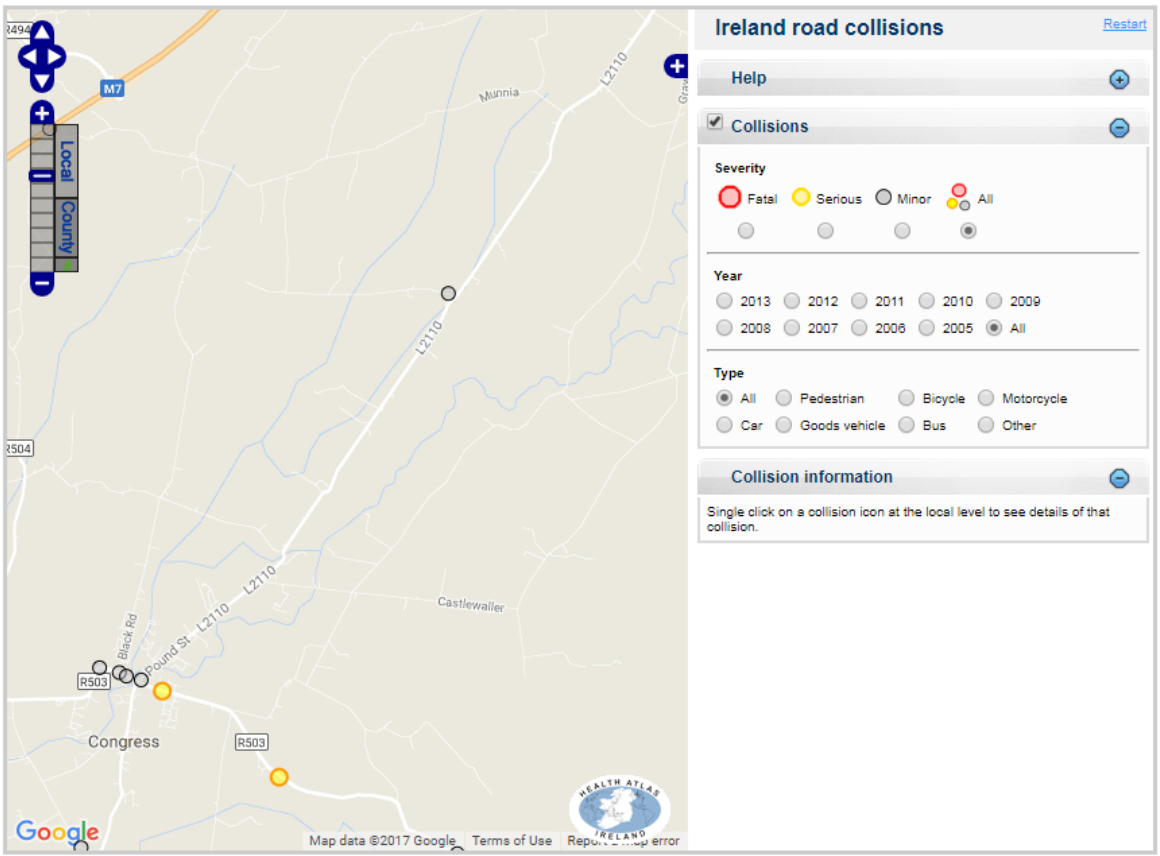


Plate 1: RSA Database Accident Statistics Extract - Map 1

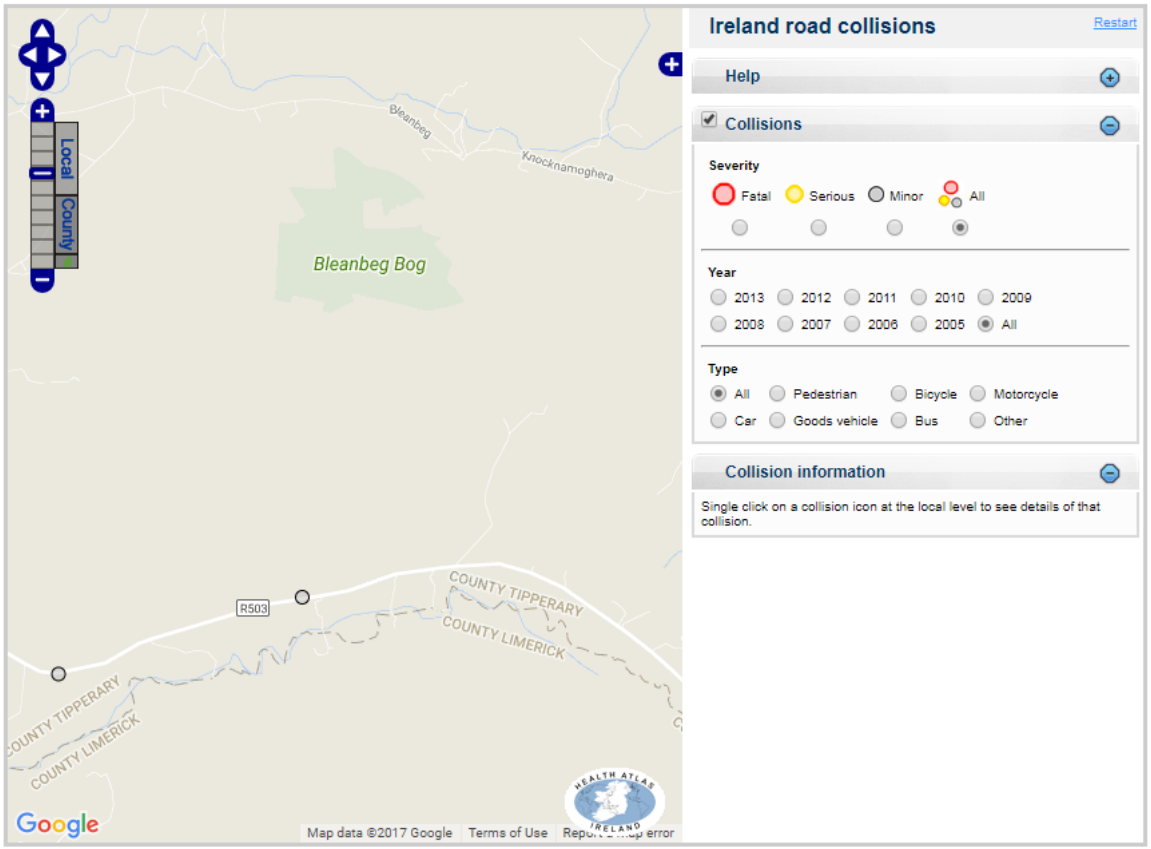


Plate 2: RSA Database Accident Statistics Extract - Map 2

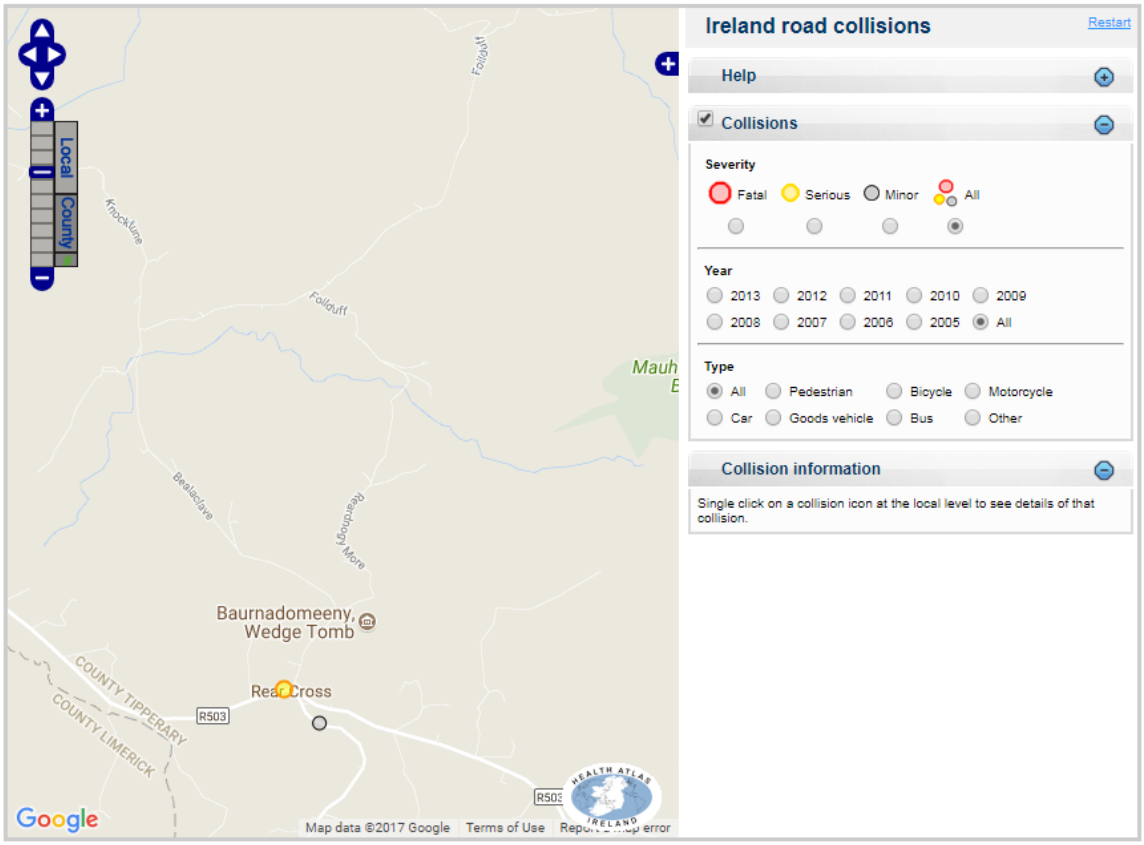


Plate 3: RSA Database Accident Statistics Extract - Map 3

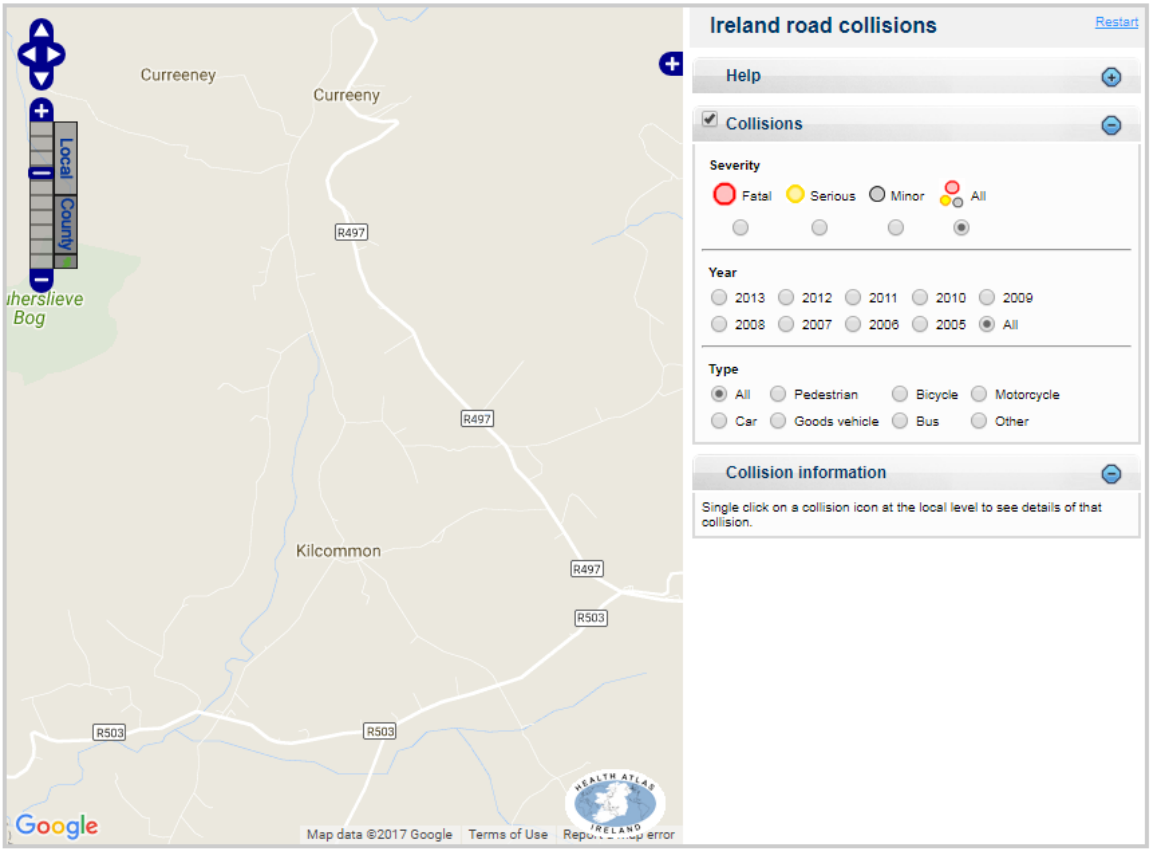


Plate 4: RSA Database Accident Statistics Extract - Map 4

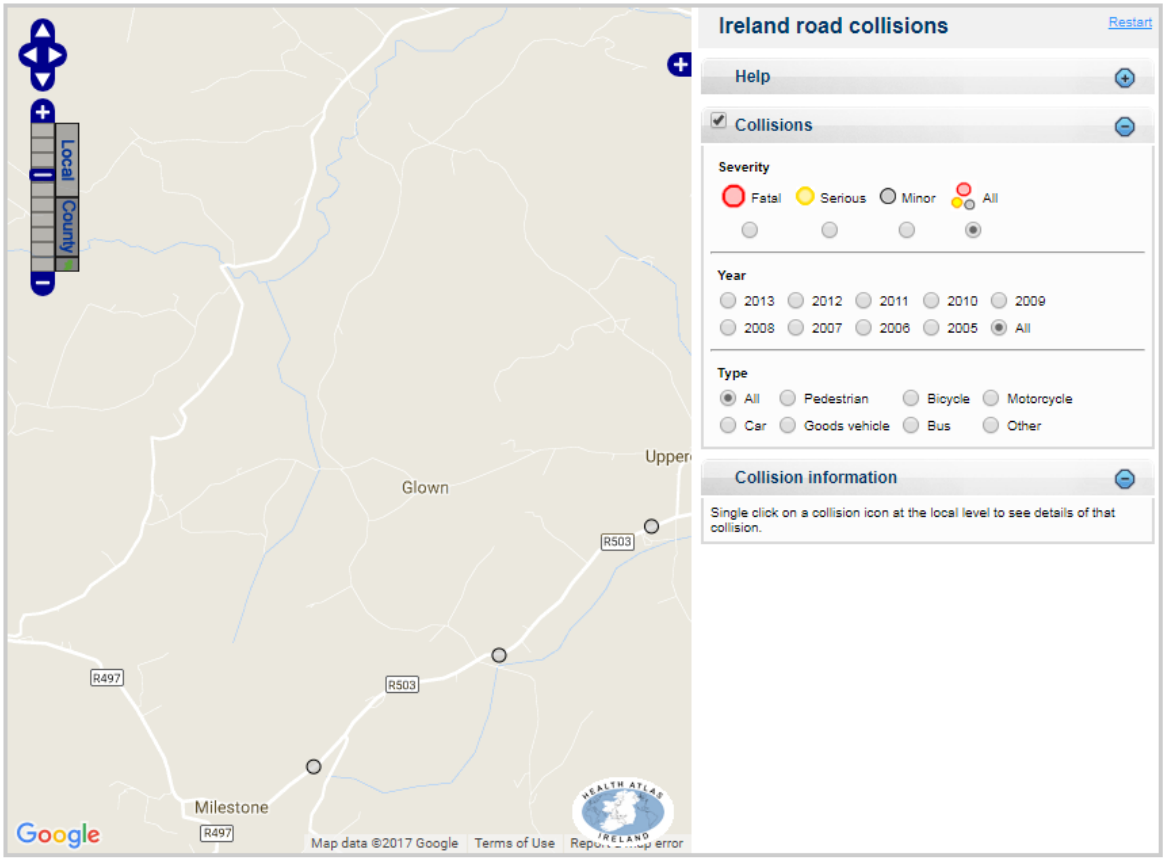


Plate 5: RSA Database Accident Statistics Extract - Map 5

A15.1.4 TRAFFIC FORECASTING

Construction traffic volumes were assigned to the various affected roads, based on the reasonable and industry standard assumption that the trip patterns associated with the construction stage will naturally gravitate to and from the temporary construction compound locations.

While construction is expected to commence in 2019, it is likely that construction works will continue into 2020. In order to evaluated the worst case traffic volumes on the affected roads during construction works, an opening year of 2020 was selected for the purposes of this assessment.

Traffic growth factors for 2020 were calculated from data obtained in the TII PE-PAG-02017 Project Appraisal Guidelines for National Roads Unit 5.3 (Travel Demand Projections October 2016, Table 5.3.2: Link-Based Growth Rates: Annual Growth Factors) which provides the recommended method of predicting future year traffic growth on public roads.

Calculations of the relevant growth factors are included in Table 5.

Table 7: Tii Traffic Growth Rates

Traffic Growth		
From Year	To Year	NRA Link Based Growth Rates
2017	2020	1.028

It should be noted that any requirement to use different or higher growth factors will have no implications for the conclusions of the study, as the available road capacity on the affected roads is very high (average 97%).

A15.1.5 DESCRIPTION OF THE INDIVIDUAL PROJECT ELEMENTS

The UWF Grid Connection, UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm (UWF) and UWF Other Activities are collectively referred to as the Whole UWF Project.

The purpose of the UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and UWF Other Activities elements is to facilitate the construction and operation of the already consented Upperchurch Windfarm (UWF). Upperchurch Windfarm when operational, will produce renewable electricity from the wind to supply the National Grid.

Table 8: Overview of the Individual Elements of the Whole UWF Project

	Element of the whole UWF project	Composition of each Element	Planning Status and Competent Authority for each Element
2	UWF Related Works (RW)	Internal Windfarm Cabling Realigned Windfarm Roads Haul Route Works Telecom Relay Pole RW Ancillary Works	Planning application to Tipperary County Council, current appeal to An Bord Pleanála
1	UWF Grid Connection (GC)	Mountphilips Substation Mountphilips – Upperchurch 110kV UGC Grid Connection Access Road Grid Connection Ancillary Works	Planning application to An Bord Pleanála
3	UWF Replacement Forestry (RF)	Replacement Forestry at Foilnaman	Already approved
4	Upperchurch Windfarm (UWF)	Consented UWF Turbines Consented UWF Substation Consented UWF Roads UWF Ancillary Works	Already consented under Planning Reference: Tipperary Co.Co. 13/51/0003, ABP PL 22.243040
5	UWF Other Activities (OA)	Haul Route Activities Upperchurch Hen Harrier Scheme Monitoring Activities Overhead Line Activities	No planning permission required

Three separate Environmental Impact Assessment Reports (EIA Report also called EIAR) have been prepared, one each for the UWF Grid Connection, the UWF Related Works and the UWF Replacement Forestry. The individual EIA Reports accompany the application to the relevant Competent Authorities, for example the UWF Grid Connection EIA Report accompanies the SID application to An Bord Pleanála.

The EIA Reports are included with the applications as Volume C. A description of the location, layout, size and design, the construction stage, operational stage, and changes to the project, along with a description of the use of natural resources, emissions and wastes, and the vulnerability of the element to natural disasters and events is provided in Chapter 5 of the relevant EIA Report Main Report (Volume C2).

This information is also available on the following website: www.upperchurchwindfarmgridconnection.ie, where the full UWF Grid Connection EIA Report is available. A description of UWF Grid Connection is included in Chapter 5: Description of UWF Grid Connection. A description of the Other Elements of the Whole UWF Project are included as Appendices 5.3, 5.4, 5.5 and 5.6 of the UWF Grid Connection EIA Report (EIAR Volume C4).

A15.1.5.1 Project Design Environmental Protection Measures

The design of the UWF Grid Connection and UWF Related Works includes the Project Design Environmental Protection Measures listed on Table 7, which were devised to avoid, prevent or reduce likely or potentially significant effects to public roads or road users.

Table 9: Project Design Environmental Protection Measures

Project Design Environmental Protection Measure
Construction works in Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons townlands, which are within 350m of local residences, will not take place at the same time as either the UWF Related Works or Upperchurch Windfarm.
Confirmatory consultations with Irish Water, Eir and ESB and confirmatory ground surveys at service locations will be carried out ahead of works; 'Goal Posts' will be used to identify and highlight the height of nearby overhead lines; and a foreman will look out for underground pipes during excavations near services.
Flag-men will be used at temporary site entrances rather than creating sightlines by the removal of roadside boundaries. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the local road network in a in a safe and efficient manner.
All construction works will be carried out during daylight hours.

A15.1.6 TRIP GENERATION, ASSIGNMENT & DISTRIBUTION

The trips associated with the construction stage only have been modelled. Operational stage trip generation will be negligible and does not require or warrant further evaluation.

Similar to the operational stage, **the trips associated with the UWF Replacement Forestry and the UWF Other Activities will be very low and will have no effect on traffic or transport**. Consequently, the very low number of trips generated by these two elements are not included in the model.

The construction traffic associated with the UWF Grid Connection and the UWF Related Works have been quantified and are included in the model. Furthermore, the cumulative volumes associated with both of these developments along with the already Upperchurch Windfarm have been calculated in order to evaluate the whole project impact on any local roads which are affected by more than one element of the whole project.

The modelling of trip generation, assignment and distribution to the road network has been based on information[1] in Chapter 5 of the relevant EIA Report Main Report (Volume C2).

In order to quantify the impact on traffic and transport, the construction traffic volumes and movements to and from the site compounds and the various site entrances and to and from quarries and the various construction works areas was calculated, and the daily and peak hour construction traffic movements associated with each site entrance or road works location was then calculated for the relevant local road.

This was undertaken for a typical 24 Hour Annual Average Daily Traffic volume, and for the traditional weekday AM and PM peak hours.

[1] This information is also available on the following website: www.upperchurchwindfarmgridconnection.ie, where the full UWF Grid Connection EIA Report is available. A description of UWF Grid Connection is included in Chapter 5: Description of UWF Grid Connection. A description of the Other Elements of the Whole UWF Project are included as Appendices 5.3, 5.4, 5.5 and 5.6 of the UWF Grid Connection EIA Report (EIAR Volume C4).

A15.1.7 IMPACT ASSESSMENT

A15.1.7.1 Introduction

TII's Traffic and Transportation Assessment Guidelines (2014), recommends that a threshold assessment & analysis is undertaken to determine the increases in traffic associated with any particular development, and whether this might be considered as significant. The threshold levels are outlined in Table *10*.

Table 10: Tii Threshold Analysis

Traffic Management Guidelines Thresholds for Transport Assessments	**Criteria met? Yes/No?**
Traffic to and from the development exceeds 10% of the traffic flow on the adjoining road.	Yes, due to the extremely low existing traffic volumes on some of the local roads in the study area.
Traffic to and from the development exceeds 5% of the traffic flow on the adjoining road where congestion exists or the location is sensitive	No, There are no roads are classed as 'congested' (A junction or link is considered to be congested when traffic flows are at 85% of the estimated capacity of the junction or link)
Residential development in excess of 200 dwellings.	No Not applicable
Retail and leisure development in excess of 1,000m^2.	No Not applicable
Office, education and hospital development in excess of 2,500m^2.	No Not applicable
Industrial development in excess of 5,000m2.	No Not applicable
Distribution and warehousing in excess of 10,000m2	No Not applicable

As the construction related traffic on some of the local roads associated with the UWF Grid Connection and the UWF Related Works will meet the first listed threshold in Table 10 above, this Traffic and Transport Assessment has been prepared and the Annual Average Daily Traffic volumes in PCUs without the works, for each of the affected roads has been measured through traffic counts, which were carried out on each affected road.

The transport impact of the additional construction traffic has been evaluated against the existing volumes and the future volumes, together with the quantified road link capacity based on the existing pavement width and conditions, using industry standard methods *(TD76/99 Link Capacity Assessment*) of link capacity assessment traffic volumes and link capacity details for each affected road.

The distribution of traffic to the local road network for each separate site entrance or road works location associated with the UWF Related Works, UWF Grid Connection and cumulatively with the Upperchurch Windfarm are included on Table 11 & Table 12. The resultant increase in projected 2019 traffic levels is provided in Table 13. It should be noted that some percentage changes in traffic conditions due to the addition of the cumulative construction traffic appear large because the existing traffic levels are so low.
The results of the transport modelling are presented below.

A15.1.7.2 Traffic and Transportation Modelling

Table 11: Construction Traffic Distribution in relation to the UWF Related Works and Upperchurch Windfarm

		UWF Related Works			*-Upperchurch Windfarm*		
Road Label	**Road 2-Way Capacity Based on conditions (PCUs/Hr 2-way)**	**24Hr 2-Way AADT (PCUs)**	**AM Peak Hr 2-Way Flow (PCUS)**	**PM Peak Hr 2-Way Flow (PCUS)**	**24Hr 2-Way AADT (PCUs)**	**AM Peak Hr 2-Way Flow (PCUS)**	**PM Peak Hr 2-Way Flow (PCUS)**
R503 Knockmaroe	2000	9	1	1	8	8	8
L2264-50	1555	21	3	3	22	4	4
L6188-0	1533	12	2	2	22	4	4
L4139-0	1310	12	2	2	22	4	4
L4138-12	1425	12	2	2	22	4	4
L4139-16	1325	3	1	1	0	0	0
L61881-0	1325	3	1	1	0	0	0
L6185-13	1310	3	1	1	22	4	4
L2264-34	1555	3	1	1	0	0	0

Table 12: Construction Traffic Distribution in relation to the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm and combined cumulative traffic

		Projected Construction Related Development Traffic									*Total Combined Works Traffic (Cumulative)*		
		UWF Grid Connection			*UWF Related Works*			*-Upperchurch Windfarm*					
Road Label	**Road 2-Way Capacity Based on conditions (PCUs/Hr 2-way)**	**24Hr 2-Way AADT (PCUs)**	**AM Peak Hr 2-Way Flow (PCUS)**	**PM Peak Hr 2-Way Flow (PCUS)**	**24Hr 2-Way AADT (PCUs)**	**AM Peak Hr 2-Way Flow (PCUS)**	**PM Peak Hr 2-Way Flow (PCUS)**	**24Hr 2-Way AADT (PCUs)**	**AM Peak Hr 2-Way Flow (PCUS)**	**PM Peak Hr 2-Way Flow (PCUS)**	**24Hr 2-Way AADT (PCUs)**	**AM Peak Hr 2-Way Flow (PCUS)**	**PM Peak Hr 2-Way Flow (PCUS)**
L-2166-0 Coole	2000	134	31	31							134	31	31
L2166-0 Newport	2000	134	31	31							134	31	31
R503 Newport	2000	58	6	6							58	6	6
R503 Rear Cross	2000	58	6	6							58		6
R503 Knockmaroe	2000	58	6	6	9	1	1	8	8	8	75	15	15
L2264-50	1555	16	2	2	21	3	3	22	4	4	59	9	9
L6188-0	1533	16	2	2	12	2	2	22	4	4	50	8	8
L4139-0	1310				12	2	2	22	4	4	34	6	6
L4138-12	1425				12	2	2	22	4	4	34	6	6
L4139-16	1325				3	1	1	0	0	0	3	1	1
L61881-0	1325				3	1	1	0	0	0	3	1	1
L6185-13	1310				3	1	1	22	4	4	25	5	5
L2264-34	1555				3	1	1	0	0	0	3	1	1

Table 13: Projected Increase in Traffic Volumes on Affected Roads during the Construction Stage

		Existing Traffic Conditions Without Development			*Projected Opening Year **2020** using Tii Annual Growth Rates Without Development Traffic*			*Total Combined Works Traffic (Cumulative)*			*2020 Projected Traffic + Cumulative Works Traffic*			*Percentage Change in Conditions Associated with Cumulative Works*			*% Road Capacity Used With addition of Cumulative Works Traffic*	
Road Label	Road 2-Way Capacity Based on conditions (PCUs/Hr 2-way)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	24Hr 2-Way AADT (PCUs)	AM Peak Hr 2-Way Flow (PCUS)	PM Peak Hr 2-Way Flow (PCUS)	*AM Peak Hour*	*PM Peak Hour*
L-2166-0c	2000	721	88	63	741	97	68	134	31	31	875	128	99	18.1%	32.1%	45.7%	6.4%	4.9%
L2166-0n Newport	2000	2109	265	199	2168	286	212	134	31	31	2302	317	243	6.2%	10.8%	14.6%	15.8%	12.1%
R503 Newport	2000	2862	242	269	2942	267	296	58	6	6	3000	273	302	2.0%	2.2%	2.0%	13.7%	15.1%
R503 RearC	2000	950	73	101	977	82	113	58	6	6	1035	88	119	5.9%	7.3%	5.3%	4.4%	6.0%
R503 Knockr	2000	709	60	80	729	68	89	75	15	15	804	83	104	10.3%	22.1%	16.8%	4.1%	5.2%
L2264-50	1555	183	18	21	188	20	24	59	9	9	247	29	33	31.4%	46.1%	38.1%	1.8%	2.1%
L6188-0	1533	76	7	7	78	7	7	50	8	8	128	15	15	64.0%	111.2%	111.2%	1.0%	1.0%
L4139-0	1310	64	5	2	68	5	2	34	6	6	102	11	8	50.3%	113.6%	283.9%	0.9%	0.6%
L4138-12	1425	92	4	9	97	4	10	34	6	6	131	10	16	35.0%	141.9%	63.1%	0.7%	1.1%
L4139-16	1325	42	4	2	44	4	2	3	1	1	47	5	3	6.8%	23.7%	47.3%	0.4%	0.2%
L61881-0	1325	17	3	0	18	3	1	3	1	1	21	4	2	16.7%	31.5%	100%	0.3%	0.2%
L6185-13	1310	13	0	1	14	1	1	25	5	5	39	6	6	182%	500%	473.1%	0.5%	0.5%

A15.1.7.3 Evaluation of Traffic and Transport Modelling Results

A15.1.7.3.1 Road Capacity Impact:

Table 13 serves to demonstrate that the existing affected road network has more than adequate capacity to accommodate the worst case cumulative traffic associated with the development. It confirms that the existing volumes of traffic together with the cumulative works traffic will in all cases leave in excess of 90% of the traffic carrying reserve capacity available for each of the roads.

The increase in traffic associated with the Whole UWF Project will therefore have an imperceptible impact upon network capacity and operation, subject to adherence to traffic management measures at the works locations, which are included in the Traffic Management Plan.

A15.1.7.3.2 Road pavements impact

The pavements along haulage routes are not expected to be adversely impacted by construction traffic associated with the works. In any case high definition video surveys will be carried out both before and after the construction period, and any pavements which are inadvertently damaged by construction traffic will be repaired to the satisfaction of Tipperary County Council.

The pavements at road work locations, particularly at trenching locations will be impacted during road works, and as agreed with Tipperary County Council Roads Department, all sections of roads subject to trenching works in the road pavement will be reinstated. This reinstatement of trenching locations within road pavements is in accordance with the Tii Guidelines for the Opening, Backfilling and Reinstatement of Openings in Public Roads. This road reinstatement will ameliorate any impacts to road pavements, and therefore it is considered that no impacts to road pavements are likely to occur.

A15.1.7.3.3 Buried structures impact

It is considered that these road structures are currently in good condition and will be capable of supporting all works and the small increased traffic loading associated with the construction works. At the 2 No. culverts at Related Works Haul Route Works locations, the 1m extension works will be carried out without affecting the integrity of these two structures. All structures will be monitored during the construction stage, and inspected following completion of the works to ensure integrity is maintained. No impact to buried structures is expected.

A15.1.7.3.4 Traffic impact

The effect on road users has been comprehensively and cumulatively assessed and there is expected to be an imperceptible effect on journey times or use of the road by road users due to the small increase in traffic loading and the available capacity on the roads (c.90%).

At road work locations, local road users will be accommodated through minimising the amount of road closures required by using stop-go systems, steel plating and through the use of appropriately sized machines to ensure the continued use of one lane of the road.

A15.1.7.3.5 Road Safety impact

The predicted small increases in traffic associated with the works, the provision of adequate sightlines at the permanent site entrance, the use of flagmen at temporary entrances and the use of advance warning signage for entrances and road works will ensure the continued safe use of the road and it is expected that there will be no impact upon traffic safety.

A15.1.7.3.6 Pedestrians and cyclists impact

The presence of road works and increases in traffic volumes due to construction traffic is expected to have an imperceptible effect upon the continued safe progression and passage of pedestrians and cyclists on the affected roads, due to the very low usage of the roads by walkers and cyclists (CSO data, observations during site visits, traffic count survey results), the small increase in traffic volumes due to the works, the available capacity on the affected roads, and the imposition of speed limits on all vehicles delivering construction materials to works areas along the local road network.

A15.1.8 REQUIREMENT FOR MITIGATION MEASURES

There is no requirement for mitigation measures as no significant adverse effects are expected to the affected roads in the study area.

Project Design measures, described in Section A15.1.5.1 and the traffic management measures, described in the dedicated **Traffic Management Plan** in the Environmental Management Plans which accompanies the applications for the UWF Grid Connection, the UWF Related Works and the Upperchurch Windfarm.

The adherence to the Plan will be audited weekly by the Environmental Clerk of Works, and a Community Liaison Officer will inform local residences of upcoming construction schedules, in particular those relating to road works in their area.

Appendix to Chapter 15: Material Assets (Roads)

Appendix 15.2: FWD Testing on UWF Related Works Local Roads

The data and descriptions in this appendix have informed Chapter 15: Material Assets (Roads) of the EIA Report.

The information presented in this Appendix 15.2 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 15.2 Section	Section Heading	Relevant Individual Project Element
A-15.2	FWD Testing on UWF Related Works Local Roads	UWF Related Works

The Falling Weight Deflectometer (FWD) surveys were carried out by Milestone Pavement Technologies, who are an independent civil engineering firm who have been providing pavement evaluation services to the civil engineering industry for 20 years.


MILESTONE
Pavement Technologies

A-15.2.1 FWD TESTING ON UWF RELATED WORKS LOCAL ROADS

A-15.2.1.1 Introduction:

Falling Weight Deflectometer (FWD) surveys are carried out to assess the condition and load bearing capacity of road pavements.

Pavement Technologies were engaged by Ecopower Developments to carry out a FWD survey along the local roads associated with the Haul Route Works, which is part of the UWF Related Works. In addition to measuring deflections coring was carried out to determine pavement structure.

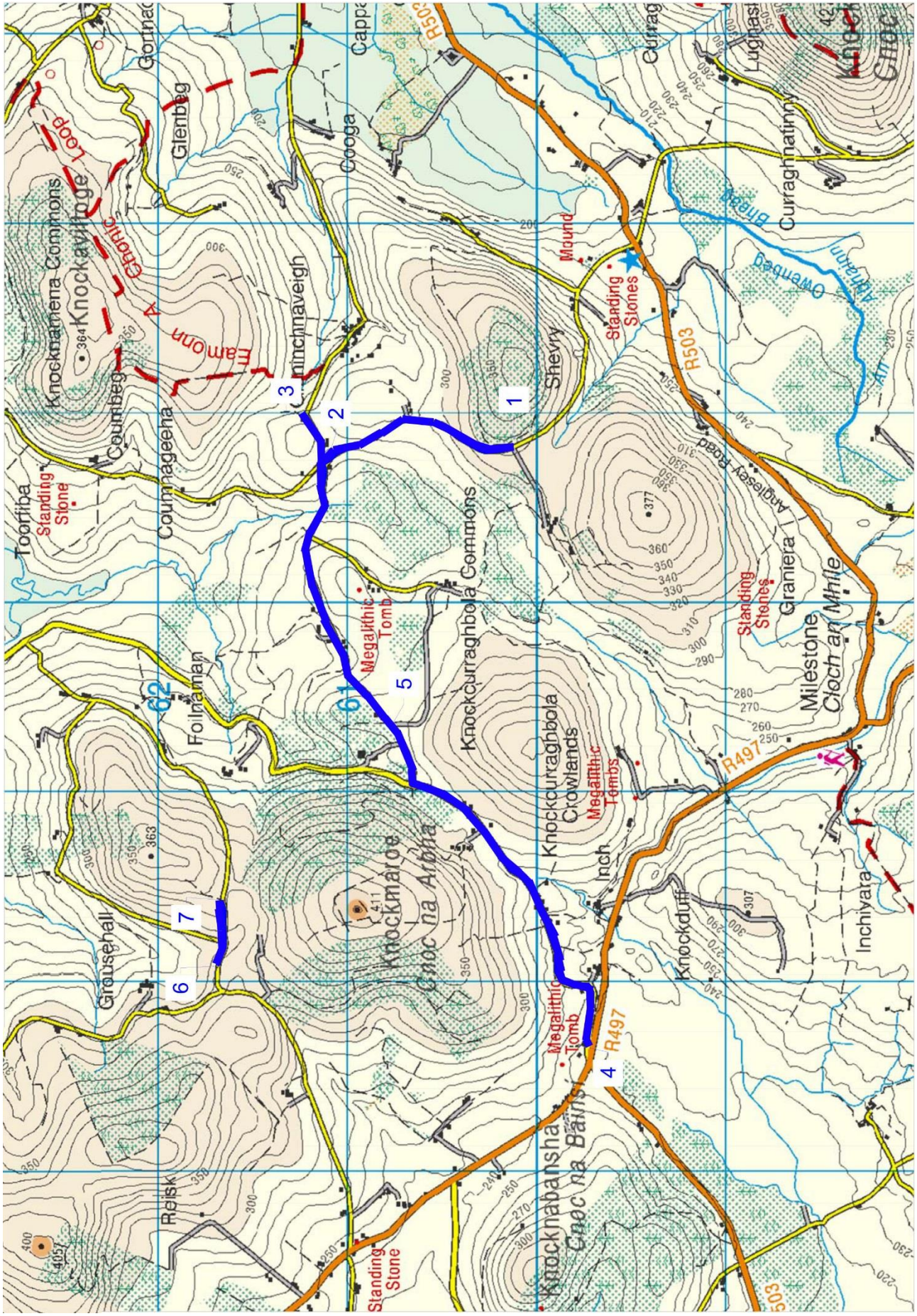
A-15.2.1.2 Survey Overview

The survey took place on five road sections defined by start and end points as shown in Figure 1. The length of each section is shown in Table 1 and maps detailing the chainages used are contained in report Section A-15.2.2.6.. As all of these road sections were narrow, testing was carried out in one direction only.

Table 1: Section Details

Section		Length Tested (m)
Start	Finish	
1	2	1400
2	3	450
5	2	1650
4	5	2200
6	7	400

Figure 1: Map of SurveyRoute (UWF Related Works)



A-15.2.1.3 FWD Survey Details

FWD Equipment and Data Collection

FWD testing was carried out in accordance with Appendix B of TII publication AM-PAV-06050 Pavement Assessment Repair and Renewal Principles and 'Guidelines on the Depth of Overlay to be used on Rural Regional and Local Roads' (March 2014) issued by the D.T.T.A.S. The equipment used was a trailer mounted Primax FWD manufactured by Grontmij. The 9 geophones mounted radially from the centre of the load plate were positioned as shown in Table 2.

Table 2: FWD Geophone Positions

Geophone Number	D1	D2	D3	D4	D5	D6	D7	D8	D9
Distance from centre of load(mm)	0	300	450	600	900	1200	1500	1800	2100

A load pulse is produced by dropping a known mass, and is transmitted to the pavement through the loading plate. The load cell measures the load imparted to the pavement surface and the geophones measure the pavement deflection in response to the load.

In this case the load level was set at 40kN to produce a load pulse similar to that produced by the moving wheel of a heavy goods vehicle. The load pulse was applied through a 300mm diameter plate which is a standard size plate for all FWD equipment. Deflections at each geophone were measured at a resolution of 1 micron. At each test point at least 3 drops were made, after an initial drop to settle the load plate.

Longitudinal spacing of measurements were generally at 50 metre intervals.

Coring

150mm diameter cores of the bound surface layer were cut from the pavement using a standard trailer version coring rig. Sub-base material was removed at each core location to get an indication of the depth and type of material.

A-15.2.1.4 FWD Survey Results

Pavement Condition based on FWD Results

The deflection bowl created by the FWD load pulse is influenced by the stiffness of the different pavement layers. Tables of measured deflections and Surface Curvature Index (SCI) provide information on pavement condition as follows:

D1: Indication of overall pavement performance

SCI: Indicates condition of upper pavement layers

D9: Indication of sub-grade condition

Guidance on the interpretation of deflection values is given in '*Guidelines on the Depth of Overlay to be used on Rural Regional and Local Roads (March 2014)*' as issued by the Department of Transport, Tourism and Sport, and this guidance is reproduced in Table 3 and Table 4. Tabulated deflection results contained in this report are highlighted in colour, based on the guidance.

Table 3: Central and SCI (D1-D2) Deflection Criteria (normalised to 40kN)

Central Deflection (D1)	SCI	Comment
<300	<150	Good load spreading ability
300-500	150-250	Good to poor load spreading ability
501-800	251-400	Poor to bad load spreading ability
>800	>400	Bad load spreading ability

Table 4: Outer Deflection Criteria (normalised to 40kN)

Outer Deflection (D9)	Comment
<15	Stiff subgrade
15-30	Stiff to moderate subgrade
31-45	Moderate to weak subgrade
>45	Weak subgrade

Report sections A-15.2.2.1 to A-15.2.2.6 contain tables of results for deflection values measured at each test point along each test section, and graphs of these values against distance.

Pavement condition can be considered based on sub-sections with deflections of similar magnitude deflection. A summary of the average deflection results for each sub-section is presented in Table 5.

Table 5: Average Deflection Values

Section	Chainage	Lane	D1	D1-D2	D9
1 to 2	0-900	Northbound	570	314	4
	900-1400	Northbound	1200	655	3
2 to 3	0-300	Eastbound	418	245	0
	300-450	Eastbound	564	287	7
5 to 2	0-800	Eastbound	608	328	3
	800-1400	Eastbound	910	517	4
	1400-1650	Eastbound	535	220	2
4 to 5	0-1350	Eastbound	714	259	17
	1350-1800	Eastbound	1406	360	17
	1800-2200	Eastbound	577	276	7
6 to 7	0-400	Eastbound	960	568	8

The condition of the pavement could generally be described as follows:

- D1 deflections indicate weak pavements on all sections with excessive values, highlighted in red, indicating failure. The exception to this is the sub-section of (2 to 3) from Chainage 0 to 300 which is significantly stronger.
- (D1-D2) values are very high indicating poor to bad load spreading ability in the upper layers.
- The sub-grade is generally stiff along all test sections based on D9 values.

Core Results

Table 6 contains locations and pavement layer thicknesses for cores taken along each test section.

Table 6: Core Results

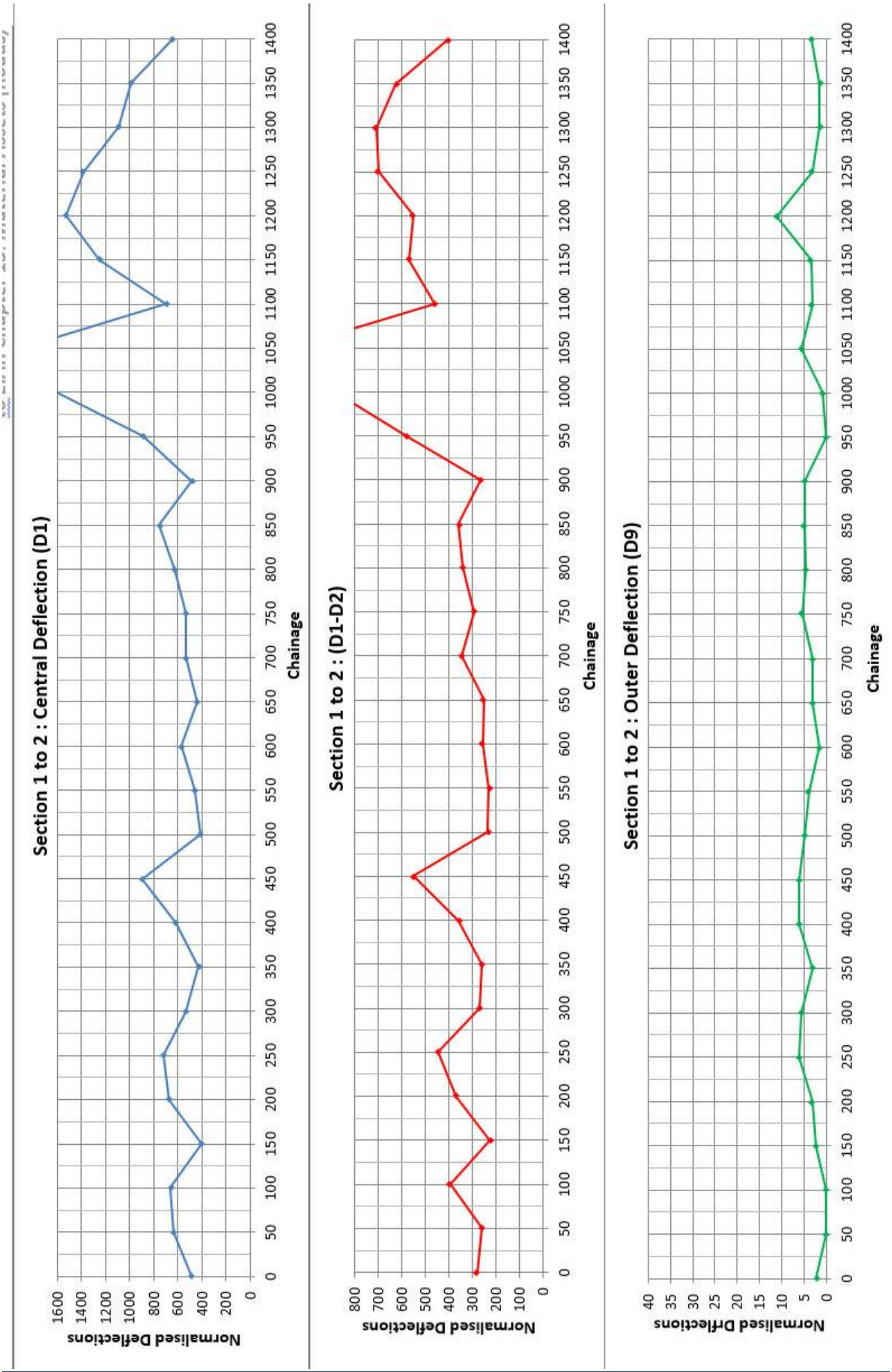
Section	Chainage	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5
1 to 2	500	20mm S.D.	40mm C.R.	10mm S.D.	25mm C.R.	25mm S.D. on Clay
	1100	15mm S.D.	50mm C.R.	20mm S.D.	Clay	---
5 to 2	100	40mm S.D.	45mm C.R.	30mm S.D.	50mm C.R.	Clay
	650	30mm S.D.	50mm C.R.	25mm S.D.	25mm C.R.	Clay
	1100	35mm S.D.	40mm C.R.	30mm S.D.	40mm C.R.	Clay
4 to 5	200	40mm S.D.	30mm C.R.	80mm S.D.	110mm Shale	Clay
	700	35mm S.D.	45mm C.R.	30mm S.D.	80mm C.R.	Clay
	1300	45mm S.D.	40mm C.R.	25mm S.D.	60mm C.R.	Clay
	1750	50mm S.D.	230mm C.R.	Clay	---	---
6 to 7	350	10mm S.D.	125mm C.R.	10mm S.D.	Clay	---

S.D. = Surface Dressing C.R. = Crushed Rock

FWD Section 1 to 2: Tabulated Results and Graphs

Table A1: Section 1 to 2 Deflection Values

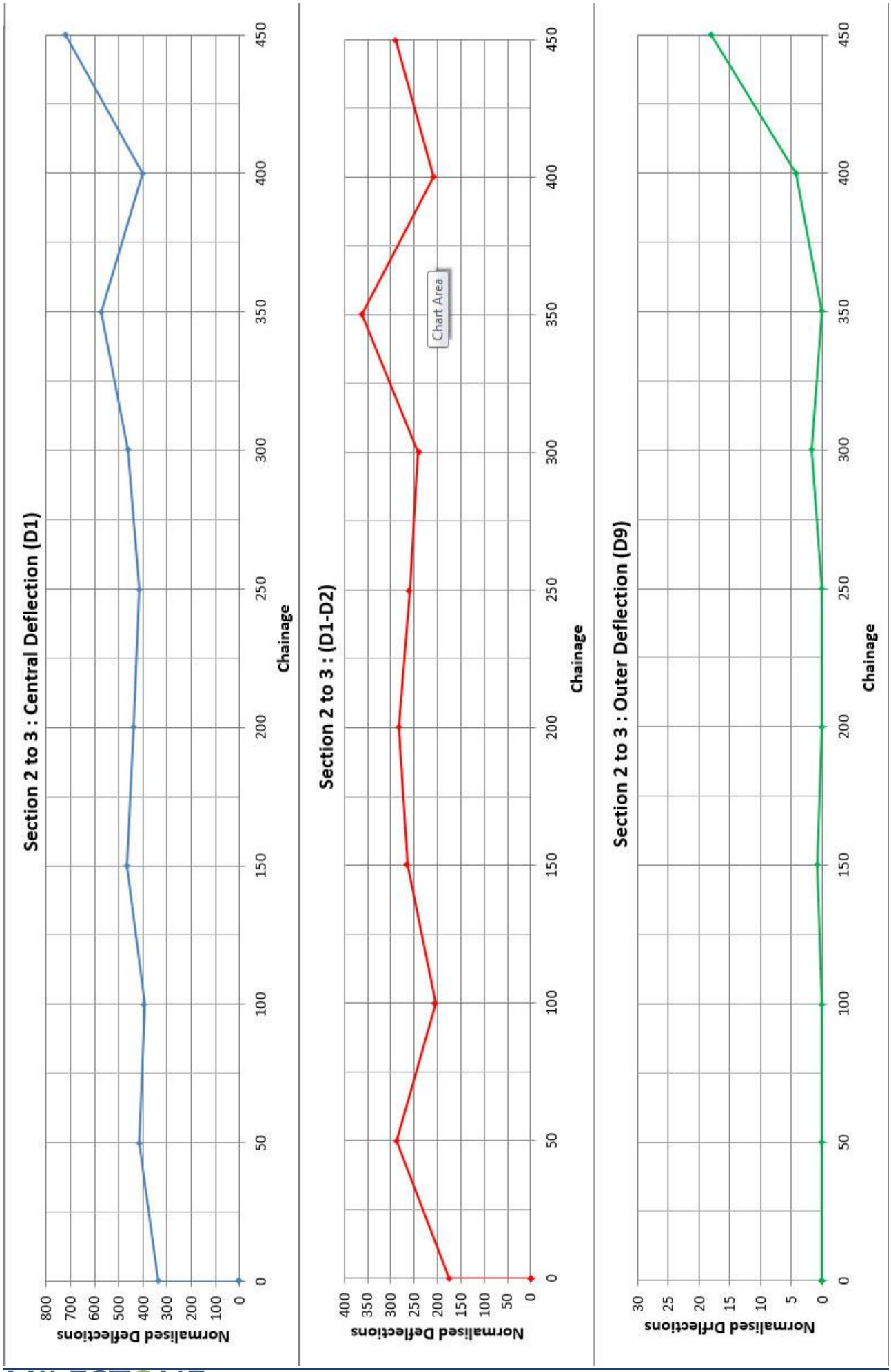
Chainage	D1	D1-D2	D9
0	486	280	2
50	637	259	0
100	658	394	0
150	404	224	2
200	674	371	3
250	718	445	6
300	528	266	6
350	425	257	3
400	613	358	6
450	892	548	6
500	410	234	5
550	458	230	4
600	566	257	2
650	438	251	3
700	528	347	3
750	528	290	5
800	625	340	5
850	754	357	5
900	483	263	5
950	890	579	0
1000	1603	887	1
1050	1918	1071	6
1100	697	460	3
1150	1250	569	3
1200	1531	551	11
1250	1384	698	3
1300	1090	708	2
1350	993	624	2
1400	646	399	3


Section 1 to 2 : Central Deflection (D1)
Normalised Deflections
Chainage
Section 1 to 2 : (D1-D2)
Normalised Deflections
Chainage
Section 1 to 2 : Outer Deflection (D9)
Normalised Deflections
Chainage

FWD Section 2 to 3: Tabulated Results and Graphs

Table B1: Section 2 to 3 Deflection values

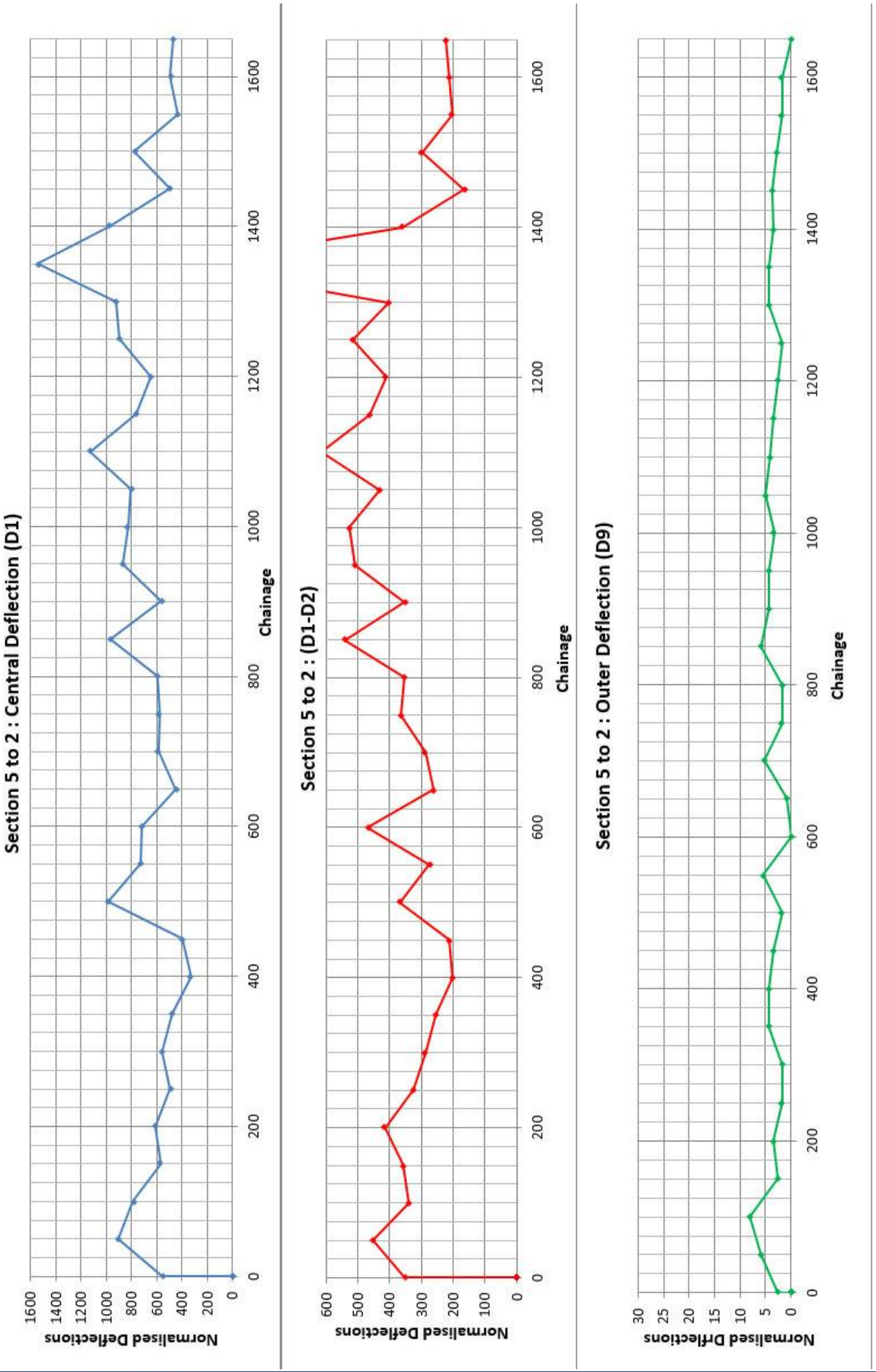
Chainage	D1	D1-D2	D9
0	337	175	0
50	414	288	0
100	394	205	0
150	468	264	1
200	440	283	0
250	414	260	0
300	461	241	2
350	573	361	0
400	400	209	4
450	719	290	18


Section 2 to 3 : Central Deflection (D1)
Normalised Deflections
Chainage
Section 2 to 3 : (D1-D2)
Chart Area
Normalised Deflections
Chainage
Section 2 to 3 : Outer Deflection (D9)
Normalised Deflections
Chainage

FWD Section 5 to 2: Tabulated Results and Graphs

Table C1: Section 5 to 2 Deflection values

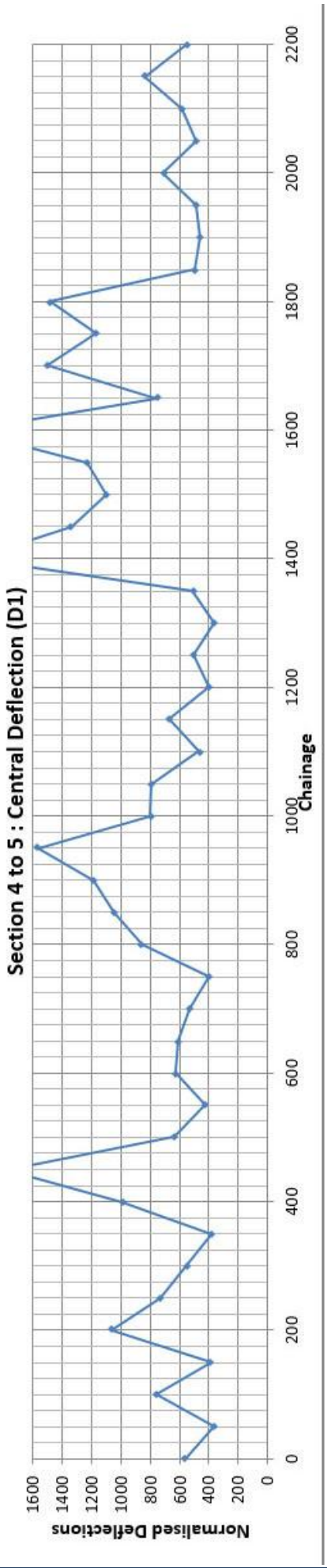
Chainage	D1	D1-D2	D9
0	555	352	3
50	904	454	6
100	788	340	8
150	569	359	3
200	613	415	3
250	492	325	2
300	563	287	2
350	476	254	4
400	328	200	4
450	397	212	3
500	989	367	2
550	729	274	5
600	720	469	0
650	448	263	1
700	588	288	5
750	580	365	2
800	592	355	2
850	969	542	6
900	567	352	4
950	867	509	4
1000	829	527	3
1050	806	431	5
1100	1130	613	4
1150	766	463	3
1200	646	412	3
1250	896	515	2
1300	927	402	4
1350	1545	1077	4
1400	976	360	3
1450	499	165	4
1500	778	298	3
1550	433	202	2
1600	492	211	2
1650	471	224	0

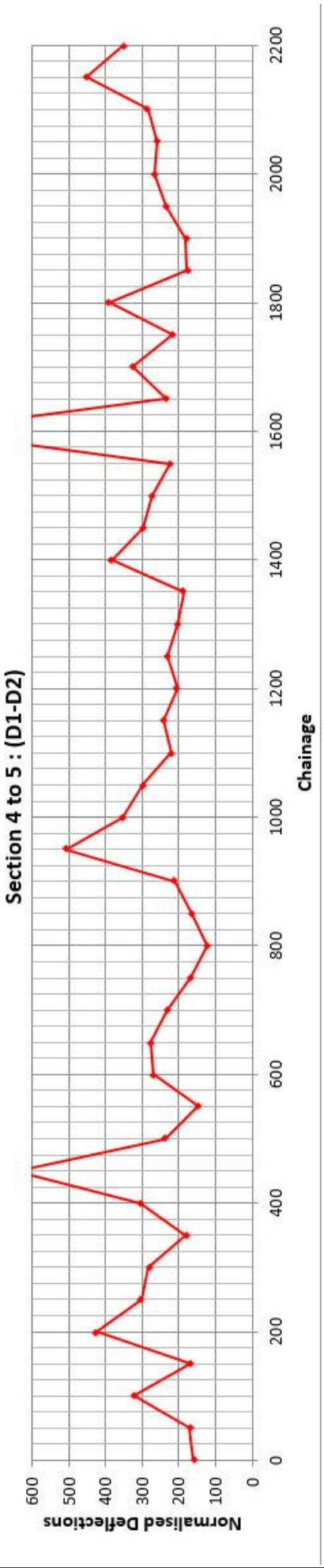

Section 5 to 2 : Central Deflection (D1)
Normalised Deflections
Chainage
0
200
400
600
800
1000
1200
1400
1600
Section 5 to 2 : (D1-D2)
Normalised Deflections
Chainage
0
100
200
300
400
500
600
Section 5 to 2 : Outer Deflection (D9)
Normalised Drflections
Chainage
0
5
10
15
20
25
30

FWD Section 4 to 5: Tabulated Results and Graphs

Table D1: Section 4 to 5 Eastbound values

Chainage	D1	D1-D2	D9
0	559	160	4
50	365	171	10
100	762	322	9
150	386	169	5
200	1064	425	17
250	736	303	3
300	556	282	9
350	384	181	3
400	992	305	11
450	1786	643	25
500	637	238	16
550	430	147	15
600	630	271	9
650	609	278	18
700	535	233	21
750	401	169	14
800	858	121	73
850	1050	165	111
900	1184	212	23
950	1564	508	28
1000	802	355	11
1050	793	298	12
1100	466	222	10
1150	670	243	7
1200	397	204	1
1250	504	232	4
1300	363	203	1
1350	510	187	10
1400	2006	383	0
1450	1338	298	11
1500	1098	275	12
1550	1230	224	5
1600	2062	897	26
1650	756	234	13
1700	1506	325	28
1750	1169	216	45
1800	1486	390	14
1850	496	179	8
1900	465	182	9
1950	488	236	6
2000	711	267	18
2050	487	260	7
2100	580	285	2
2150	833	452	5
2200	555	352	3


Section 4 to 5 : Central Deflection (D1)
Normalised Deflections
Chainage
0
200
400
600
800
1000
1200
1400
1600
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200


Section 4 to 5 : (D1-D2)
Normalised Deflections
Chainage
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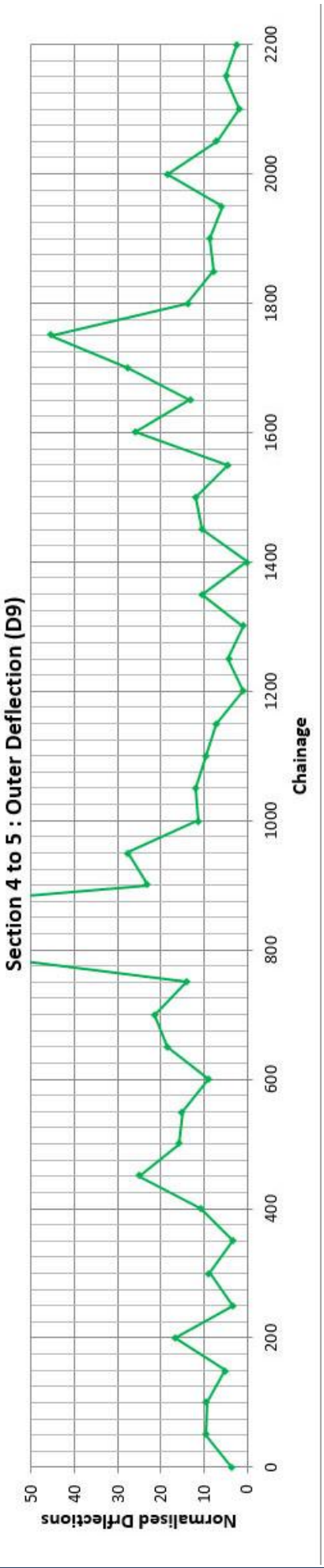
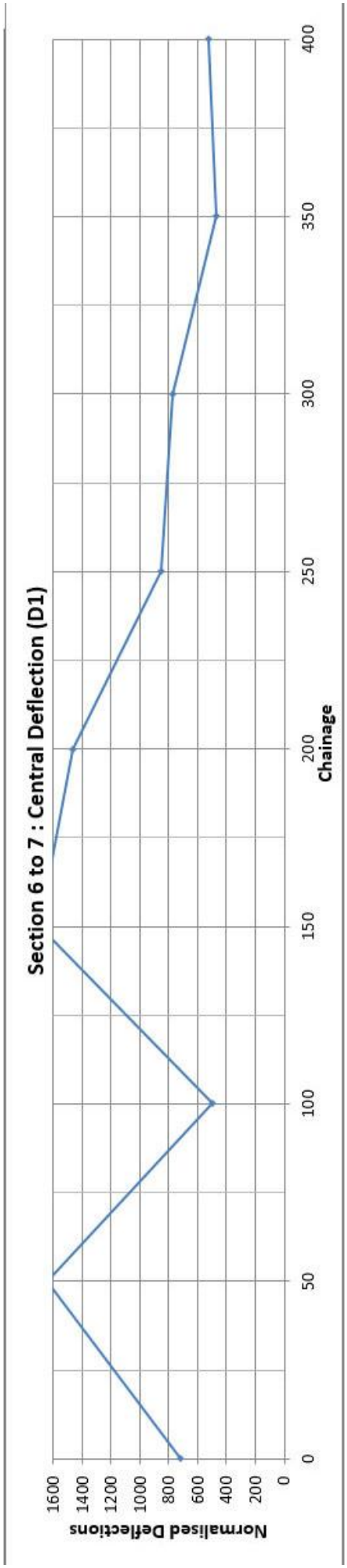
100
200
300
400
500
600
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200


Section 4 to 5 : Outer Deflection (D9)
Normalised Drflections
Chainage
0
10
20
30
40
50
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200

FWD Section 6 to 7: Tabulated Results and Graphs

Table C1: Section 6 to 7 Deflection Values

Chainage	D1	D1-D2	D9
0	721	349	6
50	1642	1280	6
100	497	287	11
150	1694	1433	14
200	1466	308	21
250	849	428	9
300	776	484	2
350	473	253	1
400	524	290	1


Section 6 to 7 : Central Deflection (D1)
Normalised Deflections
0
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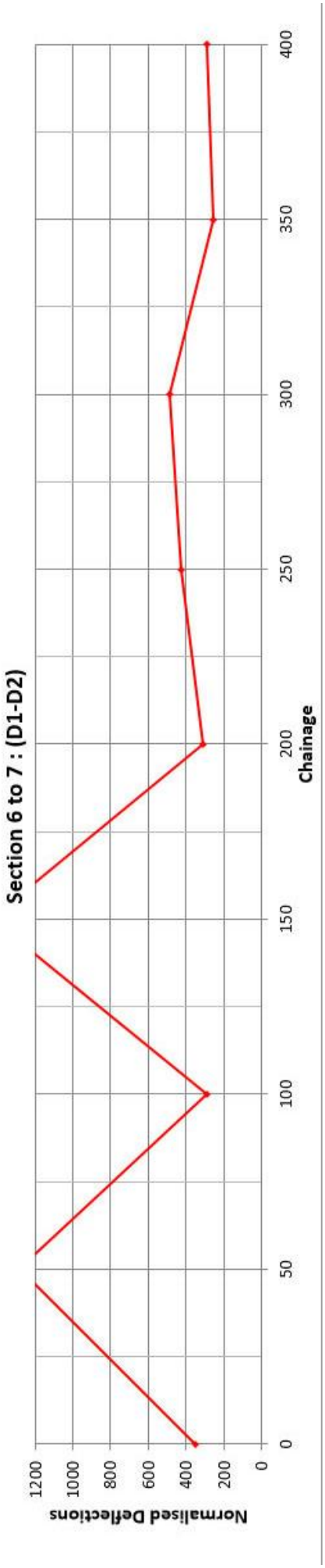
400
600
800
1000
1200
1400
1600
Chainage
0
50
100
150
200
250
300
350
400


Section 6 to 7 : (D1-D2)
Normalised Deflections
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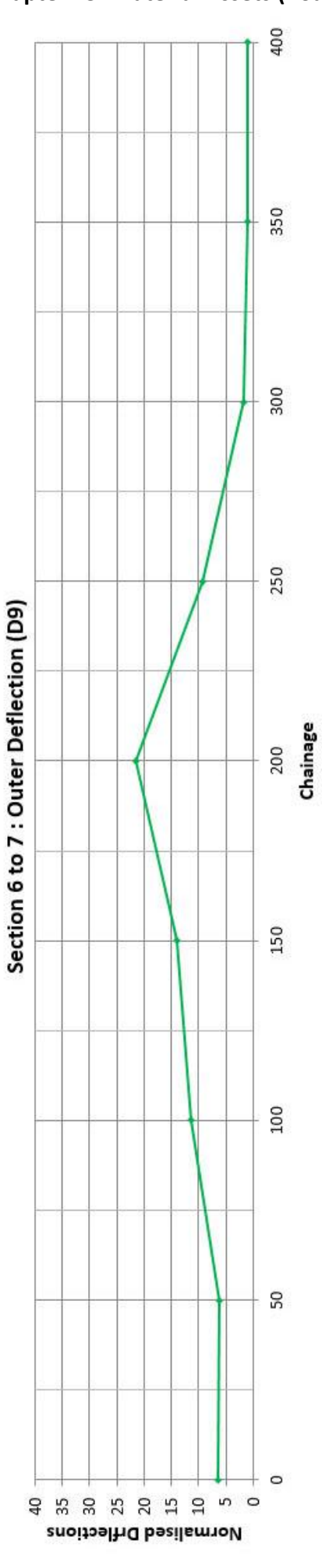
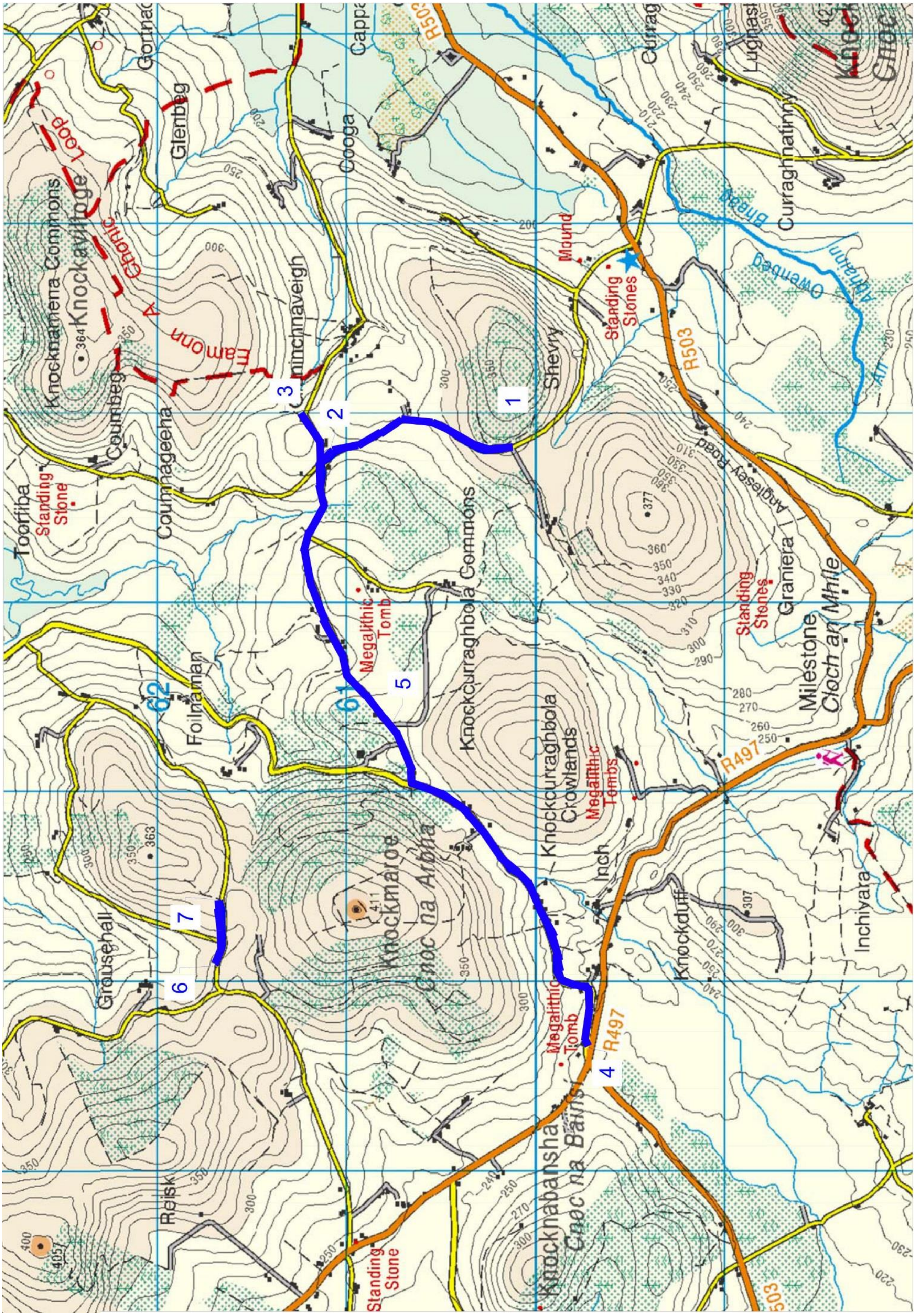
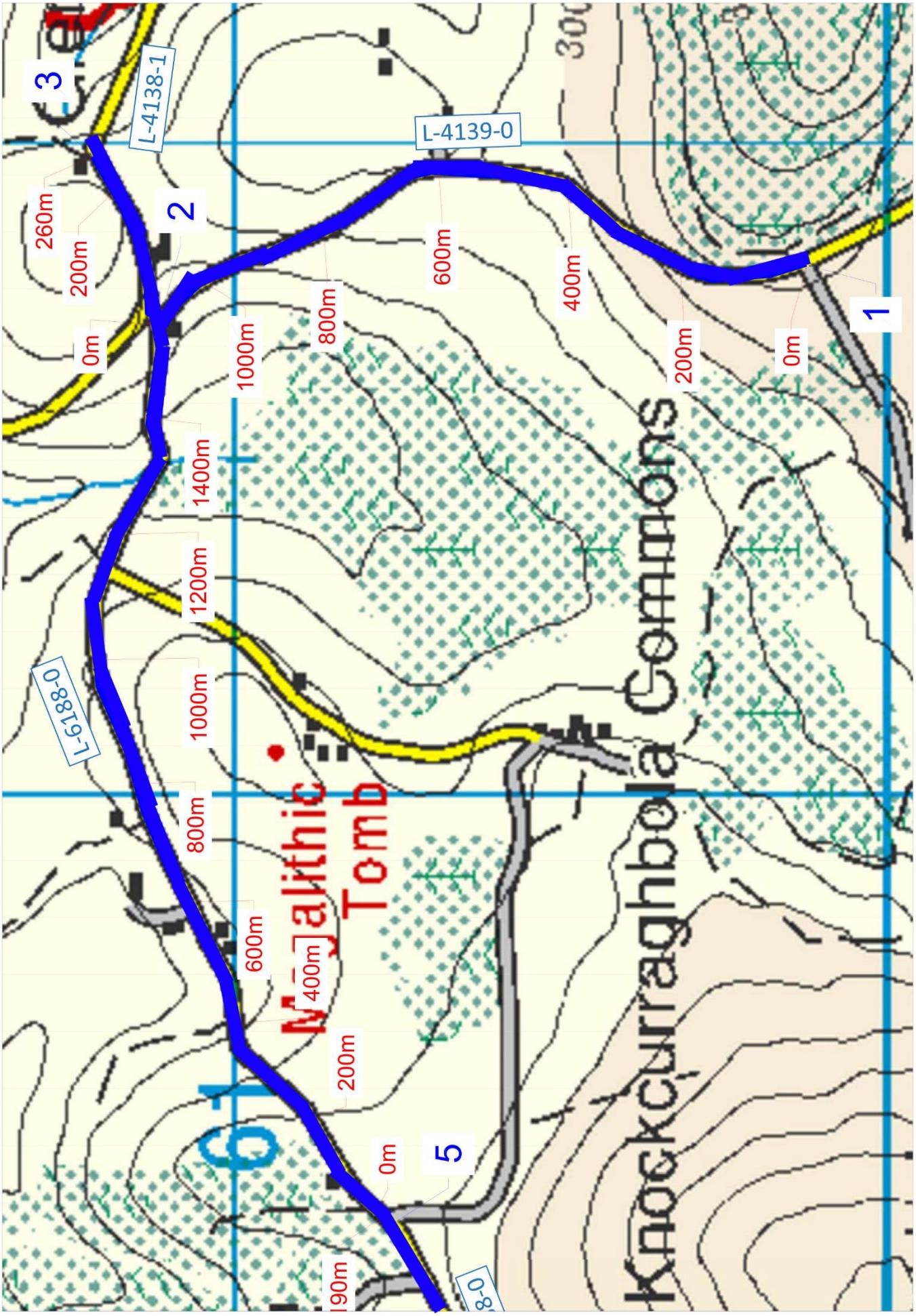
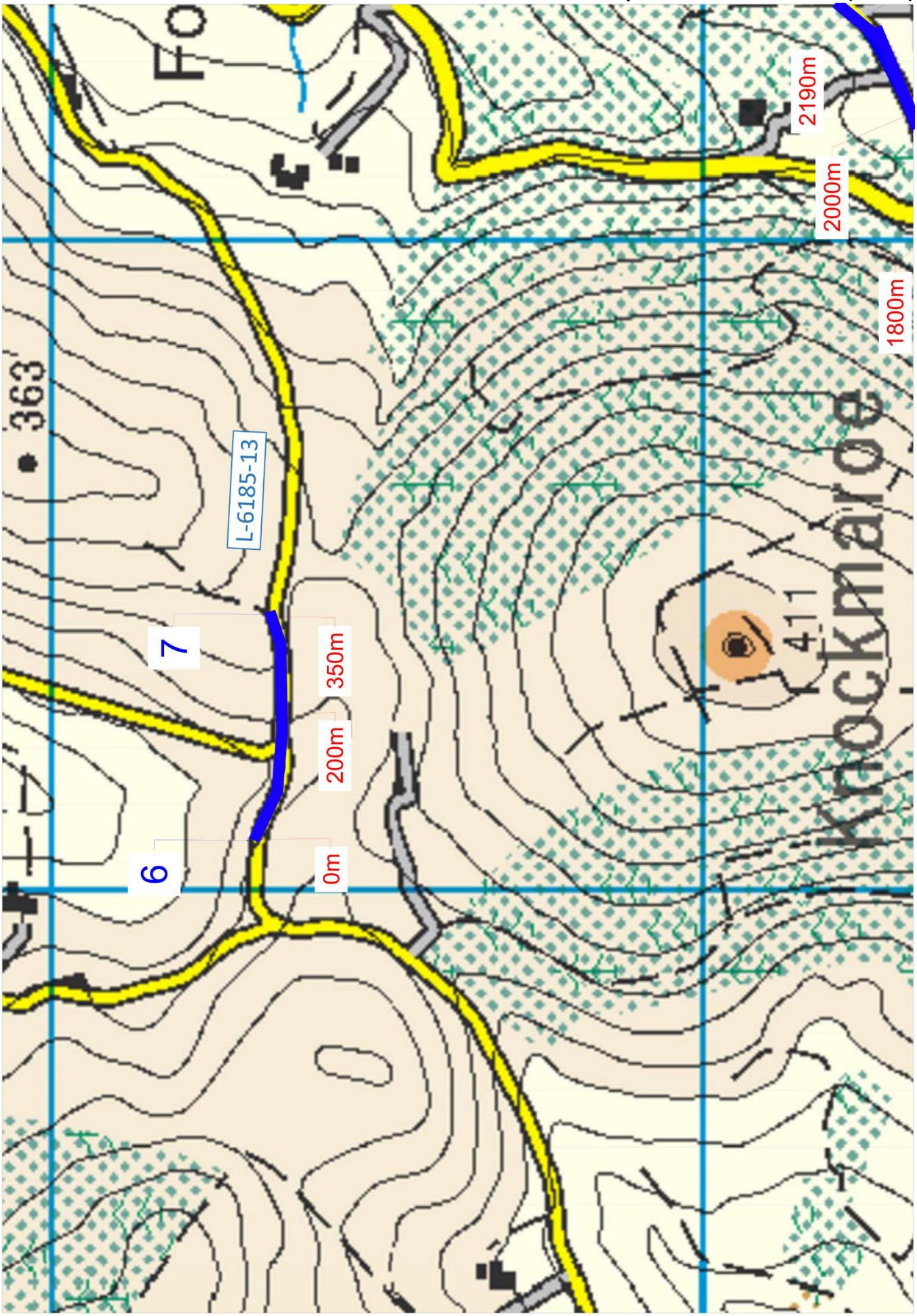
200
400
600
800
1000
1200
Chainage
0
50
100
150
200
250
300
350
400


Section 6 to 7 : Outer Deflection (D9)
Normalised Drflections
0
5
10
15
20
25
30
35
40
Chainage
0
50
100
150
200
250
300
350
400


1
2
3
4
5
6
7
R503
R497
Anglesey Road
Knockcurraghbola Commons
Knockcurraghbola Crowlands
Knockmaroe
Cnoc na Arbha
Knocknabansha
Milestone
Cloch an Mhíle
Standing Stones
Megalithic Tomb
Shevry
Inch
Knockduff
Inchivara
Foilnaman
Grousehall
Reisk
Coumbeg
Coumageena
Toorfiba
Knockavilloge
Knocknamena Commons
Glenbeg
Cooga
Mound
Graniera
Curraghnafinna
Owenbeg
Eamonn A Chnoic Loop


L-4138-1
L-4139-0
L-6188-0
Megalithic Tomb
Knockcurraghbola Commons
260m
200m
0m
600m
400m
800m
1000m
1400m
1200m
200m
0m
1000m
800m
600m
400m
200m
0m
190m
1
2
3
5


0m
5
2190m
2000m
L-6188-0
1800m
1600m
1400m
1200m
1000m
800m
600m
400m
200m
0m
4
L2264-50
R497
Knock
Knockcurraghbola
Crowlands
Megalithic
Tombs
Knockmaroe
Cnoc na Arbha
411
350
300
Inch


2190m
2000m
1800m
L-6185-13
7
6
350m
200m
0m
411
Knockmaroe

Appendix to Chapter 15: Material Assets - Roads

Appendix 15.3: Site Photographs

The data and descriptions in this appendix have informed Chapter 15: Material Assets (Roads) of the EIA Report.

The information presented in this Appendix 15.3 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 15.3 Section	Section Heading	Relevant Individual Project Element
A-15.3.1	Photos of UWF Related Works roads and culverts	UWF Related Works
A-15.3.2	Photos of UWF Grid Connection roads and bridges/culverts	UWF Grid Connection

A-15.3 SITE PHOTOGRAPHS

A-15.3.1 PHOTOS OF UWF RELATED WORKS ROADS AND CULVERTS

	UWF Related Works Roads UWF Related Works Internal Windfarm Cable Public Road Crossings RW1
	UWF Related Works Internal Windfarm Cable Public Road Crossings RW2

	UWF Related Works Internal Windfarm Cable Public Road Crossings RW3
	UWF Related Works Internal Windfarm Cable Public Road Crossings RW4 & RW5

	UWF Related Works Internal Windfarm Cable Public Road Crossings RW6
	UWF Related Works Internal Windfarm Cable Public Road Crossings RW7

	UWF Related Works Internal Windfarm Cable Public Road Crossings RW8
	UWF Related Works Internal Windfarm Cable Public Road Crossings RW9

	UWF Related Works Haul Route Works Bridge/Culvert Crossings WW1**2**
	UWF Related Works **Culverts** UWF Related Works Haul Route Works Bridge/Culvert Crossings WW12

	UWF Related Works Haul Route Works Bridge/Culvert Crossings WW31
	UWF Related Works Haul Route Works Bridge/Culvert Crossings WW31

	UWF Related Works Haul Route Works Bridge/Culvert Crossings WW32
	UWF Related Works Haul Route Works Bridge/Culvert Crossings WW32

A-15.3.2 PHOTOS OF UWF GRID CONNECTION ROADS AND BRIDGES/CULVERTS

	UWF Grid Connection Roads L2166-0 at Coole
	L2166-0 at Newport

	R503 at Newport
	R503 at Rear Cross

	R503 at Knockmaroe
	L2264-50 at Knockmaroe

	L6188-0 at Knockmaroe
	UWF **Grid Connection Bridges / Culverts** Watercrossing Structure W4

	Watercrossing Structure W5
	Watercrossing Structure W6

	Watercrossing Structure W7
	Watercrossing Structure W8

	Watercrossing Structure W9
	Watercrossing Structure W10

	Watercrossing Structure W11
	Watercrossing Structure W12

	Watercrossing Structure W13
	Watercrossing Structure W14

	Watercrossing Structure W15
	Watercrossing Structure W16

	Watercrossing Structure W17
	Watercrossing Structure W18

	Watercrossing Structure W19
	Watercrossing Structure W20

	Watercrossing Structure W21
	Watercrossing Structure W22

	Watercrossing Structure W23
	Watercrossing Structure W24

	Watercrossing Structure W25
	Watercrossing Structure W26

	Watercrossing Structure W27
	Watercrossing Structure W28

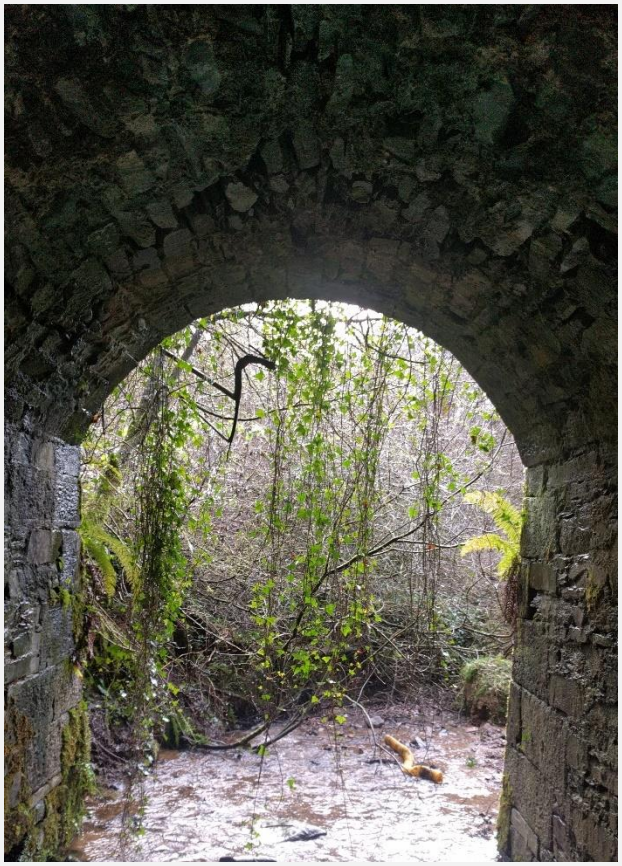
	Watercrossing Structure W29
	Watercrossing Structure W30

	Watercrossing Structure W31
	Watercrossing Structure W32

	Watercrossing Structure W33
	Watercrossing Structure W34

	Watercrossing Structure W35
	Watercrossing Structure W36

	Watercrossing Structure W37
	Watercrossing Structure W38

	Watercrossing Structure W39
	Watercrossing Structure W40

	Watercrossing Structure W41
	Watercrossing Structure W42

	Watercrossing Structure W43
	Watercrossing Structure W44

	Watercrossing Structure W45
	Watercrossing Structure W46

	Watercrossing Structure W47
	Watercrossing Structure W48

	Watercrossing Structure W49
	Watercrossing Structure W50

	Watercrossing Structure W51
	Watercrossing Structure W52

	Watercrossing Structure W53
	Watercrossing Structure W54

	Watercrossing Structure W55
	Watercrossing Structure W56

	Watercrossing Structure W57
	Watercrossing Structure W58

	Watercrossing Structure W59
	Watercrossing Structure W60

	Watercrossing Structure W61
	Watercrossing Structure W62

	Watercrossing Structure W63

Appendices to Chapter 16: Cultural Heritage

The data and descriptions in these appendices have informed Chapter 16: Cultural Heritage of the EIA Report.

Appendix 16.1 Section	Section Heading	Relevant Individual Project Element
A-16.1	Archaeological and Historical Background	UWF Related Works UWF Grid Connection UWF Replacement Forestry
A-16.2	Cultural Heritage Sites within the Study Areas	UWF Related Works UWF Grid Connection
A-16.3	Test Excavation Report – Knockcurraghbola Common	UWF Related Works
A-16.4	Field Walking Description	UWF Related Works UWF Grid Connection

Appendix to Chapter 16: Cultural Heritage

Appendix 16.1: Detailed Cultural Heritage Desktop and Field Survey Results

The data and descriptions in this appendix have informed Chapter 16: Cultural Heritage of the EIA Report. The information presented in this Appendix 16.1 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 16.1 Section	Section Heading	Relevant Individual Project Element
A-16.1	Archaeological and Historical Background	UWF Related Works UWF Grid Connection UWF Replacement Forestry

Appendix 16.1: Archaeological and Historical Background

16.1 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

A-16.1.1 General archaeological background

The Silvermine mountain range is a region with an extremely rich and diverse history of human settlement going back to prehistoric times. This is reflected in the archaeological record. This report focussed on cultural heritage sites within the Geographical Study Area – i.e. within construction works areas and in some cases, within 500m of construction works areas; and within 2km of any above ground structures associated with the project.

Within the study area there are 73 recorded monuments (RMPs). However if the scope is extended to the general landscape of the Silvermine Mountains this number rises dramatically to c.680 recorded monuments. These monuments date from the Neolithic through to post medieval and modern times. The monuments of Tipperary were surveyed in the early 1980s by the Archaeological Survey of Ireland. A review of prehistoric archaeology in Tipperary undertaken by Richard Raleigh (1985) highlighted the prehistoric richness of this North Tipperary region, while between 1992 and 1995 the North Munster Project of the Discovery Programme sought to understand settlement patterns over a vast 7000km^2 area that centred on the lower Shannon catchment (Grogan 1996). An Archaeological Inventory for County Tipperary was published in 2002 (see Farrelly and O'Brien 2002). In 1959, Michael O'Kelly from the Department of Archaeology, University College Cork, excavated one of the most visually impressive monuments in the region, the prehistoric Wedge tomb of Baurnadomeeny (RMP TN038-009), which is located c800m north of the proposed development area (UF Grid Connection) on the southeast face of Moherslieve (O'Kelly 1959; 1961). These works all formed the core of the desk study portion of this report.

A-16.1.2 The Mesolithic Period (7000-4000BC)

While there are no sites within the study area which can be directly attributed to this period, some 20km to the south of the study area, in the townland of Rathjordan, a small group of Early Mesolithic microliths were identified among the finds from an excavation of a ring barrow carried out in the 1940s (Woodman 1986, 10). A precise date for this material is impossible to ascertain other than it was most likely earlier than 6000 BC (Woodman 1986, 10). This might indicate that the wider region, in particular lower slopes of the western Silvermine Mountains, may have been a location for some of the earliest human settlement in the country.

A-16.1.3 The Neolithic Period (4000-2400BC)

The Neolithic period sees the first concrete evidence of human settlement in the study area. While people in the Neolithic were predominantly farmers and lived in rectangular or oval shaped wooden houses, it is their megalithic tombs and cairns which leave a lasting visual impression in the landscape. A court tomb at Shanballydesmond (RMP TN038-013), c510km south of the study area (UWF Grid Connection), is the oldest known Neolithic monument in Tipperary (Raleigh 1985). Excavations by Kelly in 1958 inside the tomb yielded six unburnt or cremated human remains and tools of flint and chert. The tomb itself sits at high point in the landscape overlooking the Bilboa River. Several other Megalithic Tombs have been identified within the study area where not enough remains to accurately attribute them to a specific period. While they are most likely later Wedge Tombs (see below), the possibility remains that they are earlier Neolithic examples.

Another probable Neolithic monument class is a cairn, and one such monuments is c1.1km north of the study area (UWF Grid Connection). This cairn, located at Baurnadomeeny, (~~Site 68,~~ TN038-007001), is located on the southwest of Mauherslieve and contains a cist burial (~~Site 69,~~ TN038-007002)

~~Site 68 –~~Cairn and ~~Site 69 –~~Cist from the north

A-16.1.4 The Bronze Age (2400-500BC)

The Bronze Age period is represented in the region area by several main site types: Wedge tombs, barrows, standing stones, stone circles/rows and fulachta fiadh. The tradition of megalithic tomb construction in the region continued through into this Early Bronze Age period with the construction of a number of wedge tombs. These tombs date to between 2300 and 2000 BC and are often associated with the Beaker pottery of the Early Bronze Age (Newman and Halpin 2000, 9). There are a total of four examples of wedge tombs located within the study area (Site RL5/GL47 *TN039-009*, Site RL9/GL45 *TN039-008*, Site RL11 *TN039-017* and Site *RL12 TN039-016*). There are also three additional megalithic tombs (Site RL8/GL46 TN039-050, Site RL14 TN039-045 and Site RL15 TN039-037) which have not been classified by the RMP, but most likely fall within this category. The most prominent and complete wedge tomb is located at Knockcurraghbola Commons and sits on the southern slopes of a small knoll (Site RL5/GL47). It is situated within the study area, 97m northwest of the Internal Windfarm Cabling works. The tomb is 7m long and decreases in height and width from southwest to northeast.

Site 82 - Wedge Tomb, from east.

Another complex of four tombs – two of which are wedge tombs and two are possible wedge tombs – are located 1.5m southwest of the Knockcurraghbola Commons tomb (Site RL11, RL12, RL14 and RL15) are also in this townland. The first one is the most preserved of this group. These tombs were visited by the author as part of the field survey carried out for the archaeological assessment of the Upperchurch windfarm in 2012.

Site RL11
Megalithic Tomb
(from NE)

Site RL12
Megalithic Tomb
(from NE)

Site RL14
Megalithic Tomb,
(from W)

Site RL15
Megalithic Tomb
(from SE)

Site RL8/GL46 Megalithic Tomb (from N)

Elsewhere, excavations at the Baurnadomeeny Wedge tomb (c800m north of the proposed UF Grid Connection) by O'Kelly yielded 21 burials and a range of flint tools (Raleigh 1985). A distribution analysis of the tombs of the study area and the immediate surroundings of the Silvermine Mountains revealed that these types of burial monuments were not on the summits of hills like in the Neolithic but were more generally on lower lying, sloping land. The Wedge tombs are associated with a series of rivers and streams that ultimately flow into the River Shannon, with the exception of the Knockcurraghbola Commons group, which are at the juncture where streams flow to both the Bilboa River (and on to the Shannon) and the Turraheen River, which connects with the Suir River.

Baurnadomeeny - Wedge Tomb (from S)

The Middle Bronze Age period is represented in the study area by standing stones, stone rows and stone circles. There are at least 3 examples of standing stones (Site RL3 TN039-004002, Site RL10

TN039-043, and Site RL13 TN039-044), a stone circle (Site RL2 TN039-004001), and a stone row (Site RL6/GL48 TN039-052) from the study area. Distribution and viewshed analyses (carried out in 2012 by the author) of the standing stones within and adjacent to the study area show a striking pattern: they are overwhelmingly placed at positions which overlook the numerous rivers and streams.

Site RL10
Standing Stone
(from NW)

Site RL13
Standing Stone
(from N)

Test excavations were also carried out in the vicinity of Site RL6/GL48 - *Stone Row* by the author in 2017 as part of this report

Site RL6/GL48, Stone Row, from SE

A single fulacht fiadh, a type of Bronze Age site where water was heated for both domestic and ritual use, was identified within the development area (Site RL7/GL49 TN039-051). This was located to the south of Site RL6/GL48 - Stone Row in an area completely covered by dense mature forestry.

A-16.1.5 The Iron Age (2400-500BC)

Later burial monuments come in the form of barrows. There are three examples of this monument type in the development area (Site GL13 TN031-071, Site GL21 TN037-044 and Site RL1 TN039-035). These burial mounds are generally dated to the Late Bronze and Early Iron Age but may be earlier.

No work has been carried out on any of the examples from within the study area to more accurately date these monuments. As with the earlier megalithic examples there is a high concentration of these monuments evident in the wider landscape of the development area. One example, a well preserved bowl-barrow (Site GL13) is located *c.125*m from the development area.

Site GL13 - Bowl Barrow from south

To make sense of the prehistoric site distribution patterns and the heavy concentration of prehistoric monuments in the upland region, Raleigh (1985) observed that mineral resources may have been an attraction for settlement. There is 1 no. mine recorded in the study area, a prehistoric copper mine 40m south of the study area in Lackamore (GL34 - TN038-020).

A-16.1.6 The Early Medieval Period (400-1100AD)

Occupation continued during the Early Medieval (c.400-1100 AD) period with a large concentration of ringforts to be found on the slopes of the Silvermine Mountains. Ringforts enclosed single farmsteads and are by far the most common medieval archaeological monument surviving in Ireland with over 47,000 examples having been identified across the island (Aalen et al. 2012, 45).

Although there are some examples dotted around the valleys in the Silvermine mountains, ringforts typically avoided upland areas. This monument type is more commonly found on flat ground and the lower slopes of river valleys. Within the study area there are a total of 9 ringforts. All bar one of these is located at the western extents of the development area.

Location of Site 56 - Ringfort

There is also enclosures (Site GL23 TN-37-022, Site GL28 TN37-031, GL42 TN39-025001 and GL43 TN39-025002) within the study area which may be attributed to this period.

The Early Medieval period also saw the spread of Christianity across Ireland and many churches and monastic centres emerged during this period. The significance of holy wells and other sites of ritual significance, such as Ballaun Stones, can be traced back to this period. While it is unclear that any of the four medieval churches from the study area have their origins in this period, within the environs of the proposed development there are three holy wells (Site GL5 TN031-010002, Site GL15 TN037-046 and Site-GL10 TN031-072) and two Ballaun Stone (Site GL1 TN031-009 and Site GL32 TN037-032002) which may.

A-16.1.7 The Later Medieval Period (1179-1400AD)

The next significant archaeological period for the region followed the Anglo-Norman conquest in the late-12th century. During this period the western portion of the study area was part of the kingdom of Limerick. (Empey 1985, 76). It was conquered by 1206 and the previous Gaelic order was replaced by a new feudal regime that was organised on entirely different principles (Empey 1985, 76). The Anglo-Norman conquest had a massive impact on the landscape of Ireland. With the conquest came a new architecture of power in the form of great stone castles, cathedrals and churches. These great buildings were designed and located to assert the new-found dominance of the Anglo-Normans over the landscape, the people and their traditions. Within the broader landscape of the proposed development area there are a wide array of examples of Anglo-Norman buildings, from early motte and baileys through to the subsequent masonry castles and churches.

The two churches within the study area (Site GL4 and Site GL12), possibly dating from the medieval period, provide evidence for the Anglo-Norman encroachment into the locality. Within the broader region of the Silvermine Mountains there is greater evidence of this conquest, specifically the military aspect. The castles are situated at the foothills of the mountains overlooking the Clodiagh and Owenbeg rivers but not in the upland regions, which would have remained out of Norman influence. These frontier castles (for example Site GL7, *tower house*) appear to defend a key routeway into the mountainous regions of North Tipperary.

A-16.1.8 The 'Age of Improvement' (17th-18th Century)

In the 17th-18th-centuries country estates known as demesnes emerged across the country. These had their origins in the "Age of Improvement". Demesnes consisted of designed landscapes which were usually enclosed by stone walls and were often entered through elaborate gate lodges and gateways. They often contained an area of managed woodland known as a wilderness; this included pathways for the gentry to stroll through. Trees were planted along the roads in the estate to create shelter belts and avenues along the approaches to the 'Big House'. The houses formed the centrepiece of every demesne and were generally constructed in the Palladian style which drew on aspects of Classical Roman and Greek architecture.

Within the study area, a total of five designed landscapes are shown on the first edition Ordnance Survey Maps. The Mountphilips 110kV Substation is located within the footprint of Mount Philips Demesne (GR3). Within the immediate vicinity of the substation site are two additional demesnes, Barna Demesne (GR4) and Coole Demesne (GU7). Practically all features associated with these sites within the vicinity of the development area are no longer extant.

A-16.1.9 Early Modern Period (1850-Present)

Agricultural farming and land improvement is evident across the majority of the study area. This is characterised by large scale land enclosure in upland areas and the presence of a significant number of smithys (15), lime kilns (31), gravel pit (1) and quarries (2) present in the study area.

In 1973, Ireland's accession to the E.E.C. (E.U.) and the subsequent effects of the Common Agricultural Policy (CAP) had far reaching consequences for the landscape. CAP promoted intensification and industrial-scale farming which was mainly responsible for the destruction of many of the field-boundaries marked on the first edition map of the development area. The land in the area is now a mix of improved agricultural grassland and wet grassland employed for pasture, though coniferous forest also makes up a sizeable proportion – c.30%.

Appendix to Chapter 16: Cultural Heritage

Appendix 16.2: Cultural Heritage Sites within the Study Areas

The data and descriptions in this appendix have informed Chapter 16: Cultural Heritage of the EIA Report. The information presented in this Appendix 16.2 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 16.2 Section	Section Heading	Relevant Individual Project Element
A-16.2	Cultural Heritage Sites within the Study Areas	UWF Related Works UWF Grid Connection

Tables	
Table 1	Cultural Heritage Sites within the Windfarm Related Works Study Area
Table 2	Cultural Heritage Sites within the UWF Grid Connection Study Area

APPENDIX 16.2 Cultural Heritage Sites within the Study Areas

The archaeological sites identified in the study area, along with a description, an impact evaluation and recommendations, are summarised in Table 1 (UWF Grid Connection Study Area) and Table 2 (UWF Related Works Study Area) below.

These sites were identified during both desktop studies and field walking surveys which were conducted between 2016 and 2019. Desktop studies included a review of primary sources and secondary sources.

Primary sources included:

- Record of Monuments and Places
- Record of Protected Structures
- National Inventory of Architectural Heritage
- National Museum of Ireland Topographic Files
- All editions of the historic Ordnance Survey Maps (including the first edition 1841 and the second edition 1898 1:10560 maps)
- Other historic mapping, such as the Down Survey (1655) and the Griffith Valuation (1850).

Maps
First edition 1840 Ordnance Survey map sheet
Second edition 1900 Ordnance Survey map sheet
Griffith's Valuation maps and valuation report
Records of Monuments and Places (RMP) constraints maps

Aerial photographs
2000 Ordnance Survey orthophotography
2005 Ordnance Survey orthophotography
Google Earth
Bing maps aerial photos

Secondary sources:
DoEHLG, 1999, *Framework and Principles for the Protection of the Archaeological Heritage*, Dublin.

EPA, 2002, *Guidelines on the information to be contained in Environmental Impact Statements*, EPA, Dublin.

EPA, 2003, *Advice noted on current practice (in the preparation of Environmental Impact Statements),* EPA, Dublin.

Farrelly and O'Brien 2002 Archaeological Inventory of County Tipperary. Volume 1: North Tipperary. The Stationery Office, Dublin.

Halpin, A and Newman, C., (2006) *Ireland: An Oxford Archaeological Guide* Oxford, Oxford University Press.

Grogan, E. 1994. The North Munster Project in Discovery Programme Report 4, p26-72. Royal Irish Academy, Dublin

Lewis, S.1846 A Topographical Dictionary of Ireland. London.

O'Kelly, M. J. 1959. A court cairn at Shanballydesmond, County Tipperary, *Cork Archaeological Society Journal*, pp34-7.

O'Kelly, M. J. 1959. A wedge shaped gallery grave at Baurnadomeeny, County Tipperary, preliminary notice in *North Munster Antiquarian Journal* 8: p62

O'Kelly, M. J. 1960. A wedge shaped gallery grave at Baurnadomeeny, County Tipperary, *Cork Archaeological Society Journal* 65: 85-115

Raleigh 1985 The Archaeology of prehistoric Tipperary. In Nolan (ed) *Tipperary: History and Society*. Geography Publications, Dublin.

Stout, G. and Stout, M., 2011 "Early landscapes: from prehistory to plantation", in Aalen, F.H.A., Whelan, K. and Stout, M. (eds) *Atlas of the Irish Rural Landscape* Cork, Cork University Press.

Waddell, J., (1998), *The Prehistoric Archaeology of Ireland*, Galway, Galway University Press.

Table 1 and Table 2 below for Cultural Heritage Site details

Tab 16 of Volume C3 EIA Report Figures for Cultural Heritage mapping showing site locations

A16.1.2.1 Cultural Heritage Sites within the UWF Related Works Study Area

Table 1: Cultural Heritage Sites within the Windfarm Related Works Study Area

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
RL1	RMP	Recorded Protected Site	TN039--035----	Barrow - ring-barrow	591832	661143	Reisk	Situated on the gentle SW-facing slope of a hill, in pasture. A circular site (12.8m N-S; 12.8m E-W) consisting of a central mound (diam. 4.8m; H 0.26m), a narrow, U-shaped fosse (W 1.7m; D 0.86m) and an outer bank (W 2m; ext. H 0.14m). The bank is steep-sided and the fosse is well defined with some rushes growing in it.	1.37km to the NW	None	Avoidance
RL2	RMP	Recorded Protected Site	TN039-004001-	Stone circle	591582	660963	Reisk	Situated in rough terrain on a small hillock, on a SW-facing slope, overlooking a valley. A stone circle not marked on the 1st ed. (1840) OS 6-inch map but depicted on the 2nd ed. (1905). There are no visible remains of the stone circle or of the standing stone (TN039-004002) also indicated at this location on the current 6-inch map.	1.31km to the N	None	Avoidance
RL3	RMP	Recorded Protected Site	TN039-004002-	Standing stone	591582	660953	Reisk	Situated in rough terrain on a small hillock on a SW-facing slope, overlooking a valley. A low standing stone (H 0.8m; dims. 0.85m x 0.2m) aligned NE-SW, sloping slightly to SW. The ground level has been built up with spoil and field clearance. A stone circle (TN039-004001), no longer evident, is also named on the map at this location.	1.3km to the NW	None	Avoidance
RL4	RMP	Recorded Protected Site	TN039--005----	Ringfort - rath	591963	660856	Reisk	Situated on a slight break in a S-facing slope in pasture. A denuded bivallate ringfort consisting of a circular area (diam. 34.5m N-S; 33m E-W) enclosed by a low bank (Wth 4m; int. H 0.13m; ext. H 1m), a U-shaped fosse (Wth 4m; D 0.43m) and outer bank (Wth 3.2m; ext. H 0.38m). Possible entrance in NE quadrant (Wth c. 2.5m) which appears to have been widened. The outer bank is not apparent along the NE quadrant - probably disturbed by adjacent NW-SE field boundary.	1.06km to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
RL5	RMP	Recorded Protected Site	TN039-009----	Megalithic tomb - wedge tomb	595031	660986	Knockcurraghbola Commons	Situated on a hillock at the NE end of a low ridge. It consists of a long, narrow, partly roofed gallery closed at the SW by a septal-stone. Both sides of the gallery are flanked by outer-walling with the more westerly stone at either side set in advance of the septal-stone. These two stones would have served as the sides of a portico or, alternatively, represent a doubling of the portico sides since removed.The structure is 7m in overall length. The main chamber, open at its more easterly end, is 5.3m long and 1.2m wide at the septal-stone whence it narrows slightly towards the E.Two roofstones cover its forward end. There are five sidestones on the N side and three on the S side. There are six outer-wall stones to the N and four to the S. These are set close to the gallery walls and two of those to the N double as buttress-stones. Beyond the easternmost at the S there is a small stone which may be the butt of a taller one, probably another outer-wall stone. There are traces of a mound around the structure. A large retangular slab lies prostrate at the SW end of the gallery. (De Valera and Ó Nualláin 1982, 90, No.10)	97m to the W	None	Avoidance
RL6	RMP	Recorded Protected Site	TN039-052----	Stone row	595083	660868	Knockcurraghbola Commons	Situated in pasture on SE facing slope of rising fround in upland area with good views of mountian valley to S and E, higher ground to N. Nearby wedge tomb (TN039-009) to NNW and fulacht fiadh (TN 039-051) to SE. Monument consists of two low limestone orthostats, aligned E-W, and 2.48m apart. Both stones are roughly triangular in shape with rectangular sections and the tops of the stones are tapering towards a point. The W stone measures 0.9m H; 0.58m x 0.21m. The E stone measures 0.8m H; 0.60m x 0.30m. Local landowner has no recollection that they were ever erected as scratching posts for livestock.	37m to the SE	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
RL7	RMP	Recorded Protected Site	TN039-051----	Fulacht fia	595166	660772	Knockcurraghbola Commons	Situated in wet marshy field in upland area with stream immediately to the S, field has recently been planted with conifer trees. Possible two stone row (TN039-052) and wedge tomb (TN039-009) to NW. During the planting of trees in this field a drainage ditch (Wth 0.70m; D 0.40m) was cut through the middle of the mound on an E-W axis revealing the burnt material of the monument. The monument consists of a large circular mound (diam. 16m N-S ; 20m E-W; H 1m) of burnt material with stream immediately to S of mound. No visible sign of any trough.	149m to the SE	None	Avoidance
RL8	RMP	Recorded Protected Site	TN039-050----	Megalithic tomb - unclassified	594849	660334	Knockcurraghbola Commons	Situated in upland region, in pasture with good panoramic views in all directions, view of Galtee More to the SW on a clear day. Good views of Wedge tomb (TN039-009) located 670m to N. A roughly rectangular chamber, 1m long by 0.85m wide and 0.3m high at the open SW end formed by four low upright stones with a large capstone (H 0.55m; L 2m; Wth 2m) sitting on top of the side stones. A second capstone may be a displaced roofstone from the SW end of the chamber. Not clear whether this is a megalithic tomb or not however the arrangement of the capstone sitting on side stones forming a chamber suggests that it is a possible megalithic structure. It also has an impressive siting in the landscape with fine panoramic views of hilltops within this mountain region.	228m to the S	None	Avoidance
RL9	RMP	Recorded Protected Site	TN039-008----	Megalithic tomb - wedge tomb	592512	659913	Knockmaroe	Situated close to the foot of the S-facing slope of Knockmaroe Hill. The remains consist of a mound about 9m in diameter and 1m high with a hollow towards its western perimeter where there are three stones. One of these is an orthostat aligned WSW-ENE. This stone, which declines in height from W to E, may have formed part of a chamber side. Resting against the last is a large slab, possibly a displaced roofstone. A thin slab beneath this	21m to the W	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								may have been detached from its underside. Some stones exposed at the edge of the hollow and at the perimeter of the mound are of uncertain origin. The scant remains seem to be those of a wedge tomb. (De Valera and Ó Nualláin 1982, 89, No.9)			
RL10	RMP	Recorded Protected Site	TN039-043----	Standing stone	594282	659643	Knockcurraghbola Crownlands	Situated on a poorly drained S-facing slope of rising ground in an upland region. A narrow standing stone (H 1.25m; 0.25m x 0.2m) which is rectangular in plan with its long axis orientated N-S. The stone is unusually narrow and may have been erected as a scratching post.	775m to the SE	None	Avoidance
RL11	RMP	Recorded Protected Site	TN039-017----	Megalithic tomb - wedge tomb	594102	659543	Knockcurraghbola Commons	Sited 200m E of the a wedge tomb (TN039-016) and on the same S-facing slope. The scant remains consist of a septal-stone at the WSW, two sidestones of the more southerly side of the chamber and one of the opposite side. Another stone a little to the E of the last is somewhat loosely set and of uncertain origin. A small, low mound adjoins the S side of the chamber. The origin of a number of displaced stones at the site is uncertain. (De Valera and Ó Nualláin 1982, 91-2, No.12)	779m to the S	None	Avoidance
RL12	RMP	Recorded Protected Site	TN039-016----	Megalithic tomb - wedge tomb	593918	659522	Knockcurraghbola Commons	Sited on a S-facing slope in farmland. A narrow, SW-facing, wedge-shaped gallery flanked at either side by outer-walling survives. There are slight traces of a mound along the S side of the structure. The gallery, at least 4.2m long, is open at both ends. It narrows from 1m wide at the SW to 0.65m at the NE and a diminution in the height of the gallery orthostats in the same direction is also indicated. Four orthostats survive along both sides of the gallery. Two of those on the S side have split into two or more separate uprights. Four outer-wall stones flank the S side of the gallery. The easternmost is set inside the line of the other three and adjoins the gallery wall. Six outer-wall stones flank the	55m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								N side of the gallery, a number of them also split into separate uprights. Two transversely set stones seem to mark the end of this line of outer-walling. A number of partly concealed slabs lie to the W of the structure. (De Valera and Ó Nualláin 1982, 92, No.13)			
RL13	RMP	Recorded Protected Site	TN039-044----	Standing stone	594222	659443	Knockcurraghbola Commons	Situated on flat elevated pasture with good views in all directions. A triangular shaped standing stone (H 1.26m; 1m x 0.2m) which is rectangular in plan with its long axis orientated E-W.	958m to the SE	None	Avoidance
RL14	RMP	Recorded Protected Site	TN039-045----	Megalithic tomb - unclassified	593952	659313	Knockcurraghbola Commons	Situated on a low rise of ground overlooking a river valley in an upland region. A chamber, 1.35m long (SSE-NNW) is 0.85m wide at the open SSE end and narrows slightly towards the opposite end. It is formed by four low stones, one at the more westerly side, one at the NNW end, and there are two, a longer outer and shorter inner example, at the more easterly side. The shorter of the latter two stones is skewed so as to narrow the rear of the chamber. There is a largely concealed stone at the inner face of the last. The structural stones are relatively thin slabs and none rises more than 0.25m above ground level. This seems to be a large cist.	1.01km to the S	None	Avoidance
RL15	RMP	Recorded Protected Site	TN039-037----	Megalithic tomb - unclassified	594212	659313	Knockcurraghbola Commons	Sited just 200m S of wedge tomb (TN039-017) in a prominent position on a hillock in upland pasture. The remains are scant perhaps because of deliberate disturbance that may account for a subcircular depression measuring some 7m x 6m and at least 0.3m deep on top of the hillock. At the northern edge of the depression there is a low orthostat aligned WNW-ESE. It is 1.45m long, 0.15m thick and slopes from 0.65m high at its more westerly end to 0.15m at the opposite end. Some 0.5m S of this	1.08km to the SE	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								there is a prostrate slab 1.6m in maximum dimension while 5-7m to the SW there are three irregularly spaced stones, possibly representing a kerb. The diminution in height of the orthostat from W to E would suggest it could be the surviving remnant of the gallery side or outer-wall of a wedge tomb.			
RL16	RMP	Recorded Protected Site	TN040-046001	Enclosure	597461	662172	KNOCKNAMENA COMMONS	A large semicircular enclosure situated on a SE-facing slope of rising ground in an upland area overlooking a mountain valley with higher ground above the site to the N. Originally a circular enclosure, the present remains consist of a semicircular area (dims. 52m SE-NW; 60m E-W) enclosed by a bank (Wth 5m; int. H 0.25m; ext. H 0.7m) and external fosse (Wth 5m; D 0.3m) which survives from NW through N to SSE. The site is intersected by a road from SSE to S running along an E-W axis and from S to W by a field boundary aligned on a N-S axis. No entrance feature visible.	428m to the SE	None	Avoidance
RL17	RMP	Recorded Protected Site	TN040-046002	Ditch Barrow	596800	662195	KNOCKNAMENA COMMONS	Situated on a poorly drained SE-facing slope of rising ground in an upland area with a nearby enclosure (TN040-046001) 70m to the S. A low flat-topped mound (diam. 4.2m NE-SW; 4.4m E-W; H 0.45m) enclosed by a shallow water-logged fosse (Wth 2.4m; D 0.1m) with no evidence for an external bank.	428m to the SE	None	Avoidance
RL18	RMP	Recorded Protected Site	TN039-048	Ring Barrow	596570	662064	GLENBEG	Situated in pasture, on a SE-facing slope of rising ground in a mountainous region. Well preserved monument consisting of a raised circular area (diam. 4m N-S; 3.7m E-W; H 0.3m) with sunken depression (diam. 3m) on top of mound, defined by an inner fosse (Wth 1m; ext. D 0.2m) with the slightest traces of an outer bank, only visible in places. Overall diameter 8m N-S. Central depression may be due to collapsed cist in centre of mound.	136m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
RL19	RMP	Recorded Protected Site	TN039-047	Enclosure	596494	661813	KNOCKNAMENA COMMONS	Situated in pasture on E facing slope overlooking mountain valley in upland region, higher ground to W of enclosure. A roughly rectangular-shaped area (int. dims. 19m E-W; 20m N-S) enclosed by an earthen bank (Top Wth 1m; base Wth 2m; int. H 0.1m; ext. H 0.3m) with slight traces of an outer fosse, no entrance feature visible. Quarry in NE quadrant of enclosure. Possible linear field boundaries intersect enclosure along its S side. Possible summer grazing enclosure or booley site for upland grazing during the summer months.	180m to the S	None	Avoidance
RL20	RMP	Recorded Protected Site	TN039-046	Ring Barrow	596551	660533	KNOCKNAMENA COMMONS	Situated on top of high ground in upland region with good panoramic views in all directions. Much degraded monument consisting of a barely visible circular mound (diam. 8m N-S) enclosed by an inner fosse (Wth 2m; ext. D 0.2m) and slight traces of an outer bank (Wth 1m). A field boundary bisected the monument on a N-S axis. This field boundary has since been levelled. Monument is barely visible in the winter months and is probably not visible during the summer months.	136m to the E	None	Avoidance
RL21	RMP	Recorded Protected Site	TN039-038001	Ring Barrow	596015	659170	SHEVERY	Situated on a break in an E-facing slope in upland terrain, under pasture. Extensive views in all directions except upslope to SW. A circular area (diam. 11.5m N-S; 11.4m E-W) consisting of a central mound (diam. 4.6m N-S; 4.7m E-W; H 0.23m) enclosed by a water-logged fosse (Wth 1.6m; D 0.26m) and well-preserved outer bank (Wth 1.9m; H 0.3m), partially denuded in the SE quadrant. There are three stones embedded in the N half of the central mound which appear to be set on edge, possibly indicating the presence of a cist (TN039-038002).	239m to the NE	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
RL22	RMP	Recorded Protected Site	TN039-038002	Cist	595551	659023	SHEVERY	A circular ring-barrow (TN039-038001) consisting of a central mound enclosed by a water-logged fosse and well-preserved outer bank, partially denuded in the SE quadrant. There are three stones embedded in the N half of the central mound which appear to be set on edge, possibly indicating the presence of a cist.	239m to the NE	None	Avoidance
RL22	RMP	Recorded Protected Site	TN039-028	Possible Field System	596551	660533	GRANIERA	Possible field system identified on GSI aerial photograph (April 1974, R.278/277). Old field drains situated on SE facing slope. Drain 1-1.6m wide but quite shallow. Modern, deep field drain further upslope. Not an ancient field system. Narrow trackway runs along side of hill, built into the slope. It is 1.8m wide and 0.6m above lower hill slope and below the upper hill slope.	328m to the SE	None	Avoidance
RL23	RMP	Recorded Protected Site	TN039-018	Megalithic Tomb - Unclassified	597461	662172	GRANIERA	Situated on an E-facing slope. An orthostat 1.2m high and aligned NE-SW, stands here. Another stone, probably but not certainly in situ, leans against its more southerly face. There are traces of a mound around the stones. The two stones might be the remnants of a megalithic tomb. (De Valera and Ó Nualláin 1982, 99, No.11)	169m to the S	None	Avoidance
RU1	25 Inch Ordnance Survey		NA	House	595052	658833	GRANIERA	A house is shown at this location on the 25 Inch edition of the historic OS maps.	468m to the SE	None	Avoidance

A16.1.2.2 Cultural Heritage Sites within the UWF Grid Connection Study Area

Table 2: Cultural Heritage Sites within the UWF Grid Connection Study Area

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL1	RMP	Recorded Protected Site	TN031-009----	Bullaun stone	571716	666067	BALLYARD	Situated on a low SE-facing slope of rising ground in an upland area with a nearby stream to the SE and a church (TN031-010001) some 200m to the SW. Although at some distance this is possibly associated with the church site to the SW as there is a holy well called 'St Commaneth's Well' (TN031-010002) close to the church. A large earthfast boulder (dims. 2m x 0.9m x 0.65m) with two deep depressions (dims. 0.35m x 0.17m; 0.38m x 0.10m) and one shallow one on its upper surface.	1610m to the NW	None	Avoidance
GL2	RMP	Recorded Protected Site	TN031-010001-	Church	571590	665889	BALLYARD	Situated at the base of a W-facing slope with a stream immediately to the S, a holy well (TN031-010002-) to the SE and a bullaun stone (TN031-009----) to the NE. Present remains consist of a low rise of ground where the church was located in the centre of a graveyard (TN031-010003-) enclosed by a stone wall. Several architectural fragments are located in the SW sector of the graveyard and others are reused as grave surrounds. Berry (1904, 99-110) described the church as surviving to foundation level only measuring internally 60ft x 26ft (18m x 8.7m) with architectural fragments of a late medieval date scattered around the graveyard. An octagonal-shaped limestone stoup which rested on a four-clustered column is now located in the grounds of Newport RC church.	1510 m to the NW	None	Avoidance
GL3	RMP	Recorded Protected Site	TN031-010002-	Ritual site - holy well	571630	665877	BALLYARD	Situated at the base of a W-facing slope of rising ground with a church and graveyard (TN031-010001-) to the NW. A disused holy well originally enclosed by a drystone wall and now enclosed by a modern concrete surround with broken statues on a shelf to the N of the well.	1510 m to the NW	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL4	RMP	Recorded Protected Site	TN031-010003-	Graveyard	571580	665884	BALLYARD	Situated at the base of a W-facing slope with a stream immediately to the S, a holy well (TN031-010002-) to the SE and a bullaun stone (TN031-009----) to the NE. Present remains consist of a low rise of ground where the church (TN031-010001-) was located in the centre of a graveyard enclosed by a stone wall. Several architectural fragments are located in the SW sector of the graveyard and others are reused as grave surrounds. Berry (1904, 99-110) described the church as surviving to foundation level only measuring internally 60ft x 26ft (18m x 8.7m) with architectural fragments of a late medieval date scattered around the graveyard. An octagonal-shaped limestone stoup or font (TN031-010004-/TN037-046----) which rested on a four-clustered column is now located in the grounds of Newport RC church.	1480m to the NW	None	Avoidance
GL5	RMP	Recorded Protected Site	TN031-010004-	Font	571580	665888	BALLYARD	An octagonal-shaped limestone stoup or font (TN037-046----) which rested on a four-clustered column is now located in the grounds of Newport RC church, originally came from the church (TN031-010001-) and graveyard (TN031-010003-) at Ballyard.	1480m to the NW	None	Avoidance
GL6	RMP	Recorded Protected Site	TN031-011----	Ringfort - rath	571784	665776	BALLYARD	Situated on the N-facing slope of an E-W ridge in an upland area overlooking a church (TN031-010) to NW. The present remains consist of a semicircular area (diam. 33m E-W) enclosed by an earth and stone bank (Wth 1.45m; int. H 0.4m ; ext. H 1.7m) visible from S through W through N to E, elsewhere destroyed with external fosse (Wth 3m; D 0.7m) visible at W only. Possible entrance gap at NE. Field fence intersects site at SE on a NE-SW axis.	1330m to the NW	None	Avoidance
GL7	RMP	Recorded Protected Site	TN031-048001-	Castle - tower house	571035	665428	CRAGG	Situated on rock outcrop in an upland area with extensive views. Described in the Civil Survey (1654-6) as 'the walls of a castle and a Barbicon' (Simington 1934, vol. 2, 179). John Ryan is listed as proprietor in 1640 (ibid.). Present remains consist of a rectangular	1530 to the NW	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								tower house (ext. dims. 8.7m N-S; 6.6m E-W; wall T 1.7m) three storeys high built with roughly coursed sandstone rubble with a high pronounced base-batter. There is good evidence of lime plaster on the internal faces of the walls of the tower house chambers. The external face of the S wall is destroyed and originally contained a round-arched rebated limestone doorway of which only one jambstone survives on the W side with evidence of a yett-hole. The main doorway led into a lobby protected by an overhead murder-hole. Access to spiral stairs (now destroyed) in the SW angle was via this lobby, with the main ground-floor barrel-vaulted chamber being reached via a round-arched limestone doorway in the N wall of the lobby. This chamber has a single-light flat-headed window set into the centre of the W, N and E walls with a brick fireplace inserted into the N end of the W wall. The first floor, which was accessed through a doorway in the centre of the S wall, had a wooden ceiling carried in the thickness of the wall. This floor was lit by single-light flat-headed windows set into the centre of the W, N and E walls. The second floor has a barrel-vaulted ceiling and is accessed from a round-arched limestone doorway in the centre of the S wall. In the NW angle there is a flat-headed doorway, now inaccessible, which probably led to a garderobe. Nineteenth-century outhouses now obscure a possible bawn area (TN031-048002-) located to the N and W of the tower.			
GL8	RMP	Recorded Protected Site	TN031-048002-	Bawn	571014	665445	CRAGG	Situated on rock outcrop in an upland area with extensive views. Described in the Civil Survey (1654-6) as 'the walls of a castle and a Barbicon' (Simington 1934, vol. 2, 179). John Ryan is listed as proprietor in 1640 (ibid.). Present remains consist of a rectangular tower house (TN031-048001) three storeys high built with roughly coursed sandstone rubble with a high pronounced base-batter.	1510 to the NW	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								Nineteenth-century outhouses now obscure a possible bawn area (TN031-048002) located to the N and W of the tower.			
GL9	RMP	Recorded Protected Site	TN031-061----	Ringfort - rath	574186	663943	OAKHAMPTON	Situated on a rise of ground in an upland area in the front garden of Oakhampton House with a nearby cliff-edge fort (TN031-062) to the E. A raised circular platform (diam. 42m N-S) defined by a scarp (H 2-3m) with traces of a shallow external fosse best visible at S and a possible causewayed entrance at SE. A possible ringfort of platform type reused as a landscape feature. A cobblestone surface is visible underneath a yew tree in the S sector of the interior.	1310m to the E	None	Avoidance
GL 10	RMP	Recorded Protected Site	TN031-072----	Ritual site - holy well	573184	663369	FOILDARRIG	Situated in a slight depression in undulating countryside with the nearby Mulkear River to the S. A disused holy well consisting of a natural spring (dims. 0.9m x 0.5m) with water flowing S towards the nearby river. According to a local landowner the well was known as St Bridget's Well (FitzPatrick 1985b, 160).	500m to the E	None	Avoidance
GL 11	RMP	Recorded Protected Site	TN031-070002-	Children's burial ground	572906	663612	FOILDARRIG	Situated on an E-facing slope in an upland area with a bowl-barrow (TN031-071) to the SW. Described in the OS Namebooks (1840) as a place for 'still born infants or children dying without baptism'. No visible remains of any children's burial ground in the vicinity of the church site (TN031-070001).	190m to the E	None	Avoidance
GL 12	RMP	Recorded Protected Site	TN031-070001-	Church	572905	663603	FOILDARRIG	This church site was located on an E-facing slope of rising ground overlooking a river with a nearby bowl-barrow (TN031-071) to the SW. The OS Letters describe the site as consisting of the wall-footings of a church which measures 5.7m N-S by 12m approx. E-W with a wall thickness of 1m (O'Flanagan 1930, vol. 2, 7). Described in the OS Namebooks (1840) as a children's burial ground (TN031-070002). No visible remains at ground level.	180m to the E	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL 13	RMP	Recorded Protected Site	TN031-071----	Barrow - bowl-barrow	572831	663577	FOILDARRIG	Situated on flat, poorly drained land in an upland area with church site (TN031-070001) to NE. A poorly preserved round-topped mound (diam. 23m N-S; H 1.2m) enclosed by a wide, flat-bottomed fosse (Wth 7.5m; ext. D 0.4m) which was waterlogged at time of visit.	125m to the E	None	Avoidance
GL 14	RMP	Recorded Protected Site	TN031-073----	Earthwork	572776	663172	CLONBEALY	Situated on the W face of a low N-S ridge overlooking the Mulkear River to the W. Present remains consist of a roughly circular area covered in dense overgrowth with no evidence of an enclosing element. Rock outcrop protrudes from the surface of the interior. Of doubtful antiquity; dense cover of vegetation makes detailed examination impossible.	165m to the E	None	Avoidance
GL 15	RMP	Recorded Protected Site	TN037-046----	Font (present location)	572386	662282	NEWPORT	An octagonal-shaped limestone stoup or font (TN037-046) which rested on a four-clustered column is now located in the grounds of Newport RC church, originally came from the church (TN031-010001) and graveyard (TN031-010003) at Ballyard.	70m to the N	None	Avoidance
GL 16	RMP	Recorded Protected Site	TN037-001----	Bridge	572512	662298	NEWPORT,TULLOW (Kilvellane Par.)	Modern bridge traverses Mulkear river replacing 19th century stone bridge the arches of which were supported on large columns of which only one survives. Monitoring (Licence No. 02E0816) was undertaken of all groundworks on a site to the east of the town of Newport. A possible bridge, SMR TN037-001, and an enclosure, SMR TN037-004, were close to the development. The site showed evidence of agricultural practices such as ploughing and reclamation, but nothing of archaeological significance was uncovered.	5m to the N (Adjacent to Bridge)	None	Avoidance
GL 17	RMP	Recorded Protected Site	TN037-003----	Water mill - unclassified	572256	661880	TULLOW (Kilvellane Par.)	Situated on the E bank of the Mulkear River. Depicted on the 1st ed. OS 6-inch map as 'Old Mill' and described in the Civil Survey of 1654-6 as 'the ruins of a water mill'(Simington 1934, vol. 2, 189). No visible remains.	484m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL 18	RMP	Recorded Protected Site	TN037-005----	Ringfort - rath	573393	662000	DERRYLEIGH	Situated on the E face of a N-S ridge in undulating countryside. Depicted as a circular enclosure on the latest ed. OS 6-inch map between two roads which intersect the site, one at N on an E-W axis and one at S on a NW-SE axis. Not visible at ground level.	8m to the N	None	Avoidance
GL 19	RMP	Recorded Protected Site	TN037-009----	Castle - unclassified	573874	661494	DERRYLEIGH	Situated on a S-facing slope of rising ground in an upland area. Described in the Civil Survey (1654-6) as the 'ruines of a Castle and Barbicon, a Courte leete & Courte Barron to be held by the sd. William oge Ryan his heires or Assignes belongeth to the sd. lands by Grant as wee are informed. The sd. lands are intermixt wth. wood & ould oake trees & now totally waste' (Simington 1934, vol. 2, 191). According to the OS Name Books (1840) the castle was destroyed in 1839. The Ordnance Survey field name books for the parish of Killenaule recorded that 'until the year 1839, part of this old castle was standing. Mr Hanrahan razed it to the ground. Nothing remains of it now but a bank of rubbish' (SMR File). No visible remains at ground level.	82m to the N	None	Avoidance
GL 20	RMP	Recorded Protected Site	TN037-023----	House - indeterminate date	574443	660865	DERRYLEIGH	Situated on a low hillock on poorly drained land in upland area. The poorly preserved foundations of a small square-shaped building (int. dims. 5.2m NE-SW x 5.6m NW-SE; wall T 1m) the SE wall of which is totally destroyed, with the remaining walls surviving to a maximum height of 0.7m. A possible enclosing bank is visible to the N of house only, where it survives as a scarp. The walls are built with roughly coursed rubble with a rounded corner at N and a possible square corner at W. These are the possible foundations of a stronghouse with associated enclosure.	405m to the S	None	Avoidance
GL 21	RMP	Recorded Protected Site	TN037-044----	Barrow - ring-barrow	574501	661111	KILNACAPPAGH	Situated on top of a low hillock on poorly drained land in an upland area. A low circular mound (diam. 4m; H 0.2m) enclosed by a fosse (Wth 1m; ext. D 0.2m) with slight traces of an outer bank.	174m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL 22	RMP	Recorded Protected Site	TN037-037----	Redundant record	574753	661420	KILNACAPPAGH	No surface remains of any site of archaeological significance in area marked on OS 6-inch map. Site identified from GSI aerial photograph (R. 285/6) taken in 1974.	154m to the N	None	Avoidance
GL 23	RMP	Recorded Protected Site	TN037-022----	Enclosure	574996	661213	KILNACAPPAGH	No surface remains visible, site depicted as a semi-circular enclosure on 1st ed. OS 6-inch map, doubtful antiquity.	180m to the N	None	Avoidance
GL 24	RMP	Recorded Protected Site	TN037-018----	Ringfort - cashel	575147	661336	KILNACAPPAGH	Situated on high ground in a mountainous area with a nearby cashel (TN037-019) to the NE. The barely visible outline of a heather-covered cashel wall (T 1.3m) enclosing a circular area (diam. 19m E-W) with no evidence of an entrance feature. Detailed examination of the site was impossible due to a dense cover of heather.	360m to the N	None	Avoidance
GL 25	RMP	Recorded Protected Site	TN037-019----	Ringfort - cashel	575229	661381	CARROWKEALE (Kilvellane Par.)	Situated on high ground with extensive views and a nearby cashel (TN037-018) to the SW. A circular area (diam. 22.5m NW-SE) enclosed by a well-preserved drystone wall (T 2m; H 1.5m) with no entrance feature visible. Field walls intersect the site at NW and E. A millstone roughout lies nearby to the SE.	450m to the N	None	Avoidance
GL 26	RMP	Recorded Protected Site	TN037-024----	Ringfort - cashel	575012	660732	DERRYLEIGH,SCRAGGEEN	Situated on a N-facing slope in an upland area. A circular area (diam. 22m N-S) enclosed by a well-preserved drystone wall (T 1.2m; H 2m) with possible entrance gap (Wth 1.5m) at E. A townland boundary intersects the enclosing wall at W on a NE-SW axis.	160m to the S	None	Avoidance
GL 27	RMP	Recorded Protected Site	TN037-030----	Ringfort - cashel	575197	660968	KILNACAPPAGH	Situated on a hillock in an area of rock outcrop in a mountainous region. A circular area (diam. 31m E-W) originally enclosed by two drystone walls of which only the wall-footings survive with intervening fosse (Wth 2.5m; D 0.6m) and causewayed entrance (Wth 4m) at E. The inner bank (Wth 1.5m; ext. H 1m; int. H 0.5m) is mainly reduced to a scarp while the outer bank (Wth 1.5m; ext. H	125m to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								0.6m) is best visible from E to S. A field fence intersects the fosse at W on a N-S axis.			
GL 28	RMP	Recorded Protected Site	TN037-031----	Enclosure	575464	660669	SCRAGGEEN	Situated on the NE face of a N-S ridge in an upland area. A circular area (diam. N-S 25m) enclosed by an earth and stone bank (Wth 2m; int. H 0.3m; ext. H 1.5m) and an outer fosse (Wth 3m; D 0.7m) with no entrance feature visible. Located in centre of nineteenth-century forest plantation and possibly contemporary with the plantation. A possible landscape feature.	40 to the S	None	Avoidance
GL 29	RMP	Recorded Protected Site	TN037-039001-	Redundant record	575646	660763	DERRYGAREEN	Situated on S facing slope of rising ground in mountainous area. Pennanular enclosure defined by a low dry stone wall as indicated on OS 6-inch map, enclosing element visible from S through W to N with no remains visible elsewhere. Probable 19th century field fence as indciated on OS 6-inch map.	150m to the N	None	Avoidance
GL 30	RMP	Recorded Protected Site	TN037-039002-	Redundant record	575666	660773	DERRYGAREEN	This is a 19th century field wall adjoining onto a larger 19th century field wall in mountainous region.	180m to the N	None	Avoidance
GL 31	RMP	Recorded Protected Site	TN037-032001-	Ringfort - rath	575675	660889	DERRYGAREEN	Situated on a SW slope of rising ground in a mountainous area. A circular area (diam. 25m N-S) enclosed by a well-preserved flat-topped earth and stone bank (Wth 1.5-2m; int. H 0.5-1m; ext. H 2.5m), intervening fosse and outer bank (Wth 1-1.5m; H 0.5m), with entrance gap (Wth 1.2m) at SE. There is a small portable bullaun stone (TN037-032002) in the N sector of the ringfort.	250m to the N	None	Avoidance
GL 32	RMP	Recorded Protected Site	TN037-032002-	Bullaun stone	575680	660897	DERRYGAREEN	A small portable bullaun stone (diam. 0.24m; D 0.05m) situated in the N sector of a ringfort (TN037-032001) in an area that appears to have been quarried.	260m to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL 33	RMP	Recorded Protected Site	TN037-033----	Fulachtfia	576426	660023	KNOCKANCULLENAGH	Situated on a S-facing slope of poorly drained rising ground in an upland area. A well- preserved horseshoe-shaped mound of burnt material (H 1m; dims. 14m N-S; 13m E-W); open (Wth 1.5m; L 4m; D 1m) to ENE.	130m to the N	None	Avoidance
GL 34	RMP	Recorded Protected Site	TN038-020----	Mine - copper	578805	660496	LACKAMORE (Kilvellane Par.)	Situated on a S-facing slope of rising ground in an upland region overlooking the Clare River valley. According to Kinahen (1886) 'ancient tools were found in the “old mens'” workings' at this mine. These artefacts were probably found when the mine was exploited between 1810 and 1859 (pers. comm. Dr William O'Brien; Cowman 1992, 109-12). Several shafts have collapsed leaving large open pits with evidence of spoil heaps all over the area containing copper ore. There is no evidence for prehistoric mining visible in the area although the site is heavily overgrown making detailed examination of the exposed cliff faces impossible.	40m to the S	None	Avoidance
GL 35	RMP	Recorded Protected Site	TN038-006----	Megalithic tomb - wedge tomb	583583	659745	REARDNOGY MORE	This monument, removed in 1956, stood close to the foot of the southern slope of Barnarhu Hill. A plan of the tomb (Crawford 1910, 44, 'Baurnadomeeny West') shows the remains of a gallery, open at both ends, aligned W-E, measuring approximately 2.7m long and 1m wide. Each side of the gallery consisted of two stones set end to end. An outer-wall or doubling of the gallery side consisting of three stones was present on the S side and there was a single stone outside the most westerly sidestone on the N side. (De Valera and Ó Nualláin 1982, 83-4, No.5)	300m to the N	None	Avoidance
GL 36	RMP	Recorded Protected Site	TN038-012----	Pit-burial	584284	659423	REARDNOGY MORE	Situated on an E-facing slope of rising ground overlooking a nearby river to the E in an upland area. Cremated human bones found in a pit (0.65m D; 0.52m W) with flagstone floor and capstone with prostrate pointed stone (1.7m x 0.8m x 0.25m) which may have been erected over the site (Lucas 1961, 89). The second burial was found	80m to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								10m to the W and consisted of the cremated remains of a burial placed in a pit protected by three small slabs with accompanying bronze blade (Waddell 1969, 3-5). No visible remains at ground level.			
GL 37	RMP	Recorded Protected Site	TN039-013----	Redundant record	587493	658373	COONMORE	Small square-shaped field on 2nd (1905) OS ed. and depicted as an irregular field on 1st (1840) ed. It formerly contained an orchard an now has within its boundaries an early twentieth-century house with modern extensions has been built in this field. Non-archaeological.	55m to the W	None	Avoidance
GL 38	RMP	Recorded Protected Site	TN039-012----	Children's burial ground	587489	658441	COONMORE	Situated on level ground at the base of a high natural scarp, overlooking a river valley to the NE. The Clasher River runs c. 2m NE of the site. An irregular, roughly circular enclosure (34.6 N-S; 34m E-W) in a level area between the river and the cliff-edge. The enclosure is defined by a denuded, moss-covered wall of earth and stone construction (Wth 1.3-2.1m; int. H 0.25-1m; ext. H 0.75-1m). There is a heavy growth of scrub in the NW quadrant. The site was described as 'disused keel' or children's burial ground in 1910 (Crawford 1910, 51), however, no grave-markers were apparent. A low linear mound (TN039-012001) in the SW quadrant, running NW-SE (L 6.1m x W 1.3m; H 0.4m), is constructed of earth and stone. It appears to be a section of a low field boundary and is not a megalithic structure.	50m to the W	None	Avoidance
GL 39	RMP	Recorded Protected Site	TN039-012001-	Mound	587493	658456	COONMORE	Situated on level ground at the base of a high natural scarp, overlooking a river valley to the NE. The Clasher River runs c. 2m NE of the site. An irregular, roughly circular enclosure (TN039-012) in a level area between the river and the cliff-edge. The enclosure is defined by a denuded, moss-covered wall of earth and stone construction. There is a heavy growth of scrub in the NW quadrant. The site was described as 'disused keel' or children's burial ground in 1910 (Crawford 1910, 51), however, no grave-markers were	55m to the W	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								apparent. A low linear mound in the SW quadrant, running NW-SE (L 6.1m x W 1.3m; H 0.4m), is constructed of earth and stone. It appears to be a section of a low field boundary and is not a megalithic structure.			
GL 40	RMP	Recorded Protected Site	TN039-024----	Redundant record	588663	658923	FOILDARRAGH	Site identified as possible enclosure from aerial photograph (GSI April 1974, R.362/1). This is a natural, roughly circular knoll at highest point of E-W ridge. Ridge continues E at slightly lower level. Non-archaeological.	230m to the N		RMP - Not on website
GL 41	RMP	Recorded Protected Site	TN039-030----	Ringfort - rath	588773	658513	FOILDARRAGH	Located on the level ground of a river valley with the Aughraria River to the S and the Bilboa River to the N. The site was identified on an aerial photograph (GSIAP, R 362/361). A large roughly circular enclosure (diam. c. 63m N-S; 55m E-W) consisting of a raised interior surrounded by a wide fosse (Wth 4.5-6m) which is evident as lush grass growth. A field boundary which transected the W sector has been removed as have field boundaries to the N. The field has been reclaimed and the site has been levelled. A deep drainage ditch skirts the S limit of the site making the edge difficult to define.	165m to the S		
GL 42	RMP	Recorded Protected Site	TN039-025001-	Enclosure	589493	658773	KILCOMMON (Templebeg Par.)	Situated just below the summit of a hill on a steep SW-facing slope, in pastureland with another possible enclosure site (TN039-025002) c. 20m to the NE. Identified on an aerial photograph taken in April 1974 (GSIAP, R 362/1). Not visible at ground level. A raised curving area roughly in the NW portion of the site may represent the flattened remains of a bank, however, the field is full of slight undulations which may be misleading.	220m to the N	None	Avoidance
GL 43	RMP	Recorded Protected Site	TN039-025002-	Enclosure	589553	658793	KILCOMMON (Templebeg Par.)	Situated near the summit of a gentle W-facing slope, in pasture with another possible enclosure site (TN039-025001) c. 20m to the SW. Identified on an aerial photograph taken in 1974 (GSIAP, R 362/1). Not visible at ground level.	270m to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL 44	RMP	Recorded Protected Site	TN039-026----	Redundant record	589583	658613	KILCOMMON (Templebeg Par.)	Possible enclosure identified on GSI aerial photograph (April 1974, R.362/1). This is natural outcrop forming a rocky, roughly circular knoll in pasture field. Non-antiquity.	140m to the N	None	Avoidance
GL 45	RMP	Recorded Protected Site	TN039-008----	Megalithic tomb - wedge tomb	592512	659913	KNOCKMAROE	Situated close to the foot of the S-facing slope of Knockmaroe Hill. The remains consist of a mound about 9m in diameter and 1m high with a hollow towards its western perimeter where there are three stones. One of these is an orthostat aligned WSW-ENE. This stone, which declines in height from W to E, may have formed part of a chamber side. Resting against the last is a large slab, possibly a displaced roofstone. A thin slab beneath this may have been detached from its underside. Some stons exposed at the edge of the hollow and at the perimeter of the mouond are of uncertain origin. The scant remains seem to be those of a wedge tomb. (De Valera and Ó Nualláin 1982, 89, No.9)	145m to the N	None	Avoidance
GL 46	RMP	Recorded Protected Site	TN039-050----	Megalithic tomb - unclassified	594849	660334	KNOCKCURRAGHBOLA COMMONS	Situated in upland region, in pasture with good panoramic views in all directions, view of Galtee More to the SW on a clear day. Good views of Wedge tomb (TN039-009) located 670m to N. A roughly rectangular chamber, 1m long by 0.85m wide and 0.3m high at the open SW end formed by four low upright stones with a large capstone (H 0.55m; L 2m; Wth 2m) sitting on top of the side stones. A second capstone may be a displaced roofstone from the SW end of the chamber. Not clear whether this is a megalicthic tomb or not however the arrangement of the capstone sitting on side stones forming a chamber suggests that it is a possible megalithic structure. It also has an impressive siting in the landscape with fine panoramic views of hilltops within this mountain region.	400m to the NE	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL 47	RMP	Recorded Protected Site	TN039-009----	Megalithic tomb - wedge tomb	595031	660986	KNOCKCURRAGHBOLA COMMONS	Situated on a hillock at the NE end of a low ridge. It consists of a long, narrow, partly roofed gallery closed at the SW by a septal-stone. Both sides of the gallery are flanked by outer-walling with the more westerly stone at either side set in advance of the septal-stone. These two stones would have served as the sides of a portico or, alternatively, represent a doubling of the portico sides since removed.The structure is 7m in overall length. The main chamber, open at its more easterly end, is 5.3m long and 1.2m wide at the septal-stone whence it narrows slightly towards the E.Two roofstones cover its forward end. There are five sidestones on the N side and three on the S side. There are six outer-wall stones to the N and four to the S. These are set close to the gallery walls and two of those to the N double as buttress-stones. Beyond the easternmost at the S there is a small stone which may be the butt of a taller one, probably another outer-wall stone. There are traces of a mound around the structure. A large retangular slab lies prostrate at the SW end of the gallery. (De Valera and Ó Nualláin 1982, 90, No.10)	320m to the NE		
GL 48	RMP	Recorded Protected Site	TN039-052----	Stone row	595083	660868	KNOCKCURRAGHBOLA COMMONS	Situated in pasture on SE facing slope of rising fround in upland area with good views of mountian valley to S and E, higher ground to N. Nearby wedge tomb (TN039-009) to NNW and fulacht fiadh (TN 039-051) to SE. Monument consists of two low limestone orthostats, aligned E-W, and 2.48m apart. Both stones are roughly triangular in shape with rectangular sections and the tops of the stones are tapering towards a point. The W stone measures 0.9m H; 0.58m x 0.21m. The E stone measures 0.8m H; 0.60m x 0.30m. Local landowner has no recollection that they were ever erected as scratching posts for livestock.	310m to the NE	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GL 49	RMP	Recorded Protected Site	TN039-051----	Fulachtfia	595166	660772	KNOCKCURRAGHBOLA COMMONS	Situated in wet marshy field in upland area with stream immediately to the S, field has recently been planted with conifer trees. Possible two stone row (TN039-052) and wedge tomb (TN039-009) to NW. During the planting of trees in this field a drainage ditch (Wth 0.70m; D 0.40m) was cut through the middle of the mound on an E-W axis revealing the burnt material of the monument. The monument consists of a large circular mound (diam. 16m N-S ; 20m E-W; H 1m) of burnt material with stream immediately to S of mound. No visible sign of any trough.	200m to the S	None	Avoidance
GR1	First Edition Ordnance Survey	Other Recorded Site		Demesne	571003	665365	CRAGG	The extent of Cragg demesne is shown at this location on the first edition Ordnance Survey (1838).	1570m to the NW	None	Avoidance
GR2	NIAH	Other Recorded Site	22403113	Cragg House	570830	665216	CRAGG	Detached two-pile three-bay single-storey with dormer floor house, built c. 1880, with lower three-bay two-storey block to rear of west end. Gabled porch projection to middle bay and gabled ends with projecting chimneystacks to north elevation. Pitched slate roofs with decorative timber bargeboards with finials and cut limestone chimneystacks with single, paired and tripled round-profile chimneys. Rendered walls. Square-headed openings with single, double and paired one-over-one pane timber sash windows, latter with combined sills. U-plan layout of former stable blocks comprising L-plan single-storey blocks flanking central three-bay two-storey block, latter with integral segmental carriage arches and whole now converted to dwellings, with pitched slate roofs, gabled dormers and snecked dressed limestone walls. enclosing wall with gate piers. Limestone entrance gate piers with stone caps.	1240m to the NW	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GR3	First Edition Ordnance Survey	Other Recorded Site		Demesne	572186	664398	MOUNTPHILIPS	The extent of Mount Philips demesne is shown at this location on the first edition Ordnance Survey (1838).	CWB within Demense	None	Avoidance
GR4	First Edition Ordnance Survey	Other Recorded Site		Demesne	572043	663805	BARNA	The extent of Barna demesne is shown at this location on the first edition Ordnance Survey (1838).	380m to the W	None	Avoidance
GR5	NIAH	Other Recorded Site	22403114	Oakhampton House	574129	663987	OAKHAMPTON	Detached three-bay two-storey house, with projecting gabled central bay, built c. 1820, with earlier lower four-bay two-storey house, c. 1760, at right angles to rear. Pitched slate roofs, reconstructed to front block, with rendered chimneystacks and with stone eaves course to rear block. Exposed rubble sandstone walls with dressed quoins and voussoirs to openings. Square-headed openings with six-over-six pane timber sash windows and glazed timber door. Recent single- and two-storey additions to south gable. Courtyard to rear of house has detached six-bay two-storey stable block with pitched slate roof, exposed sandstone walls and square-headed openings with replacement timber windows and doors. Three-bay single-storey rubble sandstone outbuilding to south-east of house with integral carriage arches. Single-storey stone pavillion with hipped slate roof built c. 2000 connected to north-east of main block with flanking arched stone wall. Rubble limestone boundary walls with square-profile gate piers with plinths and flat caps, topped by carved stone eagles.	1130m to the E	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GR6	First Edition Ordnance Survey	Other Recorded Site		Demesne	574356	663944	OAKHAMPTON	The extent of Oakhampton demesne is shown at this location on the first edition Ordnance Survey (1838).	850m to the E	None	Avoidance
GR7	First Edition Ordnance Survey	Other Recorded Site		Demesne	573226	663147	MACKNEY (Bourke)	The extent of Fort Emil demesne is shown at this location on the first edition Ordnance Survey (1838).	360m to the E	None	Avoidance
GR8	NIAH	Other Recorded Site	22311001	Charter School	572983	662736	CLONBEALY	Detached four-bay two-storey over basement former charter school, built c. 1820, with entrance porch. Later used as barracks and now a house. Pitched slate roof with rendered chimneystacks at gables. Rendered walls with render quoins. Replacement uPVC windows, set in square-headed openings to ground and first floors and segmental-headed to basement and upper south gable. Porch has gabled roof with gable front and uPVC door approached by flight of curved steps. Rendered gate piers and wrought-iron entrance gate. Remnants of rubble garden walls.	470m to the E	None	Avoidance
GR9	NIAH	Other Recorded Site	22311004	Saint John's Church of Ireland Graveyard	572231	662449	NEWPORT	Freestanding cuboidal limestone mausoleum, built c. 1830, and standing in graveyard of now demolished church. Rubble limestone walls with cut stone coping, dressed stone quoins and with pilasters to front with egg-shaped finials. Square-headed entrance with keystone and with carved stone coat of arms and inscribed plaque, now illegible. Inscribed stone tablet to rear, also illegible. Enclosed by rubble limestone walls and containing stone and cast-iron tombs and memorials.	175m to the E	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GR 10	NIAH	Other Recorded Site	22311 007	Church of the Most Holy Redeemer	572215	662352	NEWPORT	Detached double-height church, built 1933, with tower over north-west corner. Projecting tetrastyle pedimented portico with cross finial and with Corinthian columns set above flight of granite steps. Semi-circular apse to rear, and lower projecting porches to sides. Four-stage square-plan tower with lantern topped with octagonal top with curved copper roof. Copper roof to church set behind parapet. Rendered walls with banded string courses and with render quoins to lower walls. Large round-headed window over entrance doorway flanked by niches with statues. Round-headed openings to first floor, square-headed openings with block-and-start surrounds to ground floor and Venetian windows with render pilasters and keystones to side elevations, all with leaded lights. Round-headed windows to lantern of tower with render pilasters and keystones flanked by pilasters supporting entablature and segmental pediments. Eight-panel vertically-divided timber doors. Retaining interior features. Rendered boundary walls and piers with cast-iron railings to site.	175m to the E	None	Avoidance
GR 11	NIAH	Other Recorded Site	22311 008	School	572262	662382	NEWPORT	Detached five-bay two-storey school, built c. 1880, with three-bay side elevations. Pediment over centre of façade, projecting gable-fronted pedimented porch and projecting two-storey gable-ended rear return. Pitched and flat-roofed extensions to rear. Pitched slate roof with terracotta ridge capping, corbelled parapet to gables and with cross finial to ront and rear gables. Cast-iron rainwater goods. Lined-and-ruled rendered walls with continuous render label mouldings to ground floor. Square-headed six-over-six pane timber sash windows with stone sills and round-headed windows to centre of first floor of façade and to porch, with render hood mouldings and keystones. Timber battened door with fanlight and sidelights with render hood moulding and keystone. Date plaque to pediment.	130m to the E	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								Rendered piers and plinths having wrought-iron railings and gates and gardens with sculpted crucifixion scene to site.			
GR 12	NIAH	Other Recorded Site	22311 012	Saint John's Church	572385	662264	NEWPORT	Detached cruciform-plan former church, built c. 1796,now roofless, with chamfered junction to nave and transepts. Coursed snecked rubble limestone walls to entrance gable topped by dressed stone belfry with cross finial and with rendered rubble limestone walls elsewhere. Dressed stone quoins and copings. Round-headed openings with dressed sandstone voussoirs and brick jambs. Tall window openings to nave partly blocked up. Doorways to front gable and to north walls of transepts. Inscribed foundation stone and holy water fonts set into walls. Set behind rubble limestone boundary wall with cast-iron piers and decorative cast-iron gates.	90m to the S	None	Avoidance
GR 13	NIAH	Other Recorded Site	22311 009	House	572431	662322	NEWPORT	End-of-terrace corner-sited four-bay two-storey house, built c. 1820. Pitched slate roof covered with bituminous felt, and brick chimneystacks. Coursed rubble limestone walls, painted to front façade and rendered to rear. Timber sash windows, six-over-six pane to first floor, one-over-one pane to ground and rear, with brick surrounds in square-headed openings to front and rear walls and segmental to gable. Six-panel timber door with overlight. Rendered and painted rubble boundary wall to garden with wrought-iron gate.	15m to the S	None	Avoidance
GR 14	NIAH	Other Recorded Site	22311 010	Bridge	572512	662296	NEWPORT,TULLOW (KILVELLANE PR)	Single-arch concrete road bridge over River Mulcair, built c. 1930. Decorative chevron cut-outs to parapet. String course to bridge and abutments, excised to vehicular sides and with panels to abutments. Remains of earlier bridge at north-west corner of existing bridge has round dressed limestone pier and remains of second, supporting sandstone upper structure with dressed voussoirs, string course, rendered parapets and with arch between standing pier and river bank.	5m to the N (Adjacent to Bridge)	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GR 15	NIAH	Other Recorded Site	22311013	J. Daly - House	572575	662242	TULLOW (KILVELLANE PR)	Terraced three-bay three-storey house, built c. 1870, now in use as public house to ground floor. Pitched artificial slate roof with rendered chimneystacks and replacement uPVC rainwater goods. Rendered walls with moulded string course and render fascia between ground and first floors. One-over-one pane timber sash windows to upper floors, with stone sills and moulded surrounds. Ground floor openings altered and timber doors and windows inserted.	5m to the S	None	Avoidance
GR 16	NIAH	Other Recorded Site	22311018	Newport Courthouse	572478	662160	TULLOW (KILVELLANE PR)	Detached three-bay double-height courthouse, built 1862, and extended 1865 and 1875, with a recessed single-bay single-storey entry annex to north. Hipped slate roofs with rendered chimneystack and cast-iron rainwater goods. Roughly-coursed sandstone rubble walls, originally rendered, with dressed quoins and with voussoirs to openings. Timber casement and replacement uPVC windows with stone sills. Timber battened door with overlight. Stone boundary walls to street with dressed stone gate piers with carved capstones and wrought-iron gate.	115m to the S	None	Avoidance
GR 17	NIAH	Other Recorded Site	22311020	Newport Bridewell	572497	662158	TULLOW (KILVELLANE PR)	Detached bridewell in complex with and at rear of courthouse, built c.1862. Comprising six-bay two-storey building with canted turret-like entrance projection to rear with later octagonal stairs tower attached. Hipped slate roof with rendered chimneystacks and cast-iron rainwater goods. Rubble limestone walls with dressed stone quoins and block-and-start surrounds to openings. Vents to upper rear wall. Replacement timber casement windows to front elevation with block-and-start surrounds, stone sills and wrought-iron bars to ground and to part of first floor. Chamfered round-headed narrow lights to upper rear wall, with dressed stone surrounds and leaded glazing and square-headed timber sliding sash windows to canted	130m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
								projection. Six-panel timber door. Limestone walls enclose two exercise yards to rear.			
GR 18	NIAH	Other Recorded Site	22311006	Handball Alley	572550	662378	NEWPORT	Three handball alleys constructed in mass concrete against the rendered random stone walls of the former two-storey National School. Contains remnants of tiered pre-cast concrete seating and steps to ball alleys, and blocked window openings with stone sills to school building. Date plaque to school in partition wall.	80m to them to the N	None	Avoidance
GR 19	NIAH	Other Recorded Site	22403801	Church of the Visitation	583908	659528	REARDNOGY MORE	Detached gable-fronted cruciform-plan church, built c. 1840, relocated and re-erected c. 1877, restored c. 2000. Composed of three-bay side elevations to nave, with single-bay transepts, and single-bay sacristy to north. Square bell tower to east of entrance with metal clad broached spire above louvres, and pitched roof with pressed metal imitation shingling below.	13m to the N	None	Avoidance
GR 20	NIAH	Other Recorded Site	22403802	Rear Cross National School	583943	659529	REARDNOGY MORE	Detached eight-bay single-storey former national school, built 1881, with central two-bay gabled projecting porch. Pitched slate roof with rendered chimneystack. Roughcast rendered walls with limestone date plaque to porch. Replacement uPVC and some six-over-six pane timber sash windows to front and fixed timber windows to rear. Timber battened doors, with steps and with paned overlight to west door. Green area to front of building.	18m to the N	None	Avoidance
GR 21	NIAH	Other Recorded Site	22403905	Anglesea Bridge	588921	658727	FOILDARRAGH,KILCOMMON (AGLISHCLOGHANE PR)	Double-arch sandstone road bridge, built c.1800, over Aughvaria River, with U-plan cut-waters to south elevation. Dressed stone voussoirs to arches and snecked rubble walls, dressed below springing point, with rubble stone above brought to courses and separated from snecked stone parapet by dressed stone string course dressed stone capping.	UGC Crosses over Bridge	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GR 22	NIAH	Other Recorded Site	TN-59-R-736614	Derryleigh House	573597	661466	DERRYLEIGH	Derryleigh House is present on the first edition Ordnance Survey (1838). Virtually no recognisable features	100m to the S	None	Avoidance
GU 1	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Pond	572066	665098	Mountphilips	Pond shown at this location on the first edition Ordnance Survey (1838)	654m to the NW	None	Avoidance
GU 2	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	House	572066	664351	Mountphilips	A house is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). This appears to have been the main residence for Mount Philips Demesne (Site 13).	259m to the W	None	Avoidance
GU 3	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	Ford	573616	664363	Oakhampton	A ford is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	10m to the S	None	Avoidance
GU 4	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Bridge	571588	664145	Mountphilips	Bridge shown at this location on the first edition Ordnance Survey (1838)	955m to the W	None	Avoidance
GU 5	First Edition Ordnance Survey	Previously Unrecorded Site	NA	House	572645	664133	Coole	House shown at this location on the first edition Ordnance Survey (1838). This appears to have been the main residence for Coole Demesne (Site 19).	358m to the SE	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GU 6	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	Stepping Stones	571531	664002	Barna	Stepping stones is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	1.01km to the SW	None	Avoidance
GU 7	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Demesne	572433	664069	Coole	The extent of Coole demesne is shown at this location on the first edition Ordnance Survey (1838).	215m to the S	None	Avoidance
GU 8	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	House	570985	663961	Killeen	A house is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). It is referred to as "Killeen House" within a cluster of farm buildings.	1.53km to the SW	None	Avoidance
GU 9	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	Lodge	571972	663948	Barna	The Gate Lodge for Barna Demesne is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	699m to the S	None	Avoidance
GU 10	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	House	572027	663855	Barna	A house is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). This appears to have been the main residence for Barna Demesne (Site 24).	740m to the SE	None	Avoidance
GU 11	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Gate Lodge	572654	663889	Foildarrig	Gate Lodge at the entrance to Coole Demesne shown at this location on the first edition Ordnance Survey (1838)	593m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GU 12	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	Stepping Stones	573098	663674	Foildarrig	A stepping stone is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	784m to the S	None	Avoidance
GU 13	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	House	572999	663543	Foildarrig	Brook Lodge is shown at this location on the 25 Inch edition of the Ordnance Survey (1905).	956m to the S	None	Avoidance
GU 14	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Mill	573803	663337	Rockvale	Mill shown at this location on the first edition Ordnance Survey (1838)	1.01km to the S	None	Avoidance
GU 15	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Bridge	573817	663356	Rockvale	Bridge shown at this location on the first edition Ordnance Survey (1838)	1.05km to the S	None	Avoidance
GU 16	First Edition Ordnance Survey	Previously Unrecorded Site	NA	House	573339	662976	Mackney (Bourke)	Fort Emil House shown at this location on the first edition Ordnance Survey (1838)	1.45km to the S	None	Avoidance
GU 17	First Edition Ordnan	Previously Unrecorded Site	NA	School	572961	662690	Clonbealy	School shown at this location on the first edition Ordnance Survey (1838)	1.98km to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
	ce Survey										
GU 18	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Demesne	572647	662556	Clonbealy	The extent of Rose Hill demesne is shown at this location on the first edition Ordnance Survey (1838).	1.73km to the S	None	Avoidance
GU 19	First Edition Ordnance Survey	Previously Unrecorded Site	NA	Demesne	571873	662399	Newport	The extent of Newport demesne is shown at this location on the first edition Ordnance Survey (1838).	1.87km to the S	None	Avoidance
GU 20	25 Inch Ordnance Survey	Previously Unrecorded Site	NA	Smithy	570759	665625	Touknockane	A smithy is shown at this location on the 25 Inch edition of the Ordnance Survey (1905). It is shown as a cluster of farm buildings at a crossroads.	1.99km to the NW	None	Avoidance
GU 21	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Well	573253	662087	Cooldrisla	GU21 is shown at this location on the 25 Inch Ordnance Survey (1905).	19m to the N		
GU 22	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Lime Kiln	574816	661249	Kilnacappagh	GU22 is shown at this location on the 25 Inch Ordnance Survey (1905).	23m to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GU 23	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Lime Kiln	575704	660331	Derrygareen	GU23 is shown at this location on the 25 Inch Ordnance Survey (1905).	18m to the N	None	Avoidance
GU 24	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Well	576890	659921	Knockanculle nagh	GU24 is shown at this location on the 25 Inch Ordnance Survey (1905).	33m to the S	None	Avoidance
GU 25	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Lime Kiln	577120	660084	Knockanculle nagh	GU25 is shown at this location on the 25 Inch Ordnance Survey (1905).	5m to the N	None	Avoidance
GU 26	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Lime Kiln	578476	660430	Lackamore	GU26 is shown at this location on the 25 Inch Ordnance Survey (1905).	55m to the S	None	Avoidance
GU 27	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Lime Kiln	578572	660555	Lackamore	GU27 is shown at this location on the 25 Inch Ordnance Survey (1905).	48m to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
GU 28	First Edition Ordnance Survey (1838).	Previously Unrecorded		Shaft	579160	660684	Tooreenbrien Upper	GU28 is shown at this location on the First Edition Ordnance Survey (1838).	25m to the N	None	Avoidance
GU 29	First Edition Ordnance Survey (1838).	Previously Unrecorded		Lackamore Lodge	579475	660650	Tooreenbrien Upper	GU29 is shown at this location on the First Edition Ordnance Survey (1838).	70m to the S	None	Avoidance
GU 30	First Edition Ordnance Survey (1838).	Previously Unrecorded		Lackamore Post Office	580216	660849	Tooreenbrien Upper	GU30 is shown at this location on the First Edition Ordnance Survey (1838).	10m to the N	None	Avoidance
GU 31	First Edition Ordnance Survey (1838).	Previously Unrecorded		Ford	580514	660745	Tooreenbrien Lower	GU31 is shown at this location on the First Edition Ordnance Survey (1838).	22m to the S	None	Avoidance
GU32	25 Inch Ordnance	Previously Unrecorded		Well	583242	659251	Shanballyedmond	GU32 is shown at this location on the 25 Inch Ordnance Survey (1905).	18m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
	Survey (1905).										
GU 33	First Edition Ordnance Survey (1838).	Previously Unrecorded		Creamery	583653	659488	Reardnogy More	GU33 is shown at this location on the First Edition Ordnance Survey (1838).	10m to the N	None	Avoidance
GU 34	First Edition Ordnance Survey (1838).	Previously Unrecorded		Smithy	583763	659507	Reardnogy More	GU34 is shown at this location on the First Edition Ordnance Survey (1838).	10m to the N	None	Avoidance
GU 35	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Constab Bk	583842	659539	Reardnogy More	GU35 is shown at this location on the 25 Inch Ordnance Survey (1905).	30m to the N	None	Avoidance
GU 36	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Well	583926	659449	Reardnogy More	GU36 is shown at this location on the 25 Inch Ordnance Survey (1905).	48m to the S	None	Avoidance
GU 37	25 Inch Ordnance	Previously Unrecorded		Well	583993	659376	Reardnogy More	GU37 is shown at this location on the 25 Inch Ordnance Survey (1905).	86m to the S	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
	Survey (1905).										
GU 38	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Well	584350	659346	Reardnogy More	GU38 is shown at this location on the 25 Inch Ordnance Survey (1905).	12m to the N	None	Avoidance
GU 39	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Lime Kiln	584931	659178	Baurnadomeeny	GU39 is shown at this location on the 25 Inch Ordnance Survey (1905).	55m to the N	None	Avoidance
GU 40	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Well	584965	659070	Baurnadomeeny	GU40 is shown at this location on the 25 Inch Ordnance Survey (1905).	30m to the South	None	Avoidance
GU 41	First Edition Ordnance Survey (1838).	Previously Unrecorded		Smithy	588705	658706	Foildarragh	GU41 is shown at this location on the First Edition Ordnance Survey (1838).	25m to the N	None	Avoidance
GU 42	First Edition Ordnance	Previously Unrecorded		Kilcommon Creamery	588848	658785	Foildarragh	GU42 is shown at this location on the First Edition Ordnance Survey (1838).	40m to the N	None	Avoidance

Site No.	Source	Receptor Type	Ref No.	Class	Easting	Northing	Townland	Description	Distance to Construction Works Area Boundary	Impact	Recomm-endation
	Survey (1838).										
GU 43	First Edition Ordnance Survey (1838).	Previously Unrecorded		Constab Bk	588986	658666	Kilcommon	GU43 is shown at this location on the First Edition Ordnance Survey (1838).	25m to the S	None	Avoidance
GU 44	25 Inch Ordnance Survey (1905).	Previously Unrecorded		Well	590251	658573	Loughbrack	GU44 is shown at this location on the 25 Inch Ordnance Survey (1905).	13m to the N	None	Avoidance

Appendix to Chapter 16: Cultural Heritage

Appendix 16.3: Test Excavation Report - Knockmaroe

The data and descriptions in this appendix have informed Chapter 16: Cultural Heritage of the EIA Report. The information presented in this Appendix 16.3 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 16.3 Section	Section Heading	Relevant Individual Project Element
A-16.3	Test Excavation Report - Knockmaroe	UWF Related Works

APPENDIX 16.3
TEST EXCAVATION REPORT – KNOCKCURRAGHBOLA COMMONS

Archaeological Assessment Report:

UWF Related Works,
Test Excavations at Knockcurraghbola Commons, Co Tipperary.

KILKENNY ARCHAEOLOGY
Archaeological Consultants

Client:
Ecopower Developments, Zetec House, Purcellsinch Business Park, Dublin Road, Kilkenny

Excavation Licence Reference:
17E0173

Licensed archaeologist:
Barry Fitzgibbon MA MIAI

Report authors:
Barry Fitzgibbon MA MIAI

06th July 2017

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Document title	UWF Related Works, Test Excavations at Knockcurraghbola Commons, Co Tipperary.
Client	Ecopower Developments, Zetec House, Purcellsinch Business Park, Dublin Road, Kilkenny
Document type	Archaeological Assessment
Excavation licence	17E0173
Planning reference	Pre planning
Licensed archaeologist	Barry Fitzgibbon MA MIAI
Contributing authors	Barry Fitzgibbon MA MIAI
Issue number/date	06th July 2017

All recommendations and contents of this report are subject to the approval of the National Monuments Service of the Department of Arts, Heritage and Gaeltacht and the National Museum of Ireland.

BARRY FITZGIBBON MA MIAI
Licenced archaeologist
06th July 2017

Contents

16.3.1 INTRODUCTION

This report was commissioned by Ecopower Developments as part of a planning application to Tipperary County Council for works relating to UWF Related Works. The entirety of the Related Works is to be the subject of a comprehensive Cultural Heritage Assessment and this report will form part of that assessment.

The application will include underground Internal Windfarm Cables, Realigned Windfarm Roads at three locations, Haul Route Works comprising temporary widening of the public road in a number of locations and an 18m high wooden Telecom Relay Pole.

The Internal Windfarm Cables will involve the laying underground of electrical cables requiring a trench between the already Consented UWF Turbines and the already Consented UWF Substation. These trenches will be fully excavated. Initial scoping of the route (Kilkenny Archaeology March 2017) identified that a section of the Internal Windfarm Cable route will pass within the Zone of Notification for TN039-052 *Stone Row (RL6 Revised EIAR report reference number for UWF Related Works)*, at Knockcurraghbola Commons, Co Tipperary. This report presents the results of licenced test excavations along the proposed line at RMP TN039-052 (RL6).

16.3.1.1 Assessment Methodology

Archaeological test excavations were conducted as per a method statement agreed with the National Monuments Service and licenced under the National Monuments Acts 1930-2004. The material contained within the document is based on the *Guidelines on the Information to be Contained in Environmental Impact Statements* (E.P.A. 2002, 2003), and conforms to the methodologies recommended in 'Framework and Principles for the Protection of the Archaeological Heritage' issued by the Dept. of Arts, Heritage, Gaeltacht and the Islands (1999). Section 3.6.6 of 'Framework and Principles for the Protection of the Archaeological Heritage' notes '*Environmental impact assessment should unless there are substantial grounds to show that it is not necessary, involve the carrying out of archaeological assessment including, where appropriate, test excavation'* (Dept. of Arts, Heritage Gaeltacht and the Islands 1999). All recommendations conform to the legislative frameworks of the *National Monuments Acts 1930-1994*, *Heritage Act 2000* and the *European Convention on the Protection of the Archaeological Heritage (ratified by Ireland 1997)*. The National Roads Authority's (NRA) G*uidelines for the Assessment of Archaeological Heritage Impacts of*

National Road Schemes (2005) was also consulted because of its in-depth consideration of archaeological heritage as part of Environmental Impact Assessments (EIA).

16.3.1.2 Assessment Components

This assessment comprises a desk-based study and archaeological test excavations within the study area.

16.3.1.2.1 Desk-based study

The desk-top study employs a range of archival and documentary sources to provide an historical and archaeological account of the development area and its wider context. The sources utilised are listed in the bibliography below.

16.3.1.2.2 Archaeological test excavation

Archaeological test excavation is defined as: 'that form of archaeological excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development' (Framework and Principles for the Protection of the Archaeological Heritage 1999, 27).

The archaeological testing methodology for the project was agreed with the Archaeological Licensing Section of the National Monuments Service and the National Museum of Ireland via a method statement. Testing consisted of the mechanical excavation of two test trenches under excavation licence reference 17E0173. The primary aim of the testing was to discover if any subsurface archaeological remains existed within the Related Works area which would be negatively impacted upon by the excavations for the cable route.

16.3.2 THE DEVELOPMENT

16.3.2.1 Development Proposal

As part of a planning application for additional works related to the Consented Upperchurch Windfarm at Upperchurch, Co. Tipperary, permission is to be sought for the laying, underground Internal Windfarm Cables within the development area. This will require trenches from the already Consented Turbine locations to the already Consented Substation location, to be fully excavated. The cable ducts and backfill material are then to be placed in the cable trench.

16.3.2.2 Reason for archaeological intervention

A preliminary scoping report by Kilkenny Archaeology noted that a section of the Internal Windfarm Cables passes through the Zone of Notification for RMP TN039-052 *Stone Row (RL6).* In light of this, it was recommended that this portion of the proposed development be archaeologically tested in advance of the planning application.

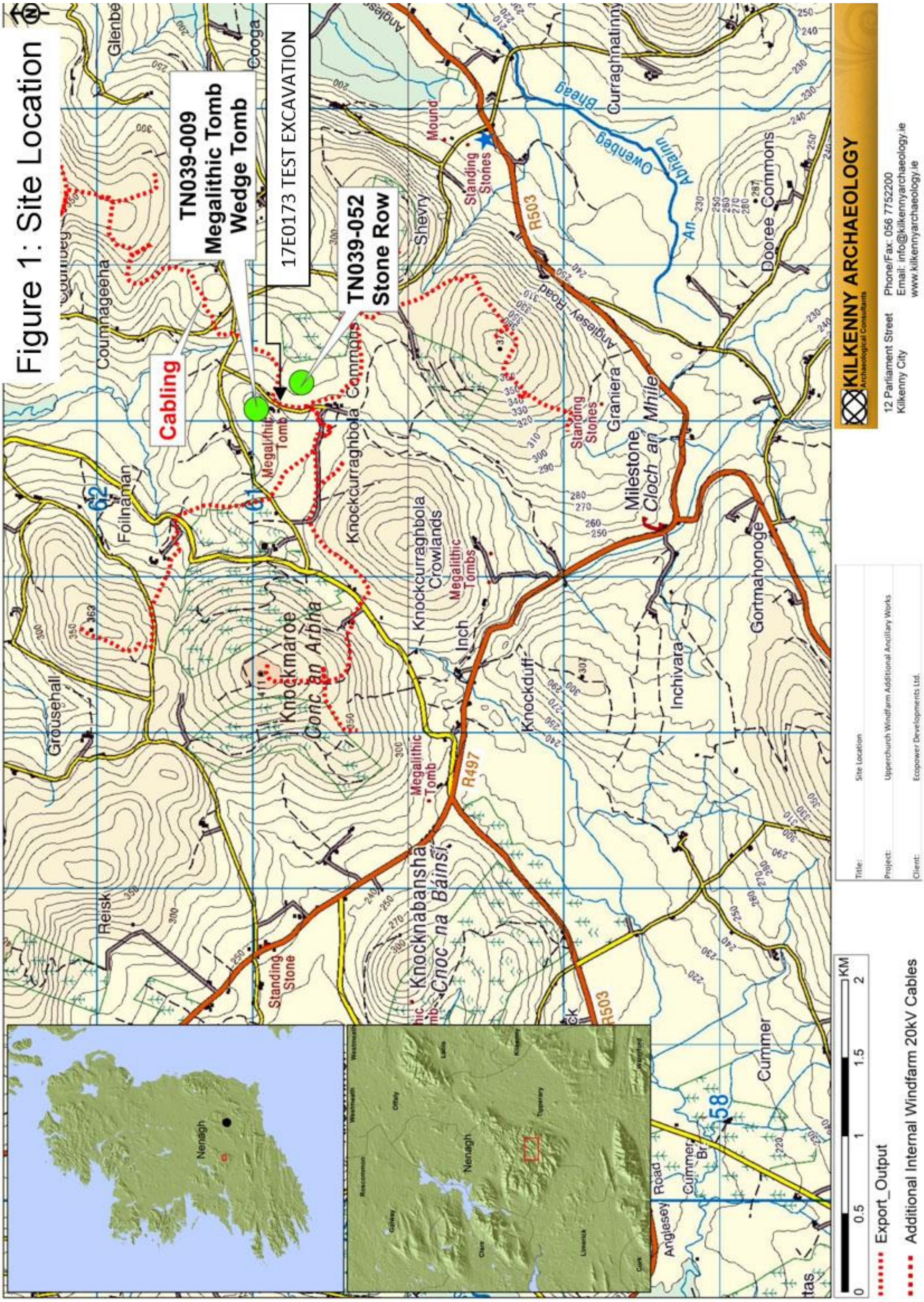
Figure 1: Site Location
TN039-009
Megalithic Tomb
Wedge Tomb
17E0173 TEST EXCAVATION
TN039-052
Stone Row
Cabling
Knockcurraghbola Commons
Knockcurraghbola Crowlands
Knockmaroe
Knocknabansha
Knockduff
R503
R497
KILKENNY ARCHAEOLOGY
12 Parliament Street
Kilkenny City
Phone/Fax: 056 7752200
Email: info@kilkennyarchaeology.ie
www.kilkennyarchaeology.ie
Export_Output
Additional Internal Windfarm 20kV Cables

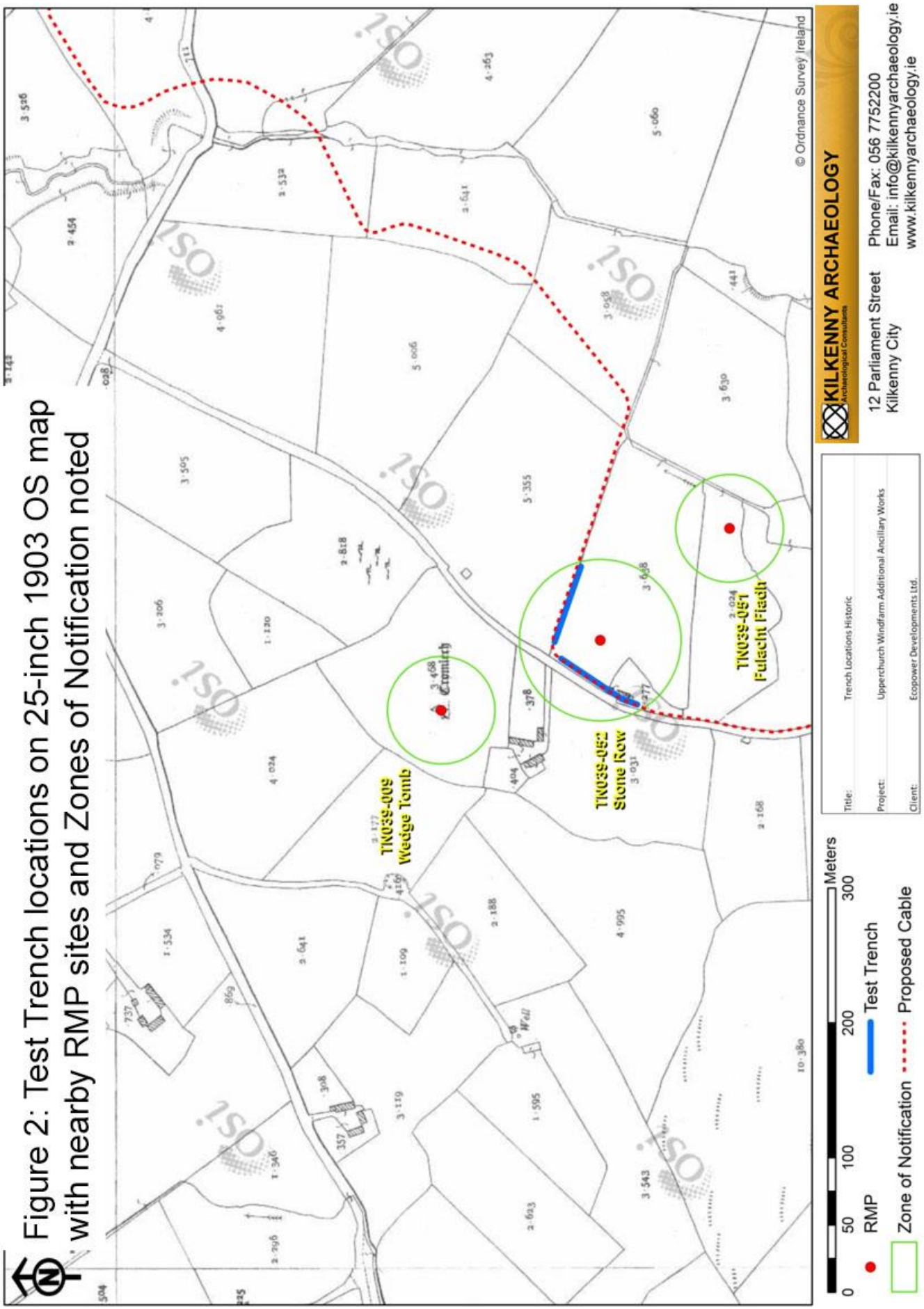
Figure 2: Test Trench locations on 25-inch 1903 OS map with nearby RMP sites and Zones of Notification noted
© Ordnance Survey Ireland
TN038-009 Wedge Tomb
TN038-052 Stone Row
TN038-051 Fulacht Fiach
KILKENNY ARCHAEOLOGY
Archaeological Consultants
12 Parliament Street
Kilkenny City
Phone/Fax: 056 7752200
Email: info@kilkennyarchaeology.ie
www.kilkennyarchaeology.ie
Title: Trench Locations Historic
Project: Upperchurch Windfarm Additional Ancillary Works
Client: Ecopower Developments Ltd.
Meters
0 50 100 200 300
RMP
Test Trench
Zone of Notification
Proposed Cable

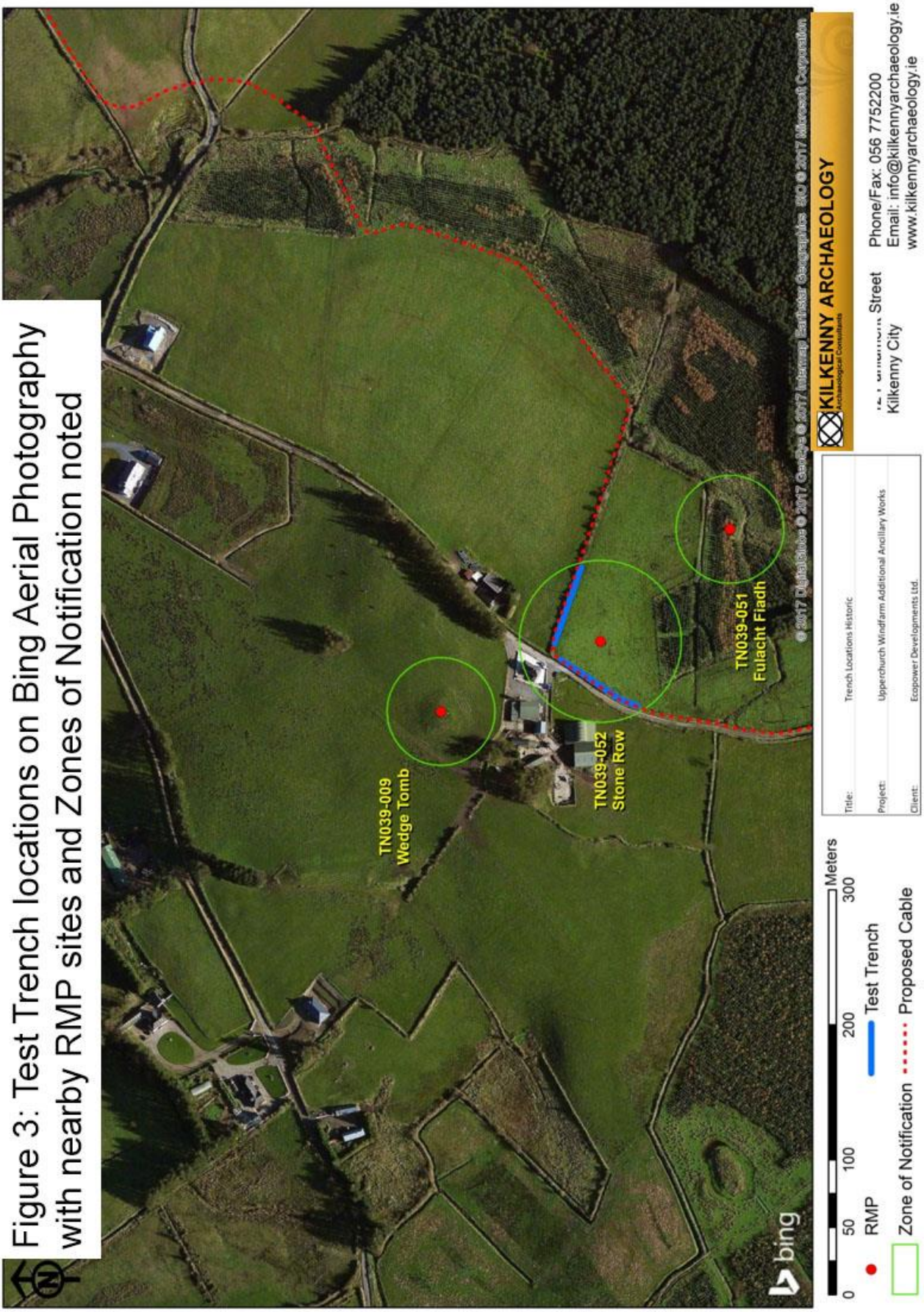

Figure 3: Test Trench locations on Bing Aerial Photography with nearby RMP sites and Zones of Notification noted

16.3.3 ARCHAEOLOGICAL BACKGROUND

The mountain ranges of northern Tipperary, centred around Moherslieve, the Silvermine Mountains and Slievefelim Mountains, is a region with an extremely rich and diverse history of human settlement going back to the Early Neolithic. This is reflected in the archaeological record with more than 300 RMPs in the vicinity, including a wide variety of impressive megalithic tombs. The monuments of Tipperary were surveyed in the early 1980s by the Archaeological Survey of Ireland. A review of prehistoric archaeology in Tipperary undertaken by Richard Raleigh (1985) highlighted the prehistoric richness of this North Tipperary region, while between 1992 and 1995 the North Munster Project of the Discovery Programme sought to understand settlement patterns over a vast 7000km^2 area that centred on the lower Shannon catchment (Grogan 1996).

The entirety of the UWF Grid Connection and UWF Related Works for the Upperchurch Windfarm is to be subject of a comprehensive Cultural Heritage Assessment and this report will form part of the assessment. This report focuses on the archaeological monument in the immediate vicinity of the test excavation area, TN039-052 *Stone Row (RL6)*, at Knockcurraghbola Commons, Co Tipperary (Figure 6).

At this location the Internal Windfarm Cable passes within the Zone of Notification of Recorded Monument TN039-052 *Stone Row (RL6)* (Figure 4, 5). Although a Stone Row is defined as a row of three or more stones erected in a line, this monument only comprises of two stones and as such may have been better described as a *Standing Stone - Pair*. Rows or Pairs are considered to have been aligned on various solar and lunar events and usually date to the Bronze Age (c. 2400-500 BC).

As mentioned above the monument has been described in detail by the RMP (Farrelly and O'Brien 2002). It is situated in a pasture with a moderate southeast facing slope of rising ground in upland area with good views of mountain valleys to south and east, with higher ground to north. The monument consists of two low limestone orthostats, aligned east-west, and 2.48m apart. Both stones are roughly triangular in shape with rectangular sections and the tops of the stones are tapering towards a point. The west stone measures 0.9m high; 0.58m x 0.21m wide. The east stone measures 0.8m high; 0.60m x 0.30m. A fulacht fiadh (TN 039-051) is located c.126m to the southeast and a wedge tomb (TN039-009) is located c.130m to the north-northwest. Both of these monuments also would have had their

origins during the Bronze Age, indicating that location may have held some significance during this period (See Figure 2 and Figure 3).

Figure 1: TN039-052 - Stone Row from south (Revised EIAR Ref number RL6)

Figure 2: TN039-052 - Stone Row from northwest (Revised EIAR Ref number RL6)

16.3.4 ARCHAEOLOGICAL TEST EXCAVATION RESULTS

Test excavations were undertaken by mechanical excavator fitted with a 0.9m wide toothless bucket. The Internal Windfarm Cable trench will be of the same width. Two trenches were excavated along the cable route to the level of the natural glacial substratum or bedrock.

Figure 3: Test excavations underway, taken from west.


Figure 7: Location of test trenches on Bing Aerial Photography 2012
TN039-009 Wedge Tomb
Trench 1
Trench 2
TN039-052 Stone Row
TN039-051 Fulacht Fiadh
bing
0 20 40 80 120 Meters
RMP
Test Trench
Zone of Notification
Proposed Cable
Title: Trench Locations Historic
Project: Upperchurch Windfarm Additional Ancillary Works
Client: Ecopower Developments Ltd.
12 Parliament Street
Kilkenny City
Phone/Fax: 056 7752200
Email: info@kilkennyarchaeology.ie
www.kilkennyarchaeology.ie

Figure 4: Trench 1 from the southeast

Figure 5: Trench 1 from the northeast

Figure 6: Trench 2 from the northeast

Figure 7: Trench 2 from the southwest. Spread of mixed demolition rubble visible in the foreground

Test trench 1 was 71m long x 0.95m wide (Figure 6, 7). The topsoil was 0.15m deep over the glacial subsoil, a bright orange glacial substratum. Patches of bedrock were visible throughout the trench, indicating that this subsoil is quite shallow. Nothing of archaeological interest was noted.

Test trench 2 was 72m long x 0.95m wide (Figure 10, 11). The topsoil was 0.2m deep over the glacial subsoil, where it was present. Otherwise the topsoil directly overlay bedrock. Towards the south of the trench, at the location of the present gate into the field, a spread of darker soil and stone was uncovered (Figure 11). This was most likely associated with the demolished building, shown at this location on the 25 inch map. The land owner confirmed

that this building was knocked within the last 40 years. No structural remains associated with the building appeared to survive. Nothing else of archaeological interest was noted.

16.3.5 ARCHAEOLOGICAL IMPACT STATEMENT

16.3.5.1 Potential impact

Archaeological test excavations adjacent to RMP TN039-052 - *Stone Row* (revised EIAR reference number RL6) uncovered nothing of archaeological potential. The Internal Windfarm Cable trench at this location will therefore have no archaeological impact.

16.3.5.2 Recommendations

It is recommended that all groundworks during the construction of the development should be archaeologically monitored under licence from the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.

16.3.6 BIBLIOGRAPHY

Unpublished Primary Sources Consulted
Sites and Monuments Record (SMR) files held by the Archaeological Survey of Ireland
Topographical files of The National Museum of Ireland

Maps
First edition 1840 Ordnance Survey map sheet
Second edition 1900 Ordnance Survey map sheet
Griffiths's Valuation maps and valuation report
Records of Monuments and Places (RMP) constraints maps

Aerial photographs
2000 Ordnance Survey orthophotography
2005 Ordnance Survey orthophotography
Google Earth
Bing maps aerial photos

Secondary sources:

DoEHLG, 1999, *Framework and Principles for the Protection of the Archaeological Heritage*, Dublin.

EPA, 2002, *Guidelines on the information to be contained in Environmental Impact Statements*, EPA, Dublin.

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Farrelly and O'Brien 2002 Archaeological Inventory of County Tipperary. Volume 1: North Tipperary. The Stationery Office, Dublin.

Grogan, E. 1994. The North Munster Project in Discovery Programme Report 4, p26-72. Royal Irish Academy, Dublin

Raleigh 1985 The Archaeology of prehistoric Tipperary. In Nolan (ed) *Tipperary: History and Society*. Geography Publications, Dublin.

Appendix to Chapter 16: Cultural Heritage

Appendix 16.4: Field Walking Description

The data and descriptions in this appendix have informed Chapter 16: Cultural Heritage of the EIA Report. The information presented in this Appendix 16.4 is outlined below and the relevant element(s) of the Whole UWF Project are also identified.

Appendix 16.3 Section	Section Heading	Relevant Individual Project Element
A-16.4	Field Walking Description	UWF Related Works UWF Grid Connection

16.4 FIELD WALKING DESCRIPTION

A16.4.1 FIELD WALKING DESCRIPTION - UWF RELATED WORKS

INTERNAL WINDFARM CABLES

SW1-SW12 (Figure 1)

These sections of the UWF Related Works occur within the footprint of Upperchurch Windfarm. There will be no additional works in this area beyond those assessed in the 2013 EIS, when this section was previously walked by the author. Nothing of archaeological significance was noted at this time.

SW13 (Figure 2)

Section SW13 of the Internal Windfarm Cable route runs in a general northerly direction for a distance of 37m. It runs along the verge of an open, poorly drained, pasture containing a section of the Upperchurch Windfarm before crossing a narrow farm track. No features of archaeological significance were noted in the area.

SW14 (Figure 2)

Section SW14 of the Internal Windfarm Cable route crosses a narrow farm track, which is defined by low earthen banks and wire and post fencing. No features of archaeological significance were noted in the area.

SW15 (Figure 2)

Section SW15 of the Internal Windfarm Cable route runs in a general northerly direction for a distance of 263m before crossing a low earthen boundary to the north. The boundary acts as a townland boundary between the townlands of Shevry and Knockcurraghbola Commons. The route runs along the western boundary of an undulating pasture. To the immediate west is an area of dense mature cultivated forestry. No features of archaeological significance were noted in the area.

SW16 (Figure 2)

Section SW16 of the Internal Windfarm Cable route runs in an easterly direction, along the line of the Realigned Windfarm Road RWR1, through an area of young cultivated forestry before turning in a northerly direction for a total distance of 270m. No features of archaeological significance were noted in the area.

SW17-SW19 (Figure 2)

These sections of the UWF Related Works occur within the footprint of the Upperchurch Windfarm. There will be no additional works in this area beyond those assessed in the 2013 EIS, when this section was previously walked by the author. Nothing of archaeological significance was noted at this time.

SW20 (Figure 2)

Section SW20 of the Internal Windfarm Cable route runs in a general northerly direction for a distance of 27m along a forestry firebreak before emerging into an open pasture. No features of archaeological significance were noted in the area.

SW21 (Figure 2)
Section SW21 of the Internal Windfarm Cable route runs in a general westerly direction and cuts across the corner of a well-drained open pasture with a moderate north facing slope. The eastern boundary of this pasture acts as the townland boundary between Shevry and Knockcurraghbola Commons. The boundary is a low earthen bank topped with wire and post fencing. No features of archaeological significance were noted in the area.

SW22 (Figure 2)
Section SW22 of the Internal Windfarm Cable route runs in a general westerly direction for a distance of 273m. It crosses a well-drained pasture with a moderate north facing slope. A portion of this section follows the foot print of the permitted windfarm. No features of archaeological significance were noted in the area.

RW1 (Figure 2)
At this point the Internal Windfarm Cable route crosses the public road, L-4139-0, before entering a pasture field to the west. No features of archaeological significance were noted in the area.

SW23 (Figure 2)
Section SW23 of the Internal Windfarm Cable route runs along the footprint of the consented windfarm in an open in a general westerly direction for a distance of 217m before branching to the south, along SW15, and southwest, towards SW24. It crosses a well-drained pasture with a moderate north facing slope. No features of archaeological significance were noted in the area.

SW24 (Figure 2)
Section SW24 of the Internal Windfarm Cable route runs in a general westerly direction for a distance of 90m. It runs through an area of mature cultivated forestry. No features of archaeological significance were noted in the area.

SW25 (Figure 2)
Section SW25 of the Internal Windfarm Cable route runs in a general westerly direction for a distance of 212m. It follows the route of a forestry track through an area of mature cultivated forestry. No features of archaeological significance were noted in the area.

SW26 (Figure 2)
SW26 of the Internal Windfarm Cable route runs in a general northwesterly direction for a distance of 132m. It passes through a poorly drained marshland in a hollow between two hills. The northernmost portion of this section crosses a shallow brook. No features of archaeological significance were noted in the area.

SW27 (Figure 2)
Section SW27 of the Internal Windfarm Cable route runs in a general northwesterly direction for a distance of 44m. It passes through a poorly drained marshland with a gentle southeast facing slope. No features of archaeological significance were noted in the area.

SW28 (Figure 2)
Section SW28 of the Internal Windfarm Cable route runs in a general northerly direction for a distance of 218m. It runs along the eastern side of a complex of modern farm buildings

before turning to the west and crossing a narrow laneway (RW5). The boundaries are low earth and stone banks. No features of archaeological significance were noted in the area.

RW5 (Figure 2)

At this point the Internal Windfarm Cable route crosses the public road, L-61881-0, before entering a pasture field to the west. No features of archaeological significance were noted in the area.

SW29 (Figure 2)

Section SW29 of the Internal Windfarm Cable route runs in a general southerwesterly direction for a distance of 66m. It passed through a well-drained pasture with a moderate east facing slope. No features of archaeological significance were noted in the area.

SW30-SW31 (Figure 2)

These sections of the UWF Related Works occur within the footprint of the Upperchurch Windfarm. There will be no additional works in this area beyond those assessed in the 2013 EIS, when this section was previously walked by the author. Nothing of archaeological significance was noted at this time.

SW32-SW50 (Figure 3)

These sections of the UWF Related Works occur within the footprint of the Upperchurch Windfarm. There will be no additional works in this area beyond those assessed in the 2013 EIS, when this section was previously walked by the author. Nothing of archaeological significance was noted at this time.

SW51 (Figure 4)

Section SW51 of the Internal Windfarm Cable route runs in a general southwesterly directions for a distance of 458m. It starts after crossing the townland boundary between Coumnageeha / Gleninchnaveigh / Knockcurraghbola Commons and follows eastern and southern boundaries of a large, poorly drained, pasture at the peak of a small hill. No features of archaeological significance were noted in the area.

RW2 (Figure 4)

At this point the Internal Windfarm Cable route crosses the public road before entering a pasture field to the west. No features of archaeological significance were noted in the area.

SW52 (Figure 4)

Section SW52 of the Internal Windfarm Cable route runs in a general southwesterly direction for a distance of 179m. It follows the northern and western boundary of an open pasture with a moderate south facing slope. No features of archaeological significance were noted in the area.

RW3 (Figure 4)

At this point the Internal Windfarm Cable route crosses the public road, L-6188-0, before entering a pasture field to the south. The boundaries are moderately sized earth and stone banks. No features of archaeological significance were noted in the area.

SW53 (Figure 4)

Section SW53 of the Internal Windfarm Cable route runs in a general southerly direction for a distance of 23m across the northern corner of an open well drained pasture with a

moderate southeast facing slope. The boundaries are earth and stone banks. There is a large drain at the southern extent of this section. No features of archaeological significance were noted in the area.

SW54 (Figure 4)

Section SW54 of the Internal Windfarm Cable route runs in a general southerly direction for a distance of 52m through a well-drained pasture with a moderate southeast facing slope. No features of archaeological significance were noted in the area.

SW55 (Figure 4)

Section SW55 of the Internal Windfarm Cable route runs in a general southwesterly direction for a distance of 90m. It passes over an area of poorly drained marshland and along a forestry firebreak in a section of young cultivated forestry. No features of archaeological significance were noted in the area.

SW56 (Figure 4)

Section Sw56 of the Internal Windfarm Cable route runs in a general southerly direction for a distance of 256m along the eastern boundary of a large, well-drained pasture at the bottom of a steep east facing slope before crossing through an earth and stone bank into a field to the west. No features of archaeological significance were noted in the area.

SW57 (Figure 4)

Section SW57 of the Internal Windfarm Cable route runs along the northern and western boundaries of a large pasture field with a moderate to steep east facing slope. This field contains both RL6 (Site 83 on Figures) - *Stone Row* and RL7 (Site 84 on Figures) - *Fulacht Fiadh*. RL7 (Site 84 on Figures) is under an area of mature cultivated forestry. Test excavations were carried out by the author along this stretch of the Internal Windfarm Cable route and no features of archaeological interest were uncovered.

RW4 (Figure 4)

At this point the Internal Windfarm Cable route crosses the public road, L-61881-0, before entering a pasture field to the west. No features of archaeological significance were noted in the area.

SW58-SW59 (Figure 5)

These sections of the UWF Related Works occur within the footprint of the Upperchurch Windfarm. There will be no additional works in this area beyond those assessed in the 2013 EIS, when this section was previously walked by the author. Nothing of archaeological significance was noted at this time.

SW60 (Figure 5)

Section SW60 of the Internal Windfarm Cable route runs in a general southerly direction for a distance of 78m. It starts after crossing the townland boundary between Grousehall and Foilnaman and follows the route of an existing farm on the western boundary of an open pasture. No features of archaeological significance were noted in the area.

RW7 (Figure 5)

At this point the Internal Windfarm Cable route crosses the public road, L-6185-13. The boundaries of the road comprise of earth and stone banks. No features of archaeological significance were noted in the area.

SW61 (Figure 5)
Section 163 of the Internal Windfarm Cable route runs in a general easterly and then southeasterly direction for a distance of 367m. It runs along the northern boundary of a well-drained pasture with a moderate south facing slope. At the eastern section the route passes over an earthen bank and drain. No features of archaeological significance were noted in the area.

SW62 (Figure 5)
Section SW62 of the Internal Windfarm Cable route runs in a general south-easterly direction for a distance of 190m. It follows the line of a drain running down slope in the same direction before crossing an earth and stone bank into a neighbouring pasture. No features of archaeological significance were noted in the area.

SW63 (Figure 5)
Section SW63 of the Internal Windfarm Cable route runs in a general south-easterly direction for a distance of 98m along the northeast boundary of a well-drained pasture with a moderate east facing slope. It follows the line of a drain and bank before turning east and into a neighbouring pasture. No features of archaeological significance were noted in the area.

SW64 (Figure 5)
Section SW64 of the Internal Windfarm Cable route runs in a general northeasterly direction for a distance of 85mm. It crosses a well-drained pasture with a moderate east facing slope. At its eastern extent it crosses an earth and stone boundary onto a farm track adjacent to a modern residential building. No features of archaeological significance were noted in the area.

SW65 (Figure 5)
Section SW65 of the Internal Windfarm Cable route runs follows a modern farm track for distance of 100m. No features of archaeological significance were noted in the area.

SW66 (Figure 5)
Section SW66 of the Internal Windfarm Cable route follows the southern boundary of an open green field for a distance of 48m. No features of archaeological significance were noted in the area.

RW8 (Figure 6)
At this point the Internal Windfarm Cable route crosses the public road, L-2264-34, which acts as the townland boundary between Foilnaman and Knockcurraghbola Commons, before entering a pasture field to the east. No features of archaeological significance were noted in the area.

SW67 (Figure 6)
Section SW67 of the Internal Windfarm Cable route runs in a general southeasterly direction for a distance of 135m. Initially it passes through an area of moderately well drained pasture and then into an area of poorly drained marshland at the base of a moderate south facing slope. At the end of this section the route passes over a shallow drain and low bank. No features of archaeological significance were noted in the area.

SW68 (Figure 6)
Section SW68 of the Internal Windfarm Cable route runs in a general southerly direction for a distance of 52m. It passes through an area of poorly drained marshland. At the southern extent it crosses an earth and stone field boundary. No features of archaeological significance were noted in the area.

SW69 (Figure 6)
Section SW69 of the Internal Windfarm Cable route runs in a general southerly direction for a distance of 376m. It follows the western boundary of an open green field. At the southern extent it leaves the field through an existing farm gate and crosses the public road. No features of archaeological significance were noted in the area.

RW9 (Figure 6)
At this point the Internal Windfarm Cable route crosses the public road, L-6188-0, before entering a pasture field to the south. No features of archaeological significance were noted in the area.

SW70 (Figure 6)
Section SW70 of the Internal Windfarm Cable route runs in a general south-easterly direction for a distance of 160m. It crosses a mix of poorly drained marshland and along a forestry track through mature cultivated forestry. No features of archaeological significance were noted in the area.

SW71 (Figure 6)
Section SW71 of the Internal Windfarm Cable route runs in a general south-easterly direction for a distance of 260m travels along a forestry track through mature cultivated forestry. No features of archaeological significance were noted in the area.

SW72-SW76 (Figure 7)
These sections of the UWF Related Works occur within the footprint of the Upperchurch Windfarm. There will be no additional works in this area beyond those assessed in the 2013 EIS, when this section was previously walked by the author. Nothing of archaeological significance was noted at this time.

SW77 (Figure 7)
Section SW77 crosses 70m of an agricultural pasture, a modern farmyard lies to the east. No features of archaeological significance were noted in the area.

RW6 (Figure 7)
At this point the Internal Windfarm Cables crosses the road L-2264-50, the UWF Grid Connection runs along the L2264-50 and the Internal Windfarm Cable crosses at right angles, before entering a pasture field to the southeast. This road acts as the townland boundary between Knockmaroe and Knockcurraghbola Crownlands. No features of archaeological significance were noted in the area.

SW78 (Figure 7)
Section SW78 runs in a general southeasterly direction for a distance of 100m and then turns northeast. It crosses a well-drained agricultural pasture with a northwest facing slope. No features of archaeological significance were noted in the area.

SW79 (Figure 7)
Section SW79 runs in a general northeasterly direction for a distance of 88m. It crosses a well-drained agricultural pasture with a northwest facing slope. At the eastern extent the route passes through the townland boundary between Knockcurraghbola Crownlands and Knockcurraghbola Commons. No features of archaeological significance were noted in the area.

SW80 (Figure 7)
Section SW80 runs in a general northeasterly direction for a distance of 163m. It crosses a well-drained agricultural pasture with a gentle northwest facing slope. The field is bound on all sides by an earth and stone bank and ditch. No features of archaeological significance were noted in the area.

SW81 (Figure 6)
Section SW81 runs in a general northeasterly direction for a distance of 262m. It crosses a well-drained agricultural pasture with a northwest facing slope. The field is bound on all sides by an earth and stone bank and ditch. No features of archaeological significance were noted in the area.

S82 (Figure 6)
Section SW82 it follows the route of an existing farm and forestry track for 140m, the UWF Grid Connection is runs along the farm and forestry track. Section SW82 runs through an area of mature cultivated forestry before crossing to the southern side of the existing farm track for 90m. No features of archaeological significance were noted in the area.

S83 (Figure 6)
Section SW83 runs through an area of mature cultivated forestry in a southeasterly direction for 230m. No features of archaeological significance were noted in the area.

S84 (Figure 6)
Section SW84 follows the route of an existing farm and forestry track, for 340m, through an area of mature cultivated forestry before turning south and then east before entering the Upperchurch Windfarm Substation. The UWF Grid Connection enters the Upperchurch Windfarm Substation on the other side. No features of archaeological significance were noted in the area.

HAUL ROUTE WORKS

HW1 – HW2 (Figure 2)

Minor road widening works are to be carried out along the route of the L-4139-0 road as part of the overall program of haul route works. The road sides are banked by earth and stone banks, beyond which are patches of mature cultivated forestry and poorly drained pasture fields. No features of archaeological interest were noted at any of the locations marked for widening

HW3 – HW4 (Figure 2)

Minor road widening works are to be carried out along the route of the L-4139-0 road as part of the overall program of haul route works. The road sides are banked by earth and stone banks, beyond which are patches of mature cultivated forestry and poorly drained pasture fields. No features of archaeological interest were noted at any of the locations marked for widening.

HR5 (Figure 2)

New road works are to be carried out across a pasture field and existing farm yard in a general north direction for 180m between the L-4139-0 and the L-4138-12 as part of the overall program of haul route works. The road sides are banked with by earth and stone banks topped with hedgerows. No features of archaeological significance were noted in the area.

HR6 (Figure 2)

Minor road widening works are to be carried out along the route of the L-4138-12 road as part of the overall program of haul route works. The road sides are banked with by earth and stone banks topped with hedgerows. No features of archaeological interest were noted at any of the locations marked for widening.

HR7

HR7 is an open yard site with no features of archaeological significance noted in the area.

HR8-HR10 (Figure 7)

Minor road widening works are to be carried out along the route of the L-2264-50 road as part of the overall program of haul route works. The UWF Grid Connection also runs along the L-2264-50. The road sides are banked with by earth and stone banks topped with hedgerows. No features of archaeological interest were noted at any of the locations marked for widening.

HW11 (Figure 7)

New road works are to be carried out across a pasture field in a general northeasterly direction for 82m between the L-2264-50 and the L-6188-0 as part of the overall program of haul route works. The road sides are banked with by earth and stone banks topped with hedgerows. No features of archaeological significance were noted in the area.

HR12 (Figure 6)

Minor road widening works are to be carried out along the route of the L-6188-0 road as part of the overall program of haul route works. The UWF Grid Connection also runs along the L-6188-0. The road sides are banked with by earth and stone banks topped with hedgerows. No features of archaeological interest were noted at any of the locations marked for widening.

HR13 (Figure 5)

Minor road widening works are to be carried out along the route of the L-6185-13 road as part of the overall program of haul route works. The road sides are banked with by earth and stone banks topped with hedgerows. No features of archaeological interest were noted at any of the locations marked for widening.

REALIGNED WINDFARM ROADS

RWR1 (Figure 2)

Section RWR1 of the Realigned Windfarm Roads runs in a westerly direction, along the line of the Internal Windfarm Cable SW16, through an area of young cultivated forestry for a total distance of 270m. No features of archaeological significance were noted in the area.

RWR 2(Figure 5)

Section RWR2 of the Realigned Windfarm Roads runs in a northerly direction, through a well-drained agricultural pasture, along an existing farm track and through another well drained agricultural pasture for a total distance of 350m. RWR3 crosses the townland boundary between Knockmaroe and Grousehall. No features of archaeological significance were noted in the area.

RWR3 (Figure 5)

Section RWR3 of the Realigned Windfarm Roads runs in a northeasterly direction, through a well-drained agricultural pasture with a south facing slope for a total distance of 30m. No features of archaeological significance were noted in the area.

UWF REPLACEMENT FORESTRY

UWF Replacement Forestry (Figure 6)

The replacement forestry is due to be planted over 3 open, poorly drained pasture fields. The fields are bound by a combination of mature cultivated forestry, streams and earth and stone banks. No features of archaeological significance were noted in the area.

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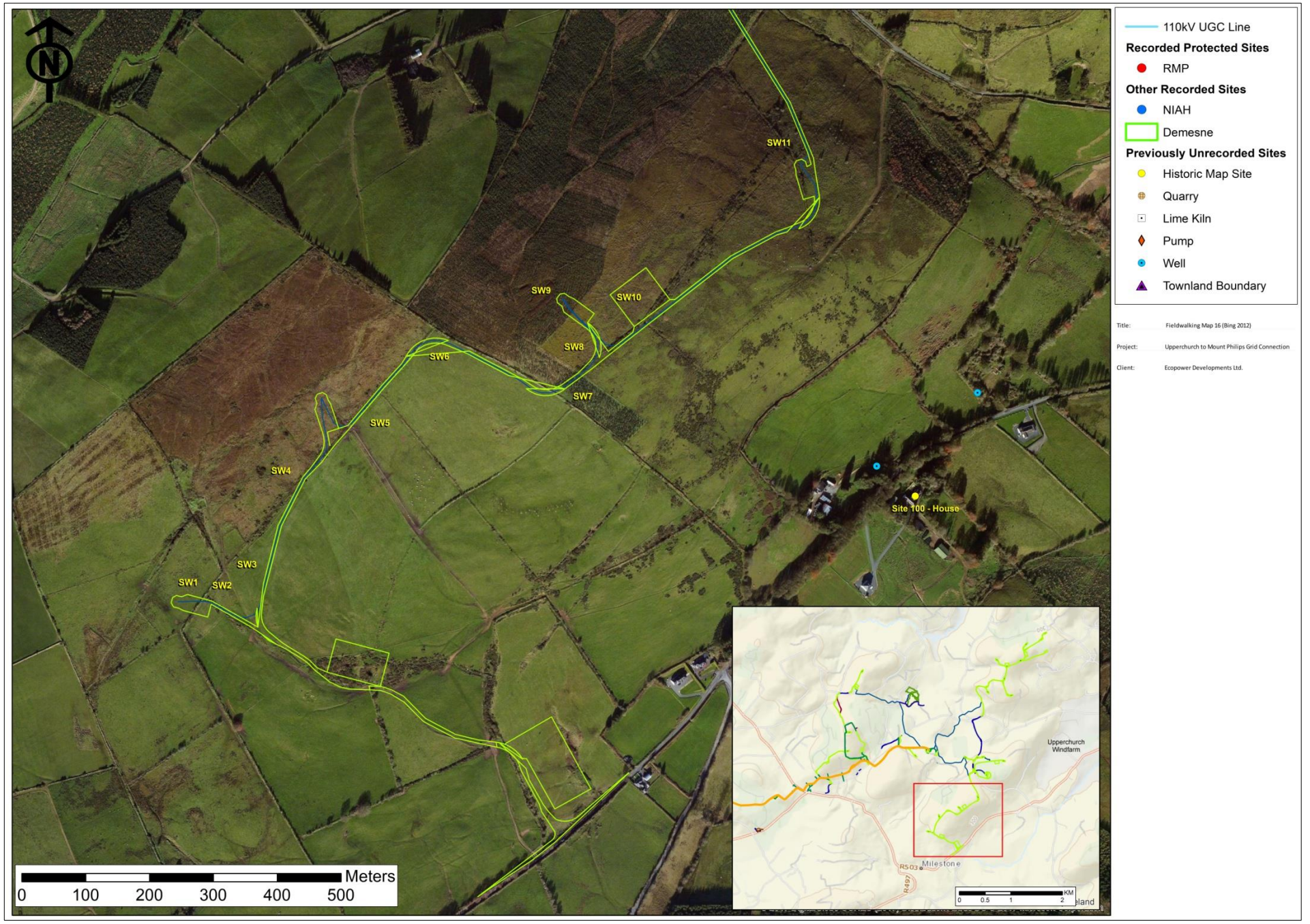

Figure 1: Fieldwalking Map 1 on Bing Aerial Photography 2012

REFERENCE DOCUMENTS

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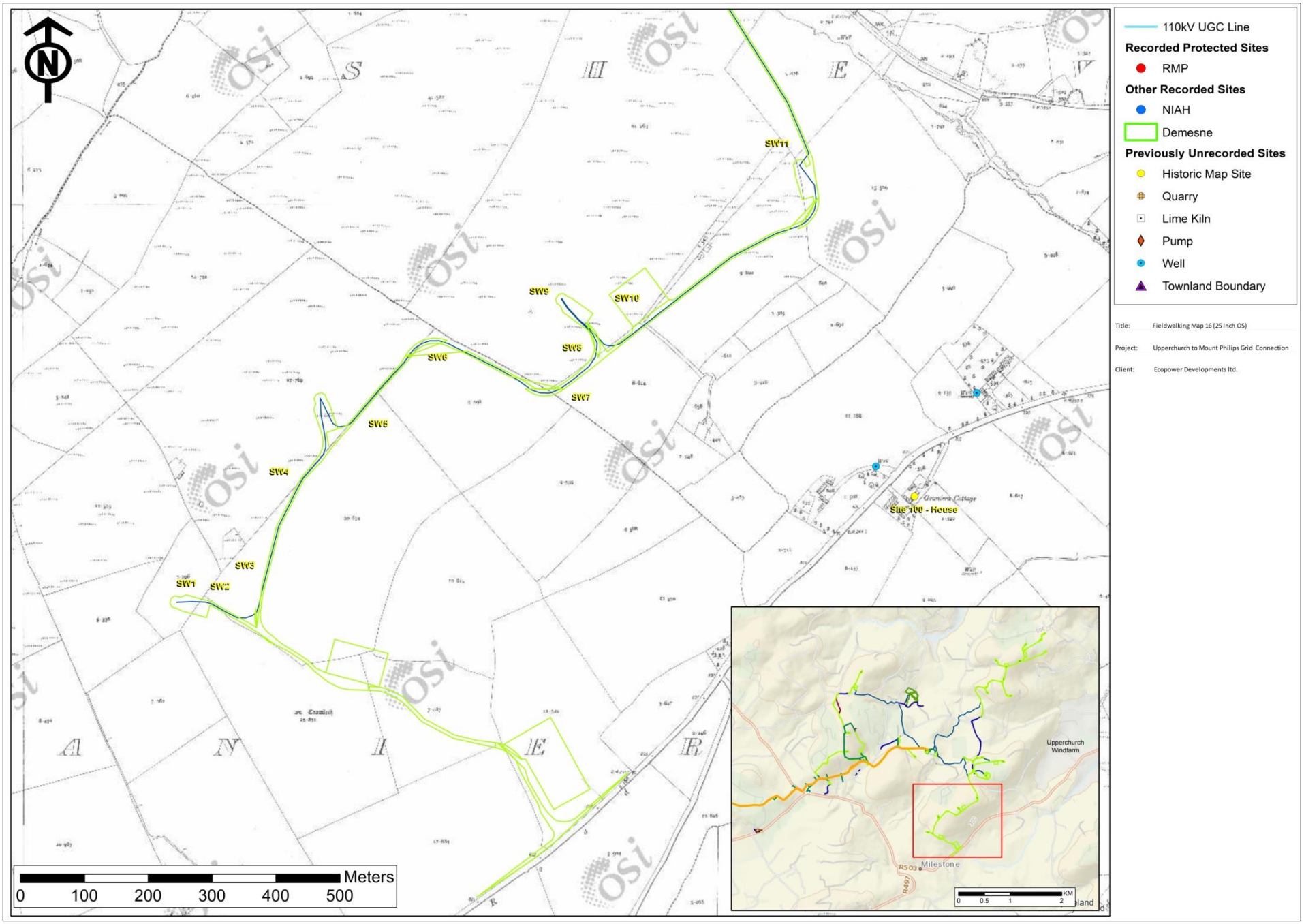

Figure 1: Fieldwalking Map 16 on 25 Inch Ordnance Survey 1905

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Figure 2: Fieldwalking Map 17 on Bing Aerial Photography 2012

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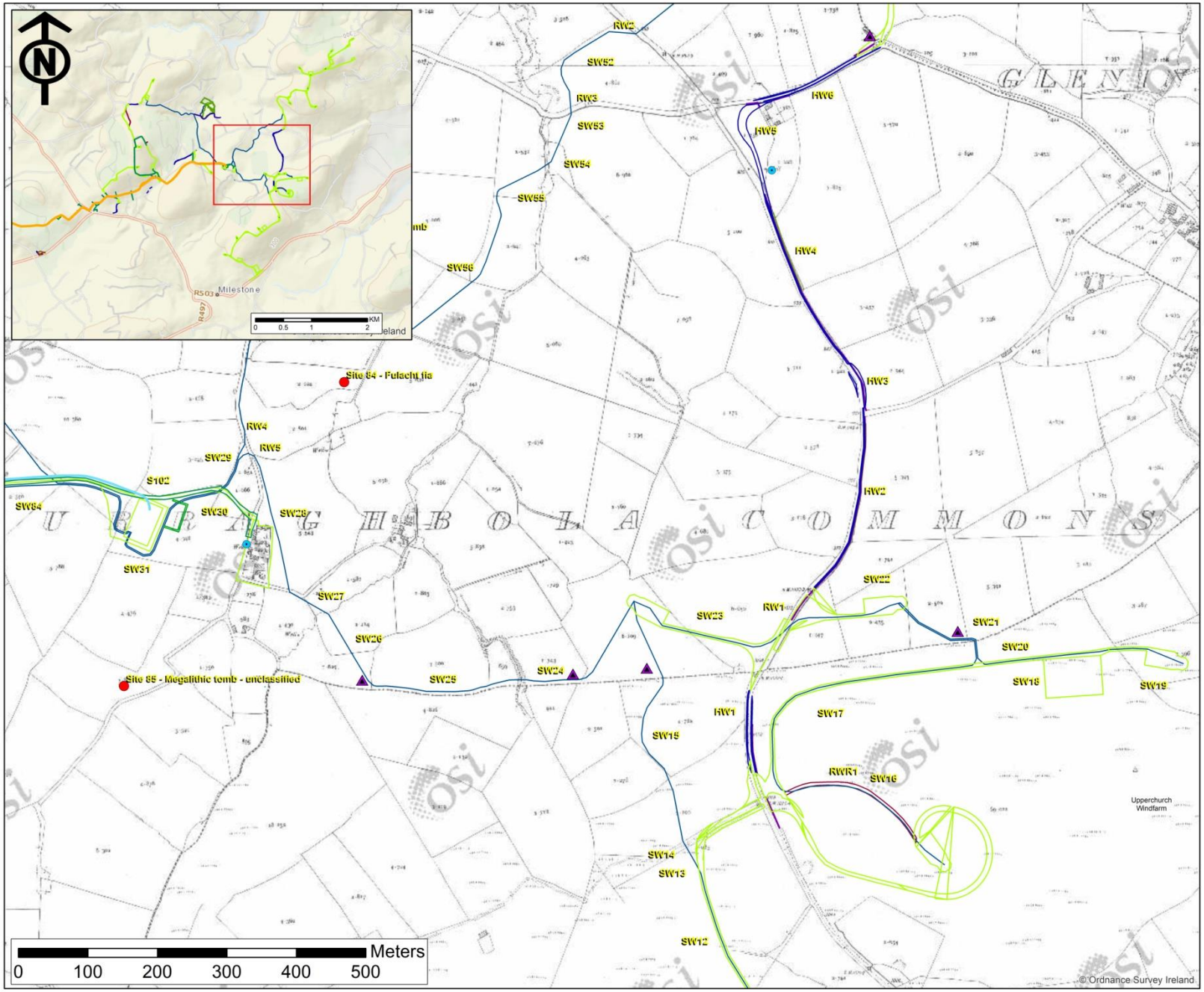

Figure 2: Fieldwalking Map 17 on 25 Inch Ordnance Survey 1905

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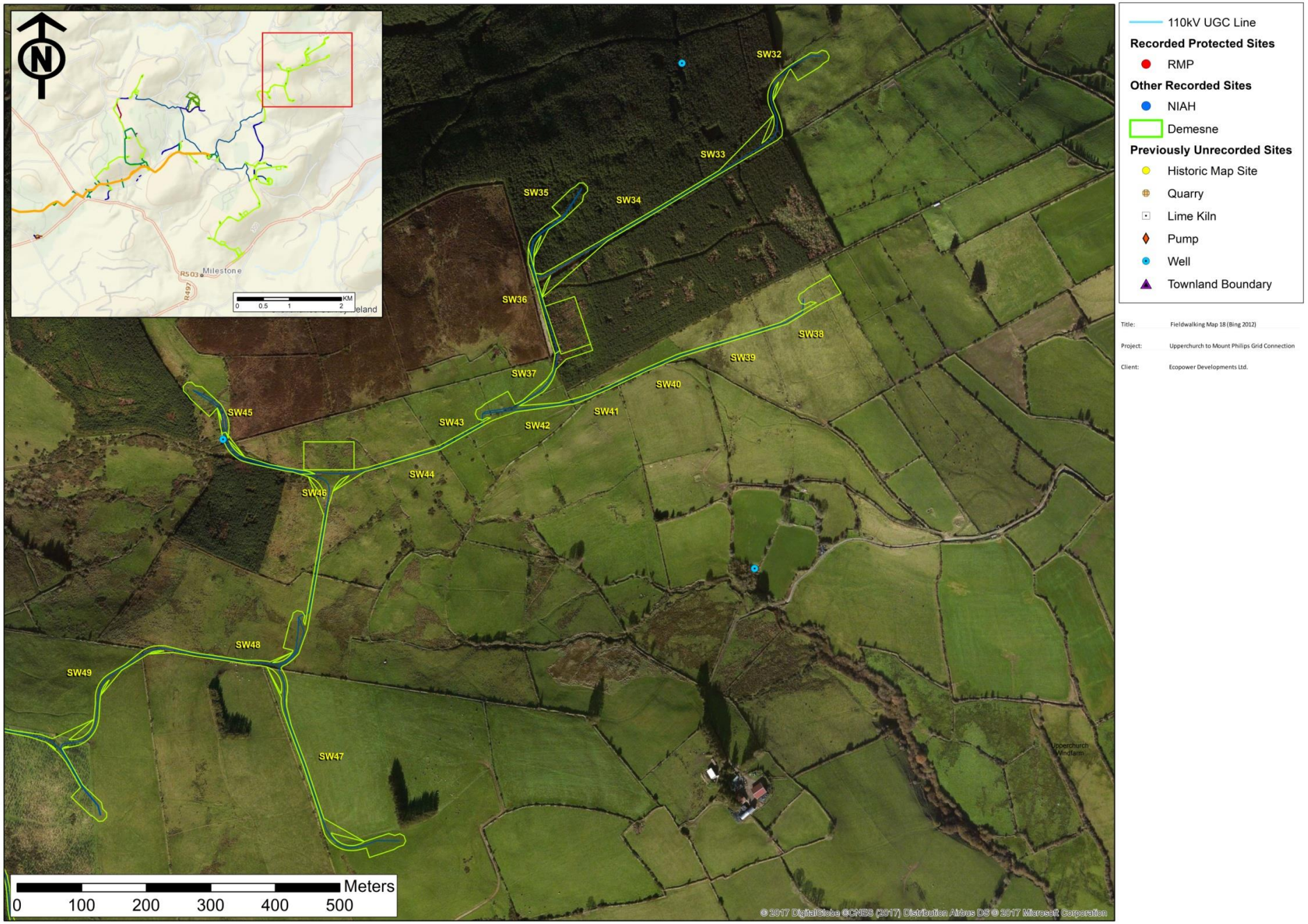

Figure 3: Fieldwalking Map 18 on Bing Aerial Photography 2012

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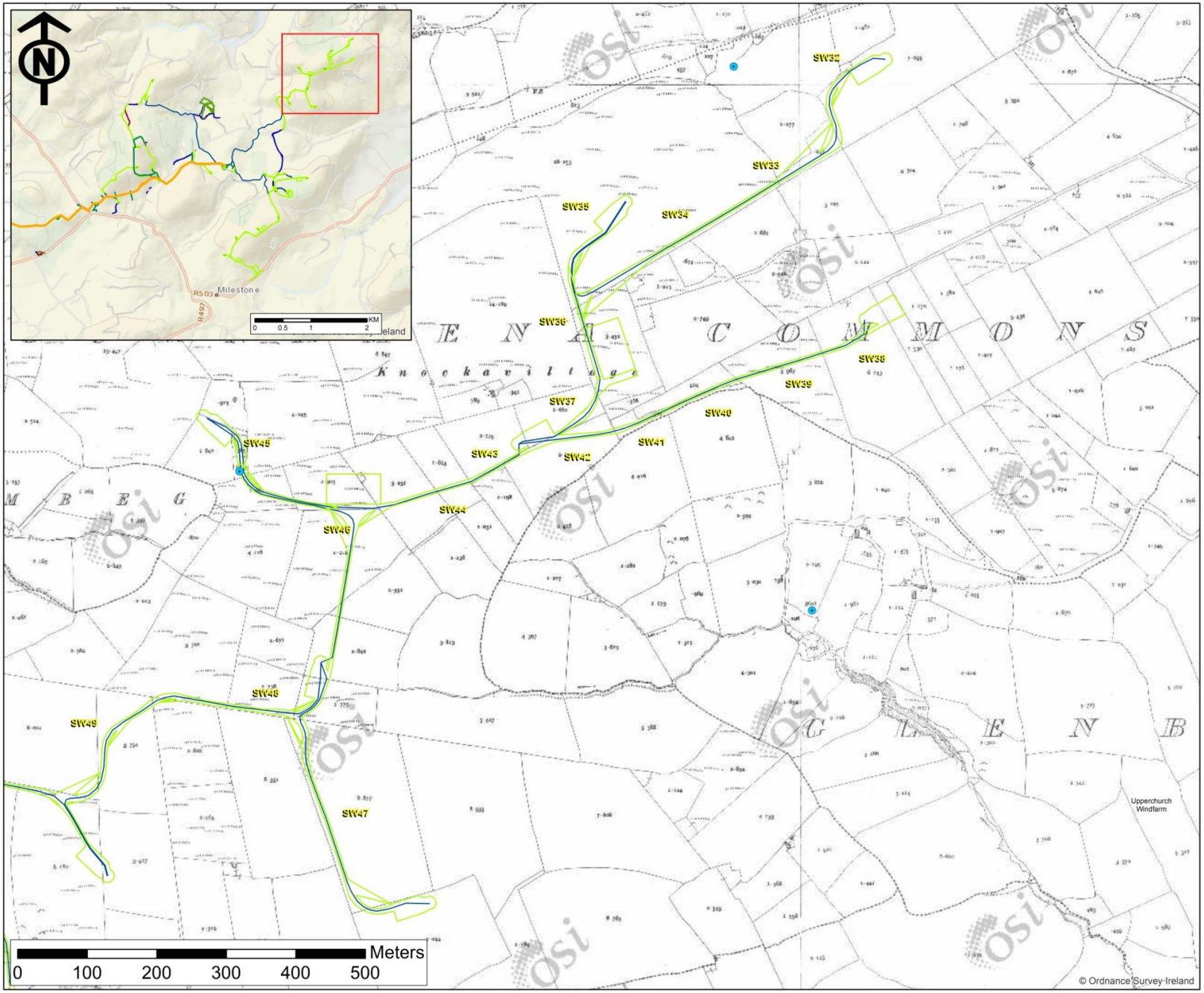

Figure 3: Fieldwalking Map 18 on 25 Inch Ordnance Survey 1905

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Figure 4: Fieldwalking Map 19 on Bing Aerial Photography 2012

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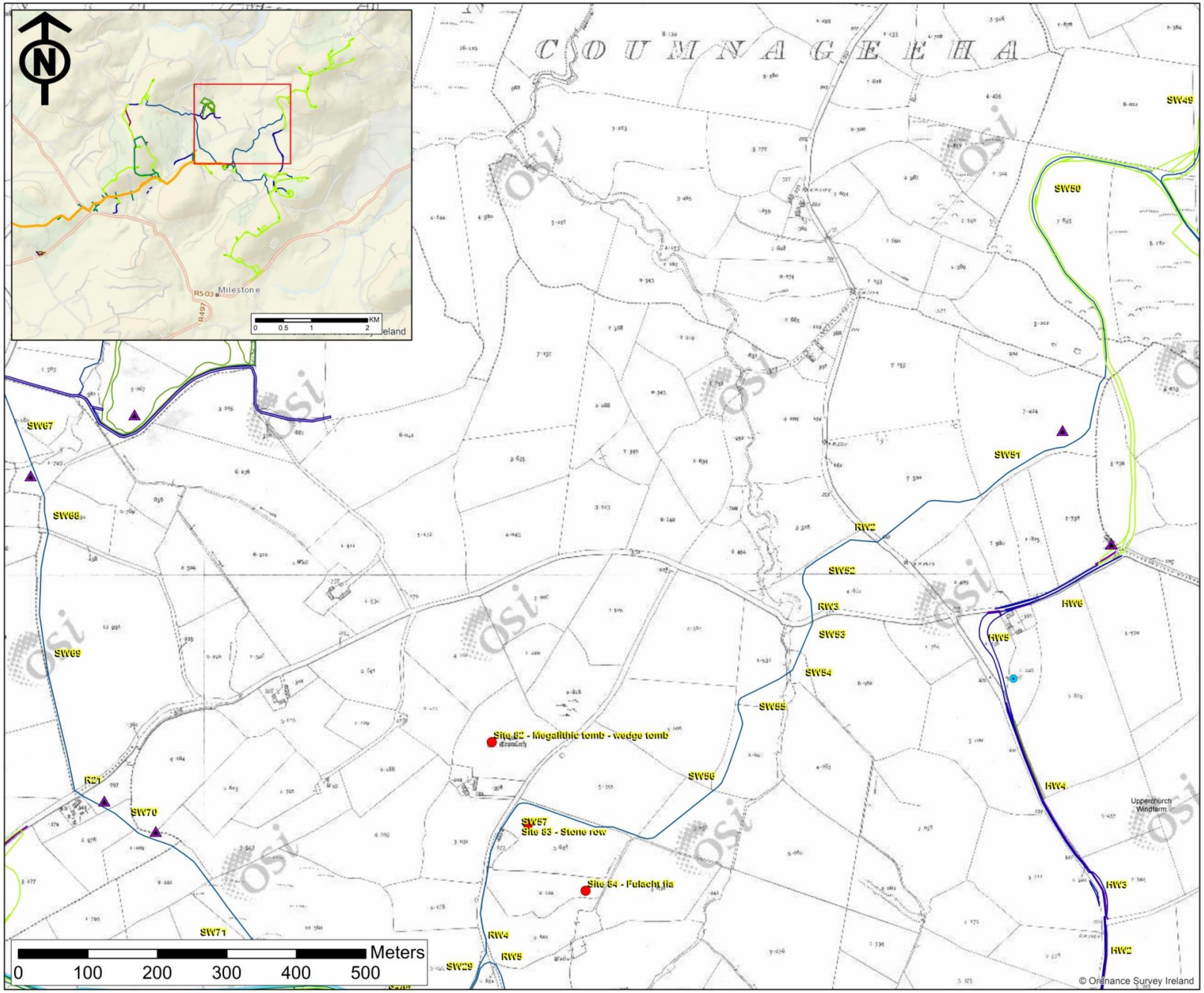

Figure 4: Fieldwalking Map 19 on 25 Inch Ordnance Survey 1905

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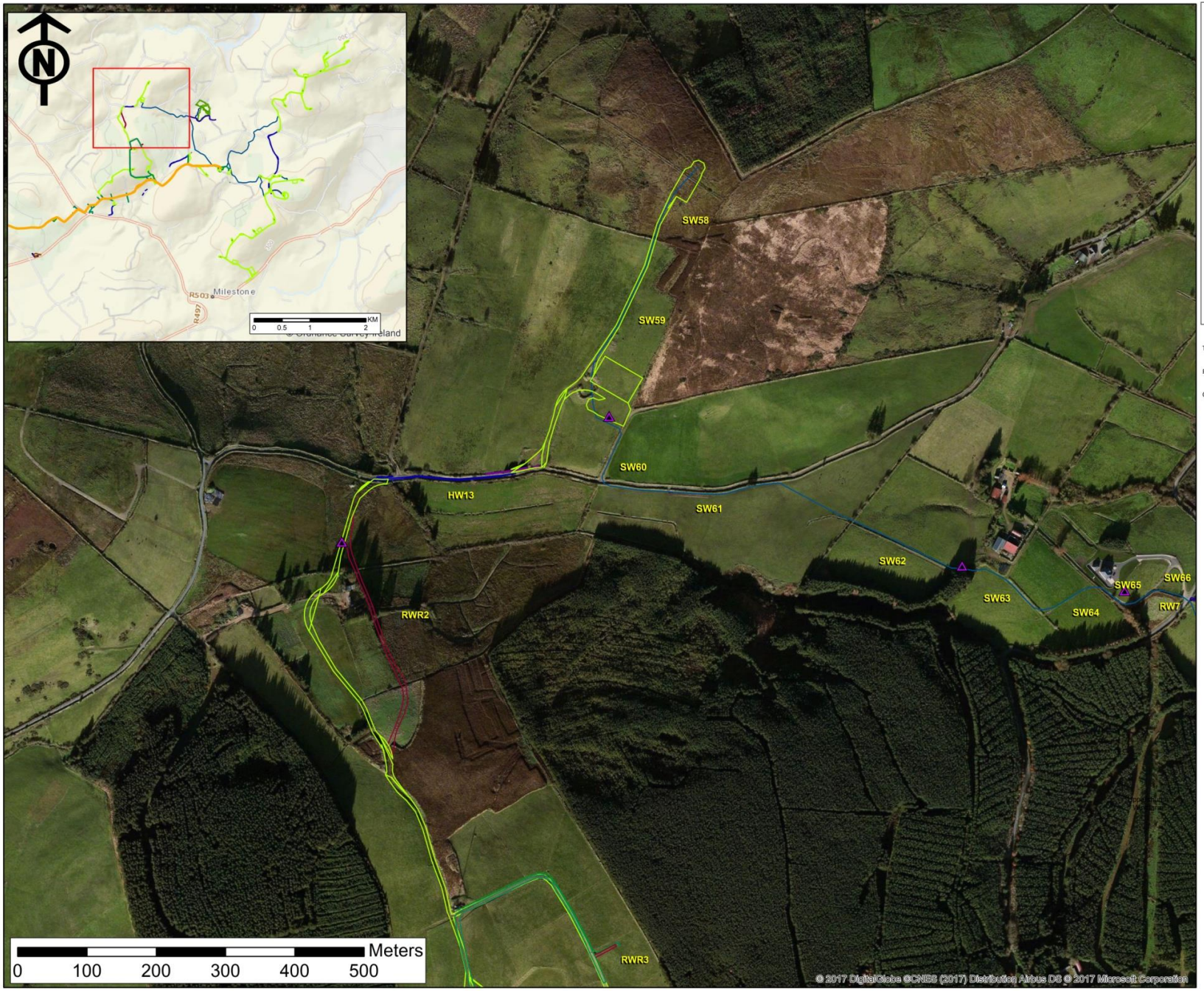

Figure 52: Fieldwalking Map 20 on Bing Aerial Photography 2012

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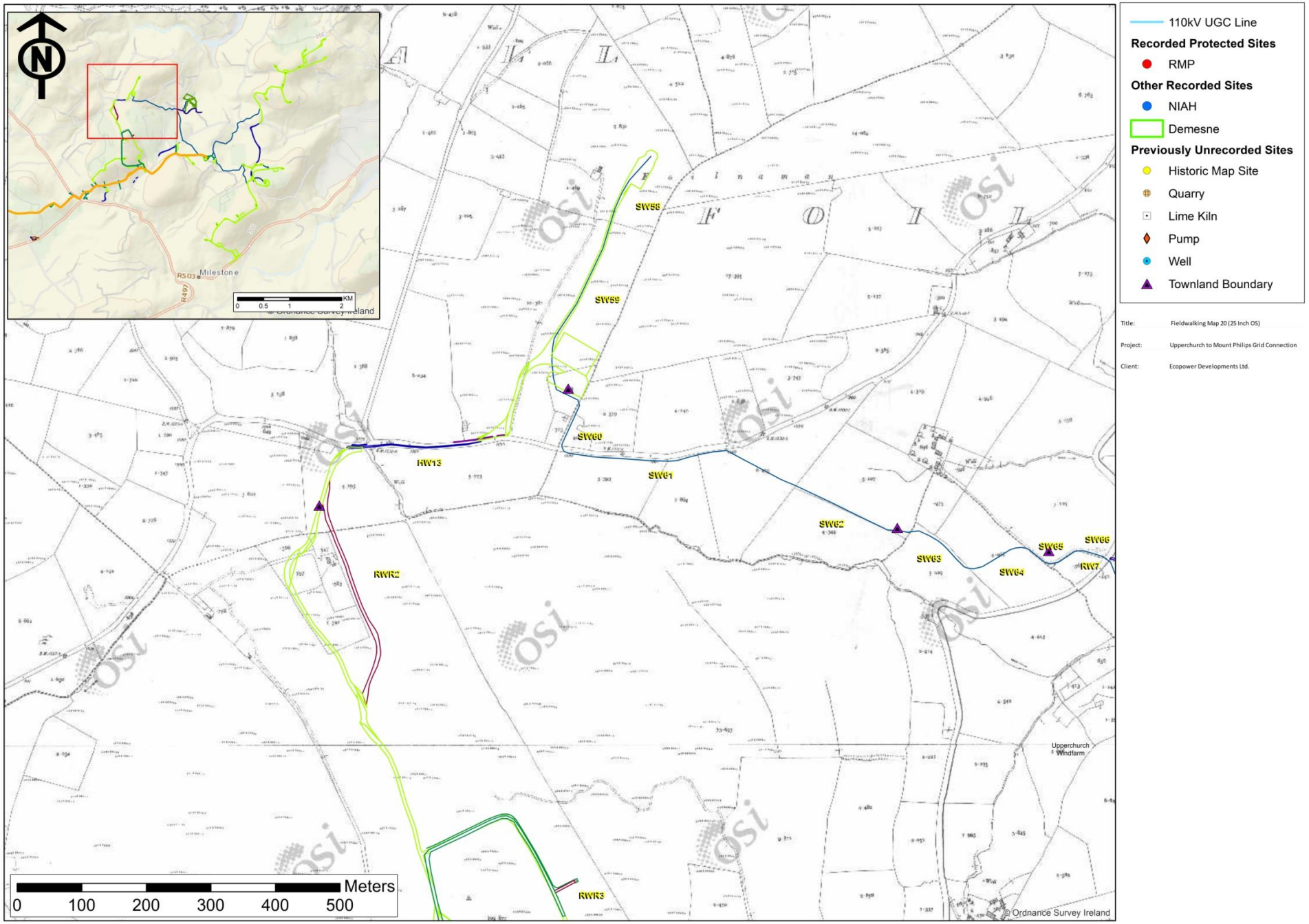

Figure 5: Fieldwalking Map 20 on 25 Inch Ordnance Survey 1905

REFERENCE DOCUMENTS

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Figure 6: Fieldwalking Map 21 on Bing Aerial Photography 2012

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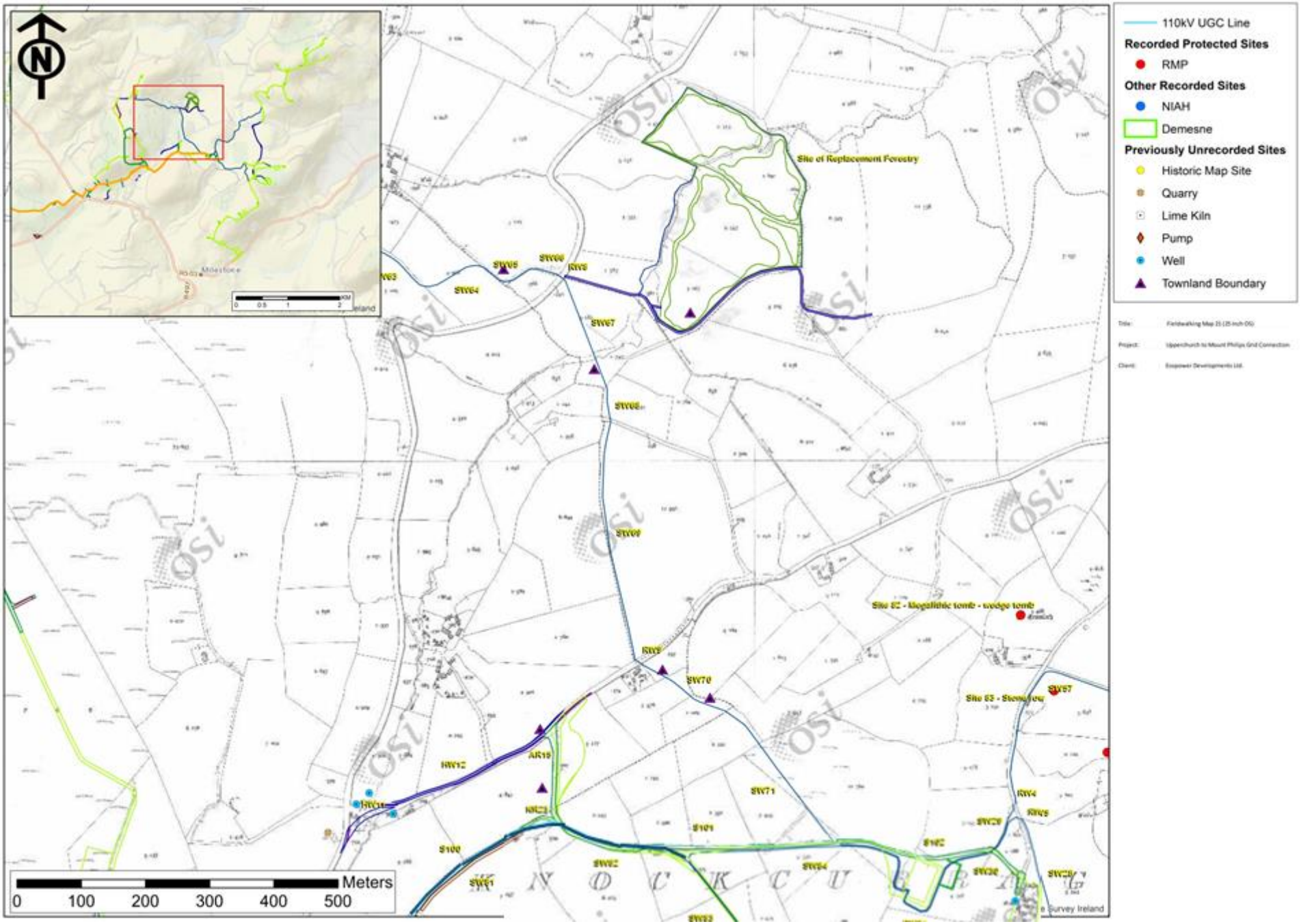

Figure 6: Fieldwalking Map 21 on 25 Inch Ordnance Survey 1905

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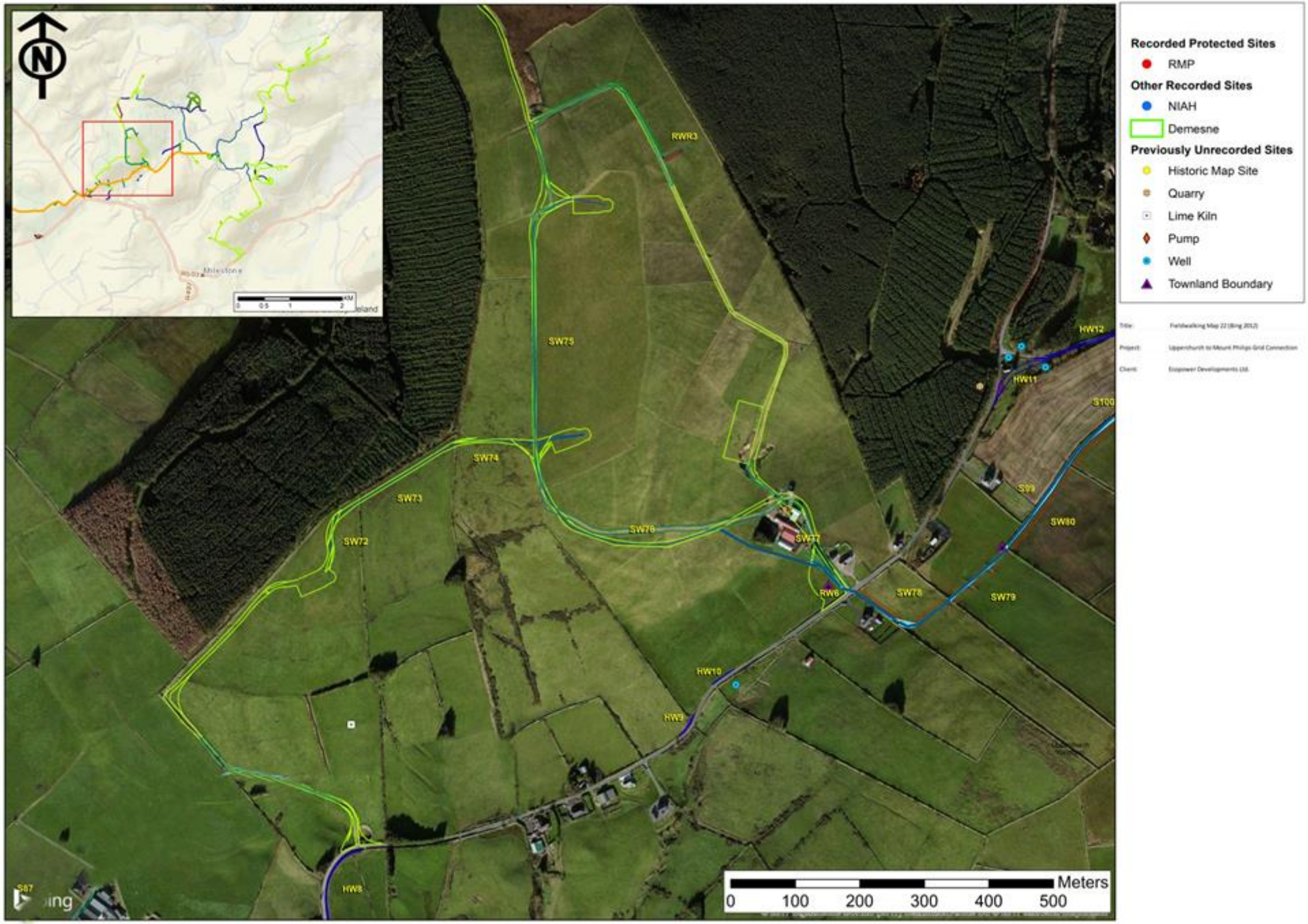

Figure 7: Fieldwalking Map 22 on Bing Aerial Photography 2012

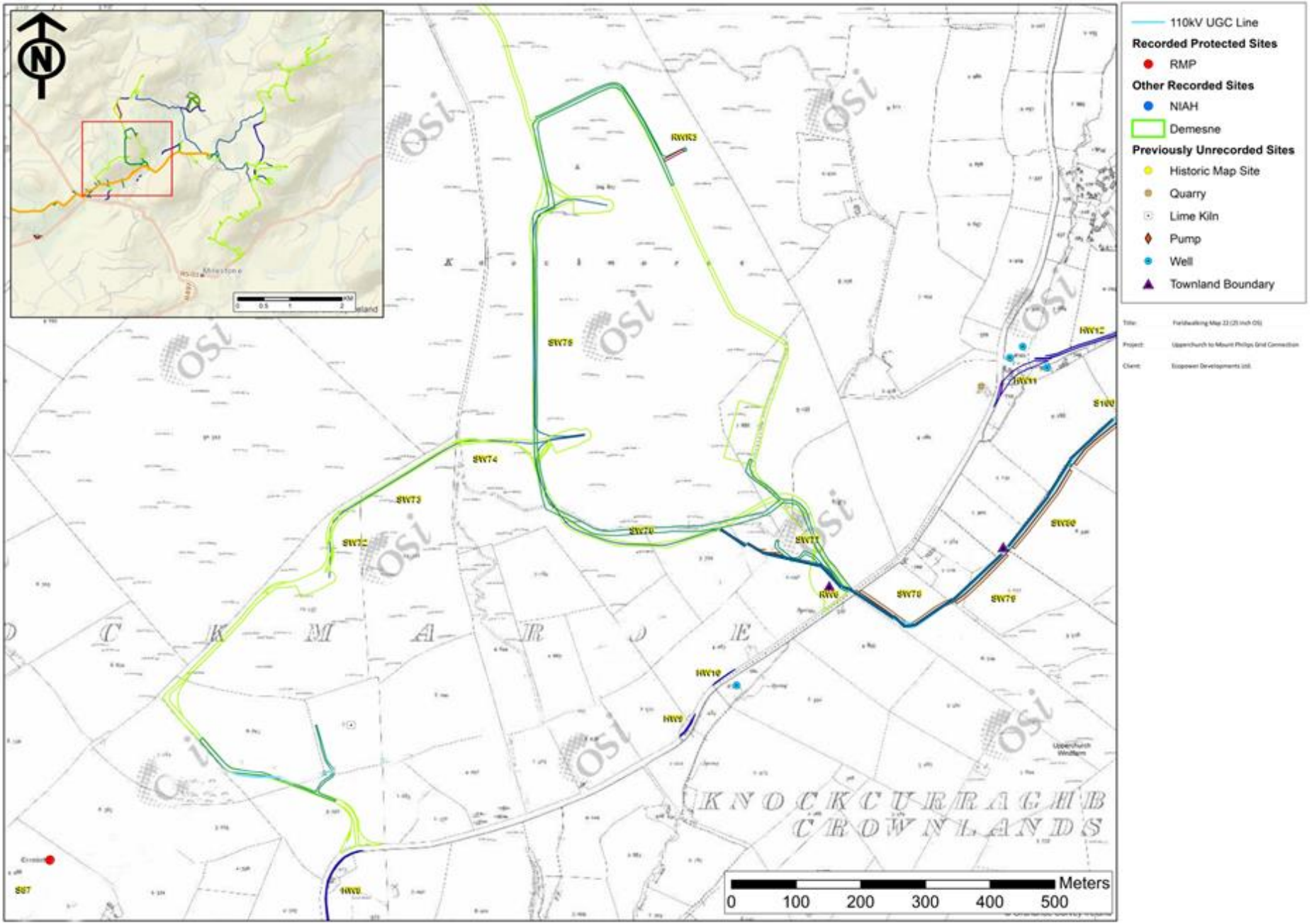

Figure 7: Fieldwalking Map 22 on 25 Inch Ordnance Survey 1905

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Figure 8: Fieldwalking Map 23 on Bing Aerial Photography 2012

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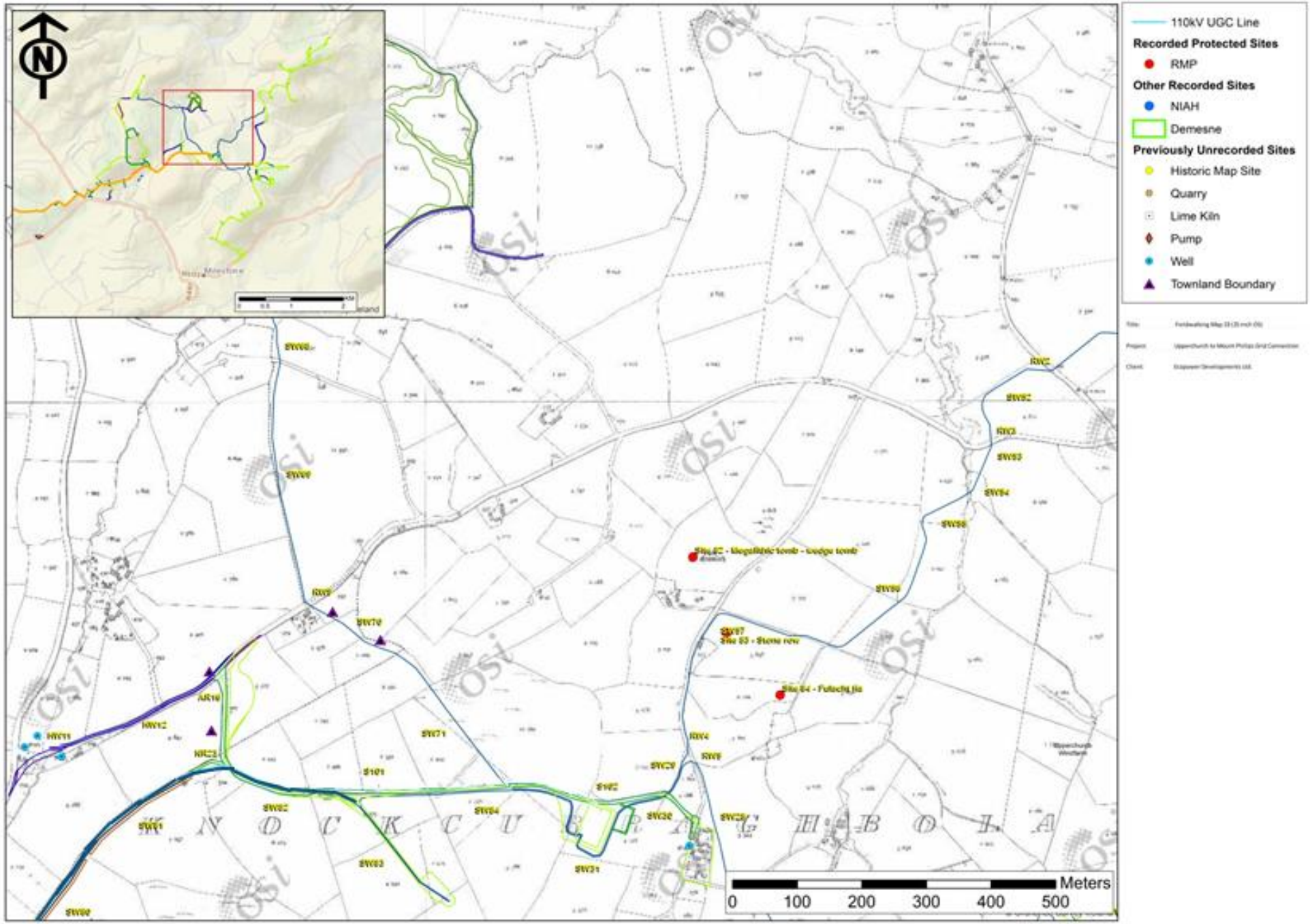

Figure 8: Fieldwalking Map 23 on 25 Inch Ordnance Survey 1905

APPENDIX 16.4

A16.4.2 FIELD WALKING DESCRIPTION - UWF GRID CONNECTION

END MAST UNDERGROUND CABLES AND MOUNTPHILIPS SUBSTATION

Section 01 comprises of a temporary access road and grid connection end mast cables connecting to the existing overhead mains in the field immediately west of the Mountphilips Substation. The field is a gently undulating, well-drained pasture with occasional reedy patches to the north. It is bound on all sides by trees. The development also passes over a small stream which runs along the eastern boundary (Figure 4). No features of archaeological significance were noted in the area.

Section 02 comprises of the site of the Mountphilips Substation, the termination point of the underground UWF Grid Connection and all associated works. It crosses a poorly-drained pasture with frequent reedy patches. A stream runs along the northern and then western boundaries. No features of archaeological significance were noted in the area.	
Section 03 of the UWF Grid Connection runs in a general easterly direction for a distance of c.103m. It runs crosses a small stream which runs through field boundary comprising of earthen bank and ditch lined with mature trees and the along the southern boundary of a pasture field with some poorly drained patches. No features of archaeological significance were noted in the area.	

Section 04of the UWF Grid Connection runs in a general easterly direction for a distance of 156m. It crosses a well drained agricultural pasture before exiting through an existing gateway. No features of archaeological significance were noted in the area.	
Section 05 of the UWF Grid Connection runs in a general easterly direction for a distance of 128m. It crosses a well drained agricultural pasture after which is emerged through a gateway on to a public road, L2166-0, the townland boundary between Coole and Freagh. No features of archaeological significance were noted in the area.	

Section 06 of the UWF Grid Connection runs south along the public road from the gateway on to the public road, L2166-0, for c.1.7km to the outskirts of Newport town. Along this public road section passing through the townlands of Freagh and Foildarrig, and up to the Newport townland boundary. There are no Legally Protected Sites or Other Recorded Sites within 100m of this section and no features of archaeological significance were noted in the area. (	
Section 07 of the UWF Grid Connection runs c.1.5km along the public road from the outskirts of Newport town on the L2166-0, The Black Road, through Newport town, over Newport Bridge crossing the townland boundary between Newport and Tullow, and runs east along the R503 towards Thurles, along the edge of Cooldrisla townland. This section finishes on the outskirts of Newport town on the townland boundary between Tullow, Cooldrisla and Derryleigh. The following sites are located within 100m of the Construction works boundary: GL16 – Bridge, GL12 – Saint John's Church, GR13 – House, GR14 – Bridge, GR15 – J Daly House, GR18 – Handball Alley. The UWF Grid Connection traverses the zone of notification of GL16 - Bridge	

Section 08 of the UWF Grid Connection runs east along the R503 public road for c3.9km through the townland of Derryleigh, Kilnacappagh, Scaggeen and Derrygareen to the townland boundary with Knockancullenagh. This section of public road is through open country side with tall roadside hedgerow, the terrain is undulating. The following sites are within 100m of Construction works boundary:, RL18 – Ringfort and RL19 –Castle, GL28 - Enclosure and GR22 – Derryleigh House. The UWF Grid Connection traverses the zone of notification of GL18 – Ringfort & GL28 - Enclosure	
Section 09 of the UWF Grid Connection runs east along the R503 public road for c4.3km through the townland of Knockancullenagh, Fanit, Lackamore and Tooreenbrien Upper to the townland boundary with Tooreenbrien Lower. This section of public road has coniferous forestry on hills on both sides of the road. The following site is within 100m of Construction works boundary: RL34 – Mine Copper. The UWF Grid Connection traverses the zone of notification of GL34 – Mine Copper	

Section 10 of the UWF Grid Connection runs east along the R503 public road for c3.2km through the townland of Tooreenbrien Lower, Reardnogy Beg, Reardnogy More and along the boundary of Shanbally Edmond to the outskirts of Rear Cross Village. This section of public road is through open country side with low roadside hedgerow in places. The terrain is even with the slopes of Barnarhy Hill immediately to the north and views across fields to the forested slopes of the Slieve Felim Mountains to the south. The following sites is within 100m of Construction works boundary: RL36 – Pit Burial.	
Section 11 of the UWF Grid Connection runs east through the Rear Cross Village for 1.1km to the outskirts of the village to the townland boundary between Reardnogy More and Baurnadomeeny. Two sites are located within 100m of Construction works boundary: RL19 – Church of VisitationBridge, GL20 Rear Cross National School.	

Section 12 of the UWF Grid Connection runs east along the R503 public road for c1.7km through the townland of Baurnadomeeny to the boundary of Coonmore townland. This section of public road is through more closed country side with roadside hedgerow and houses, the terrain is even. No features of archaeological significance were noted in the area and no Legally Protected Sites or Other Recorded Sites are within 100m of this section.	
Section 13 of the UWF Grid Connection runs east along the R503 public road for c2.2km through the townland of Coonmore to the boundary with Foildarragh townland. This section of public road has some coniferous forestry on both sides of the road with views of Mother Mountain to the south and Knockastanna to the north. The terrain is undulating. The following sites are within 100m of the Construction works boundary: RL37 – Redunant Record, GL38 – Children's Burial Ground, GL39 – Mound.	

Section 14 of the UWF Grid Connection runs east along the R503 public road for c1.4km through the townland of Foildarragh over Anglesey Bridge to the boundary of Kilcommon townland. This section of public road is through mixed country side with some roadside hedgerow, the terrain is undulating. The following site is within 100m of the Construction works boundary: RL21 – Anglesea Bridge.	
Section 15 of the UWF Grid Connection runs east along the R503 public road for c2.8km through the townland of Kilcommon and Loughbracken to the boundary of Knocknabansha townland. This section of public road is through mixed country side with some roadside hedgerow, the terrain is undulating. No features of archaeological significance were noted in the area and no Legally Protected Sites or Other Recorded Sites are within 100m of this section.	

Section 16 of the UWF Grid Connection runs east along the R503 public road for c1.2km through the townland of Knocknabansha, with the forested Knocknabansha hill immediately to the north, to the boundary of Knockmaroe townland and the junction between the R503, R497 and L2264-50. This section of public road has some coniferous forestry on both sides of the road. The terrain is even. No features of archaeological significance were noted in the area and no Legally Protected Sites or Other Recorded Sites are within 100m of this section.	
Section 17 of the UWF Grid Connection leaves the R503 and run along the L2264-50, Borrisoleigh Road, for c2km through the townland of Knockmaroe, and along the Knockcurraghbola Crownlands townland boundary, until the Junction with the L6188-0. This section of public road has farm land on both sides of the road with tall roadside hedgerow. The terrain is even, passing between the hills of Knockmaroe to the north and Knockcurraghbola Crownlands to the south. No features of archaeological significance were noted in the area and no Legally Protected Sites or Other Recorded Sites are within 100m of this section.	

Section 18 of the UWF Grid Connection runs along the L6188-0 for c0.3km in the townland of Knockmaroe to the junction with a 3rd party road on the Knockcurraghbola Commons townland boundary. This section of public road conifer forestry on one side of the road and field on the other. The terrain is even. No features of archaeological significance were noted in the area and no Legally Protected Sites or Other Recorded Sites are within 100m of this section.	
Section 19 of the UWF Grid Connection runs along the 3rd party road for c0.7km to the site of Upperchurch Windfarm Substation, the termination point of the underground UWF Grid Connection and all associated works. The 3rd party road is through a plantation of young conifer forestry. The site of Upperchurch Windfarm Substation is in a field. The terrain is even. No features of archaeological significance were noted in the area and no Legally Protected Sites or Other Recorded Sites within 100m of this section.	

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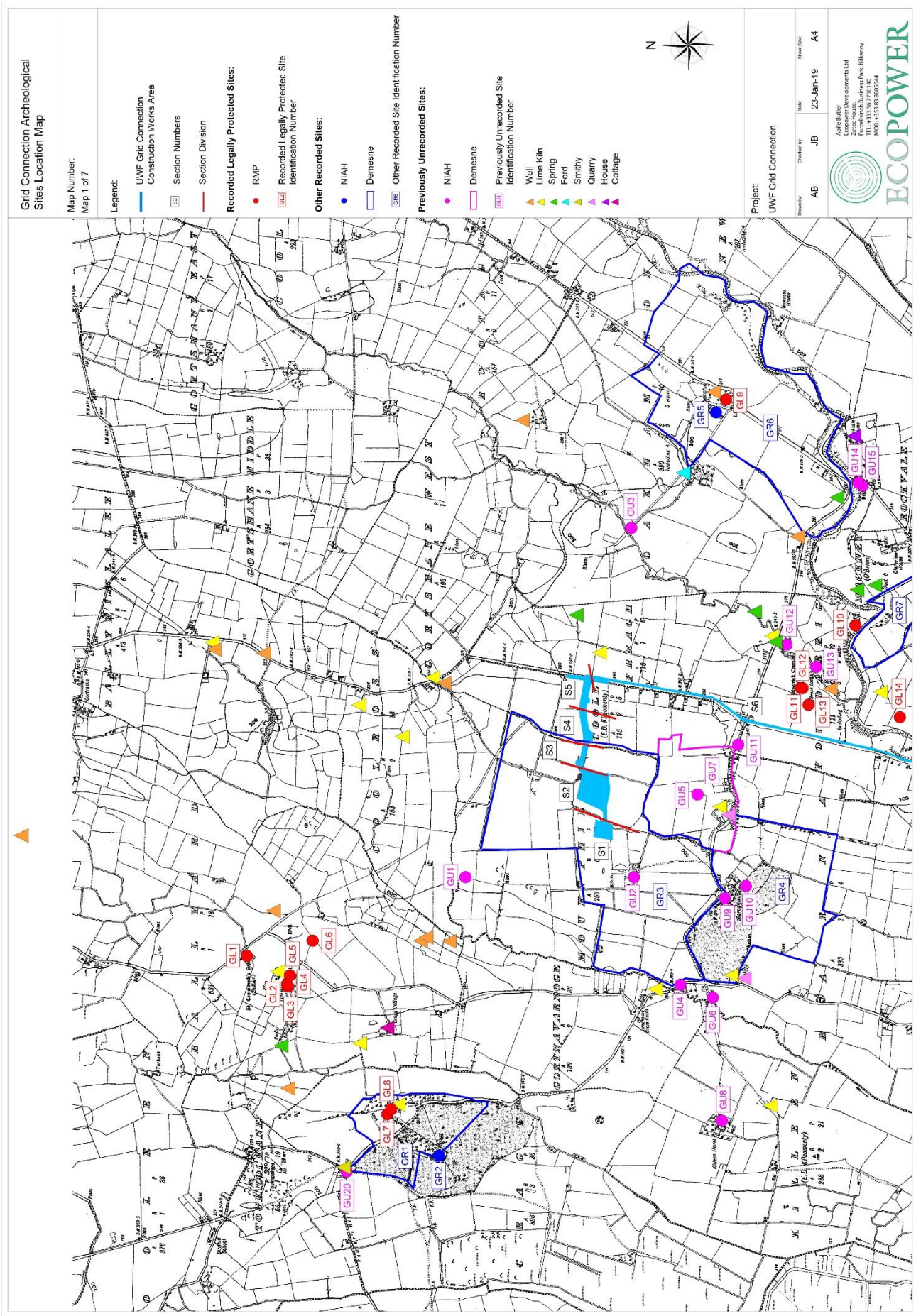
to Revised EIAR Chapter 16: Cultural Heritage



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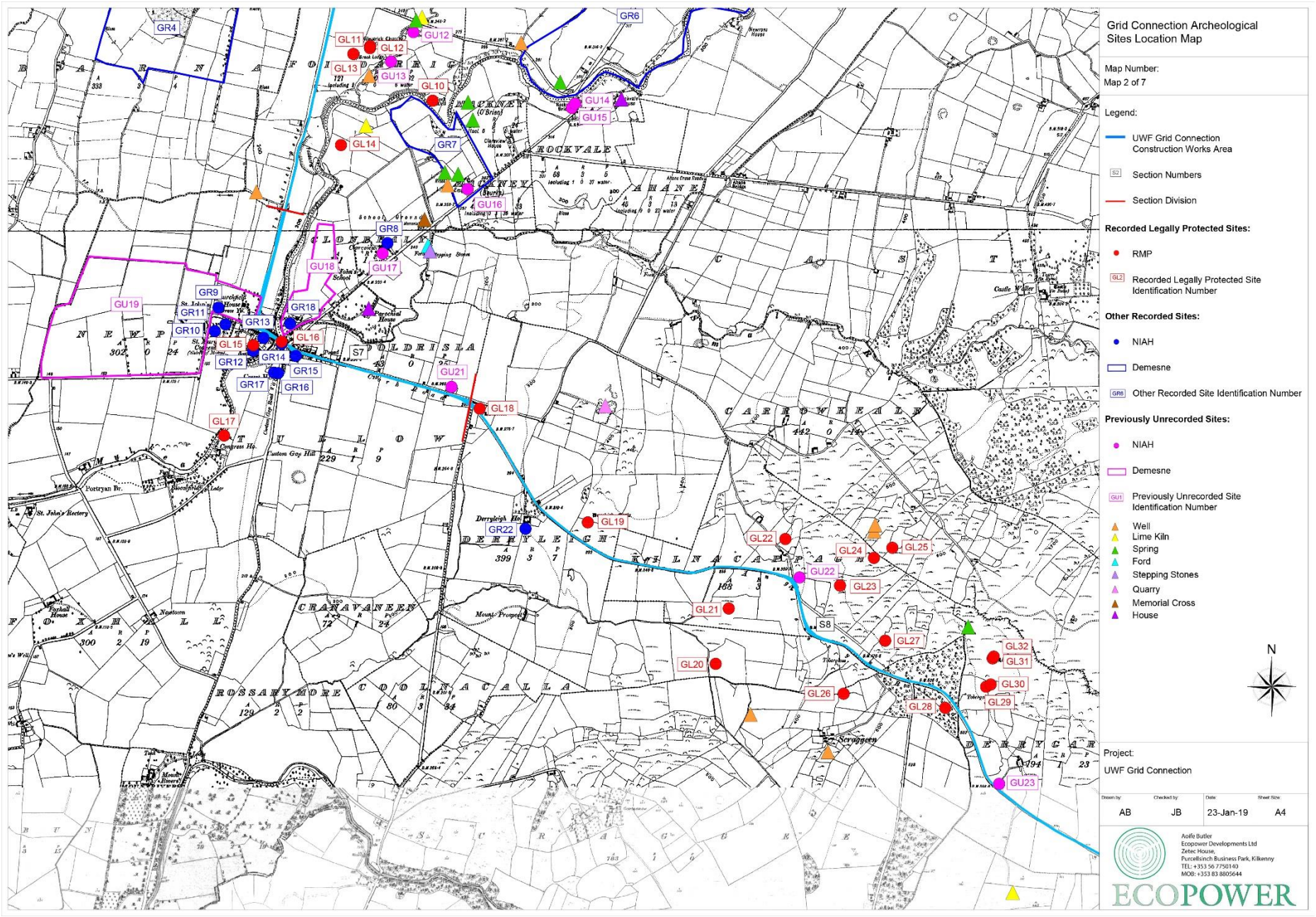

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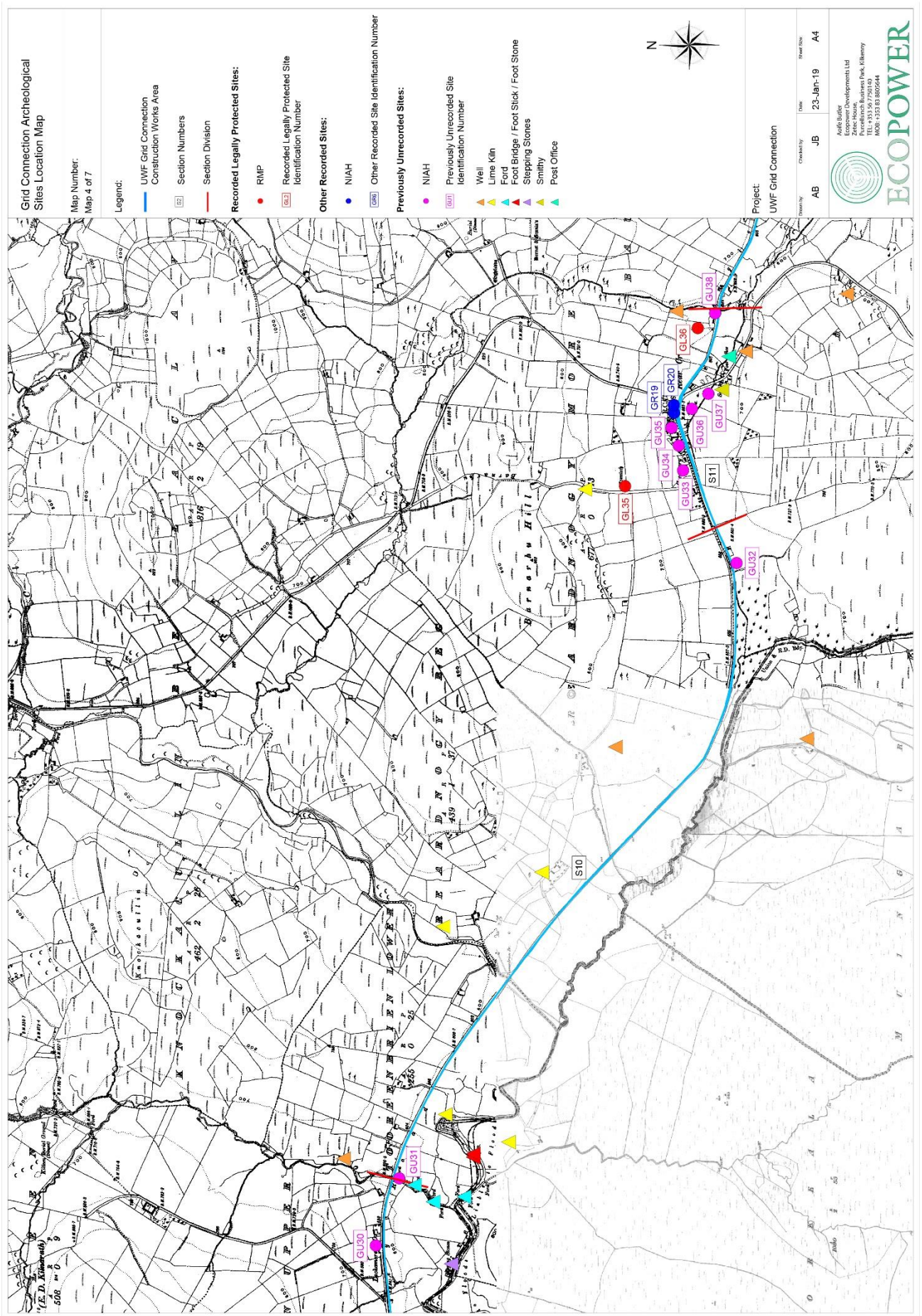
Grid Connection Archeological Sites Location Map
Map Number: Map 4 of 7
Legend:
UWF Grid Connection Construction Works Area
Section Numbers
Section Division
Recorded Legally Protected Sites:
RMP
Recorded Legally Protected Site Identification Number
Other Recorded Sites:
NIAH
Other Recorded Site Identification Number
Previously Unrecorded Sites:
NIAH
Previously Unrecorded Site Identification Number
Well
Lime Kiln
Ford
Foot Bridge / Foot Stick / Foot Stone
Stepping Stones
Smithy
Post Office
Project: UWF Grid Connection
Drawn by: AB
Checked by: JB
Date: 23-Jan-19
Sheet Size: A4
Aoife Butler
Ecopower Developments Ltd
Business Park
Purcellsinch Business Park, Kilkenny
TEL: +353 56 7750140
MOB: +353 83 8805644
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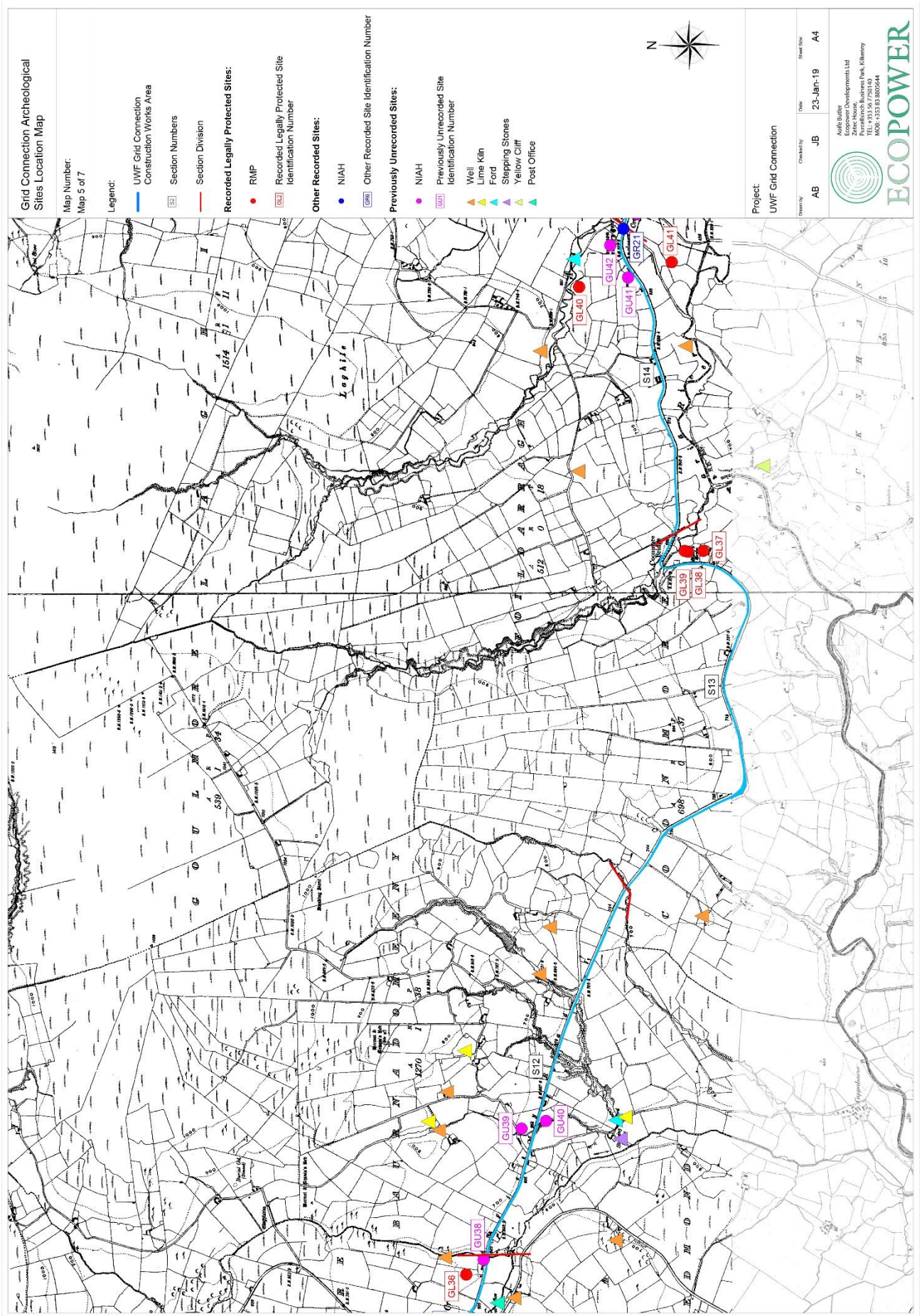

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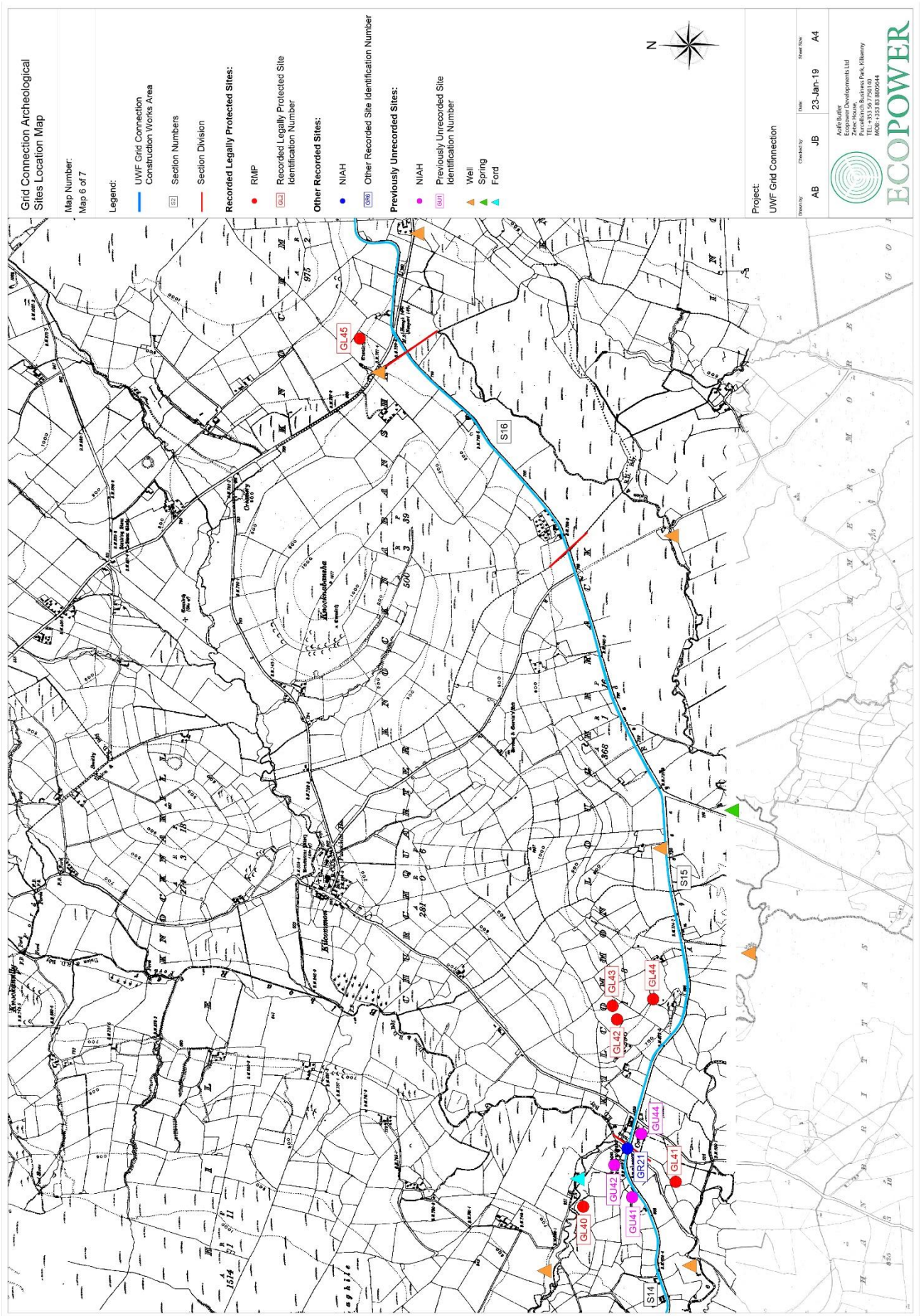
APPENDIX 16.4
to Revised EIAR Chapter 16: Cultural Heritage



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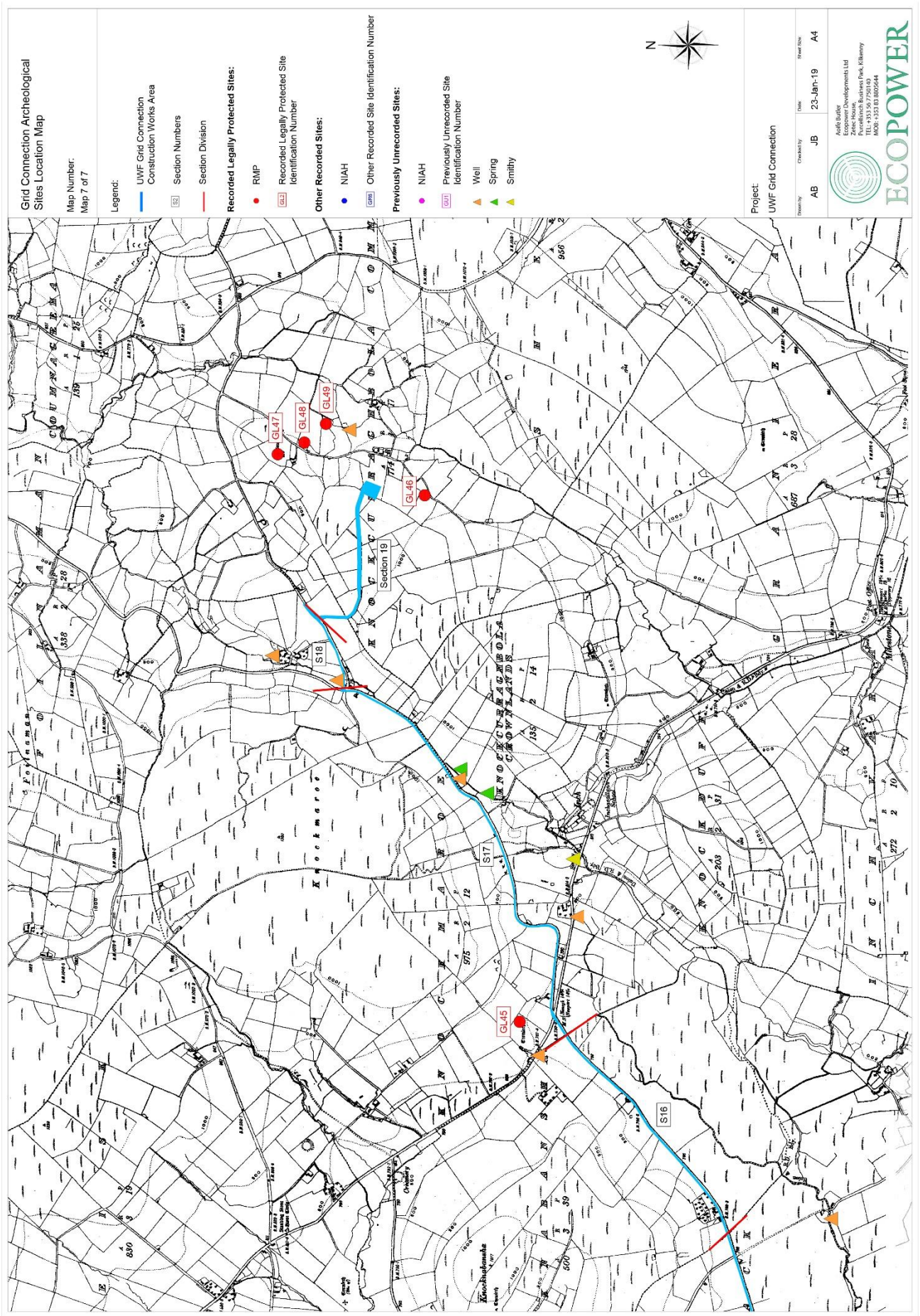

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Appendix to Chapter 17: Landscape

Appendix 17.1: Contextual Photographs and Theoretical Visibility within the Study Areas

The data and descriptions in this appendix have informed Chapter 17: Landscape of the EIA Report, in relation to landscape character and visual amenity. The information presented in this Appendix 17.1 is outlined below and the relevant element(s) of the Whole Windfarm Project are also identified.

Appendix 17.1 Section	Section Heading	Relevant Individual Project Element
A-17.1.1	Contextual Photographs of the Study Area	UWF Related Works UWF Grid Connection
A-17.1.2	ZTV No.2: Telecom Relay Pole within the 2km Study Area	UWF Related Works
A-17.1.3	ZTV No.1 :Theoretical Visibility of the Mountphilips Substation within the 2km Study Area	UWF Grid Connection

The surveys and modelling described in this appendix has been undertaken in accordance with the reference documents as appropriate in 17.1.6 of Chapter 17.

REFERENCE DOCUMENTS

REFERENCE DOCUMENTS

A-17.1.1 Contextual Photographs of the Study Area

UWF Related Works

Image 1 - Portion of UWF Related Works study area (along the L2264-50) in townland of Knockmaroe within LCA17 – 'Upperchurch, Kilcommon & Hollyford Mountain Mosaic'

UWF Grid Connection

Image 2 - Portion of Grid Connection study area (along the R503) in the townlands of Coole within LCA12 'River Shannon – Newport'

Image 3 - Portion of Grid Connection study area (along the R503) in the townlands of Kilnacappagh on border between LCA12 'River Shannon – Newport' and LCA18 – 'Silvermines – Rearcross'

Image 4 - Portion of UWF Grid Connection study area (along the R503) in the townlands of Baurnadomeeny within LCA18 – 'Silvermines – Rearcross'

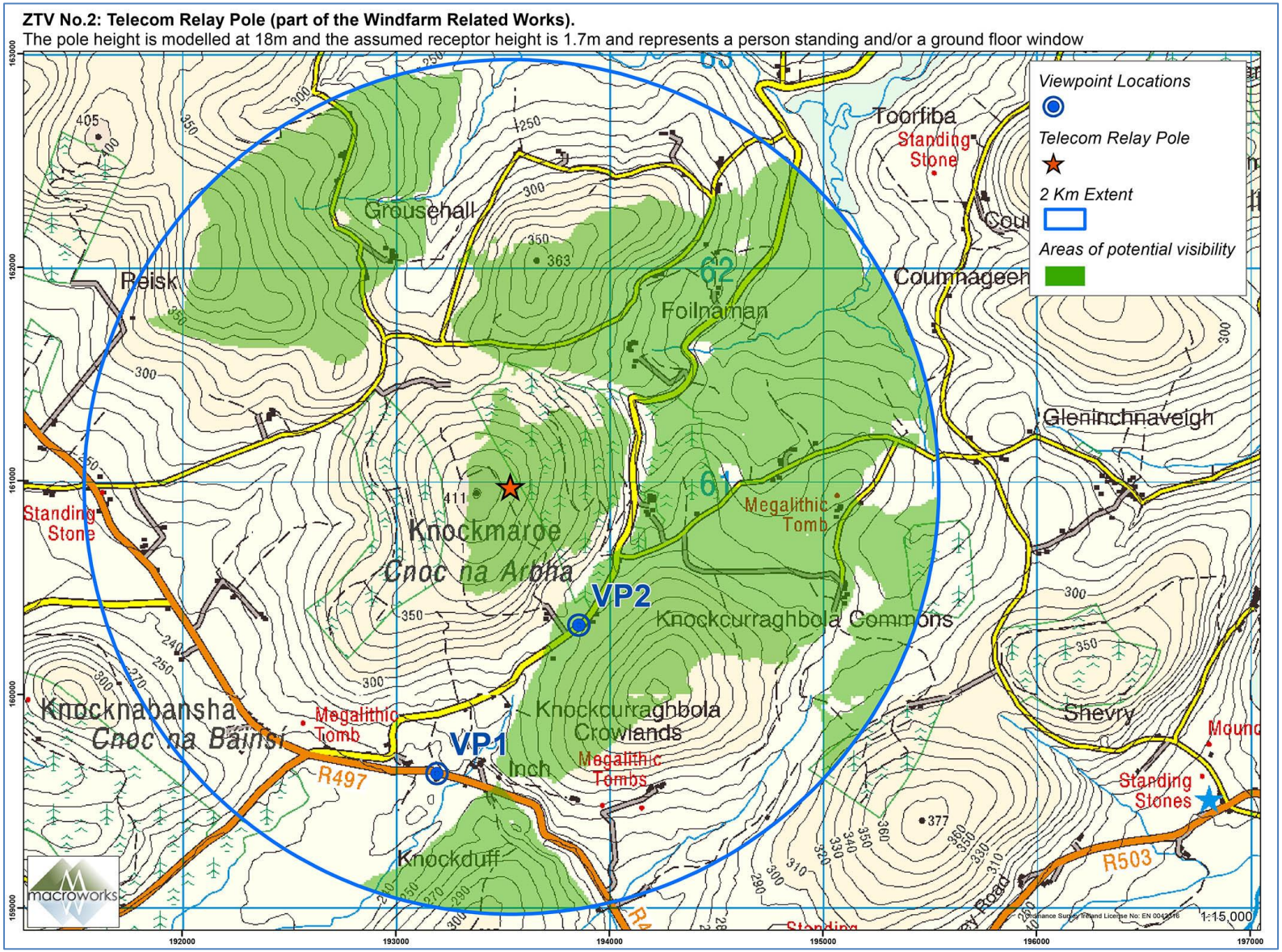
Image 5 - Portion of Grid Connection study area (along the R503) in the townlands of Kilcommon on border between LCA18 – 'Silvermines – Rearcross' and LCA17 – 'Upperchurch, Kilcommon & Hollyford Mountain Mosaic'

Image 6 - Portion of UWF Grid Connection study areas (along the L2264-50) in townland of Knockmaroe within LCA17 – 'Upperchurch, Kilcommon & Hollyford Mountain Mosaic'

A-17.1.2 ZTV No.2: Telecom Relay Pole within the 2km Study Area

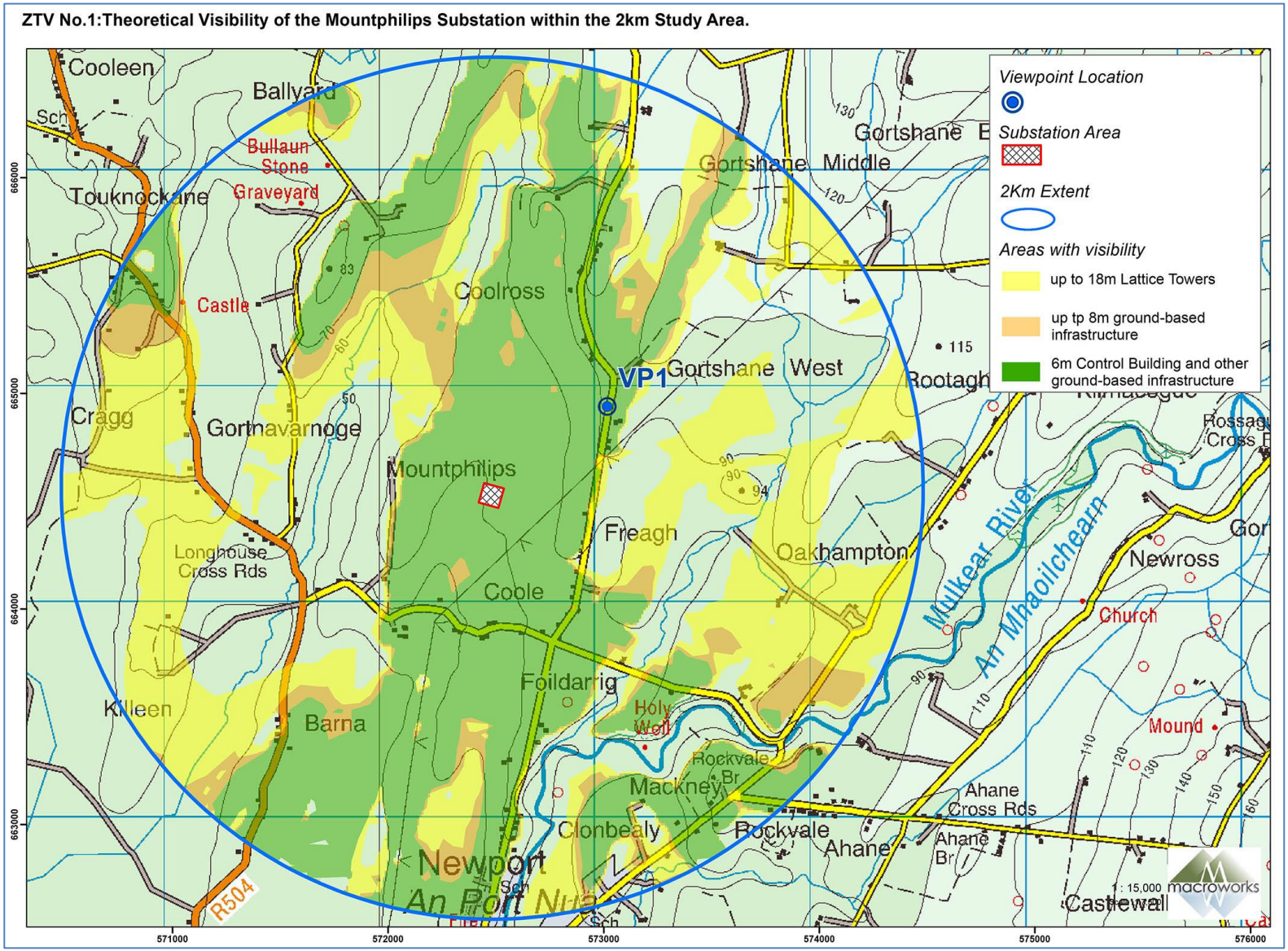
The Zone of Theoretical Visibility (ZTV) map below indicated from where in the surrounding landscape of the study area the top of the Telecom Relay Pole is potentially visible in a 'bare-ground' scenario and does not take account of screening by existing vegetation and buildings.

ZTV No.2: Telecom Relay Pole (part of the Windfarm Related Works).
The pole height is modelled at 18m and the assumed receptor height is 1.7m and represents a person standing and/or a ground floor window



A-17.1.3 ZTV No.1: Theoretical Visibility of the Mountphilips Substation within the 2km Study Area

The Zone of Theoretical Visibility (ZTV) map below indicated from where in the surrounding landscape of the study area the Mountphilips Substation is potentially visible in a 'bare-ground' scenario and does not take account of screening by existing vegetation and buildings.



Appendix to Chapter 18: Interaction of the Foregoing

No Appendices for Chapter 18

Appendix to Chapter 19: Monitoring Arrangements

No Appendices for Chapter 19

Appendix to Chapter 20: Executive Summary

No Appendices for Chapter 20

Upperchurch Windfarm Related Works
(UWF Related Works)

UWF Related Works Revised EIA Report (Revised EIAR)

VOLUME C3: REVISED EIAR FIGURES

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January 2019

REFERENCE DOCUMENTS

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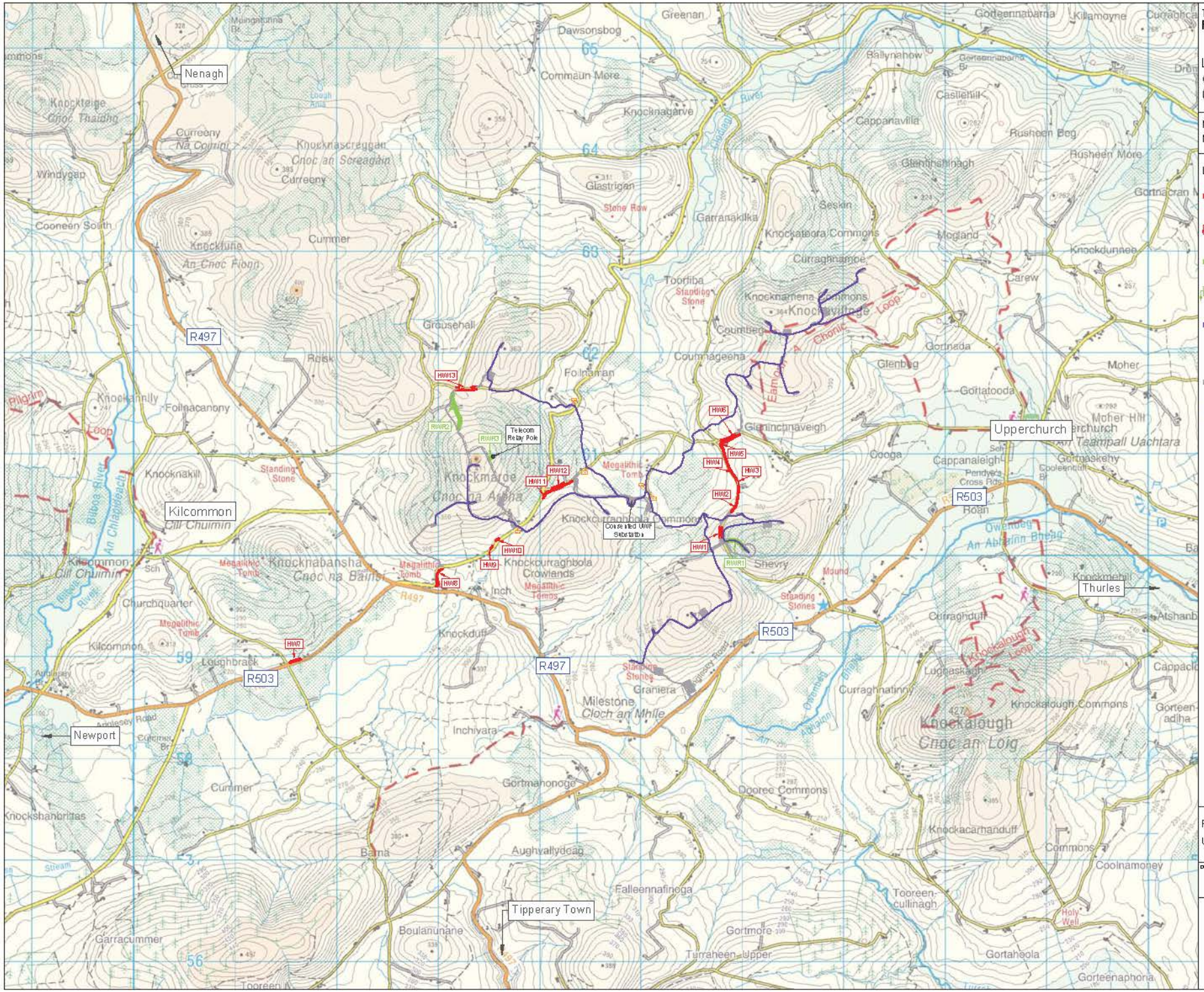
No mapping or figures for Chapter 18		
Figures for Chapter 19: Monitoring Arrangements		**Tab 18 (printed version)**
No mapping or figures for Chapter 18		
Figures for Chapter 20 Executive Summary		**Tab 18 (printed version)**
No mapping or figures for Chapter 20		



Title:
Figure RW 1.1

Location of UWF Related Works on OSI Discovery Mapping (The Subject Development)

Map Number:
Map 1 of 1

Legend:

- Haul Route Works
- HW1 — Haul Route Works Numbers (HW1 - HW13)
- Realigned Windfarm Road
- RWR1 — Realigned Windfarm Road Numbers (RWR1 - RWR3)
- Internal Windfarm Cabling
- Telecom Relay Pole
- Upperchurch Windfarm (UWF)
- R503 — Regional Road Number

REFERENCE DOCUMENTS

N

Project:
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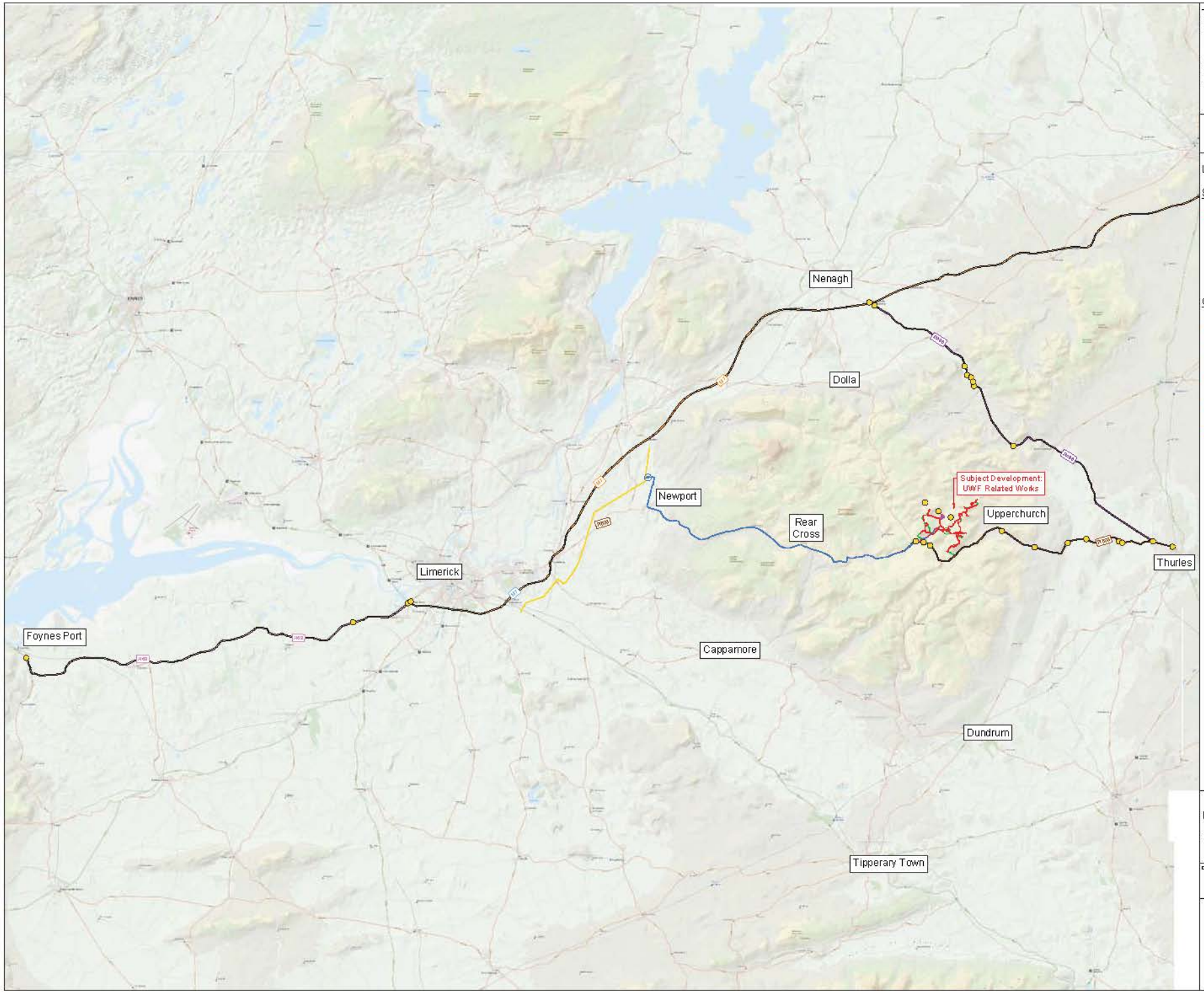

Title:
Figure CE 1.1

Location of UWF Related Works and the Other Elements of the Whole UWF Project on OSI Mapping

Map Number:
Map 1 of 1

Legend:

Subject Development:

- UWF Related Works
  - Haul Route Works
  - Realigned Windfarm Road
  - Internal Windfarm Cabling
  - Telecom Relay Pole

Other Elements of the Whole UWF Project:

- UWF Grid Connection
- Mountphilips Substation
- Upperchurch Windfarm
- UWF Replacement Forestry
- UWF Other Activites

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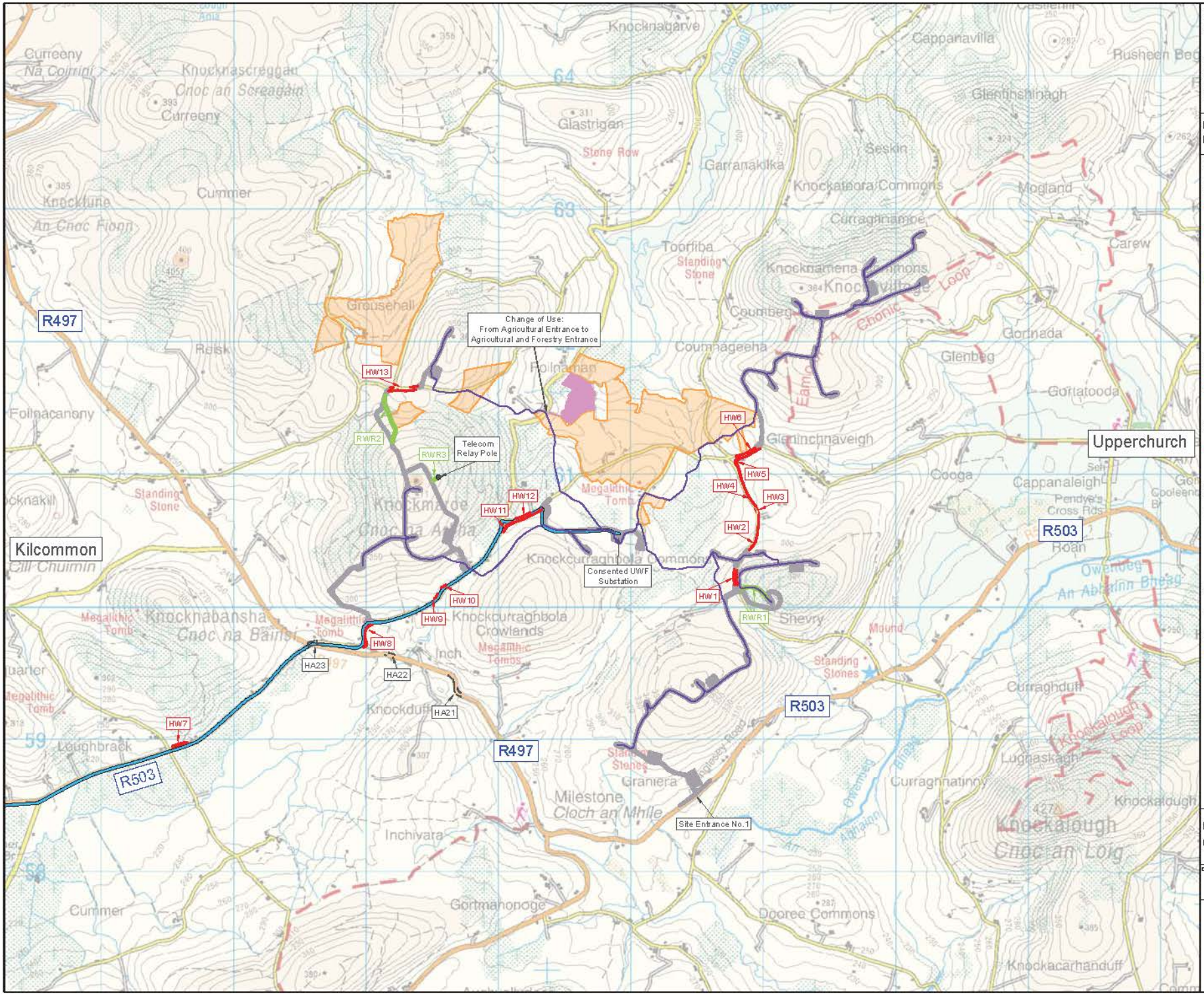

Title:
Figure CE 1.2

UWF Related Works and the Other Elements of the Whole UWF Project in the vicinity of Upperchurch Windfarm

Map Number:
Map Overview on OSI Mapping

Legend:

UWF Related Works: (Subject Development)

- Haul Route Works
- Haul Route Works Numbers (HW1 - HW13)
- Realigned Windfarm Road
- Realigned Windfarm Road Numbers (RWR1 - RWR3)
- Internal Windfarm Cabling
- Telecom Relay Pole

UWF Grid Connection:

- UWF Grid Connection

UWF Replacement Forestry:

- UWF Replacement Forestry

Upperchurch Windfarm:

- Upperchurch Windfarm
  - -Consented UWF Turbines
  - -Consented UWF Substation
  - -Consented UWF Roads

UWF Other Activities:

- Haul Route Activities
- Haul Route Activities Number
- Upperchurch Hen Harrier Scheme

- Regional Road Number

N

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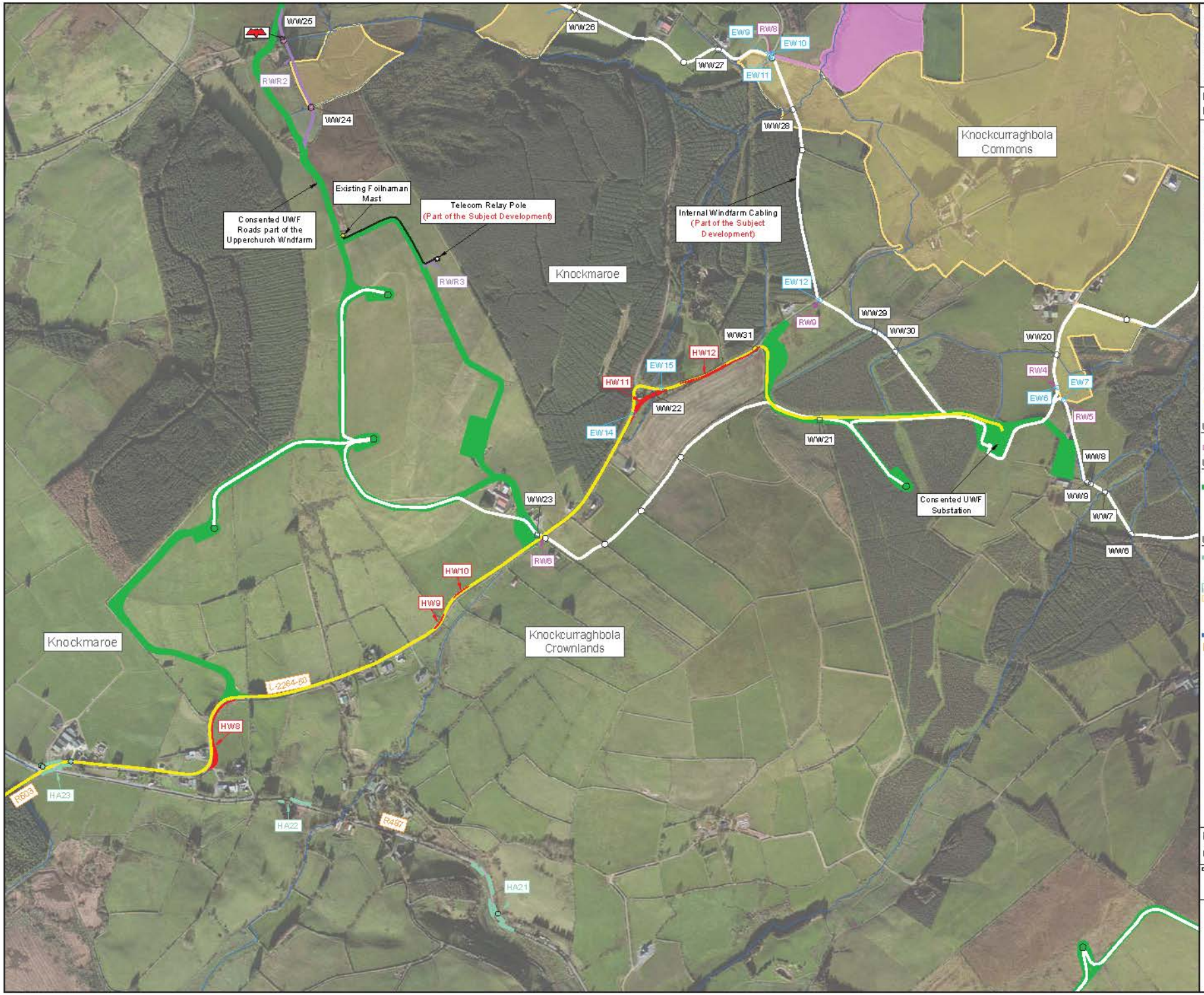

Title:
Figure CE 1.3

UWF Related Works and the Other Elements of the Whole UWF Project in Knockmaroe, Knockcurraghbola Commons and Knockcurraghbola Crownlands

Map Number:
Map Overview on OSI Mapping

Legend:

UWF Related Works: (Subject Development)
- Haul Route Works
- Haul Route Works Numbers (HW8 - HW12)
- Realigned Windfarm Road
- Realigned Windfarm Road Numbers (RWR2 - RWR3)
- Internal Windfarm Cabling
- Telecom Relay Pole
- Temporary hedge/tree removal & pruning
- Permanent hedge/tree removal & pruning
- Related Works Water Crossings
- Bat Crossing Location
- Related Works Road Crossings
- Related Works Site Entrance

UWF Grid Connection:
- UWF Grid Connection

UWF Replacement Forestry:
- UWF Replacement Forestry

Upperchurch Windfarm:
- Upperchurch Windfarm
  - -Consented UWF Turbines
  - -Consented UWF Substation
  - -Consented UWF Roads

UWF Other Activities:
- Haul Route Activity - Vegetation Trimming
- Haul Route Activity - Street Furniture Removal
- Haul Route Activities Number
- Upperchurch Hen Harrier Scheme

- Watercourse
- Regional Road Number

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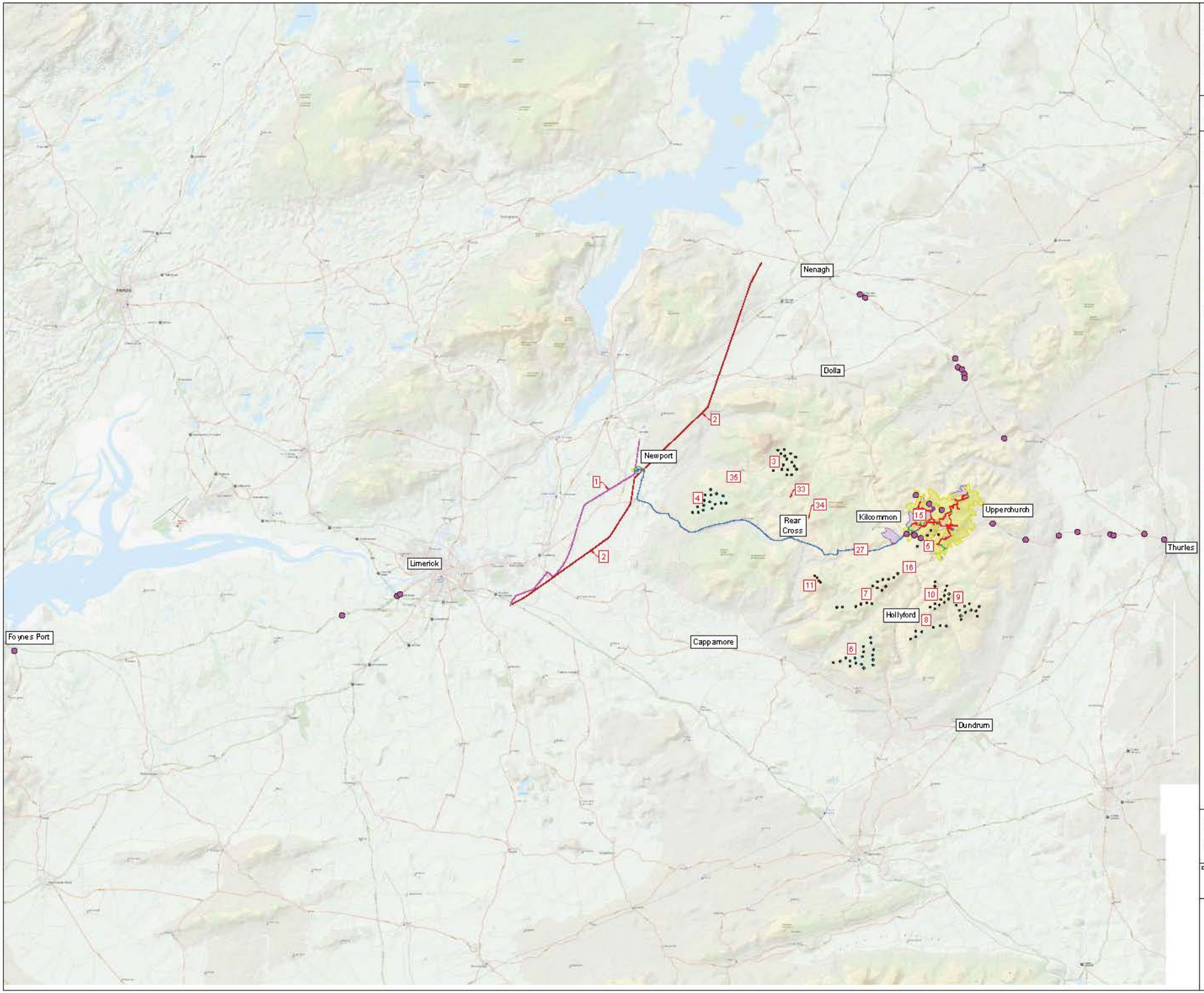

Title:

Figure CE 2.1

Other Projects or Activities Scoped in for Cumulative Evaluation in the Environmental Factor topic chapters

Map Number:
Map 1 of 1

Subject Development:

- UWF Related Works

Other Elements of the Whole UWF Project:

- UWF Grid Connection
- Mountphilips Substation
- Upperchurch Windfarm
- UWF Replacement Forestry
- UWF Other Activites

Other Projects or Activties Scoped in:

1. Killonan to Nenagh 110kV OHL
2. Shannonbridge to Killonan 220kV OHL
3. Bunkimalta Windfarm
4. Castlewaller Windfarm
5. Milestone Windfarm
6. Cappawhite Windfarm
7. Garracummer Windfarm
8. Glencarby Windfarm
9. Glenough Windfarm
10. Hollyford Windfarm
11. Knockastanna Windfarm
15. Foilnaman Mast
16. Cummermore Communications Pole
33. Forestry
34. Agriculture
35. Turf - Cutting

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UWF Related Works (RW)

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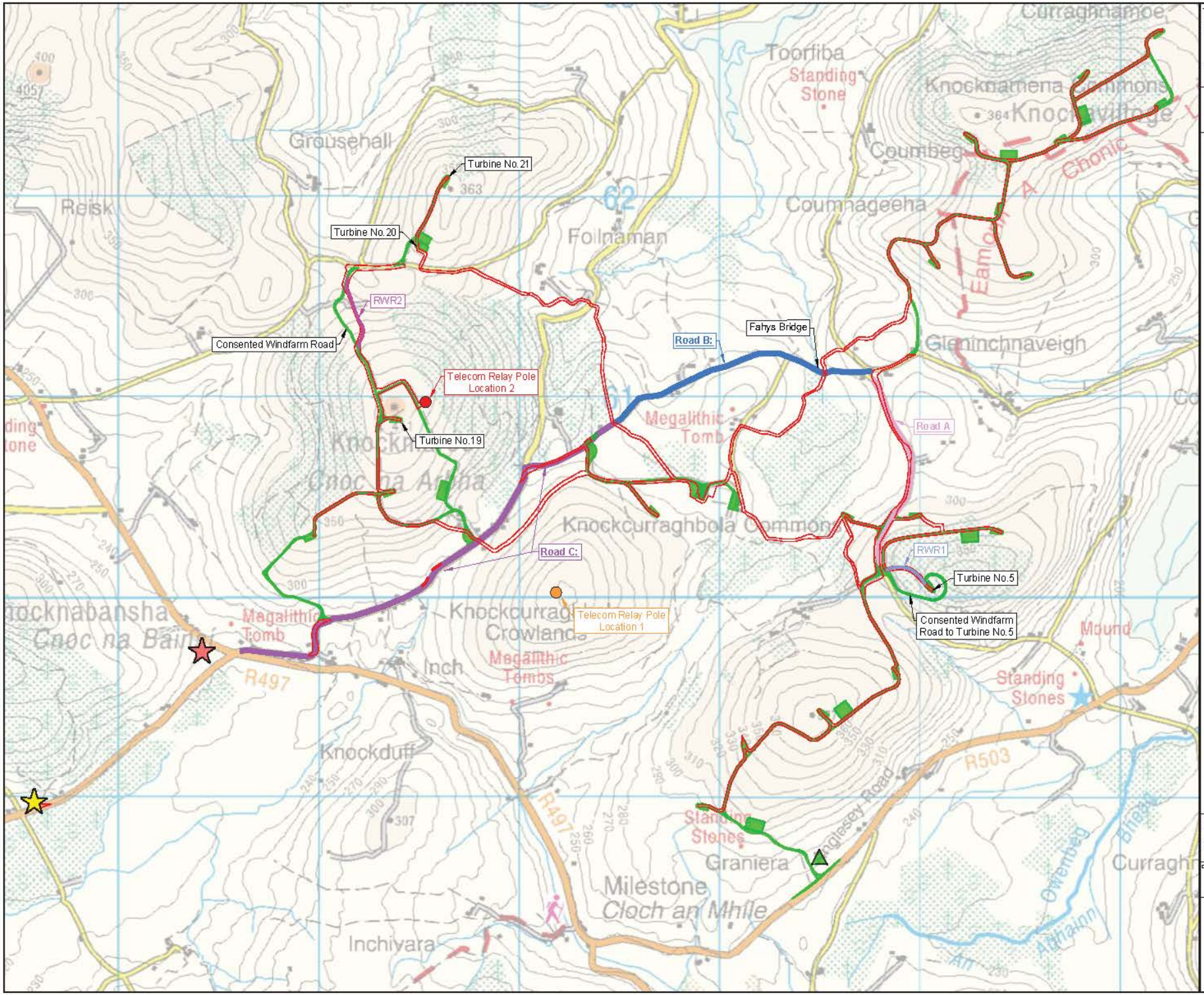
Figures for Chapter 3: EIA Report Process	Tab 3 (printed version)
No mapping or figures for Chapter 3	



Title:

Figure RW 4.1

Alternatives for UWF Related Works

Map Number:
1 of 1

Legend:

- UWF Related Works Construction Works Area
  - Internal Windfarm Cabling
  - Realigned Windfarm Road
  - Telecom Relay Pole
  - Haul Route Works
- Upperchurch Windfarm (Road)
- Upperchurch Windfarm (Turbine)
- Upperchurch Windfarm Site Compound No.1

Alternative Delivery Routes

- Road A: L4139-0
- Road B: The eastern section of the L6188-0
- Road C: The L2264-50 and the western section of the L6188-0

Alternative Turning Areas for Road C selection

- Turning Point 1
- Turning Point 2

Alternative Locations - Telecom Relay Pole

- Location 1 at Knockcurraghbola Crownlands
- Location 2 at Knockmaroe

Alternative Layouts - Realigned Windfarm Road

- Realigned Windfarm Road (RWR1)
- Realigned Windfarm Road (RWR2)

N

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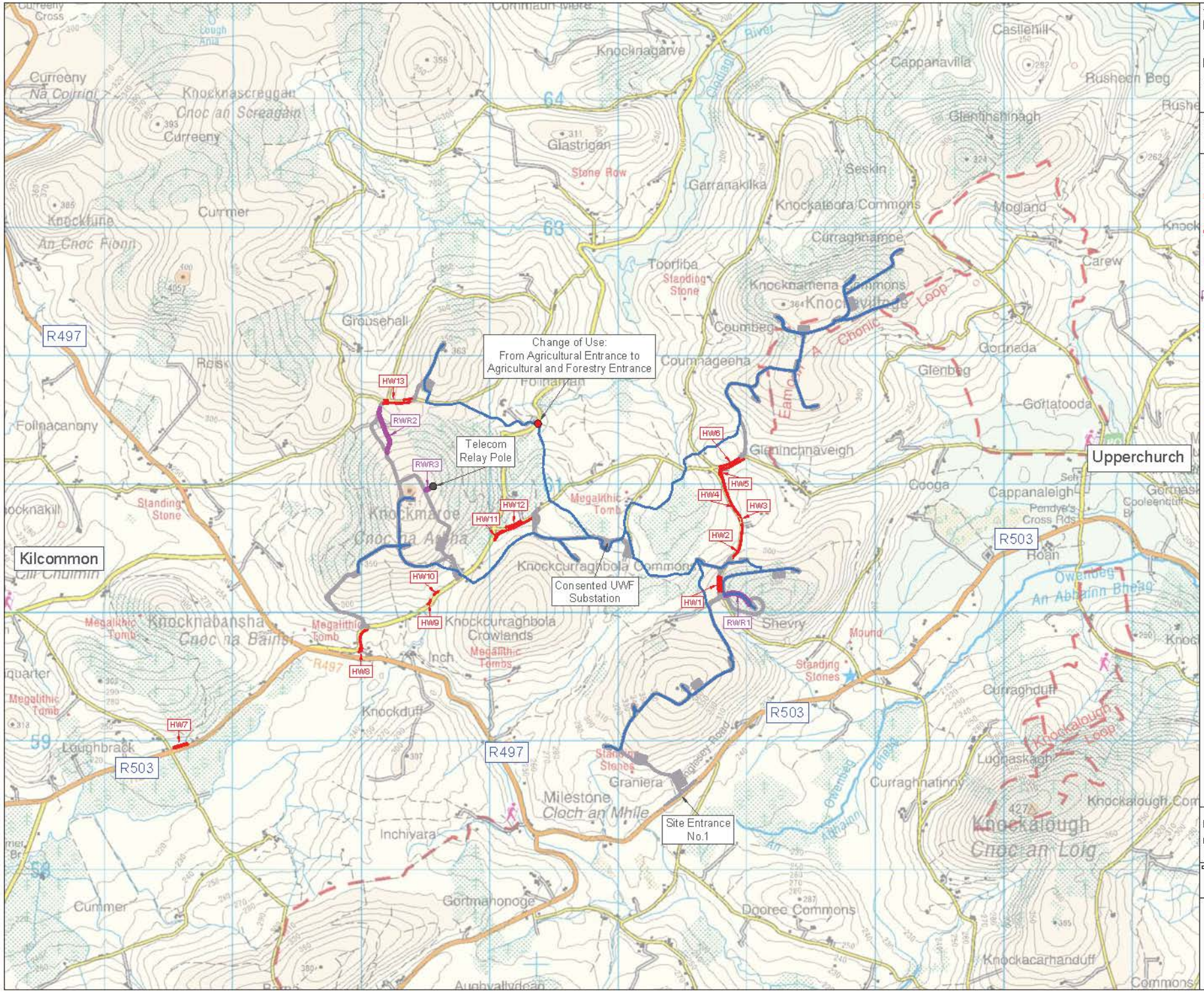

Title:
Figure RW 5.1

Location of UWF Related Works on OSI Discovery Mapping

Map Number:
Map 1 of 1

Legend:

- Haul Route Works
- HW1 — Haul Route Works Numbers (HW1 - HW13)
- Realigned Windfarm Road
- RWR1 — Realigned Windfarm Road Numbers (RWR1 - RWR3)
- Internal Windfarm Cabling
- Telecom Relay Pole
- Upperchurch Windfarm (UWF)
- R503 — Regional Road Number

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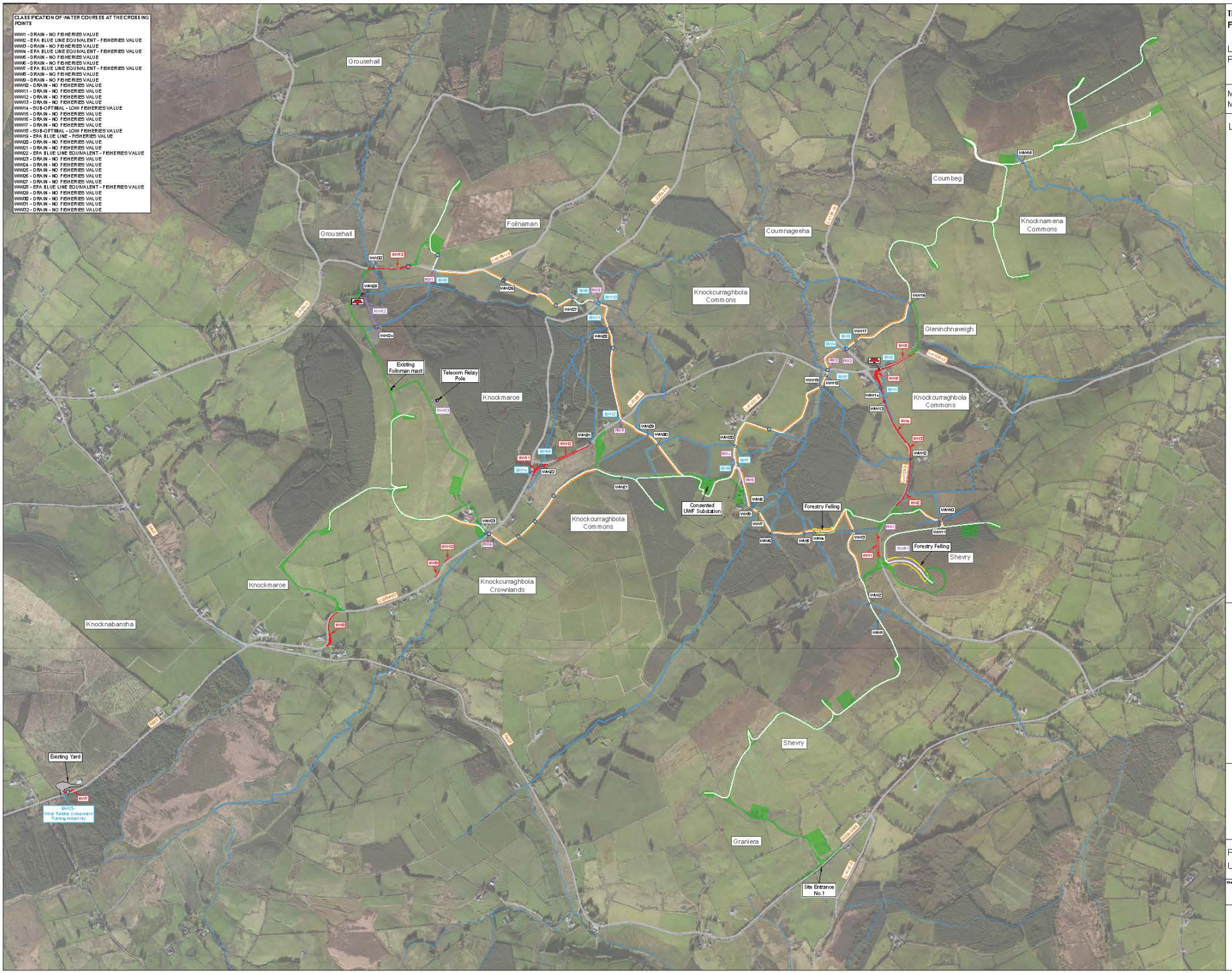

Title:

Figure RW 5.2

Layout of UWF Related Works on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

PROPOSED

- Haul Route Works
- Haul Route Works Numbers (HW1 - HW13)
- Realigned Windfarm Road
- Realigned Windfarm Road Numbers (RWR1 - RWR3)
- Internal Windfarm Cabling
- Temporary Access Roads
- Telecom Relay Pole
- Water Crossings
- Bat Crossing Locations
- Site Entrance
- Road Crossing (RW1 - RW9)
- Forestry Felling
- Temporary hedge/tree removal & pruning
- Permanent hedge/tree removal

EXISTING

- Watercourse
- Public Road
- Public Road Number
- Townlands

N

CONSENTED Planning Ref: ABP PL 22.243040

- Consented Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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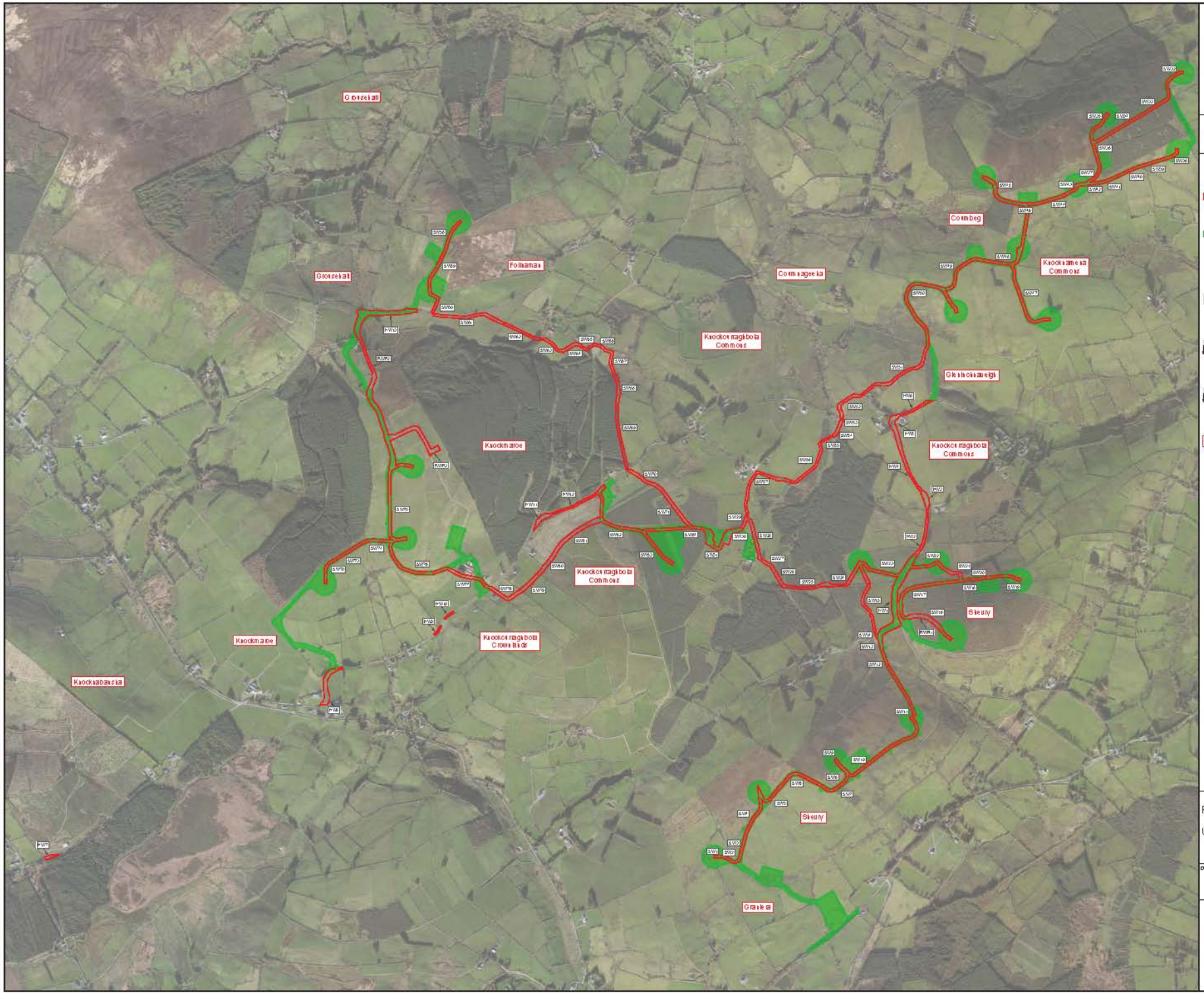

Title:
Figure RW 5.3

UWF Related Works Construction Works Area Boundary

Map Number:
Map 1 of 1

Legend:

- Construction Works Area
- Upperchurch Windfarm (Land requirement during construction phase)
- SW3 — Section numbers for Internal Windfarm Cabling (SW1 - SW84)
- HW2 — Section numbers for Haul Route Works (HW1 - HW13)
- RWR1 — Section numbers for Realigned Windfarm Roads (RWR1 - RWR3)
- Sleuny — Townlands

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N

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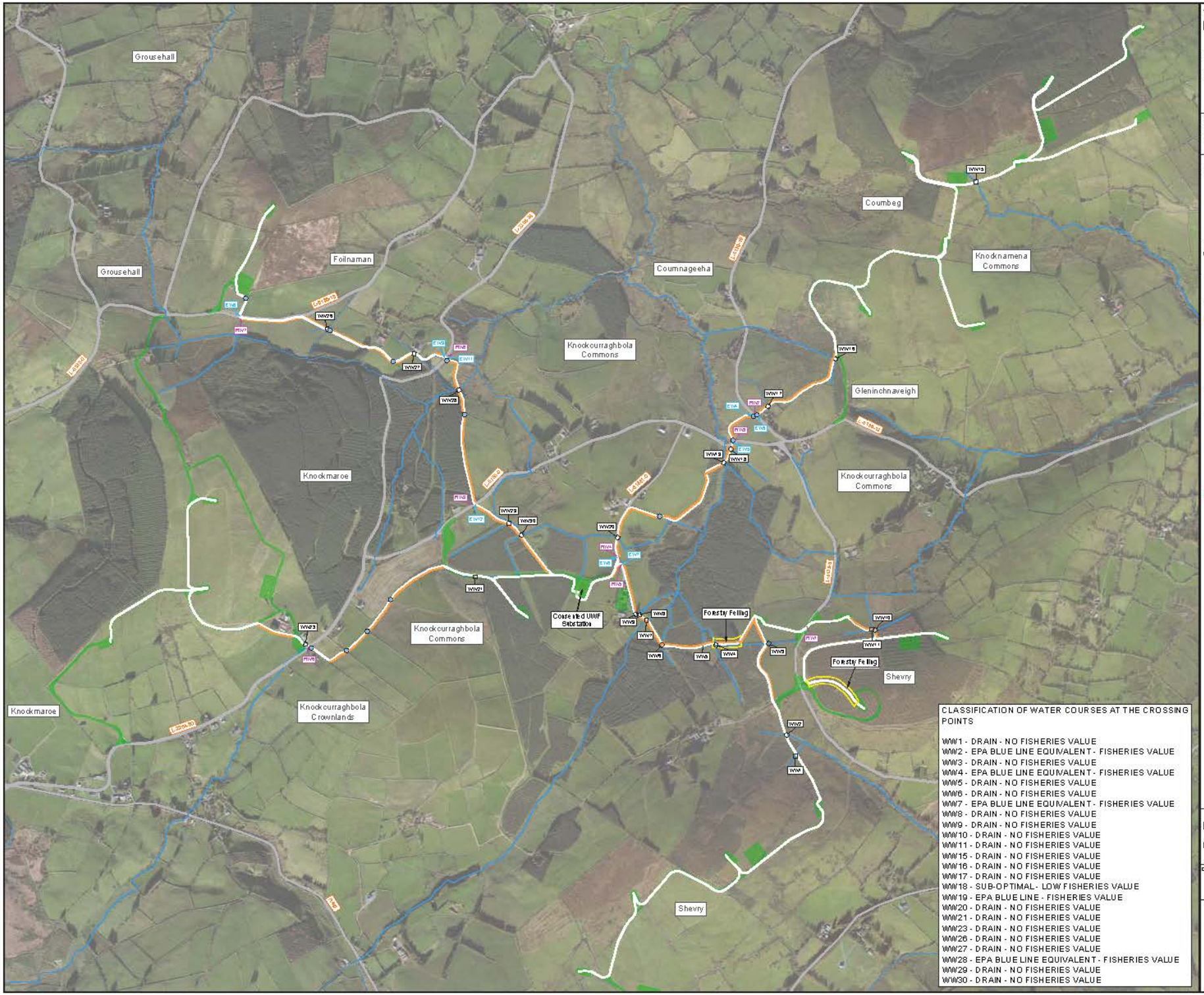

CLASSIFICATION OF WATER COURSES AT THE CROSSING POINTS

WW1 - DRAIN - NO FISHERIES VALUE
WW2 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW3 - DRAIN - NO FISHERIES VALUE
WW4 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW5 - DRAIN - NO FISHERIES VALUE
WW6 - DRAIN - NO FISHERIES VALUE
WW7 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW8 - DRAIN - NO FISHERIES VALUE
WW9 - DRAIN - NO FISHERIES VALUE
WW10 - DRAIN - NO FISHERIES VALUE
WW11 - DRAIN - NO FISHERIES VALUE
WW15 - DRAIN - NO FISHERIES VALUE
WW16 - DRAIN - NO FISHERIES VALUE
WW17 - DRAIN - NO FISHERIES VALUE
WW18 - SUB-OPTIMAL - LOW FISHERIES VALUE
WW19 - EPA BLUE LINE - FISHERIES VALUE
WW20 - DRAIN - NO FISHERIES VALUE
WW21 - DRAIN - NO FISHERIES VALUE
WW23 - DRAIN - NO FISHERIES VALUE
WW26 - DRAIN - NO FISHERIES VALUE
WW27 - DRAIN - NO FISHERIES VALUE
WW28 - EPA BLUE LINE EQUIVALENT - FISHERIES VALUE
WW29 - DRAIN - NO FISHERIES VALUE
WW30 - DRAIN - NO FISHERIES VALUE

Title:
Figure RW 5.4

Layout of Internal Windfarm Cabling on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

- Internal Windfarm Cabling
- Temporary Access Roads
- WW6 Water Crossings
- EW6 Site Entrance Numbers
- RW2 Road Crossing Numbers
- Forestry Felling
- Temporary hedge/tree removal & pruning
- Watercourse
- Public Road
- L-2186-0 Public Road Number
- Shevry Townlands
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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Purcellsinch Business Park, Kilkenny
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MOB: +353 83 8805644

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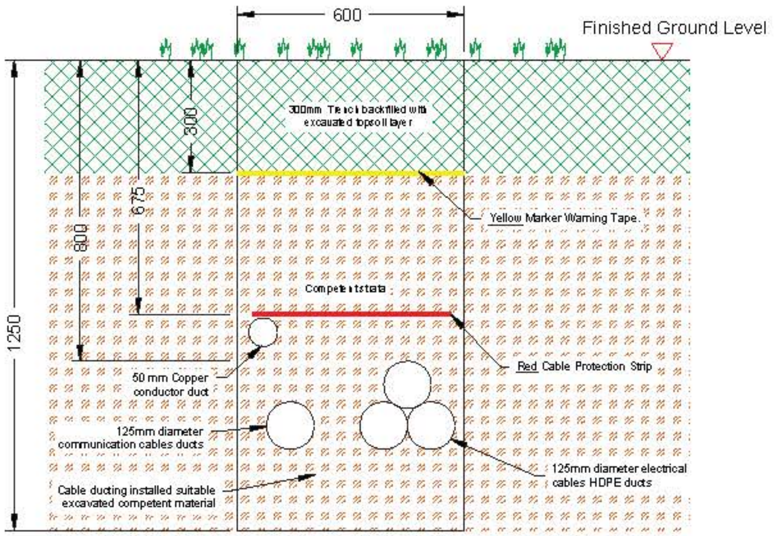
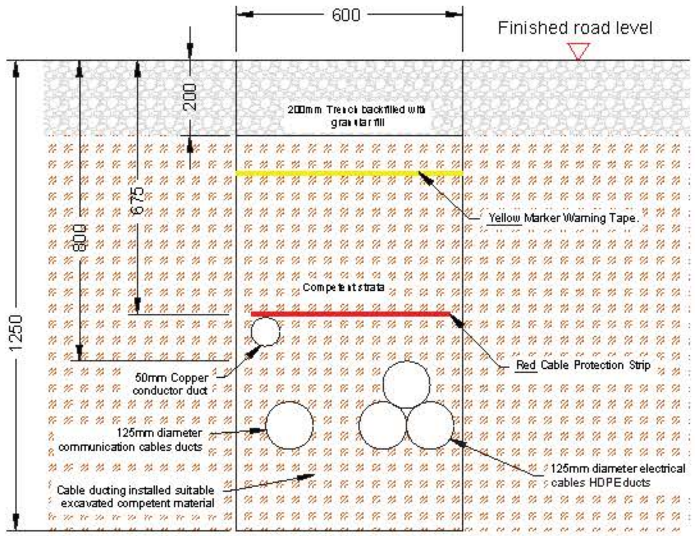
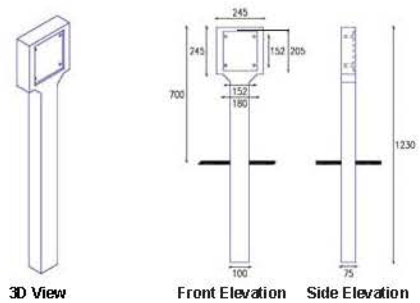


33kV CABLES TRENCH - TYPICAL SECTION THROUGH AGRICULTURAL LANDS AND FORESTRY LANDS



33kV CABLES TRENCH - TYPICAL SECTION THROUGH REALIGNED WINDFARM ROADS OR CONCENTED UWF WINDFARM ROADS



TYPICAL MARKER POST AND MARKER PLATE DIMENSIONS

REFERENCE DOCUMENTS

Title:
Figure RW 5.5

Cross Sections of Internal Windfarm Cables Trench

Map Number:
N/A

Note :
Drawings not to scale. For illustration purposes only

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UWF Related Works (RW)

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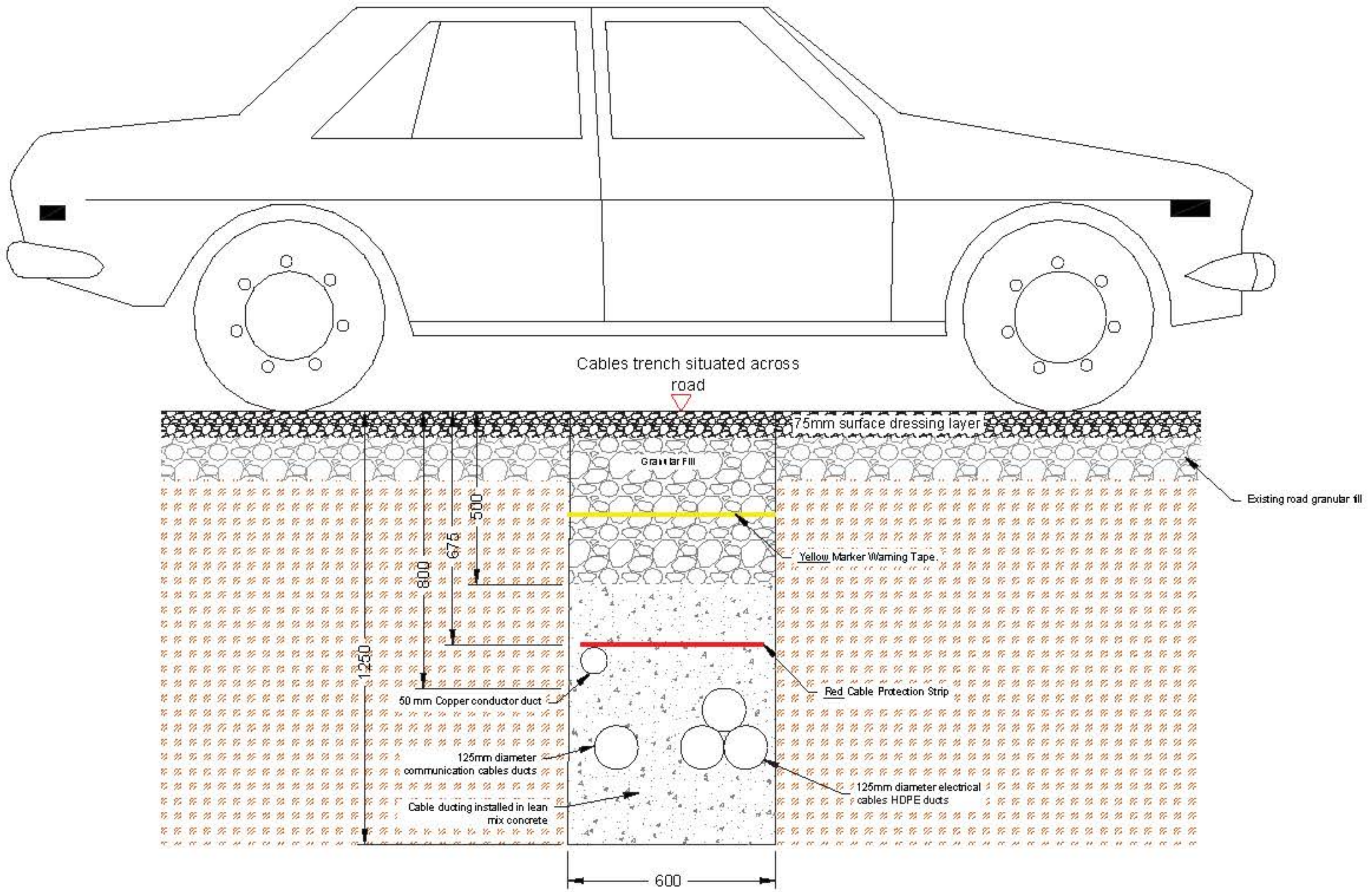

33kV TRENCH ACROSS PUBLIC ROADS (RW1 TO RW9)

REFERENCE DOCUMENTS

Title:
Figure RW 5.6
Cross Section of Internal Windfarm Cabling in Public Road Pavement

Map Number:
N/A

Note :
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Project:
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CB	JB	11-Feb-18	A3

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Title:
Figure RW 5.7

Layout of Realigned Windfarm Roads on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

- Realigned Windfarm Road
- Realigned Windfarm Road Numbers (RWR1 - RWR3)
- Water Crossings
- Bat Crossing Locations
- Forestry Felling
- Permanent hedge/tree removal & pruning
- Watercourse
- Public Road
- Public Road Number
- Townlands
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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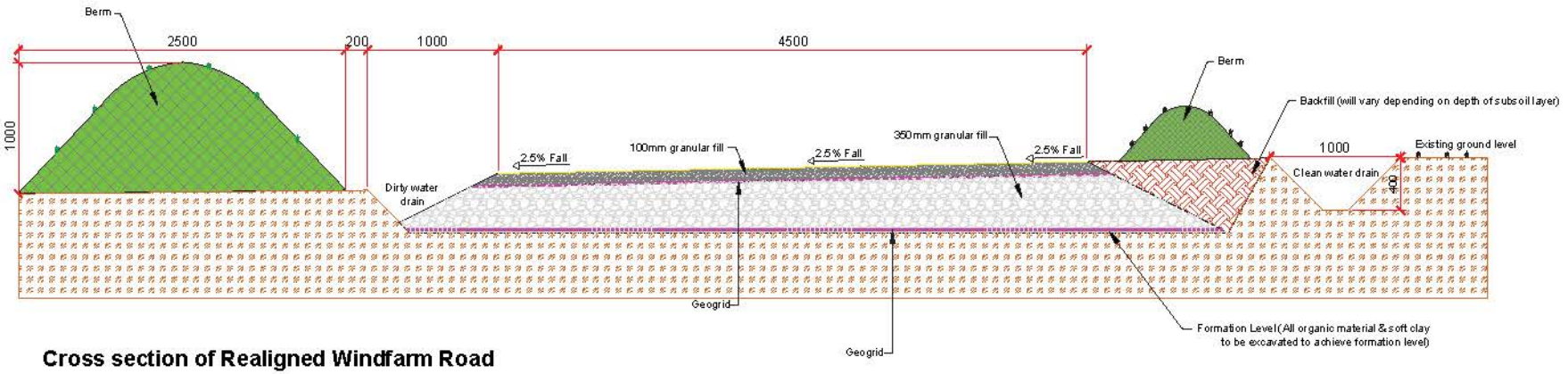

Cross section of Realigned Windfarm Road

Title:

Figure RW 5.8

Cross Section of Realigned Windfarm Road

Map Number:

N/A

Note :
Drawings not to scale. For illustration purposes only

REFERENCE DOCUMENTS

Project:

UWF Related Works (RW)

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ECOPOWER

Title:
Figure RW 5.9

Layout of Haul Route Works on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

- Haul Route Works
- Haul Route Works Numbers (HW1 - HW13)
- Water Crossings
- Bat Crossing Locations
- Site Entrances
- Temporary hedge/tree removal & pruning
- Permanent hedge/tree removal
- Watercourse
- Public Road
- Public Road Number
- Townlands
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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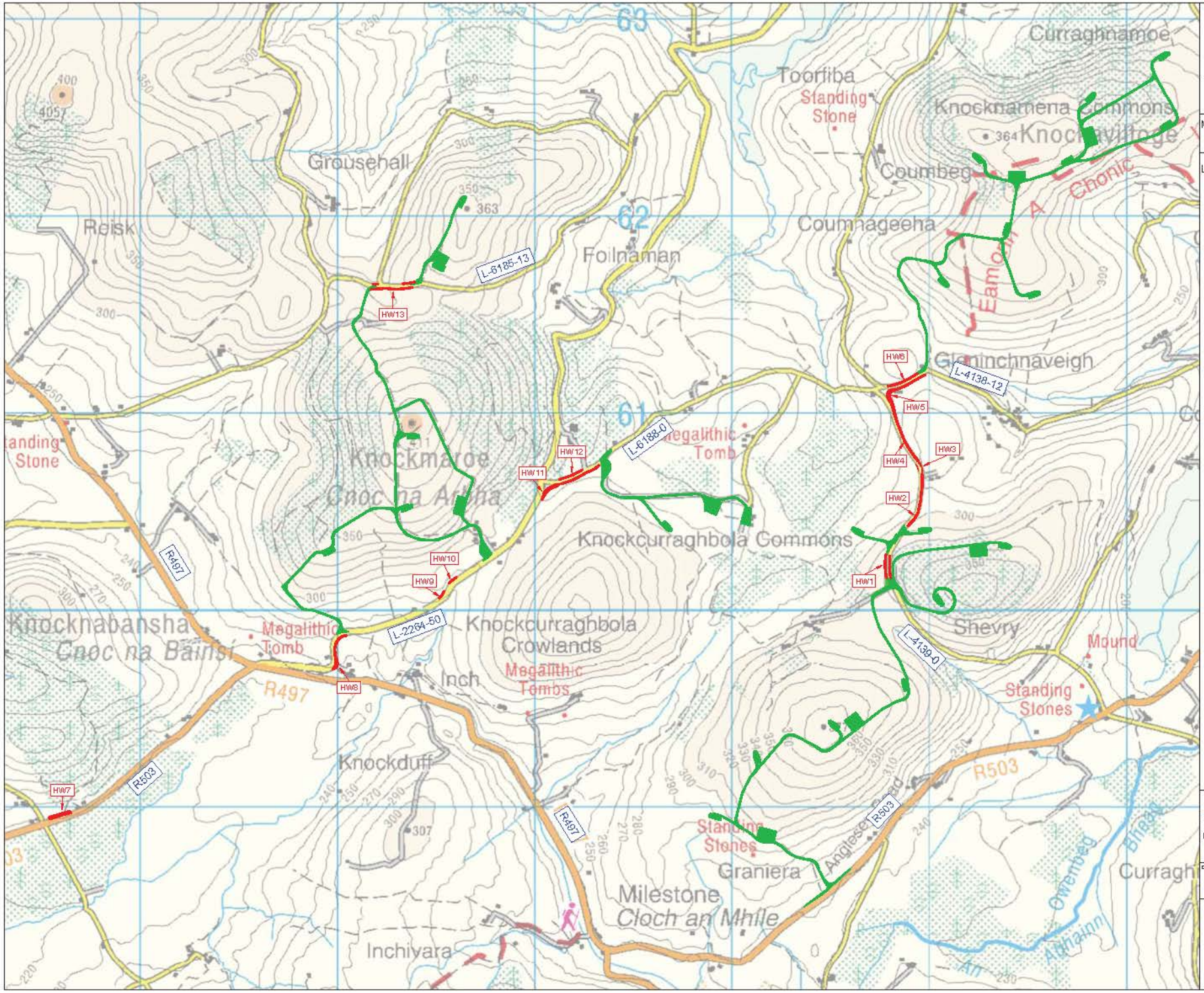

Title:
Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map Overview

Legend:

- HW6 — Haul Route Works ID
- Haul Route Works
- Upperchurch Windfarm
- R503 — Public Road Numbers

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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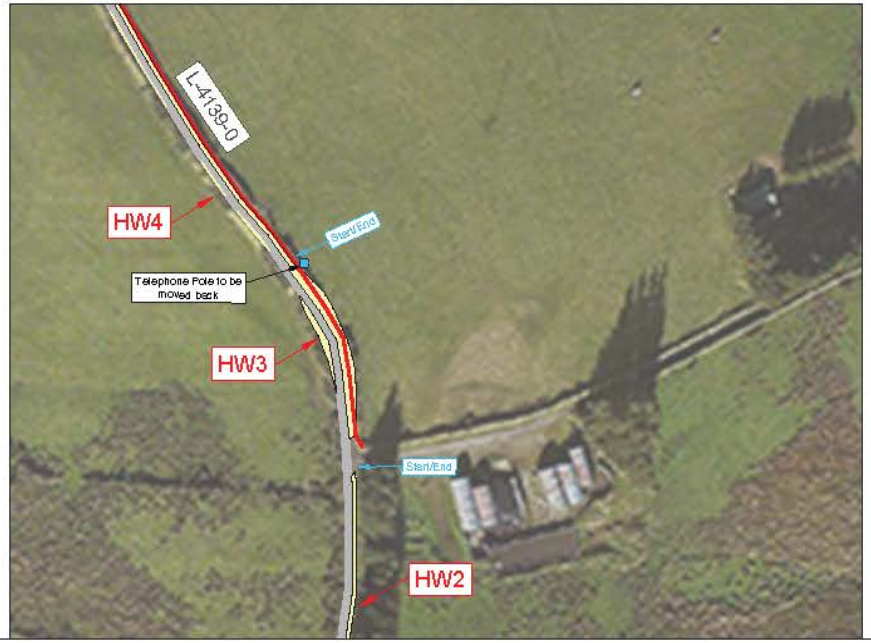

Title:

Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map 1 of 3

Legend:

- Move Telephone Pole
- Road Widening
- Public Road
- Temporary Removal of Roadside Boundary
- L-4139-0 Public Road Number
- Upperchurch Windfarm

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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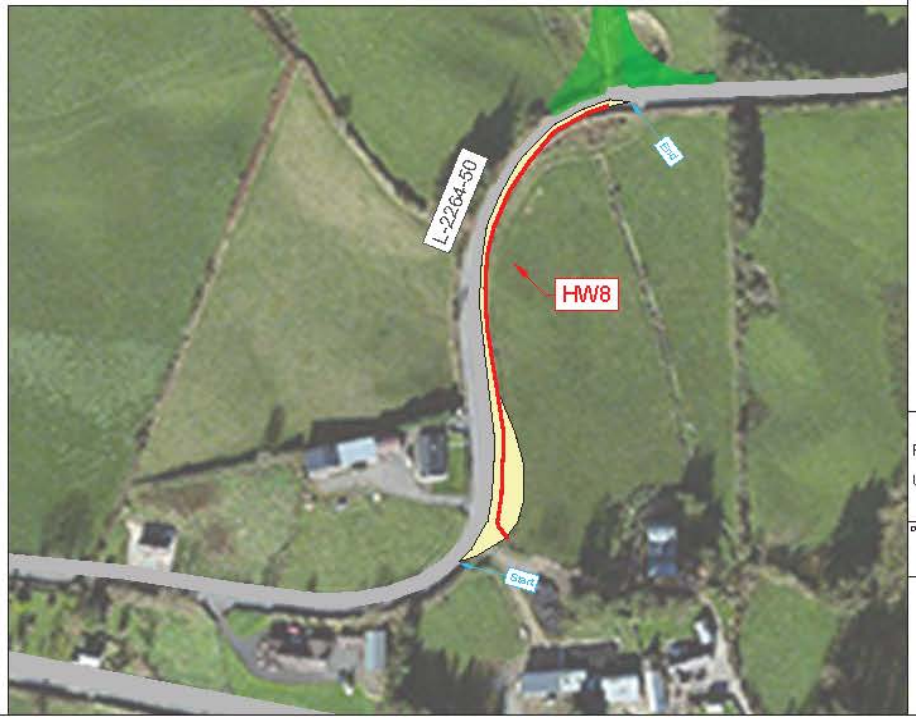

Title:
Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map 2 of 3

Legend:

- Move Telephone Pole
- Road Widening
- Public Road
- Temporary Removal of Roadside Boundary
- L-4139-0 Public Road Number
- Upperchurch Windfarm

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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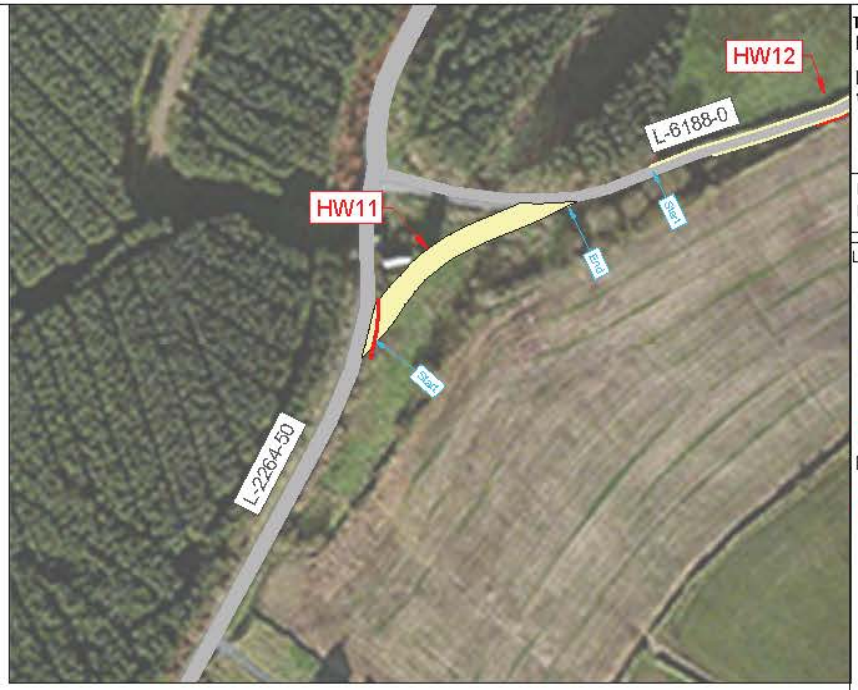

Title:
Figure RW 5.10

Location and Layouts of Haul Route Works (Overview and Maps 1 to 3)

Map Number:
Map 3 of 3

Legend:

- Move Telephone Pole
- Road Widening
- Public Road
- Temporary Removal of Roadside Boundary
- Public Road Number
- Upperchurch Windfarm

REFERENCE DOCUMENTS

N

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UWF Related Works (RW)

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Title:
Figure RW 5.11

Location of the Telecom Relay Pole on Aerial Photography Mapping

Map Number:
Map 1 of 1

Legend:

- Telecom Relay Pole and Compound
- Realigned Windfarm Road (RWR3)
- Public Road
- L-2169-0 Public Road Number
- Knockmaroe Townland
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

N

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UWF Related Works (RW)

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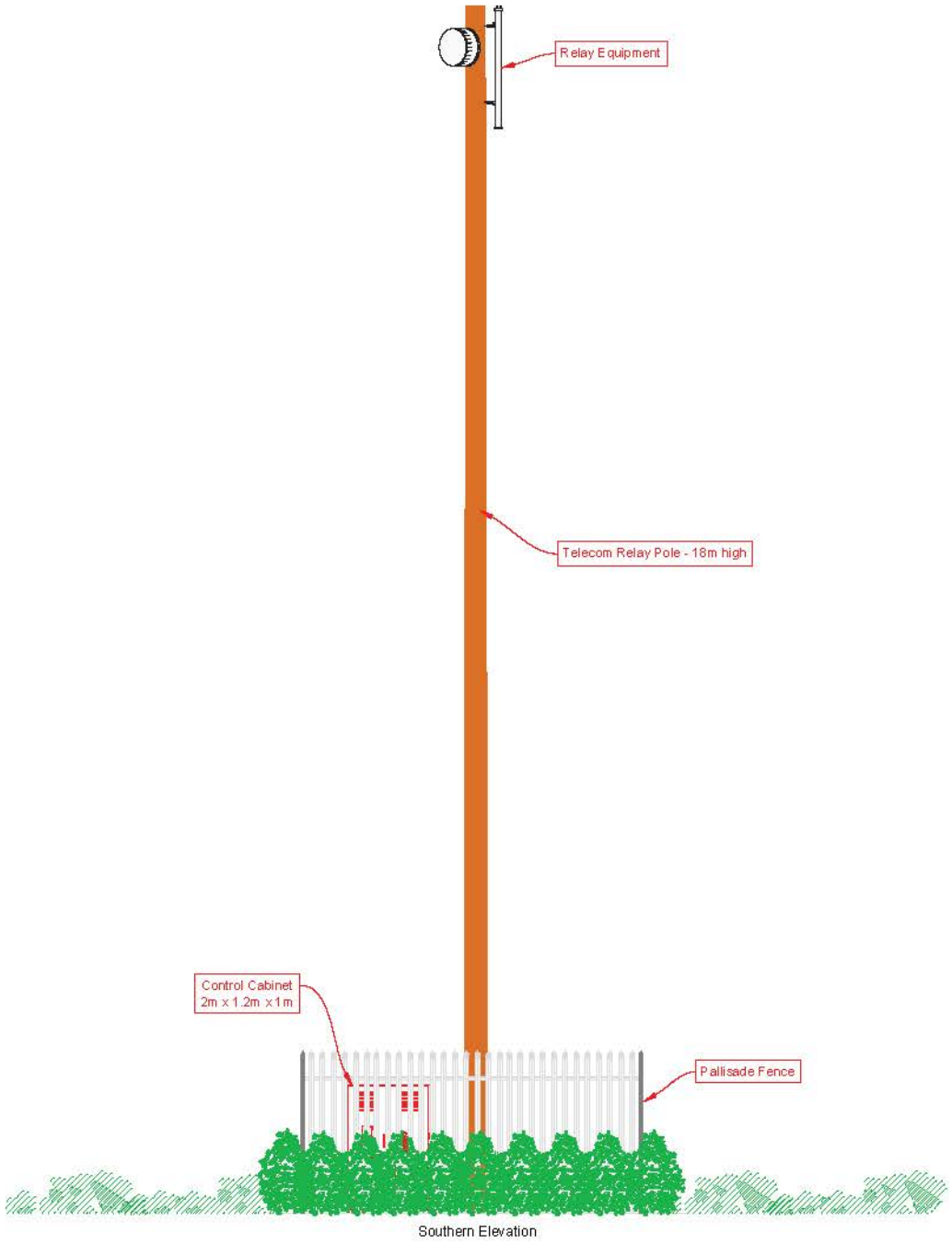
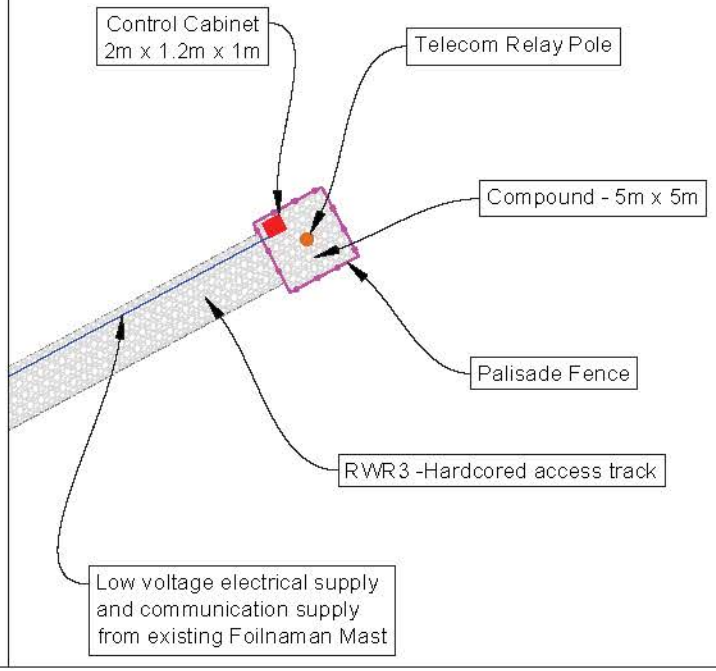


Southern Elevation



Title:

Figure RW 5.12

Plan and Elevation of Telecom Relay Pole and Compound

Map Number:

N/A

Note :
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UWF Related Works (RW)

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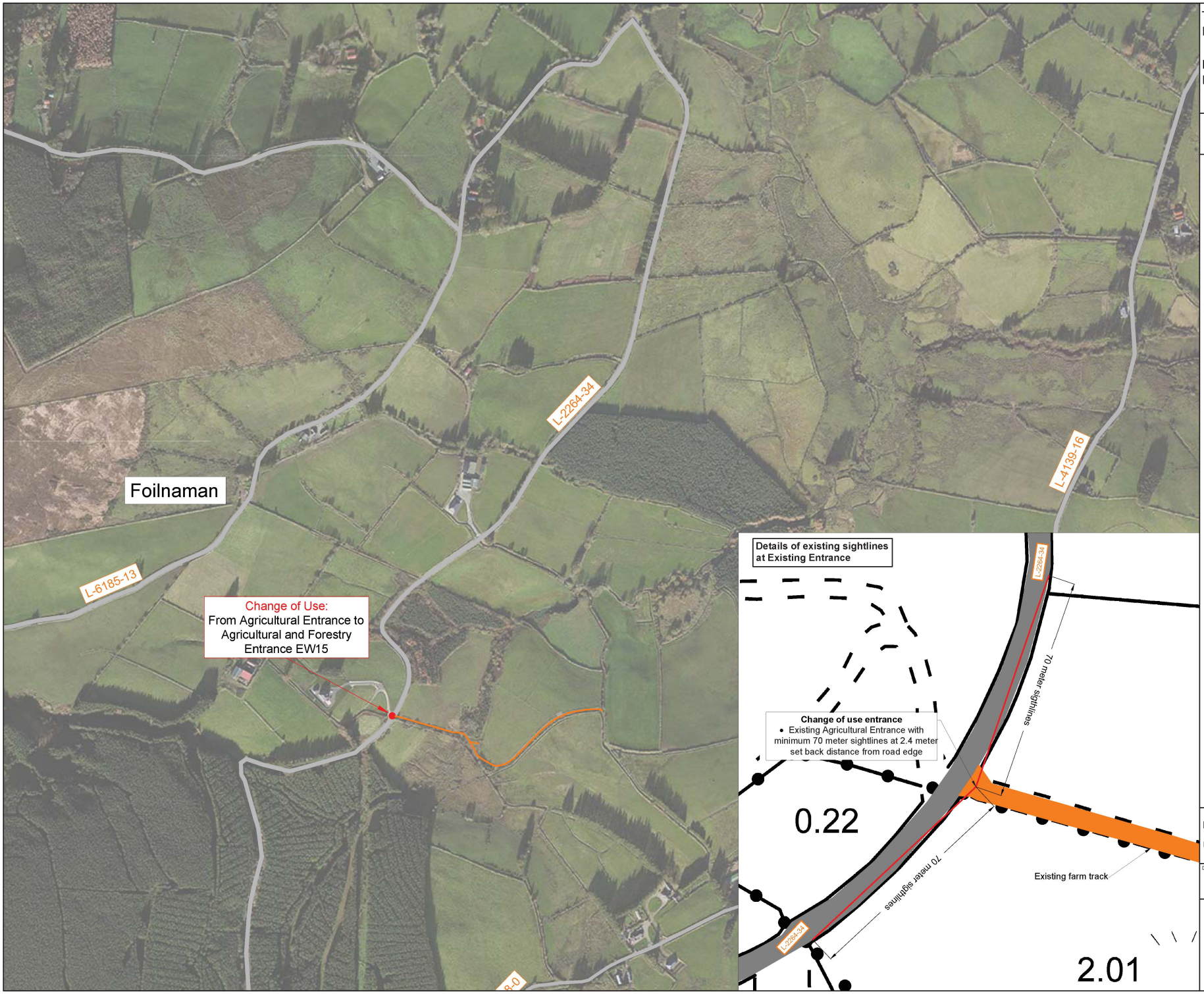

Title:

Figure **RW 5.13**

Location of "Change of Use at Existing Entrance" (including sightlines)

Map Number:
Map 1 of 1

Legend:

- Location of the change of use from Agricultural Entrance to Agricultural and Forestry Entrance
- Public Road
- Existing farm track
- L-2166-0 Public Road Number
- Foilnaman Townland
- Upperchurch Windfarm (UWF)

REFERENCE DOCUMENTS

Project:

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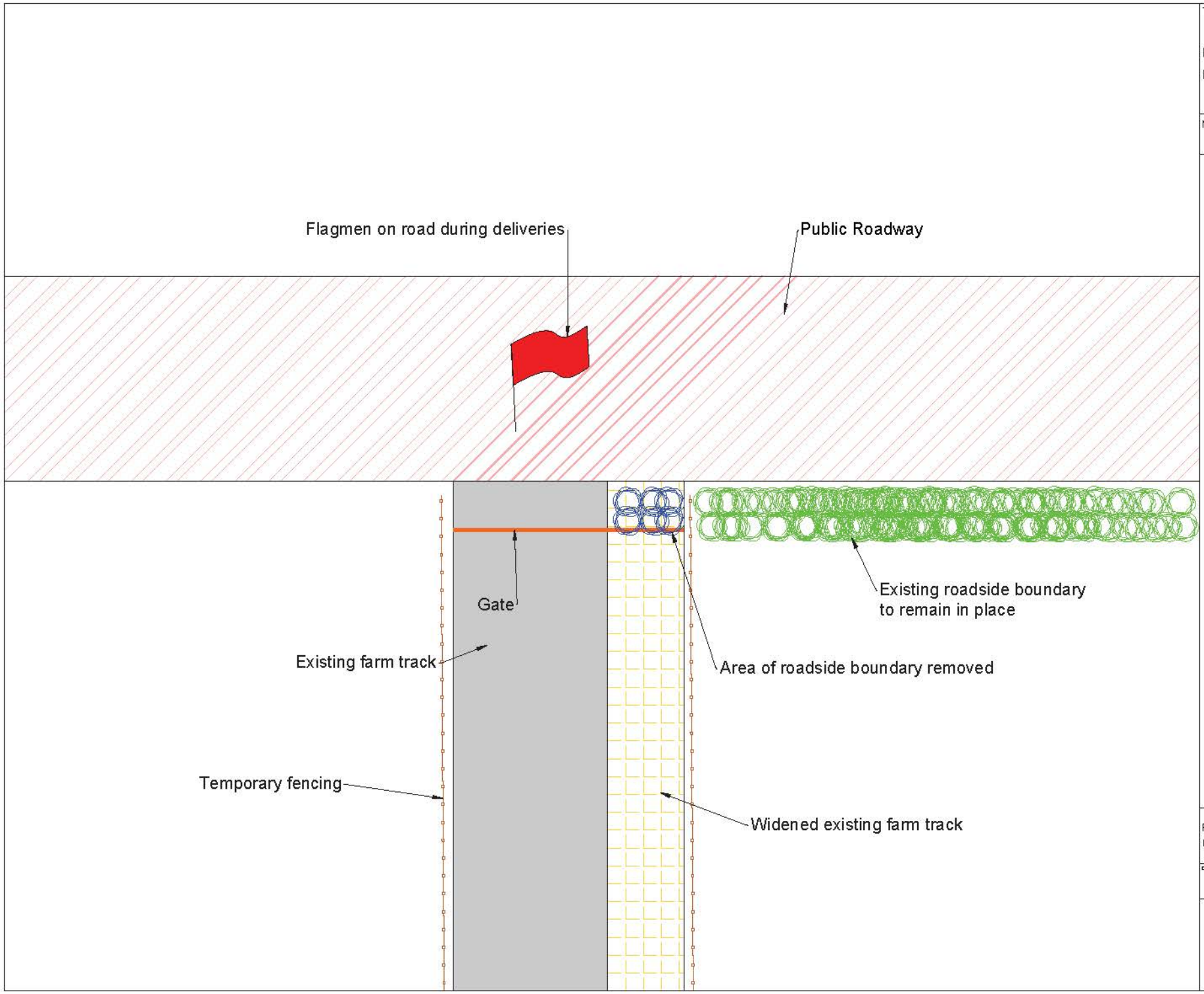

Title:

Figure RW 5.14

Plan View of Typical Temporary Site Entrance

Map Number:

N/A

Note :
Drawings not to scale. For illustration purposes only

REFERENCE DOCUMENTS

Project:

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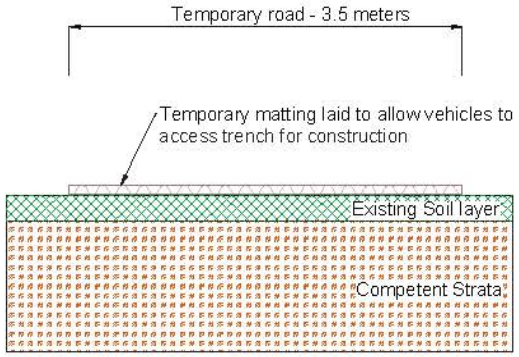
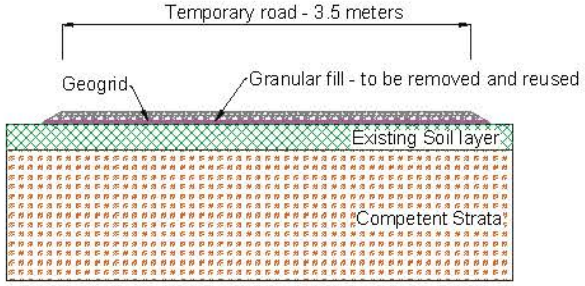
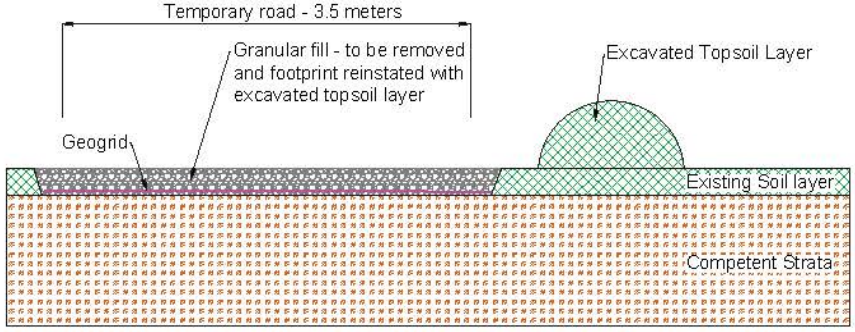


Cross Section of temporary access road - Matting



Cross Section of temporary access road - Floating road



Cross Section of temporary access road - Excavate and fill

Title:
Figure RW 5.15

Cross Section of Temporary Access Roads

Map Number:
N/A

Note :
Drawings not to scale. For illustration purposes only

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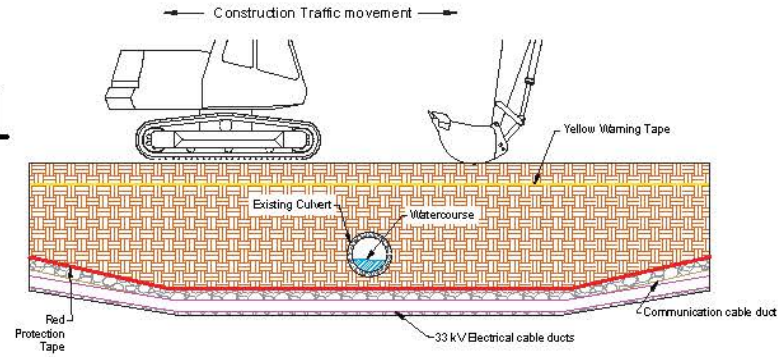
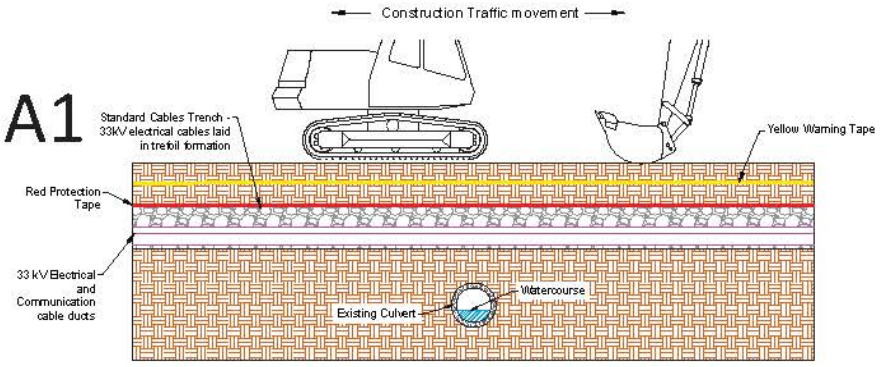
A1



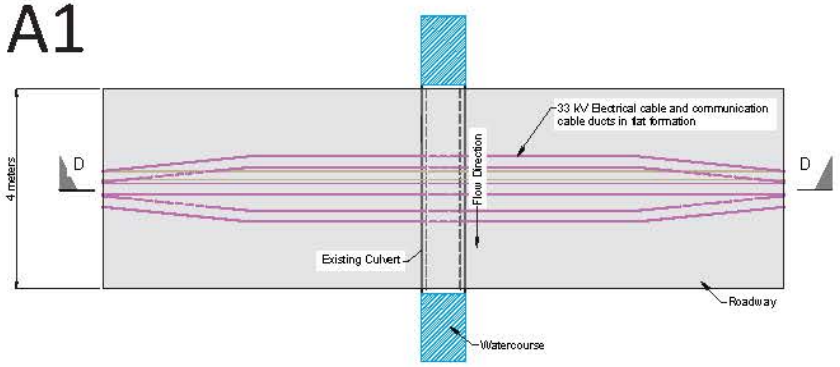
Cross Section D - D of watercourse crossing type A1 - Cables trench under existing structure

A1



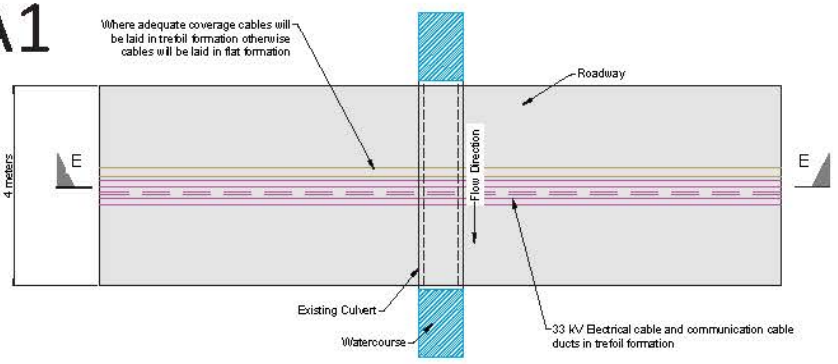
Cross Section E - E of watercourse crossing type A1 - Cables trench above existing structure

A1



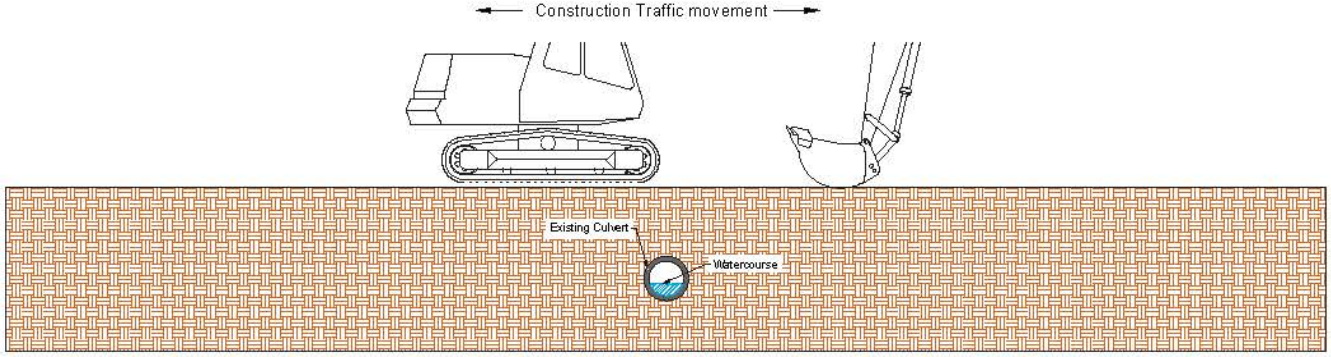
Plan View of watercourse crossing type A1 - Cable ducts laid in flat formation under existing structure
Excavation within 500mm of structure will be done by hand.
(No Instream works required)

A1



Plan View of watercourse crossing type A1 - Cable ducts laid in trefoil formation over existing structure
Excavation within 500mm of structure will be done by hand.
(No Instream works required)

A2



Cross Section of watercourse crossing type A2 - Traffic Movement only over structure (No instream works required)

Title:

Figure RW 5.16

Watercourse Crossing Type A1 & A2 - UWF Related Works at Existing Crossing Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type A1 (Total 5)

Class 4 - Drain - No Fisheries Value: WW6, WW11, WW23, WW29, WW30

Description of Crossing Type A1

- Existing crossing structure
- No Instream Works
- Cable and Traffic crossing
- No works to existing watercourse crossing structure
- 33kV Cables and Ducting installed over or under existing structure

Watercourse Crossing Type A2 (Total

Class 4 - Drain - No Fisheries Value: WW2

Description of Crossing Type A2

- Existing crossing structure
- No Instream Works
- Traffic crossing only
- No works to existing watercourse crossing structure
- No Cables or Ducting installed

REFERENCE DOCUMENTS

HYDRO ENVIRONMENTAL SERVICES

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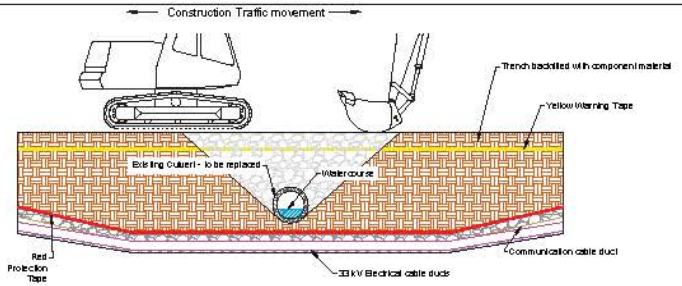
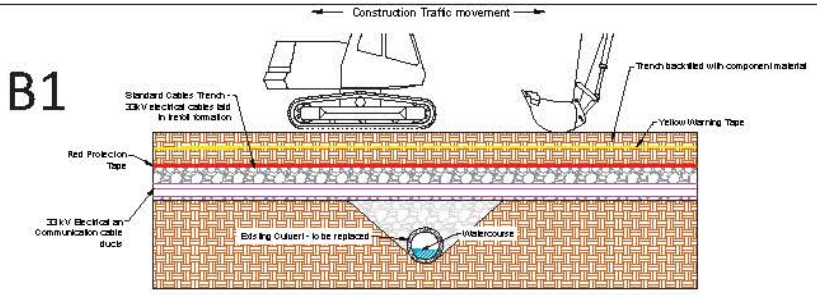
B1



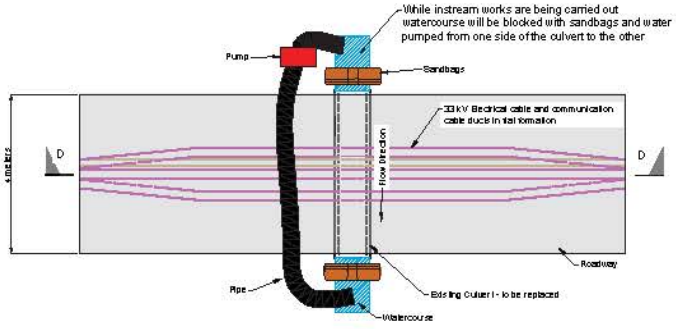
Cross Section D - D of watercourse crossing type B1 - Cables trench under replaced structure

B1



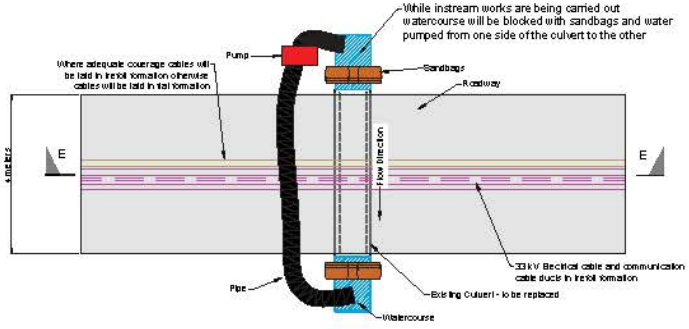
Cross Section E - E of watercourse crossing type B1 - Cables trench over replaced structure

B1

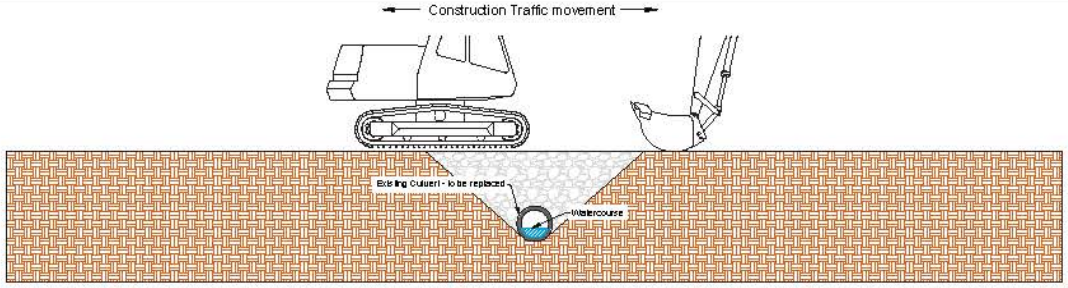


Plan View of watercourse crossing type B1 - Cable ducts laid in flat formation under replaced structure

B1

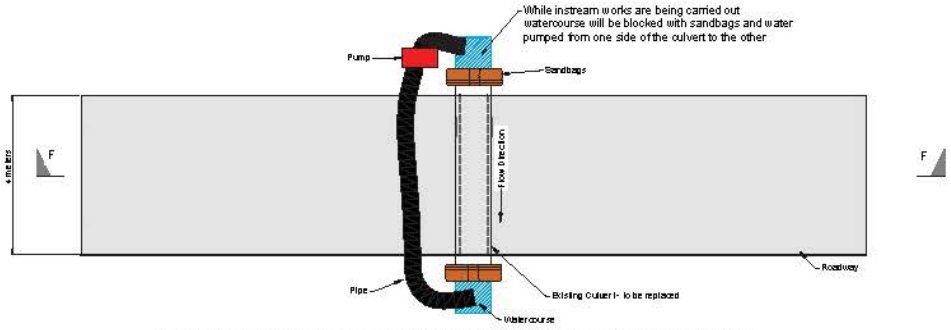


Plan View of watercourse crossing type B1 - Cable ducts laid in trefoil formation over replaced structure



Cross Section F - F of watercourse crossing type B2 - Construction Traffic crossing replaced existing structure

B2



B2

Plan view of watercourse crossing type B2 - Construction Traffic crossing replaced existing structure

Note:

The damming and over-pumping method will typically be carried out at watercourses where a permanent crossing structure is being installed or where an existing culvert is being replaced.

All permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be at least 900mm in diameter regardless of the anticipated flood flow. 900mm culverts will be set into the river bed to a depth of 300mm and 1200mm culverts will be set in 500mm.

Title:

Figure RW 5.17

Watercourse Crossing Type B1 & B2 - UWF Related Works at Replaced and/or widened Crossing Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type B1 (Total 1)

Class 4 - Drain - No Fisheries Value: WW21

Description of Crossing Type B1

- Existing crossing structure
- Instream Works
- Cable and Traffic crossing
- Replacement of existing watercourse crossing structure
- 33kV Cables and Ducting installed over or under replaced existing crossing structure

Watercourse Crossing Type B2 (Total 2)

Class 4 - Drain - No Fisheries Value: WW21, WW31

Description of Crossing Type B2

- Existing crossing structure
- Instream Works
- Traffic crossing only
- Replacement of existing watercourse crossing structure
- No Cables or Ducting installed

REFERENCE DOCUMENTS

HYDRO ENVIRONMENTAL SERVICES

Designed in conjunction with

Project:
UWF Related Works (RW)

Drawn by:	Checked by:	Date:	Drawing Scale:
CB	JB	11-Feb-18	A3

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Mobile - +353 (0)87-6831458

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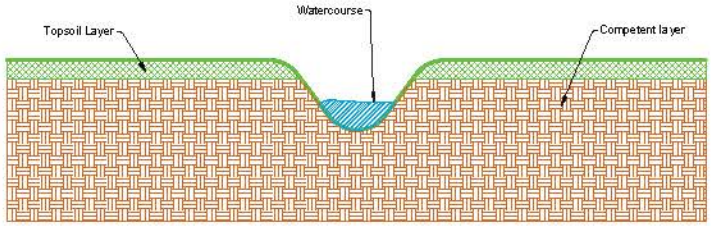
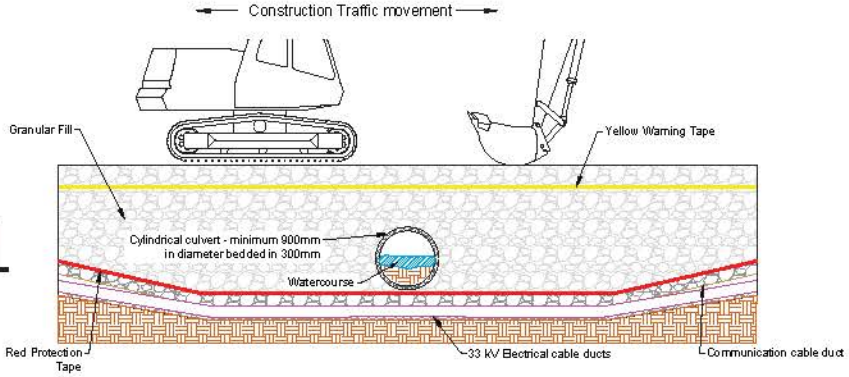
C1



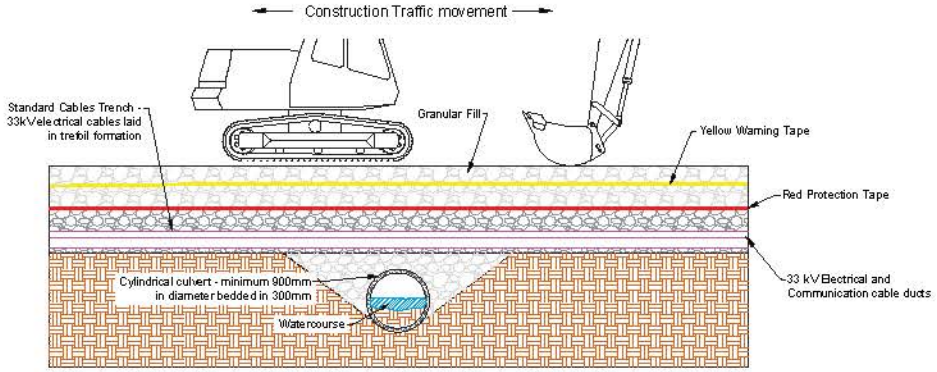
Cross Section View D - D of watercourse crossing C1 - Existing watercourse

C1



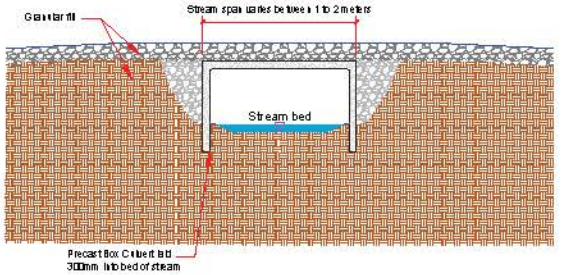
Cross Section View of watercourse crossing types C1 - Cables trench under new permanent crossing structure

C1

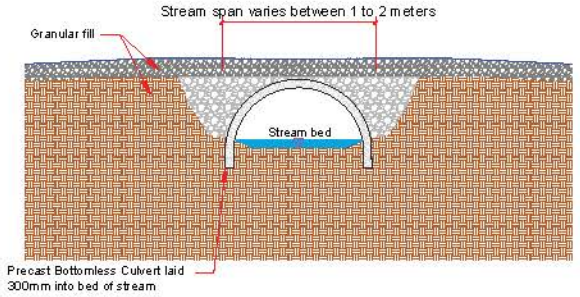


Cross Section View of watercourse crossing C1 - Cables trench over new permanent crossing structure

(Watercourse dammed and over-pumped)



Permanent Crossing structure - Bottomless Box Culvert



Permanent Crossing structure - Bottomless Box Culvert

Note:

The damming and over-pumping method will typically be carried out at watercourses where a permanent crossing structure is being installed or where an existing culvert is being replaced.

All permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be at least 900mm in diameter regardless of the anticipated flood flow. 900mm culverts will be set into the river bed to a depth of 300mm and 1200mm culverts will be set in 500mm.

Title:

Figure RW 5.18

Watercourse Crossing Type C1 - New Permanent Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type C1 (Total 5)

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW4

Class 4 - Drain - No Fisheries Value: WW1, WW15, WW,24, WW25

Description of Crossing Type C1

- No existing crossing structure
- Instream Works
- Cable and Traffic crossing
- Installation of New Permanent watercourse crossing structure
- 33kV Cables and Ducting installed over or under new permanent watercourse crossing structure

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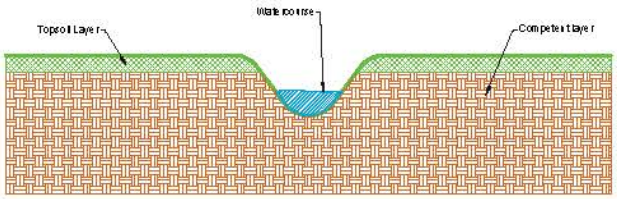
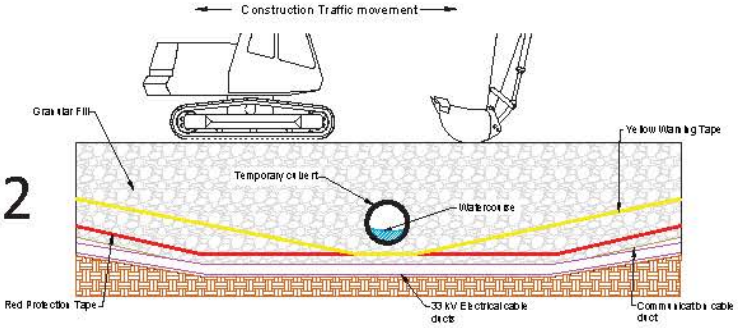
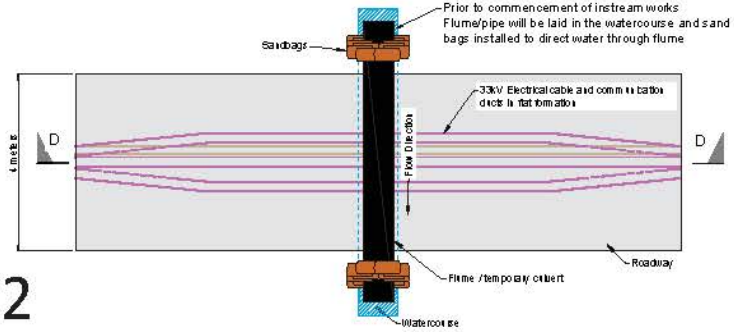
C2



Cross Section View D - D of watercourse crossing C2 - Existing watercourse



Cross Section View D - D of watercourse crossing types C2 - Cables trench under new temporary crossing structure



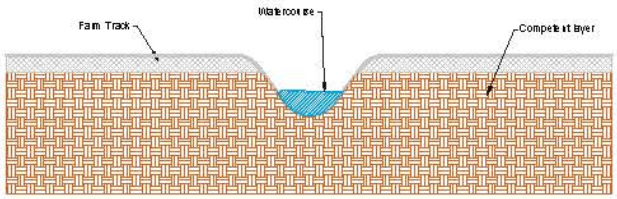
Plan View of watercourse crossing C2 - Cables trench under new temporary crossing structure

(Watercourse dammed and flume installed during instream works)

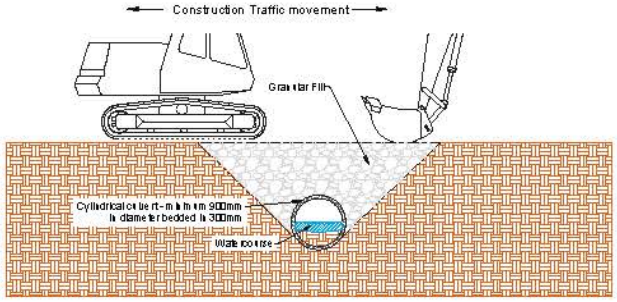
Note:

The flume/pipe watercourse crossing method will typically be used where a temporary watercourse crossing structure is proposed.

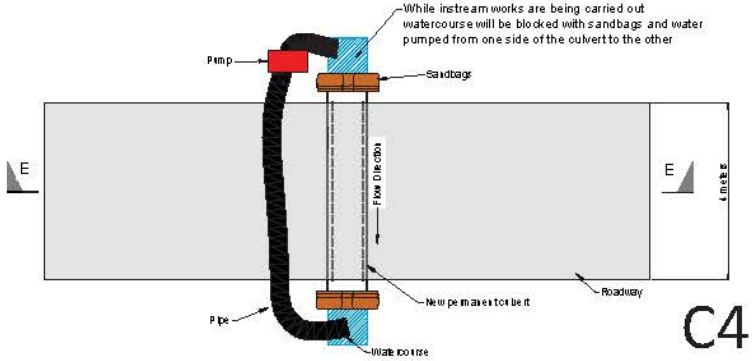
C4



Cross Section View D - D of watercourse crossing W90 - Existing watercourse



Cross Section View E - E of watercourse crossing types C4 - Traffic over new permanent crossing structure



Plan of watercourse crossing types C4 - Traffic over new permanent crossing structure

(Watercourse dammed and over pumped during instream works)

Note:

The damming and over-pumping method will typically be carried out at watercourses where a permanent crossing structure is being installed or where an existing culvert is being replaced.

All permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be at least 900mm in diameter regardless of the anticipated flood flow. 900mm culverts will be set into the river bed to a depth of 300mm and 1200mm culverts will be set in 500mm

Title:

Figure RW 5.19

Watercourse Crossing Type C2 - New Temporary Structure & Watercourse Crossing Type C4 - New Permanent Structure

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type C2 (Total 5)

Class 2 -EPA Blue Line Equivalent - Fisheries Value: WW7

Class 4 - Drain - No Fisheries Value: WW5, WW8, WW16, WW27

Description of Crossing Type C2

- No existing crossing structure
- Instream Works
- Cable and Traffic crossing
- Installation of New Temporary watercourse crossing structure
- 33kV Cables and Ducting installed under new temporary watercourse crossing structure

Watercourse Crossing Type C4 (Total 3)

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW22

Class 3 - Sub-Optimal - Low Fisheries Value: WW14

Class 4 - Drain - No Fisheries Value: WW13

Description of Crossing Type C4

- No existing crossing structure
- Instream Works
- Traffic crossing only
- Installation of New Permanent watercourse crossing structure
- No Cables or Ducting installed

Designed in conjunction with

HYDRO ENVIRONMENTAL SERVICES

Project:
UWF Related Works (RW)

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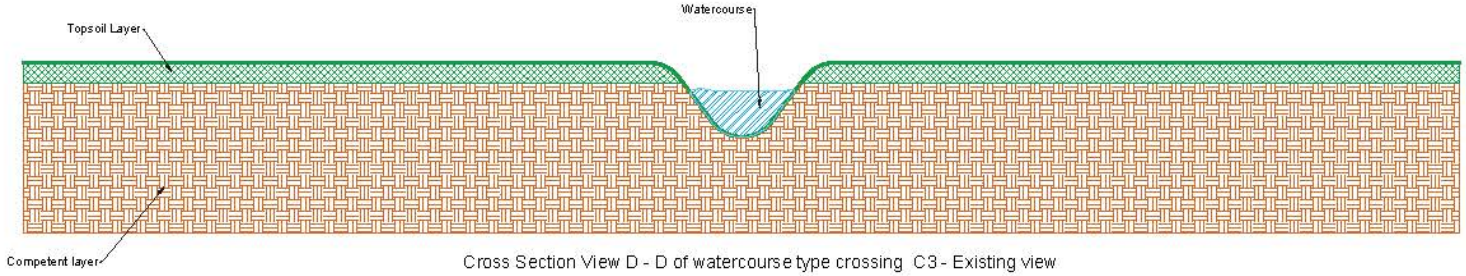
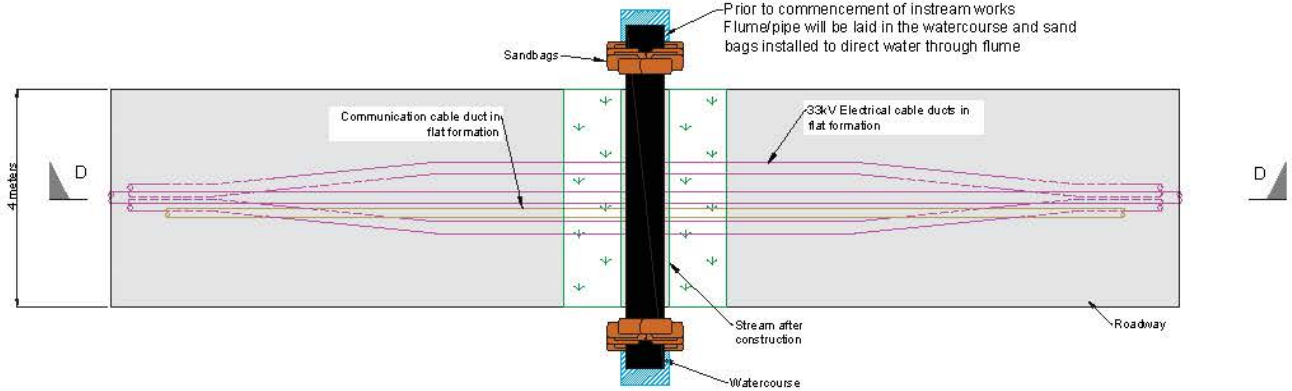
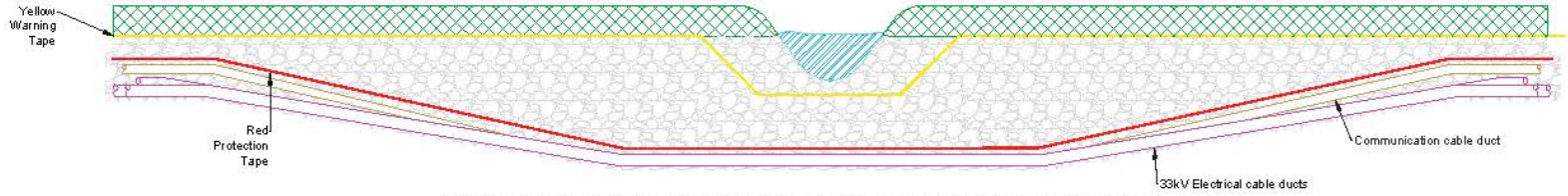


Cross Section View D - D of watercourse type crossing C3 - Existing view



Plan View of watercourse crossing type C3 - Cables trench across watercourse

(Watercourse dammed and over-pumped)



Cross Section D - D of watercourse crossing type C3 - Cables trench across watercourse

Note:

The damming and over-pumping method will also be used at cable-only crossings where flows are very low at the time of the proposed crossing works.

The flume/pipe watercourse crossing method will also be used or at cable-only crossings where flows are too large to be managed by the dam and over pump method at the time of the proposed crossing works.

Title:

Figure RW 5.20

Watercourse Crossing Type C3 - Internal Windfarm Cable trench and ducting only

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type C3 (Total 9)

Class 1 - EPA Blue Line - Fisheries Value: WW19

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW28

Class 3 - Sub-Optimal - Low Fisheries Value: WW18

Class 4 - Drain - No Fisheries Value: WW3, WW9, WW10, WW17, WW20, WW26

Description of Crossing Type C3

- No existing crossing structure
- Instream Works
- Cable crossing only
- No watercourse crossing structure required
- 33kV Cables and Ducting installed under watercourse

REFERENCE DOCUMENTS

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Title:

Figure RW 5.21

Watercourse Crossing Type E - Plan and Cross Section Views of Bailey Bridge

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type E

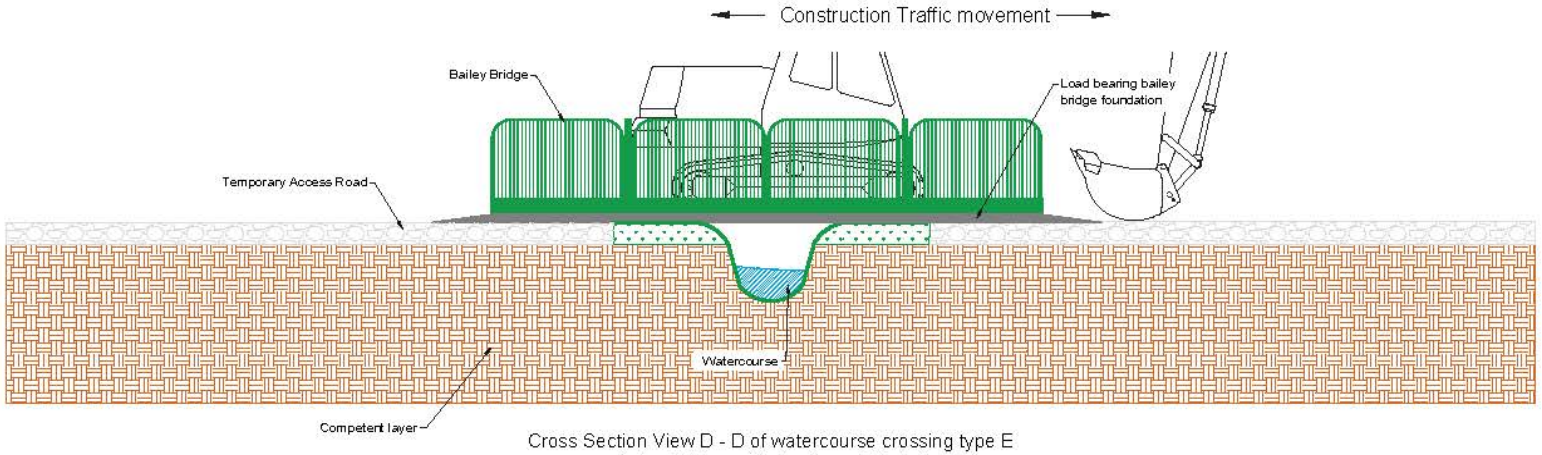
Used at C type water crossings where required

Description of Crossing Type E

- No existing crossing structure
- No instream Works
- Traffic crossing only
- No Cables or Ducting installed

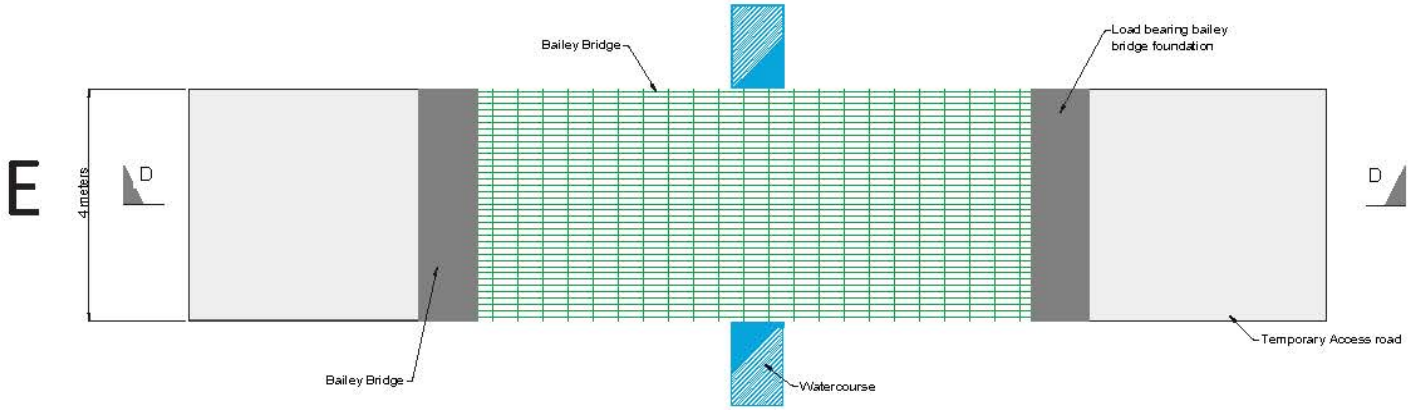
REFERENCE DOCUMENTS

E



Cross Section View D - D of watercourse crossing type E
Bailey Bridge - (No Instream Works)

E



Plan View of watercourse crossing type E
Bailey Bridge - (No Instream Works)

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UWF Related Works (RW)

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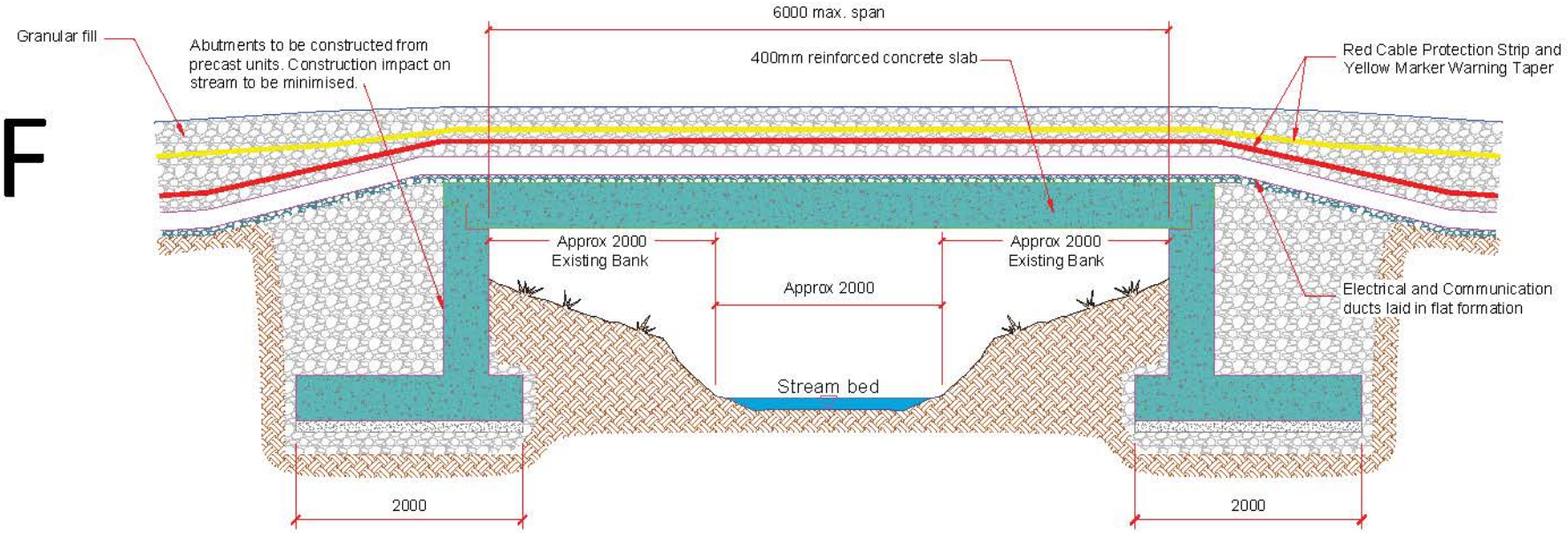
Note:
Slab to be designed to withstand all vehicular traffic loading.

Permanent Crossing structure - Clear span bridge

F



Title:
Figure RW 5.22

Watercourse Crossing Type F - New permanent clear-span bridge

Map Number:
N/A

Note :
Drawings not to scale. For illustration purposes only

Watercourse Crossing Type F (Total 1)

Class 2 - EPA Blue Line Equivalent - Fisheries Value: WW2

Description of Crossing Type F

- No existing crossing structure
- No Instream Works
- Internal Windfarm Cabling installed over watercourse using the consented UWF Clear span bridge
- Cable and Traffic crossing

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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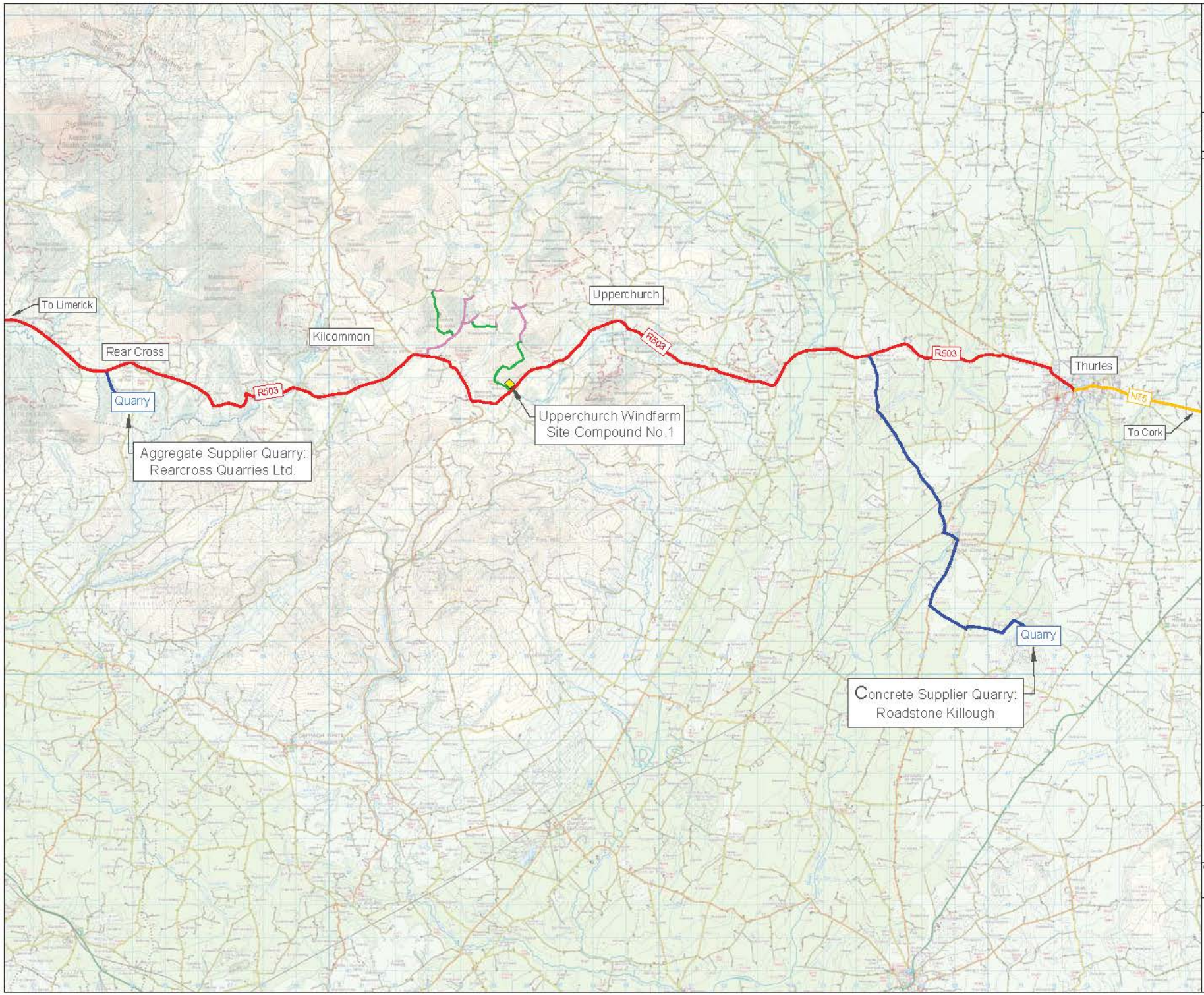

Title:

Figure RW 5.23

Haul Routes for Delivery of Aggregate, Concrete and Other Materials to UWF Site Compound No.1

Map Number:
Map 1 of 1

Legend:

- Haul Route from Local Quarries to the R503
- Regional Road R503
- National Road N75
- Upperchurch Windfarm Site Compound No.1
- Local Roads used to access the UWF Related Works Areas
- Consented UWF Roads used to access the UWF Related Works Areas

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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Ecopower Developments Ltd
Zetec House,
Purcellsinch Business Park, Kilkenny
TEL: +353 56 7750140
MOB: +353 83 8805644

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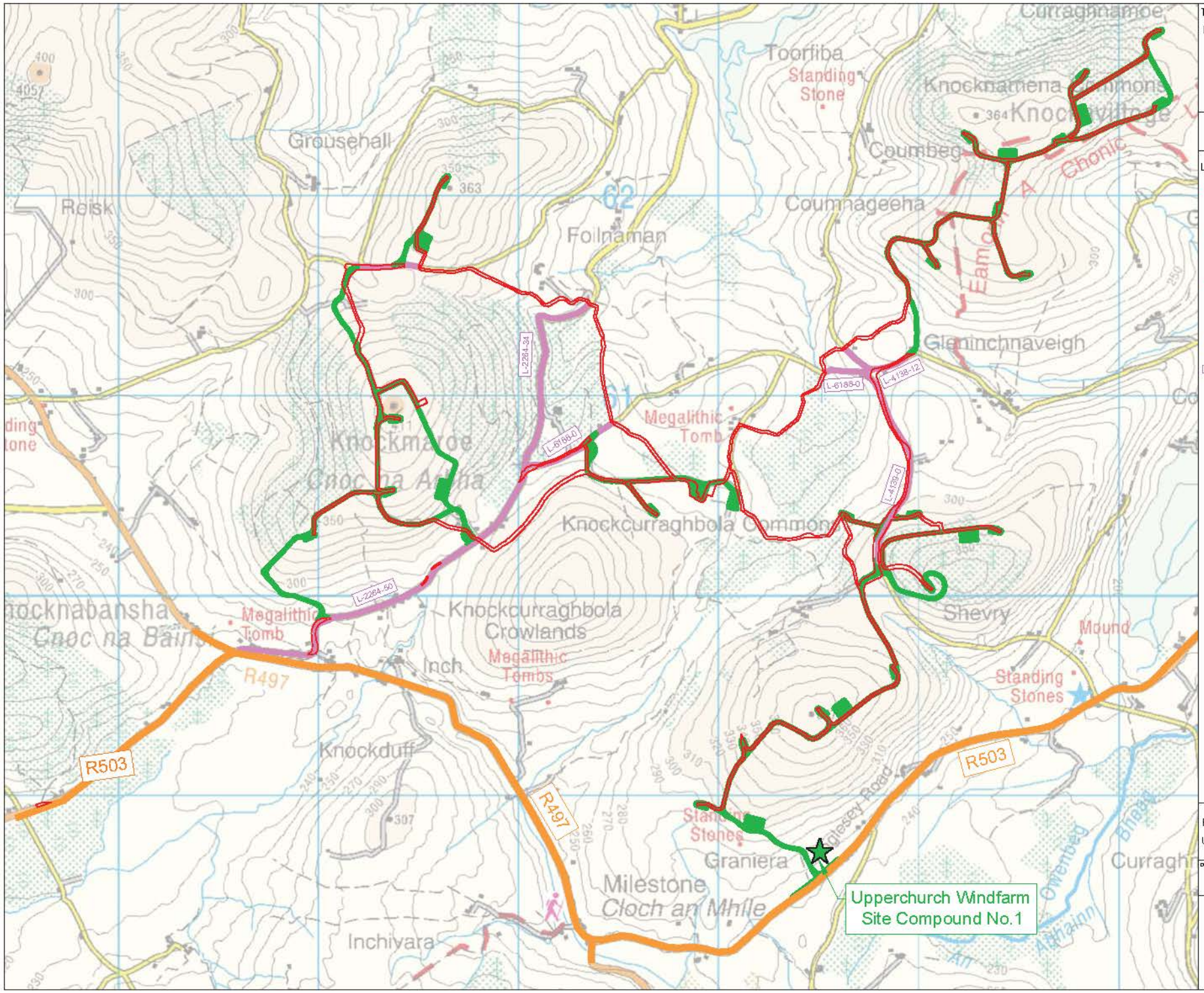

Title:

Figure RW 5.24

Haul Routes from UWF Site Compound No.1 to Construction Works Areas

Map Number:
Map 1 of 1

Legend:

- UWF Related Works Construction Works Area
- Haul Route along local roads from the R503 or the Upperchurch Windfarm Site Compound No.1 to the UWF Related Works Areas
- Consented UWF Roads
- Upperchurch Windfarm Site Compound No.1
- Regional Road
- L-4138-12 Public Road Number

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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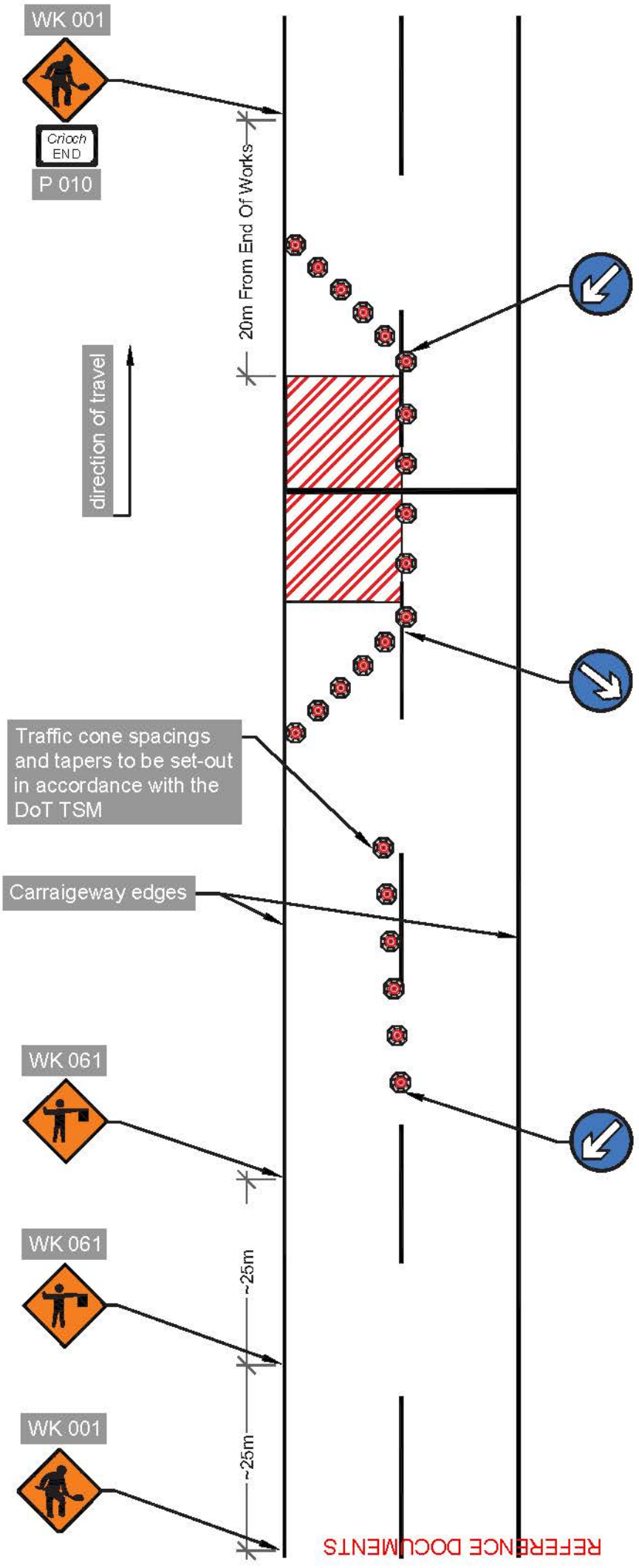

Title:

Figure RW 5.25

Advance Warning Signage for Half Lane Closures

Designed in conjunction with

NRB consulting engineers

Note: This drawing is not to scale

Department of Transport Traffic Signs Manual (DoT TSM)

Project:

UWF Related Works (RW)

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Title:
Figure RW 5.26

Operational Stage Land Use Change

Map Number:
Map 1 of 1

Legend:

- Agricultural Lands to New Permanent Road
- Forestry to Permanent Road
- Forestry to Forestry Firebreak

REFERENCE DOCUMENTS

N

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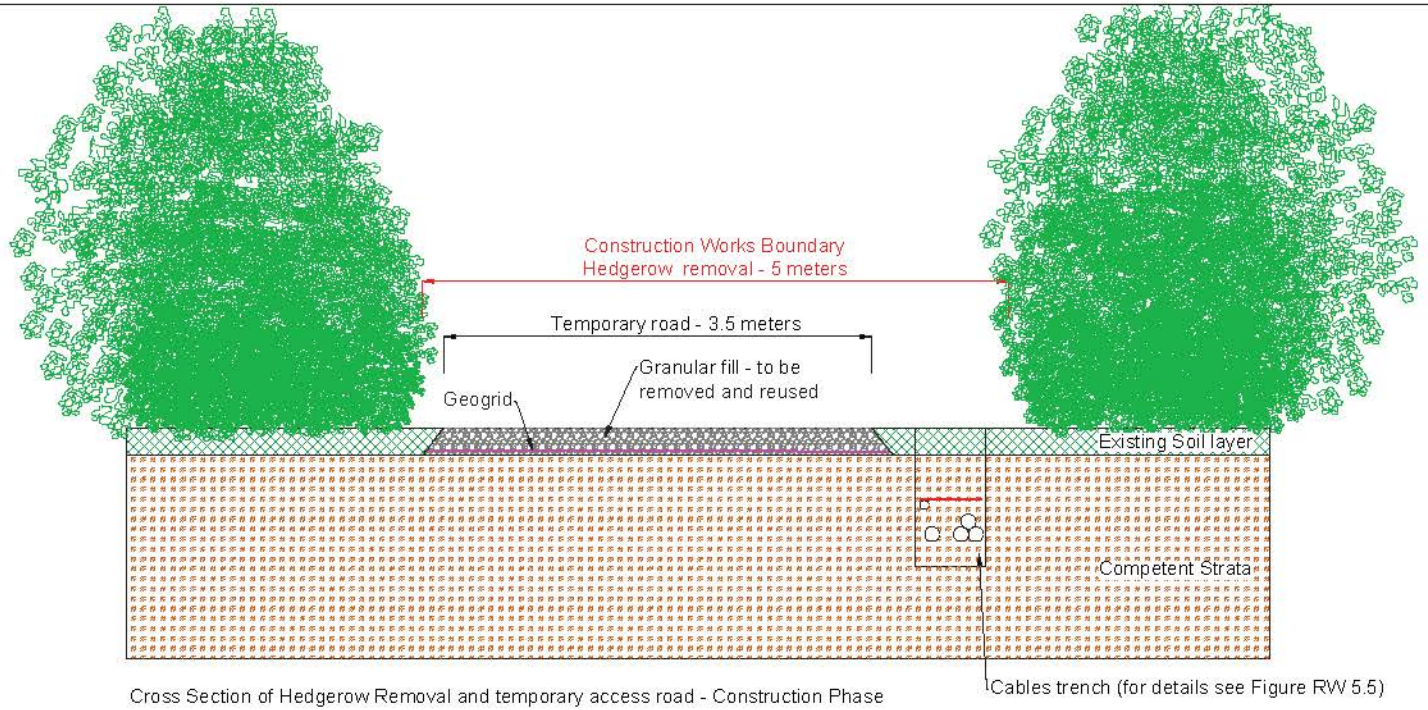
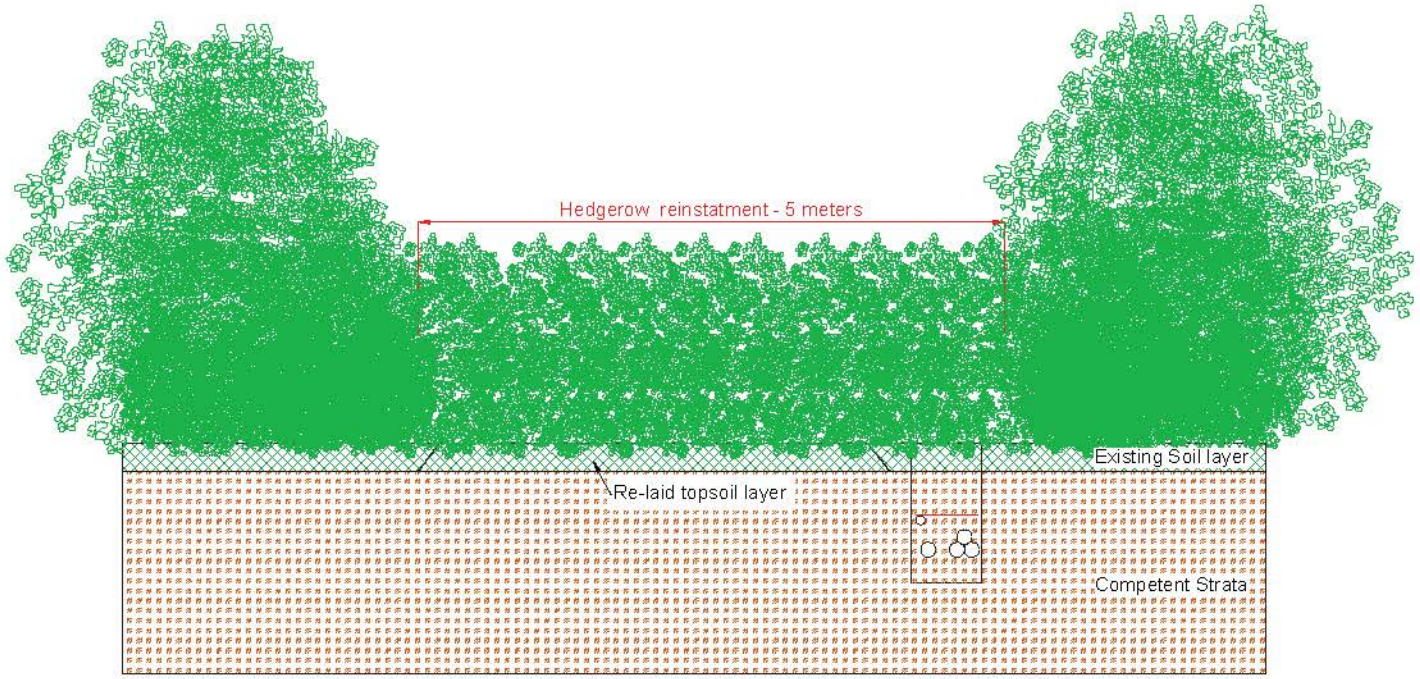


Cross Section of Hedgerow Removal and temporary access road - Construction Phase



Cross Section of Hedgerow Reinstatement and temporary access road - Post Construction

Title:
Figure RW 5.27

Cross Section of Hedgerow Removal and Reinstatement

Map Number:
N/A

Note :
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REFERENCE DOCUMENTS

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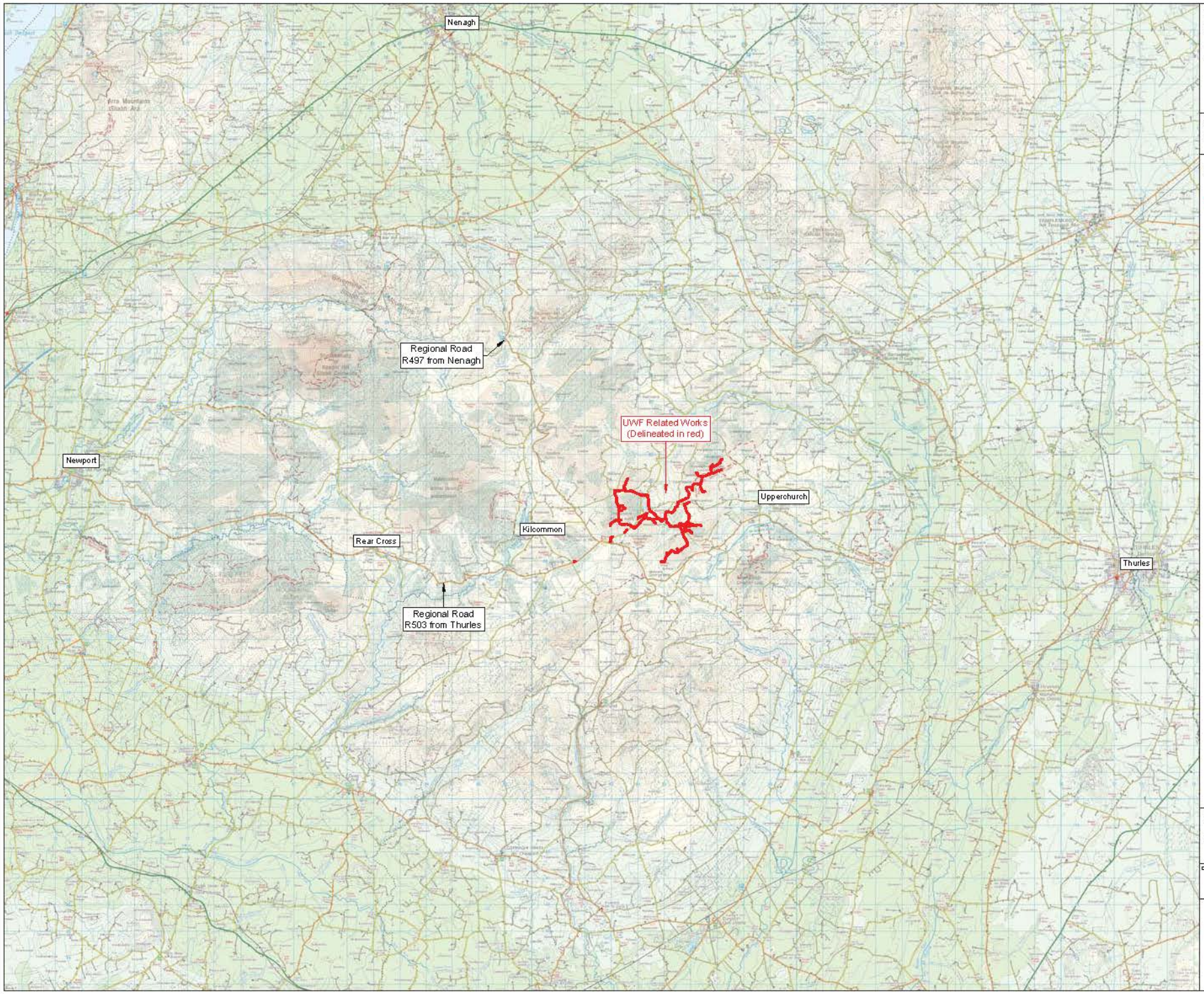

Title:

Figure RW 6.1

Location of the UWF Related Works

Map Number:
Map 1 of 1

Legend:

UWF Related Works
- -Realigned Windfarm Roads
- -Internal Windfarm Cabling
- -Telecom Relay Pole
- -Haul Route Works

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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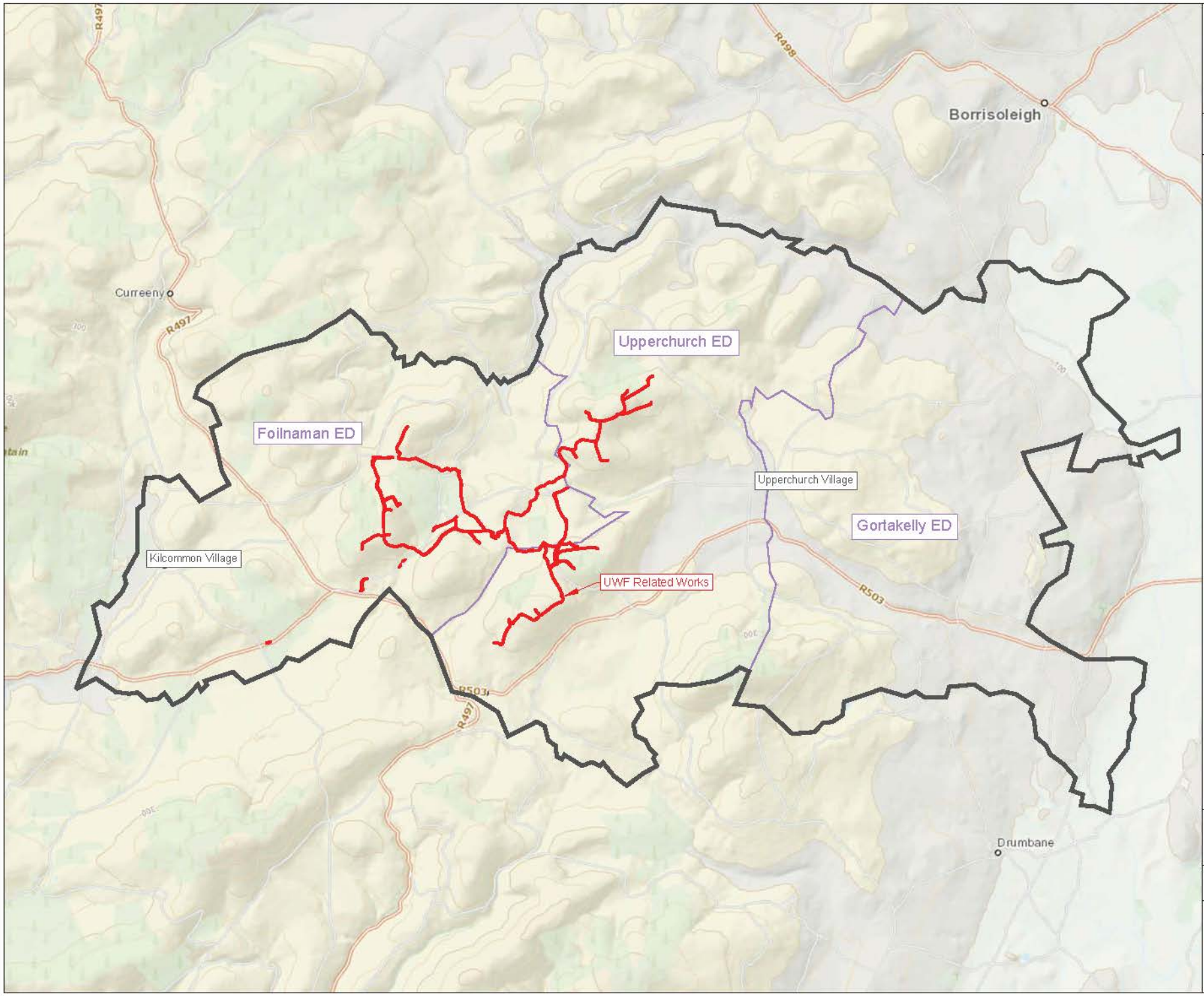

Title:

Figure RW 6.2

Local Economy within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- Study Area for the Local Economy
- Electoral Divisions
- Foilnaman Electoral Division Names
- Villages

REFERENCE DOCUMENTS

N

Project:

UWF Related Works (RW)

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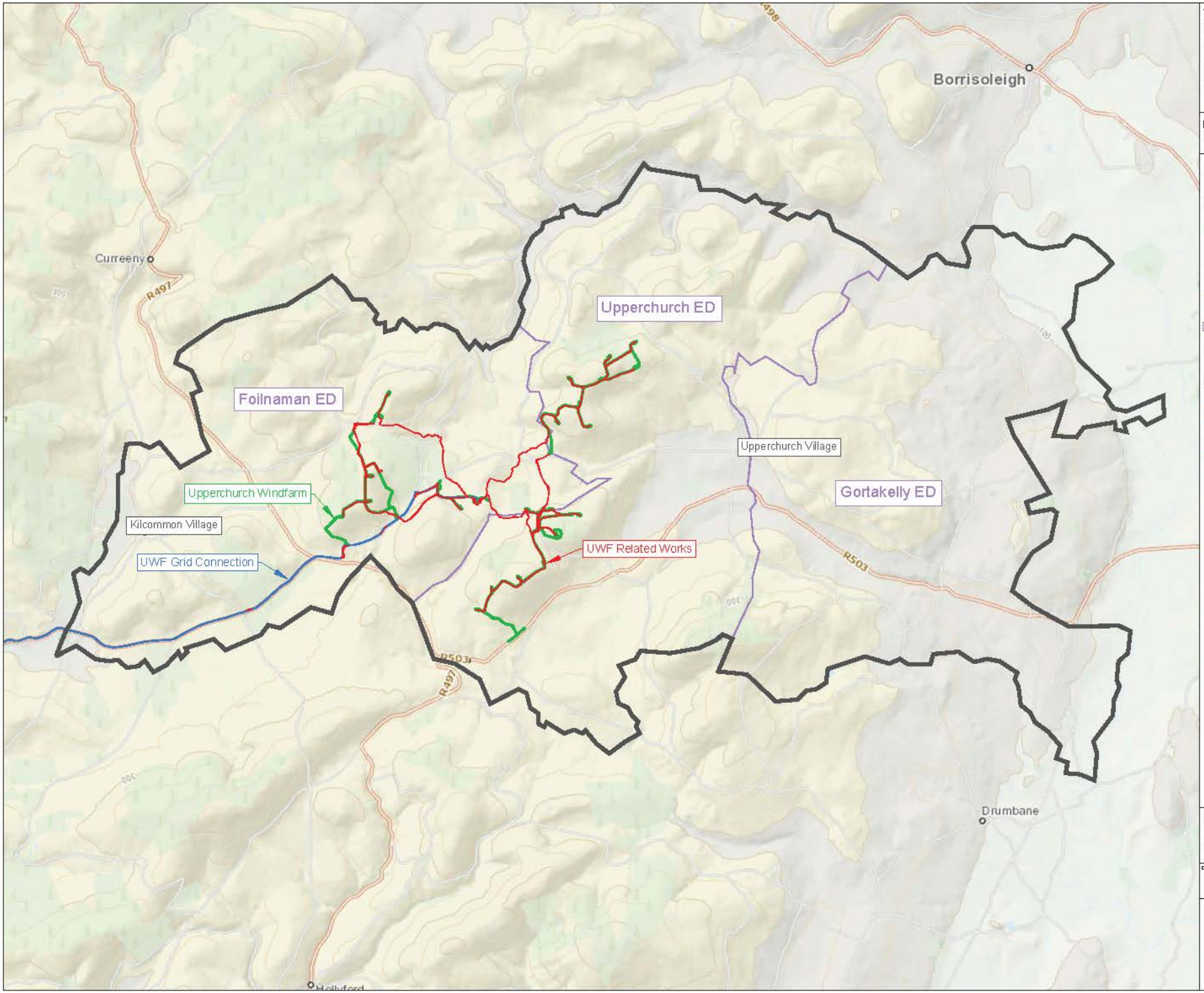

Title:

Figure CE 6.2

Local Economy within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- Study Area for the Local Economy
- Electoral Divisions
- Foilnaman Electoral Division Names
- Kilcommon Villages

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

REFERENCE DOCUMENTS

N

Project:

UWF Related Works (RW)

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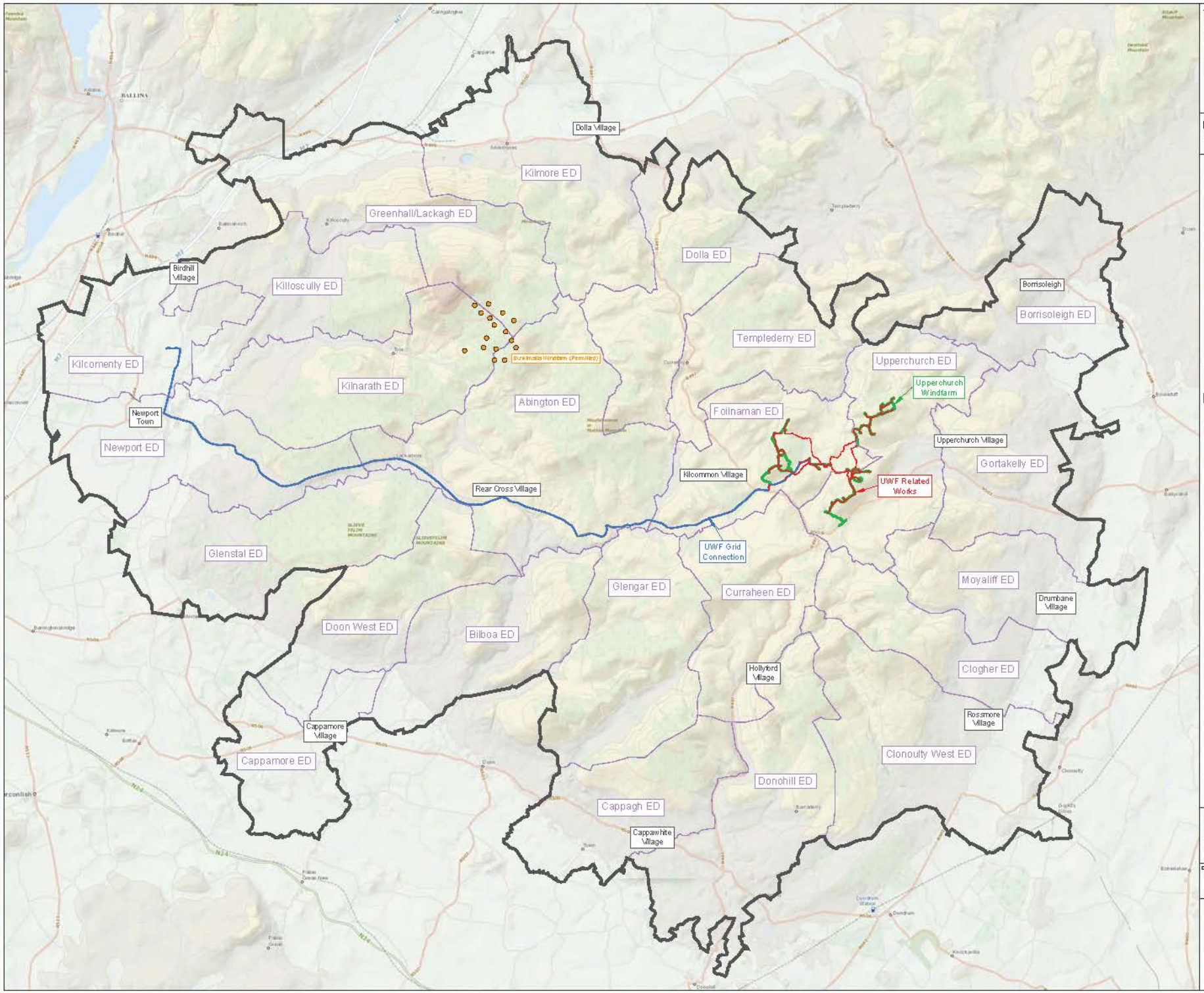

Title:

Figure WP 6.2

Local Economy within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Grid Connection
- UWF Related Works
- Upperchurch Windfarm
- Study Area for the Local Economy
- Electoral Divisions
- Dolla — Electoral Division Names
- Newport — Villages/Towns

Survey Results :

- Bunkimalta Wind Turbines

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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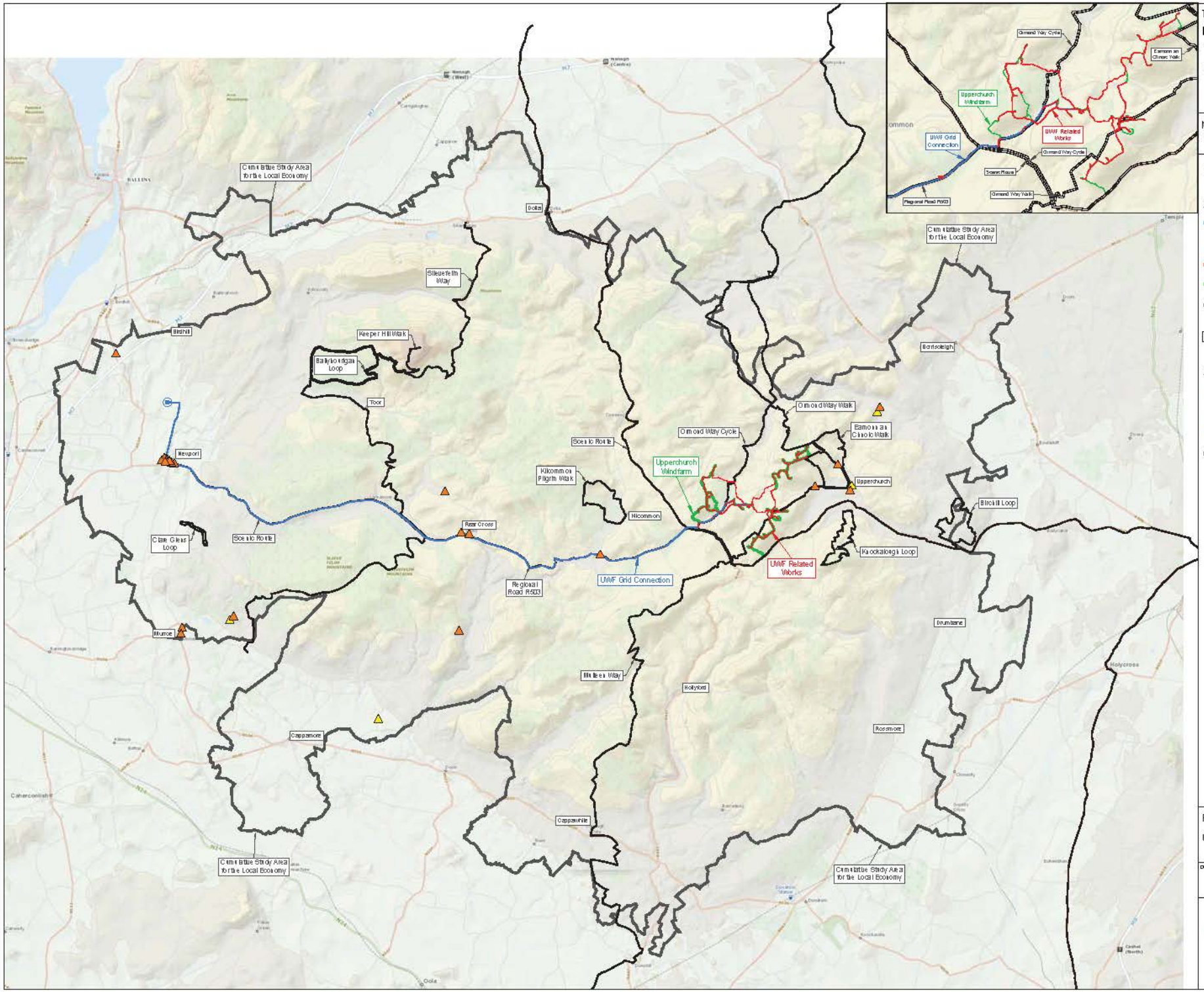

Title:

Figure 6.2.1

Tourism Products within the Cumulative Evaluation Study Areas

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Grid Connection
- Mountphilips Substation
- UWF Related Works
- Upperchurch Windfarm
- Cumulative Study Area for the Local Economy
- Newport — Villages

Survey Results :

- Accomodation or Food Services
- Landowner Holiday Cottage
- Activites
- Walking/Cycling Trails and Driving Route

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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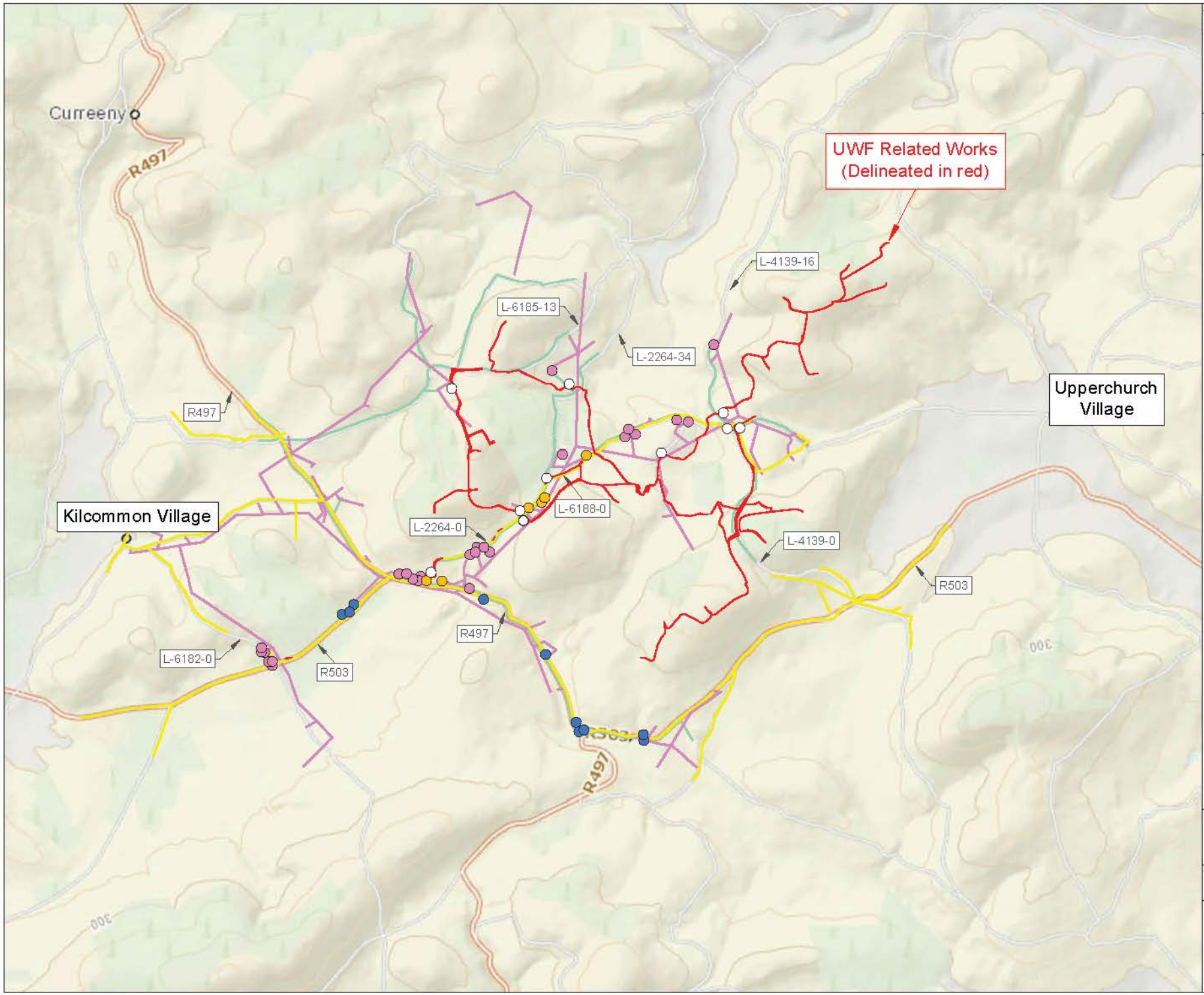

Title:
Figure RW 7.1

Location of the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Extents:

- UWF Related Works
  - -Realigned Windfarm Roads
  - -Internal Windfarm Cabling
  - -Telecom Relay Pole
  - -Haul Route Works

Survey Results:

- Irish Water Line
- Eir Network Overhead Line
- ESB Networks Overhead Line
- **Air Quality:** Houses within 50m of Construction Works Area
- **Air Quality:** Houses between 51m and 100m of Construction Works Area
- **Air Quality:** Houses between 101m and 350m of Construction Works Area
- **Air Quality:** Houses 50m from Local Haul Roads
- L-6188-0 Road Number

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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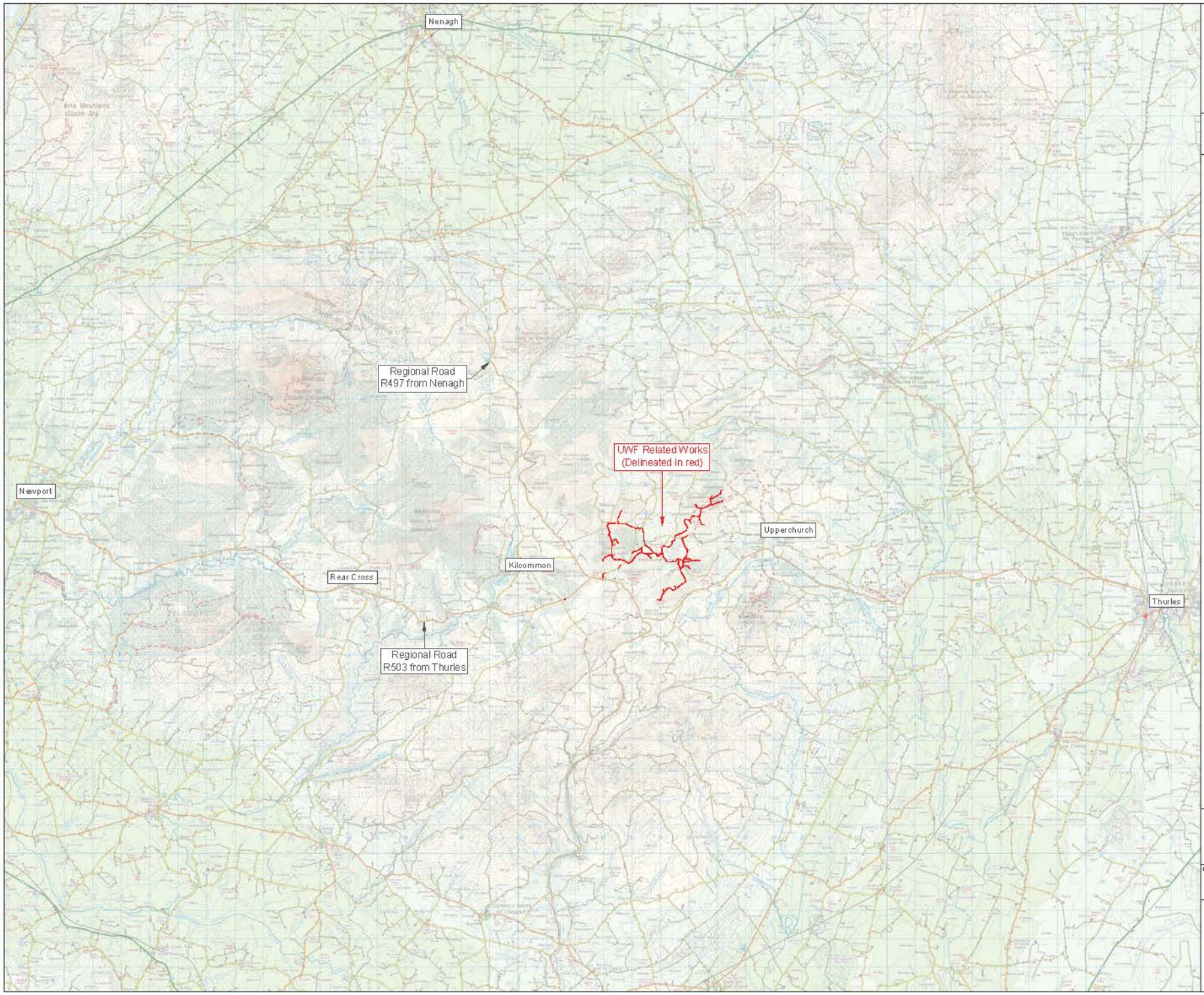

Title:

Figure RW 8.1

UWF Related Works Location Map

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

UWF Related Works
Construction Works Area

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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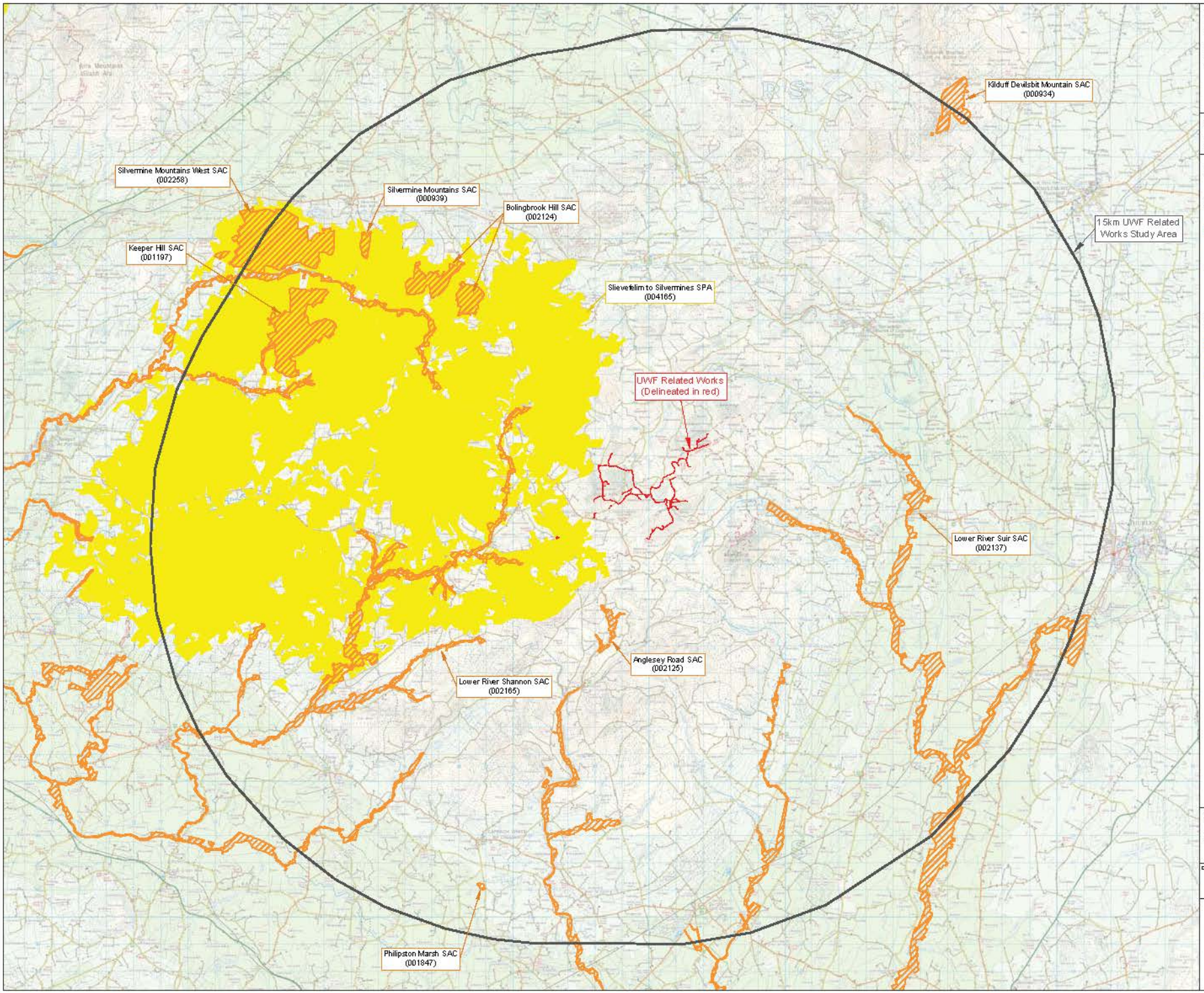

Title:

Figure RW 8.2

European Sites within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 15km Study Area:
  - UWF Related Works Construction Works Area

Survey Results :

- Special Areas of Conservation
- Special Protection Areas

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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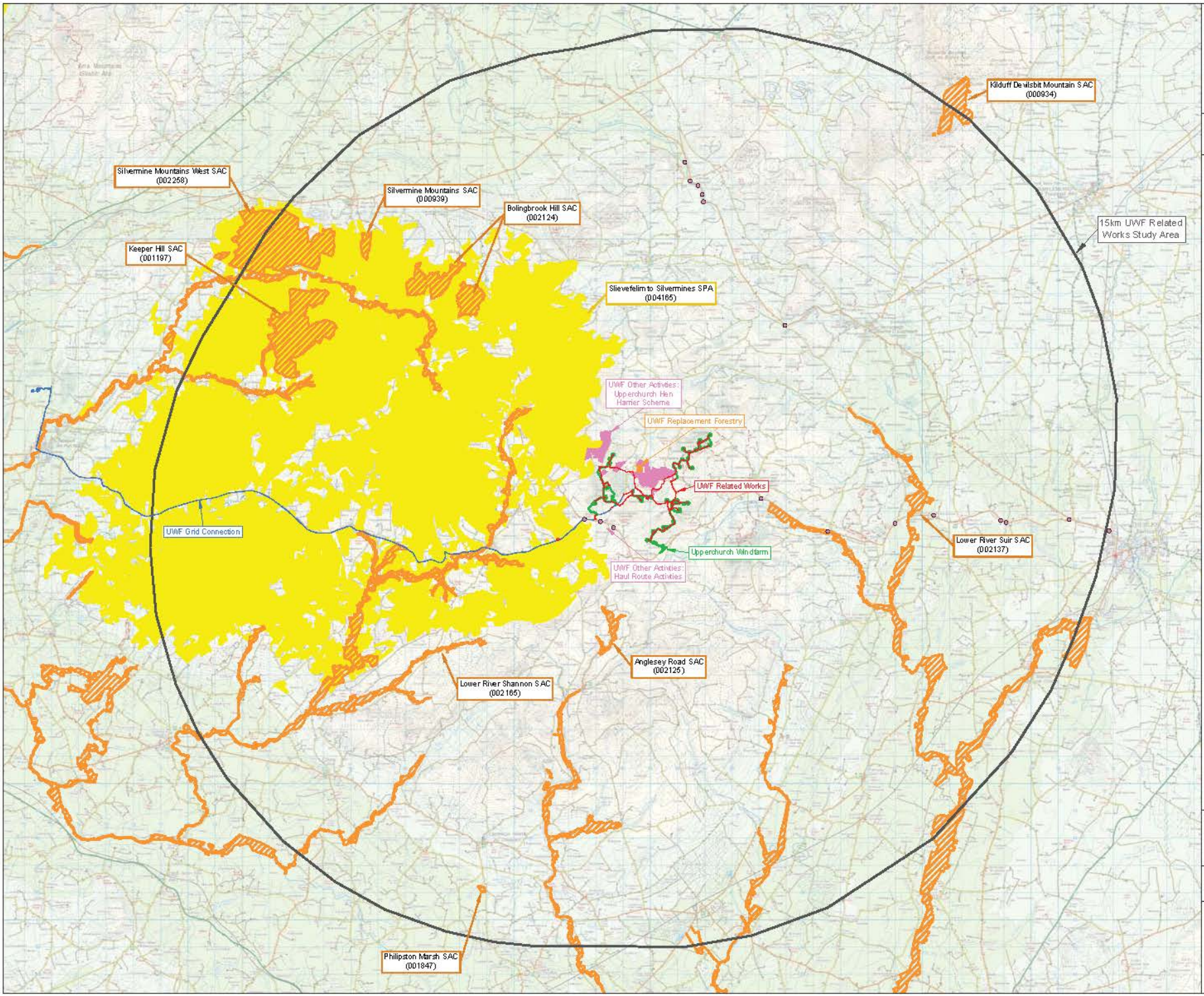

Title:

Figure CE 8.2

European Sites within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 15km Study Area:
  - UWF Related Works Construction Works Area

Cumulative Projects :

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities

Survey Results :

- Special Areas of Conservation
- Special Protection Areas

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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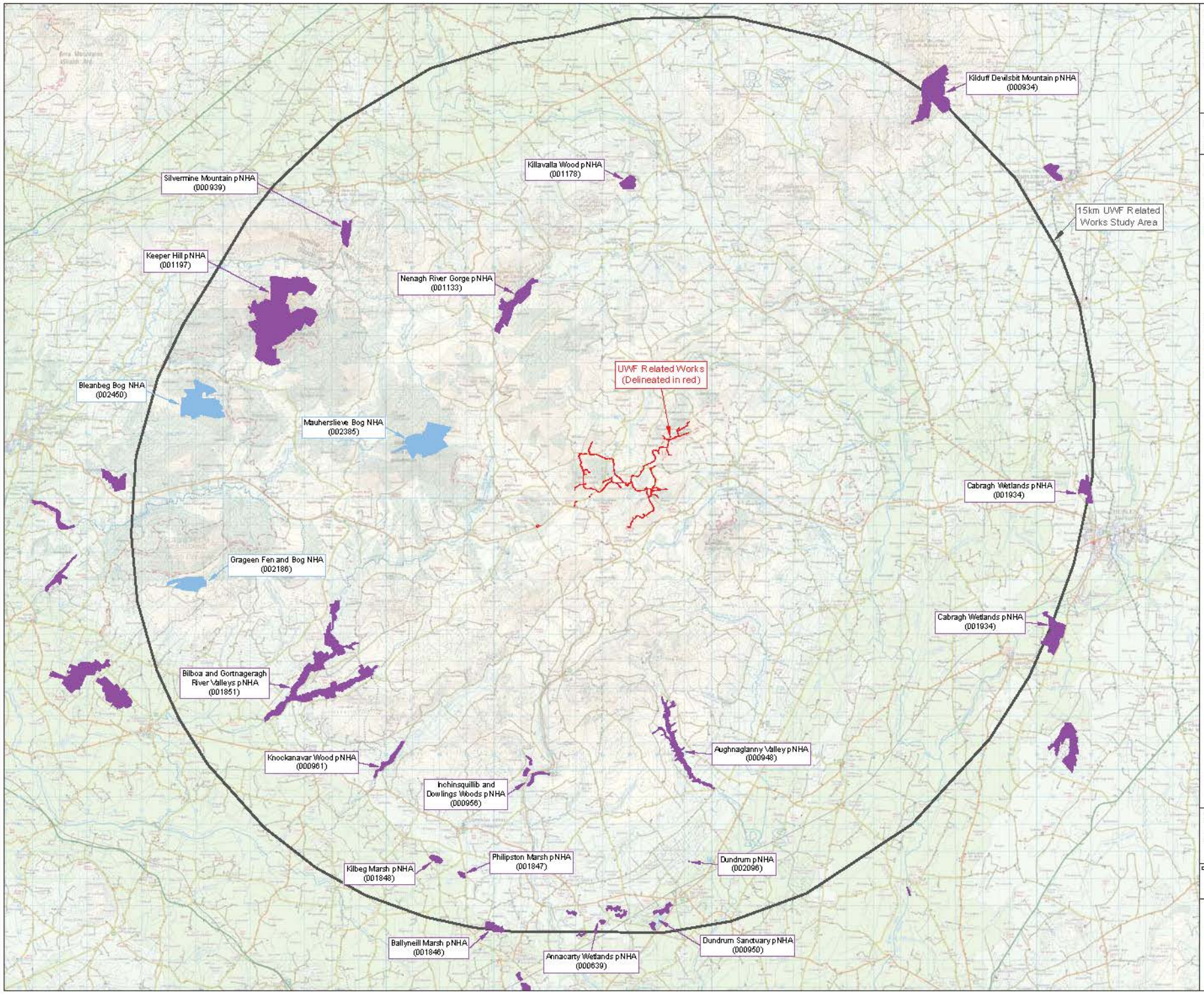

Title:

Figure RW 8.3

National Sites within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 15km Study Area:
  - UWF Related Works Construction Works Area

Survey Results :

- National Heritage Areas
- Proposed Natural Heritage Areas

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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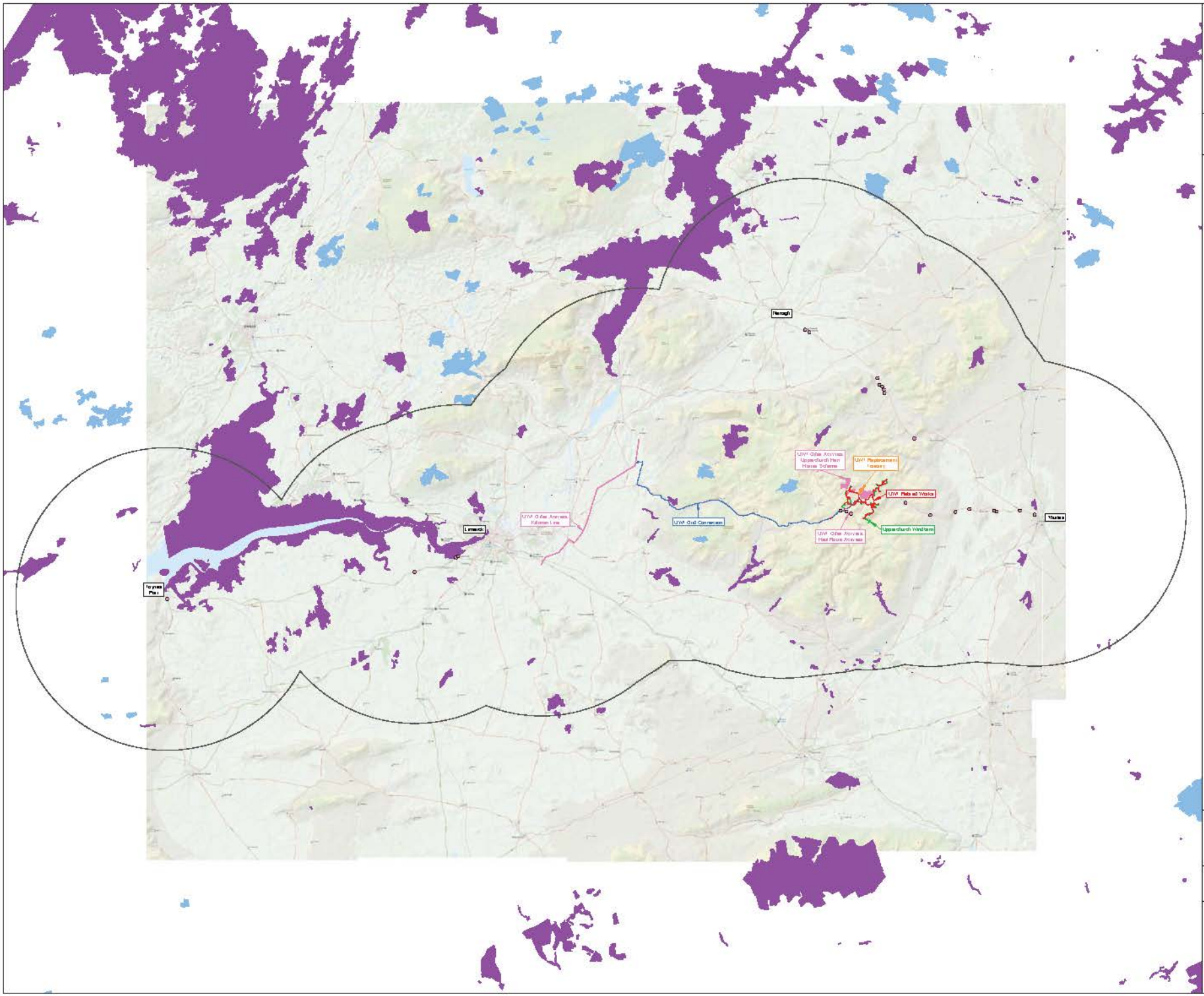

Title:

Figure WP 8.3

National Sites within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
  - Killonan Line
- 15km Study Area from all Construction Works Areas

Survey Results :

- National Heritage Areas
- Proposed Natural Heritage Areas

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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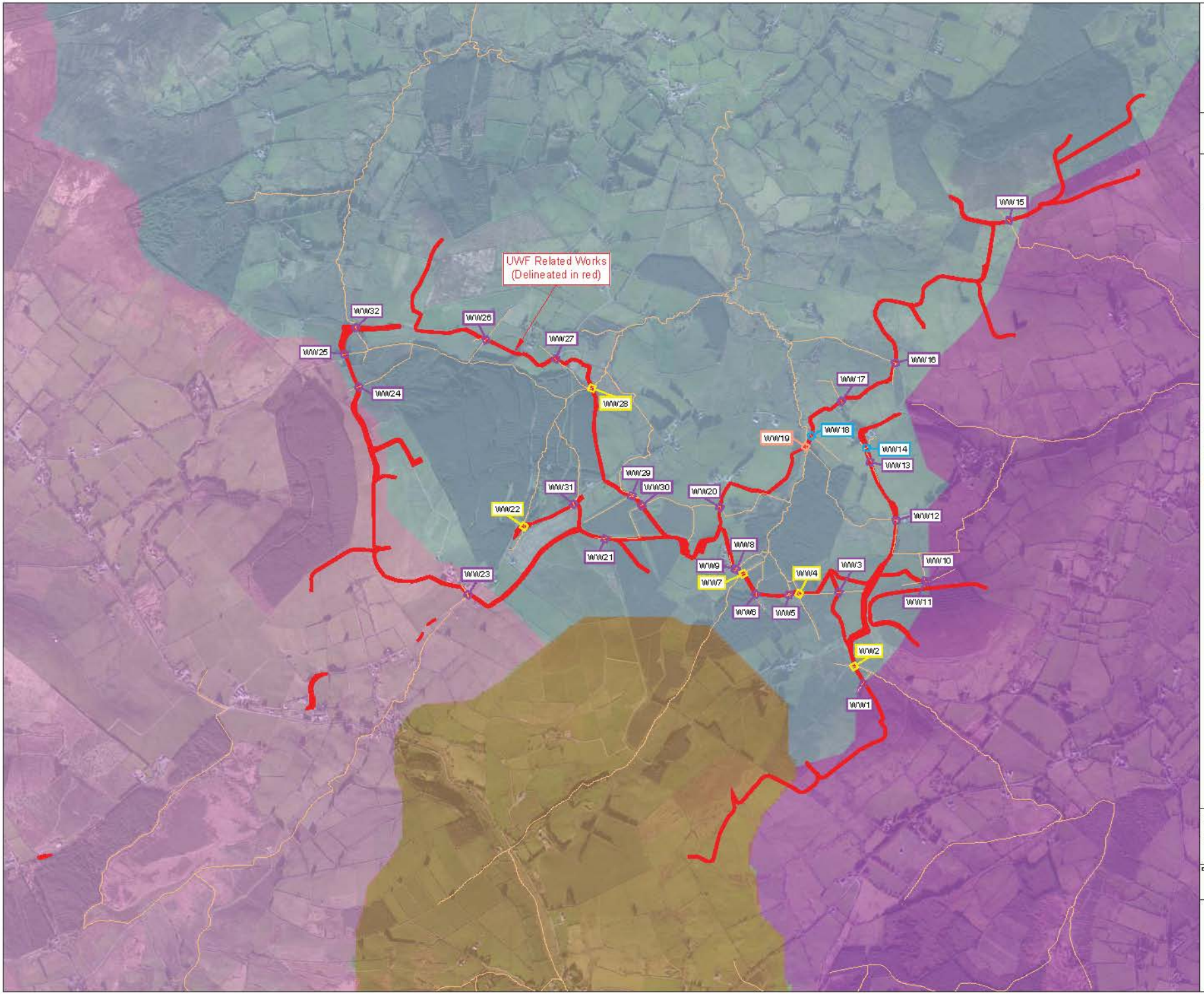

Title:

Figure RW 8.4

Aquatic Habitats & Species within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- Watercourses
- Watercourse Crossing Location: Class 1
- Watercourse Crossing Location: Class 2
- Watercourse Crossing Location: Class 3
- Watercourse Crossing Location: Class 4
- Bilboa River
- Owenbeg River
- Newport (Mulkear) River
- Turraheen River

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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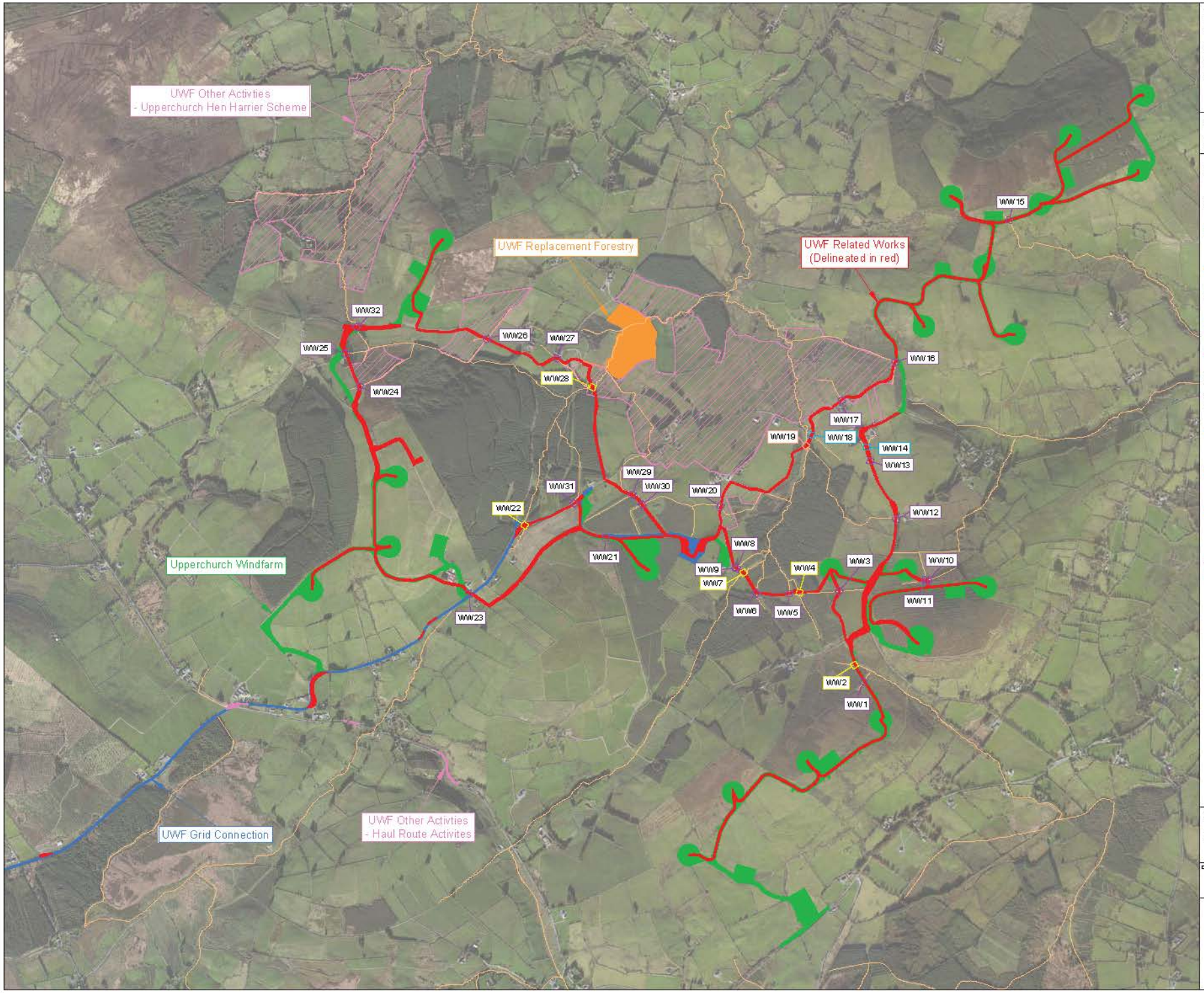

Title:

Figure CE 8.4

Aquatic Habitats & Species within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- Watercourses
- Watercourse Crossing Location: Class 1
- Watercourse Crossing Location: Class 2
- Watercourse Crossing Location: Class 3
- Watercourse Crossing Location: Class 4

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area

UWF Other Activities:
- Upperchurch Hen Harrier Scheme
- Haul Route Activities

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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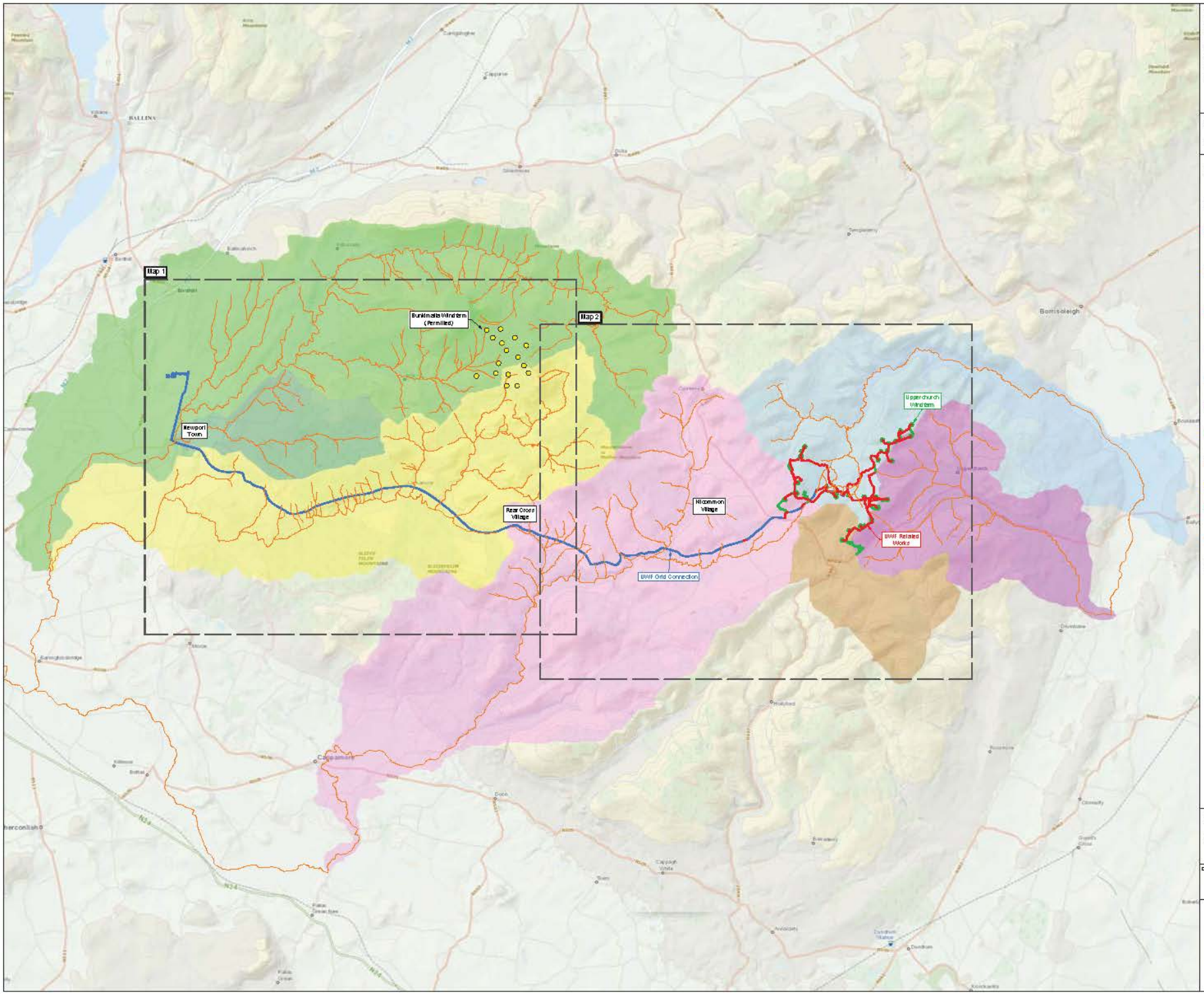

Title:

Figure WP 8.4

Aquatic Habitats within the Whole Project Cumulative Evaluation Study Area

Map Number:
Overview Map

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- Bilboa River
- Clodaigh River Local
- Owenbeg River
- Newport (Mulkear) River
- Turraheen River
- Clare (Annagh) River
- Small River
- River Network

Survey Results :

- Bunkimalta Windfarm

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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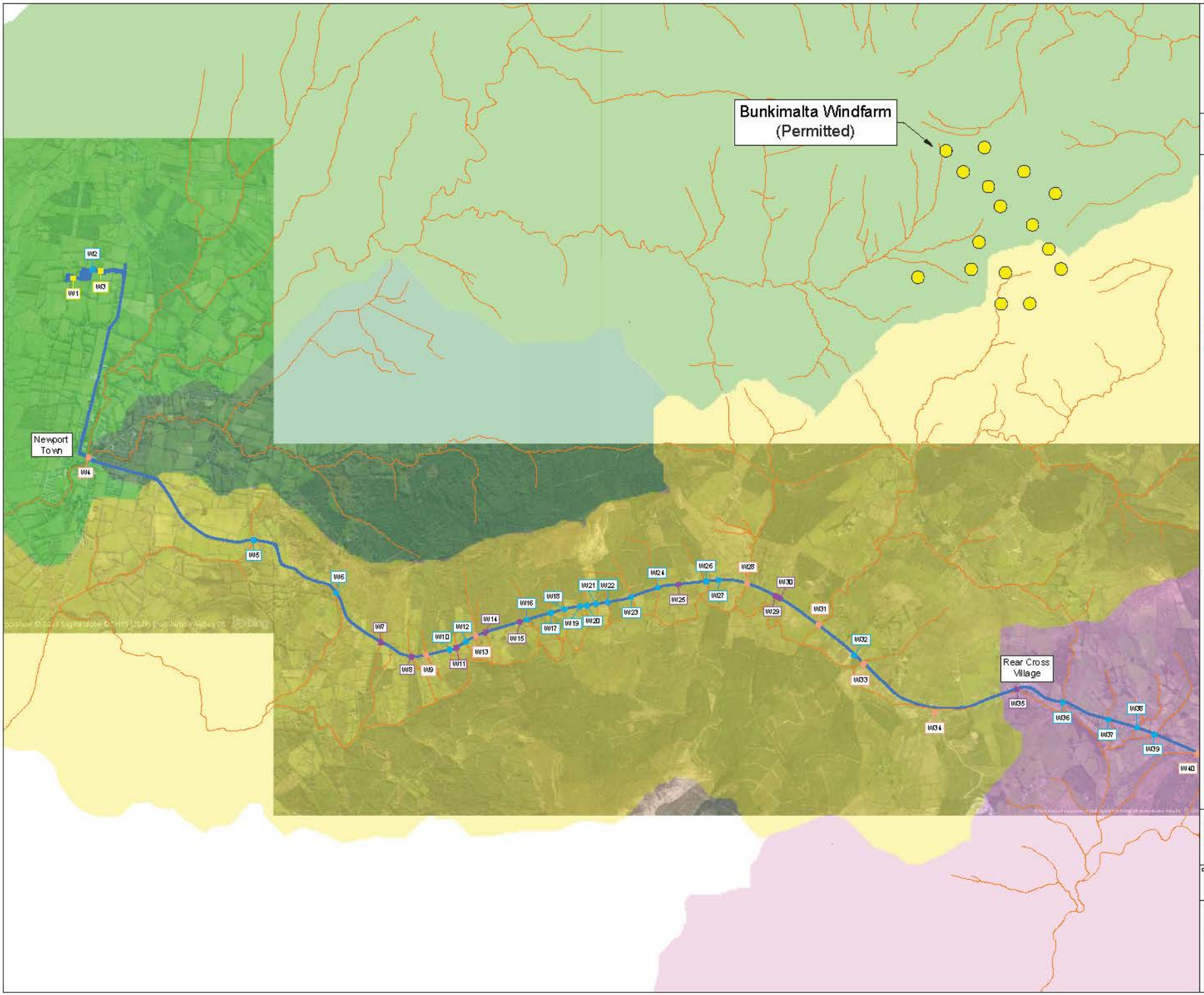

Title:

Figure WP 8.4

Aquatic Habitats within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 2

Legend:

Study Area Extents :

- UWF Grid Connection Construction Works Area
- Bilboa River
- Newport (Mulkear) River
- Clare (Annagh) River
- Small River
- Watercourse Crossing Location (UWF Grid Connection): Class 1
- Watercourse Crossing Location (UWF Grid Connection): Class 2
- Watercourse Crossing Location (UWF Grid Connection): Class 3
- Watercourse Crossing Location (UWF Grid Connection): Class 4
- River Network

Survey Results :

- Bunkimalta Windfarm

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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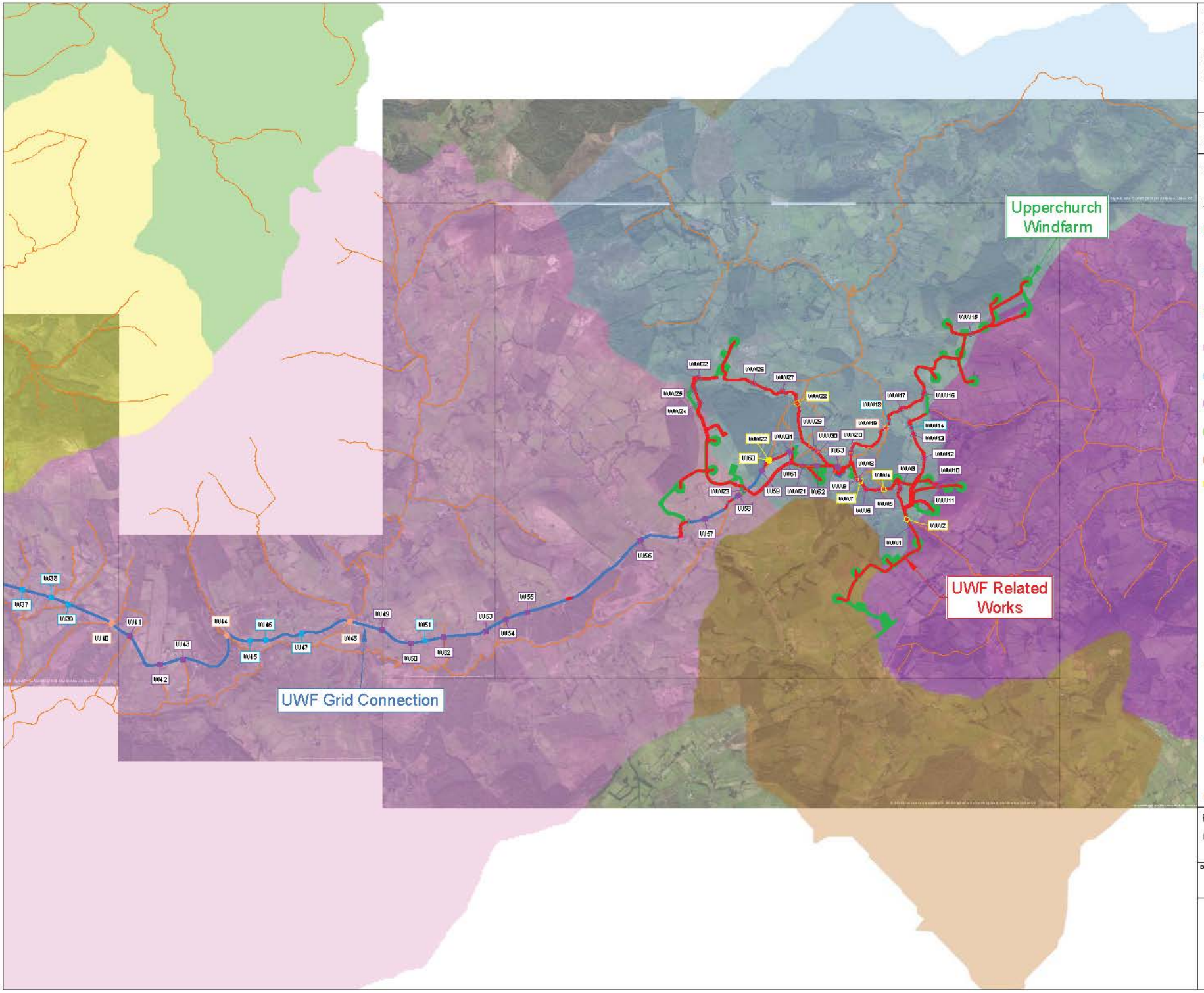

Title:
Figure WP 8.4

Aquatic Habitats within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 2 of 2

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- Bilboa River
- Clodaigh River Local
- Owenbeg River
- Newport (Mulkear) River
- Turraheen River
- Clare (Annagh) River
- Watercourse Crossing Location (UWF Grid Connection): Class 1
- Watercourse Crossing Location (UWF Grid Connection): Class 2
- Watercourse Crossing Location (UWF Grid Connection): Class 3
- Watercourse Crossing Location (UWF Grid Connection): Class 4
- Watercourse Crossing Location (UWF Related Works): Class 1
- Watercourse Crossing Location (UWF Related Works): Class 2
- Watercourse Crossing Location (UWF Related Works): Class 3
- Watercourse Crossing Location (UWF Related Works): Class 4
- River Network

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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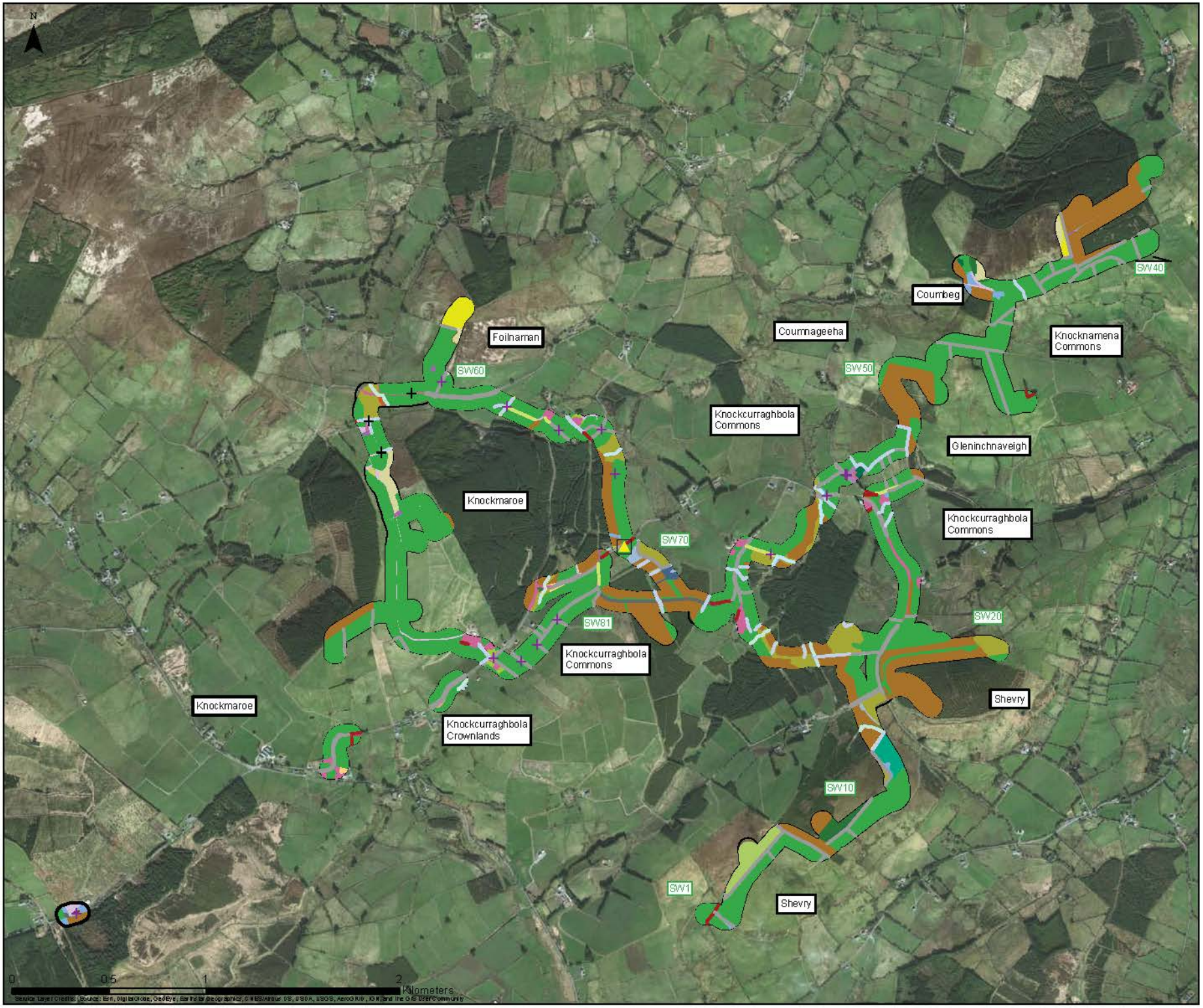

Client: Ecopower Developments Ltd.

Project: UWF Related Works (RW)

Title:
Figure RW8.5: Terrestrial Habitats within the UWF Related Works Study Area.

Legend:

- BL3
- ED2
- ED3
- GA1
- GA1/GS4
- GA1/WS1
- GA2
- GS2
- GS3
- GS3/HH3
- GS4
- GS4/WS1
- HH1/GS4
- HH3
- PB2
- PB2/GS4
- PB4
- WD1
- WD4
- WL1
- WL2
- WS1
- WS2
- WS2/GS4
- BL2
- BL3
- FW1
- FW2
- FW4
- GS2
- WL1
- WL1/WL2
- WL2
- Temporary hedge/tree removal and pruning
- Permanent hedge/tree removal
- Japanese Knotweed
- Study Area Boundary
- S1 Section Number

REFERENCE DOCUMENTS

For illustrative purposes only. Map not to scale

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Date:	Map Reference:
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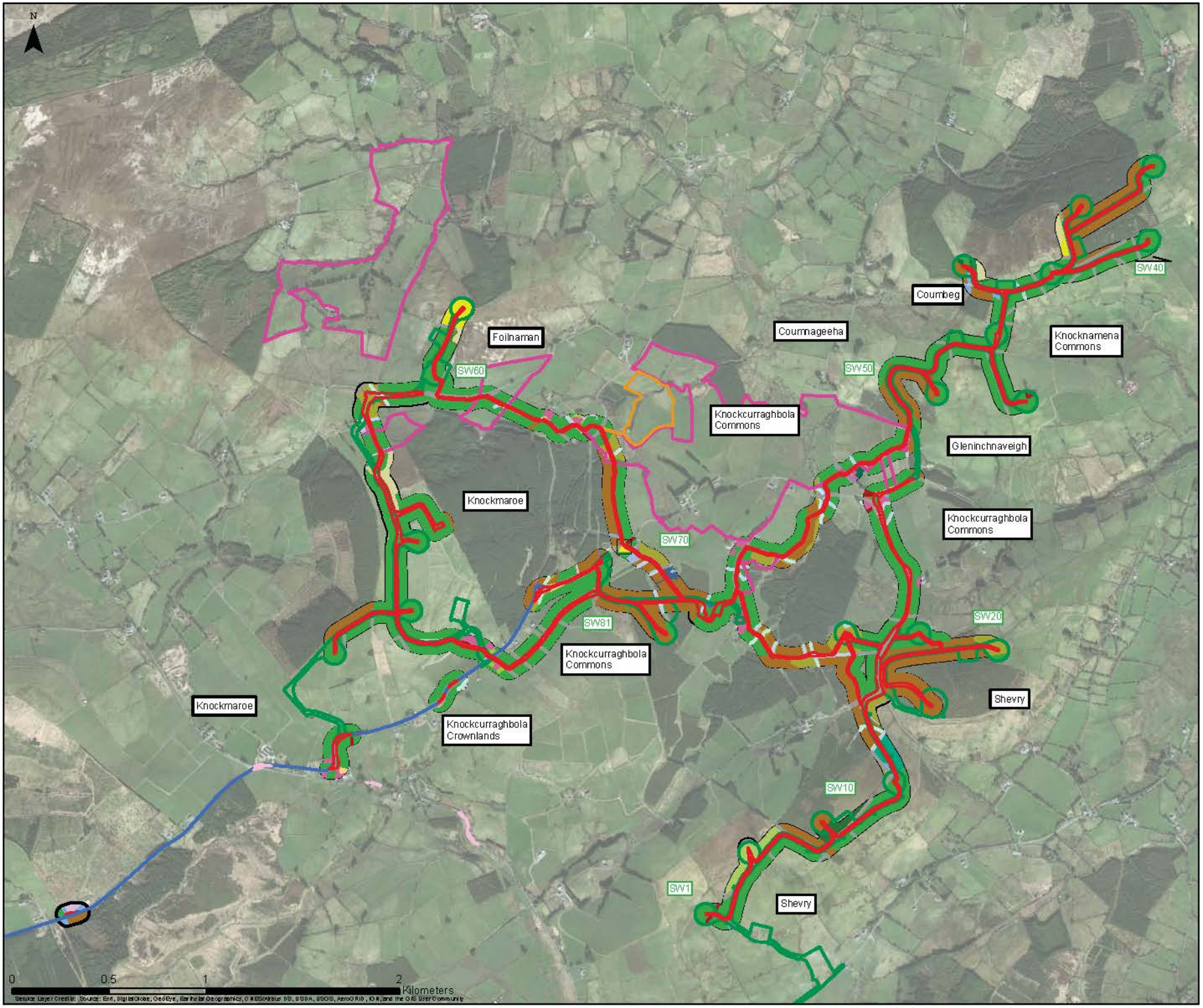

Client: Ecopower Developments Ltd.

Project: UWF Related Works (RW)

Title:
Figure CE 8.5: Terrestrial Habitats within the UWF Related Works Cumulative Evaluation Study Area

Legend:

- Haul Route Activities
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities Hen Harrier Scheme
- UWF Grid Connection Construction Works Area
- Himalayan Knotweed
- Japanese Knotweed
- Study Area Boundary Related Works (50m)

BL3	HH1/GS4
ED2	HH3
ED3	PB2
GA1	PB2/GS4
GA1/GS4	PB4
GA1/WS1	WD1
GA2	WD4
GS2	WL1
GS3	WL2
GS3/HH3	WS1
GS4	WS2
GS4/WS1	WS2/GS4

BL2	GS2
BL3	WL1
FW1	WL1/WL2
FW2	WL2
FW4	S1 Section Number

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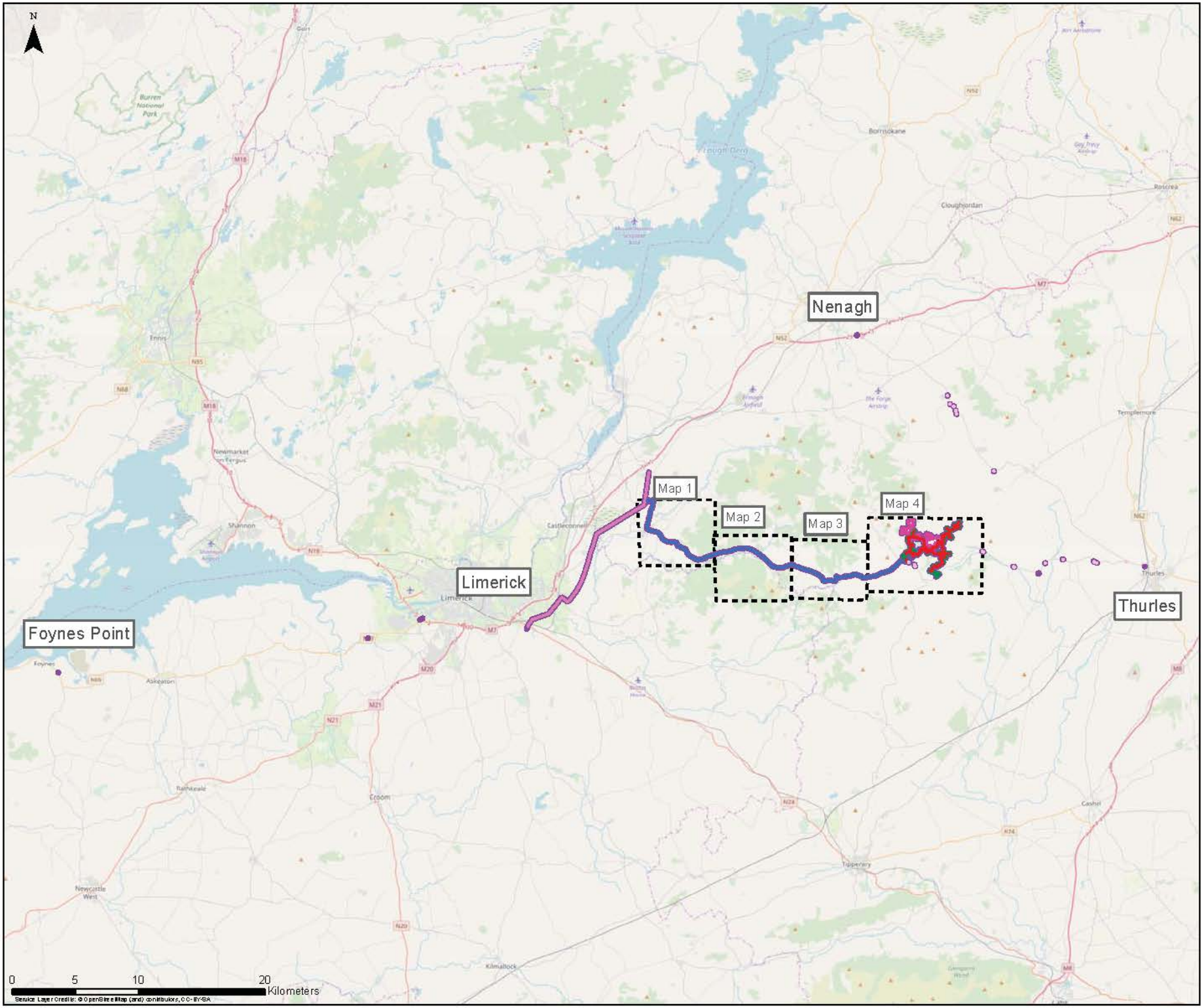

Client: Ecopower Developments Ltd.

Project: UWF Related Works (RW)

Title:
Figure WP 8.5: Terrestrial Habitats within the Whole Project Cumulative Evaluation Study Area Overview Map

Legend:
- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Other Activities Hen Harrier Scheme
- Haul Route
- Killonan Line
- 50m Study Area from all Construction Works Areas

REFERENCE DOCUMENTS

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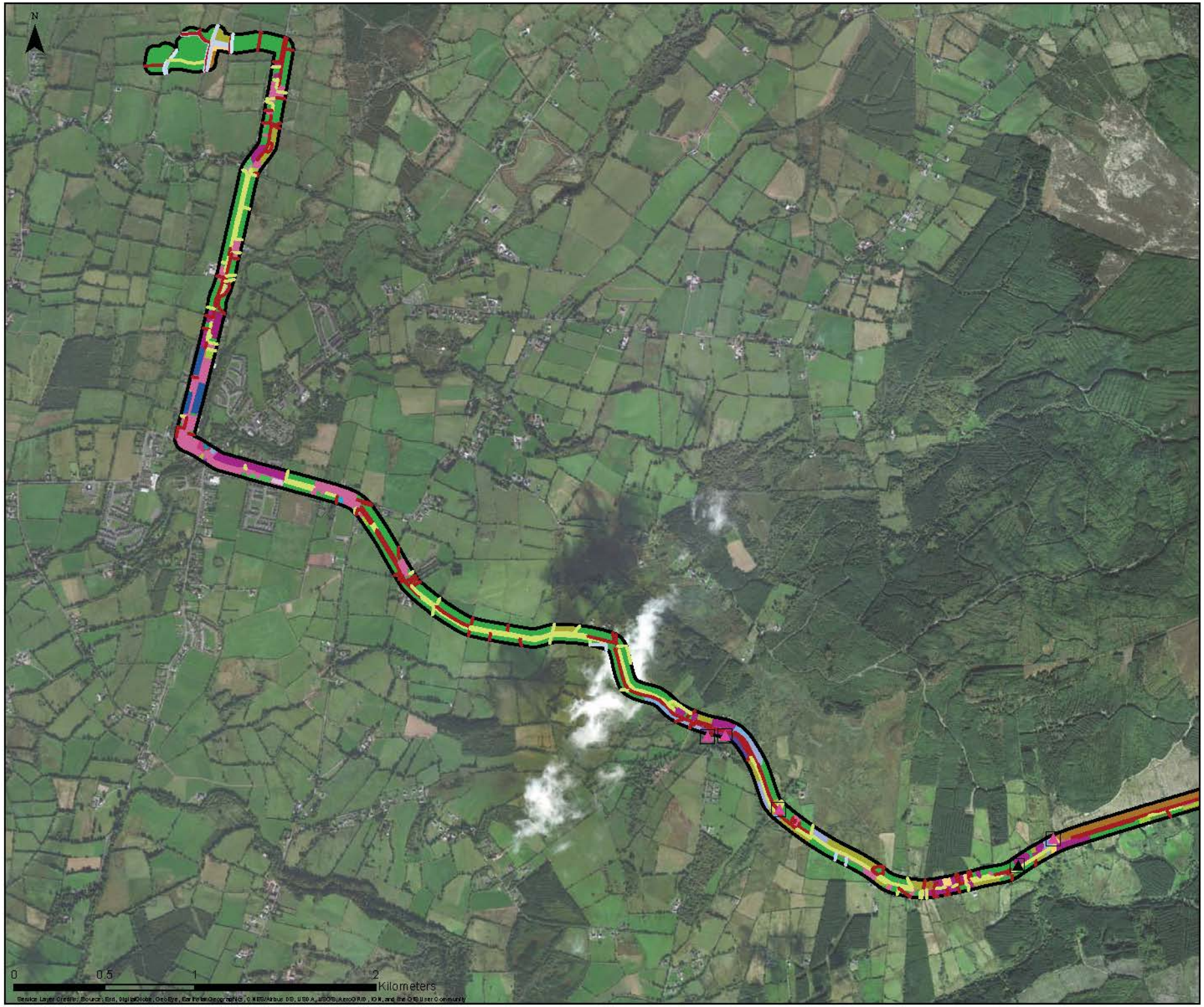

Client: Ecopower Developments Ltd.

Project: UWF Related Works (RW)

Title:
Figure WP 8.5: Terrestrial Habitats within the Whole Project Cumulative Evaluation Study Area Map 1 of 4

Legend:

- BL3
- BL3/BC4GA1
- BL3/BC4GA2
- BL3/GA2
- ED2
- ED2/BL3
- ED2/GA1
- GA1
- GA2
- GA2/WS3
- GS4
- GS4/WD1
- GS4/WS1
- HD1
- WD1
- WD4
- WN1
- WN5
- WN5/GA1
- WS1
- WS1/GS4
- WS2
- WS4
- BL2
- FW2
- FW4
- WL1
- WL2
- Rhododendron
- Rhododendron & Montbretia
- Grid Connection 50m Buffer

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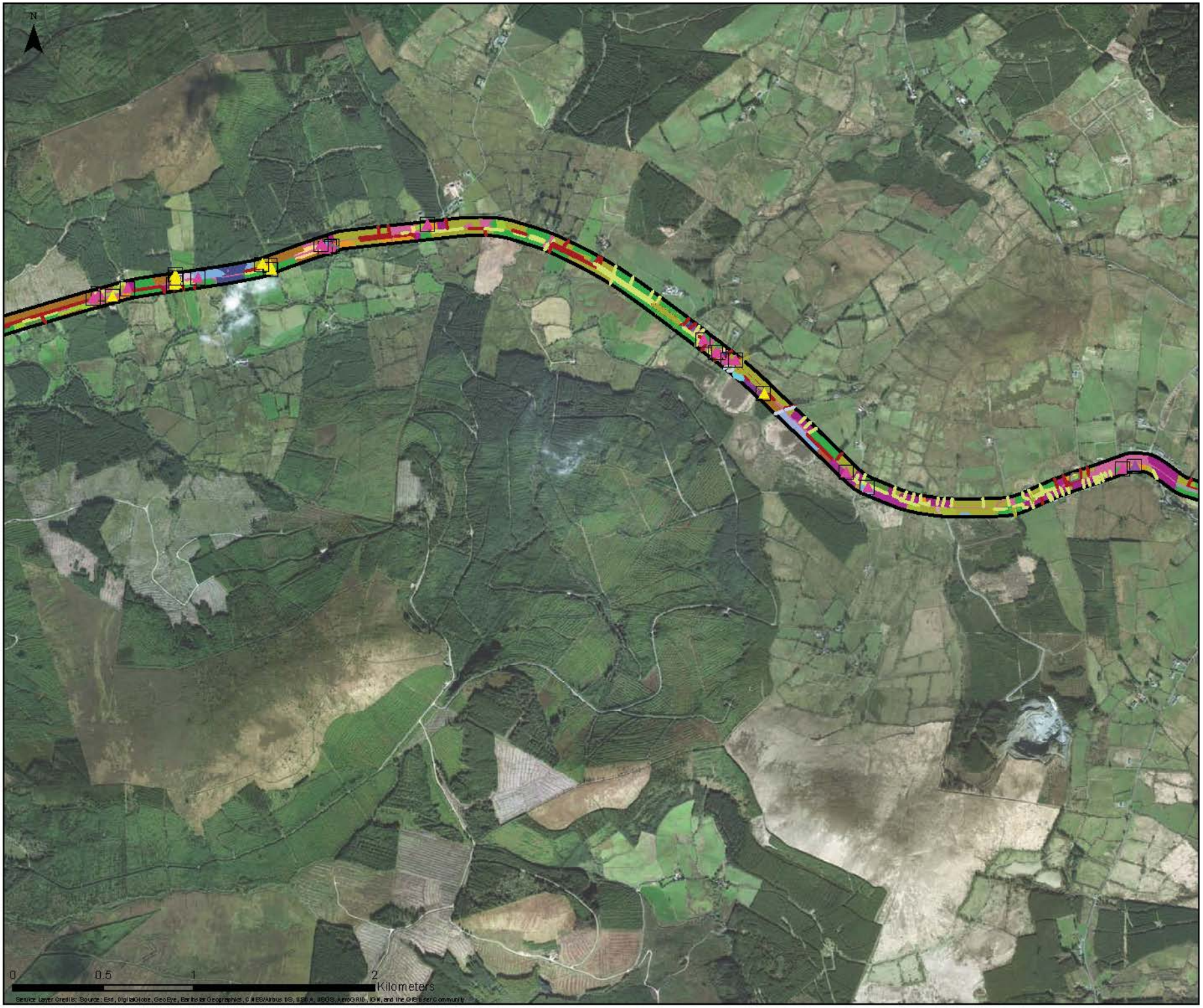

Client: Ecopower Developments Ltd.

Project: UWF Related Works (RW)

Title:
Figure WP 8.5: Terrestrial Habitats within the Whole Project Cumulative Evaluation Study Area Map 2 of 4

Legend:

- BL2
- BL3
- BL3/GA2
- ED1
- ED2
- ED3
- FS1
- FS1/GS4
- FS1/WS1
- GA1
- GA2
- GA2/BL3
- GS4
- GS4/WS1
- PB3
- WD1
- WD2
- WD4
- WS1
- WS1/BL2
- WS1/GS4
- WS5
- Japanese Knotweed
- Rhododendron
- Japanese Knotweed
- Rhododendron
- Rhododendron & Box Honeysuckle
- Rhododendron
- BL2
- FW4
- WL1
- WL2
- Grid Connection 50m Buffer

REFERENCE DOCUMENTS

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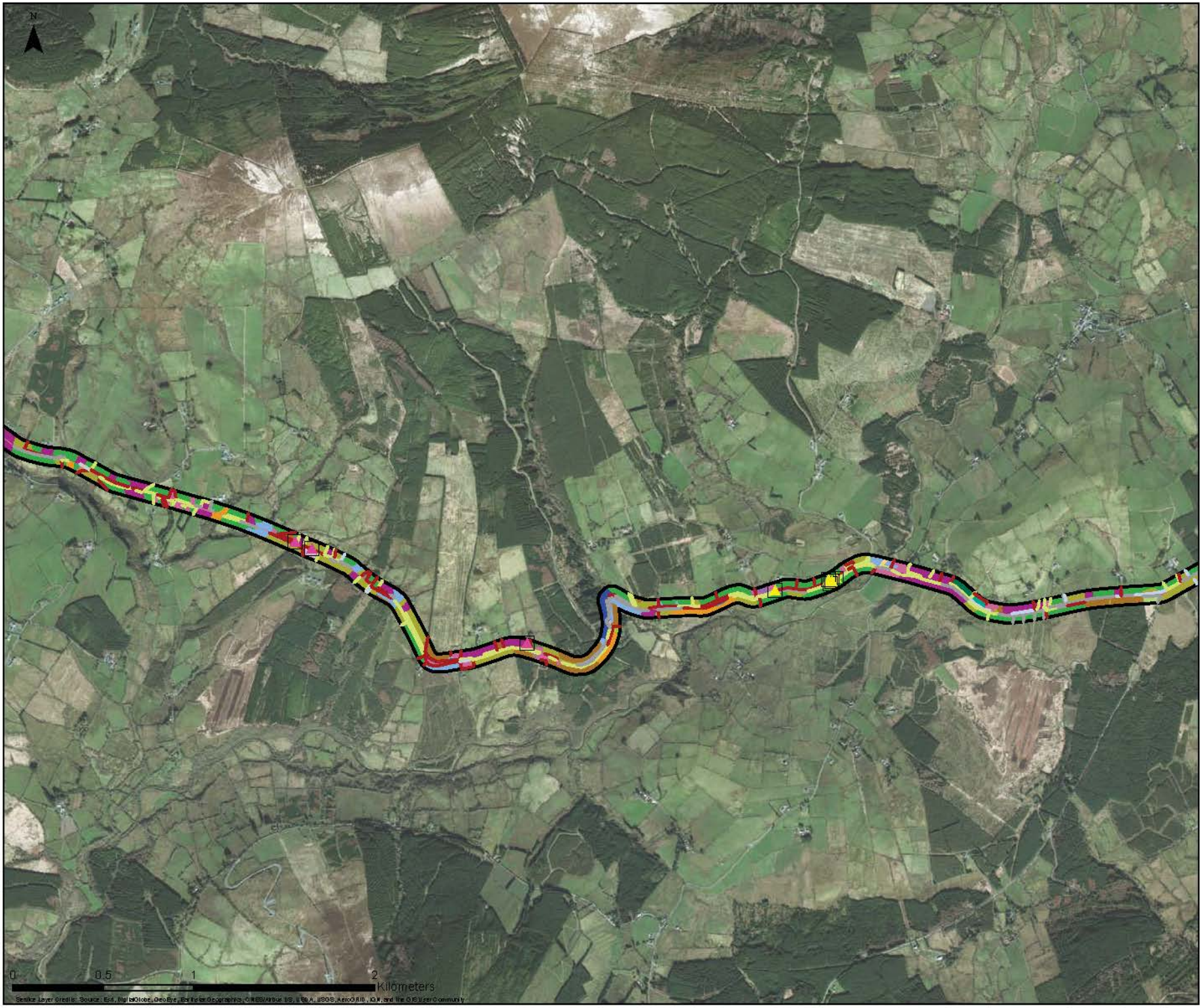

Client: Ecopower Developments Ltd.

Project: UWF Related Works (RW)

Title:
Figure WP 8.5: Terrestrial Habitats within the Whole Project Cumulative Evaluation Study Area Map 3 of 4

Legend:

- BL3
- BL3/GA1
- BL3/GA2
- ED2
- ED3
- GA1
- GA1/GS4
- GA1/WS1
- GA2
- GS4
- GS4/HH3
- GS4/WS1
- WD1
- WD2
- WD4
- WD4/WS1
- WS1
- WS1/WD2
- Japanese Knotweed
- Rhododendron
- BL1
- BL2
- FW4
- WL1
- WL2
- Grid Connection 50m Buffer

REFERENCE DOCUMENTS

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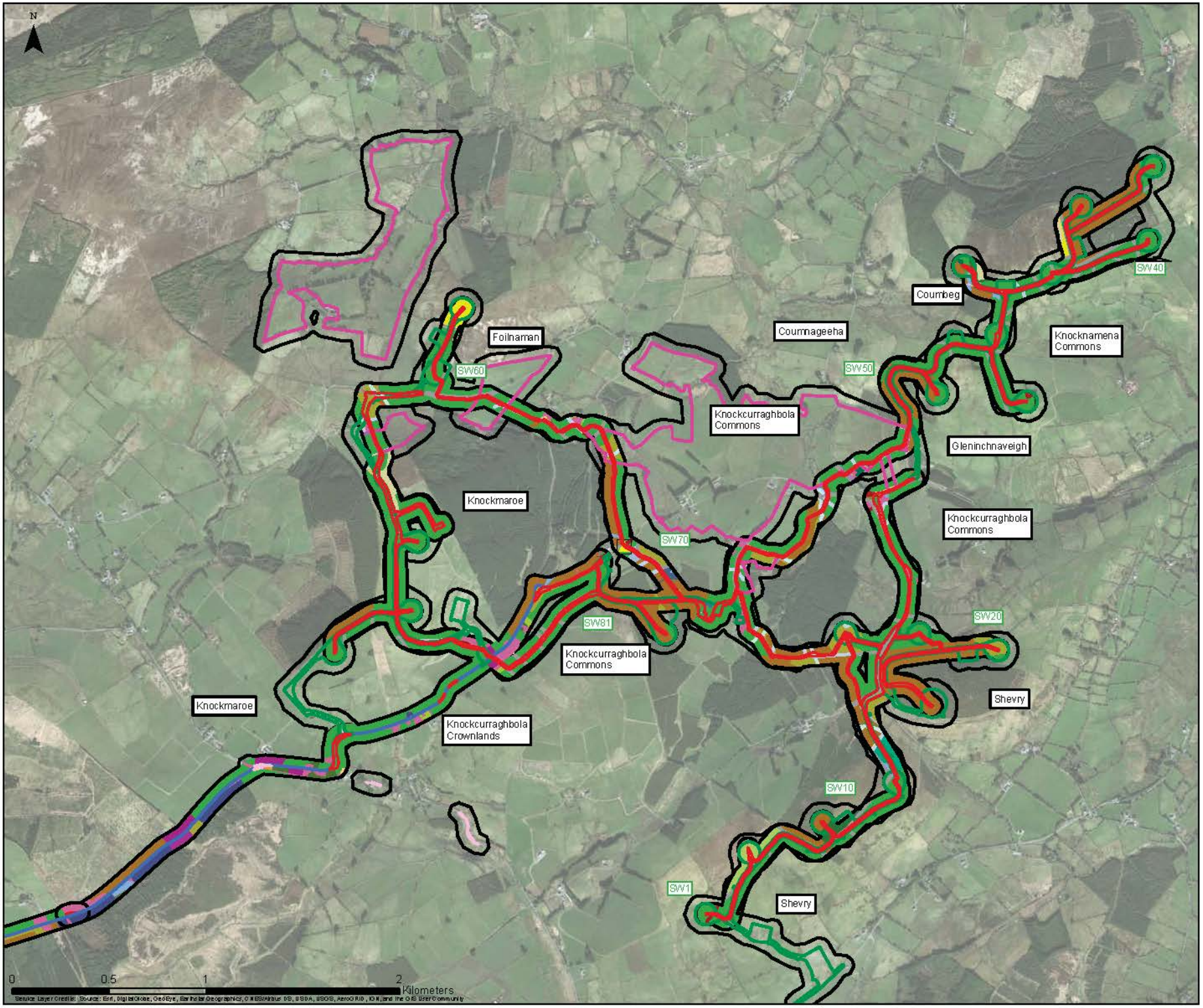

Client: Ecopower Developments Ltd.

Project: UWF Related Works (RW)

Title:
Figure WP 8.5: Terrestrial Habitats within the Whole Project Cumulative Evaluation Study Area Map 4 of 4

Legend:

- 50m Study Area from all Construction Works Areas
- Haul Route Activities
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Other Activities Hen Harrier Scheme
- UWF Grid Connection Construction Works Area
- Japanese Knotweed

BL3	HH1/GS4
ED2	HH3
ED3	PB2
GA1	PB2/GS4
GA1/GS4	PB4
GA1/WS1	WD1
GA2	WD4
GS2	WL1
GS3	WL2
GS3/HH3	WS1
GS4	WS2
GS4/WS1	WS2/GS4

BL2	GS2
BL3	WL1
FW1	WL1/WL2
FW2	WL2
FW4	S1 Section Number

REFERENCE DOCUMENTS

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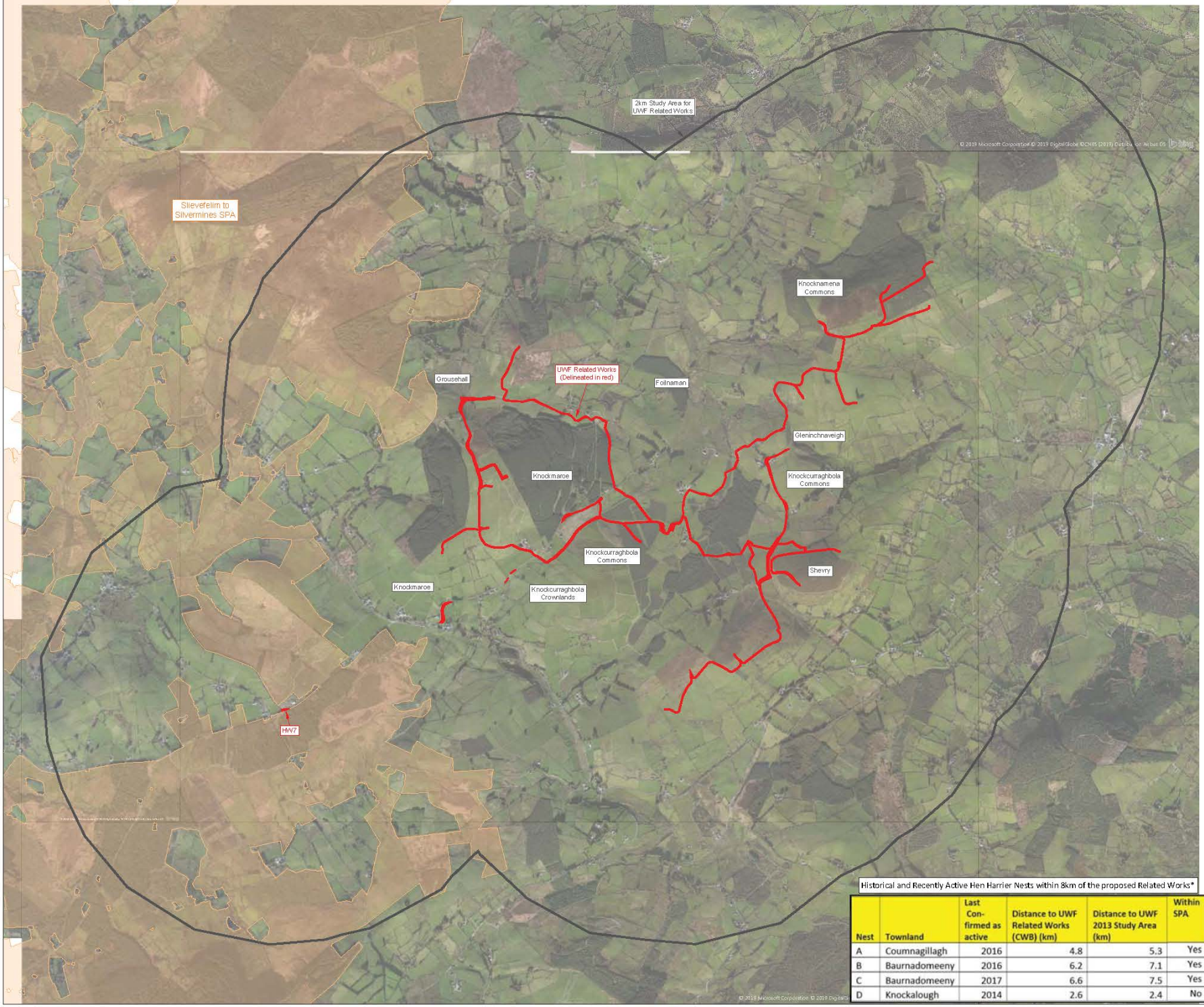
Information Age Park, Gort Road,
Ennis, Co. Clare



Historical and Recently Active Hen Harrier Nests within 8km of the proposed Related Works*

Nest	Townland	Last Con-firmed as active	Distance to UWF Related Works (CWB) (km)	Distance to UWF 2013 Study Area (km)	Within SPA
A	Coumnagillagh	2016	4.8	5.3	Yes
B	Baurnadomeeny	2016	6.2	7.1	Yes
C	Baurnadomeeny	2017	6.6	7.5	Yes
D	Knockalough	2014	2.6	2.4	No

Title:

Figure RW 8.6

Hen Harrier within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 2km Study Area - UWF Related Works Construction Works Area
- Location HW7 of Haul Route Works

Survey Results :

No known or historical nests or roosts within 2km of the UWF Related Works

- Slievefelim to Silvermines SPA

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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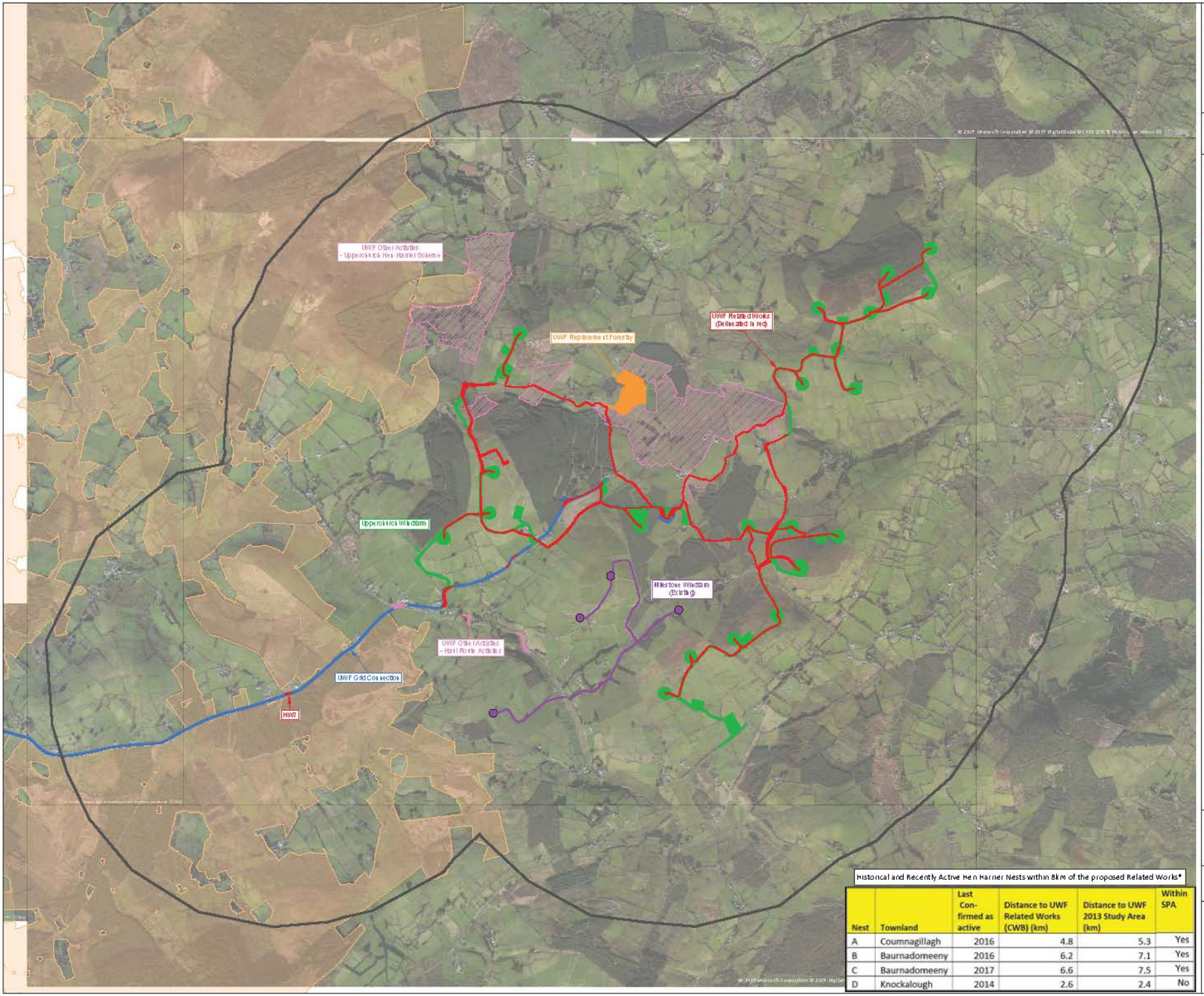

Historical and Recently Active Hen Harrier Nests within 8km of the proposed Related Works*

Nest	Townland	Last Con-firmed as active	Distance to UWF Related Works (CWB) (km)	Distance to UWF 2013 Study Area (km)	Within SPA
A	Coumnagillagh	2016	4.8	5.3	Yes
B	Baurnadomeeny	2016	6.2	7.1	Yes
C	Baurnadomeeny	2017	6.6	7.5	Yes
D	Knockalough	2014	2.6	2.4	No

Title:

Figure CE 8.6

Hen Harrier within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 2km Study Area
  - UWF Related Works Construction Works Area
- Location HW7 of Haul Route Works

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
- UWF Replacement Forestry Construction Works Area
- Milestone Windfarm Footprint

Survey Results :

No known or historical nest or roosts within 2km of the UWF Related Works

- Slievefelim to Silvermines SPA

N

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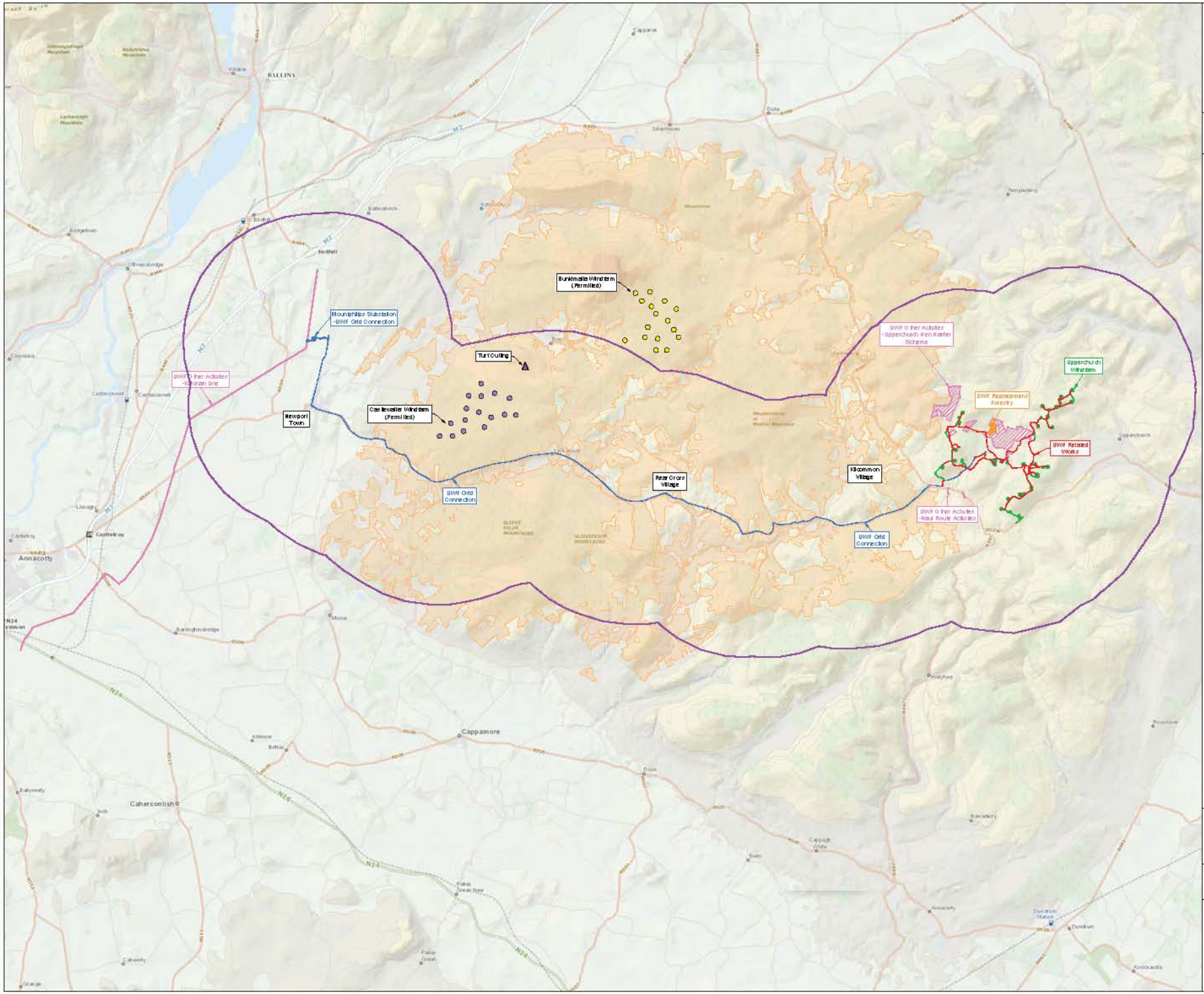

Title:

Figure WP 8.6

Hen Harrier within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities (HA21-HA23)
  - Killonan Line
- 4km Study Area

Survey Results :

- Castlewaller Windfarm
- Bunkimalta Windfarm
- Turf Cutting

Forestry and Agriculture:
Please see terrestrial habitats figure on aerial photography for reference purposes with respect to the extent of Forestry and Agricultural lands.

- Slievefelim - Silvermins SPA

N

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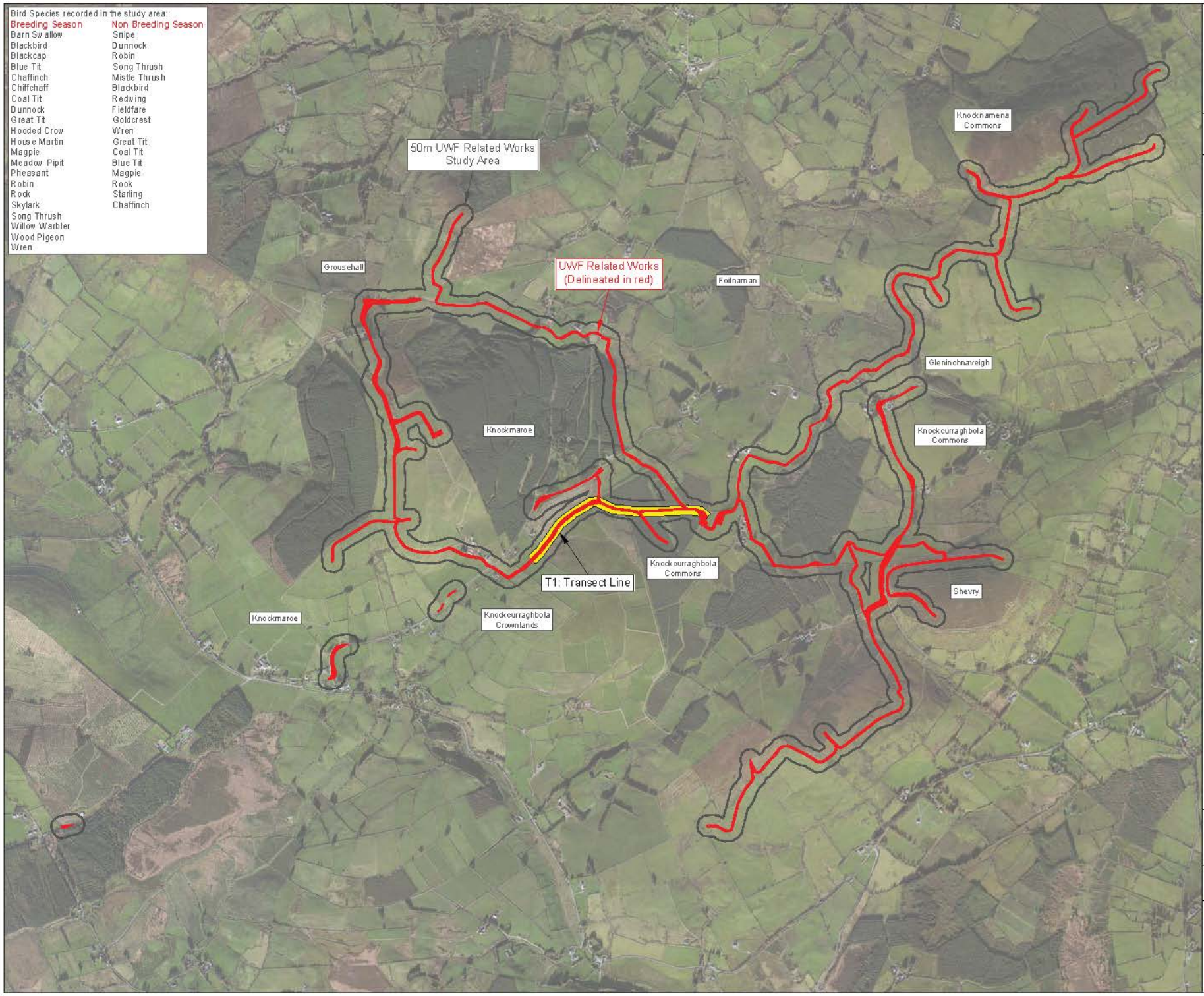

Title:

Figure RW 8.7

General Bird Species within the UWF Related Works Study Area

Map Number:

Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 50m Study Area
  - UWF Related Works Construction Works Area
- T1: Transect Line

Survey Results :

Survey Results listed in table:

**Countryside bird surveys were undertaken along Transect T1 during the breeding season of 2016*

**Winter bird surveys were undertaken along Transect T1 during the non-breeding season of 2016/17*

REFERENCE DOCUMENTS

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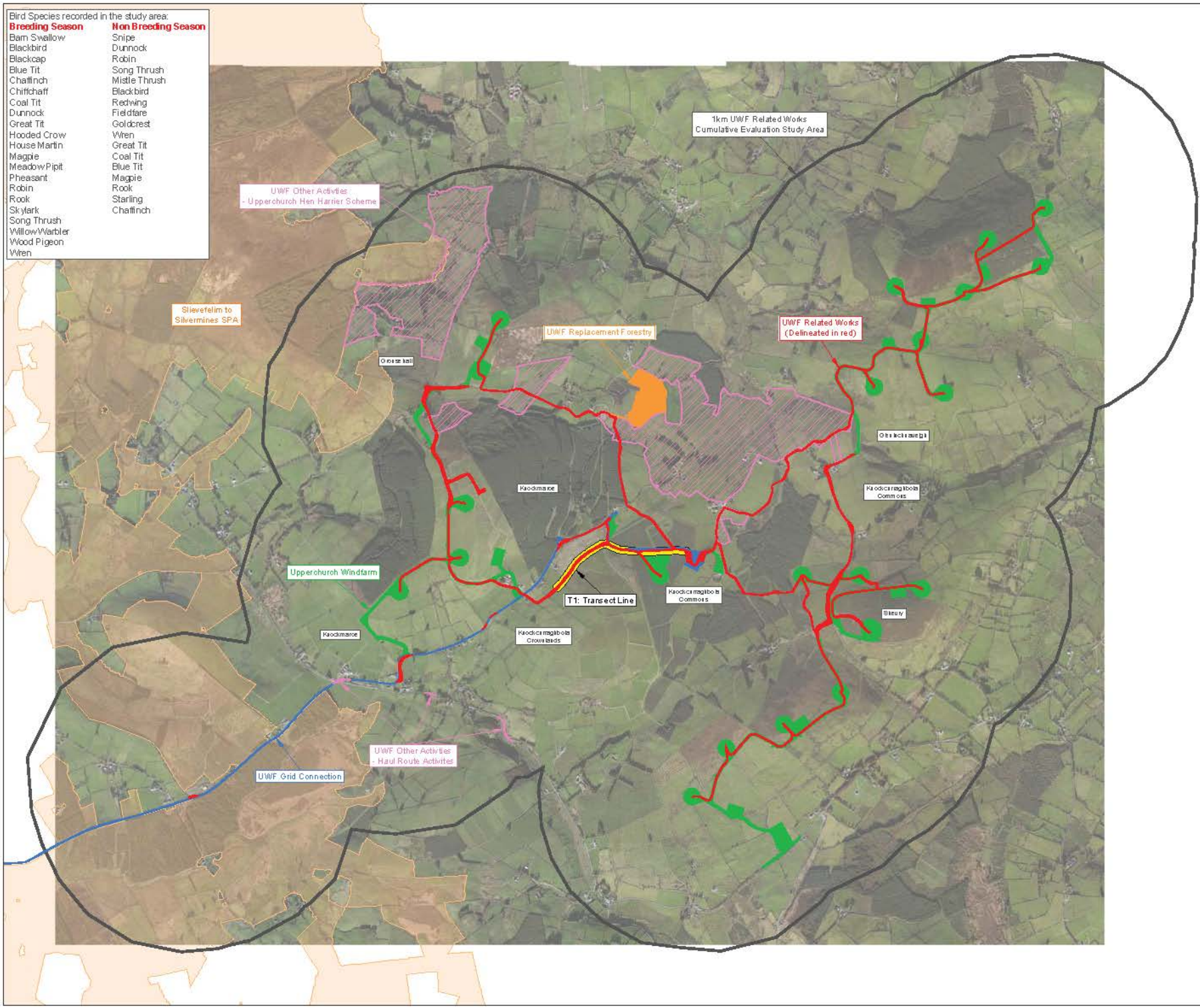

Title:

Figure CE 8.7

General Bird Species within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 1km Study Area
  - UWF Related Works Construction Works Area
- T1: Transect Line

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities

Survey Results :

Survey Results listed

- Slievefelim to Silvermines SPA

REFERENCE DOCUMENTS

N

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UWF Related Works (RW)

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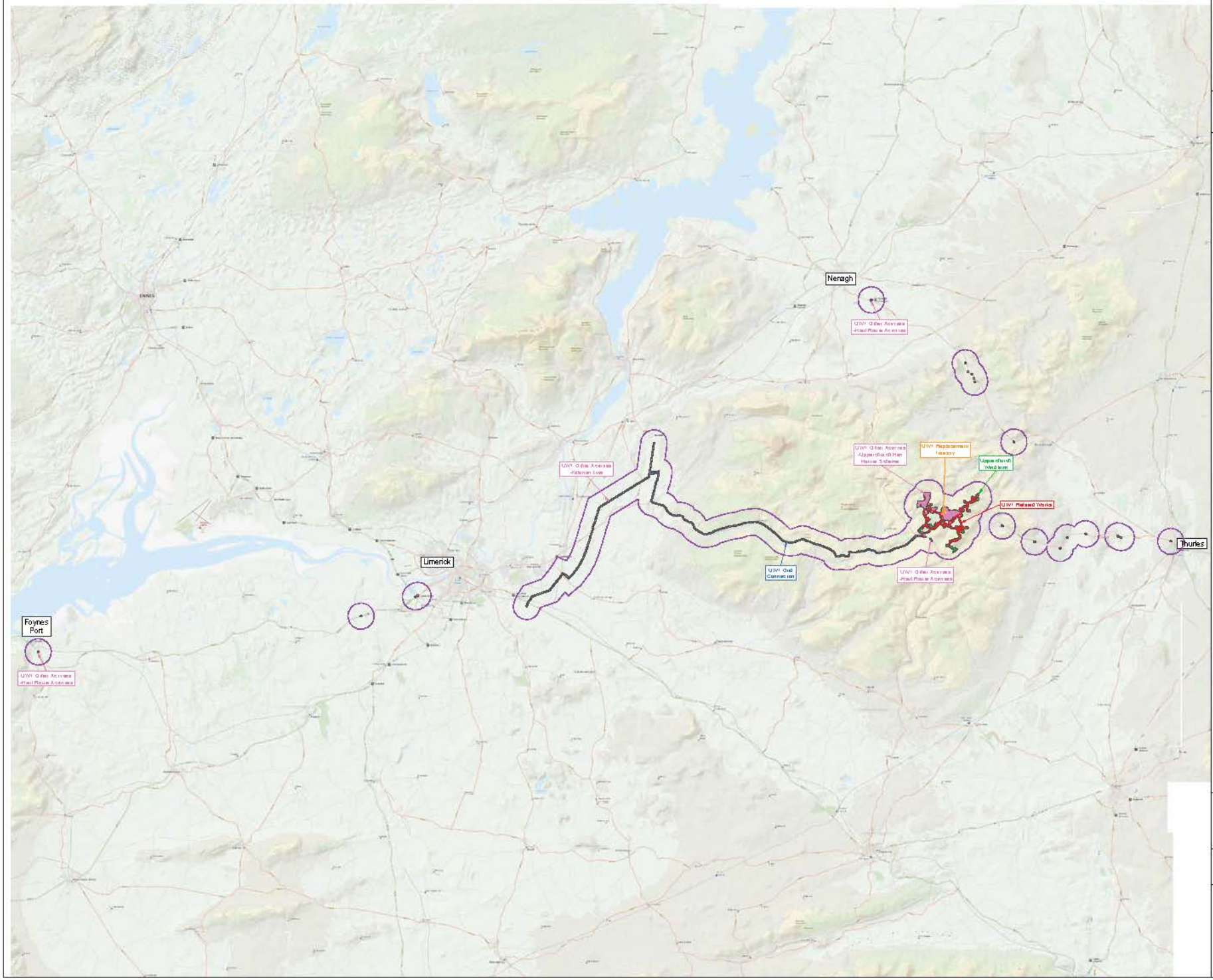

Title:

Figure WP 8.7

General Bird Species within the Whole Project Cumulative Evaluation Study Area

Map Number:
Overview Map

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
  - Killonan Line
- 1km Study Area from all of the Construction Works Area
- 50m Study Area from all of the Construction Works Area

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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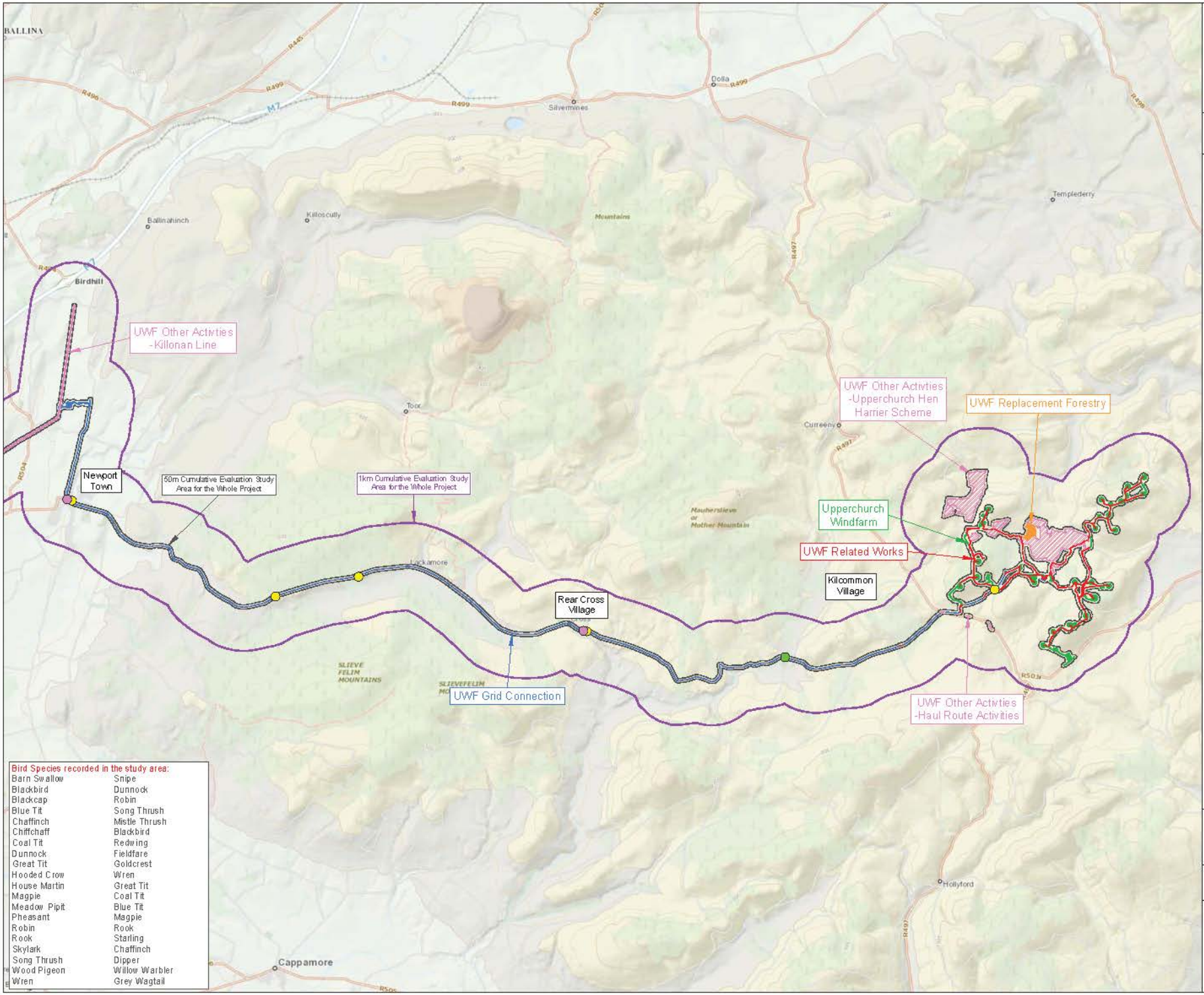

Title:

Figure WP 8.7

General Bird Species within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
  - Killonan Line
- 1km Study Area from all of the Construction Works Area
- 50m Study Area from all of the Construction Works Area

Survey Results :

- Dipper
- Grey Wagtail
- Swallow

REFERENCE DOCUMENTS

N

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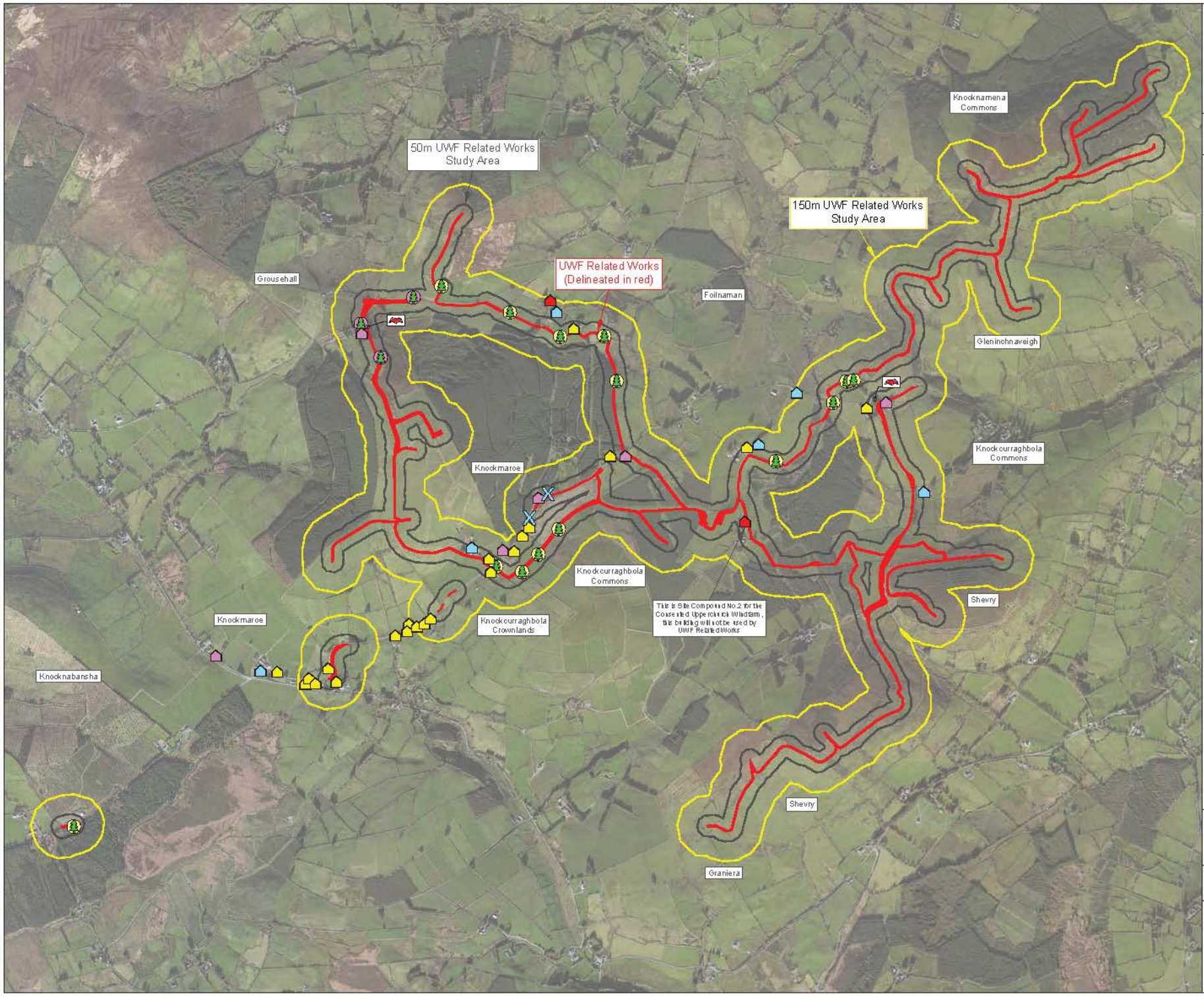

Title:

Figure RW 8.8

Bats within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 50m Study Area
  - UWF Related Works Construction Works Area
- 150m Study Area
  - UWF Related Works Construction Works Area

Survey Results :

- Bat Crossing Location

Bat Roost Suitability :

- Culvert: Negligible
- Buildings: High
- Buildings: Moderate
- Buildings: Low
- Buildings: Negligible
- Temporary hedge/tree removal and pruning
- Permanent hedge/tree removal

REFERENCE DOCUMENTS

N

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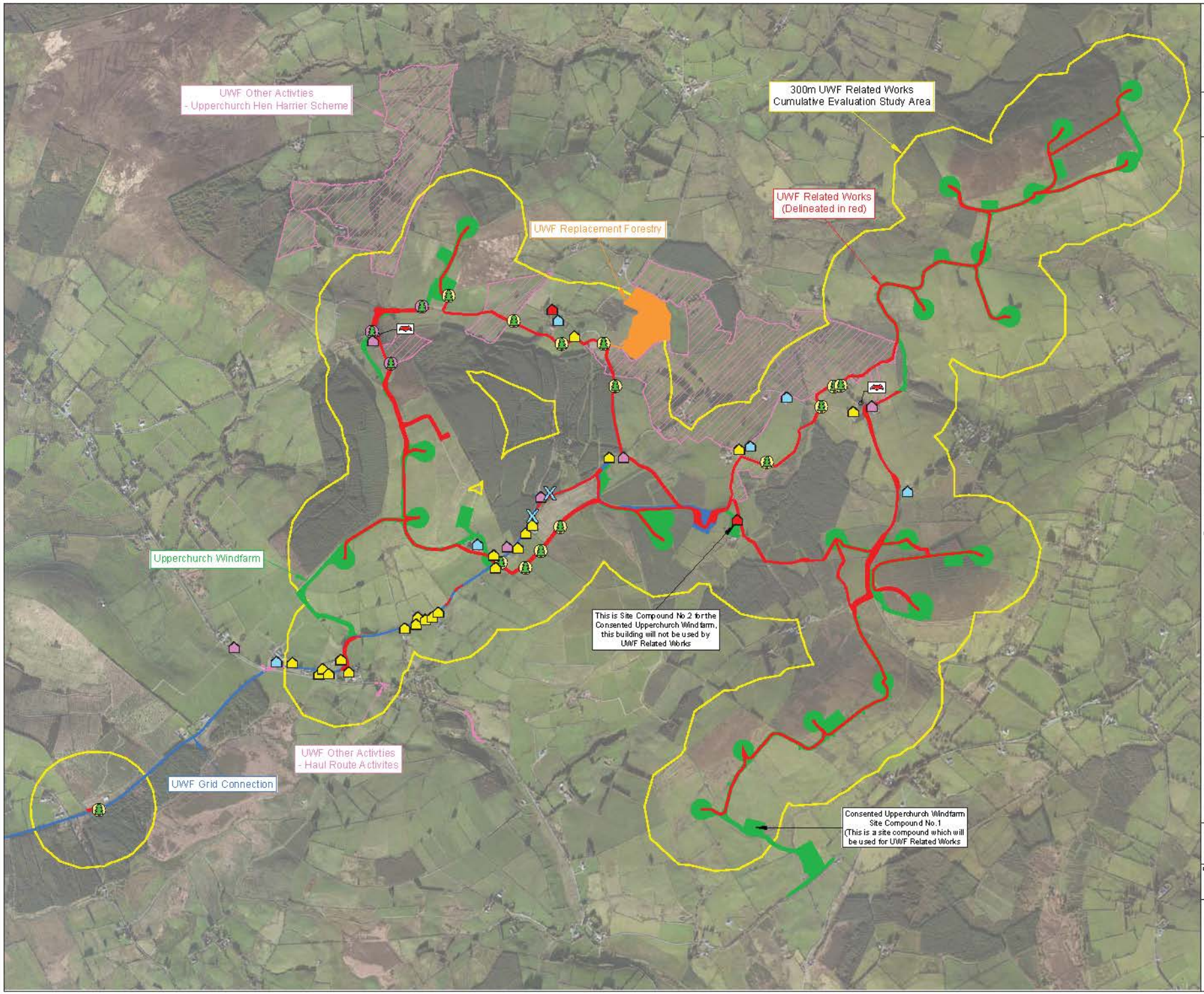

Title:

Figure CE 8.8

Bats within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 300m Study Area
  - UWF Related Works Construction Works Area

Cumulative Projects :

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities

Survey Results :

- Bat Crossing Location

Bat Roost Suitability :

- Culvert: Negligible
- Buildings: High
- Buildings: Moderate
- Buildings: Low
- Buildings: Negligible
- Temporary hedge/tree removal and pruning
- Permanent hedge/tree removal

N

REFERENCE DOCUMENTS

Project:
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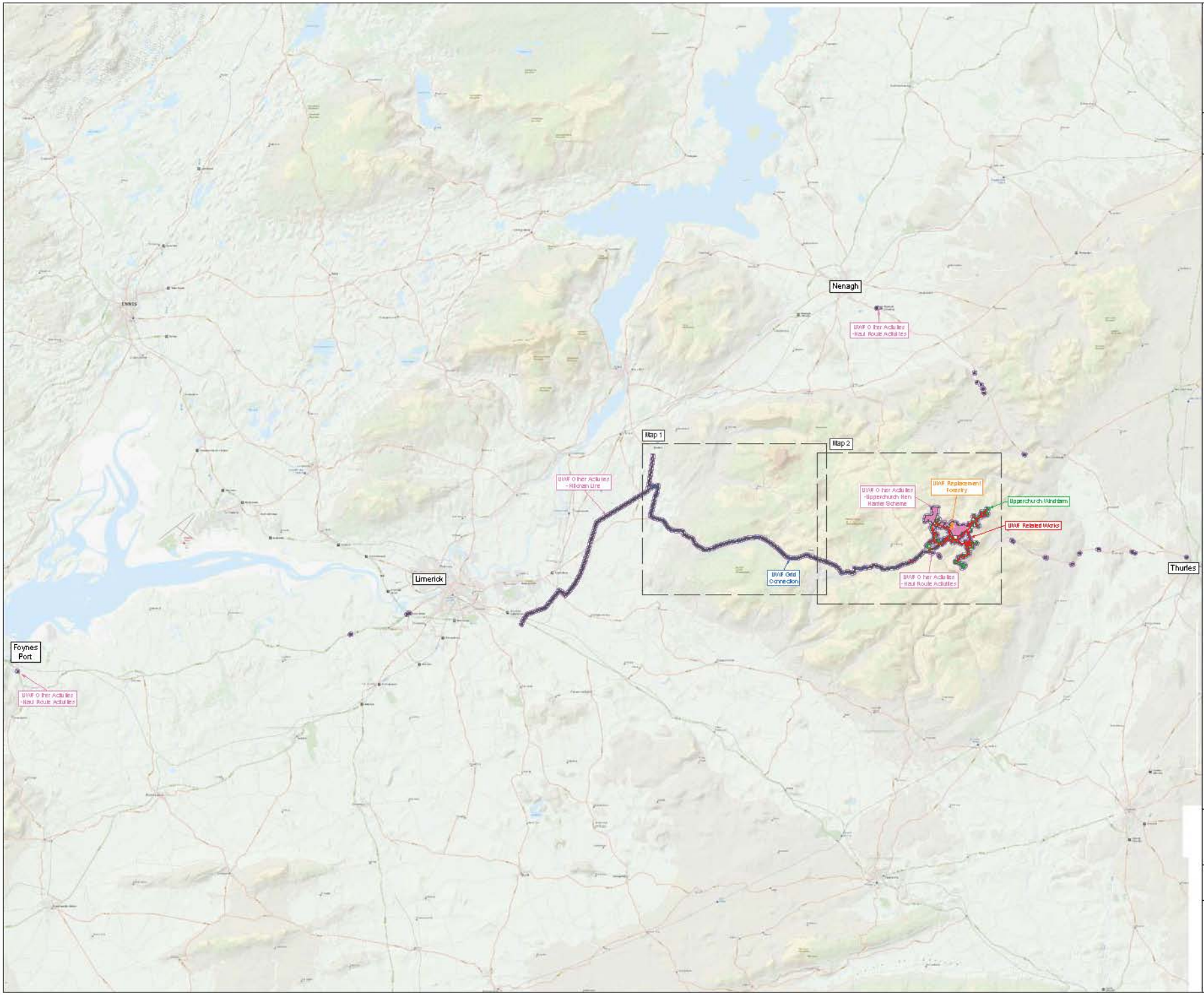

Title:

Figure WP 8.8

Non Volant Mammals within the Whole Project Cumulative Evaluation Study Area

Map Number:
Overview Map

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
  - Killonan Line
- 50m Study Area from all Construction Works Area
- 150m Study Area from all Construction Works Area

Survey Results :

Survey Results shown in zoomed in map

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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Title:

Figure WP 8.8

Bats within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 2

Legend:

Study Area Extents :

- UWF Grid Connection Construction Works Area
- UWF Other Activities:
  - Killonan Line
- 150m Study Area from all of the Construction Works Area
- 50m Study Area from all of the Construction Works Area

Survey Results :

Bat Roost Suitability :

- Bridge/Culvert: Low
- Bridge/Culvert: Moderate
- Bridge/Culvert: Negligible
- Buildings: High
- Buildings: Moderate
- Buildings: Low
- Buildings: Negligible
- Tree: Low
- Tree: Moderate

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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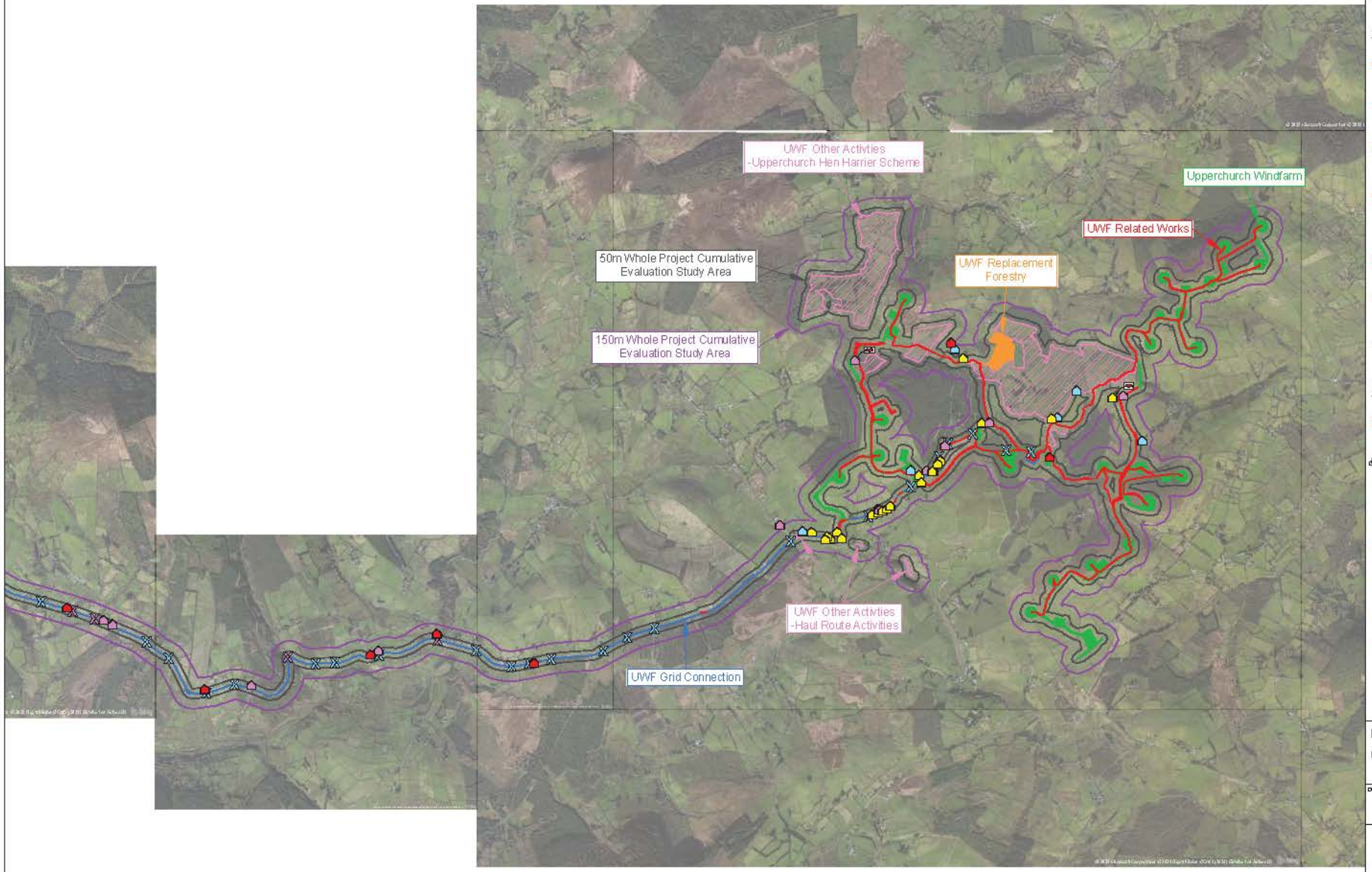

Title:

Figure WP 8.8

Bats within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 2 of 2

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
- 150m Study Area from all of the Construction Works Area
- 50m Study Area from all of the Construction Works Area

Survey Results :

Bat Roost Suitability :

- Bat Crossing Location
- Bridge/Culvert: Moderate
- Bridge/Culvert: Negligible
- Buildings: High
- Buildings: Moderate
- Buildings: Low
- Buildings: Negligible

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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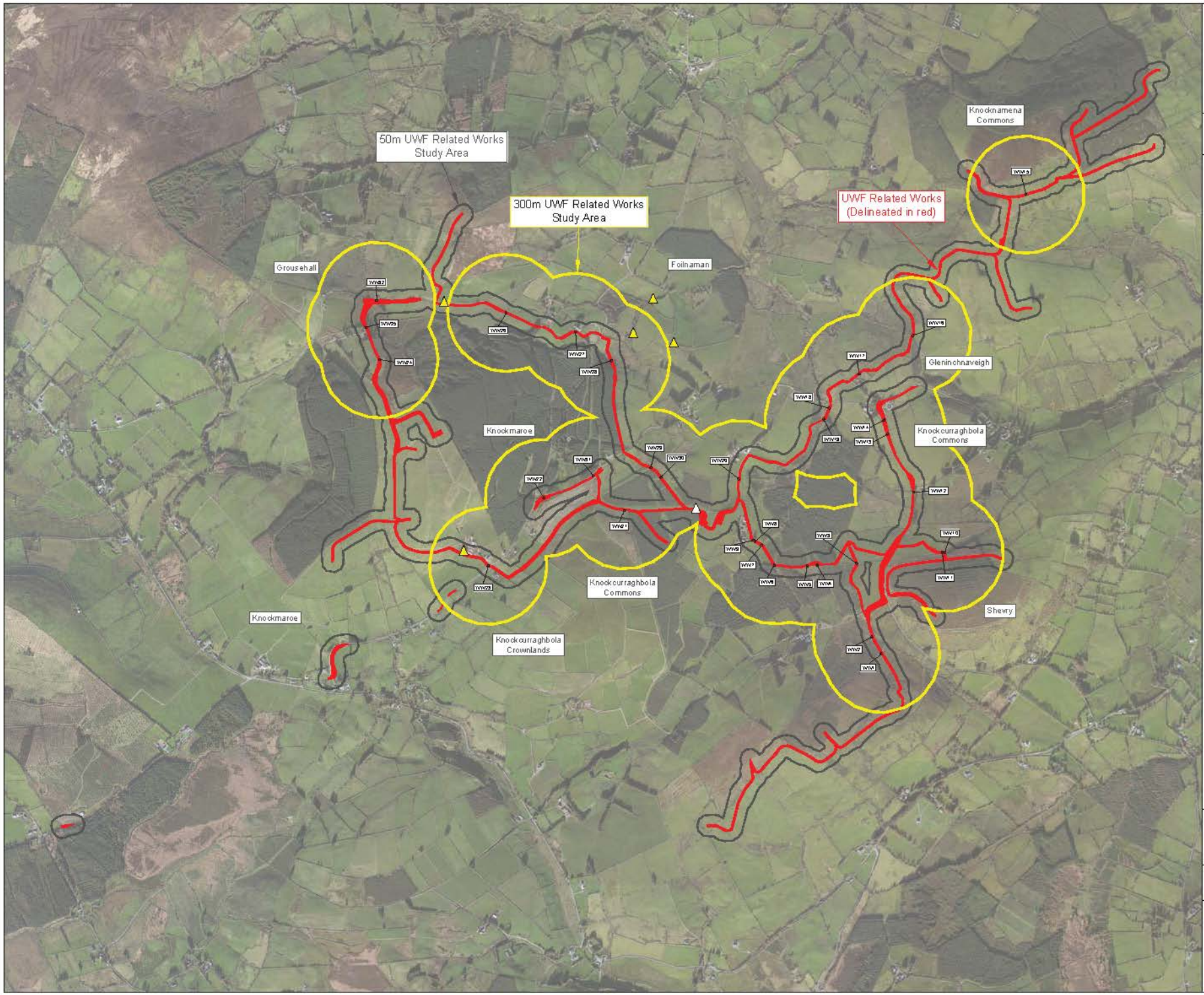

Title:

Figure RW 8.9

Non-Volant Mammals within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 50m Study Area
  - UWF Related Works Construction Works Area
- 300m Study Area
  - 300m from Watercourse crossing locations
- Watercourse Crossing Locations

Survey Results :

- Fox
- Deer

No badger recorded during July 2017 surveys

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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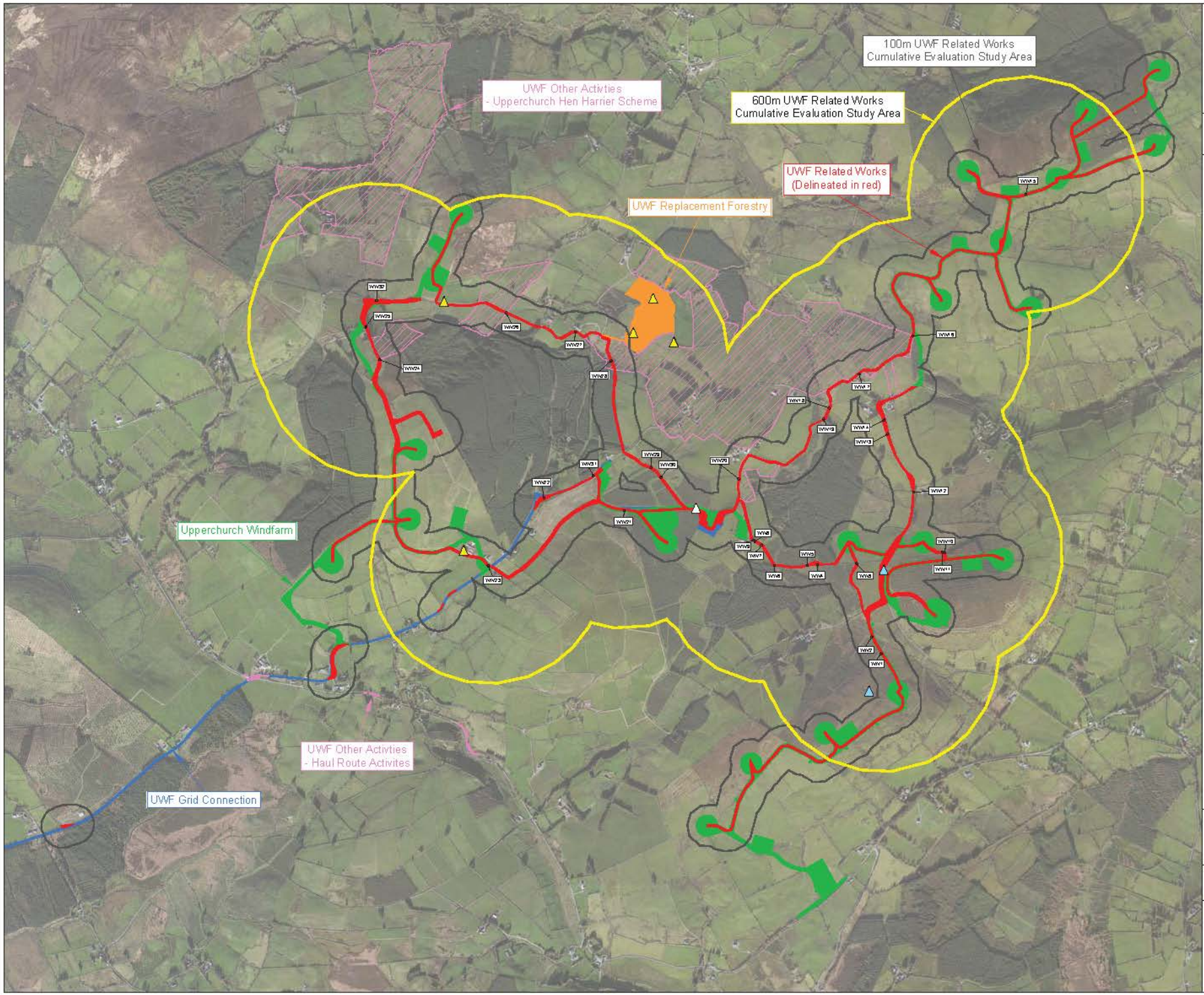

Title:

Figure CE 8.9

Non-Volant Mammals within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- 100m Study Area
  - UWF Related Works Construction Works Area
- 600m Study Area
  - 600m from Watercourse crossing locations
- Watercourse Crossing Locations

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities

Survey Results :

- Fox
- Deer
- Badger - Results from Upperchurch Windfarm RFI EIS 2013

N

REFERENCE DOCUMENTS

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UWF Related Works (RW)

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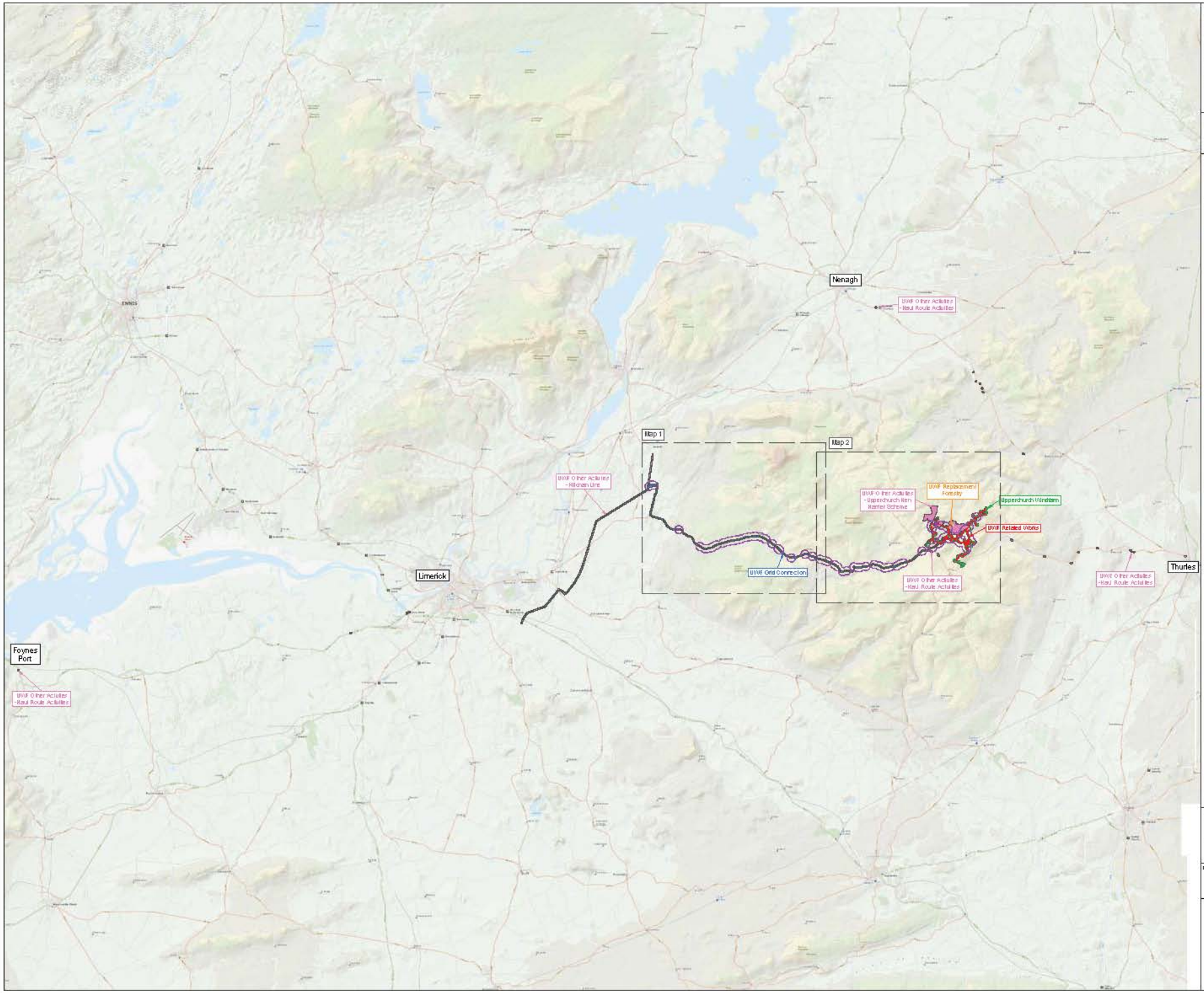

Title:

Figure WP 8.9

Non Volant Mammals within the Whole Project Cumulative Evaluation Study Area

Map Number:
Overview Map

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
  - Killonan Line
- 50m Study Area from all Construction Works Area
- 300m Cumulative Evaluation Study Area from all Watercourse Crossing Locations

Survey Results :

Survey Results shown in zoomed in map

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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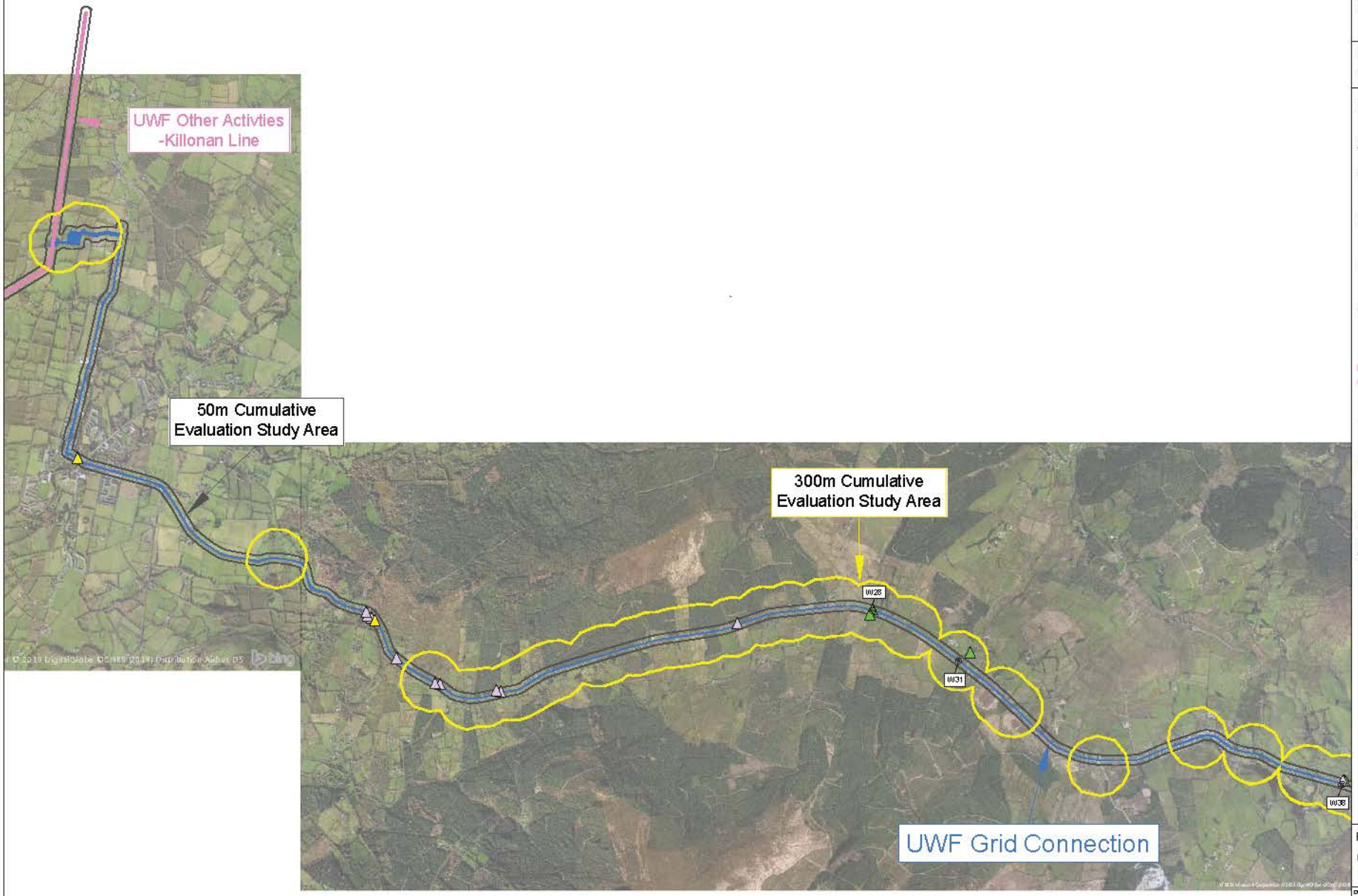

Title:

Figure WP 8.9

Non Volant Mammals within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 2

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
  - Killonan Line
- 50m Study Area from all Construction Works Area
- 300m Cumulative Evaluation Study Area from all Watercourse Crossing Locations
- WI01 Nearest watercourse crossing location to the otter

Survey Results :

- Fox
- Otter
- Mammal Pathways

N

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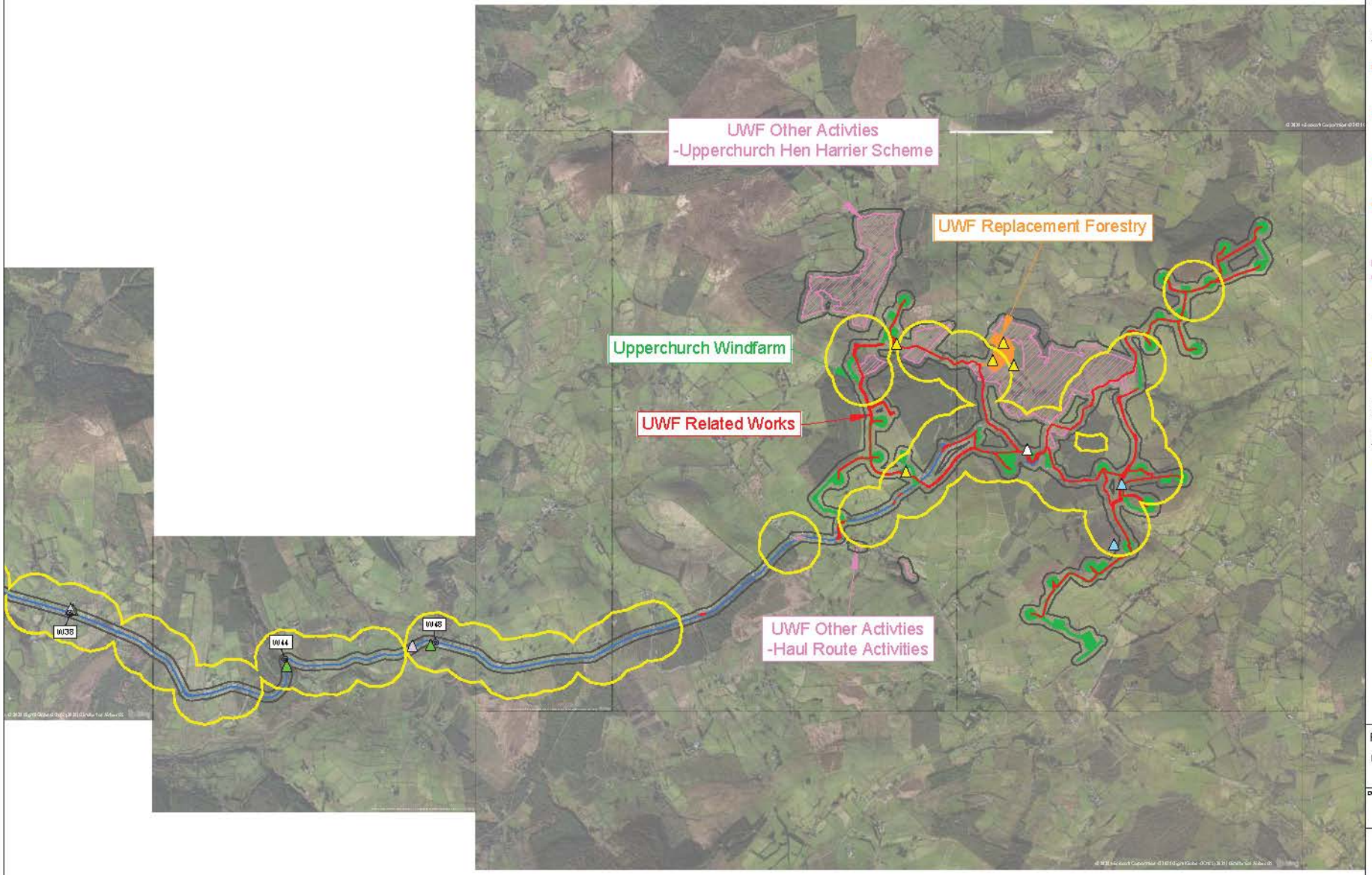

Title:

Figure WP 8.9

Non Volant Mammals within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 2 of 2

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities
  - Killonan Line
- 50m Study Area from all Construction Works Area
- 300m Cumulative Evaluation Study Area from all Watercourse Crossing Locations
- WI31 Nearest watercourse crossing location to the otter

Survey Results :

- Fox
- Deer
- Otter
- Mammal Pathways
- Badger - Results from Upperchurch Windfarm RFI EIS 2013

N

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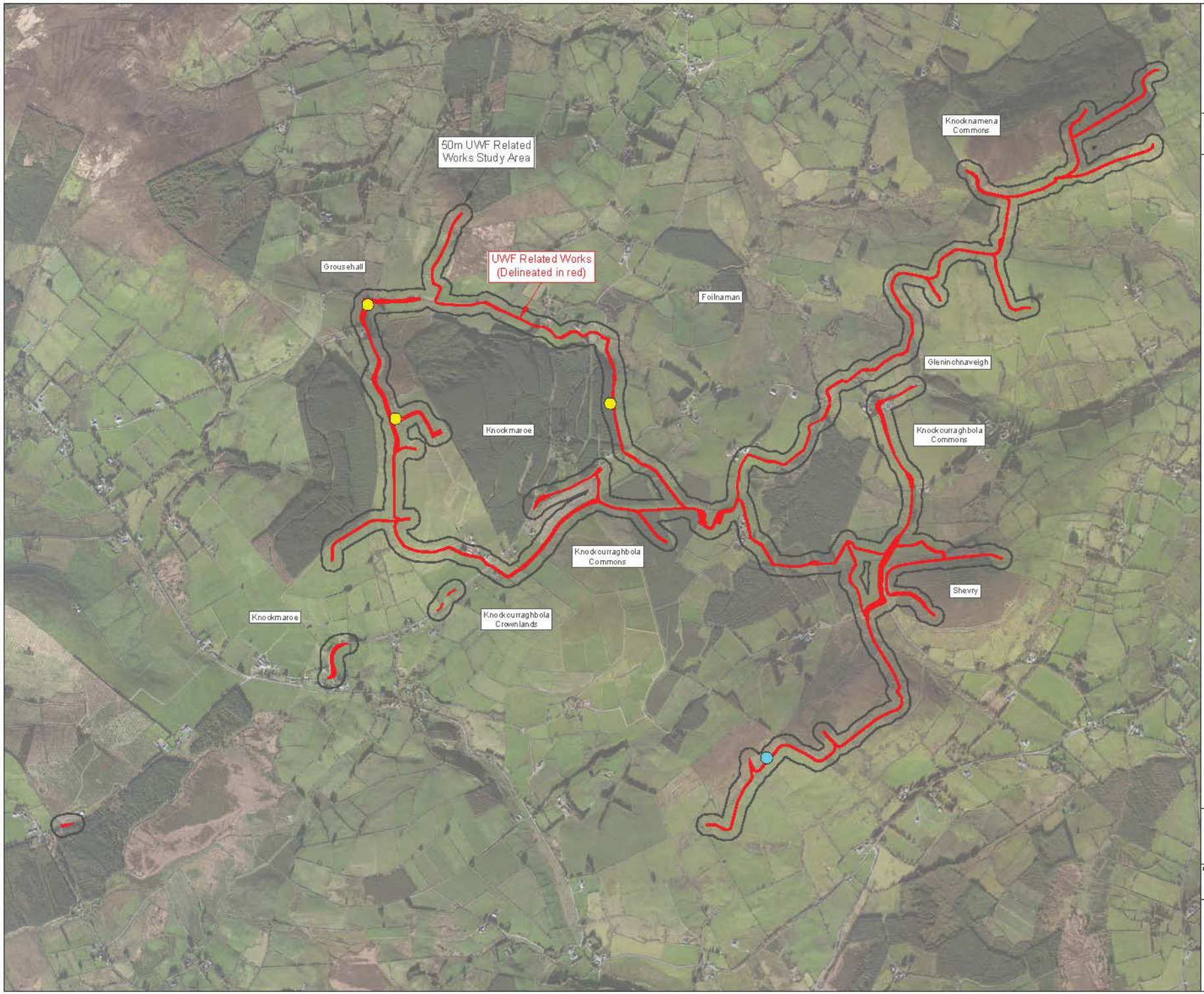

Title:

Figure RW 8.10

Amphibians & Reptiles within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 50m Study Area
  - UWF Related Works Construction Works Area

Survey Results :

- Viviparous Lizard
- Frog

Survey Results on the map are those of the UWF 2013 EIS

No Smooth Newt, Common Frog or Viviparous Lizard were recorded in 2017 survey

REFERENCE DOCUMENTS

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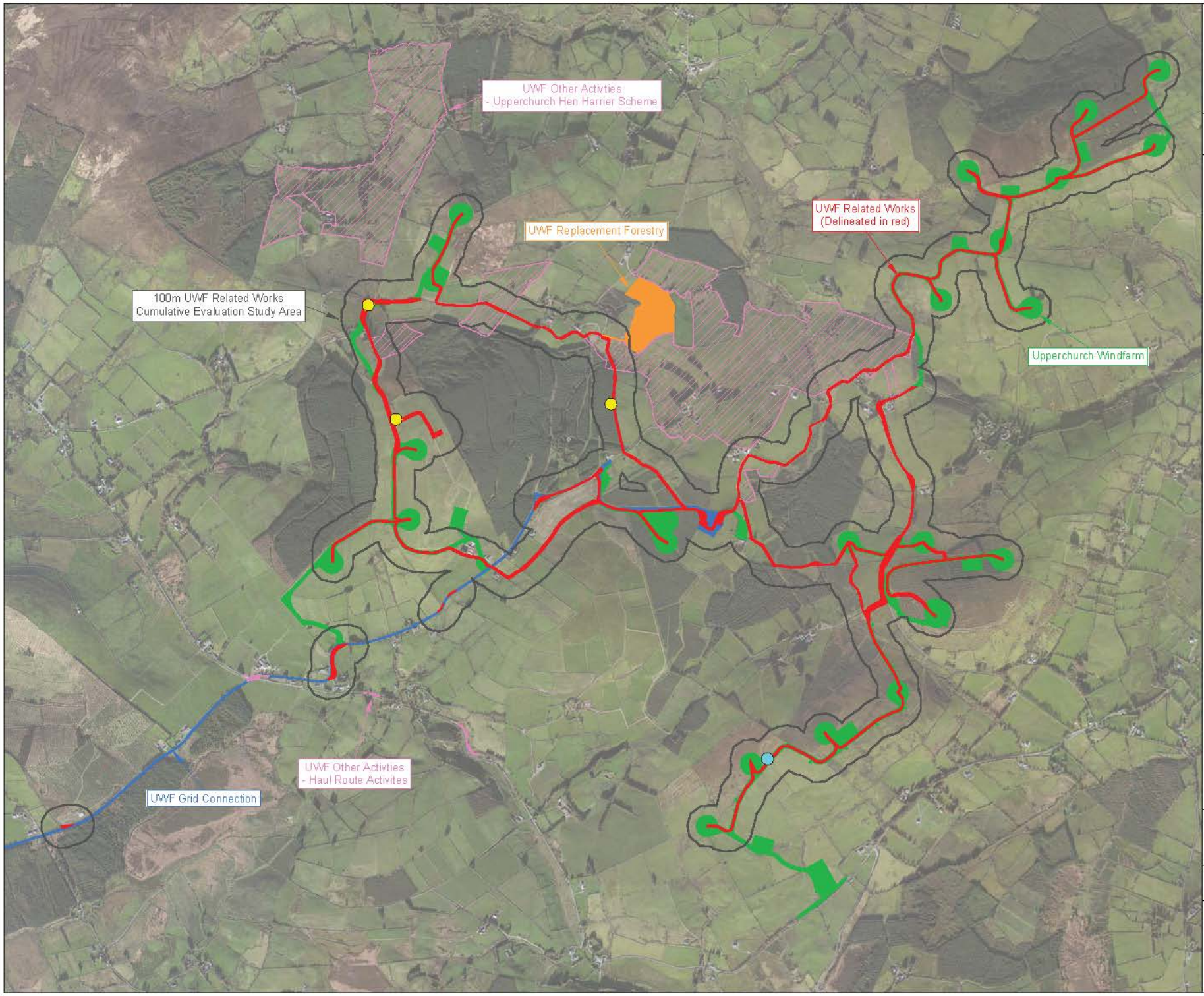

Title:

Figure CE 8.10

Amphibians & Reptiles within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- 100m Study Area
  - UWF Related Works Construction Works Area

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities

Survey Results :

- Viviparous Lizard
- Viviparous Lizard

Survey Results on the map are those of the UWF 2013 EIS

No Smooth Newt, Common Frog or Viviparous Lizard were recorded in 2017 survey

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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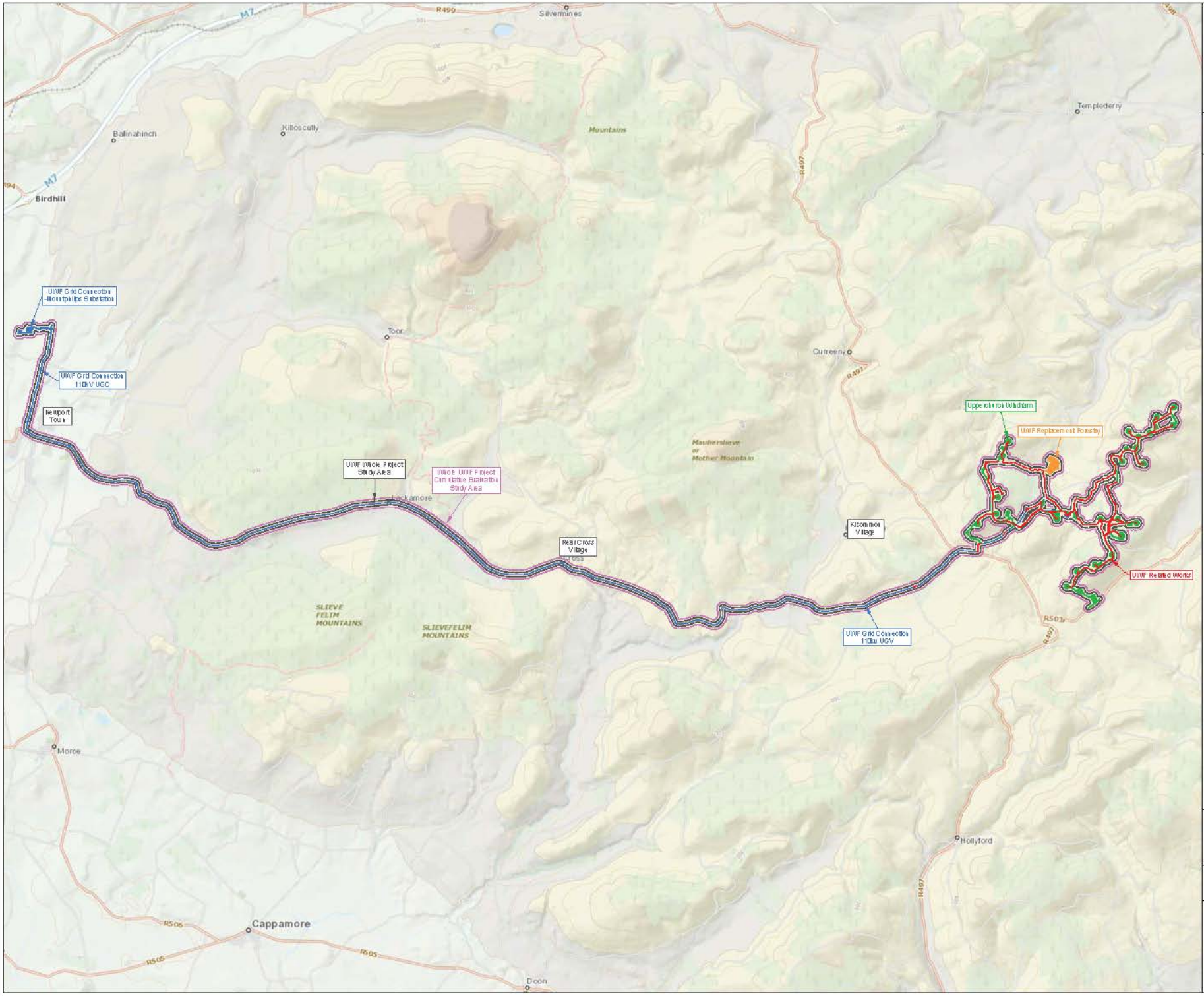

Title:

Figure WP 8.10

Amphibians & Reptiles within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- 50m Study Area from all Construction Works Area
- 100m Cumulative Evaluation Study Area from all Construction Works Area

REFERENCE DOCUMENTS

N

Project:

UWF Related Works (RW)

Drawn by:	Checked by:	Date:	Sheet Size:
AB	JB	January 19	A3

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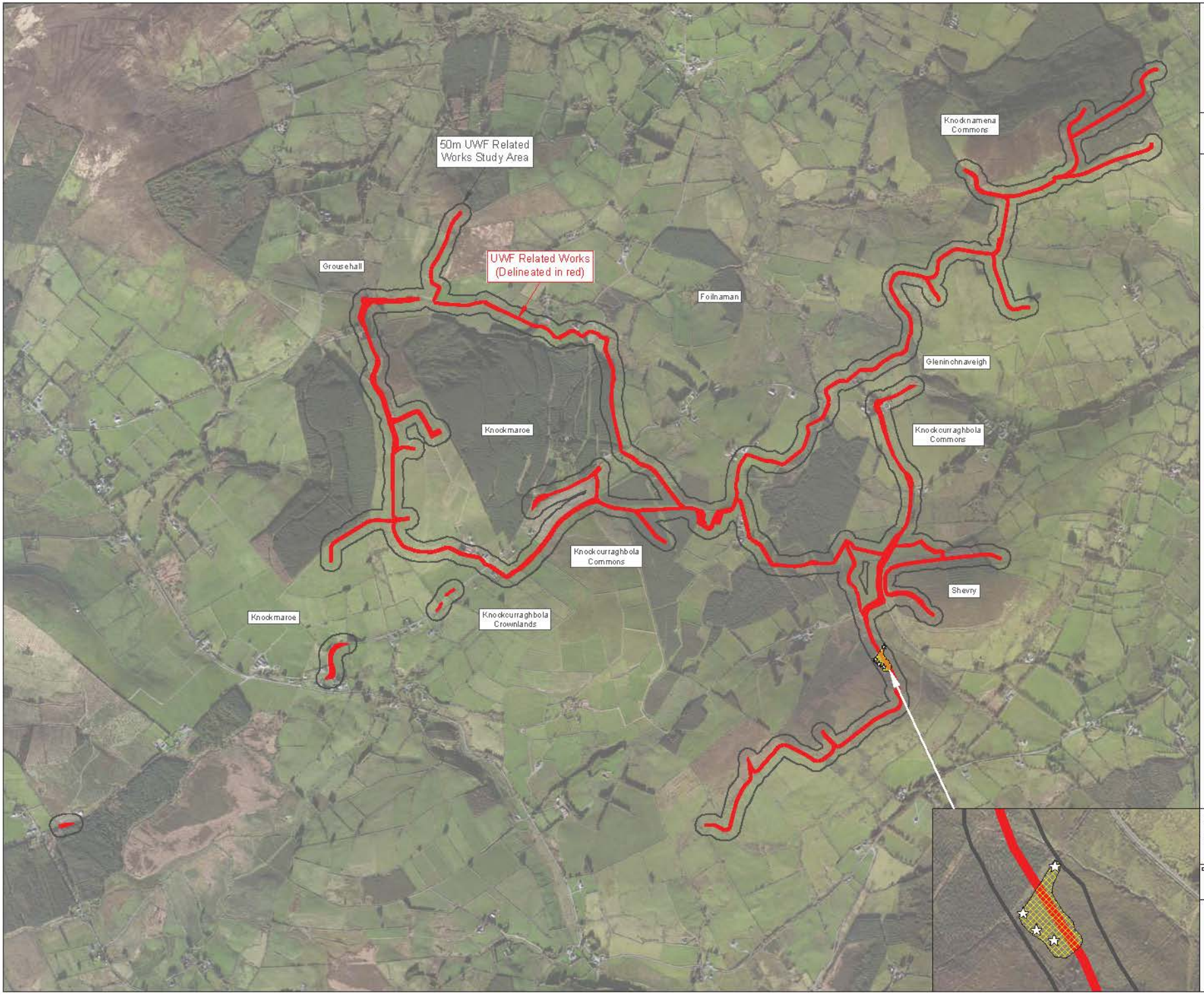

Title:

Figure RW 8.11

Marsh Fritullary within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 50m Study Area - UWF Related Works Construction Works Area

Survey Results :

- Marsh Fritillary
- Suitable Marsh Fritillary Habitat

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
AB	JB	January 19	A3

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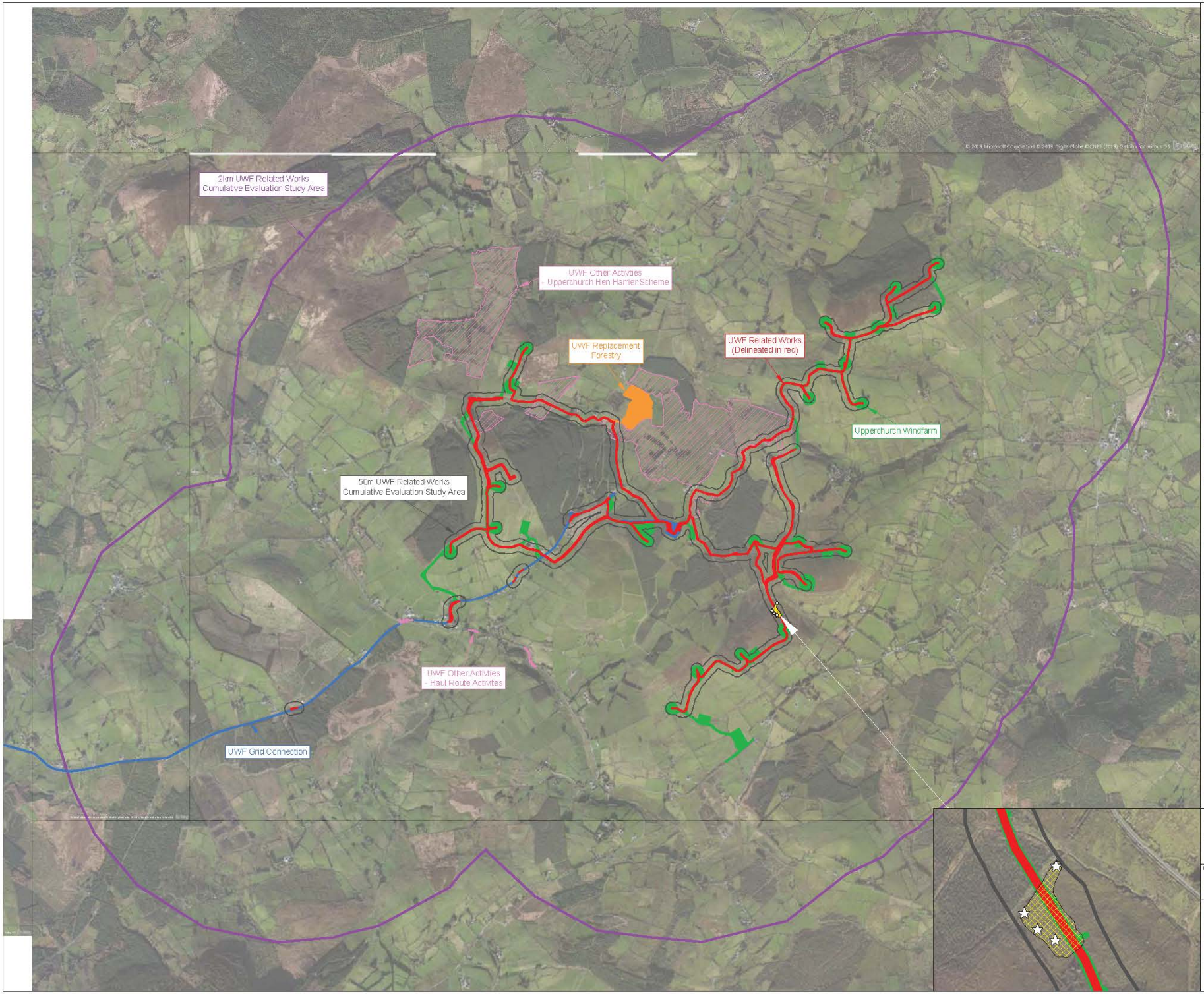

Title:

Figure CE 8.11

Marsh Fritillary within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 50m Study Area
  - UWF Related Works Construction Works Area
- 2km Study Area
  - UWF Related Works Construction Works Area

Cumulative Projects :

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- UWF Other Activities:
  - Upperchurch Hen Harrier Scheme
  - Haul Route Activities

Survey Results :

- Marsh Fritillary
- Suitable Marsh Fritillary Habitat

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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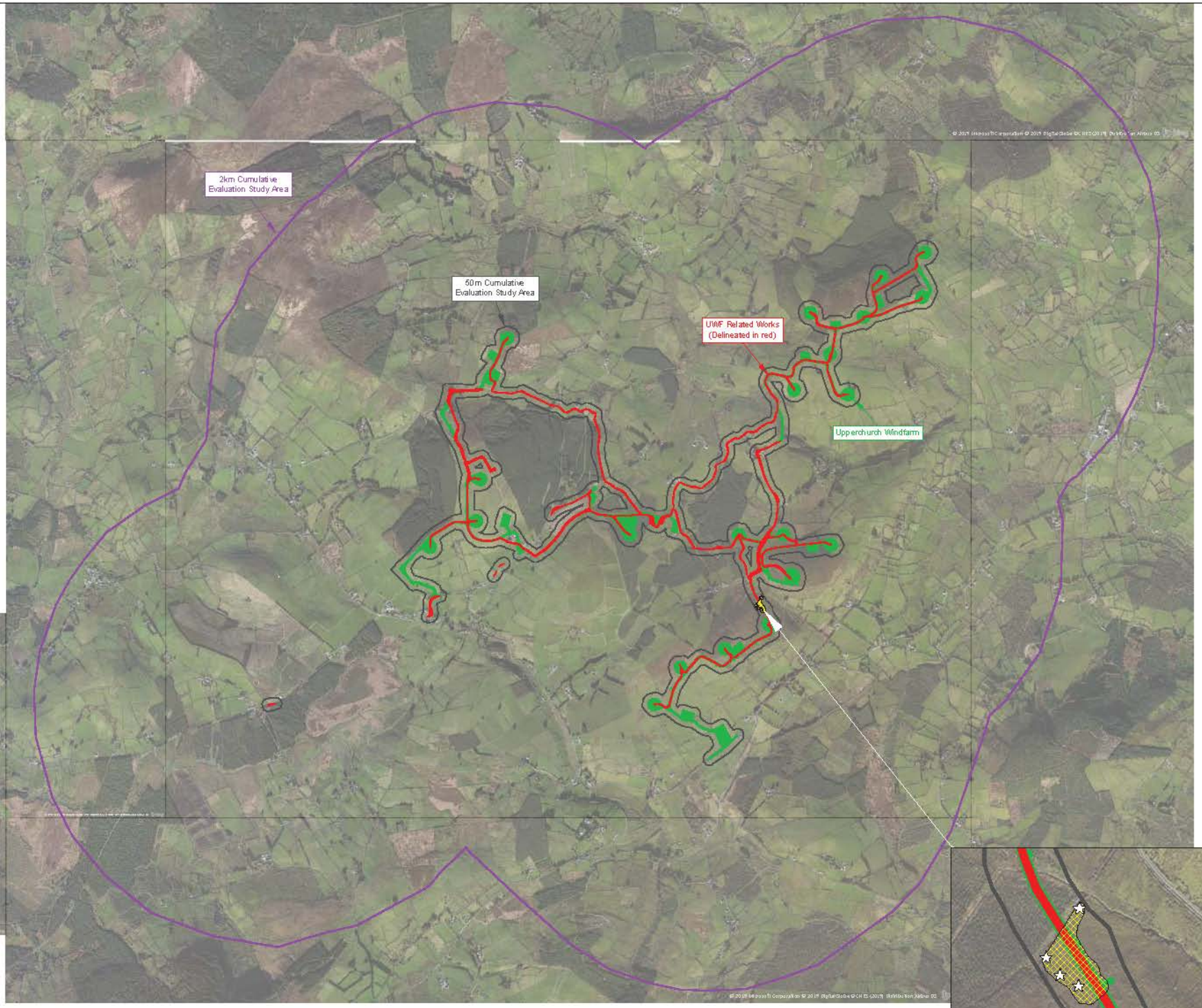

Title:

Figure WP 8.11

Marsh Fritillary within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- 50m Cumulative Evaluation Study Area
- 2km Cumulative Evaluation Study Area

Survey Results :

- Marsh Fritillary
- Suitable Marsh Fritillary Habitat

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
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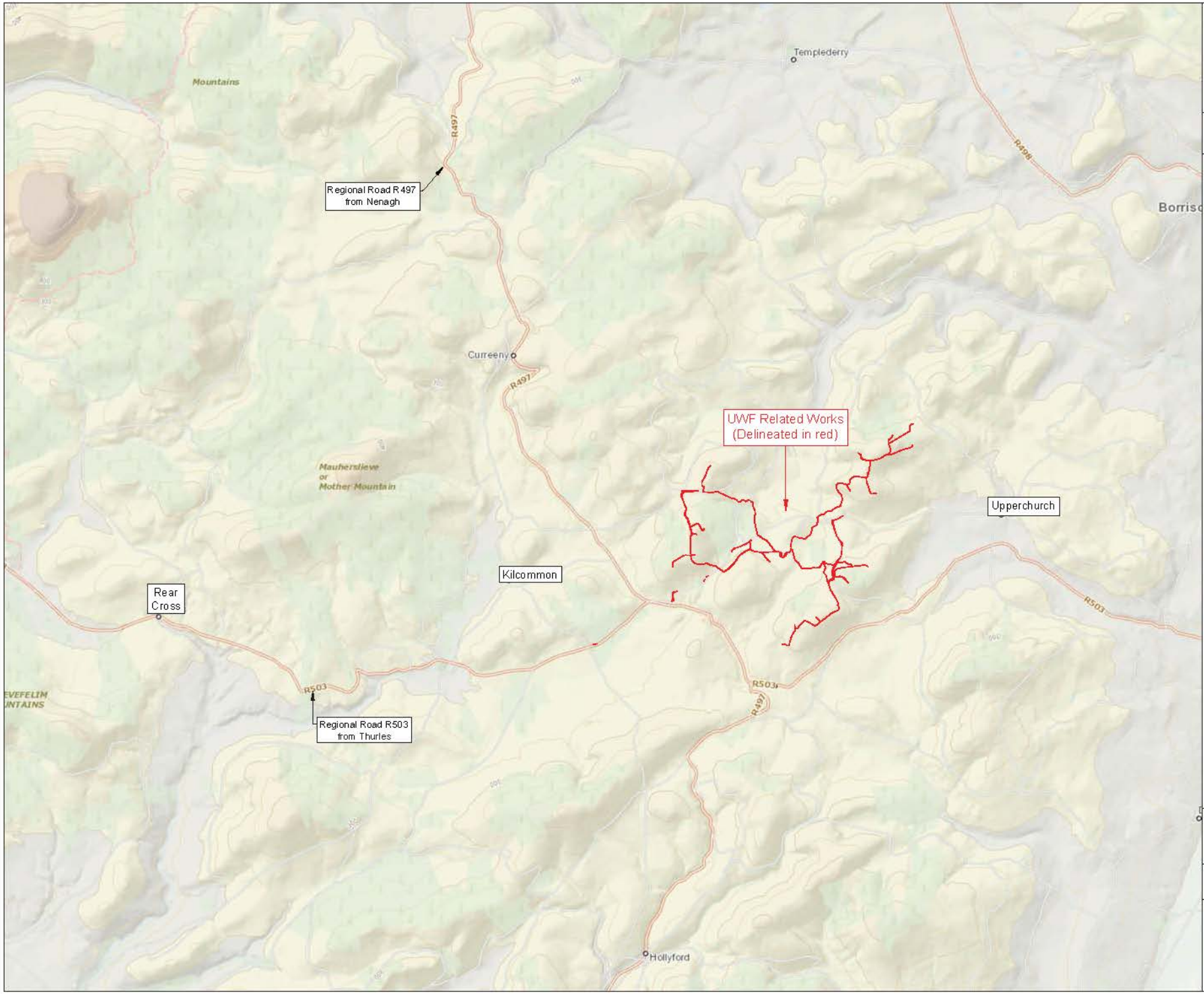

Title:
Figure RW 9.1

Location of the UWF Related Works Study Area

Map Number:
1 of 1

Legend:

UWF Related Works
- -Realigned Windfarm Roads
- -Internal Windfarm Cabling
- -Telecom Relay Pole
- -Haul Route Works

Kilcommon Villages

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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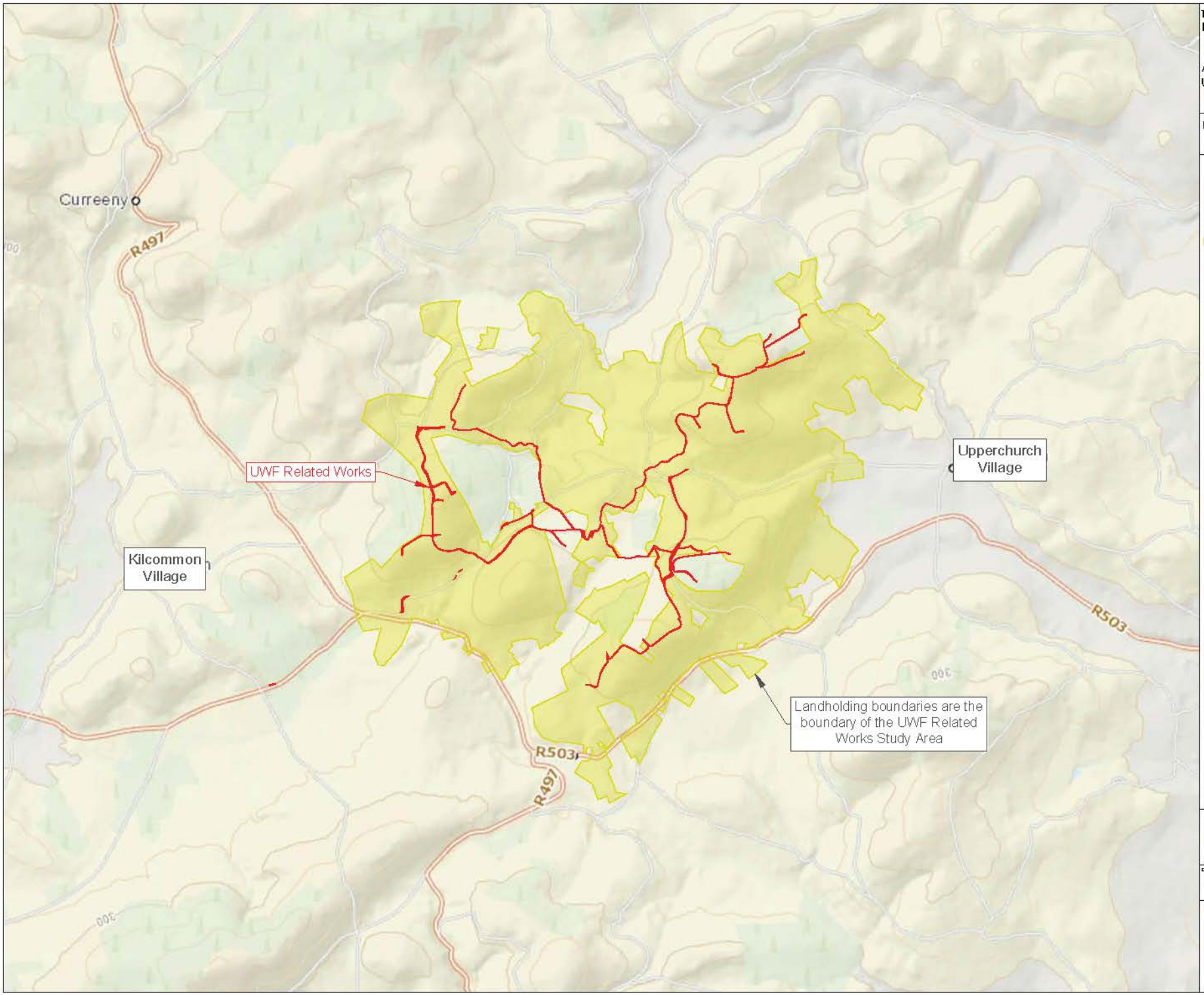

Title:
Figure RW 9.2

Agricultural Lands within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

- UWF Related Works Construction Works Area
- Landholding - Agricultural Land

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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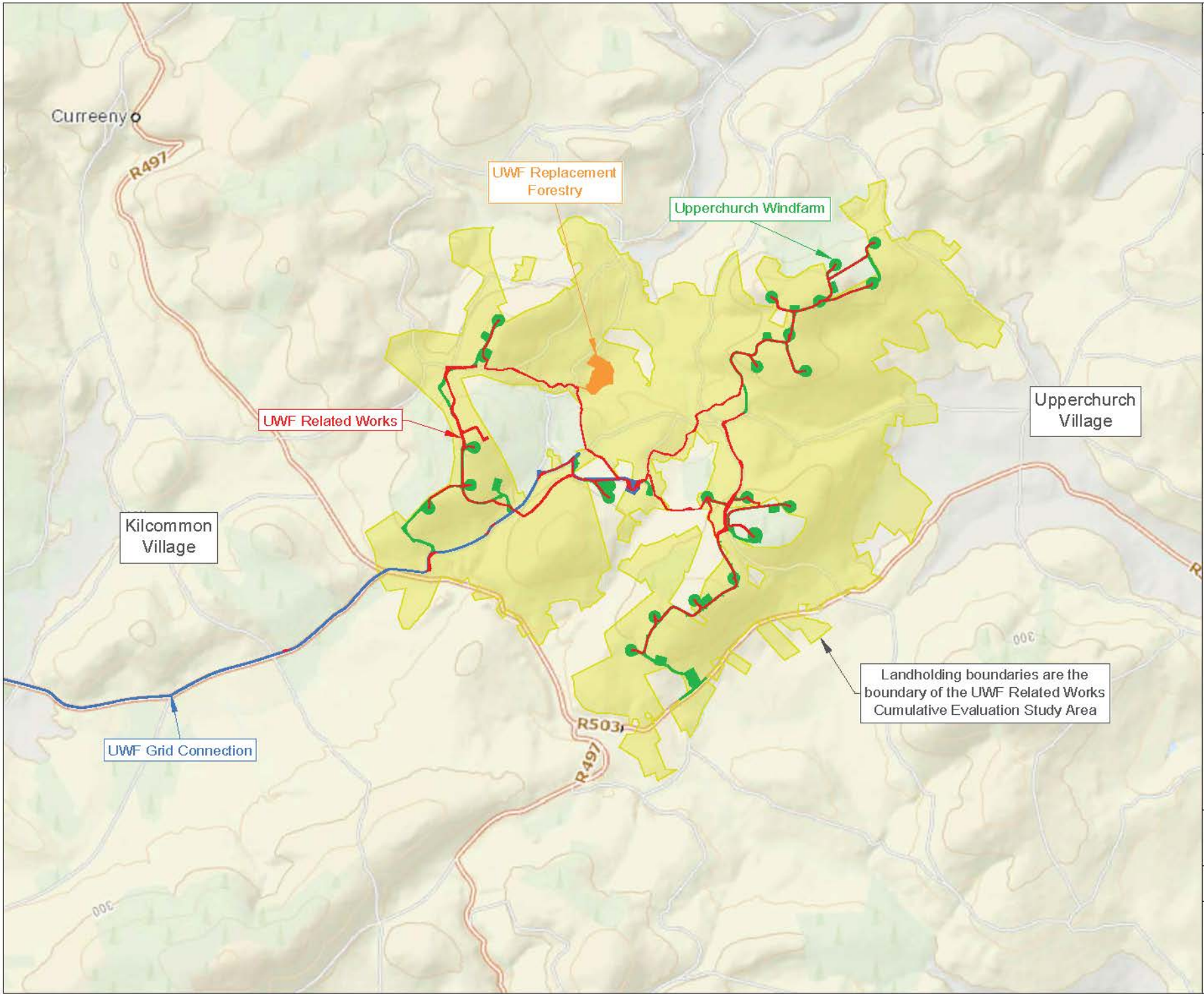

Title:

Figure CE 9.2

Agricultural Lands within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area

Survey Results:

- Landholding - Agricultural Land

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
AB	JB	January 19	A3

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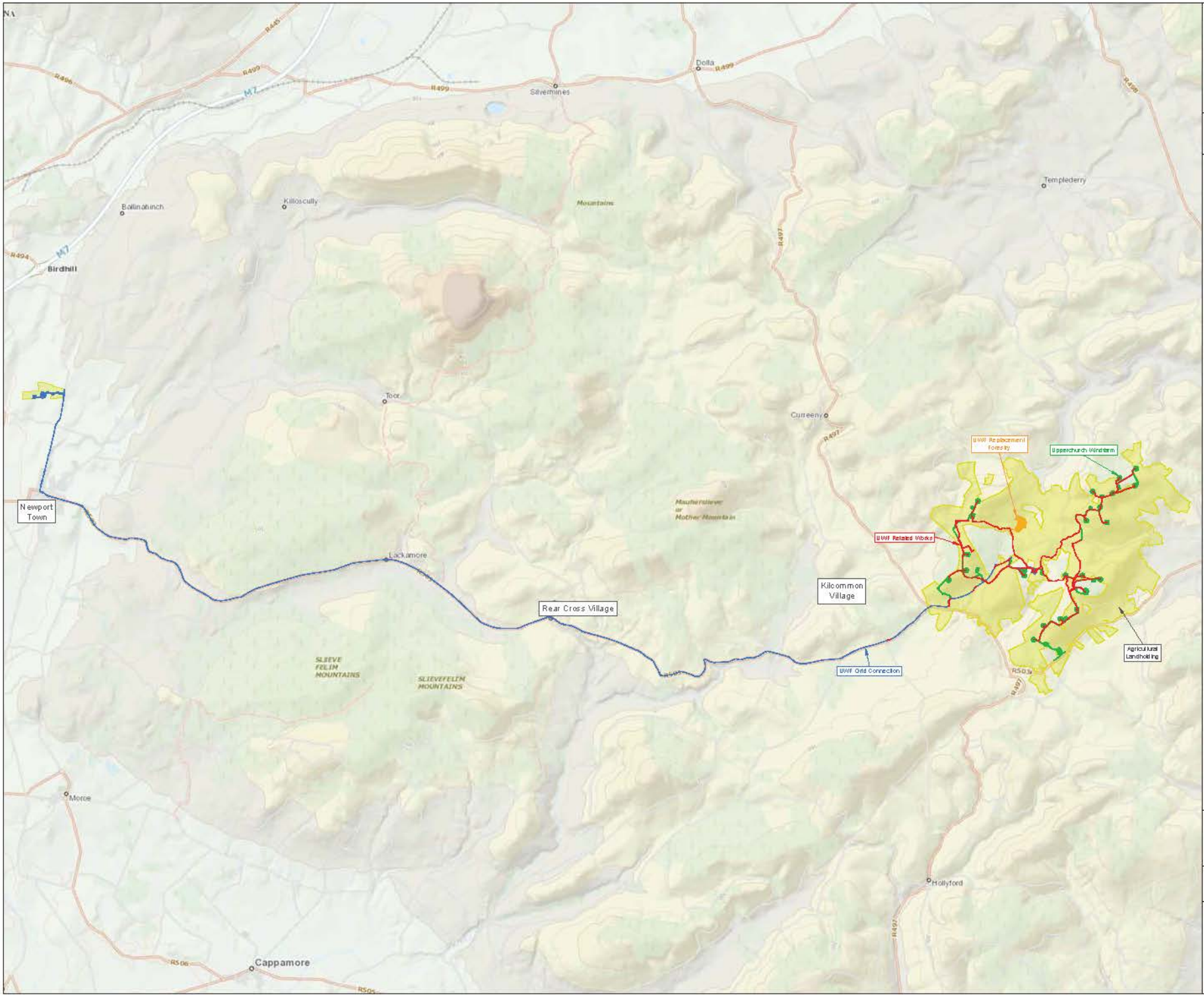

Title:
Figure WP 9.2

Agricultural Lands within the Whole Project Cumulative Evaluation Study Area

Map Number:
1 of 1

Legend:

- UWF Grid Connection Construction Works Area
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- Landholding - Agricultural Land

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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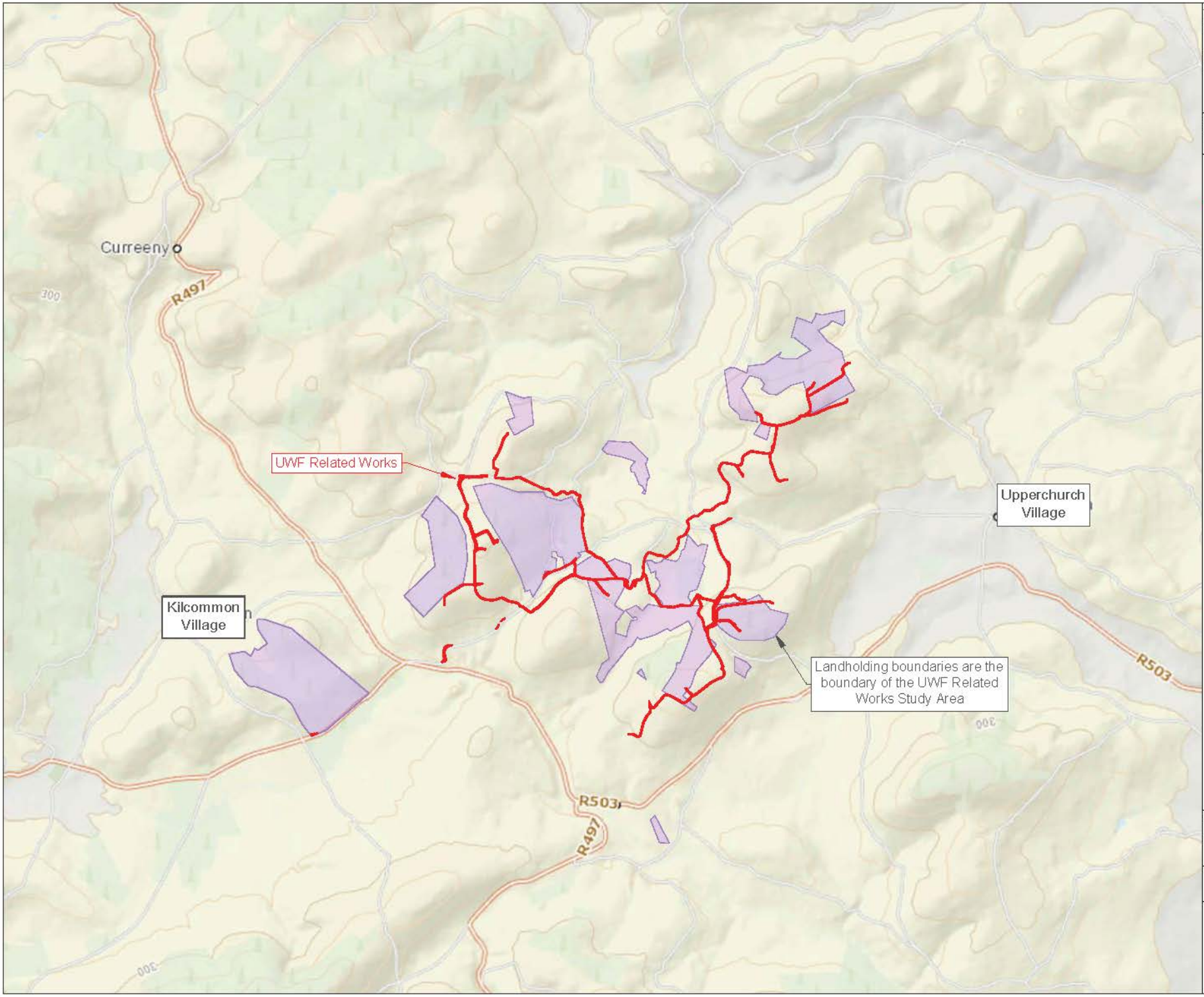

Title:

Figure RW 9.3

Forestry Lands within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

- UWF Related Works Construction Works Area
- Landholding - Forestry Land

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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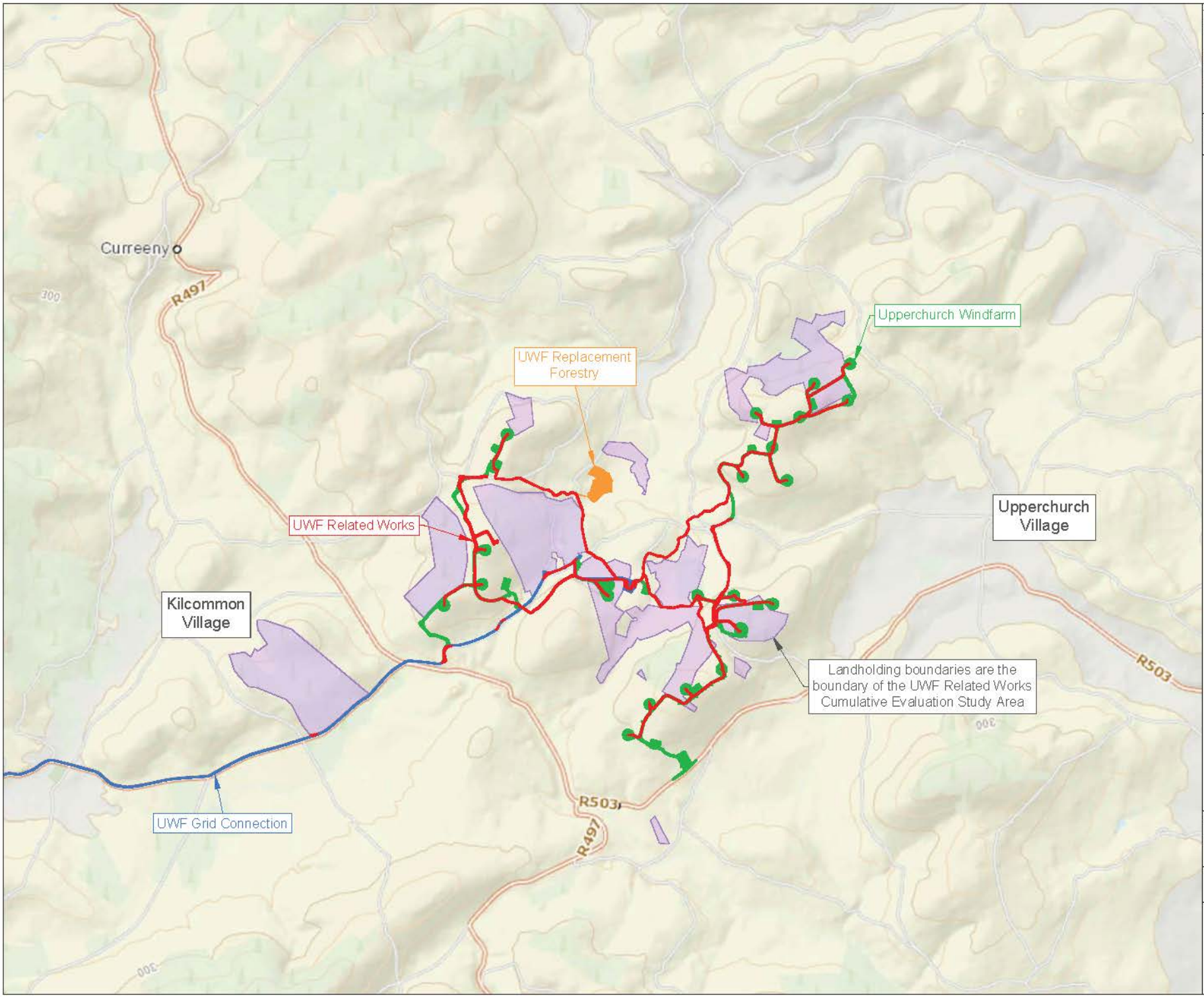

Title:

Figure CE 9.3

Forestry Lands within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area

Survey Results:

- Landholding - Forestry Land

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area

REFERENCE DOCUMENTS

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Project:
UWF Related Works (RW)

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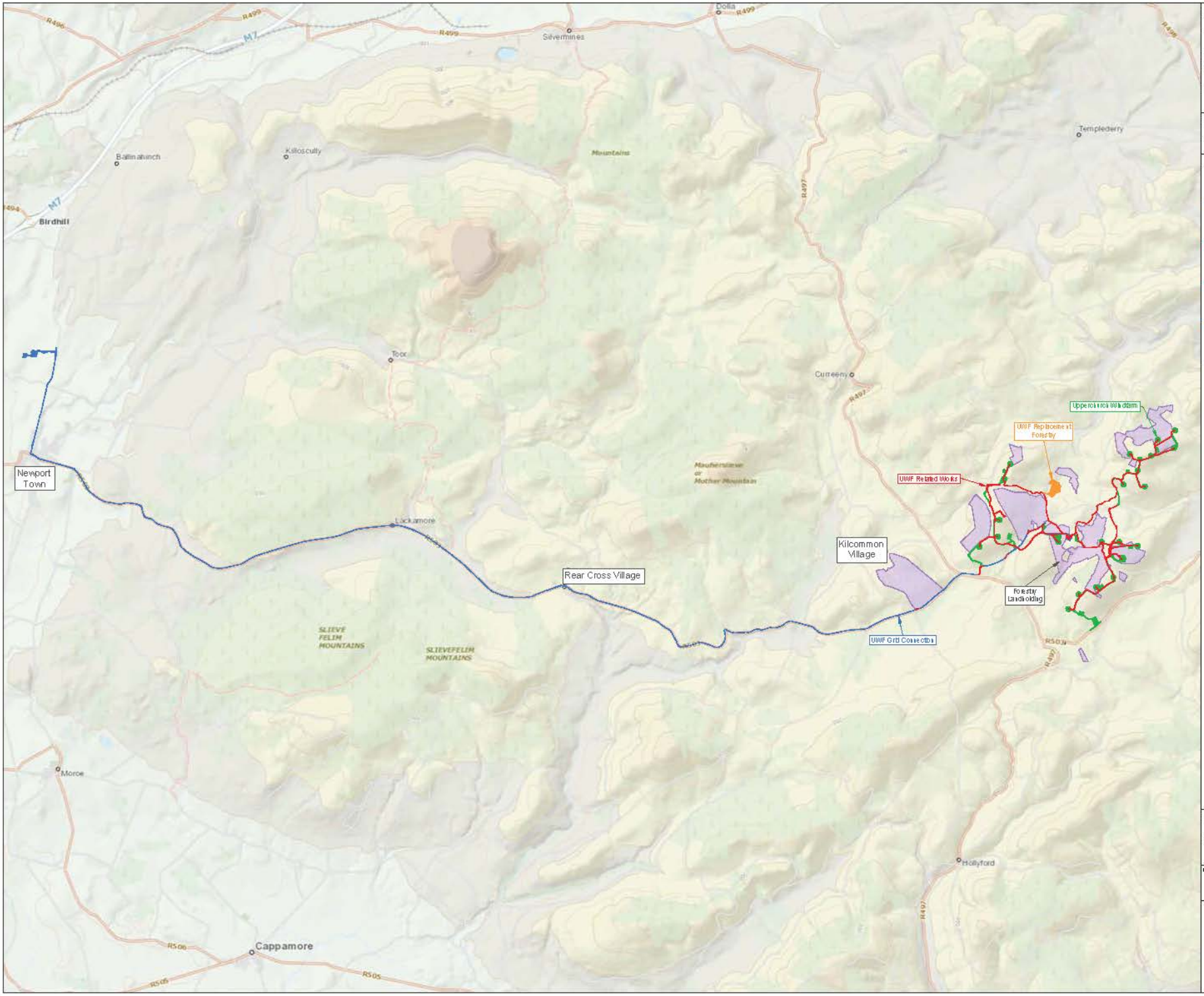

Title:
Figure WP 9.3

Forestry Lands within the Whole Project Cumulative Evaluation Study Area

Map Number:
1 of 1

Legend:

- UWF Grid Connection Construction Works Area
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- Landholding - Forestry

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
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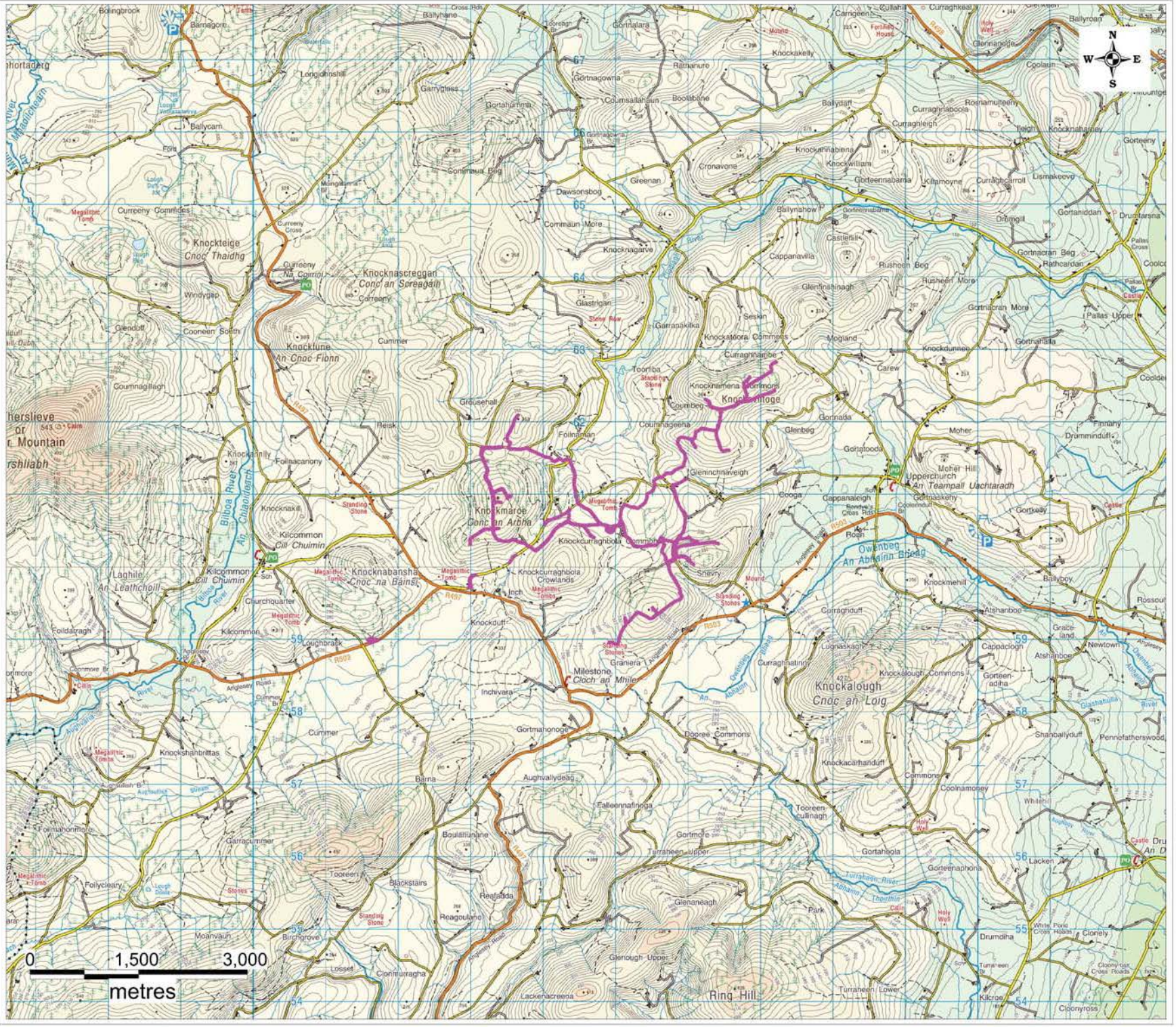

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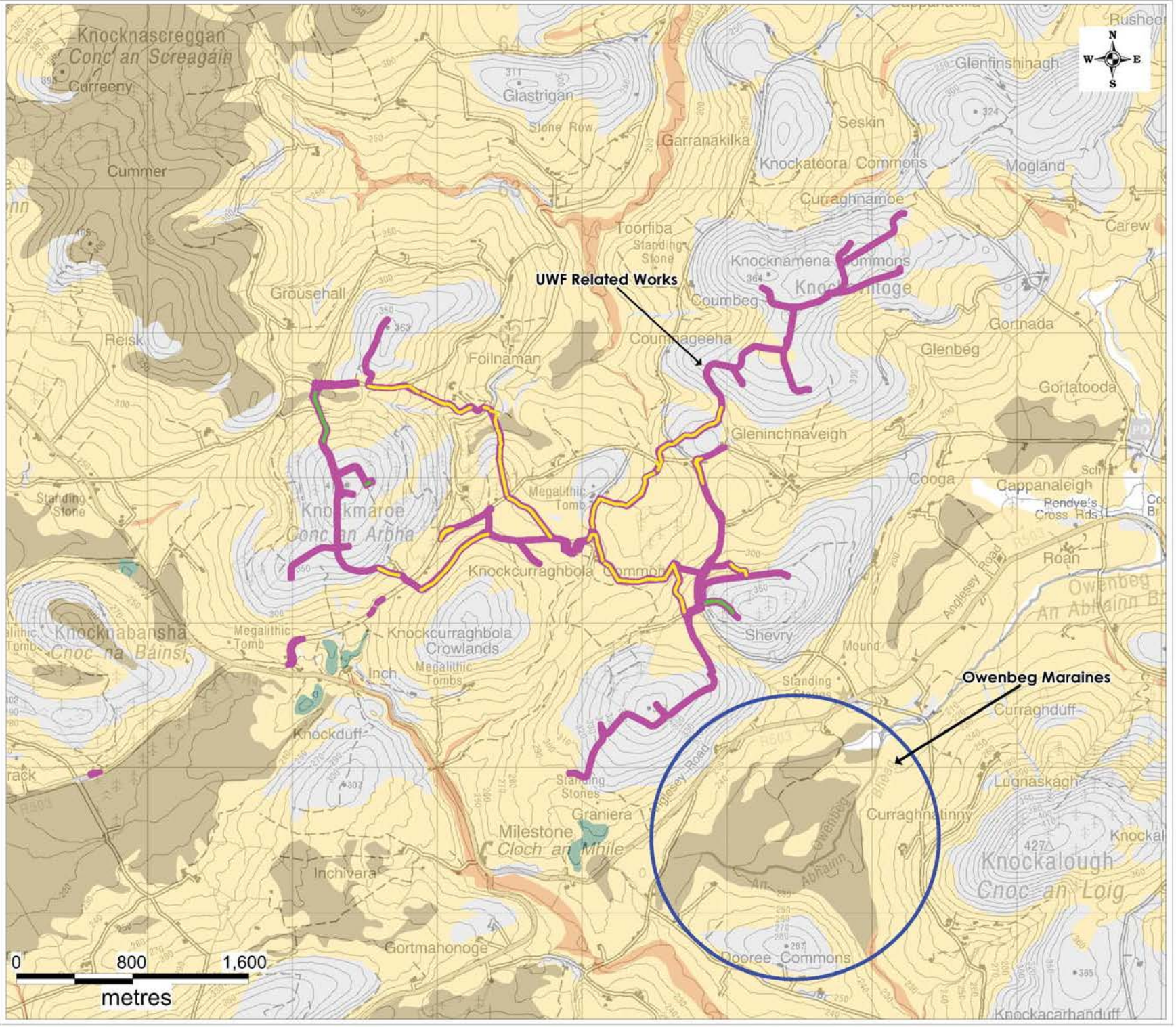
web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Location of the UWF Related Works	
Figure No: Figure RW 10.1	
Drawing No: P1299-4-0119-FRW-10-1-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:50,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



Legend

- UWF Related Works Construction Works Boundary
- Permanent Access Roads
- Temporary Access Roads
- Geological Heritage Site
- Alluvium
- Blanket Peat
- Cutover Peat
- Sandstone Sands and Gravels
- Bedrock at Surface
- Sandstone and Shales Till

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Soils & Subsoils within the UWF Related Works Study Area	
Figure No: Figure RW 10.2.1	
Drawing No: P1299-4-0119-FRW-10-2-1-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:25.000	Drawn By: GD
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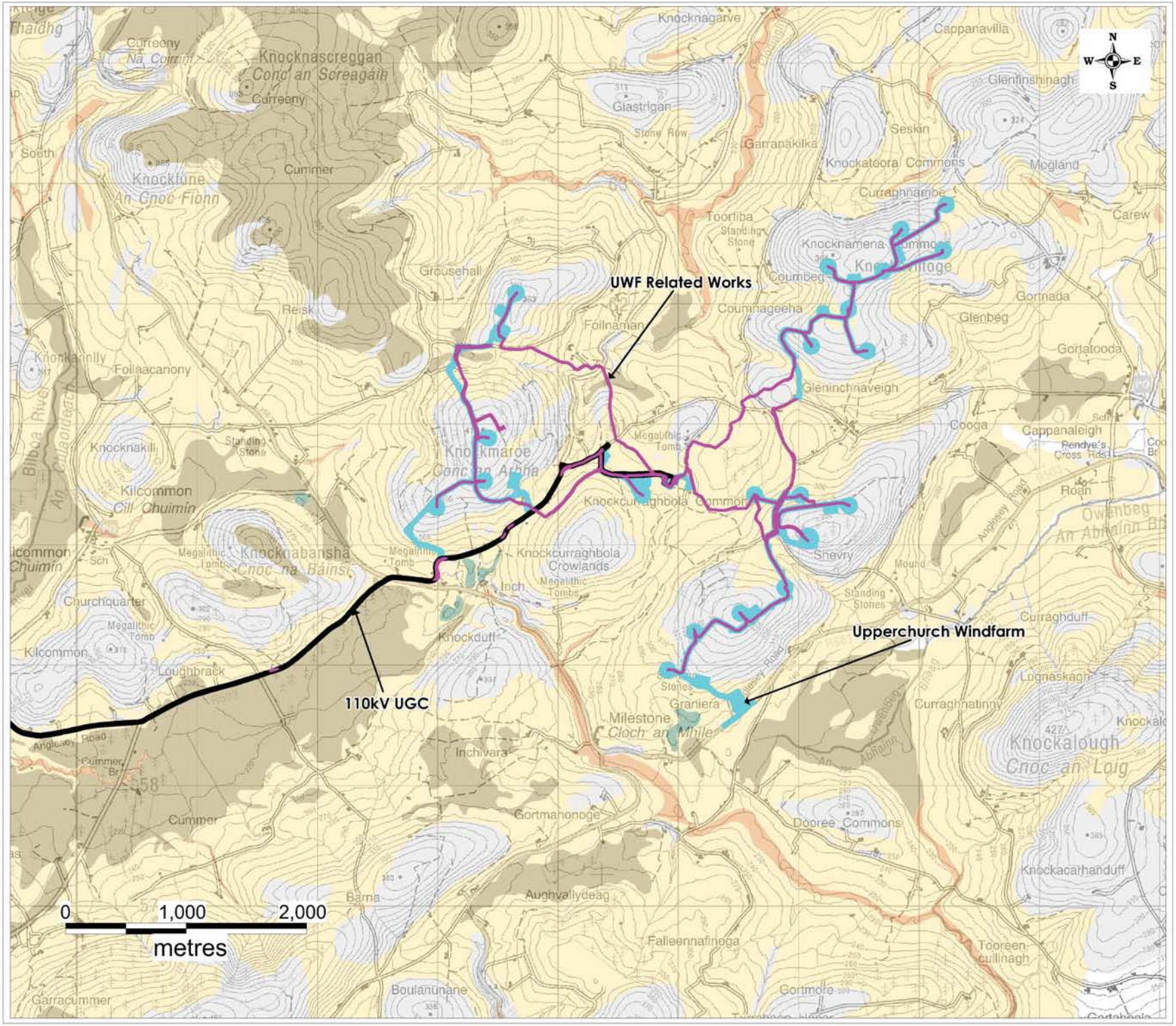

Legend

- UWF Grid Construction Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Upperchurch Windfarm Construction Works Boundary
- Alluvium
- Blanket Peat
- Sandstone Sands and Gravels
- Bedrock at Surface
- Sandstone and Shales Till

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web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Soils & Subsoils within the UWF Related Works Cumulative Evaluation Study Area Map	
Figure No: Figure CE 10.2.1	
Drawing No: P1299-4-0119-FCE-10-2-1-A3-0A	
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Scale: 1:30,000	Drawn By: GD
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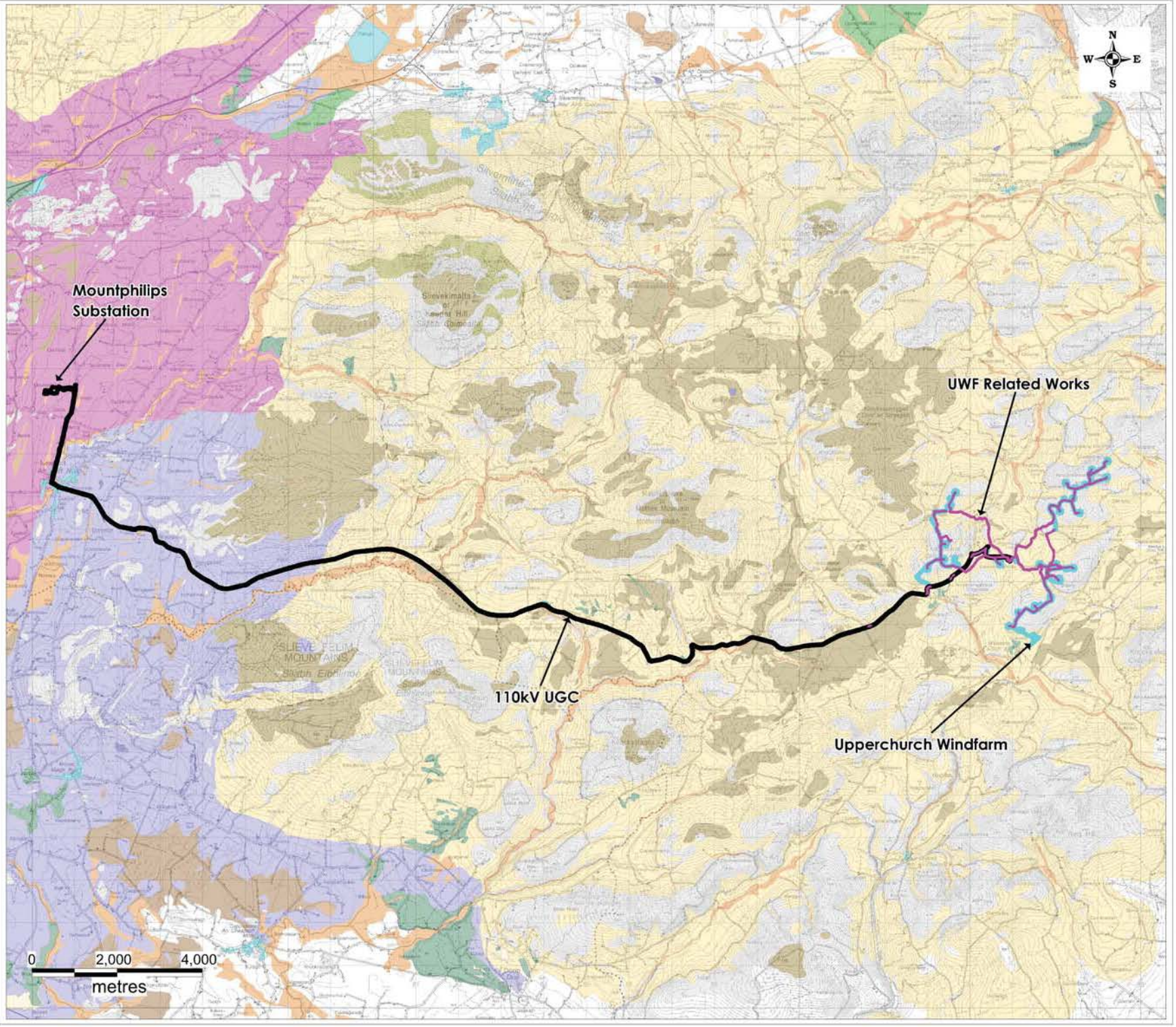

Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Upperchurch Windfarm Construction Works Boundary
- Alluvium
- Blanket Peat
- Cutover Peat
- Sandstone Sands and Gravels
- Made Ground
- Bedrock at Surface
- Sandstone Till Devonian
- Sandstone Till Lower
- Sandstone and Shales Till
- Water

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Client: Ecopower Developments Ltd.

Job: UWF Related Works

Title: Local Soils & Subsoils within the Whole Project Cumulative Evaluation Study Area Map

Figure No: Figure WP 10.2.1

Drawing No: P1299-4-0119-FWP-10-2-1-A3-0A

Sheet Size: A3	Project No: P1299-4
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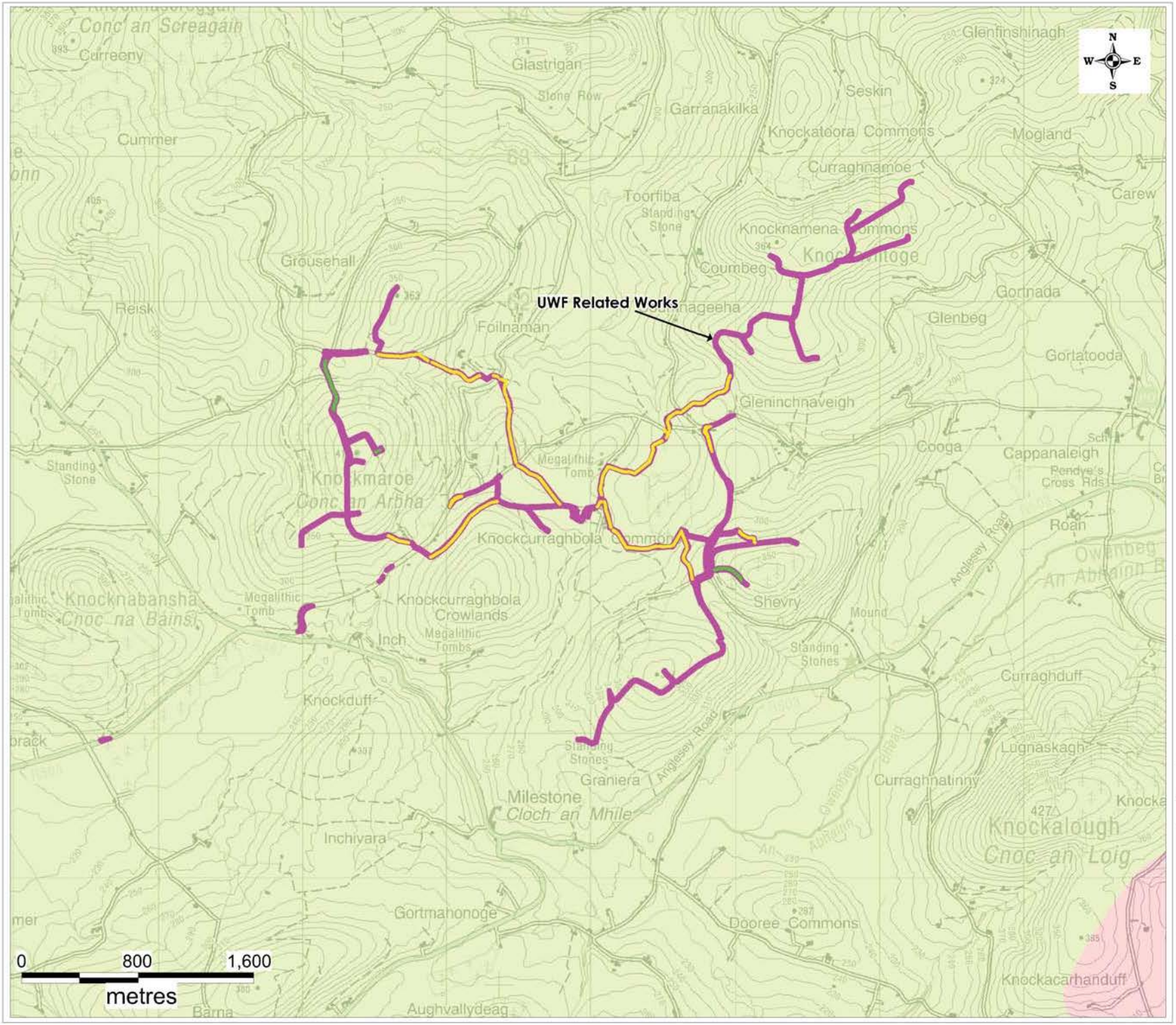

Legend

- UWF Related Works Construction Works Boundary
- Permanent Access Roads
- Temporary Access Roads
- Devonian Old Red Sandstones
- Silurian Metasediments and Volcanics

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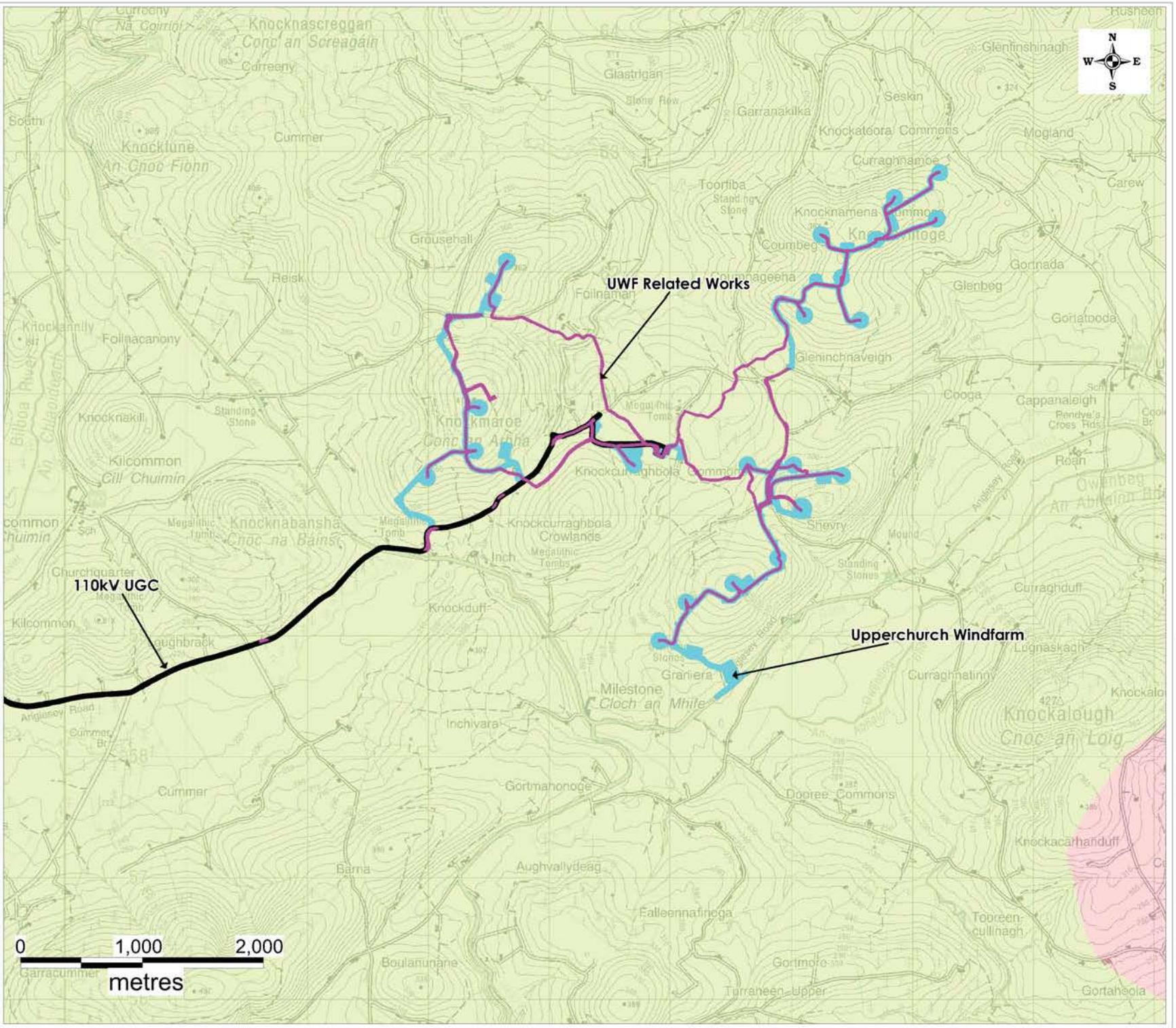
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Bedrock within the UWF Related Works Study Area Map	
Figure No: Figure RW 10.2.2	
Drawing No: P1299-4-0119-FRW-10-2-2-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:25,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Upperchurch Windfarm Construction Works Boundary
- Devonian Old Red Sandstones
- Silurian Metasediments and Volcanics

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Bedrock within the UWF Related Works Cumualtive Evaluation Study Area Map	
Figure No: Figure CE 10.2.2	
Drawing No: P1299-4-0119-FCE-10-2-2-A3-0A	
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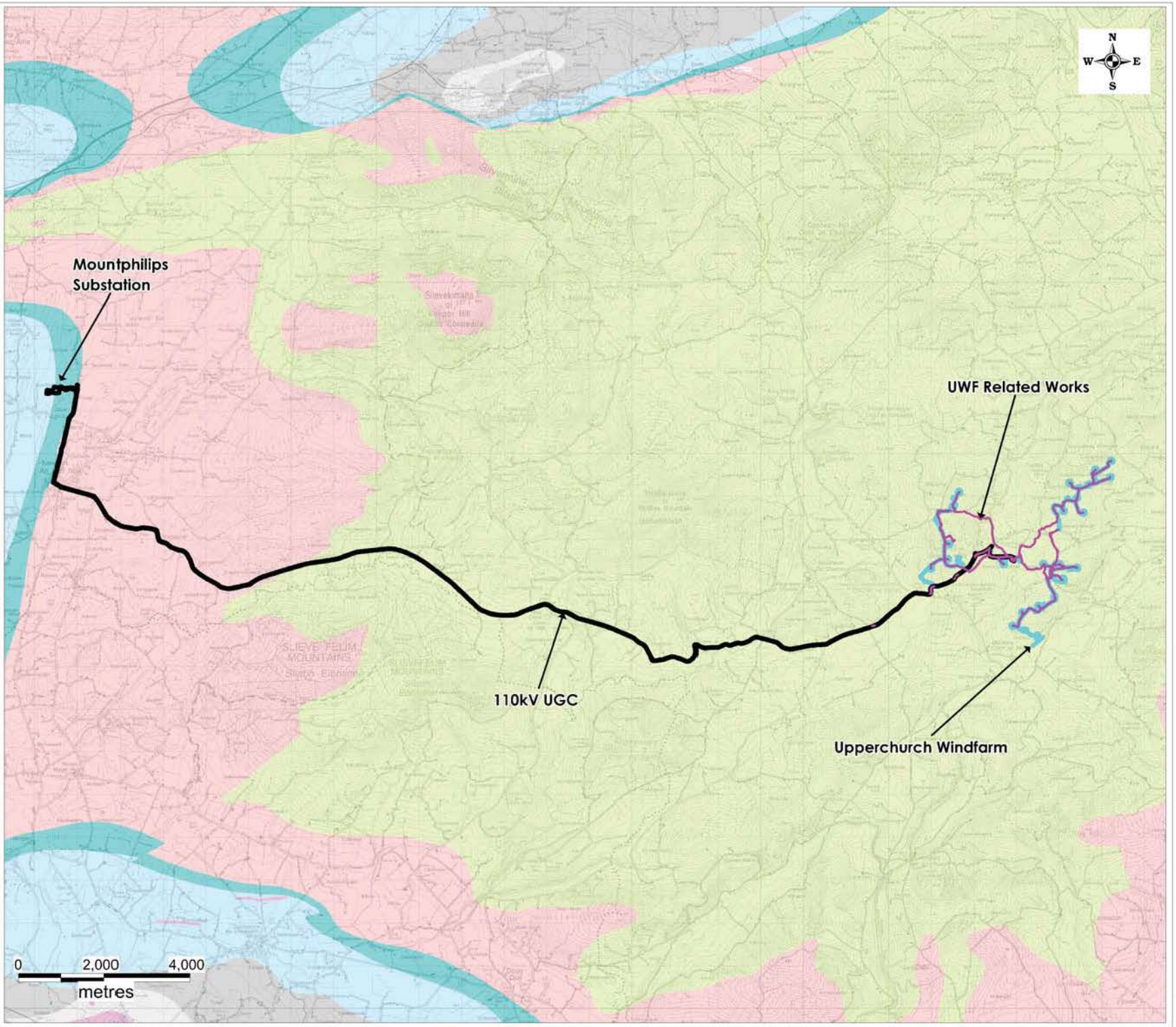
Scale: 1:30,000	Drawn By: GD
Date: 28/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Upperchurch Windfarm Construction Works Boundary
- Dinantian (early) Sandstones, Shales and Limestones
- Dinantian Lower Impure Limestones
- Devonian Old Red Sandstones
- Dinantian Pure Bedded Limestones
- Dinantian Pure Unbedded Limestones
- Silurian Metasediments and Volcanics

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Bedrock within the Whole Project Cumulative Evaluation Study Area Map	
Figure No: Figure WP 10.2.2	
Drawing No: P1299-4-0119-FWP-10-2-2-A3-0A	
Sheet Size: A3	Project No: P1299-4
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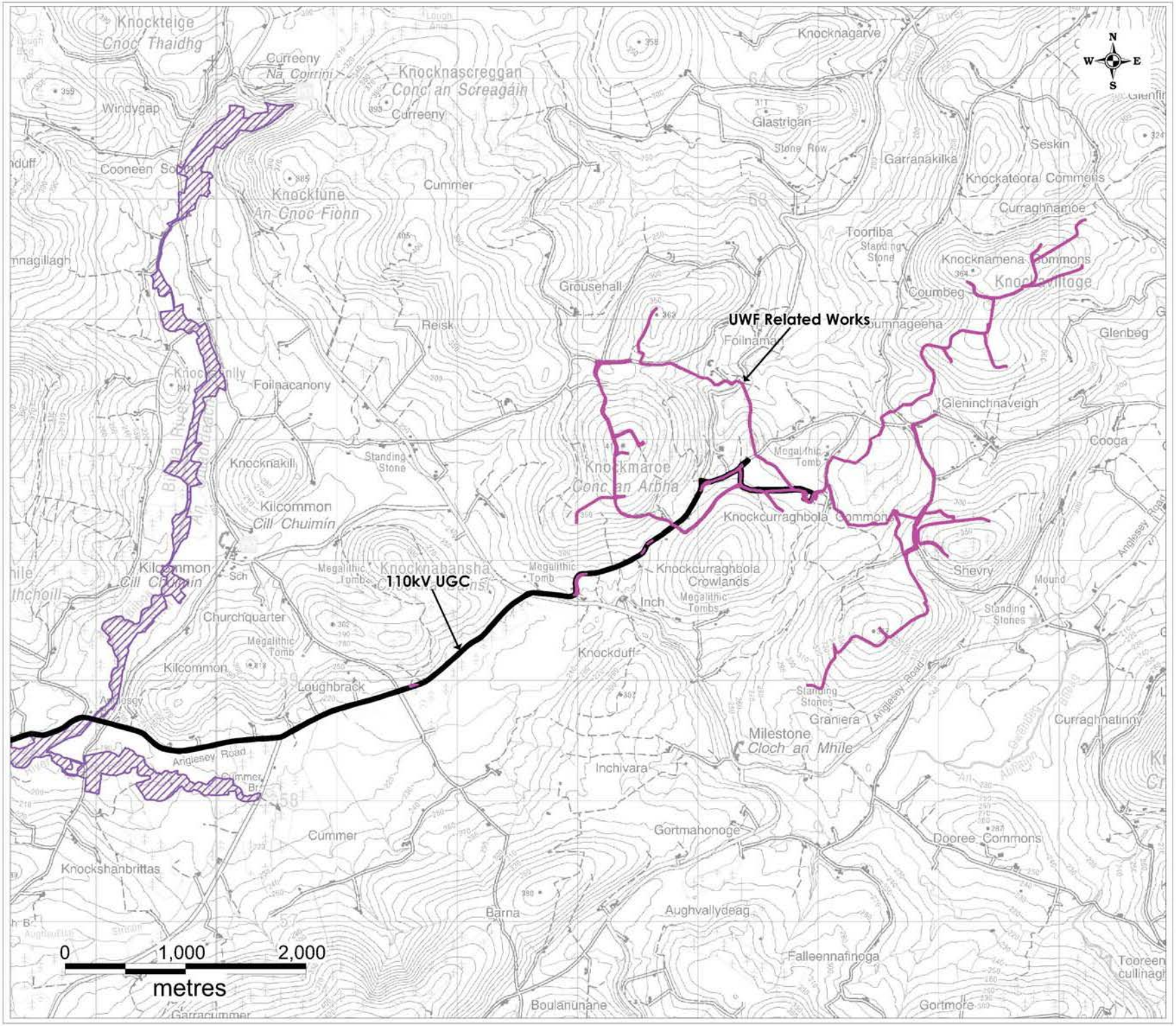

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Lower River Shannon SAC within the UWF Related Works Cumualtive Evaluation Study Area	
Figure No: Figure CE 10.3	
Drawing No: P1299-4-0119-FCE-10-3-A3-0A	
Sheet Size: A3	Project No: P1299-4
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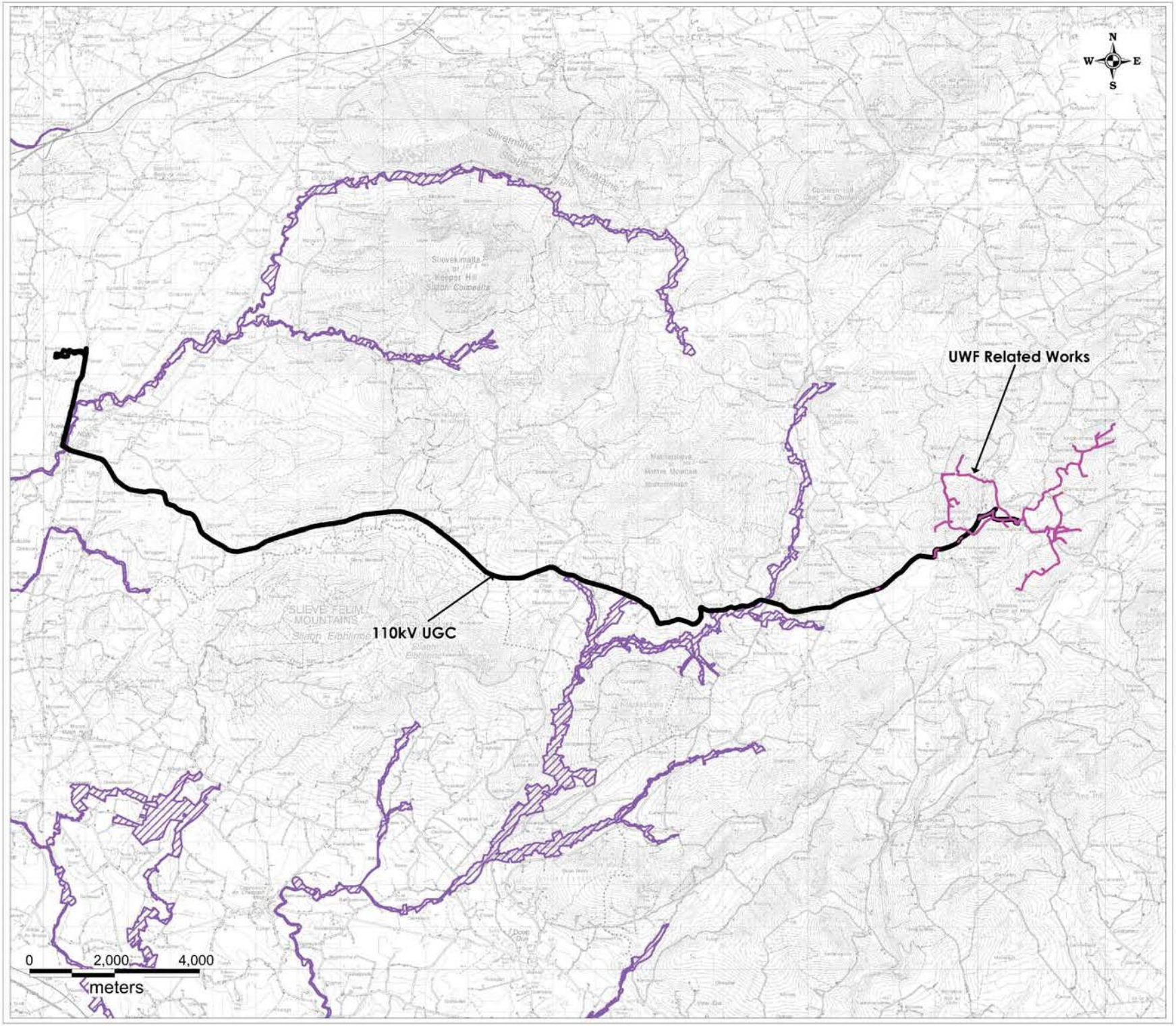

Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Lower River Shannon SAC

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Lower River Shannon SAC within the Whole Project Cumulative Evaluation Study Area	
Figure No: Figure WP 10.3	
Drawing No: P1299-4-0119-FWP-10-3-A3-0A	
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Scale: 1:85.000	Drawn By: GD
Date: 28/01/2019	Checked By: MG

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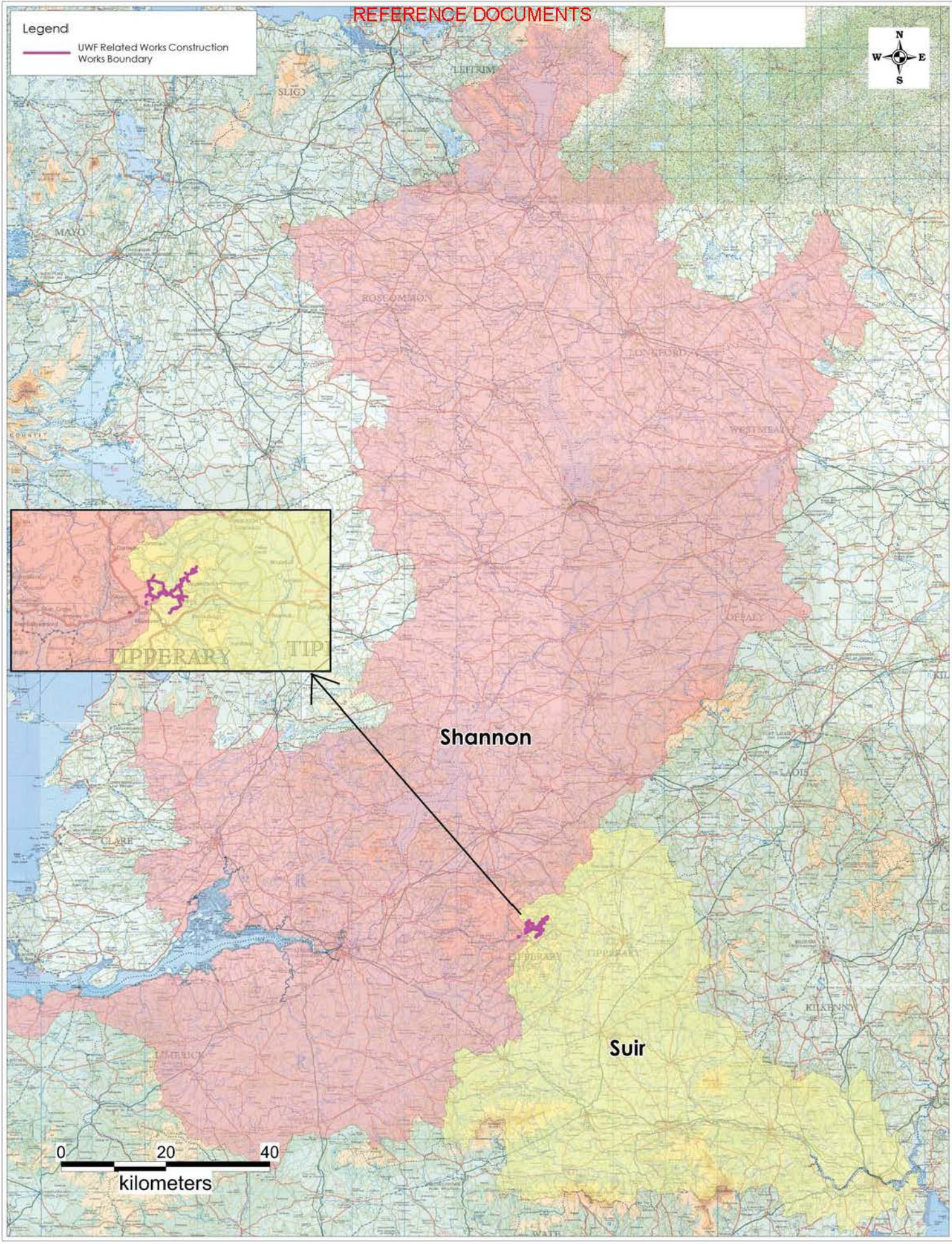

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Job: UWF Related Works	Sheet Size: A3	Project No: P1299-4
Title: Location of the UWF Related Works - River-Basin Map	Scale: 1:650,000	Drawn By: GD
Figure No: Figure RW 11.1.1	Date: 29/01/2019	Checked By: MG

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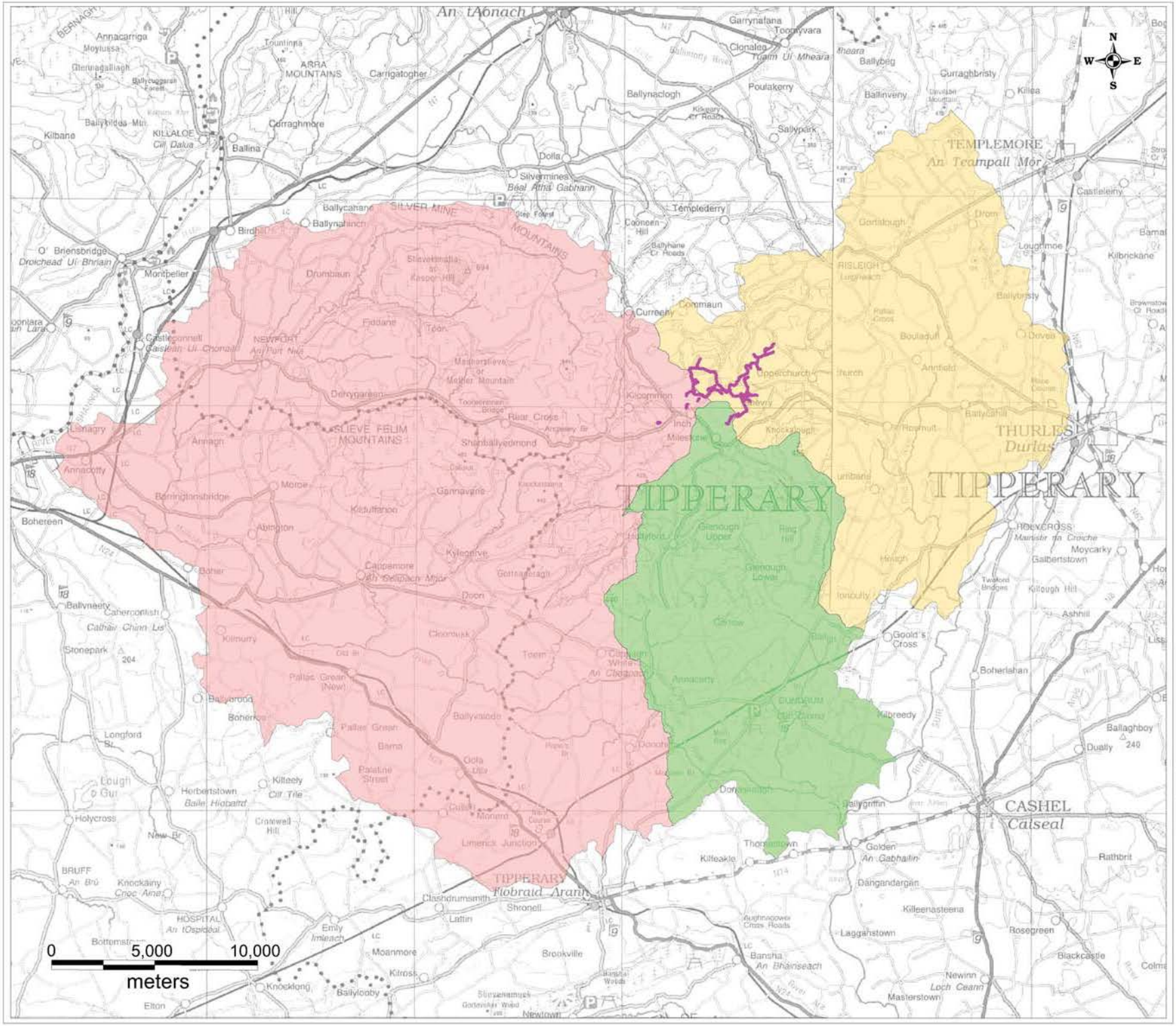

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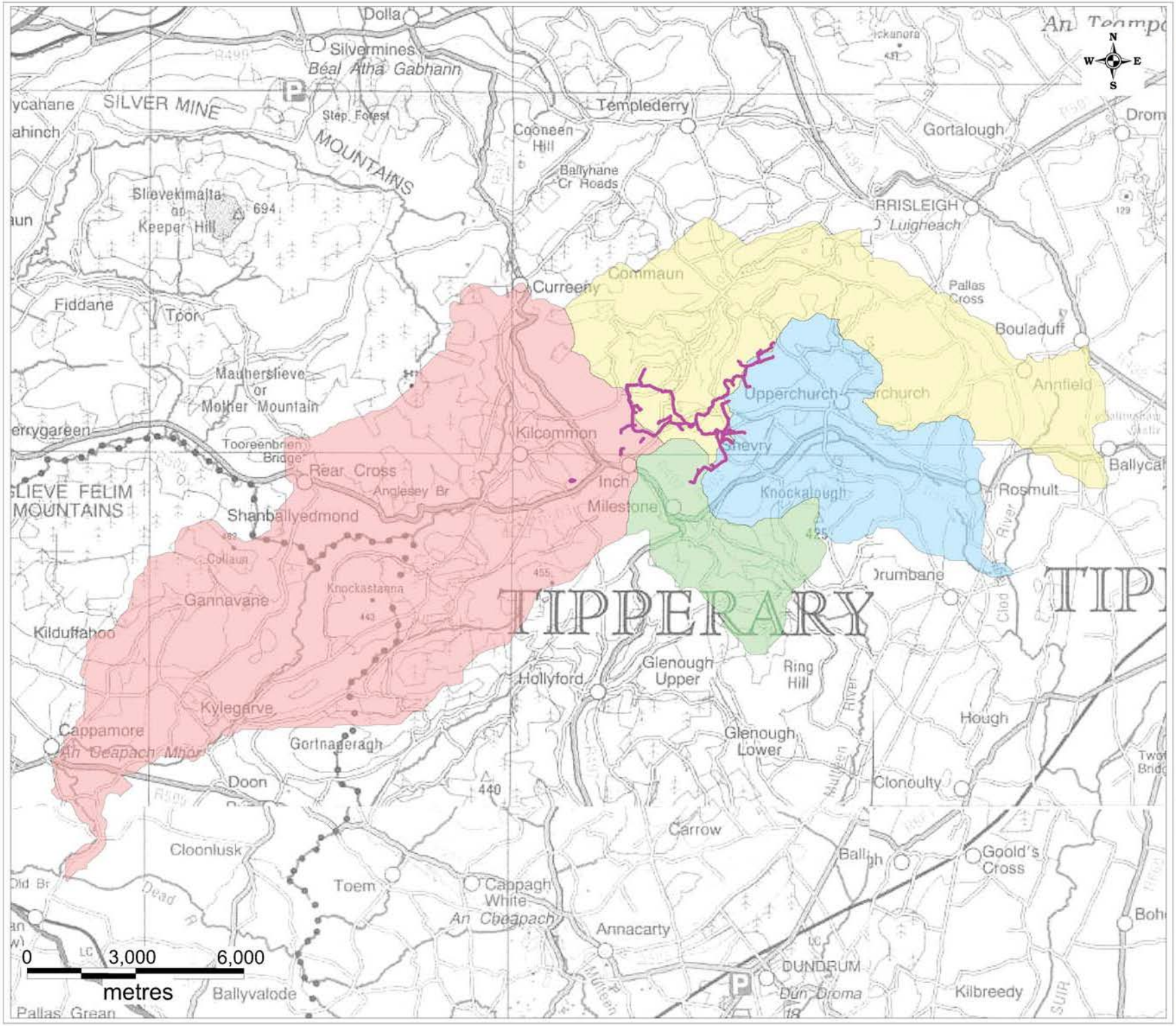
web: www.hydroenvironmental.ie

Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Location of the UWF Related Works - Regional Hydrology	
Figure No: Figure RW 11.1.2	
Drawing No: P1299-4-0119-FRW-11-1-2-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:175,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



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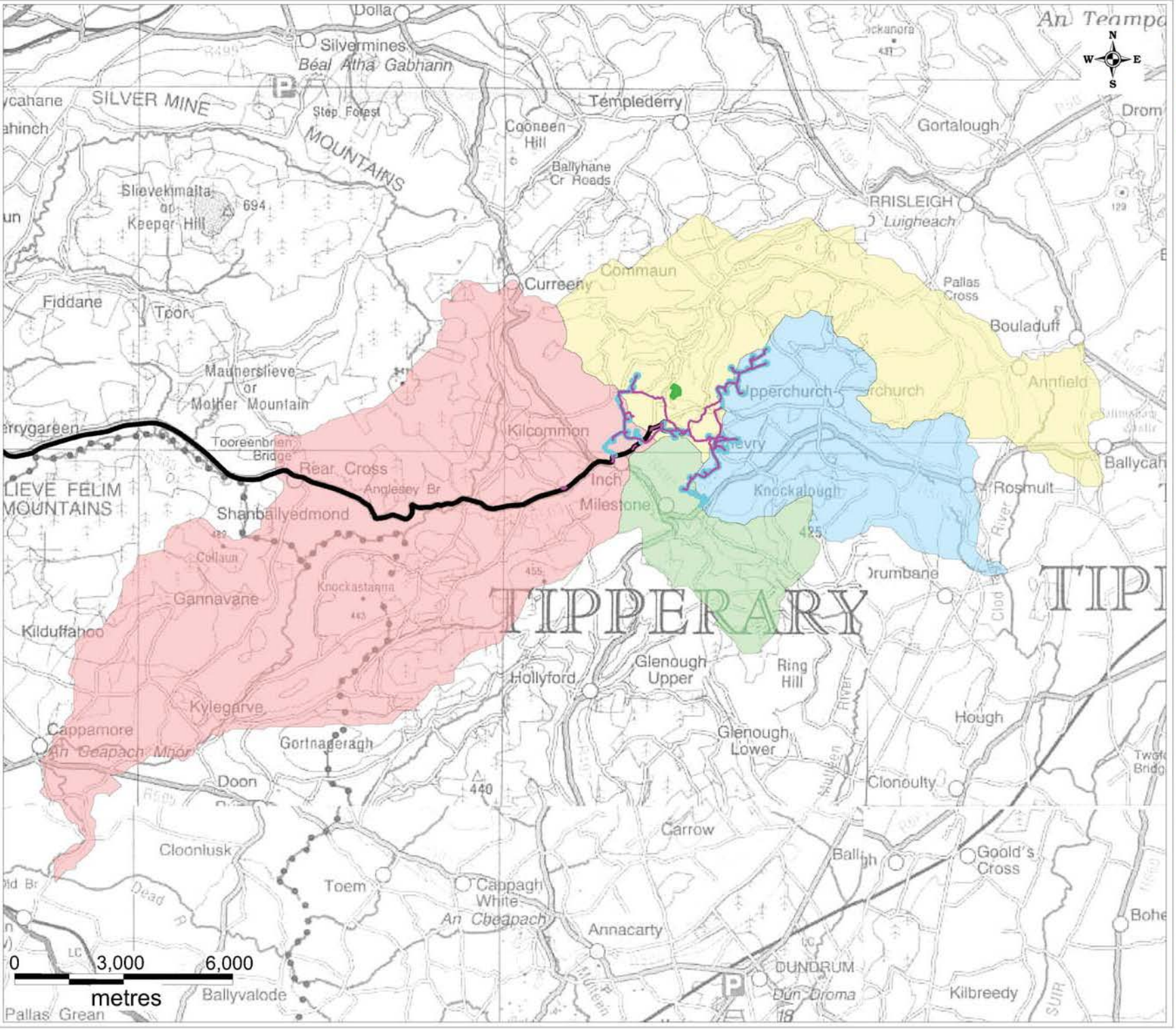
Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Surface Waterbodies within the Related Works Study Area	
Figure No: Figure RW 11.2.1	
Drawing No: P1299-4-0119-FRW-11-2-1-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:100,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



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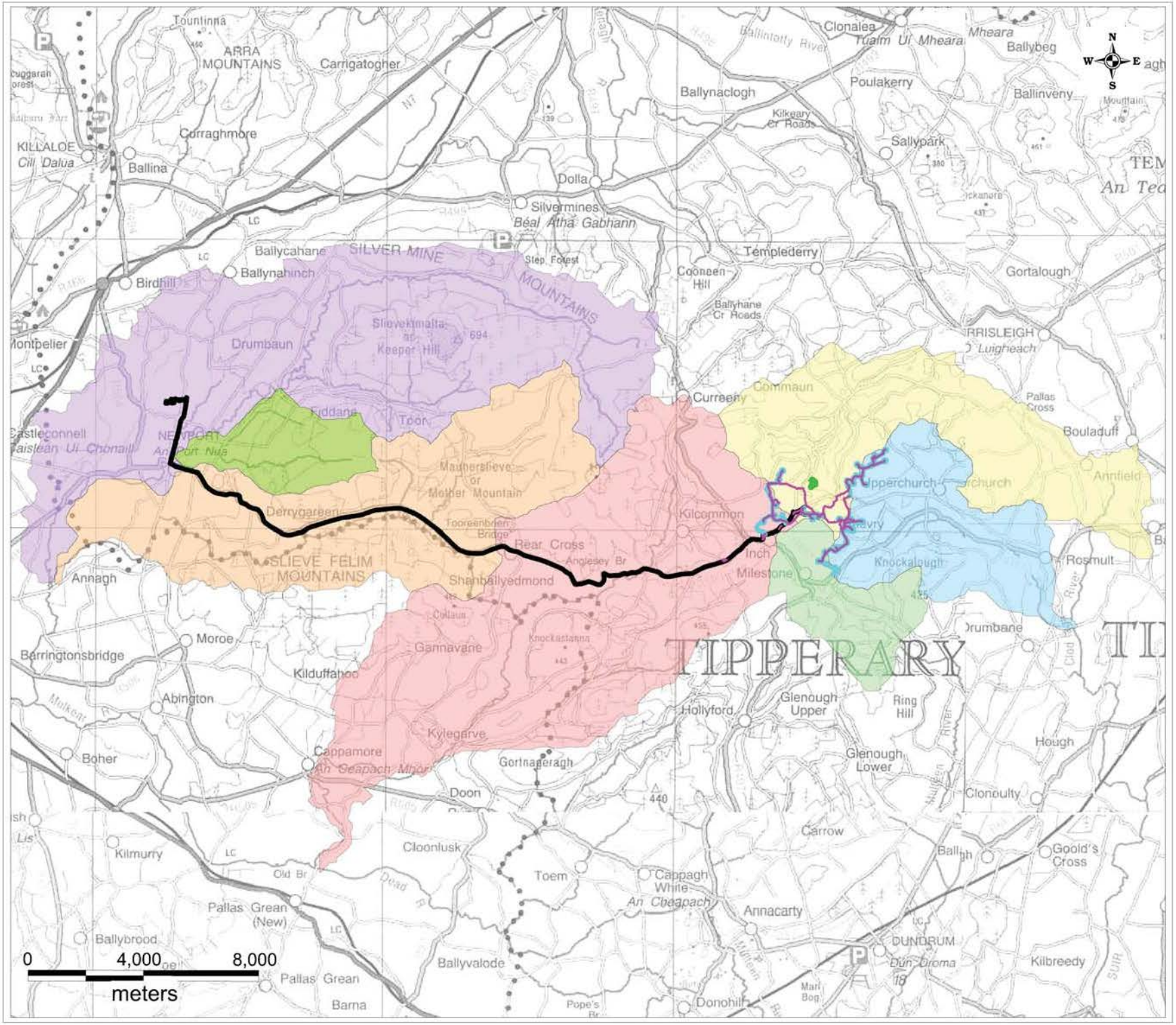
web: www.hydroenvironmental.ie

Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Surface Water Bodies within the UWF Related Works Cumulative Evaluation Study Area Map	
Figure No: Figure CE 11.2.1	
Drawing No: P1299-4-0119-FCE-11-2-1-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:100,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



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Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Surface Waterbodies within the Whole Project Cumulative Evaluation Study Area - Overview Map	
Figure No: Figure WP 11.2.1	
Drawing No: P1299-4-0119-FWP-11-2-1-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:125,000	Drawn By: GD
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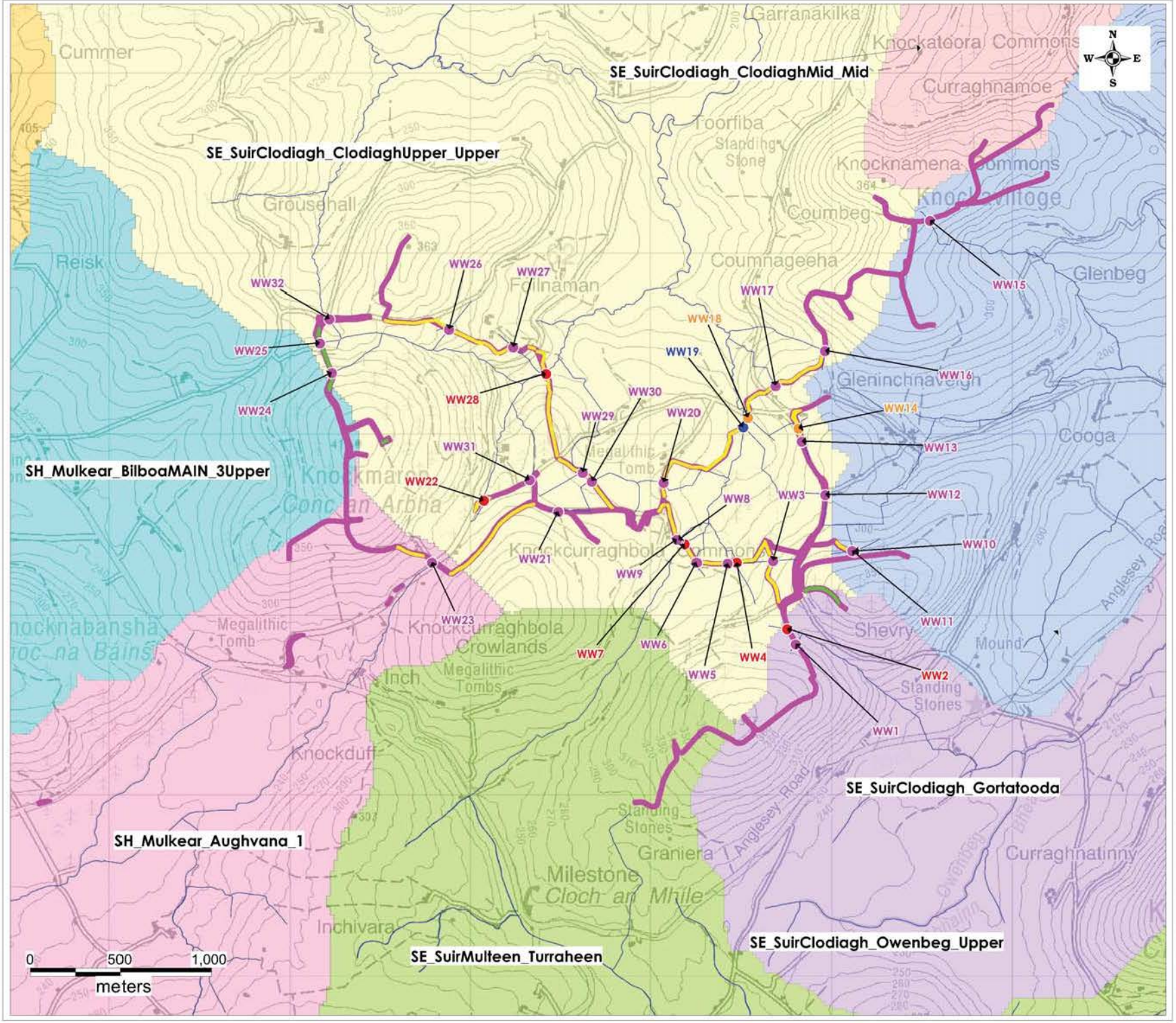

Legend

- UWF Related Works Construction Works Boundary
- Permanent Access Roads
- Temporary Access Roads
- Watercourse

Watercourse Crossing Class Type

- Class 1_EPA Blueline
- Class 2_EPA Blueline Equivalent
- Class 3_Sub Optimal
- Class 4_Drainage Ditch

*Note: WW - Related Works Watercourse Crossing

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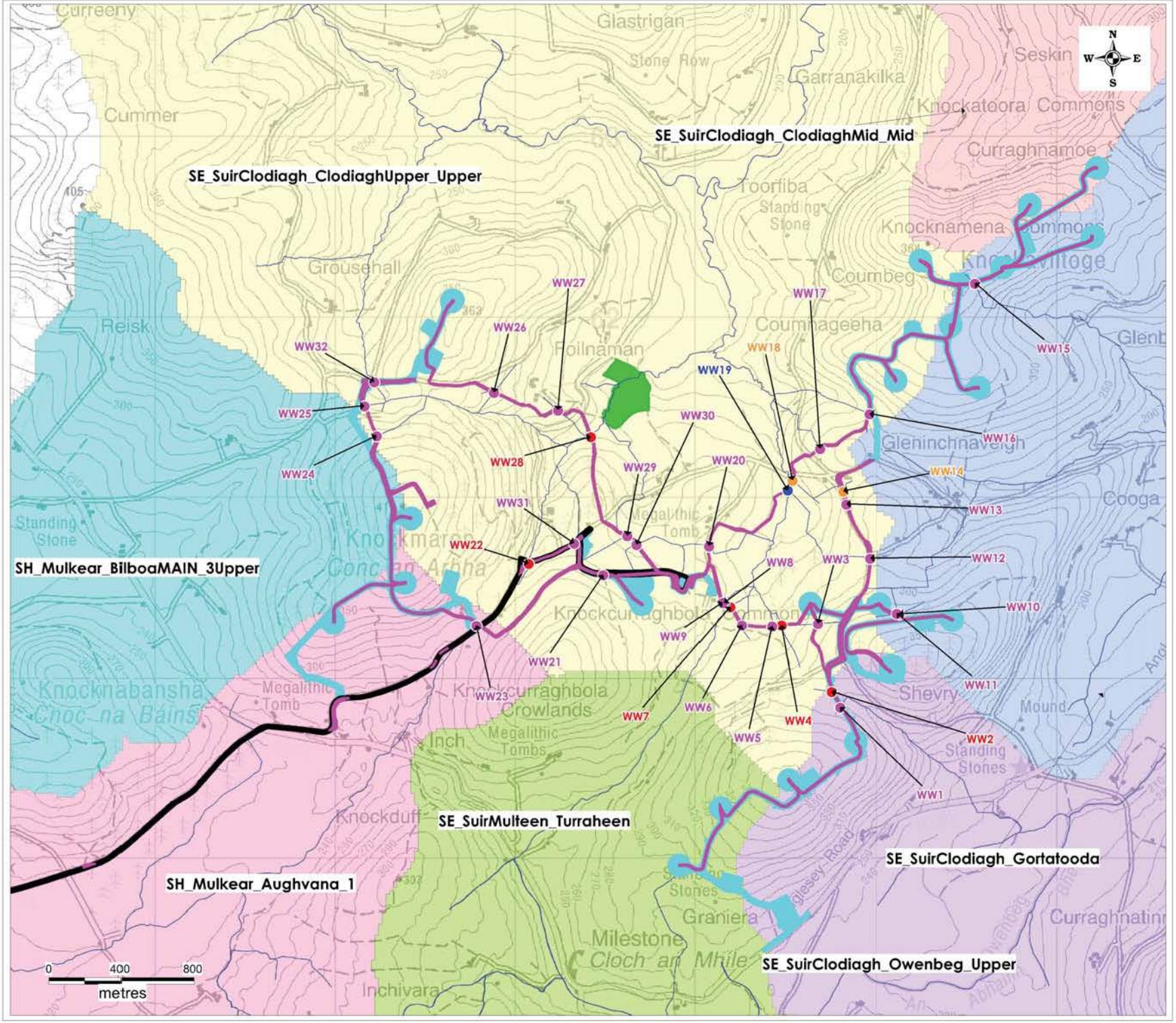
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Surface Waterbodies (WFD) within the UWF Related Works Study Area	
Figure No: Figure RW 11.2.2	
Drawing No: P1299-4-0119-FRW-11-2-2-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



Legend

- UWF Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary
- UWF Replacement Forestry Construction Works Area
- UWF Grid Connection Construction Works Boundary
- Watercourse

Watercourse Crossing Class Type

- Class 1_EPA Blueline
- Class 2_EPA Blueline Equivalent
- Class 3_Sub Optimal
- Class 4_Drainage Ditch

*Note: WW - Related Works Watercourse Crossing

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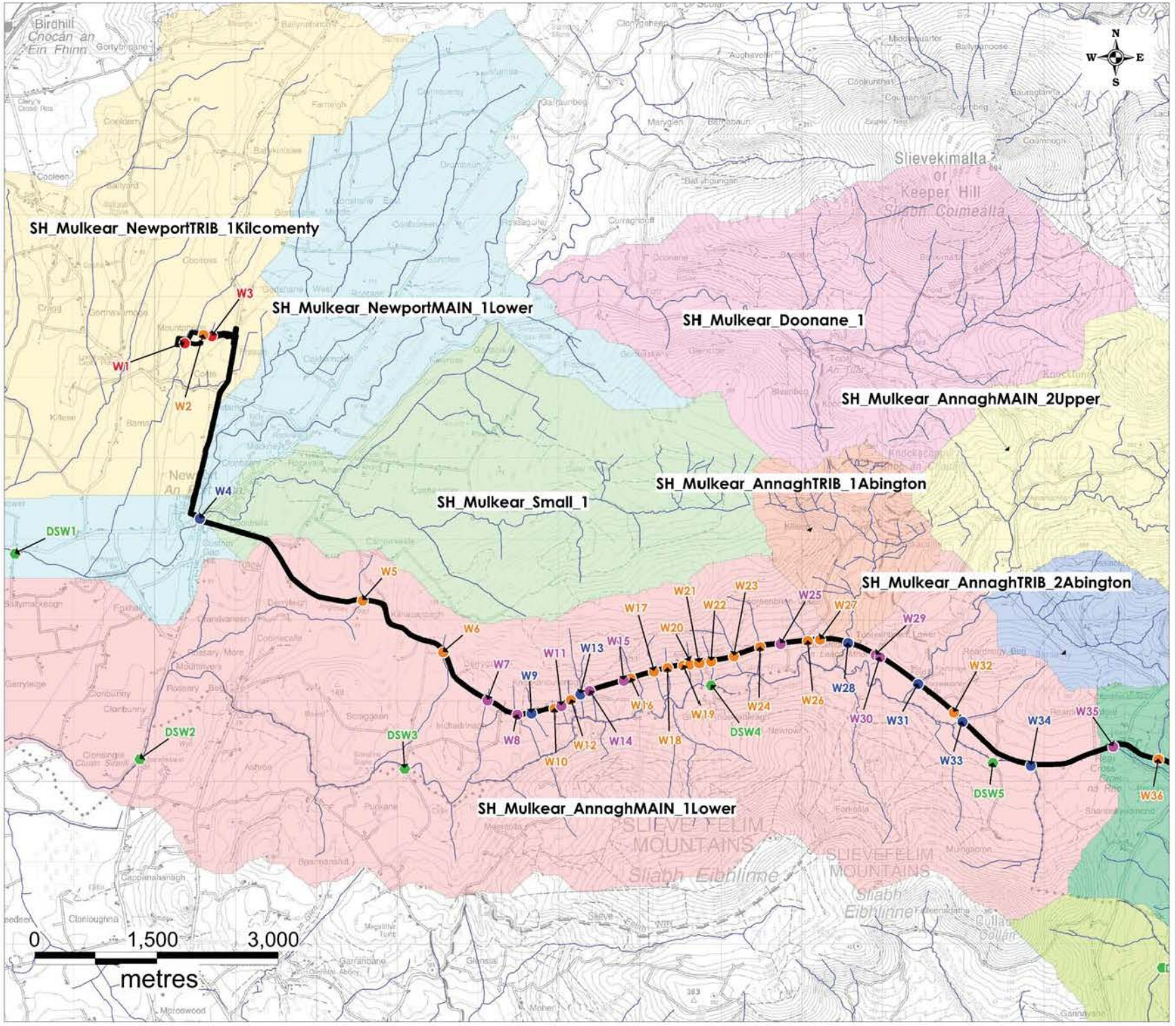
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Surface Waterbodies (WFD) within the UWF Related Works Cumulative Evaluation Study Area	
Figure No: Figure CE 11.2.2.	
Drawing No: P1299-4-0119-FCE-11-2-4-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 28/01/2019	Checked By: MG



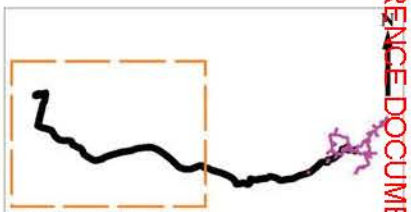
Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works boundary
- Watercourse
- Recommended Downstream Samplin

Watercourse Crossing Class Type

- Class 1_EPA Blueline
- Class 2_EPA Blueline Equivalent
- Class 3_Sub Optimal
- Class 4_Drainage Ditch

*Note: W - Grid Connection Watercourse Crossing
WW - Related Works Watercourse Crossing



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Client: Ecopower Developments Ltd.

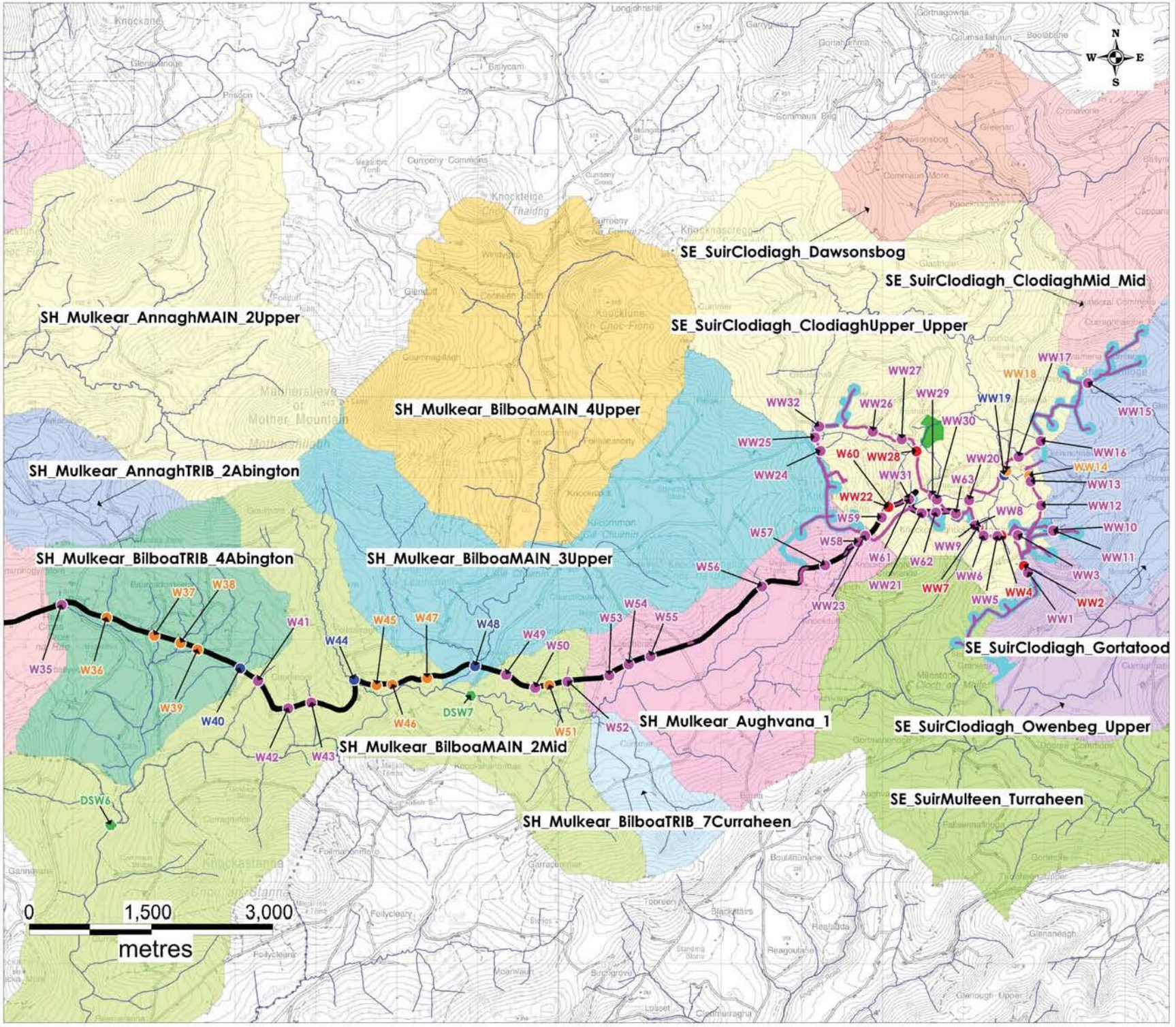
Job: UWF Related Works

Title: Local Surface Waterbodies (WFD) within the Whole Project Cumulative Evaluation Study Area - Map 1 of 2

Figure No: Figure WP 11.2.2.

Drawing No: P1299-4-0119-FWP-11-2-2-A3-0A

Sheet Size: A3	Project No: P1299-4
Scale: 1:45,000	Drawn By: GD
Date: 28/01/2019	Checked By: MG



Legend

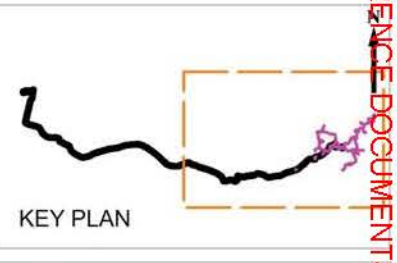
- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary
- UWF Replacement Forestry Construction Works Area
- UWF Grid Connection Construction Works Area
- Watercourse
- Recommended Downstream Samplin

Watercourse Crossing Class Type

- Class 1_EPA Blueline
- Class 2_EPA Blueline Equivalent
- Class 3_Sub Optimal
- Class 4_Drainage Ditch

*Note: W - Grid Connection Watercourse Crossing
WW - Related Works Watercourse Crossing

REFERENCE DOCUMENTS



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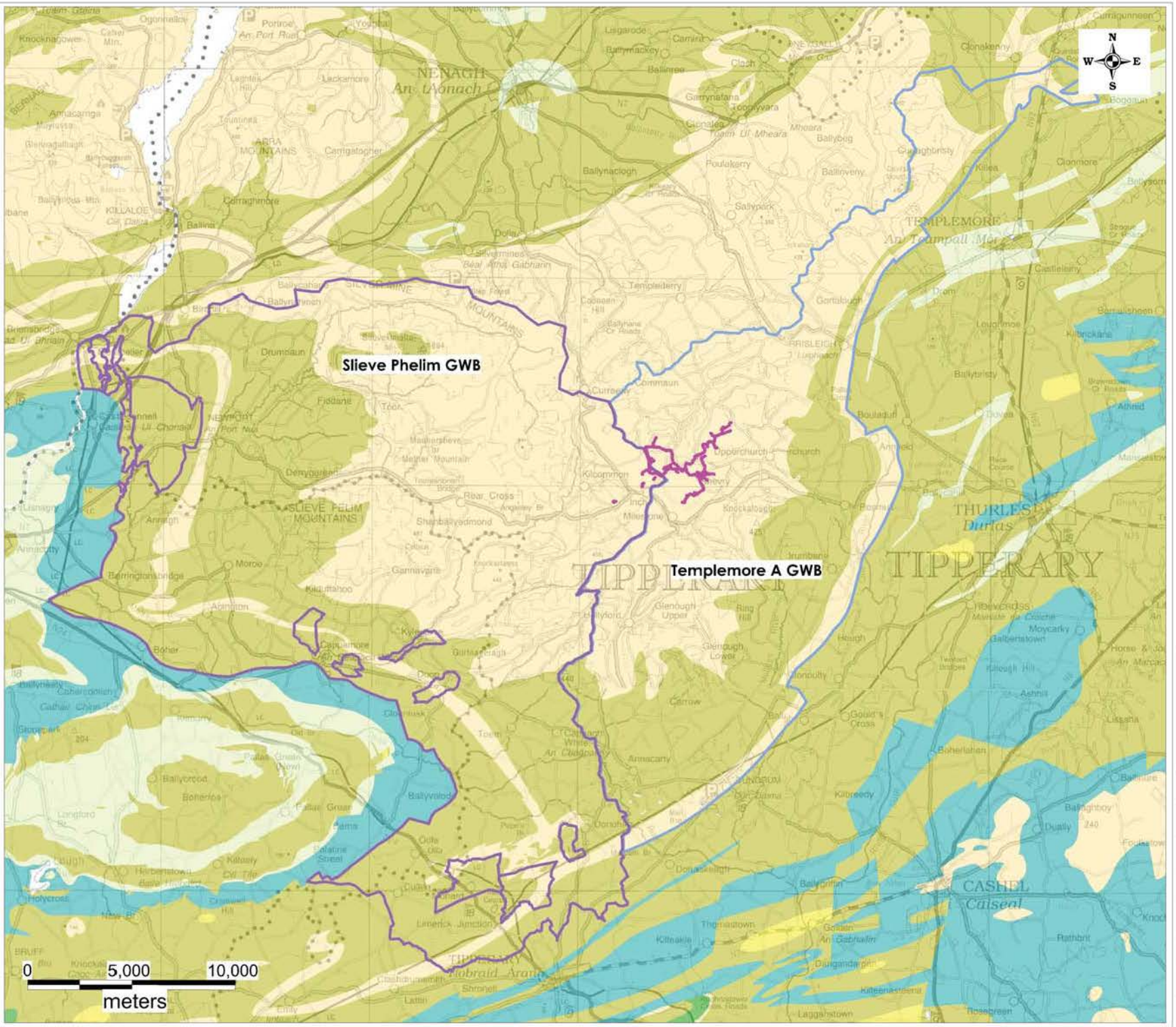
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Surface Waterbodies (WFD) within the Whole Project Cumulative Evaluation Study Area - Map 2 of 2	
Figure No: Figure WP 11.2.2.	
Drawing No: P1299-4-0119-FWP-11-2-2-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:45,000	Drawn By: GD
Date: 28/01/2019	Checked By: MG



Legend

UWF Related Works Construction Works Boundary

Groundwater Bodies

- Slieve Phelim GWB Boundary
- Templemore A GWB Boundary

Aquifer Type

- Locally Important Aquifer - Karstified
- Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Regionally Important Aquifer - Karstified (diffuse)

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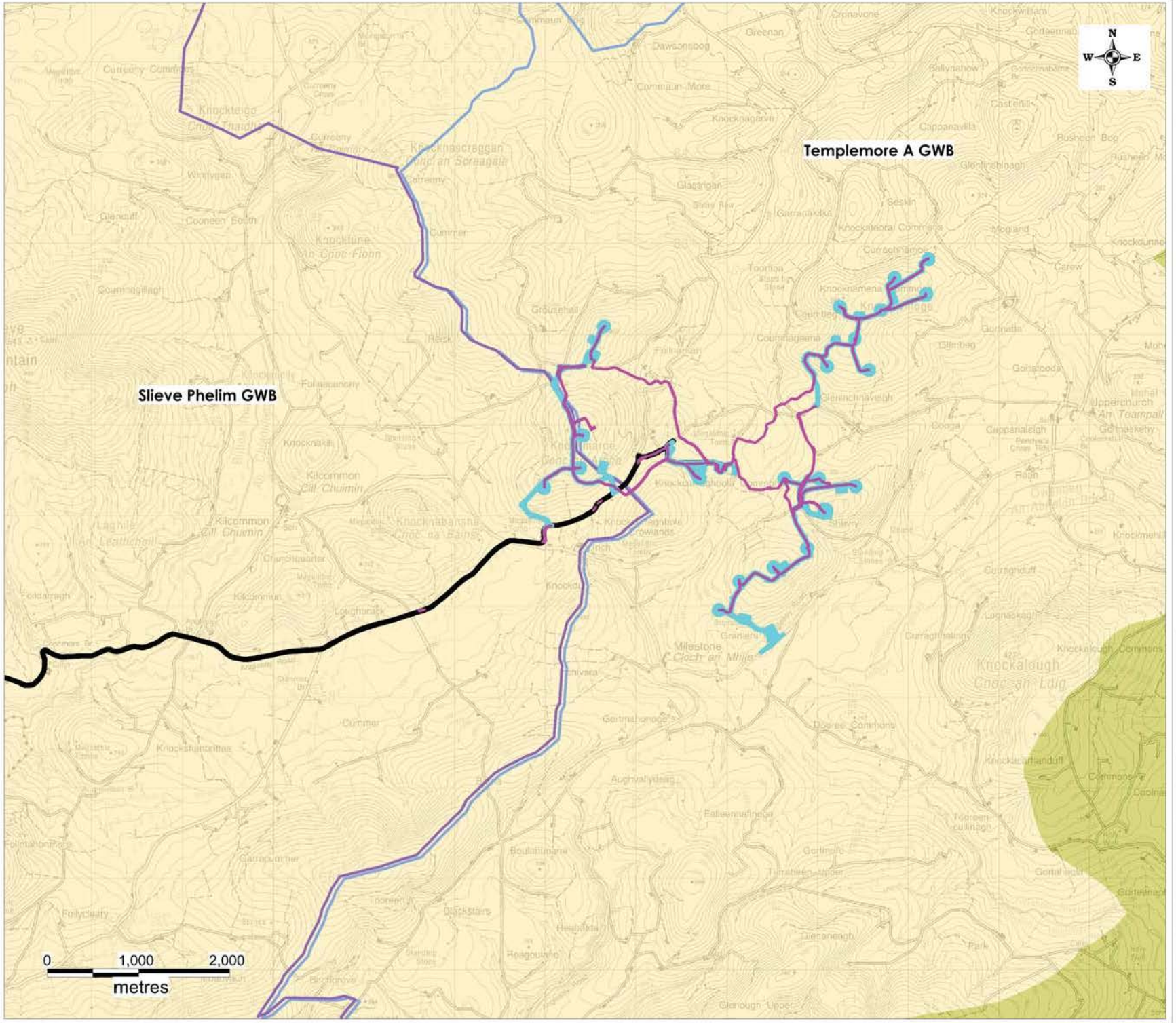
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Groundwater Bodies within the UWF Related Works Study Area	
Figure No: Figure RW 11.3	
Drawing No: P1299-4-0119-FRW-11-3-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:175,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary

Groundwater Bodies

- Slieve Phelim GWB Boundary
- Templemore A GWB Boundary

Aquifer Type

- Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

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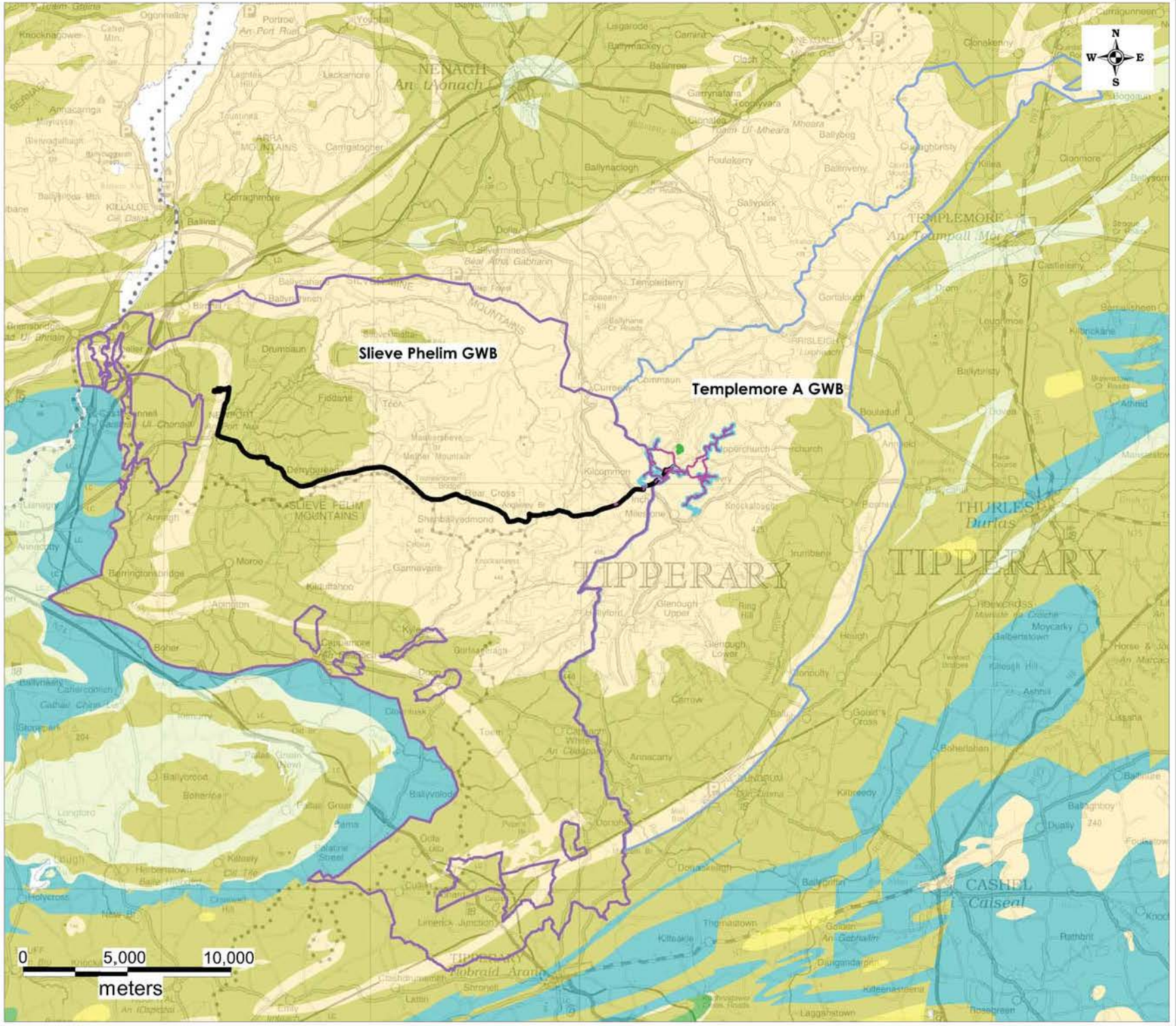
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Groundwater Bodies within the UWF Related Works Cumulative Evaluation Study Area	
Figure No: Figure CE 11.3	
Drawing No: P1299-4-0119-FCE-11-3-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:40,000	Drawn By: GD
Date: 28/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary
- UWF Replacement Forestry Construction Works Area

Groundwater Bodies

- Slieve Phelim GWB Boundary
- Templemore A GWB Boundary

Aquifer Type

- Locally Important Aquifer - Karstified
- Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones
- Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- Regionally Important Aquifer - Karstified (diffuse)

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Client: Ecopower Developments Ltd.

Job: UWF Related Works

Title: Local Groundwater Bodies within the **Whole Project** Cumulative Evaluation Study Area

Figure No: Figure **WP** 11.3

Drawing No: P1299-4-0119-FCE-11-3-A3-0A

Sheet Size: A3	Project No: P1299-4
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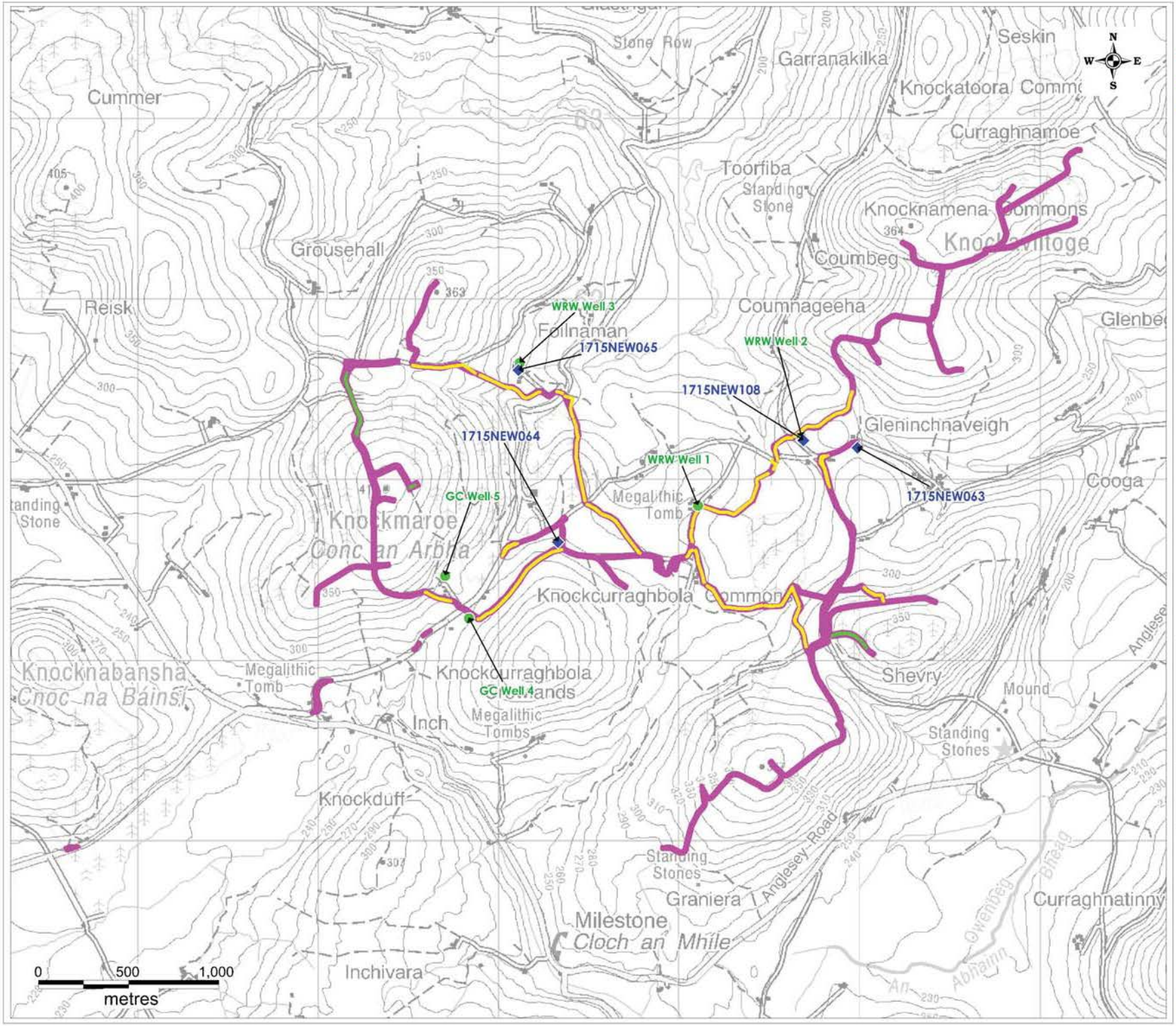
Date: 28/01/2019	Checked By: MG



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Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Wells & Springs within the UWF Related Works Study Area Map	
Figure No: Figure RW 11.4.	
Drawing No: P1299-4-0119-FRW-11-4-A3-0A	
Sheet Size: A3	Project No: P1299-4
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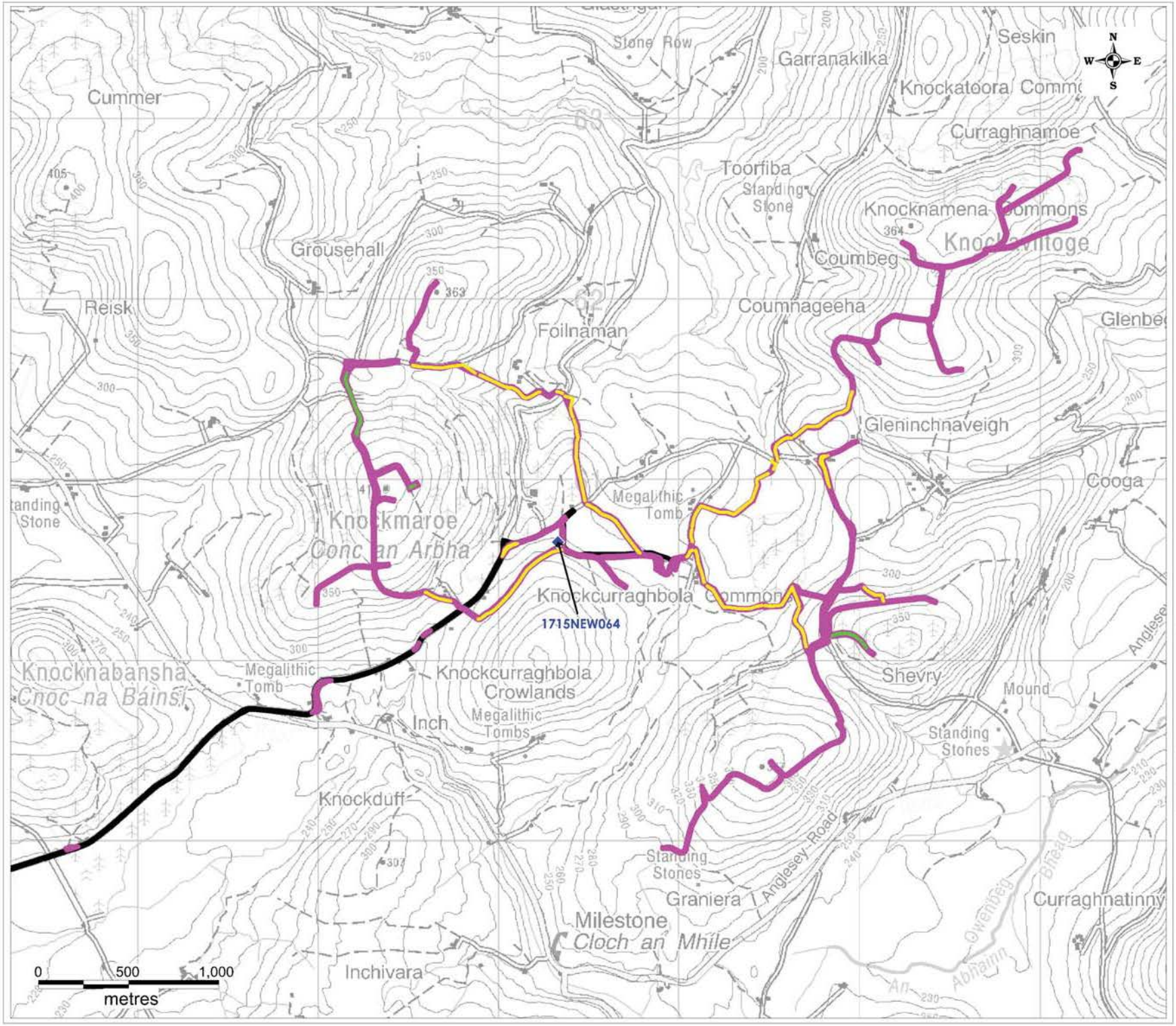

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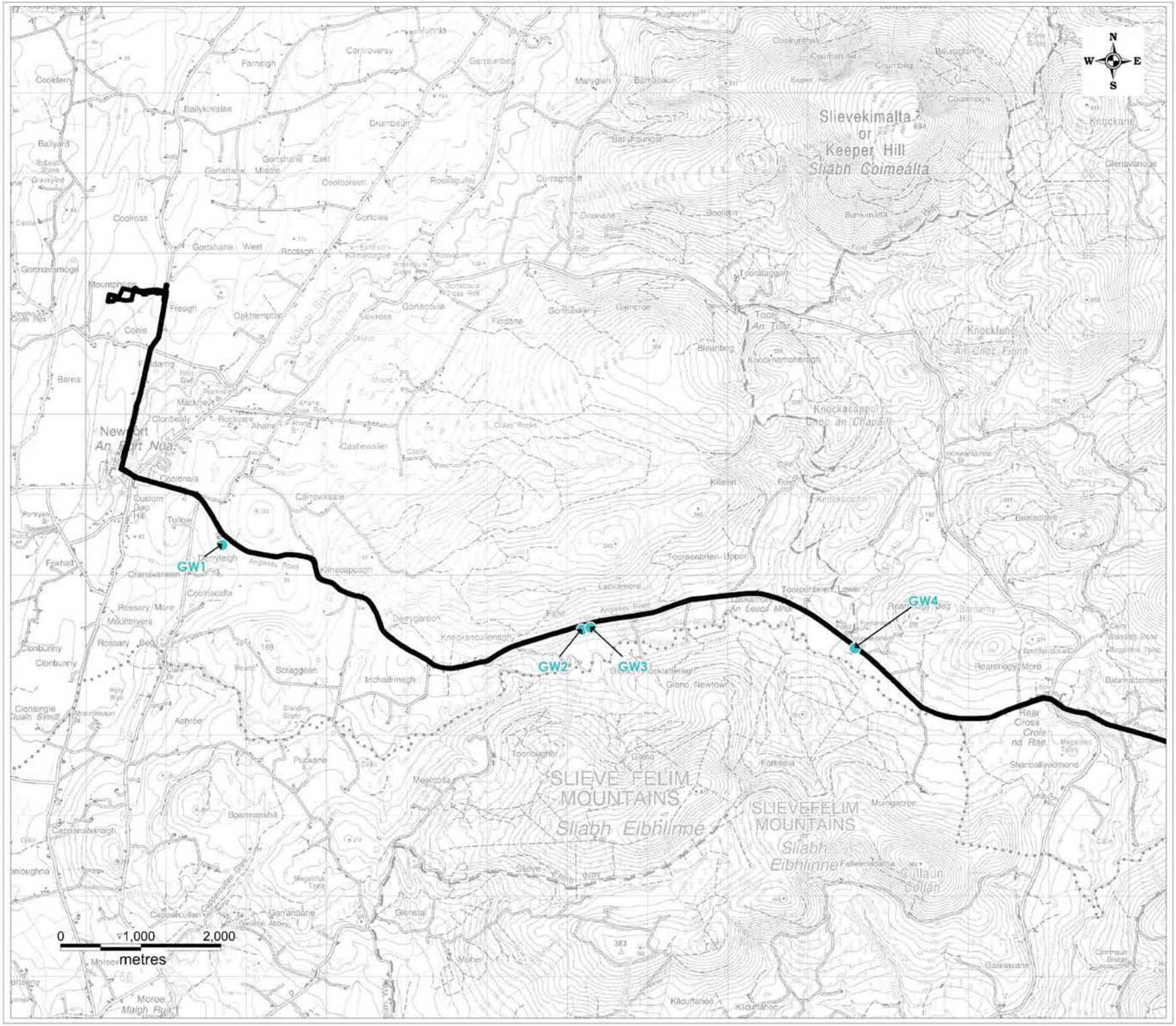
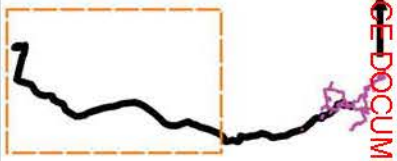
Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Wells & Springs within the UWF Related Works Cumulative Evaluation Study Area Map	
Figure No: Figure CE 11.4.	
Drawing No: P1299-4-0119-FCE-11-4-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:20,000	Drawn By: GD
Date: 28/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Mapped GSI Wells (accuracy <50m) Within 100m of the UWF Related Works and UWF Grid Connection
- Private Dwelling Locations Within 100m of the UWF Related Works and UWF Grid Connection



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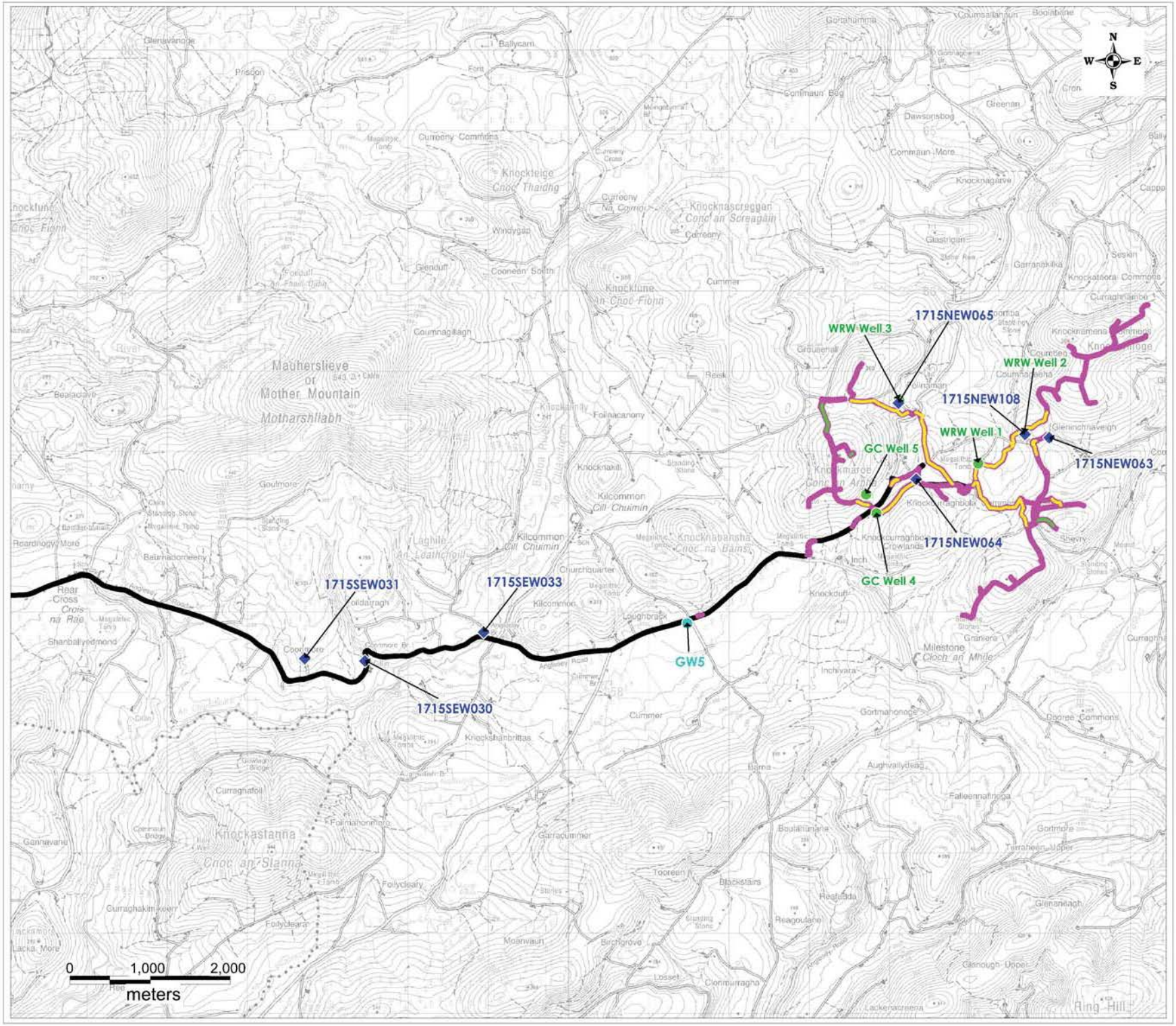
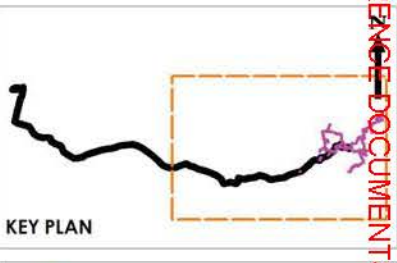
Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Wells & Springs within the Whole Project Cumulative Evaluation Study Area - Map 1 of 2	
Figure No: Figure CE 11.4.	
Drawing No: P1299-4-0119-FCE-11-4-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:45,000	Drawn By: GD
Date: 28/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Permanent Access Roads
- Temporary Access Roads
- Mapped GSI Wells (accuracy <50m) Within 100m of the UWF Related Works and UWF Grid Connection
- Mapped Third Party Wells (accuracy <5m)
- Private Dwelling Locations Within 100m of the UWF Related Works and UWF Grid Connection



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Client: Ecopower Development Ltd.	
Job: UWF Related Works	
Title: Local Wells & Springs within the Whole Project Cumulative Evaluation Study Area - Map 2 of 2	
Figure No: Figure CE 11.4.	
Drawing No: P1299-4-0119-FCE-11-4-A3-0A	
Sheet Size: A3	Project No: P1299-4
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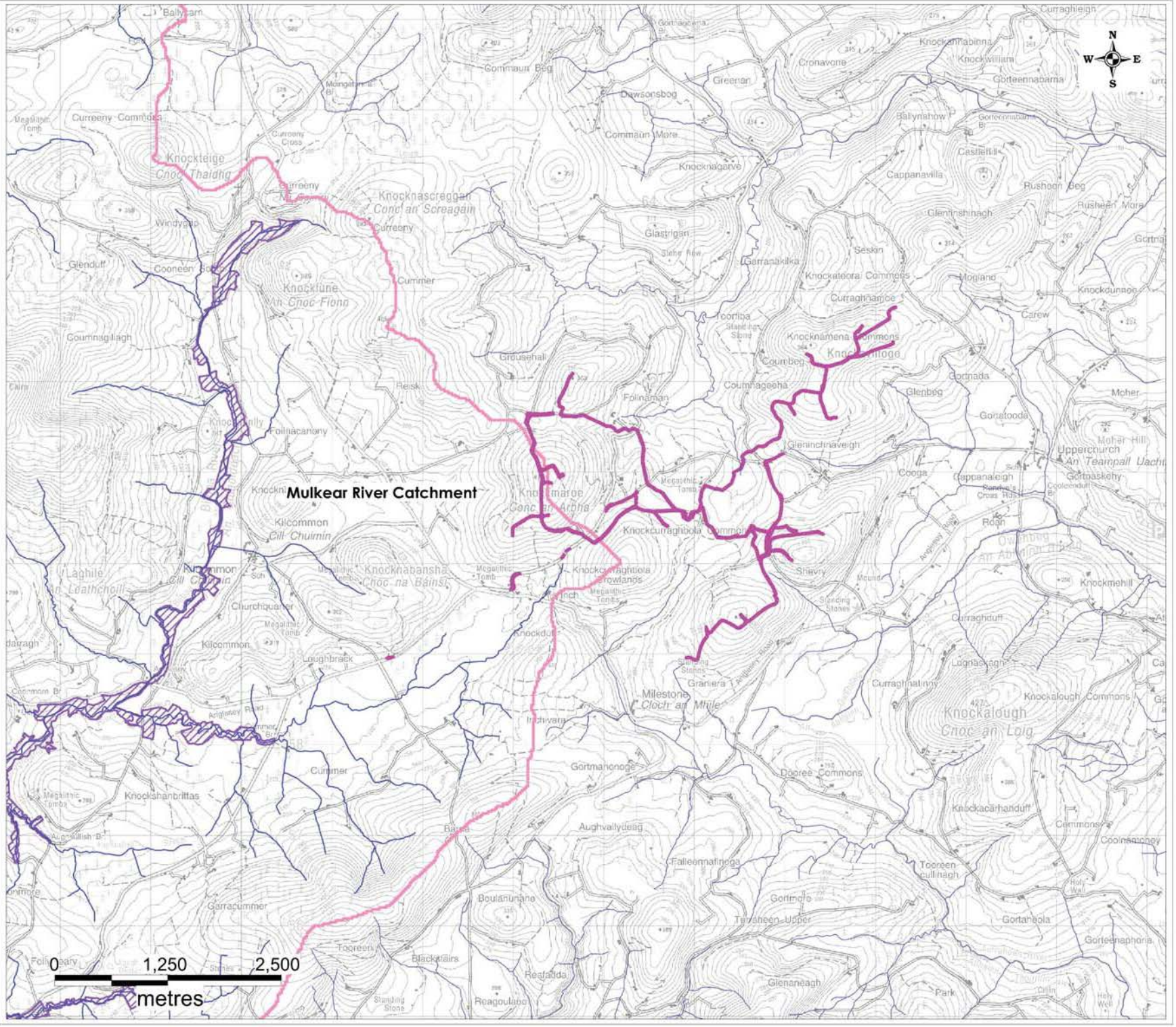
Date: 28/01/2019	Checked By: MG



Legend

- UWF Related Works Construction Works Boundary
- Lower River Shannon SAC
- Mulkear River Catchment
- Watercourse

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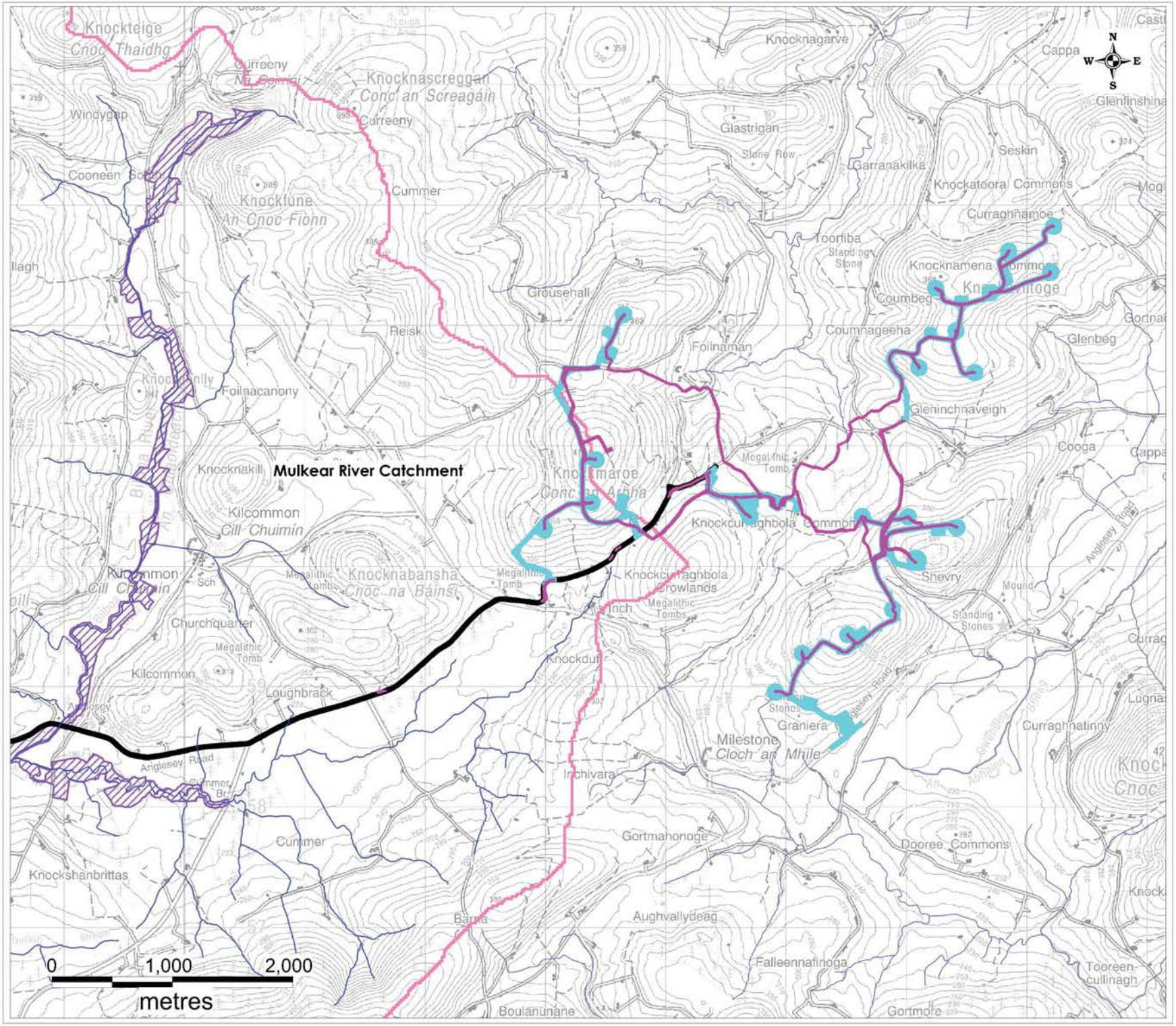
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Lower River Shannon SAC within the UWF Related Works Study Area	
Figure No: Figure RW 11.5	
Drawing No: P1299-4-0119-FRW-11-5-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:40,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works Boundary
- Upperchurch Windfarm Construction Works Boundary
- Lower River Shannon SAC
- Mulkear River Catchment
- Watercourse

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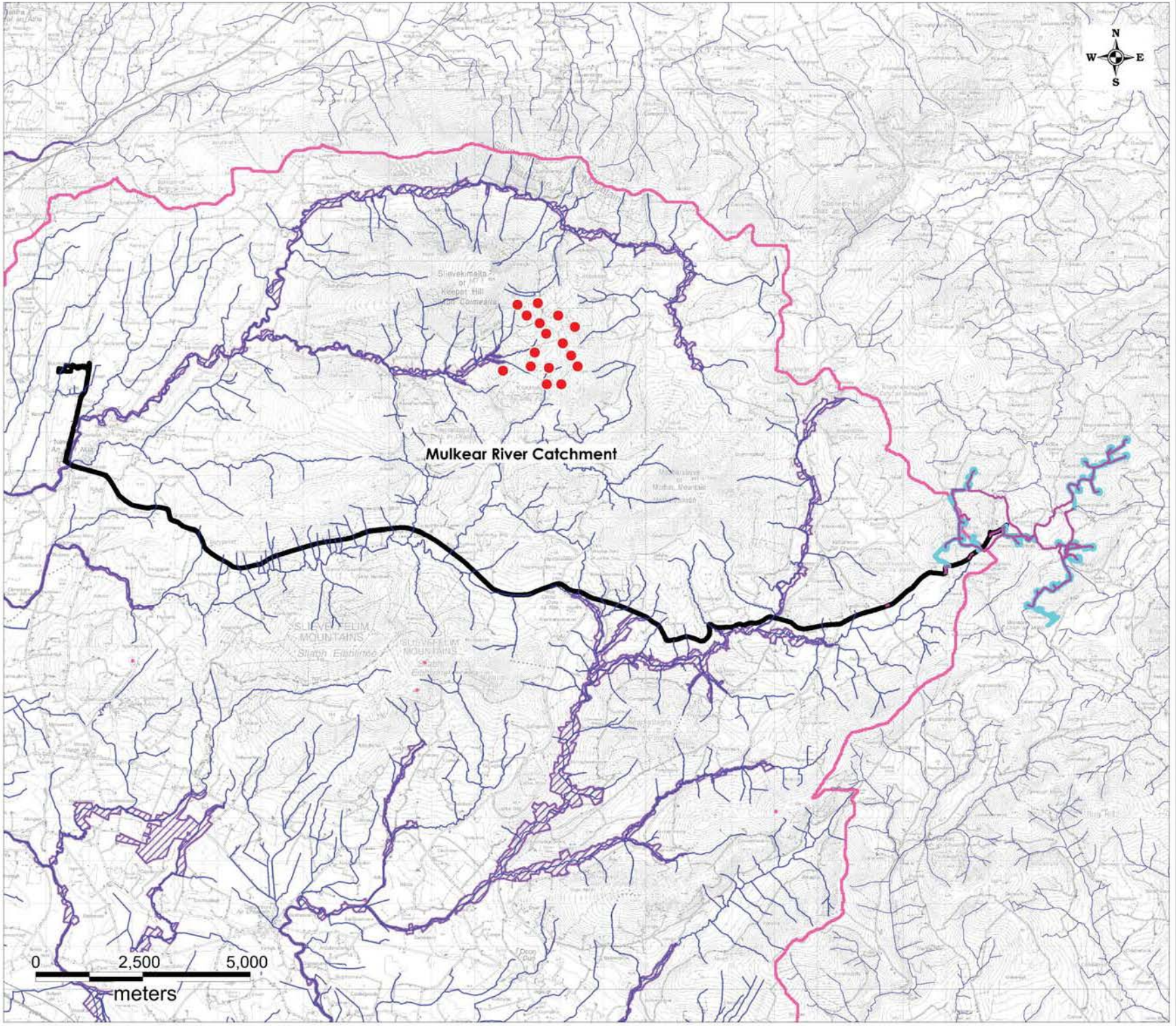
Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Lower River Shannon SAC within the UWF Related Works Cumulative Evaluation Study Area	
Figure No: Figure CE 11.5	
Drawing No: P1299-4-0119-FCE-11-5-A3-0A	
Sheet Size: A3	Project No: P1299-4
Scale: 1:30,000	Drawn By: GD
Date: 29/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary
- Lower River Shannon SAC
- Bunkimalta WF Turbines
- Mulkear River Catchment
- Watercourse

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Client: Ecopower Developments Ltd.

Job: UWF Related Works

Title: Lower River Shannon SAC within the Whole Project Cumulative Evaluation Study Area

Figure No: Figure WP 11.5

Drawing No: P1299-4-0119-FWP-11-5-A3-0A

Sheet Size: A3	Project No: P1299-4
Scale: 1:85,000	Drawn By: GD
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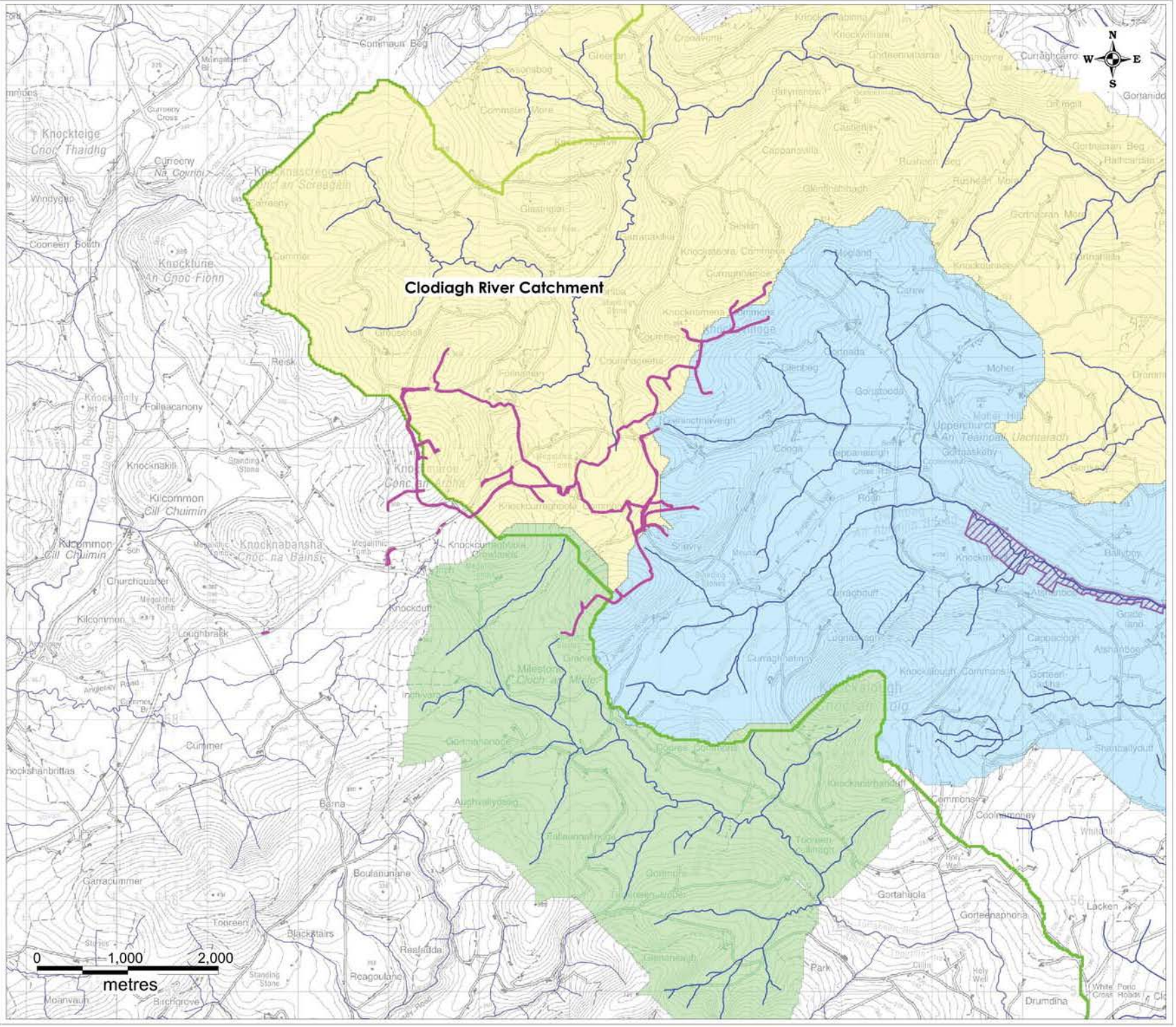

Legend

- UWF Related Works Construction Works boundary
- Lower River Suir SAC
- Clodiagh River Catchment
- Watercourse
- Cloadagh River (Suir Catchment)
- Turraheen River (Suir Catchment)
- Owenbeg River (Suir Catchment)

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web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.

Job: UWF Related Works

Title: Lower River Suir SAC within the UWF Related Works Study Area

Figure No: Figure RW 11.6

Drawing No: P1299-4-0119-FRW-11-6-A3-0A

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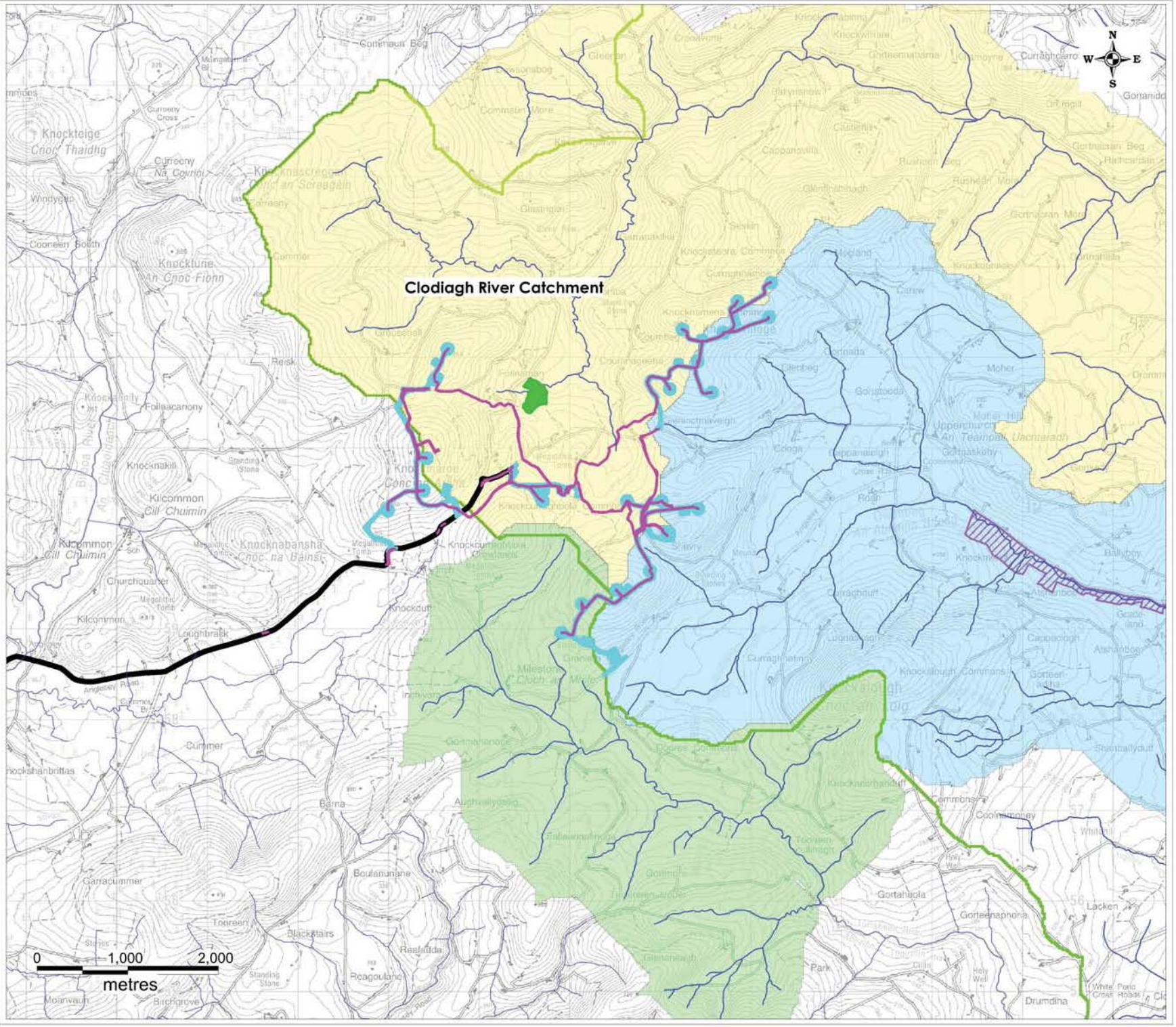
Date: 28/01/2019	Checked By: MG



Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary
- Lower River Suir SAC
- Clodiagh River Catchment
- UWF Replacement Forestry Construction Works Area
- Watercourse
- Cloadagh River (Suir Catchment)
- Turraheen River (Suir Catchment)
- Owenbeg River (Suir Catchment)

REFERENCE DOCUMENTS

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web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.

Job: UWF Related Works

Title: Lower River Suir SAC within the UWF Related Works Cumulative Evaluation Study Area

Figure No: Figure CE 11.6

Drawing No: P1299-4-0119-FCE-11-6-A3-0A

Sheet Size: A3	Project No: P1299-4
Scale: 1:40,000	Drawn By: GD
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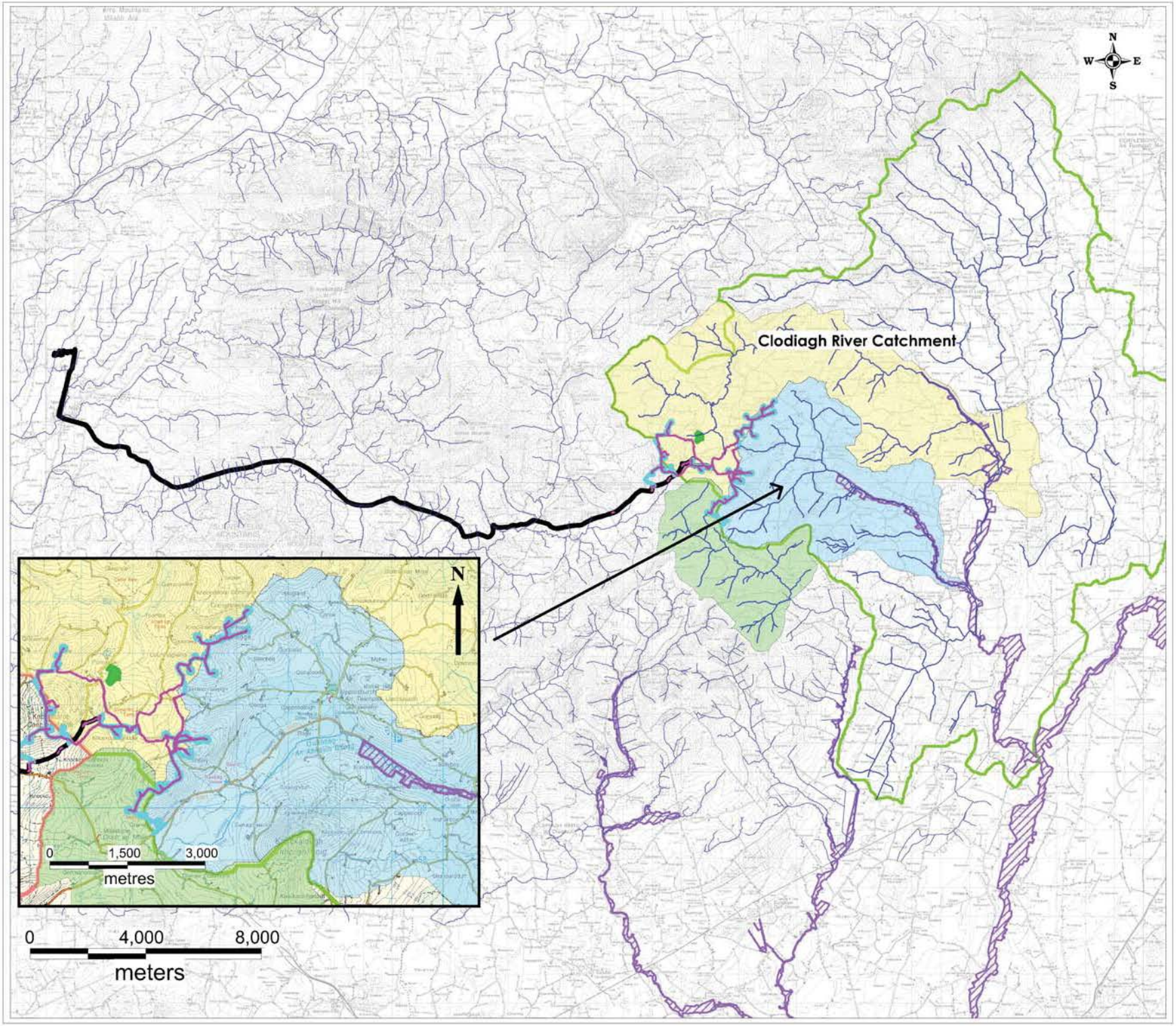

Legend

- UWF Grid Connection Construction Works Boundary
- UWF Related Works Construction Works boundary
- Upperchurch Windfarm Construction Works Boundary
- Lower River Suir SAC
- Clodiagh River Catchment
- UWF Replacement Forestry Construction Works Area
- Watercourse
- Cloadagh River (Suir Catchment)
- Turraheen River (Suir Catchment)
- Owenbeg River (Suir Catchment)

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Lower River Suir SAC within the Whole Project Cumulative Evaluation Study Area	
Figure No: Figure WP 11.6	
Drawing No: P1299-4-0119-FWP-11-6-A3-0A	
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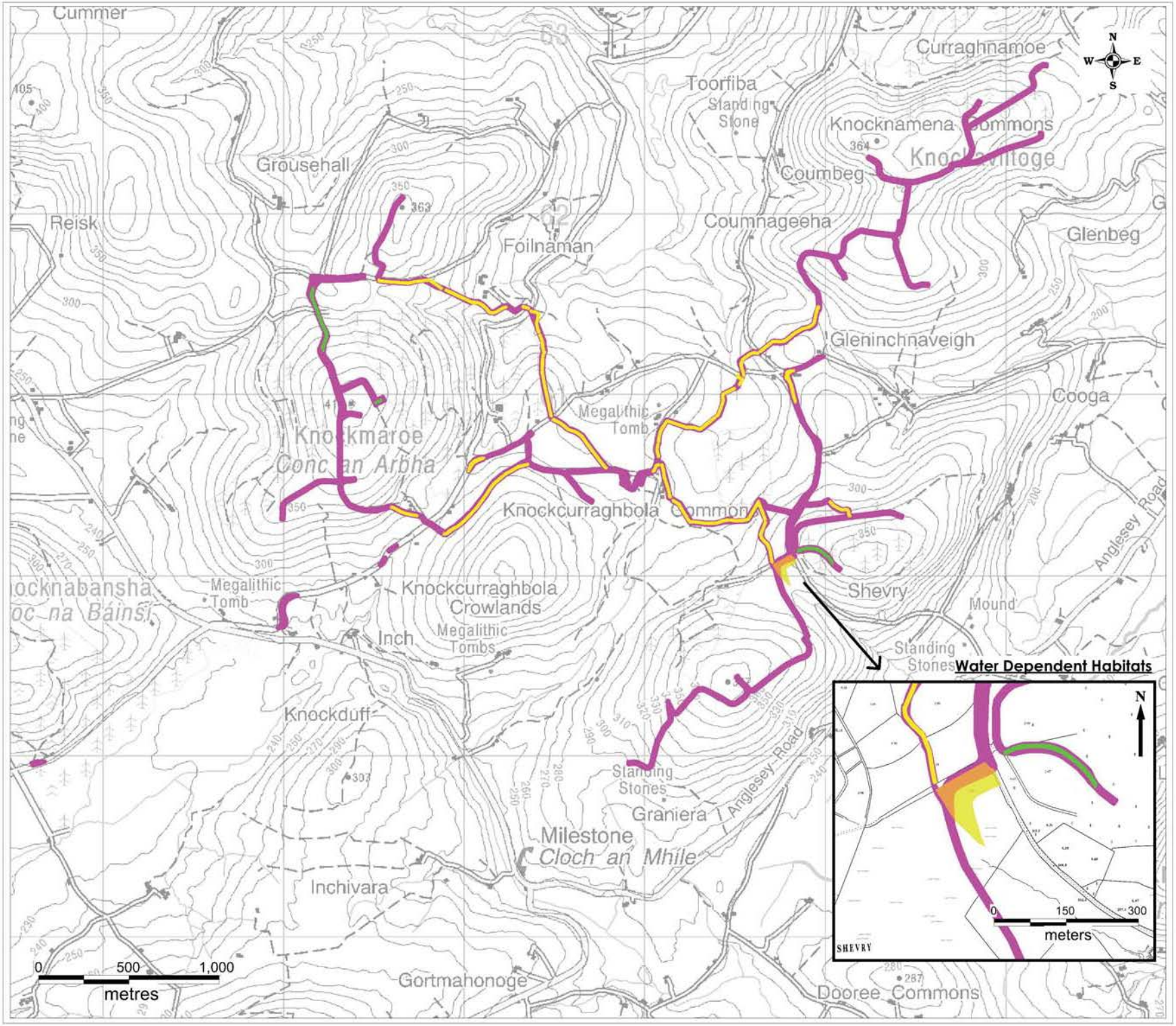

Legend

- UWF Related Works Construction Works Boundary
- Permanent Access Roads
- Temporary Access Roads
- Local Water Dependent Habitats

*Note: Smaller maps show Local Water Dependent Habitats that are intersected or adjacent to UWF Related Works

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web: www.hydroenvironmental.ie

Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Water Dependent Habitats within the UWF Related Works Study Area	
Figure No: Figure RW 11.7	
Drawing No: P1299-4-0119-FRW-11-7-A3-0A	
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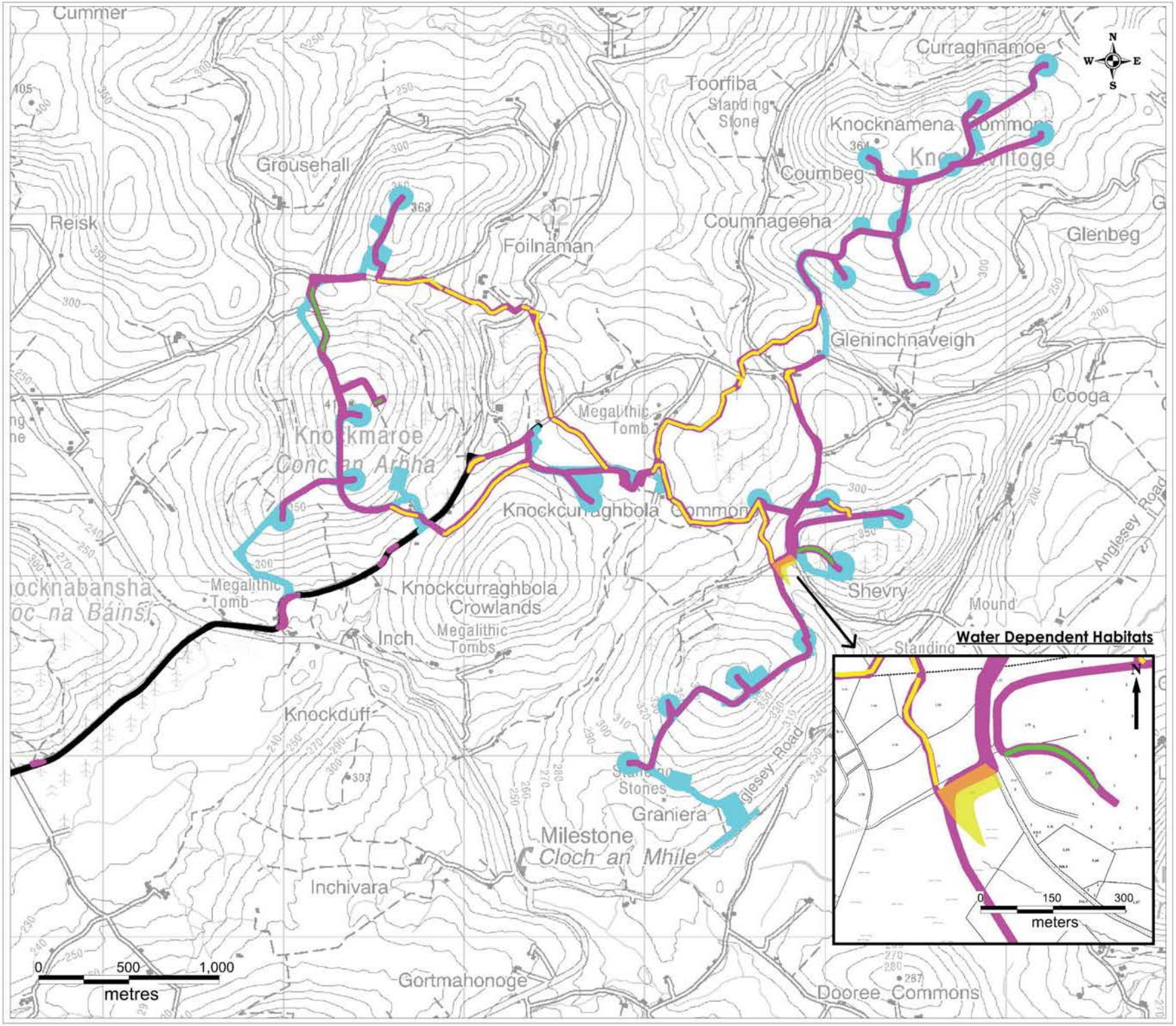

Legend

- UWF Related Works Construction Works Boundary
- Permanent Access Roads
- Temporary Access Roads
- Upperchurch Windfarm Construction Works Boundary
- UWF Grid Connection Construction Works Boundary
- Local Water Dependent Habitats

*Note: Smaller map show Local Water Dependent Habitat that is intersected or adjacent to UWF Related Works

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Job: UWF Related Works	
Title: Local Water Dependent Habitats within the UWF Related Works Cumulative Evaluation Study Area	
Figure No: Figure CE 11.7	
Drawing No: P1299-4-0119-FCE-11-7-A3-0A	
Sheet Size: A3	Project No: P1299-4
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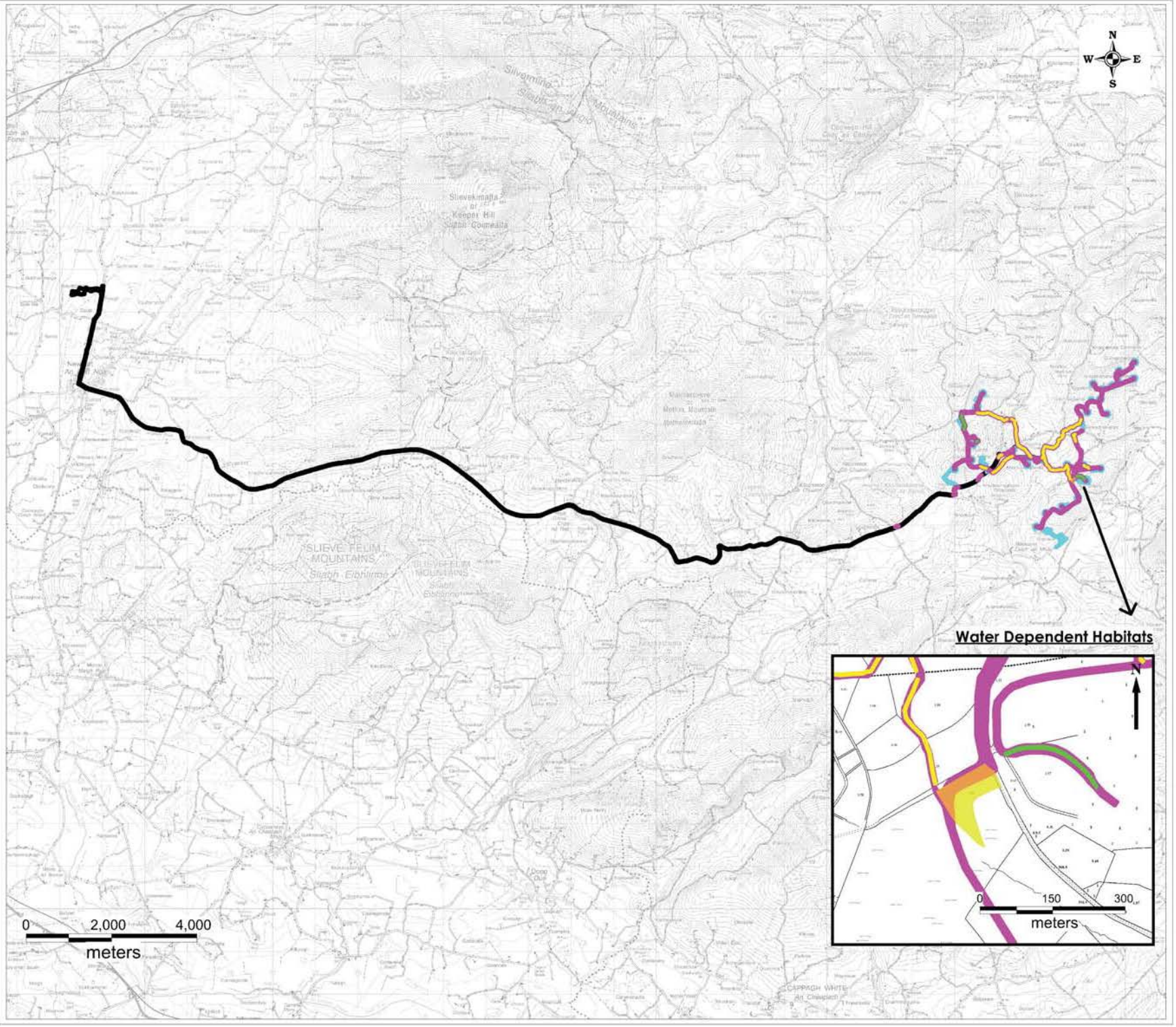

Legend

- UWF Related Works Construction Works Boundary
- Permanent Access Roads
- Temporary Access Roads
- Upperchurch Windfarm Construction Works Boundary
- UWF Grid Connection Construction Works Boundary
- Local Water Dependent Habitats

*Note: Smaller map show Local Water Dependent Habitat that is intersected or adjacent to UWF Related Works

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Client: Ecopower Developments Ltd.	
Job: UWF Related Works	
Title: Local Water Dependent Habitats within the Whole Project Cumulative Evaluation Study Area	
Figure No: Figure WP 11.7	
Drawing No: P1299-4-0119-FWP-11-7-A3-0A	
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Scale: 1:85.000	Drawn By: GD
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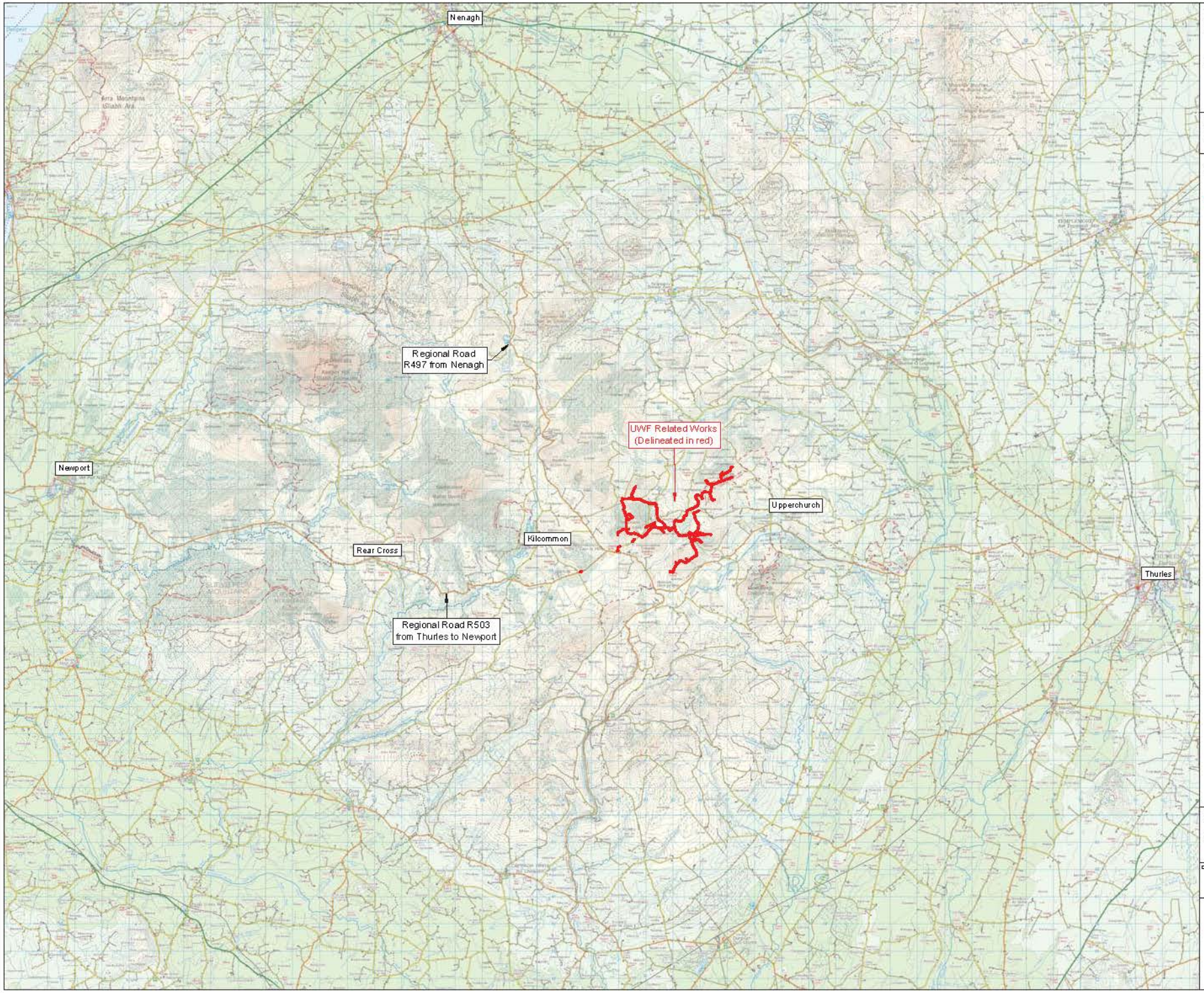

Title:
Figure RW 12.1

Location of the UWF Related Works

Map Number:
1 of 1

Legend:

UWF Related Works
- -Realigned Windfarm Roads
- -Internal Windfarm Cabling
- -Telecom Relay Pole
- -Haul Route Works

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
AB	JB	January 19	A3

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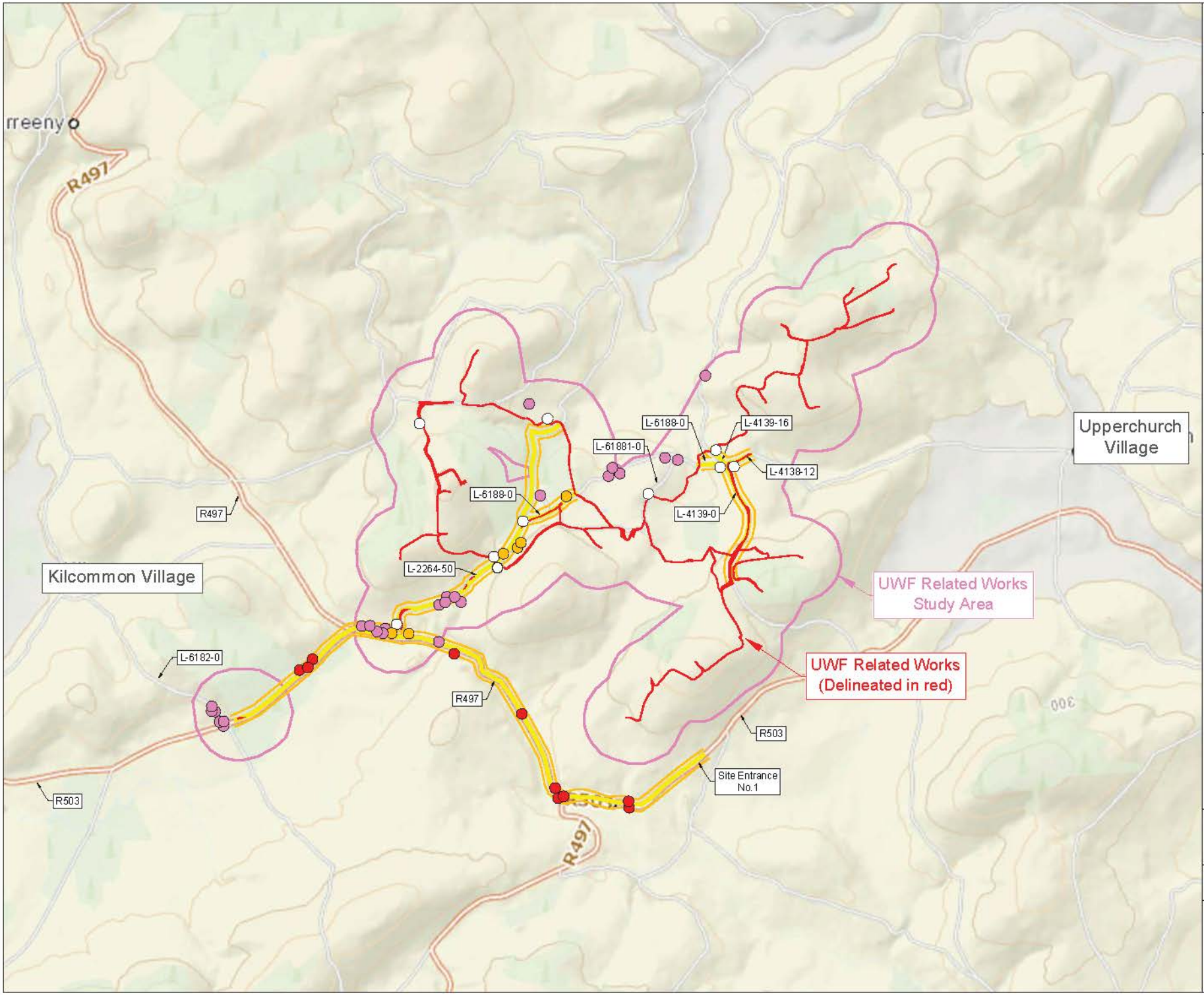

Title:
Figure RW 12.2.1

Local Residents & Community (Dust, Noise) within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Extents:

- UWF Related Works Construction Works Area
- **Air Quality, Noise and Vibration:** 350m Study Area from Grid Connection Construction Works Area
- Local Haul Roads
- **Air Quality:** 50m from Local Haul Roads
- Road Numbers

Survey Results:

- **Air Quality:** Houses within 50m of Construction Works Area
- **Air Quality:** Houses between 51m and 100m of Construction Works Area
- **Air Quality:** Houses between 101m and 350m of Construction Works Area
- **Air Quality:** Houses 50m from Local Haul Roads

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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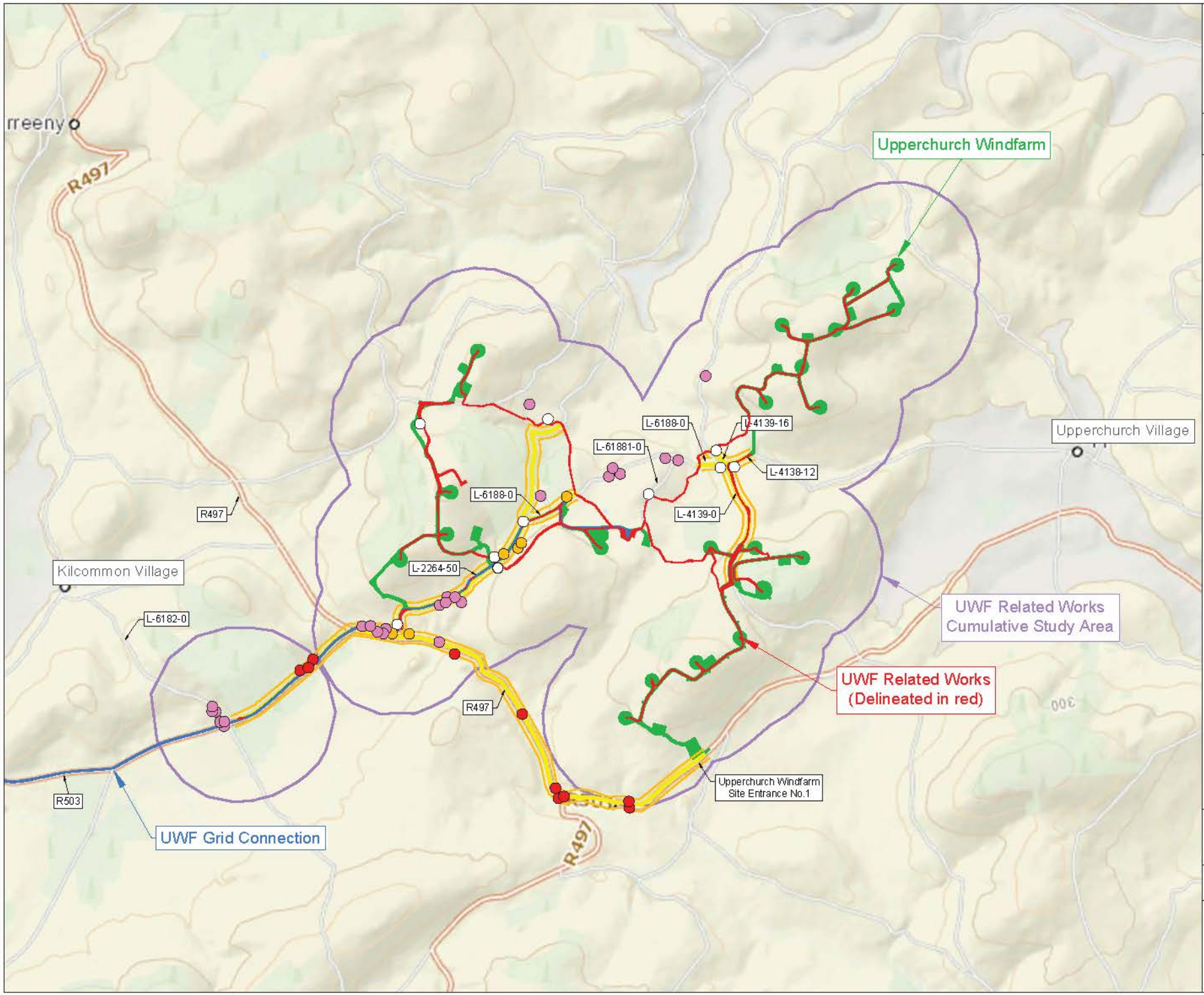

Title:
Figure CE 12.2.1

Local Residents & Community (Dust, Noise) within the UWF Related Works Cumulative Study Area

Map Number:
Map 1 of 1

Legend:

Study Extents:

- UWF Related Works Construction Works Area
- **Air Quality, Noise and Vibration:** 700m Study Area from Construction Works Area
- Local Haul Roads
- **Air Quality:** 50m from Local Haul Roads
- Road Numbers

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results:

- **Air Quality:** Houses within 50m of the UWF Related Works Construction Works Area
- **Air Quality:** Houses between 51m and 100m of the UWF Related Works Construction Works Area
- **Air Quality:** Houses between 101m and 350m of the UWF Related Works Construction Works Area
- **Air Quality:** Houses 50m from Local Haul Roads

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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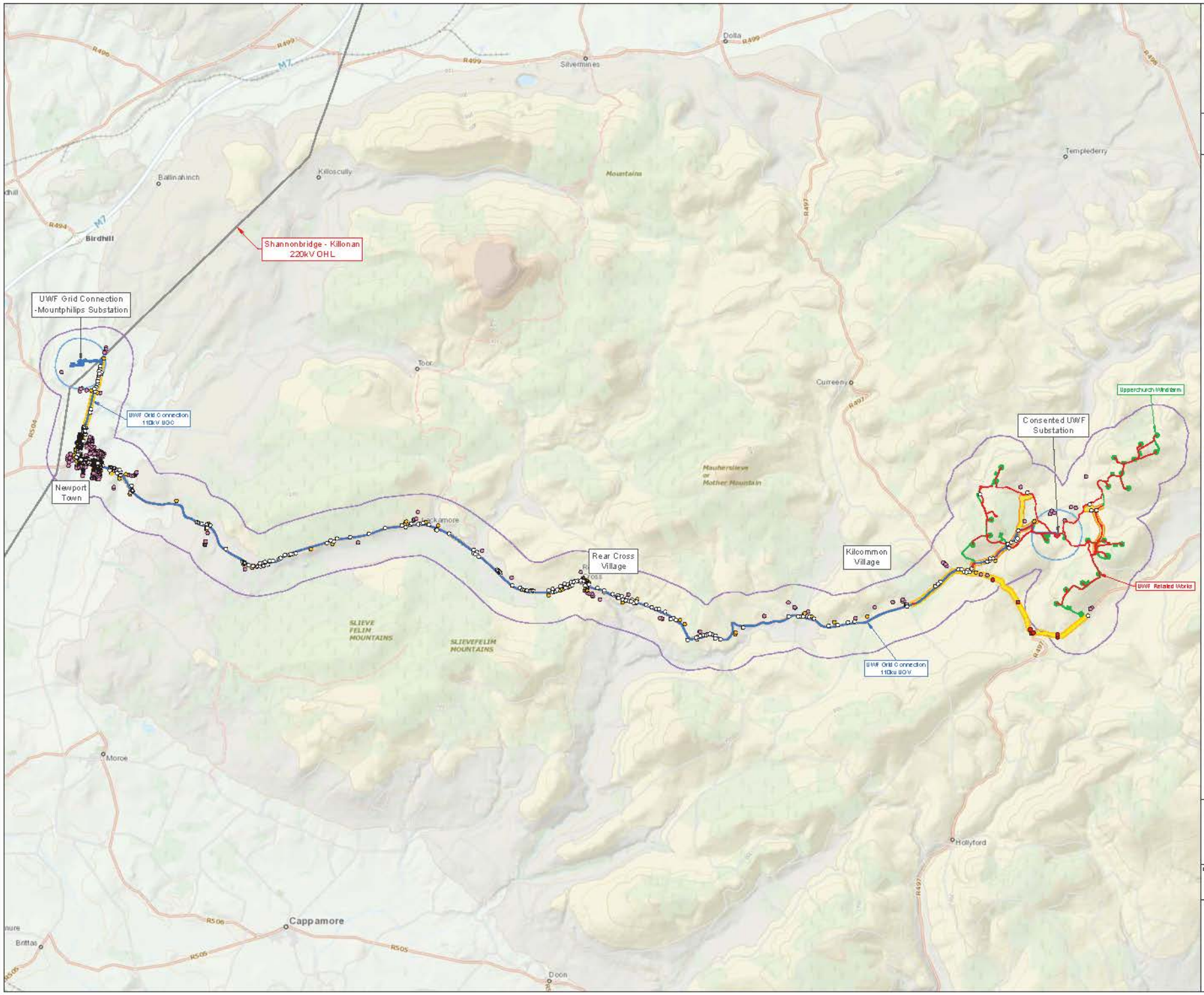

Title:
Figure WP 12.2.1

Local Reisdents & Community (Dust, Noise) within the Whole Project Cumulative Evaluation Study Area

Map Number:
1 of 1

Legend:

Study Area:

- UWF Grid Connection Construction Works Area
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- **Air Quality,Noise & Vibration:** 700m Study Area from all of the Construction Works Areas
- **Air Quality,Noise & Vibration:** 500m Study Area from Substations
- **Air Quality,Noise & Vibration:** 50m from the Haul Route Roads
- Haul Route Roads

Survey Results:

- Shannonbridge - Killonan 220kV OHL
- **Air Quality:** Houses 50m from Local Haul Roads
- **Air Quality:** Houses within 50m of all Construction Works Areas
- **Air Quality:** Houses between 51m and 100m of all Construction Works Areas
- **Air Quality:** Houses between 101m and 350m of all Construction Works Areas

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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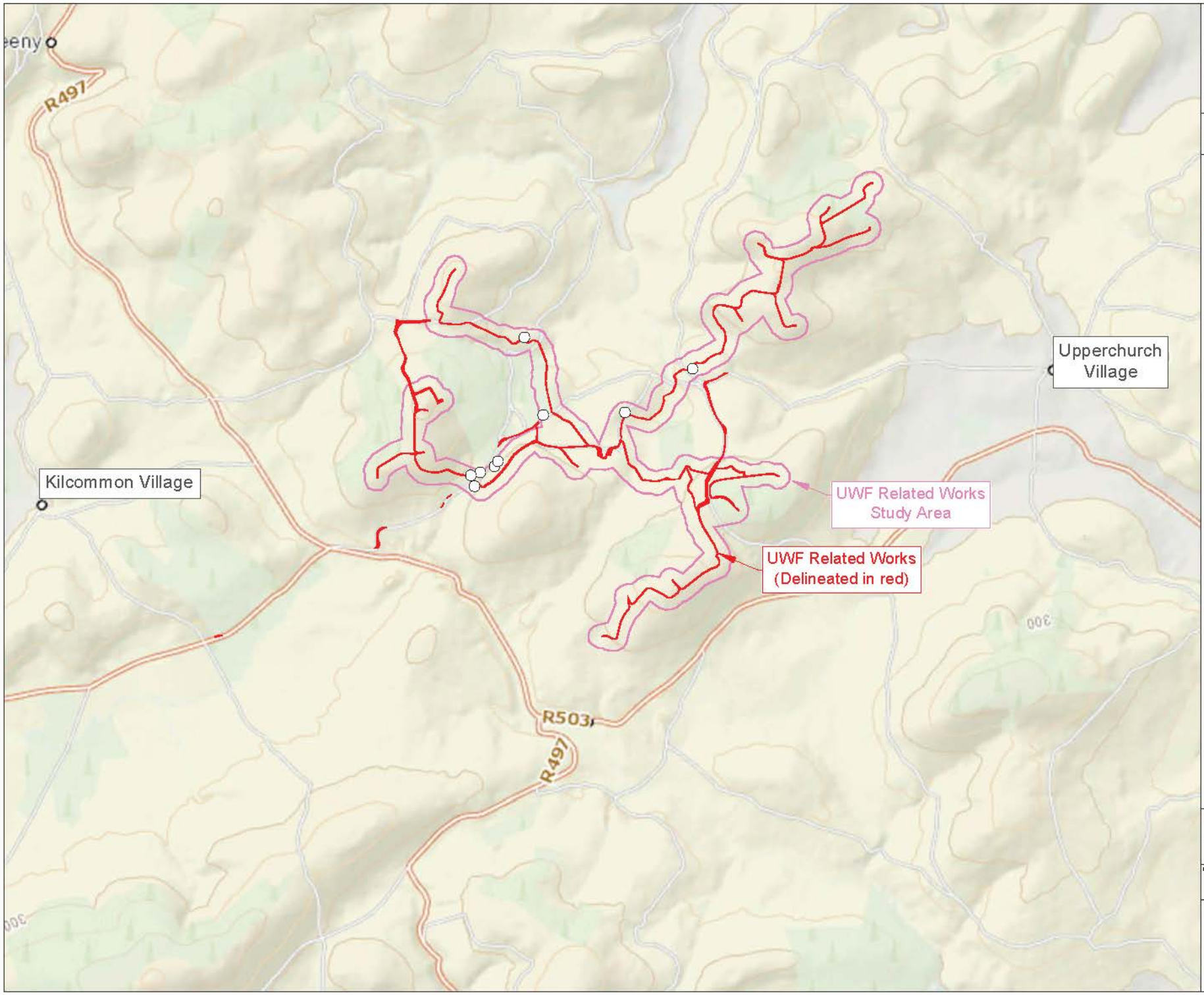

Title:
Figure RW 12.2.2

Local Residents & Community (EMF) within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Extents:

- UWF Related Works Construction Works Area
- **EMF:** 100m Study Area
  - Internal Windfarm Cabling

Survey Results:

- **EMF:** Houses within the 100m Study Area

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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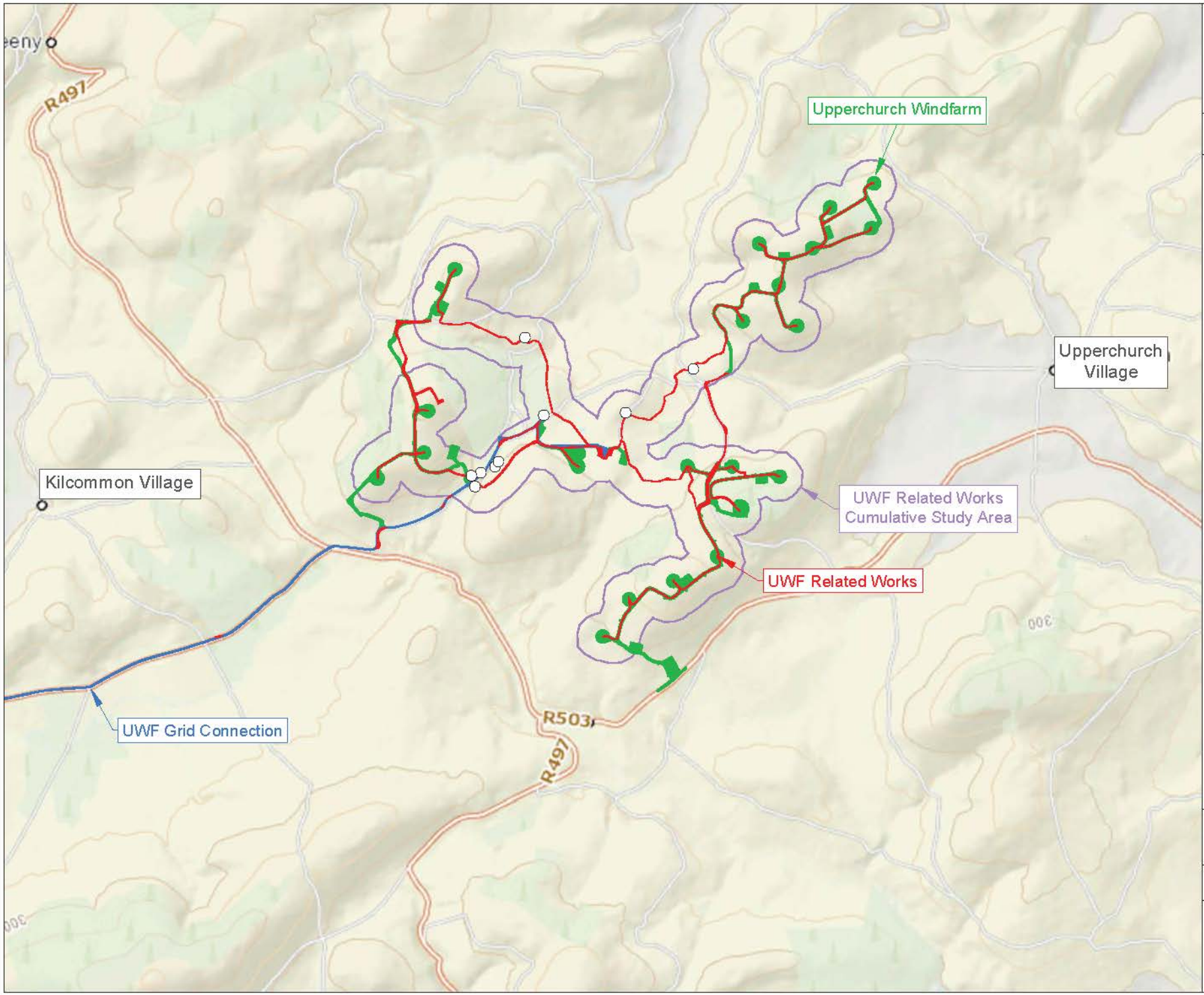

Title:
Figure CE 12.2.2

Local Residents & Community (EMF) within the UWF Related Works Cumulative Study Area

Map Number:
Map 1 of 1

Legend:

Study Extents:

- UWF Related Works Construction Works Area
- **EMF:** 200m Study Area
  - Internal Windfarm Cabling

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results:

- **EMF:** Houses within 100m of Internal Windfarm Cabling

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
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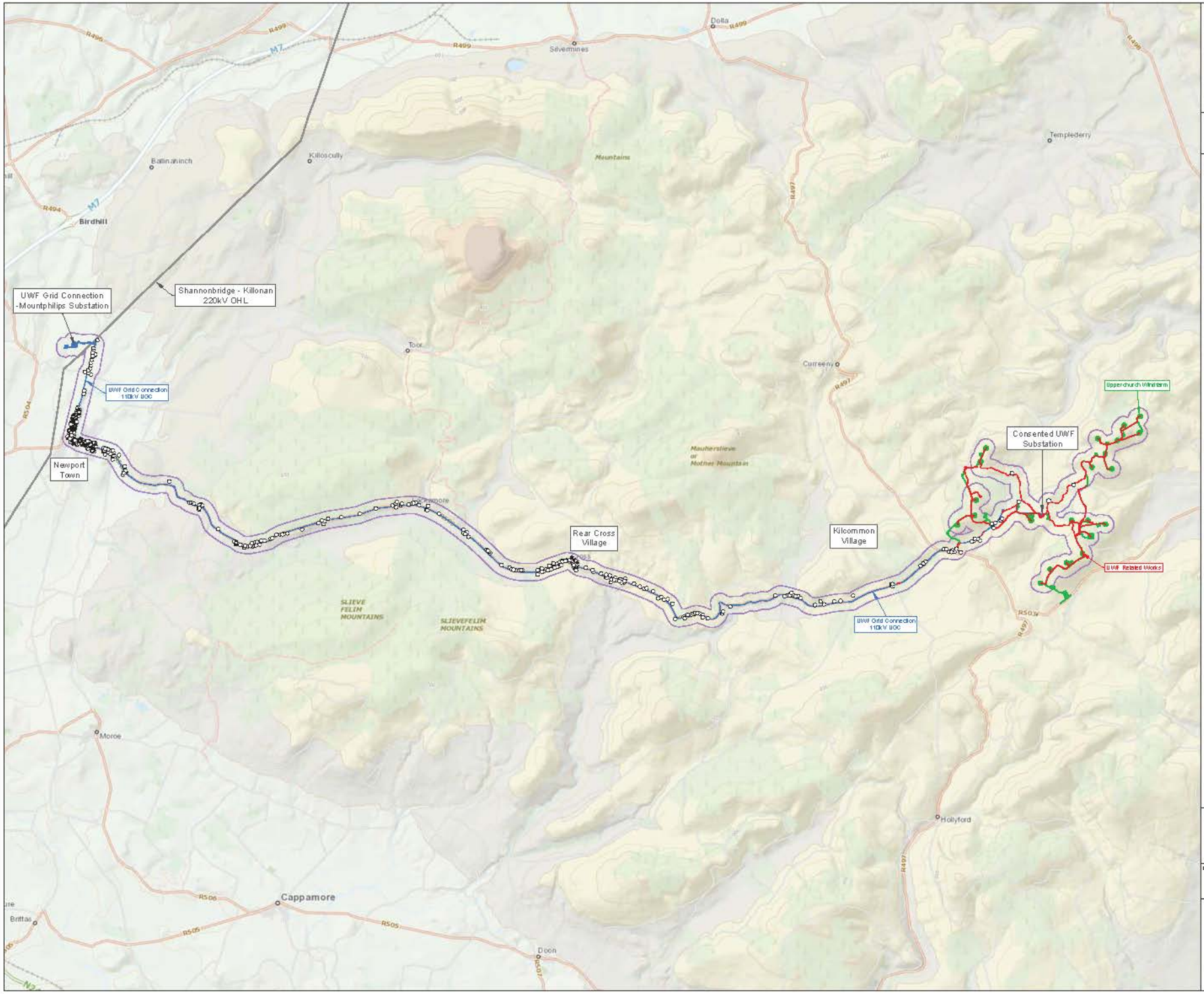

Title:

Figure WP 12.2.2

Local Reisdents & Community (EMF) within the Whole Project Cumulative Evaluation Study Area

Map Number:
1 of 1

Legend:

Study Area:

- UWF Grid Connection Construction Works Area
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- **EMF:** 200m Study Area
  - Mountphilips Substation
  - UWF Grid Connecion
  - Internal Windfarm Cabling
  - Consented Upperchurch Turbines
  - Consented Upperchurch Substation

Survey Results:

- Shannonbridge - Killonan 220kV OHL
- **EMF:** Houses within the 100m of
  - Mountphilips Substation
  - UWF Grid Connecion
  - Internal Windfarm Cabling
  - Consented Upperchurch Turbines
  - Consented Upperchurch Substation

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Project:
UWF Related Works (RW)

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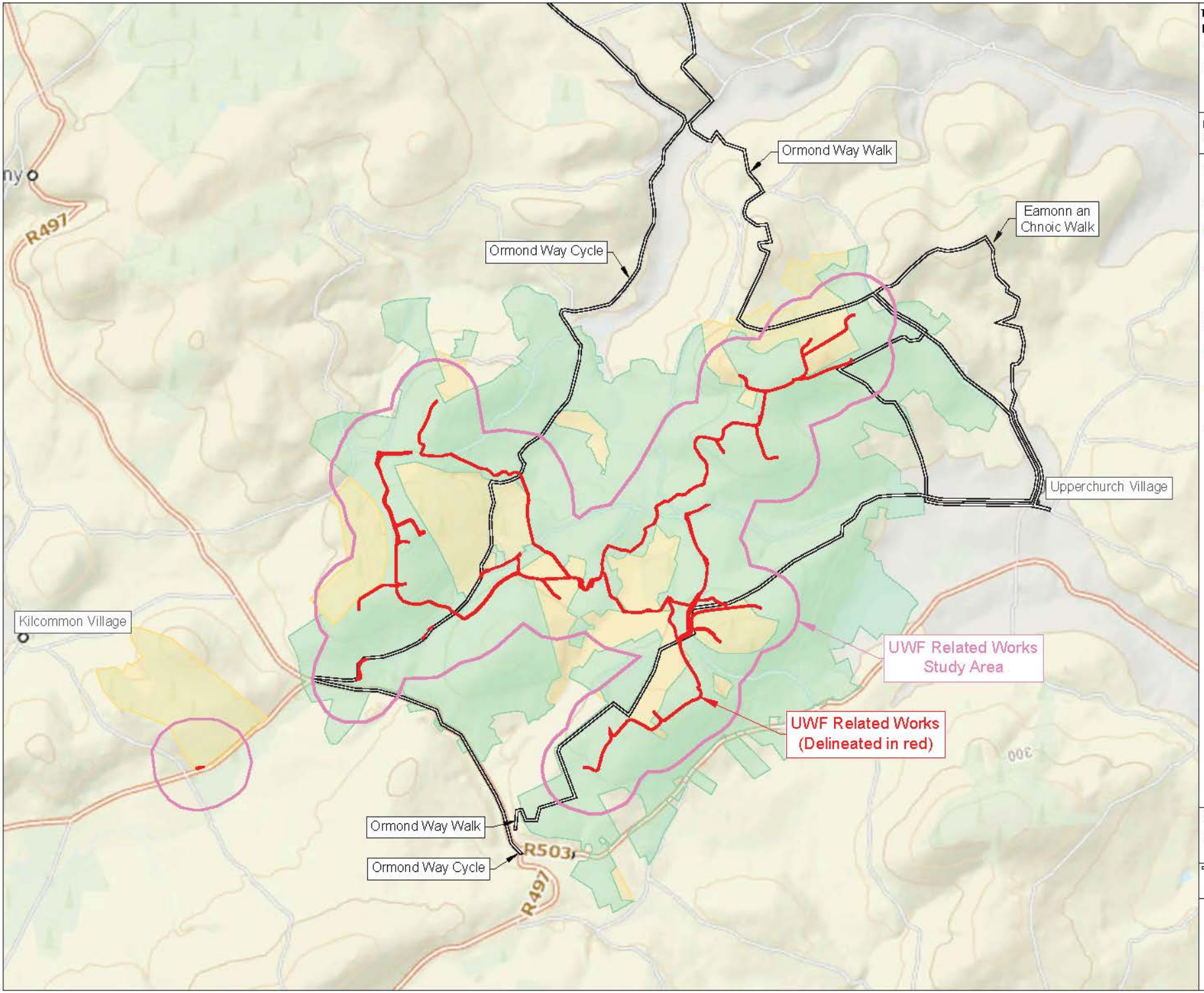

Title:

Figure RW 12.3

Transient People within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area:

- UWF Related Works Construction Works Area
- **Air Quality, Noise & Vibration:** 350m Study Area from the Construction Works Area

Survey Results:

- **Air Quality, Noise & Vibration:** Landholding - Agricultural Land
- **Air Quality, Noise & Vibration:** Landholding - Forestry
- **Air Quality, Noise & Vibration:** Walking/Cycling Trails

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
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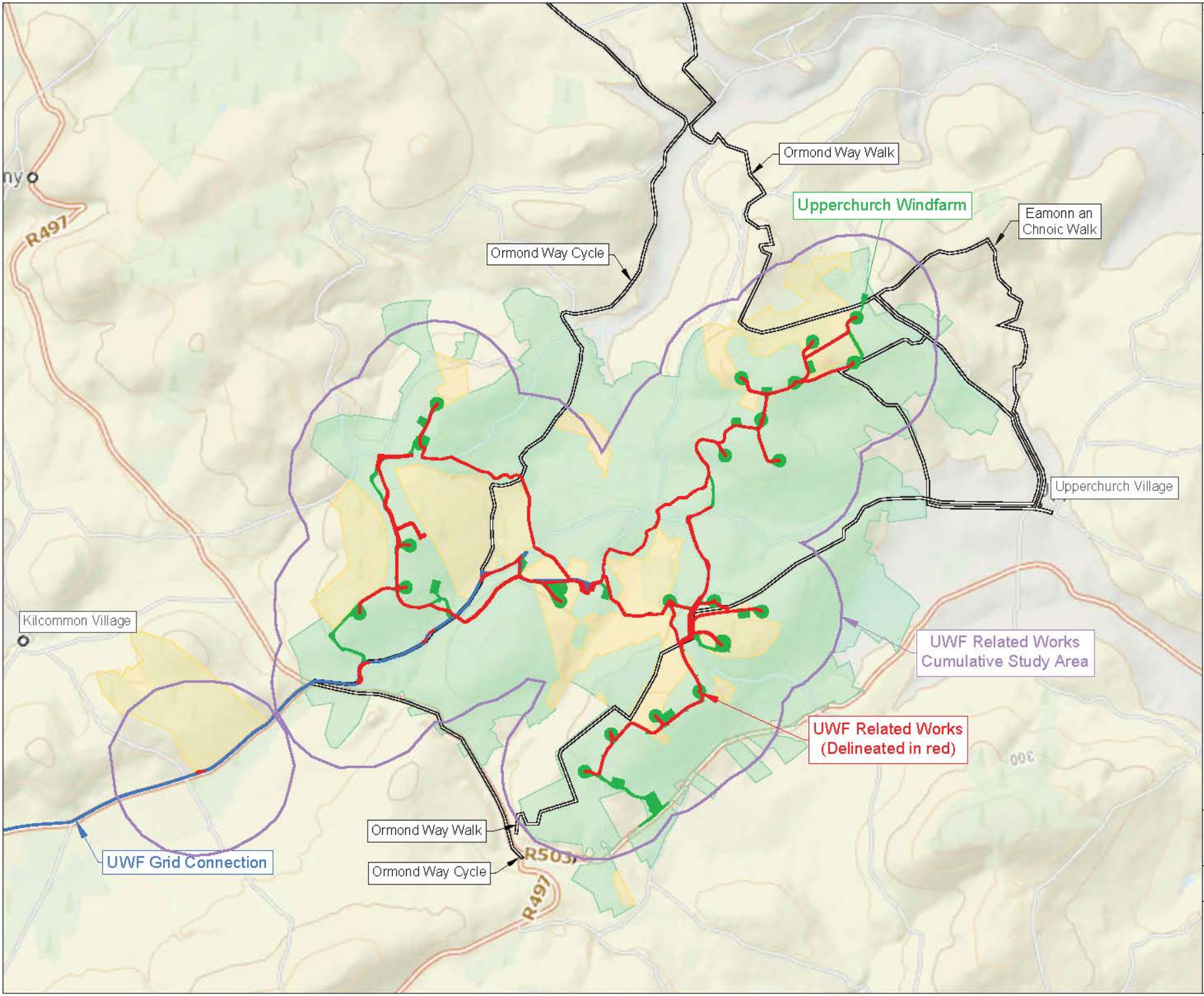

Title:
Figure CE 12.3

Transient People within the UWF Related Works Cumulative Study Area

Map Number:
Map 1 of 1

Legend:

Study Area:

- UWF Related Works Construction Works Area
- **Air Quality, Noise & Vibration:** 700m Study Area from the Construction Works Area

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results:

- **Air Quality, Noise & Vibration:** Landholding - Agricultural Land
- **Air Quality, Noise & Vibration:** Landholding - Forestry
- **Air Quality, Noise & Vibration:** Walking/Cycling Trails

REFERENCE DOCUMENTS

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Project:
UWF Related Works (RW)

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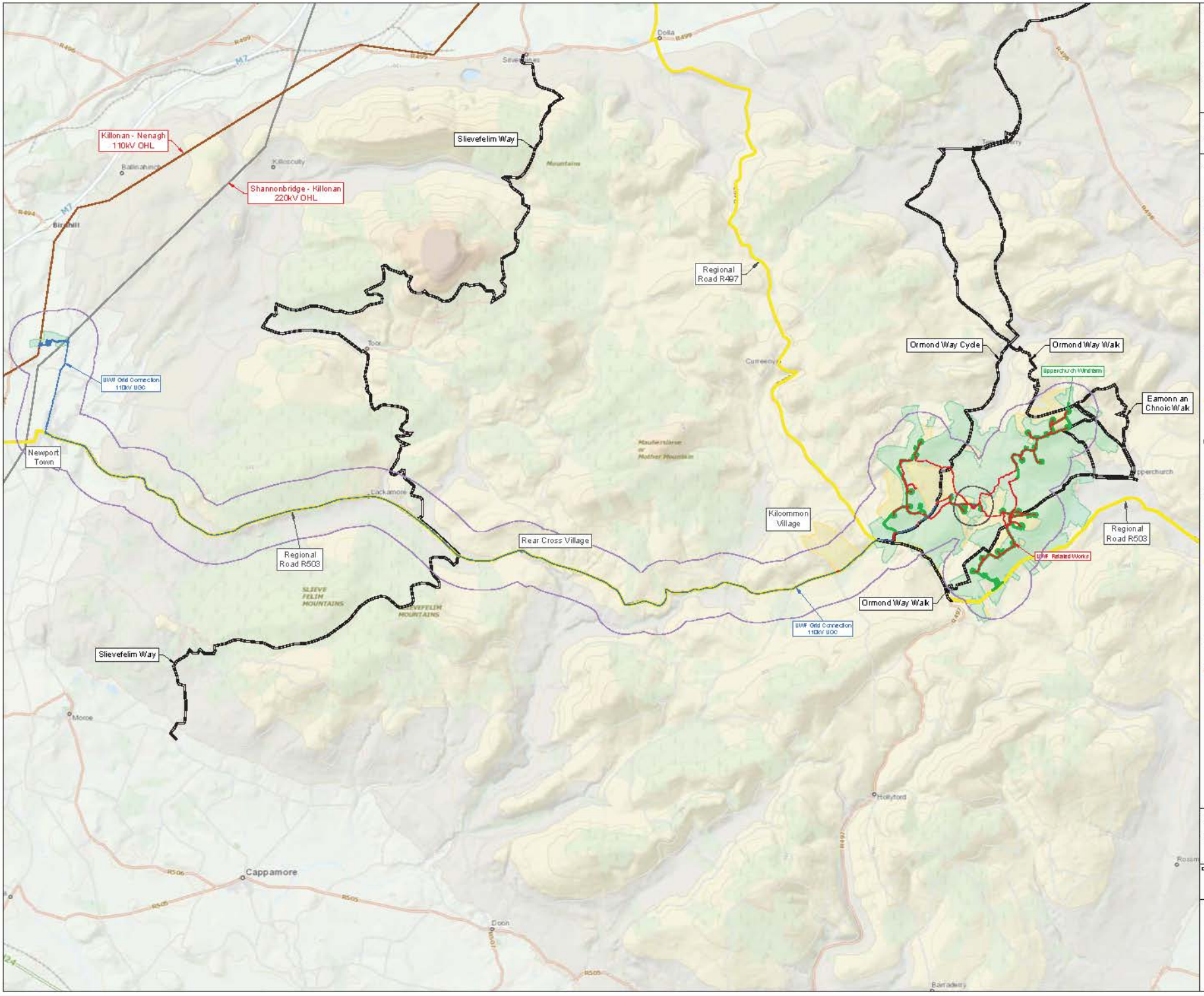

Title:

Figure WP 12.3

Transient People within the Whole Project Cumulative Evaluation Study Area

Map Number:
1 of 1

Legend:

Study Area:

- UWF Grid Connection Construction Works Area
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- **Air Quality, Noise & Vibration:** 700m Study Area from all of the Construction Works Areas
- **Air Quality, Noise & Vibration:** Regional Roads
- **Operational Stage Noise:** 400m Study Area
  - Consented Upperchurch Substation

Survey Results:

- **Air Quality, Noise & Vibration:** Landholding - Agricultural Land
- **Air Quality, Noise & Vibration:** Landholding - Forestry
- **Air Quality, Noise & Vibration:** Walking/Cycling Trails
- Shannonbridge - Killonan 220kV OHL
- Killonan - Nenagh 110kV OHL

N

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Project:
UWF Related Works (RW)

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AB	JB	January 19	A3

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Figures for Chapter 13: Climate	Tab 13 (printed version)
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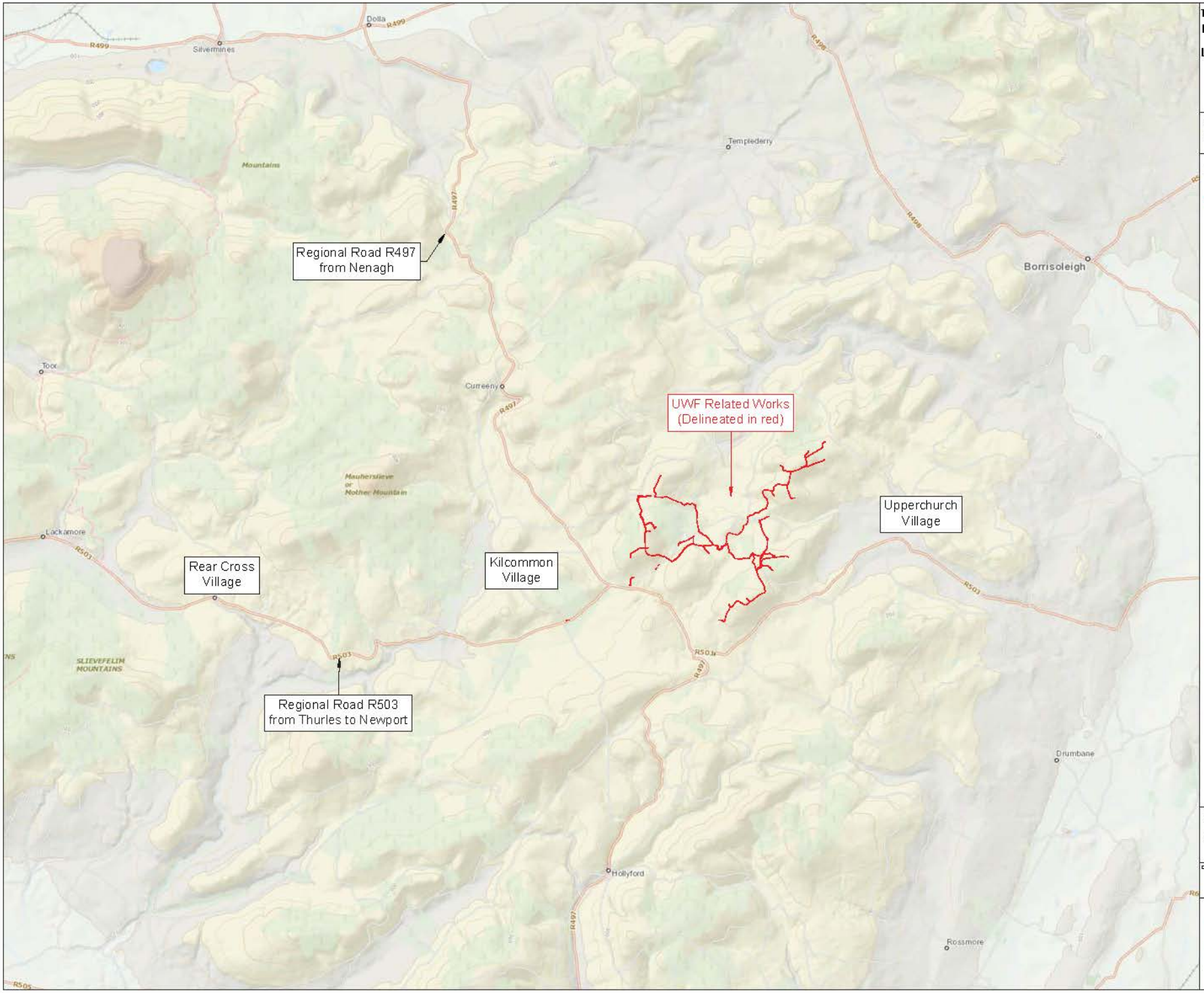

Title:

Figure RW 14.1

Location of the **UWF** Related Works

Map Number:
Map 1 of 1

Legend:

UWF Related Works Construction Works Area

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn by:	Checked by:	Date:	Size / Scale:
AB	JB	January 19	A3

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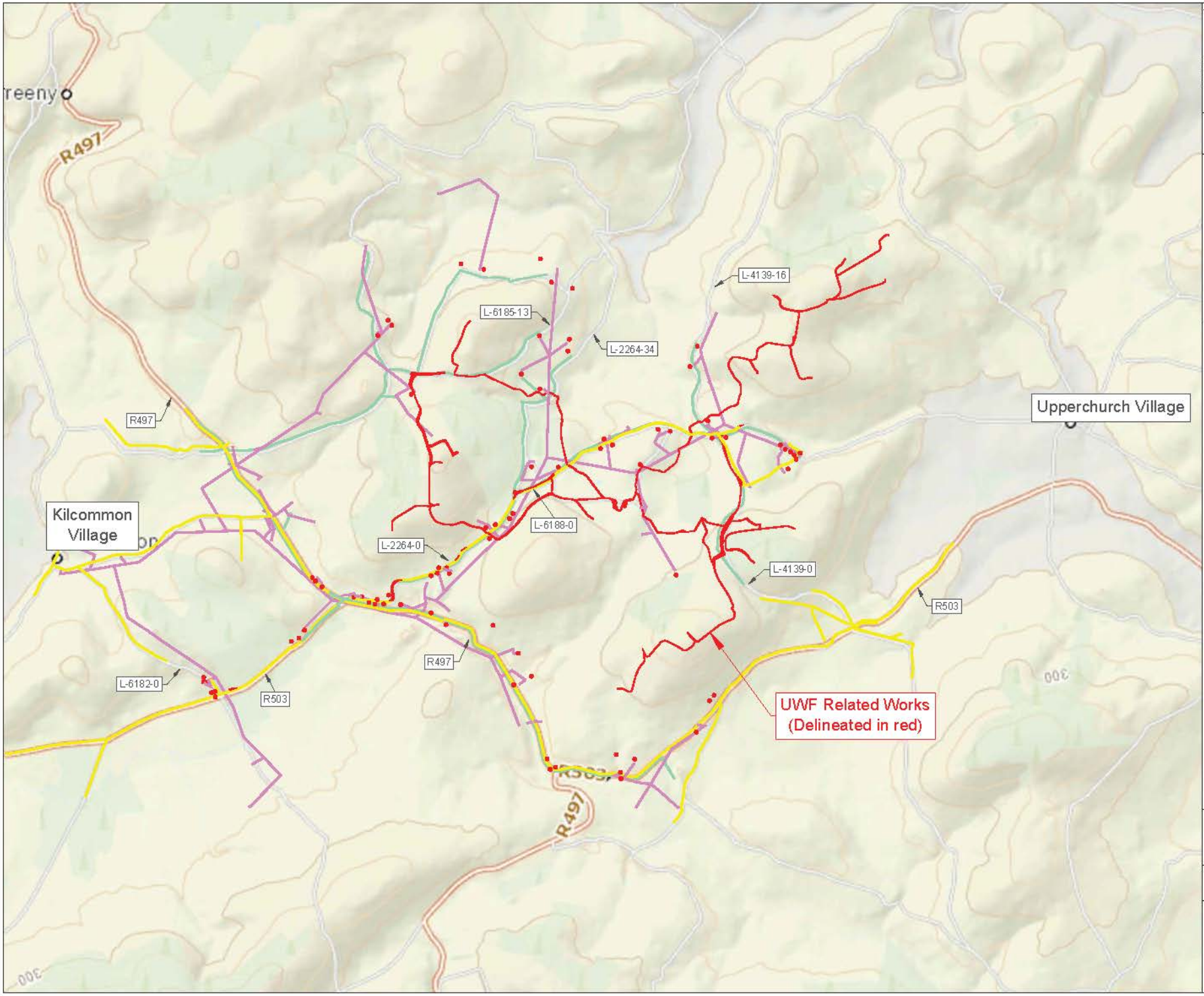

Title:

Figure RW 14.2

Local Residents & Community (Built Services) within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area with 7m Buffer
- Irish Water Line
- Eir Network Overhead Line
- ESB Networks Overhead Line
- L-6188-0 Road Number

Survey Results:

- Built Service Users

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
AB	JB	January 19	A3

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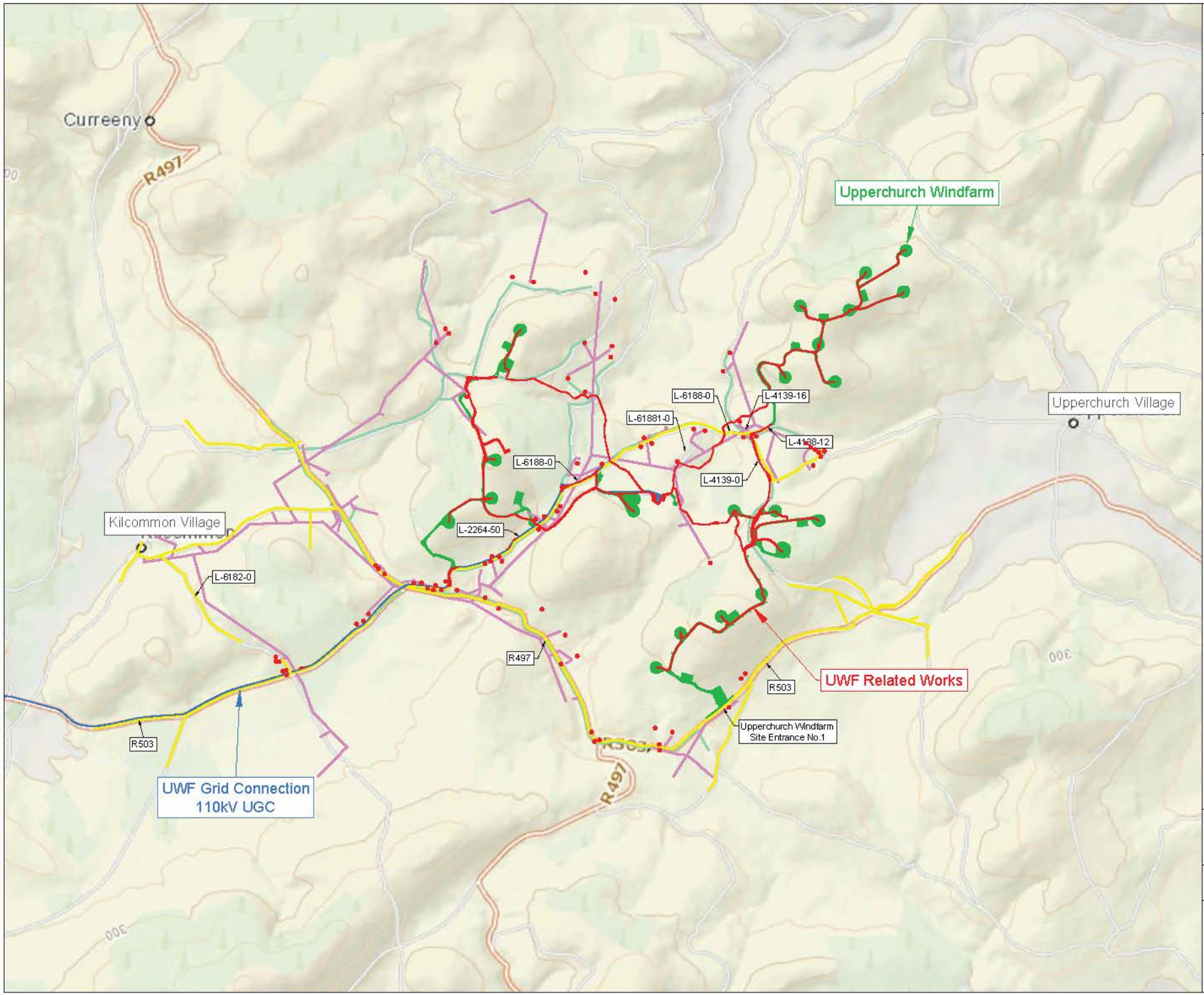

Title:

Figure CE 14.2

Local Residents & Community (Built Services) within the Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area with 7m buffer
- Irish Water Line
- Eir Network
- ESB Networks

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results:

- Built Service Users

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
AB	JB	January 19	A3

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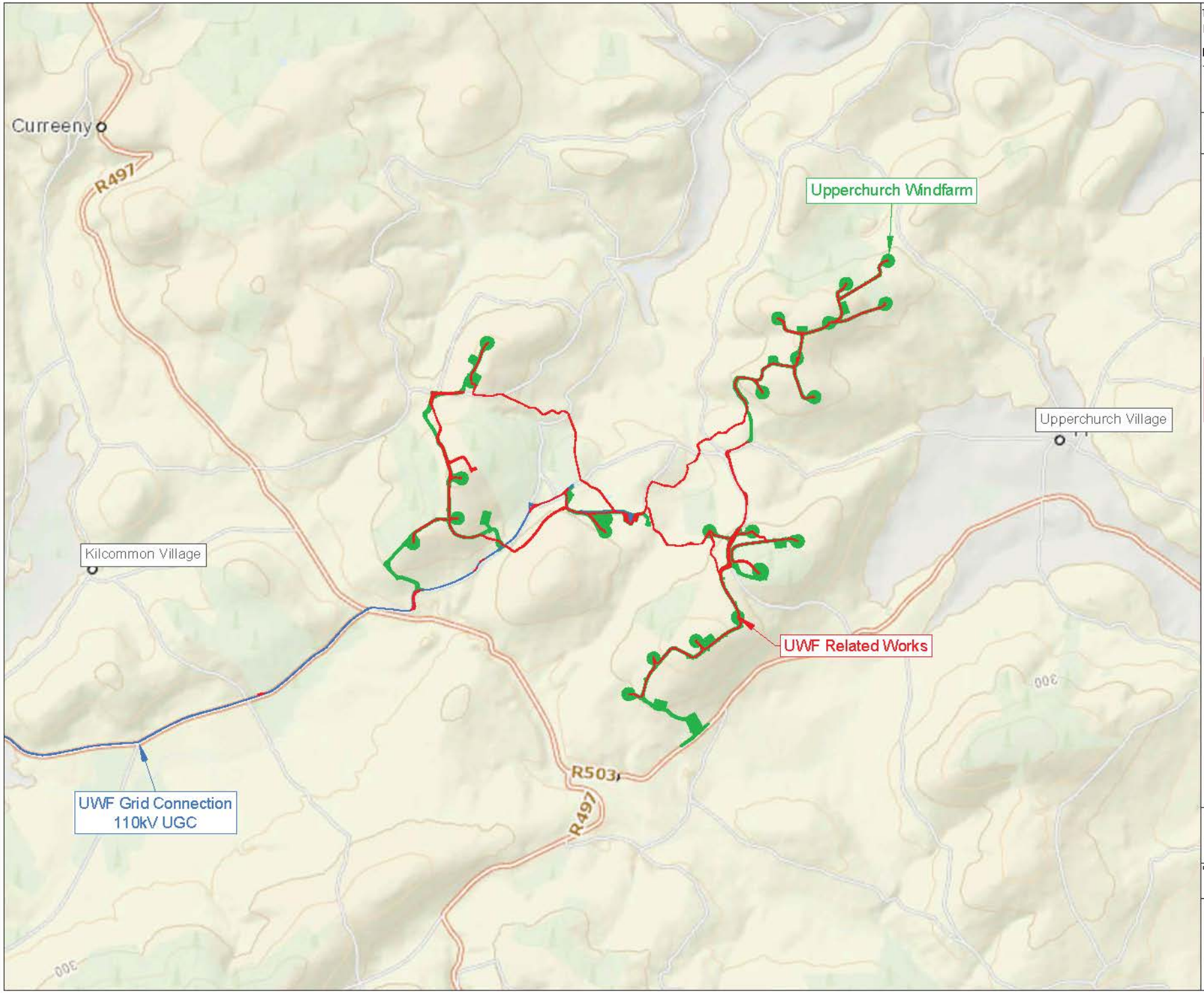

Title:

Figure CE 14.3

Electricity Transmission System within the Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results:

Within the UWF Related Works Cumulative Evaluation Study Area there were no record of any Electricity Transmission Systems

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
AB	JB	January 19	A3

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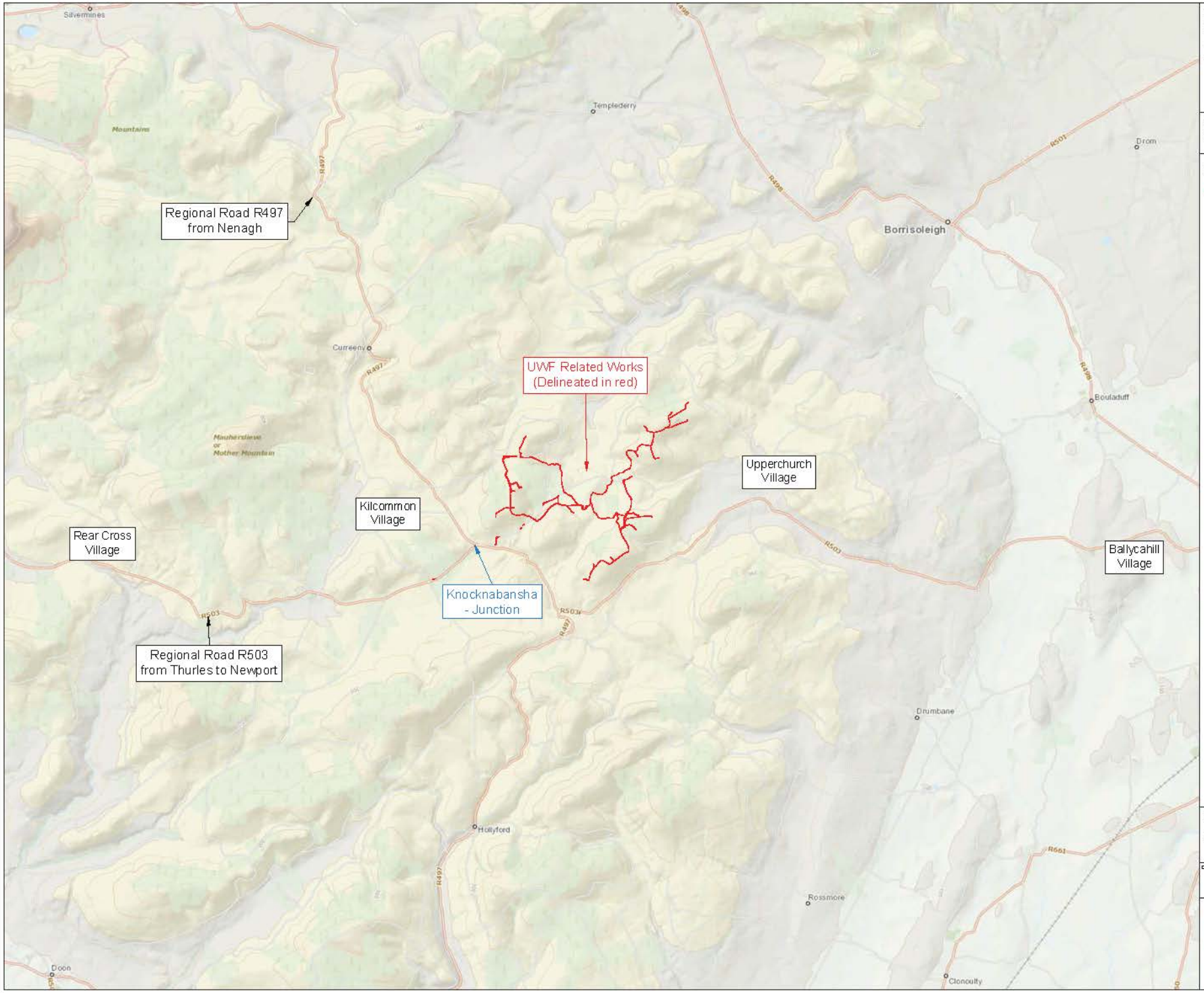

Title:

Figure RW 15.1

Location of the UWF Related Works

Map Number:
1 of 1

Legend:

UWF Related Works
- -Realigned Windfarm Roads
- -Internal Windfarm Cabling
- -Telecom Relay Pole
- -Haul Route Works

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
AB	JB	January 19	A3

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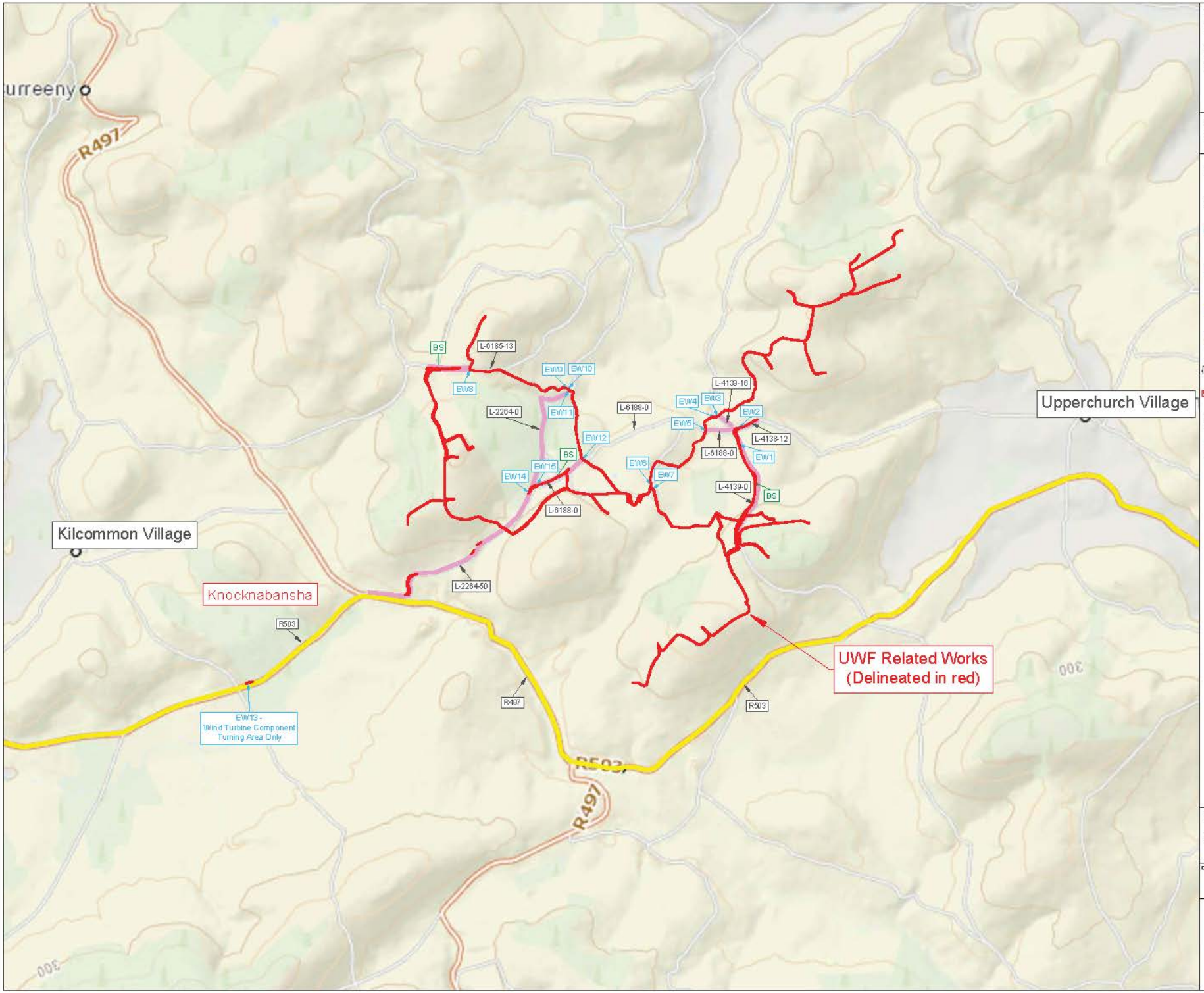

Title:

Figure RW 15.2

Public Roads within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- Public Roads - Local roads used to deliver construction materials
- Regional Roads
- Related Works Site Entrances
- Road Number
- Knocknabansha Townland

Survey Results:

- Buried Structures along the Haul Route

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
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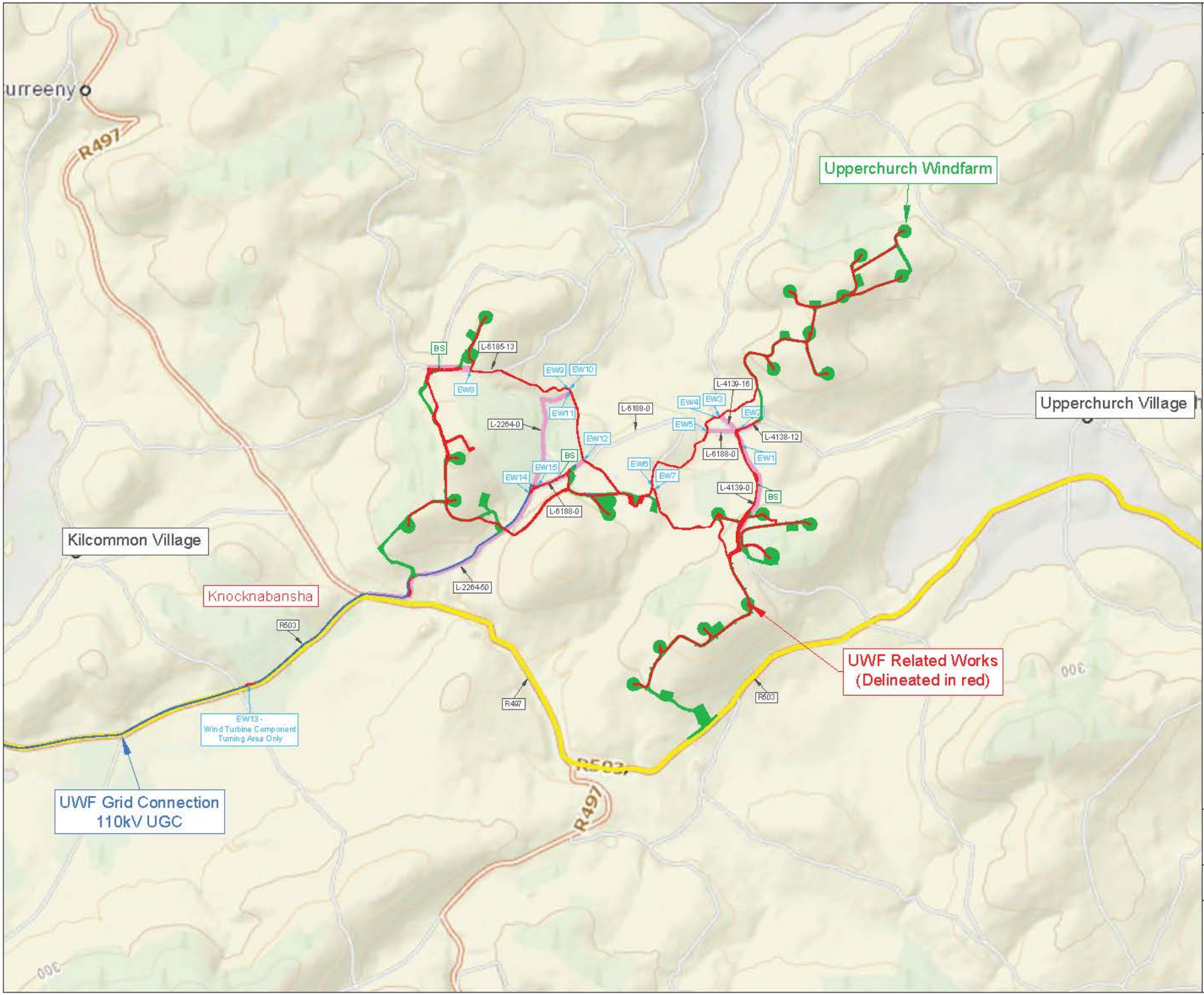

Title:
Figure CE 15.2

Public Roads within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- Public Roads - Local roads used to deliver construction materials
- Regional Roads
- Related Works Site Entrances
- Road Number
- Knocknabansha Townland

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results:

- Buried Structures along the Haul Route

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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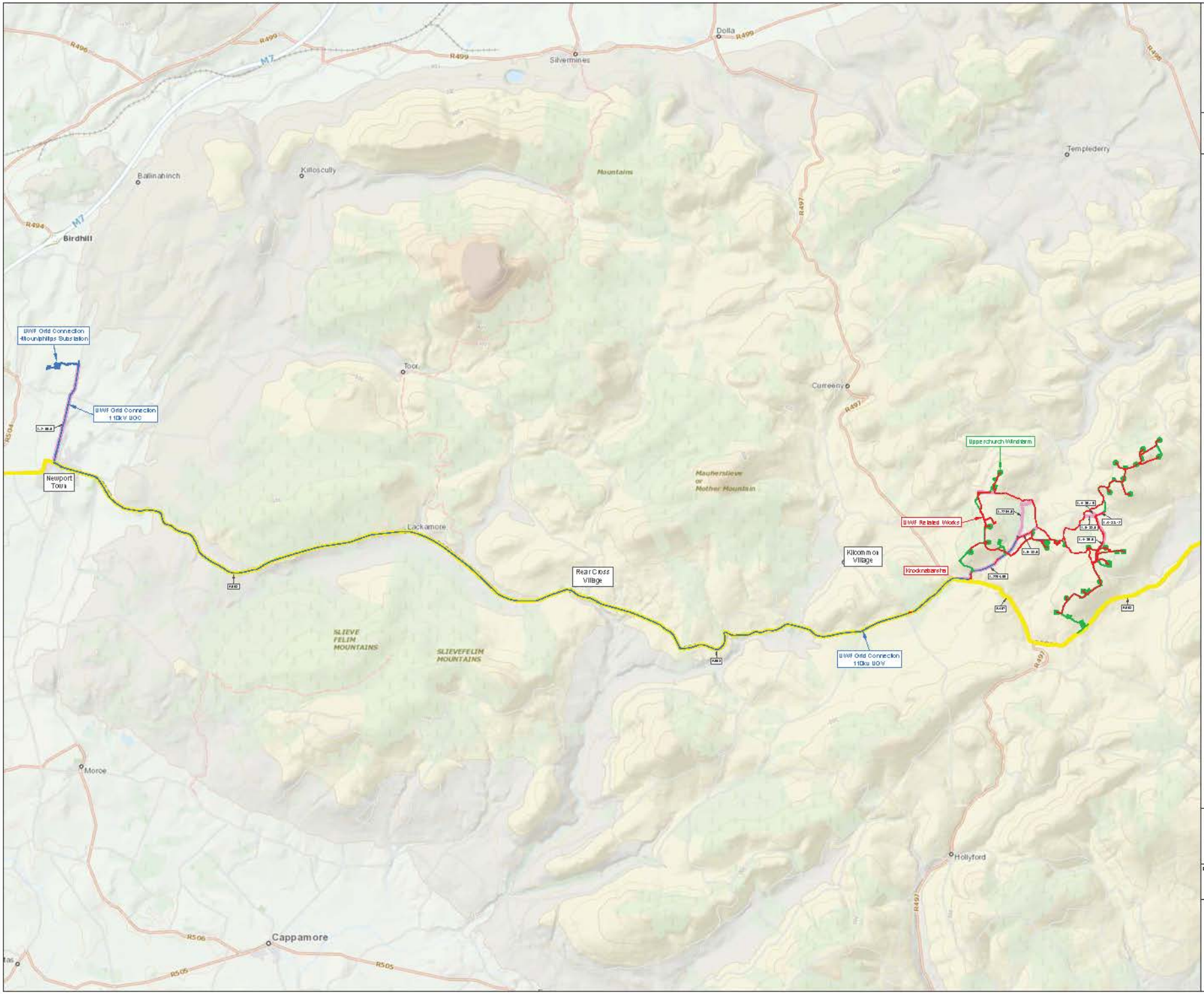

Title:

Figure WP 15.2

Public Roads within the Whole Project Cumulative Evaluation Study Area

Map Number:
1 of 1

Legend:

Study Area Extents:

- UWF Grid Connection Construction Works Area
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- Public Roads - Local roads used to deliver construction materials
- Regional Roads
- Road Number

REFERENCE DOCUMENTS

N

Project:

UWF Related Works (RW)

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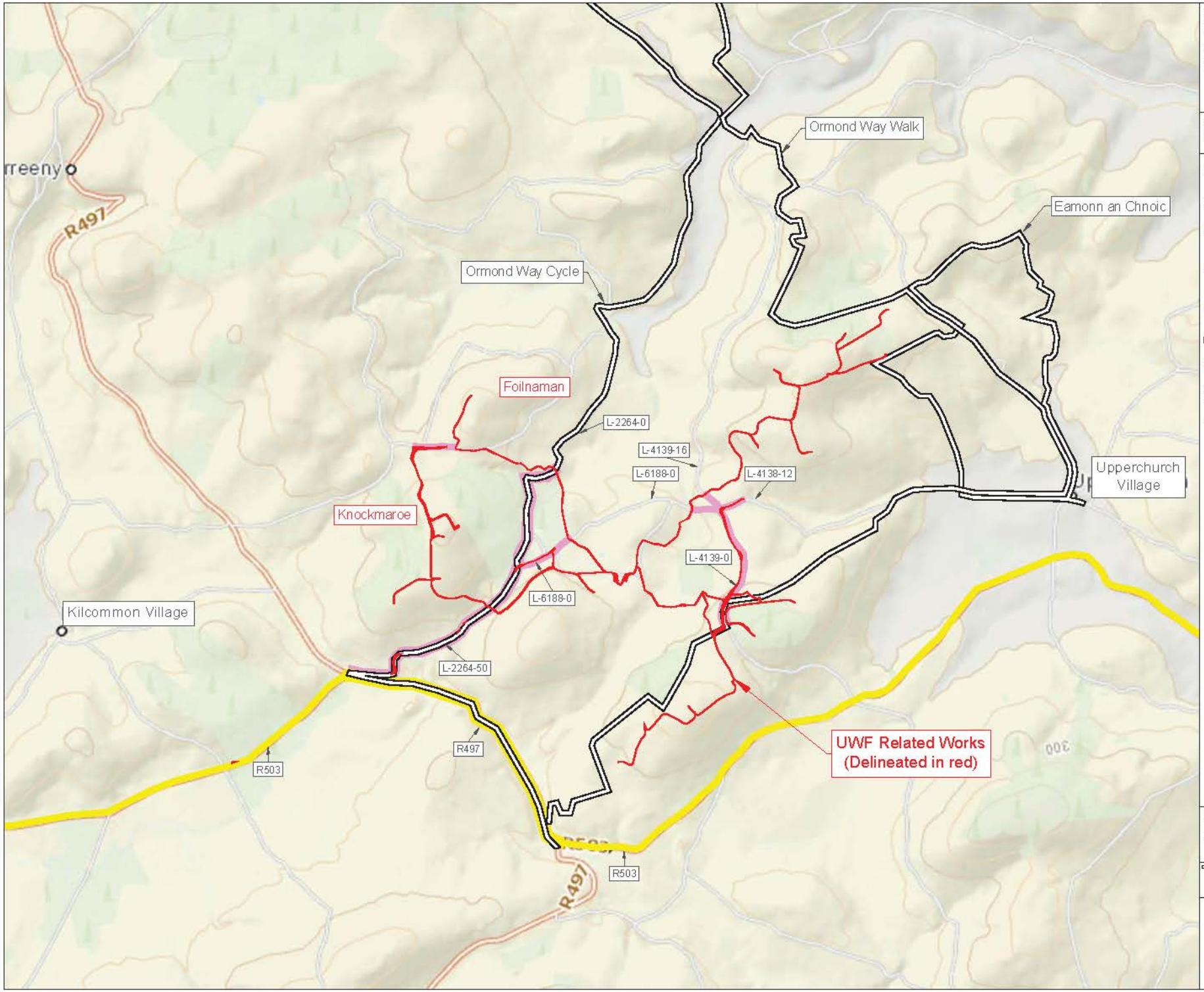

Title:
Figure RW 15.3

Road Users within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- Public Roads - Local roads used to deliver construction materials
- Regional Roads
- L-2264-50 Road Number
- Foilnaman Townlands

Survey Results:

- Walking and Cycling Trails

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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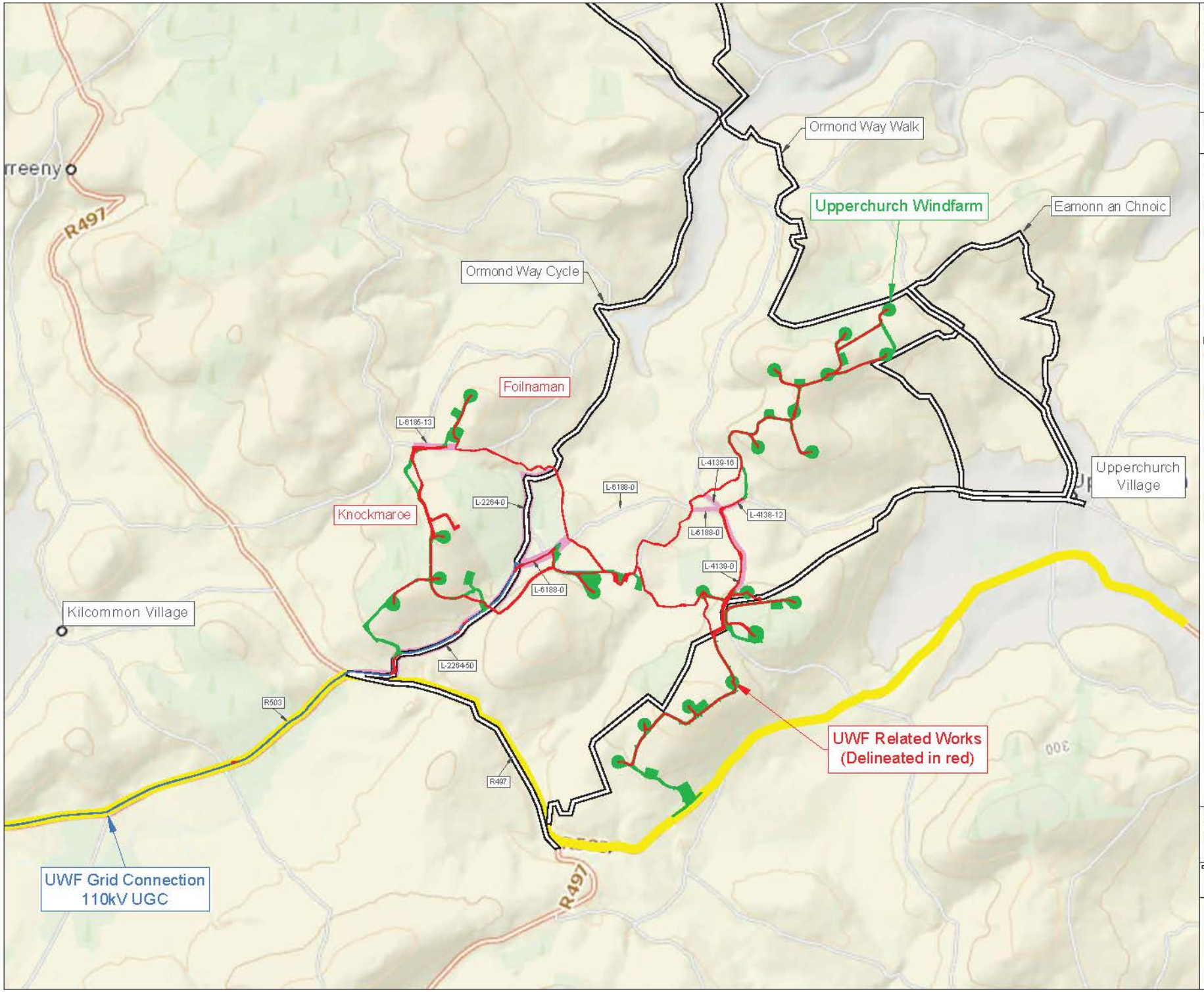

Title:
Figure CE 15.3

Road Users within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- Public Roads - Local roads used to deliver construction materials
- Regional Roads
- Road Number
- Townlands

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results:

- Walking and Cycling Trails

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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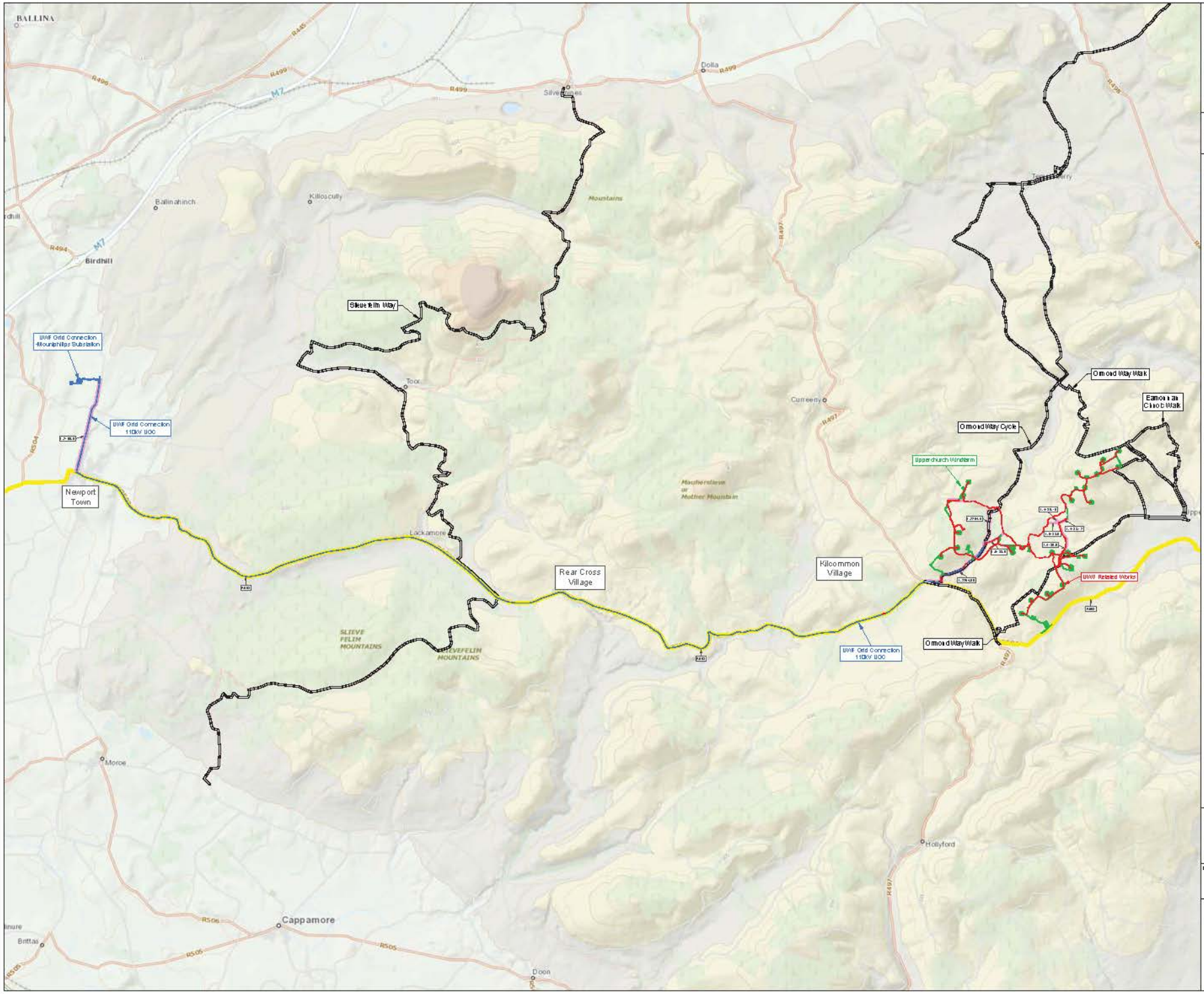

Title:

Figure WP 15.3

Road Users within the Whole Project Cumulative Evaluation Study Area

Map Number:
1 of 1

Legend:

Study Area Extents:

- UWF Grid Connection Construction Works Area
- UWF Related Works Construction Works Area
- Upperchurch Windfarm Construction Works Area
- Public Roads - Local roads used to deliver construction materials
- Regional Roads
- Road Number

Survey Results:

- Walking and Cycling Trails

REFERENCE DOCUMENTS

N

Project:

UWF Related Works (RW)

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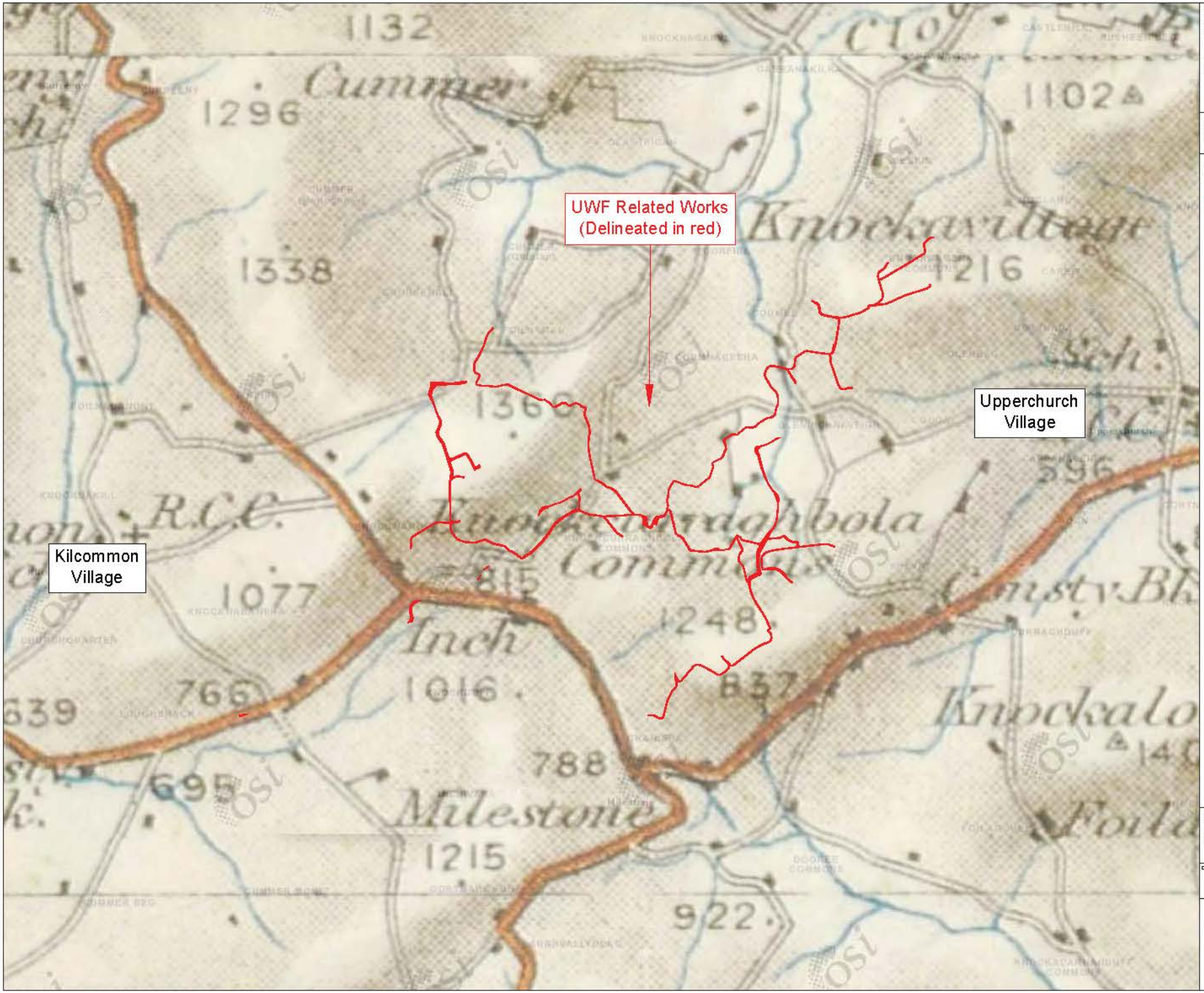

Title:
Figure RW 16.1

Location of the UWF Related Works on Historical Mapping

Map Number:
Map 1 of 1

Legend:

UWF Related Works
- -Realigned Windfarm Roads
- -Internal Windfarm Cabling
- -Telecom Relay Pole
- -Haul Route Works

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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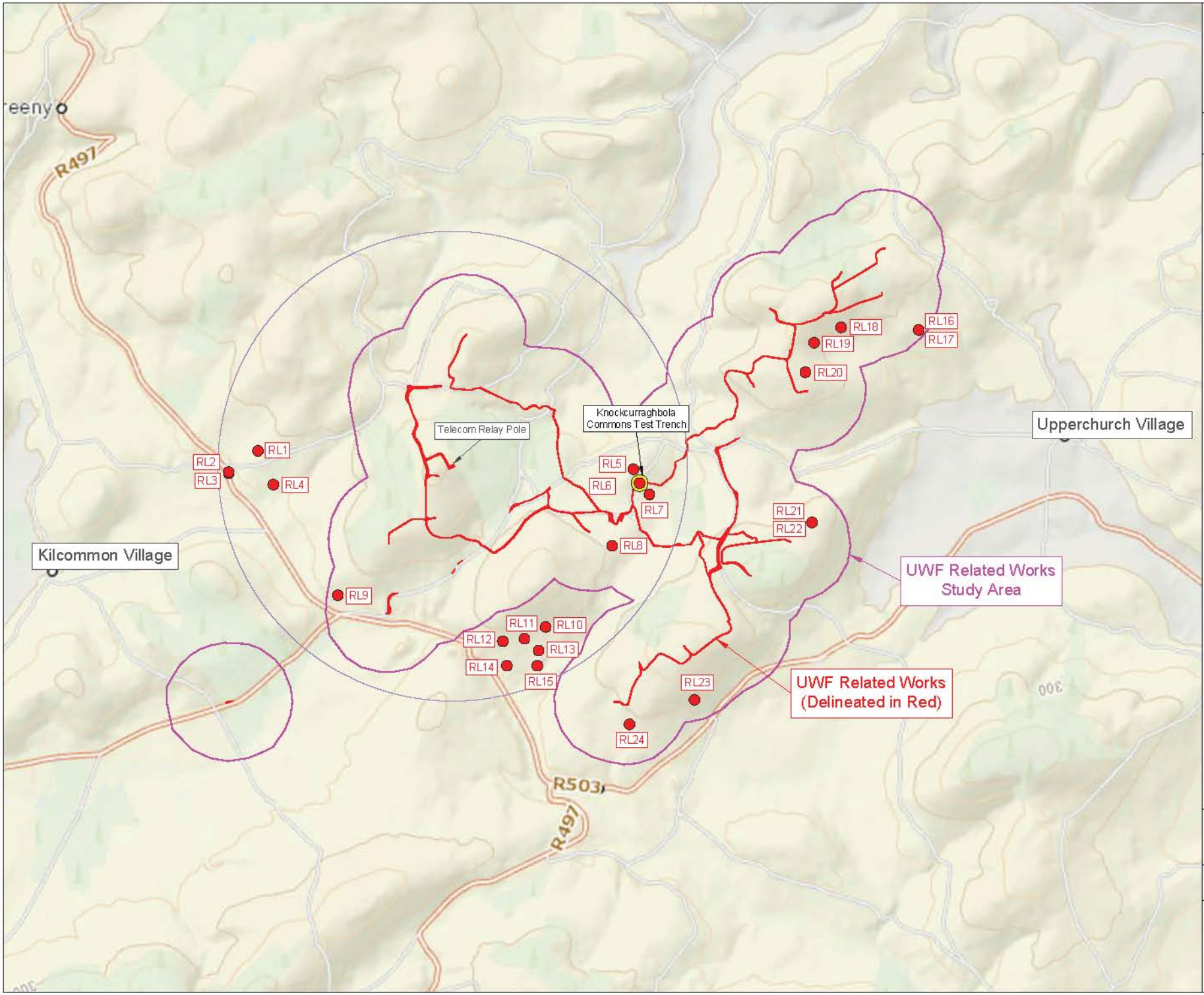

Title:

Figure RW 16.2

Recorded Legally Protected Sites within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 500m Study Area
  - UWF Related Works Construction Works Area
- 2km Study Area
  - Telecoms Relay Pole

Survey Results :

- Recorded Legally Protected Sites
- RL16 Recorded Legally Protected Sites Identification (Related Works)
- Location of Test Trench at RL6

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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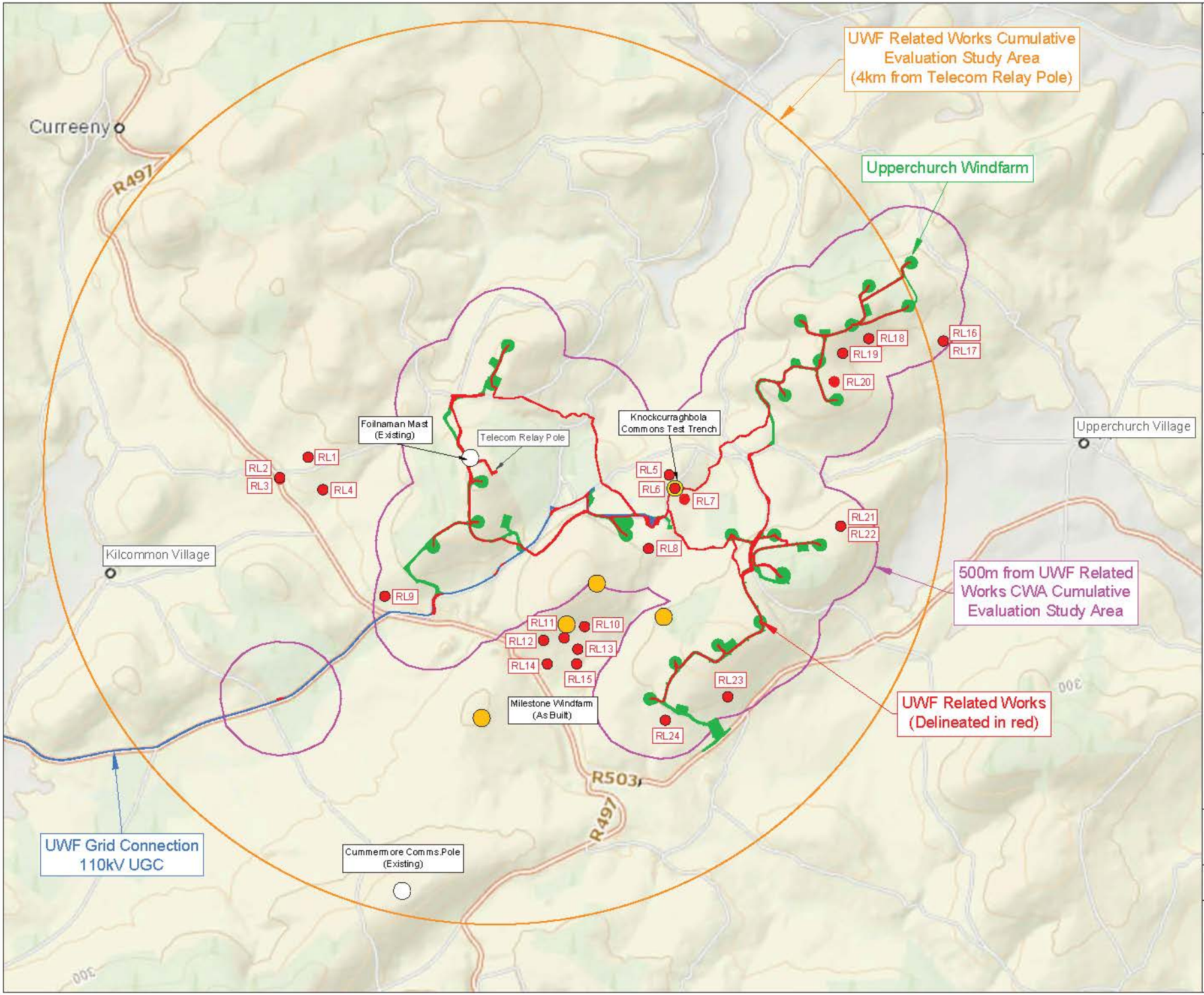

Title:

Figure CE 16.2

Recorded Legally Protected Sites within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 500m Study Area - UWF Related Works Construction Works Area
- 4km Study Area - Telecoms Relay Pole

Cumulative Projects :

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- Other existing and permitted projects/activity
- Milestone Windfarm turbines

Survey Results :

- Recorded Legally Protected Sites within either 500m of CWA or 2km of Telecom Relay Pole
- RL16 Recorded Legally Protected Sites Identification
- Location of Test Trench at RL6

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Sheet Size:
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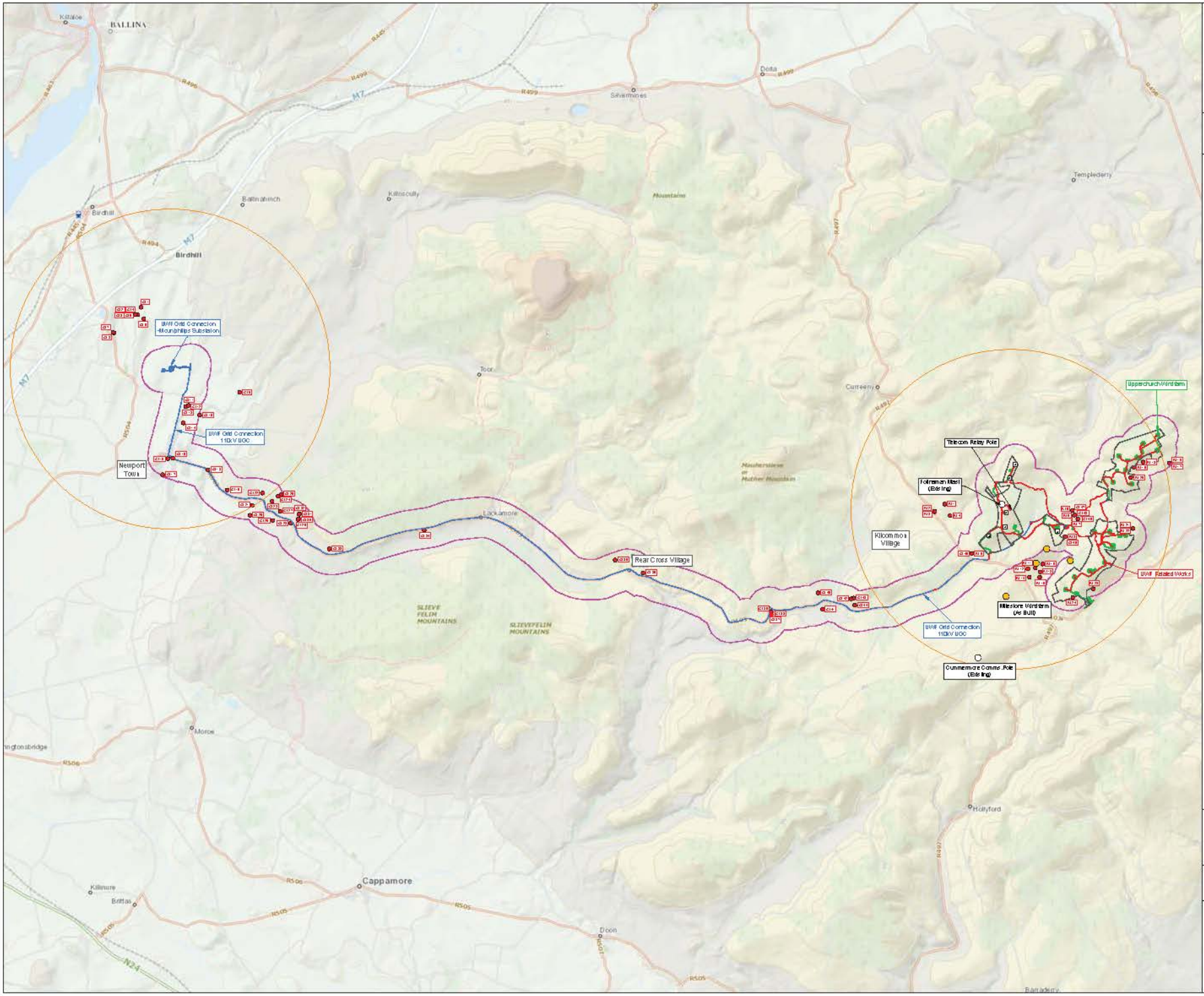

Title:

Figure WP 16.2

Recorded Legally Protected Sites within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works
- UWF Grid Connection
- Upperchurch Windfarm
- 500m Study Area
  - UWF Related Works
  - UWF Grid Connection
- Upperchurch Windfarm 2013 Study Area
- 4km Study Area
  - Mountphilips Substation
  - Telecoms Relay Pole

Survey Results :

- Other existing and permitted projects/activity
- Other project - Milestone Windfarm turbines
- Recorded Legally Protected Sites within either 500m pf CWA or 2km of Telecom Relay Pole
- R L16 Recorded Legally Protected Sites Identification (Related Works)
- GL1D Recorded Legally Protected Sites Identification (Grid Connection)
- Consented UWF Turbines within 2km of Telecoms Relay Pole

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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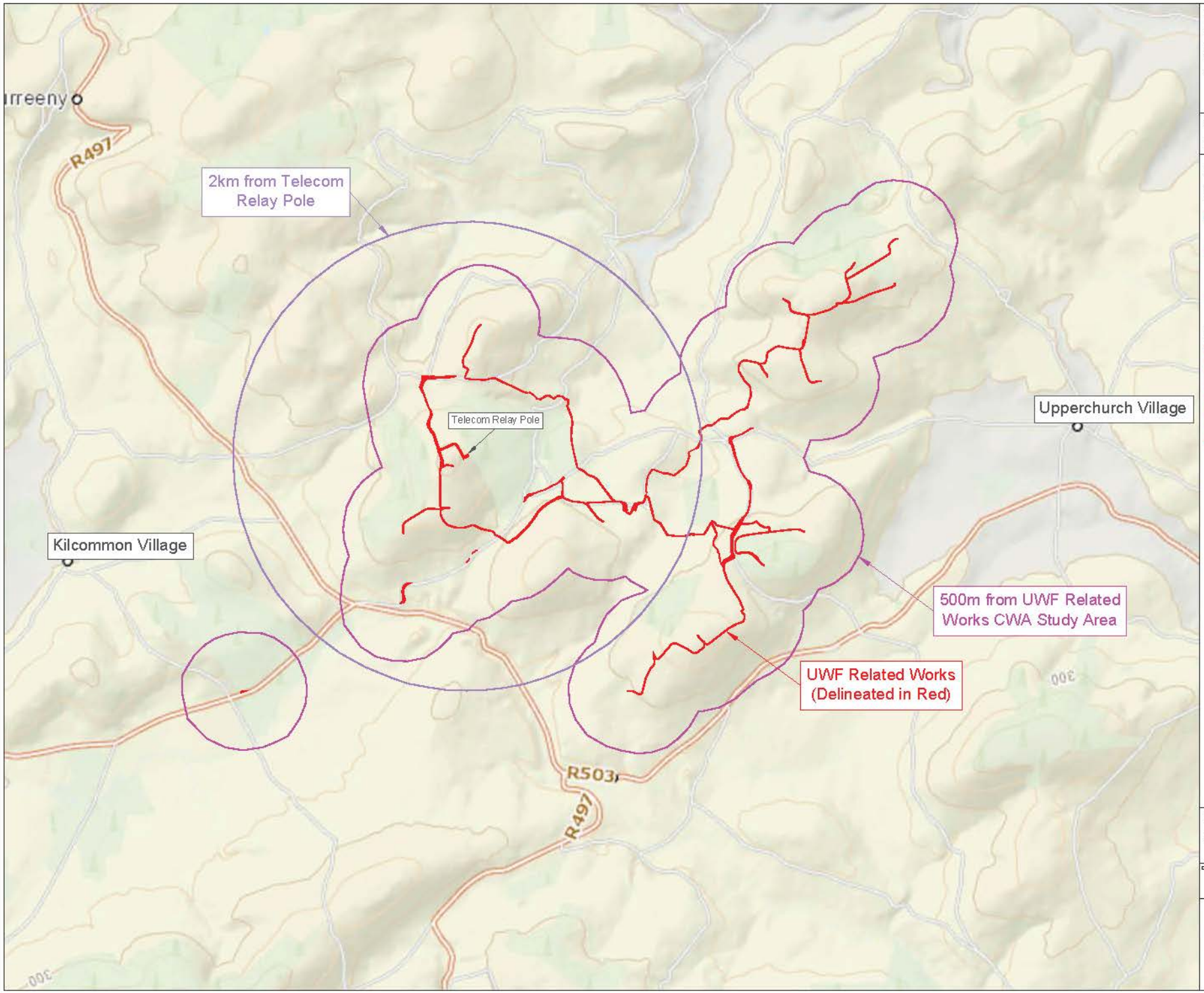

Title:
Figure RW 16.3

Other Recorded Sites within the UWF Related Works Study Area

Map Number:
Map Overview on OSI Mapping

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 500m Study Area
  - UWF Related Works Construction Works Area
- 2km Study Area
  - Telecoms Relay Pole

Survey Results :

Within the 500m Study Area of the UWF Related Works Construction Works Area and the 2km Study Area for the Telecoms Relay Pole there were no Other Recorded Sites recorded

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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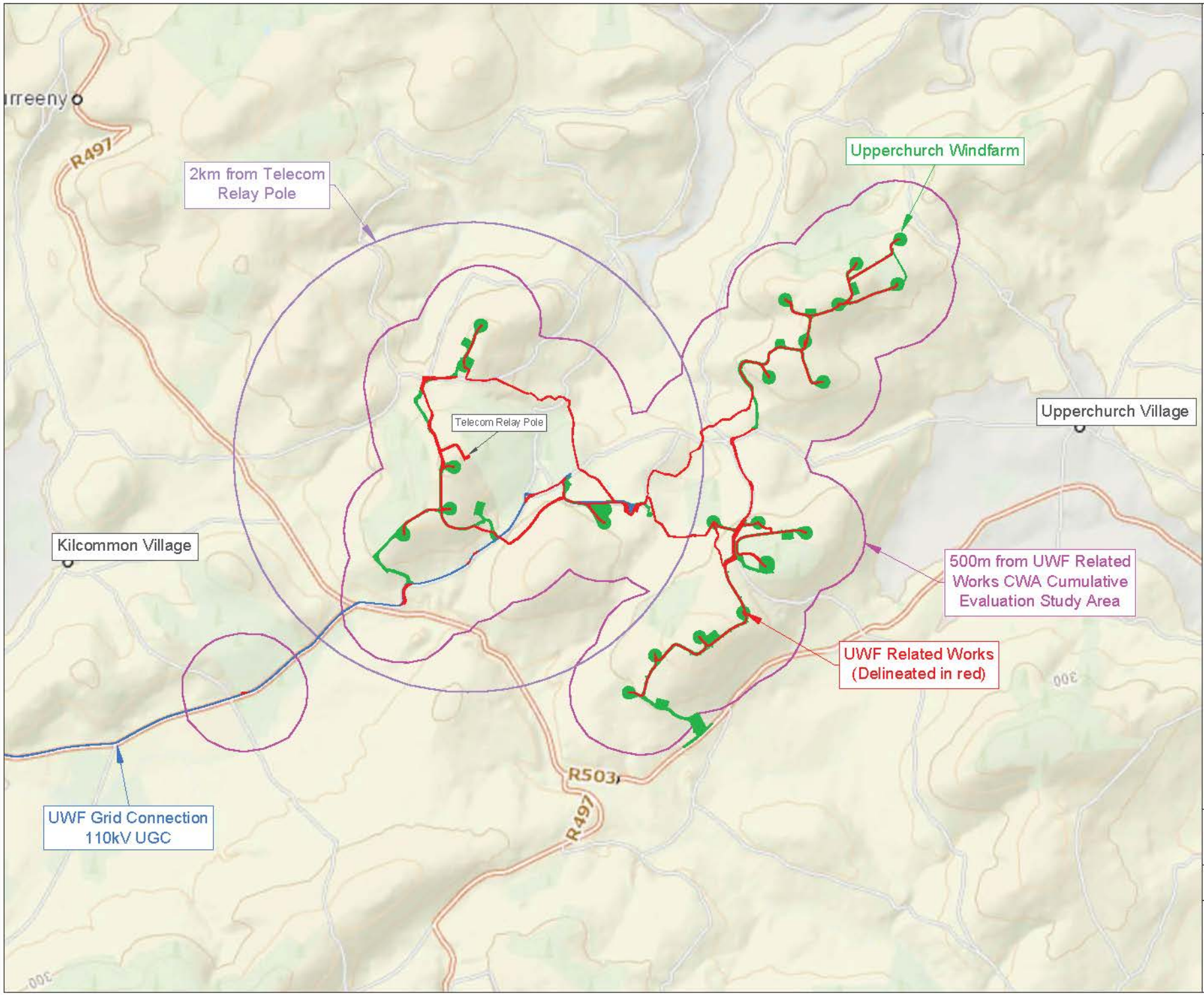

Title:

Figure CE 16.3

Other Recorded Sites within the UWF Related Works Cumulative Evaluation Study Area

Map Number:

Map Overview on OSI Mapping

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 500m Study Area
  - UWF Related Works Construction Works Area
- 2km Study Area
  - Telecoms Relay Pole

Cumulative Projects :

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results :

Within the 500m Study Area of the UWF Related Works Construction Works Area and the 2km Study Area for the Telecoms Relay Pole there was no Other Recorded Sites recorded

REFERENCE DOCUMENTS

N

Project:

UWF Related Works (RW)

Drawn By:	Checked By:	Date:	Size / Scale:
AB	JB	January 19	A3

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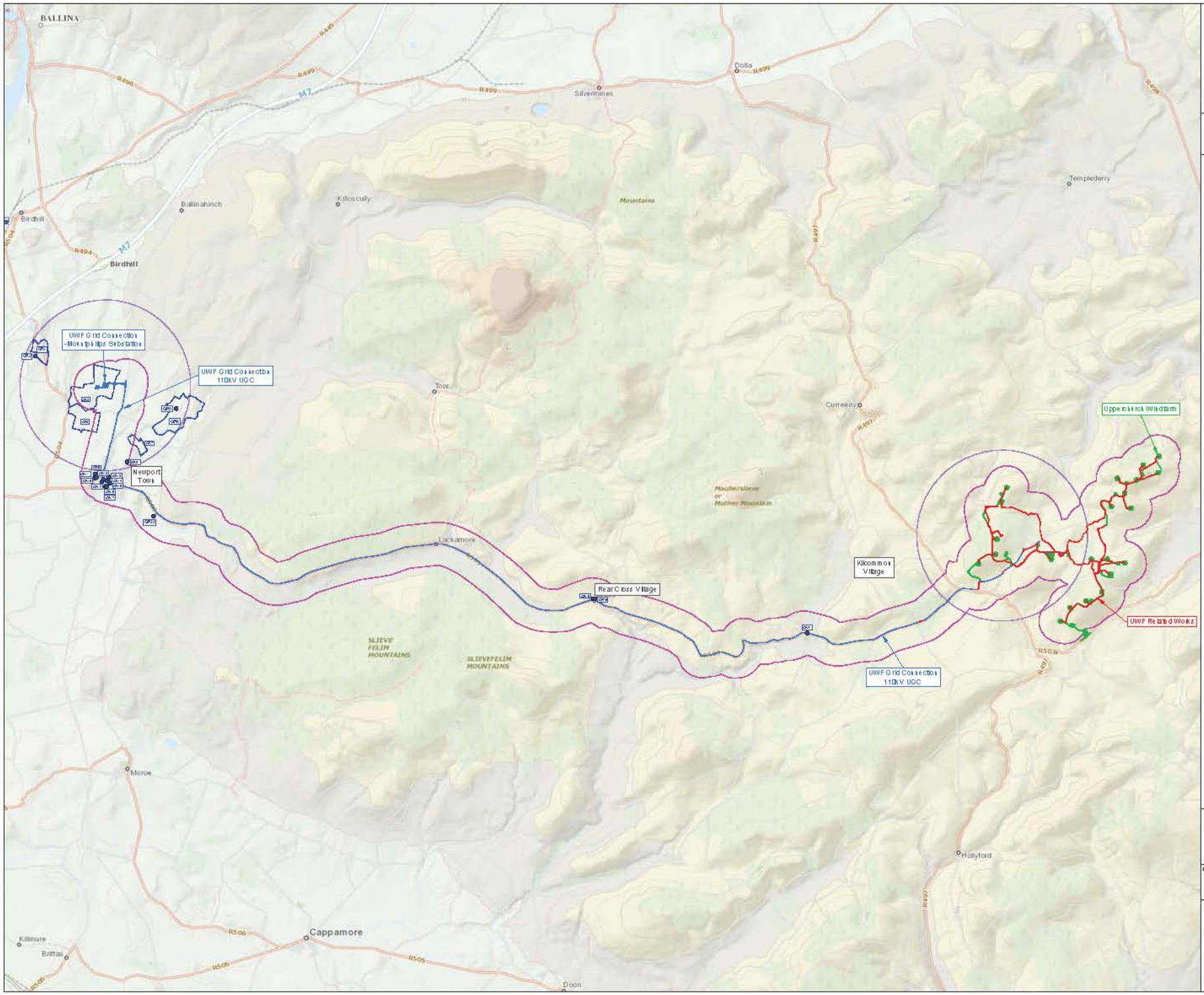

Title:

Figure WP 16.3

Other Recorded Sites within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Grid Connection
- UWF Related Works
- Upperchurch Windfarm
- 500m Study Area
  - UWF Grid Connection
  - UWF Related Works
- 2km Study Area
  - Telecoms Relay Pole
  - Mountphilips Substation

Survey Results :

- Other Recorded Sites
- ORG Other Recorded Sites Identification (Grid Connection)
- Other Recorded Site - Demesne

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn by:	Checked by:	Date:	Sheet Size:
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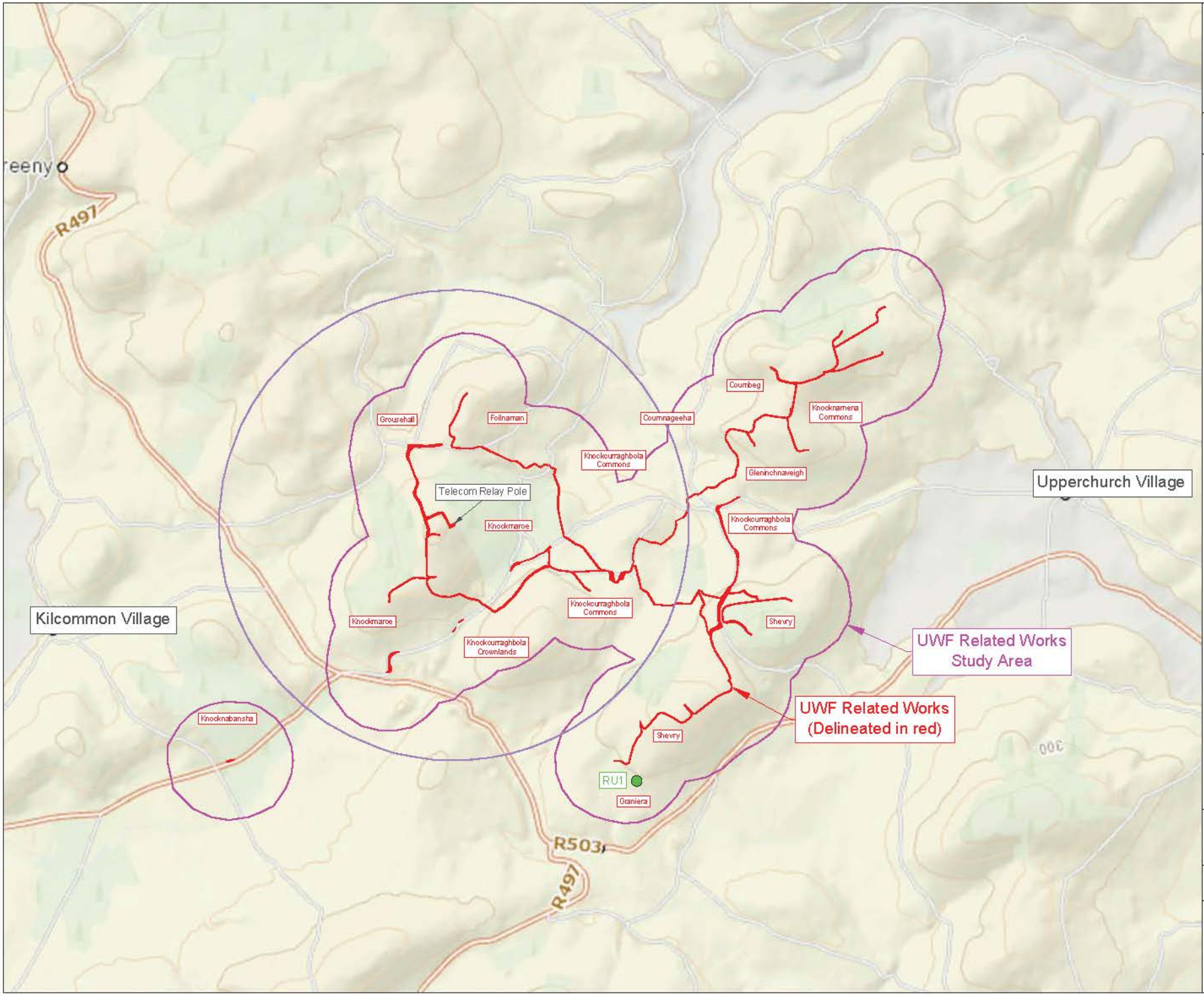

Title:

Figure RW 16.4

Previously Unrecorded Sites within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works
- 500m Study Area
  - UWF Related Works
- 2km Study Area
  - Telecoms Relay Pole
- Sheury — Townlands

Survey Results :

- Previously Unrecorded Site
- RU1 — Previously Unrecorded Site Identification (Related Works)

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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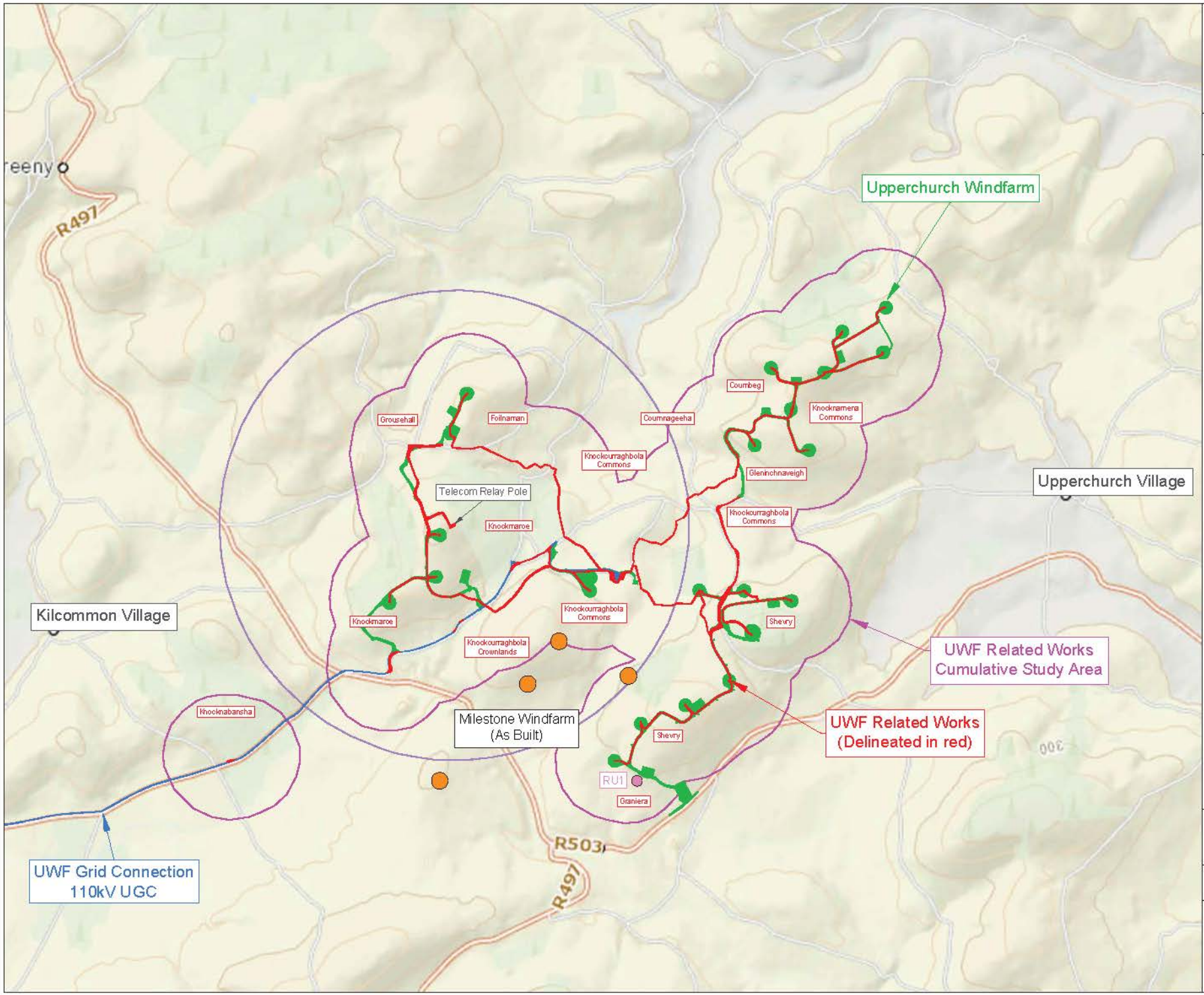

Title:

Figure CE 16.4

Previously Unrecorded Sites within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area
- 500m Study Area
  - UWF Related Works Construction Works Area
- 2km Study Area
  - Telecoms Relay Pole
- Townlands

Cumulative Projects :

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- Existing Milestone Windfarm

Survey Results :

- Previously Unrecorded Site
- Previously Unrecorded Site Identification

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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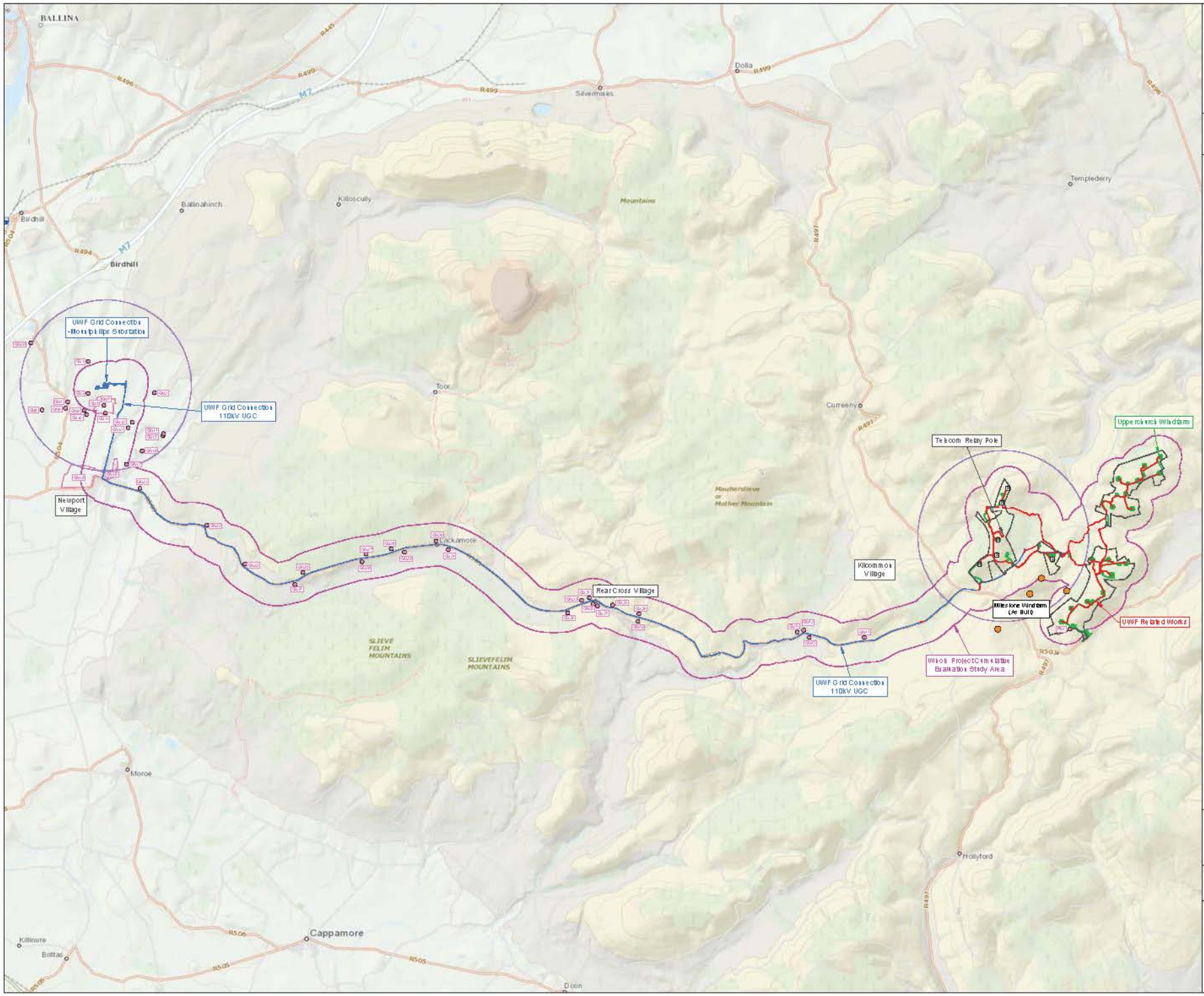

Title:

Figure WP 16.4

Previously Unrecorded Sites within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Grid Connection
- UWF Related Works
- Upperchurch Windfarm
- 500m Study Area
  - UWF Grid Connection
  - UWF Related Works
- Upperchurch Windfarm 2013 Study Area
- 2km Study Area
  - Telecoms Relay Pole
  - Mountphilips Substation

Survey Results :

- Previously Unrecorded Sites
- Previously Unrecorded Sites Identification (Grid Connection)
- Previously Unrecorded Sites Identification (Related Works)
- Previously Unrecorded Sites - Demesne
- Consented UWF Turbines within 2km of Telecoms Relay Pole
- Existing Milestone Windfarm

N

REFERENCE DOCUMENTS

Project:
UWF Related Works (RW)

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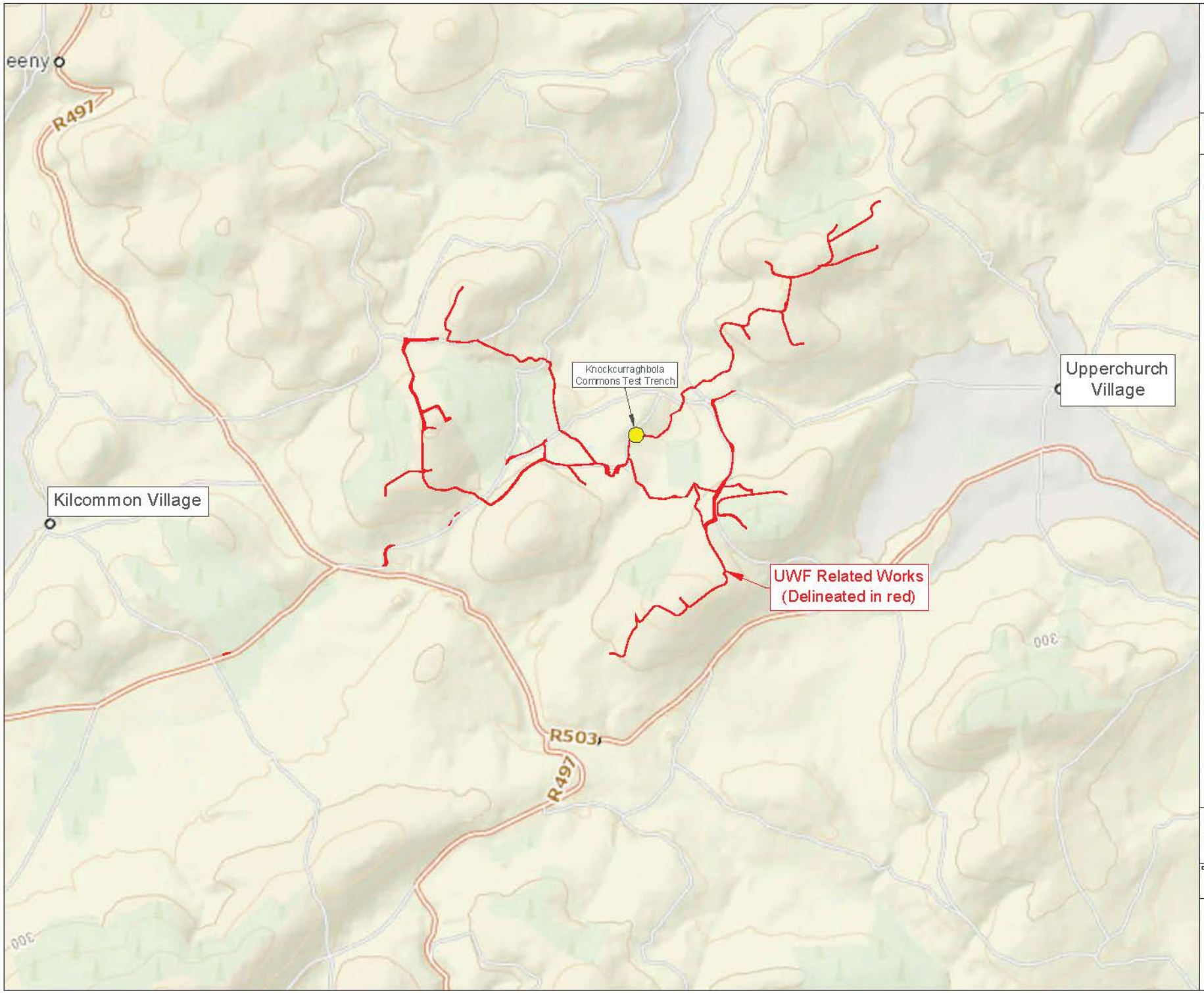

Title:
Figure RW 16.5

Unrecorded Subsurface Sites within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

UWF Related Works

Survey Results :

Location of Test Trench

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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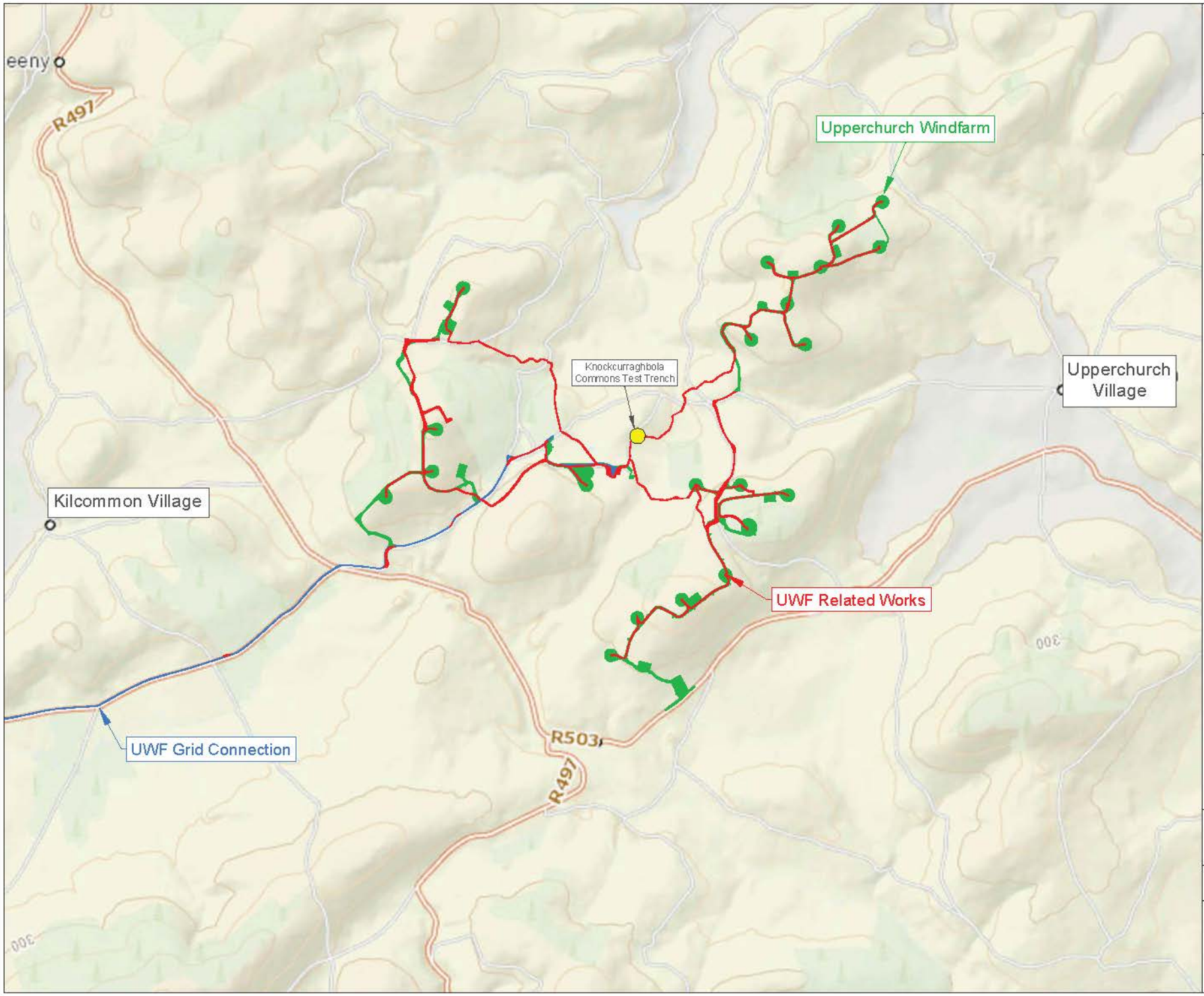

Title:
Figure CE 16.5

Unrecorded Subsurface Sites within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works Construction Works Area

Cumulative Projects :

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area

Survey Results :

- Location of Test Trench

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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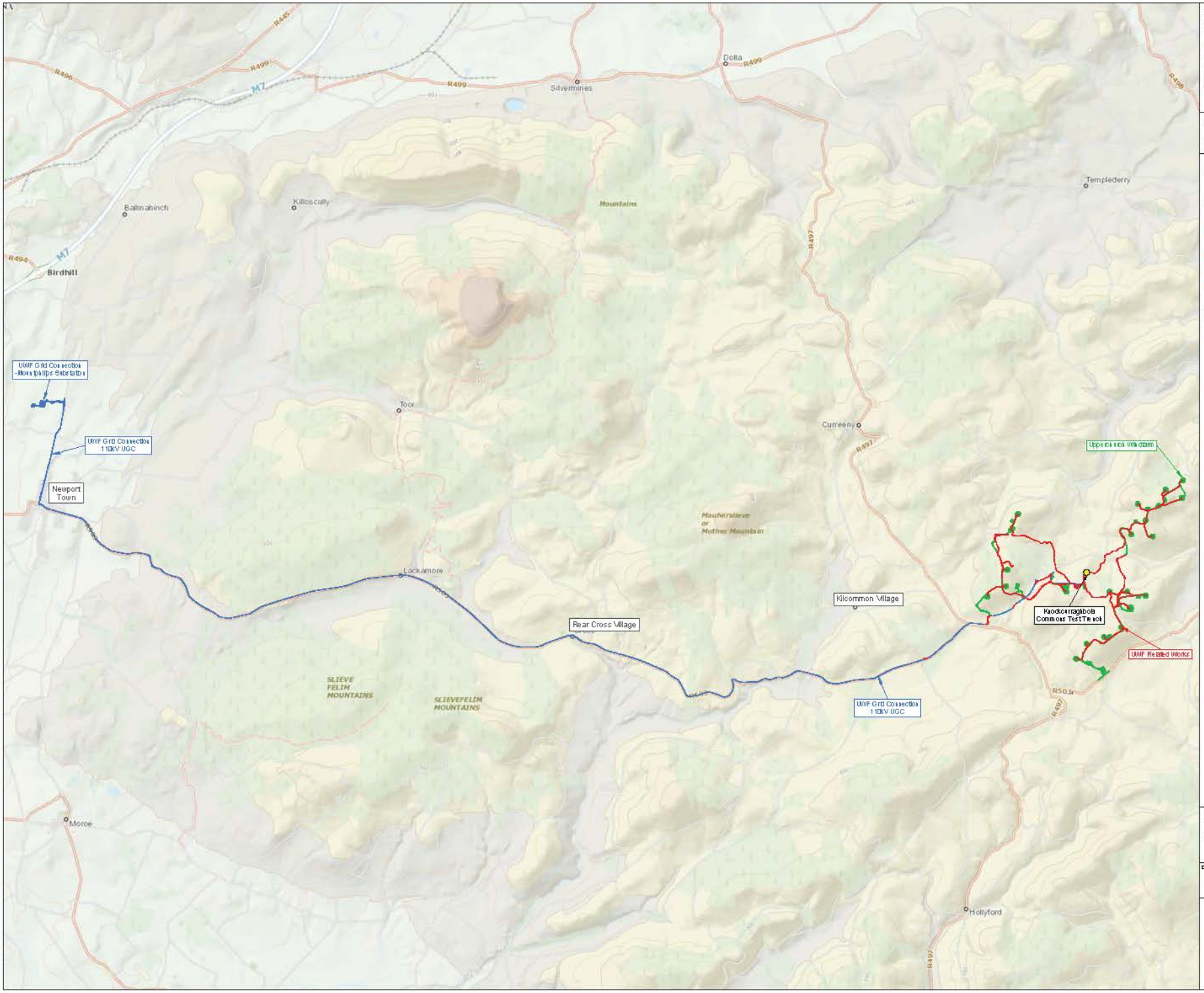

Title:

Figure WP 16.5

Unrecorded Subsurface Sites within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents :

- UWF Related Works
- UWF Grid Connection
- Upperchurch Windfarm

Survey Results :

- Location of Test Trench

REFERENCE DOCUMENTS

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UWF Related Works (RW)

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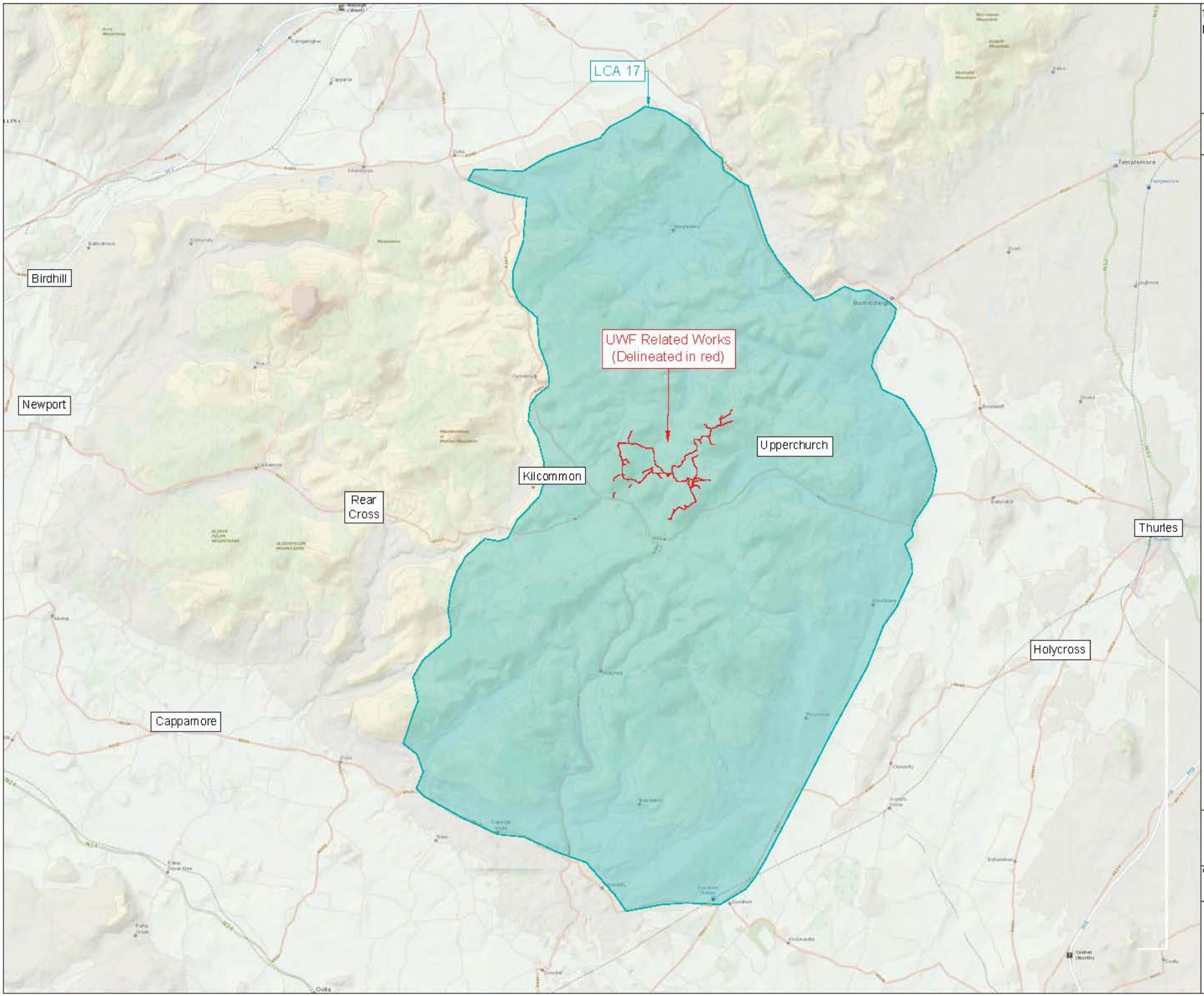

Title:
Figure RW 17.1

Location of the UWF Related Works

Map Number:
Map 1 of 1

Legend:

- UWF Related Works
- LCA 17 Upperchurch, Kilcommon & Hollyford Mountain Mosaic

REFERENCE DOCUMENTS

N

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UWF Related Works (RW)

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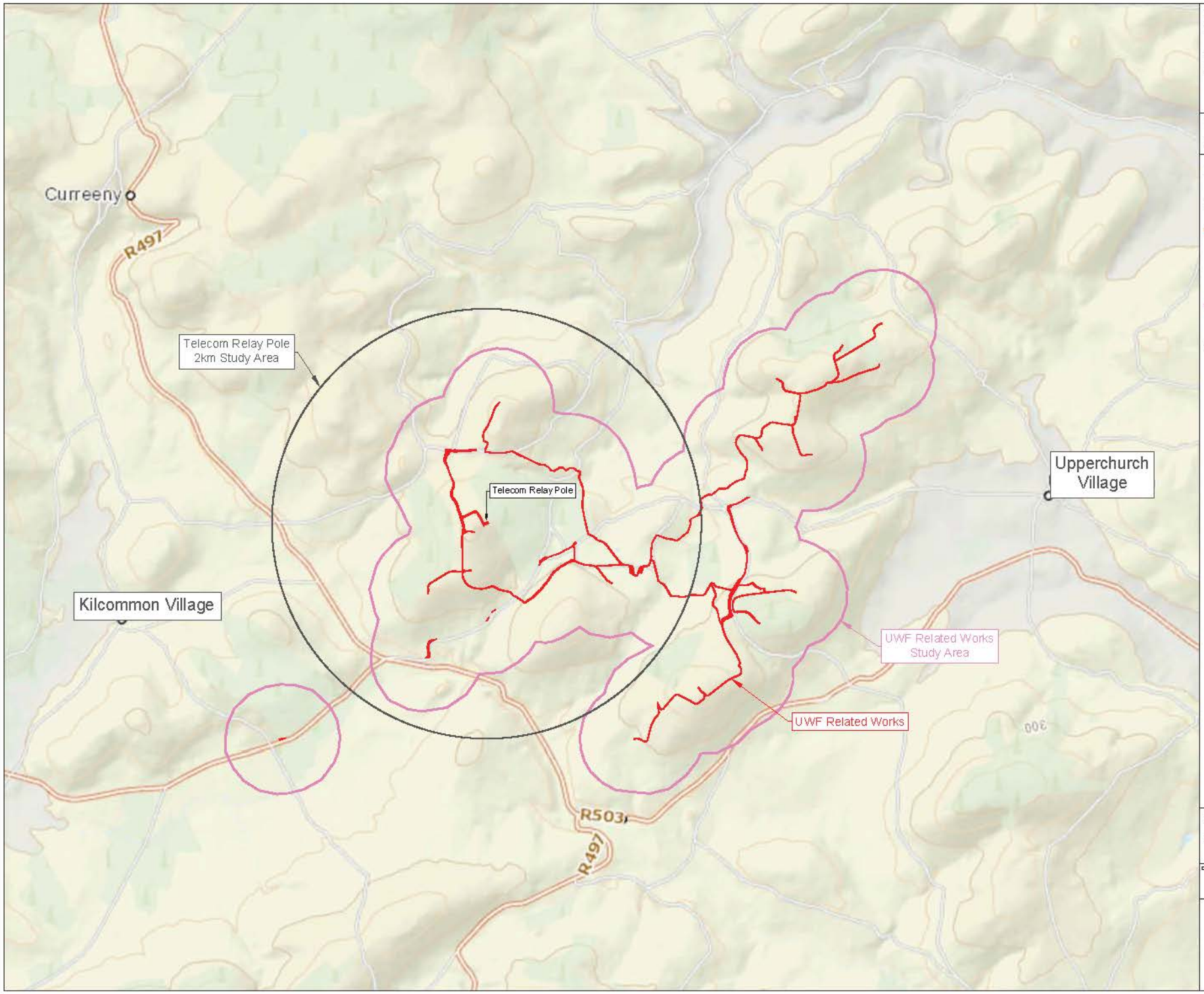

Title:
Figure RW 17.2

Landscape Character within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area:

- UWF Related Works
  - -Realigned Windfarm Roads
  - -Internal Windfarm Cabling
  - -Telecom Relay Pole
  - -Haul Route Works
- 500m Study Area from the UWF Related Works
- 2km Study Area from Telecom Relay Pole

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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MOB: +353 83 8805644

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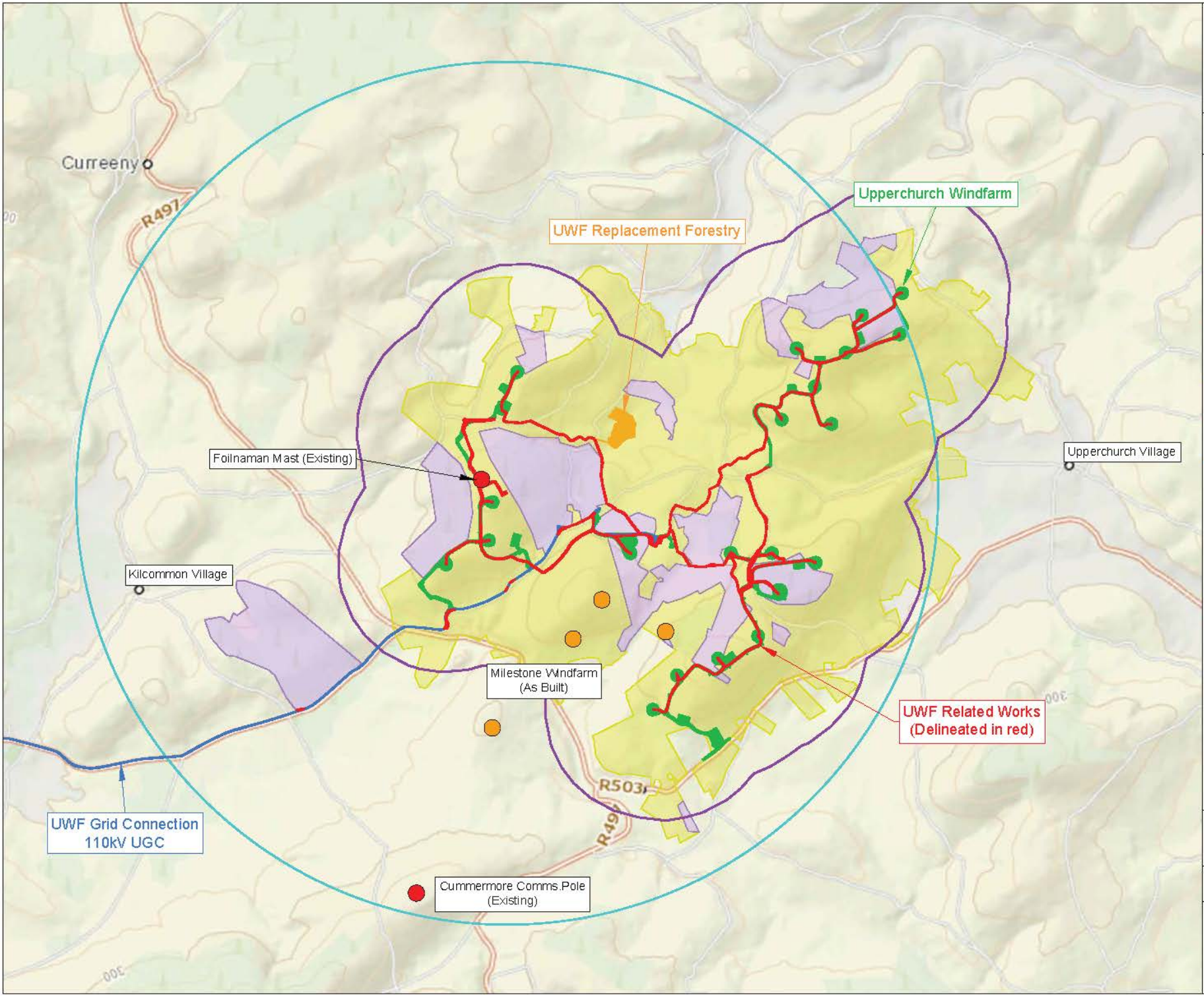

Title:

Figure CE 17.2

Landscape Character within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- 1km Study Area
  - Internal Windfarm Cabling
  - Realigned Windfarm Roads
- 4km Study Area from Telecom Relay Pole

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- Existing Milestone Windfarm
- Other existing and permitted projects/activity

Survey Results:

- Landholding - Agricultural Land
- Landholding - Forestry Land

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

Drawn by:	Checked by:	Date:	Sheet Size:
AB	JB	January 19	A3

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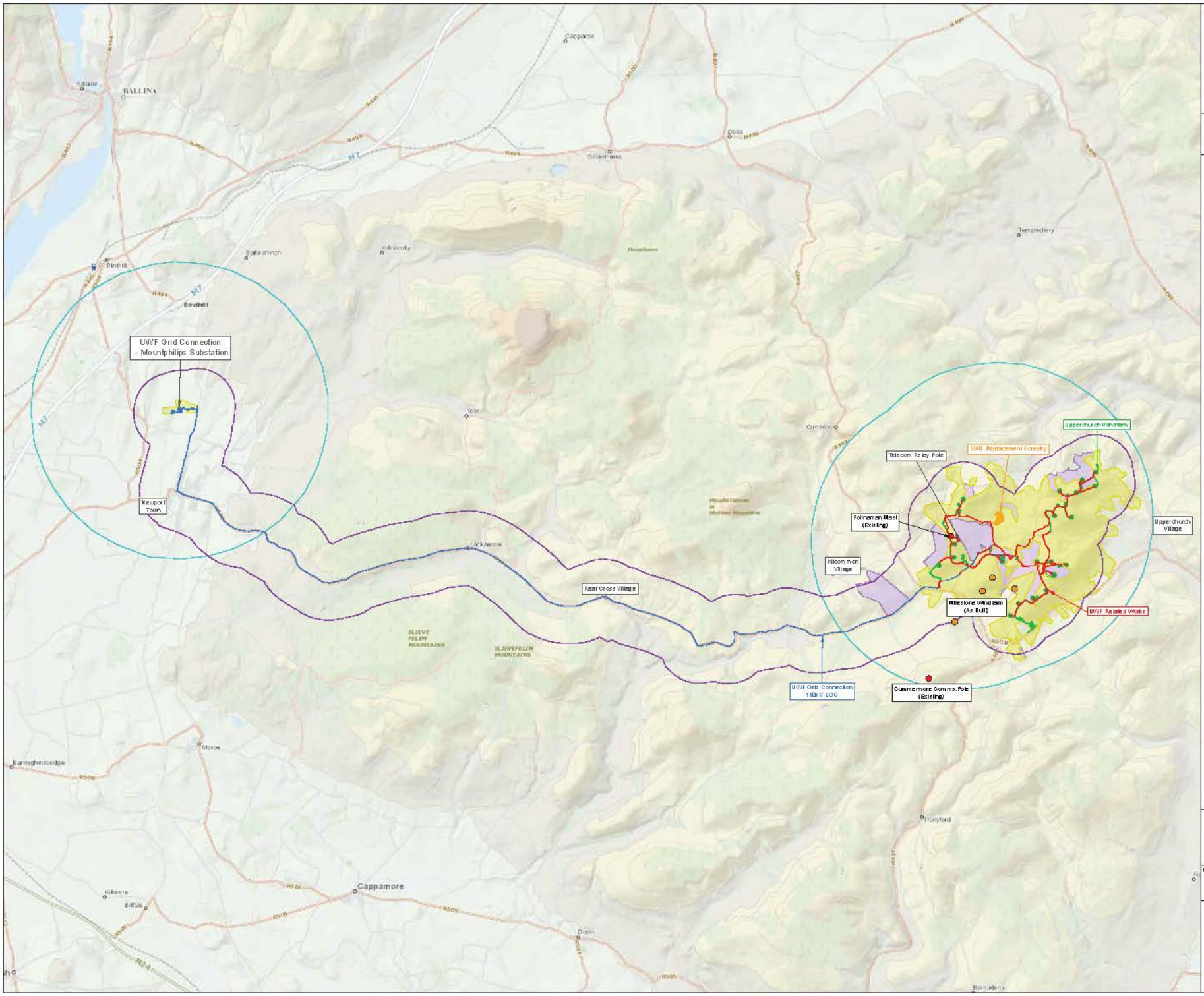

Title:

Figure WP 17.2

Landscape Character within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area:

- UWF Grid Connection
- UWF Related Works
- UWF Replacement Forestry
- Upperchurch Windfarm
- 1km Study Area
  - UWF Grid Connection
  - Internal Windfarm Cabling
  - Realigned Windfarm Roads
- 4km Study Area
  - Mountphilips Substation
  - Telecom Relay Pole
  - UWF Replacement Forestry

Survey Results:

- Existing Milestone Windfarm
- Other existing and permitted projects/activity
- Landholding - Agricultural Land
- Landholding - Forestry Land

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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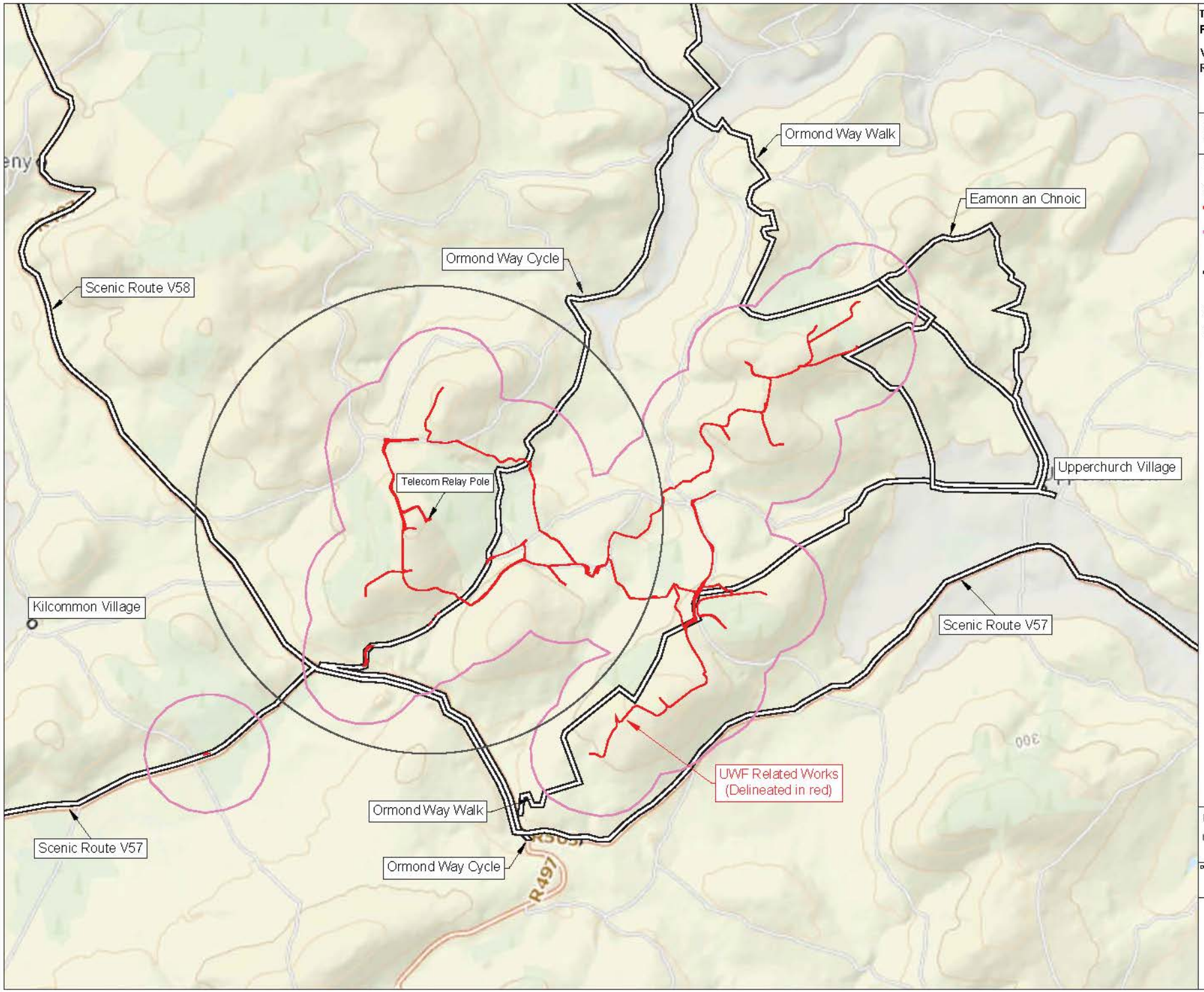

Title:
Figure RW 17.3

Visual Amenity within the UWF Related Works Study Area

Map Number:
Map 1 of 1

Legend:

Study Area:

- UWF Related Works
- 500m Study Area from the UWF Related Works
- 2km Study Area from Telecom Relay Pole

Survey Results:

- Walking/Cycling and Scenic Routes

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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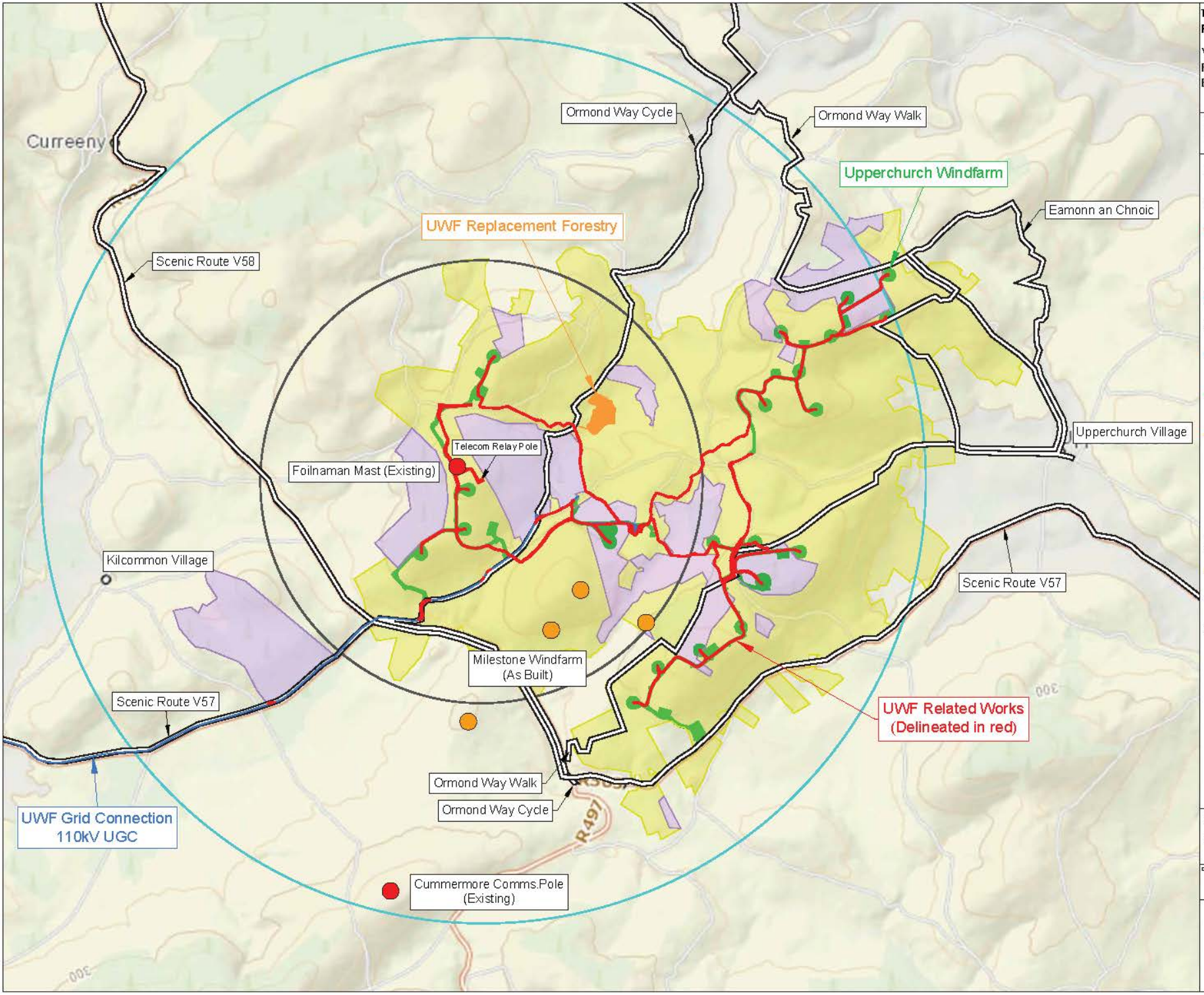

Title:
Figure CE 17.3

Visual Amenity within the UWF Related Works Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area Extents:

- UWF Related Works Construction Works Area
- 2km Study Area from Telecom Relay Pole
- 4km Study Area from Telecom Relay Pole

Cumulative Projects:

- UWF Grid Connection Construction Works Area
- Upperchurch Windfarm Construction Works Area
- UWF Replacement Forestry Construction Works Area
- Existing Milestone Windfarm
- Other existing and permitted projects/activity

Survey Results:

- Landholding - Agricultural Land
- Landholding - Forestry Land
- Walking/Cycling and Scenic Routes

REFERENCE DOCUMENTS

N

Project:
UWF Related Works (RW)

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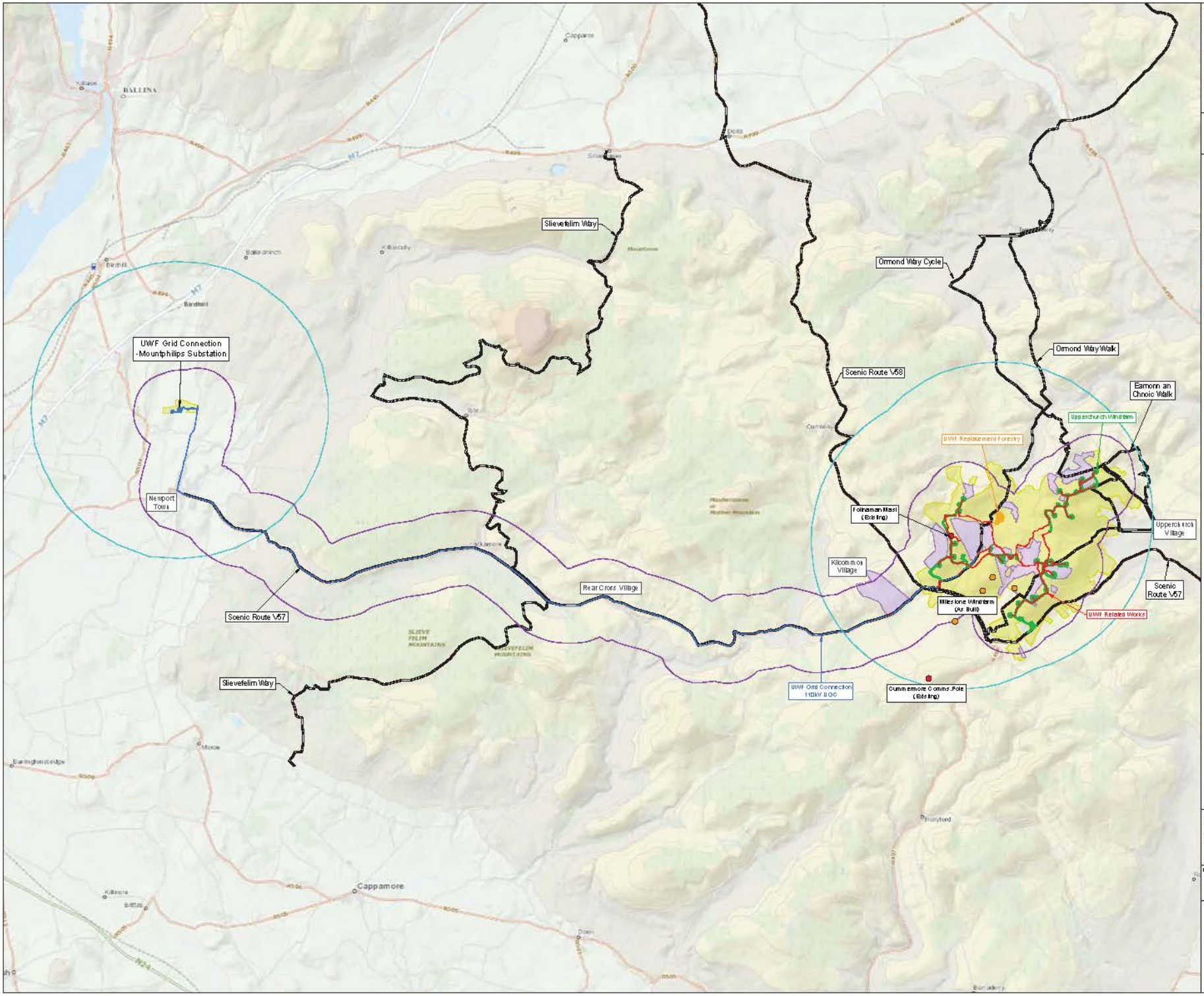

Title:

Figure WP 17.3

Visual Amenity within the Whole Project Cumulative Evaluation Study Area

Map Number:
Map 1 of 1

Legend:

Study Area:

- UWF Grid Connection
- UWF Related Works
- UWF Replacement Forestry
- Upperchurch Windfarm
- 1km Study Area
  - UWF Grid Connection
  - Internal Windfarm Cabling
  - Realigned Windfarm Roads
- 4km Study Area
  - Mountphilips Substation
  - Telecom Relay Pole
  - UWF Replacement Forestry

Survey Results:

- Existing Milestone Windfarm
- Other existing and permitted projects/activity
- Landholding - Agricultural Land
- Landholding - Forestry Land
- Walking/Cycling and Scenic Routes

REFERENCE DOCUMENTS

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Project:
UWF Related Works (RW)

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UWF Related Works

Figure RW 17.4: Visibility of the Telecom Relay Pole from VP1 on the R503

These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified **correct viewing distance of 30cm**. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (IG):	193193	Lens:	50mm / Full Frame Sensor	Date:	15-Mar-17
Northing (IG):	159631	Camera:	Canon 1-D Mark II digital SLR	Time:	12:30
Direction of View	14° E of Grid North	Camera Height:	1.7m Above Ground Level		
Angle of View:	80°				

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REFERENCE DOCUMENTS

Figure RW 17.5: Visibility of the Telecom Relay Pole from VP2 on the L-2264-50 Local Road

These are 80° panoramic montages captured and presented in accordance with the guidance set by the British Landscape Institute 2011 - Advice Note 01/11.

To view these panoramas on a flat surface one must move from left to right along its length whilst maintaining a perpendicular viewing direction and the specified **correct viewing distance of 30cm**. To see this entire panoramic scene in reality would necessitate turning one's head through 40°.

Easting (IG):	193857	Lens:	50mm / Full Frame Sensor	Date:	15-Mar-17
Northing (IG):	160325	Camera:	Canon 1-D Mark II digital SLR	Time:	12:47
Direction of View	26° W of Grid North	Camera Height:	1.7m Above Ground Level		
Angle of View:	80°				

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Figures for Chapter 18: Interaction of the Foregoing	Tab 18 (printed version)
No mapping or figures for Chapter 18	

Figures for Chapter 19: Monitoring Arrangements	Tab 19 (printed version)
No mapping or figures for Chapter 19	

Figures for Chapter 20: Executive Summary	Tab 20 (printed version)
No mapping or figures for Chapter 20	