Haweswater Aqueduct Resilience Programme
Proposed Marl Hill Section

Chapter 9A – Appendix 9A.8

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United Utilities

Environmental Statement

Haweswater Aqueduct Resilience Programme

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Contents

1. eDNA Appendix

1.1 Introduction

1) TEP was appointed by United Utilities to complete an Ecological Impact Assessment (EcIA) for the Haweswater Aqueduct Resilience Programme - Proposed Marl Hill Section. The EcIA is required to inform an Environmental Impact Assessment (EIA) and support production of the Environmental Statement (ES).

2) A series of ecological surveys was undertaken to complete the EcIA. This Appendix is one of a series of Ecological Technical Reports (ETRs) produced to support the EcIA. This ETR documents the methods and findings of the eDNA surveys undertaken by Bowland Ecology.

1.2 Summary of Findings

3) A wider area was surveyed than will be potentially impacted by the proposed works within the Proposed Marl Hill Section. Consequently only some of the ponds for which eDNA survey findings are presented within the Appendix A are of relevance to the EcIA for the Proposed Marl Hill Section. The ponds which fall within potential influencing distance (500 m) of the Braddup Compound and Bonstone Compound which will be considered within the EcIA are:

   - Pond TR4.P1 (approximately 35 m north of the Bonstone Compound access road)
   - Pond TR4.P2 (approximately 30 m north of the Bonstone Compound access road)
   - Pond TR4.P9 (approximately 275 m north west of the Braddup Compound)
   - Pond TR4.P10 (approximately 235 m south of the Braddup Compound)
   - Pond TR4.P14 (approximately 370 m south east of the Braddup Compound)

4) The locations of these ponds are illustrated at Figure 9A.22.

5) There was no pond present at Pond T04.P15 and therefore no eDNA sample was taken.

6) Ponds TR4.P1, TR4.P2, TR4.P9, TR4.P10 and TR4.P14 tested negative for great crested newt eDNA.

Appendix A. Great Crested Newt eDNA Survey Report

1 Project Details			
Project Name:	Haweswater Aqueduct Resilience Programme	Project Number:	80061155
Written:	Eve Loxham, *Ecologist*	Approved:	Ellen Milner, *Principal Ecologist* Alice Helyar, *Principal Ecologist*
Report reference:	TR4 Great Crested Newt eDNA Report V3	Date:	21/05/2020
2 Project Drawings			
eDNA Survey Results Proposed Marl Section Sheet 1 to 8		BOW167_HARP_9.5_eDNA_TR4	
3 Ecology Surveys			
Surveyors:	Mark Breaks (Natural England Class I Survey licence for great crested newts 2016-26714-CLS-CLS), Eve Loxham (Natural England Class I Survey licence for great crested newts 2017-27825-CLS-CLS), Sophie King, Lucy Pocock, Heather Whalley as accredited agents/assists of Natural England Class I Survey licence for great crested newts of Eve Loxham and Ellen Milner (2015-18329-CLS-CLS).		
Survey date(s):	12.04.19, 14.04.19, 10.06.19, 18.06.19, 20.06.19, 24.04.20, 18.05.20.		
Survey Method:	eDNA sampling methods followed Biggs *et al.* 2015 and samples were sent to FERA, a Natural England accredited laboratory for eDNA analysis.		
Weather Conditions:	12.04.19: Dry, 70% cloud, 1-2 Beaufort scale wind, approximately 10°C. 14.04.19: Dry, 60% cloud, 2 Beaufort scale wind, approximately 7°C. 10.06.19: Dry, 50% cloud, 1 Beaufort scale wind, approximately 15°C. 18.06.19: Dry, 30% cloud, 1 Beaufort scale wind, approximately 16°C. 20.06.19: Dry and sunny, 30% cloud, 1 Beaufort scale wind, approximately 15°C. 24.04.20: Dry and sunny, 0% cloud, 1 Beafort scale wind, approximately 17°C. 18.05.20: Light rain, 100% low cloud, 1 Beaufort scale wind, approximately 11°C.		
4 Pond Descriptions			
TR4 Pond 1:			

Area is 10 m x 5 m, however, the pond is drying out and is approximately one third of the full size, the rest being bare earth/mud. This pond is a wader scrape and was excavated between 2005 and 2010 as part of the Environmental Stewardship Scheme along with TR4.P2.

Soft rush (*Juncus effusus*) is scattered at the pond edge, and brooklime (*Veronica beccabunga*) is present within the pond.

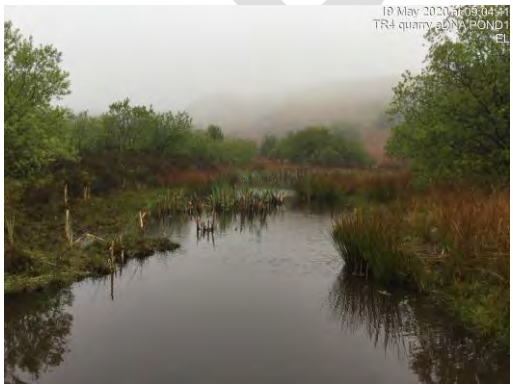
Sheep grazed dense, rough grass pasture surrounds the pond.

Breeding lapwing (*Vanellus vanellus*), redshank (*Tringa totanus*), oystercatcher (*Haematopus ostralegus*) and moorhen (*Gallinula chloropus*) present. Greylag goose (*Anser anser*), Canada goose (*Branta canadensis*), and mallard (*Anas platyrhynchos*) also recorded. There is major impact of waterfowl on the pond itself.

TR4 Pond 2:	
	Small roughly triangular shaped pond (6 m x 5 m), which has similar bird associations to TR4.P1. Sheep grazed, rough pasture surrounds the pond. Soft rush is present around the edges, with a small amount of brooklime and floating sweet grass (*Glyceria fluitans*) present within the water. The water is shallow and the pond has dried out to approximately one third the full size.
TR4 Pond 3:	
	Small (7 m x 10 m) roughly circular, shallow (<10 cm) pond enclosed within a fence with a nearby line of mature ash (*Fraxinus excelsior*) and alder (*Alnus glutinosa*) trees. Immature alder scrub also lines the pond to the east, with soft rush present at the pond edges to the west. Broadleaved woodland borders to the south, and species-poor semi-improved grassland is present to the north. The pond is drying out due to warm and dry weather at the time of the survey and is approximately one third the full size.
TR4.Pond 4:	
	Medium (15 m x 15 m), roughly circular and deep pond situated within semi-natural upland moorland. The water is clear and peat rich. The banks are densely vegetated and include the species willow (*Salix* sp.), soft rush, bulrush (*Typhalatifolia*), bracken (*Pteridium aquilinum*) and bilberry (*Vaccinium myrtillus*). The only macrophytes is a small area of bulrush within the pond.
TR4 Pond 5:	
	Large (20 m x 20 m), circular pond within a private garden. The water is deep and clear. Surrounding vegetation consists of willow, soft rush and grasses, with an area of coniferous plantation. Macrophytes are present around the edges and include yellow flag iris (*Iris pseudoacorus*), bulrush and water lily (*Nymphaea* sp.). Tadpoles were identified at the pond edges.

TR4 Pond 6:	
	Medium sized (10 m x 5 m) garden pond, with deep and clear water. The entire pond is covered by bulrush and the banks are dominated by soft rush and grasses. Amenity grassland surrounds the pond.
TR4 Pond 7:	
	Large (60 m x 50 m) oval waterbody located on semi-natural upland moorland. The banks are dominated by soft rush and the surrounding vegetation comprises predominantly soft rush and mosses (including sphagnums). There is no macrophyte vegetation within the waterbody. The water is clear and deep. There is an inflow at the east bank and outflow at the west.
TR4 Pond 8:	
	Large (20 m x 20 m) pond located within a sheep grazed field. There is a stream inflow from the north and an outflow to south. The water is shallow at the margins (<10 cm) and deeper at the centre (up to 50 cm). The water is clear with many tadpoles (not identified to species)present. Macrophyte vegetation includes several individual plants of water forget-me-not (*Myosotis scorpioides*). The banks are steeply sloped and consist of grass species, soft rush, marsh thistle (*Cirsium palustre*) and common nettle (*Urtica dioica*). Alder and willow trees are to the east, and oak (*Quercus* sp.) trees to the north.
TR4 Pond 9:	
	Large (30 m x 30 m), open pond located at the field boundary of a sheep-grazed grassland. There is a broken fence which does not prevent cattle/sheep access, and the edges are poached from the eastern side. Scattered common gorse (*Ulex europaeus*) is present at the pond edges. Macrophytes identified within the pond edges include common water starwort (*Callitriche stagnalis*), horsetail (*Equisetum* sp.) and soft rush. The water is turbid and contains a high density of midge fly larvae. Breeding moorhen present.

TR4 Pond 10:	
	Small (5 m x 4 m), shallow section of a larger pond which has dried up (approx 20% of original size). The vegetation is dense and the water surface is completely covered with yellow flag iris with a small amount of common water starwort beneath. Some immature alder trees are growing within the pond. The pond is set within a hay meadow with nearby broadleaved woodland. The pond edges are poached by cattle in sections. Adjacent vegetation includes brooklime, greater bird's-foot trefoil (*Lotus pedunculatus*), field forget-me-not (*Myosotis arvensis*), blinks (*Montia fontana*) and broadleaved dock (*Rumex obtusifolius*).
TR4 Pond 11:	
	Large (20 m x 15 m) roughly circular pond within a grazed field. The pond is over 0.5m deep, there is no submerged vegetation but there is a small amount of water mint (*Mentha aquatica*) at the edges of the pond – the vegetation is not submerged and therefore not suitable for egg laying. There is a fringe of soft rush around the pond edge along with young willow and elder (*Aegopodium podagraria*) trees. Tadpoles (not identified to species level), mosquito (Culicidae sp.) larvae and mallard were recorded during the survey.
TR4 Pond 12:	
	Large (20 m x 15 m) roughly circular pond at the boundary of a grazed field. The pond is fenced off from livestock. The water is over 0.5m deep and turbid at the time of survey. There is no aquatic or marginal vegetation. The banks are earth and stone, and sloped at a gentle gradient. Bankside species include Yorkshire fog (*Holcus lanatus*), common nettle and broadleaved dock. Tadpoles (not identified to species level), two mallard and greater water boatman (*Notonecta glauca*) were recorded during the survey.
TR4 Pond 13:	
	Large (20 m x 20 m) circular pond located within plantation woodland. The depth is unknown due to the water being highly turbid, however the pond is shallow around the edges. There is exposed dry mud at the pond edges, signifying the pond has dried recently. No aquatic or marginal vegetation was recorded. There are some immature willow scrub trees which are encroaching on the pond and shade 50% of the surface. Additional surrounding vegetation includes coarse grasses, common nettle and broadleaved dock.

TR4 Pond 14:	
	Large (20 x 20 m) circular pond located at the edge of a grazed field, close to a woodland and dry stone wall. The pond is fenced off from livestock. The depth is less than 0.5 m, and the water was turbid at the time of survey. There is no aquatic vegetation within the pond, and there are occasional rushes at the margins. The banks are gently sloping and vegetated with rushes, lesser celendine (*Ranunculus ficaria*) and broadleaved dock. Mature willow trees surround the pond and shade 70% of the surface. Water shrimp (*Gammarus pulex/fossorum agg.*), mallard and a moorhen nest was noted during the survey.
TR4 Pond 15:	
	No pond present; no areas of wet ground observed on steeply sloping ground within plantation woodland.
TR4 Pond 16:	
 	A horseshoe-shaped pond, the last in a line of settling ponds which are situated on a slope at the edge of Waddington Quarry. The pond is large, measuring approximately 40 m x 10 m at the northern half, and 25 m x 20 m at the southern half. The eastern half of the pond in the arch of the horseshoe, has a dense stand of bulrush (*Typha latifolia*). Additional aquatic plants include brooklime and willowherb (*Epilobium* sp.). Banks are steep sided and undercut in places. The surrounding habitat is dry dwarf shrub heath and scattered willow scrub. There is a notable abundance of dead common toads (*Bufo bufo*) and common frogs (*Rana temporaria*) showing signs of predation (possibly grey heron or otter). Hundreds of tadpoles (toad and frog) were noted within the pond. The road is approximately 30 m to the east of the pond and is a known crossing point for toads and frogs during the migration. Canada geese are present around the pond, however their impact is considered to be minor. The depth of the pond is unknown, although it is shallow (approximately 30 cm) at the banks. At the north-western corner there is a minor flow of water from TR4.P17, and at the south-western corner there is a minor outflow of water from the pond itself.

TR4 Pond 17:	
	A large (60 m x 25 m), oval pond, which is second to last in the line of settling ponds situated on a slope at the edge of Waddington Quarry. The surrounding habitat comprises dry dwarf shrub heath and mature willow scrub. Marginal vegetation includes soft rush, bird's-foot trefoil (*Lotus uliginosus*) and willowherb sp. There is no aquatic vegetation. As with TR4.P16 there are numerous dead toads and frogs around the pond. A minor outflow of water is present in the south-western corner which was not flowing at the time of survey but connects to TR4.P16. The depth of the pond is unknown, although it is shallow (approximately 30 cm) at the banks.

5 eDNA survey results

Pond ID	Results	Limitations
TR4.P1:	Negative	None.
TR4.P2:	Negative	None.
TR4.P3:	Negative	None.
TR4.P4:	Negative	None.
TR4.P5:	Negative	None.
TR4.P6:	Negative	None.
TR4.P7:	Negative	None.
TR4.P8:	Negative	None.
TR4.P9:	Negative	Cattle/sheep poached pond edges.
TR4.P10:	Negative	Cattle/sheep poached pond edges.
TR4.P11:	Negative	None.
TR4.P12:	Negative	None.
TR4.P13:	Negative	None.
TR4.P14:	Negative	None.
TR4.P15:	N/A	No Pond Present.
TR4.P16:	Pending result.	None.
TR4.P17:	Pending result.	None.

References

Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Dejean, T., Griffiths, R. A., Foster, J., Wilkinson, J. W., Arnell, A., Brotherton, P., Williams, P. & Dunn, F. (2015). *Using eDNA to develop a national citizen science-based monitoring programme for the great crested newt (*Triturus cristatus*).* Biological Conservation. **183**, 19-28.