P2024037 Merkland Burn river habitat walkover survey report

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Client

Merkland Burn Hydropower Ltd.

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Reviewed by

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1. Introduction

1.1. Background

Merkland Burn Hydropower Ltd. are proposing a new run-of-river hydro scheme on the Merkland Burn, near Brodick, on the Isle of Arran (the Proposed Project). The proposed scheme includes an intake featuring a weir, along with a powerhouse and outfall located just north of the A841.

The Merkland Burn is a short watercourse located on the east of the Isle of Arran near Brodick Castle. The burn rises on the slopes between Maol Donn and Goat Fell and flows for approximately 3 km through the steep Merkland Wood. It then discharges into the Firth of Clyde at Brodick Bay.

1.2. Project location

The locations of key infrastructure required for the Proposed Project, as provided by the Client, are shown in Figure 1.1. The extent of Merkland Burn within the dewatered zone, between the intake and outfall, will be surveyed along with a standard 100 m (upstream) and 500 m (downstream) buffer, where access allows.

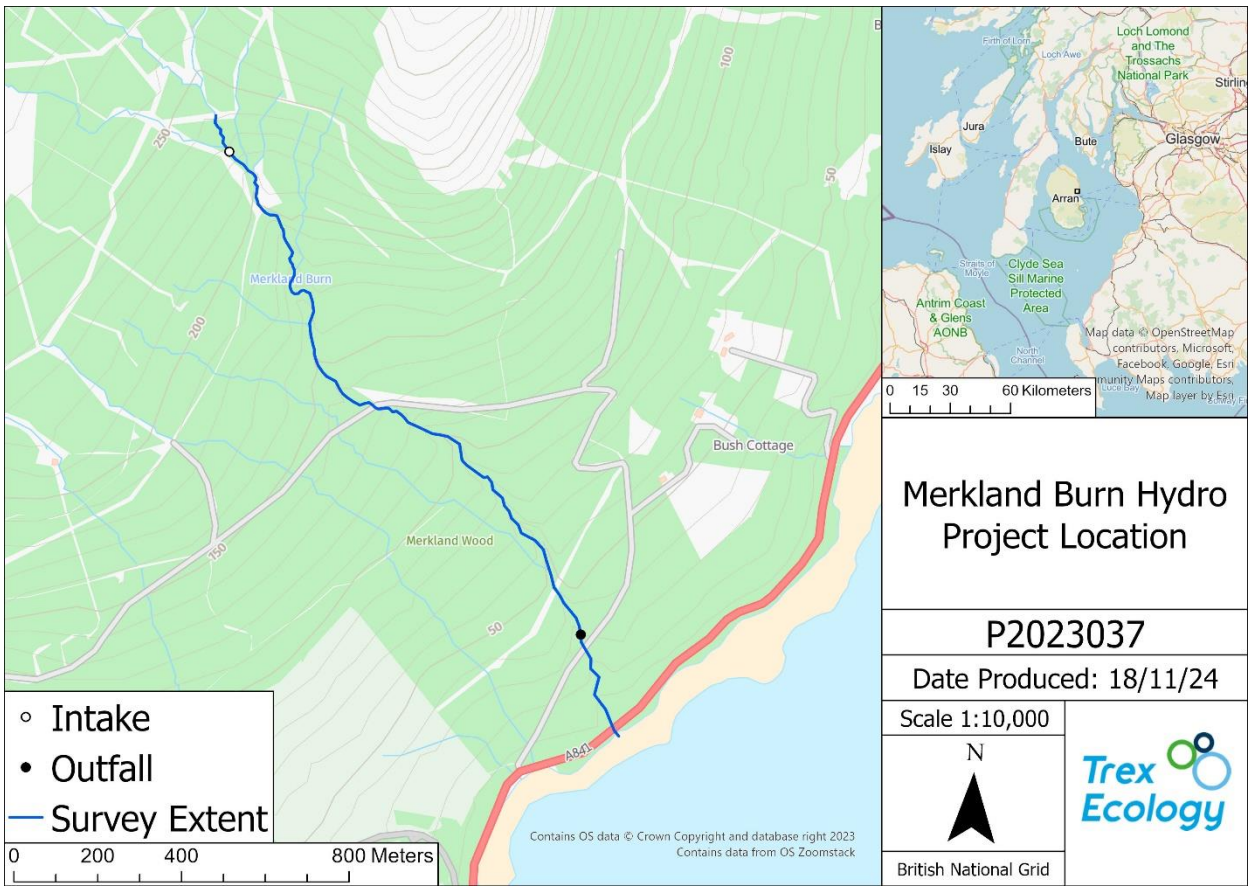

Figure 1.1. Project location

1.3. Project Scope

Merkland Burn Hydropower Ltd. have commissioned Trex Ecology Ltd. to undertake a fish habitat walkover survey along the area that will be subjected to reduced flow between the intake and outfall (i.e., the dewatered zone), along with the additional 100 m upstream and the remaining section of channel below the outflow. This is to identify the presence of the relevant sensitive receptors that could potentially be affected by the works.

Specifically, Trex Ecology will deliver the following:

I. Desk-based assessment;
II. River habitat walkover survey; and
III. Report of findings.

1.4. Purpose of this document

This document presents the methods used to identify the potential presence of relevant species (the receptors) through the determination of related habitats (the walkover surveys). It includes the results of the Desk-Based Assessment (DBA) and the walkover survey and provides a discussion and interpretation of all findings within the context of the legal frameworks involved.

2. Approach

2.1. Review of available information

The DBA was undertaken to assess the available information on the presence of important and relevant ecological receptors. It also highlights key regulatory information that should be understood, such as the Water Framework Directive (WFD) Status Classifications which could influence the outcomes of this report. The sources of data assessed are detailed below in Table 2.1.

Table 2.1. Data sources assessed

Asset	Location	Date accessed	Purpose
NatureScot Site Link	https://sitelink.nature.scot/map	25/11/24	Identify relevant protected areas/species
SEPA WFD data	https://www.sepa.org.uk/data-visualisation/water-environment-hub/	25/11/24	Identify current WFD status of the site
SEPA river barrier locations	https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1746	25/11/24	Identify channel barriers to fish migration
OS Maps 1:25K layer	https://explore.osmaps.com/	04/11/24	Identify channels to be surveyed and to ascertain information on the site
Marine Scotland salmon map	https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=843	25/11/24	Salmond distributions
Marine Scotland NEPS data	https://scotland.shinyapps.io/sg-national-electrofishing-programme-scotland/	25/11/24	NEPS Survey overview

2.2. Walkover survey

Survey Extents

The full survey extent comprises the channel within the dewatered zone along with the standard buffers described in Section 1.2. Therefore the entire burn was surveyed from the tidal zone to 100 m upstream of the proposed intake. The survey extent is summarised in Table 2.2 and presented in Figure 2.1, overleaf.

Table 2.2. Surveyed channels

Watercourse	U/S NGR	D/S NGR	Distance (m)
Merkland Burn	NS 01280 39788	NS 02231 38321	1,997

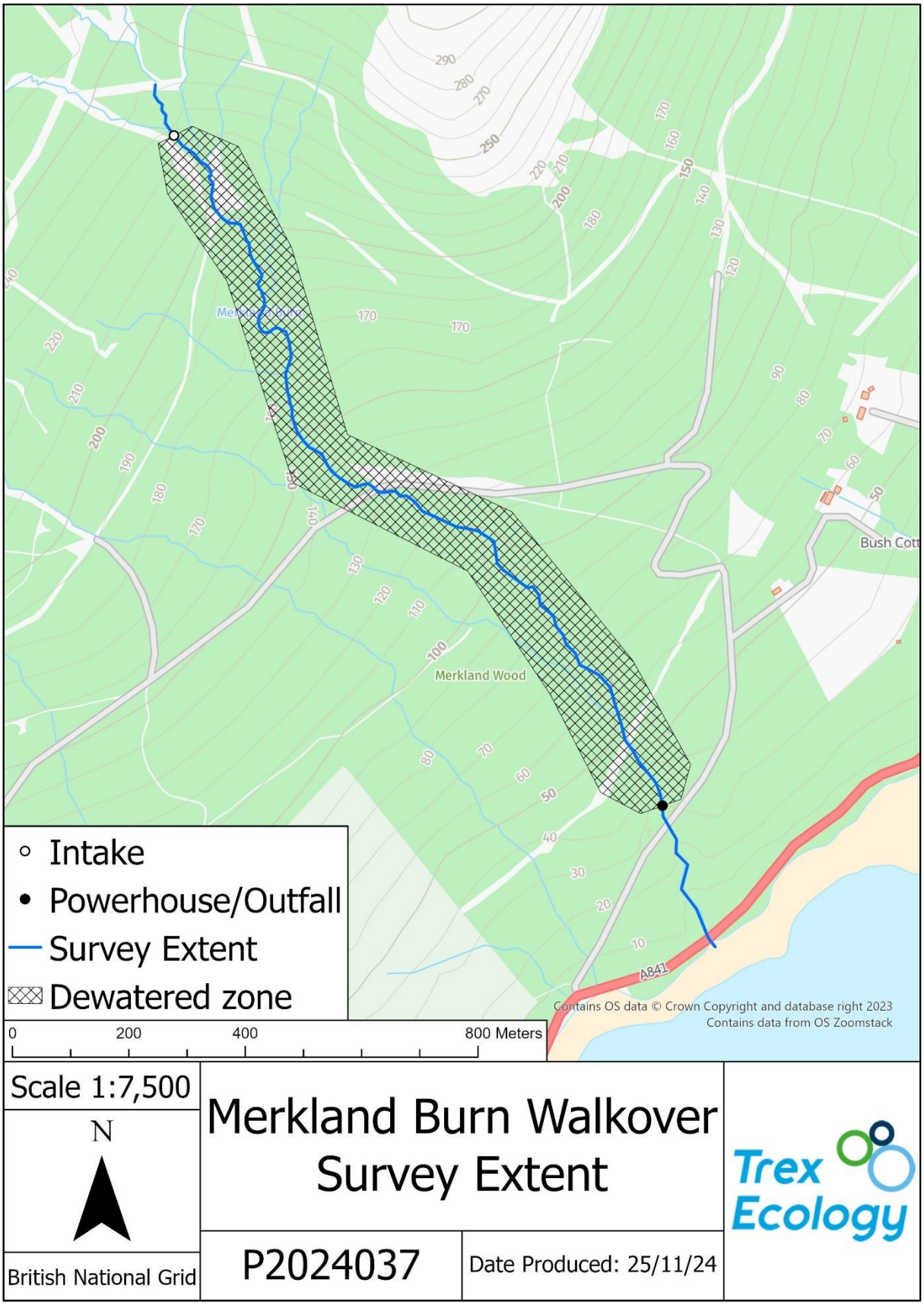

Figure 2.1. Surveyed channels

Fish habitat walkover

A detailed river habitat walkover survey, including a complete inventory of relevant habitats for fish, was conducted at the site shown above in Figure 2.1. This habitat walkover took the form of an adapted Hendry & Cragg-Hine, (1997) approach to identify important features. The approach has been made more robust by incorporating elements of the River Habitat Survey (RHS, Raven *et al*., 1998) and River Habitat Assessment Technique (RHAT, Toland *et al*., 2008), allowing for a longer-term determination of habitat presence, which is more resistant to seasonal factors and provides a multi-species assessment.

These features include the presence and composition of deposition features; salmonid and lamprey spawning habitat; the presence of lamprey juvenile habitat; and in-channel structures such as Large Woody Debris (LWD), debris dams and bank undercuts. The presence of other current pressures such as weirs, fords, morphological alteration (e.g., straightening) and stock poaching was also included. These features were recorded using a "point and line" based approach. Additionally, flow types and in-channel features characterised by area based attributes rather than linear or point-based ones, such as riffles, runs, barforms, and islands, were recorded using a “polygon” based approach. A complete inventory of habitat features is presented in Appendix A

Channel survey tables were created on ArcGIS home and exported to the Field Maps App hosted on iPads Version 7. Offline versions of the survey area were then created and stored on the iPads ensuring feature collection would continue in the absence of mobile reception. The iPads were geolocated using the Garmin Glo GPS/Glonass portable receiver attached via Bluetooth. System redundancy was provided by iPhones meaning data collection could continue using the same approach if the iPads ran out of battery power.

3. Results

3.1. Desktop review

Protected areas and species

The Proposed Project is situated in the North Arran National Scenic Area (NSA). However, there are no relevant Special Areas of Conservation (SAC) or Sites of Special Scientific Interest (SSSI) within the vicinity of the Proposed Project that relate to freshwater habitats.

Atlantic salmon (*Salmo salar*), sea / brown trout (*Salmo trutta*), all three lamprey species (brook (*Lampetra planeri*), river (*Lampetra fluviatilis*), and sea (*Petromyzon marinus*)) and European eel (*Anguilla anguilla*) are the primary receptors considered as part of this report.

The Salmon Act

All channels within the assessment area are potentially subject to the requirements of the Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act, 2003, aka the Salmon Act, irrespective of whether they are located within a protected area, such as an SAC. Under this Act, it may be an offence to, recklessly or otherwise, interfere with the spawning and migration of anadromous salmonids. It also protects spawning habitats. This act is regulated by the local District Salmon Fishery Board (DSFB), in this case the Argyll District Salmon Fishery Board (ADSFB).

Atlantic salmon

Atlantic salmon are of high conservation value and protected under the European Habitats Directive and the Salmon Act. They are listed as a priority species for conservation on the Scottish Biodiversity List (NatureScot, 2020a), and now classified as *Endangered* in the UK (Nunn *et al.*, 2023) and *Near Threatened* globally on the International Union for Conservation of Nature (IUCN) Red List (Darwall, 2023). The abundance of Atlantic salmon has declined markedly (Maguire *et al*., 2023), and according to the Atlantic Salmon Trust, wild salmon are in crisis, with a decline of 70% in the last few decades (Bull *et al*., 2022).

Trout

Sea trout have the same legal protection as Atlantic salmon under the Salmon Act. It is not possible to establish with absolute certainty whether a given juvenile trout is a sea trout or resident brown trout based on observation (they are the same species with differing life history strategies). This is an important consideration, given the legal protection afforded to sea trout. They are listed as a priority species for conservation on the Scottish Biodiversity List, and their exploitation and capture are reserved under the Salmon Act. They are listed as *Least Concern* (Freyhof, 2011) on the IUCN Red List of Threatened Species.

Lamprey

There are three species of lamprey found in Scotland: sea, river, and brook. Although none of these species holds specific protected status other than restrictions on their method of capture (Schedule 3 Conservation (Natural Habitats, &c.) Regulations 1994) (as amended), they can form the basis of protected area designations elsewhere in Scotland. They are also listed as priority species for conservation on the Scottish Biodiversity List. All three species are listed as *Least Concern* (Freyhof & Brooks, 2011) on the European Red List of Freshwater Fishes prepared by IUCN.

European eel

The European eel is protected under The Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008 and is also protected by measures relating to previous compliance with

Council Regulation (EC) No 1100/2007 - Establishing measures for the recovery of the stock of European eel. An eel management plan has been produced for Scotland (DEFRA, 2010) in support of this regulation, and they are also a priority species for conservation in the Scottish Biodiversity List. They are listed as *Critically Endangered* (Pike *et al.,* 2020) on the IUCN Red List of Threatened Species

Water Framework Directive

The Merkland Burn does not have a WFD classification as it is below the Water Body catchment area threshold.

Obstacles

There are no barriers listed on the SEPA barriers database available on the Marine Scotland Science (MSS) map portal NMPi (MSS, 2021a) throughout the survey extent. However, given the small size of this channel it may be possible that any barriers on this channel have not yet been recorded.

Based on this information, and unless evidence suggests otherwise, it should be assumed that migratory species are likely capable of accessing Merkland Burn. However, barriers are often unrecorded and become apparent during surveys.

Salmonid distribution

The salmonid distribution database available on the MSS map portal NMPi (MSS, 2022) shows salmon and sea trout as absent from Merkland Burn.

The National Electrofishing Programme for Scotland (NEPS) data from 2018 and 2019 (MSS, 2021b) also indicates that salmon and trout are absent from Merkland Burn.

3.2. Walkover survey results

The walkover surveys were undertaken by [redacted], Trex Ecology Ltd., on the 20th of November 2024. River levels were low, and weather conditions were good with sunshine throughout.

The walkover maps are presented in Figures 3.1-3.6 in a downstream to upstream manner. Representative site images are provided in Figures 3.7-3.14.

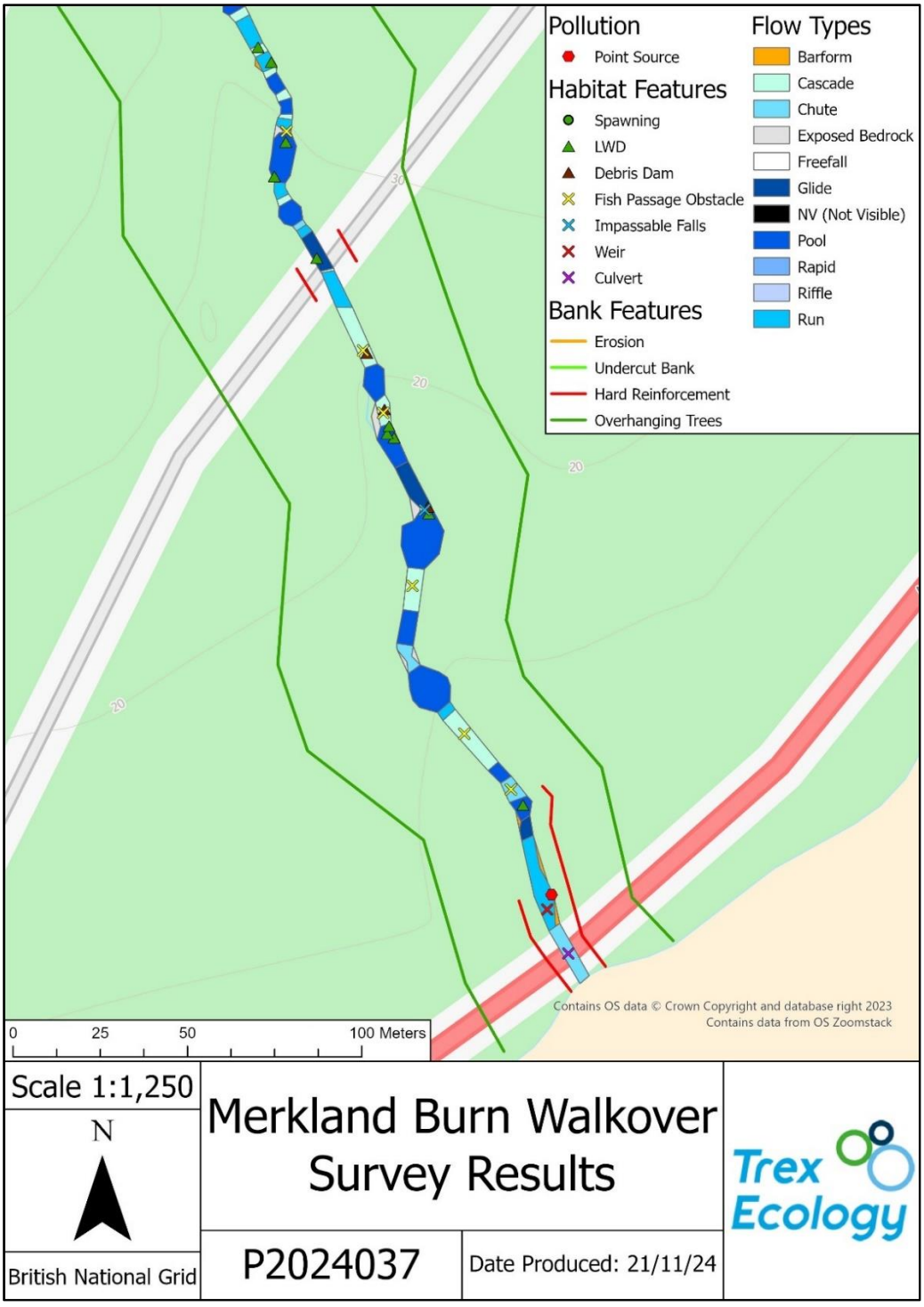

Figure 3.1. Walkover survey results map 1

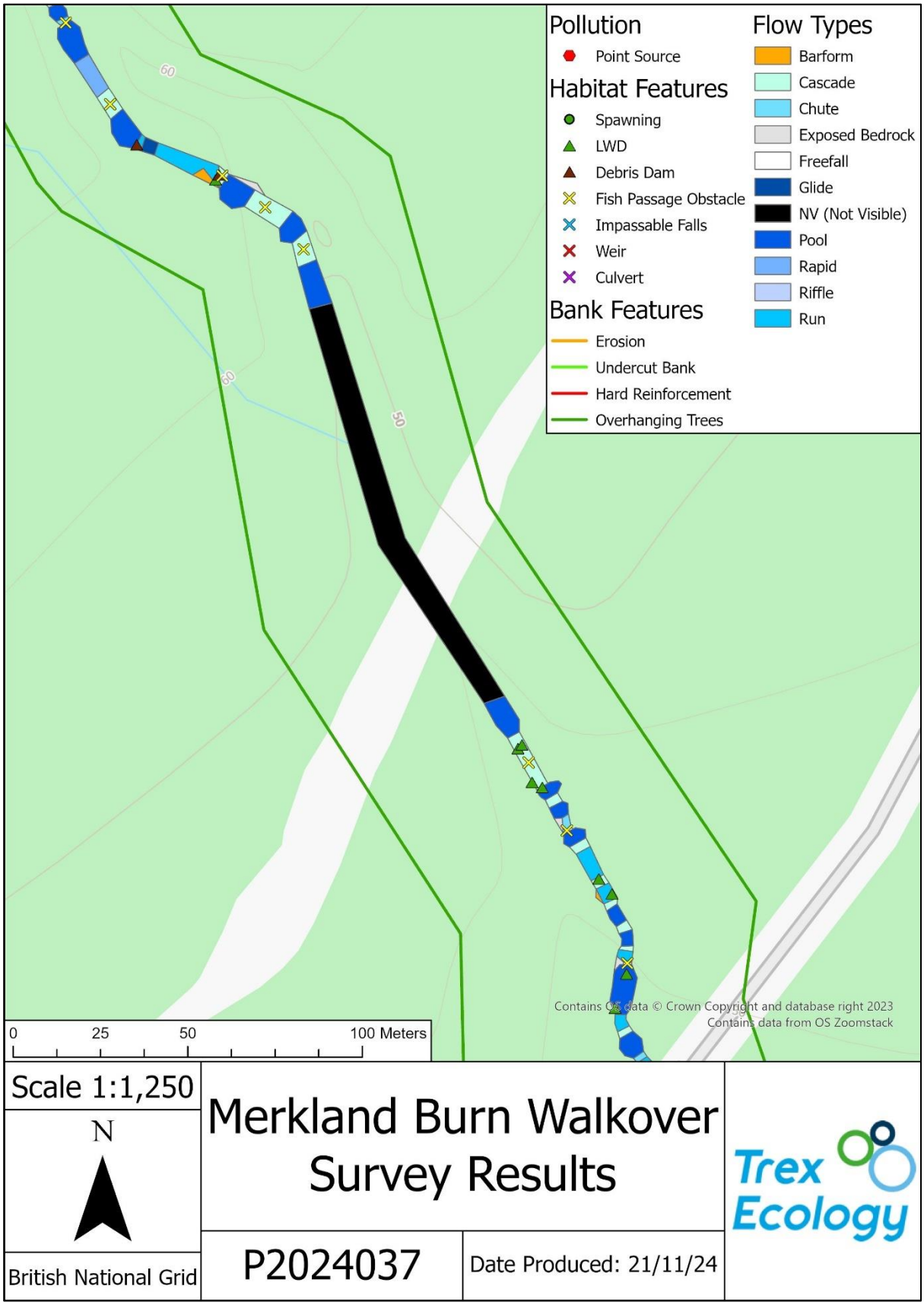

Figure 3.2. Walkover survey results map 2

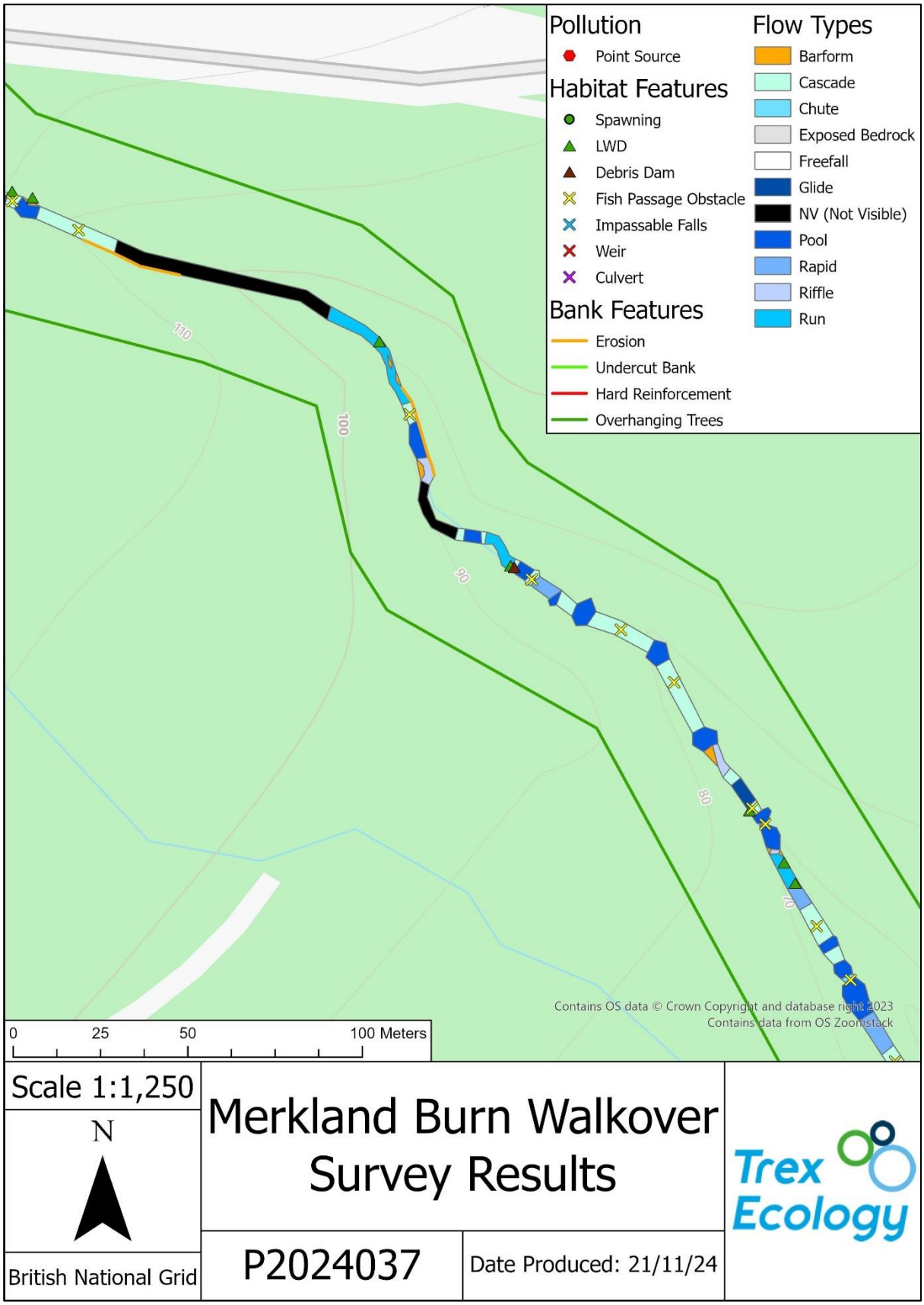

Figure 3.3. Walkover survey results map 3

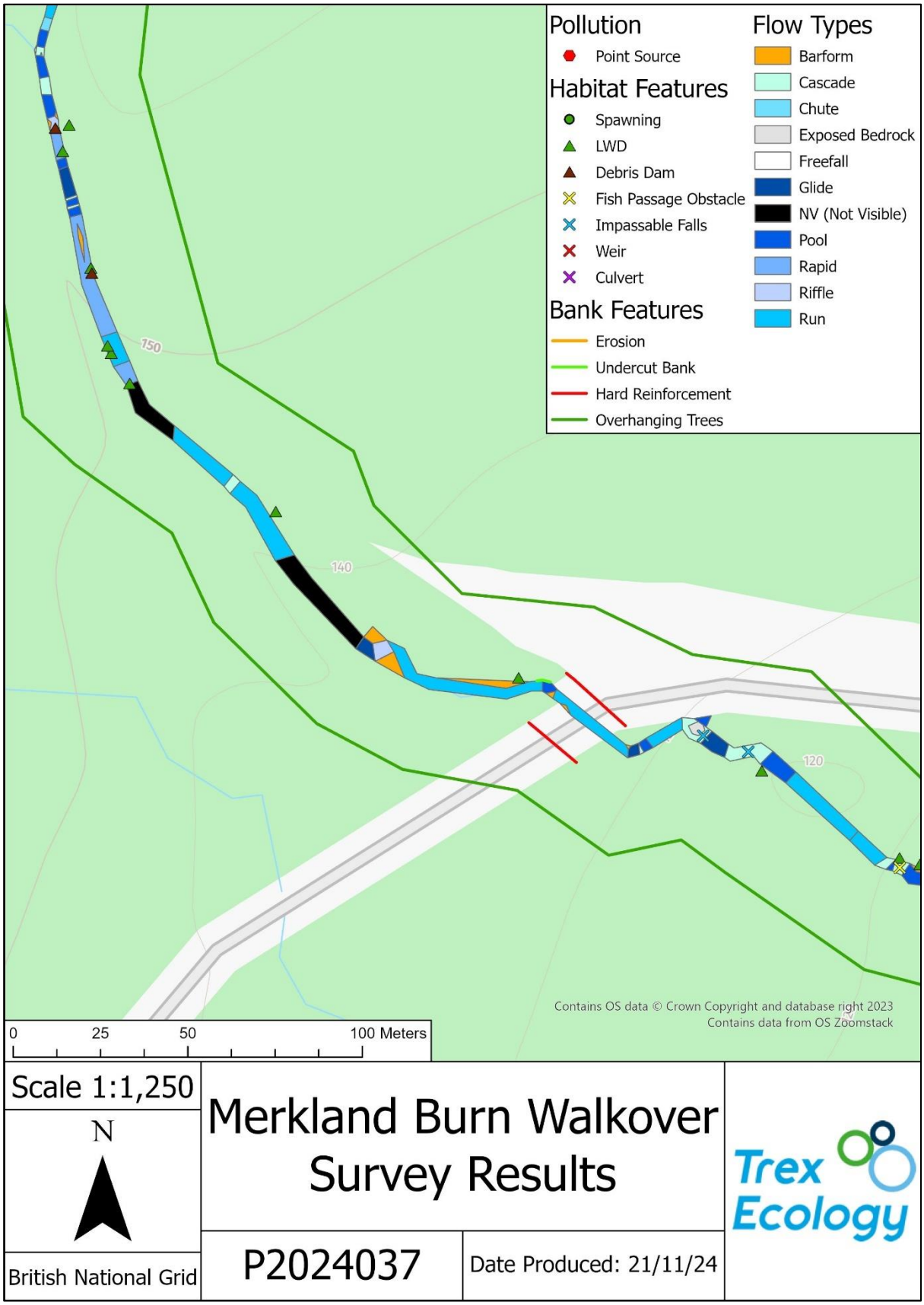

Figure 3.4. Walkover survey results map 4

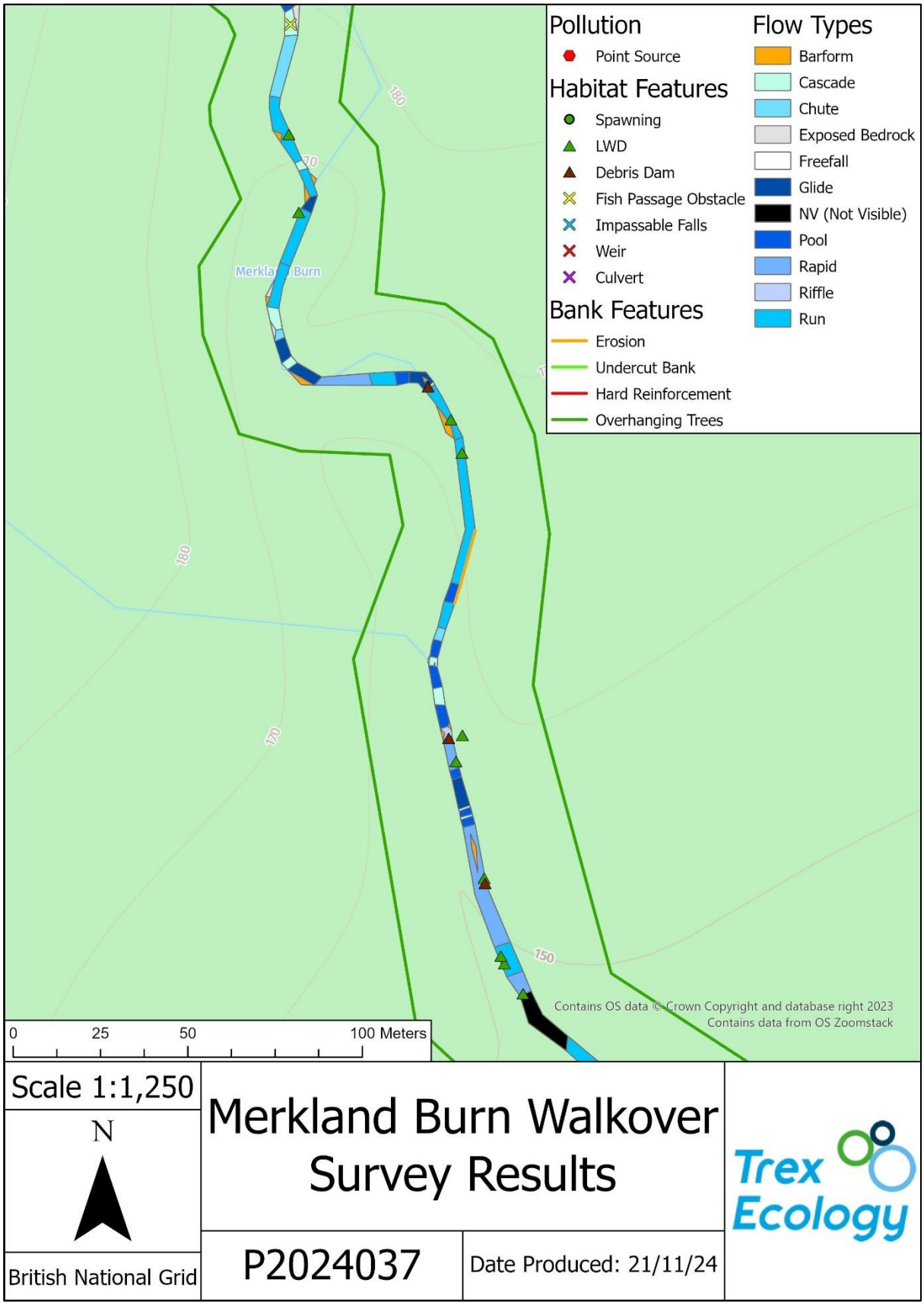

Figure 3.5. Walkover survey results map 5

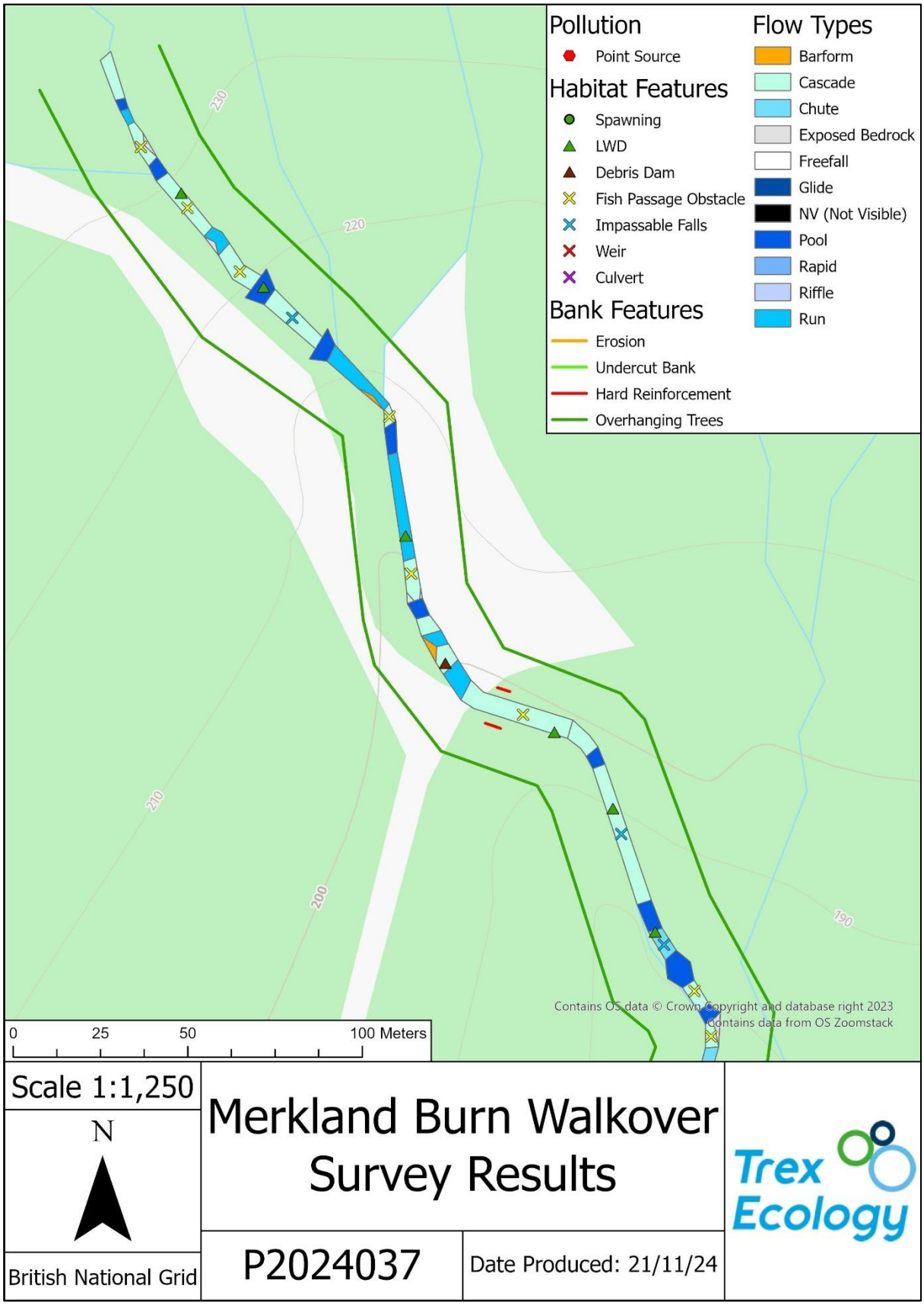

Figure 3.6. Walkover survey results map 6

The Merkland Burn is a steep and energetic watercourse that flows through a wooded gorge dominated by bedrock. At the downstream end of the survey extent, where Merkland Burn discharges into the Firth of Clyde, the channel passes through a double arched culvert under the A841 (see Figure 3.7), which in certain conditions is a possible barrier to fish passage. Upstream of the culvert, there is a run with a boulder weir, which is potentially passable, and small areas of barform which have mixed substrate sizes from gravels to boulders. Hard reinforcement is present on both banks and overhanging trees are also present on both banks providing shade and cover for fish.

Figure 3.7. Culvert under the A841

Upstream of this area, there is a pool with some LWD present which can provide fish cover from predators and increase storage of substrates. However, from here to where the forestry track crosses over the channel, the channel form and slope changes. The channel is within a deep gorge and becomes predominately a steep bedrock channel with various cascade-step-pool complexes present. Exposed bedrock is present throughout and is the dominant substrate. Five cascades are likely fish passage obstacles with one impassable falls present. LWD is present throughout and three of these obstacles are made more difficult to navigate due to debris dams gathering (see Figure 3.8, overleaf). Overhanging trees are present along both banks.

Figure 3.8. Impassable falls and debris dam

The channel then passes under the forestry track bridge which is reinforced on both sides to the outfall location. The cascade-step-pool pattern continues upstream of here with bedrock substrates dominant and three further fish passage obstacles. LWD is again present in the channel with overhanging trees along both banks. The channel sits within an inaccessible steep gorge and was Not Visible (NV) from the top of the bank.

The channel form upstream of the NV section is of a similar character (see Figure 3.9, overleaf) to below. There is some storage of substrates in the channel. However, these are probably mobile and have been deposited behind bedrock or boulders. The channel remains in a steep gorge and is NV in places. Fourteen further fish passage obstacles are present through this section with two impassable falls present just downstream of the forestry track bridge (see Figure 3.10, overleaf). LWD is again present along with three debris dams. Erosion is apparent in a few places and has caused a small landslip (see Figure 3.11, overleaf). Overhanging trees continue along both banks.

Figure 3.9. Cascade-step-pool

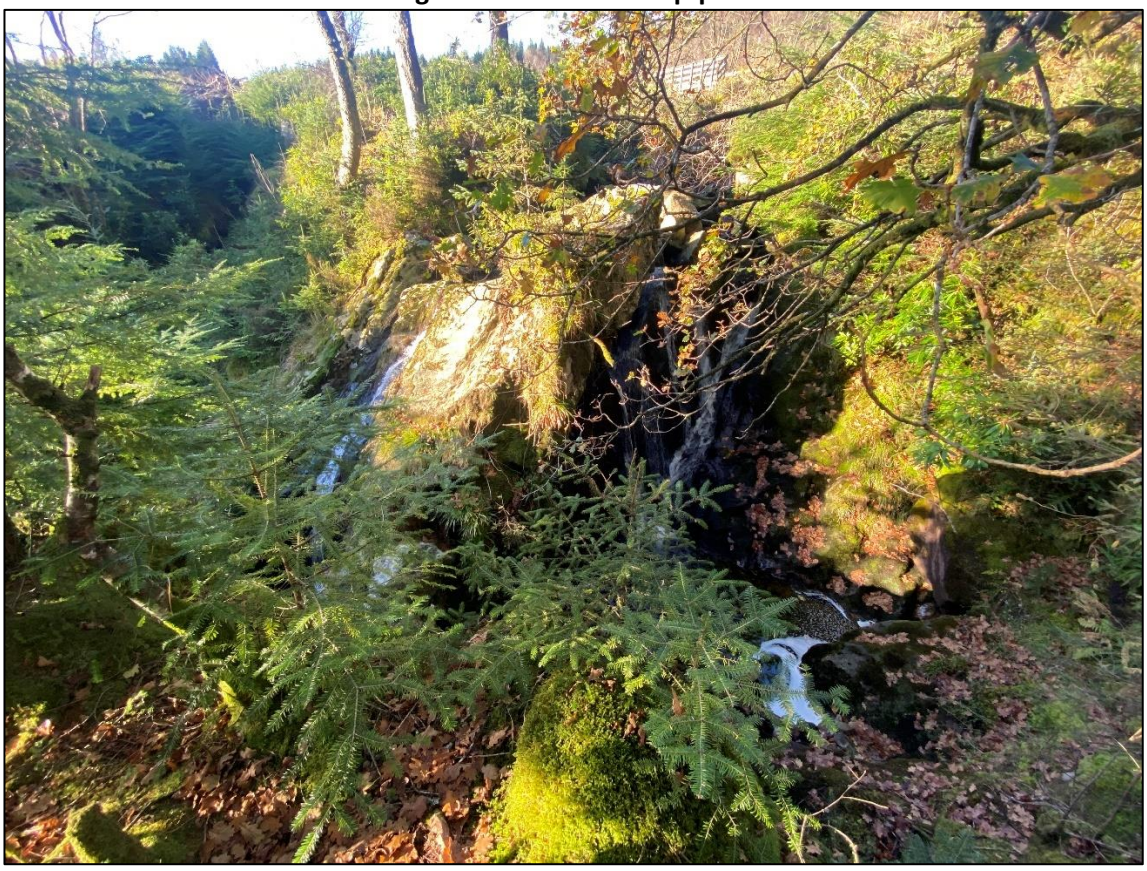

Figure 3.10. Impassable falls

Figure 3.11. Landslip along riverbank

The forestry track bridge is supported by hard reinforcement. Upstream of the hard reinforcement on the Left-Hand Bank (LHB) there is an undercut bank. There is a reduced channel slope immediately upstream of the bridge and as a result there is increased substrate storage, predominately cobble and gravel/pebble, as shown by the presence of barforms (see Figure 3.12, overleaf). Flow types also consist of runs and riffles with cobble and boulder substrates within the channel. LWD is present with overhanging trees along both banks. The channel becomes NV shortly upstream of here due to dense vegetation.

Figure 3.12. Substrate storage in the form of a cobble gravel/pebble barform

Upstream of the short NV section, the channel remains energetic, but the slope is reduced resulting in areas of rapid flow type instead of steep cascades and shorter cascade-step-pool sequences. There are short sections where the channel is NV due to a combination of dense vegetation and steep bank slopes. In the channel, the substrates are predominantly boulder and bedrock, with smaller substrates such as cobble and gravel/pebble stored in barforms. There are several pieces of LWD present which have formed debris dams at three separate points and overhanging trees are present along both banks. There was one area of erosion on the LHB that had resulted in a landslip.

Closer to the proposed intake, the channel slope remains high and is set within another steep sided gorge. Flow types are dominated by bedrock cascades, chutes and freefalls, several of which are likely impassable, broken up by areas of pool. There are eight fish passage obstacles recorded here and three impassable falls (see Figure 3.13, overleaf). LWD and overhanging trees are again present throughout with one debris dam forming. There is a short section of hard reinforcement with what appears to be an old gate over the channel (see Figure 3.14, overleaf). At the proposed intake, bedrock cascades are present and there is no habitat for fish.

Figure 3.13. Impassable bedrock cascades and freefalls

Figure 3.14. Old gate over channel

4. Discussion

4.1. Caveats and survey limitations

Accessibility to the entire channel was the only survey limitation. There were several instances where the channel was not visible due to it either being within a bedrock gorge or dense vegetation. However, this did not affect the findings of the survey.

4.2. Survey findings

The Proposed Project is not within any protected areas that are relevant to freshwater species or habitats.

The DBA did not identify any barriers to fish migration; however, following the walkover survey it is very clear that diadromous fish (Atlantic salmon, sea trout, river and sea lamprey and eel) are unlikely to use the Merkland Burn due to access issues. There are six impassable falls, 30 natural fish passage obstacles, one culvert and one weir present in the survey extent. The furthest downstream impassable falls is located only 150 m from where the Merkland Burn discharges into the Firth of Clyde and is approximately 100 m downstream of the outfall. These falls likely delimit the accessibility of this channel to diadromous species, meaning they are likely absent from the dewatered zone.

The Merkland Burn through much of the survey extent is a steep, energetic bedrock channel and as such, no suitable salmonid spawning habitat was recorded. The burn is unlikely to be a productive channel for fish, and the risk to receptors is minimal.

4.3. Next steps

Mitigations should consider the risk of downstream pollution during construction and operations to the downstream buffer and to Brodick Bay. Plans should correspond to the relevant regulatory documentation such as SEPA (2015) and NatureScot (2020b).

Discussion with SEPA, NatureScot and the ADSFB is advised to agree specific mitigation requirements, with mitigations secured within the Construction Management Plan (CMP) and operations plan.

5. Conclusions

In summary, the walkover survey confirms that the survey extent is largely inaccessible to the receptors discussed, including the entire dewatered zone, and where accessible there is no spawning habitat.

Mitigations should consider the potential risks of downstream pollution during construction and operations and should be agreed with regulators.

6. References

[redacted] The likely suspects framework: the need for a life cycle approach for managing Atlantic salmon (Salmo salar) stocks across multiple scales. *ICES Journal of Marine Science*. 79(5):1445-1456.

[redacted] 2023. *Salmo salar. The IUCN Red List of Threatened Species 2023*: e.T19855A67373433. [Accessed: 25/11/24].

DEFRA. 2010. *Eel Management plans for the United Kingdom: Scotland River Basin District*. Department for Environment, Food and Rural Affairs Commissioned Report.

[redacted] 2011. *Salmo trutta*. *The IUCN Red List of Threatened Species* 2011: e.T19861A9050312. Available online at: https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T19861A9050312.en. [Accessed: 25/11/24].

[redacted] E. 2011. *European Red List of Freshwater Fishes*. Publications Office of the European Union. Luxembourg.

[redacted] 1997. *Restoration of riverine salmon habitat.* EA Fisheries Technical Manual 4. EA Bristol.

[redacted] E.J. 2023. *Report of the Third NASCO Performance Review.* Available online at: https://nasco.int/wp-content/uploads/2023/05/CNL2317rev_Report-of-the-Third-NASCO-Performance-Review.pdf. [Accessed: 25/11/24].

Marine Scotland Science. 2021a. *SEPA barrier database*. Available online at: https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=1746 [Accessed: 25/11/24].

Marine Scotland Science. 2021b. *National Electrofishing Programme for Scotland data app*. Available online at: https://scotland.shinyapps.io/sg-national-electrofishing-programme-scotland/ [Accessed: 25/11/24].

Marine Scotland Science. 2022. Scottish Salmon Rivers. Available online at: https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=843 [Accessed: 25/11/24].

NatureScot. 2020a. *Scottish Biodiversity List*. Available online at: https://www.nature.scot/doc/scottish-biodiversity-list [Accessed: 25/11/24]

NatureScot. 2020b. *Guidance – Guide to Hydro Construction Best Practice.* Available online at: https://www.nature.scot/doc/guidance-guide-hydro-construction-good-practice [Accessed: 25/11/24].

[redacted] Extinction risks and threats facing the freshwater fishes of Britain. *Aquatic Conservation in Marine and Freshwater Ecosystems*. 2023:1-7

[redacted] *Anguilla anguilla*. *The IUCN Red List of Threatened Species 2020*: e.T60344A152845178. Available online at: https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T60344A152845178.en [Accessed: 25/11/24].

[redacted]. *Quality Assessment using River Habitat Survey Data.* Aquatic Conservation Marine and Freshwater Ecosystems. 8:477-499.

SEPA. 2015. *Guidance for developers od run-of-rover hydropower schemes*. 37pp.

[redacted] 2008. *The River Hydromorphology Assessment Technique; A WFD compliant assessment method for Ireland*. Nor. rn Ireland Environment Agency Water Management Unit, Lisburn.

Appendix A: List of Habitat walkover features (Standard)

A1.1. Features recorded

Feature Class	Feature	Code	Type
In-channel features	Side Channel	SC	Polygon
	Side bar *	Sb	Polygon
	Mid channel bar*	MCB	Polygon
	Point Bar*	Pb	Polygon
	Island	Mi	Polygon
	Debris dams	Dd	Polygon
	Large woody debris	LWD	Point
	Ford	Fo	Polygon
	Culvert	Cu	Polygon
	Erratic boulders	Bo	Point
	Lithophilic spawning habitat	X	Point
Modifications	Weir	W	Point
	Ford	Fo	Polygon
	Culvert	Cu	Polygon
	Channel reinforcement	Ri	Polygon
	Hard bank mods	HMB	Line
	Soft bank mods**	SMB	Line
Riparian	Overhanging trees	OH	Line
	Tunnel vegetation	TV	Line
	Bank erosion	Er	Line
	Poaching	Pc	Line
	Overhanging bank	OB	Line
Pollution inputs	Diffuse pollution source	DP	Polygon
	Diffuse pollution input	DP	Point/Line

A1.2. Data recorded on form of modifications and composition

Feature Class	Composition	Code
Hard bank modification (Reinforcement)	Brick (Br)	Br
	Concrete (Cc)	Cc
	Stone (St)	St
	Riprap	RR
	Gabion	Ga
	Tipped Debris	TD
Soft Bank Modifications	Realigned	Ra
	Resectioned	Rs
	Embankment	Emb
	Over widened	OW