Technical Appendix 6.1

Target Notes

TN1	*Salix* scrub with patchy *Rubus fruticosus* on disturbed ground adjacent to quarry track, opening out in places with much *Ulex europaeus*. Ground flora grass-dominated, with occasional *Juncus effusus.* Dense *Rhododendron* on roadside bank. Snuffle hole and trail leading into *Rhododendron.*
TN2	Area of acid/neutral grassland on margin of TN1. Grasses include *Cynosurus cristatus, Holcus lanatus, Festuca ovina.* Mosses abundant, mainly *Rhytidiadelphus squarrosus* but with frequent *Calliergonella cuspidata, Kindbergia praelonga* and occasional *Hylocomium splendens.* Herbs frequent but of low diversity – mainly *Hypochaeris radicata, Trifolium repens, Taraxacum officinale* with occasional *Ranunculus acris.* Stands of *Cirsium arvense, Urtica dioica* in places.
TN3	Small pool with *Juncus articulatus, Veronica beccabunga, Carex rostrata.*
TN4	Marginal slopes of quarry generally grass-dominated but with bare surfaces resulting from surface slippage. Self-seeded, mainly young, *Picea sitchensis* along quarry top. Encroaching *Salix cinerea, S. caprea* and *U. europaeus* scrub in places.
TN5	Quarry floor of hardstanding with residual concrete structures, used as a car race track.
TN6	Open scrub with young *P. sitchensis, U. europaeus, S. cinerea* and grassy ground flora. Acid grassland in open areas with patchy *Calluna,* occasional *Molinia purpurea* and occasional *H. splendens.*
TN7	Scrub on disturbed ground dominated by *S. cinerea,* with occasional *P. sitchensis, Fraxinus excelsior, Acer pseudoplatanus.* Ground flora dominated by grasses; a marginal area of marshy grassland has frequent *J. effusus,* occasional *J. articulatus.*
TN8	Slope with species-poor acid grassland, with much *H. lanatus, Agrostis capillaris,* occasional *Nardus stricta, Agrostis canina, Polytrichum commune, Hypnum cupressiforme.*
TN9	Pond with marginal *Typha latifolia* swamp, grading into an extensive stand of emergent *Equisetum fluviatile.* Open water supports abundant *Potamogeton polygonifolius.*
TN10	*P. sitchensis* plantation separated from farm track by *Salix aurita, S. cinerea* scrub. Separated from roadside scrub and self-seeded *P. sitchensis* by acid grassland and a small area of *Typha* swamp.
TN11	Extensive area of marshy grassland on gentle slopes, dominated by *Juncus acutiflorus.* Much of the lower part has been sown with *Lolium perenne*¸ but this species becomes less frequent with increasing distance from the farm track. In the more distal parts, *Molinia* and *Nardus* become frequent. Forbs are rather sparse, but with locally frequent *Trifolium repens*¸ dispersed *Pedicularis sylvatica,* occasional *Ranunculus flammula* and rare *Potentilla erecta. Carex nigra* and *C. flacca* are occasional. Mosses are sparse, but include *H. cupressiforme, R. squarrosus* and *H. splendens.*
TN12	On slightly elevated ground towards the west of the site, *Nardus* becomes locally dominant, *J. acutiflorus* becomes sparse and *J. effusus, C. cristatus, A. capillaris* occasional. Occasional small stands of *Sphagnum capillifolium* occur in wetter hollows.
TN13	Western boundary of the site is a minor stream, largely lined and/or choked with *J. acutiflorus* and occasional stands of *J. effusus.* Streamside forbs are generally restricted to abundant *Ranunculus repens* and occasional *R. flammula.* The raised streamside bank is often dominated by *L. perenne.*
TN14	On slightly higher slope, *J. effusus* becomes dominant, *J. acutiflorus* becoming scarce. Tree stumps record the former presence of a conifer plantation.
TN15	The top of a ridge, likely of morainic origin, has been sown with *L. perenne* and supports few forbs, mostly occasional *P. erecta,* and has occasional small stands of *J.effusus.* Parts of the northern slope retain species-poor *Nardus* grassland.
TN16	A cutover basin supports grassland dominated by *Eriophorum vaginatum,* or co-dominant with grasses (*A. capillaris, N. stricta, D. flexuosa*) with scarce *J. acutiflorus. Sphagnum* is often abundant, mainly *S. palustre, S. denticulatum,* with *S. fallax, S. tenellum,* and with scarce *S. capillifolium* and *S. cuspidatum* in wetter parts. Mosses generally abundant, with much *Aulocomnium palustre, Pseudoscleropodium purum, Polytrichum commune, H. splendens.* Likely to be locally, at least, peat-forming.
TN17	Cutover margin with species-poor acid grassland. Parts of mid-slope grass-dominated, with much *N. stricta, H. lanatus, Agrostis canina, A. capillaris,* and occasional *Cynosurus cristatus, Deschampsia cespitosa.* Forbs frequent but of low diversity, consisting mainly of *R. acris, C. palustre,* with occasional *Cardamine pratensis, Taraxacum officinale.*
TN18	Swathe of waste timber and tree stumps mark location of former conifer plantation at western edge of site.
TN19	Upper slopes of the site dominated by extensive *J. acutiflorus* marshy grassland, with *J.effusus* rarely locally dominant. *E. vaginatum* frequent throughout. Limited range of forbs – *P.erecta,*

	Leontodon autumnalis, R. acris, R. repens, Galium saxatile, Cirsium palustre. Mosses scarce, dominated by *P. purum, R. squarrosus. Sphagnum* limited to rare hummocks of *S. capillifolium*
TN20	Series of around 5 minor rills generally choked with *Juncus* species or *P. polygonifolius.*
TN21	Extensive *J. acutiflorus* marshy grassland continues across the upper slopes.
TN22	Low-relief morainic ridge generally grass-dominated, with dispersed stands of *J. acutiflorus* and *E. vaginatum* and rarely, hummocks of *S. capillifolium.*
TN23	Flush near foot of moraine ridge with carpet of *S. cuspidatum* and *S. denticulatum,* much *P. commune* and with dispersed stands of *E. vaginatum.* IGR C75089 2594 0
TN24	Well-marked moraine ridge with top supporting species-poor acid grassland. *Nardus* and *Molinia* both frequent, with patchy *E. vaginatum. Sphagnum* (*S. capillifolium, S. papillosum, S. palustre*) locally frequent, but patches dispersed. IGR C75135 25981 Grades downslope into *J. acutiflorus*-dominated grassland, with frequent *D. flexuosa, A. odoratum* and patchy hummocks of *S. palustre* with, locally, much *Rhytidiadelphus squarrosus, P. commune.* Occasional more open areas with much *N. stricta, D. flexuosa, Carex echinata.* Minor flushes here with much *S. palustre, S. capillifolium, S. fallax.* IGR C75004 26109
TN25	Moraine ridge with species-poor acid grassland. Eastern flank with locally frequent small hummocks and spreads of *S. capillifolium, S. papillosum* near junction with rush pasture.
TN26	Localised area of species-poor acid grassland with occasional *Nardus, Molinia, H. lanatus* and isolated tussocks of *E. vaginatum.* This area dominated by hummocks and spreads of mosses, dominated by *H. splendens,* with frequent *P. commune, R. loreus, S. capillifolium.* Forbs scarce, mainly occasional *P. erecta.* Grades downslope into *Juncus acutiflorus*-dominated grassland with frequent *Molinia* tussocks and *P. erecta* on lower slopes. Patchy small tussocks of *E. vaginatum* tend to be more frequent upslope. Grasses include frequent *A. capillaris* and occasional *Nardus, H. lanatus, D. flexuosa. Sphagnum* rare, consisting of dispersed small patches of *S. papillosum, S. capillifolium, S. fallax*. Other mosses consist of patchy *P. commune,* frequent *K. praelonga* and occasional *Breutelia chrysocoma, R. loreus* and *H. splendens*.
TN27	Roadside boundary a bank of *Rhododendron ponticum,* with occasional young *B. pubescens.*
TN28	Low-gradient *J. acutiflorus* grassland with locally frequent *S. fallax, S. denticulatum, S. papillosum.*
TN29	Isolated, restricted area of acid grassland with much *Nardus, A. odoratum,* occasional *C. echinata.* Frequent small hummocks of *S. capillifolium* and patchy *S. papillosum, S. fallax. E. vaginatum* frequent throughout.
TN30	Roadside hedge of leggy, gappy *C. monogyna,* with occasional *B. pubescens.*
TN31	Improved grassland field with occasional patchy *J. effusus,* rarely *J. acutiflorus.*
TN32	Extensive area of *J. effusus*-dominated grassland with occasional *S. cinerea* regeneration and small area of *S. cinerea* scrub.
TN33	Improved grassland dominated by *L. perenne, H.* lanatus, with much *C. cristatus.* Occasional *Carex disticha.* Separated from TN32 by shallow rush and grass-choked drain.
TN34	Improved grassland field dominated by *L. perenne.*
TN35	Western site boundary an entrenched, tumbling, stream, with steep banks supporting *U. europaeus/R. fruticosus* scrub (spreading in places into adjacent fields) and open areas dominated by rank grasses. Occasional mature *C. monogyna.*
TN36	Marshy grassland field, with patchy or dispersed *J. effusus, J. acutiflorus.* Grasses dominated by *H. lanatus.* Species-poor, with forbs dominated by *R. acris, C. palustre.* Separated from TN34 by stone bank and ditch.
TN37	Bank and drain with dispersed mature *S. cinerea.* Drain generally choked with *J. effusus.* Occasional *Montia fontana, J. bulbosus, Ranunculus hederacea, R. flammula.*
TN38	Marshy grassland dominated by *Molinia,* but with much *H. lanatus,* frequent *C. cristatus,* occasional *N. stricta, Agrostis canina, D. cespitosus.* Sparse *J. effusus, J. acutiflorus.* Occasional hummocks of *H. splendens.* Locally encroaching *U. europaeus* scrub, particularly from western boundary stream bank. Forbs frequent but low diversity, including *C. palustre, R. repens, R. acris, T. repens,* occasional *S. pratensis.* 2no mature *B. pubescens.*
TN39	On flatter ground towards Curly River rushes become more frequent; *Filipendula ulmaria* becomes frequent, with occasional *S. graminea, Lathyrus pratensis. Molinia* remains dominant but *A. odoratum, A. capillaris* are frequent. *S. pratensis* is locally frequent on lower parts. Patchy *U. europaeus* scrub, with occasional mature *S. cinerea, B. pubescens.*
TN40	Curly River lined with *S. cinerea/U. europaeus/B. pubescens* scrub, with occasional mature *B. pubescens.*

TN41	Small stand of mature *B. pubescens.* Grass-dominated ground flora.
TN42	Minor stream/drain with broad belt of *Iris pseudacorus* along banks.
TN43	Improved grassland field with much *L. perenne, H. lanatus,* patchy *J. effusus.* Species -poor, with forbs dominated by *R. acris, T. repens* and with occasional *C. pratensis.*
TN44	Extensive area of *U. europaeus* scrub, interspersed with areas of marshy grassland.
TN45	Marshy grassland, with *J. effusus* dominant towards lower end of field, *J. acutiflorus* dominant elsewhere, with frequent *E. vaginatum.* Grasses dominated by *H. lanatus,* with frequent *A. odoratum,* occasional *Molinia, C. cristatus.* Where rushes thin out, vegetation has more semi-improved aspect. Low diversity forbs, dominated by *R. acris, R. repens*, occasional *Rumex acetosa*.
TN46	Area around abandoned house with wooded aspect, with mature *Pinus sylvestris, A. pseudoplatanus,* often with scrubby layer of *C. monogyna, R. fruticosus,* occasional *Ulmus glabra.*
TN47	Improved grassland, with much *Rumex obtusifolius,* grading into rushes towards east, with much *Chamerion angustifolium.*
TN48	Swiftly flowing Curly River, with intermittent scrub along banks.
TN49	Broad, outgrown, mainly *B. pubescens*, hedge with much *R. fruticosus, C. angustifolium.*
TN50	Species-poor improved grassland dominated by *L. perenne* but with sparse or densely clumped rushes.
TN51	Marshy grassland generally dominated by *Molinia* but with frequent *N. stricta.* Sparse rushes. Species-poor, forbs consisting of occasional *R. Repens, P. erecta, Jacobaea vulgaris, C. palustre, P. sylvatica.* Frequent *H. splendens.*
TN52	Species-poor acid semi-improved grassland in mosaic with *Molinia*-dominated acid grassland.
TN53	Minor stream in well-marked valley. Stream banks frequently with rushes and occasional patches of *U. europaeus* scrub.
TN54	*Molinia*-dominated slope down towards stream. with patchy *E. vaginatum, J . acutiflorus* and locally frequent hummocks of *H. splendens.* Rushes become more frequent upslope towards lower flank of a morainic ridge. Here *N. stricta* is locally frequent, *D. cespitosa* occasional. Species-poor – forbs generally restricted to *R. acris, R. repens.*
TN55	Ridge top and much of upper slope under semi-improved acid grassland, with occasional *N. stricta, J. effusus.*
TN56	*Picea sitchensis* plantation.
TN57	*Molinia*-dominated grassland with patchy *N. stricta,* frequent *H. lanatus.* Sparse *J. acutiflorus.* Species-poor.
TN58	Generally *Molinia*-dominated grassland with frequent *N. stricta,* but *Nardus* locally dominant. Rushes patchy, mostly thinly distributed *J. acutiflorus*, but occasionally denser stands of *J. effusus.* Species-poor, forbs limited to locally frequent *T. repens, P. erecta,* occasional *R. acris, C. palustre*; also occasional *Carex panicea, C. binervis. S. pratensis* occasional, particularly along drain margins. Rarely, small, isolated stands of *S. fallax, S. palustre, S. capillifolium, S. papillosum. H. splendens* locally frequent, *P. commune* occasional.
TN59	*Molinia*-dominated grassland with sparse rushes. Species-poor.
TN60	Irregular areas of improved grassland dominated by *L. perenne,* extending into and interfingering with marshy grassland dominated by *J. effusus* with occasional *J. acutiflorus.* Merges into *J. acutiflorus*-dominated marshy grassland.
TN61	*J. acutiflorus*-dominated marshy grassland with occasional *J. effusus.* Well-dispersed tussocks of *Molinia* and *E. vaginatum. Molinia* very locally co-dominant with *J. acutiflorus* and *E. vaginatum* also locally frequent. Forbs rare - *P. erecta, C. palustre, R. acris, R. acetosa* all rare. Mosses frequent, with frequent *R. squarrosus,* locally frequent *S. palustre* and occasional *P. purum, H. splendens, P. commune.*
TN62	Towards the northern end of the field, *Molinia* becomes dominant, with frequent *E. vaginatum,* occasional *J. acutiflorus, Calluna, E. tetralix.* Mossy hummocks generally dominated by *P. purum, Polytrichum alpestre, S. capillifolium, S. palustre, P. commune.* Forbs scarce – occasional *R. acris, R. acetosa, P. erecta.*
TN63	Cut edge at northern end of field, forming a low ridge along part of the field boundary. Here residual *Calluna* and *E. vaginatum* dominated mire, with patchy *Molinia,* occasional *T. germanicum. Sphagnum* scarce – occasional *S. capillifolium.*
TN64	Southern end of field an extension of low ridge in adjacent field, with *Calluna/E. vaginatum* mire on deep peat. Moss cover increases downslope, with *R. loreus, P. schreberi, R. squarrosus, P. commune. Sphagnum* restricted to occasional *S. capillifolium.* Rapidly merges downslope into *Molinia/J. acutiflorus* marshy grassland with patchy *Calluna,* and much *P. schreberi, P. purum.*

TN65	Extensive field generally dominated by *J. acutiflorus*, but with extensive areas dominated by *Molinia* with occasional *J. acutiflorus*. Eastern boundary a minor stream marked by a broad swathe of rush-dominated marshy grassland, generally *J. acutiflorus*, but with much *J. effusus.* Forbs rather scarce, including *C. palustre* and occasional *S. pratensis.*
TN66	Mosaic of *Molinia/J. acutiflorus* and *J. effusus* marshy grassland. Species-poor, with abundant mosses. Grading northwards into semi-improved grassland with much *L. perenne* and patchy rushes.

Technical Appendix 6.2

Quadrat Data

Q1	15.05.24	275188 426192	Sward height 1.6m; grazing pressure light. NVC M23b	
Marshy grassland		Peat depth: 0.45m		
Species		% cover	Species	% cover
Juncus effusus		80	*Cardamine pratense*	1
Ranunculus acris		5	*Juncus acutiflorus*	10
Rumex acetosa		3	*Luzula multiflora*	1
Anthoxanthum odoratum		10	*Rhytidiadelphus squarrosus*	40
Ranunculus flammula		2		
			Species total	9

Quadrat 1

Quadrat 2

Q2	15.05.24	275149 426163	Sward height 1m; grazing pressure light. NVC M20/M23b mosaic	
Marshy grassland		Peat depth: 0.60m		
Species		% cover	Species	% cover
Juncus effusus		80	*Galium saxatile*	5
Eriophorum vaginatum		5	*Hylocomium splendens*	40
Potentilla erecta		3	*Sphagnum fallax*	5
Anthoxanthum odoratum		10	*Polytrichum commune*	5
Juncus acutiflorus		2	*Rhytidiadelphus squarrosus*	10
Carex nigra		1		
			Species total	11

Q3	15.05.24	275096 426104	Sward height 1.2m; grazing pressure light. NVC M23b	
Marshy grassland		Peat depth: 0.45m		
Species		% cover	Species	% cover
Juncus effusus		90	*Polytrichum commune*	15
Anthoxanthum odoratum		10	*Sphagnum palustre*	5
Eriophorum vaginatum		8	*Sphagnum fallax*	8
Galium saxatile		5	*Hylocomium splendens*	45
Potentilla erecta		2	*Thuidium tamariscinum*	2
Juncus acutiflorus		15		
			Species total	11

Quadrat 3

Quadrat 4

Q4	15.05.24	275044 426041	Sward height to 70cm; grazing pressure light to moderate. NVC M23a	
Marshy grassland		Peat depth: 0.45m		
Species		% cover	Species	% cover
Juncus acutiflorus		85	*Festuca ovina*	3
Anthoxanthum odoratum		15	*Luzula multiflora*	2
Eriophorum vaginatum		8	*Carex nigra*	1
Potentilla erecta		3	*Rhytidiadelphus squarrosus*	35
Galium saxatile		3	*Hylocomium splendens*	45
			Species total	10

Q5	15.05.24	275024 425982	Sward height 40cm; grazing pressure light. NVC M23b	
Marshy grassland		Peat depth: 0.35m		
Species		% cover	Species	% cover
Anthoxanthum odoratum		20	*Hylocomium splendens*	10
Juncus acutiflorus		65	*Rhytidiadelphis squarrosus*	70
Potentilla erecta		8	*Sphagnum fallax*	3
Galium saxatile		3	*Thuidium tamariscinum*	2
Holcus lanatus		20		
			Species total	9

Quadrat 5

Quadrat 6

Q6	15.05.24	275012 425946	Sward height 1.5m; grazing pressure light. NVC M23b	
Marshy grassland		Peat depth: 0.20m		
Species		% cover	Species	% cover
Juncus effusus		70	*Ranunculus flammula*	3
Juncus acutiflorus		8	*Cardamine pratense*	1
Ranunculus acris		5	*Anthoxanthum odoratum*	8
Taraxacum officinale agg.		3	*Rhytidiadelphus squarrosus*	15
Holcus lanatus		15		
			Species total	9

Q7	15.05.24	275010 425887	Sward height 70cm; ungrazed. Wet hollow, very wet underfoot. NVC M23a	
Marshy grassland		Peat depth: 0.20m		
Species		% cover	Species	% cover
Juncus acutiflorus		80	*Ranunculus flammula*	3
Equisetum fluviatile		5	*Epilobium palustre*	1
Ranuculus acris		2	*Carex nigra*	3
Ranunculus repens		5	*Trifolium repens*	115
Juncus effusus		3	Bare peat	
			Species total	9

Quadrat 7

Quadrat 8

Q8	15.05.24	274990 425843	Sward height 80cm; grazing pressure light. NVC M23a	
Marshy grassland		Peat depth: 0.70m		
Species		% cover	Species	% cover
Juncus acutiflorus		80	*Sphagnum palustre*	45
Anthoxanthum odoratum		10	*Sphagnum fallax*	3
Holcus lanatus		8	*Thuidium tamariscinum*	2
Potentilla erecta		3	*Rhytidiadelphus squarrosus*	10
			Species total	8

Q9	15.05.24	274951 425808	Sward height 80cm; grazing pressure light.. NVC M23a	
Marshy grassland		Peat depth: 0.70m		
Species		% cover	Species	% cover
Juncus acutiflorus		85	*Ranunculus flammula*	2
Anthoxanthum odoratum		10	*Rhytidiadelphus squarrosus*	15
Holcus lanatus		5	*Sphagnum fallax*	8
Potentilla erecta		5	*Pseudoscleropodium purum*	3
Ranunculus acris		8		
			Species total	9

Quadrat 9

Quadrat 10

Q10	15.05.24	274895 425779	Sward height 1m; grazing pressure light. NVC M23a	
Marshy grassland		Peat depth: 0.40m		
Species		% cover	Species	% cover
Juncus acutiflorus		80	*Potentilla erecta*	3
Holcus lanatus		15	*Sphagnum fallax*	8
Anthoxanthum odoratum		10	*Sphagnum palustre*	10
Viola palustris		3	*Hylocomium splendens*	15
Carex panicea		3	*Rhytidiadelphus squarrosus*	5
Juncus effusus		3		
			Species total	11

Q11	15.05.24	274828 425747	Sward height 1.2m; grazing pressure light. NVC M23b	
Marshy grassland		Peat depth: 0.30m		
Species		% cover	Species	% cover
Juncus effusus		80	*Ranunculus acris*	8
Stellaria alsine		1	*Taraxacum officinale agg*	3
Cardamine pratense		3		2
Anthoxanthum odoratum		10	*Trifolium repens*	2
Rumex acetosa		5	*Dactylorhiza* sp.	3
Juncus acutiflorus		15	*Rhytidiadelphus squarrosus*	20
Holcus lanatus		5	*Hylocomium splendens*	8
			Species total	14

Quadrat 11

Quadrat 12

Q12	15.05.24	274757 425677	Sward height 70cm; grazing pressure light. NVC M20/ M23a mosaic	
Marshy grassland		Peat depth: 0.65m		
Species		% cover	Species	% cover
Juncus acutiflorus		90	*Carex panicea*	2
Cirsium palustre		3	*Luzula multiflora*	1
Dactylorhiza sp.		2	*Holcus lanatus*	3
Ranunculus acris		5	*Anthoxanthum odoratum*	10
Potentilla erecta		2	*Rhytidiadelphus squarrosus*	55
Leontodon autumnalis		1	*Calliergonella cuspidatum*	20
Ranunculus flammula		3		
			Species total	13

Q13	15.05.24	274667 425605	Sward height 1m; grazing pressure light. NVC M23a	
Marshy grassland		Peat depth: 0.20m		
Species		% cover	Species	% cover
Juncus acutiflorus		45	*Ranunculus flammula*	2
Anthoxanthum odoratum		15	*Leontodon autumnalis*	1
Eriophorum vaginatum		35	*Luzula multiflora*	2
Holcus lanatus		10	*Cardamine pratense*	1
Carex nigra		5	*Ranunculus acris*	3
Potentilla erecta		5	*Rhytidiadelphus squarrosus*	45
Carex panicea		8	*Calliergonella cuspidatum*	5
			Species total	14

Quadrat 13

Quadrat 14

Q14	15.05.24	274615 425555	Sward height 1.6m; ungrazed. NVC M23b	
Marshy grassland		Peat depth: 0.80m		
Species		% cover	Species	% cover
Juncus effusus		85	*Potentilla erecta*	3
Juncus acutiflorus		10	*Rumex acetosa*	5
Holcus lanatus		8	*Ranunculus acris*	3
Cardamine pratense		2	*Poa pratensis*	5
Epilobium palustre		1	*Rhytidiadelphus squarrosus*	35
Anthoxanthum odoratum		15		
			Species total	11

Q15	15.05.24	274573 425500	Sward height 1m; grazing pressure light.. NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: 0.30m		
Species		% cover	Species	% cover
Juncus effusus		35	*Holcus lanatus*	10
Juncus acutiflorus		55	*Potentilla erecta*	3
Ranunculus acris		3	*Rhytidiadelphus squarrosus*	60
Anthoxanthum odoratum		15	*Kindbergia praelonga*	3
			Species total	8

Quadrat 15

Quadrat 16

Q16	15.05.24	274545 425449	Sward height 1m; grazing pressure light.. NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: 0.30m		
Species		% cover	Species	% cover
Juncus acutiflorus		90	*Holcus lanatus*	10
Anthoxanthum odoratum		15	*Trifolium repens*	3
Ranunculus acris		20	*Rhytidiadelphus squarrosus*	75
			Species total	6

Q17	15.05.24	274434 426126	Sward height 50cm; grazing pressure moderate.. NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: 0.10m		
Species		% cover	Species	% cover
Juncus acutiflorus		65	*Ranunculus acris*	5
Anthoxanthum odoratum		30	*Rhytidiadelphus squarrosus*	15
Luzula multiflora		2	Dung	
			Species total	5

Quadrat 17

Quadrat 18

Q18	15.05.24	274347 426185	Sward height 50cm; grazing pressure moderate. Species-poor rush-pasture in mosaic with Gorse *Ulex europaeus* scrub in immediate vicinity of quadrat. NVC M23b/W23 mosaic	
Marshy grassland		Peat depth: 0.15m		
Species		% cover	Species	% cover
Juncus effusus		55	*Trifolium repens*	2
Holcus lanatus		15	*Cerastium fontanum*	2
Anthoxanthum odoratum		20	*Rush thatch*	40
Ranunculus acris		5	*Dung*	8
			Species total	6

Q19	15.05.24	274337 426145	Sward height 55cm; grazing pressure low to moderate. NVC M23a	
Marshy grassland		Peat depth: 0.10m		
Species		% cover	Species	% cover
Juncus acutiflorus		80	*Luzula multiflora*	1
Anthoxanthum odoratum		20	*Ranunculus flammula*	1
Cynosurus cristatus		3	*Trifolium repens*	2
Agrostis stolonifera		4	*Carex nigra*	2
Carex panicea		5	*Rhytidiadelphus squarrosus*	25
Holcus lanatus		10	*Hylocomium splendens*	10
			Species total	12

Quadrat 19

Quadrat 20

Q20	15.05.24	274383 426107	Sward height 60cm; grazing pressure moderate to heavy. NVC M23a mosaic	
Marshy grassland		Peat depth: 0.40m		
Species		% cover	Species	% cover
Juncus acutiflorus		65	*Cerastium fontanum*	2
Cirsium palustre		8	*Luzula multiflora*	2
Ranunculus acris		10	*Potentilla erecta*	3
Anthoxanthum odoratum		15	*Hylocomium splendens*	55
Trifolium repens		3	*Rhytidiadelphus squarrosus*	20
			Species total	10

Q21	15.05.24	274343 426044	Sward height 45cm; grazing pressure moderate NVC M23a/unclassified acid grassland mosaic	
Marshy grassland		Peat depth: 0.40m		
Species		% cover	Species	% cover
Juncus acutiflorus		45	*Carex nigra*	5
Potentilla erecta		5	*Hylocomium splendens*	2
Pedicularis sylvatica		8	Bare peat	3
Anthoxanthum odoratum		30	Dung	3
Carex panicea		8		
			Species total	7

Quadrat 21

Quadrat 22

Q22	15.05.24	274296 426020	Sward height 45cm; grazing pressure moderate. NVC M23a	
Marshy grassland		Peat depth: 0.10m		
Species		% cover	Species	% cover
Juncus acutiflorus		45	*Trifolium repens*	2
Juncus effusus		8	*Potentilla erecta*	5
Anthoxanthum odoratum		15	*Ranunculus flammula*	2
Carex panicea		8	*Pedicularis sylvatica*	2
Cardamine pratense		3	*Rhytidiadelphus squarrosus*	60
Ranunculus acris		3	*Hylocomium splendens*	30
			Species total	12

Q23	15.05.24	274294 425958	Sward height 40cm; grazing pressure moderate to heavy. NVC M23a	
Marshy grassland		Peat depth: 0.10m		
Species		% cover	Species	% cover
Juncus acutiflorus		65	*Trifolium repens*	5
Juncus effusus		10	*Taraxacum officinale* agg.	2
Anthoxanthum odoratum		10	*Luzula multiflora*	1
Ranunculus acris		8	*Equisetum fluviatile*	1
Carex panicea		8	*Rhytidiadelphus squarrosus*	80
Ranunculus flammula		3	*Hylocomium splendens*	10
			Species total	12

Quadrat 23

Quadrat 24

Q24	17.05.24	274253 425915	Sward height 80cm; grazing pressure moderate . NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: 0.10m		
Species		% cover	Species	% cover
Juncus acutiflorus		70	*Cirsium palustre*	8
Juncus effusus		15	*Dactylorhiza maculata*	2
Luzula multiflora		3	*Anthoxanthum odoratum*	15
Carex panicea		8	*Trifolium repens*	3
Taraxacum officinale agg.		3	*Rhytidiadelphus squarrosus*	60
Carex nigra		5	*Calliergonella cuspidatum*	15
Ranunculus flammula		3	Dung	
Ranunculus acris		5		
			Species total	14

Q25	17.05.24	274366 425911	Sward height 80cm; grazing pressure moderate . NVC M23b/unclassified acid grassland mosaic	
Marshy grassland/acid grassland		Peat depth: 0.10m		
Species		% cover	Species	% cover
Juncus effusus		15	*Ranunculus acris*	8
Anthoxanthum odoratum		30	*Cardamine pratense*	1
Carex panicea		10	*Cynosurus cristatus*	1
Carex nigra		3	*Rhytidiadelphus squarrosus*	85
Cirsium palustre		3	*Pseudoscleropodium purum*	3
Ranunculus flammula		5	*Hylocomium splendens*	10
			Species total	12

Quadrat 25

Quadrat 26

Q26	17.05.24	274392 425862	Sward height 70cm; grazing pressure light NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: 0.50m		
Species		% cover	Species	% cover
Juncus effusus		25	*Ranunculus flammula*	3
Juncus acutiflorus		55	*Rhytidiadelphus squarrosus*	65
Anthoxanthum odoratum		15	*Calliergonella cuspidatum*	10
Cardamine pratense		2		
Ranunculus acris		*5*		
			Species total	9

Q27	17.05.24	274400 425818	Sward height 40cm; grazing pressure low to moderate . NVC M23a	
Marshy grassland		Peat depth: 0.90m		
Species		% cover	Species	% cover
Juncus acutiflorus		75	*Ranunculus acris*	5
Taraxacum officinale agg.		3	*Potentilla erecta*	3
Carex nigra		3	*Anthoxanthum odoratum*	15
Carex panicea		10	*Pseudoscleropodium purum*	2
Carex flacca		2	*Hylocomium splendens*	10
Cirsium palustre		3	*Rhytidiadelphus squarrosus*	65
			Species total	12

Quadrat 27

Quadrat 28

Q28	17.05.24	274396 425768	Sward height 1m; grazing pressure light. Situated within narrow band of clearfell Sitka Spruce. NVC M23b/unclassified acid grassland mosaic	
Marshy grassland/acid grassland		Peat depth: 0.50m		
Species		% cover	Species	% cover
Juncus effusus		35	*Equisetum fluviatile*	5
Anthoxanthum odoratum		40	*Holcus lanatus*	15
Cirsium palustre		3	*Rhytidiadelphis squarrosus*	65
Carex panicea		8	Sitka spruce brash	8
			Species total	7

Q29	17.05.24	274387 425738	Sward height 40cm; grazing absent . NVC M23a	
Marshy grassland		Peat depth: >1m		
Species		% cover	Species	% cover
Juncus acutiflorus		75	*Trifolium repens*	5
Equisetum fluviatile		3	*Carex nigra*	3
Anthoxanthum odoratum		3	*Ranunculus repens*	15
Cardamine pratense		10	*Galium palustre*	2
Ranunculus flammula		2	*Calliergonella cuspidatum*	10
			Species total	10

Quadrat 29

Quadrat 30

Q30	17.05.24	274389 425682	Sward height 70cm; grazing pressure light . NVC M23a	
Marshy grassland		Peat depth: 0.40m		
Species		% cover	Species	% cover
Juncus acutiflorus		80	*Trifolium repens*	2
Anthoxanthum odoratum		20	*Cirsium palustre*	5
Ranunculus acris		5	*Pseudoscleropodium purum*	3
Luzula multiflora		3	*Rhytidiadelphus squarrosus*	55
			Species total	8

Q31	17.05.24	274456 425742	Sward height 1.3m; grazing pressure low to moderate. Situated in narrow band of clearfell Sitka NVC MG10/unclassified acid grassland mosaic	
Marshy grassland/acid grassland		Peat depth: 0.10m		
Species		% cover	Species	% cover
Juncus effusus		30	*Holcus lanatus*	35
Cirsium palustre		8	*Cerastium fontanum*	1
Epilobium montanum		3	*Viola palustre*	1
Dryopteris dilatata		3	*Polytrichum commune*	5
Dryopteris filix-mas		5	*Rhytidiadelphus squarrosus*	45
Rubus fruticosus agg.		2	*Hylocomium splendens*	30
Anthoxanthum odoratum		15	Sitka spruce brash	20
			Species total	13

Quadrat 31

Quadrat 31

Q32	17.05.24	274503 425714	Sward height 40cm; grazing pressure light . NVC M23a	
Marshy grassland		Peat depth: 0.70m		
Species		% cover	Species	% cover
Juncus acutiflorus		90	*Cardamine pratense*	1
Anthoxanthum odoratum		8	*Sphagnum fallax*	10
Epilobium palustre		2	*Sphagnum palustre*	5
Carex panicea		3	*Polytrichum commune*	3
Carex nigra		2	*Rhytidiadelphus squarrosus*	35
Potentilla erecta		3		
			Species total	11

Q33	17.05.24	274591 425706	Sward height 80cm; grazing pressure light . NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: >1m		
Species		% cover	Species	% cover
Juncus acutiflorus		70	*Galium palustre*	1
Juncus effusus		20	*Luzula multiflora*	2
Potentilla erecta		3	*Cardamine pratense*	2
Ranunculus acris		10	*Cirsium palustre*	2
Viola palustris		3	*Rhytidiadelphus squarrosus*	45
Anthoxanthum odoratum		15		
			Species total	11

Quadrat 33

Quadrat 34

Q34	17.05.24	274660 425747	Sward height 1.3m; grazing pressure light . NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: >1m		
Species		% cover	Species	% cover
Juncus acutiflorus		55	*Ranunculus flammula*	5
Juncus effusus		40	*Galium palustre*	2
Cardamine pratense		5	*Taraxacum officinale* agg.	5
Ranunculus acris		8	*Epilobium palustre*	2
Anthoxanthum odoratum		15	*Rhytidiadelphus squarrosus*	55
			Species total	10

Q35	17.05.24	274754 425805	Sward height 1.3m; grazing pressure light . NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: 0.15m		
Species		% cover	Species	% cover
Juncus acutiflorus		75	*Potentilla erecta*	2
Juncus effusus		20	*Carex nigra*	2
Ranunculus acris		8	*Luzula multiflora*	2
Cirsium palustre		8	*Taraxacum officinale* agg.	2
Anthoxanthum odoratum		10	*Rhytidiadelphus squarrosus*	70
Carex panicea		3	*Polytrichum commune*	3
			Species total	12

Quadrat 35

Quadrat 36

Q36	17.05.24	274872 425854	Sward height 60cm; grazing pressure light . NVC M23a/unclassified acid grassland mosaic	
Marshy grassland		Peat depth: 0.15m		
Species		% cover	Species	% cover
Juncus acutiflorus		65	*Leontodon autumnalis*	1
Anthoxanthum odoratum		20	*Ranunculus flammula*	3
Potentilla erecta		3	*Trifolium repens*	2
Ranunculus acris		5	*Cirsium palustre*.	2
Dactylorhiza maculata		5	*Rhytidiadelphus squarrosus*	55
Luzula multiflora		2	*Hylocomium splendens*	15
Taraxacum officinale agg.		2		
			Species total	13

Q37	17.05.24	274946 425904	Sward height 80cm; grazing pressure light . NVC M23a	
Marshy grassland		Peat depth: 0.05m		
Species		% cover	Species	% cover
Juncus acutiflorus		90	*Ranunculus flammula*	8
Anthoxanthum odoratum		10	*Taraxacum officinale* agg.	3
Ranunculus acris		8	*Prunella vulgaris*	3
Potentilla erecta		5	*Rhytidiadelphus squarrosus*	60
Luzula multiflora		2	*Calliergonella cuspidatum*	25
Cirsium palustre		3	*Pseudoscleropodium purum*	2
			Species total	12

Quadrat 37

Quadrat 38

Q38	17.05.24	274985 425925	Sward height 60cm; grazing pressure light . NVC M20/M23a mosaic	
Marshy grassland		Peat depth: 0.50m		
Species		% cover	Species	% cover
Juncus acutiflorus		45	*Luzula multiflora*	3
Eriophorum vaginatum		40	*Anthoxanthum odoratum*	8
Ranunculus acris		5	*Sphagnum fallax*	5
Potentilla erecta		3	*Rhytidiadelphus squarrosus*	15
Galium saxatile		2	*Hylocomium splendens*	60
Taraxacum officinale agg.		3	*Polytrichum commune*	3
			Species total	12

Q39	17.05.24	274316 426296	Sward height 1.2m; grazing absent. Developing Gorse & Bramble scrub with occasional scattered willows *Salix* sp. in wider area. NVC M23b	
Marshy grassland		Peat depth: 0.40m		
Species		% cover	Species	% cover
Juncus effusus		50	*Viola riviniana*	5
Equisetum fluviatile		5	*Holcus lanatus*	25
Rubus fruticosus agg.		8	*Anthoxanthum odoratum*	15
Filipendula ulmaria		5	*Chamaenerion angustifolium*	3
Cirsium palustre		5		
			Species total	9

Quadrat 39

Quadrat 40

Q40	17.05.24	274341 426342	Sward height 1.6m; grazing absent. . NVC M23a/M23b mosaic	
Marshy grassland		Peat depth: 0.30m		
Species		% cover	Species	% cover
Juncus effusus		30	*Holcus lanatus*	15
Juncus acutiflorus		65	*Luzula multiflora*	3
Molinia caerulea		10	*Sphagnum fallax*	2
Potentilla erecta		3	*Rhytidiadelphus squarrosus*	35
Anthoxanthum odoratum		8	*Hylocomium splendens*	20
			Species total	10

Q41	17.05.24	274406 426346	Sward height 40cm; grazing pressure moderate. . NVC M23a	
Marshy grassland		Peat depth: 0.30m		
Species		% cover	Species	% cover
Juncus acutiflorus		90	*Ranunculus acris*	3
Anthoxanthum odoratum		20	*Rhytidiadelphus squarrosus*	65
			Species total	4

Quadrat 41

Quadrat 42

Q42	17.05.24	274461 426387	Sward height 1.6m; grazing pressure light. . NVC M25	
Marshy grassland		Peat depth: 0.30m		
Species		% cover	Species	% cover
Molinia caerulea		95	*Anthoxanthum odoratum*	10
Potentilla erecta		5	*Plantago lanceolata*	3
Carex nigra		5	*Rhytidiadelphus squarrosus*	20
			Species total	6

Q43	17.05.24	274985 425925	Sward height 35cm; grazing pressure light . NVC M23a/U5 mosaic	
Marshy grassland		Peat depth: 0.05m		
Species		% cover	Species	% cover
Nardus stricta		15	*Potentilla erecta*	2
Juncus acutiflorus		65	*Trifolium repens*	2
Carex nigra		2	*Dactylorhiza maculata*	2
Anthoxanthum odoratum		15	*Plantago lanceolata*	2
Luzula multiflora		2	*Succisa pratensis*	2
Cirsium palustre		3	*Rhytidiadelphus squarrosus*	70
Ranunculus acris		8		
			Species total	11

Quadrat 43

Technical Appendix 6.3 pt1.

Bat Roost Potential / Ground Level Tree Assessment Survey

530/202406/A

BRP / GLTA Report for Extension of Dunbeg South Wind Farm, Limavady Co. Derry/Londonderry

For:

June 2024

Ecological Assessment | Ecological Clerk of Works | Bat Surveys | Badger Surveys
Biodiversity Checklists | Ornithological Assessment | Preliminary Ecological Appraisal

Blackstaff Ecology

Document history

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Issue	**Date**	**Revision Details**
A	28/06/24	First Issue (Draft)

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Contents

Executive Summary

This is a brief summary of survey results. For full details please read the report in its entirety.

- Blackstaff Ecology Ltd. conducted a Bat Roost Potential (BRP) and Ground Level Tree Assessment (GLTA) survey for all structures and trees present within a 200m plus rotor radius buffer zone, for four proposed turbine locations, on 11.06.24.

- Three brick structures present within the nearby quarry were assessed in accordance with latest BCT guidelines. Structure 1 was categorised as Negligible to Low BRP; Structure 2 was categorised as Negligible BRP; and Structure 3 was categorised as Negligible to Low BRP. BCT recommend one dusk emergence survey for structures of Low BRP, to be carried out between May and August. Use of night vision aids (NVAs) is recommended. Alternatively, at height inspection to better assess depth of identified PRFs / at height endoscopic inspection under license could be undertaken.

- The buffer zones feature Negligible willow scrub, PRF-NONE hawthorn hedgerows and PRF-NONE to PRF-I (under the precautionary principle) coniferous plantation blocks. No PRF-M trees were recorded. BCT do not recommend further survey effort for trees which may lend BRP only to individual or low numbers of opportunistic bats. No further survey effort is recommended for trees.

Introduction

Overview

1. The development proposes to extend the current and operational wind farm at Dunmore / Dunbeg, located near Limavady Co. Derry, through the provision of a further four wind turbines west of the existing wind farm. It is proposed that one new turbine will be sited to the north of Broad Road (A37) and three to the south.

Statement of Authority

2. The field survey was conducted by Catriona Porter MSc and Jazmin Creaney BSc. Field data was compiled in this report by Catriona which was then reviewed and approved by Cormac Loughran CEnv MCIEEM MSc.

3. Catriona has an MSc in Animal Behaviour and Welfare (Distinction) from Queen's University, Belfast. She has several years of experience within the nature conservation sector through extensive volunteering including organisations such as UK Overseas Territories Conservation Forum, Ulster Wildlife and the RSPB. Catriona has just over 3 years of experience within the ecological consultancy sector beginning in April 2021 with Allen & Mellon Environmental. She has been involved in projects in the north and south of Ireland and has gained varied experience in survey techniques and the associated ecological reports. Catriona has conducted approximately thirty emergence/re-entry bat surveys, fifteen bat roost potential assessments on buildings and trees, two Ecological Clerk of Works (ECoW) supervised demolitions and over one hundred bat carcass searches for single wind turbines. She is a Qualifying CIEEM member.

4. Jazmin has a BSc in Zoology and is a Qualifying member of CIEEM. She has undertaken further courses including Animal Conservation, GIS and Environmental Management. She has a range of experience in conducting field surveys both locally, with organisations including BTO, The National Trust and TetraTech, and abroad, through her time monitoring elephant behaviour and habitat damage in South Africa. Since joining Blackstaff Ecology in 2021, Jazmin has veeb involved in projects throughout NI and the ROI and has gained significant ecological experience. She has conducted: approximately thirty-two emergence / re-entry surveys, twenty-two bat roost potential (BRP) surveys, four bat activity transects, one Ecological Clerk of Works (ECoW) supervising tree endoscoping, eighty-one carcass searches, nine Bat Monitoring and Mitigation Plan (BMMP) reports and twenty-eight single wind turbine reports. She has also attended the 2023 Irish Bat Conference.

5. Cormac is a Chartered Environmentalist (CEnv), and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). He holds an MSc (Distinction) in Environmental Management from the University of Ulster and has extensive experience in bat surveys; having undertaken and coordinated full bat surveys and associated impact assessments for more than 20 major wind farm developments, and 25 single turbines. He is also a licenced bat surveyor and regularly undertakes licenced activities under licence from NIEA. Cormac has previously held a Natural England Disturbance Licence (20121610) for Bats (all species, (all counties of England)). He regularly attends lectures, courses and conferences, specifically relating to bats, for the purposes of CPD (Continuing Professional Development). Furthermore, having worked in the Ecological Consultancy sector for over 15 years he has been involved in dozens of badger surveys and PEAs.

Wildlife and the Law

6. All bat species found in Northern Ireland are listed under Appendix III of the Bern Convention and Annex IV of the EC Habitats Directive. In addition, bats and their habitats are listed under Appendix II of the Bonn Convention; therefore, there is an obligation to protect the habitat of bats, including links to important feeding areas. Bats also receive protection under Schedule 2 of the Conservation (Natural Habitats) Regulations (NI) 1995, as amended.

7. In relation to the above European Protected Species, it is an offence if:

   - *They are deliberately captured, injured or killed*
   - *These animals are disturbed in such a way as to significantly affect their ability to survive, breed, or rear / nurture their young, or in a way that affects the local distribution or abundance of that species*
   - *A breeding site or resting place of these species is damaged or destroyed, even if this is unintentional and / or when the animal is not present*
   - *Access to a structure or place used by these species for protection or shelter is intentionally or recklessly obstructed*
   - *This legislation applies to all life stages of these species*

8. Also note that a licence may be required from the Northern Ireland Environment Agency for development work which is likely to affect a bat roost.

9. In addition to the above legislation, local planning authorities are also required to take into consideration natural heritage (including protected species and habitats) when a proposed planning application is being considered; the criteria used for this purpose are detailed in the guidance document 'Planning Policy Statement 2 (PPS2) – Natural Heritage'. The local planning authority should also consult with the Northern Ireland Environment Agency regarding protected species and / or habitats which may be present within the application area.

10. All UK bats are listed under the following European Community Directives, Conventions or UK legislation:

    - *Appendix II of the Bern Convention. An agreement on the Conservation of Bats in Europe (EUROBATS) under the auspices of the Bonn Convention, also known as the Convention on Migratory Species (CMS) is in force, and all European bats are listed under Appendix II of the CMS;*
    - *Appendix II of the Bonn Convention (and Recommendation 36 on the Conservation of Underground Habitats),*
    - *Annexes II and IV of the EC Habitats Directive; and*
    - *The Conservation (Natural Habitats etc.) Regulations (Northern Ireland) 1995 (as amended).*

Methodology

11. An assessment of trees and structures was made within a 200m plus rotor radius buffer zone, with regard to their suitability to support roosting bats. This buffer zone was applied to all four turbine locations made available to Blackstaff Ecology at the time of survey. Should the development alter to include additional and / or differently sited turbines, an updated GLTA / BRP assessment should be made. The following survey findings are applicable only to the buffer zone applied around the aforementioned four turbine locations.

12. Some examples of PRF-NONE trees are included in this report for good practice to show the data points assessed and for context in conjunction with supplied photographs. Not every PRF-NONE tree is included as this is not considered pragmatic nor necessary. Numerous photographs have been taken and are supplied within this report, for visual context of the lack of bat roosting potential in tree species present within the buffer zones.

13. These surveys were informed by the latest Bat Conservation Trust (BCT) 'Bat Surveys for Professional Ecologists: Good Practice Guidelines' (2023). This entailed a ground level external assessment with the aim of identifying any potential roosting features (PRFs) including but not limited to:

Trees

- *Cavities (formed by woodpeckers, rot, branch-tearing, cankers, butt-rots, double-leaders forming compression forks or manmade);*
- *Cracks and splits (vertical and horizontal) in stems and branches*
- *Partially detached 'platey' bark;*
- *Partially detached ivy;*

Structures

- *Peeling paintwork*
- *Cavities under and behind tiles/slates/felt/corrugated metal*
- *Gaps or holes in brick/stone work*
- *Loose mortar between bricks*
- *Lead flashing*
- *Cavities between walls and fascias/barge boards/soffits*

14. The potential presence of roosting bats was also assessed by searching for:

- *Bat droppings*
- *Odour*
- *Staining*

15. Trees were assigned new categorisations of NONE, FAR or PRF. If PRF was selected, it was then further categorised into either PRF-I or PRF-M to reflect changes in the updated 2023 BCT guidelines. Further detail was recorded for trees where relevant including an estimate of tree height, species, diameter at chest height, PRF orientation et cetera.

16. BCT 2016 guidelines '*Bat Surveys for Professional Ecologists: Good Practice Guidelines*' provide descriptions of what qualifies for each BRP classification in Table 4.1.

17. BCT 2023 updated guidelines '*Bat Surveys for Professional Ecologists: Good Practice Guidelines'* provide an updated Table 4.1 with slightly different descriptions of what qualifies for each BRP classification. This table provides slightly more detail and adopts a more precautionary approach, as does the updated document in general. This guidance also places more focus on the PRF suitability to support different roost types. Trees are not specifically mentioned in this table: section 6.7 'Ground level tree assessment (GLTA)' paragraph 6.7.14 directs to Table 4.2 and Table 6.2 for tree PRF categorisation.

Table 4.1 - Guidelines for assessing the suitability of a structure or tree for roosting bats, taken from BCT 2016 guidelines (page 35).

Suitability	Description
Negligible	*Negligible habitat features on site likely to be used by roosting bats*
Low	*A structure with one or more potential roost sites that could be used by individual bats opportunistically. However, these potential roost sites do not provide enough space, shelter, protection, appropriate conditions and / or suitable surrounding habitat to be used on a regular basis or by larger numbers of bats (i.e. unlikely to be suitable for maternity or hibernation).* *A tree of sufficient size and age to contain PRFs but with none seen from the ground or features seen with only very limited roosting potential.*
Moderate	*A structure or tree with one or more potential roost sites that could be used by bats due to their size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status (with respect to roost type only – the assessments in this table are made irrespective of species conservation status, which is established after presence is confirmed).*
High	*A structure or tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time due to their size, shelter, protection, conditions and surrounding habitat.*

Table 4.2 - Guidelines for categorising the suitability of a tree for roosting bats, taken from BCT 2023 guidelines (page 45).

Suitability	Description
NONE	*Either no PRFs in the tree or highly unlikely to be any*
FAR	*Further assessment required to establish if PRFs are present in the tree*
PRF	*A tree with at least one PRF present*

Table 6.2 - Guidelines for categorising assessing suitability of PRFs for roosting bats, taken from BCT 2023 guidelines (page 62).

Suitability	Description
PRF-I	*PRF is only suitable for individual bats or very small numbers of bats either due to size or lack of suitable surrounding habitats.*
PRF-M	*PRF is suitable for multiple bats and may therefore be used by a maternity colony.*

Results

Trees

18. The buffer zones contain two separate areas of conifer plantation located at the north and south ends of the site. These tree groups predominantly feature trees of <0.5m DCH, however for the northern Sitka spruce *Picea sitchensis* plantation some trees present along the plantation edge appeared more mature: these were thoroughly inspected. The plantation tree groups featured minor flaking bark not substantial enough to lend BRP, and which is considered PRF-NONE. These

tree groups also featured some broken branches, all of which appeared splintered inside and which did not form cavities et cetera lending BRP. Random trees were sampled throughout the plantations therefore it remains possible slightly deeper flaking bark could be present for unsurveyed trees, lending BRP to low numbers of individual bats roosting on an opportunistic basis (PRF-I). This deviation from minor areas of flaking bark and splintered branches is however considered unlikely due to the similar age, size and species of trees present. The plantation areas are not considered to support roosting bats.

19. All other trees within the buffer zones were assessed as PRF-NONE. These trees had a similar low DCH and lacked BRP features. Species present largely consisted of willow scrub *Salix sp.*; hawthorn *Crataegus monogyna* hedgerows were present to the north. The survey areas were otherwise dominated by Negligible species such as Rhododendron *Rhododendron ponticum*, gorse *Ulex sp*., fuscia *Fuscia riccartonnii*, scotch broom *Cytisus scoparius*.

Photograph 1 – Example PRF-NONE trees present

Photograph 2 – Example PRF-NONE trees present

Structures

20. The search zone to the south of the A37 included three derelict / unfinished built structures located by the quarry.

21. Structure 1 lacked a roof or internal compartments and was comprised of concrete bricks. This structure featured minor external cracks. These cracks were inspected, using binoculars where necessary, and were found to be mostly shallow. Some cracks appeared to extend deeper between bricks. This structure is considered to lend Negligible to Low BRP.

22. Structure 2 is a similar brick structure with an open internal area enclosed by three walls and roof. This structure featured similar minor cracks which upon inspection were found to be shallow. This structure is considered to lend Negligible BRP.

23. Structure 3 again is a similar brick structure lacking roof or internal compartments. This structure features minor cracks. It also features more substantial gaps presumably from displaced support beams. This structure is considered to lend Negligible to Low BRP, under the precautionary principle in absence of closer inspection of these gaps.

Photograph 3 – Structure 1

Photograph 4 – Structure 2

Photograph 5 – Structure 3

Survey Constraints

24. Sheep were present at the time of survey however they did not impact access. The entirety of the buffer zones applied to the four proposed turbine locations were inspected for bat roost potential, either in trees or built structures. The resulting data and survey conclusions are considered robust and sufficient to inform the need for any further survey effort, if any.

Evaluation

25. Hedgerow trees and scattered trees present in the surrounding landscape were not found to lend BRP and have been categorised as PRF-NONE.

26. Random sampling occurred for the coniferous plantation blocks as it was not pragmatic nor possible to individually inspect each tree. Minor flaking bark and splintered branch breaks were the only features identified; these were not found to lend BRP therefore have been categorised as PRF-NONE. Due to similar age, species and associated features it is considered unlikely more substantial and / or different PRFs are present within these plantation blocks, however this possibility of PRF-I cannot be ruled out due to absence of individual tree inspection.

27. BCT do not recommend further survey effort for trees capable of supporting individual or lower numbers of roosting bats on an opportunistic basis. No further action is recommended for any tree within the buffer zones.

28. Three brick structures are present by the quarry, south of the A37. Minor cracks and gaps are present, the majority of which appear shallow and do not provide suitable BRP. Some cracks in Structure 1 appeared to extend deeper between bricks and some larger gaps of unknown depth were observed in Structure 3. It is considered unlikely bats are utilising either structure to roost, however under the precautionary principle and in absence of further inspection effort the noted PRFs are categorised as Low BRP: due to lending roosting potential for individual or low numbers of opportunistic bats. BCT guidelines recommend one dusk emergence survey for such structures, to be undertaken by a suitably qualified ecologist between May and August. Night vision aids (NVAs) should be employed.

29. A Bat Monitoring and Mitigation Plan has been recommended for this development: the post-construction monitoring and mitigation provisions within such are considered proportionate and reasonable protective measures, should individual bats be utilising minor PRFs in the surrounding landscape.

Conclusions

30. In the absence of at-height inspection to clarify depth of identified PRFs, one dusk emergence survey is recommended for the identified structures. Alternatively an at height endoscopic inspection (under NIEA license) could be completed.

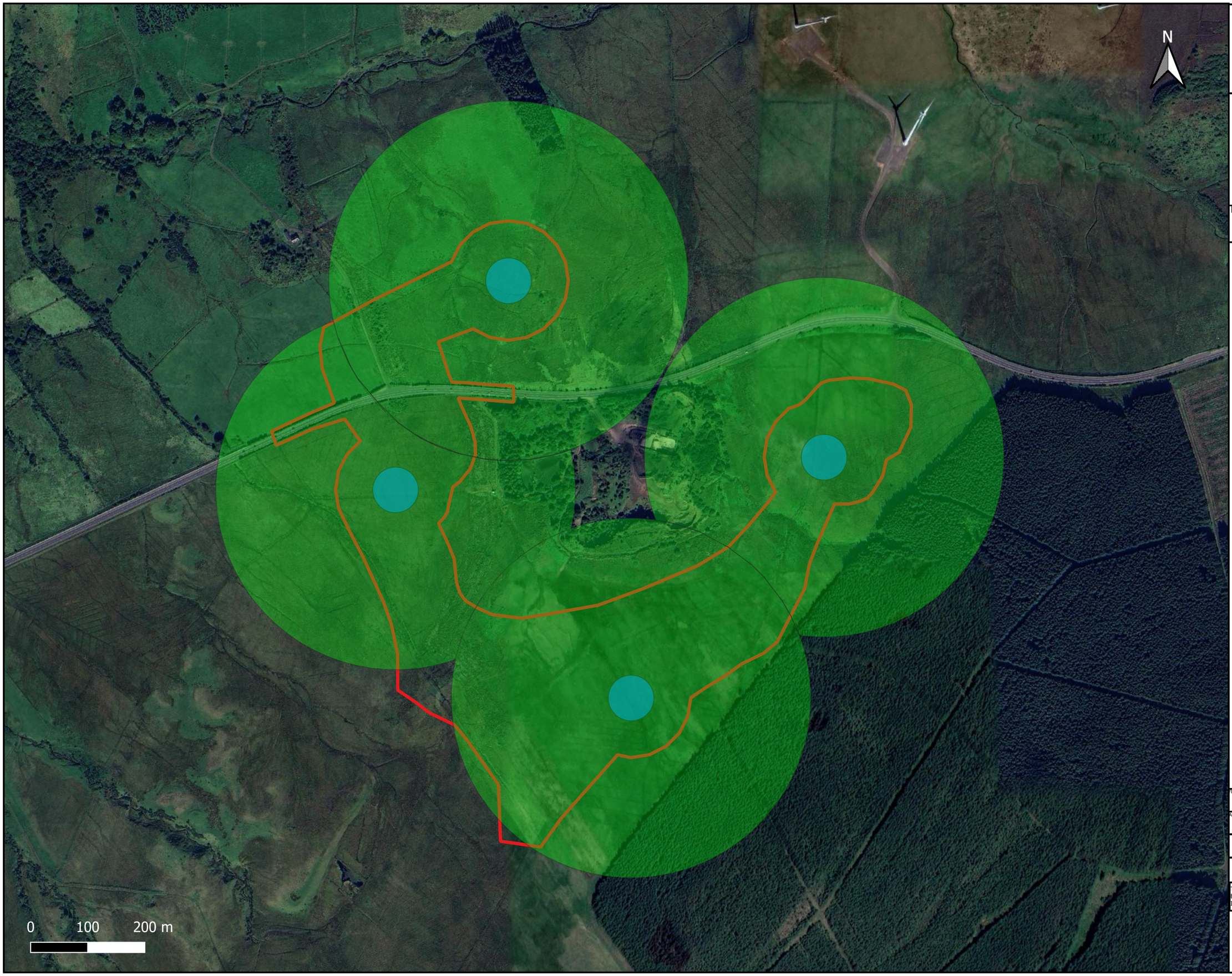
References

Andrews, H. and Garder, M. (2015) Surveying trees for bat roosts: Encounter probability v. survey effort. In Practice 88: 33-38.

Collins, J. (ed.) (2016) Bat Surveys for Professional Ecologists – Good Practice Guidelines. 3rd edition. Bat Conservation Trust, London.

Collins, J. (ed.) (2023) Bat Surveys for Professional Ecologists – Good Practice Guidelines. 4th edition. Bat Conservation Trust, London.

Figure 1 – Turbine Locations and Buffer Zones



Dunbeg South Wind Farm

FIGURE 1

Turbine Locations and Buffer Zones

KEY

- Site Boundary
- BRP / GLTA Buffer Zone
- Proposed Turbine Location

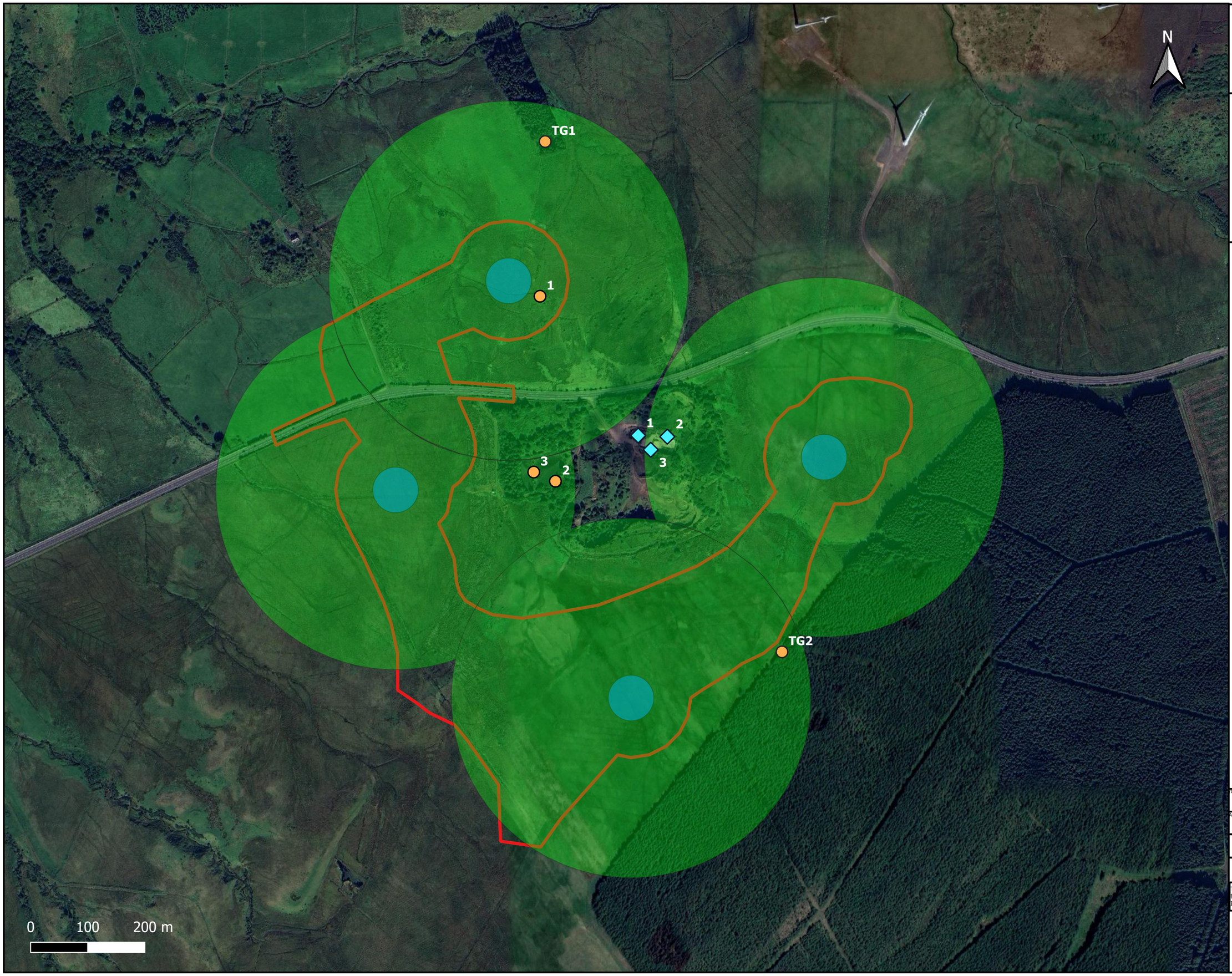
OUT DWG

T-LAYOUT NO.

AWING NUMBER

BRP / GLTA Survey Report

Figure 2 – BRP / GLTA Locations



res
power for good

Dunbeg South Wind Farm

FIGURE 2

BRP / GLTA Locations

KEY

- Site Boundary
- BRP / GLTA Buffer Zone
- Proposed Turbine Location
- Structure
- Tree

OUT DWG

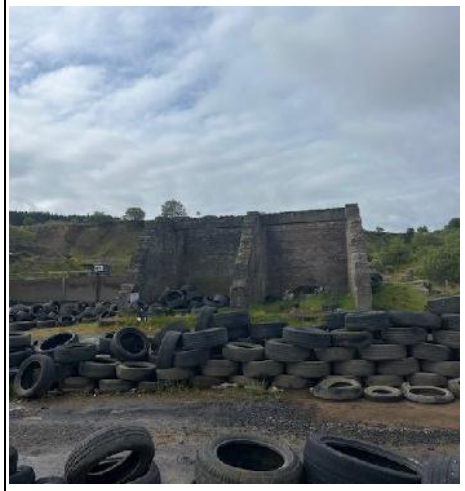
T-LAYOUT NO.

AWING NUMBER

BRP / GLTA Survey Report

Blackstaff Ecology

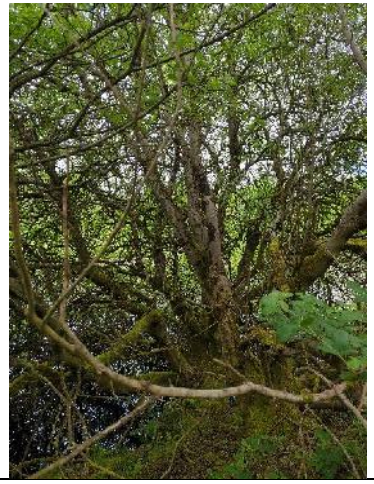
Appendix 1 – BRP Table

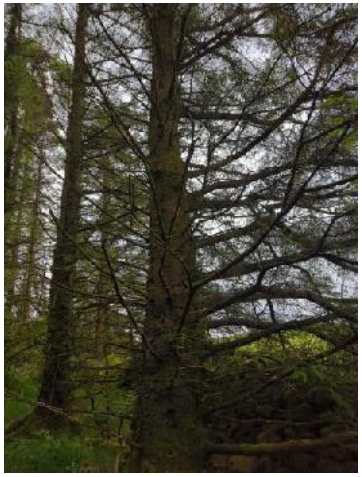
Structure Number	Easting	Northing	PRF Description	Photograph
1	274770	426136	Minor cracks in bricks. Majority appear too shallow to lend BRP, however some appear to extend deeper between bricks. It remains possible they could support individual or low numbers of bats roosting on an opportunistic basis. This structure has therefore been precautionarily categorised **between Negligible and Low BRP.**	*Photograph 1 – Structure 1*  *Photograph 2 – Structure 1 close-up*  *Photograph 3 – Structure 1 cracks*  *Photograph 4 – Structure 1 apparent deeper gap* 

2	274821	426134	Minor cracks in bricks. All appear too shallow to lend BRP: no PRFs which would be categorised beyond Negligible BRP observed.	*Photograph 5 – Structure 2* 
3	274792	426111	Minor cracks in bricks observed. Larger gaps around apparent former support beams noted. These gaps are present at height and it is uncertain how shallow / deep they are. From a ground level vantage it appears possible they could extend farther in and lend roosting potential for individual or low numbers of opportunistic bats. **Negligible to Low BRP.**	*Photograph 6 – Structure 3*  *Photograph 7 – Structure 3 associated wall* 

				Photograph 8 – PRF close-up 

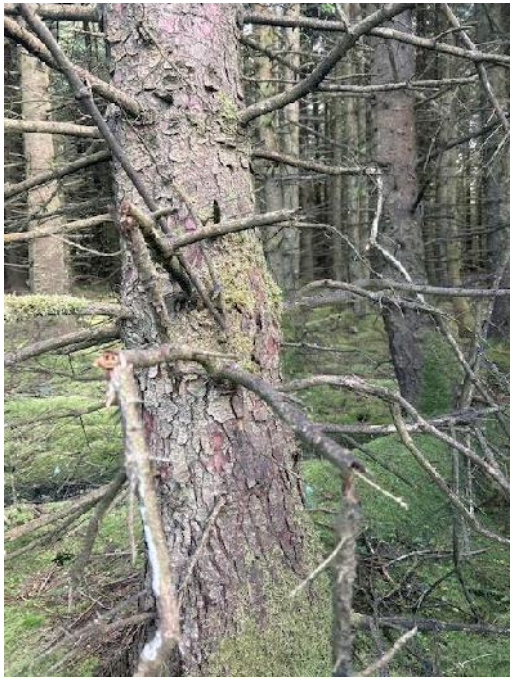
Appendix 2 – GLTA Table

Tree Number	Location (Easting, Northing)	Height (m)	Diameter at chest height (DCH) (m)	Species	Health Status	PRF Type, Description, Orientation	Photograph(s)
1	274598, 426380	~4	0.3	*Salix sp.*	Alive	**PRF-NONE.**	*Photograph 1* 
2	274625, 426056	~4	~0.6	*Salix sp.*	Alive	**PRF-NONE.**	*Photograph 2* 

3	274587, 426072	~6	~0.4	*Salix cinerea*	Alive	**PRF-NONE.**	*Photograph 3* 
Group 1	274607, 426651	~18	~0.6	*Picea sitchensis*	Alive	**PRF-NONE.**	*Photograph 4*  *Photograph 5*  *Photograph 6* 

							Photograph 7 
Group 2	275022, 425757	~12	~0.3 – 0.6	*Picea sitchensis*	Alive	**PRF-NONE.**	*Photograph 8*  *Photograph 9* 

							Photograph 10 	*Photograph 11* 

							Photograph 12 	*Photograph 13* 

Appendix 3 – General Site Photographs

Photograph 1	*Photograph 2*	*Photograph 3*
Example Negligible Trees	Example Negligible Trees	Example Negligible Trees
		
Photograph 4	*Photograph 5*	*Photograph 6*
Example Negligible Trees	Example Negligible Trees	Example Negligible Trees
		
Photograph 7	*Photograph 8*	*Photograph 9*
Example Negligible Trees	Example Negligible Trees	Example Negligible Trees
		

Photograph 10	*Photograph 11*	*Photograph 12*
Example Negligible Quarry Scrub	Example Negligible Quarry Scrub	Example Negligible Quarry Scrub
		
Photograph 13	*Photograph 14*	*Photograph 15*
Example Negligible Quarry Scrub	Example Negligible Quarry Scrub	Example Negligible Quarry Scrub
		
Photograph 16	*Photograph 17*	*Photograph 18*
Example Negligible Trees	Example Negligible Trees	Example Negligible Trees
		

Technical Appendix 6.3 pt2.

Static Detector Results

T1

Spring									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230601	2	0	28	0	28	110	0	**168**	**21.00**
20230602	3	0	161	0	39	261	0	**464**	**58.00**
20230603	0	0	59	0	8	8	0	**75**	**9.38**
20230604	1	0	25	1	61	61	0	**149**	**18.63**
20230605	2	0	85	0	20	30	0	**137**	**17.13**
20230606	0	0	45	0	43	25	0	**113**	**14.13**
20230607	3	0	64	0	13	22	1	**103**	**12.88**
20230608	1	0	92	0	6	8	0	**107**	**13.38**
20230609	1	0	32	0	0	0	0	**33**	**4.13**
20230610	0	0	76	0	19	22	0	**117**	**14.63**
Species Total	**13**	**0**	**667**	**1**	**237**	**547**	**1**	**1466**	
Passes per hour	**0.16**	**0.00**	**8.34**	**0.01**	**2.96**	**6.84**	**0.01**	**18.33**	

Summer									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230728	0	0	1	0	0	0	0	**1**	**0.11**
20230729	0	0	1	0	0	0	0	**1**	**0.11**
20230730	1	0	0	0	0	1	0	**2**	**0.22**
20230731	0	0	0	0	0	0	0	**0**	**0.00**
20230801	0	0	12	0	1	14	1	**28**	**3.11**
20230802	1	0	10	0	1	3	0	**15**	**1.67**
20230803	0	1	1	0	0	1	0	**3**	**0.33**
20230804	0	0	7	0	1	1	0	**9**	**1.00**
20230805	0	0	3	0	0	0	0	**3**	**0.33**
20230806	5	0	4	0	2	6	0	**17**	**1.89**
Species Total	**7**	**1**	**39**	**0**	**5**	**26**	**1**	**79**	
Passes per hour	**0.08**	**0.01**	**0.43**	**0.00**	**0.06**	**0.29**	**0.01**	**0.88**	

Autumn									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230912	2	0	3	0	1	8	1	**15**	**1.22**
20230913	0	1	0	0	0	0	0	**1**	**0.08**
20230914	2	0	0	0	5	10	0	**17**	**1.39**
20230915	0	0	2	0	0	2	1	**5**	**0.41**
20230916	1	0	2	0	2	7	0	**12**	**0.98**
20230917	0	0	0	0	2	8	0	**10**	**0.82**
20230918	0	0	0	0	0	6	0	**6**	**0.49**
20230919	0	0	0	0	0	0	0	**0**	**0.00**
20230920	0	0	0	0	0	4	0	**4**	**0.33**
20230921	0	0	1	0	1	18	0	**20**	**1.63**
Species Total	**5**	**1**	**8**	**0**	**11**	**63**	**2**	**90**	
Passes per hour	**0.04**	**0.01**	**0.07**	**0.00**	**0.09**	**0.51**	**0.02**	**0.73**	

T1 Habitat Feature

Spring									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230601	1	0	229	0	282	591	0	**1103**	**137.88**
20230602	0	0	297	0	101	225	0	**623**	**77.88**
20230603	0	0	131	0	210	968	0	**1309**	**163.63**
20230604	0	0	91	0	202	756	0	**1049**	**131.13**
20230605	0	0	98	0	118	910	0	**1126**	**140.75**
20230606	0	1	36	0	248	587	2	**874**	**109.25**
20230607	0	0	60	0	125	1169	0	**1354**	**169.25**
20230608	0	0	132	0	76	763	0	**971**	**121.38**
20230609	2	0	34	0	22	22	2	**82**	**10.25**
20230610	0	1	37	0	47	165	0	**250**	**31.25**
Species Total	**3**	**2**	**1145**	**0**	**1431**	**6156**	**4**	**8741**	
Passes per hour	**0.04**	**0.03**	**14.31**	**0.00**	**17.89**	**76.95**	**0.05**	**109.26**	

Summer									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230728	0	0	1	0	5	6	0	**12**	**1.33**
20230729	0	0	0	0	0	4	0	**4**	**0.44**
20230730	6	1	1	0	0	1	0	**9**	**1.00**
20230731	0	0	1	0	0	1	0	**2**	**0.22**
20230801	2	2	13	0	19	132	0	**168**	**18.67**
20230802	0	0	7	0	8	32	2	**49**	**5.44**
20230803	0	0	4	0	0	28	1	**33**	**3.67**
20230804	2	0	1	0	1	21	0	**25**	**2.78**
20230805	0	1	9	0	1	2	0	**13**	**1.44**
20230806	4	0	4	0	17	28	0	**53**	**5.89**
Species Total	**14**	**4**	**41**	**0**	**51**	**255**	**3**	**368**	
Passes per hour	**0.16**	**0.04**	**0.46**	**0.00**	**0.57**	**2.83**	**0.03**	**4.09**	

Autumn									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230912	0	0	1	0	4	54	1	**60**	**4.90**
20230913	0	0	0	0	0	6	0	**6**	**0.49**
20230914	0	0	4	0	29	443	2	**478**	**39.02**
20230915	1	0	1	0	5	141	1	**149**	**12.16**
20230916	1	1	3	0	5	322	3	**335**	**27.35**
20230917	1	0	3	0	10	38	2	**54**	**4.41**
20230918	0	0	2	0	0	10	0	**12**	**0.98**
20230919	0	0	0	0	0	12	0	**12**	**0.98**
20230920	0	0	0	0	0	10	0	**10**	**0.82**
20230921	0	0	2	0	0	11	0	**13**	**1.06**
Species Total	**3**	**1**	**16**	**0**	**53**	**1047**	**9**	**1129**	
Passes per hour	**0.02**	**0.01**	**0.13**	**0.00**	**0.43**	**8.55**	**0.07**	**9.22**	

T2

Spring									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230601	0	1	1	0	1	4	0	**7**	**0.88**
20230602	0	0	1	0	0	0	0	**1**	**0.13**
20230603	7	1	2	0	2	0	0	**12**	**1.50**
20230604	0	0	2	0	3	2	0	**7**	**0.88**
20230605	1	0	1	0	4	1	0	**7**	**0.88**
20230606	1	0	1	0	10	1	0	**13**	**1.63**
20230607	0	4	5	0	3	1	0	**13**	**1.63**
20230608	0	0	2	0	0	1	0	**3**	**0.38**
20230609	0	0	0	0	0	0	0	**0**	**0.00**
20230610	0	0	2	0	0	1	0	**3**	**0.38**
Species Total	**9**	**6**	**17**	**0**	**23**	**11**	**0**	**66**	
Passes per hour	**0.11**	**0.08**	**0.21**	**0.00**	**0.29**	**0.14**	**0.00**	**0.83**	

Summer									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230728	0	0	1	0	0	0	0	**1**	**0.11**
20230729	0	0	1	0	0	0	0	**1**	**0.11**
20230730	0	0	0	0	0	0	0	**0**	**0.00**
20230731	0	0	10	0	0	0	0	**10**	**1.11**
20230801	0	0	6	0	5	6	0	**17**	**1.89**
20230802	0	0	11	0	0	0	0	**11**	**1.22**
20230803	1	0	1	0	0	2	0	**4**	**0.44**
20230804	0	0	0	0	0	0	0	**0**	**0.00**
20230805	0	0	5	0	2	1	0	**8**	**0.89**
20230806	0	0	9	0	13	4	0	**26**	**2.89**
Species Total	**1**	**0**	**44**	**0**	**20**	**13**	**0**	**78**	
Passes per hour	**0.01**	**0.00**	**0.49**	**0.00**	**0.22**	**0.14**	**0.00**	**0.87**	

Autumn									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230912	0	0	2	0	0	0	1	**3**	**0.24**
20230913	0	0	0	0	0	0	0	**0**	**0.00**
20230914	0	0	13	0	5	5	0	**23**	**1.88**
20230915	0	0	0	0	0	0	0	**0**	**0.00**
20230916	0	0	0	0	3	1	0	**4**	**0.33**
20230917	0	0	0	0	0	0	0	**0**	**0.00**
20230918	0	0	0	0	0	0	0	**0**	**0.00**
20230919	0	0	0	0	0	0	0	**0**	**0.00**
20230920	0	0	0	0	0	0	0	**0**	**0.00**
20230921	0	0	0	0	1	1	0	**2**	**0.16**
Species Total	**0**	**0**	**15**	**0**	**9**	**7**	**1**	**32**	
Passes per hour	**0.00**	**0.00**	**0.12**	**0.00**	**0.07**	**0.06**	**0.01**	**0.26**	

T2 Habitat Feature

Spring									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230601	0	0	43	0	8	4	1	**56**	**7.00**
20230602	0	0	3	0	1	1	0	**5**	**0.63**
20230603	0	0	50	0	10	4	3	**67**	**8.38**
20230604	0	0	111	0	23	4	1	**139**	**17.38**
20230605	0	0	66	0	27	1	4	**98**	**12.25**
20230606	1	0	131	0	19	3	2	**156**	**19.50**
20230607	0	0	157	0	7	1	0	**165**	**20.63**
20230608	1	2	199	0	2	6	4	**214**	**26.75**
20230609	0	0	87	0	11	0	2	**100**	**12.50**
20230610	0	0	102	0	2	1	2	**107**	**13.38**
Species Total	**2**	**2**	**949**	**0**	**110**	**25**	**19**	**1107**	
Passes per hour	**0.03**	**0.03**	**11.86**	**0.00**	**1.38**	**0.31**	**0.24**	**13.84**	

Summer									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230728	0	2	1	0	3	1	0	**7**	**0.78**
20230729	0	0	0	0	0	0	0	**0**	**0.00**
20230730	0	0	1	0	0	0	0	**1**	**0.11**
20230731	0	0	5	0	0	0	0	**5**	**0.56**
20230801	5	0	27	0	30	26	1	**89**	**9.89**
20230802	1	1	7	0	1	2	1	**13**	**1.44**
20230803	0	0	1	0	0	2	0	**3**	**0.33**
20230804	0	0	2	0	0	0	0	**2**	**0.22**
20230805	0	0	1	0	0	0	0	**1**	**0.11**
20230806	1	0	10	0	3	3	1	**18**	**2.00**
Species Total	**7**	**3**	**55**	**0**	**37**	**34**	**3**	**139**	
Passes per hour	**0.08**	**0.03**	**0.61**	**0.00**	**0.41**	**0.38**	**0.03**	**1.54**	

Autumn									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230912	1	1	4	0	2	4	0	**12**	**0.98**
20230913	0	0	3	0	0	0	0	**3**	**0.24**
20230914	0	3	17	0	18	8	2	**48**	**3.92**
20230915	0	0	0	0	2	4	0	**6**	**0.49**
20230916	2	1	1	0	5	8	1	**18**	**1.47**
20230917	0	0	0	0	0	0	0	**0**	**0.00**
20230918	0	0	0	0	0	0	0	**0**	**0.00**
20230919	0	0	0	0	0	0	0	**0**	**0.00**
20230920	1	0	1	0	0	0	0	**2**	**0.16**
20230921	0	0	0	0	1	0	0	**1**	**0.08**
Species Total	**4**	**5**	**26**	**0**	**28**	**24**	**3**	**90**	
Passes per hour	**0.03**	**0.04**	**0.21**	**0.00**	**0.23**	**0.20**	**0.02**	**0.73**	

T3

Spring								
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230601	0	0	64	0	13	2	0	**79**	**9.88**
20230602	0	0	26	0	4	2	0	**32**	**4.00**
20230603	0	0	44	0	9	5	0	**58**	**7.25**
20230604	0	0	79	0	12	10	2	**103**	**12.88**
20230605	0	0	34	0	4	8	2	**48**	**6.00**
20230606	0	1	49	0	12	6	0	**68**	**8.50**
20230607	1	0	55	0	9	7	2	**74**	**9.25**
20230608	0	1	3	0	1	3	1	**9**	**1.13**
20230609	0	0	2	0	2	1	3	**8**	**1.00**
20230610	0	0	18	0	6	3	1	**28**	**3.50**
Species Total	**1**	**2**	**374**	**0**	**72**	**47**	**11**	**507**	
Passes per hour	**0.01**	**0.03**	**4.68**	**0.00**	**0.90**	**0.59**	**0.14**	**6.34**	

Summer								
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230728	0	0	0	0	0	2	1	**3**	**0.33**
20230729	0	0	0	0	0	0	0	**0**	**0.00**
20230730	0	0	0	0	0	0	0	**0**	**0.00**
20230731	0	0	26	0	0	0	0	**26**	**2.89**
20230801	0	0	13	0	4	3	0	**20**	**2.22**
20230802	0	0	11	0	0	4	1	**16**	**1.78**
20230803	0	0	1	0	0	0	0	**1**	**0.11**
20230804	0	0	3	0	0	0	0	**3**	**0.33**
20230805	0	0	4	0	1	4	0	**9**	**1.00**
20230806	0	0	7	0	0	6	0	**13**	**1.44**
Species Total	**0**	**0**	**65**	**0**	**5**	**19**	**2**	**91**	
Passes per hour	**0.00**	**0.00**	**0.72**	**0.00**	**0.06**	**0.21**	**0.02**	**1.01**	

Autumn								
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230912	0	0	2	0	3	4	1	**10**	**0.82**
20230913	0	0	0	0	0	0	0	**0**	**0.00**
20230914	0	0	2	0	5	4	0	**11**	**0.90**
20230915	0	0	1	0	0	0	0	**1**	**0.08**
20230916	0	0	0	0	3	1	0	**4**	**0.33**
20230917	0	0	25	0	8	8	0	**41**	**3.35**
20230918	0	0	0	0	0	1	0	**1**	**0.08**
20230919	1	0	1	0	0	0	0	**2**	**0.16**
20230920	0	0	0	0	0	1	1	**2**	**0.16**
20230921	0	0	1	0	0	5	0	**6**	**0.49**
Species Total	**1**	**0**	**32**	**0**	**19**	**24**	**2**	**78**	
Passes per hour	**0.01**	**0.00**	**0.26**	**0.00**	**0.16**	**0.20**	**0.02**	**0.64**	

T3 Habitat Feature

Spring									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230601	0	0	113	0	40	9	1	**163**	**20.38**
20230602	0	0	0	0	7	6	0	**13**	**1.63**
20230603	0	1	39	0	52	32	1	**125**	**15.63**
20230604	0	0	144	0	73	30	2	**249**	**31.13**
20230605	0	0	88	0	37	34	1	**160**	**20.00**
20230606	0	0	111	0	83	29	2	**225**	**28.13**
20230607	1	0	103	0	30	58	3	**195**	**24.38**
20230608	0	1	138	0	36	35	1	**211**	**26.38**
20230609	0	0	82	0	22	4	4	**112**	**14.00**
20230610	0	0	142	0	7	5	3	**157**	**19.63**
Species Total	**1**	**2**	**960**	**0**	**387**	**242**	**18**	**1610**	
Passes per hour	**0.01**	**0.03**	**12.00**	**0.00**	**4.84**	**3.03**	**0.23**	**20.13**	

Summer									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230728	0	0	0	0	0	1	2	**3**	**0.33**
20230729	0	0	0	0	0	0	0	**0**	**0.00**
20230730	0	0	0	0	0	0	0	**0**	**0.00**
20230731	0	0	24	0	0	0	0	**24**	**2.67**
20230801	2	3	30	0	19	13	4	**71**	**7.89**
20230802	0	0	8	0	0	1	0	**9**	**1.00**
20230803	0	0	1	0	0	0	1	**2**	**0.22**
20230804	0	1	3	0	0	0	1	**5**	**0.56**
20230805	0	0	0	0	0	0	0	**0**	**0.00**
20230806	0	0	6	0	6	6	2	**20**	**2.22**
Species Total	**2**	**4**	**72**	**0**	**25**	**21**	**10**	**134**	
Passes per hour	**0.02**	**0.04**	**0.80**	**0.00**	**0.28**	**0.23**	**0.11**	**1.49**	

Autumn									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230912	0	1	4	0	1	6	1	**13**	**1.06**
20230913	0	0	1	0	0	0	0	**1**	**0.08**
20230914	2	1	9	0	7	7	0	**26**	**2.12**
20230915	0	0	0	0	2	7	0	**9**	**0.73**
20230916	2	1	3	0	13	11	1	**31**	**2.53**
20230917	0	0	5	0	0	1	0	**6**	**0.49**
20230918	0	0	0	0	0	1	0	**1**	**0.08**
20230919	0	0	1	0	0	0	0	**1**	**0.08**
20230920	0	1	0	0	0	0	0	**1**	**0.08**
20230921	0	0	0	0	0	0	0	**0**	**0.00**
Species Total	**4**	**4**	**23**	**0**	**23**	**33**	**2**	**89**	
Passes per hour	**0.03**	**0.03**	**0.19**	**0.00**	**0.19**	**0.27**	**0.02**	**0.73**	

T4

Spring									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230601	1	0	0	0	43	36	0	**80**	**10.00**
20230602	0	0	0	0	12	5	0	**17**	**2.13**
20230603	0	0	0	0	3	4	0	**7**	**0.88**
20230604	0	0	0	0	12	7	0	**19**	**2.38**
20230605	0	0	0	0	2	3	0	**5**	**0.63**
20230606	0	0	1	0	9	1	0	**11**	**1.38**
20230607	0	0	0	0	7	1	0	**8**	**1.00**
20230608	0	0	0	0	2	3	0	**5**	**0.63**
20230609	0	1	0	0	0	0	0	**1**	**0.13**
20230610	0	0	7	0	10	4	0	**21**	**2.63**
Species Total	**1**	**1**	**8**	**0**	**100**	**64**	**0**	174	
Passes per hour	**0.01**	**0.01**	**0.10**	**0.00**	**1.25**	**0.80**	**0.00**	**2.18**	

Summer									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230728	0	0	0	0	2	4	0	**6**	**0.67**
20230729	0	0	0	0	3	4	0	**7**	**0.78**
20230730	0	0	0	0	2	3	0	**5**	**0.56**
20230731	0	0	44	0	2	10	1	**57**	**6.33**
20230801	0	0	11	0	0	5	1	**17**	**1.89**
20230802	0	0	4	0	1	1	0	**6**	**0.67**
20230803	0	0	0	0	1	4	0	**5**	**0.56**
20230804	0	0	0	0	0	2	0	**2**	**0.22**
20230805	0	0	1	0	0	1	0	**2**	**0.22**
20230806	0	0	5	0	2	11	2	**20**	**2.22**
Species Total	**0**	**0**	**65**	**0**	**13**	**45**	**4**	127	
Passes per hour	**0.00**	**0.00**	**0.72**	**0.00**	**0.14**	**0.50**	**0.04**	**1.41**	

Autumn									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230912	2	0	2	0	0	2	0	**6**	**0.49**
20230913	0	0	0	0	0	0	0	**0**	**0.00**
20230914	1	0	6	0	8	7	0	**22**	**1.80**
20230915	3	0	0	0	3	16	0	**22**	**1.80**
20230916	0	0	0	0	3	9	0	**12**	**0.98**
20230917	4	0	2	0	28	29	0	**63**	**5.14**
20230918	0	0	2	0	0	0	0	**2**	**0.16**
20230919	0	0	0	0	0	0	0	**0**	**0.00**
20230920	0	0	0	0	0	0	0	**0**	**0.00**
20230921	0	0	0	0	3	19	0	**22**	**1.80**
Species Total	**10**	**0**	**12**	**0**	**45**	**82**	**0**	149	
Passes per hour	**0.08**	**0.00**	**0.10**	**0.00**	**0.37**	**0.67**	**0.00**	**1.22**	

T5

Spring									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230601	0	1	4	0	171	135	0	**311**	**38.88**
20230602	1	0	5	0	43	15	0	**64**	**8.00**
20230603	1	0	4	0	21	8	0	**34**	**4.25**
20230604	0	1	3	0	29	12	0	**45**	**5.63**
20230605	0	1	7	0	8	8	0	**24**	**3.00**
20230606	0	0	7	0	35	19	0	**61**	**7.63**
20230607	0	0	8	0	7	16	0	**31**	**3.88**
20230608	0	1	6	0	8	5	0	**20**	**2.50**
20230609	0	0	4	0	4	1	0	**9**	**1.13**
20230610	0	1	10	0	20	4	0	**35**	**4.38**
Species Total	**2**	**5**	**58**	**0**	**346**	**223**	**0**	634	
Passes per hour	**0.03**	**0.06**	**0.73**	**0.00**	**4.33**	**2.79**	**0.00**	**7.93**	

Summer									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230728	0	0	4	0	0	4	0	**8**	**0.89**
20230729	0	0	2	0	0	2	0	**4**	**0.44**
20230730	0	0	2	0	1	1	0	**4**	**0.44**
20230731	0	0	10	0	4	10	0	**24**	**2.67**
20230801	0	1	11	0	9	8	0	**29**	**3.22**
20230802	0	0	2	0	3	9	0	**14**	**1.56**
20230803	0	0	1	0	1	3	0	**5**	**0.56**
20230804	0	0	2	0	0	1	0	**3**	**0.33**
20230805	0	0	6	0	0	5	0	**11**	**1.22**
20230806	0	0	11	0	0	4	1	**16**	**1.78**
Species Total	**0**	**1**	**51**	**0**	**18**	**47**	**1**	118	
Passes per hour	**0.00**	**0.01**	**0.57**	**0.00**	**0.20**	**0.52**	**0.01**	**1.31**	

Autumn									
DATE	**MYODAU**	**MYONAT**	**NYCLEI**	**PIPNAT**	**PIPPIP**	**PIPPYG**	**PLEAUR**	**TOTALS**	**BAI**
20230912	1	0	1	0	2	3	0	**7**	**0.57**
20230913	0	0	0	0	0	2	0	**2**	**0.16**
20230914	1	0	1	0	18	7	0	**27**	**2.20**
20230915	0	0	0	0	2	2	0	**4**	**0.33**
20230916	0	0	0	0	10	21	0	**31**	**2.53**
20230917	0	0	0	0	9	15	0	**24**	**1.96**
20230918	1	0	0	0	0	6	0	**7**	**0.57**
20230919	0	0	0	0	0	0	0	**0**	**0.00**
20230920	1	0	1	0	0	0	1	**3**	**0.24**
20230921	0	1	1	0	16	56	0	**74**	**6.04**
Species Total	**4**	**1**	**4**	**0**	**57**	**112**	**1**	179	
Passes per hour	**0.03**	**0.01**	**0.03**	**0.00**	**0.47**	**0.91**	**0.01**	**1.46**	

T5 Habitat Feature

Spring									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230601	2	0	32	0	53	43	0	**130**	**16.25**
20230602	1	0	60	0	228	208	1	**498**	**62.25**
20230603	1	0	23	0	49	83	0	**156**	**19.50**
20230604	4	0	22	0	89	51	2	**168**	**21.00**
20230605	5	0	21	0	44	51	1	**122**	**15.25**
20230606	3	1	19	0	51	70	2	**146**	**18.25**
20230607	1	0	20	0	43	83	1	**148**	**18.50**
20230608	0	0	52	0	34	15	1	**102**	**12.75**
20230609	0	0	2	0	6	4	2	**14**	**1.75**
20230610	0	0	45	0	20	18	0	**83**	**10.38**
Species Total	**17**	**1**	**296**	**0**	**617**	**626**	**10**	1567	
Passes per hour	**0.21**	**0.01**	**3.70**	**0.00**	**7.71**	**7.83**	**0.13**	19.59	

Summer									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230728	0	0	7	0	0	0	0	**7**	**0.78**
20230729	0	0	5	0	0	5	0	**10**	**1.11**
20230730	0	0	0	0	0	0	0	**0**	**0.00**
20230731	0	0	4	0	0	1	0	**5**	**0.56**
20230801	2	1	26	0	91	188	2	**310**	**34.44**
20230802	4	5	8	0	177	861	3	**1058**	**117.56**
20230803	0	0	4	0	172	854	4	**1034**	**114.89**
20230804	0	0	1	0	0	2	1	**4**	**0.44**
20230805	4	2	10	0	19	243	1	**279**	**31.00**
20230806	0	1	25	0	12	29	0	**67**	**7.44**
Species Total	**10**	**9**	**90**	**0**	**471**	**2183**	**11**	2774	
Passes per hour	**0.11**	**0.10**	**1.00**	**0.00**	**5.23**	**24.26**	**0.12**	30.82	

Autumn									
DATE	MYODAU	MYONAT	NYCLEI	PIPNAT	PIPPIP	PIPPYG	PLEAUR	TOTALS	BAI
20230912	3	1	3	0	19	32	0	**58**	**4.73**
20230913	0	0	0	0	0	3	0	**3**	**0.24**
20230914	4	1	8	0	192	100	0	**305**	**24.90**
20230915	3	0	0	0	62	75	0	**140**	**11.43**
20230916	0	2	1	0	80	126	0	**209**	**17.06**
20230917	0	0	0	0	0	0	0	**0**	**0.00**
20230918	0	0	13	0	0	0	0	**13**	**1.06**
20230919	0	0	0	0	0	0	0	**0**	**0.00**
20230920	2	0	12	0	1	0	0	**15**	**1.22**
20230921	0	0	29	0	1	14	0	**44**	**3.59**
Species Total	**12**	**4**	**66**	**0**	**355**	**350**	**0**	787	
Passes per hour	**0.10**	**0.03**	**0.54**	**0.00**	**2.90**	**2.86**	**0.00**	6.42	

Technical Appendix 6.4

Lizard Survey Report

Lizard Survey Report for Extension of Dunbeg South Wind Farm, Limavady Co. Derry/Londonderry

For:

July 2024

Document history

Author	Catriona Porter	08/07/24
Checked	Cormac Loughran	08/07/24
Approved	Cormac Loughran	08/07/24

Client Details		
Contact	David McVeigh	
Client Name	RES	
Address	Beaufort Court, Egg Farm Lane, Kings Langley, Hertfordshire, WD4 8LR	
Issue	**Date**	**Revision Details**
A	08/07/24	First Issue (Draft)

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Contents

Executive Summary

This is a brief summary of survey results. For full details please read the report in its entirety.

- **Common lizard *Zootoca vivipara* presence is suspected within the development red line boundary.** No lizards were observed however potential lizard scat was recorded atop refugia.

- The construction phase has potential to cause injury or death to lizards which may be present within the works corridor. Mitigation is recommended.

- Similar to the habitat evaluation regarding smooth newt *Lissotriton vulgaris,* a western portion of the site which contains short vegetation subjected to grazing pressures is unsuitable for common lizard. Mitigation is not considered necessary for this area.

- Common lizard hibernate, often in groups, amongst habitat such as rocks or dead wood. The identified old stone walls and deadwood areas could support overwintering common lizard and are recommended to remain undisturbed by the development. These areas are also recommended to receive protection due to their potential importance to smooth newt.

- Injury / death to common lizard will be avoided during construction through 'passive exclusion' by habitat modification. This will consist of staged vegetation clearance which will occur during September when lizards are most active and in periods of suitable weather for this species. This has been recommended for smooth newt however is required only for a section of track within the smooth newt buffer zone. This form of mitigation for common lizard is required for the entirety of the works corridor which occurs within suitable habitat for this species i.e. all infrastructure areas except the unsuitable area to the west.

- Common lizard is anticipated to be receptive to disturbance caused by this clearance and should readily disperse into retained surrounding vegetation. An Ecological Clerk of Works (ECoW) will conduct a site walkover following each stage of vegetation clearance to confirm vegetation clearance is being successfully achieved in the desired stages and identify any potential issues with the staged habitat modification, which is the main form of mitigation for common lizard.

- Upon completion of the 'passive exclusion' lizard absence will be assumed; however the ECoW will maintain a watching brief during construction and a toolbox talk given to all staff with clear instructions upon identifying common lizard and protocols should this species be encountered – i.e. all works within the affected area will cease immediately, the ECoW and NIEA informed, and works will not resume until the ECoW has relocated the lizard(s) a minimum distance of 30 metres from any works (under NIEA licence). A detailed record of any such relocations will be kept and included in the subsequent ECoW report.

- If the ECoW determines potential for any ongoing risk for lizard presence anywhere during the infrastructure areas, it may be necessary to erect exclusionary one-way barrier fencing around these identified lizard hot-spots to mitigate against injury / mortality by construction activities.

Introduction

1. Blackstaff Ecology Ltd investigated the site for common lizard *Zootoca vivipara* presence, to provide further environmental information in support of the Environmental Statement chapter for the proposed extension to the current and operational wind farm at Dunmore / Dunbeg, located near Limavady, Co. Derry. The development proposes to install one new turbine to the north of A37 Broad Road and three new turbines to the south.

2. The purpose of this lizard survey was to ascertain whether common lizard is present or likely absent within the boundary of the application site and, if present, to estimate the distribution and density. This information will identify any potential for the proposed installation to have adverse impacts upon the local reptile population, and inform any mitigation measures required.

3. These surveys were conducted under license (LRS-6-24) issued by NIEA on 26/03/2024 and valid from the date of issue until the 01/11/2024. Common lizard is a protected species in Northern Ireland, and individuals are therefore protected from being killed, injured or taken. If this species is present on site then measures must be taken to protect them from any potential negative impacts of the development.

4. The construction phase of a wind farm installation has the potential to negatively impact on the local reptile population. Suitable mitigation measures are required to ensure the project avoids negatively impacting this species.

Statement of Authority

5. Field surveys for common lizard were conducted by Catriona Porter and Jazmin Creaney. This report was prepared by Catriona then reviewed and approved by Cormac Loughran CEnv MCIEEM MSc.

6. Catriona has an MSc in Animal Behaviour and Welfare (Distinction) from Queen's University, Belfast. She has several years of experience within the nature conservation sector through extensive volunteering including organisations such as UK Overseas Territories Conservation Forum, Ulster Wildlife and the RSPB. Catriona has over 3 years of experience within the ecological consultancy sector, beginning in April 2021 with Allen & Mellon Environmental. She has been involved in projects in the north and south of Ireland and has gained varied experience in survey techniques and the associated ecological reports. Catriona has conducted approximately ten lizard refugia surveys. She is a Qualifying CIEEM member and holds a BTO T-permit under which she has ringed approximately one hundred and ten birds / twenty-one species.

7. Jazmin has a BSc in Zoology and is a Qualifying member of CIEEM. She has undertaken further courses including Animal Conservation, GIS and Environmental Management. She has a range of experience in conducting field surveys both locally, with organisations including BTO, The National Trust and TetraTech, and abroad, through her time monitoring elephant behaviour and habitat damage in South Africa. Since joining Blackstaff Ecology in 2021, Jazmin has been involved in projects throughout NI and the ROI and has gained significant ecological experience. She has conducted approximately 10 lizard refugia surveys.

Methodology

8. A common lizard survey was conducted under NIEA licence in accordance with NIEA (2017), JNCC (2004) and Froglife (1999) guidelines. The survey aimed to establish the presence or likely absence of common lizard within the survey site.

9. Thirty artificial refugia (50cm x 50cm carpet tiles) were deployed across the site, black side up, in existing vegetation to provide suitable basking spots for any common lizard which may be present. The location of each refugium was recorded as Irish Grid co-ordinates. Red marking flags were deployed alongside those refugia which were difficult to identify from a distance to aid the surveyor in locating and slowly approaching. At the time of deployment an initial walking transect search between refugia locations was also conducted, in which surveyors sought any natural refugia present and recorded any observed lizards.

10. Deployed refugia were then subject to three survey visits each, during which they were visually inspected for basking lizards from a distance using binoculars. Inspection distance varied between refugium depending on topography and vegetation height. After a visual assessment from a distance, the surveyor slowly approached each refugium before gently lifting it to check for lizards present underneath. The refugia were also inspected for presence of lizard scat, which would be recorded if found. Thirty refugia were deployed however several of these subsequently could not be found and did not receive full inspection survey effort.

11. In conjunction with these refugia inspections, a visual transect survey was also conducted for the stretches of habitat between each refugium. This survey adopted a 'look-see' approach and involved scanning 3 – 4 metres ahead for present lizards. If any lizards were spotted incidentally at any other time by the surveyors they would also be recorded.

12. Refugia were deployed and the initial transect inspection conducted in March 2024.

13. NIEA lizard survey specifications note the surveys should be carried out between March and October with optimal periods generally being April-May and September. Three refugia inspections (and the associated transect walks) were undertaken in April, May and June. They lasted for several hours each visit. During the second check, refugia located within the northern section of the site across A37 Broad Road could not be accessed due to cattle presence. These refugia received a separate second check on a later date. Each refugium received the required three checks (excepting missing refugia).

14. Froglife advise searches may yield better results when undertaken between 08:30 – 11:00 or 16:30 – 18:30 during April, May and September, whereas searches would be best undertaken close to midday when its warmest for earlier in the year. For midsummer searches, Froglife advise midday may be too hot and reptiles may be found progressively earlier in the morning / later in the afternoon. This advice is acknowledged within the NIEA survey specifications sheet: *"Early in the year reptiles are often encountered closer to midday when the temperature is at its warmest. Conversely, in very hot conditions in midsummer, reptiles may be found increasingly earlier in the morning and later in the afternoon".* The surveys were only conducted during periods of weather conditions considered most likely to yield lizard presence - i.e. no rainfall or strong winds, air temperature between 9 – 18° Celsius, sunshine present or only light cloud. Specific timings of survey visits were determined based upon all available weather data. Where weather data indicated better survey conditions outside the generalist timings specified above, searches were completed in these conditions.

Results

15. Tables 1 and 2 below summarise the survey data; Photos 1 and 2 on the following page provide example evidence of sighted lizards. All photographs may be observed in Appendix 4. Appendix 1, Table 1 provides co-ordinates of each deposited refugium. Appendix 2, Figure 1 shows spatial positioning of each refugium deposited across the site as part of this survey and Figure 2 here shows both lizard sighting locations and lizard scat locations. Tables 3 and 4 on the following page provide summaries of lizard and lizard scat sightings.

Table 1 – Details concerning refugia deployment and the associated initial transect inspections.

Refugium Number	Deployment Date	Deployment Time	Weather Data	Transect Results
R1 – R30	20.03.24	10:30 – 15:30	Nil precipitation, 9°C, 6/8 cloud, 3/SE wind	0 lizards observed. **Natural refugia found (stone walls, deadwood with rocks)**

Table 2 – Details concerning subsequent refugia checks and transect surveys.

Refugium Number	Date Checked	Time of Survey	Weather Data	Results
R1 – R30	23.04.24	11:30 – 13:58	Wind 0-1 SW Air temp 11 – 12 Sunny spells through light cloud	No evidence of lizard observed.
R1 – R23	10.05.24	08:35 – 10:20	Wind 2-3 NE Air Temp 9 – 11 Light cloud	**Lizard scat atop R21 and R23.**
R24 – R30	16.05.24	16:45 – 17:30	Wind 0 Air Temp 13 Humid	No evidence of lizard observed.
R1 – R30	11.06.24	11:44 – 12:56	Wind 1 – 2 NE Air Temp 9 Cool morning several hours prior to 11:00; sunny spells after 11:00	R24 and R29 missing. **Lizard scat atop R8.**

Survey Constraints

16. Two out of thirty deployed refugia could not be located in the final check. The reason for absence is unknown and could be attributed to strong winds, livestock or human interference. Twenty-eight refugia remained present and unmoved throughout the survey period – this is considered an acceptable number of refugia which ascertained lizard presence.

Discussion and Mitigation

17. It should be noted that conclusions and recommendations are made based upon findings from the current survey and the current site proposal at time of survey. Changes to site management can alter use of the site by common lizard. This species is highly mobile and requires re-assessment should a significant period of time elapse between the production of this report and commencement of the proposed works.

18. Habitat suitable for supporting common lizard is present across the site and common terrestrial invertebrates were observed, confirming ample food source. Habitat present to the west presented as sub-optimal for this species: this area presented open habitat lacking shelter in the form of longer vegetation, populated by sparse rush tussocks at time of survey, or debris such as logs or stones.

19. No lizards were observed during the survey period. Scat was recorded on three refugia located in habitat

immediately surrounding the identified ponds and also an area of deadwood.

20. It is difficult to convert survey counts into an indication of relative population size for reptiles due to the inherent challenges associated with the survey methodology, and as such it should be noted that each survey visit may only reveal a small sample of the true population. A basic estimation of the population is usually conducted by assessing survey results against the Key Reptile Site Survey Assessment Categories (Froglife 1999). This assessment details that Low (<5), Good (5-20) and Exceptional (>20) population scores are determined by the maximum number of adults observed in one day. No lizards were directly observed and lizard presence has been determined by lizard scat viewed atop refugia. Three deposits were observed in total and two in one day. The lizard population across the proposed windfarm site is presumed to be **Low.**

Table 5 – Key Reptile Site Survey Assessment Categories (Froglife, 1999)

Species	Low Population (No. of individuals)	Good Population (No. of individuals)	Exceptional Population (No. of individuals)
Adder	<5	5-10	>10
Common Lizard	<5	5-20	>20
Grass snake	<5	5-10	>10
Slow-worm	<5	5-20	>20

21. Unstaged devegetation, excavation and tracking heavy vehicles over the site could cause injury or death to common lizards present and mitigation is necessary.

22. Due to the expanse of the proposed infrastructure (i.e. length of the site track) and challenging nature of the terrain, one-way barrier fencing although an effective method for avoiding lizard injury / mortality is considered impractical as the main mitigation option for this development. An alternative form of mitigation is 'passive exclusion' through staged vegetation clearance of all infrastructure areas, in conjunction with potential for more minor relocation and exclusionary fencing mitigation efforts targeting identified lizard hot-spots.

23. The works corridor will be subject to strimming. This will take place at least two weeks prior to construction commencing and will reduce habitat suitability for common lizard within the infrastructure boundaries. This species is anticipated to be receptive to this habitat alteration. It will occur in September when common lizards are fully active thus should be able to disperse quickly from disturbance caused by noise, vibrations and visuals. Common lizard are also active in August, however this month is within the breeding bird season (March – August inclusive) therefore vegetation clearance will not occur at this time. Should clearance be required in August, it will not be done until a nesting bird survey is first conducted by a suitably qualified ecologist. The vegetation clearance should be conducted during suitable weather conditions for common lizard, i.e. no rainfall or strong winds, with an air temperature between 9 – 18° Celsius with sunshine or light cloud. Optimal weather conditions are considered to be a morning warmer than the prior evening.

24. The first stage of this clearance will reduce vegetation (predominantly rushes) to approximately 150mm. The second stage will reduce vegetation to approximately 75mm, and the third stage will reduce it to approximately 30mm. This maximum height of approximately 30mm must be maintained through regular mowing / strimming to discourage common lizard from returning to the infrastructure layout. The ECoW will conduct a site walkover after each stage to confirm vegetation clearance is being successfully achieved in the desired stages and identify any potential issues with the staged habitat modification, which is the main proposed form of mitigation for common lizard. After the final stage of vegetation clearance, the site infrastructure layout should then be left for 3 – 4 hours minimum to further allow any lizards present to move out from working areas and into the retained surrounding habitat. The final stage should also be

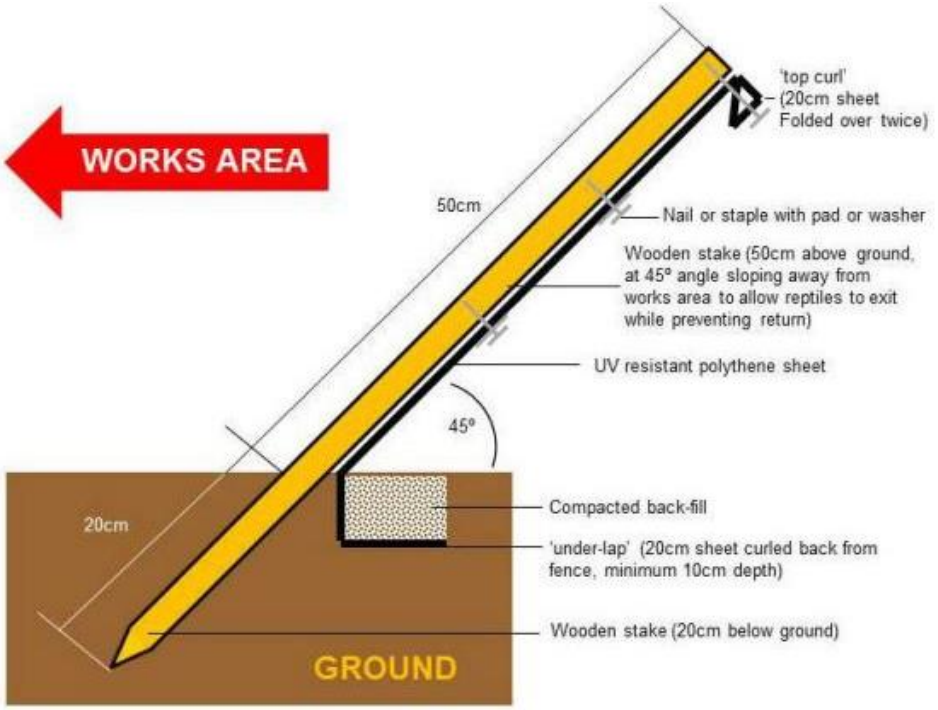
subject to ECoW inspection.

25. Following completion of the staged vegetation clearance, deploying refugia within infrastructure boundaries is not considered a suitable tactic to determine if lizards continue to be present as provision of basking spots may attract lizards to construction areas following efforts to disperse them through habitat modification. Upon completion of this habitat modification lizard absence will be assumed and the ECoW will maintain a watching brief throughout the construction phase. A toolbox talk will also be given to include all site staff, with clear instructions upon identifying common lizard and protocols should this species be encountered – i.e. all works within the affected area will cease immediately, the ECoW and NIEA informed, and works will not resume until the ECoW has relocated the lizard(s) a minimum distance of 30metres from any works. The surrounding landscape is considered suitable release habitat for this species and the exact location will be decided by the appointed ECoW. This is not considered translocation as reptiles will not be moved to a new site, but will be moved out of the way of temporary works and remain able to return to the original area later (Froglife, 1999). This relocation will be conducted under NIEA licence and data will be recorded including details of the number of lizards, date(s), time(s), Irish Grid co-ordinates and capture and release habitat including photographs.

26. If the ECoW determines potential for any ongoing risk for lizard presence anywhere during the infrastructure areas, for example creation of potential basking spots upon imported site materials, it may be necessary to erect exclusionary one-way barrier fencing around these identified lizard hot-spots to mitigate against injury / mortality by construction activities. Exclusionary fencing, if required, will be constructed of thick UV resistant polythene sheeting (or equivalent e.g. polypropylene) measuring a minimum of 40 – 50 cm above ground level. This should be held in place by stakes. The sheeting should be buried approximately 20cm below ground level to prevent common lizard from entering the exclusionary area below the fencing. Curl joins should be used to join two sheets together and form continuous fencing. Likewise this join should continue for approximately 20cm below ground level. The fencing should be sloped, at an angle of between 45 and 40 degrees, and should slope outwards from the works area. The sheeting should be attached to the stakes using staples or nails.

27. Any stones, tree stumps, logs, rocks or piles of similar debris discovered within the infrastructure layout will be removed by hand. This removal will not occur during the hibernation period (mid-October to mid-March). The aforementioned stone walls and deadwood areas will be retained and undisturbed: additionally, protective measures are recommended for these habitat features which may be providing important overwintering habitat for common lizard. Both the areas of deadwood and stone walls appear to lay outside any current intended infrastructure areas. Wall 1 is ~14m from Option 2 Site Tracks and ~76m from Proposed Site Tracks; Wall 2 is ~100m from Control Building and Substation and ~70m from Option 2 Tracks. Likewise areas of deadwood appear to be situated ~46m from Temporary Construction Compound, ~31m from Control Building and Substation, ~20m from Option 2 Tracks. For areas of potential overwintering habitat which construction activities occur in closer proximity to, i.e. <20m distance, the habitat should receive clear demarkation prior to construction activities occurring e.g. through a series of brightly coloured tall flags or posts with joined string staked into the ground. This will ensure construction activities do not encroach upon the habitat and its retention is secured from clearance or damage throughout the construction phase.

Plate 1 – *Example diagram of one-way reptile exclusion fencing, taken from Froglife Advice Note 10*



Conclusions

28. The development has potential to negatively impact common lizard through injury or death during the construction period. Mitigation is required. Mitigation will initially be enacted in the form of serial vegetation clearance and if necessary one-way barrier fencing and relocation.

References

ARG (2018) Advice Note 10: Reptile Survey and Mitigation Guidance for Peatland Habitats

Gent, A. & Gibson, S. (2003) Herpetofauna Workers' Manual

Froglife (1999) Reptile Survey: An Introduction to Planning, Conducting and Interpreting Surveys for Snake and Lizard Conservation. Froglife Advice Sheet 10

JNCC (2004) Common Standards Monitoring Guidance for Reptiles and Amphibians

NIEA (2017) NIEA Specific Requirements: Common Lizard Surveys

Sewell et. al (2013) Survey protocols for British herpetofauna Version 1.0

Appendix 1 – Tables

Table 1 – Locations of Artificial Refugia

Refugia	Easting	Northing
1	274586.3	426038.9
2	274548.6	426033.6
3	274523.4	426118.1
4	274644.7	426086.8
5	274542.6	425989.9
6	274576.9	425985.6
7	274479.2	426009.7
8	274486.9	425973.2
9	274410.7	426005.7
10	274450.5	425889.6
11	274509.6	425837.9
12	274495	425760
13	274548.3	425752
14	274627.1	425705.9
15	274714.1	425760.9
16	274709.5	425891.1
17	274738	425937
18	274794.8	425952.3
19	274845.6	425965.4
20	274881.9	425996.6
21	274648.5	426026.6
22	274668.6	426089.5
23	274687.4	426158
24	274512.1	426229.2
25	274551.3	426312.8
26	274566	426463.6
27	274497.7	426464.9
28	274455.1	426461.2
29	274387.6	426422.7
30	274358.1	426306

Table 2 – Details of Refugia Inspections.

Refugia have been colour coded for ease of reference regarding inspection effort.

Received the full three inspections
Became lost and received less than three inspections

Refugium Number	Number of Checks Completed	Date(s) Checked	Date(s) Refugia Was Missing
R1	3	23.04.24 10.05.24 11.06.24	-
R2	3	23.04.24 10.05.24 11.06.24	-
R3	3	23.04.24 10.05.24 11.06.24	-
R4	3	23.04.24 10.05.24 11.06.24	-
R5	3	23.04.24 10.05.24 11.06.24	-
R6	3	23.04.24 10.05.24 11.06.24	-
R7	3	23.04.24 10.05.24 11.06.24	-
R8	3	23.04.24 10.05.24 11.06.24	-
R9	3	23.04.24 10.05.24 11.06.24	-
R10	3	23.04.24 10.05.24 11.06.24	-
R11	3	23.04.24 10.05.24 11.06.24	-
R12	3	23.04.24 10.05.24 11.06.24	-
R13	3	23.04.24 10.05.24 11.06.24	-
R14	3	23.04.24	-

		10.05.24 11.06.24	
R15	3	23.04.24 10.05.24 11.06.24	-
R16	3	23.04.24 10.05.24 11.06.24	-
R17	3	23.04.24 10.05.24 11.06.24	-
R18	3	23.04.24 10.05.24 11.06.24	-
R19	3	23.04.24 10.05.24 11.06.24	-
R20	3	23.04.24 10.05.24 11.06.24	-
R21	3	23.04.24 10.05.24 11.06.24	-
R22	3	23.04.24 10.05.24 11.06.24	-
R23	3	23.04.24 10.05.24 11.06.24	-
R24	2	23.04.24 16.05.24 11.06.24	11.06.24
R25	3	23.04.24 16.05.24 11.06.24	-
R26	3	23.04.24 16.05.24 11.06.24	-
R27	3	23.04.24 16.05.24 11.06.24	-
R28	3	23.04.24 16.05.24 11.06.24	-
R29	2	23.04.24 16.05.24 11.06.24	11.06.24
R30	3	23.04.24 16.05.24 11.06.24	-

Appendix 2 – Figures

Figure 1 – Artificial Refugia Locations and Scat Recordings

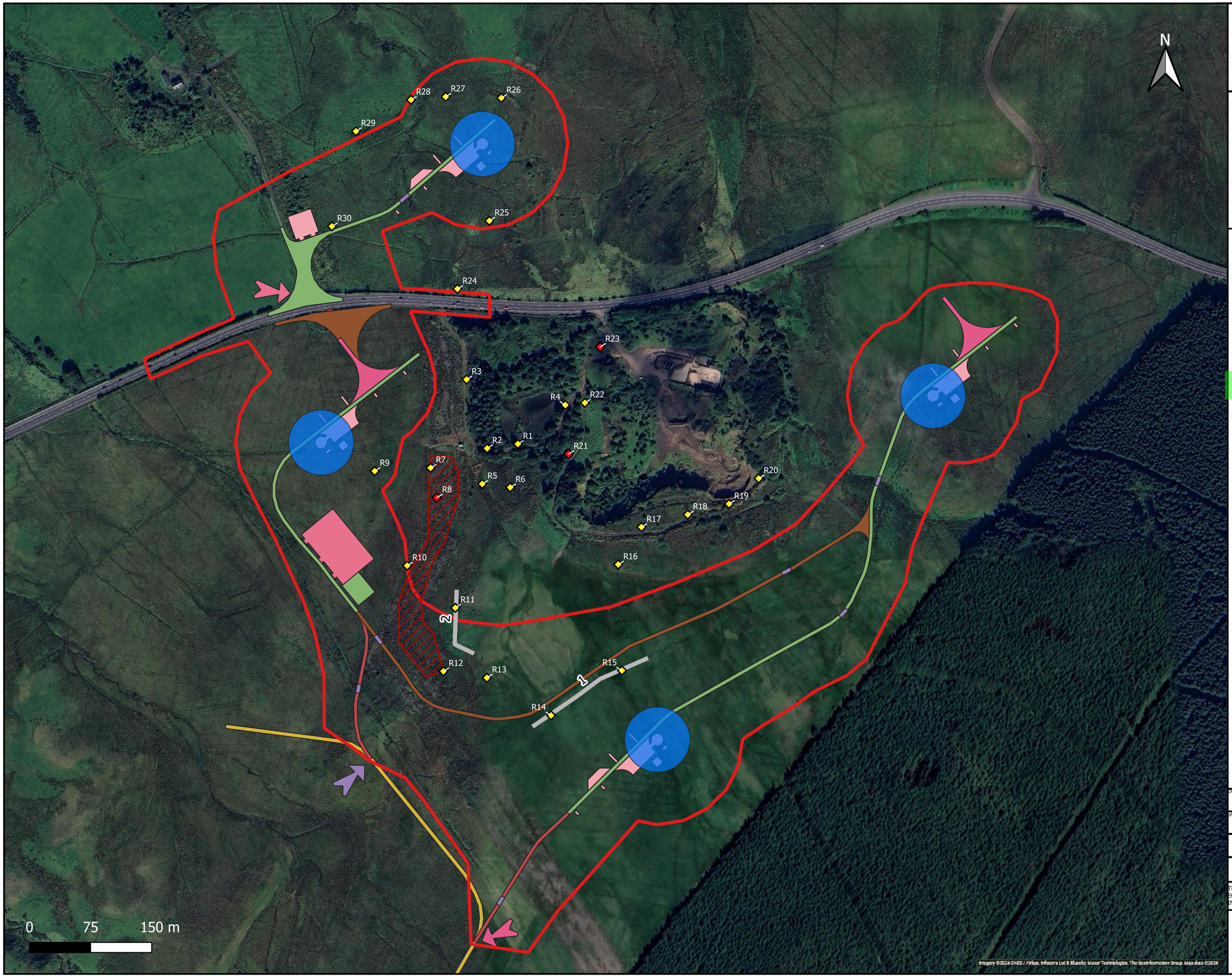


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FIGURE 1

Artificial Refugia Locations and Scat Recordings

KEY

- Site Boundary
- Approximate Deadwood Area With Rocks
- Old Stone Wall
- Refugia Locations
- Scat Locations
- Staged Vegetation Clearance
- Watercourse Crossings
- Turbines
- Temp Construction Compound
- Small Construction Compound
- Turning Heads
- Proposed Site Tracks
- Option 2 Tracks
- Option 2 Entrance
- Option 1b Entrance
- Option 1a Entrance
- Option 1 Tracks
- North Section Entrance
- Hardstandings
- South Track
- Control Building & Substation

OUT DWG | T-LAYOUT NO.

WING NUMBER

Lizard Survey Report

Blackstaff Ecology

Figure 2 – Protective Demarkation

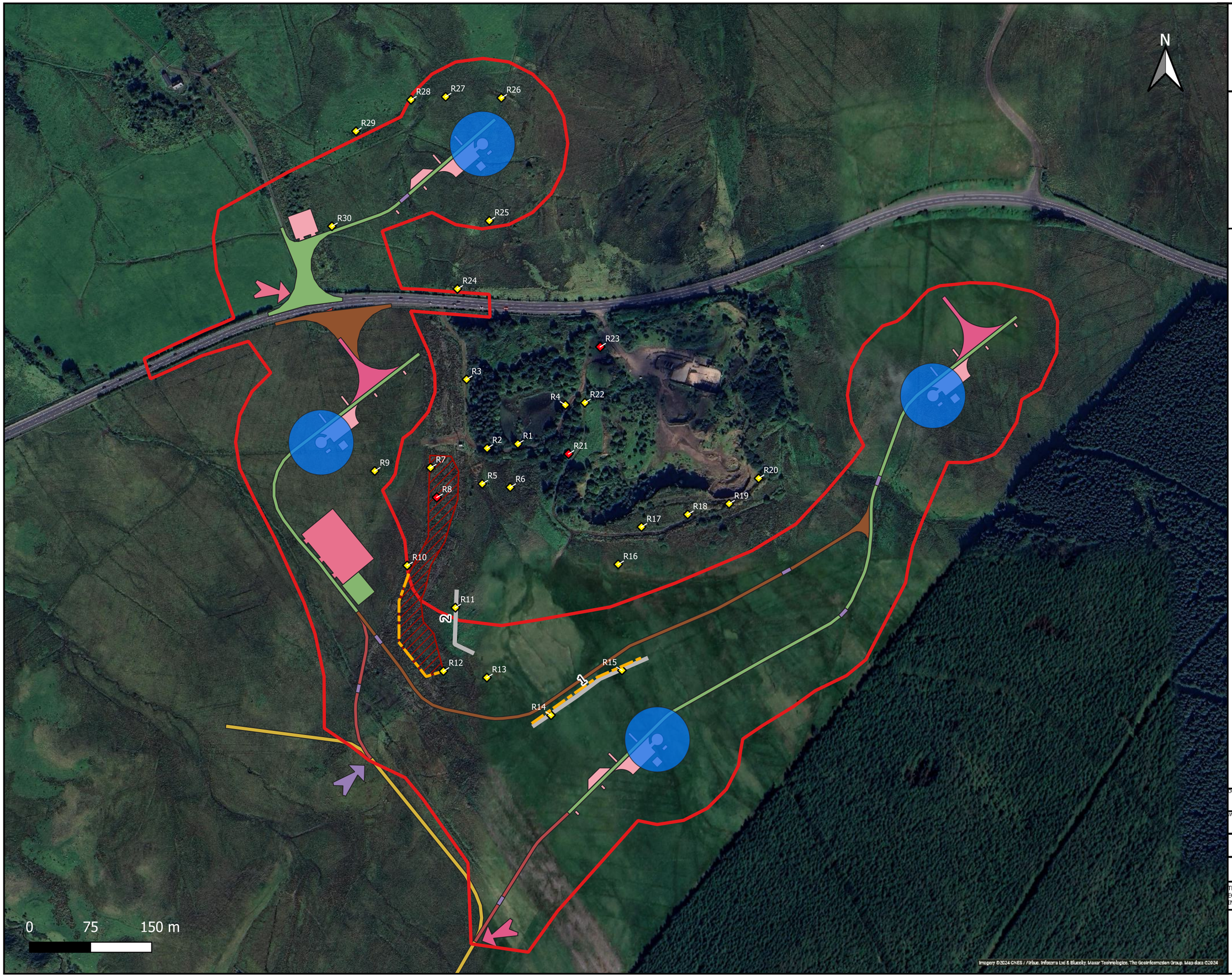

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FIGURE 2

Protective Demarkation

KEY

- Site Boundary
- Approximate Deadwood Area With Rocks
- Old Stone Wall
- Protected Area Demarkation During Construction
- Refugia Locations
- Scat Locations
- Watercourse Crossings
- Turbines
- Temp Construction Compound
- Small Construction Compound
- Turning Heads
- Proposed Site Tracks
- Option 2 Tracks
- Option 2 Entrance
- Option 1b Entrance
- Option 1a Entrance
- Option 1 Tracks
- North Section Entrance
- Hardstandings
- South Track
- Control Building & Substation

OUT DWG | T-LAYOUT NO.

WING NUMBER

Lizard Survey Report

Blackstaff Ecology

Appendix 3 – Photographs

Photograph Set 1 – Deployed Refugia

R1

Photo 1

R2

Photo 2

R3

Photo 3

R4

Photo 4

R5

Photo 5

R6

Photo 6

R7

Photo 7

R8

Photo 8

R9

Photo 9

R10

R11

R12

Photo 10

R13

Photo 11

R14

Photo 12

R15

Photo 13

R16

Photo 14

R17

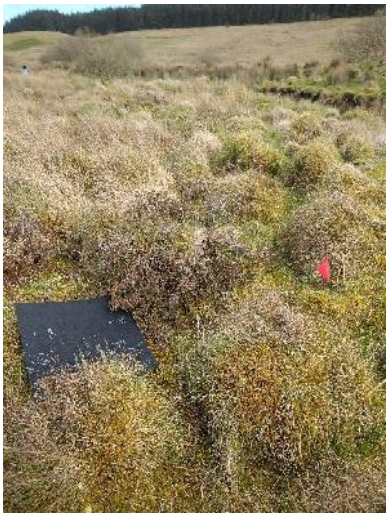
Photo 15

R18

Photo 16

R19

Photo 17



R20

Photo 18

R21

Photo 19

Photo 20

Photo 21

R22

Photo 22

R23

Photo 23

R24

Photo 24

R25

Photo 25

R26

Photo 26

R27

Photo 27

R28

Photo 28

R29

Photo 29

R30

Photo 30



Photograph Set 2 – Lizard Scat Recorded

Second Check, R21

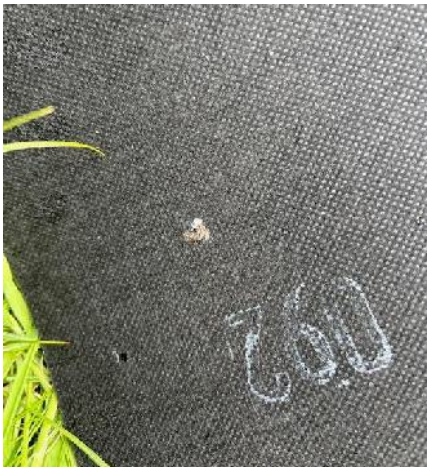
Photo 1

Second Check, R23

Photo 2

Third Check, R8

Photo 3



Technical Appendix 6.5

Smooth Newt Survey Report

Smooth Newt Survey Report for Extension of Dunbeg South Wind Farm, Limavady, Co. Derry/Londonderry

For:

July 2024

Document history

Author	Catriona Porter	08/07/2024
Checked	Cormac Loughran	08/07/2024
Approved	Cormac Loughran	08/07/2024

Client Details	
Contact	David McVeigh
Client Name	RES
Address	Beaufort Court, Egg Farm Lane, Kings Langley, Hertfordshire, WD4 8LR

Issue	Date	Revision Details
A	08/07/2024	First Issue

Contents

Executive Summary

This is a brief summary of survey results. For full details please read the report in its entirety.

- Blackstaff Ecology Ltd. identified eight ponds near the development, in the surrounding landscape outside the red line boundary (RLB). The ponds were assessed on their suitability for smooth newt; presence of this species was subsequently confirmed by eDNA Analysis.

- A 200m protective buffer zone has been applied to ponds with a HSI of 0.5 or above. Portions of the development RLB encroach within this protective buffer: overlapping areas present both suitable and unsuitable habitat for smooth newt.

- An overlapping area west of the ponds consists of habitat considered unsuitable for smooth newt as it is more heavily degraded from grazing pressure and features short vegetation, dry ground and sparse rush tussocks. Several infrastructure components are proposed within this area. As this section of the protective buffer zone is considered unsuitable for smooth newt, no mitigation is here recommended.

- Habitat within the northern section of the site, separated from the ponds by the A37 Broad Road, is not recommended to receive any mitigation efforts. The main road is considered a habitat barrier which breeding smooth newt are unlikely to disperse across, particularly with presence of abundant and accessible suitable habitat on the southern side of the road.

- Smooth newt could disperse farther from breeding ponds into an overlapping area of marshy grassland south of Pond 6. Pond 6 is ~63m from the RLB and ~112m from Option 2 Site Track. The construction phase here has potential to cause injury or death to newts which may be present within the works corridor. This section of the works corridor is recommended to receive staged vegetation clearance via mowing / strimming to reduce vegetation height down to 150mm, 75mm and finally 30mm (where applicable, as not all areas will be vegetated evenly). This will encourage newts to disperse away from the corridor into more suitable habitat.

- Potential overwintering sites have been identified in the form of two old stone walls and deadwood areas with rocks. Such areas appear to lay outside any current intended infrastructure areas. Wall 1 is ~14m from Option 2 Site Tracks and ~76m from Proposed Site Tracks; Wall 2 is ~100m from Control Building and Substation and ~70m from Option 2 Tracks. Likewise areas of deadwood appear to be situated ~46m from Temporary Construction Compound, ~31m from Control Building and Substation, ~20m from Option 2 Tracks. The development is recommended to retain these habitat features.

- If possible, the development is recommended to avoid construction of Option 2 Site Tracks in favour instead of Proposed Site Tracks. This would reduce the area recommended for staged vegetation clearance from ~400m to a ~100m stretch, and provide greater distance between construction activities and potential overwintering sites.

- If a smooth newt is found in or in proximity to any works area during the construction phase, works in that area shall cease until it has been translocated a minimum distance of 30m from development activities by a suitably qualified ecologist, under NIEA licence. The receptor location will be habitat considered suit able for smooth newt by the appointed ecologist.

Introduction

Overview

1. Blackstaff Ecology Ltd investigated the identified ponds for Smooth Newt *Lissotriton vulgaris* presence / absence, to provide further environmental information in support of the Environmental Statement chapter for the proposed extension to the current and operational wind farm at Dunmore / Dunbeg, located near Limavady, Co. Derry. The development proposes to install one new turbine to the north of A37 Broad Road and three new turbines to the south.

2. This report details the results of eDNA surveys targeting Smooth Newt in addition to proposed mitigation.

Statement of Authority

3. The ponds were identified by Catriona Porter and Jazmin Creaney. eDNA samples were collected and subsequent data compiled in this report by Catriona. This report was then reviewed and approved by Cormac Loughran.

4. Catriona has an MSc in Animal Behaviour and Welfare (Distinction) from Queen's University, Belfast. She has several years of experience within the nature conservation sector through extensive volunteering including organisations such as UK Overseas Territories Conservation Forum, Ulster Wildlife and the RSPB. Catriona has over 2.5yrs of experience within the ecological consultancy sector, beginning in April 2021 with Allen & Mellon Environmental. She has been involved in projects in the north and south of Ireland and has gained varied experience in survey techniques and the associated ecological reports. Catriona has undertaken approximately twenty-six nocturnal torchlight newt surveys. She is a Qualifying CIEEM member and holds a BTO T-permit under which she has ringed approximately one hundred and ten birds / twenty-one species.

5. Jazmin has a BSc in Zoology and is a qualifying member of CIEEM. She has undertaken further courses including Animal Conservation, GIS and Environmental Management. She has a range of experience in conducting field surveys both locally, with organisations including BTO, The National Trust and TetraTech, and abroad, through her time monitoring elephant behaviour and habitat damage in South Africa. Since joining Blackstaff Ecology in 2021, Jazmin has been involved in projects throughout NI and the ROI and has gained significant ecological experience. She has conducted approximately fifteen lizard refugia surveys and two torchlight newt surveys to date.

6. Cormac is a Chartered Environmentalist (CEnv), and a full member of the Chartered Institute of Ecology and Environmental Management (MCIEEM). He holds an MSc (Distinction) in Environmental Management from the University of Ulster and has extensive experience in bat surveys; having undertaken and coordinated full bat surveys and associated impact assessments for more than 20 major wind farm developments, and 25 single turbines. He is also a licenced bat surveyor and regularly undertakes licenced activities under licence from NIEA. Cormac has previously held a Natural England Disturbance Licence (20121610) for Bats (all species, (all counties of England)). He regularly attends lectures, courses and conferences, specifically relating to bats, for the purposes of CPD (Continuing Professional Development). Furthermore, having worked in the Ecological Consultancy sector for over 15 years he has been involved in dozens of protected species surveys and PEAs.

Legislation

7. Smooth Newt receive protection under Schedules 5, 6 and 7 of the Wildlife (NI) Order 1985 (as amended). This makes it an offence to:

- Intentionally or recklessly kill, injure or take a newt;
- Intentionally or recklessly damage or destroy, or obstruct access to, any structure or place that newts use for shelter or protection;
- Intentionally or recklessly damage or destroy anything which conceals or protects such any such structure; or
- Intentionally or recklessly disturb a Badger while it is occupying a structure or place which it uses for shelter or protection.

In addition, any person who knowingly causes or permits to be done an act which is made unlawful by any of these provisions shall also be guilty of an offence.

Smooth Newt Life Cycle Stages and Associated Habitats

8. Adult smooth newt emerge from terrestrial hibernation from late February to May, where they begin to move towards waterbodies to breed. The breeding season for this species is considered to be February to June. Therefore, adult smooth newt are found in waterbodies and surrounding associated vegetation during these months.

9. Spawn is laid as individual eggs, deposited on leaves of aquatic plants. Larvae hatch after two to four weeks, dependent upon local weather conditions. Newt larvae breathe through external gills thus remain in the waterbody. During this time, adult newts will spend a large proportion of time in the water foraging. Larval newts then undergo a phase of metamorphosis whereby the gills are reabsorbed back into the body and forelegs develop followed by hindlegs. Juvenile newts, known as efts, now emerge from the water in summer after losing their gills. At this time adults may still remain in or around the breeding waterbody, foraging. Efts will then take 2 – 3 years to reach maturity.

10. Later in the summer and into autumn, when not foraging for invertebrates, smooth newt are found sheltering in terrestrial vegetation, under wood and rocks. Whilst commonly encountered near waterbodies, adult smooth newts are terrestrial – returning to water to breed. Preferred terrestrial habitat includes that such as scrub, woodland, long grass and are often found in damp places and underneath debris and log piles in summer months.

11. Smooth newt overwinter in a variety of habitats that will offer protection from the elements including old walls, wood piles and rotting logs, among tree roots, under rocks, and occasionally in ponds. This species does not enter true hibernation and will take advantage of milder weather to emerge for foraging purposes.

12. Terrestrial behaviours of smooth newt are still not fully understood. Adult movement is thought to be short distances from breeding water bodies (Griffiths 1984) and has been described as philopatric – i.e. individuals returning to or remaining near few locations (Dolmen 1981; Sinsch and Kirst 2015). Research has also indicated dispersal distance between breeding habitat and overwintering sites may vary depending on the landscape and surrounding habitat quality – e.g.

newts in agricultural areas may move up to 400m, as opposed to newts in wooded habitats (Bell 1977; Schmidt et al 2006). Smooth newt recorded in terrestrial habitat several hundred metres from waterbodies are more likely to be the exception than the rule. Most smooth newts will remain relatively close to the breeding pond, provided that habitat quality immediately surrounding the breeding water body is optimal and connectivity is excellent (Mulkeen et al 2017).

Methodology

13. Due to difficult terrain surrounding many of the identified ponds, it would not have been possible to access the full perimeter of ponds nor secure a safe vantage from which to gain direct physical access to the water. Access restrictions here were considered likely to impact efficacy of nocturnal torchlight surveys, in addition to other survey methods such as netting and egg search. Environmental DNA (eDNA) Analysis was deemed the most appropriate survey methodology for this site.

14. Organisms release DNA into the environment constantly in the form of urine, faeces, gametes, shedding skin or hair etc., remaining present in aquatic environments for up to three weeks. This DNA can be extracted from water samples and analysed to determine the presence or likely absence of a target species. Water sampling is a non-invasive method which negates possibility of individual stress response, accidental injury, exposure to predation or mortality which although unlikely may occur as consequence of more invasive field survey methods.

15. eDNA sample kits were obtained from SureScreen Scientifics, to whom the collected samples were then returned. qPCR testing was then utilised to determine presence or likely absence of smooth newt.

Habitat Suitability Index Assessments

16. The potential for newts to be present in a particular pond increases when the waterbody holds certain characteristics (Oldham et al., 2000). These characteristics include:

SI1 - Geographic location – lowland areas are more likely to support newts
SI2 - A large pond surface area – the suitability of a pond for newts increases with its surface areas until 800m2, after which the suitability begins to decline again, but remains higher than that of ponds smaller than 400m2 in surface area.
SI3 - Pond permanence – the less likely a pond is to dry out, the more likely newts are to be present.
SI4 - High water quality – an abundant and diverse invertebrate community, as well abundant submerged plants are indicators of good water quality. The higher the water quality, the more likely newts are to be present.
SI5 - Shade – a high level of shade at the edge of the water body is most preferable
SI6 - Absence of waterfowl – waterfowl reduce habitat quality of a pond for newts by removing vegetation, polluting the water and even predating the newts. Therefore, if waterfowl are absent or are low in number, this increases the likelihood that newts are present.
SI7 - Absence of fish – fish can predate upon newt larvae. Therefore, if fish are low in number, newts are more likely to be present.
SI8 - A high pond count – the higher the number of ponds within a 1 km radius of the pond in question, the higher the likelihood that newts might have dispersed to the area.
SI9 - Terrestrial habitat – A water body surrounded by suitable newt habitat offering cover and foraging opportunities is more likely to support newts.
SI10 - Macrophyte cover – The higher the percentage of macrophyte cover (up to 80%), the higher the suitability of the pond for newts. Macrophytes provide them with shelter and habitat for females to lay eggs. When macrophyte cover increases above 80%, suitability begins to decline, but remains high.

17. The Habitat Suitability Index (HSI) for each pond was calculated following the methodology presented in ARG UK Great Crested Newt Habitat Suitability Index (2010) document. The HSI is a geometric mean of ten suitability indices (SI) and is calculated as follows:
HSI = $(SI1 \times SI2 \times SI3 \times SI4 \times SI5 \times SI6 \times SI7 \times SI8 \times SI9 \times SI10)^{1/10}$

Pond 1 HSI: $(1 \times 0.985 \times 0.9 \times 0.67 \times 1 \times 0.67 \times 0.7 \times 0.85 \times 0.67 \times 0.5)^{1/10} = 0.7727$ **(Good)**

Pond 2 HSI: $(1 \times 0.3 \times 1 \times 0.33 \times 1 \times 0.67 \times 0.7 \times 0.85 \times 0.67 \times 0.9)^{1/10} = 0.6851$ **(Average)**

Pond 3 HSI: $(1 \times 0.05 \times 1 \times 0.33 \times 1 \times 0.67 \times 0.7 \times 0.85 \times 0.67 \times 0.9)^{1/10} = 0.5727$ **(Below Average)**

Pond 4 HSI: $(1 \times 0.985 \times 0.9 \times 0.67 \times 1 \times 0.67 \times 0.3 \times 0.85 \times 0.67 \times 1)^{1/10} = 0.7716$ **(Good)**

Pond 5 HSI: $(1 \times 0.81 \times 0.9 \times 0.67 \times 1 \times 0.67 \times 0.3 \times 0.85 \times 0.67 \times 0.95)^{1/10} = 0.7528$ **(Good)**

Pond 6 HSI: $(1 \times 0.5 \times 0.5 \times 0.67 \times 1 \times 0.67 \times 0.7 \times 0.85 \times 0.67 \times 0.85)^{1/10} = 0.718$ **(Good)**

Pond 7 HSI: $(1 \times 0.05 \times 0.5 \times 0.33 \times 0.7 \times 0.67 \times 1 \times 0.85 \times 0.67 \times 0.95)^{1/10} = 0.5396$ **(Below Average)**

Pond 8 HSI: $(1 \times 0.05 \times 0.1 \times 0.67 \times 0.9 \times 0.67 \times 1 \times 0.85 \times 0.67 \times 0.4)^{1/10} = 0.4638$ **(Poor)**

18. Waterbodies are usually considered capable of supporting smooth newt if they present with a HSI of above 0.5.

Pond Choice

19. The survey has undertaken selective eDNA analysis based upon the initial habitat suitability index assessments for each individual pond; this approach, in utilising baseline HSI data to inform pond sampling choice, is pragmatic and avoids unnecessary resource use i.e. sampling sub-optimal or unsuitable waterbodies statistically less likely to feature smooth newt occupation. This selective approach is considered a reasonable survey design. The design is aimed at maximising probability of successfully identifying smooth newt presence – it should not be mistaken for confirmation of smooth newt absence from the nearby sub-optimal yet still potentially suitable ponds (HSI 0.5 or above), if eDNA presence of this species is confirmed in Good HSI ponds. This is because adult smooth newts are terrestrial, returning to waterbodies to breed, therefore if presence is confirmed in one Good HSI pond, they could also disperse to nearby surrounding habitat, including suitable ponds which meet suitable breeding habitat criteria as well as the associated terrestrial habitat.

20. Ponds were chosen for eDNA sampling based upon their HSI score and proximity to one another. Out of the eight ponds identified, four presented Good HSI scores whilst the remaining four presented Average, Below Average and Poor. Ponds which presented below Good were not sampled. Of the four ponds with Good HSI (Pond 1, Pond 4, Pond 5, Pond 6), three were sampled. One sample was taken from Pond 6, a standalone pond separated from the others by distance and topography (located at the top of the quarry track). One sample was then taken from Pond 1, a waterbody separated from Pond 2 (Average) by several metres. The final sample was jointly taken from Pond 4 and Pond 5: two sizable ponds separated by a centre strip of terrestrial habitat, and for which a small section of shallow water provided a direct hydrological link. These two ponds, given their size and almost total central separation, were initially subjected to separate HSI assessments. For the purpose of eDNA collection they were subsequently reconsidered as one waterbody due to their direct proximity and connection via a shallow strip of water breaking the central terrestrial separation: sampling water from both sections would conclude either presence for both, or likely absence for both.

Water Sampling

21. Pond water sampling methodology here followed instructions from SureScreen Scientifics (see Appendix 3).

22. The survey period of a waterbody for smooth newt is acknowledged by NIEA to be mid-March to mid-June. Water samples were collected on 09.05.24.

eDNA Analysis

23. Below is a methodology summary extracted from the eDNA analysis report issued by SureScreen Scientific:

"The analysis is conducted in two phases. The sample first goes through an extraction process where the filter is incubated in order to obtain any DNA within the sample. The extracted sample is then tested via real-time PCR (also called q-PCR) for each of the selected target species. This process uses species-specific molecular markers (known as primers) to amplify a select part of the DNA, allowing it to be detected and measured in 'real time' as the analytical process develops. qPCR combines amplification and detection of target DNA into a single step. With qPCR, fluorescent dyes specific to the target sequence are used to label targeted PCR products during thermal cycling. The accumulation of fluorescent signals during this reaction is measured for fast and objective data analysis. The primers used in this process are specific to a part of mitochondrial DNA only found in each individual species. Separate primers are used for each of the species, ensuring no DNA from any other species present in the water is amplified. If target species DNA is present, the DNA is amplified up to a detectable level, resulting in positive species detection. If target DNA is not present then amplification does not occur, and a negative result is recorded. Analysis of eDNA requires scrupulous attention to detail to prevent the risk of false positive and false negative results. True positive controls, negative controls, and spiked synthetic DNA are included in every analysis and these have to be correct before any result is declared. Stages of the analysis are also conducted in different buildings at our premises for added security."

24. eDNA results were categorised as either Positive, Negative or Inconclusive. Below is the definitive criteria for each, in addition to an explanation of Positive Replicates, taken from the eDNA analysis report issued by SureScreen Scientific:

Positive: *DNA was identified within the sample, indicative of species presence within the sampling location at the time the sample was taken or within the recent past.*

Positive Replicates: *Number of positive qPCR replicates out of a series of 12. If one or more of these are found to be positive the pond is declared positive for species presence. It may be assumed that small fractions of positive analyses suggest low level presence, but this cannot currently be used for population studies. Even a score as low as 1/12 is declared positive. 0/12 indicates negative species presence.*

Negative: *eDNA was not detected or is below the threshold detection level and the test result should be considered as evidence of species absence, however, does not exclude the potential for species presence below the limit of detection.*

Inconclusive: *Controls indicate inhibition or degradation of the sample, resulting in the inability to provide conclusive evidence for species presence or absence.*

Survey Constraints

25. The full perimeter was difficult to access for many of the eight identified ponds. This was due to steep banks and vegetation which was at times dense, difficult to penetrate, or which would impact surveyor ability to move, stand or adequately view the pond (for example bramble, willow scrub). These access constraints impacted the choice of survey methodology whereby eDNA sampling was considered the most feasible. Water sampling methodology detailed by SureScreen Scientifics

(Appendix 3) recommends collecting 20 ladles from pre-defined locations around the waterbody perimeter. As it was not possible to fully access the perimeter, 20 ladles were collected from as many varied locations as possible within the same pond. The efficacy of this methodology is considered robust enough to determine smooth newt presence or likely absence, as is evidenced by the results.

26. It must be acknowledged that eDNA sampling has provided an accurate conclusion of presence / likely absence however cannot enable a population count estimate. eDNA Analysis may not be suitable as a standalone survey method in all development contexts. For example, site-specific scenarios which would require pond removal, smooth newt translocation or development activities with potential to significantly impact the local newt population. Within this particular site-specific context, i.e. the overlapping extent of a protective buffer within development RLB and the associated suitable / unsuitable habitat areas, absence of knowledge in this regard is not considered a significant constraint to mitigation design.

Results

27. **Pond 1 presented an eDNA result of Negative**, with 0 Positive Replicates. This is a sizable pond which featured criteria indicative of suitable smooth newt habitat. This pond presented a HSI score of Good, however it is pertinent to note that this pond is also located directly beside a main road, the A37. Of all Good HSI ponds sampled, this pond was considered by the surveyor least likely to support smooth newt due to its location, as evidenced in these eDNA results. The HSI calculation widely used to categorise smooth newt suitability does not factor in potential disturbances in the surrounding habitat which may deter smooth newt from an otherwise suitable waterbody – for example noise, light, vibrations and emissions are all factors associated with the A37 which could reduce the habitat suitability of Pond 1, and further reduce Pond 2. Roads adjacent to the breeding waterbody have been shown to interfere with newt migration (Matos et al., 2017). The Negative result here has confirmed likely absence in this pond and is not entirely unusual nor unexpected.

28. **Ponds 4 and 5 presented an eDNA result of Positive**, with 12 Positive Replicates. These sizable ponds are located beside one another, separated by a central strip of terrestrial habitat and linked by a shallow, narrow section of water interrupting this central strip. Both ponds are situated farther from the A37, and both are somewhat sheltered by a surrounding natural vegetative buffer consisting of associated trees and scrub. An existing access track leads from the A37 past these ponds to the quarry, however occasional vehicular passage here is not anticipated to cause significant levels of disturbance. The Positive result has confirmed smooth newt are present in these ponds.

29. **Pond 6 presented an eDNA result of Positive,** with 12 Positive Replicates. This pond is long and narrow, having formed in an abandoned / unfinished deep track excavation. It is located on higher ground than the other identified ponds, on land at the highest level of the quarry. This pond is situated in a location so as to be undisturbed by vehicular passage. The Positive result has confirmed smooth newt are present in this pond.

Discussion

30. Copious amounts of frogspawn were observed in and around the ponds and on separate occasions individual / pairs of waterfowl were flushed. Small fish were also observed in several ponds therefore whilst unobserved for some ponds from limited bank vantage points, their presence remains possible. All of these factors serve to reduce the suitability of present waterbodies for smooth newt due to predation. These factors have been acknowledged in the initial habitat

suitability index assessments.

31. The Negative result for Pond 1 must be considered in conjunction with Positive results from nearby ponds. It remains possible that smooth newt could occupy this pond and / or its surrounding terrestrial habitat. Other ponds presenting as Average and slightly Below Average should also be included in the mitigation design. This is due to the mobile nature of this species, as caveated in the Smooth Newt Life Cycle Stages and Associated Habitats section.

32. Ponds 4, 5 and 6 have confirmed smooth newt presence. Smooth newt are therefore considered present in habitat beyond yet nearby to the development RLB. Mitigative efforts are considered necessary.

Evaluation and Mitigation

Pond Retention

33. All ponds are located outside the development RLB; all eight identified ponds and their associated immediate surrounding terrestrial habitat shall be retained. As the development RLB does not extend to include existing access tracks leading to both the quarry and into lands within the RLB, vehicular passage associated with the development is not anticipated to here occur. Construction activities are not anticipated to occur within immediate distance of any identified pond.

34. A section of the RLB encroaches upon Pond 1. The RLB section extending east along the A37 appears to include a linear stretch of ~5m depth, encompassing Pond 1's northern bank and a small portion of the waterbody itself. The purpose for this RLB area is unknown though presumed to be sightline facilitation. Removal of vegetation along the A37 here is anticipated to involve removal of young hawthorn located on the far side of post and wire fencing: mitigative action is not considered necessary here.

Protective Buffer Zone

35. The standard protective buffer zone for smooth newt is 200m. This has been applied to all ponds with HSI of 0.5 or above i.e. Ponds 1 – 7.

36. Portions of this buffer zone overlap with the development RLB, namely to the north, west and south. Areas of this overlap contain both suitable and unsuitable habitat for smooth newt, as well as containing habitat features which could be utilised by this species to overwinter. See Figures 1, 2 and 3 for visual context of the site layout, buffer zone, pond and RLB locations, and also habitat features and proposed mitigation areas.

Suitable Habitat

37. Once on land, smooth newt must seek suitable refuge from predation, the elements and desiccation (Griffiths, 1984). Habitat within both the RLB and 200m buffer zone which may provide this exists to the south of Pond 6 – here the landscape features rush cover of varying densities and wet ground. This habitat is also present south-west of Ponds 4 and 5, or WSW of Pond 6, and may provide vegetative cover used by smooth newt which have dispersed from breeding ponds.

38. Suitable overwintering habitat was noted in the form of old stone walls and areas of deadwood with rocks. Two derelict old stone walls are present to the south and west of the ponds; deadwood was noted to the west and south-west. Protective measures are recommended for these habitat features which may be providing important overwintering habitat for smooth newt.

Unsuitable Habitat

39. Similar habitat which features rush cover and wet ground exists to the north. This habitat is separated from the breeding ponds by the A37 Broad Road: this main road is considered a likely habitat block for this species. Habitat separated from the ponds by the A37 is not recommended to receive mitigation.

40. Unsuitable habitat is also present within overlapping areas between both the 200m buffer zone and the development RLB. Large areas of open habitat which offer little cover are known to act as a barrier during newt migrations to and from waterbodies. This is due to such habitats providing a combination of little to no cover, shelter, foraging opportunity, or overwintering habitat. The overlap area located west of Ponds 1 – 5 appears more heavily degraded from grazing pressure with short vegetation, dry ground and sparse rush tussocks. Several infrastructure components are proposed for construction here including: Option 2 Tracks, Hardstanding, Option 2 entrance and Turning Head. Mitigation is not considered necessary for this area identified as habitat of poor suitability for smooth newt.

Photograph 1 – unsuitable habitat for smooth newt, present within the western overlap area

Staged Vegetation Clearance

41. Research has indicated that smooth newt will tend to remain relatively close to breeding waterbodies, and individuals may remain near and / or return to few locations, whereas individuals which travel more significant distances tend to be the exception to the rule as opposed to the norm. Research also suggests that habitat quality impacts the dispersal distance of this species. All available evidence therefore indicates that the smooth newt breeding in the identified ponds are more likely to remain in the immediate vicinity of the ponds into late summer and autumn, taking advantage of available protective habitat features in that wooded area such as tree roots, rocks and scrub – though possibility remains individuals may venture farther into surrounding marshy grassland, which could also provide protection from desiccation, predation and the elements. Mitigation design must be proportionate and reasonable: staged vegetation clearance is proposed

for the section of proposed site track passing through the overlap area of suitable habitat south of Pond 6.

42. The construction phase here has potential to cause injury or death to newts which may be present within the works corridor. Pond 6 is ~63m from the RLB and ~112m from Option 2 Site Track. This section of the works corridor is recommended to receive staged vegetation clearance via mowing / strimming to reduce vegetation height down to 150mm, 75mm and finally 30mm (where applicable, as not all areas will be vegetated evenly). This will encourage newts to disperse away from the corridor into more suitable habitat.

43. Staged vegetation clearance is also recommended for common lizard, which may be more widespread across the site. Although this form of mitigation is only considered necessary for smooth newt for areas of suitable habitat within 200m of identified ponds, common lizard are not subject to this buffer zone - therefore for common lizard, staged vegetation clearance is recommended for all infrastructure areas within suitable habitat.

44. Should any smooth newt be found during construction, they will be translocated to a minimum distance of 30m from construction activities. This must be undertaken by a suitably qualified ecologist, under NIEA licence. The receptor area will be habitat considered suitable for smooth newt by the appointed ecologist. Details of any such translocation must be recorded and submitted to Council / NIEA.

Retention of Potential Overwintering Features

45. Some researchers consider smooth newt to be philopatric: smooth newt could return to the same overwintering sites. It remains possible smooth newt could disperse several hundred metres from the ponds, around which suitable overwintering habitat exists, to overwinter in more preferential habitat i.e. the identified stone walls and deadwood / rock areas. The development is recommended to retain these habitat features, which also hold value for other wildlife including common lizard. Both the areas of deadwood and stone walls appear to lay outside any current intended infrastructure areas. Wall 1 is ~14m from Option 2 Site Tracks and ~76m from Proposed Site Tracks; Wall 2 is ~100m from Control Building and Substation and ~70m from Option 2 Tracks. Likewise areas of deadwood appear to be situated ~46m from Temporary Construction Compound, ~31m from Control Building and Substation, ~20m from Option 2 Tracks. For areas of potential overwintering habitat which construction activities occur in closer proximity to, i.e. <20m distance, the habitat should receive clear demarkation prior to construction activities occurring e.g. through a series of brightly coloured tall flags or posts with joined string staked into the ground. This will ensure construction activities do not encroach upon the habitat and its retention is secured from clearance or damage throughout the construction phase.

Option 2 Site Tracks

46. Sections of this site track option pass closely by the aforementioned potential overwintering habitat. This site track also passes through the area of suitable habitat south of Pond 6, for which staged vegetation clearance is recommended.

47. If the development is able to avoid construction of Option 2 Site Tracks, in favour instead of Proposed Site Tracks, this would negate need for more extensive staged vegetation clearance specifically relating to smooth newt. A ~100m stretch of this alternative track route passes through the edge of the 200m protective buffer zone, as opposed to ~400m of Option 2 Site Tracks. It is important to note this alternative route does not lessen the need for staged vegetation clearance for common lizard. Staged clearance continues to be recommended for a greater area for common

lizard, i.e. all infrastructure areas. This alternative route would however lessen probability of encountering smooth newt within the construction corridor, being farther afield from the identified ponds.

48. Proposed Site Tracks is also a more desirable option regarding overwintering habitat, as it would maximise distance between construction activities and potentially wintering smooth newt.

Conclusion

49. Smooth newt are present in the nearby landscape.

50. Mitigation is not recommended for unsuitable habitat within overlapping areas of the 200m protective buffer zone and the development RLB, nor for habitat separated from the identified ponds by the A37 Broad Road.

51. Staged vegetation clearance is recommended for this species for infrastructure passing through an area of suitable habitat located within an overlapping area of the 200m protective buffer zone and the development RLB.

52. The development is recommended to retain identified potential overwintering sites.

53. The development is recommended to consider avoiding construction of Option 2 Site Tracks in favour instead of Proposed Site Tracks.

54. Should smooth newt be found at any stage of the construction phase, works will cease until they have been translocated a minimum distance of 30m from construction works. This will only be undertaken by a suitably qualified ecologist under NIEA licence. The receptor area will be habitat considered suitable for smooth newt by the appointed ecologist.

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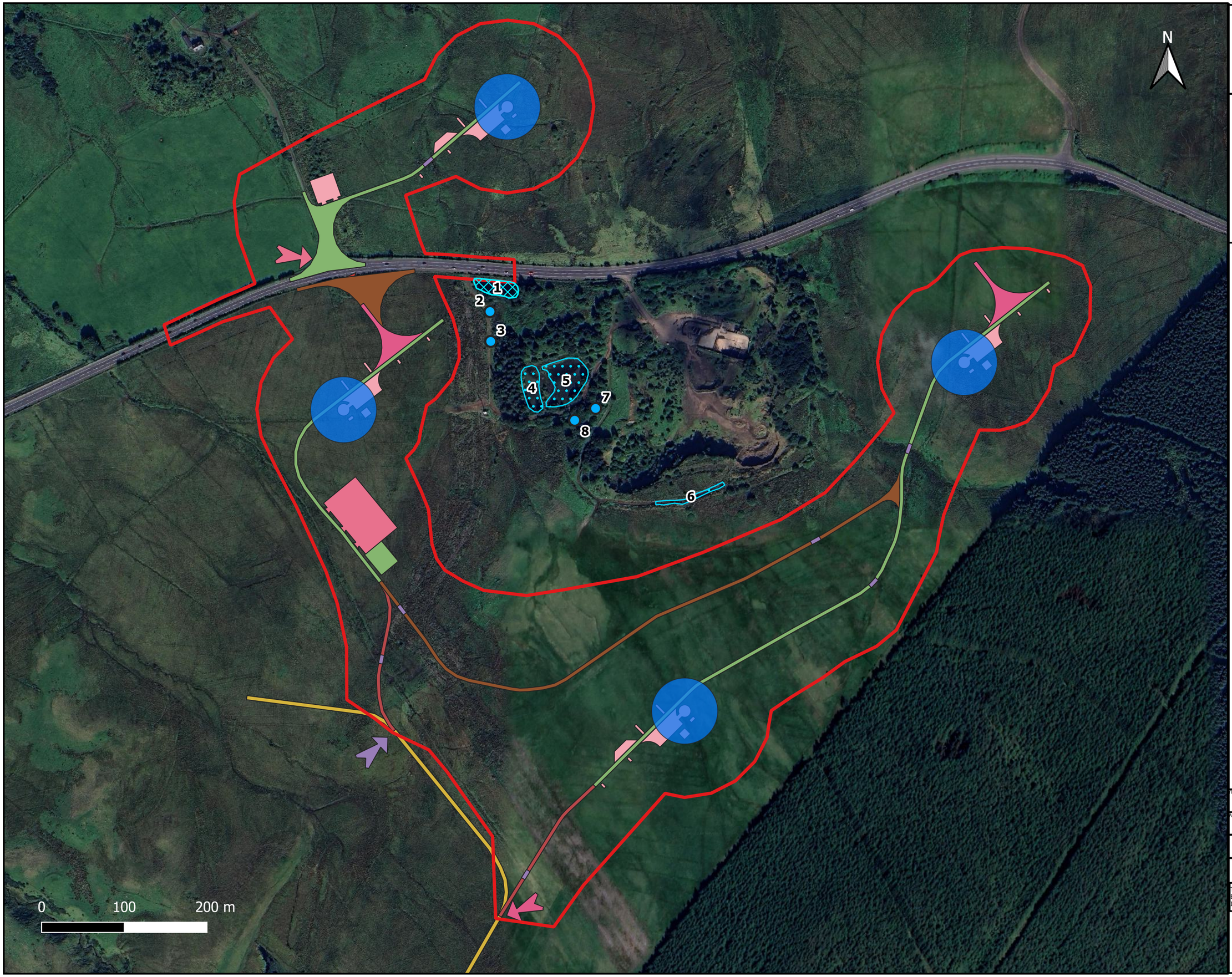
Appendix 1 – Figures

Figure 1 – Proposed Infrastructure, Pond / eDNA Locations



res
power for good

Dunbeg South Wind Farm

FIGURE 1

Proposed Infrastructure, Pond / eDNA Locations

KEY

- Site Boundary
- Pond Location
- Tested for eDNA - Positive
- Tested for eDNA - Negative
- Proposed Turbine Location
- Control Building and Substation
- Turning Head
- Site Track
- Hardstandings
- North Section Entrance
- Option 1 Tracks
- Option 1a Entrance
- Option 1b Entrance
- Option 2 Entrance
- Option 2 Tracks
- Proposed Site Tracks
- Small Construction Compound
- Temp Construction Compound
- Turbines
- Watercourse Crossings

OUT DWG | T-LAYOUT NO.

AWING NUMBER

Smooth Newt Survey Report

Blackstaff Ecology

Figure 2 – Overlapping Buffer Zone and RLB Areas

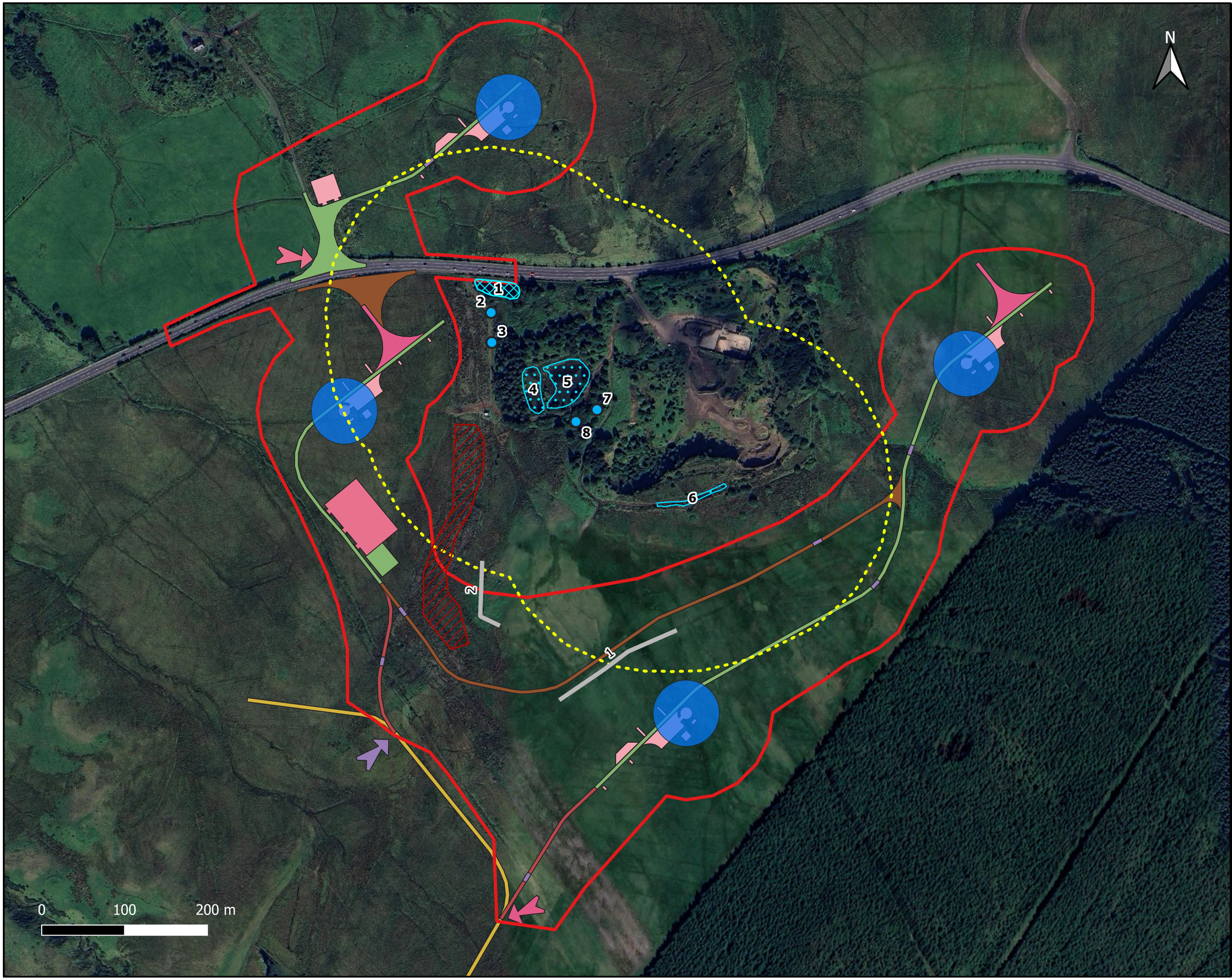


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FIGURE 2

Overlapping Buffer Zone and RLB Areas

KEY

- Site Boundary
- 200m Buffer
- Old Stone Wall
- Approximate Deadwood Area with Rocks
- Pond Location
- Tested for eDNA - Positive
- Tested for eDNA - Negative
- Proposed Turbine Location
- Control Building and Substation
- Turning Head
- Site Track
- Hardstandings
- North Section Entrance
- Option 1 Tracks
- Option 1a Entrance
- Option 1b Entrance
- Option 2 Entrance
- Option 2 Tracks
- Proposed Site Tracks
- Small Construction Compound
- Temp Construction Compound
- Turbines
- Watercourse Crossings

OUT DWG | T-LAYOUT NO.

AWING NUMBER

Smooth Newt Survey Report

Blackstaff Ecology

Figure 3 – Proposed Mitigation

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FIGURE 3

Proposed Mitigation

KEY

- Site Boundary
- 200m Buffer
- Old Stone Wall
- Approximate Deadwood Area with Rocks
- Protective Demarkation
- Track Section for Staged Vegetation Clearance
- Pond Location
- Tested for eDNA - Positive
- Tested for eDNA - Negative
- Proposed Turbine Location
- Control Building and Substation
- Turning Head
- Hardstandings
- North Section Entrance
- Option 1 Tracks
- Option 2 Entrance
- Option 2 Tracks
- Proposed Site Tracks
- Small Construction Compound
- Temp Construction Compound
- Turbines
- Watercourse Crossings

OUT DWG	T-LAYOUT NO.
WING NUMBER	

Smooth Newt Survey Report

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Appendix 2 – Photographs

Pond 1

Photograph 1

Photograph 2

Photograph 3

Photograph 4

Photograph 5

Photograph 6

Pond 2

Photograph 7

Photograph 8

Pond 3

Photograph 9

Photograph 10

Pond 4

Photograph 11

Photograph 12

Pond 5

Photograph 13

Photograph 14

Photograph 15

Pond 6

Photograph 16

Photograph 17

Photograph 18

Pond 7

Photograph 19

Pond 8

Photograph 20

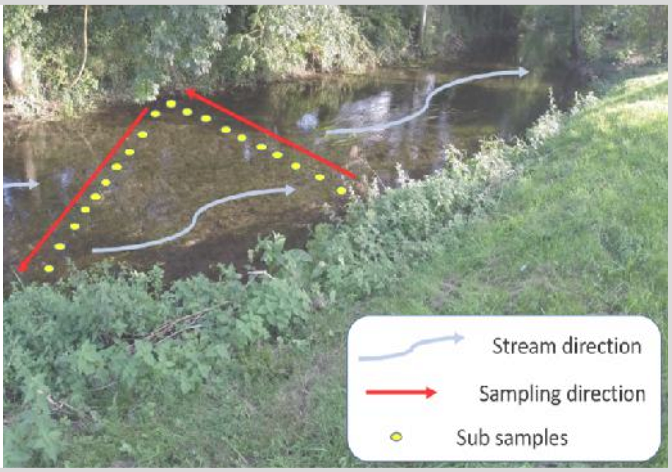
Appendix 3 – SureScreen Scientifics Water Sampling Methodology

SureScreen Scientifics
Morley Retreat, Church Lane, Morley,
Derbyshire, DE7 6DE
+44 (0)1332 292003
edna@surescreen.com

Detailed Filtration Sample Collection Guidance

1 Identify where 20 sub-samples will be taken from the river or pond perimeter.

The location of these should be spaced as evenly as possible around the site. In ponds, samples should be taken from locations around the entire pond perimeter, where accessibility permits. In rivers, samples should be taken against the flow of the stream, working upstream in a diagonal pattern where possible. This will ensure that any disturbed sediment is not collected, should it be necessary for the collector to enter the watercourse.



2 Wearing gloves, open the sterile Whirl-Pak bag and collect 20 ladles of water from the 20 sub-sites.

The water sample should be taken from the middle of the water column (at least 10cm from bottom where possible). Where possible, avoid any disruption of sediment as this can both quickly clog the filter and introduce ancient DNA into the sample. In larger sites it may be necessary to use a telescopic pole.

Once collected close the bag securely and shake to mix the water sample.

3

Using the large syringe, take 50ml of sample from the Whirl-Pak bag.

Attach the syringe using a half twist action to the filter unit. The syringe will only fit to one end of the filter unit. Note, twisting too far can damage the luer lock connection on the filter.

Apply pressure to the syringe until all liquid has passed into and through the filter.

Remove the syringe from the filter and repeat the process until:

A) you have filtered 500ml OR

B) The filter has become blocked and cannot filter any more.

The more liquid passed through the filter unit, the more reliable results will be, however, be careful not to push too hard as the filter casing can crack under extreme pressure. Record the volume of liquid which has been filtered on the sample collection form.

Instructions continue overleaf

4 Empty the syringe and fill with air, re-attach to the filter and push air through the filter unit until it is completely free of water.

5

Screw the spare red cap tightly onto the thick end of the filter unit.

Place the filter unit to one side.

6 **Remove the cap from the small syringe and store to one side.**

An excess of preservative solution is provided.

It is important to add preservative solution into the filter unit to prevent sample degradation during transport to the laboratory.

7 **Attach the syringe to the open end of the filter unit.**

Slowly apply light pressure until the filter casing is filled with preservative solution.

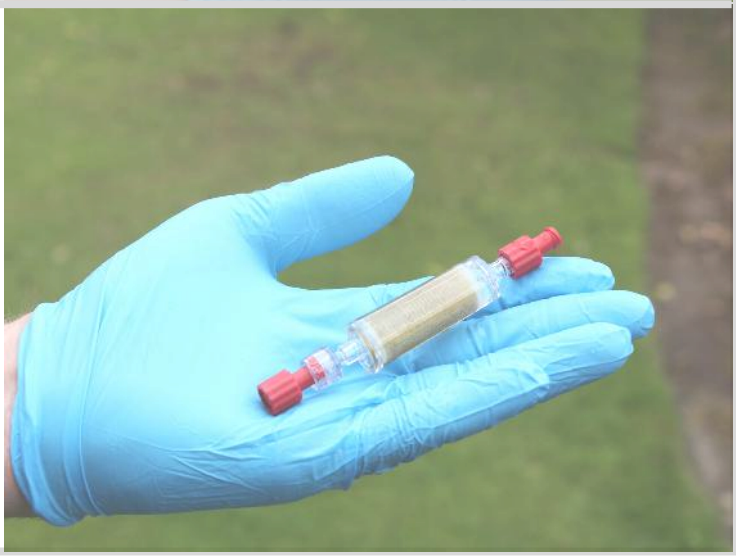
The preservative solution allows for the filter to be stored at room temperature before analysis. In the absence of a preservative, filters must be frozen immediately and returned to the lab on ice.

8 **Finally, screw the red cap on to the other end of the filter casing.**

Ensure that both caps are secured tightly to avoid leakage of preservative solution during transport to the laboratory.

Place the sample into the 50ml tube provided and return to laboratory.

Samples can be stored at room temperature for up to 2 weeks, 4 weeks if chilled.



Appendix 4 – Pond Locations

Pond	Easting	Northing	Latitude	Longitude
1	274495.3253	426185.6739	55.0774066	-6.834423706
2	274522.0042	426159.4894	55.07716745	-6.834012949
3	274522.8659	426123.3866	55.0768431	-6.834008894
4	274587.3829	426041.0815	55.07609428	-6.833020562
5	274605.8522	426048.5243	55.07615835	-6.832729529
6	274792.8737	425947.9035	55.07522662	-6.829828601
7	274649.7542	426042.3183	55.07609602	-6.832043986
8	274624.4308	426027.9425	55.07597072	-6.832444116