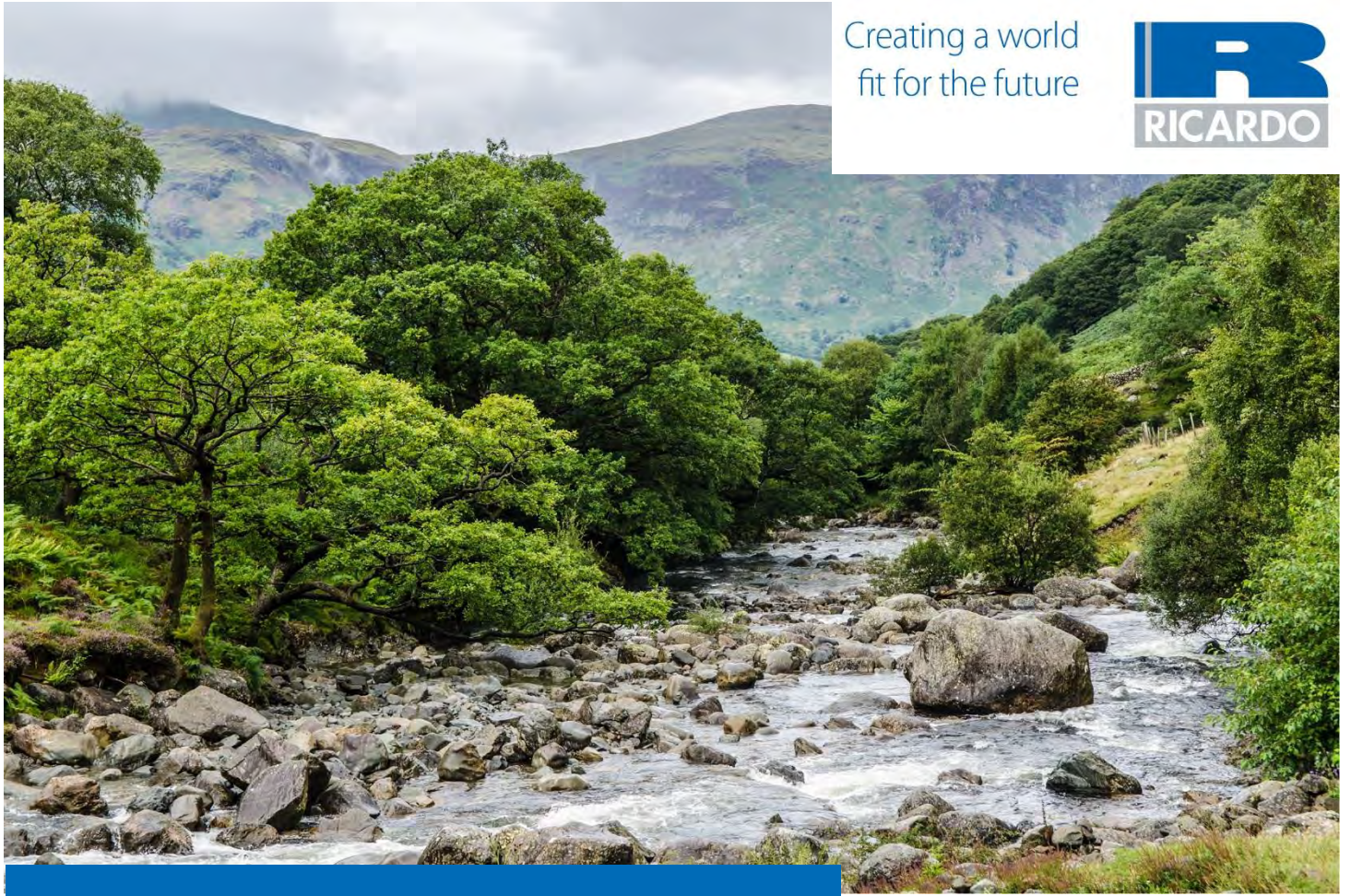


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Haweswater Aqueduct Resilience Programme
Proposed Marl Hill Section Environmental Statement
Aquatic Ecology Baseline
Technical Appendix 9B.1

RVBC-MH-TA-009-02-001

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Annex 1: Walkover survey results

1 Introduction

This report is a technical appendix to Chapter 9B Aquatic Ecology of the HARP Proposed Marl Hill Section Environmental Statement. The purpose of the report is to identify within the Proposed Marl Hill Section study area the presence of designated sites, the baseline condition of the aquatic ecology communities which inform the Water Framework Directive (WFD) status of the watercourses in the study area, and the presence of protected or notable species to inform the Ecological Impact Assessment (EclA) and the associated mitigation strategy presented in Chapter 9B Aquatic Ecology.

This report presents baseline ecological data collated from a desk study of existing ecological data, walkover surveys, and white clawed crayfish surveys of watercourses within the Proposed Marl Hill Section study area.

2 Methodology

2.1 Desk study

The MAGIC website mapping tool was used to help identify any statutory or non-statutory designated sites for freshwater fish, macrophyte and aquatic macroinvertebrate species within the Proposed Marl Hill Section study area.

In addition, ecological datasets for the period 2005 – 2018 were obtained via the Environment Agency Ecology and Fish Data Explorer website¹, this data included:

- National Fish Populations Database (NFPD): Freshwater Fish Counts for all Species for all Areas and all years. NFPD consists of information collected from fisheries monitoring work on rivers and lakes. This monitoring work is undertaken by the Environment Agency.
- Data for freshwater and marine biological surveys for macroinvertebrates, diatoms and macrophytes in England. The Environment Agency undertakes freshwater and marine biological monitoring in England. Freshwater and Marine Biological Surveys England is a large dataset containing taxonomic level species data for biological surveys carried out in freshwater and marine environments. This archive is more commonly known as BIOSYS.

These data were analysed in order to

- Identify important migratory pathways for diadromous fish species;
- Identify important spawning and nursery habitat for protected and notable species;
- Identify the location of protected and notable macrophyte and macroinvertebrate species in relation to the proposed development; and
- Identify important habitats that support key macrophyte and macroinvertebrate communities.

Several macrophyte species are known to be good indicators of water chemistry, habitat disturbance and seasonal changes in flow and have been used as a biological method to assess the trophic status of rivers and streams in the UK, including the impact of eutrophication and flow. They were selected for this method because:

- their species composition can change with increased nutrient concentrations;
- the changes in macrophyte community can be highly visible and may be deemed 'undesirable';
- most species recorded for the surveys are readily identifiable with the naked eye; and
- the rooted nature of many species means that any absence or presence of species is significant.

The UKTAG Fisheries Classification Scheme 2 (FCS2)² is used to assess the status of fish fauna (the WFD 'Fish' element) in rivers in England and Wales. Electric fishing data is inputted into a model which compares this observed data with the predicted fish assemblage for the river type given site location and four environmental variables (altitude, distance to tidal limit, mean wetted width and survey area). The site is then classified based on how the site performs against the predicted fish assemblage.

¹ Environment Agency Ecology and Fish Data Explorer website <https://environment.data.gov.uk/ecology-fish/>. Accessed 17 April 2020

² Available from:

<http://www.wfduk.org/sites/default/files/Media/Characterisation%20of%20the%20water%20environment/Biological%20Method%20Statements/river%20fish.pdf>

Records of white clawed crayfish (*Austropotamobius pallipes*) supplied by the Cumbria Biodiversity Data Centre (CBDC) and Lancashire Environmental Records Network (LERN) were reviewed for within 2 km of the proposed scheme.

2.2 Watercourse walkover surveys

Walk-over habitat surveys were undertaken in April 2020 for watercourses within 500m of the Bonstone Compound (tunnelling launch site) and Braddup Compound (tunnelling receptor site) which contain open cut sections, construction compounds, and an access track.

The walk-over habitat survey methodology was based on the Environment Agency's 'Restoration of Riverine Salmon Habitats' guidance manual³. The 'Hendry & Cragg-Hine' method was developed to be used to inform habitat restoration, fish survey site selection, and fish population studies.

The main objective walk-over survey was to obtain a detailed representation of the location, extent, and condition of habitat features along and surrounding a watercourse. This was done by walking the riverbank of the selected survey stretch and entering the river when necessary. The habitats and features were mapped using Esri ARC GIS and are presented in **Annex 1** to this appendix. The habitats and features recorded during the walk-over surveys included:

- Flow type
- Water depth
- Flow velocity (estimate of surface velocity)
- Substrate composition
- Species specific habitats
- Obstructions
- Macrophytes – estimated percentage cover for:
 - submerged macrophytes
 - emergent macrophytes
 - filamentous algae
 - Macrophyte choked channel
- Other features:
 - Coarse woody material
 - Debris dam
 - Bankside roots (target note)
 - Undercut bank (line along bank)
 - Overhanging terrestrial vegetation
 - Shading.

Incidental findings were also recorded during the walk-over surveys including Invasive Non-native Species (INNS), pollution sources, field boundaries, land use, and bank modifications.

2.3 White clawed-crayfish surveys

In order to establish if white-clawed crayfish could be present in waterbodies within the zone of influence surveys were undertaken in 2020.

An initial habitat assessment was undertaken as part of the Extended Phase 1 survey to determine the requirement for detailed white clawed crayfish surveys. The Extended Phase 1 survey of the Marl Hill scheme is presented in the Phase 1 Technical Appendix 9A.2 (RVBC-MH-TA-009-01-002) to Chapter 9A of the Marl Hill Environmental Statement.

³ Hendry & Cragg-Hine (1997) <http://www.apemltd.co.uk/wp-content/uploads/2016/08/Restoration-of-Riverine-Salmon-Habitats-A-Guidance-Manual.pdf>

Water courses with suitable habitat to support white clawed crayfish were subject to surveys to determine presence/likely absence in 2020 by Ricardo Energy & Environment. The results of the white clawed crayfish surveys are presented in **Section 3.2**.

Water courses surveyed for white clawed crayfish in 2020:

- River Hodder
- Bashall Brook
- Unnamed Watercourse 431
- Unnamed Watercourse 433
- Unnamed Watercourse 442
- Unnamed Watercourse 463

The surveys followed the methodology within Survey and Monitoring Protocol for white clawed crayfish⁴. This comprised manual searching by carefully lifting suitable stones and debris on the channel bed which crayfish may use as refuge sites. Initially 100 refugia were searched within a 50 m stretch of riverbed. If five or more crayfish were observed (and captured) searching ceased. If fewer than five crayfish were observed, searching continued to 250 refugia. Refuge searching took place in an upstream direction to avoid poor visibility caused by disturbing silt/sediment. All crayfish captured were identified to species level, sexed, checked for signs of disease or injury and their carapace length (mm) recorded. A record of the approximate size/age class of crayfish observed but not captured was also made.

2.3.1 Weather conditions and survey dates

The weather conditions and survey dates for the white clawed crayfish surveys are shown below in **Table 2.1**.

Table 2.1: Surveys dates and weather conditions for white clawed crayfish

Survey Date	Weather conditions
29/04/2020	Surveys were undertaken during dry weather with temperature 11°C and a light breeze The survey was undertaken following a prolonged dry spell meaning water levels were low and water visibility excellent.

2.4 Study Limitations

The absence of desk study records cannot be relied upon to infer absence of a species/habitat. Often, the absence of records is a result of under-recording within the given search area.

White clawed crayfish surveys were undertaken following a prolonged dry spell meaning water levels were low and water visibility excellent, therefore, survey conditions are considered to be optimal and no constraints to the surveys were identified.

⁴ Peay S (2003). Monitoring the White-clawed Crayfish *Austropotamobius pallipes*. Conserving Natura 2000 Rivers Monitoring Series No.1, English Nature, Peterborough.

3 Baseline Conditions

3.1 Water Framework Directive (WFD) communities and status

3.1.1 Macrophytes

Available Environment Agency macrophyte monitoring data (2000-2020) have been reviewed for the relevant reaches of the Hodder - conf Easington Bk to conf Ribble (Northern extent of Proposed Marl Hill Section) and Bashall Brook (Southern extent of Proposed Marl Hill Section). GB112071065560 (Hodder - conf Easington Bk to conf Ribble) classifies as 'Good' for combined macrophytes and diatoms in 2016, Cycle 2. The WFD waterbody GB112071065520 (Bashall Brook) is classified as 'Moderate' for combined macrophytes and diatoms in 2016, Cycle 2. Data to inform the baseline conditions for the macrophyte communities were absent from available Environment Agency data.

Table 3.1 shows the available WFD diatom (phytobenthos) monitoring sites.

Table 3.1: Details of diatom monitoring sites and WFD classification: Hodder - conf Easington Bk to conf Ribble and Bashall Brook

Monitoring site	NGR	WFD Waterbody
Hodder - conf Easington Bk to conf Ribble		
Hodder (65135)	SD7043139172	GB112071065560
Greystonely Brook (69622)	SD6462744114	
Bashall Brook		
N/A	N/A	GB112071065520

The assessment of diatoms (phytobenthos) in rivers according to the requirements of the WFD is completed using a tool called DARLEQ2 (Diatoms for Assessing River and Lake Ecological Quality), based on a metric called the Trophic Diatom Index (TDI). The TDI describes the nutrient preferences of a diatom community. It ranges from 1 (preference for extremely low nutrient levels) to 100 (preference for extremely high nutrient levels). The TDI4 scores were used by the Environment Agency in the assessment of WFD status of the Cycle 2 assessments.

Percentage Motile Taxa data are also provided which gives the relative proportions of phytobenthos taxa within the community that are motile. A high proportion of motile taxa (>50%) can indicate that light availability is influencing the community, which can be brought about by pressures such as siltation and high covers of filamentous algae. The available baseline TDI scores for the sites associated with the Hodder - conf Easington Bk to conf Ribble (**Table 3.2**) are indicative of moderate to high nutrient conditions, while the moderate percentage motile taxa are indicative of siltation and disturbed waters.

Table 3.2: Details of diatom monitoring sites and WFD classification: Hodder - conf Easington Bk to conf Ribble only

	TDI Score	Motile %
Hodder - conf Easington Bk to conf Ribble (No of sites: 2, No of samples 6)		
Mean	57.35	35.27
Min	55.81	10.93
Max	60.79	56.35

3.1.2 Macroinvertebrates

Available Environment Agency macroinvertebrate data (2000-2020) have been collated for the relevant WFD water bodies. GB112071065560 (Hodder - conf Easington Bk to conf Ribble) classifies as 'High' for macroinvertebrates in 2016, Cycle 2. The WFD waterbody GB112071065520 (Bashall Brook) classifies as 'Moderate' for macroinvertebrates in 2016, Cycle 2. It should be noted that 2016 was the most recent WFD classification for the macroinvertebrate provided by the Environment Agency at the time of preparing this report.

Table 3.3 Details of macroinvertebrate monitoring sites and WFD classification: Hodder - conf Easington Bk to conf Ribble & Bashall Brook

Monitoring site	NGR	WFD Waterbody
Hodder - conf Easington Bk to conf Ribble		
Hodder (64960)	SD6580047915	GB112071065560
Hodder (65135)	SD7043139172	
Greystonely Brook (69622)	SD6462744114	
Unnamed Trib or Hodder (West of Withgill Farm) (142808)	SD7007640737	
Unnamed Trib or Hodder (West of Withgill Farm) (142809)	SD7020841151	
Unnamed Trib or Hodder (West of Withgill Farm) (142810)	SD7057741298	
Bashall Brook		
Bashall Brook (66703)	SD7274641776	GB112071065520
Bashall Brook (69609)	SD7210043100	
Bashall Brook (159007)	SD7169742862	
Bashall Brook (159008)	SD7088342057	
Bashall Brook (159009)	SD7026343541	
Bashall Brook (1590010)	SD7011944213	

Over 180 invertebrate taxa have been recorded from the monitoring site on the Hodder - conf Easington Bk to conf Ribble. The main groups represented are Chironomidae (flies), Oligochaeta (worms) and Baetidae (beetles). Over 160 invertebrate taxa have been recorded from the monitoring sites on Bashall Brook. The main groups represented are Oligochaeta (worms), Ephemeroptera (mayflies) and Coleoptera (beetles).

The Whalley Hawkes Paisley Trigg (WHPT) metric is primarily used to monitor the impact of organic enrichment, but also responds to toxic pollution, siltation, habitat reduction and reduced flows. High WHPT scores are associated with good water quality and high habitat quality. The WHPT scores observed for both the Hodder - conf Easington Bk to conf Ribble and Bashall Brook ranged from 24.7 to 249.6 to 125.5 to 223.9, respectively (see **Table 3.4**). The WHPT_{ASPT} provides an indication of the tolerance of macroinvertebrates to pollution or adverse water quality. The WHPT_{ASPT} values for the Hodder - conf Easington Bk to conf Ribble and Bashall Brook ranged from 3.09 to 7.44 and 6.15 to 7.54, respectively. The WHPT and WHPT_{ASPT} data indicate that, in general, the macroinvertebrate community associated with these water bodies are representative of good to very good water quality with a number of pollution sensitive families present. Any impacts on water quality as a result of the implementation of the scheme could therefore result in changes in the macroinvertebrate community structure.

WHPT_{NTAXA} is a simple species richness index. It is simply the number of scoring taxa (families) that contributed to the WHPT score. Habitat-rich rivers, such as lowland chalk streams will often have WHPT_{NTAXA} scores exceeding 30. Upland systems with restricted habitats tend to have lower values. River reaches with impoverished habitat quality; siltation issues or reduced water quality will typically have reduced WHPT_{NTAXA} scores compared with less impacted reaches in similar river types. The WHPT_{NTAXA} ranged from 8 to 36 and 18 to 33 for the sites associated with the Hodder - conf Easington Bk to conf Ribble and Bashall Brook respectively. The LIFE score was developed as a means of assessing flow as a stressor of the macroinvertebrate community of flowing watercourses. Individual species and family groups are assigned to a flow group depending on their documented flow preferences (current velocity) ranging from I (Rapid) to VI (Drought Resistant).

Species LIFE (S) provides a more precise measure than Family LIFE (F) as a number of aquatic invertebrate families contain species with wide-ranging flow requirements. The community LIFE score can be broadly

interpreted according to published thresholds, ranging from 6.5 and below (Low sensitivity to reduced flows) to 7.26 and above (high sensitivity to reduced flows). The LIFE scores indicate that the macroinvertebrate community of both water bodies were mostly associated with moderate to high flow velocities. 6 to 8.41 for the sites associated with the Hodder - conf Easington Bk to conf Ribble. LIFE scores ranged from 7.24 to 8.22 at sites in the Bashall Brook waterbody. The average LIFE score for both water bodies indicates the presence of communities with a preference for moderate flow velocities and a high sensitivity to low flows.

Table 3.4 Macroinvertebrate Indices for monitoring sites along the affected reach of the Hodder - conf Easington Bk to conf Ribble and Bashall Brook

	WHPT ASPT	WHPT	NTAXA	LIFE (Family)
Hodder - conf Easington Bk to conf Ribble (No of sites:4, No of samples 55)				
MEAN	6.77	168.07	24.52	7.80
MIN	3.09	24.7	8	6
MAX	7.44	249.6	36	8.41
Bashall Brook (No of sites:6, No of samples 25)				
MEAN	6.82	169.27	25.36	7.76
MIN	6.15	125.5	18	7.24
MAX	7.54	223.9	33	8.22

3.1.3 Freshwater fish

Available fish data from Environment Agency monitoring sites (2000-2020) were collated for the Hodder - conf Easington Bk to conf Ribble and Bashall Brook (**Table 3.6**) along with the WFD status classification for the waterbodies. These waterbodies comprise a mix of salmonid and coarse fish species, including several internationally and/or nationally designated species including Atlantic salmon (*Salmo salar*), brown trout (*Salmo trutta*), bullhead (*Cottus gobio*) and eel (*Anguilla anguilla*).

Table 3.5 Details of freshwater fish monitoring sites and WFD classification: Hodder - conf Easington Bk to conf Ribble & Bashall Brook

Monitoring site	NGR	WFD Waterbody
Hodder - conf Easington Bk to conf Ribble		
Birkett Farm	SD6828749150	GB112071065560
Newton Sewage Works U/S Road Bridge	SD6987250313	
Above Footbridge Birkett Farm	SD6902349885	
D/S Boarsden Farm footbridge	SD6790750014	
Gibbs Farm	SD6925249332	
Bashall Brook		
Clough Bottom	SD7007443686	GB112071065520
Wetters Bridge	SD7219543124	
Backridge	SD7167742873	
Roadside	SD7167742873	

Species presence and distribution data from the fish monitoring sites can be used to provide an indicative reach-based classification of community environmental preferences and therefore sensitivity to potential environmental pressures associated with the proposed development. This is determined using the WFD Fisheries Classification Scheme Version 2 (FCS2). FCS2 uses a range of complex statistical models and geographical data to predict the fish community at any given location under natural conditions. The system then compares this with the actual survey catch at individual sites and provides a score (Ecological Quality Ratio, EQR) that reflects whether or not the two are similar. Scores determine the formal WFD status classification.

The Environment Agency collects data on the fish species and numbers present in the water bodies through a number of mechanisms including electric fishing survey data, fish counter data, fishery catch records and various other observations. Reach sensitivity can broadly be defined by the most sensitive of the fish taxa present (i.e. those with the lowest tolerance of environmental disturbance).

Table 3.6: Environment Agency fish monitoring sites: summary of species distribution (species tolerance of environmental disturbance as defined by the Fisheries Classification Scheme (FCS2)⁵ used in WFD classifications for the fish biological quality element).

Site	Date	Low Tolerance						Medium Tolerance						High tolerance					
		Brown / sea trout	Grayling	Bullhead	Atlantic salmon	Lamprey sp. ammocoetes	Brook Lamprey	Minnow	Stone loach	Pike	Gudgeon	Chub	Dace	Tench	European eel	European eels > elvers	Roach	3-spined stickleback	Perch
Hodder - conf Easington Bk to conf Ribble																			
Birkett Farm	18/08/2004	81		100-999	7			100-999	1-9					1					
Birkett Farm	14/07/2009	50		100-999	40				1-9					4					
Birkett Farm	16/07/2015	106		10-99	3				1-9					6					
Newton Sewage Works u/s Road Bridge	19/07/2004	3			5									5					
Above Footbridge Birkett Farm	10/09/2004	4		10-99	99			10-99	10-99					10					
D/S Boarsden Farm footbridge	19/07/2004	3			45									2					
D/S Boarsden Farm footbridge	22/09/2009	3		100-999	170			10-99	100-999					7					
D/S Boarsden Farm footbridge	06/08/2015	8		100-999	65			100-999	10-99					4					
Bashall Brook																			
Clough Bottom	28/03/2003	119			1														
Clough Bottom	06/08/2008	78		10-99	2				10-99										
Clough Bottom	18/07/2014	158		100-999					10-99										
Wetters Bridge	08/08/2003	6		100-999				1000-9999	100-999					2					
Backridge	08/08/2003	6		100-999				1000-9999	10-99										
Roadside	23/07/2003	31			2														
Roadside	29/07/2008	4		100-999				100-999	100-999										

⁵ UKTAG (2008) Rivers Assessment Methods Fish Fauna (Fisheries Classification Scheme 2 (FCS2)) ISBN: 978-1-906934-09-5

3.2 Protected and notable species

3.2.1 White clawed crayfish

3.2.1.1 Desk study

No records of white clawed crayfish were received from LERC for within 2 km of the proposed scheme in the period 2010 to 2020.

3.2.1.2 White clawed crayfish surveys

The watercourses scoped out for requiring surveys following the Extended Phase 1 survey or habitat suitability assessment are shown in **Table 3.6**. The results of the surveys of watercourses for crayfish and habitat suitability undertaken in 2019 and 2020 are summarised in **Table 3.7**.

Five watercourses were surveyed in the Bashall Brook catchment to the south of the Marl Hill section adjacent to the launch site for the tunnelling works. Four of these watercourses were typically small streams in field boundaries and likely to be unsuitable for otters. One watercourse (Bashall Brook) was a wider, meandering stream which supports numerous potential refugia sites ranging from small stones to large boulders. A weir is present at the upstream limit of the surveyed section and this would pose a physical barrier to upstream white clawed crayfish movements. Unnamed watercourse 431, Unnamed watercourse 433, Unnamed watercourse 463 are small streams/ditches that appear to dry annually under low flows as such they are considered unsuitable to support white clawed crayfish.

No white clawed crayfish were recorded during the surveys on watercourses in the Bashall Brook catchment. Bashall Brook was considered to be suitable to support crayfish. Although the surveys cannot confirm absence of white clawed crayfish and there remains the possibility that a few individuals could be present, the survey effort employed, using three different survey techniques, would have established if a substantial population was present.

One water course, the River Hodder, was surveyed in the Hodder - conf Easington Bk to conf Ribble waterbody. The River Hodder is a large tributary of the River Ribble. The watercourse is 10 m wide and flows over a substrate of stones, cobbles and boulders providing a good range of refuge sizes for white clawed crayfish. The survey section was flanked by steep sloping semi-natural broadleaved woodland on the north bank (with tree roots providing additional habitat for white clawed crayfish) and pasture on the south bank. The survey reach includes a number of pools, riffles and glides with exposed cobble bars. No white clawed crayfish were recorded during the survey of the River Hodder.

Table 3.6 Watercourses scoped out of surveys for white clawed crayfish

Name	WFD waterbody	Results of scoping exercise
Unnamed watercourse 402	Hodder - conf Easington Bk to conf Ribble	Not suitable
Unnamed watercourse 430	Bashall Brook	Not suitable
Sandy Ford Brook	Bashall Brook	Not suitable
Unnamed watercourse 441	Bashall Brook	Not suitable
Cow Hey Brook	Bashall Brook	Not suitable
Unnamed watercourse 449	Bashall Brook	Not suitable

Table 3.7 White clawed crayfish survey results summary

Watercourse name	WFD catchment	Upstream NGR	Downstream NGR	WCC recorded?	Survey results
Unnamed watercourse 431	Bashall Brook	SD71727 45030	SD71737 44952	No	Small ditch which was completely dry at the time of survey meaning it represents unsuitable habitat for white clawed crayfish.
Unnamed watercourse 433	Bashall Brook	SD71960 45103	SD71975 45019	No	Small field drain flowing through sheep grazed pasture but with occasional scattered trees and scrub adjacent. The watercourse was almost completely dry except for an occasional pool. Cobbles and stones are present within these pools, but no white clawed crayfish were found. The watercourse is likely to completely dry up annually during summer resulting in unsuitable white clawed crayfish habitat.
Unnamed watercourse 442	Bashall Brook	SD70293 44498	SD70454 44396	No	Small watercourse (approx. 0.5 m wide) which has been fenced off from surrounding sheep grazed pasture fields resulting in a thin strip of woodland either side of the stream. The surveyed section was relatively straight there were low flows during the survey with little water in the channel outside of occasional pools. A good range of stones and cobble sizes were observed but almost all of these were attached to the stream bed meaning they could not be lifted and had limited suitability as refuges for crayfish.
Bashall Brook	Bashall Brook	SD69928 44567	SD70018 44057	No	The watercourse is approximately 5 m wide and meanders through semi-natural broadleaved woodland with pool and riffle sequences throughout the surveyed section. The stream supports numerous potential refugia sites ranging from small stones to large boulders but no WCC were recorded. A weir was present at the upstream limit of the surveyed section and this would pose a physical barrier to upstream movement of white clawed crayfish. An otter spraint was observed during the survey.
Unnamed watercourse 463	Bashall Brook	SD71799 45413	SD71799 45413	No	Field drain no wider than 0.2 m and almost completely dry at the time of survey in April 2020. The drain flows through sheep grazed pasture and patches of rushes before entering a narrow strip of plantation woodland. The substrate was dominated by silt with few suitable refuges present. The watercourse is likely to dry up annually during summer meaning it is un-suitable to support white clawed crayfish.
River Hodder	Hodder - conf Easington Bk to conf Ribble	SD69231 49703	SD68876 49580	No	No evidence of white-clawed crayfish or non-native crayfish species. This watercourse is considered to be suitable for crayfish

3.3 Invasive species

3.3.1.1 Desk study

Environment Agency records from within 2km of the scheme did not contain any records of invasive non-native macrophyte or riparian plant species.

The Environment Agency data also included two records of a non-native aquatic macroinvertebrate species; Jenkin’s spire snail (*Potamopyrgus antipodarum*) within 2km of the proposed Marl Hill section. These records were on Bashall Brook downstream of the proposed Marl Hill Section. Jenkins' spire snail is naturalised and widely distributed throughout the country it is not listed although it is non-native it is not listed as an invasive species under the Wildlife and Countryside act 1981 (as amended). The Environment Agency INNS records for within 2km of the Proposed Marl Hill Section are summarised in **Table 3.8**.

Table 3.8: Environment Agency invasive and non-native species records from within 2km of the Scheme

Scientific name	Common name	Start date	WFD waterbody	Locality	NGR	Distance to Marl Hill Section
Potamopyrgus antipodarum	Jenkins' Spire Snail	31/05/2016	Bashall Brook	Bashall Brook at Backridge Farm	SD 71650 42850	1.91 km south of the launch compound
Potamopyrgus antipodarum	Jenkins' Spire Snail	21/03/2016	Bashall Brook	Bashall Brook - U/S Waddington STW	SD 72180 43110	1.82 km south east of eth launch compound

3.3.1.2 Survey results

Rhododendron (*Rhododendron ponticum*) plantations were present at upstream extent of the surveyed reaches of Cow Hey Brook and Unnamed Watercourse 463. Rhododendron is an invasive non-native species listed on Schedule 9 of the wildlife and countryside act 1981 (as amended) which makes it an offence to cause to grow in the wild. No evidence of INNS was identified during walkover surveys of the other seven watercourses adjacent to the Proposed Marl Hill Section. A summary of the watercourses subject to walkover surveys is shown in **Table 3.9**.

Table 3.9: Watercourses subject to walkover surveys in 2020

Name	WC_ID	U/S Grid Ref	D/S Grid Ref	Biological
Unnamed Watercourse 402	W483	SD6964849106	SD6963749017	No evidence of INNS
Bashall Brook	W512	SD6993344560	SD7001844057	No evidence of INNS
Unnamed Watercourse 430	W520	SD7149845196	SD7154244746	No evidence of INNS
Unnamed Watercourse 431	W521	SD7172745030	SD7173744952	No evidence of INNS
Unnamed Watercourse 433	W523	SD7196045103	SD7197545019	No evidence of INNS
Unnamed Watercourse 441	W532	SD7058045117	SD7075544553	No evidence of INNS
Unnamed Watercourse 442	W533	SD7029344498	SD7045444396	No evidence of INNS
Cow Hey Brook	W535	SD7085245027	SD7082944591	Rhododendron (<i>Rhododendron ponticum</i>) plantation present at upstream extent of reach.
Unnamed Watercourse 463	W557	SD7179945413	SD7191944809	Rhododendron plantation present at upstream extent of reach.

4 Summary

4.1 Baseline Summary

A summary of the baseline conditions as identified through the desk study and surveys undertaken for the watercourses is presented for the Hodder waterbody in **Table 4.1** and for the Bashall Brook waterbody in **Table 4.2**.

Table 4.1: Summary of Baseline conditions of watercourses within the Hodder – conf Easington Bk to conf Ribble WFD waterbody

Watercourse	Unnamed Watercourse 388	Unnamed Watercourse 402
WFD waterbody	Hodder – conf Easington Bk to conf Ribble (GB112071065560)	Hodder – conf Easington Bk to conf Ribble (GB112071065560)
Macrophytes and phytobenthos	The available baseline TDI scores for the sites associated with the Hodder - conf Easington Bk to conf Ribble are indicative of moderate to high nutrient conditions, while the moderate percentage motile taxa are indicative of siltation and disturbed waters.	
Fish	The River Hodder catchment supports populations of Atlantic salmon, brown trout, bullhead, lamprey species, and European eel. Due to the high proportion of the fish community comprising Atlantic salmon, bullhead, and brown trout the fish community of watercourses within the catchment are considered to be highly sensitive to reductions in water quality and increases in sedimentation.	
Macroinvertebrates	Macroinvertebrate communities in the River Hodder catchment are associated with good water quality, moderate to high flows and coarse substrate. The macroinvertebrates present are considered to be sensitive to reductions in flow or water quality and increases in fine sediment.	
White clawed crayfish	Not surveyed -likely to be absent due to absence of evidence of presence in wider catchment.	Not suitable to support white clawed crayfish
Invasive Non-native Species	No INNS identified in baseline data	No INNS identified in baseline data

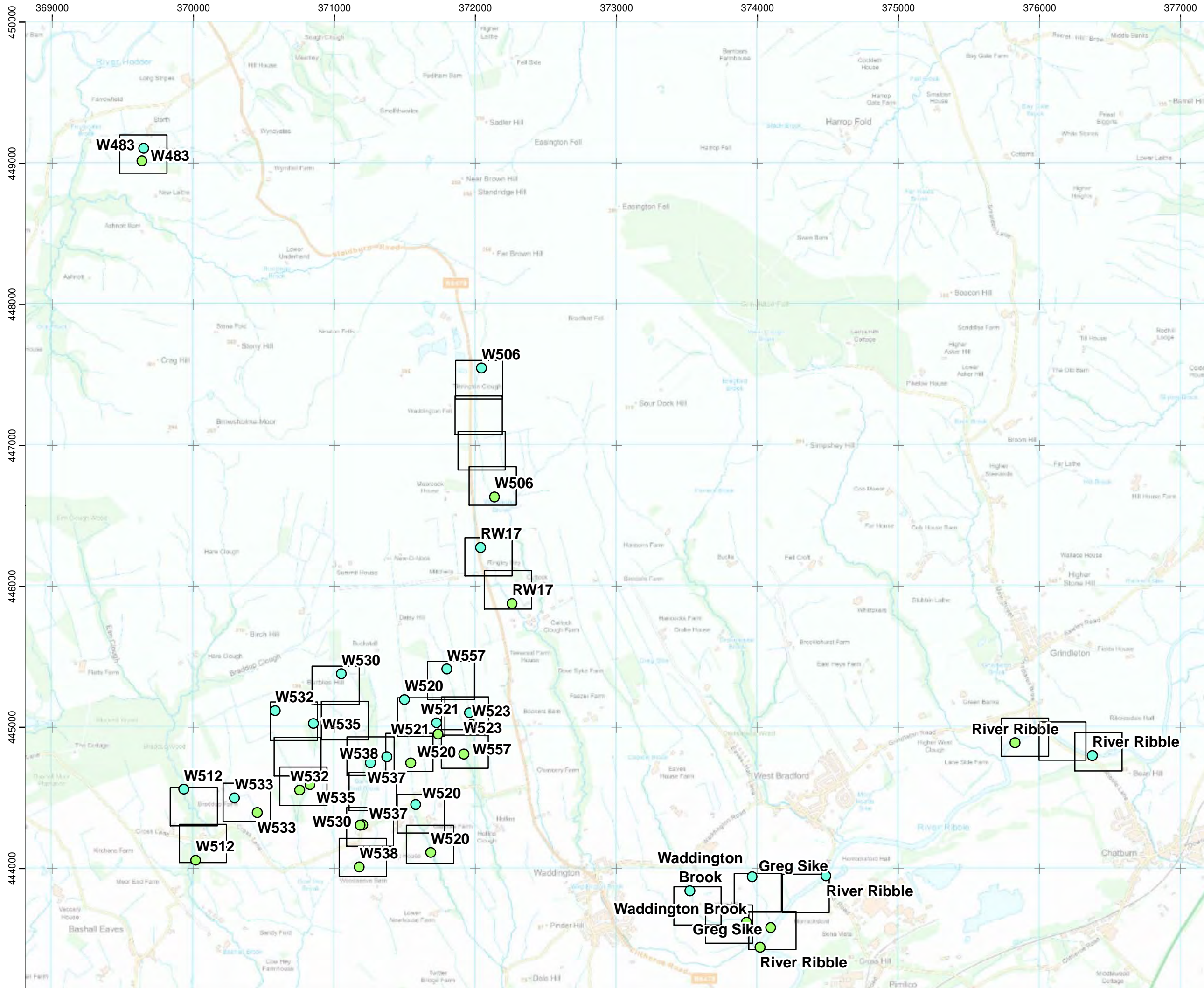
Table 4.2: Summary of Baseline conditions of watercourses within the Bashall Brook WFD waterbody

Watercourse	Bashall Brook	Unnamed Watercourse 430	Unnamed Watercourse 431	Unnamed Watercourse 433	Unnamed Watercourse 436	Sandy Ford Brook	Cow Hey Brook	Unnamed Watercourse 444	Unnamed Watercourse 463
WFD waterbody	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)	Bashall Brook (GB1120710655 20)
Macrophytes and Phytobenthos	No baseline macrophyte and phytobenthos data was available from the Bashall Brook waterbody. The baseline macroinvertebrate and fish communities indicate that macrophyte phytobenthos communities present are likely to be associated with low nutrient levels, and sensitive to increases in fine sediment or reductions in flow velocity.								
Fish	The fish community of Bashall Brook is dominated by brown trout (<i>Salmo trutta</i>) with high abundance of minor species frequently recorded including bullhead, minnow, and stone loach. Occasional low numbers of migratory species were present in the baseline data including Atlantic salmon (<i>Salmo salar</i>) and European eel (<i>Anguilla anguilla</i>).	The fish community is likely to be comparable in composition to Bashall Brook but with migratory species likely to be absent. The walkover survey identified several potential obstructions to fish passages within the watercourse, no suitable/sub-optimal habitats for juvenile lamprey or salmonid species were identified.	The fish community is likely to be comparable in composition to Bashall Brook. Several sections of the watercourse were dry during the walkover survey. No suitable/sub-optimal habitats for juvenile lamprey or salmonid species were present.	The fish community is likely to be comparable in composition to Bashall Brook but with migratory species likely to be absent. The walkover survey identified several potential obstructions to fish passages within the watercourse, no suitable/sub-optimal habitats for juvenile lamprey or salmonid species were identified.	The fish community is likely to be comparable in composition to Bashall Brook but with a lower proportion of salmonid species due to the smaller size.	The fish community is likely to be comparable in composition to Bashall Brook but with migratory species likely to be absent. No suitable/sub-optimal habitats for juvenile lamprey or salmonid species were present in addition to the five-potential obstruction to fish passages identified within the watercourse.	The fish community is likely to be comparable in composition to Bashall Brook but with migratory species likely to be absent. No suitable/sub-optimal habitats for juvenile lamprey or salmonid species were present in addition to the single potential obstruction to fish passages identified within the watercourse. Several areas of the watercourse were dry during the survey.	The fish community is likely to be comparable in composition to Bashall Brook but with a lower proportion of salmonid species due to the smaller size.	The fish community is likely to be comparable in composition to Bashall Brook but with a lower proportion of salmonid species due to the smaller size. Several areas were dry during the walkover survey. Three possible obstacles for fish passages were noted within the watercourse.
Macro-invertebrates	Baseline data available from six sites on Bashall Brook indicate macroinvertebrate communities in the Bashall Brook catchment are associated with good to very good water quality, moderate to high flows and coarse substrate. The macroinvertebrates present are considered to be sensitive to reductions in flow or water quality and increases in fine sediment.								
White clawed crayfish	Not present in surveys -likely to be absent	Not suitable to support white clawed crayfish.	Not recorded in survey. Not suitable to	Not recorded in survey. Not suitable to	Not surveyed - likely to be absent due to absence of	Not suitable to support white clawed crayfish	Not suitable to support white clawed crayfish	Not surveyed - likely to be absent due to absence of	Not recorded in survey. Not suitable to

Watercourse	Bashall Brook	Unnamed Watercourse 430	Unnamed Watercourse 431	Unnamed Watercourse 433	Unnamed Watercourse 436	Sandy Ford Brook	Cow Hey Brook	Unnamed Watercourse 444	Unnamed Watercourse 463
			support white clawed crayfish	support white clawed crayfish	evidence of presence in wider catchment			evidence of presence in wider catchment	support white clawed crayfish
Invasive species	No INNS identified in baseline data	No INNS identified in baseline data	No INNS identified in baseline data	No INNS identified in baseline data	No INNS identified in baseline data	No INNS identified in baseline data	Rhododendron (<i>Rhododendron ponticum</i>) plantation present at upstream extent of surveyed reach outside of red line boundary	No INNS identified in baseline data	Rhododendron (<i>Rhododendron ponticum</i>) plantation present at upstream extent of surveyed reach outside of red line boundary

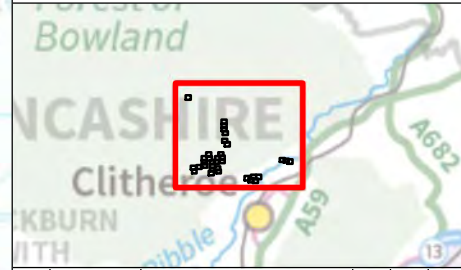
Annexes

Annex 1: 2020 Watercourse walkover survey results



- Legend:**
- Start Point
 - End Point
 - TR4 Map Views

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter

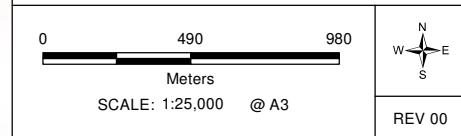


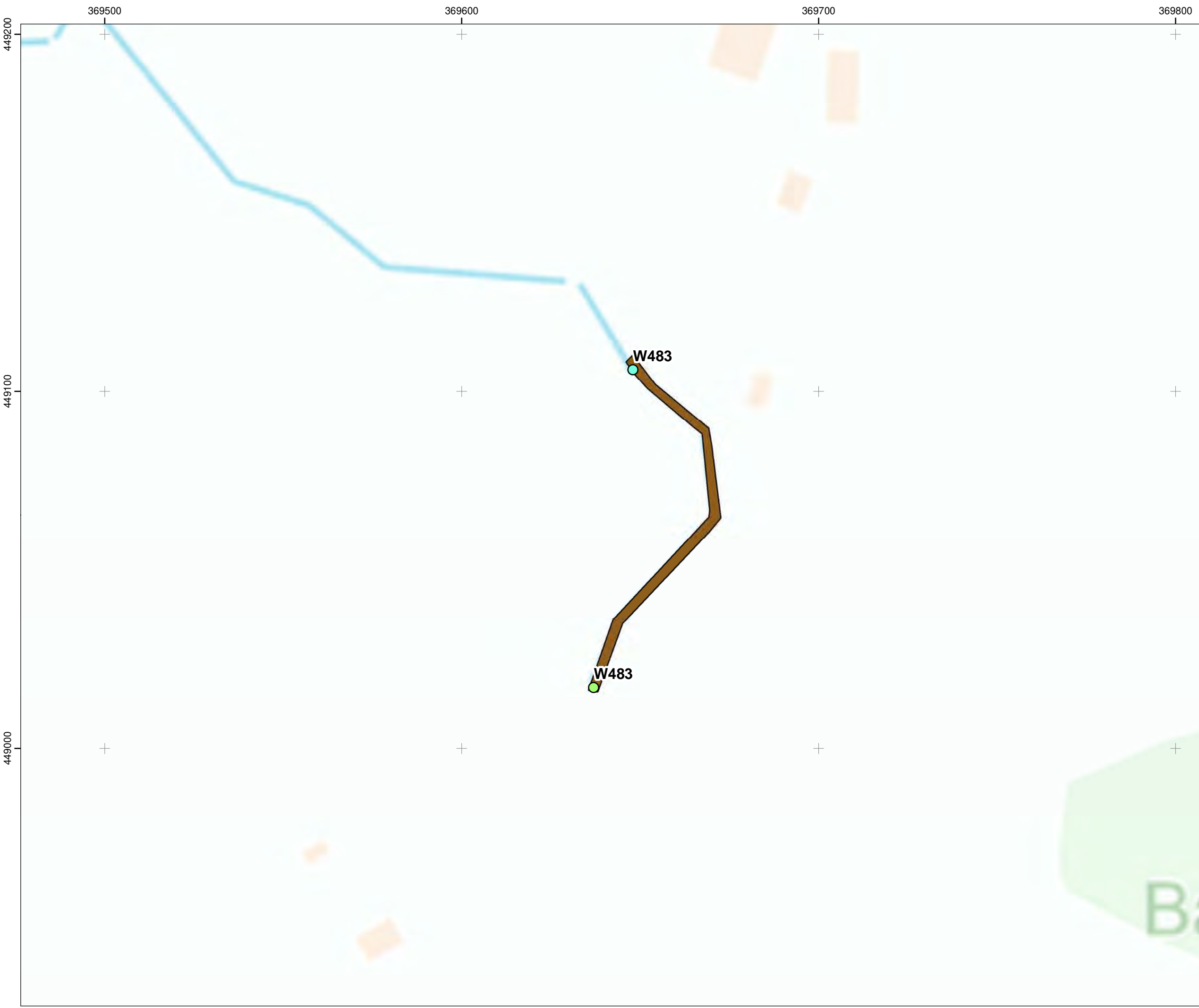
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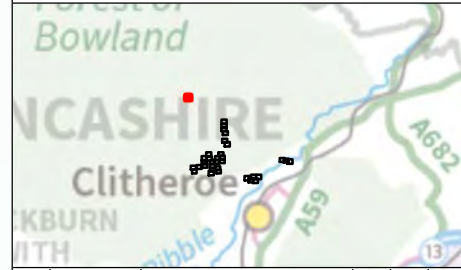
TITLE: Figure 1:
 Marl Hill TR4
 Walkover Survey Overview





- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
 - Eddy
 - Juvenile Lamprey habitat
 - Salmonid habitat
 - Dry
 - Exposed Sediment
 - Potential obstacle / obstruction to fish passage
 - Overhanging Vegetation
 - Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



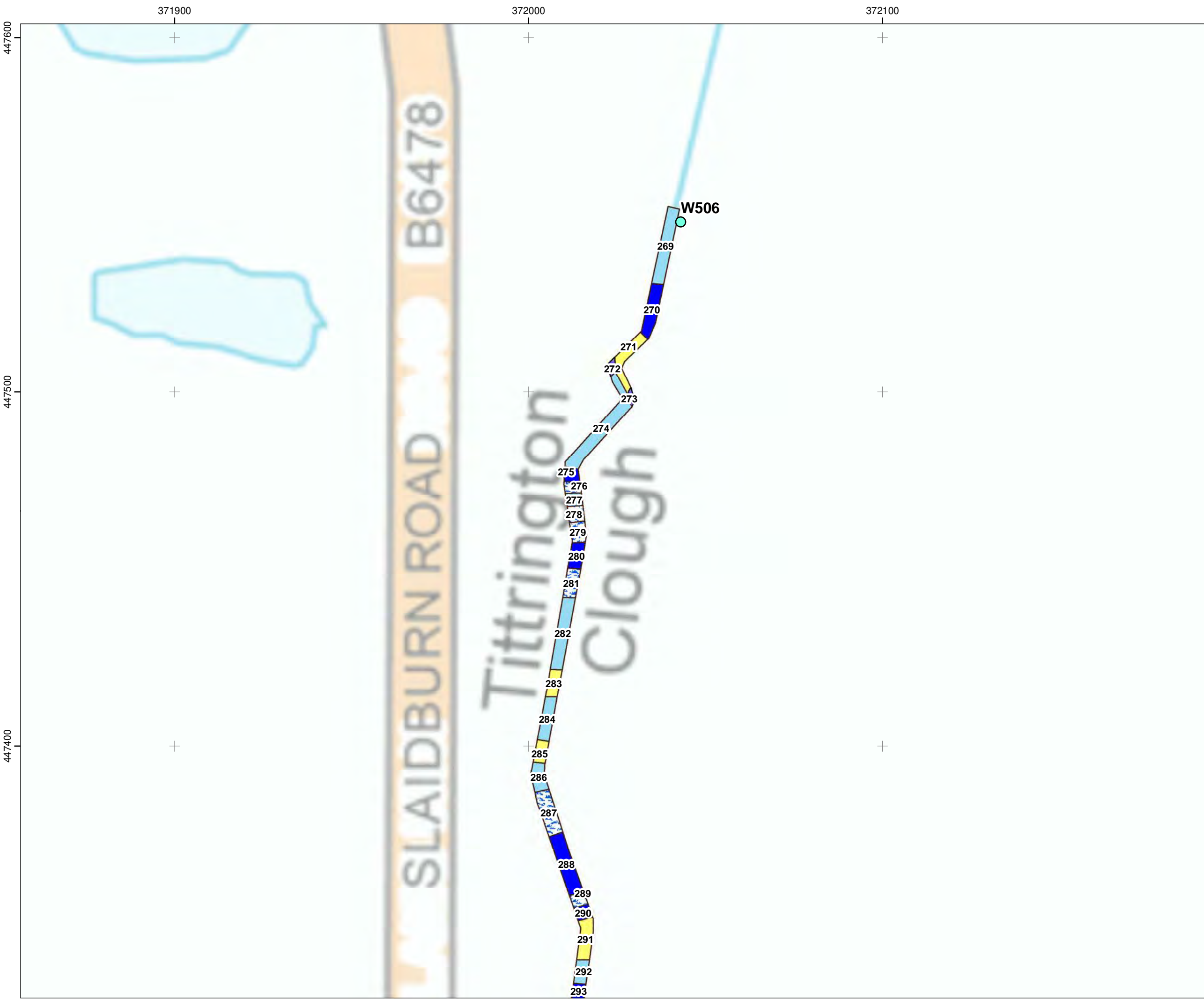
Rev	Date	Description	Drn	Chk	App
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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 1 of 34

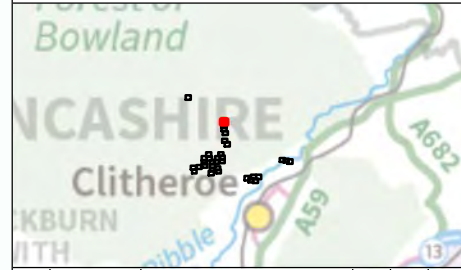
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- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
 - Eddy
 - Juvenile Lamprey habitat
 - Salmonid habitat
 - Dry
 - Exposed Sediment
 - Potential obstacle / obstruction to fish passage
 - Overhanging Vegetation
 - Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 2 of 34

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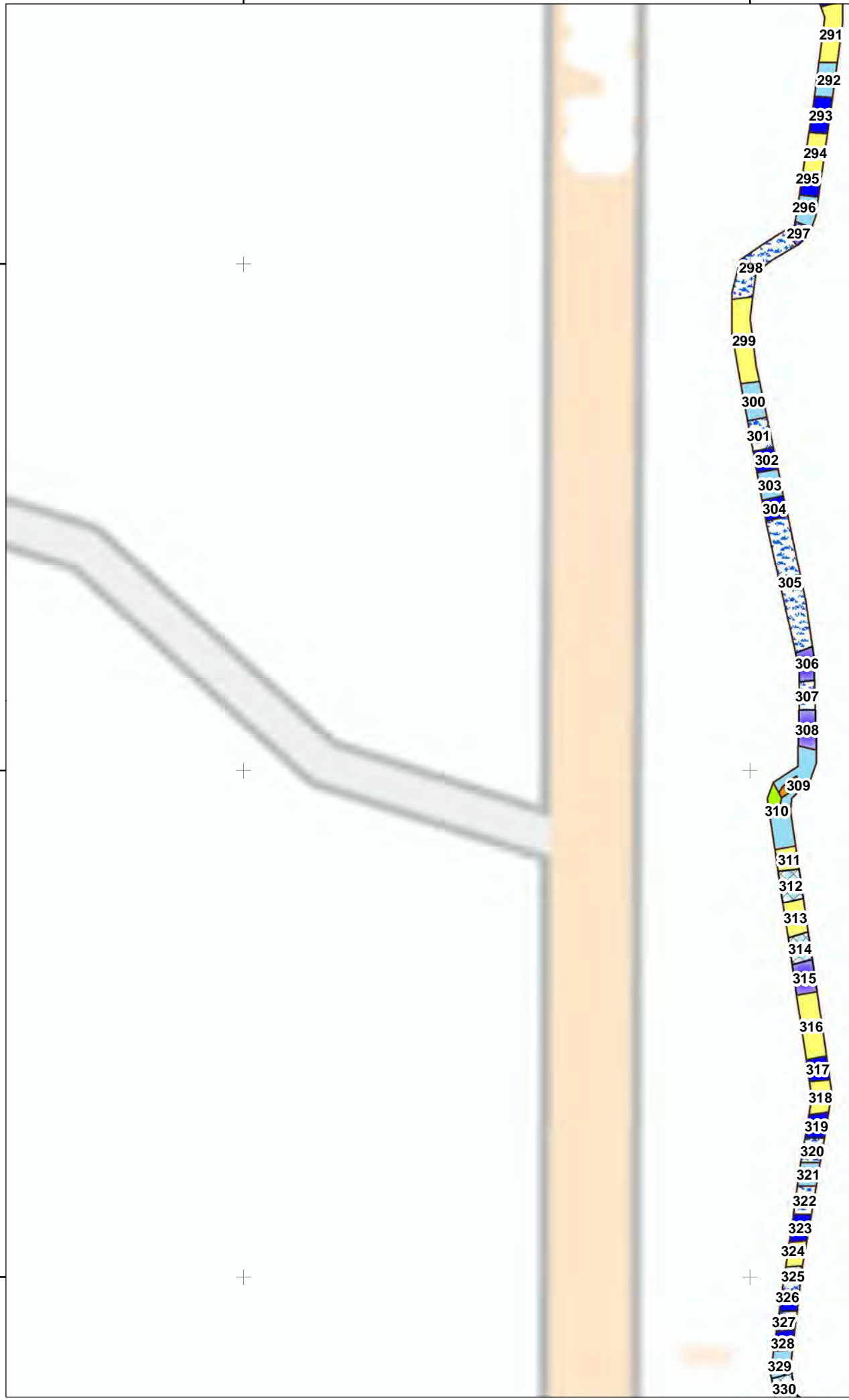
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Legend:

Walkover extents

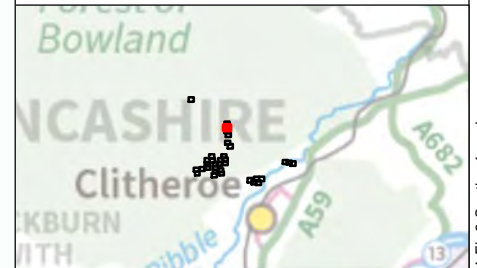
- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy

- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter

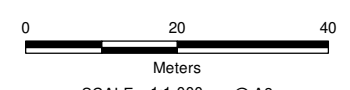


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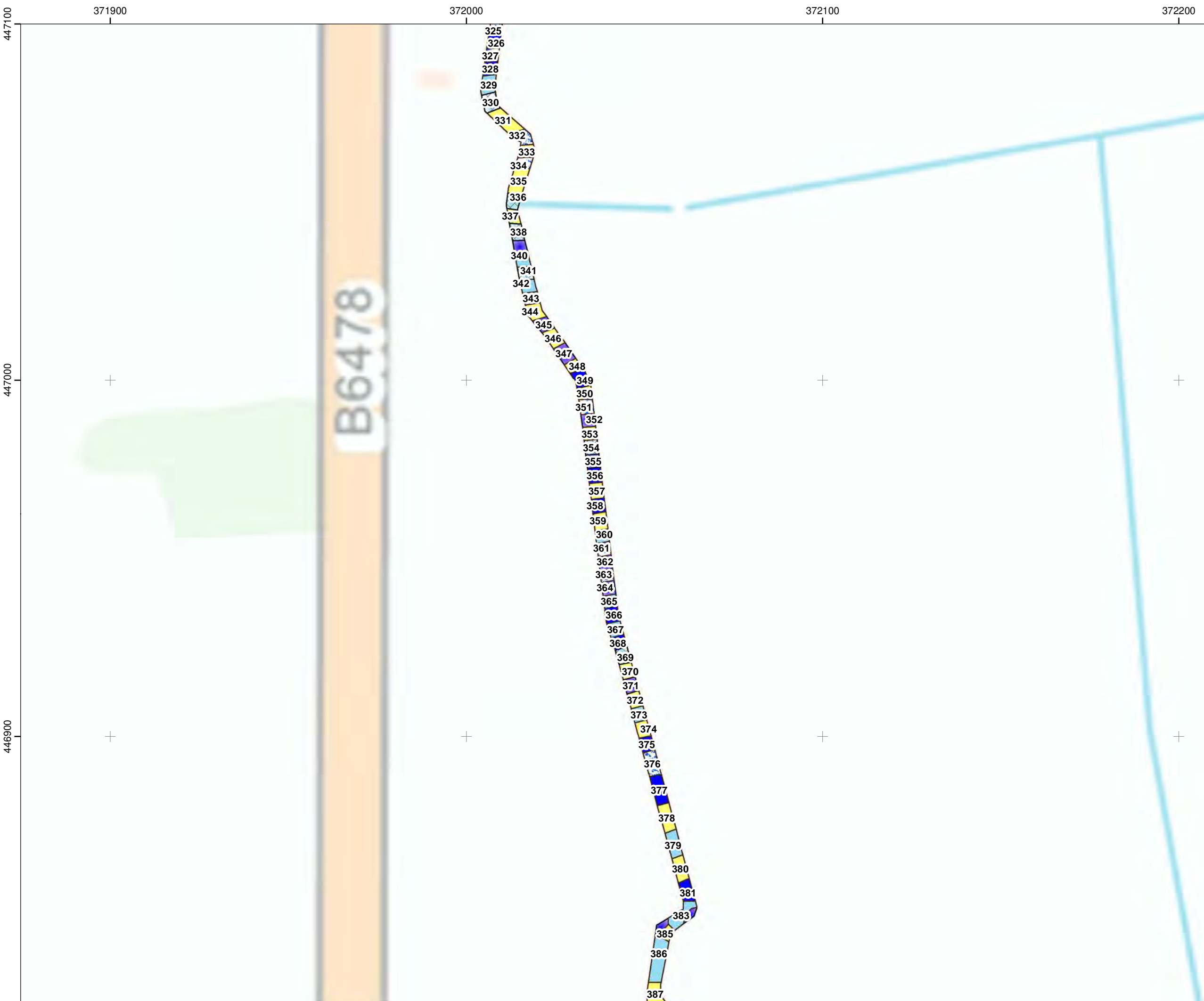
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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 3 of 34



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Legend:

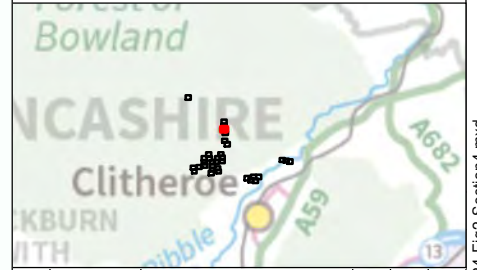
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 4 of 34

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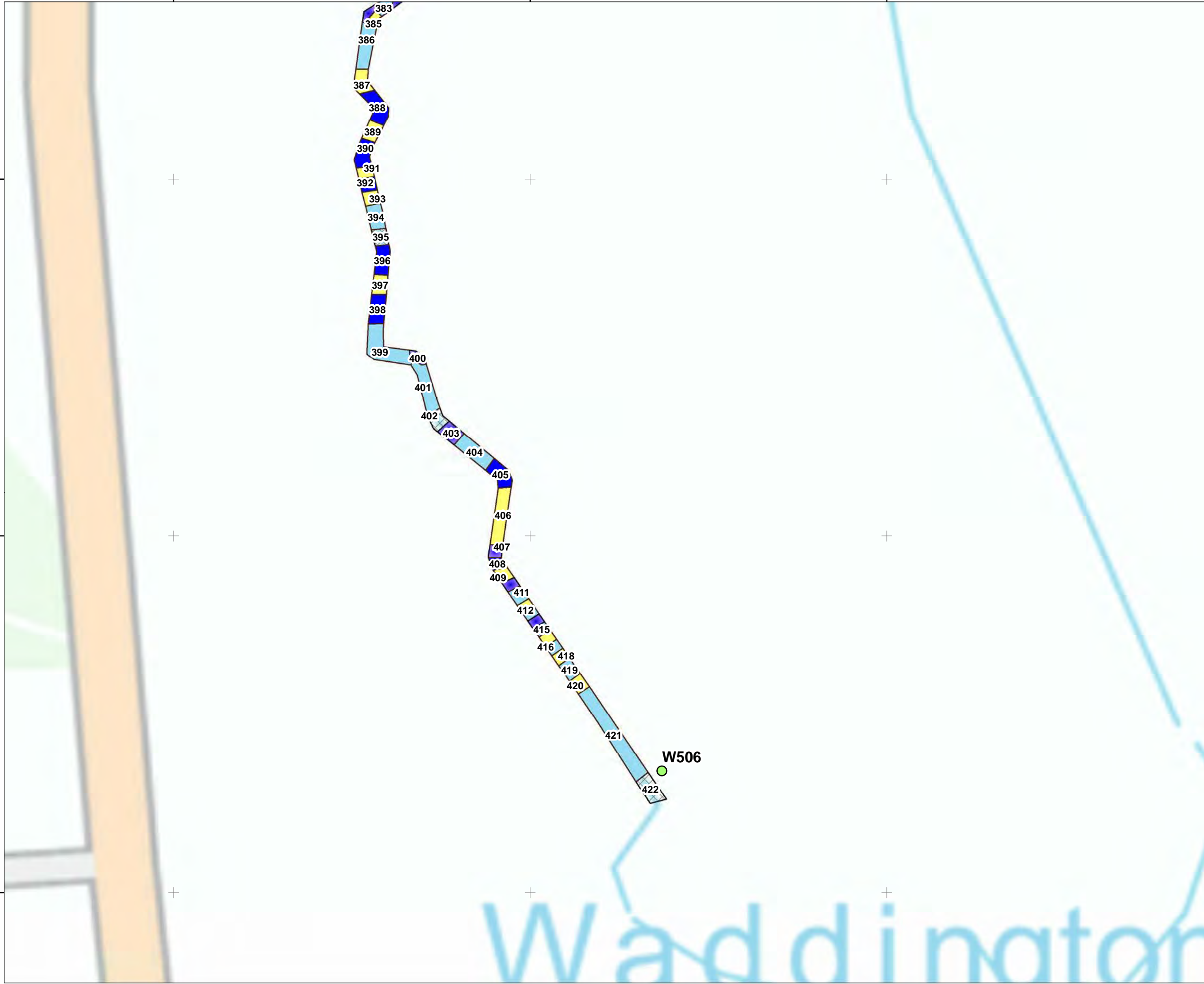
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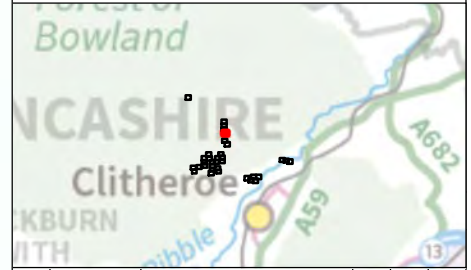
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 5 of 34

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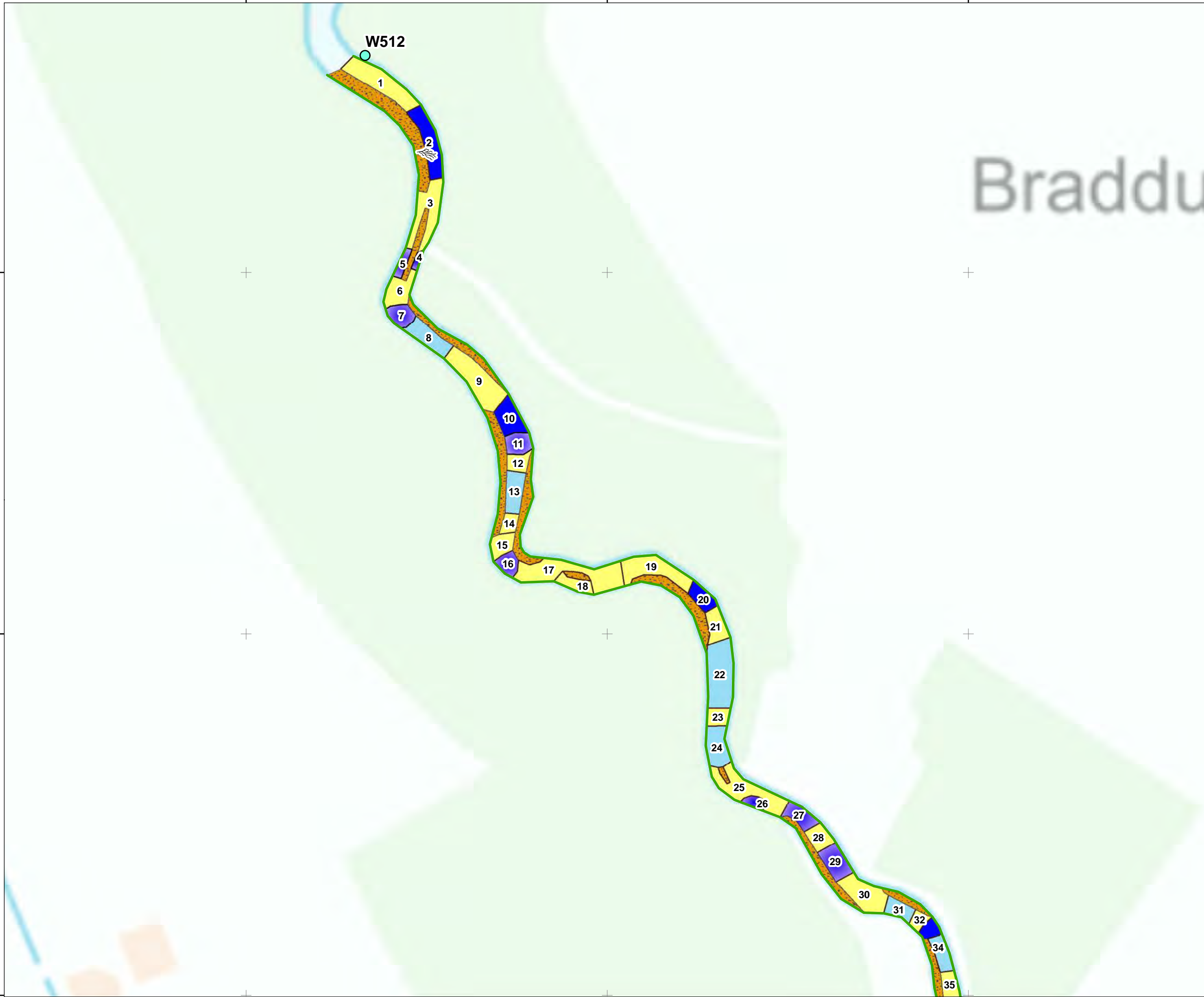
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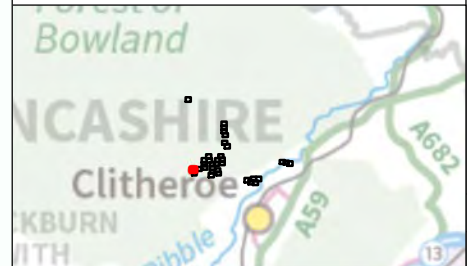
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
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- Overhanging Vegetation
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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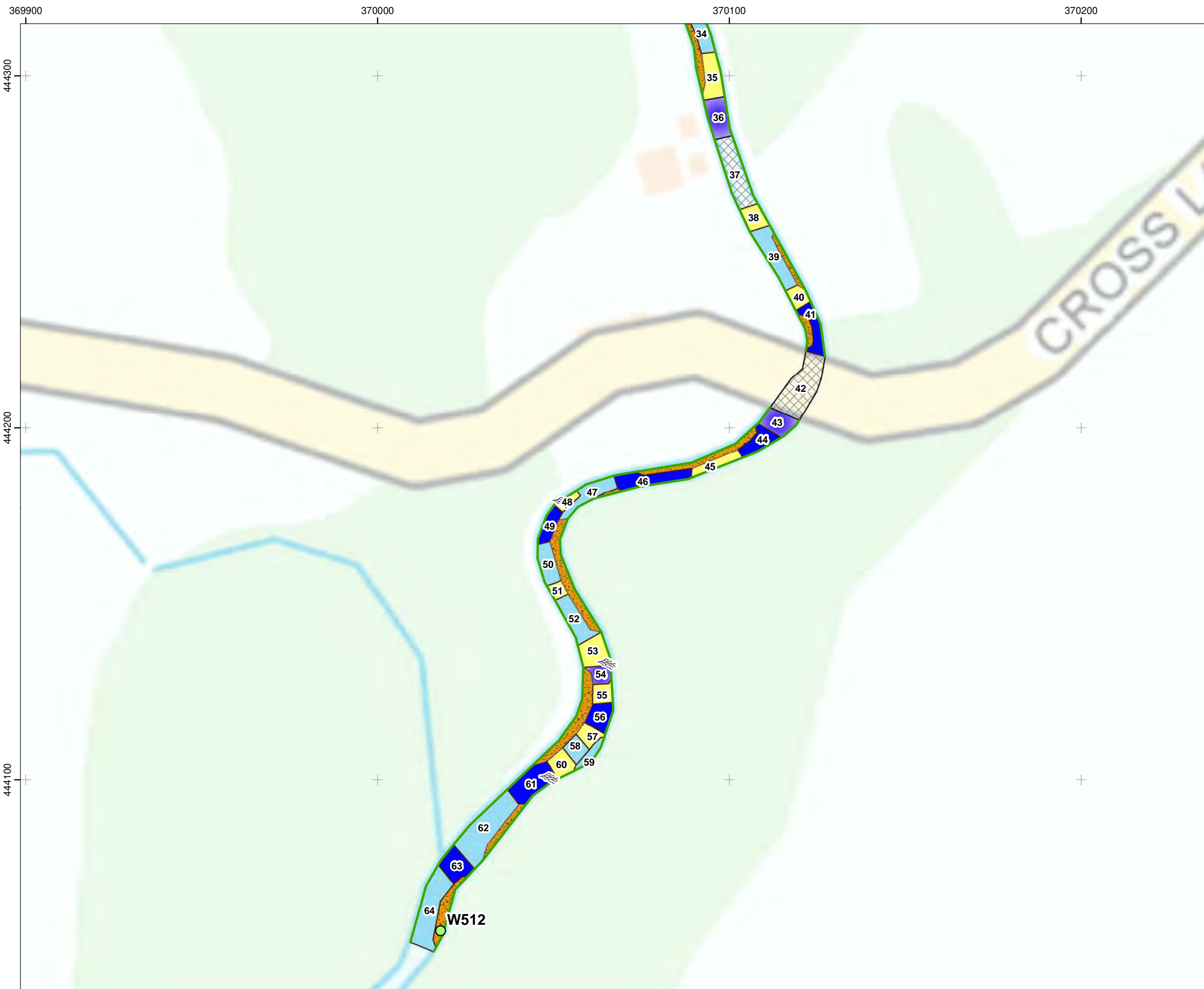
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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 6 of 34

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 Meters
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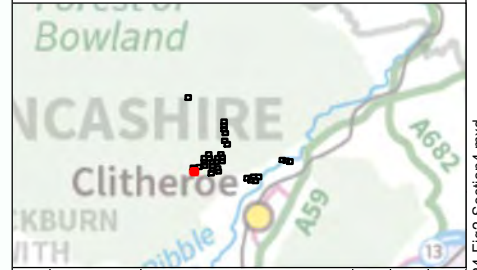
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 7 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
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0 20 40
 Meters
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370700

370800

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445000

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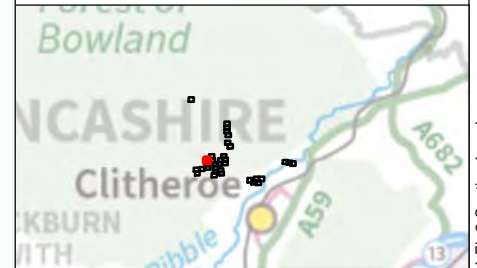
Walkover extents

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- End Point

Flow Type

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- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
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- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
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 Units: Meter

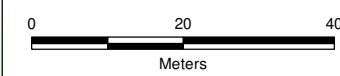


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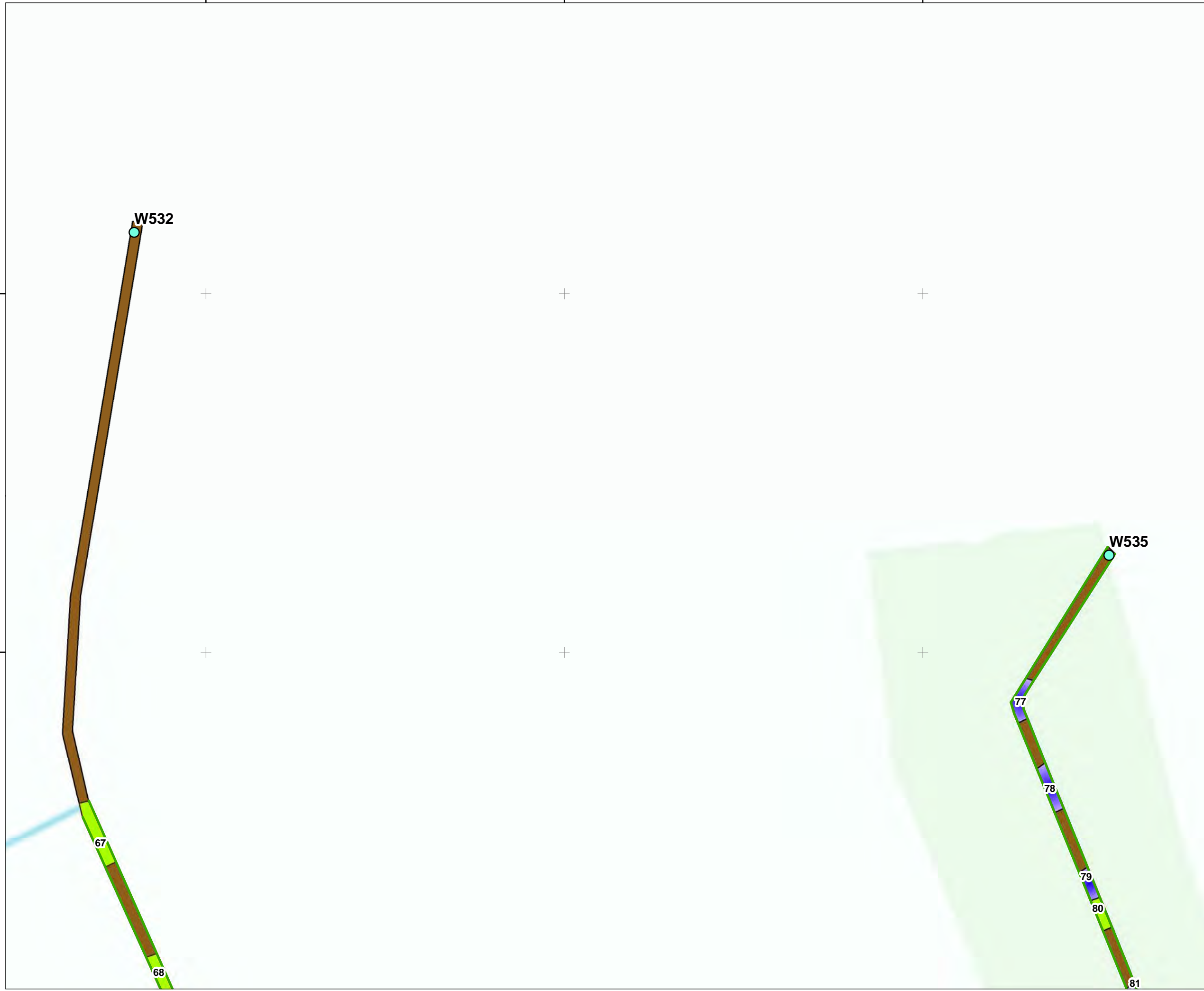
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 Marl Hill TR4
 Walkover Survey
 Map 9 of 34

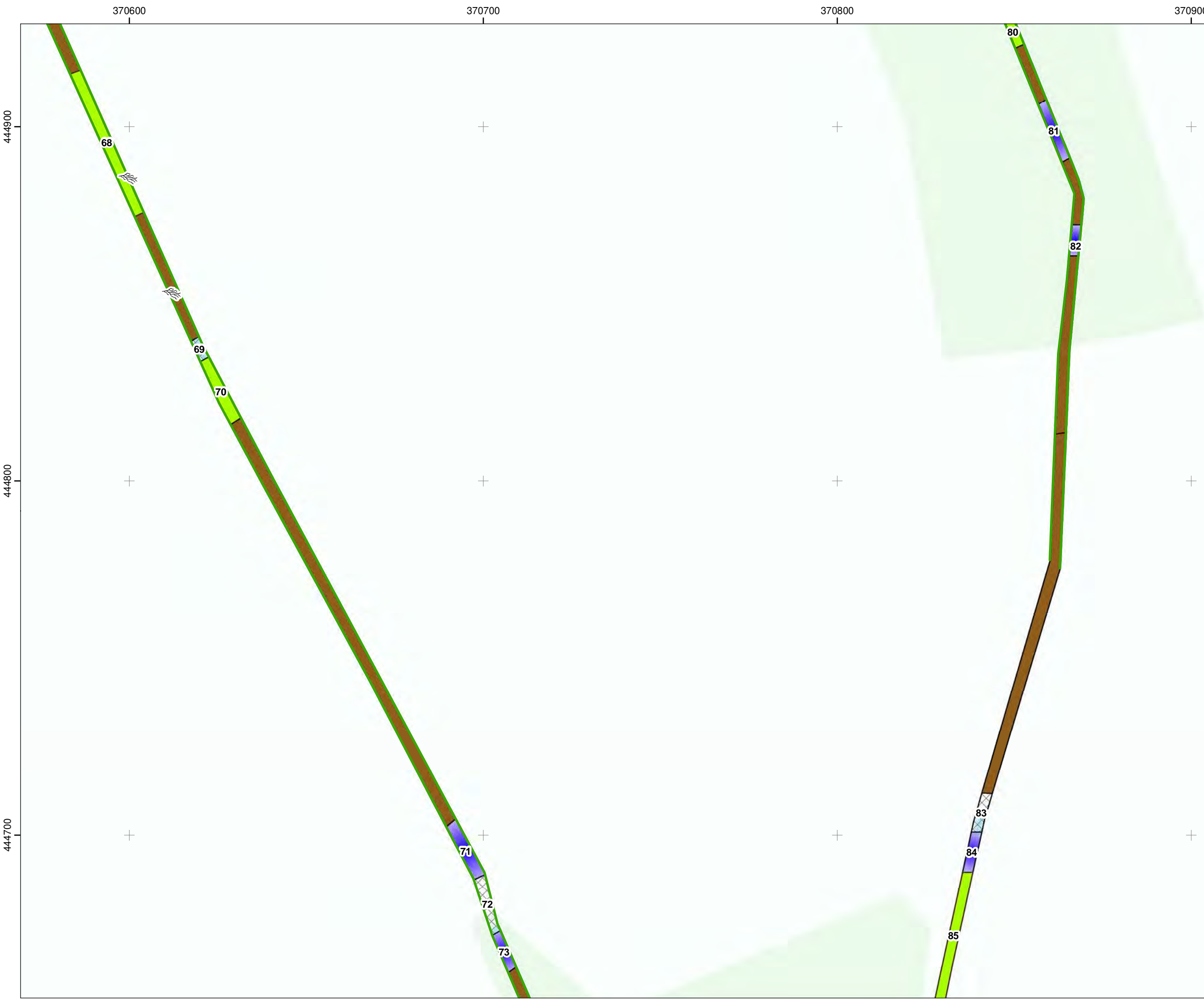


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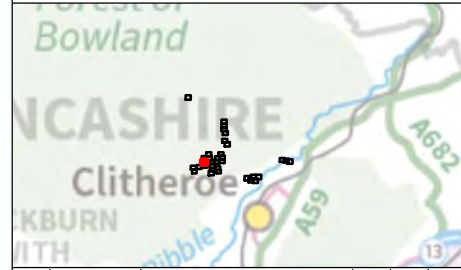
Walkover extents

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- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
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 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 10 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter

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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 11 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

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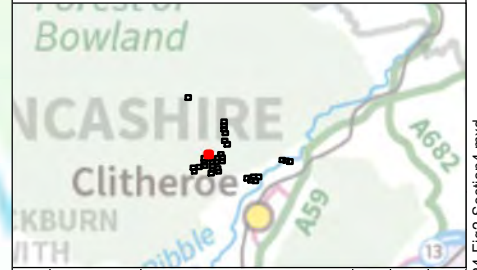
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
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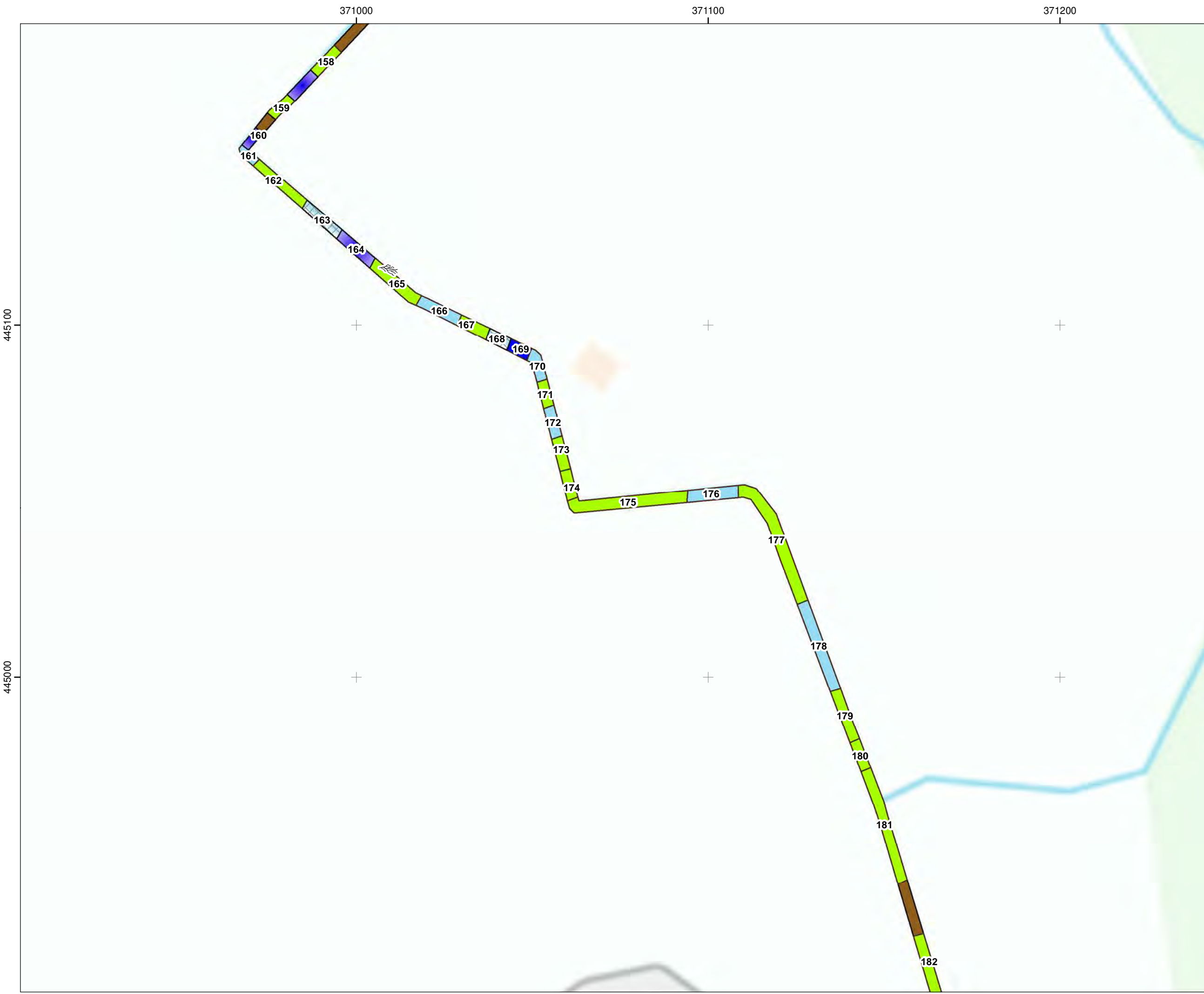
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HARP Aquatics

TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 12 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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HARP Aquatics

TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 13 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



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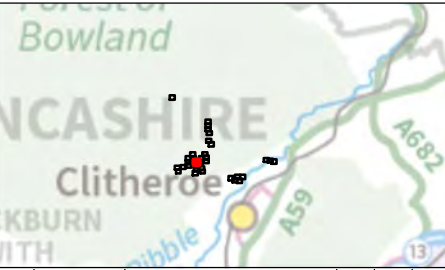
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 14 of 34

0 20 40
 Meters
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371300

371400

444600

444500

Sandy Ford Brook



Legend:

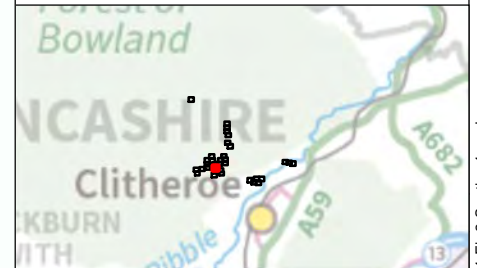
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter

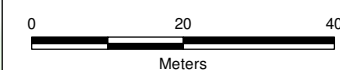


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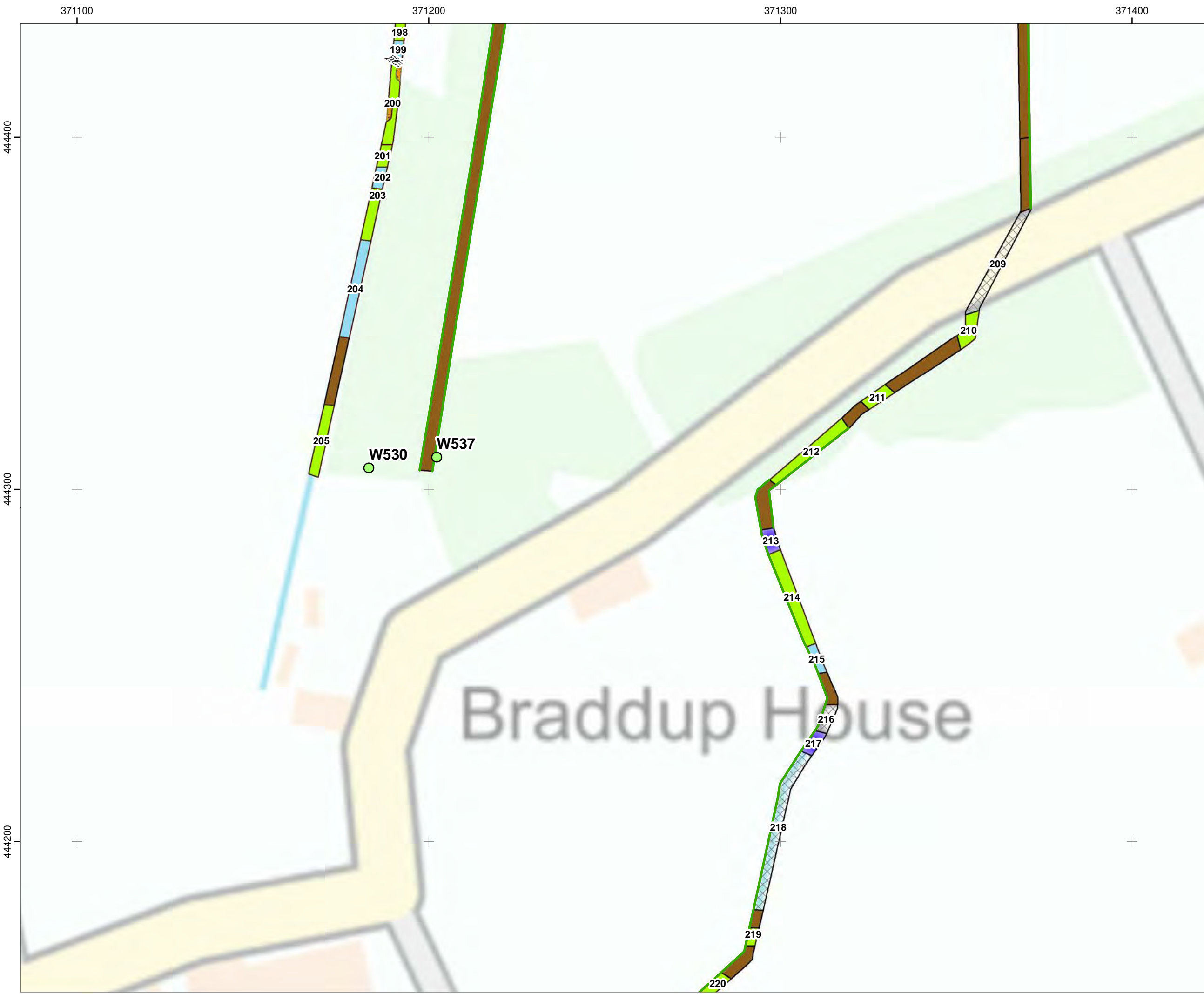
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 Marl Hill TR4
 Walkover Survey
 Map 15 of 34



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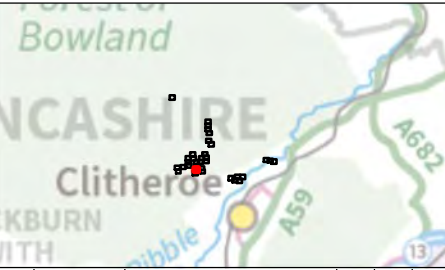


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- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
 - Eddy
 - Juvenile Lamprey habitat
 - Salmonid habitat
 - Dry
 - Exposed Sediment
 - Potential obstacle / obstruction to fish passage
 - Overhanging Vegetation
 - Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter

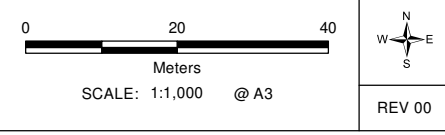


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HARP Aquatics



TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 16 of 34





Legend:

Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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HARP Aquatics

TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 17 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

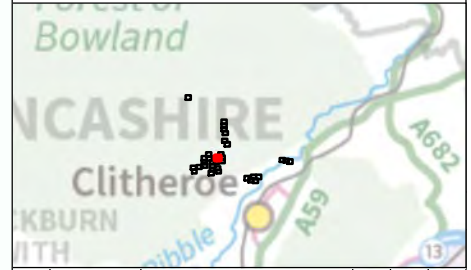
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
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- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



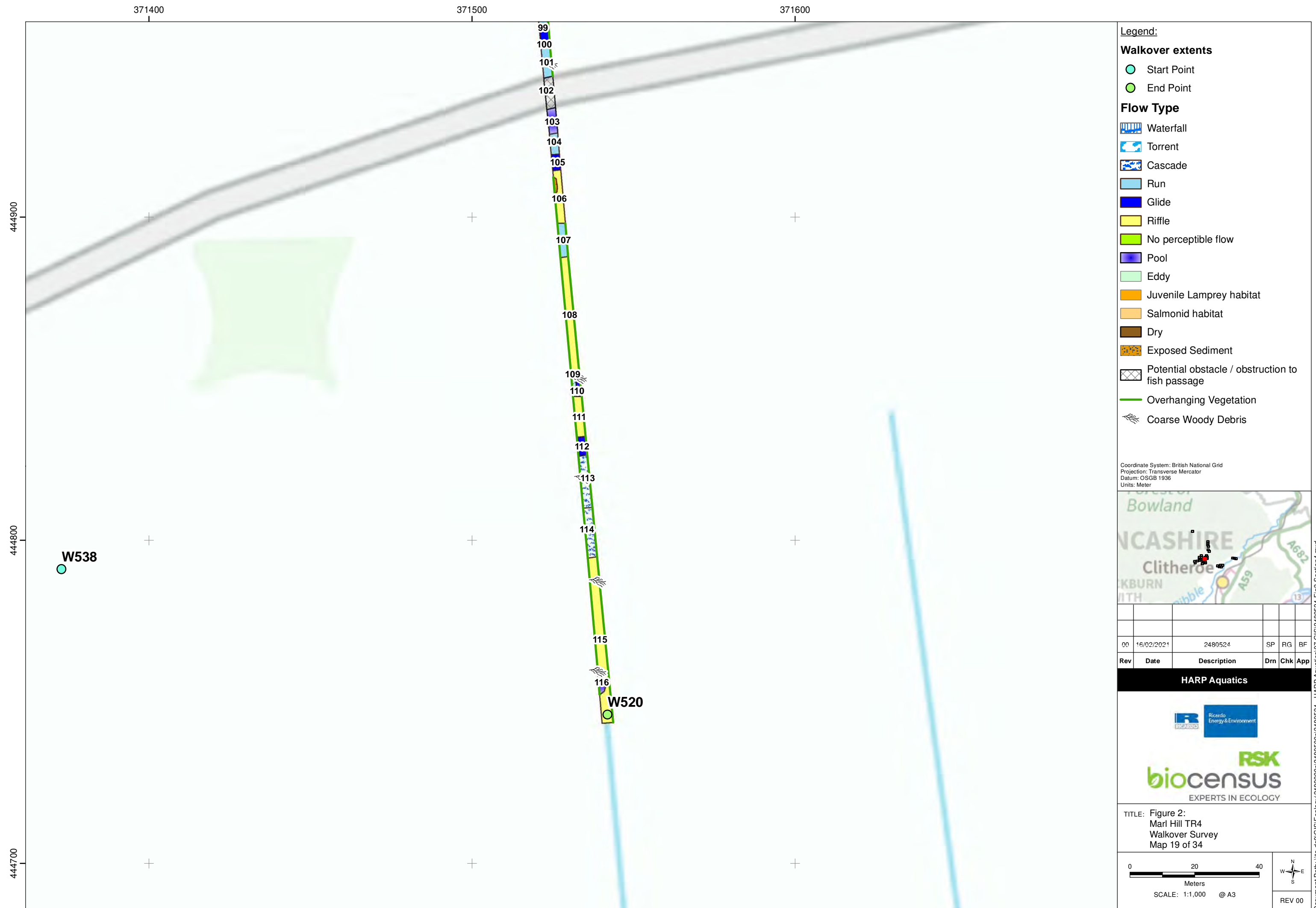
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00	16/02/2021	2480524	SP	RG	BF

HARP Aquatics

TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 18 of 34

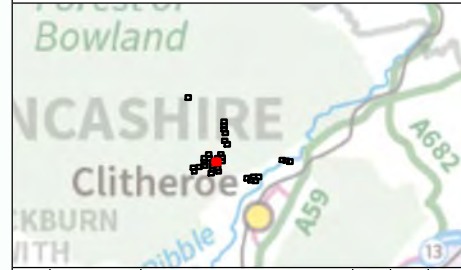
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REV 00



- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
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 - Riffle
 - No perceptible flow
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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HARP Aquatics



TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 19 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
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- Juvenile Lamprey habitat
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- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



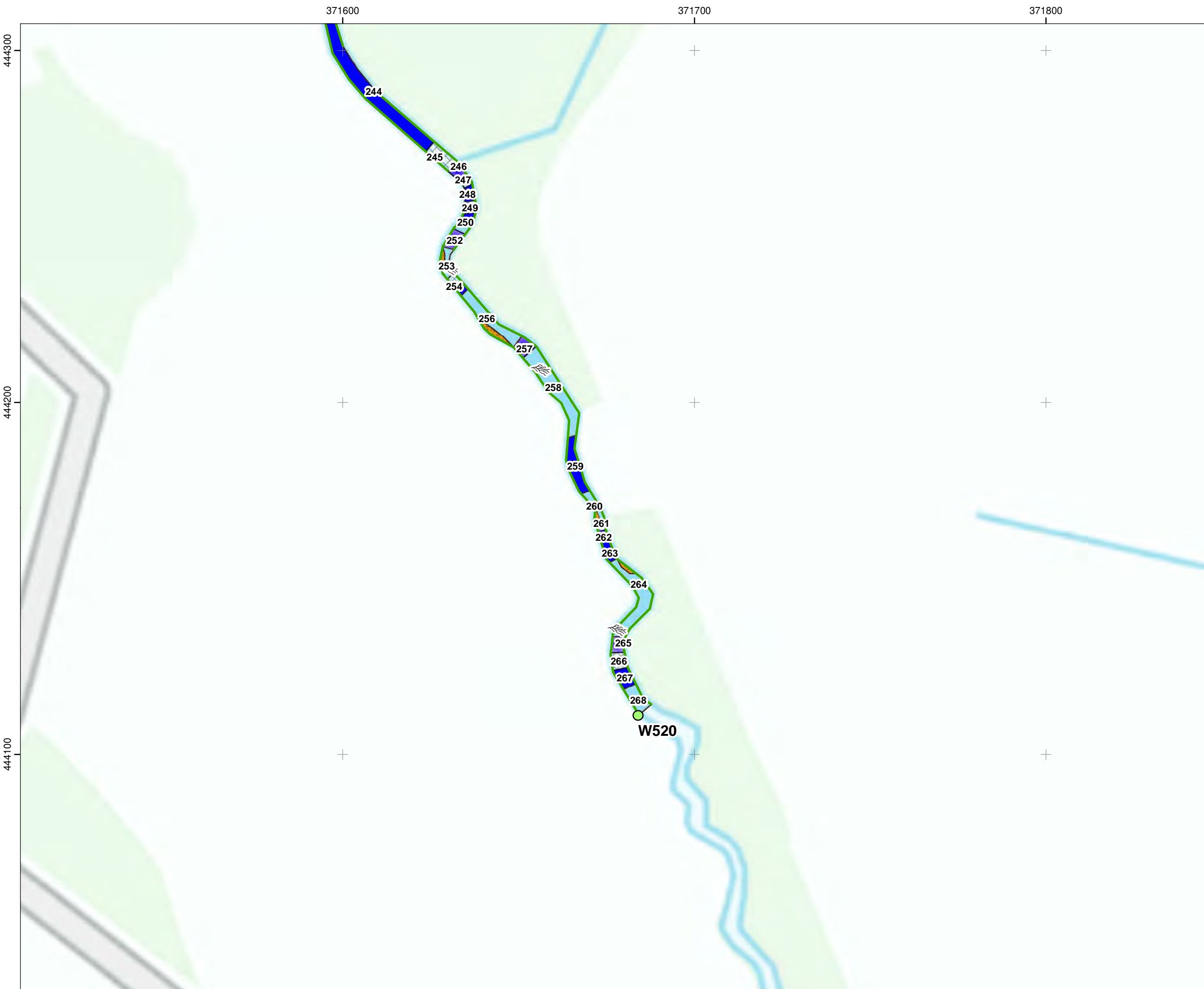
Rev	Date	Description	Drn	Chk	App
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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 20 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

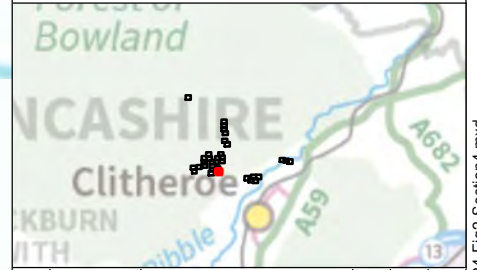
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
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- Salmonid habitat
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- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 21 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00

371700

371800

371900

445400

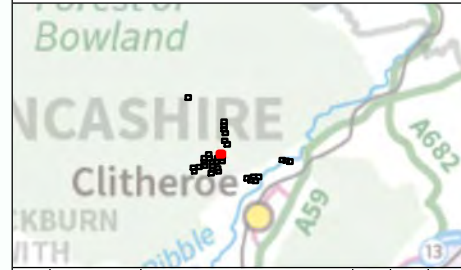
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445200



- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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00	16/02/2021	2480524	SP	RG	BF

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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
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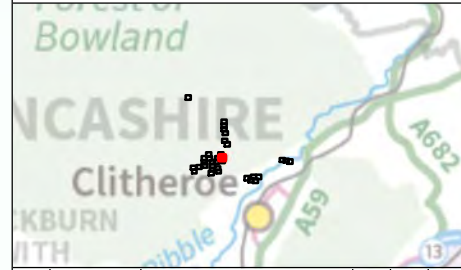
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REV 00



- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 23 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00

371800

371900

372000

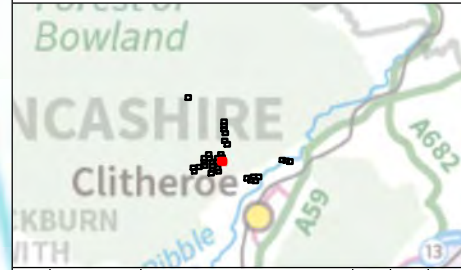
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444800



- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
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 - Potential obstacle / obstruction to fish passage
 - Overhanging Vegetation
 - Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter

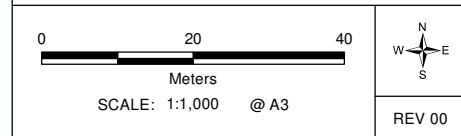


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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
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375800

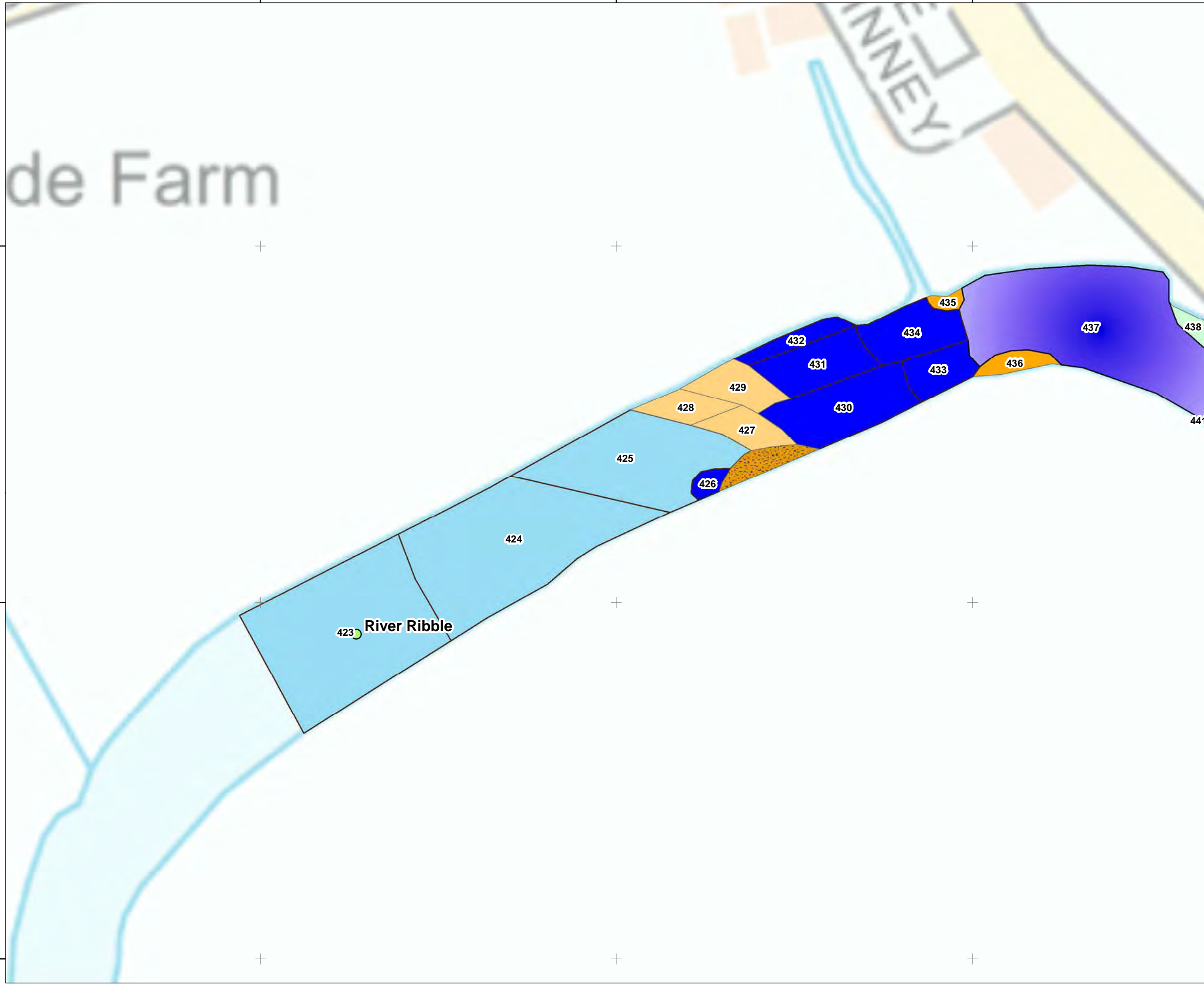
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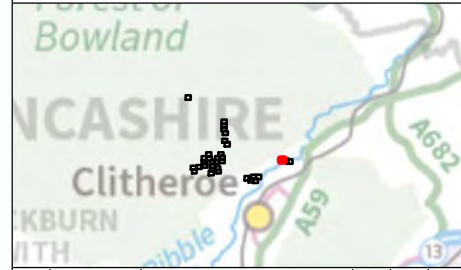
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- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



Rev	Date	Description	Drn	Chk	App
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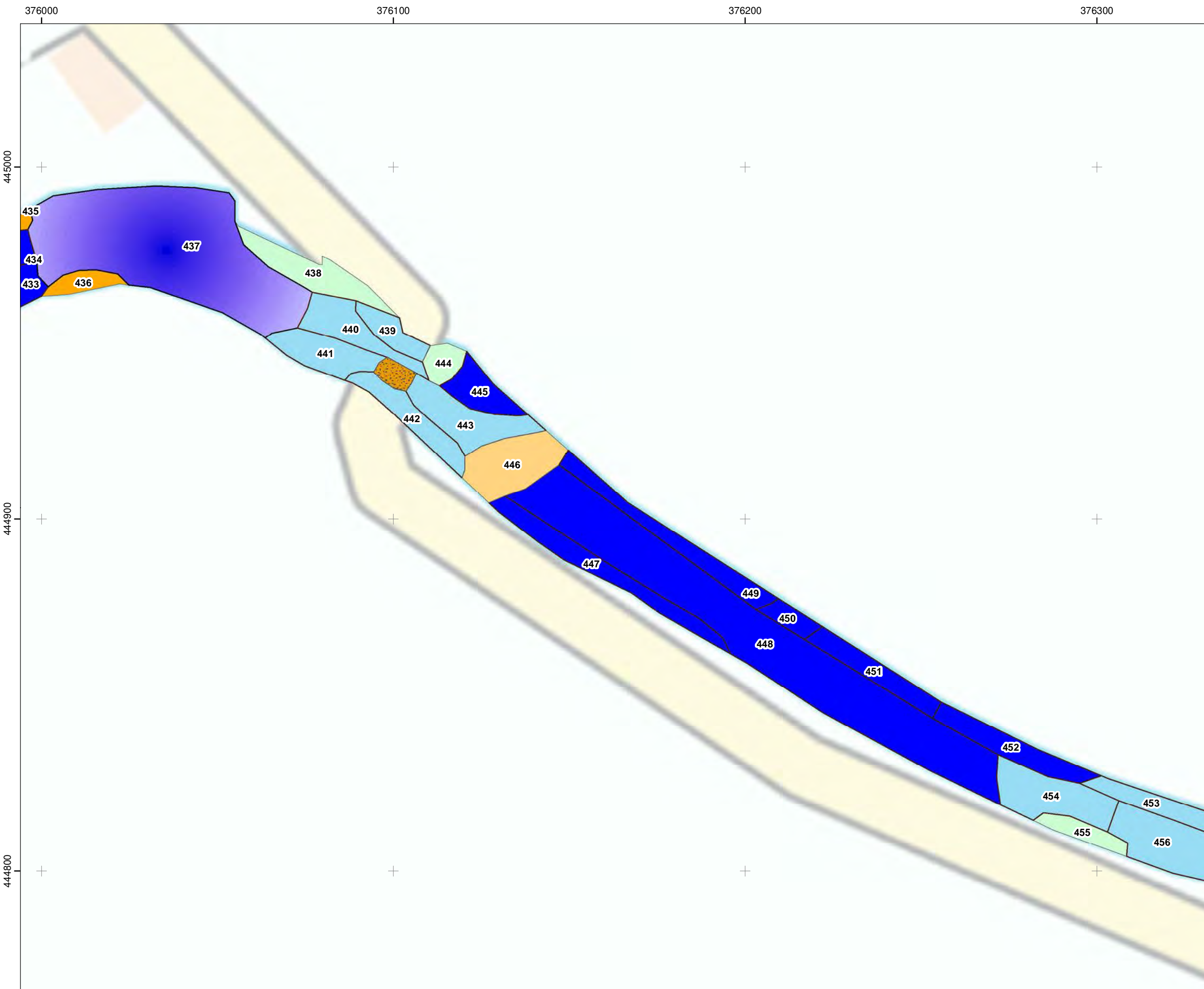
HARP Aquatics



TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 25 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

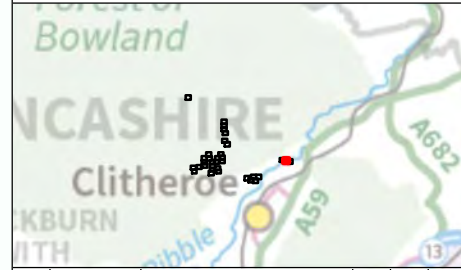
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

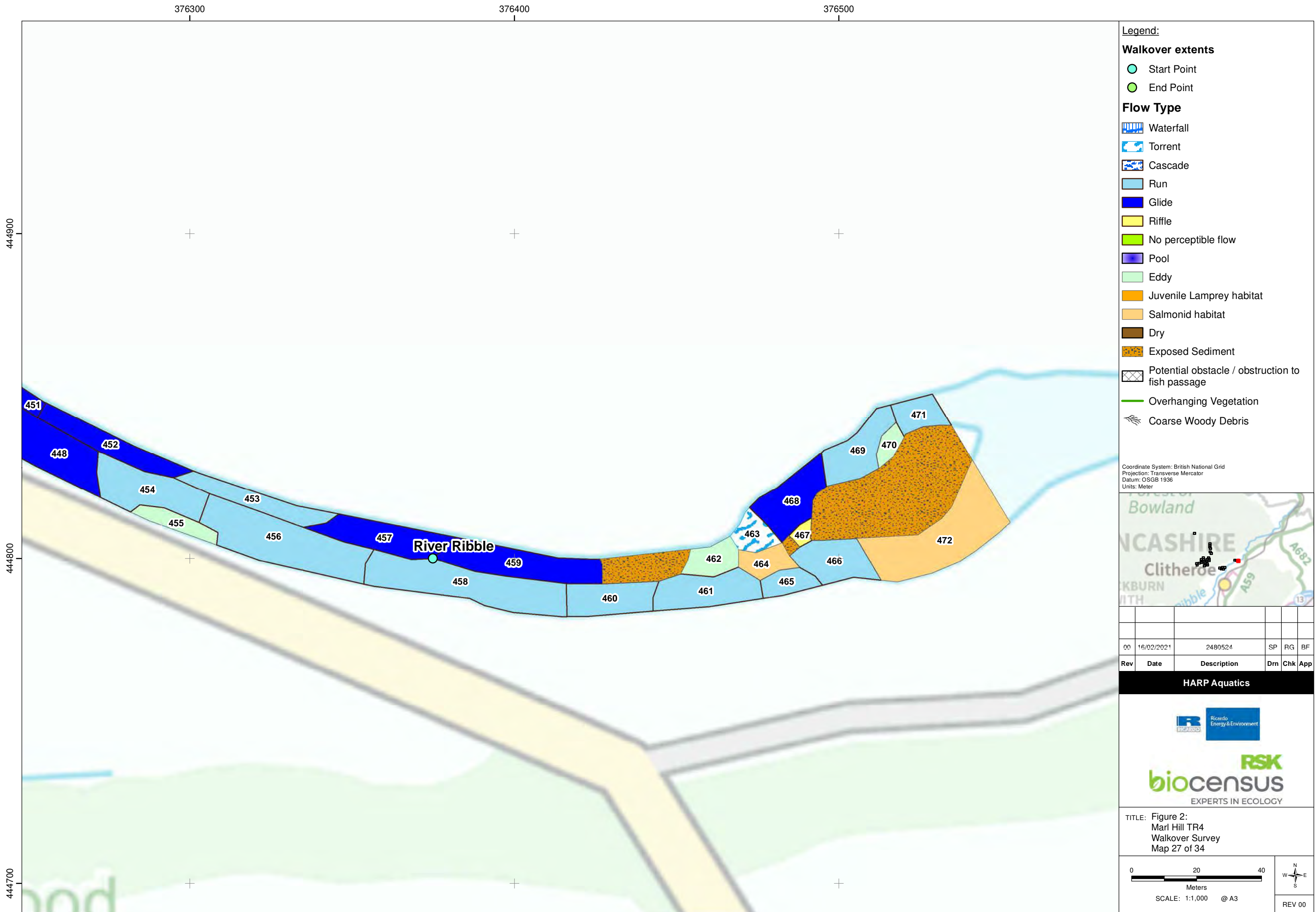
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 Datum: OSGB 1936
 Units: Meter



Rev	Date	Description	Drn	Chk	App
00	16/02/2021	2480524	SP	RG	BF

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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
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- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
 - Eddy
 - Juvenile Lamprey habitat
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
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0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00

372000

372100

372200

446300

446200

446100



Legend:

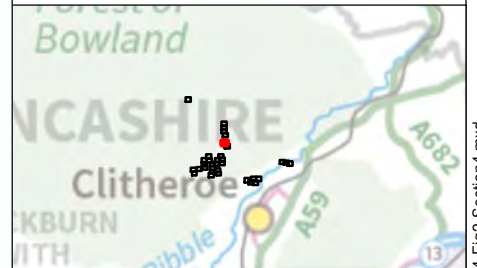
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
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- Salmonid habitat
- Dry
- Exposed Sediment
- Potential obstacle / obstruction to fish passage
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- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



Rev	Date	Description	Drn	Chk	App
00	16/02/2021	2480524	SP	RG	BF

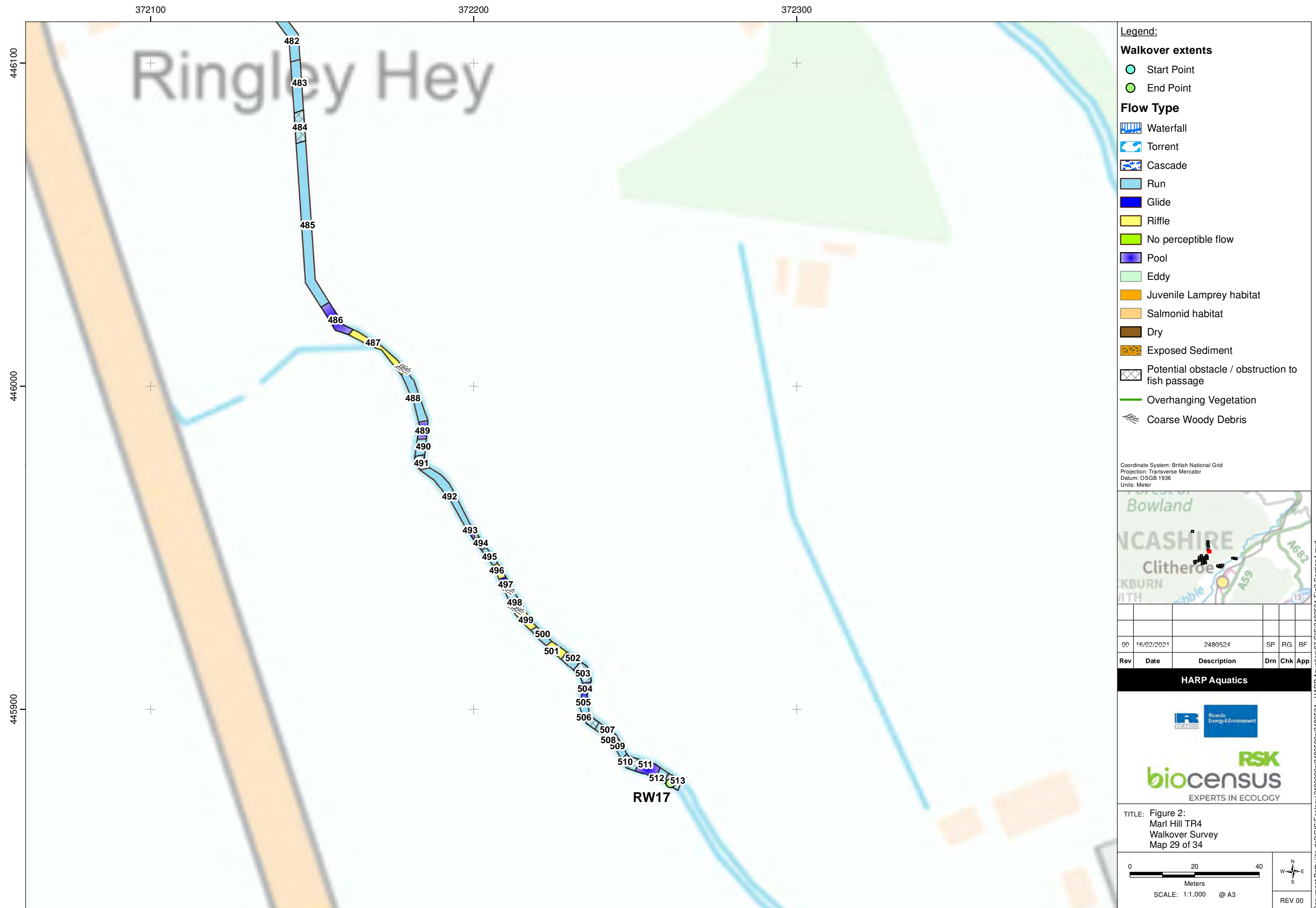
HARP Aquatics



TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 28 of 34

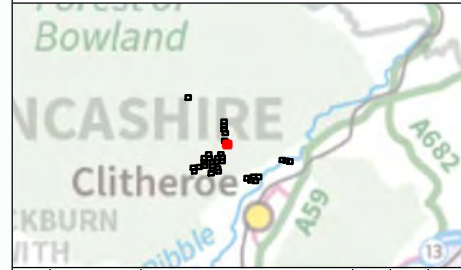
0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
 - Eddy
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 - Salmonid habitat
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 - Potential obstacle / obstruction to fish passage
 - Overhanging Vegetation
 - Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



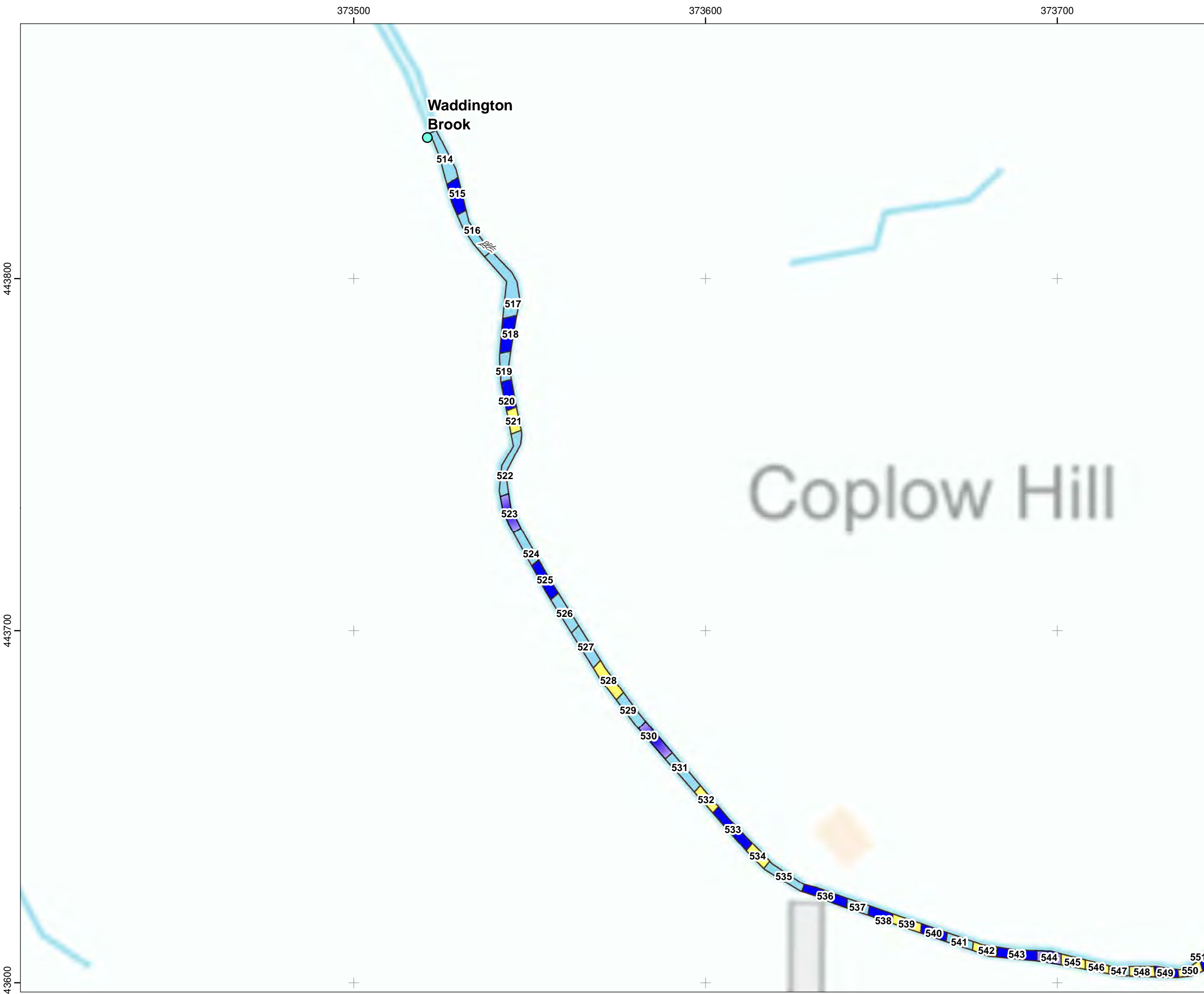
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00	16/02/2021	2480524	SP	RG	BF

HARP Aquatics

TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 29 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00



Legend:

Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
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- Exposed Sediment
- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



Rev	Date	Description	Drm	Chk	App
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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 30 of 34

0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00

373700 373800 373900

443700

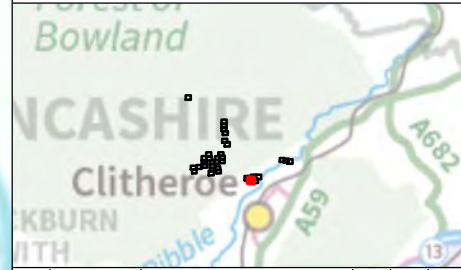
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443500



- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
 - Pool
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Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter



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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
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0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00

373900

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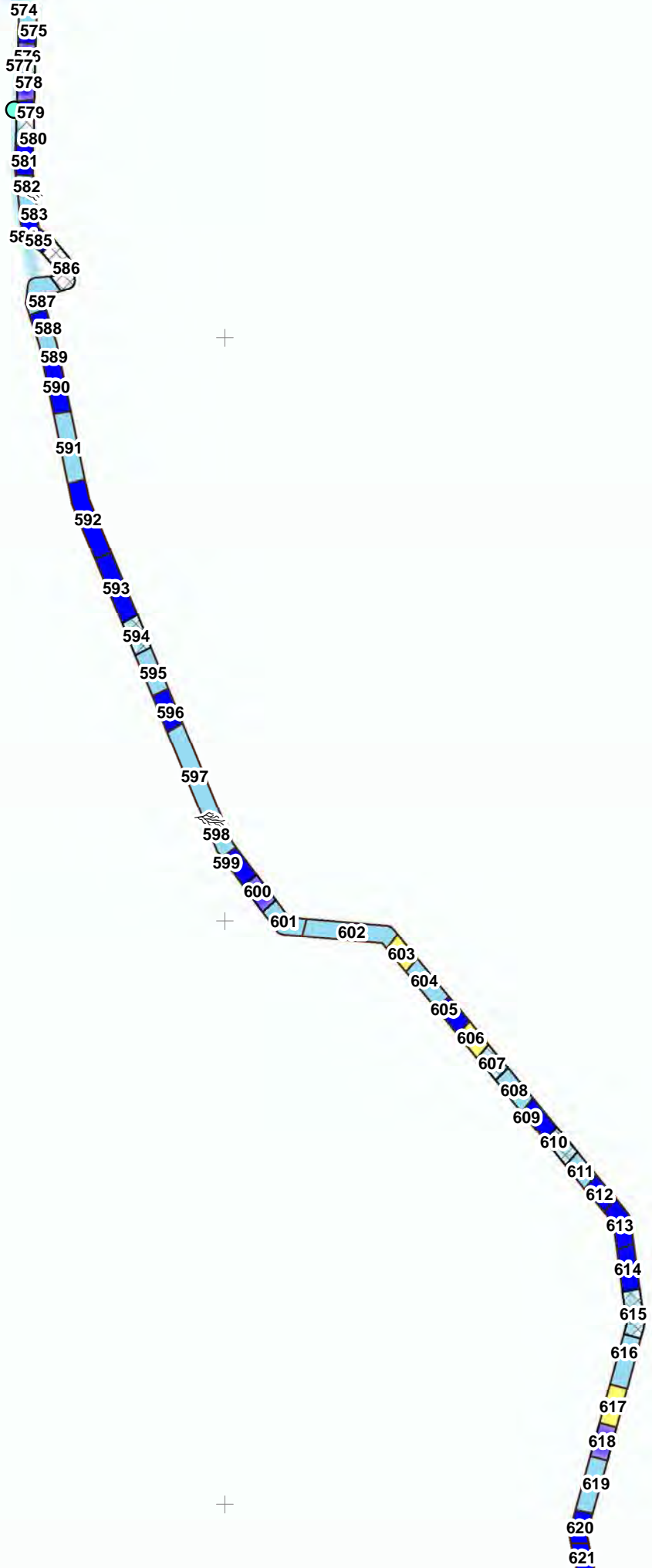
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Greg Sike



Legend:

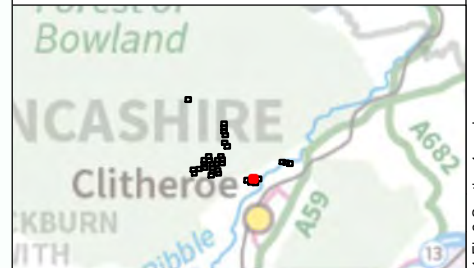
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
- Run
- Glide
- Riffle
- No perceptible flow
- Pool
- Eddy
- Juvenile Lamprey habitat
- Salmonid habitat
- Dry
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- Potential obstacle / obstruction to fish passage
- Overhanging Vegetation
- Coarse Woody Debris

Coordinate System: British National Grid
 Projection: Transverse Mercator
 Datum: OSGB 1936
 Units: Meter

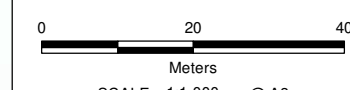


Rev	Date	Description	Drn	Chk	App
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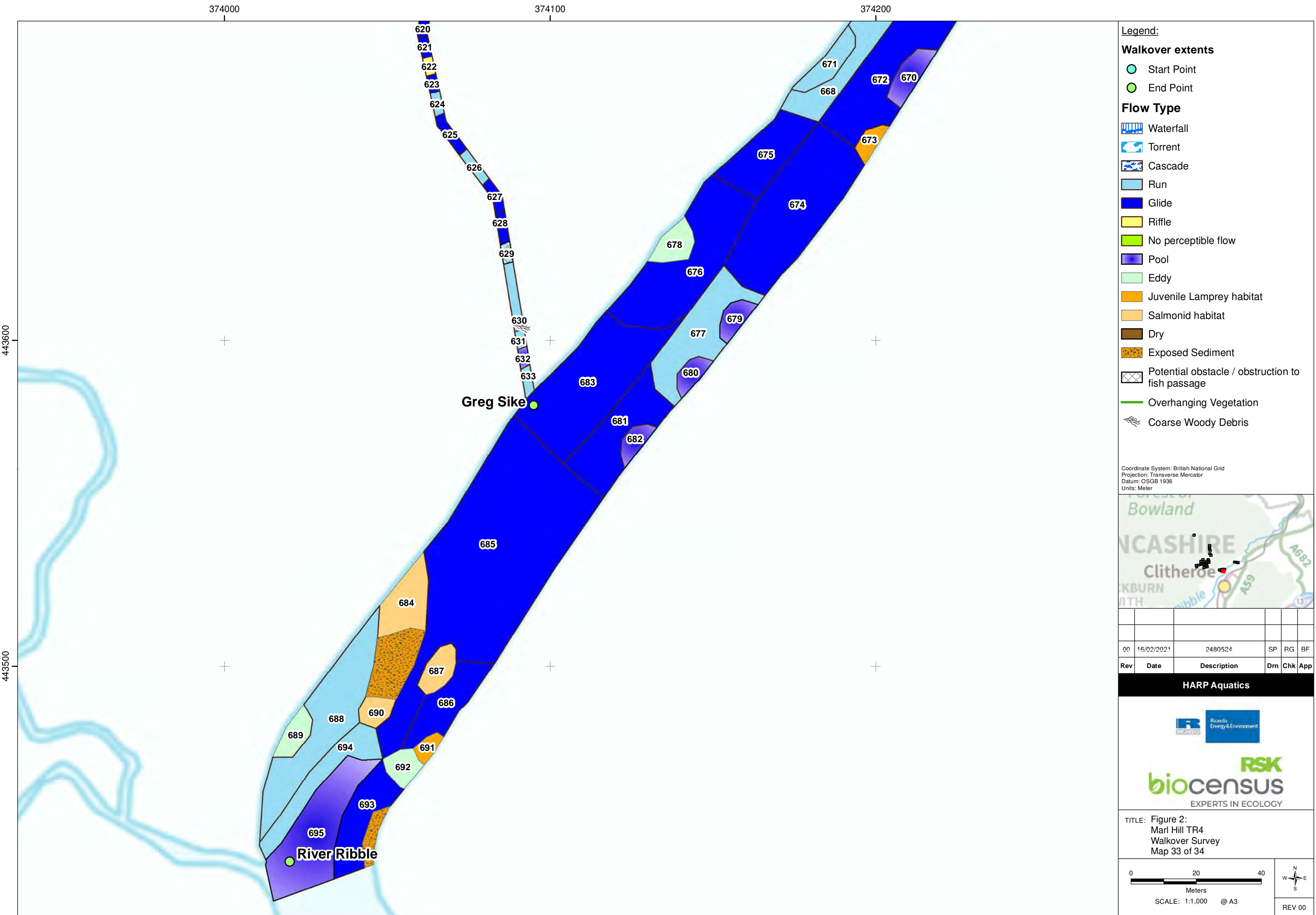
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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 32 of 34

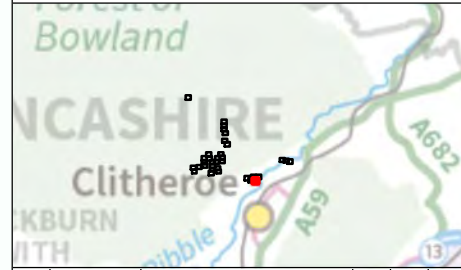


REV 00



- Legend:**
- Walkover extents**
- Start Point
 - End Point
- Flow Type**
- Waterfall
 - Torrent
 - Cascade
 - Run
 - Glide
 - Riffle
 - No perceptible flow
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Coordinate System: British National Grid
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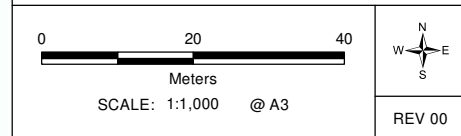


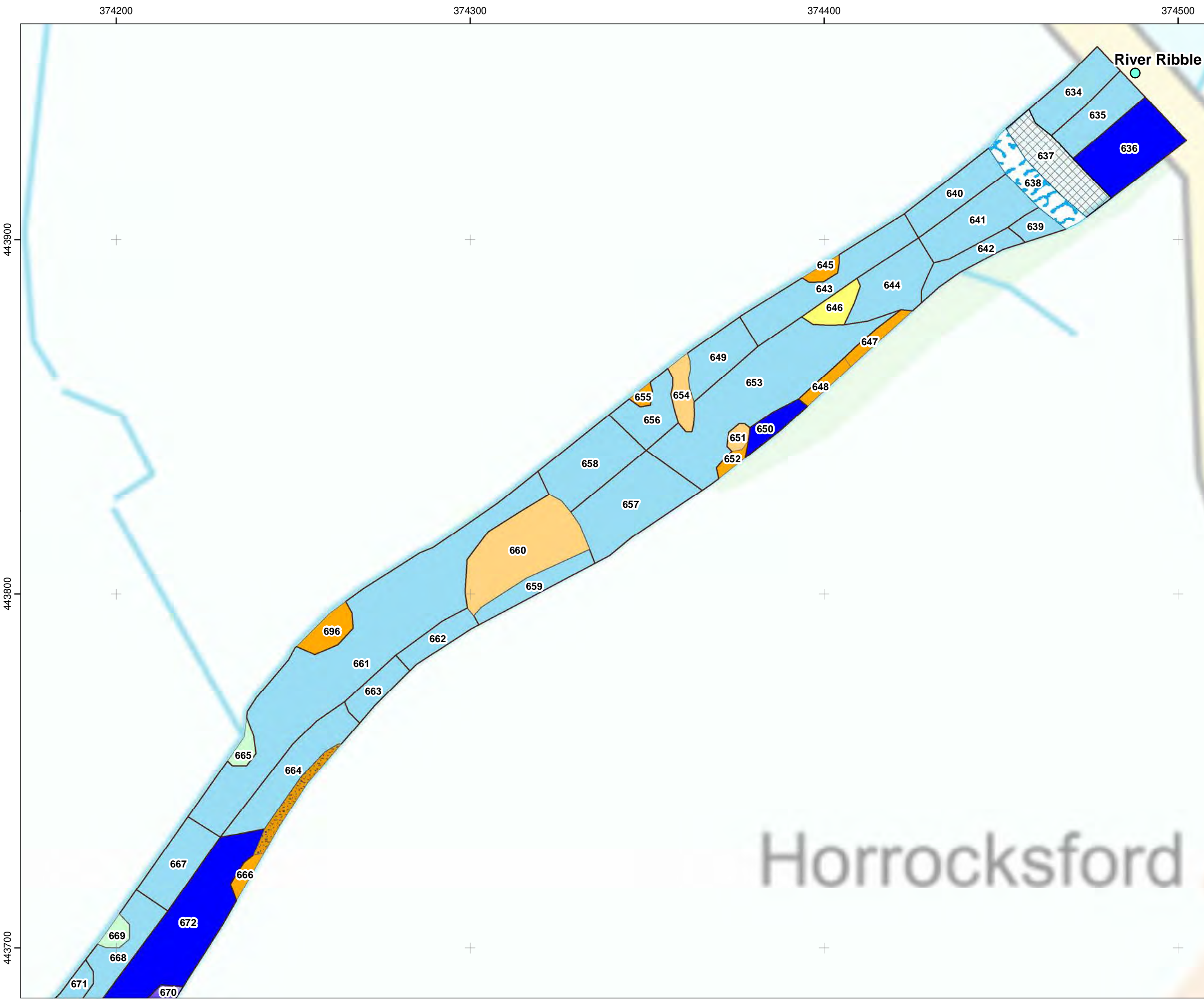
Rev	Date	Description	Drn	Chk	App
00	16/02/2021	2480524	SP	RG	BF

HARP Aquatics



TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
 Map 33 of 34





Legend:

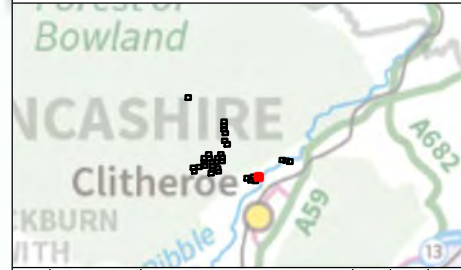
Walkover extents

- Start Point
- End Point

Flow Type

- Waterfall
- Torrent
- Cascade
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- Glide
- Riffle
- No perceptible flow
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TITLE: Figure 2:
 Marl Hill TR4
 Walkover Survey
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0 20 40
 Meters
 SCALE: 1:1,000 @ A3

REV 00

Table 1: Habitat classifications and abbreviations

	Flow Type		Depth		Velocity		Substrate		Notable/species specific habitat		Macrophyte (% cover)		Other features
GL	Glide	A	0.05 - 0.1 m	0	0.01 - 0.05 m/s	BE	Bedrock	Pr	Salmonid parr habitat	SFL	Submerged fine-leaved	Obstruction	Potential obstacle/obstruction to fish passage
R	Run	B	0.1 - 0.2 m	1	0.05 - 0.15 m/s	BO	Boulder (> 256 mm)	Fr	Salmonid fry habitat	SLL	Submerged linear-leaved		
RI	Riffle	C	0.2 - 0.4 m	2	0.15 - 0.3 m/s	CO	Cobble (64 - 256 mm)	Pr/Fr	Mixed juvenile salmonid habitat	SBL	Submerged broad-leaved		
P	Pool	D	0.4 - 1.0 m	3	0.3 - 0.5 m/s	GR	Gravel (2 - 64 mm)	SPO	Optimal salmonid spawning habitat	ELL	Emergent linear-leaved		
CAS	Cascade	E	> 1.0 m	4	0.5 - 0.7 m/s	SA	Sand (< 2 mm)	SPSO	Sub optimal salmonid spawning habitat	EBL	Emergent broad-leaved		
ED	Eddy			5	> 0.7 m/s	SI	Silt	LO	Optimal juvenile lamprey habitat	FL	Filamentous algae		
TOR	Torrent					CL	Clay	LSO	Sub optimal juvenile lamprey habitat	FLO	Floating		
NP	No perceptible flow					AR	Artificial			FLR	Floating-leaved rooted		
DRY	Dry					NV	Not visible			CHOKED	Channel choked (veg)		

Table 2: HARP Marl Hill (TR4) walkover data

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
1	Riffle	A	2	BO/CO/GR		
2	Glide	B	2	BO/CO/GR	FL 40%	
3	Riffle	A	3	BO/CO/GR		
4	Pool	C	1	BO/CO/GR		
5	Pool	C	1	BO/CO/GR		
6	Riffle	A	3	BO/CO/GR		
7	Pool	D	1	BO/CO/GR		
8	Run	B	3	BO/CO/GR	FL 10%	
9	Riffle	A	3	BO/CO/GR		
10	Glide	B	2	BO/CO/GR	FL 10%	
11	Pool	C	1	BO/CO/GR		
12	Riffle	A	3	BO/CO/GR	FL 10%	
13	Run	B	2	BO/CO/GR	FL 30%	
14	Riffle	A	3	BO/CO/GR	FL 5%	
15	Riffle	A	3	BO/CO/GR	FL 10%	
16	Pool	C	1	BO/CO/GR	FL 40%	
17	Riffle	B	3	BO/CO/GR		
18	Riffle	A	3	BO/CO/GR		
19	Riffle	A	3	BO/CO/GR	FL 10%	
20	Glide	B	1	CO/BO/BE	FL 10%	
21	Riffle	A	2	BO/CO/GR	FL 10%	
22	Run	B	2	BO/CO/GR	FL 10%	
23	Riffle	A	3	BO/CO/GR		
24	Run	B	2	BO/CO/GR	FL 10%	
25	Riffle	A	3	BO/CO/GR		
26	Pool	C	1	BO/CO/GR	FL 10%	
27	Pool	C	1	BO/CO/GR	FL 10%	
28	Riffle	A	3	BO/CO/GR	FL 10%	
29	Pool	D	1	BO/CO/GR	FL 20%	
30	Riffle	A	3	BO/CO/GR	FL 20%	
31	Run	B	2	BO/CO/GR	FL 20%	
32	Riffle	A	3	BO/CO/GR	FL 10%	
33	Glide	B	2	CO/BO/BE	FL 40%	
34	Run	B	2	BO/CO/GR		
35	Riffle	A	2	BO/CO/GR	FL 10%	
36	Pool	C	1	BO/CO/GR		
37	Potential obstacle/obstruction to fish passage					
38	Riffle	A	2	BO/CO/GR	FL 10%	
39	Run	B	2	BO/CO/GR		
40	Riffle	A	2	BO/CO/GR	FL 10%	
41	Glide	B	1	BO/CO/GR		
42	Potential obstacle/obstruction to fish passage					
43	Pool	C	1	BO/CO/GR		
44	Glide	B	2	BO/CO/GR	FL 10%	
45	Riffle	A	2	BO/CO/GR		
46	Glide	B	2	BO/CO/GR		
47	Run	A	2	BO/CO/GR		
48	Riffle	A	2	BO/CO/GR		
49	Glide	B	2	BO/CO/GR		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
50	Run	B	2	BO/CO/GR		
51	Riffle	A	2	BO/CO/GR		
52	Run	B	2	BO/CO/GR	FL 10%	
53	Riffle	A	2	BO/CO/GR		
54	Pool	C	1	BO/CO/GR	FL 10%	
55	Riffle	A	2	BO/CO/GR		
56	Glide	B	2	BO/CO/GR		
57	Riffle	A	2	BO/CO/GR		
58	Run	B	2	BO/CO/GR		
59	Run	B	2	BO/CO/GR		
60	Riffle	A	2	BO/CO/GR		
61	Glide	B	2	BO/CO/GR		
62	Run	B	2	BO/CO/GR		
63	Glide	B	2	BO/CO/GR		
64	Run	B	2	BO/CO/GR		
65	Pool	B	1	BO/CO/GR	FL 10%	
66	No perceptible flow	A	0	BO/CO/GR	FL 20%	
67	No perceptible flow	A	0	GR/CO/SI		
68	No perceptible flow	A	0	GR/CO/SI		
69	Potential obstacle/obstruction to fish passage					
70	No perceptible flow	A	0	SA/SI/GR		
71	Pool	B	1	SA/SI/GR		
72	Potential obstacle/obstruction to fish passage					
73	Pool	B	1	GR/CO/SI		
74	No perceptible flow	A	0	GR/CO/SI		
75	Run	A	1	SI/BO/CO		
76	No perceptible flow	A	0	GR/CO/SI		
77	Pool	B	0	SI		
78	Pool	B	0	SI		
79	Pool	B	0	SI/BO/CO		
80	No perceptible flow	A	0	SI/BO/CO		
81	Pool	B	1	SI/BO/CO		
82	Pool	B	1	SI/BO/CO		
83	Potential obstacle/obstruction to fish passage					
84	Pool	C	0	BO/CO/GR		
85	No perceptible flow	A	0	BO/CO/GR		
86	Run	A	1	BO/CO/GR		
87	Riffle	A	2	SA/BO/CO		
88	Glide	B	1	SA/BO/CO		
89	Run	A	2	SA/BO/CO		
90	Riffle	A	2	SA/BO/CO		
91	Run	A	2	SA/BO/CO		
92	Pool	C	0	SA/BO/CO		
93	Potential obstacle/obstruction to fish passage					
94	Run	B	2	SI/BO/CO		
95	Pool	C	1	SA/BO/GR		
96	Cascade	A	2	BO/CO		
97	Run	B	2	BO/CO/GR		
98	Pool	C	1	SA/BO/CO		
99	Run	B	2	SA/BO/CO		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
100	Glide	B	1	SA/BO/CO		
101	Run	A	2	BO/CO/GR		
102	Potential obstacle/obstruction to fish passage					
103	Pool	C	1	BO/CO/GR		
104	Run	A	2	BO/CO/GR		
105	Glide	B	1	BO/CO/GR		
106	Riffle	A	2	SA/BO/CO		
107	Run	B	2	BO/CO/GR		
108	Riffle	A	2	SA/BO/CO		
109	Potential obstacle/obstruction to fish passage					
110	Pool	C	1	SA/BO/CO		
111	Riffle	A	2	BO/CO/GR		
112	Glide	B	1	BO/CO/GR		
113	Cascade	A	1	BO/CO		
114	Cascade	A	1	BO/CO		
115	Riffle	A	2	BO/CO/GR		
116	Pool	C	1	SA/BO/CO		
117	Cascade	A	1	BO/CO		
118	No perceptible flow	A	0	BO/CO/GR		
119	No perceptible flow	A	0	BO/CO/GR		
120	Potential obstacle/obstruction to fish passage					
121	Pool	C	1	SI		
122	Pool	B	1	CL/CO		
123	No perceptible flow	A	0	BO/CO/GR		
124	Pool	A	0	BO/CO/GR		
125	Cascade	A	2	BO/CO		
126	No perceptible flow	A	0	BO/CO/GR		
127	Pool	A	1	BO/CO/GR		
128	Pool	B	1	BO/CO/GR		
129	Pool	A	1	BO/CO/GR		
130	Pool	A	1	BO/CO/GR		
131	Pool	C	1	BO/CO/GR		
132	Pool	C	1	BO/CO/GR		
133	Potential obstacle/obstruction to fish passage					
134	No perceptible flow	B	0	BO/CO/GR		
135	Waterfall	A	2	BO/CO		
136	Pool	B	0	BO/CO/GR		
137	No perceptible flow	A	0	BO/CO/GR		
138	Potential obstacle/obstruction to fish passage					
139	No perceptible flow	A	0	BO/CO/GR		
140	Pool	A	0	BO/CO/GR		
141	No perceptible flow	A	0	BO/CO/GR		
142	Run	A	1	BO/CO/GR		
143	No perceptible flow	A	0	BO/CO/GR		
144	Pool	B	1	BO/CO/GR		
145	Run	A	1	BO/CO/GR		
146	Waterfall	A	2	BO/CO		
147	Pool	C	1	CL/GR/BO		
148	Potential obstacle/obstruction to fish passage					
149	Glide	B	1	BO/CO/GR		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
150	Run	A	2	BO/CO/GR		
151	Pool	B	1	BO/CO/GR		
152	Potential obstacle/obstruction to fish passage					
153	Pool	B	1	BO/CO/GR		
154	Run	A	1	BO/CO/GR		
155	No perceptible flow	A	0	CL/BO/SA		
156	No perceptible flow	A	0	CL/BO/SA		
157	No perceptible flow	A	0	BO/CO/GR		
158	No perceptible flow	A	0	BO/CO/GR		
159	No perceptible flow	A	0	BO/CO/GR		
160	Pool	B	1	BO/CO		
161	Run	A	1	BO/CO/GR		
162	No perceptible flow	A	0	CL/BO		
163	Potential obstacle/obstruction to fish passage					
164	Pool	C	1	CL		
165	No perceptible flow	A	0	BO/CO/GR		
166	Run	A	1	BO/CO/GR		
167	No perceptible flow	C	0	BO/GR/SA		
168	Potential obstacle/obstruction to fish passage					
169	Glide	A	1	BO/CO/GR		
170	Run	A	1	BO/CO/GR		
171	No perceptible flow	A	0	BO/CO/GR		
172	Run	A	1	BO/CO/GR		
173	No perceptible flow	A	0	BO/CO/GR		
174	No perceptible flow	D	0	SI		
175	No perceptible flow	B	0	SI		
176	Run	B	2	SI		
177	No perceptible flow	B	0	BO/CO/GR		
178	Run	A	1	BO/CO/GR		
179	No perceptible flow	A	0	BO/CO/GR		
180	No perceptible flow	B	0	BO/CO/GR		
181	No perceptible flow	A	0	BO/CO/GR		
182	No perceptible flow	B	0	BO/CO/GR		
183	No perceptible flow	C	0	BO/CO/GR		
184	No perceptible flow	B	0	BO/CO/GR		
185	Potential obstacle/obstruction to fish passage					
186	Potential obstacle/obstruction to fish passage					
187	No perceptible flow	B	0	BO/CO/SA		
188	No perceptible flow	B	0	BO/CO/GR		
189	Potential obstacle/obstruction to fish passage					
190	No perceptible flow	B	0	BO/CO/GR		
191	No perceptible flow	B	0	BO/CO/GR		
192	No perceptible flow	B	0	BO/CO/GR		
193	No perceptible flow	B	0	BO/CO/GR		
194	No perceptible flow	B	0	BO/CO/GR		
195	No perceptible flow	C	0	BO/CO/GR		
196	No perceptible flow	B	0	BO/CO/GR		
197	Run	A	2	BO/CO/GR		
198	No perceptible flow	B	0	BO/CO/GR		
199	Run	A	1	BO/CO/GR		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
200	No perceptible flow	B	0	BO/CO/GR		
201	No perceptible flow	B	0	BO/CO/GR		
202	Run	A	1	BO/CO/GR		
203	No perceptible flow	B	0	BO/CO/GR		
204	Run	A	1	BO/CO/GR		
205	No perceptible flow	B	0	BO/CO/GR		
206	No perceptible flow	B	0	BO/CO/GR		
207	No perceptible flow	B	0	BO/CO/GR		
208	Potential obstacle/obstruction to fish passage					
209	Potential obstacle/obstruction to fish passage					
210	No perceptible flow	B	0	BO/CL		
211	No perceptible flow	A	0	BO/GR/SA		
212	No perceptible flow	A	0	BO/GR/SA		
213	Pool	C	1	BO/CO/GR		
214	No perceptible flow	A	0	BO/CO/GR		
215	Run	A	1	BO/CO/GR		
216	Potential obstacle/obstruction to fish passage					
217	Pool	C	1	BO/CL		
218	Potential obstacle/obstruction to fish passage					
219	No perceptible flow	B	0	BO/CO/GR		
220	No perceptible flow	C	0	BO/CO/GR		
221	No perceptible flow	B	0	BO/CO/GR		
222	Potential obstacle/obstruction to fish passage					
223	No perceptible flow	C	0	BO/GR		
224	No perceptible flow	B	0	BO/CL		
225	No perceptible flow	C	0	BO/CL		
226	No perceptible flow	B	0	BO/CL		
227	No perceptible flow	B	0	BO/CL		
228	Run	B	2	BO/CO/GR		
229	Pool	C	1	GR/SA/BO		
230	Glide	B	1	GR/BO/SA		
231	Pool	C	1	SA/CO/BO		
232	Glide	A	1	GR/SA/BO		
233	Pool	C	1	GR/SA		
234	Potential obstacle/obstruction to fish passage					
235	Pool	C	1	GR/SA		
236	Run	A	2	GR/SA/BO		
237	Potential obstacle/obstruction to fish passage					
238	Run	B	2	BO/GR/SA		
239	Pool	B	1	SA/BO		
240	Run	B	2	BO/GR/SA		
241	Pool	B	1	SA/BO		
242	Run	B	2	BO/GR/SA		
243	Potential obstacle/obstruction to fish passage					
244	Glide	B	1	BO/GR/SA		
245	Potential obstacle/obstruction to fish passage					
246	Pool	D	1	BE/BO/SA		
247	Potential obstacle/obstruction to fish passage					
248	Glide	B	1	BE/SA		
249	Potential obstacle/obstruction to fish passage					

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
250	Glide	B	1	BO/CO/SI		
251	Run	B	2	CO/BO/GR		
252	Pool	C	1	BO/CO/SA		
253	Run	B	2	BO/CO/GR		
254	Potential obstacle/obstruction to fish passage					
255	Glide	B	1	BO/CO/GR		
256	Run	B	2	BO/CO/GR		
257	Pool	C	1	BO/CO/GR		
258	Run	B	2	BO/CO/GR		
259	Glide	C	1	GR/BO/SA		
260	Run	B	2	CO/BO/SA		
261	Potential obstacle/obstruction to fish passage					
262	Pool	C	1	BO/SA		
263	Glide	B	1	BO/SA		
264	Run	B	2	BO/GR/SA		
265	Pool	C	1	BO/SA/CO		
266	Potential obstacle/obstruction to fish passage					
267	Glide	B	1	BO/SA		
268	Run	B	2	BO/CO/SA		
269	Run	B	2	SI/CO/BO		
270	Glide	B	1	SI/CO/BO		
271	Riffle	A	2	BO/CO/GR		
272	Pool	C	1	CL/BO		
273	Pool	C	1	CL/BO		
274	Run	B	2	CL/BO/GR		
275	Glide	B	1	CL/BO/GR		
276	Cascade	A	2	BO/CO		
277	Run	B	2	GR/SI/BO		
278	Cascade	A	2	BO/CO		
279	Cascade	A	3	BO/CO		
280	Glide	B	1	BO/SI	FL 60%	
281	Cascade	A	2	BO/CO		
282	Run	B	2	CO/BO/SI		
283	Riffle	A	2	CO/BO/SI		
284	Run	B	2	BO/GR/SI		
285	Riffle	A	2	CO/BO/SI		
286	Run	A	2	CO/BO/SI		
287	Cascade	A	2	BO/CO		
288	Glide	B	1	GR/SI/BO		
289	Cascade	A	2	BO/CO		
290	Glide	B	1	GR/SI/BO		
291	Riffle	B	2	GR/SI/BO		
292	Run	B	2	CO/BO/SI		
293	Glide	B	1	GR/SI/BO		
294	Riffle	B	2	BO/CO/GR		
295	Glide	B	1	BO/CO/SI		
296	Run	B	2	BO/CO/GR		
297	Pool	C	1	BO/CO/GR		
298	Cascade	A	3	BO/CO		
299	Riffle	B	2	BO/GR/BE		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
300	Run	B	2	BE		
301	Cascade	A	3	BE		
302	Glide	C	1	BO/CO/SI		
303	Run	B	2	BO/GR/SA		
304	Glide	B	1	BO/CO/SI		
305	Cascade	A	3	BO/CO		
306	Pool	C	1	BO/GR/SI		
307	Cascade	A	3	BO/CO		
308	Pool	B	1	BE/BO		
309	Run	A	2	BE		
310	No perceptible flow	A	0	BE		
311	Riffle	A	2	BE/BO/GR		
312	Potential obstacle/obstruction to fish passage					
313	Riffle	A	2	BO/CO/GR		
314	Potential obstacle/obstruction to fish passage					
315	Pool	B	1	BO/GR/CO		
316	Riffle	A	2	BO/CO/GR		
317	Glide	B	1	BO/GR/SA		
318	Riffle	A	2	BO/SA/GR		
319	Glide	B	1	BO/GR/SA		
320	Cascade	A	3	BO		
321	Run	A	2	BE/BO		
322	Cascade	A	2	BE/BO		
323	Glide	B	1	BO/GR/SA		
324	Riffle	A	2	BO/SA/GR		
325	Cascade	A	3	BO/CO		
326	Glide	B	1	BO/GR/SA		
327	Cascade	A	3	BO/CO		
328	Glide	B	1	BO/GR/SA		
329	Run	B	2	BO/GR/SA		
330	Potential obstacle/obstruction to fish passage					
331	Riffle	A	2	BO/SA/GR		
332	Cascade	A	3	BO/CO		
333	Riffle	A	2	BO/SA/GR		
334	Cascade	A	3	BO		
335	Riffle	A	2	BO/SA/GR		
336	Potential obstacle/obstruction to fish passage					
337	Riffle	A	2	BO/SA/GR		
338	Potential obstacle/obstruction to fish passage					
339	Pool	C	1	BO/SA		
340	Run	B	2	BO/GR/SA		
341	Potential obstacle/obstruction to fish passage					
342	Run	B	2	BO/GR/SA		
343	Cascade	A	2	BO		
344	Riffle	A	2	BO/SA/GR		
345	Pool	C	1	BO/SA/GR		
346	Riffle	A	2	BO/SA/GR		
347	Pool	C	1	BO/SA/GR		
348	Riffle	A	2	BO/SA/GR		
349	Glide	B	1	BO/GR/SA		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
350	Riffle	A	2	BO/SA/GR		
351	Cascade	A	3	BO/CO		
352	Pool	C	1	BO/SA		
353	Riffle	A	2	BO/SA/GR		
354	Potential obstacle/obstruction to fish passage					
355	Pool	C	1	BO/SA		
356	Glide	B	1	BO/GR/SA		
357	Riffle	A	2	BO/SA/GR		
358	Glide	B	1	BO/GR/SA		
359	Riffle	A	2	BO/SA/GR		
360	Run	B	2	BO/GR/SA		
361	Cascade	A	3	BO		
362	Pool	C	1	BO/SA		
363	Cascade	A	2	BO		
364	Pool	C	1	BO/SA		
365	Run	B	2	BO/GR/SA		
366	Glide	B	1	BO/SA/GR		
367	Run	B	2	BO/GR/SA		
368	Glide	B	1	BO/SA/GR		
369	Potential obstacle/obstruction to fish passage					
370	Riffle	A	2	BO/CO/GR		
371	Pool	C	1	BO/CO/GR		
372	Riffle	A	2	BO/CO/GR		
373	Run	B	2	BO/GR/SA		
374	Riffle	A	2	BO/CO/GR		
375	Glide	B	1	BO/GR/SA		
376	Cascade	A	3	BO		
377	Glide	B	1	BO/GR/SA		
378	Riffle	A	2	BO/CO/GR		
379	Run	B	2	BO/GR/SA		
380	Riffle	A	2	BO/CO/GR		
381	Glide	B	1	BO/GR/SA		
382	Pool	B	1	BO/CO/SA		
383	Run	B	2	BO/GR/SA		
384	Pool	C	1	BO/GR/SA		
385	Riffle	A	2	BO/CO/GR		
386	Run	B	2	BO/GR/SA		
387	Riffle	A	2	BO/CO/GR		
388	Glide	B	1	BO/GR/SA		
389	Riffle	A	2	BO/CO/GR		
390	Glide	B	1	BO/GR/SA		
391	Riffle	A	2	BO/CO/GR		
392	Glide	B	1	BO/GR/SA		
393	Riffle	A	2	BO/CO/GR		
394	Run	B	2	BO/GR/SA		
395	Potential obstacle/obstruction to fish passage					
396	Glide	B	1	BO/GR/SA		
397	Riffle	A	2	BO/CO/GR		
398	Glide	B	1	BO/GR/SA		
399	Run	B	2	BO/GR/SA		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
400	Pool	C	1	BO/CO/GR		
401	Run	B	2	BO/GR/SA		
402	Potential obstacle/obstruction to fish passage					
403	Pool	C	1	BO/CO/GR		
404	Run	B	2	BO/GR/SA		
405	Glide	B	1	BO/CO/GR		
406	Riffle	A	2	BO/CO/GR		
407	Pool	C	1	BO/CO/GR		
408	Glide	B	1	BO/CO/GR		
409	Riffle	B	2	BO/CO/GR		
410	Pool	C	1	BO/CO/GR		
411	Run	B	2	BO/CO/GR		
412	Riffle	B	2	BO/CO/GR		
413	Run	B	2	BO/CO/GR		
414	Pool	C	1	BO/CO/GR		
415	Run	B	2	BO/CO/GR		
416	Riffle	B	2	BO/CO/GR		
417	Run	B	2	BO/CO/GR		
418	Riffle	B	2	BO/CO/GR		
419	Run	B	2	BO/CO/GR		
420	Riffle	B	2	BO/CO/GR		
421	Run	B	2	BO/CO/GR		
422	Potential obstacle/obstruction to fish passage					
423	Run	C	3	BO/CO/GR		
424	Run	B	3	BO/CO/GR		
425	Run	C	3	BO/CO/GR		
426	Glide	B	1	BO/CO/GR		
427	Salmonid	B	4	BO/CO/GR		Fry
428	Salmonid	C	4	BO/CO/GR		Parr
429	Salmonid	D	3	BO/CO/GR		Sub optimal spawning
430	Glide	B	1	BO/CO/GR		
431	Glide	C	1	BO/CO/GR		
432	Glide	B	1	BO/CO/GR		
433	Glide	D	1	BO/CO/GR		
434	Glide	E	1	BO/CO/GR		
435	Lamprey	C	1	SI/SA/GR		Sub optimal
436	Lamprey	C	1	SI/SA/GR		Sub optimal
437	Pool	E	1	BO/CO/GR		
438	Eddy	C	0	BO/CO/SA	EFL-10	
439	Run	B	2	BO/CO/GR		
440	Run	D	2	BO/CO/GR		
441	Run	E	3	BO/CO/GR		
442	Run	C	4	BO/CO/GR		
443	Run	B	3	BO/CO/GR		
444	Eddy	D	0	BO/CO/GR		
445	Glide	B	2	BO/CO/GR		
446	Salmonid	C	2	BO/CO/GR		Sub optimal spawning
447	Glide	E	3	BO/CO/GR		
448	Glide	E	2	BO/CO/GR		
449	Glide	D	2	BO/CO/GR		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
450	Glide	E	1	BO/CO/GR		
451	Glide	D	1	BO/CO/GR		
452	Glide	C	1	BO/CO/GR		
453	Run	C	2	BO/CO/GR		
454	Run	E	2	BO/CO/GR		
455	Eddy	E	0	BO/CO/GR		
456	Run	E	3	BO/CO/GR		
457	Glide	C	2	GR/CO/SA		
458	Run	E	4	BO/CO/GR		
459	Glide	B	2	GR/CO/SA		
460	Run	D	4	BO/CO/GR		
461	Run	C	4	BO/CO/GR		
462	Eddy	C	0	BO/CO/SA		
463	Torrent	C	5	BO/CO/GR		
464	Salmonid	B	3	BO/CO/GR		Parr/Fry
465	Run	A	3	BO/CO/GR		
466	Run	D	3	BO/CO/GR		
467	Riffle	A	2	BO/CO		
468	Glide	C	2	BO/CO/SA		
469	Run	C	3	BO/CO/SA		
470	Eddy	C	0	BO/CO/SA		
471	Run	D	4	BO/CO/GR		
472	Salmonid	C	4	BO/CO/GR		Parr
473	Run	A	2	CO/GR/SA		
474	Riffle	A	2	CO/GR/SA		
475	Run	A	2	CO/GR/SA		
476	Potential obstacle/obstruction to fish passage					
477	Potential obstacle/obstruction to fish passage					
478	Run	B	2	BO/SA/GR		
479	Riffle	A	2	BO/SA/GR		
480	Run	B	2	BO/SA/GR		
481	Riffle	A	2	BO/SA/GR		
482	Run	B	2	BO/SA/GR		
483	Run	B	3	BO/SA/GR		
484	Potential obstacle/obstruction to fish passage					
485	Run	B	2	BO/SA/GR		
486	Pool	C	1	BO/SA/GR		
487	Riffle	B	3	BO/CO/SA		
488	Run	B	3	BO/CO/SA		
489	Pool	C	1	BO/SA/SI		
490	Run	B	3	BO/CO/SA		
491	Potential obstacle/obstruction to fish passage					
492	Run	B	3	BO/CO/SA		
493	Pool	C	1	BO/SA/SI		
494	Potential obstacle/obstruction to fish passage					
495	Run	B	3	BO/CO/GR		
496	Riffle	B	3	BO/SA/GR		
497	Glide	C	1	BO/SA/CO		
498	Run	B	3	BO/SA/CO		
499	Riffle	B	3	BO/CO/GR		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
500	Run	B	3	BO/SA/CO		
501	Riffle	B	3	BO/CO/GR		
502	Run	B	3	BO/SA/CO		
503	Potential obstacle/obstruction to fish passage					
504	Pool	B	1	BO/SA/CO		
505	Run	A	2	BO/CO/GR		
506	Potential obstacle/obstruction to fish passage					
507	Run	A	2	BO/CO/GR		
508	Potential obstacle/obstruction to fish passage					
509	Run	B	3	BO/CO/GR		
510	Potential obstacle/obstruction to fish passage					
511	Pool	C	1	BO/CO/SA		
512	Run	B	2	BO/CO/GR		
513	Potential obstacle/obstruction to fish passage					
514	Run	B	2	BO/CO/GR		
515	Glide	B	1	BO/CO/GR		
516	Run	B	2	BO/CO/GR		
517	Run	B	3	BO/CO/GR		
518	Glide	B	2	BO/CO/GR		
519	Run	B	2	BO/CO/GR		
520	Glide	B	1	CO/GR/SA		
521	Riffle	B	2	BO/CO/GR		
522	Run	B	2	BO/CO/GR		
523	Pool	C	1	BO/CO/GR		
524	Run	B	2	BO/CO/GR		
525	Glide	B	2	CO/GR/SA		
526	Run	B	2	CO/GR/SA		
527	Run	B	3	BO/CO/GR		
528	Riffle	B	3	BO/CO/GR		
529	Run	B	3	BO/CO/GR		
530	Pool	C	1	CO/GR/SA		
531	Run	B	2	CO/GR/SA		
532	Riffle	B	2	BO/CO/GR		
533	Glide	C	1	BO/CO/GR		
534	Riffle	B	2	BO/CO/GR		
535	Run	B	2	BO/CO/GR		
536	Glide	C	2	CO/GR/SA		
537	Run	B	2	BO/CO/GR		
538	Glide	B	3	BO/CO/GR		
539	Riffle	B	3	BO/CO/GR		
540	Glide	B	2	BO/CO/GR		
541	Run	B	2	BO/CO/GR		
542	Riffle	B	3	BO/CO/GR		
543	Glide	B	2	BO/CO/GR		
544	Pool	D	1	BO/CO/GR		
545	Riffle	B	1	BO/CO/GR		
546	Riffle	B	3	BO/CO/GR		
547	Run	C	3	BO/CO/GR		
548	Riffle	B	3	BO/CO/GR		
549	Glide	C	2	BO/CO/GR		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
550	Riffle	B	3	BO/CO/GR		
551	Glide	C	2	CO/GR/SI		
552	Riffle	B	3	CO/GR/SA		
553	Glide	C	2	CO/GR/SA		
554	Riffle	B	2	BO/CO/GR		
555	Pool	D	1	CO/GR/SA		
556	Glide	C	2	CO/GR/SA		
557	Riffle	B	2	CO/GR/SA		
558	Glide	C	2	CO/GR/SA		
559	Pool	C	1	CO/GR/SA		
560	Glide	C	2	CO/GR/SA		
561	Riffle	B	3	CO/GR/SA		
562	Glide	B	2	CO/GR/SA		
563	Riffle	B	3	CO/GR/SA		
564	Glide	B	2	CO/GR/SA		
565	Riffle	B	3	CO/GR/SA		
566	Run	B	2	CO/GR/SA		
567	Glide	B	2	CO/GR/SA		
568	Run	B	2	CO/GR/SI		
569	Riffle	B	2	CO/GR/SI		
570	Run	B	2	CO/GR/CL		
571	Glide	B	1	CO/GR/SI		
572	Glide	C	1	CO/GR/SI		
573	Run	A	2	CO/GR/SI		
574	Run	B	2	CO/GR/SA		
575	Glide	B	2	CO/GR/SA		
576	Pool	C	1	GR/SA/SI		
577	Potential obstacle/obstruction to fish passage					
578	Pool	C	1	GR/SA/SI		
579	Glide	B		CO/GR/SA		
580	Potential obstacle/obstruction to fish passage					
581	Glide	B	1	CO/GR/SA		
582	Run	B	2	CO/GR/SA		
583	Run	B	3	CO/GR/SA		
584	Glide	C	1	BO/CO/GR		
585	Glide	B	1	CO/GR/SA		
586	Potential obstacle/obstruction to fish passage					
587	Run	B	2	BO/CO/GR		
588	Glide	B	2	BO/CO/GR		
589	Run	B	3	BO/CO/GR		
590	Glide	C	2	BO/CO/GR		
591	Run	B	2	CO/GR/SA		
592	Glide	B	2	CO/GR/SA		
593	Glide	B	2	GR/SA/SI		
594	Potential obstacle/obstruction to fish passage					
595	Run	B	2	GR/SA/SI		
596	Glide	C	2	GR/SA/SI		
597	Run	B	2	CO/GR/SA		
598	Run	B	3	CO/GR/SA		
599	Glide	B	2	GR/SA/SI		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
600	Pool	C	1	GR/SA/SI		
601	Run	B	3	BO/CO/GR		
602	Run	B	2	BO/CO/GR		
603	Riffle	B	3	BO/CO/GR		
604	Run	B	2	BO/CO/GR		
605	Glide	B	1	BO/CO/GR		
606	Riffle	B	2	BO/CO/GR		
607	Potential obstacle/obstruction to fish passage					
608	Run	B	2	BO/CO/GR		
609	Glide	C	2	CO/GR/SA		
610	Potential obstacle/obstruction to fish passage					
611	Run	B	2	BO/CO/GR		
612	Glide	B	1	GR/SA/SI		
613	Glide	C	1	GR/SA/SI		
614	Glide	B	1	GR/SA/SI		
615	Potential obstacle/obstruction to fish passage					
616	Run	B	2	CO/GR/CL		
617	Riffle	B	3	CO/GR/SA		
618	Pool	C	1	CO/GR/SA		
619	Run	B	2	CO/GR/SA		
620	Glide	B	3	CO/GR/SA		
621	Glide	B	2	CO/GR/SA		
622	Riffle	A	1	CO/GR/SA		
623	Glide	B	2	CO/GR/SA		
624	Run	B	2	CO/GR/SA		
625	Glide	C	2	CO/GR/SA		
626	Run	B	2	CO/GR/SA		
627	Glide	B	2	CO/GR/SA		
628	Glide	C	1	SA/SI		
629	Potential obstacle/obstruction to fish passage					
630	Run	B	2	CO/GR/SA		
631	Run	C	2	CO/GR/SA		
632	Pool	C	1	CO/GR/SA		
633	Run	B	2	CO/GR/SA		
634	Run	C	3	BO/CO/GR		
635	Run	E	3	BO/CO/GR		
636	Glide	D	2	BO/CO/BE		
637	Potential obstacle/obstruction to fish passage					
638	Torrent			BO/CO		
639	Run	D	3	BE/CO/BO		
640	Run	D	4	BO/CO/GR		
641	Run	E	3	BE/CO/BO		
642	Run	C	2	BE/CO/GR		
643	Run	D	3	BO/CO/GR		
644	Run	B	2	BO/CO/GR		
645	Lamprey	C	0	SA/SI/GR	Sub-optimal	
646	Riffle	B	3	BO/CO/GR		
647	Lamprey	B	1	SA/SI/GR	Sub-optimal	
648	Lamprey	B	1	SA/SI	Optimal	
649	Run	C	3	BO/CO/GR		

Target Note	Flow Type	Water depth	Water velocity	Dominant substrate	Vegetation type and % coverage	Habitat type
650	Glide	B	2	BO/CO/GR		
651	Salmonid	B	3	BO/CO/GR		Fry
652	Lamprey	C	1	SI/SA/GR		Sub-optimal
653	Run	C	3	BO/CO/GR		
654	Salmonid	C	4	BO/CO/GR		Parr
655	Lamprey	B	0	SI/SA/GR		Sub-optimal
656	Run	C	3	BO/CO/BE		
657	Run	C	3	BO/CO/GR		
658	Run	C	3	BO/CO/BE		
659	Run	D	4	BO/CO/GR		
660	Salmonid	C	4	BO/CO/GR		Parr
661	Run	D	4	CO/GR/SA		
662	Run	B	2	CO/GR/SA		
663	Run	C	2	CO/GR/SA		
664	Run	C	3	CO/GR/SA		
665	Eddy	D	0	BO/CO/GR		
666	Lamprey	C	1	SI/SA/GR		Sub-optimal
667	Run	D	3	CO/GR/SA		
668	Run	C	3	BO/CO/GR		
669	Eddy	E	0	BO/CO/GR		
670	Pool	D	3	BO/CO/GR		
671	Run	D	3	BO/CO/GR		
672	Glide	D	3	BO/CO/GR		
673	Lamprey	C	1	SI/SA/GR		Sub-optimal
674	Glide	C	2	BO/CO/GR		
675	Glide	C	3	BO/CO/GR		
676	Glide	D	2	BO/CO/GR		
677	Run	D	1	BO/CO/GR		
678	Eddy	C	0	BO/CO/GR		
679	Pool	C	1	BO/CO/GR		
680	Pool	E	1	BO/CO/GR		
681	Glide	D	2	BO/CO/GR		
682	Pool	D	1	BO/CO/GR		
683	Glide	C	3	BO/CO/GR		
684	Salmonid	B	3	BO/CO/GR		Fry
685	Glide	C	2	BO/CO/GR		
686	Glide	C	3	BO/CO/GR		
687	Salmonid	C	3	BO/CO/GR		Sub-optimal spawning
688	Run	C	4	BO/CO/GR		
689	Eddy	D	0	BO/CO/GR		
690	Salmonid	B	4	BO/CO/GR		Fry
691	Lamprey	C	1	SI/SA		Optimal
692	Eddy	C	0	BO/CO/GR		
693	Glide	D	2	BO/GR/CO		
694	Run	C	3	BO/CO/GR		
695	Pool	E	1	BO/GR/CO		
696	Lamprey	C	1	SI/SA/GR		Sub-optimal



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